CENTRAL COALFIELDS LIMITED (CCL)

MINING PLAN AND MINE CLOSURE PLAN OF KOTRE BASANTPUR PACHMO (PROJECT AREA-1162.87 HA, RATED CAPACITY-5.0MTY)

WEST BOKARO COALFIELDS

DIST – RAMGARH & BOKARO (JHARKHAND)

[TEXT & PLANS]

JUNE 2021

REGIONAL INSTITUTE-III
CENTRAL MINE PLANNING & DESIGN INSTITUTE LIMITED
(A Subsidiary of Coal India Limited)
GONDWANA PLACE, KANKE ROAD, RANCHI – 834 008,
JHARKHAND, INDIA

राजीब हुई / RAJIB HUI
परियोजना पदाधिकारी / PROJECT OFFICER
कोतरे बसंतपुर पंचमो कोल परियोजना
Kotre Basantpur Pachmo Coal Mine
सी०सी०एल०, राँची / C.C.L., Ranchi

INDEX OF CHAPTERS OF THE MINING PLAN (INCLUDING MINE CLOSURE PLAN)

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LIST OF PLATES

Sl. No.	Particulars	Scale
MINING		
1.	Key Land use Plan	1: 6000
2.	Final Stage Dump Plan	1: 6000
3.	Post Mining Land Use Plan	1: 6000

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SUMMARISED DATA

Sl. No.	Particulars	Unit	Value
A.	**GENERAL**		
1	Name of Project		**Kotre Basantpur Pachmo OCP**
2	Name of Area / Company		Central Coalfield Ltd.
3	Nearest Railway Station from project	Name	Dania Railway Station
		km	4
4	Nearest National / State Highway / Approach Road	Name	NH 33
		km	15

B.	**GEOLOGICAL**				
1	Name of geological blocks considered	Name	Kotre Basantpur	Pachmo	Total
2	Area of the geological blocks	sq. km	3.75	2.70	6.45
3	Borehole Density within blocks	BHs / sq.km	21.07	19.26	20.31
4	Description of all coal seams within block				

Stratigraphic Sequence	*Thickness (m)*	*Net Geological Reserves (MT)*	*Remarks*
XIII	1.29 - 4.54	1.201	-
XII	1.10 - 2.86	1.752	-
XI	2.48 - 5.20	4.669	-
X	1.00 - 6.63	9.293	-
IX	1.00 - 2.88	4.232	-
VIII C	1.00 - 1.40	0.365	-
VIII B	1.00 - 1.50	1.161	-
VIII A	1.00 - 1.60	0.644	-
VIII	1.30 - 3.45	9.378	-
VI/VII	4.80 - 9.66	34.722	-
VA	1.72 - 7.40	26.077	-
V	1.19 - 9.65	36.780	-
IV	1.00 - 7.40	34.035	-
III	1.00 - 8.17	25.848	-
IIA	1.00 - 4.80	6.615	-
II Top	1.00 - 7.63	5.960	-
II Bot	1.00 - 6.41	7.181	-
II	1.00 - 12.45	22.023	-
I	0.15-3.98	9.457	Not opencast able. About 44% reserve in Indicated
Local	0.10-3.78	8.998	Not opencast able. About 48% reserve in Indicated
'O'	0.40-3.85	-	Reserve not assessed in GR.
TOTAL		**250.391**	

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Sl. No.	Particulars	Unit	Value
C.	TECHNICAL		
1	Area of the proposed mine block (only the quarry area)	sq. km	6.29
2	Borehole density within mine area	BHs/sq. km	20
3	Mine parameters Extent along strike (min. – max.) Extent along dip (min. - max.)	m	 800 – 5500 500 – 1200
4	**Description of coal seams proposed to be worked along with the parting details**		

Name of seam/ Parting	Thickness range considered (m)	Av. Thickness / Parting Thickness (m)	Avg Ash %	Avg Grade	Mineable Reserve (MT)	Volume of OB (Mcum)
Top OB	4.65 - 70.02	27.36				78.66
Seam XIII	0.45 - 4.71	2.45	31.74	W IV	0.59	
Parting XIII - XII	2.31 - 31.2	10.23				4.42
Seam XII	0.25 - 3.94	1.97	30.32	W IV	0.80	
Parting XII - XI	28.79 - 67.05	43.67				17.25
Seam XI	2.48 - 6.38	3.96	34.44	W IV	2.91	
Parting XI - X	24.09 - 49.79	36.02				30.11
Seam X	0.45 - 6.63	4.31	29.74	W IV	5.92	
Parting X - IX	10.34 - 51.36	20.97				31.57
Seam IX	0.13 - 2.88	1.62	32.58	W IV	3.12	
Parting IX - VIII/VIII C	4.8 - 25.66	19.12				85.23
Seam VIII C	0.26 - 2.14	0.93	31.01	W IV	0.35	
Parting VIII C - VIII B	7 - 32.82	22.26				19.74
Seam VIII B	0.12 - 1.85	0.97	29.73	W IV	0.79	
Parting VIII B - VIII A	3.27 - 17.21	10.62				8.90
Seam VIII A	0.15 - 1.6	0.86	38.66	UG	0.63	

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Name of seam/ Parting	Thickness range considered (m)	Av. Thickness / Parting Thickness (m)	Avg Ash %	Avg Grade	Mineable Reserve (MT)	Volume of OB (Mcum)
Parting VIII A - VIII	4.32 - 28.89	16.65				16.06
Seam VIII	0.59 - 4.65	2.26	30.61	W IV	6.42	
Parting VIII - VI/VII	32.11 - 63.68	50.05				136.49
Seam VI/VII	3.28 - 9.66	6.59	24.77	W III	26.80	
Parting VI/VII - VA	1.04 - 5.53	2.13				6.84
Seam VA	0.98 - 9.03	4.37	27.09	W III	17.17	
Parting VA - V	5.49 - 39.94	20.22				70.87
Seam V	0.66 - 9.65	5.20	32.07	W IV	22.69	
Parting V - IV	4.97 - 25.95	14.16				47.44
Seam IV	0.25 - 8.39	4.62	31.61	W IV	20.20	
Parting IV - III	2.4 - 39.44	22.48				82.05
Seam III	0.09 - 8.17	3.20	34.4	W IV	15.67	
Parting III - IIA	11.9 - 30.9	17.74				23.54
Seam IIA	0.1 - 4.8	2.30	38.85	UG	3.27	
Parting IIA - II top	4.71 - 13.9	9.81				11.74
Seam II Top	0.71 - 3.33	2.01	36.36	UG	2.86	
Parting II Top - II Bot	0.62 - 7.66	2.75				1.76
Seam II Bot	0.97 - 5.2	2.64	40.32	UG	3.66	
Parting III – II comb	9.35 - 37.93	22.10				45.90
Seam II	0.1 - 12.45	4.85	39.72	UG	15.80	
Total Coal					**149.65**	
OB						**718.57**

Sl. No.	Particulars	Unit	Value
5	Av. Stripping Ratio	m^3/te	**4.80**
6	Method of Mining		By Shovel Dumper Combination
	Target Output	MTY	5.00

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Sl. No.	Particulars	Unit	Value
7	Production capacity (at 125%)	MTY	NA
	Production capacity (at 85%)	MTY	NA
8	Year of achieving Target Production	Year	6th
9	Year of start of Internal Dumping	Year	5th

10	Production Phasing (date upto target year)		MT			
Year	*1*	*2*	*3*	*4*	*5*	*6*
Coal (MT)	Construction period		0.40	1.50	3.00	5.00
OB (Mcum)			1.31	5.73	10.91	18.45

11	Total Mine Life	Years	35
	Pre-construction period	Years	0
	Construction period	Years	2
	Production build-up period	Years	3
	Production period	Years	28
	Tapering / mine closure period	Years	2
12	**Major HEMM Deployed (Max)**	**Unit**	**No.**
	Diesel Hydraulic Shovel	10-12 Cum	6
	Diesel Hydraulic Shovel	5.5-6.5 Cum	5
	Diesel Hydraulic Backhoe	4.3-5.0 Cum	1
	Rear Dumper	100 T	55
	Rear Dumper	60 T	53
	Diesel RBH Drill	250 mm	6
	Diesel RBH Drill	160 mm	7
	Dozer	410 HP	5
	Dozer with Ripper Attachment	410 HP	3
	Dozer	700-880 HP	7
13	Total Manpower (Peak) CCL/MDO	Nos	98/1004

Sl. No.	Particulars	Unit	Value
14	Presence of Major Surface Constraints (nallas, road, power line, etc.)	Nalas & Nadi	Chutua nala in the South and Baghraiya nala in south-east.
15	Coal Transport within the mine (In-pit belt conveying system or by Truck)		Dumper, In-pit belt conveyor and HAC

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16	Surface Coal Transport to Siding/Despatch Point and Mode of Despatch		By conveyor to nearby Washery (existing/ upcoming).
17	Name of any Specific Customer/Industry		Basket linkage

D.	ENVIRONMENTAL & OTHERS

Sl. No.	Particulars	Unit	Value
1	Total Land required Land acquired Total Land to be acquired Non-Forest land Forest land	Ha	1162.87 0.00 1162.87 156.70 1006.17
2	Land to be acquired within minetake area (excavation area) Non-Forest land Forest land	Ha	629.60
3	Land to be acquired outside minetake area (Beyond Excavation Area, such as Approach Road, Infrastructure, Colony, nala diverson etc.)	Ha	219.75
4	Land to be acquired for external dumping	Ha	313.52
5	Habitation & Rehabilitation No. of villages within mine boundary No. of PAFs to be rehabilitated	Nos.	 8 1000
6	Drainage of the Area (Name of river/nala)		Chutua nala, a prominent tributary to Bokaro River, flows roughly west to east near the southern boundary. North to south flowing Pachmo nala, Kotre nala and Jhumra nala joins Chutua nala in the area. To the east of Pachmo nala, another prominent nala, Baghraiya nala flows from north to south.

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E.	FINANCE		Unit	Values
1	Total Capital Investment	Upto Target	Rs. crores	548.41
		Beyond Target		76.99
		Total		625.40
2	Estimated Cost of Production at 100% production level		Rs. / tonne	1567.53
3	Estimated average selling price		Rs. / tonne	2524.25
4	Estimated Profit at 100% production level		Rs. / tonne	956.72
5	Financial Internal rate of return (FIRR) at 100% production level		%	38.56%

*Cost of Production, Average selling price and Profit /Loss data is taken from "Project Report for Kotre Basantpur Pachmo OCP (5.0 MTY), MDO Mode".

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CHAPTER 1: PROJECT INFORMATION

	Parameters	*Details*
1.1	**INTRODUCTION**	
1.1.1	Name of Coal Block	Kotre Basantpur & Pachmo (KBP)
1.1.2	Name of the Coalfield	West Bokaro Coalfield
1.1.3	Base date of Mining Plan/ Mine Closure Plan	June 2021
1.1.4	Linked End Use Plant	Kedla Washery
1.1.5	Distance of End use plant from the pit head of the project in "km"	0.4 km
1.1.6	Mode of Coal Transport	Conveyor belt, Railway

1.2 LOCATION, TOPOGRAPHY AND & COMMUNICATION

1.2.1	Location of coal deposit (District and State)	District-Ramgarh and Bokaro , State-Jharkhand
1.2.2	Communication: PWD roads, railway lines, Air	Kotre-Basantpur block is connected to National Highway No. 33 between Ranchi and Hazaribagh by an all- weather metalled road leading from Charhi to Kedla washery. This road terminates in the south-western corner of the block near Kedla washery. The block is also connected by few Kutcha seasonal roads. However, an all- weather road connection to the interior of the block does not exist. Pachmo block lies adjacent to Kotre-Basantpur block in the east. Their common boundary falls in Pachmo nala. The block is approachable by a 2 km long dry weather Kutcha road from Loiyo-Charhi metalled road near Ichakdih village. This road crosses Chutua Nala immediately east of Ichakdih village. The block is also connected by a few Kutcha seasonal roads. The office of the General Manager, Hazaribagh Area of CCL at Charhi, is located at a distance of about 15km from the south west corner of Kotre-Basantpur block. The Dania Railway station is about 4 kms from the eastern boundary of the block. It is located near the foothill of the Lugu hill in the North- Eastern part of the West Bokaro Coalfields on Gomoh Barkakana loop line of the East Central Zone of Indian Railways.The block is about 40km from Hazaribagh & about 95km from Ranchi via Charhi. The nearest commercial airport is situated at Ranchi.
1.2.3	Availability of power supply and water requirement	Nearest source of power for the Project is Naisarai Substation of DVC. There is a switching station at Ghato from where a double circuit feeder at 33 kV may be drawn to provide power to Kotre Basantpur Pachmo OCP. The power consumption details are as given below. 1. Max. Demand- 8950 KVA 2. Total annual consumption=38.86 MkWh Water requirement:

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	Parameters	Details
		1. Industrial water demand is 0.249 MGPD 2. Domestic water demand is 0.123 MGPD Source of water for potable and industrial use will be existing nadi, nalas or mine water.
1.2.4	Prominent physiographic features, drainage pattern, natural water courses, rainfall data, highest flood level	The topography of the area is more or less flat with gentle undulations which at times is dissected by ravines and gullies at places. There are numerous seasonal nalas emerging from the high range (Hazaribagh plateau) which flow mostly towards south and forms prominent nalas and meet the major nalas of the block. The area to the north of blocks are marked by metamorphics. The ground elevation varies from 305m (in the south) to 365m (in the north). The general elevation varies from 330 to 350m in the area and the general slope of the ground is towards south. The climate is tropical with severe summer. The temperature during summer (March to June) goes as high as 45°C. The summer days are hot with dusty winds but nights are generally pleasant. The minimum summer temperature is around 20°C. The winters (November to February) are cold and the minimum temperature recorded is 4°C. The rainy season is generally from June to October. The total rainfall in a year on an average is about 1200 mm of which about 80% of the precipitation is during rainy season. Chutua nala, a prominent tributary to Bokaro River, flows roughly west to east near the southern boundary. North to south flowing Pachmo nala, Kotre nala and Jhumra nala joins Chutua nala in the area. To the east of Pachmo nala, another prominent nala, Baghraiya nala flows from north to south. It meets Baghlata nala in the south east of the area which finally joins Bokaro River. The Chutua nala is more or less perennial in nature for a major part of the year except for hot summer days. Rest nalas of the block become dry during summer season but they experience flash floods during rainy season. Drainage of the block is mainly controlled by Chutua nala and to some extent by Baghlata nala. Both of these nala ultimately discharges the total run-off to Bokaro River in the east of the block at a distance of more than 2.0 km. The easterly flowing Bokaro River is the major drainage and perennial source of water for the area. The HFL of the Chutua nala as recorded in the vicinity of the Kedla UGP project is 332.18 m above MSL (As on 26.09.1978) (nearby RL is ranges from 336.0 m to 340.0 m.

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	Parameters	Details
1.2.5	Important surface features within the project area and major diversion or shifting involved	The Kotre-Basantpur and Pachmo blocks lie between Hazaribagh plateau in the north and Damodar valley in the south. The Lugu hill (peak 976m), is 10km to the south-east. The topography of the area is more or less flat with gentle undulations which at times is dissected by ravines and gullies at places. The ground elevation varies from 305m (in the south) to 365m (in the north). The general elevation varies from 330m to 350m in the area and the general slope of the ground is towards south. There are numerous seasonal nalas emerging from the high range (Hazaribagh plateau) which flow mostly towards south and forms prominent nalas and meet the major nalas of the block. Major nalas flowing within the project boundary and needs to be diverted are Kotre nala, Jhumra nala, Pachmo nala, Baghraiya nala. This project involves R&R of 7 villages namely- Basantpur, Pachanda, Purnapani, Hurdag, pachmo, Rahawan and Bhagharia. Actual no. of habitants requiring R&R is yet to be Finalized. However, as per the Census data of 2011, it has been roughly estimated that approximately 1000 families fall within the proposed project area, requiring R&R.

1.3 DETAILS OF THE ALLOTTMENT AGREEMENT

1.3.1	Name the Allottee	-NA-
1.3.2	Details of allotment/vesting order	-
1.3.3	Name and address of the applicant	-
1.3.4	Name of the Previous allottee of the Block	-
1.3.5	Starting Date of the Mine as per CMDPA	-
1.3.6	Rated Capacity as per CMDPA	-
1.3.7	Production Schedule as per opening permission (meeting provisions of CMDPA if any)	-
1.3.8	End Use of Coal as per allotment order if any	-
1.3.9	Cardinal Points co-ordinates of the Block boundary	-

1.4 DETAILS OF THE PREVIOUS APPROVAL OF MINING PLAN

1.4.1	Date of Approval	-NA-
1.4.2	Conditions, if any	-
1.4.3	Scheduled year of start of production	-
1.4.4	Proposed year of achieving the targeted production	-

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	Parameters	Details
1.4.5	Date of actual commencement of mining operations, if operations already started	-
1.4.6	Likely date of mining operations, if operations not yet started & reasons for non-commencement of operations	-
1.4.7	Planned production and actual levels achieved in last 3 years (Coal in Mte, OB in MM^3, SR in MM^3/te)	-
1.4.8	Statutory obligations vis-à-vis compliance status in a tabular form	-
1.4.9	Reasons for difference between the planned and actual production levels	

1.5 PARAMETERS OF APPROVED MINING PLAN VIS-À-VIS PROPOSED MINING PLAN

		Approved Mining Plan	Proposed Mining Plan
1.5.1	Block Area in "Ha"	645	645
1.5.2	Block Area Projectised "Ha"	645	645
1.5.3	Lease area "Ha"		
1.5.4	Project Area "Ha"	1162.87	1162.87
1.5.5	Life of the Project "Yrs"	35	35
1.5.6	Minimum and Maximum Depth of working "m"	10 m-285 m	10 m-285 m
1.5.7	Net Geological Block "Ha"	645	645
1.5.8	Production Target "MTPA"	5	5
1.5.9	Seams Available "As per GR"	1. XIII 2. XII 3. XI 4. X 5. IX 6. VIII C 7. VIII B 8. VIII A 9. VIII 10. VI/VII	Top to bottom 1. XIII 2. XII 3. XI 4. X 5. IX 6. VIII C 7. VIII B 8. VIII A

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	Parameters	Details	
		11. VA 12. V 13. IV 14. III 15. IIA 16. II Top 17. II Bot 18. II 19. I 20. Local 21. 'O'	9. VIII 10. VI/VII 11. VA 12. V 13. IV 14. III 15. IIA 16. II Top 17. II Bot 18. II 19. I 20. Local 21. 'O'
1.5.10	Seams not considered for Mining with Reasons	Seam 1, Seam 0 and Seam "Local" Seam O: due to presence of numerous strike and oblique faults. Seam 1: Inferior in quality and erratic in thickness. Seam L: Presence of very small patch of this seam.	
1.5.11	Gross Geological Reserve "Mt"	-	-
1.5.12	Net Geological Reserve "Mt"	250.39 Mt	
1.5.13	Blocked Reserve "Mt"	96.768 Mt	100.748
1.5.14	Minable Reserve "Mt"	153.63 Mt	149.65 Mt
1.5.15	Extractable Reserves "Mt"	153.63 Mt	149.65 Mt
1.5.16	% of Extraction/ recovery	100%	100%
1.5.17	Reserve Depleted (till the base date) Reserves " Mt"	Nil	Nil
1.5.18	Balance Extractable reserve "Mt"	153.63 Mt	149.65 Mt
1.5.19	Average Grade	Washery grade IV	
1.5.20	OB in MM3	734.53	718.57
1.5.21	SR MM3/te	4.78	4.80
1.5.22	Mining Technology	shovel-dumper mining system has been envisaged for working this OC mine.	
1.5.23	Coal Beneficiation envisaged	Kedla Washery and upcoming Tapin Washery	
1.5.24	Land use pattern " Ha"		
1	Excavation Area	651.61	629.60
2	Top Soil Dump		
3	External Dump	379.82	313.52
4	Safety Zone	19.27	10.58

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	Parameters	Details	
5	Other Use (Nala Diversion, embankment, road	23.51	43.73
6	Infrastructure area	38.44	27.84
7	Green Belt	50.21	137.60
	Total	1162.87	1162.87
1.5.26	**Reasons for revision**		
As per the technical report for Nala diversion of 4 seasonal nalas flowing within the project boundary, around 20.17 Ha. of project area is to be adjusted for nala diversion route. The land for nala diversion route has been adjusted from proposed quarry and external dump, and hence the mining plan has been revised.			

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	Parameters	*Details*	
2.1	**DETAILS OF THE BLOCK**		
2.1.1	Particulars of adjacent blocks: North, South, East, West	**North:** N.A **South:** Jharkhand Block	**East:** Lalgarh Block **West:** Parej Block
2.1.2	Location of the Block District / State	District-Ramgarh and Bokaro	State- Jharkhand
2.1.3	Area of the Block "Ha"	645	
2.1.4	Area of the geological block projectized "in Ha" (Area of the geological block considered for liquidation of coal reserve)	645	
2.1.5	Balance area yet to be projectized "Ha"	-	
2.1.6	Likely Reserve in the area yet to be projectized "Mte"	-	
2.1.7	Cardinal Point Co-ordinates of the non-coal/lignite bearing area/**existing mining lease** outside the allotted Geological Coal/Lignite block (Duly certified in line with para 1.9 of the Guideline, if fresh inning lease required)	This project is bounded by the latitudes 23°48'12" Nto 23°50'38.53" N and longitudes 85°34'11" to 85°37'55.65".	
2.1.8	Certificate of **Qualified person/ Accredited Mining Plan preparing agency (MPPA)**if the project area is confined within the vested/allotted block boundary/**existing mining lease** and Where the project area extends beyond the block boundary, a certificate of **Qualified person/ Accredited Mining Plan preparing agency (MPPA)**should be supported with a certificate of State Government mines and Geology department must be attached, which should specify (a) intent of the state government for grant of lease beyond the vested geological boundary; (b) non-existence of Coal/ Lignite in the area beyond the vested/allotted geological block boundary/**existing mining lease** to rule out the issue of encroachment and use of coal bearing area (beyond the vested/allotted block boundary/**existing mining lease**) in the mining plan	-	

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	Parameters	Details
	The Project area, Lease area and geological block area in "Ha" shall also be envisaged.	
2.1.9	KML file of the Proposed lease area, Project Area and geological block.	Enclosed as Annexure-
2.1.10	Whether the proposed project area is confined within the allotted block boundary/**existing mining lease**, if not, the reason for deviation from allotted block boundary, may be given.	yes
2.1.11	If the project area extends outside the allotted block boundary/**existing mining lease**, confirmation about non-occurrence of coal/lignite in the area under reference needs to be furnished	-
2.1.12	Type of the Project (Operating / under Implementation) and year of Starting.	Greenfield Project and production will start from 3rd year.
2.2	**EXPLORATION, GEOLOGY AND ASSESSMENT OF RESERVE**	
2.2.1	Regional geological set up of the area, local geology, structure, stratigraphic sequence, characteristics of the litho-logical units (coal seams /partings/overburden).	**Regional Stratigraphy:** The west Bokaro Coalfields covering an area of 207 sq.km is the 4th in alignment from east among the Damodar Valley Group of Coalfields, after Raniganj Jharia and East Bokaro. This coalfield is about 60 km. North-east of Ranchi Township and situated in Hazaribagh District of Jharkhand. The Coalfileds is separated from the East Bokaro coalfield by the famous Lugu Hill (978.40 metre) and in the west from North Karanpura Coalfields by a narrow stretch of metamprphics having several outliers of Talchir Formation. The Coalfield has complete sequence of Lower Gondwana formations, which rests unconformably over the pre-Cambrian basement. The maximum width of 11 km. of the coalfield in the west gradually narrows down to about 3.2 km near the base of the Lugu Hill. This tapering nature of the basin in the east is primarily on account of two boundary faults trending along the southern and northern boundaries of the coalfield. The generalized stratigraphic sequence of West Bokaro Coalfield as established till date is as under: **Geological Succession of west Bokaro Coalfield**

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	Parameters	Details

Period	Group/Sub-Group	Formation	Lithology
1.	2.	3.	4.
Recent	-	Alluvium	Soil and Sub-soil.
Jurassic	Co-heavals of Rajmahal trap.	Igneous intrusives	Dolerites, mica-peridotites and Lamprophyres.
Upper Permian to Lower Triassic	Lower Gondwana (Damuda Sub-Group)	Panchet (450m)	Fine to coarse grained bedded sandstones and greenish shales.
Upper Permian		Raniganj (250-400m)	Fine to medium grained white to buff coloured sandstones, grey shales with thin uneconomical coaly horizons.
Middle Permian		Barren Measures (250-600m)	Carbonaceous to micaceous shales with siderite lenses and alternating compact ferruginous sandstone with coal streaks at places.
Lower Permian		Barakar (250-600 m).	Coarse to fine grained sandstones, pebbly conglomerates, gritty sandstones, grey shales,

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	Parameters	Details

			carbonaceous shales and coal seams.
Permo Carbonifero us		Karharbari (50-100m)	Arkosic sandstones, grey shales and coal seams
Permo Carbonifero us		Talchir (180m.)	Boulder bed, dark to light grayish fine grained sandstones and greenish shales
----------Unconformity ----------			
Pre Cambrian			Granite gneisses, pegmatites, phyllites, mica schists, amphibolites and quartzites.

The Barakars and Karharbaris are the coal bearing formations of this coalfield. The Barakars are well developed in this coalfield and can be broadly grouped into three divisions based on lithological characteristics. They are, Lower, Middle and upper Barakars containing potential coal seams of the coalfield. The Karharbari Formation contains only one coal seam called "O" seam. The Talchir Formation is best developed in the western part of the basin. The Barren Measures and Raniganj Formation occur in restricted patches in the southern and northern part of the coalfield.

The Barakar Formation contains thirteen main coal seams designated as I to XIII in ascending order, besides above, there are number of thin coaly horizons which attain workable thickness in certain parts of the coalfield and have been named A, B, C of the main seams, like VIIA, VIIB, VIIC, VIIIA, VIIIB, VIIIC etc. Such coaly horizons number as high as 15. Thus, there are total 28 (13+15)

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	Parameters	Details
		standard coal horizons present in Barakar Formation on regional basis.

2.2.2

Geology:

The Basantpur-Kotre and Pachmo Block combined having an area of 6.45 sq. km. is located in the northern part of the coalfield and falls in the Ramgarh Dist. and Bokaro district of Jharkhand respectively. Both the blocks covered by Survey of India toposheet No.73 E/9 (1:50000). Geological Report on Kotre-Basantpur Block, West Bokaro Coalfield" prepared by CMPDI in Feb 1997 and "Geological Report on Pachmo Block, West Bokaro Coalfield" prepared by CMPDI in Sep 1998.

2.2.2.1 Exploration Status

In total 172 boreholes (100 in Kotre Basantpur & 72 in Pachmo Block) have been drilled in different phases from 1963 to 1995. Total meterage of 35054.23m by various agencies. The borehole density of the Kotre-Basantpur and Pachmo Geological Blocks are as follows:

Block	Area (sq km)	No of Boreholes	BH Density
Kotre-Basantpur	3.75	79	21.07
Pachmo	2.70	52	19.26
Overall	6.45	131	20.31

The Basantpur-Kotre and Pachmo blocks are situated on the northern limb of the prominent northern syncline of the West Bokaro Coalfield. The axial region of the synclinal structure roughly passes in East-West direction. This axial region extends to Pachmo block in the South Western part of the block. The reversal of dips has been observed on the basis of borehole data. This data includes Borehole nos. CMB-43 & 71, CMPM-23, 5 & 16 in Pachmo block. In Kotre-Basantpur Block these boreholes are located in 3 pockets in the southern part of the block. These pockets are around WBKB-9, CMB-39, 43 & 71 CMB-40, 65 & 100 and CMB-60, 97 & 98.

2.2.2.2 Deposit Structure

The strike of the formation in Kotre-Basantpur block is broadly E-W with southerly dip of about 8-18° (1 in 3 to 1 in 7) in major part of the property. However, the dip near the southern part of the block is northerly. In the eastern part of Kotre-Basantpur falls Pachmo block. This block exhibits gentle warp having almost E-W strike in the north-west. Towards the center the strike swings to a NW-SE trend which finally once again swing to an E-W trend in the eastern corner of the block beyond Baghraiya nala. The dip in Pachmo Block generally ranges from 8° to 25° (1 in 2 to 1 in 7). However, the dip in major part of the block varies from 10° to 15° (1 in 4 to 1 in 6). Kotre-Basantpur block is characterized by moderate structure. Kotre-Basantpur has

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Parameters	Details

9 faults with throw varying from 5m-150m. Out of these faults $F1_c$, F2 and F14 are major faults. The Pachmo block on the other hand is characterized by a fairly simple structure with only 7 faults of throw varying from 5m to 300m. Out of these faults 4 faults (F1, F3, F6 & F7) are seen to continue into the Pachmo Block from the adjoining Kotre-Basantpur block.

2.2.2.3 Stratigraphic sequence

Stratigraphic sequence of Basantpur-Kotre and Pachmo Block Combined

2.2.2.4 Sequence of Coal Seams and Parting

The youngest coal seam XIII, due to structural disposition has been encountered only in few boreholes. Among the younger seams, Seam X and XI are comparatively thick with thin intervening parting. The seam incrop has a strike length of about 1 km in sector D and is potential for opencast mining in the block. Below seam X a number of thin seams having a thickness of about 1m occur. Seam VIII is most potential from thickness and quality point of view. Seam VA, IV and III are potential seams of West Bokaro Coalfield and are attractive from quarriable point of view. Due to structural disposition however, in Basantpur Kotre the opencast potentiality of these seams have been considerably reduced. Seam III and I are inferior in quality and erratic in thickness. The only seam available in Karharbari formation i.e. seam O has a thickness of around 3-4 m in Basantpur-Kotre block. Though the quality of the seam is better, its potentiality in Basantpur-Kotre block is restricted due to presence of numerous strike and oblique faults.
The sequence of coal seams and partings as established in the block are given in the following table:

Sequence of coal seams and partings in Kotre-Basantpur & Pachmo blocks

Formation	Lithological Units	Drilled thickness Range
Alluvium	Sandy Soil	22.60-24.00 meters
Barren Measures (Found Mainly in Kotre-Basantpur Block)	Grey shale, Carb/Sandy Shales with thin coal bands& Iron stone shales	110m
Barakar Formation	Medium to coarse grained sandstone pebbly in the lower portion with shale sandy shale & coal seams	413.00-430.00m

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Parameters	Details	
Kharharbari Formation	Mainly arkosic sandstone pebbly sandstone, thin coal band one coal seam.	75-161m
----------Unconformity----------		
Pre-Cambrian/Metamorphics	Granite Gneiss, Chlorite, mica schist, quartzite, pegmatites etc	Encountered at depth range of 9.45m to 176.95m

Seam Name	Thickness Range (m.)		Generalised Range (m)	Remarks
	Min. (Bh No.)	Max. (Bh No.)		
XIII	1.29	4.54	2-4	Faulted-3Bhs
	(CMB-40)	(CMB-31)		
Parting	4.15	31.20	5-15	
	(CMB-31)	(CMB-98)		
XII	0.82	2.86	2-2.5	Faulted-3bhs
	(CMB-31)	(CMB-98)		
Parting	2.60	21.94	5-15	
	(CMB-97)	(CMB-60)		
XIA	0.15	2.10	0.15-0.90	Faulted-3bhs, Not dev.-3bhs
	(CMB-43)	(CMB-97)		
Parting	2.80	34.84	6-25	
	(CMB-23)	(CMB-97)		
XI	2.48	4.52	3-4	Faulted-2bhs
	(CMB-100)	(CMB-71)		
Parting	2.80	37.16	6-25	
	(CMB-23)	(CMB-39)		
XA	0.30	1.28	0.4-1.0	Faulted-3bhs, Not dev.-2bhs
	(WBKB-9)	(CMB-40)		
Parting	12.05	28.78	20-27	
	(CMB-57)	(NCWBK-37)		
X	0.45	6.63	3-6	Faulted-3bhs
	(CMB-57)	(CMPM-16)		
Parting	2.40	14.48	4-10	
	(CMPM-23)	(CMB-57)		

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Parameters			Details	
IXA	0.10	1.17	0.5-1.0	Faulted-3bhs, Not dev.-6bhs, Carbshale-1bh
	(CMPM-22)	(CMB-60)		
Parting	2.93	23.65	8-15	
	(CMB-57)	(CMPM-10)		
IX	0.13	2.88	1-2.50	Faulted-1 bh, Not dev.-1 bh
	(CMB-97)	(CMB-35)		
Parting	4.80	25.66	15-24.0	
	(CMPM-44)	(CMPM-1)		
VIIIC	0.26	2.14	0.7-1.20	Faulted-1hb, Not dev. 3bhs
	(CMPM-07)	(CMB-24)		
Parting	9.85	32.82	15-30	
	(CMB-64)	(CMPM-23)		
VIIIB	0.12	1.85	0.7-1.50	Faulted-1bh, Not dev-2bhs
	(CMB-37)	(WBKB-03)		
Parting	3.27	17.21	10-12	
	(CMB-57)	(CMB-64)		
VIIIA	0.15	3.50	0.5-1.20	Incrop-1bh, Not dev-1bh
	(CMPM-20)	(CMB-97)		
Parting	4.32	28.89	10-25.0	
	(CMB-24)	(CMPM-07)		
VIII	0.59	4.65	1.20-3.0	
	(CMPM-22)	(CMPM-23)		
Parting	2.20	31.47	8-15	
	(NCWBK-37)	(CMK-119)		
VIIC	0.13	1.91	0.50-1.00	Not. Dev-7bhs, Carb Shale-2bhs
	(CMB-39)	(CMPM-18)		
Parting	3.38	37.82	4.0-12.00	
	(CMB-50)	(CMB-24)		
VIIB	0.15	3.33	0.30-1.25	Not.Dev-21 Bhs, Incrop-1bh, Carbshale-5bhs
	(CMB-74)	(CMK-119)		
Parting	9.35	32.49	7.0-20.0	
	(CMB-96)	(CMPM-20)		
VIIA	0.20	2.00	0.5-1.0	Faulted-1bh, Not dev.-30bhs, Carbshale-1bhs(WBKB-3)
	(CMPM-08)	(CMB-41)		

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Parameters			Details	
Parting	0.58	6.65	1.50-3.50	
	(CMPM-04)	(CMPM-10)		
VII/VI COMB.	3.05	9.66	5.0-7.0	Faulted-1bh
	(CMK-119)	(CMB-42)		
VII/VI/VA COMB.	5.74	13.37	8.00-12.00	
	(CMPM-15)	(CMPM-23)		
Parting	1.04	4.38	1.5-2.50	
	(CMPM-06)	(CMB-57)		
VA	1.12	7.40	4.0-6.0	Faulted-1bh, Floor faulted-1bh, Incrop-3bhs
	(CMB-50)	(CMPM-10)		
Parting	5.49	46.51	9-35.0	
	(CMB-54)	(CMK-119)		
V	2.19	9.65	4-6.50	Faulted-3bhs, Weathered-1bh, Roof faulted-4bhs
	(CMB-13)	(CMB-42)		
Parting	4.97	24.91	8-20.0	
	(CMB-75)	(CMB-63)		
IV	0.25	8.39	4.0-6.0	Faulted-5bhs, Incrop-2bhs
	(CMB-37)	(CML-40)		
Parting	10.20	22.12	12-20	
	(CMPM-21)	(CMPM-08)		
IIIA	0.15	1.40	0.30-0.40	Not dev-16 bhs, Faulted-1bh
	(CMPM-20)	(CMPM-33)		
Parting	5.26	11.88	6.0-7.0	
	(CMPM-08)	(CMPM-21)		
III	0.09	8.17	2.0-5.0	Incrop-1bh, Not dev-1bh
	(CMB-30)	(CMB-62)		
Parting	11.90	30.90	15-20	
	(CMPM-30)	(CMPM-36)		
IIA	0.10	4.80	2-4	Not Dev-2bhs, Carbshale-1bh
	(CMPM-39)	(CMPM-20)		
II	0.26	12.45	5-7	Floor faulted-2bhs, Incrop-1bh Carbshale-1bh
	(CMB-96)	(CMB-70)		
Parting	4.45	8.75	3-8	

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Parameters		Details		
II TOP	0.71	7.63	1.50-3.0	Faulted-2bhs
	(CMB-33)	(CMB-72)		
Parting	0.43	5.17	1.50-3.50	
	(CMB-73)	(CMPM-24)		
II BOT	0.97	5.20	1.50-3.0	Faulted-2bhs
	(CMPM-13)	(CMPM-30)		
II(T+B)	1.07	6.41	2.00-4.00	
	(CMPM-21)	(CMPM-17)		
Parting	11.80	43.63	25.0-35.0	Parting taken with floor of II Bottom seam
	(CMPM-38)	(CMPM-21)		
I	0.15	6.57	0.5-3.0	Carbshale-6bhs, Faulted-1bh, Not.Dev-1bh
	(CMB-21)	(NCWBK-37)		
Parting	20.70	104.01	30-50	
	(CMB-94)	(NCWBK-37)		
LOCAL	0.10	3.78	1.5-2.5	Faulted-1bh, Not Dev-1bh
	(CMB-94)	(CMB-69)		
Parting	40.27	56.34	40-50	
	(CMB-64)	(NCWBK-37)		
SEAM 'O'	0.40	3.65	1.0-3.0	
	(CMB-85)	(CMB-70)		

2.2.2.5 Dip and Strike

The strike of the strata of Kotre-Basantpur block is broadly E-W with southerly dip of about 8-18° (1 in 3 to 1 in 7) in major part of the property. However, the dip near the southern part of the block is northerly. There is a prominent swing in the strike in north-western part of the block in vicinity of NCWBK-34, CMB-13, 15, 22, 23, 76, 78, 83, 87, 89, 92, 94 etc. depicting a major roll of the strata. Besides this, there are local swings in the strike which is mainly due to increase/decrease in the intervening partings between the coal seams. The gradient of the strata in major part of the block is generally 1 in 4 to 1 in 6 (9-14°). The steeper gradient of 1 in 3 (18°) is noticed in the vicinity of CMB-25, 35, 60 & 79.

In the eastern part of Kotre-Basantpur falls Pachmo block. This block exhibits gentle warp having almost E-W strike in the north-west. Towards the center the strike swings to a NW-SE trend which finally once again swing to an E-W trend in the eastern corner of the block beyond Baghraiya nala.

	Parameters	Details

The dip in Pachmo Block generally ranges from 8° to 25° (1 in 2 to 1 in 7). However, the dip in major part of the block varies from 10° to 15° (1 in 4 to 1 in 6). Steep gradient of 14° to 25° (1 in 2 to 1 in 4) is observed in northern, eastern and south-eastern parts near CMB-45, 72, 73, CMPM-31, 32, 27, 2, 33, 21, 17, 9, 11, 36, 13 and 41. Similar steepness is also observed in the vicinity of CMPM-4, 7 and 10.

2.2.2.6 Description of Coal Seams:

2.2.2.6.1 Important Coal Seams:

The Kotre-Basantpur & Pachmo blocks have complete sequence of coal seams occurring in Barakar & Karharbari formations. The 13 potential coal seams of the blocks are Seam 'Local' below seam I, Seam II, Seam III, Seam IV, Seam V, Seam VA, Seam VI/VII, Seam VIII, Seam IX, Seam X, Seam XI, Seam XII & Seam XIII. Among these, the most potential from the thickness & quality point of view are Seam IV, V, VA & VI/VII. The intervening parting between these seams is also less as compared to the other thick seams of the block. Hence, these seams are lucrative from the quarriability point of view also. Among the younger potential seams of the block seam X & XI are around 3.0-6.0 m thick while Seam VIII, IX, XII & XIII are thin having around 1.5-3.0 m thickness. Seam I & II are inferior but do show workability from thickness point of view in Pachmo block. In the same block these seams are inferior from quality point of view as are they in Kotre-Basantpur with added disadvantage of being erratic. In Pachmo, the including band Ash% of these seams goes as high as 48%. Washing these coals from here does not appear to be a profitable proposition. Hence, their grading has been done on the basis of UHV.

There is a local seam occurring between Seam 1 & '0' seam which has thickened in Kotre-Basantpur block having consistent thickness of normally 2m & is potential for underground exploitation.

In Karharbari formation, only one coal seam i.e. '0' seam occurs in both the blocks like the other blocks. Seam 0 is slightly superior to Seam I to III from quality point of view but is erratic in thickness and extent. So, does not appear to be potential for mining.

2.2.2.6.2 Description of Coal Seams of Pachmo and Basantpur-Kotre Combined

The shaly coals present within the coal seams have been considered as an economic constituent of the seam. This is mainly on account of the fact that coals on washing will yield cleans of around 17% ash and the shaly coals will yield middlings which are in great demand for the power houses. While deciphering the dirt bands within the coal seams, the bands having ash between 50% to 75% have been grouped as combustible and those with more than 75% ash as non-combustible bands, viz. grey shale, carbonaceous sandy shales, sandstones or any other extraneous bands present within the seam.

The coals of blocks are strongly caking in nature. There is a wide variation in the grade of coal seams which ranges from washery grade I to ungraded. Seam VI/VII being the thickest seam (normally 6 to 7m) of the block has an overall grade of W II/III. The next important seam from quality point of view is Seam VA (4 to 5m thick) with an average grade of W-II/III. The seams IV, V, VIII, IX, X, and XI have overall grade of W-IV seam III is WG-IV to ungraded. Seam I and II are inferior seams being high in ash% and have been graded on the basis of UHV values. Seam O is also WG-IV to marginally ungraded.

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	Parameters	Details
	There are altogether 30 coaly horizons in the Barakar & Karharbari formation. Only one Seam i.e. Seam 0, belongs to Karharbari formation. The 29 other seams belong to the Barakar. The important seams in the combined blocks are Seam IV, V, VA, VI/VII. These are thick seams & offer quarriable potentiality.	
2.2.3	Geological Block Area " Ha"	645
2.2.4	Status of Exploration of the block	Explored
2.2.5	Area covered by 'detailed' exploration within the block (sq. km)	-
2.2.6	Whether entire lease area has been covered by 'detailed' exploration.	yes
2.2.7	No. of boreholes drilled within the block	Total 126 boreholes (76 in Kotre Basantpur & 50 in Pachmo Block)
2.2.8	Whether any further exploration/study is required or suggested and time frame in which it is to be completed	A provision of 10-12 boreholes should be kept for drilling of About 1200m to meet the emergent requirement of additional information at the time of mining coal from the property in the incrop zone.
2.2.10	Overall borehole density within the block (no./ sq. km) approx	20.31
2.2.11	No of Seams available as per GR (Geological Report)	Top to Bottom 1. XIII 2. XII 3. XI 4. X 5. IX 6. VIII C 7. VIII B 8. VIII A 9. VIII 10. VI/VII 11. VA 12. V 13. IV 14. III 15. IIA 16. II Top 17. II Bot 18. II 19. I 20. Local 21. 'O'
	Seams not considered for Mining with Reasons	Seam 1, Seam 0 and Seam "Local" Seam O: due to presence of numerous strike and oblique faults. Seam 1: Inferior in quality and erratic in thickness.

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	Parameters	Details
2.2.12		Seam L: Presence of very small patch of this seam.
2.2.13	Dip of the Seam	The dip of Kotre Basantpur block ranges from 8-18° The dip in Pachmo Block ranges from 8° to 25°
2.2.14	**Seam wise thickness**	

Seam wise details of Geological Vis-à-vis Mineable Reserves

S N	Seam Name	Avg Thickness considered (m)	Thickness range (m)	Geological Reserve (MT)	Mineable Reserve (MT)
1	XIII	2.00	(1.29 - 4.54)	1.201	0.59
2	XII	2.00	(1.10 - 2.86)	1.752	0.80
3	XI	3.50	(2.48 - 5.20)	4.669	2.91
4	X	4.00	(1.00 - 6.63)	9.293	5.92
5	IX	2.00	(1.00 - 2.88)	4.232	3.12
6	VIII C	1.10	(1.00 - 1.40)	0.365	0.35
7	VIII B	1.20	(1.00 - 1.50)	1.161	0.79
8	VIII A	1.20	(1.00 - 1.60)	0.644	0.63
9	VIII	2.00	(1.30 - 3.45)	9.378	6.42
10	VI/VII	7.00	(4.80 - 9.66)	34.722	26.80
11	VA	4.50	(1.72 - 7.40)	26.077	17.17
12	V	5.00	(1.19 - 9.65)	36.780	22.69
13	IV	5.00	(1.00 - 7.40)	34.035	20.20
14	III	3.50	(1.00 - 8.17)	25.848	15.67
15	IIA	2.50	(1.00 - 4.80)	6.615	3.27
16	II Top	3.00	(1.00 - 7.63)	5.960	2.86
17	II Bot	3.00	(1.00 - 6.41)	7.181	3.66
18	II comb	6.00	(1.00 - 12.45)	22.023	15.80
19	I	-	(0.15 – 6.57)	9.457	-
20	Local	-	(0.10 – 3.78)	8.998	-
	TOTAL			250.398	149.65

2.2.15	Methodology of reserves estimation (also mention if any software package has been used).	MINEX software has been used for reserve estimation. Grade Wise, seam wise and Depth wise Tonnage of coal is calculated using the Detailed Resource Reporting module of MINEX software.
2.2.16	Average Grade	Washery grade IV
2.2.17	Gross Geological Reserve of the block "Mte"	-
2.2.18	Net Geological Reserve of the block "Mte"	250.391
2.2.19	Minable Reserve of the block "Mte"	149.65
2.2.20	Blocked Reserve "Mte	-
2.2.21	Corresponding extractable reserve of the block "Mte"	-

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	Parameters	Details
2.2.22	Percentage of Extraction	100%
2.2.23	Reserve already depleted (Base date of Mining Plan)	-
2.2.24	Balance Reserve (as on Base Date)	149.65

CHAPTER 3: MINING

	Parameters	Details
3.1	**MINING METHOD**	
3.1.1	Existing method of mining if the mine is under operation	Greenfield Project

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	Parameters	Details
3.1.2	Proposed method of mining with justification on suitability of method of mining	**Seams to be worked:** XIII, XII, XI, X, IX, VIIIC, VIIIB, VIIIA, VIII, VI/VII, VA, V, IV, III, IIA, II top,II Bot,II **Choice of mining method:** Considering the geo-mining conditions of the Kotre Basantpur Pachmo OCP viz. ➢ Gradient of seam floor, viz., 8° - 18° in Kotre-Basantpur & 8°- 25° in Pachmo block ➢ Multiple seams with variable thickness and ➢ Smooth, flexible and easy operation The method of mining proposed to be adopted to extract coal and OB in Kotre Basantpur Pachmo OCP will be open cast mining with shovel-dumper combination of mining systems. **Life of mine:** The mine life for nominal production is 35 years. It includes 2 years of construction period. The break-up of life of mine are as under:

Particulars	Years
Mine Life (Production period)	33 (Production period)
Construction period	2
Production build-up period	3
Production period	28
Tapering period	2
Total period (inc. Construction Period)	35

Mine Boundaries:

The mine boundary of the OCP has been fixed as follows:

East: The extent of eastern surface of the quarry has been fixed by keeping a minimum of 7.5m barrier from the eastern block boundary of Pachmo block as a barrier against adjoining Lalgarh Block.

West: The western floor boundary has been fixed along the incrop of Seam-II.

North: The northern floor boundary has been fixed along the fault F1.

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	Parameters	Details

South: In the south-western side, the surface boundary has been kept at the surface trace of fault F2 (near the Kotre-Basantpur block southern boundary). In the south-eastern side, the southern boundary has been kept along the surface trace of Fault F3, which also forms the southern block boundary of the Pachmo block.

Sequence of coal seam and parting

The details of sequence of coal seam with partings are given in the following table

Seam Sequence

Seam Name/ Parting	Thickness Range (m)		Average Thickness (m)
	From	To	
Soil	3.00	24.40	11.25
Top OB	1.65	45.62	16.11
Seam XIII	0.45	4.71	2.45
Parting XIII - XII	2.31	31.20	10.23
Seam XII	0.25	3.94	1.97
Parting XII - XI	28.79	67.05	43.67
Seam XI	2.48	6.38	3.96
Parting XI - X	24.09	49.79	36.02
Seam X	0.45	6.63	4.31
Parting X - IX	10.34	51.36	20.97
Seam IX	0.13	2.88	1.62
Parting IX - VIII C	4.80	25.66	19.12
Seam VIII C	0.26	2.14	0.93
Parting VIII C - VIII B	7.00	32.82	22.26
Seam VIII B	0.12	1.85	0.97
Parting VIII B - VIII A	3.27	17.21	10.62
Seam VIII A	0.15	1.60	0.86
Parting VIII A - VIII	4.32	28.89	16.65

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Parameters	Details			
	Seam VIII	0.59	4.65	2.26
	Parting VIII - VI/VII	32.11	63.68	50.05
	Seam VI/VII	3.28	9.66	6.59
	Parting VI/VII - VA	1.04	5.53	2.13
	Seam VA	0.98	9.03	4.37
	Parting VA - V	5.49	39.94	20.22
	Seam V	0.66	9.65	5.20
	Parting V - IV	4.97	25.95	14.16
	Seam IV	0.25	8.39	4.62
	Parting IV - III	2.40	39.44	22.48
	Seam III	0.09	8.17	3.20
	Parting III - IIA	11.90	30.90	17.74
	Seam IIA	0.10	4.80	2.30
	Parting IIA - II Top	4.71	13.90	9.81
	Seam II Top	0.71	3.33	2.01
	Parting II Top - II Bot	0.62	7.66	2.75
	Seam II Bot	0.97	5.20	2.64
	Parting III - II	9.35	37.93	22.10
	Seam II	0.10	12.45	4.85

Final Stage Mine Parameters:

Parameters	Unit	Minimum	Maximum
Dimensions of the quarry along strike (on floor)	m	800	5500
Depth of quarry	m	10	285
Dip rise length (on floor)	m	500	1200

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	Parameters	Details

Final Quarry Floor area	Sq.km	3.993
Final Quarry Surface area	Sq.km	6.29
Mineable reserves	(Mte)	149.65
Total OB	(Mcum)	718.57
Average Stripping Ratio	(cum/te)	4.80

Choice of technology:

Considering the geo-mining conditions of the Kotre Basantpur Pachmo OCP viz. Gradient of seam floor, viz., 8° - 18° in Kotre-Basantpur & 8° - 25° in Pachmo block Multiple seams with variable thickness and Smooth, flexible and easy operation Shovel-dumper combination has been proposed for mining the quarry.

Mining System & System Parameters

As the seams are steeply dipping, the mine will follow horizontal slicing method. The mining system has been depicted in the cross section of the mine.

The following mining parameters have been considered in the project.

Sl. No.	Particular	Unit	Value
1	OB Bench Height for 10-12 cum shovels	m	10-12
2	OB Bench Height for 5.5-6.5 cum shovels	m	8-10
3	Coal Bench Height for 10-12 cum shovels	m	10-12
4	Coal Bench Height for 5.5-6.5/4.3-5.0 cum shovels	m	8-10
5	Working bench width	m	40
6	Non - Working bench width	m	25
7	Bench Slope for OB and coal	Deg	70

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	Parameters	Details

8	Blast Hole dia for OB and coal	mm	250/160
9	Powder Factor in OB and coal	Kg/cum	0.3-0.4 & 0.2

Mine Scheduling and Calendar Programme of Excavation

The mining schedule has been formulated based upon the adopted sequence of mine development. Initial two years has been considered as construction period for the project. In the first two years, activities like land acquisition, construction work related to the rehabilitation of project affected people, and construction of infrastructure like, road, OH power line, diversion of nala, etc will take place. Based on the normative annual capacity of the mine as 5.0 MT, the proposed mining schedule is generated for 35 years of mine life.

The targeted coal production from the mine is envisaged in 6th year. The average stripping ratio is 4.80 cum/te. The summarized mining schedule for coal extraction and corresponding overburden load for the project, annual coal & OB production schedule has been provided in the tables below:

Summarized Mining Schedule

	Year	Coal Production (MT)	OB Removal (Mcum)	Stripping Ratio (cum/te)
Construction period	Y1	-	-	-
	Y2	-	-	-
Capacity build-up	Y3	0.40	1.31	3.28
	Y4	1.50	5.73	3.82
	Y5	3.00	10.91	3.64
Production	Y6	5.00	18.45	3.69
	Y7	5.00	21.10	4.22
	Y8	5.00	28.68	5.74
	Y9	5.00	28.68	5.74
	Y10	5.00	28.68	5.74
	Y11	5.00	28.68	5.74
	Y12	5.00	28.68	5.74

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	Parameters	Details				
			Y13	5.00	28.42	5.68
			Y14	5.00	27.82	5.56
			Y15	5.00	28.93	5.79
			Y16	5.00	28.78	5.76
			Y17	5.00	25.45	5.09
			Y18	5.00	24.57	4.91
			Y19	5.00	24.07	4.81
			Y20	5.00	23.02	4.60
			Y21	5.00	23.59	4.72
			Y22	5.00	23.59	4.72
			Y23	5.00	23.63	4.73
			Y24	5.00	26.01	5.20
			Y25	5.00	26.51	5.30
		Production	Y26	5.00	27.01	5.40
			Y27	5.00	27.01	5.40
			Y28	5.00	21.89	4.38
			Y29	5.00	20.53	4.11
			Y30	5.00	20.53	4.11
			Y31	5.00	18.96	3.79
			Y32	5.00	17.10	3.42
			Y33	5.00	17.10	3.42
		Tapering	Y34	3.00	6.31	2.10
			Y35	1.75	6.81	3.89
			Total	**149.65**	**718.57**	**4.80**

The envisaged requirements of HEMM are given below:

Equipment Schedule

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	Parameters	Details

HEMM	Capacity	Construction		Capacity build-up				Max
		1	2	3	4	5	6	
OB								
Diesel Hyd Shovel	10-12 Cum			0	1	2	3	6
Diesel Hyd Shovel	5.5-6.5 Cum			1	1	2	4	5
Rear Dumper	100 T				5	14	25	55
Rear Dumper	60 T			3	8	12	27	41
Diesel RBH Drill	250 mm			0	1	2	3	6
Diesel RBH Drill	160 mm			1	1	2	4	5
Dozer	700-880 HP				1	2	3	6
Dozer	410 HP			1	1	2	4	5
Coal								
Diesel Hyd Shovel	5.5-6.5 Cum			0	1	1	1	1
Diesel Hyd Backhoe	4.3-5.0 Cum			0	0	1	1	1
Rear Dumper	60 T			1	2	5	9	12
Diesel RBH Drill	160 mm			1	1	2	2	2
Dozer with Ripper Attachment	410 HP			1	2	3	3	3
Common								
Diesel Hyd Backhoe	4.3-5 Cum			1	1	1	1	1
Diesel Hyd Backhoe	2-3 Cum			1	1	1	1	1
FE Loader	5-6 Cum			1	1	1	1	1
Dump Truck	20 T			2	3	4	4	4
Drill	110-120 mm			1	1	1	1	1
Grader	250-280 HP			1	1	2	2	2
Wheel Dozer	460 HP			1	1	2	2	2
R T Crane	40T			1	1	1	1	1
R T Crane	20T			1	1	1	1	1
Mobile Crane	8-14T			1	1	1	1	1
Dozer with Ripper Attachment	850 HP			1	1	1	1	1
Tyre Handler	35 kN			1	1	1	1	1
Vibratory Compactor				1	1	1	1	
Water Sprinkler#	28KL			1	2	2	3	3
Reclamation								
Water Sprinkler	28 kL				1	1	2	2
Dozer	410 HP				1	1	2	2

The maximum number of HEMM will be required after 6th year (target year).

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	Parameters	Details
		Mining Method for Overburden Removal The OB benches along with major partings are proposed to be taken using two different shovel dumper configurations. The top OB and thick partings are proposed to be excavated by 10-12 cum diesel hydraulic shovel with 100T RD. Thinner partings are proposed to be excavated by 5.5-6.5cum diesel hydraulic shovels with 60T RD. For the estimation of the dumper population, the lead for OB transportation has been considered for each year and for each bench. **Mining Method for Coal Winning** For coal production, 5.5-6.5 cum diesel hydraulic shovel and 4.3-5.0 cum diesel hydraulic backhoe with 60T RD have been proposed. However, in thick coal seams, 10-12cum hydraulic shovels in conjunction with 100T RD will have to be utilised. This type of shovel will be shared from the HEMM provided for OB removal. Separate provision of this type of shovel and dumper has not been shown in coal production HEMM schedule. The balance capacity of 5.5-6.5 cum Hydraulic shovel shown in coal HEMM schedule will be utilised in OB removal. **Drilling & Blasting** The drilling and blasting operations for loosening of coal and OB are necessary before excavation by shovels. The sufficient number of dozers provided in the project will carry out the site preparation. The blasthole drilling will be done in patterns decided in advance depending on the strata hardness and as per the conditions laid down by DGMS. Blasthole drills of 250/160 mm diameter will be used for drilling in OB/ partings and coal benches. 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. **Seam Wise Extractable Reserves (in MT)**

XIII	0.59
XII	0.80
XI	2.91
X	5.92
IX	3.12
VIII C	0.35
VIII B	0.79
VIII A	0.63

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Parameters	Details

VIII	6.42
VI/VII	26.80
VA	17.17
V	22.69
IV	20.20
III	15.67
II A	3.27
II TOP	2.86
II BOT	3.66
II COMB	15.80
Total	**149.65**

Dumping Strategy

As explained in preceding paragraphs, it can be seen that OB dumping is a critical factor in development of this mine. The dumping strategy has been formulated with due consideration of the following aspect:

1. Minimal use of the land for external dumping
2. Rationalization of the lead distance for hauling
3. Stability of the dump both internal and external, which ultimately leads to the safety of the person working in the mine.

Based on the above criteria the following dumping strategy has been adopted:

Initial dumping of OB is being proposed to be done in north-west of the quarry in the metamorphic (mostly forest land) which is adjacent to the top edge of the proposed quarry. Subsequently OB will be dumped in the further north of the OCP.

A part of the strata in the incrop side is little flatter as compared to the rest of the property. This will allow concurrent internal dumping during the initial years. Part internal OB dumping will start in the third year where the strata (floor of Seam-II) is flatter (about 8-10deg) which will continue till fifth year. The external dump will be flushed with the internal dump.

Afterwards, internal dumping needs to be stopped due to steep floor gradient. The entire OB from the quarry will be placed in the External OB Dump till about 12 years of quarry operation.

About 30% of OB needs to be dumped externally. About 313.52 Ha land will be required for the same.

The Tentative details of internal and external dumps OB quantity is given below:

Dump	Volume (Mcum)	Top RL (m)

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	Parameters	Details
		External: 215.57 (+480) Internal: 503 (+480) Total: 718.57 (+480)
3.1.3	Coal production capacity proposed "Mtpa"	5.0 Mtpa
3.1.4	Justification for optimization Coal production capacity	Coal production capacity has been fixed as per the requirement of Central Coalfields Limited.
3.1.5	Calendar year from which the production will start	3rd Year
3.1.6	Year of Achieving rated production	6th Year

3.1.7 Tentative Coal Production Plan "MT"

	Year	Coal Production (MT)	OB Removal (Mcum)	Stripping Ratio (cum/te)
Construction period	Y1	-	-	-
	Y2	-	-	-
Capacity build-up	Y3	0.40	1.31	3.28
	Y4	1.50	5.73	3.82
	Y5	3.00	10.91	3.64
Production	Y6	5.00	18.45	3.69
	Y7	5.00	21.10	4.22
	Y8	5.00	28.68	5.74
	Y9	5.00	28.68	5.74
	Y10	5.00	28.68	5.74
	Y11	5.00	28.68	5.74
	Y12	5.00	28.68	5.74
	Y13	5.00	28.42	5.68

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	Parameters		Details			
			Y14	5.00	27.82	5.56
			Y15	5.00	28.93	5.79
			Y16	5.00	28.78	5.76
			Y17	5.00	25.45	5.09
			Y18	5.00	24.57	4.91
			Y19	5.00	24.07	4.81
			Y20	5.00	23.02	4.60
			Y21	5.00	23.59	4.72
			Y22	5.00	23.59	4.72
			Y23	5.00	23.63	4.73
			Y24	5.00	26.01	5.20
			Y25	5.00	26.51	5.30
		Production	Y26	5.00	27.01	5.40
			Y27	5.00	27.01	5.40
			Y28	5.00	21.89	4.38
			Y29	5.00	20.53	4.11
			Y30	5.00	20.53	4.11
			Y31	5.00	18.96	3.79
			Y32	5.00	17.10	3.42
			Y33	5.00	17.10	3.42
		Tapering	Y34	3.00	6.31	2.10
			Y35	1.75	6.81	3.89
			Total	**149.65**	**718.57**	**4.80**

3.1.8	**Rated Capacity "Mtpa"**	
	- By OC	5 Mtpa
	- By UG	-
	- Overall	5 Mtpa
3.1.9	**Life of the mine: "Years"**	
	- By OC	35 Years

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	Parameters	Details
	- By UG	-
	- Overall	35 Years
3.1.10	Whether the proposed external OB dump site is coal/ lignite bearing: If so, whether coal/lignite below waste disposal area is extractable.	The proposed external OB dump is non-coal bearing
3.1.11	Whether negative proving for coal / lignite in the proposed site for OB dump/ infrastructure has been done.	Not Required
3.1.12	Results of any investigation carried out for scientific mining, conservation of minerals and protection of environment; future proposals.	Slope stability study for pit and dump slopes, hydro-geology study and washability study proposed

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	Parameters	*Details*
4.1	**Safety Management**	
4.1.1	**Important safety aspects:** Major Risks and uncertainties to the project viz. Proximity to river, adjacent working, geo-mining disturbances, slope stability and remedial measures suggested. It should also include proposed overall slope of the quarry and OB dump, dump height, strata control, fire and spontaneous heating, gas monitoring, disaster management, danger from inrush of water etc.	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 means. All the the statutory provisions laid down in The Mines Act 1952, Coal Mine Regulation 2017 and specific permission from DGMS relating to mining in general and opencast mining in particular have to be adhered to and implemented in order to maintain day to day safety. **1. Safety aspects for of HEMM / equipment** Special precaution should be taken while deploying workers in the mine.Before employing any person to the mine proper vocation training should be imparted and recommendations of various Safety Conferences 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 and holds VTC Certificates. A record of the same shall be maintained. ii) Records in Form-B and Form-D shall be maintained. iii) Records of driving license of operators shall be kept by competent authority and shall be made readily available for inspection by management. iv) Adequate supervision shall be maintained by competent persons, including officials and technicians. B) **For Machineries:** Provisions of Regulation 109, 110, 216 & 217 of CMR 2017 and DGMS Cir. (Tech.) 1 of 1999 should be strictly adhered to along with the following: i) All machinery and plant used in connection with working of a mine shall be of good design, sound construction, and suitable material, adequate strength, free from patent defect and properly maintained. ii) The owner, agent and manager shall provide adequate training facilities and ensure proper training of persons employed for operation and maintenance of machinery and plant. iii) No person except an engineer or other competent person under his supervision shall undertake any work on machinery and plant in which technical knowledge or experience is required.

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		iv) All the machineries to be deployed in mines shall be so designed as to afford the operator clear and uninterrupted vision all around. v) Every heavy earth moving machineries, including trucks and tippers, used in mine shall be fitted with adequate safety features or devices as specified by DGMS. All equipment shall be provided with audio-visual alarms, proper light for use at night and fitted with suitable type of the fire extinguishers. vi) Truck mounted drill machines designed for tube well drilling for sources of water shall not be used and only proper type of blast hole drill machine, especially designed for mining purpose, shall be used in the mine. vii) Every heavy earth moving machinery shall be under the charge of a competent person (Operator or Driver), authorized in writing by the Manager. viii) All persons employed or to be employed to operate heavy earth moving machinery shall be trained and their competency shall be evaluated by a Board constituted by the management, who shall be persons who are not connected with imparting of training. ix) 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. x) Only such fitters or mechanics possessing driver's or operator's license, shall be allowed to carry out test-run of heavy earth moving machineries. xi) No person other than the operator or the driver or any person so authorised in writing by the manager shall be allowed to ride on a heavy earth moving machinery **C) General:** i) Every person shall strictly adhere to the provisions of the Act and of the rules and regulations and to any order or direction issued by the manager or an official with a view to the safety or convenience of persons not being inconsistent with the Act, rules and these regulations; nor shall he neglect or refuse to obey such orders or directions. ii) Every person shall, immediately before proceeding to work and immediately after terminating work at the end of his shift have his name recorded in the appropriate register. iii) Risk Management Plan of tipper/pay loader shall be made and implemented.

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		iv) All operators/drivers so authorised by the Manager shall observe the Regulation 62 and 63 of CMR 2017 and obey the 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. vi) Mine authority shall operate transport system in such a way so as to minimize pollution in the mine. 2 STABILITY OF BENCHES, QUARRY HIGHWALLS AND SPOIL DUMPS During quarry operations, it is necessary to adopt required mining parameters for the stability of benches, highwalls 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. To ascertain the optimum slope angles for stability of quarry benches, highwalls and spoil dumps, scientific study of slope stability along with hydro-geological study of the area needs to under taken. 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. Provisions laid down in Reg. 106 and 108 of the Coal Mines regulation 2017 shall be strictly adhered to for the safety of quarry and OB/ spoil dumps. In addition to this, the following precaution should be considered: i) The spoil dump height should not exceed 90m from immediate surface level with an overall slope of 28^0 or less. In the event of encountering steep floor gradient, floor blasting should be done and the area properly levelled by dozer before spoil dumping.

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		ii) No working or construction should be allowed within the 60m toe of the OB dump. iii) Before dumping the OB on the floor of seam, at least 10m length all along the strike length should be made horizontal at every 50 meter by floor dinting/blasting. iv) Dump should be created in such a way that there is no chance of accumulation of water in and around the base of dump as it will adversely affect the shear strength of the base material of dump. It must be ensured that there is no stagnant water at the toe of dump and the top of the dump. v) The toe and face of the dump should not be eroded or cut at any point of time to avoid slope failure. A suitable toe wall should be created along the dump periphery. vi) Formation of dumping should be done in square or circular or any regular shape as far as possible. vii) Proper drainage system should be provided to bring down rain water by construction of inclined drain on dump face and catch drain on all benches. viii) During active period of dump, all rain water should be diverted away from mining site as far as possible. ix) Sump and pumping capacity should be sufficient to accommodate peak surface run-off and seepage of water. x) Gabion wall and garland drain should be constructed and maintained to trap the surface run-off and sludge coming from dump. xi) Plantation and grassing should be done on top and slope of the dump respectively. xii) Regular monitoring is required for development of tension crack, gullies, movement of soil mass, stagnation of water and any other unusual occurrence. In case of dump movement, rate of movement of dump should be monitored. Special attention should be given at curve area/turning area of the dump. **3 Precautions Against Danger of Inundation from Surface Water** i) Adequate protection against any danger of inrush of surface water into the mine or part shall be provided and maintained to the satisfaction of DGMS, whose decision shall be final. ii) The entrance into the mine shall be so designed, constructed and maintained that its lowest point (which means the point at which a body of rising water on surface can enter the mine) shall be not less than 3.0 meters above the highest flood level at that point.

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		iii) Every year, during the rains constant watch shall be kept on the flood levels on the surface of the mine and if at any time the levels cross the highest levels earlier recorded, such levels shall be marked by permanent posts along the edges of water and the new highest levels thus observed shall be recorded with the date as the highest flood level on the plans by an actual survey. iv) If water dams or reservoirs are built across rivers and water courses on the upstream side of the mine, arrangements shall be made for communication between appropriate authorities for the purpose of ascertaining the quantity and timing of water released from the dams which is likely to endanger safety of the mine and arrangement for similar communication shall be made when water level rises on the upstream side which is likely to endanger the mine. v) The highest flood levels and danger levels at least 1.2 meters below the highest flood level, shall be permanently marked at appropriate places on the surface and whenever water rises towards the danger level at any place, all persons shall be withdrawn from the mine sufficiently in advance and for this purpose adequate arrangements of quick communication to all parts of the mine by effective systems shall be provided and maintained. vi) No working shall be made in the mine at any spot lying within a horizontal distance of 15 meters from either bank of a river or nala. vii) A competent person shall, once at least in every fourteen days during the rainy season and once at least in every thirty days during other periods of the year, examine every protective measure provided under regulations 149, whether in use or not, for their stability, and a report of every such examination shall be recorded. The protective measures and workings shall also be inspected, once at least in every quarter by the Manager personally. viii) 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. ix) An embankment, 3.0m above the HFL, along the Bokaro River and Nakti nala should be made. Inspections for any accumulation of rainwater, obstruction in normal drainage and weakening in the embankment should be made. x) Standing order for withdrawal of working persons in case of apprehended danger. During heavy rain inspection of vulnerable points is essential. In case of any danger persons are to be withdrawn to safer

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		places for 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 nala/ river after proper sedimentation. For ensuring safety of the equipment while working out bottom horizons with no access to surface profile, the following measures should be taken: i) Drivage of initial trenches if any and coal cutting on bottom benches should be done during the dry period of the year. ii) Ramps should be made for quick shifting of equipment from bottom horizons, liable to be flooded during monsoon period, to the top horizons. **5 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. i) 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. ii) 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. iii) All metal parts of electrical equipment should be properly earthed to avoid failure of insulation. iv) All H.T lines and cables located within the blasting zones should be disconnected during charging & blasting operations. **6 Dust Suppression & Dilution of Exhaust Fumes:** For precaution against dust, Regulation 143, 144 and 145 of CMR 2017 should be observed. Beside this the following measures should be adopted for dust suppression at all quarry working places, dumps, haul roads, CHP and near other auxiliary mining operations. i) Spraying with water on all working faces & haul roads, by special spraying machines or water-sprinkler.

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		ii) While drilling holes, it is necessary to use dust extraction devices. iii) Installation of local dust suppression and air conditioning devices in cabins of excavators and drilling rigs may be considered. iv) Leveling of spoil dump surface. v) 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, the following precautions should be taken: i) Drilling & blasting operations should be timed for periods of maximum wind activity during the day. ii) Dumpers may be provided with purifiers for exhaust gases. **7 Measures to Be Taken for Fire Fighting and Fire Prevention:** In addition to statutory provisions as laid down in Reg 135, 139 and 140 of CMR 2017, the measures for firefighting and prevention of fires are as follows: i) Organisation of special cell for systematic observations to examine and prevent fire. ii) Removal of spillage of coal on benches and cleaning of coal horizons to prevent cases of coal heating. iii) Storage of lubricants and cotton waste in enclosed fireproof containers in working places. iv) Provision of fire extinguishers. **8 Measures to Be Taken While Working Above Underground Galleries:** In addition to provisions laid down in DGMS Circulars (Tech. 2 & 3 of 1980, Tech. 11/1979), the additional measures for extracting pillars by opencast method are as follows: a) i) Quarry shall be worked by Heavy Earth Moving Machinery only. No manual operation in the quarry will be done. b) ii) HEMMs, except drilling machines shall not be deployed on the bench where thickness of coal or overburden above the

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		UG galleries, as proved by advance boreholes or other suitable methods, is less than 6m. c) iii) Exposed coal faces (including UG galleries shall be kept covered with fine grained incombustible OB material to prevent breathing of air and control fire to dip side working. This cover shall be removed only at the time of coal extraction. d) iv) Overburden containing carbonaceous material shall not be dumped within 30m of the exposed side of the coal benches. Hot overburden shall be quenched and cooled at dump sites. e) v) No person shall be allowed at any place in the opencast working where the thickness of overburden and/or coal over any gallery is less than 1.5m. f) vi) Except for the purpose of inspection and support work no person shall be allowed in the underground mine beneath and within 200m of the opencast excavation. The person visiting UG will take all safety precautions for safe working. vii) Blasting in fire area • No explosive other than slurry and emulsion explosive shall be used. • Blasting shall be done with detonating fuse down the hole. Fresh drill holes should be tightly plugged at the mouth. • Temperature inside the hole shall be measured by bi-metallic thermocouple heat sensor (before filling with water) and if the temperature exceeds 80°C in any hole, the hole will not be charged. • All blast holes shall be kept filled with water. When any hole is traversed by cracks or fissures the hole shall not be charged unless it is lined with an asbestos pipe and the hole filled with water. In addition, bentonite should be used for sealing any cracks at the bottom of the hole. • Detonating fuse shall not be laid on hot ground without taking suitable precautions. • Charging and firing of holes in any one round shall be expeditiously completed and in any case within 2 hours. • A parting of at least 2m between the bottom of a short hole and roof of underground gallery shall be left intact. • Effective muffling of hot shot holes with old wire rope screens shall be done for prevention of flying hot fragments.

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		• No blasting shall be done in crushed or broken ground. • No person shall be employed within 150m when blasting the heated material. • The spacing of hole in the coal/OB benches lying immediately above the galleries shall be so adjusted that the holes do not lie immediately above the galleries in order to ensure that blast holes do not directly fire into the underground working. • All holes in the coal/OB benches lying immediately above the galleries shall be charged with water impulses or with moist sand of at least 0.6m in length at the bottom of the hole. • No person including a shot firer shall take shelter within 100m of the quarry opening. Such shelter shall be of an approved design. **9 Measures to Be Taken While Drilling Blasting:** Following measures should be taken during drilling and blasting operation in the quarry beside the statutory requirements: i) Drilling and Blasting in quarry should be done in accordance with the provisions of Mines Act, rules and regulations and based on the Standing Orders for the safe use of explosives. ii) Adequate safety measures have to be taken during blasting operation in the quarry so that men/machine are not affected. **10 Conservation** Suitable measures should be taken to minimize coal loss during mining operations. Selective mining of in-seam dirt bands has been proposed. It is proposed not to dump any spoil material over coal bearing area, amenable for mining, at present or even at a future date. **11 Scientific Studies** The slopes of the quarry and dumps have been proposed on the basis of experience in the adjoining areas. However, to ascertain optimum slope angles for stability of quarry batter and dumps a scientific study need be carried out. Similarly, hydro-geological study of the area is to under taken as none is available at present. Studies should also be carried out to ascertain the pattern of surface drainage, the manner of diversion of water courses to other water courses away from the mining area and the dimension of diversion dams, garland drains and other protective structures to be constructed.
4.1.2	A Commitment from the Company Board that entire mining operation will be carried out as per the	

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	Statutory provision given under Mines Act 1952, Coal Mine Regulation 2017 and & wherever specific permission will be required the company will approach the concerned authorities.	

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	Parameters	Details
5.1	Mine infrastructure required e.g. Equipment maintenance planning, Office buildings, Workshop	The life of KBP OCP has been estimated as 35 years. For service and welfare buildings, permanent type of construction has been proposed.

WORKSHOP & STORE	
(i) Equipment maintenance planning	Planning of project workshop and store has been done based on a comprehensive maintenance and repair program to achieve the high level of equipment availability, reliability and longer life. Maintenance and repair load of project workshop has been assessed on the basis of annual operating time, inter repair period, life of the equipment/ assemblies/ sub-assemblies, weight and size of the equipment/ assemblies/ sub-assemblies, man-hours required per repair/ maintenance, etc.
(ii) Scope of work (Excavation Workshop)	(a) Preventative maintenance (b) Daily maintenance, routine lubrication & washing of equipment. (c) Technical inspection and running repair of transport equipment and checking of tyres. (d) Daily and fast filling of diesel at fuel delivery station for transport equipment. (e)Dismantling, opening and refitting of tyres. (f) Incidental minor repairs of assemblies & sub-assemblies of mining & mechanical equipment i.e., dumper, dozer, shovel, drill, excavator etc. (g)Scheduled maintenance of all HEMM at stipulated working hours. (h) Medium/minor repair and replacement of assemblies and sub-assemblies. (i) Mobile repair team with crew and facilities to cater the maintenance and minor repair needs of field equipment at site.
(iii) Scope of work (E&M Workshop)	Minor repair, medium repair and replacement of components, assemblies and sub-assemblies of Coal Handling Plant, mine pumps, motors and electrical equipment.
(iv) Facilities (Excavation Workshop)	(a) Daily maintenance, Scheduled maintenance, medium repair and minor repair facilities for dumpers, dozers and auxiliary equipment. (b)Minor repair and replacement of sub-assemblies and assemblies of shovels, drills, surface miners and other field equipment at site by mobile repair team. (c) Medium repair and overhauling of field equipment. (d) Different repair shops, diesel filling station, washing of dumper & dozer, EOT crane, chain pulley block, fork lift truck etc. (e) Supporting facilities like sub-station, electronics room, charge stores, tool room, offices, pump room, cycle stand, canteen, security post, firefighting facility ,ventilation system, etc
(v) Facilities (E&M Workshop)	(a) E&M maintenance and repair unit for maintenance and minor repair of CHP equipment, pumps, electrical equipment and other installations. (b) Mechanical and electrical repair shop. (c) LMV repair shop for maintenance of light motor vehicles.

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			(d) LMV washing station. (e) Material handling facilities, like hoists, chain pulley, etc. (f) Machine tools, general and special purpose tools, diagnostic tools, master tool kits etc for electrical and mechanical equipment.
		(vi) Project store	A project store has been provided to meet the total requirement of proposed workshop as well as additional requirement of entire project. This full-fledged store is provided adjacent to the workshop boundary with a view to minimize the time for collection of spares and consumables required for the repair & maintenance of HEMM in this unit workshop.
		(vii) Office building	Office building has been proposed for smooth functioning of workshop.
		(viii) Power supply	Sub-station has been proposed for power supply at workshop.
		(ix) Water Supply	Source of water for industrial use will be existing nadi, nalas or mine water.
5.2	Power supply & illumination	Nearest source of power for this coal block is Naisarai Substation of DVC. There is a switching station at Ghato from where a double circuit feeder at 33 kV may be drawn to provide power to Kotre Basantpur Pachmo OCP. Considering CHP, Pumping and other common loads including residential colony loads proposed in this report, a 2X10 MVA, 33/6.6kV substation has been envisaged for the project. The 2X10 MVA, 33/6.6kV substation will receive power through one no. 11 km long double circuit 33 kV incoming feeder from switching station at Ghato. The proposed 2X10 MVA 33/6.6kV substation will have provision for receiving power at 33kV through two nos. 33 kV incoming feeders and arrangement for feeding the same to the different loads of the project at 6.6 kV through required nos. outgoing feeders. **Energy Consumption** Estimated maximum annual energy consumption of the project at targeted rate of production works out to be 38.86 MkWh. **Power supply to HEMM** No electrical HEMM has been proposed in the report therefore there will be no power supply arrangement for HEMMs in the quarries. **Power supply to Pumps** Two numbers 6.6 kV overhead line feeders originating from the main substation is proposed to be drawn up to a convenient location near main sump of the quarry for feeding power to various pumps installed in the project. The overhead line feeders shall receive power at 6.6 kV from the outgoing structures installed in the switchyard of the substation. Depending upon the various stages of quarry operation these feeders may have to be shifted or extended. **Power Supply to CHP**	

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		Power at 6.6 kV shall be made available to coal handling plant through 6.6 kV overhead line feeders drawn from the Proposed 2X10 MVA, 33/6.6 kVA Sub-substation. **Power Supply to Workshop** Power at 6.6 kV shall be made available to workshop through 6.6 kV overhead line feeders drawn from the Proposed 2X10 MVA, 33/6.6 kVA substation to workshop sub-station. **Power Supply to Township** It has been presumed that Colony will be located at about 5 km from the substation. Different type of 635 residential quarters has been proposed. In addition to above, service buildings such as Staff Rest House, Officers Guest House, Dispensary, Community Hall, Officers Club, School, Post office, Bank, Training Centre etc has been proposed. Power for colony will be received at 6.6kV from Substation through a double circuit overhead line feeder and the same will be stepped down to 415V through 250kV 6.6/0.415kV distribution transformers installed at different locations in the colony. Power at 415V/230V will be distributed to the quarters and service buildings with 415V overhead line, cables etc. **Illumination:** 6.6 kV overhead line feeder originating from the main substation is proposed to be drawn up to a convenient location in the quarry for feeding power to the lighting transformers installed in the different location of the mine. • For illumination of permanent haul roads, 150 W LED lamps and luminaires mounted on 11/13 m (approx.) high steel poles have been envisaged. Temporary haul roads shall be illuminated according to the position of working, through 300 W LED lamp fitted in flood light fixtures mounted on skid mounted / mobile lighting towers. • Illumination of working face will be done with 2* 300 W LED lamp (High Bay) fitted in flood light fixtures mounted on mobile lighting towers. Illumination of quarry general area/dump area etc. will be done with 2 *300 W LED lamp (High Bay) fitted in flood light fixtures mounted on skid mounted lighting towers. • 150 W LED lamps in street light luminaires will be used for illumination of service roads of the project. • 4.5 km colony road has been proposed in this report. In addition to this there will be approach road of 5 km for the colony. 150W LED lamps in street light luminaires will be installed on steel tubular poles of 415V colony power distribution line / street lighting poles for colony and approach road illumination
5.3	Drainage & Pumping:	During the rainy season, water will be allowed to accumulate in the sump on the floor of lower most Seam of the quarry. Sumps are provided for the dewatering pumps which will transfer in-pit water for controlled discharge off the site. The planning of dewatering the mine shall be done in such a way that the working faces and haul roads in the quarry shall remain dry as far as possible.

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	Pumping Capacity	The layout of the quarry provides suitable gradient along the quarry floors and the benches to facilitate self-drainage of water to the sump at the lowest level of the quarry. Water accumulated in the mine sump will be pumped out to the surface and finally discharged into the nearby Chutua Nala & Bokaro River.

Sl. No.	Particulars	Unit	3rd year	6th year	7th year	15th year	22nd Year	27th year	32nd year	35th year
1	Pumping Capacity required	lps	35	133	281	682	643	730	745	818

Pump Selection

S N	ITEMS	QUANTITY
1	• Main Pump , 320 m head • Main Pump , 250 m head	8 Nos. (6 working + 2 standby) 4 Nos. (4 working + 1 standby)
2	• Low head Pump, 150 m head • Low head Pump , 60 m head	3 Nos (2 working + 1 standby) 3 Nos (2 working + 1 standby)
3	Face Pump, 60m head	6 Nos.(4 working + 2 standby)
4	Slurry pump, 45m head	6 Nos.(4 working + 2 standby)
5	Diesel Pumps , 320 m head	01 No.

5.4	Coal Handling Arrangement: Brief detail of the CHP/ Mode of Dispatch, Coal quality and Coal staking and handling arrangement	The total production of the mine has been the proposed as 5.0 MTY. Coal from the mine will be initially transported to Kedla Washery by belt conveyors after crushing of ROM coal in the proposed CHP. Subsequently when the coal production from the OCP increases, the additional quantity will be transported to nearby washery. The ROM coal shall be crushed down to (-) 100 mm size before it is despatched to Washery. **SYSTEM DESCRIPTION** ROM coal of (-) 1200 mm size transported in 60/100 te rear discharge dumpers will be fed into receiving hopper of semi-mobile crushing plant. After being crushed to (-) 300mm coal will be conveyed into secondary sizer to crush down to (-) 100 mm. (-100mm) coal will be then carried by a 1600 mm wide elevating cum tripper belt conveyor and discharged into 15000 te ground bunker.

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		Crushed coal from ground bunker will be loaded into the conveyors for onward conveying up to washery. **PLANT DESCRIPTION** The Run-Off-Mine coal from the opencast Project shall be received at surface CHP by means of rear discharge dumpers in the initial 12 years of mine operation (i.e., 14th year of mine life). The ROM coal will be unloaded into the receiving hoppers of semi-mobile crusher. Crushed coal of (-) 300 mm will be collected by the conveyor of 1600 mm wide and 1500 tph and fed into secondary sizer of 1500 tph capacity to crush coal to (-) 100 mm installed underneath the feeder breakers and to carry up to ground bunker. However, from 13th year (i.e. 15th year of mine life) onwards, coal will be crushed within the quarry itself by in-pit crushing to (-) 100mm, which will be brought to the surface using High Angle Conveyors (HACs). The HACs will subsequently discharge the sized coal to flat belt conveyors proposed at surface for onward transport to washery receiving system located in the west. In the 19th, 23rd and 27th year of mine life, the conveying system along with the HAC shall be shifted towards east and subsequently conveyor lengths of 500m, 500m and 600m shall be added respectively. Storage facility of 15000 te capacity of ground bunker has been provided to meet the requirement of fluctuation of coal production and despatch. Coal will be reclaimed by belt conveyor and fed into washery. **Plant Preventive Maintenance** All provisions required for plant maintenance shall be provided.

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	Parameters	Details
6.1	**LAND REQUIREMENT**	
6.1.1	Total Land requirement for the mine in "Ha"	***Break up of pre-mining land type*** (indicative) ***and source of data.***

Type of Land	Area Within Ramgarh (Ha)	Area Within Bokaro (Ha)	Total Area in Ha.
Tenancy	31.77	124.93	156.70
Govt Non-Forest			
Forest	633.19	372.98	1006.17
Total	664.96	497.91	1162.87

Source-DGPS Survey.

6.1.2 During mining Land use details:

Type	Land use (Proposed)	Land Use (End of Life)	Land Use (Post Closure)						
			Agricultural land	Plantation	Water Body	Public/ Company Use	Forest Land (Returned)	Undisturbed	Total
Excavation Area	629.60								
Backfilled Area		393.15		393.15					393.15
Excavated Void		236.45			198.18	38.27			236.45
Without plantation									
Top Soil Dump									
External Dump	313.52	313.52		313.52					313.52
Safety Zone	10.58	10.58		10.58					10.58
Haul Road between quarries									
Road diversion									
Diversion/ below River/Nala/canal	20.17	20.17			20.17				20.17
Settling pond									

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	Parameters	Details								
	Road & Infrastructure area	48.23	48.23		27.84		20.39			48.23
	Rationalization area									
	Garland drains									
	Embankment	3.17	3.17		3.17					3.17
	Green Belt	137.60	137.60		137.60					137.60
	Water Reservoir near pit									
	UG entry									
	Undisturbed/ Mining right for UG									
	Resettment									
	Pit head power plant									
	Water harvesting									
	Agricultural land									
	Total	**1162.87**	**1162.87**		**885.86**	**218.35**	**58.66**			**1162.87**
	Source-DGPS Survey.									
6.1.3	Surface features over the block area									
6.1.4	No. of villages/Houses to be shifted	Proposed project involves R&R of 7 villages namely- Basantpur, Pachanda, Purnapani, Hurdag, pachmo, Rahawan and Bhagharia. Actual no. of habitants requiring R&R is yet to be Finalized. However, as per the Census data of 2011, it has been roughly estimated that approximately 1000 families fall within the proposed project area, requiring R&R.								
6.1.5	Proposed Rehabilitation programme	As per CIL/CCL R&R Policy.								

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7.1	**Commitment from the project proponent that the company will comply Environment and Forest Condition stipulated in the respective clearances**	In order to carry out the proposed mining activity in an environmentally sustainable manner, suitable environmental protection measures shall be taken up at different stages of project operation and post closure In addition to this, few environmental protection measures have been suggested as a part of mine closure activities.

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Landuse During Mining			Post Mining Landuse Plan	
Sl. no	Particulars	Total Area in Ha.	Particulars	Total Area in Ha.
1	Quarry	629.60	Plantation On Internal Dump	393.15
			Mine void converted into water body	236.45
2	External OB Dump	313.52	Plantation on External Dump	313.52
3	Infrastructures (W/S, CHP, S/S, Magazine, etc.)	27.84	Plantation on dismantled Infrastructure	27.84
4	Diverted Nala	20.17	Diverted Nala	20.17
5	Road	20.39	Plantation on Road, Embankment & Safety zone/ Greenbelt	171.74
6	Embankment against Chutua nala	3.17		
7	Green belt	137.60		
8	Safety Zone	10.58		
Total Project Area		**1162.87**	**Total Project Area**	**1162.87**

8.10 Abandonment Cost and Financial Assurance

8.10.1 Abandonment Cost: Cost of Activities to be taken up for closure of the mine

S. No.	Activity	Weighted % of Mine Closure Cost	
		Progressive	Final
A	**Dismantling of Structure**	**0**	**8.50**
	Service building		
	Residential Building		
	Industrial Structure		
B	**Safety & Security**	**6.50**	**3.20**
	Random rubble mansory/concerete wall		
	Toe wall around dump/Gabbion wall		
	Barbared wire fencing		
	Fencing/boundary wall, fencing around water body		
	Garland drains		

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	C	**OB Dump Reclamatiom**		
	C A	**Technical Reclammation**	**60.50**	**60.50**
		Re-handling of OB		
		Levelling by Dozer		
		Grading		
		Levelling and grading of highwall slopes & OB Dump		
	C B	**Biological Reclammation & Plantation**		
		Top soil Management	**15.00**	**11.70**
		Grassing of OB dump		
		Planatation around virgin Area, safety zone, green belt, over external Dump and internal reclaimed area		
		Plantation post care (including manpower)		
		Plantation over cleared area obtained after dismantling		
	D	Land scaping of the open space in leasehold area for improving its esthetic. Drain, Pipe lines, Peripheral road,gates, Viewpoints,cemented steps on bank	**4.00**	**5.50**
		Development of Agriculture land		
	E	**Environment mitigation & management**	**12.00**	**1.50**
		Air Quality (Water tanker, Sprinkler & other Control measures)		
		Water Quality (ETP & STP etc operating cost)		
		Manpower Cost and supervision		
	F	**Post Closure Monitoring**	**0.00**	**3.20**
		Air Quality		
		Water Quality		
		Power Cost		
		Manpower Cost and supervision		
	G	Entrepreneurship Development (Vocational/skill development training for sustainable income of affected people)	**1.00**	**0.50**
	H	Miscellaneous & Other measures like Golden Handshake, one time financial grant, alternative jobs, other services etc.	**1.00**	**5.40**
		Total	**100.00**	**100.00**
8.10.2	**Financial Assurance : Amount to be deposited in Escrow account as a security against the mine activities to be carried out for the closure of the mine**			

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ESCROW ACCOUNT	
Project Name	KBP OCP
Project Area (Ha)	1162.87
Escrow Amount per Ha. For OC Project as on April, 2019 (lakhs/ Ha)	9
WPI as on April 2019	121.1
WPI as on April 2021	132
Escrow Amount per Ha. For OC Project as on April 2021(lakhs/ Ha)	9.81
Current value of corpus as on April 2021	11407.84
Amount deposited till date	0
Balance Corpus for which provision is to be made	11407.84
Balance Life of mine	35
Annual corpus (Balance corpus / Balance life in Rs. (Lakh)	325.94
Year	Amount in Lakh (Rs.)
1	325.94
2	342.24
3	359.35
4	377.31
5	396.18
6	415.99
7	436.79
8	458.63
9	481.56
10	505.64
11	530.92
12	557.47
13	585.34
14	614.61
15	645.34
16	677.60
17	711.48
18	747.06
19	784.41
20	823.63
21	864.81
22	908.05
23	953.45
24	1001.13
25	1051.18
26	1103.74
27	1158.93
28	1216.88
29	1277.72
30	1341.61

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31	1408.69
32	1479.12
33	1553.08
34	1630.73
35	1712.27
Total	**29438.85**
Total Mine closure cost (in Rs Lakhs)	**29438.85**

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