

M/s DAMODAR VALLEY CORPORATION

P.O. Bokaro Thermal- 829 107, District Bokaro, Jharkhand

MINING PLAN AND MINE CLOSURE PLAN FOR DVC BERMO COAL MINE

**AT
VILLAGES BAIDKARO, KARGALI, KARO AND EMLO
BLOCK BERMO, DISTRICT BOKARO,
JHARKHAND**

(Under Rule 22 (4) of Mineral Concessions (Amendment) Rules, 1994)

**(EXTENT OF ML: 167.434 Ha., PROJECT AREA 169.344 Ha
EXPANSION FROM 0.4 TO 2.62 MTPA)**

REVISION : 0
BASE DATE : 01-04-2017
DATE OF PREPARATION : APRIL 2017

Prepared by:

B.D.SHARMA
(Recognized Qualified Person)
(No. 34012(03)/2014-CPAM Dt. 29th May 2015, valid upto May 2025)



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An ISO 9001:2008
approved company

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ABBREVIATIONS

AMSL	-	Above Mean Sea Level
bgl	-	Below ground level
CV	-	Calorific Value
CSM	-	Continuous Surface Miner
CMPDIL	-	Central Mine Planning and Design Institute Ltd.
cum	-	Cubic metre
DGMS	-	Directorate General of Mine Safety
DGM	-	Directorate of Geology and Mining
EIA	-	Environmental Impact Assessment
EMP	-	Environmental Management Plan
E&M	-	Electrical and Mechanical
FE Loader	-	Front End Loader
FC	-	Fixed Carbon
GT	-	Grand Trunk
GR	-	Geological Report
GSI	-	Geological Survey of India
HFL	-	High Flood Level
HEMM	-	Heavy Earth Moving Machinery
Ha	-	Hectare
IB	-	Interburden
IMD	-	India Meteorological Department
K.Cal/kg	-	Kilo Calorie per Kilogram
Ltd.	-	Limited
LTPA	-	Lakh Tonne Per Annum
LHD	-	Load Haul Dump
MTPA	-	Million Tonne Per Annum
MCPA	-	Million Cubic Metre Per Annum
M cum	-	Million cubic metre
MBCM	-	Million Bank Cubic Metre
m	-	Metre
Mt	-	Million tonne
ML	-	Mining Lease
Mty	-	Million tonne per year
MOC	-	Ministry of Coal

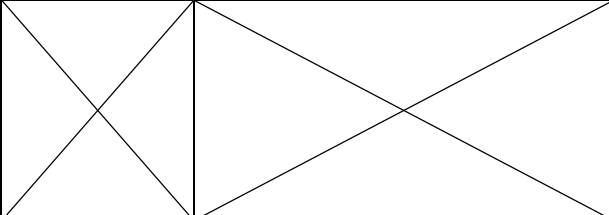
Mil. cum.	-	Million cubic metre
Mil. Te.	-	Million Tonne
MoEF&CC	-	Ministry of Environment, Forest and Climate Change
NH	-	National Highway
OC	-	Opencast
OB	-	Overburden
PA	-	Per Annum
R&R	-	Rehabilitation & Resettlement Plan
RQP	-	Recognised Qualified Person
ROM	-	Run of Mine
RH	-	Relative Humidity
RPM	-	Respirable Particulate Matter
SDL	-	Side Discharge Loader
SPM	-	Suspended Particulate Matter
SC	-	Scheduled Cast
SH	-	State Highway
ST	-	Scheduled Tribe
TPD	-	Tonne Per Day
TS	-	Topsoil
UG	-	Under Ground
UHV	-	Useful Heat Value
VM	-	Volatile Matter

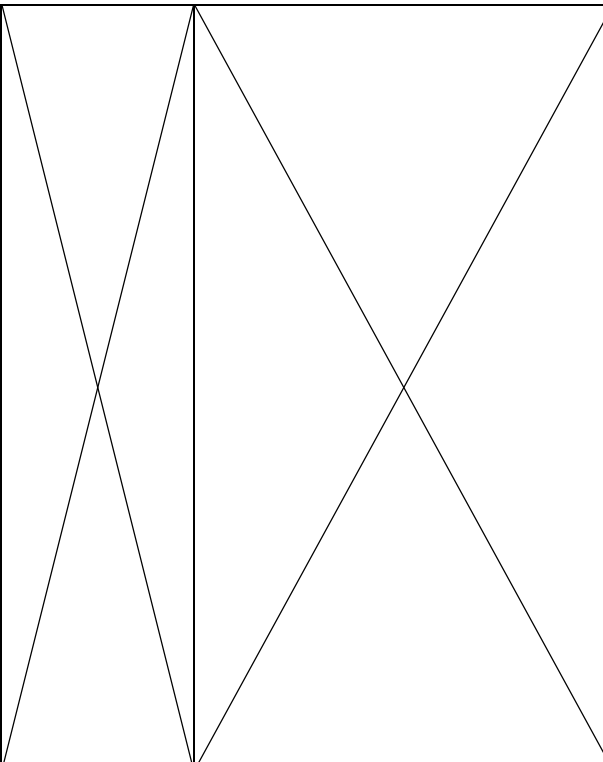
EXECUTIVE SUMMARY OF MINING PLAN AND MINE CLOSURE PLAN

A. SUMMARISED DATA

1. GENERAL	
a)	Name and address of the Applicant Company Damodar Valley Corporation (DVC) Registered Office: Damodar Valley Corporation DVC Towers, VIP Road, Kolkata-700054, W. B. Mine Office: Damodar Valley Corporation, Bermo Mines, P.O. Bermo, Bokaro, Jharkhand- 829104 Phone: 033-66072316, 09434742667 Fax: 06549-266701 E-mail: arbind.thakur@dvc.gov.in
b)	Name and address of the Block Allottee DVC (Same as 1(a))
c)	Relationship between the applicant and allottee company The block was allotted to the Applicant Company
d)	Status of the Applicant Company : Central /Public Sector Undertaking/State Government Undertaking/JV Company/ Pvt. Company/Public Co/Others (Specify) The Damodar Valley Corporation (DVC), headquartered in Kolkata, West Bengal, is a Public Corporation under the Ministry of Power Govt. of India. DVC came into existence on 7 July, 1948 under Act No. XIV of 1948 as the first multipurpose river valley project of independent India.
e)	Name of the Coal Block together with name of Coalfield & State where located Bermo (DVC), East Bokaro Coalfield, Bokaro district of Jharkhand State
f)	Date of allotment DVC had taken over this mine from the Indian Railways in 1951 (Lease Agreement with Govt. dt.19.01.1951)
g)	End Use of Coal/Lignite as per approval by the Competent Authority It is a captive mine for the Bokaro Thermal Power Station (BTPS) and Chandrapura Thermal Power Station (CTPS) of DVC. The expansion from existing 0.4 MTPA to 2.62 MTPA, is being planned to cater to upcoming 500 MW TPS, Expansion of existing Bokaro Thermal Power Station of DVC at Bokaro, Jharkhand.

h)	ROM Quantity proposed to be produced as per Mining Plan	2.62 Mtpa
i)	Norms adopted for calculating ROM quantity requirement in case it differs from the quantity indicated in the Allotment Order.	Coal requirement for the upcoming 500 MW plant has been estimated as 2.62 MTPA on the basis of Station Coal Rate of 0.6 Kg per Kilo Watt Hour.
j)	Beneficiation required – Yes/No	No
k)	Requirement of Beneficiated Coal & expected availability thereof.	NA
l)	Period for which Mining Lease has been granted/ is to be renewed/ is to be applied for.	The 1 st ML Deed was signed on 19-01-1951 for 35 years (Annexure-I) and the ML was renewed on 27-12-1986 for 30 years (from 01-01-1987 to 31-12-2016).
m)	Date of Expiry of earlier Mining Lease, if any	The earlier Mining Lease expired on 31-12-2016. The application for renewal has been submitted on 31-08-2015 for 30 years. Department of Mines and Geology, Govt. of Jharkhand has asked for Approved Mining Plan and other documents vide their letter dt 28-10-2015.(refer Annexure-XXII)
n)	RQP who has prepared the Mining Plan Name Address Phone No. Fax Email ID Web site Registration No & date till valid Date of grant/Renewal of RQP Status Validity	Mr. B. D. Sharma A-121, Paryavaran Complex, IGNOU Road, New Delhi – 110030 29534777, 29532236, 29535891 091-011-29532568 min_mec@vsnl.com; minmec@bol.net.in; minmec@gmail.com http://www.minmec.co.in No. 34012(03)/2014-CPAM 29 th May, 2015, valid up to 28 th May, 2025

B. INFORMATION REGARDING EARLIER APPROVED MINING PLANS, IF ANY. N/A (FIRST SUBMISSION)		
a)	Approval Letter no. and Date	Not applicable as no earlier mining plan has been approved by MOC for this mine/ block
b)	Lease Area	
c)	Date of grant of Lease	Old Plan
d)	Date of Expiry of Lease	New Plan
e)	Targeted Production	
f)	Proposed date of start of Production	
g)	Proposed date of achieving the targeted production level	
h)	Envisaged life of the mine (in years)	

i)	Date of actual commencement of Mining Operations, if operations already started	
j)	Likely date of Mining Operations, if operations not yet started & reasons for non-commencement of operations	
k)	Planned production and actual levels achieved in last 3 years	
l)	Coal :- U/G O/Cast OB	
m)	Reasons for difference between the planned and actual production levels	
n)	Reason for revision of the Mining Plan	
o)	Details of changes in the new mining plan compared to earlier approval	
(i)	Lease Area	
(ii)	Block Boundary	
(iii)	Production level	
(iv)	Reserves	
(v)	Mining Technology(Additional sheets to be used, if required)	

C. LOCATION

a)	Location of the Block Taluka/ Village/ Khasra/ Plot / Block Range / etc. District / State	The Block is located in Karo, Baidkaro, Kargali, and Emlo villages of Bermo circle in Bokaro district of Jharkhand state.
b)	Name of the Coalfield/ Coal belt	East Bokaro Coalfield
c)	Particulars of adjacent blocks: North, South, East, West	North - Karo Block of CCL South - Damodar River Diversion Project of CCL East - Dhorri Mines of CCL West - Bokaro Mines of CCL
d)	Area of the Allotted Block (hectares) i Geological block area ii Mining Block Area	Block Area/ ML Area = 167.434 ha. Project Area = 169.344 ha (including additional area of 1.66 Ha for pit head facilities and 0.25 ha for Magazine outside ML area and DVC has only surface rights over these areas).
e)	Reference no. of plan of block boundary issued by CMPDI/ SCCL/ NLC (A copy of the Plan also to be annexed)	The block boundary issued by CMPDI vide "Geological Plan" Plan no. III of GR prepared in 2016. (Also refer Annexure XXIII of Mining Plan)
f)	Whether the lease	Required Mining Lease (167.434 ha) is the same as the

boundary/ required boundary is same as demarcated by CMPDI/ SCCL/ NLC for delineating block/sub-block	existing ML/ boundary demarcated by CMPDI. An additional area of 1.66 Ha has been acquired long back by DVC in the past for pit head facilities and 0.25 ha for Magazine outside ML area and DVC has only surface rights over these areas. These areas are outside the ML and they lie over Karo coal block and will be surrendered when required.
g) Existing mining Lease Area in case of existing mines, (hectares)	167.434 ha
h) Applied/ required Lease Area as per the Mining Plan under consideration (hectares)	167.434 ha
i) Whether the applied lease area falls within the allotted block	Yes (Block area and ML area is the same)
j) Area (hectares) of lease which falls outside the block/sub-block delineated by CMPDI/SCCL/NLC.	Nil
k) Details of outside area: - Whether forms part of any other coal block - Whether it contains any coal/lignite reserves - Purpose for which it is required, e.g. roads/ OB dumps/ service buildings/ colony/ safety zone/ others (specify)	Not applicable
l) Whether some part(s) of the allotted block has not been applied for mining lease. - Total area in Ha. of such part(s). - Total reserves in such part(s). - Brief reasoning for leaving such part(s),	The whole allotted block area has been applied for mining lease.

m) Type of Land involved in Hectares	PRE-MINING LAND USE OF THE PROJECT AREA							
	Village/ mauza	Pre Mining Land Use in ML Area in acres (Area detailed in acres in the lease records)						Total area in ha
		Tenancy	GMK Govt. Land (Waste land)	GMK Jungle	GM- Aam (Others)	Water body	Total	
	Within ML/Block							
	Karo	3.76	11.45	36.9	0.99	1.00	54.10	21.893
	Baidkaro	16.03	14.40	29.81	0	0	60.24	24.378
	Kargali	9.72	0.87	215.5	0	1.31	227.40	92.026
	Emlo	37.62	18.48	15.09	0.81	0	72.00	29.137
	Total acres	67.13	45.20	297.30	1.80	2.31	413.74	
	Total in Ha	27.166	18.292	120.313	0.728	0.935		167.434
	Out side ML, ha							
	Baid karo	1.66						1.66
	Magazine and Road		0.25					0.25
	Sub total, ha	1.66	0.25					1.91
	Project Area, ha	28.826	18.542	120.313	0.728	0.935		169.344
n) Broad Land Use Pattern (Forest, Township, Industrial, Agricultural, Grazing, Barren etc.)	PRESENT LAND USE OF THE PROJECT AREA							
	Sl. No.	Particular				Total area of land (Ha)		
	Within ML/ Block Area							
	1.	Area under habitation				70.294		
	2.	Mine facilities				2.00		
	3	Top soil dump				2.00		
	4	Water reservoir/settling pond				1.50		
	5	Karo and Emlo nala				1.00		
	6	Area under backfill				5.77	90.64	
	7	Area under excavation				42.85		
	8	Area under surface dump				42.02		
	Sub Total Within ML/ Block Area					167.434		
	Outside ML/ Block							
	1	Area under Existing facilities (DVC Colony, road, undisturbed area)				1.660		
	2	Magazine and Road				0.25		
	Sub Total Outside ML/ Block							
	Grand Total Project area					169.344		

o) Proximity of public road / railway line/major water body if any and approximate distance	No public road passes through the block or ML. The coal mine is located at 45 Km from Bokaro Township in the East Bokaro coalfield near Kargali and other mines of CCL. The mine is well connected to BTPS by a metalled road. The nearest Railway Station is Bermo on Gomoh-Chandrapur, Barkakana-line of the East Central Railway, at a distance of about 1 Km towards south. Karo nallah flows north to south, through the middle of the block. Emlo Nallah, further east to Karo nala, also flows through the block. Another nallah, namely, Baidkaro Nallah flows parallel to the boundary in the south western side of the block.
p) Toposheet No. with latitude and longitude	Toposheet No. 73 E/9 (RF- 1:50000) Latitude : 23° 46' 48" N to 23° 47' 16" N Longitude : 85° 57' 29" E to 85° 59' 11" E

D. GEOLOGY AND EXPLORATION

a) Name of the Geological Block and area in hectares	DVC Bermo Area: 167.434 ha								
b) Name of the Geological Report (GR) with year of preparation	Geological report on DVC Bermo Mines was prepared by CMPDI in October 2016.								
c) Name of the agency which conducted exploration and prepared GR	Central Mine Planning and Design Institute (CMPDI)								
d) Period of conducting exploration	6 th December 2015 to 1 st April 2016								
e) Details of drilling (by all agencies)	<table><tr><th>Name of Agency</th><th>No. of boreholes</th><th>Meterage Drilled</th></tr><tr><td>CMPDI</td><td>24</td><td>4861m</td></tr></table>			Name of Agency	No. of boreholes	Meterage Drilled	CMPDI	24	4861m
Name of Agency	No. of boreholes	Meterage Drilled							
CMPDI	24	4861m							
f) No. of boreholes drilled within the block	24								
g) Overall borehole density within the block (no./ sq. km)	14.33								
h) Area covered by 'detailed' exploration within the block (hectares)	1.67434 sq.km								

i) Area covered by 'detailed' exploration outside the block (hectares) - No. of boreholes drilled outside the block - Bore hole density for outside area (no./sq. km)	NIL						
j) Whether entire lease area has been covered by 'detailed' exploration.	Though exploration has covered the entire block, drilling has not been done in some area of existing Overburden dump						
k) Whether any further exploration is required or suggested and timeframe in which it is to be completed	No						
l) Number of coal/lignite seams/horizons - Thickness range of coal seams - Mean Thickness of total coal horizon - Standard Deviation of thickness - Minimum & maximum depth of coal seams	12 number of coal seams with following details.						
	Coal seams/ Partings	Thickness (m)		Parting (m)		No. of BH Inter- sections	Depth Range (m)
		Min.	Max.	Min.	Max.		
	Local-IV	0.33	0.40			2	
	Parting			16.12	16.12		
	Local-III	0.32	0.83			3	
	Parting			5.87	15.22		
	Bermo	8.15	17.11			12	3.00 to 50.89
	Parting			13.50	23.63		
	Local-II	0.23	1.35			11	
	Parting			8.31	11.52		
	Local-I	0.35	1.64			23	
	Parting			4.45	12.89		
	XI	0.43	3.00				6.5 to 95.5
	Parting			17.55	33.88		
	X+IX	8.03	15.07			24	29.10 to 123.90
	Parting			4.23	37.50		
	VIII	17.00	27.59			24	17.00 to 27.59
	Parting			1.22	7.65		
	VII+VI	8.11	16.32			22	70.30 to 188.00
	Parting			28.00	39.00		
	V	0.80	2.48			24	112.03 to 232.20
	Parting			8.14	19.37		
IV	0.10	3.00					
Parting			3.34	8.90			
III	0.25	1.85			11	130 to 254	

m) Gross Calorific Value (GCV in K Cal/kg) and Useful Heat Value (UHV in K.Cal / Kg), of coal as per GR : Range Mean	Coal seams	GCV Range (K Cal/ kg)	UHV Range (K Cal/ kg)																										
	Local-IV		UHV not given in GR (being coking coal)																										
	Local-III																												
	Bermo	5080 – 5735																											
	Local-II																												
	Local-I																												
	XI	4935 – 5670																											
	X+IX	5040 – 5720																											
	VIII	4390 – 5070																											
	VII+VI	4055 – 4600																											
	V	3180 – 5605																											
	IV																												
	III	6430 to 6935																											
n) Quality (Grade) of coal as per GR : Range Mean	<table><tr><th rowspan="2">Coal Seam</th><th colspan="2">Grade</th></tr><tr><th>Min</th><th>Max</th></tr><tr><td>BERMO</td><td>UNGR</td><td>W-IV</td></tr><tr><td>XI</td><td>UNGR</td><td>W-IV</td></tr><tr><td>X+IX</td><td>UNGR</td><td>W-IV</td></tr><tr><td>VIII</td><td>UNGR</td><td>W-II</td></tr><tr><td>VII+VI</td><td>UNGR</td><td>UNGR</td></tr><tr><td>V</td><td>UNGR</td><td>W-IV</td></tr><tr><td>III</td><td>UNGR</td><td>SG-II</td></tr></table>			Coal Seam	Grade		Min	Max	BERMO	UNGR	W-IV	XI	UNGR	W-IV	X+IX	UNGR	W-IV	VIII	UNGR	W-II	VII+VI	UNGR	UNGR	V	UNGR	W-IV	III	UNGR	SG-II
	Coal Seam	Grade																											
		Min	Max																										
	BERMO	UNGR	W-IV																										
	XI	UNGR	W-IV																										
	X+IX	UNGR	W-IV																										
	VIII	UNGR	W-II																										
	VII+VI	UNGR	UNGR																										
	V	UNGR	W-IV																										
	III	UNGR	SG-II																										
	Mean Grade Not given in GR																												
	Overall ROM Grade of coal is Ungraded (for Coking Coal) with GCV Range of 4601 to 4900 Kcal/ Kg, which in case of Non coking coals is equivalent to G9 Grade.																												
	o) Total geological reserves in the block	Net Proved Reserves (MT)	Gross indicated Reserves (MT)	Total Reserves (MT)																									
111.661		19.093	130.754																										
p) Depletion of reserves (in case of running mine)	The exploration by CMPDI was carried out till 1 st April 2016 and Geological reserves mentioned are excluding the extracted reserves (i.e. the balance remaining as on 1.4.2016). Records of manual mining carried out prior to 1993 are not available. The production from 1953 till date is 14.918 Mt, as conveyed by DVC (source: Para 1.8 of GR dated October 2016)																												

q) Additional reserves established (if any for running mine)	N/A
r) Geological reserves considered for mining: by opencast by Underground	Total 130.754 Mt By opencast 124.818 Mt By Underground 5.936 Mt (Thin Seams below Quarry/ un-economical may be considered for UG in future)
s) Corresponding Extractable reserves: by opencast by Underground	OC: 60.66 Mt UG : Thin Seams below Quarry/ un-economical May be considered for UG in future
t) Percentage of recovery w.r.t. geological reserves: by opencast by Underground	48.4% NA

E. MINING

a) Existing and proposed method of mining (Opencast for OB & coal separately with dragline/ shovel/ surface miners/ manual/ etc.) (underground by longwall/ bord & pillar/ continuous miners/LHD/ SDL/ manual/ etc.)	The mine is being worked by Mechanized Opencast method. Both OBR and Coal winning are being done by hired equipment. Drilling in OB is done by hired drills, whereas, that of Coal is being done by departmental drill machine only. 3 to 4 cum diesel hydraulic excavators/ backhoes are being used in combination with 25 to 35 T Dumpers. The Mining Plan envisages 5.4 cum hydraulic shovels with 35T dumpers in OB and 2.5cum hydraulic shovels with 25T dumpers in coal.
b) Targeted capacity in MTPA when the mine is fully developed and the year in which proposed to be achieved By Underground : By opencast : Total :	Target capacity to be achieved in 6 th year: OC = 2.62 MT UG = 0.00 MT Total = 2.62 MT
c) Life of the mine Underground workings: Opencast workings : Overall :	No UG Operation 27 Years 27 Years
d) Indicate quantum of production and expected grade* as in table below:-	

**COMBINED CALENDAR PROGRAMME OF COAL MINING AND OBR FROM
OPENCAST AND UNDERGROUND**

Year	Opencast (MT)	OBR MCUM	OBR Including Rehandling MCUM	Stripping Ratio CUM/ T	SR incl. Rehandling of Surface dump and crown dump Cum/ t	Under Ground (MT)	Total (MT)
2016-17	0.20	0.10	0.10	0.50	0.50	0	0.20
1	0.40	5.20	5.20	13.00	13.00	0	0.40
2	0.60	5.40	5.40	9.00	9.00	0	0.60
3	0.55	4.93	4.93	8.96	8.96	0	0.55
4	1.04	4.35	4.35	4.18	4.18	0	1.04
5	2.00	4.15	4.15	2.08	2.08	0	2.00
6	2.62	3.84	3.84	1.46	1.46	0	2.62
7	2.62	3.84	3.84	1.46	1.46	0	2.62
8	2.62	3.84	3.84	1.46	1.46	0	2.62
9	2.62	3.84	3.84	1.46	1.46	0	2.62
10	2.62	3.84	3.84	1.46	1.46	0	2.62
11	2.62	4.08	4.08	1.56	1.56	0	2.62
12	2.62	4.08	7.57	1.56	2.89	0	2.62
13	2.62	4.08	7.57	1.56	2.89	0	2.62
14	2.62	4.08	7.57	1.56	2.89	0	2.62
15	2.62	4.08	7.57	1.56	2.89	0	2.62
16	2.62	3.69	8.06	1.41	3.08	0	2.62
17	2.62	3.69	8.06	1.41	3.08	0	2.62
18	2.62	3.69	8.06	1.41	3.08	0	2.62
19	2.62	3.69	8.06	1.41	3.08	0	2.62
20	2.62	3.69	8.06	1.41	3.08	0	2.62
21	2.62	4.76	4.76	1.82	1.82	0	2.62
22	2.62	4.76	4.76	1.82	1.82	0	2.62
23	2.62	4.76	4.76	1.82	1.82	0	2.62
24	2.62	4.76	6.20	1.82	2.37	0	2.62

Year	Opencast (MT)	OBR MCUM	OBR Including Rehandling MCUM	Stripping Ratio CUM/ T	SR incl. Rehandling of Surface dump and crown dump Cum/ t	Under Ground (MT)	Total (MT)
25	2.62	4.76	6.20	1.82	2.37	0	2.62
26	2.50	4.00	7.70	1.60	3.08	0	2.50
27	0.97	0.80	4.49	0.82	4.63	0	0.97
Total	60.66	110.79	156.87	1.83	2.59	0	60.66

Calendar programme of coal production, year wise and seam wise along with GCV has been given in Table 5.5 of chapter 5.

Furnish the detailed calendar programme of coal production year wise and seam wise along with OB removal in the relevant chapter	Calendar programme of coal production, year wise and seam wise along with GCV has been given in Table 5.5 of chapter 5.			
e) Whether the proposed external OB dump site is coal/ lignite bearing: - If so, whether coal/lignite below waste disposal area is extractable.	Yes, the OB during the initial years will be dumped over the coal bearing area within ML but will be rehandled, backfilled and the coal will be extracted from underneath.			
f) Whether negative proving for coal / lignite in the proposed site for OB dump/ infrastructure has been done.	Negative proving under surface dump is not required as the area has been proven as coal bearing. However, entire OB dump placed out side the quarry has been proposed to be rehandled and backfilled.			
g) Proposed configuration of HEMM for OC (Coal & OB) and Major Equipment for UG (Coal Production 2.62 MTPA by OC, from UG- Nil, Total 2.62 MTPA)	i. Proposed configuration of HEMM for OC (Coal & OB)			
	Sl. No.	Particulars	Capacity	Total Nos.
	A OVERBURDEN			
	1	Hydraulic shovel	4.5 m3	6
	2	RD Truck	35 T	42
	3	Dozer	410 HP	8
	4	RBH Drill	110/115 mm	4
	Sub Total (A)			70
	B COAL (OC)			
	1	Hydraulic excavator	2.5 m3	2
	2	Rear Dumper, (Coal Body)	25 T	13
	3	Dozer	320 HP	3

	4	RBH Drill	110/115 mm	2
	5	Hydraulic backhoe	0.9 -1.2 m3	1
	6	Front End Loader	6.3 CUM	2
		Sub Total (B)		23
	C	AUXILLIARY & SERVICE EQUIPMENT		
	1	Grader	220 HP	2
	2	Diesel Bouser		1
	3	Construction backhoe	0.9 CUM	1
	4	Water sprinkler	26 KL	4
	5	TOW truck	50T	1
	6	Rough Terrain Crane - mobile	40T	1
	7	Fuel trucks		1
	8	Wash trucks		1
	9	Mobile maintenance trucks		1
	10	Lube trucks		1
	11	Fire trucks		1
	12	Explosive van		1
	13	Portable air compressor		1
	14	Tyre handler		2
	15	General use trucks		2
	16	Pickup		2
	17	Jeeps		4
	18	Cars		3
		Sub Total (C)		30
	D	RECLAMATION EQUIPMENT		
	1	Front End Loader	1.2-2.5 cum	1
	2	15 T Truck		4
		Sub Total (D) for reclamation		5
		Total (coal + OB + Aux + Réclamation)		126
ii. Major Equipment for UG (Coal Production UG)- NIL				
h)	Mode of entry for underground mines (shaft, incline, adit):	NA as it is an OC mine		
i)	Operations that are proposed to be outsourced	All operations, excluding statutory operations		
j)	Proposed coal evacuation facilities Face to Surface Surface to end use plants	The crushing/deshaling system will be located near the mine entry on west side of the property (refer Plate IV). Dumpers from the ramps will unload coal into a 200 T receiving hopper from two sides. Two apron feeders below the hoppers are provided to feed ROM coal to two crushers (300TPH capacity each) for reducing size to (-) 200 mm.		

	The crushed/deshaled coal will be carried through conveyors to a Ground bunker of 8000 T capacity (one day Production). From the ground bunker coal will be taken out through reclaim conveyor to a transfer point from where two streams will emerge. One stream will go to truck loading hoppers of 50 to 60 T capacities, and another stream will link to the main conveyor system for conveying coal right up to the BTPS.

F. END USE OF COAL/ LIGNITE	
a) Capacity of the approved end use plants	It is a captive mine for the Bokaro Thermal Power Station (BTPS) and Chandrapura Thermal Power Station (CTPS) of DVC.
b) Coal/ lignite requirement for end use plant with grade/ quality	The expansion of mine capacity, from existing 0.4 MTPA to 2.62 MTPA, is being planned to cater to upcoming 500 MW TPS, coming up as an Expansion of existing Bokaro Thermal Power Station of DVC at Bokaro, Jharkhand.
c) % age of end use requirement to be met from this mine	The coal requirement for the upcoming 500 MW plant has been estimated as 2.62 MTPA on the basis of Station Coal Rate of 0.6 Kg per Kilo Watt Hour. The mine has also been planned for to its maximum capacity of 2.62 MTPA.
d) If washing / beneficiation of the coal/ lignite is planned to be conducted on site or adjacent to the extraction area, briefly describe the nature of the beneficiation and recovery rate.	Coal beneficiation has not been envisaged due to proximity of end use plant (about 18 km). Further, GCV Range of ROM coal is 4601 to 4900 Kcal/ Kg, which in case of Non coking coals is equivalent to G9 Grade, as such no coal washing is envisaged.
e) Proposed Use of Rejects/ Middlings	NA

G. ENVIRONMENTAL MANAGEMENT			
a) Existing land use pattern	PRESENT(EXISTING) (AS ON 31-03-2016)		
	LAND USE OF THE PROJECT AREA		
	Sl. No.	PARTICULAR	Total area of land (Ha)
	Within ML/ Block Area		
	1.	Area under habitation	70.294
	2.	Mine facilities	2.00

	3	Top soil dump	2.00	90.64
	4	Water reservoir/settling pond	1.50	
	5	Karo and Emlo nala	1.00	
	6	Area under backfill	5.77	
	7	Area under excavation	42.85	
	8	Area under surface dump	42.02	
	Sub Total Within ML/ Block Area			167.434
	Outside ML/ Block			
	1	Area under Existing facilities (DVC Colony, road, undisturbed area)	1.660	
	2	Magazine and Road	0.25	
	Sub Total Outside ML/ Block			1.91
	Grand Total Project area			169.344
	b)	Land area indicating the area likely to be degraded due to mining, dumping, roads, workshop, washery, township etc.		
PROPOSED LAND USE OF THE PROJECT AREA*				
Land use pattern			Area (ha)	
Within ML/ Block				
Backfilled area			101.35	
Void area			55.11	
Green Belt			6.110	
Facility area			4.864	
Sub Total			167.434	
Outside ML/ Block				
Area under Existing facilities (DVC Colony, road, undisturbed area)			1.660	
Magazine and Road			0.25	
Sub Total			1.91	
Total			169.344	
* Pre mining, present, during mining and post closure land use and post closure management have been given in detail in table 15.5 of chapter 15.				
c)	Surface features over the block area			
Existing quarry, dump, facilities and habitation and nalas as described under Sl. No. G(a).				
Karo nallah flows north to south, through the middle of the block. Emlo Nallah, further east to Karo nala, also flows north to south through the block.				
Another nallah, namely, Baidkaro Nallah flows (outside the block) parallel to the boundary in the south western side of the block.				

d) No. of villages/Houses to be shifted	DETAILS OF HABITATIONS WITHIN THE ML AREA*			
	Sl. No.	Particulars	Area	No.
	Colonies within the Leasehold area			
	1	DVC Quarters	XX	245
	2	Habitation	YY	
	2.a	CCL Quarters	Subhash Nagar	1502*
	2.b	CCL Quarters	Jawahar Nagar	662*
		Sub Total		2164
	Grand Total		2409	
* Source: Report of the joint survey committee of officials of DVC and CCL dt. 14-05-2007				
e) Population to be affected	Approximately 12045 (assuming 5 persons per house)			
f) Year wise proposal for reclamation of land affected by mining activities, ha	Stage wise reclamation programme is as shown in Table 15.4 of Chapter 15.			
g) Monitoring schedules for different environmental components after the commencement of mining and other related activities.	Ambient air quality twice a week, water once a season, soil once a year, noise once a year			

H. PROGRESSIVE AND FINAL MINE CLOSURE PLAN: Separate Chapter no. 15 given	
a) Estimated total capital expenditure for mine closure activities	□ 178.08 Crores
b) Major closure activities with proposed capital expenditure	Major closure activities with proposed capital expenditure are given below:

HEADS	ACTIVITIES	Unit	Vol. of work	Total amt. Rs. Lakh	YEARS																														
					1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	
PROGRESSIVE CLOSURE	c) Dismantling of facilities	LS Mandays		104.38	18.36																														
	k) Dismantling of power line	LS Mandays	0	20.00	20.00																														
02. Safety and Security	a) Barbed wire fencing	Mandays m	17506	37.32	9.88	2.38	2.39	2.96	2.96	1.15	1.13	1.13	1.13	1.13	0.08	0.08	0.08	0.08	0.54	0.54	0.54	0.54	0.54	1.24	1.24	1.24	1.24	0.90	0.90	-	-	-	-		
	d) Garland drain around the mine	Mandays m	2373	11.87	6.37	1.18	1.18	0.58	0.58	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
	f) Toe wall around the dump	Mandays m	6191	61.91	18.20	6.85	6.85	7.96	7.96	3.81	2.81	2.81	2.81	2.81	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
	g) Garland drain around the dump	Mandays m	5929	29.65	9.20	2.69	2.69	4.03	4.03	1.40	1.40	1.40	1.40	1.40	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
	i) Settling pond	Mandays M Cum	5.45	1090.00	118.00	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
	j) Concrete wall to protect mine from Baikaro Nala	Mandays m	300	30.00	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
	k) Connecting Amlo nala to Karo nala along Northern boundary	Mandays m	600	120.00	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
	l) Diversion of Karo nala from y-y area to X-X area	Mandays m	540	270.00	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
	04. Top soil management		Mandays M Cum	1	360.00	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	05. Technical and biological reclamation of mined out land and OB dump	a1) Reclamation	Mandays Ha	101.35	405.40	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
b2) Rehbanding of crown dump to West pit		Mandays M Cum	46.10	13830.00	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
c) Terracing, Blanketing with soil and vegetation of external OB dump		Mandays Ha	72.57	290.28	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
06. Plantation over virgin area including Green Belt	a) Plantation/ Green Belt over Virgin Area	Mandays Ha	6.11	24.44	4.92	4.88	4.88	4.88	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
09. Water quality management		LS Mandays	0	135.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00		
10. Air quality management		LS Mandays	0	135.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00		
12. Manpower cost and supervision		LS Mandays	0	81.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00		
	SUB TOTAL (Progressive Closure)			17036.25	304	43	316	96	416	64	64	64	64	64	17	1073	1073	1073	1222	1407	1377	1377	1377	1647	52	52	52	484	884	1184	1181	0	0	0	
	Estimated mandays required			22454	21790	3240	21190	4036	2908	2429	2429	2429	2429	2429	1127	1658	1658	1658	13818	7366	4966	4966	4966	24566	3955	3955	3955	3955	3955	3955	5685	5685	0	0	0
				9998	2595	2598	2128	3729	1101	1101	1101	1101	1101	36	42	42	42	42	42	42	567	267	267	267	807	588	588	588	589	591	451	451	0	0	0
FINAL CLOSURE																																			
01. Dismantling of infrastructure, disposal/ rehabilitation of minino	a) Dismantling of workshop	LS Mandays	0	30.00	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	15.00	15.00	
	b) Dismantling of CHP	LS Mandays	0	90.00	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	45.00	45.00	
	c) Dismantling of facilities	LS Mandays	0	150.00	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	75.00	75.00	
	d) Dismantling of pumps and pipes	LS Mandays	0	15.00	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	7.50	7.50	
	j) Re-arranging of water pipelines to dump top, park	LS Mandays	0	10.00	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	5.00	5.00	
	k) Dismantling of power line	LS Mandays	0	15.00	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	7.50	7.50	
	l) Rehabilitation over area of dismantled facilities	Mandays Ha	2.4	9.60	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	4.80	4.80	
	c) Boundary wall around the water body	Mandays m	3790	94.75	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	31.58	31.58	
	e) Stabilisation (viz. benching, pitching etc) of outside wall of the water body	LS Mandays	0	30.00	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	15.00	15.00	
	04. Top soil management		Mandays M Cum	0.02	10.00	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	5.00	5.00
07. Landscaping and plantation	a) Peripheral road, gates, view point, cemented steps on bank	Mandays	0	60.00	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	20.00	20.00	
	b) Beautification and landscaping over dump	LS Mandays	0	15.00	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-															

* All persons are proposed to be absorbed in other units of the company, hence no provision for Golden handshake has been made.

c. Escrow amount calculation i. Concept of calculation	The closure cost of an opencast mine has been prescribed as Rs. 6.00 lakh/ha (as on August, 2009) of Project Area as per Guidelines circulated by MOC, Govt. of India vide letter dt. 07-01-2013. These rates will stand modified based on the Whole Sale Price Index (WPI) as notified by Govt. of India time to time. Annual closure cost is to be computed considering the closure cost for total project area at the above mentioned rates and dividing the same by the entire life of the mine in years for the new projects and by the balance life of the project for operating/ existing mines. An amount equal to annual cost is to be deposited each year throughout the mine life compounded at 5% annually.																																						
ii. Basis of calculation	Basis of Calculation is given below. <table><tr><td colspan="2">Type of the Mine</td><td>OC</td></tr><tr><td colspan="2">Base rate of closure cost - August 2009 (Cr. □./Ha.)</td><td>0.06</td></tr><tr><td>Monthly Wholesale Price Index</td><td>Aug. 2009</td><td>129.6</td></tr><tr><td>Monthly Wholesale Price Index</td><td>Nov. 2016</td><td>183.1</td></tr><tr><td colspan="2">Escalation factor of Closure cost</td><td>1.41281</td></tr><tr><td colspan="2">Rate of compounding of Annual Closure Cost</td><td>5.00%</td></tr></table> <table><tr><td>Closure cost as on November 2016 (Cr. □./Ha.)</td><td>0.0847685</td></tr><tr><td>Project Area (Ha.)</td><td>169.344</td></tr><tr><td>Amount to be deposited into Escrow Account at Nov. 2016 WPI "□Cr."</td><td>14.3550</td></tr><tr><td>Amount already deposited into Escrow Account "□Cr."</td><td>0</td></tr><tr><td>Net Amount to be deposited into Escrow Account at Nov. 2016 WPI "□Cr."</td><td>14.3550</td></tr><tr><td>Starting year for Escrow deposit</td><td>1</td></tr><tr><td>Ending year for Escrow deposit</td><td>27</td></tr><tr><td>Balance Life of the project For Escrow Account "in Yrs"</td><td>27</td></tr><tr><td>Annual Closure Cost (□Cr.)</td><td>0.5317</td></tr><tr><td>TOTAL Escrow amount (□Cr.) :</td><td>29.0658</td></tr></table>	Type of the Mine		OC	Base rate of closure cost - August 2009 (Cr. □./Ha.)		0.06	Monthly Wholesale Price Index	Aug. 2009	129.6	Monthly Wholesale Price Index	Nov. 2016	183.1	Escalation factor of Closure cost		1.41281	Rate of compounding of Annual Closure Cost		5.00%	Closure cost as on November 2016 (Cr. □./Ha.)	0.0847685	Project Area (Ha.)	169.344	Amount to be deposited into Escrow Account at Nov. 2016 WPI "□Cr."	14.3550	Amount already deposited into Escrow Account "□Cr."	0	Net Amount to be deposited into Escrow Account at Nov. 2016 WPI "□Cr."	14.3550	Starting year for Escrow deposit	1	Ending year for Escrow deposit	27	Balance Life of the project For Escrow Account "in Yrs"	27	Annual Closure Cost (□Cr.)	0.5317	TOTAL Escrow amount (□Cr.) :	29.0658
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iii. Annual Escrow deposit		As shown in following table	
AMOUNT TO BE DEPOSITED IN ESCROW ACCOUNT ANNUALLY			
Year	Amount (₹ Crores)		
	OC		
1	0.5317		
2	0.5583		
3	0.5862		
4	0.6155		
5	0.6462		
6	0.6786		
7	0.7125		
8	0.7481		
9	0.7855		
10	0.8248		
11	0.8660		
12	0.9093		
13	0.9548		
14	1.0025		
15	1.0527		
16	1.1053		
17	1.1606		
18	1.2186		
19	1.2795		
20	1.3435		
21	1.4107		
22	1.4812		
23	1.5553		
24	1.6330		
25	1.7147		
26	1.8004		
27	1.8904		
Total	29.0658		

I. Others	
a) Base date of Mining Plan	1.4.2017
b) Calendar year from which the production will start	It is an operating mine already in production
c) Results of any investigation carried out for scientific mining, conservation of minerals and protection of environment; future proposals.	The EIA & EMP report prepared in 2007 by CIMFR, Dhanbad “Optimisation of Blasting Parameters for controlling Fly-Rocks and Ground Vibration within desirable limits due to deep hole blasting operation in Bermo colliery of DVC, Bokaro.” In June, 1994 by CMRI.
d) Signature of RQP Date: 25-04-2017 Place: New Delhi	

CHAPTER 1

INTRODUCTION

1.1 BACKGROUND OF THE BLOCK

Bermo Mines of Damodar Valley Corporation (DVC) is in East Bokaro Coalfield, located in Bokaro district of Jharkhand state. DVC had taken over this mine from the Indian Railways in 1951. It is a captive mine for the Bokaro Thermal Power Station (BTPS) and Chandrapura Thermal Power Station (CTPS) of DVC. All mining operations are confined to Bermo seam only and Lower seams are virgin.

Further Exploration work was carried through CMPDI for proving the lower seam reserves. This Mining Plan is based on the information and structural disposition generated by additional boreholes and envisages mining of Lower seams also.

1.2 NAME OF APPLICANT WITH COMPLETE ADDRESS

The name and address of the Company (the applicant seeking Mining Plan Approval) is given in Table 1.1 below:

TABLE 1.1
NAME AND ADDRESS OF THE COMPANY

Particulars	Information
Name of the Company	Damodar Valley Corporation
Address	<u>Registered Office:</u> Damodar Valley Corporation DVC Towers, VIP Road, Kolkata-700054, W. B. <u>Mine Office:</u> Damodar Valley Corporation, Bermo Mines, P.O. Bermo, Bokaro, Jharkhand- 829104
Phone	033-66072316, 09434742667
Fax	06549-266701
E- mail	arbind.thakur@dvc.gov.in
Official Website	www.dvc.gov.in

1.3 STATUS OF THE APPLICANT

The Damodar Valley Corporation (DVC), headquartered in Kolkata, West Bengal, is a Public Corporation under the Ministry of Power Govt. of India.

DVC came into existence on 7 July, 1948 under Act No. XIV of 1948 as the first multipurpose river valley project of independent India.

1.4 BACKGROUND OF THE COMPANY

DVC operates several power stations, both thermal and hydel, in the Damodar River area of West Bengal and Jharkhand. It has 8 thermal power stations with a capacity of 7598 MW, three hydro-electric power stations with a capacity of 147.2 MW and one gas turbine station with a capacity of 82.5 MW, with total installed capacity of 7745.2 MW. Presently DVC has 35 sub-stations and receiving stations and more than 5500-circuit km of transmission and distribution lines. DVC also has four dams, a barrage and a network of canals that play an effective role in water management. The construction of check dams, development of forests and farms and upland and wasteland treatment developed by DVC play a vital role in eco conservation and environment management.

1.5 MINERALS WHICH ARE OCCURRING IN THE AREA AND WHICH THE APPLICANT INTENDS TO MINE

Coal

1.6 PERIOD FOR WHICH MINING LEASE IS REQUIRED

The 1st ML Deed was signed on 19-01-1951 for 35 years (**Annexure I**) and the renewal for ML was granted on 27-12-1986 for 30 years (from 01-01-1987 to 31-12-2016). The application for renewal has been submitted on 31-08-2015 for 20 years. Department of Mines and Geology, Govt. of Jharkhand has asked for Approved Mining Plan and other documents vide their letter no. Kh.Ni(Bokaro)-01/2015-2260/M., Ranchi dt. 28-10-2015. (refer Annexure XII). Accordingly, this Mining Plan and Mine Closure Plan has been prepared for approval of MoC.

1.7 BLOCK ALLOTMENT STATUS

Bermo Coal mine was taken over by DVC from Railways in 1951 and is being operated by DVC.

1.8 LOCATION OF END USE PLANTS (EXISTING AND/OR PROPOSED), THEIR REQUIREMENT AND SOURCE TO FILL THE GAPS

It is a captive mine for the Bokaro Thermal Power Station (BTPS) and Chandrapura Thermal Power Station (CTPS) of DVC. At present all mining operations are confined to Bermo seam only and Lower seams are virgin. The expansion of mine capacity, from existing 0.4 MTPA to 2.62 MTPA, is being planned to cater to upcoming 500 MW TPS, coming up as an Expansion of existing Bokaro Thermal Power Station of DVC at Bokaro, Jharkhand.

1.9 NORMS USED FOR COMPUTING COAL CONSUMPTION AND COAL REQUIREMENT

The coal requirement for the upcoming 500 MW plant has been estimated as 2.62 MTPA on the basis of Station Coal Rate of 0.6 Kg per Kilo Watt Hour (Refer **Annexure III**). Environmental clearance for EUP has been received vide letter no. J-13011/21/2006-IA.II(T) dt. 30th March, 2007 (**Annexure IV**)

The mine has also been planned for to its maximum capacity of 2.62 MTPA considering geo-mining, technical parameters and available reserves.

1.10 COAL BENEFICIATION

Coal beneficiation has not been envisaged due to proximity of end use plant (about 18 km).

1.11 NAME OF RQP PREPARING MINING PLAN

Name : Mr. B. D. Sharma
Address
(i) Office : A-121,
Paryavaran Complex,
IGNOU Road,
New Delhi – 110030
Phone : 29534777, 29532236, 29535891
Fax : +91-11-29532568
E-mail : mining@minmec.com; min_mec@vsnl.com;
minmec@bol.net.in
Web site : <http://www.minmec.co.in>
Registration Number : No. 34012(03)/2014-CPAM
Date of grant / renewal : 29th May, 2015, valid up to 28th May, 2025
(ii) Residence : A-121,
Paryavaran Complex,
IGNOU Road,
New Delhi – 110030
Phone : +91-11-29534777, 29535891

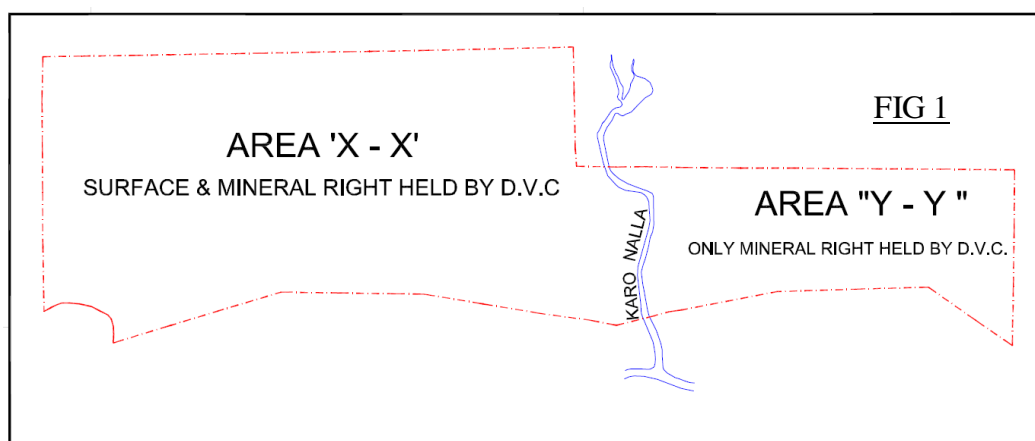
(Photo copy of the certificate of Recognition of RQP by Ministry of Coal is attached as **Annexure XIII**).

1.12 STATUS OF THE PROJECT

In the past, from 1951 to 1975, coal mining was done by opencast method and from 1976 to 1992, by underground Bord and Pillar method (development only). From 1993 onward, coal mining is being done by mechanized opencast method. The year wise coal production since 1993-94 is given in Table 4.29 under Chapter 4. All mining operations have been confined to Seam Bermo only.

The present mine capacity is 0.40 MTPA which is now being proposed to be increased to 2.62 MTPA by extending and deepening the existing opencast mine up to Seam VI.

For ease of working, the DVC Mining Lease area (167.434 ha) was divided into two sections in the past, namely, "X-X area" to the west of Karo Nala and "Y-Y area" to the east of Karo Nala as shown in figure 1 below.



Presently, opencast is being done in X-X area, where Bermo seam is almost exhausted. The Y-Y area is fully virgin and is occupied by built-up area/ quarters of Central Coalfields Ltd., that are to be shifted/ rehabilitated before exploitation of this area by opencast method.

In this Mining Plan, the X-X' and Y-Y' areas have been considered in totality as a single block for optimal planning and conservation and hence, X-X' and Y-Y' areas have not been dealt any further unless specifically required.

CHAPTER 2

DETAILS OF EARLIER APPROVED MINING PLANS

2.1 APPROVAL LETTER/ REFERENCE OF MOC

No Mining Plan for this coal mine/ block has been earlier approved by Ministry of Coal.

This is the 1st Mining Plan and Mine Closure Plan.

CHAPTER 3

LOCATION, TOPOGRAPHY & COMMUNICATION

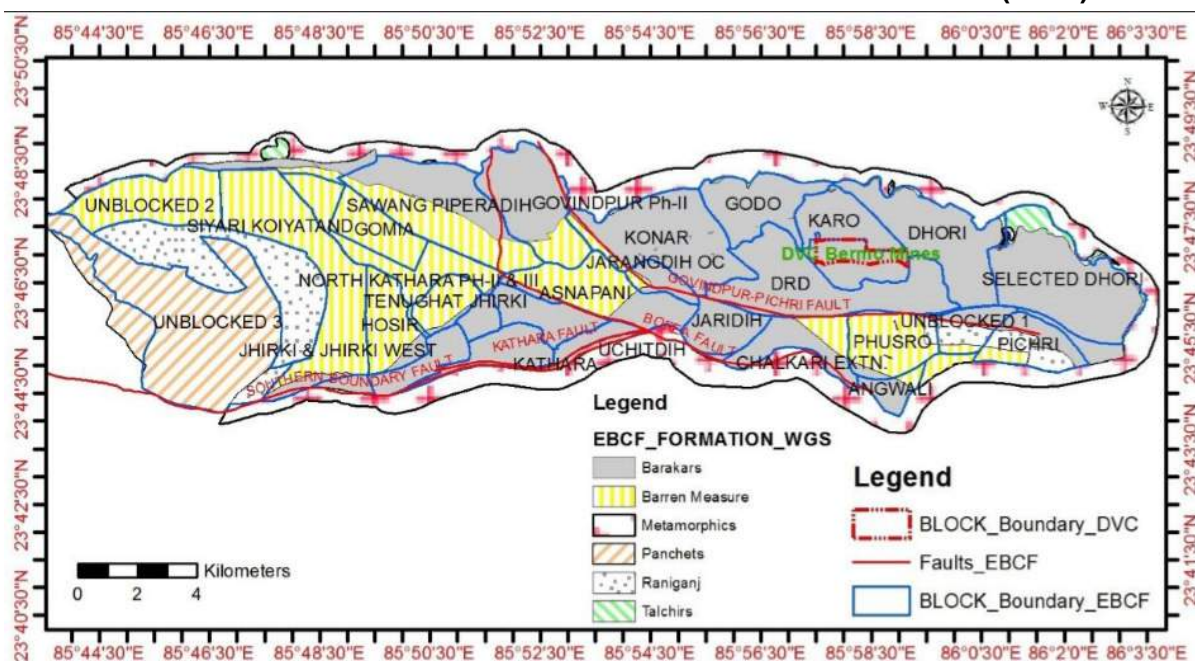
3.1 LOCATION

The Bermo Coal Mine lies in Bermo Block of East Bokaro Coalfield in Bokaro district of Jharkhand state. The mine site is located in Karo, Baidkaro, Kargali, and Emlo villages of Bermo circle. The area is covered in the Survey of India Toposheet No. 73 E/9 (RF- 1:50000) and is bounded by (as per CMPDI GR) (Refer Plate I for Location and Plate XVII for Key map):

Latitude	:	23° 46' 48" N	to	23° 47' 16" N
Longitude	:	85° 57' 29" E	to	85° 59' 11" E

The location can be seen in Fig 3.1 below.

FIG 3.1: LOCATION SHOWING DAMODAR RIVER DIVERSION (DRD)



3.2 MINING LEASE BOUNDARY

The block covers an area of 167.434 Ha which is also the ML area (413.74 Acres or 167.434 ha).

An additional area of 1.66 Ha has been acquired by DVC in the past for pit head facilities and 0.25 ha for Magazine outside ML area and DVC has only surface rights over these areas.

The Project Area therefore becomes 169.344 Ha. (167.434 Ha of ML + (1.66 Ha + 0.25Ha) outside ML).

The adjoining blocks of DVC Bermo Block are as follows:

North	:	Karo Block of CCL
South	:	Damodar River Diversion Block of CCL
East	:	Dhori Mines of CCL
West	:	Bokaro Mines of CCL

Plan showing the approved block boundary vis-a-vis the proposed ML in distinct colours with the names of the adjacent coal blocks marked Plate II

3.2.1 Boundary pillars coordinates by CMPDI

Survey was carried out with respect to Survey of India (SOI) base stations viz; KGL-3 and KGL-4, at Amlo village near Seam BERMO incline. The location of these SOI base stations, shown in Table 3.1, were obtained from “Coal Grid for Central Coalfields Limited” published in January 1991 by Department of Geological Services, Central Coalfields Limited, Ranchi. At first, the base line was transferred from SOI base to DVC Bermo Mines using static DGPS survey method and four primary base stations viz; F1, F11, TBMB and S1 were established in the area. All the secondary base stations were established by ETS.

TABLE 3.1
CO-ORDINATES OF SOI BASE STATIONS CONSIDERED FOR
CARRYING OUT SURVEY IN DVC BERMO MINES, EAST
BOKARO COALFIELDS

Station	Departure (x)	Latitude (y)	RI (z)
KGL 3	3202807.577	1087306.212	249.239
KGL 4	3203098.056	1087335.990	271.247

The whole dataset recorded by DGPS were processed in its related software (Spectrum survey office, V.8.2) to get results in X, Y, Z co-ordinates of the base stations and all ETS observed data were processed in LISCAD (V.11.3) and Magnet Office (V.1.2.1) softwares. The Departure and Latitude of the boundary pillars are given in Table 3.2.

TABLE 3.2
DEPARTURE AND LATITUDE OF SURVEYED BOUNDARY PILLARS,
DVC BERMO MINES, EAST BOKARO COALFIELDS

Pillar ID	Departure(m)	Latitude(m)
BP-01	3199682.241	1087897.065
BP-02	3199795.637	1087897.135
BP-03	3199811.492	1087897.212

Pillar ID	Departure(m)	Latitude(m)
BP-04	3199863.632	1087895.11
BP-05	3199947.587	1087898.828
BP-06	3200055.326	1087900.292
BP-07	3200079.579	1087900.541
BP-08	3200084.326	1087898.721
BP-09	3201083.58	1087915.725
BP-10	3201260.336	1087918.351
BP-11	3201261.416	1087844.206
BP-12	3201262.523	1087767.166
BP-13	3201262.709	1087646.984
BP-14	3201263.120	1087573.132
BP-15	3201265.574	1087563.554
BP-16	3201501.125	1087569.47
BP-17	3201621.176	1087572.123
BP-18	3201714.626	1087576.548
BP-19	3202006.689	1087585.437
BP-20	3202342.553	1087595.263
BP-21	3202463.768	1087596.23
BP-22	3202554.689	1087597.573
BP-23	3202558.446	1087340.382
BP-24	3202561.962	1087181.415
BP-25	3202564.069	1087097.72
BP-26	3202557.252	1087062.036
BP-27	3202296.703	1087227.113
BP-28	3201854.789	1087202.34
BP-29	3201368.502	1087100.659
BP-30	3201335.276	1087108.254
BP-31	3201299.249	1087116.5
BP-32	3201184.292	1087142.724
BP-33	3200827.397	1087206.035
BP-34	3200777.497	1087207.508
BP-35	3200622.471	1087211.947
BP-36	3200549.104	1087212.652
BP-37	3200469.191	1087215.055
BP-38	3200405.081	1087214.341
BP-39	3200362.228	1087203.924
BP-40	3200323.717	1087192.802
BP-41	3200192.987	1087154.753

Pillar ID	Departure(m)	Latitude(m)
BP-42	3199698.749	1087155.156
BP-43	3199697.092	1087204.053
BP-44	3199696.066	1087245.178
BP-45	3199690.205	1087634.642
BP-46	3199689.062	1087718.175
BP-47	3199687.561	1087811.851

In this Topographical Survey accuracy achieved in horizontal is 1 in 94000 to 290000 and in Vertical is 4mm to 13mm.

The complete processed data was transferred to dwg format to prepare topographical plan of DVC Bermo Mines in AutoCAD 2015.

3.3 COMMUNICATION

Roads: The coal mine is located at 45 Km from Bokaro Township in the East Bokaro coalfield near Kargali and other mines of CCL. The mine is well connected to BTPS by a metalled road.

Railways: The nearest Railway Station is Bermo on Gomoh-Chandrapur, Barkakana-line of the East Central Railway, at a distance of about 1 Km towards south.

Airport: The nearest airports at Ranchi and Kolkata are at a distance of about 120 km and 330 km respectively.

3.4 PHYSIOGRAPHY AND DRAINAGE

The topography is gently undulating and marked by the absence of any high hill or deep depressions. The pre-mining elevation (based on boreholes drilled during 1950s) was between 233.17 and 243.84 m.

A considerable part of the block (in X-X area) is affected by opencast mining of Bermo seam. The RL on its floor has a level of 180 m. There is an OB dump area at the northern half portion. The highest contours over the dump are 280m.

The general slope of the ground is towards south. The drainage of the area is controlled by Damodar River flowing from west to east, located south of the mines at a distance of around 1.0 km. Its tributary Karo nala flows from north to south in the eastern part of the Block dividing it into “XX” and “YY” areas. It then flows east to west, parallel to the block and joins the Damodar River south of the mine. Further east to Karo nala, Emlo nala also passes through the property.

Baid karo nala flows from north to south in the southwest of the mine and joins Karo nala in the south of the Mines, at a distance of more than 200m.

The HFL of the Karo nala as recorded in the vicinity of the project is 229.70m above MSL. The HFL of the Baid karo nala as recorded in the vicinity of the project is 221.555 m above MSL.

The eastern portion of the block ("Y-Y" Area) is occupied by Miners quarter of Kargali colliery (Jawahar Nagar: between the Karo Nallah and Emlo Nallah and Subhash Nagar: beyond Emlo Nala towards east).

The surface plan showing the drainage system, surface contours at 2m interval and location of boreholes is shown in Plate IV.

3.5 CLIMATE & RAINFALL

The East Bokaro Coalfield bears a tropical climate. During summer months (April to June), the day temperature reaches around 46 degree Celsius. During winter months (November to January), the weather is comparatively pleasant with day temperature around 24 degree Celsius. Night-time temperature often falls to 4 degree Celsius. Annual rainfall is about 1200 mm to 1260 mm, a major portion of which occurs during the monsoon period (July to September) (Source: Environmental Statement Study by ISM, Dhanbad, 2014-15).

3.6 LAND USE AND OWNERSHIP / OCCUPANCY

Pre-mining land use of the Mining Lease Area is detailed in **Annexure VI** and summarized in Table 3.3 below (Refer Plate V for Revenue plan).

TABLE 3.3
PRE-MINING LAND USE OF THE PROJECT AREA

Village/ mauza	Pre Mining Land Use in ML Area in acres (Area detailed in acres in the lease records)						Total ML area in ha
	Tenancy	GMK Govt. Land (Waste land)	GMK Jungle	GM- Aam (Others)	Water body	Total	
Within ML/ Block							
Karo	3.76	11.45	36.9	0.99	1.00	54.10	21.893
Baidkaro	16.03	14.40	29.81	0	0	60.24	24.378
Kargali	9.72	0.87	215.5	0	1.31	227.40	92.026
Emlo	37.62	18.48	15.09	0.81	0	72.00	29.137
Total acres	67.13	45.20	297.30	1.80	2.31	413.74	
Total in Ha	27.166	18.292	120.313	0.728	0.935	167.434	167.434
Out side ML							
Baidkaro, ha	1.66	0.25	0	0	0	1.91	1.91
Project Area, ha	28.826	18.542	120.313	0.728	0.935		169.344

The present (2015-2016) land use of the Mining Lease Area is given in Table 3.4 below which can also be seen in Present Surface Plan (Plate XVIII).

TABLE 3.4
PRESENT (2015-2016) LAND USE OF THE PROJECT AREA

Sl. No.	Particular	Total area of land (Ha)		Remark
Within ML/ Block Area				Mining rights
1	Area under habitation	70.294		
2	Mine facilities	2.00		
3	Top soil dump	2.00		
4	Water reservoir/settling pond	1.50		
5	Karo and Emlo nala	1.00		
6	Area under backfill	5.77	90.64	
7	Area under excavation	42.85		
8	Area under surface dump	42.02		
Sub Total Within ML/ Block Area		167.434		
Outside ML/ Block				
1	Area under Existing DVC Colony	1.660		Surface rights only
2	Magazine including approach road	0.25		
Sub Total Outside ML/ Block		1.91		
Grand Total Project area		169.344		

The present quarry area of 48.62 Ha will increase to 156.46Ha in the proposed mine.

The proposed land use of the Project Area at end of life of mine will be as given in Table 3.5 below.

TABLE 3.5
PROPOSED LAND USE OF THE PROJECT AREA

Land use pattern	Area (ha)	
Within ML/ Block		
Backfilled area	101.35	Mining rights
Void area	55.11	
Green Belt	6.110	
Facility area	4.864	
Sub Total	167.434	
Outside ML/ Block		
Facilities including magazine	1.91	Surface rights only
Sub Total	1.91	
Total	169.344	

3.7 IMPORTANT SURFACE FEATURES AND MAJOR DIVERSIONS OR SHIFTING

3.7.1 Important surface features

i. Habitation of following villages is lying within the block:

The mine surface of the DVC leasehold area is heavily built-up with CCL colonies and DVC quarters. The details of existing colonies within the leasehold area are given in Table 3.6.

TABLE 3.6
DETAILS OF HABITATIONS WITHIN THE ML AREA*

Sl. No.	Particulars	Area	No.
Colonies within the Leasehold area			
1	DVC Quarters	XX	245
2	Habitation	YY	
2.a	CCL Quarters	Subhash Nagar	1502*
2.b	CCL Quarters	Jawahar Nagar	662*
	Sub Total		2164
	Grand Total		2409

* *Source: Report of the joint survey committee comprising of officials of DVC and CCL dt. 14-05-2007*

ii. The road network is lying within the block:

No public road passes through the block or ML.

iii. The following network of drainage and canals is lying within the block:

Karo nallah flows north to south, through the middle of the block. Emlo Nallah, further east to Karo nala, also flows north to south through the block.

Another nallah, namely, Baidkaro Nallah flows (outside the block) parallel to the boundary in the south western side of the block.

iv. Forest within Block:

Out of 167.434 ha ML area, 120.313 ha GMK land was previously recorded as GMK Jungle which comes to 71.86%. Mining operation is going on in the block for over 65 years and this area, at present, is either under habitation or under mining.

As per the letter no.1669 dt. 02-06-2016 (**Annexure X**) issued by Divisional Forest Officer, Bokaro regarding "No Objection", the plots of Mining Lease are outside the Forest Land.

v. Power line:

There is no HT power line passing through the ML. The power distribution within the ML to different consumers is done through a power line network from the locally installed sub-station of DVC where power at 33 KVA is received from BTPS and stepped down to 11 KVA and 440 V as required before use.

3.7.2 Major Diversions or Shifting

There are following major activities involved in case of nalas in and outside the ML area.

i. Concrete wall to protect mine from Baidkaro Nala

The Baidkaro nala is flowing adjoining to the south eastern corner of the ML area. The mining operations will approach this boundary after 16th year hence a concrete wall is proposed to be constructed with a length of about 300m by the end of 16th year to protect the mine workings from water inundation from this nala.

ii. Connecting Amlo nala to Karo nala along Northern boundary

It will be necessary to carry out surface dumping operations after the 6th year. Therefore it will be necessary that the Amlo nala be connected to the Karo nal along the northern boundary of the ML area. The length of this connection will be about 60m.

iii. Diversion of Karo nala from y-y' area to X-X' area

The mining operations on west of Karo nala (over X-X area) will be initially carried out with concurrent backfilling the de-coaled area starting from immediate vicinity of the Karo nala and moving away from it towards further west. As the Y-Y area on east of Karo nala will have to be mined after 20 years, it will be necessary to divert this nala towards west side over the backfilled area by 20th year (refer Plate XIII-F). The length of this diverted portion will be about 540m.

CHAPTER 4

EXPLORATION, GEOLOGY, SEAM SEQUENCE, COAL QUALITY AND RESERVES

4.1 REGIONAL GEOLOGY

4.1.1 General

The East Bokaro Coalfield is third in alignment from East among the Damodar Valley Coalfields, after the Raniganj and Jharia Coalfields. It is located in the Bokaro Distt. of Jharkhand State at Latitude 23° 44' to 23° 50' N and Longitude 85° 42' to 86° 03' E, covering an area of approximately 207 Sq. Km and is separated from its western counterpart, the West Bokaro coalfield, by the Lugu hill (977m).

The Coalfield is elongated in an East–West direction and extends for about 32 Km. Its width in North–South direction varies from 4 - 8 Km.

The coalfield displays a complete sequence of the Gondwana rocks from Talchirs to Mahadeva formation. The Barakar formation covers a major part of the coalfield whereas the Barren Measures outcrop along the axial region of the coalfield.

The generalised stratigraphy of East Bokaro Coalfield is enumerated below in Table 4.1.

TABLE 4.1
GENERALISED STRATIGRAPHIC SUCCESSION
OF EAST BOKARO COALFIELD

Age	Formation	Rock Types (Approx Th.)
Recent	-	Soil and Alluvium
Post Gondwana	Intrusive	Lamprophyre and Dolerite Dykes & Sills
Upper Triassic	Supra Panchet (Mahadevas)	Coarse grained Ferruginous Sandstone, Pebbly sandstone & Red Clay (600m)
----- Unconformity -----		
Lower Triassic	Panchet	Greenish Micaceous Sand stone. Buff FG Sand stone, Red & Green Shale (500-600m)
----- Unconformity -----		
Upper Permian	Raniganj	Medium to Coarse-grained Calc. sand stone, Fine grained greenish sand stone Grey Shale, Carbonaceous. Shale & thin coal seams. (600m)

Age	Formation	Rock Types (Approx Th.)
Middle Permian	Barren Measures	Flaggy Fine grained Ferruginous sand stone, Micaceous sandy shale & black shale with Siderite bands. (500m)
Lower Permian	Barakar & Karharbari	Coarse grained Arkosic sand stone, Fine grained laminated sand stone, Grey Shale, Carbonaceous Shale & Coal seams. (900m)
Up. Carboniferous to Lower Permian	Talchir	Tillite, Greenish sand stone, Needle Shales, Varvites & Rhythmites
----- Unconformity -----		
Precambrian		Granite Gneiss, Amphibolite & Mica Schist.

The geological formations of East Bokaro Coalfield are briefly described below:

Precambrian Rocks

The Pre – Cambrian rocks, consisting mainly of Granite Gneiss and Quartz Mica Schist, form the basin of deposition. These rocks are exposed in the North, East & South of the coalfield. In addition, a few small inliers of metamorphic rocks occur within the basin close to its Northern periphery.

Talchir Formation

The Talchir Formation crops out only in the Northeastern periphery of the coalfield around Chapri village. It is not recorded over a major part of the basin. However in the eastern part of the coalfield the formation occurs over an area of 5.00 Sq. Km up to the railway line of the Gomoh – Barkakana loop of the Eastern Railway.

Karharbari Formation

The Karharbari Formation has a characteristic pebble bed or Conglomerate at the base and it rests directly on the Precambrian rocks in the block. Seams V and below are considered as belonging to this Formation. Seam III is the most promising seam of Karharbari.

Barakar Formation

The Barakar Formation covers a major part of the East Bokaro Coalfield and is also exposed in DVC Bermo mine area. Based on gross lithology, the formation can be divided into three stages, namely, Lower, Middle & Upper stages, which have been described below:-

i) Lower Stage (Kargali – Karo Stage)

This stage marked the major period of deposition of coal seams in the coalfield and comprises the Karo group of seams Bermo & Kargali seam. An important Index Horizon of this formation apart from the coal seams is a thick 6m – 27m dark, compact Carbonaceous Shale band forming the roof of Kargali seam. Thick bands of Coarse-grained sandstone, Gray shale & Carbonaceous shale are Inter-bedded with the coal seams in this stage. The average thickness of this stage is around 200 m.

ii) Middle Stage (Kathara Stage)

This stage shows the development of thin coal seams, viz the Uchitdih A, Uchitdih, Kathara, Upper Kathara & Sawang group of seams interbedded with shale and sandstones. The upper part of this stage is characterized by a 45-75m thick sandstone dominated horizon devoid of coal. The average thickness is around 400m.

iii) Upper Stage (Jarangdih Stage)

This stage is characterized by argillaceous beds. The Jarangdih group of seams is present in this stage overlain by a distinct sandstone bed in the roof. The average thickness of this stage is around 200m.

Barren Measure Formation

The Barren Measures Formation covers a large tract in the axial region of the basin and can be traced close to the eastern flank of the Lugu hill. They are also preserved on the down thrown side bounded by the Govindpur – Pichri fault in the north and the Borea fault in the south. Further west, the Barren Measures exhibit a semi – circular outcrop pattern from Koiyatanr & Dumri in the North West to Saram & Khawatanr in the South, through Ocho & Miabund.

In the Eastern part of the basin the Barren Measures reappear in Tenughat – Jhirki area where they are preserved in a trough, bounded by the Govindpur – Pichri fault in the north and the Jaridih Bazar fault in the south. Here the Barren Measures are well exposed along the course of the Damodar River south of Bhermukha village. The Barren Measures comprise alternate bands of Flaggy cross-bedded ripple marked Ferruginous sandstones and Shale beds.

The Shale is Micaceous and sandy, showing rhythmically bedded silt bands. A facies change is also observed from north to south. The Shale is black with Ferruginous inter bands in the north while Gray Shale with only subordinate amounts of black shale form bulk of the clastic Tillite in the south.

Raniganj Formation

The Raniganj Formation is developed in the two extremities of the coalfield. In the east it is observed in the area between Dhori and Rajabera as a narrow strip. The Dhori – Pichri fault with a southerly throw has favoured the preservation of this formation in this part of the coalfield. In the west the formation is developed along the fringes of the Lugu hill covering Pindra, Debipur, Tulbul & Khawatanr areas.

The Raniganj Formation comprises sandstone, shale and thin coal seams. *Glossopteris* Sp., *Vertebraria* and *Schizoneura* Sp. are the plant fossils that have been reported from this formation.

Panchet Formation

The Panchet formation occupies a vast area along the Northern, Eastern & Southern flanks of the Lugu hill. Good exposures are also recorded in the Dhardharwa nala section. The Raniganj – Panchet boundary is mostly gradational, though at places, a minor overlap of the Panchet over the older formation has been observed.

Supra Panchet (Mahadeva) Formation

A thick sequence of thick clastics is seen to cap the Lugu hill. This sequence, tentatively correlated with the Mahadeva Formation rests over the Panchet Formation with an angular unconformity that can be seen on the eastern face of the Lugu hill.

Igneous Intrusion

The Gondwana Formation in East Bokaro Coalfield is seen to be intruded by Dolerite & Lamprophyre intrusive. Dolerite dykes are seen cutting across the Kargali seam in the quarries of Jaridih Bazar, Bokaro and Sawang. A prominent Dolerite dyke is seen to run along the strike of the Kargali seam in the northern edge of Kargali quarry.

Lamprophyre Sills & Dykes have affected the coal measures around Govindpur, Sawang area and the South Western part of Kathara and Jhirki blocks. Pyrolitization most extensively affects the Govindpur block where a number of seams have been affected by Lamprophyre intrusive.

4.1.2 Coal seams

Coal seams occur in Barakar Formation Lower, Middle & Upper stages and in Karharbari formation.

4.1.3 Regional structure

The East Bokaro Coalfield is structurally an East – West aligned synclinal half basin closing towards east. The Western part of the East Bokaro Coalfield exhibits an ideal Graben of which both the northern and southern margins are defined by prominent boundary faults. The Eastern part of the coalfield, on the other hand, depicts a Half – Graben configuration. Here, along the northern boundary the Gondwana strata are unconformable with the Precambrian basement while the southern margin is defined by a prominent boundary fault.

The general strike of the formations is in an East – West, however, significant local variations. The dip of strata is also variable in different segments of the coalfields. Gently sloping beds are noted in the Bokaro – Kargali area where the dip is as low as 5 degrees to 7 degrees towards south. In the Chalkari block, strata lying on the north of the Govindpur – Pichri fault slope 7 degrees to 11degrees towards south whereas strata on the south of this major fault show comparatively steeper dips. In the adjoining Tenughat – Jhirki block the strata show steep dips towards north.

In Dhori and adjoining eastern part of the basin the dips are moderate at around 20 degrees. In Sawang and Govindpur blocks lying on the northern limb of the basin, the regional strike is ESE – WNW with variable southerly dips ranging from 15 degrees to 45 degrees.

The East Bokaro basin, in general, is traversed by a number of strike and dip faults of varying throws and alignments. Some of these faults have considerable regional extents. A brief description of the major faults of this coalfield is given below.

a) Southern Boundary Fault

One of the most prominent faults of the coalfield is the southern boundary fault. In its eastward extension it cuts off the Barakar Formation bringing the Kargali seam incrop very near to the Metamorphic contact.

b) Govindpur – Pichri Fault

It passes through the axial region of the coalfield from the eastern extremity to Govindpur village. This fault has a hade towards south with a throw estimated to be 400m or more. However, in the Integrated DRD Project area the throw of this fault varies from 80m to 100m. Along this fault the southerly dipping strata of the northern up thrown block comes in juxtaposition with the younger northerly dipping strata on the down thrown side. Close to this fault, however, the strata show erratic dips due to intense deformation and drag effect of this fault.

c) Borea Fault

It is located in the western part of the coalfield, trending WNW –ESE and having 120m – 300m-north easterly. It probably merges with the Kathara fault near the confluence of the Konar and Damodar rivers. This fault plays an important role in preserving of the Govindpur – Asnapani trough.

d) Kathara Fault

It is located near the southern limit of the basin near Jhirki – Kathara area. It trends E-W to NE - SW and throws towards North / North West. It has brought the middle Barakar sequence in juxtaposition with the basal Barakar formation.

Apart from the above prominent faults this coalfield is also traversed by a number of other faults.

4.2 GEOLOGY OF DVC BERMO BLOCK

The Bermo Block is located in East-Central part of East Bokaro coalfield. The northern part of the Block is marked by Karo Block and western, southern and eastern parts are demarcated by DRD Block. Of all the various Gondwana formations only Barakar is exposed in the area. Archean metamorphic rock has been intersected in a few boreholes.

4.2.1 Geological succession in DVC Bermo coal block

The geological succession evolved on the basis of exploration data generated in the block is given in the Table 4.2 below.

TABLE 4.2
GEOLOGICAL SUCCESSION IN DVC BERMO COAL BLOCK

Age	Formation	Thickness (m)	Lithology
Middle Permian	Barakar	88.5-220.0	Medium to coarse grained sandstone, shales and coal seams
	Karharbari	4-76.65	Coarse to very coarse grained sandstone, pebble bed, boulder bed and coal seams
----- Unconformity -----			
Pre-cambrian			Granites, gneiss and quartzite.

The entire exposed area is covered by the Barakar formation. The area is free from any igneous activity and as such coal seams are free from pyrolytisation.

4.2.2 Structure of the block

The strike of the strata is E-W, dipping southerly. Dip amount increasing from 7° to 14° from West to East

4.3 STATUS OF EXPLORATION

4.3.1 Previous work

This mine was previously owned by the Indian railways and DVC had taken over this mine from the Indian Railways in 1951. From 1951 to 1975, coal mining was done by opencast method and from 1976 to 1992, by underground Bord and Pillar method (development only). From 1993 onwards, coal mining is being done by mechanized opencast method. All mining operations are confined to Bermo seam only.

DVC Bermo mine has a leasehold area of 167.434 Ha. However, no organized drilling activity was reported in the block.

4.3.2 Recent Exploration

The recent exploration was carried out during 6th December 2015 to 1st April 2016 to make qualitative and quantitative assessment of all seams within leasehold area of DVC Bermo Block. The boreholes were drilled at desired and approachable locations to prove the lay and disposition of different coal seams and precise delineation of faults. Four coring drill machines were deployed and a total of 24 boreholes drilled by CMPDIL as is summarized in Table 4.3. The Geological report on DVC Bermo Mines was prepared by CMPDI in October 2016.

TABLE 4.3
DRILLING DONE BY CMPDIL IN DVC BERMO COAL BLOCK

Agency	Borehole Series	No. of Boreholes	Meterage (m)
CMPDIL	CMDV	24*	4861
* After completion of drilling, each borehole had been sealed with cement and sand slurry and then pillars were erected.			
* With the block area of 1.67434 sq. km, the borehole density comes to 14.33 numbers per sq. km.			

Geophysical logging activity were carried out in 19 borehole wherein Natural Gamma (N Gamma), Spontaneous Potential (SP), Long Spacing Density (LSD), High Resolution Density (HRD), Long Normal Resistivity (LONG), Short Normal Resistivity (SHOR), Single Point Resistance (SPR) and Caliper logs were recorded.

Borehole no. CMDV-17 was considered for Physico-mechanical Properties studies and the rest of 23 boreholes for band by band chemical analysis.

Upon the receipt of band by band chemical analysis results approximately 50% and 10% of the total drilled boreholes were considered for Seam Overall Proximate along with GCV determination and Special Tests respectively. Coal samples from three boreholes covering all seams were considered for petrographic studies at Petrography Laboratory, CMPDI.

4.4 GEOLOGICAL SECTIONS

For the purpose of geological correlation and assessment of reserves, geological cross sections were prepared with the help of data of different boreholes. The Geological plan & cross sections are shown in Plate III & VII. The Graphic lithologs of boreholes Plate XIX-A & XIX-B.

4.5 FUTURE PROGRAMME OF EXPLORATION

The Block has been adequately explored. No more exploration is envisaged.

4.6 PATTERN OF FAULTING

The two faults Interpreted on basis of Floor contour plan are described below in Table 4.4 below.

TABLE 4.4
DESCRIPTION OF FAULTS DVC BERMO COAL BLOCK

Fault No.	Location	Nature of Fault/ Description	Approx Throw	Length of the Fault	Nature/Dip/ Evidence
F1	In western part of the Block	Faults trends NW-SE near Bhs no CMDV-7, 9 and 2 and dies out south of Bhs no CMDV-5.	0-40 Southerly	1.08 km	1. Oblique normal fault 2. About 72° 3. Interpreted on basis of Floor contour plan
F2	In the central part of the Block	General trend of the fault NW-SE near Bhs no CMDV-21 and dies out south of CMDV-21.	5-10 Southerly	1.04 km	1. Oblique normal fault 2. About 72° 3. Interpreted on basis of Floor contour plan

4.7 COAL SEAMS

(a) Sequence of all coal seams and partings

In this block the coal seams occur in two broad groups viz; Bermo and Karo group of seams. Bermo seam occurs as a single horizon along with a few local seams, viz. Local- III and Local- IV.

Karo group consist of 7 persistent coal seams, viz. Local- I, XI, X+IX, VIII, VII+VI, V & III; and two inconsistent seams, viz. Local- II and IV.

Seam X+IX is formed due to merging of Seams X and IX, and Seam VII+VI due to merging of Seams VII and VI in this block.

Seam VII+VI and above belongs to Barakar Formation and Seams V and below to Karharbari Formation.

Seam IV is very thin and is locally developed within the block. Seam I and II are not developed in this block.

Seam-wise Thickness and Parting Ranges of Coal Seams in descending order in this block are shown in Table 4.5.

TABLE 4.5
SEQUENCE OF COAL SEAMS AND PARTINGS
IN DVC BERMO COAL BLOCK

Coal seams/ Parting	Thickness (m)		Parting (m)		No. of Borehole Intersections
	Min. Borehole	Max. Borehole	Min. Borehole	Max. Borehole	
Local-IV	0.33	0.40			2
	CMDV-01	CMDV-05			
Parting			16.12	16.12	
			CMDV-01	CMDV-01	
Local-III	0.32	0.83			3
	CMDV-20	CMDV-01			
Parting			5.87	15.22	
			CMDV-24	CMDV-01	
Bermo	8.15	17.11			12
	CMDV-13	CMDV-05			
Parting			13.50	23.63	
			CMDV-01	CMDV-06	
Local-II	0.23	1.35			11
	CMDV-03	CMDV-09			
Parting			8.31	11.52	
			CMDV-11	CMDV-22	
Local-I	0.35	1.64			23
	CMDV-01	CMDV-18			
Parting			4.45	12.89	
			CMDV-15	CMDV-18	
XI	0.43	3.00			24
	CMDV-19	CMDV-07 CMDV-12 CMDV-16 CMDV-24			
Parting			17.55	33.88	

Coal seams/ Parting	Thickness (m)		Parting (m)		No. of Borehole Intersections
	Min. Borehole	Max. Borehole	Min. Borehole	Max. Borehole	
			CMDV-13	CMDV-19	
X+IX	8.03	15.07			24
	CMDV-14	CMDV-07			
Parting			4.23	37.50	
			CMDV-18	CMDV-11	
VIII	17.00	27.59			24
	CMDV-14	CMDV-04			
Parting			1.22	7.65	
			CMDV-13	CMDV-19	
VII+VI	8.11	16.32			22
	CMDV-24	CMDV-12			
Parting			28.00	39.00	
			CMDV-10	CMDV-24	
			CMDV-21		
V	0.80	2.48			24
	CMDV-01	CMDV-15			
	CMDV-21				
Parting			8.14	19.37	
			CMDV-04	CMDV-08	
IV	0.10	3.00			
	CMDV-01	CMDV-10			21
	CMDV-03				
	CMDV-06				
Parting			3.34	8.90	
			CMDV-16	CMDV-06	
III	0.25	1.85			11

(b) Description of Coal seams

Local- IV, Local-III, Local-II and Local-I and Seam-IV are thin seams (generally <1m) and they have not been described in the GR and there reserves have not been considered in the GR. Other coal seams in descending order are described below.

Floor contour and folio plans of Bermo Seam, Seam IX, Seam X+IX, Seam VII+VI, Seam V and Seam III are given in Plate VI-A to VI-F.

1. Bermo Seam

DVC Bermo Mine has a working quarry of Bermo Seam. Extent of the quarry in plan is provided by the DVC officials. Eastern Part beyond Karo nala is free from mining.

The depth of occurrence of seam Bermo is from 3.00 m to 50.89 m. Its full thickness varies from 8.15 m to 17.11 m as encountered in boreholes CMDV-13 and CMDV-05 respectively. The general thickness of the seam varies from 10 m to 12 m. The 1 m and above dirt band is reported only in two boreholes (CMDV-14 with 2.02m and CMDV-05 with 1.82m)

The range of proximate analysis of Bermo seam is given in following Table 4.6.

TABLE 4.6
RANGE OF PROXIMATE ANALYSIS AND GRADE OF BERMO SEAM

RANGE OF PROXIMATE ANALYSIS AND GRADE OF BENIGN CLAM				
Parameters	Range			
	Bcs Samples		I100	
Borehole Considered	11		11	
Proximate analysis on Air Dried Basis				
	Min.	Max.	Min.	Max.
M%	0.6	1.3	0.6	1.3
	CMDV-15	CMDV-24	CMDV-15	CMDV-24
Ash %	28.7	35.4	28.7	35.4
	CMDV-01 CMDV-13	CMDV-15	CMDV-13	CMDV-15 CMDV-20
VM%	19.5	23.2	19.5	23.2
	CMDV-19	CMDV-24	CMDV-19	CMDV-24
FC%	42.7	49.4	42.7	49.4
	CMDV-24	CMDV-13	CMDV-24	CMDV-13
Grade	WG-IV	UNGR	WG-IV	UNGR

The ultimate analysis of Bermo seam was carried out involving boreholes CMDV – 12, 14, 24 and the test results are tabulated below in Table 4.7.

TABLE 4.7
RANGE OF ULTIMATE ANALYSIS AND OTHER TEST RESULTS FOR BERMO SEAM

Parameters	Range		Range	
	On BCS Samples		On dmmf Basis	
	Minimum	Maximum	Minimum	Maximum
C%	52.53	54.33	86.20	86.76
	CMDV-14	CMDV-24	CMDV-14	CMDV-24
H%	3.26	3.47	5.35	5.54
	CMDV-14	CMDV-24	CMDV-14	CMDV-24
N%	1.18	1.30	1.94	2.08
	CMDV-14	CMDV-24	CMDV-14	CMDV-24
S%	0.51	0.63	0.84	1.01

Parameters	Range		Range	
	On BCS Samples		On dmmf Basis	
	Minimum	Maximum	Minimum	Maximum
	CMDV-14	CMDV-24	CMDV-14	CMDV-24
O% (By Difference)	40.27	42.51	4.61	5.67
	CMDV-24	CMDV-14	CMDV-24	CMDV-14
VM%	19.50	23.20	25.90	31.80
	CMDV-19	CMDV-24	CMDV-19	CMDV-24
CV (Kcal/Kg)	5080	5790	8336	8619
	CMDV-14	CMDV-01	CMDV-14	CMDV-05

GCV and Grade

The range of determined GCV of Seam Bermo on I100 samples is 5080 – 5735 Kcal/Kg. The grade varies from WG-IV to Ungraded (for coking coal).

2. Seam XI

Seam XI is the uppermost seam that belongs to Karo Group. The depth of occurrence of this seam varies from 6.50 m to 95.50 m and its full thickness from 0.43 m to 3.00 m as encountered in boreholes CMDV-19 and CMDV-07 respectively. The general thickness varies from 2 m to 3 m.

The range of proximate analysis of Seam XI is given in following Table 4.8.

TABLE 4.8
RANGE OF PROXIMATE ANALYSIS AND GRADE OF SEAM XI

Parameters	Ranges			
	Bcs		I ₁₀₀	
BH considered	21		21	
Proximate analysis on Air Dried basis				
	Min.	Max.	Min.	Max.
M%	0.6	1.1	0.6	1.1
	CMDV-15	CMDV-11	CMDV-15	CMDV-11
	CMDV-19	CMDV-13	CMDV-19	CMDV-13
	CMDV-20	CMDV-24	CMDV-20	CMDV-24
	CMDV-22		CMDV-22	
Ash %	29.5	47.5	29.5	47.5
	CMDV-19	CMDV-18	CMDV-19	CMDV-18
VM%	16.8	20.9	16.8	20.9
	CMDV-14	CMDV-04	CMDV-14	CMDV-04
FC	41.0	48.3	41.0	48.3
	CMDV-24	CMDV-11	CMDV-24	CMDV-11
Grade	W-IV	UNGR	W-IV	UNGR

The ultimate analysis of seam XI was carried out involving boreholes CMDV – 12, 14, 24 and the test results are given below in Table 4.9.

TABLE 4.9
RANGE OF ULTIMATE ANALYSIS
AND OTHER TEST RESULTS FOR SEAM XI

Parameters	Range		Range	
	On BCS Samples		On dmmf Basis	
	Minimum	Maximum	Minimum	Maximum
C%	51.15	52.15	88.87	90.98
	CMDV-12	CMDV-24	CMDV-12	CMDV-24
H%	3.23	3.32	5.59	5.79
	CMDV-12	CMDV-24	CMDV-12	CMDV-24
N%	1.04	1.07	1.81	1.86
	CMDV-24	CMDV-14	CMDV-24	CMDV-14
S%	0.38	0.44	0.66	0.77
	CMDV-24	CMDV-14	CMDV-24	CMDV-14
O% (By Difference)	43.11	44.16	0.76	3.31
	CMDV-24	CMDV-12	CMDV-24	CMDV-12
VM%	16.80	20.90	22.70	28.50
	CMDV-14	CMDV-04	CMDV-14	CMDV-24
CV (Kcal/Kg)	4925	5670	8545	8704
	CMDV-24	CMDV-11	CMDV-12	CMDV-05

GCV and Grade

The range of determined GCV of Seam XI is 4935 – 5670 Kcal/Kg. The grade varies from WG-IV to Ungraded (for Coking Coal).

3. Seam X+IX

In DVC Bermo Mine seam X and IX are merged to form seam X+IX. However, individual occurrences of seam X and seam IX are also recorded in this block limited to a very small extent. Hence, these seams have been considered as merged seam i.e. X+IX.

Seam X+IX is consistently developed within the block. The depth of occurrence of seam X+IX varies from 29.10 m to 123.90 m. The full thickness of seam XI varies from 8.03 metres to 15.07 metres as encountered in boreholes CMDV-14 and CMDV-07 respectively, and the general thickness from 10 m to 12 m. The seam does not contain any dirt band of 1m and above thickness. The range of proximate analysis of X+IX seam is given in following Table 4.10.

TABLE 4.10
RANGE OF PROXIMATE ANALYSIS AND GRADE OF SEAM X+IX

Parameters	Ranges			
	Bcs		I ₁₀₀	
BH considered	23		23	
Proximate analysis on Air Dried basis				
	Min.	Max.	Min.	Max.
M%	0.4	1.1	0.4	1.1
	CMDV-20	CMDV-10 CMDV-11 CMDV-24	CMDV-20	CMDV-10 CMDV-11 CMDV-24
Ash %	28.1	37.5	27.8	37.5
	CMDV-04	CMDV-15	CMDV-08	CMDV-15
VM%	18.1	21.3	17.6	20.8
	CMDV-19	CMDV-04	CMDV-19	CMDV-04
FC	45.4	49.8	45.4	49.8
	CMDV-13	CMDV-03	CMDV-13	CMDV-03
Grade	W-IV	UNGR	W-III	UNGR

The ultimate analysis of seam X+IX was carried out involving boreholes CMDV – 12, 14, 24 and the test results are given below in Table 4.11.

TABLE 4.11
RANGE OF ULTIMATE ANALYSIS AND OTHER TEST RESULTS
FOR SEAM X+IX, DVC BERMO MINE

Parameters	Range		Range	
	On BCS Samples		On dmmf Basis	
	Minimum	Maximum	Minimum	Maximum
C%	56.91	57.66	86.92	89.08
	CMDV-12	CMDV-24	CMDV-24	CMDV-14
H%	3.42	3.54	5.31	5.41
	CMDV-14	CMDV-24	CMDV-14	CMDV-12
N%	1.28	1.34	1.97	2.08
	CMDV-12	CMDV-14	CMDV-12	CMDV-14
S%	0.38	0.47	0.59	0.71
	CMDV-14	CMDV-24	CMDV-14	CMDV-24
O% (By Difference)	37.02	37.90	2.94	5.06
	CMDV-24	CMDV-12	CMDV-14	CMDV-24
VM%	18.10	21.30	23.40	27.10
	CMDV-19	CMDV-04	CMDV-19	CMDV-04
CV (Kcal/Kg)	5110	5780	8416	8640
	CMDV-13	CMDV-04	CMDV-13	CMDV-24

GCV and Grade

The range of determined GCV of Seam X+IX on I100 samples is 5040 – 5720 Kcal/Kg. The Grade varies from W- III to Ungraded (for Coking Coal).

4. Seam VIII

Seam VIII is one of the most consistent seams within the block and as such, considered as most potential. Its depth of occurrence varies 47.40m to 160.15m. The full thickness of seam varies from 17.00 m to 27.59 m as encountered in boreholes CMDV-14 and CMDV-04 respectively and the general thickness from 20 m to 25 m.

This Seam is highly banded in nature. It includes both combustible and non-combustible dirt bands. The maximum thickness of 1m and above dirt bands is 3.40m. The effective thickness of this Seam varies from 17.00m (CMDV-14) to 25.00m (CMDV23). Abstract of combustible and non-combustible dirt-band constituents in seam VIII is given below in Table 4.12.

TABLE 4.12
ABSTRACT OF COMBUSTIBLE AND NON-COMBUSTIBLE
DIRT BAND CONSTITUENTS IN SEAM VIII

DIRT BAND CONSTITUENTS IN SLAM VIII

Range	Dirt Bands								% of Dirt Bands
	<1m Thick						1m & Above Thick		
	Combustible		Non-Combustible		Total				
	No.	Thick (m)	No.	Thick (m)	No.	Thick (m)	No.	Thick (m)	
Min.	0	0.00	0	0.00	0	0.00	0	0.00	0
BHs/ No. of BHs	CMDV-01 CMDV-07 CMDV-09 CMDV-20 CMDV-23	CMDV-01 CMDV-09	CMDV-07 CMDV-09 CMDV-14 CMDV-17	CMDV-07 CMDV-09 CMDV-14 CMDV-17	CMDV-07 CMDV-09	CMDV-09	6Bhs	6Bhs	6Bhs
Max.	7	0.83	5	1.30	7	3.01	4	5.37	20
BHs/ No. of BHs	CMDV-17	CMDV-13	CMDV-01	CMDV-06	CMDV-17	CMDV-17	CMDV-03 CMDV-19	CMDV-03	CMDV-03

The ranges of proximate analysis of Seam VIII is given in following Table 4.13.

TABLE 4.13
RANGES OF PROXIMATE ANALYSIS AND GRADE OF SEAM VIII

Parameters	Ranges			
	Bcs		I ₁₀₀	
Borehole considered	23		23	
Proximate analysis on Air Dried basis				
	Min.	Max.	Min.	Max.
M%	0.4	1.0	0.5	1.0
	CMDV-16	CMDV-11 CMDV-13	CMDV-07 CMDV-10	CMDV-11 CMDV-13

Parameters	Ranges			
	Bcs		I ₁₀₀	
Borehole considered	23		23	
		CMDV-23 CMDV-24	CMDV-16 CMDV-20 CMDV-22	CMDV-24
Ash %	23.0	39.0	23.0	43.0
	CMDV-09	CMDV-12	CMDV-09	CMDV-12
VM%	16.6	18.9	15.7	18.2
	CMDV-18	CMDV-04	CMDV-18	CMDV-04
FC	43.1	50.4	39.6	45.7
	CMDV-12	CMDV-06	CMDV-12	CMDV-06 CMDV-15
Grade	W-II	UNGR	W-II	UNGR

The ultimate analysis of seam VIII was carried out involving boreholes CMDV – 12, 14, 15, 23, 24 and the test results are given below in Table 4.14.

TABLE 4.14
RANGES OF ULTIMATE ANALYSIS AND OTHER
TEST RESULTS FOR SEAM VIII

Parameters	Range		Range	
	On BCS Samples		On dmmf Basis	
	Minimum	Maximum	Minimum	Maximum
C%	49.89	54.35	86.04	88.77
	CMDV-12	CMDV-14	CMDV-15	CMDV-12
H%	3.14	3.27	5.17	5.59
	CMDV-12	CMDV-15	CMDV-14	CMDV-12
N%	1.04	1.17	1.85	1.89
	CMDV-12	CMDV-14	CMDV-12	CMDV-23
S%	0.31	0.36	0.55	0.57
	CMDV-12	CMDV-15	CMDV-12	CMDV-15
O% (By Difference)	40.91	45.62	3.24	6.33
	CMDV-14	CMDV-12	CMDV-12	CMDV-15
VM%	16.60	18.90	21.60	24.50
	CMDV-18	CMDV-04	CMDV-18	CMDV-04
CV (Kcal/Kg)	4800	5760	8430	8728
	CMDV-12	CMDV-06	CMDV-19	CMDV-18

GCV and Grade

The range of determined GCV of Seam VIII on I100 samples is 4390 – 5070 Kcal/Kg. The Grade varies from W- II to Ungraded (for Coking Coal).

5. Seam VII+VI

Seam VII+VI is a merged form of seam VII and VI in the area. This seam could have been shown as split into seam VII and seam VI in few boreholes but it would have not been practically viable. Hence, it is considered as a single seam and described as such.

Seam VII+VI underlies directly below seam VIII with a parting range of 3-5m and occurs above seam V. It is one of the thickest coal horizon in the area and as such, considered as a potential mineable coal horizon in this block. The depth of occurrence of seam VII+VI varies from 70.30 m to 188.00 m. The full thickness of seam varies from 8.11 m to 16.32 m as encountered in boreholes CMDV-12 and CMDV-12 respectively and the general thickness from 10 m to 15 m.

Seam VII+VI is highly banded and includes maximum no of dirt bands with thickness 1 m and above. The effective thickness of this Seam varies from 5.69m (CMDV-14) to 15.24m. Abstract of combustible and non-combustible dirt band constituents in seam VII+VI is given below in Table 4.15.

TABLE 4.15
ABSTRACT OF COMBUSTIBLE AND NON-COMBUSTIBLE DIRT BAND
CONSTITUENTS IN SEAM VII+VI

Range	Dirt Bands								% of Dirt Bands
	<1m Thick						1m & Above Thick		
	Combustible		Non-Combustible		Total				
	No.	Thick (m)	No.	Thick (m)	No.	Thick (m)	No.	Thick (m)	1m & Above Thick
Min.	0	0.00	0	0.00	0	0.00	0	0.00	0
BHs/ No. of BHs	10Bhs	CMDV-05 CMDV-11 CMDV-18 CMDV-22 CMDV-24	8Bhs	CMDV-17 CMDV-19	CMDV-14 CMDV-18	CMDV-14 CMDV-18	6Bhs	6Bhs	6Bhs
Max.	4	0.80	3	1.70	5	2.25	3	6.31	53
BHs/ No. of BHs	CMDV-10	CMDV-08	CMDV-13	CMDV-18	CMDV-10	CMDV-15	CMDV-14 CMDV-15	CMDV-14	CMDV-14

The ranges of proximate analysis of Seam VII+VI are given in following Table 4.16.

TABLE 4.16
RANGES OF PROXIMATE ANALYSIS AND GRADE OF SEAM VII+VI

Parameters	Ranges			
	Bcs		I ₁₀₀	
BH considered	21		21	
Proximate analysis on Air Dried basis				
	Min.	Max.	Min.	Max.
M%	0.3	0.8	0.3	0.8
	CMDV-14	CMDV-06	CMDV-14 CMDV-24	CMDV-06
		CMDV-08		CMDV-15
		CMDV-13		CMDV-19
		CMDV-19		CMDV-23
CMDV-23				
Ash %	34.1	49.3	37.4	49.3
	CMDV-10	CMDV-14	CMDV-18	CMDV-24
VM%	15.1	17.8	15.0	16.9
	CMDV-19	CMDV-04	CMDV-19	CMDV-23
FC	42.5	47.1	37.0	44.8
	CMDV-06	CMDV-15	CMDV-03	CMDV-23
Grade	W-IV	UNGR	UNGR	UNGR

The ultimate analysis of seam VII+VI was carried out involving boreholes CMDV – 15, 23 and the test results are given below in Table 4.17.

TABLE 4.17
RANGES OF ULTIMATE ANALYSIS
AND OTHER TEST RESULTS FOR SEAM VII+VI

Parameters	Range		Range	
	On BCS Samples		On dmmf Basis	
	Minimum	Maximum	Minimum	Maximum
C%	51.83	53.04	88.36	89.44
	CMDV-23	CMDV-15	CMDV-15	CMDV-23
H%	3.13	3.17	5.28	5.40
	CMDV-23	CMDV-15	CMDV-15	CMDV-23
N%	0.93	0.98	1.60	1.63
	CMDV-23	CMDV-15	CMDV-23	CMDV-15
S%	0.38	0.40	0.66	0.67
	CMDV-23	CMDV-15	CMDV-23	CMDV-15
O% (By Difference)	42.41	43.73	2.90	4.06
	CMDV-15	CMDV-23	CMDV-23	CMDV-15
VM%	15.10	17.80	20.10	23.70
	CMDV-19	CMDV-04	CMDV-19	CMDV-04
CV (Kcal/Kg)	4705	5252	8493	8749
	CMDV-03	CMDV-15	CMDV-03	CMDV-15

GCV and Grade

The range of determined GCV of Seam VII+VI on I100 samples is 4055 – 4600 Kcal/Kg. Coal of Seam VII+VI is Ungraded (for Coking Coal).

6. Seam V

Seam V is thin but is one of the most consistently occurring coal horizons in the block area. The depth of occurrence of seam V varies from 112.03 m to 232.20 m. The full thickness of seam varies from 0.80 m to 2.48 m as encountered in boreholes CMDV-01 and CMDV-15 respectively and the general thickness from 1.50 m to 2.50 m.

The ranges of proximate analysis of Seam V are given in following Table 4.18.

TABLE 4.18
RANGES OF PROXIMATE ANALYSIS AND GRADE OF SEAM V

Parameters	Ranges			
	Bcs		I ₁₀₀	
BH considered	23		23	
Proximate analysis on Air Dried basis				
	Min.	Max.	Min.	Max.
M%	0.4	1.0	0.4	1.0
	CMDV-06 CMDV-07 CMDV-13 CMDV-15 CMDV-18 CMDV-21	CMDV-13	CMDV-06 CMDV-07 CMDV-13 CMDV-15 CMDV-18 CMDV-21	CMDV-13
Ash %	32.8	57.1	32.8	57.1
	CMDV-01	CMDV-19	CMDV-01	CMDV-19
VM%	11.6	18.0	11.6	18.6
	CMDV-19	CMDV-04	CMDV-19	CMDV-13
FC	30.5	49.8	30.5	49.8
	CMDV-19	CMDV-01	CMDV-19	CMDV-01
Grade	W-IV	UNGR	W-IV	UNGR

The ultimate analysis of seam V was carried out involving boreholes CMDV – 12, 14, 24 and the test results are tabulated below in Table 4.19.

TABLE 4.19
RANGES OF ULTIMATE ANALYSIS
AND OTHER TEST RESULTS FOR SEAM V

Parameters	Range	
	Minimum	Maximum
Ultimate analysis on dmmf basis		
C%	80.10	86.78
H%	4.85	5.43
N%	1.26	1.40
S%	0.60	0.64
O% (By Difference)	5.80	13.19
VM% (DMMF)	24.25	30.49

GCV and Grade

The range of determined GCV of Seam V on I100 samples is 3180 – 5605 Kcal/Kg. The Grade varies from W- IV to Ungradedd (for Coking Coal).

7. Seam III

As such, seam III is a thin coal seam but a persistent and easily correlatable coal horizon. The depth of occurrence of seam III varies from 130m to 254m.

The full thickness of seam varies from 0.25 m to 1.85 m as encountered in boreholes CMDV-08 and CMDV-12 respectively and the general thickness from 1.00 m to 1.50 m. The ranges of proximate analysis of Seam III are given in following Table 4.20.

TABLE 4.20
RANGESS OF PROXIMATE ANALYSIS AND GRADE OF SEAM III

Parameters	Ranges			
	Bcs		I ₁₀₀	
BH onsidered	9		9	
Proximate analysis on Air Dried basis				
	Min.	Max.	Min.	Max.
M%	0.4	0.8	0.4	0.8
	CMDV-06	CMDV-11 CMDV-19	CMDV-06	CMDV-11 CMDV-19
Ash %	15.8	44.8	15.5	44.8
	CMDV-21	CMDV-14	CMDV-21	CMDV-14
VM%	17.4	18.9	12.2	18.9
	CMDV-12	CMDV-16	CMDV-12	CMDV-16
FC	57.8	62.4	57.8	62.4
	CMDV-11	CMDV-16	CMDV-11	CMDV-16
Grade	SG-II	UNGR	SG-II	UNGR

The ultimate analysis of seam III was carried out involving borehole CMDV12 and the test results are tabulated below in Table 4.21.

TABLE 4.21
RANGES OF ULTIMATE ANALYSIS AND OTHER TEST RESULTS FOR
SEAM III, DVC BERMO MINE, EAST BOKARO COALFIELD

Parameters	Range	
	On BCS Samples	
	Minimum	Maximum
C%	68.96	68.96
	CMDV-12	CMDV-12
H%	3.86	3.86
	CMDV-12	CMDV-12
N%	1.10	1.10
	CMDV-12	CMDV-12
S%	0.46	0.46
	CMDV-12	CMDV-12
O% (By Difference)	25.62	25.62
	CMDV-12	CMDV-12
VM%	17.40	18.90
	CMDV-12	CMDV-16
CV (Kcal/Kg)	6430	6935
	CMDV-11	CMDV-16

GCV and Grade

The range of determined GCV of Seam III on I100 samples is 6430 to 6935 Kcal/Kg. The Grade varies from SG-I to W-IV.

4.8 QUALITY SUMMARY

The quality and Grade of individual seams has been given separately in detail in preceding Para 4.7. The Ranges of Quality of all coal seams have been summarised in a single Table 4.22 below. For quality refer Iso-grade lines in folio plans Plat IX to XIV. For seam Bermo to Seam-III respectively.

TABLE 4.22
QUALITATIVE AND QUANTITATIVE DESCRIPTION OF COAL SEAMS,
DVC BERMO MINES, EAST BOKARO COALFIELD

Coal Seam	Thickness (m)		Proximate Analysis								Grade		Net Proved Reserve (MT)
			On Air Dried Basis										
			M%		Ash%		VM%		FC%				
	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max			
BERMO	4.20	17.11	0.60	1.30	28.70	35.40	19.50	23.20	42.70	49.40	UNGR	W-IV	10.043
XI	0.43	3.00	0.60	1.10	29.50	47.50	16.80	20.90	41.00	48.30	UNGR	W-IV	4.295
X+IX	8.03	15.07	0.40	1.10	28.70	37.30	17.60	20.80	45.40	49.80	UNGR	W-IV	24.750

Coal Seam	Thickness (m)		Proximate Analysis								Grade		Net Proved Reserve (MT)
			On Air Dried Basis										
			M%		Ash%		VM%		FC%				
	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	
VIII	4.16	27.59	0.50	1.00	23.00	43.00	15.70	18.20	39.60	45.70	UNGR	W-II	43.518
VII+VI	8.11	16.32	0.30	0.80	37.40	49.30	15.00	16.90	37.00	44.80	UNGR	UNGR	25.075
V	0.80	2.40	0.40	1.00	32.80	57.10	11.60	18.60	30.50	49.80	UNGR	W-IV	3.076
III	0.40	1.85	0.40	0.80	15.50	44.80	17.40	18.90	57.80	62.40	UNGR	SG-II	1.179

HGI

The HGI of coal seam varies from 67 to 82.

Ash fusion ranges:

Initial Deformation Temperature (IDT), Hemispherical Temperature (HT) & Flow Temperature (FT) as observed in test results of boreholes for different seams are >1400 degree Celsius except in case of one borehole (CMDV 14) in Bermo seam in which values of IDT 1174°C, HT1329°C, FT 1345°C were observed.

4.9 COAL RESERVES & OVERBURDEN**4.9.1 Reserves**

Since, the area of occurrences of splitting in coal seams is very small, it has not been taken into consideration for reserve and other calculations. Existing mining on the block is been carried out in the Bermo seam. The existing quarry area has been deducted from the total area to find the actual area of the occurrence of Bermo seam for reserve estimation. Plans showing total OB and total coal are given in Plate X.

4.9.2 Basic assumptions and norms followed

The following norms have been taken into account for reserves calculation:

- The coal and carbonaceous bands were defined on the basis of results of analysis, as applicable in low moisture coking coal. Coal, shaly coal, carb shale & non-combustible /obvious dirt bands were defined as per the ash% content given below:

Coal	:	Ash%	< = 35
Shaly Coal	: 35 <	Ash%	<= 50
Carb Shale	: 50 <	Ash%	<= 75
Non-Combustible Band	:	Ash%	> 75

- ii. Quantitative and qualitative assessments of all seams are based on 1100 samples i.e. effective seam thickness including all bands having thickness less than 1 m. The combustible (Carbonaceous shale) and non-combustible (Grey Shale/Shale etc.) dirt bands of 1 m and above in thickness, and thin Coal / Shaly coal bands sandwiched between the thicker dirt bands with cumulative thickness of 1 m and above are not included in the effective thickness and, hence, added to the overburden. Seam folio plans depicting the thickness and quality variations have been prepared using the data of 1100 samples only, considering the calculated value and the determined value of overall Ash% as the case may be. Minimum thickness of individual coal seams, considered for reserve estimation has been taken as 1.00 m.
- iii. MINEX software is being used for reserve estimation. Grade Wise and Seam wise Tonnage of coal has been calculated using the Insitu Resource Reporting method of Minex software. Through the use of this software the area grid between the successive iso-chores are multiplied with the grid thickness value of corresponding iso-chores. Then the volume of coal has been converted into tonnage by multiplying with average specific gravity by the software.

4.9.3 Calculation of specific gravity

Specific gravity for each grade of coal has been calculated from the following formula, considered for low moisture coking coal, by taking average ash% for each grade: $\text{Sp. Gr.} = 1.28 + 0.01 \times \text{Ash\%}$. The following Table 4.23 shows average seam wise specific gravity, thus arrived.

TABLE 4.23
SEAM-WISE AVERAGE SPECIFIC GRAVITY OF COAL
IN DVC BERMO MINE

Sl. No.	Seams	Avg. Specific Gravity
1	Bermo	1.60
2	XI	1.65
3	X+IX	1.62
4	VIII	1.60
5	VII+VI	1.67
6	V	1.69
7	III	1.67

4.9.4 Method of Grade estimation

Since, the coal seams of the block contain low moisture, medium coking coal, grade of coal has been estimated on the basis of Ash%. The ranges of Ash% for different grades are given in the Table 4.24.

TABLE 4.24
RANGES OF ASH % FOR DIFFERENT GRADES OF COKING COAL

Sl. No.	Grade	Ash% Range
1	SG-I	Upto 15.0
2	SG-II	15.1-18.0
3	WG-I	18.1-21.0
4	WG-II	21.1-24.0
5	WG-III	24.1-28.0
6	WG-IV	28.1-35.0
7	Ungraded*	Exceeding 35.0
* It is not the prevailing practice of CMPDI to classify the Ungraded reserves on the basis of Gross Calorific Values of the seams. (ref. Para 5.2.4 of GR)		

4.9.5 Total Geological Reserves and their Categorisation

Of the total 24 nos of drilled boreholes in the area, 13 no of boreholes were drilled upto Seam III. An area of 200 m radius from the borehole has been considered as Proved area for Seam III. The reserve of the remaining area is put under Indicated Category for the seam. Since, drilling was not carried in the OB dump area at the northern part of the block the whole block area could not been brought under proved category. Reserves beneath the OB dump have mostly been classified under Indicated category.

Total Geological coal reserves, seam-wise and category-wise (proved and indicated) are given in Table 4.25.

TABLE 4.25
TOTAL GEOLOGICAL COAL RESERVES, SEAM-WISE AND CATEGORY-WISE (PROVED AND INDICATED)

Seams	Net Proved Reserves (MT)	Gross indicated Reserves (MT)	Total Reserves (MT)
Bermo	9.960	0.898	10.858
XI	4.694	0.929	5.623
X+IX	24.598	4.113	28.711
VIII	43.233	7.153	50.386
VII+VI	24.938	4.302	29.240
V	3.058	0.576	3.634
III	1.180	1.122	2.302
All seams	111.661	19.093	130.754

4.9.6 Grade Wise Proved Net Geological Proved Reserves

Seam wise, Grade wise proved net geological reserves are given in following Table 4.26.

TABLE 4.26
SEAMWISE GRADEWISE PROVED NET GEOLOGICAL RESERVES

Seam	Grade-wise net proved reserves in million tones							Net Proved Reserves (Mt)	SEAM-WISE %
	SG-I	SG-II	WG-I	WG-II	WG-III	WG-IV	UNGR Coking Coal		
Bermo	0.000	0.000	0.000	0.000	0.000	9.421	0.539	9.96	8.92
XI	0.000	0.000	0.000	0.000	0.000	3.055	1.639	4.694	4.20
X+IX	0.000	0.000	0.000	0.000	0.000	20.011	4.587	24.598	22.03
VIII	0.000	0.000	0.000	0.225	1.688	3.170	38.150	43.233	38.72
VII+VI	0.000	0.000	0.000	0.000	0.000	0.000	24.938	24.938	22.33
V	0.000	0.000	0.000	0.000	0.000	0.279	2.779	3.058	2.74
III	0.154	0.129	0.067	0.616	0.162	0.052	0.000	1.18	1.06
All seams	0.154	0.129	0.067	0.841	1.85	35.988	72.632	111.661	100.00

4.9.6.1 Classification of proved reserves of ungraded high ash (>35%) coking coal based on GCV

It is not the prevailing practice of CMPDI to classify the Ungraded reserves (of Coking Coals) on the basis of Gross Calorific Values of the seams (Ref. Para 5.2.4 of GR). However, same has been done for net proved reserves only up to Seam VII +VI. Details of Grade-wise, Seam-wise Net Proved Reserves of Ungraded coal based on GCV are given in Table 4.27 below.

TABLE 4.27
DETAILS OF GRADE-WISE, SEAM-WISE
NET PROVED RESERVES OF UNGRADED COAL BASED ON GCV

Grades	Seam-Wise Net Proved Reserved (MT)						Grade-wise%
	Bermo	XI	X-IX	VIII	VII+VI	All seams	
G6	0.507	0.389	1.781	0.000	0.000	2.677	3.81
G7	0.257	0.076	2.852	0.283	0.812	4.280	6.08
G8	0.001	1.214	0.181	16.043	8.919	26.358	37.47
G9	0.000	0.000	0.000	19.479	10.817	30.296	43.06
G10	0.000	0.000	0.000	2.397	3.636	6.033	8.58
G11	0.000	0.000	0.000	0.000	0.706	0.706	1.00
All Grades	0.765	1.679	4.814	38.202	24.890	70.35*	100.00
SEAM-WISE %	1.09	2.39	6.84	54.30	35.38	100.00	

* Excludes around 2.8 Mt of ungraded reserves of Seam V (Not proposed to be mined as per this Mining Plan). As mentioned in CMPDI GR (ref. Para 5.5, page 113), there is no direct method of calculating the Ungraded reserves on the basis of GCV in Minex. Limiting area of this ungraded reserves are derived using Autocad. Hence there is little discrepancy in decimal places (hence some difference in figures as compared to previous Table 4.26).

4.9.7 Grades Wise Indicated Reserves

Seam wise Grade wise Gross Indicated geological reserves are given in Table 4.28 below.

TABLE 4.28
SEAM WISE GRADE WISE
GROSS INDICATED GEOLOGICAL RESERVES

Seam	Grade-wise gross indicated reserves (MT)							Gross indicated reserves (MT)
	SG-I	SG-II	WG-I	WG-II	WG-III	WG-IV	UNGR	
Bermo						0.914	0.020	0.934
XI						0.437	0.433	0.870
X+IX						3.675	0.512	4.187
VIII					0.749	0.728	5.800	7.277
VII+VI							4.399	4.399
V							0.580	0.580
III	0.254	0.169	0.268	0.333	0.112	0.000	0.000	1.136
All seams	0.254	0.169	0.268	0.333	0.861	5.754	11.744	19.383

4.9.8 Overall Grade / ROM GCV

Overall ROM Grade of coal is Ungraded (for Coking Coal) with GCV Range of 4601 to 4900 Kcal/ Kg, which in case of Non coking coals is equivalent to G9 Grade.

4.9.9 Reserves exhausted

The year wise OBR & Coal productions since 1993-94 are given in Table 4.29 below:

TABLE 4.29
YEARWISE OBR, COAL PRODUCTION SINCE 1993-94

Year	Coal (Mt.)	OBR (Mcum)	Stripping Ratio (cum/t)
1993-94	0.07	0.28	4.00
1994-95	0.29	0.76	2.62
1995-96	0.23	0.62	2.70
1996-97	0.29	0.60	2.07
1997-98	0.36	0.87	2.42
1998-99	0.37	1.19	3.22
1999-00	0.37	1.30	3.51
2000-01	0.37	1.06	2.86
2001-02	0.33	0.28	0.85
2002-03	0.17	0.44	2.60
2003-04	0.38	0.94	2.47
2004-05	0.40	0.82	2.03
2005-06	0.37	0.36	0.97

Year	Coal (Mt.)	OBR (Mcum)	Stripping Ratio (cum/t)
2006-07	0.38	1.31	3.41
2007-08	0.39	0.49	1.27
2008-09	0.27	0.00	0.00
2009-10	0.14	0.00	0.00
2010-11	0.31	0.89	2.86
2011-12	0.33	0.18	0.54
2012-13	0.20	0.00	0.00
2013-14	0.05	0.00	0.00
2014-15	0.07	0.13	1.99
2015-16	0.40	0.33	0.81
Total	6.55	12.85	1.96

Notes: i. Records of manual mining carried out prior to 1993 are not available. The production from 1953 till date is 14.918 Mt, as conveyed by DVC (source: Para 1.8 of GR dated October. 2016)

ii. The exploration was carried out till 1st April 2016 and Geological reserves mentioned are excluding the extracted reserves (i.e. the balance remaining as on 1.4.2016).

4.10 NATURE OF OVERBURDEN

This Mining Plan envisages mining coal by OC method up to Seam VII+VI as described in the next Chapter 5.

Overburden of this block is generally composed of three major units: i) soil/alluvium cover, ii) weathered mantle and iii) unweathered rocks of Barakar Formation occurring below weathered mantle. The weathered mantle is mainly composed of sandstone and shale. The unweathered rocks are composed of sandstones, grey shale, carbonaceous shale and intercalations/ alternate bands of sandstone and shale.

The interburdens are Non-combustible Dirt bands, of 1m and above thickness, occurring within the seam constitute in-seam burden. The cumulative thickness of these bands have been excluded from the seam thickness and added to the overburden. These dirt bands are represented by grey shale, carbonaceous shale and thin bands of coal / shaly coal sandwiched between thicker non-coal bands.

CHAPTER 5

MINING

5.1 OPTIMISATION OF TARGETED CAPACITY

Considering, the available reserves, number of coal seams and their disposition, depth, presence of a nalas through the property and available strike length make the mine suitable for mining by opencast rather than by underground. Considering these factors and other geo-mining parameters and also taking into account the requirement of EUP, the optimum capacity of the mine has been estimated at 2.62 MTPA.

5.1.1 Derivation of extractable reserves from geological reserves

Based on the exploration carried out and Geological Report submitted by CMPDIL, an optimum OC pit has been designed considering the lowest seam which can be reached by OC method of mining within the narrow property available within the ML area after considering statutory safety barriers at surface and accommodation of facilities on NW corner of the ML. It is proposed to plan opencast operation up to the floor of Seam VI.

The details of coal seams and partings below proposed quarry (i.e. below Seam VI floor) are given below in Table 5.1 (refer Table 4.5 under Chapter 4 for all seam sequence).

TABLE 5.1
DETAILS OF SEAMS AND PARTINGS AS PER GR
BELOW PROPOSED QUARRY

Coal seams below Quarry floor of Seam VI	Seam thickness(m)		Overlying Partings (m)		Seam Net proved Reserves (> 0.9m Thickness) (Mt)	Volume of Waste (Vertical) (Mcum)	Seam wise Str. Ratio (cum/t)	Grade
	Min	Max.	Min.	Max.				
V	0.80	2.48	28.00	39.00	3.058	46.050	15.06	WG-IV to Ungraded
IV	0.10	0.30	8.14	19.37	0			
III	0.49	1.85	3.34	8.90	1.180	17.603	14.92	SG-II to W-IV
Total					4.238	63.653	15.020	

It could be seen from the above table that underlying seams below the proposed quarry floor are not suitable for opencast mining because of their low thickness, thick overlying partings (resulting into high incremental

stripping ratio), and poor Grades. Present underground prospects are also limited because of their low thickness and ongoing and proposed opencast in overlying seams. As such this Mining Plan has been prepared only for opencast operation. However, with the advancement in technology for mining thin seams, the future potential of mining these underlying seams can not be ruled out.

5.1.2 Reserves extractable by OC method

The Geological Report details the data of the remaining reserves (as on 01.04.2016). As explained in the preceding paragraph 5.1.1, the total extractable reserves are workable by opencast only. The derivation of the extractable reserves by OC has been tabulated in Table 5.2 below and further explained in the following paragraphs.

TABLE 5.2
DERIVATION OF EXTRACTABLE RESERVES BY OC FROM
GEOLOGICAL RESERVES (MT)

Seam	Vertical Seamwise Geological Reserves (Net proved + Indicated)	Thin Seams below Quarry/ un-economical (Net proved + Indicated)	Blocked in 7.5m barrier	Blocked in Facility Area	Sub Total coal blocked under barrier & Facility	Blocked in Batter	Total Blocked, Un-economical, Low Thickness etc.	Mineable reserves	Mining Losses 0%	Extractable reserves
Bermo	10.858		0.42	0.01	0.433	2.40	2.84	8.02	0	8.02
XI	5.623		0.18	0.37	0.551	1.44	1.99	3.63	0	3.63
X+IX	28.711		0.80	1.44	2.245	9.86	12.11	16.61	0	16.61
VIII	50.386		1.45	2.60	4.048	24.29	28.34	22.05	0	22.05
VII+VI	29.24		0.80	1.58	2.385	16.50	18.89	10.36	0	10.36
V	3.634	3.634					3.63	0.00	0	0.00
IV	0	0					0.00	0.00	0	0.00
III	2.302	2.302					2.30	0.00		0.00
Total	130.754	5.936*	3.67	6.004	9.662	54.497	70.095	60.66	0	60.66

* May be considered for UG in future (ref. the following Para. 5.1.3)

Presently opencast operations are being carried out in Bermo seam. The Mining Plan envisages deepening the quarry operation upto Seam VI floor; thus mining seams XI, X+IX, VIII and VII+VI along with Bermo Seam.

5.1.3 Reserves extractable by UG method

5.936Mt of geological reserves (4.238 Mt proved + 1.698 Mt indicated) are occurring in seam V (3.634Mt) and III (2.302Mt) having a thickness range of 0.8 to 2.48 m and 0.25 to 1.85 m respectively. More than 50% of these reserves are ungraded. Because of their low thickness and also, as the surface area has nalas and ongoing opencast operation; mining of these

lower seams even by underground method has not been considered viable at present.

As regard to Highwall mining, the fast advance of mining operations followed closely by the backfilling operations, especially due to dearth of space for disposal of OB on the surface with repeated rehandling, its application during the operating life of OC mine has been ruled out.

However, if in future, due to technological advancement, the potentiality to mine additional reserves through underground or highwall mining is foreseen a revised Mining Plan will be submitted, encompassing mining of such reserves.

5.2 CHOICE OF METHOD OF MINING

There are basically two mining methods viz. Opencast (OC) and Underground (UG). Techno-economically, Underground methods, due to poorer recovery, lower production and high safety concerns are adopted only if the OB: Coal ratio in OC becomes so high that the cost of production by OC method becomes higher than the underground method.

In this specific case OC method has been adopted for seams down upto seam-VI and the lower seams viz. V, IV and III do not have even UG viability at present.

Opencast mining method has been adopted due to following reasons:

- The mine is already being operated by Opencast
- The OB : Coal ratio is favourable (1.83 : 1) for opencast mining
- The mining by opencast method will be economical against underground method
- The opencast mining operations are comparatively safer and ensure higher recovery of coal resource.
- No method by UG has been established in India to give a satisfactory recovery percentage for coal seams as thick as 27.59 m occurring in the block.

5.3 OPENCAST METHOD

5.3.1 Recoverable reserves, waste quantity and stripping ratio

Total reserves as per Geological Report (GR) are 130.754 Mt. These reserves have been cross checked by RQP and have been found in order. Out of these, 60.66Mt have been considered extractable by opencast operation, after considering coal blocked in barrier, batters etc and the corresponding waste quantity will be 110.79 million cum resulting into an

OB coal ratio of 1.83 : 1 (cum : t). No mining losses have been considered in this Mining plan and therefore the mineable reserves (after deducting blocked reserves from the net geological reserves have been adopted as extractable reserves.

5.3.2 Geo-mining Characteristics for OC

The geo-mining characteristics are given in Table 5.3.

TABLE 5.3
GEO-MINING CHARACTERISTICS OF OC MINING

Particulars	Unit	Value
Extractable Reserve	Mt	60.66
Overburden (including TS)	MCum	110.79
Rehandling		46.08
OB + Rehandling		156.87
Stripping Ratio without rehandling	Cum/t	1.83
Stripping Ratio with rehandling of surface dumps	Cum/t	2.59
Total number of seams	Nos.	12
Workable Seams	-	4
Seam and partings thickness range, m		Refer Table 4.5 in Chapter 4
Area of Excavation	Ha	156.46
Angle of dip	degrees	7- 14
Dip-rise length along Surface		
i) Minimum	m	356
ii) Maximum	m	770
iii) Average	m	563
Dip-rise length along Floor:		
i) Minimum	m	40
ii) Maximum	m	460
iii) Average	m	250
Quarry depth:		
i) Minimum	m	110
ii) Maximum	m	185
iii) Average	m	147.5
Strike length along Surface:		
i) Minimum	m	1288
ii) Maximum	m	4850
iii) Average	m	3069
Strike length along Floor:		
i) Minimum	m	1022
ii) Maximum	m	2545
iii) Average	m	1783

5.3.3 Selection of OC mining technology

There are following types of equipment systems available for opencast mining:

- a) Bucket wheel mining
- b) Dragline mining
- c) Shovel dumper combination
- d) Surface Miners (SM)

Each of them has been explained below:

(a) The bucket wheel alternative has not been considered due to following reasons:

- Multiple seams
- Not enough workload in seams
- Small area available for operation

(b) The dragline (DL) has not been recommended due to following reasons:

- i) High Gradient from 7° to 14° unsuitable for Draglines.
- ii) Small area available for operation

(c) Shovel-Dumper Combination:

The mine is already being worked by diesel operated hydraulic shovels/ backhoes shovel dumper system.

Keeping in mind that there are 4 workable seams and equal nos. of inter burden layers to be tackled, shovel dumper system which is capable of dealing many layers at a time (flexibility of operations) has been recommended. The quality problem can be handled with the help of hydraulic excavators which have precise three dimensional movement of bucket. They are capable of carrying out selective mining.

5.3.4 Coal production

The coal production has been planned for the peak capacity of 2.62 MTPA.

5.3.5 Sequence of OC mining

Presently, the mine has reached to a depth of about 50 m from surface. The sequence of mining has been planned in such a way as to avoid any external dumping area outside the block/ML which is not available in the vicinity of the mine as the surrounding land is under jurisdiction of CCL and also the areas are coal bearing.

Therefore, internal dumping has been proposed within the block/ML area of the mine, and rehandling of dumps will be taken up when the mine working reaches such dump area during the course of advancement of opencast operation. As the void within the quarry increases, the OB generated as well as rehandled dumps will be placed into backfill dump within the quarry.

It is envisaged to work this mine in the manner as mentioned below (refer Plate XX for activities implementation schedule).

- i) In X-X area, where Bermo seam is being worked at present, the reserves of Bermo seam are almost exhausted except for a small portion in the dip side towards south west. This small part of X-X area will continued to be worked for first 2 years (2017-18 to 2018-19) till the faces (existing quarry) reach mine boundary (proposed limit considering also the batter & barrier).
- ii) OB dumping for the first 3 years will be done over the rise side of the ongoing quarry operation over the exposed floor of Bermo seam.
- iii) Simultaneously another trench and quarry (main) will be started along the northern boundary in the X-X area from 1st year itself which will eventually reach to the proposed quarry floor of Seam VI+VII.
- iv) The OB generated from the main quarry will be placed towards south west side of X-X area for first 3 years and part of 4th year, at the site where the OB from the existing quarry is also envisaged for dumping.
- v) From 4th year (part) onward the OB generated will be dumped on the virgin Y-Y area (coal bearing area) which will be subsequently rehandled when backfilling space is generated in the main quarry.
- vi) Then, Y-Y area, which lies towards the east of Karo Nala, will be started as separate Quarry after over 20 years. Emlo Nala also flows through the Y-Y area and is proposed to be diverted into the Karo nala to enable extraction of coal from underneath it. Early diversion of the Emlo nallah will simplify the working of Y-Y area enabling longer strike length and also unlocking the coal below this nala for extraction.
- vii) Karo Nala, which bifurcates the mine into X-X and Y-Y areas, will be eventually diverted through the worked out areas of X-X part (over the backfilled area) such that no coal is left blocked as barrier under the nala.

5.3.6 Year/ stage wise development

The mine is already operational in Bermo seam and the future development and operation is stagewise described below.

Year 1(2017-18) and year 2(2018-19), Refer Plate XIII-A

In addition to the already operational pit in Bermo seam, a new trench will be driven from west to east along northern ML boundary line in the northern portion of X-X area. The same operation will be enhanced further in the 2nd year. The coal and OB production from the two pits are given in the following table along with the stripping ratio.

Sl. No.	Year	Old Pit (Bermo seam)		New Pit		Total		SR, cum/t
		Coal, MT	OB, mcum	Coal, MT	OB, mcum	Coal, MT	OB, mcum	
1	2017-18	0.40	1.20	0.00	4.00	0.40	5.20	13.00
2	2018-19	0.60	1.40	0.00	4.00	0.60	5.40	9.00

The OB generated from both the years and from both the pits will be placed over the already extracted Bermo seam on the west side of the ML as shown in the above referred plate.

3rd year (2019-20), Refer Plate XIII-B

The Old Pit had exhausted during the 2nd year and will not operate during 3rd year onward and only New Pit will operate. The coal produced will be 0.55 MT alongwith 4.93 mcum OB which will be dumped at the same place as during the preceding year as shown in above referred Plate.

4th and 5th year (2020-21 and 2020-22), Refer Plate XIII-C

The mining operations will extend toward dip side at the eastern portion of X-X part of the mine. The coal production will be 1.04 mt and 2.00 mt during 4th and 5th year with a corresponding OB removal of 4.35 mcum and 4.15 mcum respectively. The OB generated upto the end of 4th year will be mostly accommodated at the previously being dumped site however part of the 4th year OB (0.23 mcum) will be dumped over the Y-Y area. The total OB generated 4.15 mcum will be dumped over Y-Y area.

6th to 10th year (2022-23 to 2026-27), Refer Plate XIII-D

The mining operations will expand and enhance towards west side from the previous position.

The target coal capacity of 2.62 mt will be achieved during the 6th year and will be maintained till the 10th year with an annual OB generation of 3.84 mcum annually.

All OB generated will be accommodated over the Y-Y area.

11th to 15th year (2027-28 to 2031-32), Refer Plate XIII-E

The mining operations will expand and enhance towards west side from the previous position.

The coal production of 2.62 MTPA will be continued during this period with an annual OB generation of 4.08 mcum annually.

All OB generated will be fully backfilled in the decoaled area. Additionally, the rehandling of the surface dump (on west side constructed earlier) will be started from 12 the year (2028-29) at the rate of 3.49 mcum annually.

16th to 20th year (2032-33 and 2036-37), Refer Plate XIII-F

The mining operations will expand and enhance towards west side from the previous position and reach the west end mine boundary to abut against it.

The coal production of 2.62 MTPA will be continued during this period with an annual OB generation of 3.69 mcum annually.

All OB generated during this period will be backfilled.

Additionally, the rehandling of the remaining volume 21.87 mcum surface dump (Dump D1=5.52 mcum and D2=16.35 mcum) will be carried out at the rate of 4.374 mcum annually during 16th to 20th year. Both the dumps will be totally eliminated by 20th year and backfilled into decoaled area.

21st to 25th year (2037-38 to 2041-42), Refer Plate XIII-G.

Only residual mining operations will be taken up in the X-X part and a new trench will be opened on the Y-Y part of the ML from 21st year and driven from west to east. The coal production of 2.62 MTPA will be continued during this period with an annual OB generation of 4.76 mcum annually.

All OB generated during this period will be backfilled.

26th to 27th year (2042-43 to 2043-44), Refer Plate XII

Total mining operations will be concentrated in the Y-Y area. The coal production of 2.50 MT and 0.97 MT will be done during 26th and 27th year respectively with corresponding OB removal of 4.00 and 0.80 mcum respectively.

All OB generated during this period will be backfilled.

Additionally, the rehandling of the backfilled dump (in easternmost side of X-X area) will be carried out at the rate of 3.70 mcum and 3.69 mcum during

26th year and 27th year respectively which will be backfilled in de-coaled area of Y-Y part of ML.

Final stage quarry plan is given in **Plate XI**.

5.3.7 Calendar program of excavation

The year wise OBR & Coal production since 1993-94 is furnished in Table 4.29 in Chapter 4. The summarized calendar programme of coal production, OB removal and rehandling for future life of the mine is tabulated in Table 5.4 alongwith stripping ratio.

TABLE 5.4
SUMMARISED CALENDAR PROGRAMME OF COAL PRODUCTION, OB
REMOVAL, REHANDLING AND STRIPPING RATIO

Sl Year	Calendar Year	Coal, MT		OB, Mcum		SR		Rehandal OB, Mcum		Total OB Excavation + Rehandal		SR With Rehandling	
		Prog	Cumul	Prog	Cumul	Prog	Cumul	Prog	Cumul	Prog	Cumul	Prog	Cumul
Past	2016-17	0.20	0.20	0.10	0.10	0.50	0.50	0.00	0.00	0.10	0.10	0.50	0.50
1	2017-18	0.40	0.60	5.20	5.30	13.00	8.83		0.00	5.20	5.30	13.00	8.83
2	2018-19	0.60	1.20	5.40	10.70	9.00	8.92		0.00	5.40	10.70	9.00	8.92
3	2019-20	0.55	1.75	4.93	15.63	8.96	8.93		0.00	4.93	15.63	8.96	8.93
4	2020-21	1.04	2.79	4.35	19.98	4.18	7.16		0.00	4.35	19.98	4.18	7.16
5	2021-22	2.00	4.79	4.15	24.13	2.08	5.04		0.00	4.15	24.13	2.08	5.04
6	2022-23	2.62	7.41	3.84	27.97	1.46	3.77		0.00	3.84	27.97	1.46	3.77
7	2023-24	2.62	10.03	3.84	31.81	1.46	3.17		0.00	3.84	31.81	1.46	3.17
8	2024-25	2.62	12.65	3.84	35.64	1.46	2.82		0.00	3.84	35.64	1.46	2.82
9	2025-26	2.62	15.27	3.84	39.48	1.46	2.59		0.00	3.84	39.48	1.46	2.59
10	2026-27	2.62	17.89	3.84	43.32	1.46	2.42		0.00	3.84	43.32	1.46	2.42
11	2027-28	2.62	20.51	4.08	47.40	1.56	2.31		0.00	4.08	47.40	1.56	2.31
12	2028-29	2.62	23.13	4.08	51.48	1.56	2.23	3.49	3.49	7.57	54.97	2.89	2.38
13	2029-30	2.62	25.75	4.08	55.55	1.56	2.16	3.49	6.98	7.57	62.53	2.89	2.43
14	2030-31	2.62	28.37	4.08	59.63	1.56	2.10	3.49	10.47	7.57	70.10	2.89	2.47
15	2031-32	2.62	30.99	4.08	63.71	1.56	2.06	3.49	13.96	7.57	77.67	2.89	2.51
16	2032-33	2.62	33.61	3.69	67.40	1.41	2.01	4.37	18.33	8.06	85.73	3.08	2.55
17	2033-34	2.62	36.23	3.69	71.09	1.41	1.96	4.37	22.70	8.06	93.80	3.08	2.59
18	2034-35	2.62	38.85	3.69	74.79	1.41	1.92	4.37	27.08	8.06	101.86	3.08	2.62
19	2035-36	2.62	41.47	3.69	78.48	1.41	1.89	4.37	31.45	8.06	109.93	3.08	2.65
20	2036-37	2.62	44.09	3.69	82.17	1.41	1.86	4.37	35.82	8.06	117.99	3.08	2.68
21	2037-38	2.62	46.71	4.76	86.93	1.82	1.86	0.00	35.82	4.76	122.75	1.82	2.63
22	2038-39	2.62	49.33	4.76	91.70	1.82	1.86	0.00	35.82	4.76	127.52	1.82	2.58
23	2039-40	2.62	51.95	4.76	96.46	1.82	1.86	0.00	35.82	4.76	132.28	1.82	2.55
24	2040-41	2.62	54.57	4.76	101.23	1.82	1.85	1.44	37.26	6.20	138.48	2.37	2.54
25	2041-42	2.62	57.19	4.76	105.99	1.82	1.85	1.44	38.69	6.20	144.68	2.37	2.53
26	2042-43	2.50	59.69	4.00	109.99	1.60	1.84	3.70	42.39	7.70	152.38	3.08	2.55
27	2043-44	0.97	60.66	0.80	110.79	0.82	1.83	3.69	46.08	4.49	156.87	4.63	2.59
		60.66		110.79		1.83		46.08		156.87		2.59	

Detailed calendar programme of coal production year wise and seam wise along with OB removal is given in Table 5.5.

TABLE 5.5
CALENDAR PROGRAMME OF COAL PRODUCTION,
YEAR WISE AND SEAM WISE ALONG WITH GCV

Seam	1 st year		2 nd to 3 rd year		4 th to 5 th year		6 th to 10 th year		11 th to 15 th year		16 th to 20 th year		21 st to 25 th year		26 th to 27 th year		Up to 27 th year	
	Tonnage mt	GCV	Tonnage mt	GCV	Tonnage mt	GCV	Tonnage mt	GCV	Tonnage mt	GCV	Tonnage mt	GCV	Tonnage mt	GCV	Tonnage mt	GCV	Tonnage mt	GCV
Bermo	0.60	5487	0.60	5487	0.00	0	0.18	5323	0.09	5456	1.10	5529	1.99	5440	0.11	5435	8.02	5476
XI	0.00	0	0.27	5268	0.59	5326	0.77	5168	0.69	5419	0.66	5502	10.93	5054	0.13	5299	3.63	5306
IX-XC	0.00	0	0.28	5553	2.15	5441	3.42	5471	3.97	5474	2.72	5514	1.62	5452	0.96	5385	16.60	5462
VIII	0.00	0	0.00	0	0.30	4774	5.88	4688	5.42	4756	5.85	4916	0.59	4758	1.22	4790	22.05	4808
VIIC	0.00	0	0.00	0	0.00	0	2.87	4984	2.92	4964	2.77	4823	0.59	4910	1.06	4923	10.35	4923
Total	0.6	5487	1.15	5452	3.04	5348	13.10	4983	13.10	5053	13.10	5101	15.71	5257	3.47	5127	60.66	5128

5.3.8 Mineable reserves and anticipated life of the mine

The recoverable (extractable) reserves are already given in Table 5.2 as 60.66 Mt.

Balance life of the mine, considering a capacity of 2.62 Mt coal production per annum, will be 27 years as on 1.4.2017. The average stripping ratio of the mine works out to 1.83 cum/t as per the calendar programme of excavation (without rehandling).

5.3.9 Proposed method of working

Opencast method of mining has been adopted alongwith shovel/ dumper combination.

The haul roads are planned at a gradient of 1 in 16. The present system of hiring of equipment both for coal and OB will be continue, as also drilling in OB by hired of equipment.

The pit is designed with 10m high benches in OB and less height in thin coal seams and partings in line with the available thickness. The bench width for working and non-working benches for coal and OB are each proposed to be 30 m and 20 m respectively.

The overburden and coal benches, as per the prevalent practice and as per the permission given by the DGMS, are to be worked with height of 6m and 3m respectively. As there are no underground developed workings in lower

seams as was the case in Bermo seam, the height of the benches could be suitably increased depending upon the size of the excavation equipment.

5.3.10 Extent of mechanisation

Mining and transport of coal and OB will be fully mechanised as elaborated in this chapter.

5.3.11 HEMM Productivity Calculation

5.3.11.1 Schedule of Operation HEMM

HEMM will be operated on following schedule.

Hours per Shift	:	8
Shifts per Day	:	3
No. of Working Days per year	:	330

5.3.11.2 Lead for coal and OB transportation

As the population of transportation equipment will depend upon the lead, the same was calculated and found to be about 2.5 km (one way) on an average for coal as well as for OB.

5.3.11.3 Equipment Selection under shovel-dumper system

Standardisation of equipment for Overburden removal and coal production

- (i) The plan showing the existing workings as on 31-03-2016 is shown vide Plate XVIII.

The mine is being worked by Mechanized Opencast method. Both OBR and Coal winning are being done by hired equipment. Drilling in OB is done by hired drills, whereas, that of Coal is being done by departmental / hired drill machine only.

3 to 4 cum diesel hydraulic excavators/ backhoes are being used in combination with 25 to 35 T Dumpers.

As OC mining is to be extended in lower seams within the narrow area available within ML area, after considering statutory safety barriers at surface, and facilities, diesel operated shovels/backhoes with 2.5 cum bucket capacity in combination with 25 T rear dumpers for coal production and 4.5 cum diesel shovels with 35 T rear dumpers for OB removal has been proposed As summarized in Table 5.6 below.

TABLE 5.6
PROPOSED SHOVEL AND DUMPER CAPACITIES

Equipment	For OB	For Coal
Excavators	4.5 cum bucket	2.5 cum bucket
Dumpers	35T capacity	25T capacity

5.3.11.4 Productivity calculation of Equipment

Calculation of annual productivity of shovels and dumpers has been detailed out in the following Table 5.7.

TABLE 5.7
CALCULATION OF ANNUAL PRODUCTIVITY OF
SHOVELS AND DUMPERS

Sl. No.	Combination	OB (4.5cum+35T)	Coal 2.5 Cum+25t
1	Swell Factor	0.69	0.69
2	Bucket fill factor	0.88	0.86
3	Swell Cum Fill factor	0.61	0.59
4	Bucket Capacity designed, cum	4.5	2.50
5	Solid Bucket Capacity cum	2.73	1.48
6	Capacity Used of the dumper, cum	20.3	19.4
7	Solid capacity of dumper from CP; cum	15.5	14.9
8	No of buckets for carrying capacity of dumper	5.7	10.1
9	No of passes rounded towards higher side	5.0	10.0
10	Time for loading a dumper (min) @0.51 min bucket cycle time	2.55	5.1
11	Time for placement of one dumper (0.95)	0.5	0.5
12	Time for disposal of one dumper	3.05	5.6
13	Load per dumper, cum (solid)	13.7	14.8
14	Hourly output of shovel Solid M3	268.8	158.9
15	Considering factor for positioning, traveling (0.95)	255.3	151.0
16	Rounded (out put per Hour)	255.0	151.0
17	Annual capacity of Shovel Mcum (solid)	1.52	0.90
17.A	Annual capacity of Shovel, Mt (solid)		1.48
	Dumper capacity		
18	Lead, km (one way)	2.5	2.5
19	Average Speed, km/h	25	25
20	Dumper travel time, min	12	12

Sl. No.	Combination	OB (4.5cum+35T)	Coal 2.5 Cum+25t
21	Dumper spotting unloading and waiting, (min)	2.92	2.90
22	Loading time of dumper	2.55	5.1
23	Time for placement of one dumper	0.5	0.5
24	Total Dumper cycle time(20+21+22)	17.47	20
25	Hourly output of shovel, cum	255	151
26	Hourly Out put of dumper m ³	46.92	44.51
27	No. of dumpers to work with one shovel(25/26)	5.4	3.4
28	Working dumper availability	0.8	0.8
29	Population of dumpers with one shovel by calculation	7	5
30	Annual productivity of dumper (MCUM)	0.22	0.21

5.3.12 Equipment Provision

Existing Equipment

The list of existing equipment for the current targeted production of 0.4 MT of coal is given in Table 5.8.

TABLE 5.8
LIST OF EXISTING EQUIPMENT

Sl. No.	Name of HEMM	Capacity	Departmental/ Hired	Number Running
1.	Excavator/ Shovel/ Backhoe	3 to 4 cum	Hired	2
2.	Dumpers	20 to to 35 T	Hired	10
3.	Dozers	155 HP or more	Hired	2
4.	Wagon Drill & other deep hole drilling equipment	100 mm diameter	Hired	2
5.	HJH Drill	35 mm diameter	Hired	1
6.	Compressor	Adequate capacity	Hired	2
7.	Water Sprinkler	12 KL or more	Hired	1
8.	Crawler mounted drill machine for deep hole blasting	100 mm diameter	Departmental or Hired	1

Proposed Equipment

The list of proposed production and auxiliary equipment for annual production of 2.62 MT of coal and corresponding OB is given in Table 5.9.

TABLE 5.9
LIST OF PROPOSED PRODUCTION AND AUXILIARY EQUIPMENT

Sl. No.	Particulars	Capacity	Total Nos.
A	OVERBURDEN		
1	Hydraulic shovel	4.5 m ³	6
2	RD Truck	35 T	42
3	Dozer	410 HP	8
4	RBH Drill	110/115 mm	4
	Sub Total (A)		60
B	COAL (OC)		
1	Hydraulic excavator	2.5 m ³	2
2	Rear Dumper,(Coal Body)	25 T	13
3	Dozer	320 HP	3
4	RBH Drill	110/115 mm	2
5	Hydraulic backhoe	0.9 -1.2 m ³	1
6	Front End Loader	6.3 CUM	2
	Sub Total (B)		23
C	AUXILLIARY & SERVICE EQUIPMENT		
1	Grader	220 HP	2
2	Diesel Bouser		1
3	Construction backhoe	0.9 CUM	1
4	Water sprinkler	26 KL	4
5	TOW truck	50T	1
6	Rough Terrain Crane - mobile	40T	1
7	Fuel trucks		1
8	Wash trucks		1
9	Mobile maintenance trucks		1
10	Lube trucks		1
11	Fire trucks		1
12	Explosive van		1
13	Portable air compressor		1
14	Tyre handler		2
15	General use trucks		2

Sl. No.	Particulars	Capacity	Total Nos.
16	Pickup		2
17	Jeeps		4
18	Cars		3
	Sub Total (C)		30
D	RECLAMATION EQUIPMENT		
1	Front End Loader	1.2-2.5 cum	1
2	15 T Truck		4
	Sub Total (D) for reclamation		5
	Total (coal + OB + Aux + Reclamation)		116

5.4 STACKING OF MINERAL REJECTS AND DISPOSAL OF WASTE

5.4.1 Waste generated during opencast mining

Only opencast mining has been envisaged and the waste generation will be in form of overburden including top soil.

5.4.1.1 Nature of top soil and overburden/ waste

Overburden consists predominantly sandstone with minor amount of shale, carbonaceous shale, ungraded coal and thin coal bands. Besides, the overburden also includes soil, weathered rocks, obvious bands of any thickness and dirt bands of >1m thickness. 0.60 meter average thickness of top soil has been considered for separate removal and stacking for use in mine reclamation later.

5.4.1.2 Year/ stage wise waste generation

Year/stage wise waste generation with break into Pure OB & Top Soil is given in Table 5.10 below.

TABLE 5.10
YEAR/ STAGE WISE WASTE GENERATION WITH BREAKUP INTO
PURE OB & TOPSOIL IN M.CUM

Year	Excavation Area Ha		OB+TS removal		Topsoil generated from excavation		Pure OB from excavation, Mcum	
	Prog.	Cuml.	Prog.	Cuml.	Prog.	Cuml.	Prog.	Cuml.
Actual 2016-17	48.62	48.62	0.19	0.19	0.09	0.09	0.10	0.10
1 st Year (2017-18)	19.62	68.24	5.11	5.30	0.12	0.21	4.99	5.09
2 nd & 3 rd Year (2019-20)	19.81	88.05	10.33	15.63	0.12	0.33	10.21	15.30

Year	Excavation Area Ha		OB+TS removal		Topsoil generated from excavation		Pure OB from excavation, Mcum	
	Prog.	Cuml.	Prog.	Cuml.	Prog.	Cuml.	Prog.	Cuml.
4 th & 5 th Year (2021-22)	1.50	89.55	8.50	24.13	0.01	0.34	8.49	23.79
6 th to 10 th Year (2023-27)	7.77	97.32	19.20	43.32	0.05	0.39	19.15	42.93
11 th to 15 th Year (2028-32)	4.38	101.70	20.39	63.71	0.03	0.41	20.36	63.30
16 th to 20 th Year (2033-37)	10.23	111.93	18.46	82.17	0.06	0.47	18.40	81.70
21 st to 25 th Year (2038-42)	41.00	152.93	23.82	105.99	0.25	0.72	23.57	105.27
26 th & 27 th Year (2043-44)	3.53	156.46	4.80	110.79	0.02	0.74	4.78	110.05
Grand Total	0.00	156.46	110.79		0.74		110.05	

5.4.1.3 Waste disposal sites

There are different waste disposal sites located within the ML as follows:

i. The surface dumps

The existing surface dump is on the northern portion of the X-X Area. As the alignment of the proposed access trench for the lower seam passes through this dump site, further dumping is not proposed there.

The surrounding land of the block is under jurisdiction of CCL and also the nearby areas are coal-bearing. Further, the virgin area within the block is occupied by colonies of CCL, which will take some time for shifting.

Therefore, it is proposed to place all OB generated within the block, initially till 4th year over the floor of Bermo seam as per the present practice.

There after i. e. from the 4th year itself, the external OB will also be placed on the surface over the virgin Y-Y area beyond karo nala.

The backfilling into the pit will start during 8th year.

Eventually, as the mine advances, the OB placed over Bermo seam floor as well on the surface will be rehandled and backfilled into the quarry when sufficient voids are generated.

Presently, the mine has reached to a depth of about 50 m from surface. The sequence of mining has been planned in such a way as to avoid any external dumping area outside the block which is not available in the vicinity of the mine as the surrounding land is under jurisdiction of CCL and the areas are coal bearing.

ii. Backfill dump

Backfilling will start from 8th year with a quantity of 1.00 Mcum(B). During 8th and 9th year partial backfilling will be done and then from 10th year full backfilling will take place concurrent with mining.

Mine sequence has been so planned that the OB generated while opening of Y-Y area (during 21st year) beyond Karo nala as separate quarry, gets placed in the voids already created till then in the X-X area, such that the rehandling of dump is minimised,

iii. Top soil dump

The total topsoil generated will be 0.74 Mcum (B) during the life of the mine. As the mine is already operating, the top soil generated will be spread over the reclaimed dump concurrent with mining. Top soil will be used for growing plants along the fringes of the site roads and reclamation of surface dump and backfilled area.

The topsoil stockpile will be low height not exceeding 6 m and will be grassed to retain fertility. Besides this, there would be temporary stacks near the excavation area and area to be reclaimed which will be made use of for concurrent filling without bringing the topsoil to the soil stack near the OB dump.

iv The void

The remaining void area of 55.11 ha will remain over the Y-Y are with 150m depth. The floor RLs will range between 80m and 95m. Plate XVI shows the final stage at the end of closure with external dump rehandled and final void.

The void will be ultimately become a water body useful for ground water recharge and can also be used for agriculture purpose.

5.4.2 Program of Waste Disposal

Details of year/stage wise waste disposal are given in the following tables.

The calendar program of waste disposal (direct and rehandling) at different sites	:	Table 5.11
The program of excavated, backfill and void area	:	Table 5.12
The Program of surface dump area	:	Table 5.13

TABLE 5.11
CALENDAR PROGRAMME OF WASTE DISPOSAL (DIRECT AND REHANDELED) MCUM (BANK)

Year	Backfilled OB, mil.cum		Direct Surface Dump		Direct Crown Dump		Rehandaled Crown Dump and Backfilled, mil.cum		Rehanded Sur Dump D1&D2 and Backfilled, mil.cum		Rehandling of Backfill from East of Diverted Nala		Top Soil		Total OB Including Rehandling		Total Rehandling OB Mcum	
	Prog.	Cuml.	Prog.	Cuml.	Prog.	Cuml.	Prog.	Cuml.	Prog.	Cuml.	Prog.	Cuml.	Prog.	Cuml.	Prog.	Cuml.	Prog.	Cuml.
past 2016-17	0.00	0.00	0.10	0.10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.10	0.10	0.00	0.00
1 st Year (2017-18)	0.00	0.00	4.99	5.09	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	4.99	5.09	0.00	0.00
3 rd Year (2019-20)	0.00	0.00	10.21	15.30	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.05	0.05	10.26	15.35	0.00	0.00
5 th Year (2021-22)	0.00	0.00	8.49	23.79	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.08	0.13	8.57	23.92	0.00	0.00
10 th Year (2023-27)	7.11	7.11	12.04	35.82	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.15	0.28	19.30	43.22	0.00	0.00
15 th Year (2028-32)	16.16	23.26	0.00	35.82	4.21	4.21	0.00	0.00	13.96	13.96	0.00	0.00	0.04	0.32	34.36	77.57	13.96	13.96
20 th Year (2033-37)	18.40	41.66	0.00	35.82	0.00	4.21	0.00	0.00	21.87	35.82	0.00	0.00	0.13	0.45	40.39	117.97	21.87	35.82
25 th Year (2038-42)	23.57	65.24	0.00	35.82	0.00	4.21	2.86	2.86	0.00	35.82	0.00	0.00	0.17	0.62	26.61	144.57	2.86	38.69
27 th Year (2043-44)	4.78	70.02	0.00	35.82	0.00	4.21	0.00	2.86	0.00	35.82	7.39	7.39	0.12	0.74	12.29	156.87	7.39	46.08
PMC (2044-47)	0.00	70.02	0.00	35.82	0.00	4.21	0.00	2.86	0.00	35.82	0.00	7.39	0.00	0.74	0.00	156.87	0.00	46.08
Grand Total	70.02		35.82		4.21		2.86		35.82		7.39		0.74		156.87		46.08	

The cumulative stage-wise excavated area, backfilled area, and balance void area is given below in Table 5.12.

TABLE 5.12
CUMULATIVE STAGE-WISE EXCAVATED AREA, BACKFILLED AREA, AND BALANCE VOID (HA)

Year	Excavation area	Backfilling area	Void area
Past 2016-17	48.62	0	48.62
1 st Year (2017-18)	68.24	0	68.24
3 rd Year (2019-20)	88.05	0	88.05
5 th Year (2021-22)	89.55	0	89.55
10 th Year (2023-27)	97.32	0	97.32
15 th Year (2028-32)	101.7	27.59	74.11
20 th Year (2033-37)	111.93	71.88	40.05
25 th Year (2038-42)	152.93	94.4	58.53
27 th Year (2043-44)	156.46	101.35	55.11
PMC (2044-47)	156.46	101.35	55.11

The top RL of the backfilled dump will be 270 m except for a very small area where it will have an RL of 290 m. (refer Plate XII for 27th year stage plan). The General elevation of the surrounding area is 230 to 270m.

TABLE 5.13
YEAR / STAGE WISE DUMPED PROGRESSIVE AREA AND HEIGHT

Year	OB Dump-1 (over X-X area)			OB Dump-2 (over y-Y area)			Total OB Dump-1+2		
	Area in ha	Height	Vol mcum	Area in ha	Height	Vol mcum	Area in ha	Height	Vol MCUM
Past 2016-17			0.10				0	0	0.10
1 st Year (2017-18)	15.33	50	4.99				15.33	50	4.99
3 rd Year (2019-20)	18.29	90	10.21				18.29	90	10.21
5 th Year (2021-22)		90	4.11	15.62	30	4.38	15.62	90	8.49
10 th Year (2023-27)				23.33	90	12.04	23.33	90	12.04
15 th Year (2028-32)							0	0	0.00
20 th Year (2033-37)							0	0	0.00
25 th Year (2038-42)							0	0	0.00
27 th Year (2043-44)							0	0	0.00
PMC (2044-47)							0	0	0.00
Grand Total	33.62	230.00	19.41	38.95	120.00	16.42	72.57	350	35.82

CHAPTER 6

DRILLING AND BLASTING

6.1 INTRODUCTION

This mine will be operated by Opencast Method of Mining. The method of blasting and requirement of the explosives has, therefore been separately described below.

The total coal production planned is 2.62 MTPA. The peak OB removal will be 5.40 MCum/annum (2nd year). Drilling and blasting has been proposed both for OB and coal before excavation / loading operation.

6.2 OPENCAST MINING

After shot holes are drilled into the horizontal bench cut by the shovel, the OB benches are blasted using ANFO/SME/SMS with booster explosives and detonators or TLD and DTH combination. In this mine, main waste is overburden in the form of top soil, alluvium and weathered mantle and hard OB however, considerable area within the ML has been excavated in the past. Only 0.60 m average thickness of top soil has been considered for separate removal in future and stacking for use in mine reclamation later.

6.2.1 Broad blasting parameters

The drill is deployed on the horizontal bench cut by the shovel. From this level, blast holes are drilled down to the floor of the seam or bench, the length of holes will be 10% longer than the height of the bench. Easy access to the drill is provided via the waste bench.

In the blasting operations, shaking blast practices are proposed using low powder factor. This method will generate a set of cracks in the blasted strata with material movement reduced to minimum.

It has been assumed that about 10% of the weathered mantle will not require blasting.

Holes of 110/115mm dia will be drilled both in coal and OB. Short delays will be used while blasting. The control blasting techniques will be adopted wherever required to reduce noise, ground vibrations and fly rocks.

A study by CMRI, Dhanbad in June, 1994 on “ Optimisation of Blasting Parameters for controlling Fly-Rocks and Ground Vibration within desirable limits due to deep hole blasting operation in Bermo colliery of DVC, Bokaro.”

has been conducted. The relevant suggestions in respect of vibration standards along with optimum blast designs for fruitful blasting have been considered while suggesting blasting parameters drilling and blasting (Annexure VII).

The following pattern is envisaged. The pattern may be modified to suit local site conditions:

Over pillar areas (Old UG development in Bermo seam) – 5 m x 5 m

For the gallery areas, boreholes are proposed to be drilled along the central line of the gallery at 5 m spacing (boreholes to be terminated about 2 m above the top of the gallery to avoid blowing down during blasting).

Virgin areas – 5 m x 4.5 m

The blasting parameters, when the dwellings/structures are within 50 to 70 m from the site of the blast, shall conform strictly to all the DGMS regulations and Circulars. As permitted by the DGMS for carrying out controlled deep hole blasting up to a distance of 50 m from dwelling houses, the diameter of the hole is envisaged not to exceed 100mm, the burden shall not exceed 2 m and the spacing not more than 2.4m. The depth of hole shall not exceed 4m and the maximum charge per hole shall not exceed 11.12 kg per delay. However, if the distance of the site of blast from the dwellings/structures exceeds 70 m, the maximum charge per delay may be increased to 19.1 kg and the depth of hole to 6m with a burden of 2.4 m and spacing of 2.6m. The maximum charge per round of blast shall not exceed 111.2 kg. for 50 m to 55m distance, 140 kg for 55 m to 65 m distance and 170 kg for 65 to 70m distance of site of blast from the dwellings/structures. The diameter of the hole may be increased to 150 mm if the site blast is more than 65 m from the dwellings/structures.

Blasting operations shall be carried out in such a manner that the peak particle velocity caused due to blasting vibrations measured at a distance of 50 m from the blast site does not exceed 5 mm per second.

The blast site layout, blast hole drilling and blast hole loading practices shall be carried out in such a manner so as to minimize fly rock. All open joints and cracks in rock shall be filled up before loading.

The specific consumption of explosives per cum of OB and per Tonne of coal is likely to be as follows:

OB	-	0.32 kg/cum
Coal	-	0.17 kg/te

For mining in lower horizons below Bermo seams, the parameters of benches and blasting may be suitably modified as there would be no old underground working there.

6.2.2 Type of explosives to be used

ANFO/SME/SMS explosive is proposed to be used for heavy blasting and the daily requirement will be as follows for 2.62 MTPA coal production with maximum 4.76 Mcum annual OB removal.

**TABLE 6.1
REQUIREMENT OF EXPLOSIVES**

Particulars		T/day
For peak OB $4.76 \text{ Mill.cum.} \times 10^6 \times 0.32$ powder factor in kg/cum $\times 90\%^* \div 330 \text{ days} \div 1000$	=	4.15
For coal $2.62 \text{ Mt} \times 10^6 \times 0.17$ powder factor in kg/te $\div 330 \text{ days} \div 1000$	=	1.35
Total	=	5.5 say 6 tonne.

* *Assumed that 10% of Overburden does not require the blasting.*

6.2.3 Storage of explosives to be used

Manufacturers and suppliers of permitted explosives are few and a large numbers of holes are to be blasted frequently in OC, which required considerable quantity of booster explosives and considering that there could be delays in supplies for several reasons, a 10 tonnes magazine capacity for about 2/3 weeks of storage of permitted explosive, detonators primers and fuse etc has been provided besides an already existing magazine of 4.536 te capacity (**Annexure VIII**).

SMS will be prepared at site immediately before blasting is required to be carried out for which an SMS plant of suitable capacity will be installed.

CHAPTER 7

MINE VENTILATION

7.1 VENTILATION REQUIREMENT

Bermo Mine has been planned with Opencast Mining Technology. As such there is no requirement of any additional ventilation planning.

CHAPTER 8

DRAINAGE, PUMPING, POWER SUPPLY & ILLUMINATION

8.1 DRAINAGE & PUMPING

8.1.1 General

General slope of the ground is towards south. The drainage of the area is controlled by the Damodar River flowing from west to east, located south of the mines at a distance of around 1.0 km. Its tributary Karo nala flows from north to south in the eastern part of the Block and joins the Damodar River in the south of the mines. Further east to Karo nala, Amlo nala also passes through the property.

Baid karo nala which is the tributary of Karo nala flows from north to south in the west of the mines (outside the ML) and joins Karo nala in the south of the Mines, at a distance of more than 200m.

The HFL of the Karo nala as recorded in the vicinity of the project is 229.70 m above MSL. The HFL of the Baid karo nala as recorded in the vicinity of the project is 221.555 m above MSL. The surface plan showing the drainage system, surface contours at 2m interval and location of boreholes is shown in Plate IV.

The East Bokaro Coalfield bears a tropical climate. Annual rainfall is about 1200 mm to 1260 mm, a major portion of which occurs during the monsoon period (July to September).

There are two sources of water accumulation in the mine pit during open cast mining operation. The first source is direct rainfall and second source is mine seepage. As far as surface water sources are concerned, Karo & Amlo nala are flowing through the eastern portion of ML.

The mine working will be protected from the river/nala inundation by providing embankments against HFL of Karo nala. The embankments will have 3m height and 10m width. Adequate measures to protect the mine workings from surface water flow during the rains will be taken by way of providing garland drains around the mine excavations and also by providing suitable drainage gradients for mine benches. Sumps of adequate capacity will be provided on the quarry floor. The coal excavation and transport machinery are organised to be sited over the coal bench top and will not be affected by water accumulation from rains or strata seepage.

Hydrogeological study

Hydrology and water table behaviour was studied by CMPDIL and details were included in para 6.3 of Geological Report prepared in 2016 and the same has been included as **Annexure XI** in this document.

As many as 11 semi-confined aquifers have been identified during recent exploration of varying thickness ranging from 1.22m to 39m.

Detailed Aquifer Performance Test (APT) was not carried out in the DVC Bermo Mines. However, Aquifer Performance Test (APT) had been carried out in the nearby Makoli area of East Bokaro Coalfield situated at a distance of 4.72 km east of the project where permeability of the aquifer is determined as ranging from 0.38 to 0.50 m/d.

Pumping tests and slug injection test have not been conducted in DVC Bermo mines.

Water quality tested as per applicable standards from six water sources (including effluent water, surface water and drinking water) has indicated that no serious pollutant has been observed in the mine water discharge.

To assess the water table configuration, 64 dug wells, covering most of the villages are taken into considerations for water level monitoring for pre-monsoon and post-monsoon season.

Four artesian wells are encountered on the floor of Bermo seam (i.e. roof of Karo group of seams) with a flow of the well measured on 18.01.2016 is 0.80 lps.

The results of nearby permanent station monitored show the following results:

Avg. Pre-monsoon water level =	4.47 m
Avg. Post-monsoon water level =	2.55 m
Avg. Water level fluctuation in the study area=	1.93 m

As per the Project Authority, present mine water seepage during non-monsoon is about 278m³/day. After de-siltation, is being utilized for domestic supply of Bermo project. During non-monsoon period, due to non-availability of sufficient mine water, Project Authority also withdraws water from nearby Kargali project of CCL. To handle the rainwater accumulation during monsoon period, two centrifugal pumps 125 HP/ 850 GPM and 100 HP/ 800 GPM have been installed.

Coal mining is the major industrial activity in the study area. CGWB, Mid-Eastern Region, Patna has reported the stage of ground water development

in Bermo development Mines as 43.93 % and identified the region with category “Safe”.

8.1.2 Opencast mine

a. Planning of Mine Drainage

The ultimate depths of the OC Pit will reach around 185m. It will be planned to intercept the rain water as well as the seepage water at upper benches to the extent possible so that the water can be accumulated in sumps at 2-3 different elevations and the pumping can be accordingly planned with pumps of appropriate capacity and head.

Pontoons mounted pumps will usually be installed in main sumps to prevent their submergence in the unexpectedly heavy rainfall.

b. Make of Water

There are two sources of water accumulation in the mine pit during open cast mining operation. The first source is direct rainfall and second source is mine seepage. The rainwater accumulation is estimated for two options.

- i. For normal pumping
- ii. For emergency pumping

Each case has been described below separately.

i. For normal pumping

The normal pumping has been calculated based on the average rainfall of monsoon season for which data of Jharkhand meteorological station has been utilized as given in Table 8.1 below.

**TABLE 8.1
METEOROLOGICAL DATA OF BOKARO IMD**

Month	Average monthly rainfall, mm
January	13.5
February	16.6
March	12.8
April	23.5
May	36.4
June	179.1
July	324.7
August	306.4

Month	Average monthly rainfall, mm
September	241.8
October	72.8
November	6.9
December	6.2
Total (annual)	1240.7

The total rainfall in four monsoon months (June, July, August and September) is 1052 and dividing this by 120 days, the daily average rainfall comes to 8.8 mm.

The make of water is calculated in the following Table 8.2.

TABLE 8.2
CALCULATION OF PUMPING REQUIREMENT IN NORMAL CIRCUMSTANCES

Stage	Excavated Area (Ha)	Void left after backfilling (ha)	Rainwater volume within void (Ham)	Balance Rainwater accumulated after 50% losses (30% evaporation & 20% GW recharge) for evacuation (cum/day)	Total water including GW Seepage (cum/day), 278cum/day seepage GR	Hourly pumping requirement @18 hrs /day in 1 days (cum/ hr)
1 st year	68.24	68.24	1.08	5802.45	6080.45	337.8
3 rd year	88.05	88.05	1.39	7486.90	7764.90	431.4
5 th year	89.55	89.55	1.42	7614.44	7892.44	438.5
10 th year	97.32	97.32	1.54	8275.13	8553.13	475.2
15 th year	101.70	74.11	1.17	6301.58	6579.58	365.5
20th year	111.93	40.05	0.63	3405.45	3683.45	204.6
25th year	152.93	58.53	0.93	4976.81	5254.81	291.9
27th year End of Mine	156.46	55.11	0.87	4686.01	4964.01	275.8
Mine Closure (28-30th year)	156.46	55.11	0.87	4686.01	4964.01	275.8

c. Pumping requirements criteria

To calculate the pumping requirements and for selecting the pumps, following points should be considered:-

1. Climatic conditions of the area.
2. Account must be taken of maximum rainfall in 24 hours.
3. Inflow from seepage water is assumed as 278 cum/day (max)
4. Pumping requirements are assessed on the basis that the make of water on the day of maximum rainfall will be pumped out in next three days.

For smooth working during monsoon:

1. Coal and OB working faces and the haul roads will be maintained free of water as far as possible.
2. Within the quarry, the faces will be so laid that water from the working areas shall flow into sump by gravity. From the sump, water would be pumped out to the surface, stagnated in a settling pond, utilised for the mine activities and then discharged to the nearest streamlet.
3. Water garland drains will be developed in advance for each stage of mine working so that water is collected by the garland drains collected in a settling tank, utilised for the mine activities and then discharged to the nearest streamlet.

Main Sump: Main Sump will have adequate capacity to store enough water as the entire rain water of the excavated mine area / catchment area will be flowing into the sump.

For the sake of calculation, effective pumping hours per day are taken as 18 during peak period. Adequate number of standby pumps will be provided for unforeseen hazards.

d. Requirement of pumps

i. For normal pumping

The mine already has the following pumps, to take care of its pumping need.

TABLE 8.3
PUMPS EXISTING AT DVC BERMO MINES

Sl. No.	Particulars	Size/Cap.	No.
1.	Electric pumps (440 V)	150 HP	1
2.	Electric pumps (440 V)	125 HP	2
3.	Electric pumps (440 V)	100 HP	1
4.	Electric pumps (440 V)	90 HP	2
5.	Electric pumps (440 V)	60 HP	1
6.	Electric pumps (440 V)	33 HP	1
7.	Electric pumps (440 V)	25 HP	2
8.	Electric pumps (440 V)	20 HP	2

Following pumps have been installed and which are maintained in running order.

Sl. No.	Pump/Type	Capacity	Number.
1.	Centrifugal pump	100 HP/125 HP	one
2.	Centrifugal pump	90 HP	one
3.	Centrifugal pump	125 HP	one
4.	Submersible Pump	60 HP	one

No additional pumps have been envisaged under this head except that two slurry pumps will be inducted. Any additional pumps may be acquired as and when the need is felt.

ii. For emergency pumping

A number of large capacity mines are operational in the surrounding area. In case of unexpectedly heavy rainfall, pumps will be taken from the surrounding mines under the emergency disaster management plan.

Other Pumps

During rainfall, the water inflow into the sump contains clay & silt as well. To handle slurry, 2 numbers pump of slurry have been provided. In addition to above-mentioned pumps, adequate number of diesel pumps will be kept to deal with the power failure situation.

Delivery Range

The delivery ranges will be laid along the batter of the mine as per the site of the main sump.

Also, additional pipe lines from surface to the sumps of adequate throughput will be always kept laid so that they can be made use of in emergency and can be directly connected to the pumps arranged in that situation without any loss of time.

8.1.3 Requirement of water

Requirement of water and water balance has been covered in detail under Chapter 15. The requirement of water and the source of supply has been summarised below:

Water requirement	581 m ³ /day (Potable water 242 m ³ /day & Industrial water 339 m ³ /day)
Source of water	Potable water is met from bore well and industrial water requirement is met from mine sump and surface water reservoir of the existing Mine.

8.2 POWER SUPPLY & ILLUMINATION

8.2.1 Source of supply

At present, almost all of the equipment are diesel operated for mining activities. Where electrical power is a must, diesel generator backup is available. Power will be required for the proposed expansion phase. Power is received from DVC BTPS (located about 15 km from mine) through 33 KV overhead line. It is stepped down to 11 KV/440v.

8.2.2 Electric load

Most of the HEMM Equipment will be diesel operated. Electrical power supply will be needed for illumination, Pumping, Workshop, facilities.

The estimated connected load comes to the tune of 5 MW as broadly calculated below.

TABLE 8.4
TENTATIVE POWER REQUIREMENT

Sl. No.	Particulars	Total power KW
1	CHP	1400
2	W.Shop	1200
3	Power for Pumping	295
4	Power for Colony	600
5	Power for Quarry and dump lighting (LS)	1000
6	Power for Misc. (LS)	500
	Total	4995
	Say	5 MW

8.2.3 Voltages & system earthing

The various voltages proposed to be used at the project are:

Incoming Supply	-	33 KV
Pumping	-	6.6/3.3 KVA & 415 Volts
Workshop	-	415 Volts
CHP	-	6.6/3.3 KV & 415 Volts
Lighting inside the quarry	-	220 Volts
Lighting outside the quarry	-	220 Volts

It has been proposed to adopt restricted earth neutral system for all equipment. An effective earthing system is planned to ensure safety to personnel as well as to prevent shock hazards. There will be an earthing

grid surrounding the main substation. Its combined resistance shall be preferably kept below 2 ohms.

8.2.4 Illumination

Quarry illumination has been planned as under:

Power to the light shall be fed through transformers of 500 KVA 3.3/0.415 kV capacity. The working areas of the quarry shall be illuminated by a system of 4 x 400 W HPSV Lamps mounted on 15 m high mobile masts.

Transformers will be backed by DG Sets of suitable capacities arranged on hire basis.

Entire haul roads will be illuminated by 250 W HPSV Lamps mounted on steel poles erected along the haul roads. Power to these lamps would be supplied at 240 Volts from 100 KVA, 3.3/0.415 kV transformers.

OB dump and soil dumps will be illuminated by 1000 W metal halide lamps mounted on steel tubular poles with 100 KVA, 3.3/0.415 kV transformers.

8.2.5 Emergency lighting

Provision has been made for portable emergency lights during power failures for illumination of important locations such as project office, sub-station, store, hospital, time office etc.

CHAPTER 9

COAL HANDLING, WASHING & MODE OF DISPATCH

9.1 COAL HANDLING PLANT & MODE OF DISPATCH

The end use plant, viz. Bokaro Thermal Power Station is located at a distance of about 18 km and presently ROM coal from the mine (Capacity 0.4MTPA) being dispatched by road to BTPS after weighing of trucks.

To cater to the enhanced production of 2.62 MTPA, a CHP/Deshaler for dispatching crushed coal by conveyor, with standby arrangement of truck loading is proposed.

9.2 DESCRIPTION OF CHP

9.2.1 Receiving Arrangement & Crushing of ROM Coal

This crushing system will be located near the mine entry on west side of the property (refer Plate VIII Plan showing proposed surface layout). Dumpers from the ramps will unload coal into a 200 T receiving hopper from two sides. Two apron feeders below the hoppers are provided to feed ROM coal to two crushers (300TPH capacity each) for reducing size to (-) 200 mm.

The crushed coal will be carried through conveyors to a Ground bunker of 8000 T capacity (one day Production).

From the ground bunker coal will be taken out through reclaim conveyor to a transfer point from where two streams will emerge. One stream will go to truck loading hoppers of 50 to 60 T capacities, and another stream will link to the main conveyor system for conveying coal right up to the BTPS.

Basic data

Production capacity of the mine (ultimate)	2.62 Mtpa
No. of working days considered /year	330
No. of working shifts/day	3
No. of working hours/shift	6 (i.e. 18 hrs/day)
Quality and other parameters of coal Grade	Equivalent to G9

H.G.I.	70
Type of Coal hauler/capacity to EUP	Rear Dumper/ 25T
Feeder size of coal to the coal handling plant (mm)	(-) 1200 (Maximum)
Product size of coal (mm)	(-) 200 mm
Consumer	DVC's Thermal Power Plants
Conveyor capacity upto bunker	1200 tph
Conveyor capacity after bunker	1200 tph

Till such time, the CHP is constructed and becomes operational, the present system of dispatch by trucks will continue.

9.3 COAL WASHERY

Coal is to be used for thermal power generation not far from mine (18 km) and the overall ROM Grade of coal is Ungraded (for Coking Coal) with GCV Range of 4601 to 4900 Kcal/ Kg, which in case of Non coking coals is equivalent to G9 Grade, as such no coal washing is envisaged.

CHAPTER 10

MANPOWER, SAFETY AND SUPERVISION

10.1 MANPOWER AND SUPERVISION REQUIREMENT

The existing (as on 1.1.2016) manpower strength of the mine for the present production capacity of 0.40 MTPA is 128 including 16 Officers. The manpower of the mine for the proposed production capacity of 2.62 MTPA has been estimated as 569 as detailed out in Table 10.1 below.

**TABLE 10.1
ESTIMATED MANPOWER FOR 2.62 MTPA**

Sl. No.	Particulars	Total manpower (with sick/leaves)
I	Heavy Earth Moving Machinery	
A.	OB	
1	Hydraulic shovel 4.5 m3	18
2	RD Truck, 35 T, 22.5 m3	126
3	Dozer, 410 HP	24
4	RBH Drill, 110/115 mm	12
	Sub-total for OB	180
B.	Coal	
1	Hydraulic excavator (2.5m3)	6
2	Rear Dumper, 25 T(Coal Body)	39
3	Dozer 275-320 HP	9
4	RBH Drill, 110/115 mm	6
5	Front End Loader at Pit head	6
6	Hydraulic backhoe 0.9 -1.2 m3	3
	Sub-total for Coal	69
II	Auxiliary & Service Equipment	
1	Toe Truck, on 50 T Truck Chassis	1
2	Rough terrain crane 40T	1
3	Grader, Blade length 3710 mm	4
4	Mobile Maintenance Truck	3
5	Water sprinkler 14KL	12
6	Pickup van	2
7	Tyre handler	6
8	Fire Tender	3

Sl. No.	Particulars	Total manpower (with sick/leaves)
9	Wash trucks	3
10	Lube trucks	3
11	Explosive van	1
12	Portable air compressor	1
13	Fuel trucks (Bowser)	3
14	General use trucks	2
15	Jeeps	4
16	Cars	3
	Sub-Total Auxiliary & Service Equipment	59
III	Reclamation	
	1.2-2.5 cum Front End Loader	2
	10 T Truck	8
	Sub-Total Reclamation	10
	TOTAL DIRECT MANPOWER (I+II+III)	318
IV	Excavation	63
V	CHP etc	12
VI	mining, safety, Quality, Despatch	41
VI.1	Store, Purchase	10
VI.2	Water supply	11
VI.3	Environment	4
VI.4	Personal and welfare	2
VI.5	Finance and accounts	4
VI.6	Workshop	9
VI.7	Pump attendant, Field electricians, Fitters, Mazdoors	12
VI.8	Communication	5
VI.9	Geology deptt with lab	2
VI.10	Civil	5
VI.11	Electrical	8
VI.12	Computer section	3
VI.13	Medical	5
VI.14	Planning	3
	Grand Total	517
	A provision for Sick and leave (10%)	52
	Grand Total including Sick, leave	569

OMS for the whole mine works out to

$$\frac{2620000 \text{ Tonne}}{569 \text{ Manpower} \times 264 \text{ shifts/ yr}} = \frac{2620000}{150216} = 17.44 \text{ tonnes}$$

A number of local personnel including land losers would be recruited in unskilled and semi skilled categories. These personnel need training and orientation before project starts. Besides, some I.T.I. qualified young people from the region can be recruited for operation and maintenance job of plant and machinery after proper training. The employment of local people in primary and secondary sectors of project shall upgrade the prosperity of the region. But, many skilled and highly skilled personnel have to be brought from outside as there is no industrial culture in the locality.

It is proposed to outsource the major equipment required for OB & Coal removal. Also some of the services like Security, Canteen etc. are recommended to be out sourced for better management and improved results. The company will engage only the statutory manpower required for mining including for blasting. The manpower for operating the hired equipment will be arranged by the contractor.

10.2 SAFETY ASPECTS AND DISASTER MANAGEMENT

All types of industries face certain types of hazards which can disrupt normal activities abruptly and lead to disaster like fires, inundation, failure of machinery, explosion to name a few. Similarly coal mines also have impending dangers or risk which need be investigated addressed, disaster management plan formulated with an aim of taking precautionary steps to avert disaster and also to take such action after the disaster which limits the damage to the minimum. These risks and measures against them are summarized below.

10.2.1 Inundation

To guard against the danger from inundation in the mine from surface water including inrush of water in rainy season, adequate number of pumps has been installed and which need to be maintained in running order. As the mine gets deepened, pumping capacity along with the specifications of pump to cater to extra Head will have to be augmented.

Adequate measures to protect the mine workings from surface water flow during the rains will be taken by way of providing garland drains around the mine excavations and also by providing suitable drainage gradients for mine benches. Sumps of adequate capacity will be provided on the quarry floor. The coal excavation and transport machinery are organised to be sited over the coal bench top during rainy season and will not be affected by water accumulation from rains or strata seepage on the quarry floor.

Special precaution needs to be taken when working Y-Y area and diversions of nalas need to be carefully planned.

10.2.2 Failure of pit slope

The proposed OC mine is planned for future 27 years period operation. The ultimate depth at the end of mining operation will be upto about 150m, the general surface level varies between 233.17 and 243.84 m RL.

To prevent any wall failure in the mine, adequate bench width has been provided in the mining system such that the overall working slope of the highwall remains within 25°. Overall slope of side batters shall always be within 45°. Individual working benches has been planned with 70° except for upper benches in soil at 45° against the usual 70°

Strict vigil will be kept by reconnaissance surveys especially in rainy season to detect any impending danger so that the men and equipment can be accordingly moved out of danger area in time.

10.2.3 Failure of waste dump

There are two types of waste dumps which are discussed below:

i. Surface dump

Sliding of surface waste dump poses an equally severe risk compared with quarry slope failure. Hence, it is imperative that the degree of hazard against potential failure of waste dump slope should be identified and that precautionary measures are to be adopted, if required.

The surface waste dump will be located within the ML area over the dip part of the block. The temporary dumping is proposed to be carried out upto 90 m height. The waste dump will be rehandled between 12th and 20th year however a part of it will be stabilized by tree plantations and other arrangements as detailed below:-

1. Drains will be made on the top of waste dump to arrest uncontrolled descent of water to drain away during rainy season through specially made chutes. Besides gullies (chutes) will be cut for flow of water from the waste dump slowly to channelise it to garland drain. This precaution is necessary to prevent erosion of waste dump here and there due to erratic flow of rainwater.
2. On the slope of the dump, small pits of 0.3 x 0.3 x 0.3 m will be cut and seedlings will be planted and also over the 1.5 m width of top from edge of the bench similar plantation shall be done so that the top of the waste dump slope will get stabilized.

3. A stone toe wall will be made all around the waste dump to prevent waste dump material being carried out of the dump area and mixing with the general drainage system of the area.
4. A garland drain will be constructed all around the waste dump area for smooth flow of water.
5. The overall slope of dump sides will be kept below 28°, each their being at 37°.
6. Though the height of the surface dumps will be 90 m, with the help of additional precautions being taken as mentioned above, dangers of the slope failure of the surface dumps will be alleviated.

ii. Backfill dump

The height of the backfill dump will be maximum upto about 225 m (upto 270m SRL as measured from the toe at 45m FRL in 20th year. It will, though, be supported at the sides by quarry batters but the main advancing front of the backfill dump towards dip side will be amenable to slope failure especially during rainy season. The dumps will be properly compacted and planted as soon as ultimate height (surface level) is achieved. Water channels to be carefully planned with intermediate, muck arresting pits so as to prevent any accumulation of water and erosion of dumps. It is planned not to have overall gradient of the dump more than 28°.

A systematic study will be commissioned to study the various slope stability parameters to reach at the optimum slope angle during the mine operation period. Appropriate factor of safety will be adopted supported by sensitivity analysis of critical parameters. It is also proposed to monitor the backfill dump with latest geo-technical/surface/equipment e.g. Borehole extensometer, tape extensometer, EDM, Piezometers, Theodolites etc. The monitoring will commence as a part of safety measures.

10.2.4 Surface fires/ coal stack fires

Sufficient fire extinguishers will be installed at selected locations on surface like Electrical Sub-stations, work-shop, Garage, Diesel Depot, Stores etc. Besides, sufficient number of water hydrants with sufficient hose pipes will be made available in the surface for fire protection.

In order to prevent fire hazards in coal stock piles, following types of precaution shall be taken.

- (i) Prevent the happening or presence of any external source of fire in the vicinity of coal stockpiles i.e.
 - naked fire
 - electric fire
 - fuel oil fire

In case of electric equipment operating in the vicinity of fuel oil being used or stored in the vicinity of the coal stock piles, appropriate types of fire extinguishers will be provided on or near such equipment in order to extinguish the fire at the very start.

- (ii) Restrict the stacking height of the coal to below two meters. Higher height may only be attempted for shorter interval of stacking.

The time and height shall be established with respect to spontaneous combustion which will help in restricting to safe parameters.

- (iii) Appropriate arrangement will be made by inserting pipes in the stack to monitor the internal temperature of coal. In case, temperature is found to shoot above safe limits, the coal from the part of stack shall be immediately dug out and disposed safely.
- (iv) In certain mines, the insitu coal exposed in coal bench catches fire due to spontaneous heating which has to be kept under vigil. Under such circumstances the affected area of coal shall be separately dug up and disposed off safely.

10.2.5 Storage of explosives in the magazine

Since site mixed slurry will be used, there will be no requirement of large storage facilities. However a 4.536 te capacity magazine is existing for the storage of primers, detonators, fuse etc. and an additional 10 te capacity magazine is proposed for future.

The explosive magazine is designed in such a manner that normal chances of fire inside the magazine ruled out. Still following precaution are taken:

- Clearance of dried vegetation within 15 m of Magazine House.
- Installation of lightening arresters on the Magazine to prevent damages in the event of an explosion.
- Provision of fire extinguishers, water and sand filled buckets.
- Arrangement of mounds around the magazine to mitigate damage in the event of an explosion.
- Keeping a safety zone margin around the Magazine as per the guidelines given in Schedule VIII of The Explosives Rules, 1983. The safety distance of 605m will be maintained from the public establishments.

10.2.6 Flyrock

Fly rock is produced when explosive energy is excessive for the amount of burden, stemming is inadequate or the energy is too rapidly vented through

a zone of weakness in the rock. When this happens, much of the explosive energy is used to throw rock, rather than to create fragmented rock and controlled displacement of the burden material. Geology, improper blast design, or carelessness can cause unwanted fly-rocks. Other factors such as powder factor, pattern layout, delay sequence, stemming height, drilling accuracy, and hole-loading methods should also be evaluated if any excessive fly- rock is generated.

All blasts can be expected to generate some fly-rock. The distance covered fly rock travels can range from a few metres to more than 1km with poorly controlled shots. In surface mine blast, there is a desired muckpile displacement. There is always a normal fly - rock range, and a secured blast area. The normal fly - rock range is about 2.4 times the bench height and that the secured area is nearly 4 times of the bench height. Fly- rock beyond the secured blast area is excessive fly-rock. Excessive fly-rock is a major cause of injury and damage to mine equipment.

Following recommendations may be followed for day to- day- day blasting practices.

1. The study report (Optimisation of blasting parameters for controlling fly rocks and ground vibrations, June 1994, **Annexure VII**) recommends CMRI vibration standards which should be followed during any blast.
2. Zone of disturbance, safe zone for industrial buildings and domestic houses are given in the report with 87% confidence level. This may also be calculated as recommended.
3. Maximum permissible charge as recommended.
4. Blasting pattern as suggested for different bench faces.
5. Length of stemming column should be greater than 0.6 times the burden. For better protection, it may be taken as greater than or equal to the burden.

10.2.7 Dumper Fleet

The dumper fleet would require proper management, maintenance and operation of dumper fleet and observation of safety measures as dumpers and trucks have been the cause of most of the accidents in opencast mines. To deal with the issue following measures are suggested.

- i) Managers shall ensure that all Dumpers are properly maintained and safe to operate.
- ii) Only people with appropriate skills, knowledge and training are allowed to drive dumpers.

- iii) Drivers should also be trained in the safe operation of the specific dumpers that they are required to drive.
- iv) Dumper operator shall not drive too fast, shall avoid distractions, and drive defensively, not attempt to overtake another vehicle unless he can see clearly far enough distance ahead to be sure that he can overtake it safely and sound the audible warning signal before overtaking.
- v) When approaching a stripping or loading equipment, Dumper Operator shall sound the audible warning signal and not attempt to pass the stripping equipment until he has received proper audible signal in reply;
- vi) No unauthorised person(s) shall be allowed to ride on the Dumper.
- vii) All roads for trucks, dumpers or other mobile machinery shall be designed, constructed and maintained in such condition as to be fit for their use.
- viii) Where practicable, all roads from the opencast working shall be arranged to provide for one-way traffic and where not practicable, no road shall be of a width less than three times the width of the largest vehicle plying on that road unless definite turnouts and waiting points are designated.
- ix) All corners and bends in road shall be made in such a way that the operators and drivers of vehicles have a clear view upto a distance not less than 30 metres along the road. Provided that where it is not possible to ensure visibility upto a distance of not less than 30 metres, there shall be provided two roads for the incoming and outgoing traffic or an alternative system.
- x) Standard traffic signs shall be displayed at conspicuous places along the haul road.
- xi) All roads shall be provided with side drains to prevent water logging and damage to the road.
- xii) The portion of roads where there is heavy traffic of men and machine shall have separate lane properly fenced off from haul road for use by pedestrians and two wheelers.
- xiii) Loaded trucks, dumpers or other vehicles shall not be reversed on gradient.
- xiv) A berm of height at least half the diameter of the wheel of the largest dumper plying or one meter whichever is greater and of adequate

width shall constantly be provided and maintained at the edge of the spoil or coal dump.

- xv) Sufficient number of stop-blocks shall be provided at every discharge point and it shall be used every time material is dumped from the truck, dumper or other such vehicle.
- xvi) The manager shall formulate traffic rules for movement of trucks, dumpers or other vehicles which shall be prominently displayed at the relevant places in the opencast working and truck/dumper roads.
- xvii) Separate roads shall be provided for small vehicles.
- xviii) Only authorised small vehicles shall be allowed in opencast working which have a raised red flag in day time and a red light in the night which shall be visible to a dumper operator from a distance of at least 30 metres.
- xix) All heavy earth moving machinery including light motor vehicle permitted to ply on the haul road shall be provided with flasher lights on top, indicator lights in front and rear sides of the vehicle as approved by the Chief Inspector.
- xx) Anti-Collision and Proximity Detection Device shall be installed on every Heavy Earth Moving Machinery.

With multi seam operation, the excavation, loading, and hauling operation will be carried out at different places. Minimum 4 main hauling routes will be available exclusively for dumpers through quarry floor and flanks at different horizons, for transport to internal and external OB dump sites, CHP, stockyards etc. The average distance between two dumpers comes to about 120 m and the minimum distance while hauling would not be less than 30m providing adequate safety for which relevant instructions will be issued to the dumper operators.

10.2.8 Drowning

All water bodies at the end of mining operation would be fenced off all around except at specially created ghats for public use or supervision with display boards /warning signs etc.

10.2.9 Care and Maintenance during Temporary Discontinuance

The following protective measures would be taken up to deal with the unforeseen circumstances that may arise due to temporary discontinuance of the mine.

All heavy earth moving machinery from the mine would be withdrawn and brought to the safe place so that these do not get buried due to benches collapse, if any, and get damaged during the period of discountenance.

The entry to pit would be fenced with notice board at the fences prohibiting entry the pit by unauthorised persons.

The boundaries of the pit will be fenced off to prevent cattle entry the pit.

At the entrance and strategic points, sentries/watchmen will be posted to guard the mine area and Explosives magazine. They will be provided with mobile phone/walky-Talkies to contact the mine authorities/Police for help during emergency.

The mine area will be kept illuminated during night time, after. Audible warning siren will be established at the mine office to be used during emergency so that prompt help can be received from proper sources.

Managerial supervisory and competent persons of the mine would be engaged for supervising machinery and house-keeping of the mine areas, as per needs.

CHAPTER 11

TRANSPORT OF COAL, MEN & MATERIAL

11.1 TRANSPORT OF COAL

Coal from the opencast faces will be loaded by 2.5 cum Hydraulic excavators onto 25 T coal body rear dumpers for hauling it to quarry surface.

The end use plant, viz, Bokaro Thermal Power Station is located at a distance of about 18 km and the present system of dispatch of ROM coal to BTPS/ CTPS is through tipping trucks/ dumpers after weighing which will continue till a conveyor is laid in between the mine and the EUP.

11.2 TRANSPORT OF MEN

Suitable vehicles will be provided for transport of workforce within the quarry. For executives, adequate number of cars and jeeps have been provided.

11.3 TRANSPORT OF MATERIAL

For Transport of Material by trucks, trailers, Jeeps, forklifts and trolleys will be affected.

11.4 CONTROL OF UNAUTHORISED ENTRY OF MEN AND VEHICLES

Adequate number of check points/ barriers will be made to control/ prevent unauthorised entry of men or vehicles entering or leaving the mine premises.

CHAPTER 12

MINE INFRASTRUCTURE

12.1 PRESENT STATUS OF INFRASTRUCTURE FACILITIES

DVC Bermo is an operating mine since 1951. As such, all infrastructure and facilities already exist at mine site to support the present coal production of 0.40MT as shown in Table 12.1 below.

TABLE 12.1
INFRASTRUCTURE AND FACILITIES ALREADY EXISTING AT MINE SITE

Sl. No.	Details	Area Ha
1	QTRS	0.018
2	Agent Banglow	0.025
3	DVC Colony	0.09
4	DVC Colony	0.03
5	DVC Colony Area	0.09
6	DVC Colony Area	0.045
7	Shop	0.075
8	DVC Colony Area	0.077
9	Garrage	0.005
10	Pump House	0.002
11	Shop	0.0025
12	Shop	0.006
13	Canteen	0.06
14	CISF Rest House	0.0775
15	Workshop including Dispensary	0.155
16	Check Post	0.005
17	Play Ground	1.50
18	Colony Area	0.09
19	DVC Project Office	0.08
20	Sub Station & Bank	0.06
21	Tower	0.05
22	School Area	0.0375
23	Watch Tower	0.005
24	Residential Area	0.136

Sl. No.	Details	Area Ha
25	Colony Area	0.42
26	Colony Area	0.45
27	Colony Area	0
28	Pump House Water Tank	0.003
29	Old bldg.	0
30	Mines Office Old Store	0.075
31	QTRS.	0.108
32	Huts	0.15
Total		3.9275*

** 2.4275 ha = 2 ha over virgin area + 0.4275 ha over dump and excavation area.*

At present, the facilities are partly lying over the virgin area while the rest are lying over the excavated area as well as over dumped area.

These all facilities will have to be dismantled during the initial years (preferably 1st year) as all this area is proposed to be occupied by the OB dump from 1st year onwards. New facilities will have to be constructed to support the proposed expanded coal production of 2.62 MT for which adequate area over the NW corner of ML area has been designated. The infrastructure facilities are located over the coal bearing area as there is no non-coal bearing area available for this purpose. However, these facilities do not include colony (except essential quarters) for which separate arrangement will have to be done outside the ML area.

Conceptual plan showing infrastructure facilities including colony, boundary of mining area, mine entries, roads including road diversion alignment etc. is given in Plate IX.

12.2 PROPOSED MINE SITE INFRASTRUCTURE

The proposed Mine Site Infrastructure will consist of the following facilities:

TABLE 12.2
FACILITIES/ INFRASTRUCTURE TO BE RETAINED AND DISMANTLED

Sl. No	Name of Area	Total Area, Ha
1	Essential Quarters	0.230
2	Store	0.031
3	Workshop	0.103
4	ETP	0.009
5	Sludge Pit	0.010
6	Washing Ramp For Dumper	0.039
7	Safety Office	0.007
8	Surveyor	0.008

Sl. No	Name of Area	Total Area, Ha
9	Admn. Office & accounts	0.007
10	Record Section	0.007
11	First Aid & Dispensary	0.008
12	Canteen	0.009
13	Vocational Training Centre (VTC)	0.025
14	Wash Room	0.002
15	Toilets	0.003
16	CHP Incharge Office	0.009
17	Maintenance Incharge Office	0.009
18	Shift Operator/Manager	0.009
19	GM Office	0.029
20	Diesel Bunk	0.012
21	Coal Stack Yard	0.400
22	Ground Bunker	0.20
23	Conveyor Belt	0.088
24	Emergency Truck Loading Point	0.009
25	Transfer Point (TP)	0.002
26	Unloading Ramp (1 : 16)	0.952
27	Security Room	0.003
28	Road	1.000
	TOTAL	3.22*

* *This area does not include the rationalization area (indirectly affected area between facilities) and also the hard standing areas and open storage areas.*

12.2.1 Workshop

A Workshop will be provided to maintain all HEMM as well all the other machinery and vehicles. The workshop will be equipped with standard equipments like overhead crane, lathe machines etc along with other facilities.

12.2.2 Lubricants & oil storage

A Lubricants & Oil Storage facility will be provided for Heavy Earthmoving Machinery complete with rapid fill devices.

It will be constructed adjacent to the filling pad with adequate storage capacities. Stock equivalent to one months' consumption shall be normally maintained.

12.2.3 Main office complex

The Office complex comprising of Mine Managers Office, other offices, store rooms, toilets etc. These include Survey Room, First Aid Room, safety, Personnel and other Departments.

12.2.4 Vocational training centre (VTC)

The VTC will have sufficient floor space comprising office, theory training class rooms, practical training rooms, Pantry and toilet. The Vocational Training Centre is required for imparting training for workers / engineers on various operational safety issues.

12.2.5 Worker canteen

The canteen & recreational area, toilets & shower facilities will be constructed as per statutory requirement.

12.2.6 Explosive magazine

It is proposed to use Site Mix Slurry (SMS) Explosives for blasting in the Mine. This will reduce the area for a regular explosive Magazine for conventional explosives.

A magazine is already existing outside the ML area having capacity of 4.536 te to cater to the present needs at coal production level of 0.4MT. However, for storage of additional explosive, required amount of detonator fuses, safety cords etc another 10 Tonne Capacity Explosive Magazine may be required if needed, will be constructed adjoining to the existing magazine.

12.2.7 Coal quality monitoring laboratory

For quality assurance and control, it is proposed to establish a Coal quality control Laboratory with all the necessary equipment for daily analysis of the coal quality at Mine end.

12.2.8 Internal infrastructure roads

Internal roads leading to Coal Handling Plant and other service facilities will be developed during development of the Mine Site Infrastructure.

12.2.9 Hard standing areas

Hard Standing Areas are required to be provided at pit top to facilitate parking as well as for undertaking minor repairs / inspections of the heavy mining equipment. The Areas are required to be constructed by laying Reinforced Cement Concrete.

12.2.10 Miscellaneous storage areas

Open miscellaneous storage areas will be constructed at suitable locations by laying RCC to facilitate storage of materials like tyres, construction steel,

pipes etc. It is proposed to construct two separate storage areas suitably fenced for this purpose.

12.3 RESIDENTIAL COLONY

The total manpower of the mine for expanded capacity of 2.62 MT will be 569. It is proposed to establish the colony at appropriate place outside the ML area beside New Colony.

12.4 WATER SUPPLY

Industrial water required for washing, sprinkling on mine roads for dust suppression and for watering the mine site plantations, will be supplied from pumping installation at mine sump and its surface reservoir. It is already being practiced as the mine is operational since long.

The drinking water will be supplied from piped supply and stored in overhead tank near the facilities area and distributed through pipe lines to different facilities area for drinking and domestic purposes.

Total net requirement of water for mining and allied activities are estimated as 581 m³/day. Out of this 242 m³/day will be potable water and the rest 339 KLD will be required for industrial use.

The break up of the required water for different activities is given in Table 12.3.

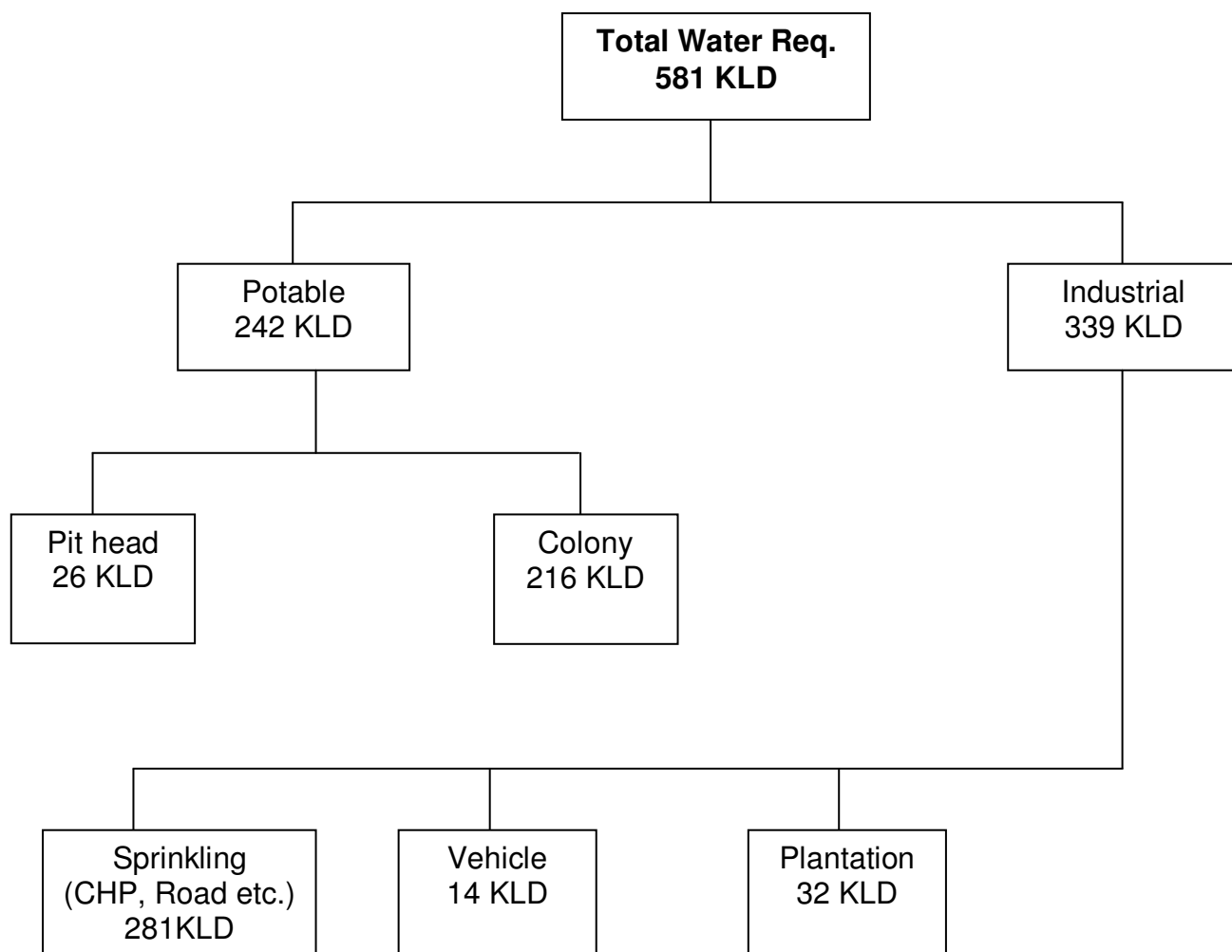
**TABLE 12.3
WATER REQUIREMENT**

Sl. No.	Particulars	KLD
I	Potable	
1	Drinking at work place @ 45lpd/head	26
2	*Colony for 70% employees @4 members in family and @ 135 lpd/head	216
	Sub Total (I)	242
II	Industrial	
1	Water required for coal washery	0
2	Sprinkling @ 30 m ³ /km of road length (5km assumed)	150
3	Coal handling Plant and related operation @21.7 cum/MT of annual coal production	131
4	Plantation (ref Table 15.8, Chapter 15) on over backfill and dump =101.35 ha +72.57 ha= 173.92 ha @ 5 cum/ha total excavation for 27 year life = 6.44 ha/year average)	32

Sl. No.	Particulars	KLD
5	HEMM washing @ 2.0 m ³ /vehicle/day*washable vehicles(about 80% of population)twice a week with 50% reclamation	14
6	Fire fighting @ 45.4 KLD/ MT (10% compensation for evaporation)	12
	Sub Total (II)	339
	Total (I+II)	581

As the make of water into the OC mine workings is expected to be more than the requirement due to larger area and depth in future (Refer table 8.2 in Chapter 8), the water requirement projected above can be easily met from the mine water. The water balance diagram is given below.

WATER BALANCE DIAGRAM



CHAPTER 13

LAND REQUIREMENT

13.1 PRE-MINING LAND USE AND PRESENT LAND USE AREA WITH BREAK-UP OF ML AREA AND PROJECT AREA

The pre-mining (Pre 1951) and the present (2016-17) land use of the area required for the project is given below in Table 13.1, and 13.2 respectively. It is to be noted.

TABLE 13.1
PRE-MINING (PRE-1951) LAND USE OF THE PROJECT AREA (REF PLATE V)

Sl. No.	Village/ mauza	Pre Mining Land Use in ML Area in acres (Area detailed in acres in the lease records)						Total area in ha
		Tenancy	GMK Govt. Land (Waste land)	GMK Jungle	GM-Aam (Others)	Water body	Total	
I	Within ML/ Block							
1	Karo	3.76	11.45	36.9	0.99	1.00	54.10	21.893
2	Baidkaro	16.03	14.40	29.81	0	0	60.24	24.378
3	Kargali	9.72	0.87	215.5	0	1.31	227.40	92.026
4	Emlo	37.62	18.48	15.09	0.81	0	72.00	29.137
	Total acres	67.13	45.20	297.30	1.80	2.31	413.74	
	Total in Ha	27.166	18.292	120.313	0.728	0.935	167.434	167.434
II	Out side ML/ Block (in Ha)							
	Baidkaro	4.10	0.63	0	0	0	4.73	1.91
I+II	Project Area	31.266	18.922	120.313	0.728	0.935		169.344

TABLE 13.2
PRESENT (2016-2017) LAND USE OF THE PROJECT AREA (REF PLATE XVIII)

Sl. No.	Particular	Total area of land (Ha)	Remark
Within ML/ Block Area			
1.	Area under habitation	70.294	Mining rights
2.	Mine facilities	2.00	
3.	Top soil dump	2.00	
4.	Water reservoir/settling pond	1.50	
5.	Karo and Emlo nala	1.00	
6.	Area under backfill	5.77	
7.	Area under excavation	42.85	
8.	Area under surface dump	42.02	
Sub Total Within ML/ Block Area		167.434	

Sl. No.	Particular	Total area of land (Ha)	Remark
Outside ML/ Block			
1	Area under Existing facilities (DVC Colony, road, undisturbed area)	1.660	Surface rights only
2	Magazine and Road	0.25	
Sub Total Outside ML/ Block		1.91	
Grand Total Project area		169.344	

13.2 PROPOSED 'DURING- MINING' LAND USE IN HA

The total land area of the block 167.434 Ha which is also the ML area. Additionally, a DVC Guest House and few DVC quarters in an area of 1.66 Ha are existing adjacent to block on its NW corner, and has been included in the project area.

The proposed land use of the Mining Lease Area at end of life of mine will be as given in Table 13.3 below.

**TABLE 13.3
PROPOSED LAND USE OF THE MINING LEASE AREA**

Sl. No.	Proposed Landuse	Area Required, Ha	
I. Within ML			
I.1	Excavation Area	Sum of I.2 & I.3	Mining rights
I.2	Backfilled Area	101.35	
I.3	Excavated Void	55.11	
I.4	Facilities incl. Coal stack, road	3.22	
I.5	Safety Zone 7.5m (Green belt)	5.54	
I.6	Rationalisation area (non-forest)	2.214	
	Sub Total (I)	167.434	
II Outside the ML Area			
II.1	Facilities excluding magazine	1.09	Surface rights only
II.2	Green Belt (10m wide) within II.1	0.57	
II.3	Magazine and Road	0.25	
	Sub-Total (II)	1.91	
	Grand Total	169.344	

Notes:

1. Top soil dump will be over the backfilled area towards the end of mine life.
2. Main colony will be located away from the ML area.
3. The OB dump lying over the coal bearing area will be fully rehandled and backfilled by 20th year.

13.3 FOREST LAND

Out of 167.434 ha ML area, 120.313 ha GMK land was previously recorded as GMK Jungle which comes to 71.86%. Mining operation is going on in the block for over 65 years and this area, at present, is either totally habituated or under mining.

As per the letter no.1669 dt. 02-06-2016 (**Annexure X**) issued by Divisional forest Officer Bokaro regarding No Objection, the mining lease area is outside the Forest Land but in case Jangal Jhar land use has been recorded against any khaara nos., no non-forest activity can be carried out over such land without prior permission from Central Govt.

13.4 REHABILITATION

Mine is already operating for more than 65 years. The virgin area of the block is occupied by CCL colony and is to be shifted/ rehabilitated in consultation with CCL. For displaced persons/ families other than CCL, policy of Govt. of Jharkhand for resettlement & rehabilitation in case of mining projects, will be followed. Land for rehabilitation is to be identified.

CHAPTER 14

ENVIRONMENTAL MANAGEMENT PLAN

14.1 INTRODUCTION

Bermo mine of Damodar Valley Corporation, entrusted Central Institute of Mining and Fuel Research (CIMFR), Dhanbad to undertake Environmental Impact Assessment (EIA) studies for various environmental components and issues to prepare an effective Environmental Management Plan (EMP) to minimize the negative impacts of the project, based on secondary data as well as primary field data collected for various environmental components viz air, water noise, land, biological and socio-economic aspects.

The statutory monitoring is being conducted in the form of “Environmental Statement” by Indian School of Mines (ISM), Dhanbad. The latest results have been adopted from Environment Statement (**Annexure V**) wherever available.

14.2 BASELINE STATUS OF ENVIRONMENT

The EIA & EMP report prepared in 2007 deals with the baseline data collected and its evaluation leading to preparation of an effective Environmental Management Plan.

14.2.1 Existing land use pattern

The existing land use has been prepared based on the actual data collected from site. The present land use is presented below in Table 14.1.

TABLE 14.1
PRESENT (2016-2017) LAND USE OF THE PROJECT AREA

PRESENT (2010-2011) LAND USE OF THE PROJECT AREA			
Sl. No.	Particular	Total area of land (Ha)	
Within ML/ Block Area			
1.	Area under habitation	70.294	
2.	Mine facilities	2.00	
3.	Top soil dump	2.00	
4.	Water reservoir/settling pond	1.50	
5.	Karo and Emlo nala	1.00	
6.	Area under backfill	5.77	90.64
7.	Area under excavation	42.85	
8.	Area under surface dump	42.02	
Sub Total Within ML/ Block Area		167.434	

Sl. No.	Particular	Total area of land (Ha)
Outside ML/ Block		
1.	Area under Existing DVC Colony	1.660
2.	Magazine and Road	0.25
Sub Total Outside ML/ Block		1.91
Grand Total Project area		169.344

Almost whole of the core zone is either disturbed by excavation or dumping or occupied by habitation.

The block is surrounded on all side by CCL property and there is no non coal bearing land available within the vicinity. In the buffer zone. Agriculture is the main activity in the core and buffer zone. However, in the absence of irrigation facility the farmers cultivate only in one season. The main crop is rice. Other crops grown in the area are Paddy, Maize, Jawar, Nawa, Bajra, Arhar, Urd, Moong, Khesari, Asee, Mustard. In the winter and rainy seasons.

14.2.2 Soil quality

To assess the mining impact on soil, the effect on agricultural field. Baseline soil quality of the area in and around Bermo Block at following locations were evaluated with respect to physical and chemical parameters at following locations.

- S1 - Subhash Nagar Agriculture field
- S2 - Charak Pania village
- S3 - Chalkari Agricultural field
- S4 - Karo Agricultural field

Soil sampling has been carried out in the month of Nov 2015 and results of testing and evolution are given below in Table 14.2.

TABLE 14.2
PHYSICO-CHEMICAL PROPERTIES OF SOIL (NOV, 2015)

Parameters	S1		S2		S3		S4	
	0-30 cm	30-60 cm	0-30 cm	30-60 cm	0-30 cm	30-60 cm	0-30 cm	30-60 cm
Physical Parameters								
Sand (%)	56.3	61.0	62.5	68.2	66.2	56.2	69.6	66.6
Silt (%)	29.4	17.5	20.3	21.6	20.3	29.6	18.1	20.4
Clay (%)	14.3	12.5	16.2	10.2	13.5	14.2	12.3	13.0
Texture	Sandy loam	Sandy loam	Sandy loam	Sandy loam	Sandy loam	Sandy loam	Sandy loam	Sandy loam
Bulk density (g/cm ³)	1.44	1.59	1.46	1.49	1.46	1.61	1.54	1.43

Parameters	S1		S2		S3		S4	
	0-30 cm	30-60 cm	0-30 cm	30-60 cm	0-30 cm	30-60 cm	0-30 cm	30-60 cm
Moisture content (%)	2.47	1.93	2.69	5.33	1.54	1.8	2.64	2.23
Water holding capacity (%)	28.72	34.64	29.73	29.4	25.75	32.71	27.20	23.62
Chemical Parameters								
pH	6.0	7.2	7.1	6.3	6.9	7.3	7.1	6.2
EC (m moh/ cm)	0.22	0.17	0.22	0.24	0.17	0.29	0.24	0.27
Organic Carbon (%)	0.31	0.22	0.21	0.25	0.26	0.24	0.45	0.37
Available N (Kg/ha)	276	212	237	221	243	236	274	234
Available P (Kg/ha)	22	21	20	19	17	25	19	19
Available K (Kg/ha)	135	132	146	142	133	136	144	156

14.2.3 Ecology

a) Flora

Floral Diversity

The area is under active mining for over 65 years and there is no endangered species of flora and fauna in the core & buffer zone of the mining site.

b) Fauna

No wild life exist within our lease hold area.

14.2.4 Quality of air, ambient noise and water

(a). Air quality

The ambient air quality data monitored at four stations monitored by ISM, Dhanbad during the year 2014-15 is presented below in Table 14.3.

The monitoring has been carried out as per Central Pollution Control Board (CPCB) guidelines for National Ambient Air Quality Standard (NAAQS).

TABLE 14.3
AMBIENT AIR QUALITY AROUND PROJECT OFFICE
(DVC BERMO MINES) (23°46'53.5"N; 85° 57'37.2"E)

Period		Parameters ($\mu\text{g}/\text{m}^3$)		
Month	Day	PM ₁₀	SO ₂	NO _x
Dec 2014 Winter	8.12.2014	89	42	43
	9.12.2014	102	49	38
	15.12.2014	95	37	48
	16.12.2014	86	39	52

Period		Parameters ($\mu\text{g}/\text{m}^3$)		
Month	Day	PM ₁₀	SO ₂	NOx
	22.12.2014	109	43	48
	23.03.2014	96	39	43
	29.13.2014	87	42	44
	30.12.2014	96	45	46
Mar 2015 Pre- monsoon	5.03.2015	93	48	41
	6.03.2015	104	47	40
	12.03.2015	91	47	38
	13.03.2015	94	43	45
	19.03.2015	85	49	47
	20.03.2015	88	38	38
	26.03.2015	84	40	51
	27.03.2015	82	39	46
Oct 2015 Post- Monsoon	3.10.2015	94	36	38
	4.10.2015	86	46	39
	10.10.2015	85	49	42
	11.10.2015	90	41	37
	17.10.2015	92	50	41
	18.10.2015	93	43	38
	24.10.2015	82	38	47
	25.10.2015	84	46	48
Maximum		109	50	52
Minimum		82	36	37
Average		91.13	43.17	43.25
Std. Deviation		6.97	4.34	4.51
98 Percentile		106.7	49.54	51.54

TABLE 14.4
AMBIENT AIR QUALITY AROUND MINES
(23°47'08.7"N; 85° 57'47.1"E)

Period		Parameters ($\mu\text{g}/\text{m}^3$)		
Month	Day	PM ₁₀	SO ₂	NOx
Dec 2014 Winter	8.12.2014	98	36	39
	9.12.2014	102	38	41
	15.12.2014	109	39	48
	16.12.2014	107	45	45
	22.12.2014	111	43	44
	23.03.2014	92	39	43
	29.13.2014	113	35	44
	30.12.2014	96	45	46

Period		Parameters ($\mu\text{g}/\text{m}^3$)		
Month	Day	PM ₁₀	SO ₂	NO _x
Mar 2015 Pre- monsoon	5.03.2015	93	48	39
	6.03.2015	104	47	40
	12.03.2015	99	44	38
	13.03.2015	94	43	45
	19.03.2015	112	44	41
	20.03.2015	106	38	38
	26.03.2015	97	40	48
	27.03.2015	101	39	46
Oct 2015 Post- Monsoon	3.10.2015	94	44	38
	4.10.2015	97	46	39
	10.10.2015	105	43	42
	11.10.2015	90	41	37
	17.10.2015	92	50	41
	18.10.2015	93	43	44
	24.10.2015	111	47	47
	25.10.2015	110	46	48
Maximum		113	50	48
Minimum		90	35	37
Average		101.08	42.63	42.54
Std. Deviation		7.45	3.93	3.59
98 Percentile		112.54	49.08	48.00

TABLE 14.5
AMBIENT AIR QUALITY AROUND GUEST HOUSE/COLONY
(DVC BERMO MINES)
(23°47'56.9"N; 85° 53'01.0"E)

Period		Parameters ($\mu\text{g}/\text{m}^3$)		
Month	Day	PM ₁₀	SO ₂	NO _x
Dec 2014 Winter	8.12.2014	111	42	44
	9.12.2014	102	45	46
	15.12.2014	95	48	41
	16.12.2014	113	47	40
	22.12.2014	109	47	38
	23.03.2014	96	43	45
	29.13.2014	91	49	47
	30.12.2014	96	38	38
Mar 2015 Pre- monsoon	5.03.2015	93	40	51
	6.03.2015	104	47	40
	12.03.2015	91	36	39
	13.03.2015	94	38	41

Period		Parameters ($\mu\text{g}/\text{m}^3$)		
Month	Day	PM ₁₀	SO ₂	NO _x
	19.03.2015	114	39	48
	20.03.2015	98	45	45
	26.03.2015	84	43	44
	27.03.2015	102	39	43
Oct 2015 Post- Monsoon	3.10.2015	94	35	44
	4.10.2015	86	45	46
	10.10.2015	105	48	39
	11.10.2015	90	47	40
	17.10.2015	92	44	38
	18.10.2015	93	43	45
	24.10.2015	89	44	41
	25.10.2015	104	46	48
Maximum		114	49	51
Minimum		84	35	38
Average		97.75	43.25	42.96
Std. Deviation		8.45	4.05	3.67
98 Percentile		113.54	48.54	49.62

TABLE 14.6
AMBIENT AIR QUALITY AROUND BERMO RAILWAY STATION
(DVC BERMO MINES)
(23°46'21.6"N; 85° 57'20.6"E)

Period		Parameters ($\mu\text{g}/\text{m}^3$)		
Month	Day	PM ₁₀	SO ₂	NO _x
Dec 2014 Winter	8.12.2014	92	38	42
	9.12.2014	90	42	45
	15.12.2014	94	39	48
	16.12.2014	99	45	45
	22.12.2014	105	43	44
	23.03.2014	111	39	43
	29.13.2014	92	35	44
	30.12.2014	115	45	46
Mar 2015 Pre- monsoon	5.03.2015	86	48	39
	6.03.2015	118	40	48
	12.03.2015	112	39	46
	13.03.2015	115	44	38
	19.03.2015	98	46	39
	20.03.2015	96	43	42

Period		Parameters ($\mu\text{g}/\text{m}^3$)		
Month	Day	PM ₁₀	SO ₂	NO _x
Oct 2015 Post- Monsoon	26.03.2015	99	41	37
	27.03.2015	91	50	41
	3.10.2015	90	43	44
	4.10.2015	85	47	47
	10.10.2015	98	46	48
	11.10.2015	89	41	37
	17.10.2015	93	50	41
	18.10.2015	92	43	44
	24.10.2015	93	47	47
	25.10.2015	111	49	42
Maximum		118	50	48
Minimum		85	35	37
Average		98.5	43.46	43.21
Std. Deviation		10.01	4	3.46
98 Percentile		116.62	50	48

(b). Ambient Noise Level**Noise level in Core zone and Buffer Zone of DVC Bermo Mines**

All the study sites in the residential areas exhibited a noise level well within the corresponding threshold limit value as prescribed by CPCB, both during the day and night time. The monitoring results are given in Table 14.7.

TABLE 14.7
NOISE LEVEL IN THE STUDY AREA* {Average Leq value in dB (A)}

Station Code	Monitoring station	Day (06.00-22.00 Hrs.)			Night (22.00-6.00 Hrs)		
		Min.	Max.	Avg.	Min.	Max.	Avg.
N1	Site office	35.3	46.8	43.2	25.6	35.8	32.4
N2	Main office	32.2	44.6	42.9	21.8	36.8	32.6
N3	Agent Bunglow	29.8	40.3	36.6	23.9	29.5	25.3
N4	Subhash Nagar	27.8	42.5	35.4	20.5	28.9	24.6
N5	Karagali	31.6	39.9	36.2	21.5	26.8	23.4
N6	Chalkari village	30.8	41.5	32.5	20.8	25.9	22.3
CPC Standard (Residential Area)		55.0			45.0		

*Source": EIA by CIMFR

(c). Water quality

Water quality monitoring was carried out by ISM, Dhanbad and the results are given below in Table 14.8.

TABLE 14.8
DRINKING WATER QUALITY OF THE STUDY AREA (NOV 2015)*

Sl. No.	Parameters	GW1	GW2	GW3	GW4	IS : 10500
		Colourless	Colourless	Colourless	Colourless	Unobjectionable
2	Odour	Unobjectionable	Unobjectionable	Unobjectionable	Unobjectionable	Unobjectionable
3	Taste	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable
4	Turbidity NTU (max)	2	1	1	2	10 NTU
5	Total Dissolved Solid	376	332	454	478	500
6	pH	7.5	7.6	7.1	7.2	6.5-8.5
7	Total Hardness (as CaCO ₃)	203.51	179.94	198.73	219.93	300
8	Alkalinity mg/L	71	65	76	70	200
9	Calcium (as Ca)	56.7	48.6	51.8	54.8	75
10	Magnesium (as Mg)	14.4	13.6	16.2	19.5	30
11	Copper (as Cu)	0.19	0.18	0.21	0.12	0.5
12	Iron (as Fe)	0.16	0.26	0.23	0.29	0.3
13	Manganese (as Mn)max	0.03	0.04	0.02	0.06	0.1
14	Chloride (as Cl ⁻)	22	21	23	21	250
15	Sulphates (as SO ₄ ²⁻)	27	25	26	37	150
16	Nitrate (as NO ₃ ⁻)	5.6	6.2	7.5	13.2	45
17	Fluorides as (F ⁻)	0.22	0.27	0.67	0.55	0.6-1.2
18	Phenoloic compound (C ₆ H ₅ OH)	<0.001	<0.001	<0.001	<0.001	0.001
19	Mercury (as Hg) mg/L	<0.0005	<0.0005	<0.0005	<0.0005	0.001
20	Cadmium (as Cd) mg/L	<0.0004	<0.0004	<0.0004	<0.0004	0.01
21	Arsenic (as As) mg/L	<0.005	<0.005	<0.005	<0.005	0.05
22	Cyanide (as CN ⁻) mg/L	<0.001	<0.001	<0.001	<0.001	0.05
23	Lead (as Pb) mg/L	<0.01	<0.01	<0.01	<0.01	0.1
24	Zinc (as Zn) mg/L	0.14	0.11	0.17	0.15	5.0
25	Chromium (as Cr ⁶⁺) mg/L	<0.003	<0.003	<0.003	<0.003	0.05
26	Mineral oil mg/L	NIL	NIL	NIL	NIL	0.01
27	Residual free Chlorine mg/L	NIL	NIL	NIL	NIL	0.2
28	Coliform organism (MPN/100ml)	absent	absent	absent	absent	should be absent

* Source : ISM Env Statement (November 2015) Refer Annexure V.

W1 – Old Colony DVC; W2-Baidkaro village; W3 – DVC colony; W4 – Jawahar Nagar
All parameters are expressed in mg/l except pH.

TABLE 14.9
SURFACE WATER QUALITY OF THE STUDY AREA (NOV. 2015)

Sl. No.	Parameters	SW1	SW2	SW3	SW4	IS 2296 Class C
1	Temperature ($^{\circ}\text{C}$)	23.4	23.4	24.3	24.3	---
2	pH	8.1	8.2	8.11	8.21	6.5-8.5
3	Turbidity NTU (max)	28.2	26.3	32.4	31.6	---
4	Total suspended Solid mg/L	142	157	143	146	---
5	Total Dissolved Solid mg/L	223	208	195	231	1500
6	DO mg/L	6.7	6.8	7.2	7.4	4
7	BOD mg/L	2.5	2.2	2.1	2.0	3
8	Total Hardness (mg/L as CaCO_3)	136	132	130	135	----
9	Nitrate (as NO_3) mg/L	13.9	13.5	22.4	25.1	50
10	Sulphates (as SO_4^{--}) mg/L	19.2	17.6	18.7	17.8	400
11	Chloride (as Cl^-) mg/L	37.5	36.2	24.5	23.2	600
12	Oil & Grease mg/L	0.03	0.02	0.04	0.02	0.1
13	Fluorides as (F^-) mg/L	0.6	0.5	0.6	0.8	1.5
14	Phenols mg/L	<0.001	<0.001	<0.001	<0.001	0.005
15	Iron (as Fe) mg/L	0.20	0.21	0.04	0.05	50
16	Chromium (VI) mg/L	BDL	BDL	BDL	BDL	0.05
17	Arsenic mg/L	<0.005	<0.005	<0.005	<0.005	0.20
18	Lead mg/L	BDL	BDL	BDL	BDL	0.10
19	Cadmium mg/L	BDL	BDL	BDL	BDL	0.01
20	Micro Organisms (MPN/100ml)	1896	1899	2673	2654	5000

W5 - Damodar River W6 – Karo Nallah W7 – Baidkaro Nallah W8 - Charak Pania

All parameters are expressed in mg/l, except pH,

The quality parameters have been found within limits.

14.2.5 Climatic conditions

The area lies in the tropical region where climate is characterized by very hot summer and cold winters. Summer is typically from mid March to mid June when temperature ranges from a maximum of 46°C during day and a minimum of 11.6°C at night. Winter is from December to February when the temperature during day goes up to 29.3°C and minimum temperature at night becomes as low as 4°C . The average annual rainfall is 1200mm-1260mm. The south-west monsoon lasts from mid-June to mid September and the area gets more than 85% of the annual rainfall during these four monsoon months.

14.2.6 Human settlements

In old colony, approx 200 quarters of DVC un-authorised occupancy exist which will be taken care by DVC. In E-E area i.e. Extended area approx. 1500 quarters un-authorised occupancy exist but these quarters belong to CCL which will be dealt by CCL. In Y-Y area approx 2000 quarters Un-authorised occupancy exist but these quarters belong to CCL which will be dealt by CCL.

Plan for rehabilitation and resettlement has been discussed in detail between DVC and CCL and it has been principally agreed that the R&R work will be taken up. Tentative costs involved have also been calculated by CCL as Rs 63.57 Crore in the year 2003.

14.3 ENVIRONMENTAL IMPACT ASSESSMENT

14.3.1 Land environment

In future all the habitation will be removed and the coal underneath excavated.

There will be no impact on the surrounding area as far as land use is concerned as all activities will be restricted to the core zone.

The sites for external dumping have been proposed within the block over the coal bearing area. These external dumps will be rehandled during course of advancement of opencast faces and eventually backfilled within the quarry. And ultimately a plain backfilled area and water body/ lagoon will be left at the end of mining operations.

14.3.2 Impact on air quality

During the past, the air quality has not deteriorated as per the monitoring carried out on regular basis.

However in future, a marginal increase in air quality deterioration has is anticipated due to expansion of the project and increase in related activities like drilling, blasting, transportation etc. if adequate control measure like regular maintenance of road, tree plantation along road and maintenance of leak proof truck bodies are not taken.

14.3.3 Impact on water quality

The surface water quality is likely to be affected with higher load of suspended solids due to envisaged expansion of mining activities by the following:

- (a) Wash off from dumps
- (b) Soil erosion from mine and roads
- (c) Pumping out mine water to surface water channels

The outside dump may contribute to the pollution of surface water in terms of suspended solids. Since dumping location proposed to be carried out at a safe distance from the local seasonal channels or natural drains, it will have negligible impact on water pollution. The pumped out water during dewatering may carry higher levels of suspended solids. Other sources of pollution are by oil spillage at the pit head and at the facilities viz. Workshop, resulting in oil and grease contamination of surface water if appropriate control measures are not adopted.

Ground water pollution can take place only if dumps and stock piles contain harmful chemical substances, which may get leached by precipitation of water and percolate to the ground water table, thus causing water pollution.

However, this is not the case with this mine, as neither the coal nor the OB, contains any harmful ingredients which may leach down to the water table and pollute it. Therefore, no adverse impact on ground water quality is anticipated considering this aspect. The leaching down of pollutants (oil, grease etc.) to the ground water may render the water un-potable and hence cannot be used by the local people. The percolation of sewage waste from the pit head as well as residential area will also pollute the ground water if control measures are not adopted as envisaged in the management plan.

Meager amount of sanitary waste, expected to be generated from various facilities will be treated properly through septic tanks and soak pits and is not anticipated to cause any water pollution.

14.3.4 Impact on noise level

The noise levels are anticipated to increase in future due to increased activity of excavation and transportation equipment.

14.3.5 Effect on vibration level (due to blasting)

The vibration levels are anticipated to increase in future due to increased activity of blasting.

14.3.6 Impact on water regime

Most of the mine water will be utilized by the mining activities and will not be discharged into the natural drainage channels hence limited impact on the regime is anticipated.

14.3.7 Impact on socio-economic environment

The industrial activity, together with inflow of capital, in-migration and employment of local inhabitants have made significant impact on the overall socio and economic condition of the people of the area. The project has provided direct job opportunity to the local persons and this includes both technical and non-technical persons. While a substantial portion of them are from villagers of the effective area, a part has also migrated in from far off areas. Construction of residential quarters for workers of all categories in and around mining sites has developed good road-link around the mine. Transportation, construction of school and in-migration of educated people and social contact with local inhabitants are also positive impact of mining for the region. Literacy has further expectedly increased because of increased income and awareness amongst the people.

Coal mining and agriculture is the basic sector of employment for the local people in this area.

The following socio-economic changes have been shown due to the mining activities:

- i) The project has a strong positive employment and income effect, both direct as well as indirect. Migrant – Non migrant ratio has shifted towards migrant side because a number of people migrated towards the central region of study circle in these years. This has happened because of better employment opportunities due to this project. But this effect is not expected to be strong because of the proximity of Bokaro City with its massive employment opportunities.
- ii) The project reflected positive impact on consumption behavior by way of raising average consumption and income through multiplier effect.
- iii) The project showed changes in the pattern of demand from food to non-food items as sufficient income is generated.
- iv) With increase in migration level there is a chance of dilution of ethnic culture in the region whereas the people located in the project area and in close vicinity, shall enjoy positive changes in life style and better quality of life. This has been reflected in the buffer zone villages where in extremist activities in these years have been a major law & order problem.
- v) People expect that the project will help in the development of various social infrastructures.

Hence, the impact of the project on the pattern of demand reasonably resulted as a shift from food to non-food items.

As a result of proposed expansion of the project considerable additional employment is envisaged and the positive impacts narrated in the foregoing paragraphs will increase further.

14.4 ENVIRONMENTAL MANAGEMENT PLAN

14.4.1 Land use planning

i. Land degradation control measures

The initial OB removed will be dumped on the surface over the coal bearing area within the ML area. As soon as the mining operations advance adequately, the excavated OB will be accommodated within the decoaled area as backfill and even the surface dump will be rehandaled at appropriate time when adequate space for accommodating it becomes available and backfilled.

The activity can be seen in stage plans vide Plate XIII-A to Plate XIII-G

The dumping and backfilling activities described above will be followed up by reclamation. As the dumping operations move, the reclamation activities will follow in the back. Similarly as the backfilling operations advance, they are followed by reclamation.

Stage wise reclamation can be seen in stage plans vide Plate XIII-A to Plate XIII-G which are presented in Table 14.10 below.

TABLE 14.10
YEAR / STAGE WISE RECLAIMED AREA OF SURFACE DUMPS AND
BACKFILLED DUMP (HA)

Year	Excavation Area		Backfilled Area (Ha.)		Backfilled Reclm. Area (ha.)		Dump Area (ha.)		Dump Reclm. Area (ha.)		Green Belt Area (ha.)	
	Prog.	Cuml.	Prog.	Cuml.	Prog.	Cuml.	Prog.	Cuml.	Prog.	Cuml.	Prog.	Cuml.
Past 2016-17	48.62	48.62	0.00	0.00	0.00	0.00	0.00	15.33	0.00	0.00	0.00	0.00
1st year (2017-18)	19.62	68.24	0.00	0.00	0.00	0.00	15.33	33.62	0.00	0.00	1.23	1.23
3rd year (2019-20)	19.81	88.05	0.00	0.00	0.00	0.00	18.29	49.24	12.10	12.10	2.44	2.44
5th year (2021-22)	1.50	89.55	0.00	0.00	0.00	0.00	15.62	72.57	21.52	33.62	2.44	2.44
10th year (2023-27)	7.77	97.32	0.00	0.00	0.00	0.00	23.33	72.57	38.95	72.57	0.00	0.00
15th year (2028-32)	4.38	101.70	27.59	27.59	9.13	9.13	0.00	72.57	0.00	72.57	0.00	0.00
20th year (2033-37)	10.23	111.93	44.29	71.88	48.16	57.29	0.00	72.57	0.00	72.57	0.00	0.00
25th year (2038-42)	41.00	152.93	22.52	94.40	26.50	83.79	0.00	72.57	0.00	72.57	0.00	0.00
27th year (2043-44)	3.53	156.46	6.95	101.35	17.56	101.35	0.00	72.57	0.00	72.57	0.00	0.00
PMC ((2044-47)	0.00	156.46	0.00	101.35	0.00	101.35	0.00	72.57	0.00	72.57	0.00	0.00
Grand total	156.46		101.35		101.35		72.57		72.57		6.11	

ii. Top soil management

Top soil is removed separately before the 1st OB bench is excavated and stacked separately. This top soil is laid over the surface dump or the backfilled area (after it reaches its final level/ stage of reclamation) followed by plantation of plant saplings.

iii. Post plantation / reclamation care

The reclaimed area is appropriately protected by fencing and by deputing watch and ward. Application of manure and water at appropriate time is also part of care.

14.4.2 Air and dust pollution control measures

i. Controlling fugitive dust

The coal mine management have adopted a number of measures to control the dust generation and there by manage the air pollution in the area as shown in the figure below:

1. Coal transportation:

- Black topped metal road for Coal transportation.
- Coal carrying trucks properly covered.
- No Overloading of trucks to prevent spillage.
- Regular cleaning of road.

a) Mines

- Wet drilling will done.
- Regular Sprinkling of water on muck- pile.
- Regular Sprinkling of water on active benches where dumpers are plying.

(b) Haul roads and stock-piles

- Haul roads is kept optimally wet.
- Grading & Compaction of roads will be done regularly.
- Regular Sprinkling of water on stock- pile.

(c) Green belt and afforestation

- Peripheral plantation.

- Annual plantation
- Plantation Over OB Dump/reclaimed mining area.

ii. Preventing dispersal of air borne dust

Management of Dust Generation:

- Regular Sprinkling of water on the haul road.
- The quantity of water must be sufficient to wet the road surface.
- Development of `Green Belt around the quarry and plantation of trees along the road side to arrest airborne dust movement.
- In order to prevent spillage by dumpers, all dumpers will be provided with a free board of 225 mm on the chassis
- Avoidance of overloading.
- Implementation of speed limit of the dumper and other transpiration.
- Regular wash of the wheels of the dumper.
- Regular cleaning of road.

The covered transportation of materials on the public road

Gaseous Pollutants:

To minimize gaseous pollutants following steps suggested:

- Development of Green Belt, strengthening and plantation of more trees suitable for attenuation of gaseous pollutants, is proposed. The site may be around the source and nearby villages. The width of green belt must be kept more than 10 meters.
- Use of improved explosives and latest technology is suggested to minimize the gaseous pollution due to blasting.
- The distance between unloading and receiving areas is also responsible for the emission, so the distance between two points should be minimal to reduce dust emission.

14.4.3 Noise and blasting

a) Measures to control noise pollution

High noise level may be produced during mining activities. The following control measures have been proposed to as to protect workers from any continued exposure to sound levels greater than 90 dB(A):

- i) The operators of stripping and coal winning equipment will be accommodated in cabins which are acoustically designed and air conditioned. It forms a part of the equipment so that level of sound inside the cabin is below 90 dB(A).
- ii) For fixed plant installations with high noise level, noise absorbent paddings have been proposed between foundation and base plate of the machinery.
- iii) For reduction of noise level from exhaust system of internal combustion engines, use of reactance type silencers is proposed.
- iv) To reduce high noise level of aerodynamic origin, use of absorption type silencers has been proposed.
- v) Chutes at transfer points in coal handling plant shall be lined properly for noise absorption.
- vi) Regular maintenance and prompt replacement of worn out parts shall be ensured.
- vii) 300 m wide green belt around the opencast working has been proposed. Further, provision of greenbelt around mine infrastructures and both sides of haul road on the surface has been made. With the above measures, noise level at colony site is not expected to be above the permissible limit at night.

14.4.4 Measures and precautions to reduce ground vibrations due to blasting and to prevent fly rocks

General recommendations and suggestion for reducing ground vibrations due to blasting are as follows:

- i. The Peak Particle Velocity (PPV) of ground vibration will be kept below 50 mm/s by controlled blasting techniques, which is substantially below the permissible limit of 70 mm/s.
- ii. A low powder factor of 0.30 to 0.35 kg per BCM (bank cubic metre) will be adopted.
- iii. Loading technique will be used with 200 kg at the bottom of the hole and remaining 165 kg at mid distance from the surface.
- iv. Drilling and charging pattern will be modified, if required, based on the vibration study to be carried out.
- v. Short delay detonators will preferably be used in blasting rounds rather than detonating fuse as trunk line.

- vi. To contain fly rocks, stemming column will not be less than burden of the hole and the blasting area will be muffled.
- vii. Each blast will be carefully planned, checked, executed and observed. Blasting data will be recorded. During blasting, a responsible officer will be supervising the whole operation.
- viii. Covering the detonating fuse, in case it is used, at least with 150 mm thick cover of sand or drill cuttings.
- ix. Blasting will be carried out at mid-day and never at night.
- x. Blasting will not be carried out when strong winds are blowing towards the inhabited areas.

Apart from the above, in order to ensure slope stabilisation, controlled production blasting will be adopted to avoid tension cracks and back breaks. Such cracks filled with water reduce stability of excavated slopes and angle of slopes. Good drainage system will be provided in and around the mine.

14.4.5 Water pollution control measures

a) Effluent from mine

The related pollution control management existing at site is summarized in the following Table 14.11.

TABLE 14.11
WATER POLLUTION CONTROL MEASURES

Sl. No.	EMP Provision	Whether Provided or not	Remarks
1.	Mine water is to be collected in the central sump on dip side of pit. This will act as sedimentation lagoon combination	Provided	Mine quarry area is being utilized for this purpose
2.	Run-off around reclamation area will be controlled by providing catch drains and sedimentation lagoon combination	Provided	Run off is diverted to sedimentation lagoon by natural drainage
3.	Since run-off from external dump would be collected through a series of contour drains which would be connected to a water retention pond. The clear water from this pond will be	Provided	Run off is diverted to sedimentation lagoon by natural drainage

Sl. No.	EMP Provision	Whether Provided or not	Remarks
	discharged to the natural water course.		
4.	Domestic waste water will be treated in screens, oxidation pond/aerated lagoon. Sanitary waste to be disposed off into septic tank & soak pit.	Provided	Sanitary wastewater is treated into Septic Tanks and Soak Pits.
5	Workshop effluents will be treated in oil & grease trap & sedimentation tank	Provided by the outsourcing agency	Vehicle and machineries maintenance is being regularly done by Contractor at his own facility outside the project area. The contractors are instructed to reuse the used lubricant for different purpose.

The above practice will be continued in future hence, no adverse impact is anticipated due to the expansion of the project.

b) Storm water

Storm water will be chanelised through the garland drains upto the settling pond, permitted to settle down and utilized for the industrial needs at the pit head.

c) Measures to minimise adverse effects on water regime

Only surplus water will be discharged into the natural drainage channels. Hence no adverse impact is anticipated.

14.4.6 Socio-economic aspects including resettlement and benefits

The rehabilitation will be taken up by CCL and DVC as the habitation settled over the DVC Bermo block belongs to both the companies. An appropriate R&R will be prepared in line with the Policy of Jharkhand Govt. and implemented.

14.5 MONITORING SCHEDULE OF EMP

Activities to be monitored by Environment Management Cell (EMC):

The following items will be considered under the monitoring schedule of the EMC:

Slope Failure: Regular examination must be carried out to look for slope failure on open cast mine faces, are and overburden benches etc. Any abnormal condition, if observed must be brought immediately to the notice of the concerned department. Slope monitoring radar may also be installed to monitor this.

Land Erosion: Regular observation for checking land erosion will be made around the mining and dumping areas.

Drainage: The effectiveness of drainage system depends upon the proper cleaning of drains and sumps. Any blockage due to siltation or accumulation of loose materials will be checked on a regular basis. Stone pitching, brick mounds etc. on drain shall also monitored.

Revegetation and Green belt development: Schedule plan for green belt development will be checked after every year and any alteration required will be implemented. Post plantation status will be regularly checked in every season. Phase wise development in the areas of plantation including rate of growth, survival rate etc. will be recorded systematically.

Environmental Quality Monitoring Schedule:

Parameters	Monitoring Schedule
Air Quality	PM10, PM2.5, SO ₂ , NO _x twice a week through the year at 3 stations
Water & effluent quality	Once a season as per applicable standards at 5 locations
Ground water level	Once a year at 4 locations
Noise level	Once a year at 6 locations
Flora and Fauna	Study Once in 3 years at all planted areas
Soil Quality	Once a year at 2 locations

Socio-economic Development: The environmental department must be in regular touch with surrounding villages to monitor the implementation of various developmental schemes made by the mine authorities. The following measures may be suggested for creating cordial working atmosphere at mining sites:

- Preparation of an environmental awareness and education package with reference to mining activities should be undertaken for disseminating the correct information to the local population. This

would help in reduction in misapprehension in the minds of the local people as well the NGOs who influence the local peoples.

- Confidence in NGOs regarding functioning of the project in the area needs be generated.
- Settlement if any, disputes regarding displacement of population need to be done.
- Nearby villages for social welfare work in the vicinity should be adopted by the company. This would generate ample goodwill for the company.
- Efforts for implementation of infrastructure in the labour colony should be made by way of perusing different schemes available with State Govt.

Important records to be maintained by Environmental Management Cell are summarized below.

TABLE 14.12
IMPORTANT RECORDS TO BE MAINTAINED BY EMC

Sl. No.	Particulars
1.	Field monitoring results for air, water, noise, soil, meteorology.
2.	Inspection record of slope failure, land erosion, drainage, socio-economic development
3.	Format to record/monitor plantation measures.
4.	Nursery records
5.	Environmental related standards and norms
6.	Records pertaining to statutory consents, approvals
7.	Code of actions for pollution in defined areas
8.	Periodic medical examinations records
9.	Records pertaining to laboratory equipments maintenance and calibration
10.	Environmental complain register
11.	Records of water and electricity consumption
12.	Periodic progress records
13.	Environmental audit records
14.	Records of annual budgetary requirement and allocation for pollution control

CHAPTER 15

MINE CLOSURE PLAN

15.1 INTRODUCTION

The overall area which will ultimately come under mine planning is termed as Bermo mine of M/s Damodar valley Corporation (DVC).

The Coal mine lies in East Bokaro Coalfield of Bokaro district in Jharkhand state and is proposed to produce coal at the rate of 2.62 MTPA by opencast operation.

The coal produced from this block shall be utilized in the existing and proposed thermal power plants DVC.

I). Name of applicant with complete address

The name of the applicant and address is given in Table 15.1.

TABLE 15.1
NAME AND ADDRESS OF THE COMPANY

Particulars	Information
Name of the Company	Damodar Valley Corporation
Address	<u>Registered Office:</u> Damodar Valley Corporation DVC Towers, VIP Road, Kolkata-700054, W. B. <u>Mine Office:</u> Damodar Valley Corporation, Bermo Mines, P.O. Bermo, Bokaro, Jharkhand- 829104
Phone	033-66072316, 09434742667
Fax	06549-266701
E- mail	arbind.thakur@dvc.gov.in
Official Website	www.dvc.gov.in

II). Status of the applicant

The Damodar Valley Corporation (DVC), headquartered in Kolkata, West Bengal, is a Statutory body Created under Act XIV of 1948 under the

Ministry of Power Govt. of India, came into existence on 7 July, 1948 as the first multipurpose river valley project of independent India.

DVC had taken over this mine from the Indian Railways in 1951 and the mine is being operated by DVC since then. It is a captive mine for Bokaro Thermal Power Station (BTPS) at Bokaro/ Chandrapura Thermal Power Station (CTPS) at Chandrapura of D.V.C.

III). Minerals which are occurring in the area and which the applicant intends to mine

Coal

IV). Information about Enduse Plants

It is a captive mine for the Bokaro Thermal Power Station (BTPS) and Chandrapura Thermal Power Station (CTPS) of DVC. All mining operations are confined to Bermo seam only and Lower seams are virgin.

The expansion of mine capacity is being planned to cater to upcoming 500 MW TPS, coming up as an Expansion of existing Bokaro Thermal Power Station of DVC at Bokaro, Jharkhand.

V). Annual coal requirement

The coal requirement for the upcoming 500MW plant has been estimated as 2.62 MTPA on the basis of Station Coal Rate of 0.6 Kg per Kilo Watt Hour.

VI). Annual target coal production

The mine has also been planned for to its maximum capacity of 2.62 MTPA considering geo-mining, technical parameters, available reserves and also taking into account the requirement of End used plant (EUP).

VII). Name of RQP preparing mining plan

The particulars of RQP are given in Table 15.2.

**TABLE 15.2
PARTICULARS OF RQP**

Name	:	Mr.B.D.Sharma
Address (i) Office	:	A-121, Paryavaran Complex, IGNOU Road New Delhi – 110030
Phone	:	011-29534777, 29532236, 29535891
Fax	:	+91-11-29532568
E-mail	:	min_mec@vsnl.com; minmec@bol.net.in
Web site	:	http://www.minmec.co.in

Registration Number	:	13016/18/2004-CA
Date of grant / renewal	:	01.06.2004
(ii) Residence	:	A-121, Paryavaran Complex, IGNOU Road New Delhi – 110030
Phone	:	011-29534777, 29535891

Copy of RQP certificate is attached as **Annexure XIII**.

VIII). Location

Sl. No.	Name of Mine	Bermo Coal Mine
i	District and state	Bokaro; Jharkhand
ii	Block (administrative)	Bermo New
iii	Villages	Baidkaro, Kargali, Karo & Amlo of Bermo circle.
iv	Khasra No. / Plot No. / Block range / felling series etc.	Refer Annexure VI and Annexure II (Page no. 6 to 9 of ML Deed renewal dt 29-12-1986)
v	Block area as (per GR), sq.km	1.67434
vi	Mine lease area (Ha)	167.434
vii	Lease area Granted as per Mine Lease Deed (Ha.)	413.74 acre (167.434 Ha)
viii	Whether the area is recorded to be in forest (Please specify whether protected, reserved etc.)	As per the letter no.1669 dt. 02-06-2016 (Annexure X) issued by Divisional forest Officer Bokaro regarding No Objection, the plots of mining lease are outside the Forest Land. (Out of 167.434 ha ML area, 120.313 ha GMK land was previously recorded as GMK Jungle which comes to 71.86%. Mining operation is going on in the block for over 65 years and this area, at present, is either under habitation or under mining.)
ix	Ownership / occupancy	Refer Annexure VI
x	Toposheet No. with latitude and longitude :of block as per GR	Latitude: 23° 46'48" N to 23° 47'16" N Longitude : 85° 57'29" E to 85° 59'11" E Toposheet No: 73 E/9 Administrative District: Bokaro Refer Location plan and Key plan – Plate I & XVII)

IX). Communication & accessibility

Roads: The coal mine is located at 45 Km from Bokaro Township in the East Bokaro coalfield near Kargali and other mines of CCL. The mine is well connected to BTPS by a metalled road.

Railways: The nearest Railway Station is Bermo on Gomoh-Chandrapur, Barkakana-line of the East Central Railway, at a distance of about 2 Km towards south.

Airport: The nearest airports at Ranchi and Kolkata are at a distance of about 120 km and 330 km respectively.

X). Summary details of the coal block area**Land Use and Ownership / Occupancy**

The present land use of the area required for the project is given below in Table 15.3.

**TABLE 15.3
PRESENT (2015-2016) LAND USE OF THE PROJECT AREA**

PRESENT (2015-2016) LAND USE OF THE PROJECT AREA				
Sl. No.	Particular	Total area of land (Ha)		Remark
Within ML/ Block Area				Mining Rights
1.	Area under habitation including nalas flowing through habitation	76.794		
2.	Area under backfill	5.77	90.64	
	Area under excavation	42.85		
3.	Area under surface dump	42.02		
Sub Total Within ML/ Block Area		167.434		
Outside ML/ Block				
1	Area under Existing facilities (DVC Colony, road, undisturbed area)	1.660		Surface rights only
2.	Magazine and Road	0.25		
Sub Total Outside ML/ Block		1.91		
Grand Total Project area		169.344		

The present quarry area of 48.62 Ha will increase to 156.46 Ha in the proposed mine.

15.1.1 Reasons for closure

It is an operating mine. Therefore Progressive Mine Closure Plan is described along with the coverage of activities to be taken care of at the closure stage. Reasons for Mine Closure can be exhaustion of mineral, lack of demand, uneconomic operations, natural calamity or directives from a statutory organization.

15.1.2 Statutory obligations

Bermo is an operating mine of DVC since 1951. The ML was taken over from Railways in 1951 and renewed in 1986. Therefore, there is no allotment letter issued by Central Govt. There is neither a Mine Plan approval letter (as Mining Plan was never prepared) nor is there an environmental clearance letter, hence no related obligations. The mine capacity is now proposed to be increased to 2.62 MTPA as proposed in this Mining Plan from present 0.40 MTPA and other relevant clearances shall have to be obtained by DVC in this respect.

The obligations at present are with respect to following:

1. Mine Lease Renewal Deed dt:- 29-12-1986 (**Annexure II**)
2. Explosive Magazine License dt:- 30-06-2016 (**Annexure VIII**)

All obligations pertaining to the above documents are fulfilled by DVC as follows:

1. **Mine Lease Renewal Deed dt 27-12-1986 (renewed from 01-12-1987 to 31-12-2016, for 30 years)**

PART-III

Restrictions and Conditions as to the Exercise of The Light of Powers and Privileges in Part II.

Sl. No.	Conditions	Compliances
1.	No building etc. upon certain places; No building or thing shall be erected, set up or placed and surface operation shall be carried on in or upon any public pleasure ground, burning or burial ground or place held sacred by any class of persons or any house or village sites, public road or other places which the State Government may determine as public ground nor in such a manner as to injured of prejudicially effect any building work, property	Complied and will be complied

Sl. No.	Conditions	Compliances
	or rights of other persons and no land shall be used for surface operation which is already occupied by persons other than the State Government for works or purposes not included in this lease. The leases shall not also interfere with any right of way, well or tank.	
2.	Permission for surface operations in a land not already in uses:- Before using for surface operations any land which has not already been used for such operations, the lessee shall give to Deputy Commissioner of the district two calendar months previous notice in writing specifying the names or other description of the situation and the extent of the land prepared to be so used and the purpose for which the same is required and the said lands shall not be so used if abjection is issued by the Deputy Commissioner within two months after the receipt by him of such notice unless the abjection so stated shall on reference to the state Government been nulled or waived.	Complied and will be complied
2(a)	The agricultural lands will not be acquired strictly beyond the purpose of prospecting and mining which should be determined by the District officers or by any other officer authorised in this behalf.	Complied and will be complied
(b)	Where ever agricultural lands have not been permanently required and mining operations have been conducted by any private arrangements care will be taken to fill up the ditches etc. caused on the agricultural lands in courses of propagating or Mining operations to the satisfaction of the District officer or any other officer authorised in this behalf.	
(c)	The Agriculturist and their dependents who are affected any way either by acquisition or otherwise shall be provided employment or minimum fair wages as soon as mining operations are undertaken in the agricultural lands to the satisfaction of the district officer or any officer or may officer authorised in this	Complied and will be complied

Sl. No.	Conditions	Compliances
	behalf.	
(d)	The lessee will not claim remission of deed rent from the State Government in case they are not allowed by the raiyati concerned to do mining work in the raiyati loads within the lease field areas.	OK noted
3	To cut trees in unreserved lands; The lessee shall not without the express sanction of the Deputy Commissioner cut down or injure any timber or trees on the said lands but he may without such sanction clear any brushwood or undergrowth which interfere with any operations authorised by these presents. The Deputy Commissioner or the State Govt. may require lessee to pay for any trees or timber felled and utilised by them at the rates specified by the Deputy Commissioner of the district.	Deputy Commissioner
4.	To enter upon reserved forest; Notwithstanding anything in this schedule contained the lessee shall not enter upon any reserved forest including in the said lands without previous sanction in writing of the district forest officer, nor fell, cut and use any timber or trees without obtaining the sanction in writing of that officer nor otherwise than in accordance with such conditions as the State Government may prescribe.	Not applicable as no forest
4(1)	The Mining lessee or their agents and workmen shall after the Divisional forest officer's permission has been awarded under clause 4 Part III of the form of Mining lease has the right and liberty to enter upon any part of the private protected forest or reserved forest of Government product forest under his lease without the loss or hindrance for purposes of prospecting quarrying or mining but shall do nothing in respect of on forest production nor shall they disturb the surface in any way except as hereinafter provided;	Not applicable as no forest
(ii)	Where prospecting quarrying or operations	Not applicable as no

Sl. No.	Conditions	Compliances
	does not involve the clearing or cutting of any forest growth it may be done without the permission or without reference to the Divisional Forest officer.	forest
(iii)	Whether prospecting, Mining Quarrying or Mining involve clearance of undergrowth such as shrubs or bushes over an area not exceeding one tenth of an acres but does not involve the cutting of any trees or pole or sampling of bamboo the clearance may be done without the permission of the Divisional Forest officer but a report thereof shall immediately be submitted to Divisional Forest Officer. This right of the lessee to clear the bushes and shrubs shall be exercised only once in every years.	Not applicable as no forest
(iv)	Where prospecting or quarrying or Mining may necessitate undergrowth over an area exceeding one tenth of an acrs of the cutting down or the trees or poles or bamboos, the previous permission in writing of the forest officer shall be necessary and the clearance shall not be cut until those have been marked by the forest Department, for falling and the royalty thereon assessed and paid; PROVIDED That in case the forest officer decided to refuse such permission they shall consult the Mining officer of the District before doing so and if they agree the permission may be refused, but if they disagree the matter may be referred to the Chief Conservator of forest, Bihar who will consult the Director of Mines, Bihar and if both of them agree the permission may be refused, but if the Chief Conservator of forests and the Director of Mines disagree the matter shall be referred to the Government for orders.	Not applicable as no forest
(v)	If the Mining lessee desires to construct any road building or any other work or structure for purposes of Mining or quarrying they shall obtain the previous permission of the Forest Officer and shall pay compensation so assessed by the Forest Officer and abide by	Not applicable as no forest

Sl. No.	Conditions	Compliances
	the condition and regulations issued by the Forest Officer in this behalf	
(vi)	The lessee must carry on mining or quarrying operation down to the maximum economics depth in the area already taken upon and obtain a certificate from the Mining Officer of the district that the economic depth has been reached before proceeding to any other areas	Will be complied
5.	No Mining operations within 50 metres of Public works etc; The lessee shall not work or carry on or allow to be worked or carried on any Mining operations at or to any point within a distance 50 metres from any Railway lines except with the previous written permission of the Railway administration concerned or from any reservoir canal on other public works, such as public roads and buildings or inhabited site except with the previous written permission of the Deputy Commissioner or any other officer authorised by the State Government. On this behalf and otherwise than in accordance with the instructions, restrictions and conditions either general or special which may be attached to such permission. The said distance of 50 met shall be measured in the case of railway reservoir or canal horizontally from the outer toe of the bank or the outer edge of the cutting, as the case may be and in case of a building horizontally from the plinth thereof. In the case of village roads no working shall be carried on within a distance of 10 metres of the outer edge of the cutting except with the previous permission of the Deputy Commissioner or any other officer duly authorised by the State Government in this behalf and otherwise than in accordant with such directions, restrictions and additions, either general or special which may be attached to such permission. EXPLATION:- For the purpose of this clause the expression "Railway Administration" shall	Complied and Will be complied

Sl. No.	Conditions	Compliances
	have the same meaning as it is defined to have in the Indian Railway Act 1890, by clause (6) of Section 3 of the Act "Public Road shall mean a road which has been constructed by artificially surfaced as distinct from a track resulting from repeated use village Roads will include any track shown in the revenue records as village road	
6.	Facilities for adjoining Government licenses and leases; The lessee shall allow existing and future holders of Government licenses or leases over any land which is comprised to an adjoining or is reached by the land held by the lessee reasonable facilities to access thereto. Provided that no substantial hindrance or interference shall be caused by such holders of licences or leases to the operations of the leases under these presents and fair compensation as may be mutually agreed upon or in the event of disagreement as may be decided by the State Government shall be made to the leases for all loss or damage sustained by the leases by reasons of the exercise of this liberty. The lessee shall have to employ either a qualified geologist or Mining Engineer to look after the mining operations as required by Rule 12 of the Mineral Conservation and Development Rules 1950.	Will be complied

PART VII

THE COVENANTS OF THE LESSEE

Sl. No.	Conditions	Compliances
1.	Lessee to pay rents and royalties, taxes etc; The Lessee shall pay the rent, water rate and royalties reserved by this lease at such time and	Will be complied

Sl. No.	Conditions	Compliances
	in the manner provided in Part V and VI of these presents and shall also pay and discharge all taxes, rates, assessments and impositions whatsoever being in the nature of public demands which shall from time to time be charged, assess or imposed by the authority of the Central Government and State Government upon or in respect of the premises and works of the lessee in common with other premises and works of a like nature except demands for land revenue.	
2.	To maintain and keep boundary marks in good orders; The lessee shall at his own expenses erect and times maintain and keep in regular boundary marks and pit according to the demarcation to be shown in the plan annexed to this lease. Such marks and pillars shall be sufficiently clear of the scrubs and other obstruction as to allow easy identification.	Being complied
3.	To commence operations within an year and work like workman like manner:- Unless the State Government for good cause permits, otherwise, the lessee shall commence operations within one year from the date of execution of the lease and shall thereafter at all times during the continuance of this lease search for, win, work, and develop the said mineral without voluntary intermission in a skillful and workmen like manner and as prescribed under clause 2 after without doing or permitting to be done any unnecessary or avoidable damage to the surface of the said land of the crops buildings structures or other property thereon, for the purpose of this clause operation shall include the a ruction of machinery, laying of tramways or the construction of a road in connection with the mine	Being complied
4.	To indemnify Government against all claims:- The lessee shall make and pay such reasonable satisfactions and compensation as may be assessed by lawful authority in accordance with law in force on the subject for all damage, injury	Complied and will be complied

Sl. No.	Conditions	Compliances
	or disturbance which may be done by them in exercise of the powers granted by this lease and shall indemnify and keep indemnified full and completely the State Government against all claims which may be made by any person in respect of any such damage, injury of disturbance and all costs and expenses to connection therewith,	
5.	To secure and keep in good condition pits shafts etc. The leases shall during the subsistence of this lease will and sufficiently secure and keep open with timber or other durable means all pits, shafts and workings that may be mined or used in the said lands and make and maintain sufficient fences to the satisfaction of the State Government round every such pits, shaft or working whether the same is abandoned or not and during the same period keep all workings or the said lands except such as may be abandoned due to reasons from water and foul air so far as possible.	Being complied and will be complied
6.	To strengthen and support the mine to necessary extant:- The leases shall strengthen and support to the satisfaction of the Railway administration concerned or the State Government as the case may be any part of the mine which in its opinion require such strengthening or support for the safety of any railway, reservoir, canal road and any other public works of structures.	Being complied and will be complied
7.	To allow inspection of working:- The leases shall any officer authorised by the Central Government or State Government in that behalf to enter upon the premises including any building, excavation or land comprised in the lease for the purpose of inspecting, examining surveying, prospecting and making plans thereof, sampling and collecting any data and the lessee with proper person employed by the lessee and acquainted with the mines and works effectually	Being complied and will be complied

Sl. No.	Conditions	Compliances
	assist such, officer, agent, servants and workmen inducing every such inspection and shall afford them all facilities, information connected with the working of the mine which they may reasonably require and also shall and will conform to and observe all orders and regulations which the Central Government or State Government as the result of such inspection or otherwise may from time to time are fit to impose (No. 169(44)66 dated 7.9.1961).	
8.	To report accidents; The leases shall without delay send to the Deputy Commissioner a report of any accident causing death or serious bodily injury or serious injury to property or seriously affecting or endangering life or property which may occur in the course of the operation under this lease.	Being complied and will be complied
9.	To report discovery at other minerals: The lessee shall report to the State Government the discovery in the leased area of any mineral not specified in the lease within sixty days of such discovery alongwith full particulars of the natures and position of each such find. If any mineral not specified in the lease is discovered in the lessee area, the lessee shall not win and dispose of such minerals unless such mineral is included in the lease or a separate lease is obtained thereof.	Will be complied
10.	To keep records and accounts regarding production and employees etc. The Lessee shall at all times during the said terms keep of cause to the kept at an office to be situated upon or near the said lands correct and intelligible books (bound and paged) of accounts which shall contain accurate entries showing from time to time;	Being complied and will be complied
.	1. Quantity and quality of the said mineral realised from the said lands.	
	2,Quantity of the various qualities of area beneficated or converted (for example Coal	

Sl. No.	Conditions	Compliances
	converted into coke)	Being complied and will be complied
	3. Quantities of the various qualities of the said minerals sold and exported separately.	
	4. Quantities of the various qualities of the said minerals otherwise disposed of and the manner and purpose of such disposal;	
	5. The prices and all other particulars of all sale of the said mineral;	
	6. The number of purpose employed in the mines, works or upon the said lands specifying nationality qualification and any of the technical personnel.	
	7. Such other facts, particulars and circumstances as the Central or the State Government may from time to time required and shall also furnish free of charge to such officers and at such times and as the Central or State Government may appoint true and correct abstract of all or any such books of accounts and such information and returns to all or any of the matters aforesaid as the State Government may prescribe and shall, stall reasonable times, allow such officers as the Central Government or State Government shall in that behalf appoint to enter into and have free access to the said officer for the purpose of examining and inspecting the said books of accounts, plans and records and to make copied there of and make extract there from.	
	8. The lessee shall submit to the State Government monthly returns of raising and dispatching of the mineral by the 7 th of each month.	
11.	To maintain plans etc; The leases shall at all times during the said term maintain of the mines officer correct, intelligible, upto rate and complete plans and sections of the mine in the said lands, they shall show all the generations and working and alternatives, pits and drilling made by them in the course of operations carried on by them under the lease, faults and other disturbances encountered and geological dats and all such plans and section	

Sl. No.	Conditions	Compliances
	shall be amended and filled up by and from actual survey to be made for that purpose at the end of twelve months or any period specific from time to time and the lessee shall furnish free of charge to the Central and State Government true and correct copies of such plans and section whenever required accurate records of trenches, pits and drillings shall show;	Being complied and will be complied
a)	The sub-soil and stack through which they pass.	
b)	Any mineral encountered	
c)	Any other matter of interest and all data required by Central and State Government from time to time. The lessee shall allow any officer of the Central or the State Government authorised in this behalf by the Central Government is inspect the same at all reasonable times. He shall also apply when asked for the State/Central Government the Coal Controlling authority. The Director Geological Survey of India/Director, Indian Bureau of Mines, a composite plan of the area about the thickness, dip inclination etc. of all the seams as also quantity of reserve quality wise.	
12.	Act 67 of 1957. The lessee shall be bound by such rules as may be issued from time to time by the Government of India Section 18 of the Mines and Minerals (Regulation and Development Act 1957 (67) of 1957) and shall not carry any Mining or other operation under the said lease in any way other than the prescribed under these rules.	Noted
13.	TO PROVIDE, WEIGHING, MACHINES: Unless specifically exempted by the State Govt. the lessee shall provide and at all times keep at or near the pit head or each of the pit head at which the said mineral shall be brought to bank a properly constructed and efficient weighing machines and shall weigh or cause to be weighed thereon all the said minerals from time to time brought to Bank, sold, exported and converted and also the converted products and	Will be complied

Sl. No.	Conditions	Compliances
	shall at the close of each day cause the total weights, ascertained by such means of the said minerals, ores, products, raised, sold exported and converted during the previous twenty four hours to be entered in the aforesaid books of accounts. The lessee shall permit the State Government at all times during the said term to employ any person or persons to be present at the weighing of the said minerals as aforesaid and keep accounts thereof and to check up the accounts kept by the lessee. The lessee shall give ten days previous notice in writing to the Deputy Commissioner of every such measuring or weighing in order that he or some officer on his behalf may be present there at.	
14.	To allow test of weighing machines; The lessee shall allow any person or persons appointed in that behalf by the State Government any time during the said term to examine and test every weighing machine to be provided and kept as aforesaid and the weights used there with in order to ascertain whether the same respectively are correct and are in good repair and order and if upon any such examination or test in such weighing machine or weight shall be found incorrect or out of repair or order the State Government may require that the same be adjusted, repaired and put in order by at the expense of the lessee, or the same lessee and if such requisition be not complied with within fourteen days after the same shall have been made, the State Government may cause such weighing machine or weights to be put in order and the expense if so doing will be paid by the lessee to the State Government demand and if upon any such examination and testing as aforesaid, if any error shall be discovered in any weighing machine or weights the prejudices of the State Government such error shall be regarded as having existence for three calendar months previous to the discovery of the same or from the last occasion of so examining and testing the same weighing machine and weights and testing in case such accession shall be	Will be complied

Sl. No.	Conditions	Compliances
	within such period of three months.	
15.	To pay compensation for injury of third parties; The lessee shall make and pay reasonable satisfaction and compensation for all damage, injury or disturbance of person or property which may be done by or on the part of the lessee in exercise of the liberties and power granted by these presents and shall at all times have harmless and keep indemnified the State Government from and against all suits claims and demands which may be brought or made any person in respect of any such damage, injury or disturbances.	Will be complied
16.	Not to obstruct working of other minerals; The Lessee shall exercise the liberties and power hereby granted in such a manner as to offer no unnecessary or reasonable avoidable obstructions or interruption to the Development and working within the said lands of any mineral not included in this lease and shall at all times afford to control and State Government and to the holders of prospecting licence or Mining leases in respect of any such minerals or any other minerals within any land adjacent to the said lands, as the case may be reasonable means of access and safe, convenient passage upon and across the said land to such minerals for the purpose and getting, working, developing and carrying away the same; Provided that the lessee shall receive reasonable compensation for any damage or injury which they may sustain by reason or in consequence of the use of such passage by such lessee or holders of prospecting licence.	Will be complied
17(a)	Transfer of Land; The lease shall not without previous consent in writing of the State Government which in the case of a Mining Lease, in respect of any mineral specified in the first schedule to the Act shall not	

Sl. No.	Conditions	Compliances
	be given except after previous approval of the Central Government	Will be complied
a)	Assign, sub-let, mortgage, or in any other manner, transfer the Mining lease or any right, title or interest therein or;	
b)	Enter into or make any arrangement contract or understanding where by the lessee will or may be directly or indirectly financed to a substantial extent by on under which the lessees operations or undertaking will on may be substantially controlled by any person on body of parsons other than the lessee; Provided that the State Government shall not give the written consent unless;	
a)	The lessee has to furnish an affidavit alongwith the application for transfer of Mining lease specifying the amount that has already been taken of proposed to be taken as consideration from the transform.	
b)	The transfer of mining lease is to be made to a person or body directly under taking the Mining operation no. 1 (33) 67 MII dated 30.3.68.	
c)	Without prejudice to the above provisions the leased any, subject to this condition specified in the provisions to rule 35 of the said rules transfer this lease or any right, title or interest therein to a person holding certificate of Approval and an Income tax clearance from the Income tax Officer to the State Government. Provided that the leases shall make available to the transferee the origination or certified copies of all plans of abandoned workings in the area and in belt 65 meteres vide surrounding it. The State Government may by orders in writing determination the lease at any time, if the lease has in the opinion of the State Government committed a branch of any of the above previsions or has transferred the lease or any right, title or interest therein otherwise than in accordance with clause(2).	

Sl. No.	Conditions	Compliances
	Provided that no such order shall be made without giving the lessee on reasonable opportunity of stating their case.	
18.	Not to be financed or controlled by a Trust Corporation firm or persons; The lease shall not been controlled and the Lessee shall not allow themselves to be controlled by any trust, syndicate, corporation, firm or person except with the written consent of the Central Government. The lessee shall not enter into or make any arrangement compact or understanding whereby the lessee will or may be directly or indirectly financed by or under which the lessee operations or undertakings will or may be carried on directly or indirectly by or for the benefit of or subject to the control of any trust, syndicate, corporation, firm or persons unless with the written sanction given prior to such arrangement, compact or under standing being entered into or made of the Central Government and any or every such arrangement compact or understanding as aforesaid (entered into or made with such sanction as aforesaid) shall only be entered into be made and shall always be subject to on express condition binding upon the other party or parties thereto that on the occession of a State of emergency of which the president of India in his direction shall be the judged it shall be terminable if so required in writing by the State Government and shall in the event of any such requisition being made be forthwith thereafter determined by the lessee accordingly.	Will be complied
19.	Lessee shall deposit any additional amount necessary:- Whenever the security deposit of Rs. or any part thereof or any further sum hereafter deposited with the State Government in replenishment thereof shall be forfeited or applied by the Central or State Government pursuant to the power hereinafter declared in that behalf the leases shall deposit with the State Government such	Will be complied

Sl. No.	Conditions	Compliances
	further sum as may be sufficient with the un-appropriated part thereof to bring the amount in deposit with the State Government upto the sum of Rs. 1,000/-	
20.	Delivery of working in good order to State Government after determination of lease; The lessee shall at the expiration or sooner determination of the said term or any removal thereof deliver upto the State Government all mines, pits, shafts, inclines, drifts, levels, waterways, airways and other works now existing or hereafter to be sunk or made on or under the said lands except such as have been abandoned with the sanction of the State Government and in any ordinary and fair course of working all engines, machinery, plants, buildings, structures, other works and convenience which at the commencement of the said terms were upon or under the said lands and all such machinery set up by the lessee below ground which cannot be removed without causing injury to the mines or works under the said lands (except such of the same as may with the sanction of the State Government have become disused) and all buildings and structure of bricks or stones erected by the lessee above ground level in good repair order and condition and fit in all respects for further working of the said mines and the said minerals.	The lessee has applied for renewal
21.	The right of pre-emption; a) The State Government shall from time to time and at all times during the said term have the right (to be exercised by notice in writing to the Lessee) or pre-emption of the said minerals and all products thereof) lying in or upon the said lands hereby demised or also where under the control of the lessee and the lessee shall, with all possible expedition, deliver all minerals of products or mineral purchased by the State Government under the power conferred by this provision in the quantities at the time, in the manner and at the place specified in the notice	Noted

Sl. No.	Conditions	Compliances
	exercising the said right.	
b)	Should the right of pre-emption conferred by this present provision be exercised and a vessel chartered to carry the mineral or products thereof procured on behalf of the State Government or Central Government be detained or demurrage at the part of landing the lessee shall pay the amount due for demurrage according to the terms of the charter party of such vessel unless the State Government shall be satisfied that the delay is due to causes beyond the control of the lessee.	
c)	The price to be paid for all mineral products of minerals taken in pre-emption by the State Govt. in exercise of the right hereby conferred shall be the fair market price prevailing at the time of pre-emption. Provided that in order to arrive at the said fair market price the lessee shall if so required, furnish to the State Government particulars of the quantities, description and prices of the said mineral or products thereof sold to other customers and of charters entered into for freight for carriage of the same and shall produce to such officer or officers as may be directed by the State Government original or authenticated copies contracts and charter, entered into for the sale or freightage of such mineral or products.	The applicable rules will be complied
d)	In the event of the existence of a State of War or emergency (of which existence the President of India shall be the sole Judge and a notification to this effect in the Gazette of India shall be conclusive proof) the State Government with the consent of the Central Government shall from time to time and at all times during the said term, have the right (to be exercised by a notice in writing to the lessee) forthwith take possession and control of the works, plants, machinery, and premises of the lessee on or in connection with the said lands or operations under this lease and during such possession or control the lessee shall confirm to obey all directions given by or on behalf of the central government of State	Noted

Sl. No.	Conditions	Compliances
	Government regarding the use of employment of such works, plants, premises and minerals; Provided that fair compensation which shall be determined in defaults of agreement by the State Government shall be paid to the lessee for all loss or damage sustained by the lessee by reason or in consequence of the exercise of the power conferred by this clause and provided also that the exercise of such powers shall not determine the said term hereby granted or effect the terms and provisions of these presents further than may be necessary to give effect to the provision of this clause.	
22.	Employment of foreign national; The leases shall not employ, in connection with the mining operations any person who is not an Indian National except with the previous approval of the central government.	Will be complied
23.	Recovery of expenses incurred by the state government: If any of the works or matter which in accordance with the covenants in that behalf herein before contained, are to be carried on performed by the lessee be not so carried out of performed within the time specified in that behalf, the State Government may cause the same to be carried out or performed and the lessee shall pay the State Government on demand all expenses which shall be incurred in such carrying out performance of the same and the decision of the State Government as to such expenses shall be final.	Will be complied
24.	Furnishing of Geophysical Data The lessee shall furnish:	Will be complied
a)	All geophysical data relating to mining fields of engineering and groundwater surveys such as anomaly maps section, plans, structure contour maps logging collected by them during the course of mining operations the director geological survey of India, Calcutta.	

Sl. No.	Conditions	Compliances
b)	All informations pertaining to investigation of radio active mineral collected by them during the course of Mining operation to the Secretary Department of Atomic Energy, New Delhi. Date of information referred to above shall be furnished every year reckoned from the date of Commencement of the period of the Mining lease	

PART VIII

THE COVENANTS OF THE STATE GOVERNMENT

Sl. No.	Conditions	Compliances
1.	Lessee may hold and enjoy rights quietly; The Lessee having paying the rents, water rate and royalties hereby reserved and observing and performing all the covenants and agreements herein contained and on the part of the lessee to be observed and performed shall and may quietly hold and enjoy the rights and premises hereby demised for and during the said term hereby granted without any unlawful interruption from or by the State Government or any person rightfully claiming under it.	Noted
2.	Acquisition of land of third parties and compensation thereof; If in accordance with the provisions of clause (4) of Part VII of this Schedule the lessee shall offer to pay to an occupier of the surface of any part of the said lands compensations for any damage or injury which may arise from the proposed operations of the lessee and the said occupier shall refuse his consent to the exercise of the rights and powers reserved to the State Government and demised of the lessee by these presents and the Lessee shall report the matter to the State Govt. and shall deposit with it the amount offered as compensation and if the Central/State Government are satisfied that the amount of compensation offered is fair and reasonable or if it is not so satisfied and the Lessee	Noted

Sl. No.	Conditions	Compliances
	shall have deposited with it such further amount as the State and Central Government shall consider fair and reasonable the State Government shall order the occupier to allow the lessee to enter the land and to carry out such operations as may be necessary for the purpose of this lease. In assessing the amount of such compensation the State Government shall be guided by the principles of the land Acquisition Act.	
3.	To Renew:-Deleted.	
4.	Liberty to determine the Lease; The lessee at any time may determine this lease by giving not less than 12 calendar months notice in writing to the State Government or to such officer or authority as the State Government may specify on this behalf and upon the expiration of such notice. Provided that the lessee shall upon such expiration render and pay all rents and water rate royalties, compensation for damage and other moneys which may then be due and payable under these presents to the Lesser or any other person or persons and shall deliver these presents to the State Government then this lease and the said terms and the liberties, powers and privileges hereby granted shall absolutely cease and determine but without prejudice to any right or remedy of the Lesser in respect of any breach of any of the covenants or agreements contained in these presents; Provided that the State Government or the officer or the authority appointed as aforesaid may declare the lease to be determined after the period of 12 Calendar months notice is ever irrespective of whether all the dues payable have been paid up or not without prejudice to any effects for realisation of such dues under statute or otherwise and shall be free to advertise the area under rule 58 of the Mineral Concession Rules, or any other laws existing at the time.	Noted
4(a)	The State Government may on an application made by the lessee permit him to surrender one or more minerals from his lease which is for a group of minerals on the ground that the deposit of that minerals have since exhausted or dilapidated to	Noted

Sl. No.	Conditions	Compliances
	such an extent that it is no longer possible to work the mineral economically subject to the conditions that the lessee.	
	a) Make an application for such surrender of mineral at least six months before the intended date of surrender and;	Will be complied
	b) Give an undertaking that he will not cause any hindrance in the working of the mineral so surrendered by any other person who is subsequently granted a Mining lease for that Mineral (No.MII-152(18)/61 dated 4.12.1962.	Will be complied
5.	Refund of Security deposit; On such date as the State Government may elect within 12 Calendar months after the determination of this lease or of any renewal thereof, the amount of the security deposit with State Government and not required to be applied to any of the purposes mentioned in this lease shall be refunded to the Lessee. No interest shall run on the Security deposit.	Will be complied

PART IX

GENERAL PROVISIONS

Sl. No.	Conditions	Compliances
1.	Obstruction to inspection:- In case the Lessee or their transferees does not allow entry to inspection by the officer authorised by the Central or State Government under clause (i)(j) of (1) of Sub rule (i) of rule 27 of the said rules, the State Govt. shall give notice in writing to the lessee requiring them to show cause within such time as may be specified in the notice why the lease should not be determined and their security deposit for failed and if the lessee fail to show cause within the aforesaid time to the satisfaction of the State Govt. the State Govt. may determine the lease and forfeit the whole or part of the security deposit.	Noted
2.	Penalty in case of default in payment of royalties and breach of covenants; If the Lessee or his transferees or assigns makes any	Noted

Sl. No.	Conditions	Compliances
	default in payment of rent or water rate or royalties as required by section 9 of the Act or commits a breach of any of the conditions and covenants other than these referred to in covenants (1) above, the State Govt. or their officer or officers authorised in this behalf, shall give notice to the lessee requiring them to pay the rent, water rate, royalty, or remedy the breach as the case may be within sixty days from the date of receipt of the Notice if the rent, water rate and royalty are not paid or the breach is not remedied within such period, the State Government may without prejudice to any proceeding that may be taken against him determined the lease and forfeit the whole or part of the security deposit penalty for repeated breaches of covenants;	
3.	In case of repeated breaches of covenants and agreements made by the lessee for which notice has been given by the State Government or officer or officers authorised in this behalf accordance with clauses(1) and (2) aforementioned on earlier occasions the State Government without giving any further notice may impose penalty not exceeding twice the amount of annual dead rent specified in clause 2 of Part V. Failure to fulfil the terms of lease due to “force Majure”	Noted
4.	Failure to fulfil the terms of lease due to “Force Majure” failure on the part of the Lessee to fulfil any of the terms and conditions of this lease shall not give the Central or State Government any claim against the lessee or be deemed to breach of this lease, in so far as such failure is considered by the said Govt. to arise from force majeure, and if through force Majure the fulfilment by the lessee of any of the terms and conditions of this lease be delayed the period of such delay shall be added to the period fixed by this lease. In this clause the expression “Force Majure” means act of God, War insurrection, riot, Civil Commotion, strike, earthquake, tide, storm, tidal, wave, flood, lightening, explosion, fire earth quake and any other happening which the lessee could not reasonable prevent or control. Lessee to remove his properties on the expiry of Lease.	Will be complied
5.	The lessee having first paid and discharged rents, rates and royalties payable by virtue of these presents may at the expiration or sooner determination of the said term or within	Noted

Sl. No.	Conditions	Compliances
	six calendar months thereafter (unless the lease shall be determined under clauses 1 and 2 of this part and in that case at any time not less than three calendar months nor more than six calendar months after such determination take down and remove for their own benefit all or any engines, machinery, plant building structures tramways railways, and other works erections and covenants which may have been erected, set up or placed by the Lessee in or upon the said lands and which the Lessee are not bound to deliver to the State Government under clause 20 of Part VII of this Schedule and which the State Government shall not desire to purchase. Forfeiture of property left more than six months after determination of lease.	
6.	If at the end of six calendar months after the expiration or sooner determination of the said term under the provisions contained in clause 4 of Part VIII of this Schedule become effective there shall remain in or upon the said lands any engines, machinery, plant, building, structures, tramways, railways and other work erection and conveniences or other property which are not required by the lessee in connection with operation in any other land held by them under prospecting licence or Mining lease or Mining lease the same shall if not removed by the Lessee within one calendar month after notice in writing requiring their removal has been given to the lessee by the State Government be deemed to become the property of the State Government and may be sold or disposed of in such manner as State government shall deem fit without liability to pay any compensation or to account to the Lessee in respect thereof.	Noted
7.	Notice	
	Every notice by these presents required to be given to the Lessee shall be given in writing to such person resident on the said lands as the such notice and if there shall have been no such appointment, then every such notice shall be sent to the Lessee by registered post at the address recorded by them in this lease or at such other address in India as the Lessee may from time to time in writing to the State Government designate for the receipt of Notices and every such services shall be deemed to be proper and valid services upon the lessee and shall not be questions for challenge by them.	Noted

Sl. No.	Conditions	Compliances
8.	Immunity of State Government from liability to pay compensation. In any event the orders of the State Government are revised, reviewed or cancelled by the Central Government in pursuance of proceedings under Chapter VII of the Mineral Concession Rules, 1960, the Lessee shall not be entitled to compensation for any loss sustained by the Lessee in exercise of powers and privileges conferred upon them by these presents.	Noted

2. Explosive Magazine License dt 30-06-2016 (Annexure VIII)

Sl. No.	Conditions	Compliances
1.	The quantity of explosives on the premises at any one time shall not exceed the licenceable capacity.	Being complied
2.	The magazine shall be used only for keeping all explosives specified in Additional Condition No.1(a) of this licence and of receptacles for, or tools or implements for work connected with the keeping of such explosive.	Being complied
3.	The opening of packages and the weighing and packing of explosives shall not be carried on in magazine/store house.	Being complied
4. (1)	Two or more descriptions of explosives which may be permitted to be kept in the magazine/store house by additional condition no.1(a) shall be kept only if they are separated from each other by an intervening partition of such substance and character, or by such intervening space, as will be effectually prevent explosion on fire in the one communicating with the other. Provided that-	Being complied
	(a) the various explosives of Classes 1 (gunpowder, 2 (nitrate-mixture), 3 (nitro-compound) and 4 (chlorate mixture), safety fuses belonging to the 1 st Division of the 6 th (Ammunition) Class and such of the various explosives of the 2 nd Division of the 6 th (Ammunition) Class as do not contain any	Being complied

Sl. No.	Conditions	Compliances
	exposed iron or steel, may be kept with each without any intervening partition or space;	
	(b) the various explosives of the 1 st Division of the 6 th (Ammunition) Class may be kept with each other without any intervening partition or space;	Being complied
	(c) such of the various explosives of the 2 nd Division of the 6 th (Ammunition) Class as contained any exposed iron or steel, may be kept with each other without any intervening partition or space;	Being complied
	(d) the various explosives of the 3 rd Division of the 6 th (Ammunition) Class may be kept with each other without any intervening partition or space;	Being complied
	(e) the various explosives of the 7 th (Fireworks) Class other than those containing chlorate may be kept with each other without any intervening partition or space.	Being complied
(2)	Save as aforesaid, two or more description of explosives shall not be kept in the magazine/store house notwithstanding the provision of Additional Condition No. 1(a)	Being complied
(3)	(a) Explosives of the 3 rd (Nitro-Compound) Class shall not be kept in the magazine after the expiration of one year from the date of their manufacture except with the special sanction of a Controller of Explosives.	Being complied
	(b) When such sanction has been given, a written certificate showing the period covered by the sanction must be obtained from a Controller of Explosives at each inspection, and must be kept by the licensee and produced on demand.	Being complied
5.	When an explosive owing to its being no longer of standard purity or owing to signs of liquefaction or of exuded intro-glycerine or liquid nitro compound is no longer for storage in the magazine/store house, the licensee shall comply, at this own expense, with such directions as to its disposal as the Chief Controller or Controller of Explosives may issue.	Will be complied
6.	The interior of the magazine/store house and the benches, shelves and fittings therein, shall be so	Being complied

Sl. No.	Conditions	Compliances
	constructed or so lined or covered as to prevent the exposure of any iron or steel and the detaching of grit, iron, steel or similar substances in such manner as to come into contact with the explosives such interior, benches, shelves and fittings shall so far as is reasonably practicable, be kept free from grit and otherwise clean; and, in case of any explosive liable to be dangerously affected by water, due precautions shall be taken to exclude water therefrom; Provided that so much of this condition as relates to precautions against the exposure of any iron or steel shall not be obligatory in a building in which no explosives other than explosives of the 1st Division of 6th (Ammunition) Class is kept.	
7	If the lightning conductor is tested by a Controller of Explosives, the licensee shall pay the fees prescribed for such test. In the event of the test proving unsatisfactory, the same fees shall be payable by the licensee for each subsequent test until the lightning conductor is passed by the testing officer as satisfactory: Provided that the fees payable for a single test shall be charged for all tests made on a conductor during any one day: Provided that the fees payable for a single test shall be charged for all tests made on a conductor during any one day: Provided further that where two or more lightning conductors are attached to one and the same magazine, the fee for the testing of all such conductors shall not exceed the fee prescribed in this condition for testing a single lightning conductor.	Will be complied
8.	Due provision shall be made by the use of suitable working clothes without pockets, suitable shoes, and by searching or otherwise, or by some such means for preventing the introduction into the magazine/store house of fire. Lucifer matches or any substance; or article likely to cause	Being complied

Sl. No.	Conditions	Compliances
	explosion or fire, or of any grit, iron or steel but this condition shall not prevent the introduction of an artificial light of such construction, position or character as not to cause any danger of fire or explosion: Provided that so much of this condition as applies to the exclusion of iron or steel, shall not be obligatory in a building in which no explosive other than an explosive of the 1st Division of the 6th (Ammunition) Class is kept.	
9.	The licensee shall keep records and accounts of all explosives in stock and used in Forms 32 and 34 in his office and produce the stock books and records to any officer authorised under Rule 179 whenever such officer may call office upon him so to do.	Being complied
10.	Any accident and all losses, shortage of stock and thefts of explosives shall be reported without delay to the nearest police station and licensing authority.	Will be complied
11.	Free access to the licensed premises shall be given at all reasonable times to any inspecting or sampling officer and every facility shall be given to such officer for ascertaining that the rules and conditions of the licence are duly observed.	Being complied
12.	No changes or alterations shall be carried out to the premises without prior approval of the licensing authority and the licensee shall comply with any condition that may be specified by the licensing authority in this behalf.	Being complied
13.	If the licensing authority calls upon the holder of the license by a notice in writing to take any action which may in the opinion of such authority be necessary for the safety of the premises or the public, the holder of licence shall take such action within such period, not being less than one month from the date of receipt of the notice, as may be fixed by the notice.	Will be complied
14.	Magazine/store house shall at all times be kept in state of good repair (or maintained in good condition). The licensee shall report to licensing	Will be complied

Sl. No.	Conditions	Compliances
	authority forthwith if the magazine/store house becomes unfit for storage of any explosive for any reason whatsoever.	
15.	The licensee shall submit to the licensing authority as well as the renewal authority at the end of every month a return in Form 36 showing receipts and issue of explosives so as to reach the above authorities by 10 th day of the succeeding month	Being complied
16.	Any encroachment of the safety distance shall be immediately communicated to the licensing authority for necessary advice and action.	Will be complied
17.	The licensing authority shall be immediately informed for advice if any explosive is found deteriorated or serviceable.	Being complied
18.	The explosive packages shall be stacked in such a way so as to allow movement of at least one person to check the condition of all packages stored and to read the manufacture particulars of each package.	Being complied
19.	The resistance of the lightning conductor to earth shall be as low as possible and in no case more than 10 ohms.	Will be complied
20.	A distance of 15 metres surrounding the magazine/store house shall be kept clear of dried grass or bush of flammable materials.	Being complied
21.	Every packet of explosive at the time of bringing inside the magazine shall be examined for its sound condition	Being complied
22.	Not more than 4 persons shall be allowed inside the magazine at any one time.	Being complied
23.	Empty Package of the explosives shall be removed at the earliest and destroyed.	Being complied
24.	The explosives shall not be used for blasting purposes in the areas not coming within the purview of Mines Act. Unless the licensee employs a qualified shot-firer holding a shot-firer's permit granted under the Explosives Rules or the person having equivalent qualifications as recognised by the Chief Controller.	Will be complied
25.	The licensee and the shot-firer shall be responsible for preparation of charges, the	Being complied and will

Sl. No.	Conditions	Compliances
	charging of holes and the firing of shots and shall take all precautions against fire and accident involving the explosives.	be complied
26.	No smoking or any source of light or fire shall be allowed in or near the place where explosives charges are being prepared or kept.	Being complied and will be complied
27.	For charging or stemming a shot hole, no person shall use an iron or steel tools, scraper or tamping rod, nor shall forcibly press the explosive into a hole of insufficient size. A temping rod made entirely of wood shall be used.	Being complied and will be complied
28.	Before exploding any blasting charge, adequate measures shall be taken so as to prevent as far as possible, the projection of fragments of stone by the explosion of the blasting charge.	Being complied and will be complied
29.	No person shall re-bore or tamper a hole that has once been charged or attempt to withdraw a charge either before firing or after a misfire or deepen or tamper with empty holes or sockets left after blasting	Being complied and will be complied
30.	Before commencing shot firing, the licensee shall give sufficient warning to the public by an efficient system of signals and by putting up red flags in the danger zone. He shall see that all persons in the vicinity have taken proper shelter and shall also take suitable steps to prevent any person approaching the shot	Being complied and will be complied
31.	The licensee shall warn the public not to approach the site of blasting operation at least within an hour after explosion or in the case of an open quarry, not to approach such quarry within half an hour after explosion.	Being complied and will be complied
32.	The number of shots which explode shall be counted and unless it is certain that all the shots have been exploded no person shall approach or be permitted to approach the place until 30 minutes after the firing of shots.	Being complied and will be complied
33.	In the event of a misfire, if a relieving hole is to be drilled, it shall not be placed within 30 cm. from the misfired hole. The relieving hole shall run parallel to the misfired hole.	Will be complied

Sl. No.	Conditions	Compliances																																																																								
	(a)Storage vide let no 16754 dt. 2-7-1990 at any time shall not exceed <table><tr><td>Class</td><td>Quantity</td><td></td><td></td><td>Units</td></tr><tr><td>Class 1</td><td>-</td><td>-</td><td>-</td><td>Kg.</td></tr><tr><td>Class 2</td><td>-</td><td>-</td><td>-</td><td>Kg.</td></tr><tr><td>Class 3</td><td>1850</td><td>-</td><td>-</td><td>Kg.</td></tr><tr><td>Class 6 Division 1</td><td>25000</td><td>-</td><td>-</td><td>Metres</td></tr><tr><td>Class 6 Division 2</td><td>-</td><td>-</td><td>-</td><td>Metres</td></tr><tr><td>Class 6 Division 3</td><td>10,000.</td><td>-</td><td>-</td><td>Nos.</td></tr><tr><td>Class 7 Division 2 Sub-Divn. 1</td><td>-</td><td>-</td><td>-</td><td>Kg.</td></tr><tr><td>Class 7 Division 2 Sub-Divn. 2</td><td>-</td><td>-</td><td>-</td><td>Ks.</td></tr></table>	Class	Quantity			Units	Class 1	-	-	-	Kg.	Class 2	-	-	-	Kg.	Class 3	1850	-	-	Kg.	Class 6 Division 1	25000	-	-	Metres	Class 6 Division 2	-	-	-	Metres	Class 6 Division 3	10,000.	-	-	Nos.	Class 7 Division 2 Sub-Divn. 1	-	-	-	Kg.	Class 7 Division 2 Sub-Divn. 2	-	-	-	Ks.	The quantity as per Renewal no. E/HQ/JH/22/146(E1234) dt 30.06.2016 <table><tr><td>Class</td><td>Quantity</td><td>Units</td></tr><tr><td>Class 1</td><td>-</td><td>Kg.</td></tr><tr><td>Class 2</td><td>-4536</td><td>Kg.</td></tr><tr><td>Class 3</td><td></td><td>Kg.</td></tr><tr><td>Class 6 Division 1</td><td>48000</td><td>Metres</td></tr><tr><td>Class 6 Division 2</td><td>10,000</td><td>Metres</td></tr><tr><td>Class 6 Division 3</td><td>44000.</td><td>Nos.</td></tr><tr><td>Class 7 Division 2 Sub-Divn. 1</td><td>-</td><td>Kg.</td></tr><tr><td>Class 7 Division 2 Sub-Divn. 2</td><td>-</td><td>Ks.</td></tr></table>	Class	Quantity	Units	Class 1	-	Kg.	Class 2	-4536	Kg.	Class 3		Kg.	Class 6 Division 1	48000	Metres	Class 6 Division 2	10,000	Metres	Class 6 Division 3	44000.	Nos.	Class 7 Division 2 Sub-Divn. 1	-	Kg.	Class 7 Division 2 Sub-Divn. 2	-	Ks.
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	(b) The maximum quantity of explosives purchased in one calendar month shall not exceed.(Ten times of the magazine capacity) Class = 45360 kgs																																																																									
2.	The magazine shall not be taken into use until this licence is endorsed by a Controller of Explosives or written permission for the same is otherwise obtained from the licensing authority.	Noted																																																																								
3.	The premises shall at all times maintain in distance required to be kept clear as shown in enclosed Form 18.	Being complied and will be complied																																																																								
4.	The licensee may be filling cartridges, making charges filling or otherwise adapt or prepare for use any explosive he is authorised to possess under this license provided that-	Being complied and will be complied																																																																								
	(a) The quantity of explosives in the workshop in which such adaptation or preparation is carried on shall not be more than that is prescribed by the licensing authority in this behalf;	Being complied and will be complied																																																																								
	(b) The total quantity of explosives on the licensed premises including the workshop shall not exceed the quantity the licensee is authorised to possess;	Being complied and will be complied																																																																								
	(c) No work unconnected with such adaptation or preparation shall be carried on in the said	Being complied and will be complied																																																																								

Sl. No.	Conditions	Compliances
	workshop while such adaptation or preparation is being carried on;	
	(d) The said workshop shall be situated at a distance of -- shown in drawing dated..... attached herewith;	Will be complied
	(e) An explosive of one description shall not be converted into an explosive of another description and an explosive shall not be deformed or bifurcated into its constituents	
	(f) The licensee shall give notice to the authority which granted his licence that he intends to carry on such adaptation or preparation as is allowed by this condition	Will be complied
5.	All tools and implements kept or used in opening/closing of packages of explosives shall be made only of wood, copper, brass or other similar soft metal or shall be covered with some safe and suitable material.	Being complied and will be complied
6. (1)	The following articles shall at all times be provided-	Being complied and will be complied
	(a) a hair broom;	
	(b) A coir mat about 750 mm x 500 mm in size;	
	(c) A sufficient number of suitable copper, brass or wooden tools or implements for opening package;	
	(d) Where persons are to enter the magazine, a sufficient number of overshoes not having any exposed iron or steel for used by these persons	
(2)	The mat, tools or implements and overshoes prescribed above shall at all times, when they are not in use be kept in suitable place within the licensed premises.	Being complied and will be complied
(3)	There shall at all times be kept prominently exhibited clearly legible writing-	Being complied and will be complied
	(a) Licence No. of the premises;	
	(b) The quantity of the various explosives authorised for storage	
	(c) The daily opening stock of various explosives.	
(4)	License No. of the premises shall also be	Being complied and will

Sl. No.	Conditions	Compliances
	exhibited in clearly legible writing on outer side of the building.	be complied
7.	Blasting operations shall be carried out between hours.1.00 PM to 4.00 PM	Being complied
8.	Not more than 12. holes shall be loaded and fired at any one time.	Being complied

- 3. DGMS letter No. KR/2134/Karma, dated, the 19/10/2000 for Permission Under Regulation 100(1) of the Coal Mines Regulation 1957, to extract developed pillars of Bermo seam by opencast method and relaxation from the provisions of Regulation 98(1) & 98(3) of the Coal Mines Regulation 1957 in respect of height and width of benches while working Bermo seam by using Heavy Earth Moving Machinery and deep hole blasting (Annexure XX)**

Sl. No.	Conditions	Compliances
1.0	Before starting any quarrying operations, the buildings and other structures likely to be affected shall be vacated and rendered uninhabitable and/or removed from the area.	Being complied and will be complied
2.0	Quarrying operation by using Heavy Earth Moving Machinery and deep hole blasting shall be done strictly in accordance with the schedule of conditions appended herewith.	Noted
3.1	No heavy machinery or vehicles except drilling machines shall be deployed when the thickness of over-burden above the underground galleries as proved by advances bore hole or other suitable means is reduced to 6m.	Being complied and will be complied
3.2	Blasting shall be done in such a manner so that the underground galleries are completely filled up. Otherwise mutti/overburden shall be dozed to fill up the galleries completely.	
3.3	Each coal pillar shall be exposed completely by removing the overburden overlying the pillar and the adjoining galleries on all sides.	
4.1	The distance between mechanised quarry and manual quarry shall not be less than 60m.	Being complied and will be complied
5.1	The water level shall be maintained at 60m away from the quarry face.	Being complied and will be complied
6.1	Provisions of Regulation 170 of the Coal Mines Regulation 1957 shall be strictly complied with.	Being complied and
6.2	No blasting shall be done in crushed/broken	

Sl. No.	Conditions	Compliances
	ground.	will be complied
7.0	The quarrying operations shall be done from rise to the dip.	Being complied and the future operations will be as per approved Mining plan
8.0	Overburden containing carbonaceous material shall not be dumped within 15m of the exposed side of coal.	Being complied and will be complied
9.0	At the time of blasting operations in the quarry, no persons shall be employed below ground either in the same or any other seams or sections interconnected with the seam where pillars are being extracted by opencast method. Further the work persons shall not be readmitted underground after blasting operation are completed, unless and until the seam has been inspected by a competent person and found free from any danger due to noxious gases or fire etc.	Being complied and will be complied
10.0	If at any time any one of the conditions subject to which this permission has been granted, is violated or not complied with this permission shall be deemed to have been revoked with immediate effect.	Noted
11.0	The above permission may be amended or withdrawn at any time, if considered necessary in the interest of safety and is being issued without prejudice to any other provisions of the law which may or may become applicable at any time.	Noted
12.0	In the event of any change in the circumstances connected with this permission which is likely to endanger the life of persons employed in the mine or the mine, the mining operations for which this permission has been granted shall be stopped forth with and intimation sent to this Directorate. The said mining operations shall not be resumed without express and fresh written permission from this Directorate.	Noted and will be complied
13.0	This Directorate shall be informed as soon as mining operations are commenced in accordance with the above permission. Intimation about completion of the Mining operations shall also be sent promptly and in any case not later than one month thereof.	Complied

4. Conditions for Relaxation under Regulation 98 of the coal mines regulations 1957 for working the opencast mine with heavy earth moving machinery and/or adopting a system of deep-hole blasting at mechanised opencast mine.

Sl. No.	Conditions	Compliances
I.	General	
1.0	a) Except where otherwise provided for in this conditional permission, all provisions of the coal Mines Regulations. 1957, relating to opencast workings, use of Explosives and Machinery etc. shall be strictly complied with.	Being complied and will be complied
	b) It may be amended, modified or withdrawn at any time should it be considered necessary in the interest of safety.	Noted
II.	Opencast Working	
2.0	Height and width of Benches:	
2.1	The height of the benches shall not exceed the maximum reach of the machines used for digging, excavation or removal.	Being complied and will be complied
2.2	The width of any bench shall not be less than	
	a) The width of the widest machine plying on the bench plus two metres.	
	b) If dumpers ply on the bench – three times the width of the dumpers.	
	c) The height of the bench, whichever is more.	
3.0	General	
3.1	Quarrying operations shall be conducted from top downwards.	Being complied and will be complied
3.2	The provisions of sub-regulations (4) and (5) of the Regulation 98 shall be complied with.	
3.3	When persons are employed within 5m. of the working face, adequate precautions shall be taken to ensure their safety by dressing the sides of the benches.	
3.4	Special care shall be taken when any slip or other planes of weakness or other geological disturbances exist, so as to prevent danger to the work persons.	
3.5	No persons shall be engaged or allowed to travel close to high sides/benches, from which he is likely to fall more than 1.8 metres vertically down. Unless he is provided with and uses a safety belt or rope.	
3.6	The sides in overburden & coal shall be kept sloped	Being complied and

Sl. No.	Conditions	Compliances
	to prevent danger from fall of sides.	will be complied
4.0	Fencing around opencast working:	
4.1	The top edge of the Opencast working shall be kept fenced with wire rope strands or barbed wire, supported by (movable) posts of timber, iron or concrete. The gap between the adjacent rope strands or wires shall not be more than 0.30 metre & bottom most rope, strand or wire shall not be more than 0.25 metre and top most rope or wire shall not be less than 1.00 metre from ground level.	Being complied and will be complied
4.2	At the finishing stage opencast working shall be fenced with masonry wall using lime mortar not less than 0.4m. thick and not less than 1.2 metres high with a parapet.	
5.0	Spoil Bank:	
5.1	a) The slope of spoil bank face shall be determined by the natural angle of repose of the material being deposited but shall in no case exceed 45 degree from the horizontal. The spoil bank face shall not be retained by artificial means at an angle in excess of its natural angle of repose.	Being complied and will be complied
	b) Any Spoil bank exceeding 30 metres in height shall be benched so that no bench exceeds 30 metres in height and the general slope does not exceed 1 vertical to 1.5 metres horizontal.	
5.2	a) The toe of spoil bank face shall not be permitted to approach Railway or other public works, public road, buildings or other permanent structure not belonging to the owner of mine for more than a distance equal to the vertical height of its face.	Being complied and will be complied
	b) A suitable fence shall be erected between any railway, public works or roads or Building or structure and the unauthorised persons from approaching the spoil-bank.	
5.3	No person shall, or shall be permitted to approach the toe of an active spoil-bank where he may be endangered from material rolling down the face.	Being complied and will be complied
6.0	Roads four Truck and Dumpers etc:	
6.1	All roads for trucks, dumpers or other mobile machinery shall be maintained in good condition.	
6.2	Where practicable, all roads from the opencast working shall be arranged to provide one way traffic where this is not practicable no road shall be of a	

Sl. No.	Conditions	Compliances
	width less than three times the width of the largest vehicle plying on that road unless, definite turnouts and waiting points are designated.	
6.3	All corners and bends of the roads shall be made in such a way that the operators and drivers of vehicles have a clear view for a distance of not less than 30 metres. Along the road. Wherever it is not possible to ensure a visibility for a distance of 30 metres, there shall be provided two roads for the up & down traffic.	Being complied and will be complied
6.4	Ordinarily no road shall have a gradient steeper than 1 in 16 at any place. Provided that in case of Ramps over small stretches a gradient up to 1 in 10 may be permitted.	
6.5	Where any road exists above the level of the surrounding area, it shall be provided with strong parapet walls or embankments not less than 1 metre in height to prevent any vehicle from getting off the road.	Being complied and will be complied
7.0	Precautions against dust:	
7.1	Adequate arrangements, to allay dry dust by wetting shall be made if, during any operations of drilling, loading, unloading, crushing, dressing etc. dust is likely to be produced in such quantity as may be injurious to health of persons, and also on roads and benches where trucks and dumpers operate. The directives contained in DGMS (Tech.) Circular No. 16 of 75 should be complied with.	Being complied and will be complied
8.0	General Lighting:	
	Where natural lighting is insufficient, adequate general lighting as per standards laid down in Notification No. G.S.R. 804 dated 18.6.75. Part III-Section3(i) (Reproduced in DGMS (Legis.) Circular No. I of 1975), issued under Regulation 154(2) shall be provided during working hours, in the opencast working and along roads. Etc. for proper inspection of high sides and benches of the Opencast working at night suitable search lights shall be provided. The individual workers should also be provided with electric cap lamps to use when they have to go in poorly illuminated places.	Being complied and will be complied
9.0	Supervision:	
9.1	During every production shift the opencast working shall be placed under the charge of an Assistant	Being complied and will be complied

Sl. No.	Conditions	Compliances
	Manager and during maintenance shift, the working shall be placed under the charge of an Overman who shall be responsible to see that, all the regulations and the orders made thereunder are strictly complied with	
9.2	He shall in particular	
	a) Make frequent inspection for avoidance of slides or of materials that may slide or roll from the high walls (including the face and sides) or spoil banks.	Being complied and will be complied
	b) Not allow any persons to work under overhanging ledges or where there is chance of slides, until such danger has been removed.	
	c) Ensure that every person engaged in dressing operations, on high walls is provided with, and uses a safety belt of a type approved by the Director-General of Mines Safety.	
	d) Ensure that all loose material is removed from high walls before drillers are engaged there and	
	e) Ensure that parapet walls along truck roads are properly maintained.	
10.0	Protective Equipment:	
	Every person working in the opencast working shall be provided with, and shall use, protective footwears, hard hat of a type approved by the Director-General of Mines Safety and such other protective equipment as may be prescribed by the Director-General of Mines Safety in accordance with the provisions of Regulation 191, 191-A and 191-B respectively.	Being complied and will be complied
11.0	Precautions while Drilling:	
11.1	The position of every deep hole to be drilled shall be distinctly marked by the overman so as to be readily seen by the drillers.	Being complied and will be complied
11.2	i) No drilling shall be commenced in an area where shots have been fired, until the Shot firer has made a thorough examination at all places, including remaining butts of old deep holes, for unexploded charges that the drill may strike.	
	ii) No drill or bore red or pick shall be inserted in butts of old deep holes even if an examination under clause(a) has failed to reveal presence of explosives.	

Sl. No.	Conditions	Compliances
12.0	Bulk Transport of Explosives:	
	Where explosives are transported in bulk for deep hole blasting the precaution laid down in Regulation 164(4) of the Coal Mines Regulation 1957 shall be strictly complied with.	Being complied and will be complied
13.0	Precautions During Shot Firing	
13.1	a) Shots shall not be fired except during the hours of day light or until adequate artificial light is provided. All holes charged on any one day shall be fired on the same day.	Being complied and will be complied
	b) Shots, if fired beyond day light hours, should be muffled so that, flying fragments from blasting cannot project beyond a distance of 10 metres from the place of firing. In this connection your attention is drawn to DG(Tech.), Circular No. 8 of 1976 for compliance.	Being complied and will be complied
	c) As far as practicable the shotfiring shall be carried out either between shifts or during the rest interval or at the end of work for the day.	
13.2	During the approach and progress of a storm, the following precautions shall be taken	
	a) No explosives, particularly detonators shall be handled.	Being complied and will be complied
	b) If charging operations have begun, the work shall be discontinued until the storm has passed.	
	c) If the blast is to be fired electrically all exposed wires shall be coiled up and it possible placed in the mouth of the holes, or kept covered by something other than a metal plate.	
	d) All wires shall be removed from contact with the steel rails or a haulage track so as to prevent the charge being exploded prematurely by a local strike of the lightening.	
13.3	a) Precautions with regards to taking shelter etc. as laid down in Regulation 170 of coal Mines Regulations 1957 shall be complied with.	Being complied and will be complied
	b) Notwithstanding what is contained in Coal Mines Regulation 170, no persons other than Shotfirer and his assistants, if any, shall be permitted to remain within a radius of 20 metres, or within 60 metres on the same bench where charging of holes with explosives is being carried out.	
13.4	Notwithstanding anything contained in the Coal	

Sl. No.	Conditions	Compliances
	Mines Regulations 1957, the preparation of charges and the charging and stemming of holes shall be carried out under the personal supervision of an Overman who shall fire the shots in deep holes himself.	Being complied and will be complied
14.0	Design Maintenance & Operation of Machinery & Vehicles:	
14.1	Every place of drilling and earth moving machinery or equipment (hereinafter called machine) and every truck, dumpers etc. (hereinafter called vehicle) shall be maintained in good and safe working condition.	Being complied and will be complied
14.2	a) Every machinery or vehicle shall be provided with efficient warning devices, adequate front and rear lights and efficient brakes.	
	b) Audio-visual alarms shall be fitted in all the Heavy Earth Moving machinery and vehicles.	
	c) Every shovel or dragline shall be so designed as to afford the operator clear and uninterrupted vision all around and shall be provided with portable lamp, suitable portable fire extinguishers and retracting ladder for emergency.	Being complied and will be complied
14.3	a) The code of instructions furnished by the manufactures in the matter of maintenance of various machinery and vehicles and preventive maintenance schedules for each type of machinery and vehicle shall be strictly followed.	
	b) Every machine and vehicle shall be allocated atleast one day in every week for maintenance. Before the machine or vehicle is sent out for work after maintenance, it shall be thoroughly inspected by the Engineer, Mechanical Foreman or other competent person appointed by the manager in writing who shall satisfy himself that the machine and vehicle is mechanically sound and in efficient working order.	
	c) A report of every inspection made under clause(c) be recorded in a bound paged book kept for the purpose and shall be signed and dated by the person making the inspection.	
	d) Every machine in use shall be thoroughly inspected once at least in every 24 hours by a competent person. Any damaged or worn-out cable shall be replaced immediately.	

Sl. No.	Conditions	Compliances
	e) A report of every inspection made under clause(e) shall be recorded in a bounded paged book kept for the purpose and shall be signed and dated by person making the inspection.	Being complied and will be complied
14.4	If the Engineer, Mechanical Forman or other competent person, making an inspection, notices any defect in any machinery or in a dumper, the said machinery or the dumper shall not be used until the defect had been remedied.	Being complied and will be complied
14.5	Any defect in a machinery or vehicle reported by its operator shall be promptly attended to	
14.6	Any machine or vehicle found to be in unsafe operating condition shall be tagged at the operating position "OUT OF SERVICE DO NOT USE" and its use shall be prohibited until the unsafe condition has been corrected.	
14.7	All repairs to a machinery or vehicle shall be done at a location which will provide a safe place for the persons engaged on repairs.	
14.8	Except for testing trail or adjustment which must un-accessorily be done while the machine or vehicle is in motion, every machine or vehicle shall be shut down and positive means taken to prevent its operation while any repair or manual/lubrication is being done.	
14.9	Any machinery, equipment or part there of which is suspended or held apart by use of slings, hoists or jacks shall be substantially blocked or cribbed before men are permitted to work underneath or between such machinery, equipment or part thereof	Being complied and will be complied
14.10	Power shall be disconnected when repairs are made in any electric machine.	Being complied and will be complied
14.11	Daily Examination of Machinery and Vehicle:	
	a) At the commencement of every shift, the Engineer, Mechanical Foreman or other authorised competent person shall personally inspect and test every machine and vehicle paying special attention to the following details:-	Being complied and will be complied
	i) That the brakes and horn or other warning devices are in working order.	
	ii) If the vehicle or machine is required to work after day light hours, that the lights are in working order. He shall not permit the vehicle or machinery to be	

Sl. No.	Conditions	Compliances
	taken out for work nor shall he drive the vehicle unless he is satisfied that it is mechanically sound and in efficient working order.	
	b) He shall also maintain a record of every inspection in a bound paged book kept for the purpose. Every entry in the book shall be signed and dated by the person making the inspection.	
15.0	Operation of Machinery	
	a) No person other than the operator or his helper, if any. Or the manager or any person so authorised in writing by the manager shall ride on a shovel (or dragline).	Being complied and will be complied
	b) No person shall be permitted to ride in the bucket of a shovel.	
	c) No shovel (or dragline) shall be operated in a position where any part of the machine, suspended loads or lines are brought closer than 3 mtrs. To exposed high voltage lines, unless the current has been cut off and the line de-energized. A notice of this requirement shall be posted at the operation's cabin.	
	d) Electrical cables, if any, shall be laid in such a manner that they are not endangered either by falling object or by mobile equipment.	
15.2	The shovel bucket shall be pulled out of the bank as soon as it is full.	Being complied and will be complied
15.3	When not in operation, the bucket shall be kept resting on stable ground and shall not be left hanging.	
15.4	When being operated in soft or unstable ground every shovel (and dragline) shall be supported by heavy planks or poles so as to distribute the load of the machine over larger area to prevent any danger of the shovel (or dragline) overturning. When not in use, the shovel or dragline shall be moved to and kept on stable ground.	
15.5	If more than one stripping machine is in use in any area, either on the same bench or on different benches, the machine shall be so spaced that there is no danger of accident from flying or falling objects etc. from one machine to the other.	
16.0	Duties of Machine operations:	
16.1	a) Every shovel (and dragline) shall be under the	

Sl. No.	Conditions	Compliances
	charge of a competent person authorised in writing by the manager herein called the "Operator".	Being complied and will be complied
	b) At the commencement of every shift, the operator shall also personally inspect and test the machine, paying special attention to the following details.	
	i) That brakes and every warning device are in working order and,	
	ii) If the machine is required to work after day lights hours, that lights are in working order. He shall not take out the machine for work nor shall be work the machine unless he is satisfied that it is mechanically sound and in efficient working order	
16.2	a) The operator shall not operate the machine when persons are in such proximity as to be endangered.	Being complied and will be complied
	b) He shall not swing the bucket of a shovel over passing haulage units. While trucks/dumpers are being loaded, he shall swing over the body of the truck/dumper and not over the cab, unless the cab is protected by a substantially strong cover.	
16.3	The operator shall not allow any unauthorised person to ride on the machine.	
17.0	Operation of Trucks-Dumpers and other vehicles:	
17.1	No person shall be permitted to ride on the running board of a truck or dumper.	Being complied and will be complied
17.2	a) As far as possible, loaded trucks or dumpers shall not be reversed on gradient.	
17.2.	c) Standard traffic rules shall be adopted and followed during movement of all trucks and dumpers. They shall be prominently displayed at the relevant places in the open cast workings and truck/dumper road.	
17.3	When not in use every truck or dumper shall be moved to and stood on proper parking places.	
17.4	No person shall be permitted to work on the chassis of a truck or dumper with the body in a raised position until after the truck or dumper body has been securely blocked in position.	
17.5	No unauthorised person shall be permitted to enter or remain in any dumping yard or turning points	

Sl. No.	Conditions	Compliances
18.0	Duties of Truck/Dumper operations:-	
18.1	Before commencing work the driver shall generally inspect and test the vehicle for its roadworthiness paying special attention to the tyre air-pressure, brakes, horn and lights. If he finds any defect which is likely to make the driving unsafe, he shall report the matter to the competent person and shall not operate the vehicle till the defects are remedied.	Being complied and will be complied
18.2	a) He shall not drive too fast, shall avoid distractions and shall drive defensively. He shall not attempt to overtake another vehicle unless he can see clearly far enough ahead to be sure that he can see clearly far enough ahead to be sure that the can pass it safety. He shall also sound the audible warning signal before overtaking.	
	b) When approaching a stripping equipment, the driver of the truck or dumper shall sound the audible warning signal and shall not attempt to pass the stripping equipment until he has received a proper audible signal in reply.	
	c) Before crossing road or railway line, he shall reduce his speed, look in both directions along the road or line and shall proceed across the road or line only if it is safe to do so.	
	d) The driver shall sound the audible warning signal while approaching blind corner or any other points from where person may walk in front unexpectedly.	
	e) The driver shall not operate a truck or dumper in reverse unless he has clear view of the area behind the vehicle and/or he has the assistance of a (Spotter or Pitman) duly authorised in writing for the purpose by the Manager. He shall also give an audible warning signal before reversing a truck or dumper.	
	f) The driver shall be sure of clearance before driving through tunnels, archways, plants, structures etc.	
18.3	The driver shall not allow any unauthorised person to drive the vehicle. He shall also not allow more than the persons allowed with vehicle.	Being complied and will be complied
18.4	The driver shall see that the vehicle is not over loaded and that the material is not loaded in truck or dumper so as to project horizontally beyond the sides of its body and that any material projecting	

Sl. No.	Conditions	Compliances
	beyond the front or rear, is indicated by a red flag during day and by red light after day light hours.	
19.0	Protection of workers against noise and vibration in the working environment:	
	Suitable steps should be taken by all appropriate means to reduce the exposure of workers to any excessive noise and vibration. In this connection, the requirements of DGMS (Tech.) Circular No. 18 of 1975 should be complied with.	Being complied and will be complied

5. **DGMS letter No. KR/63/Ranchi, dt 7th/October, (Nov.) 1989 Permission under Regulation 98 and 100(1) of Coal Mines Regulations, 1957 to do deep hole drilling/blasting in overburden deploying H.E.M.M. and to extract pillar of Bermo seam manually adopting O/C method at DVC Bermo Colliery.**

Sl. No.	Conditions	Compliances
(1)	The conditions detailed in Annexure A & B attached with this letter shall be strictly followed.	Noted
(2)	Height of benches in coal shall strictly comply with Reg. 98(3) of Coal Mines Regulations, 1957.	Being complied and will be complied
(3)	Height of bench in overburden shall not exceed digging height of the machines working on it.	
(4)	Adequate precautions shall be observed while working at an near any fault plane to guard against danger of slidding of sides.	
(5)	Accumulation of water shall not be allowed within 60m of the quarry.	
(6)	Blasting shall not be done within 300m of the P.W.D. road company quarters as well as C.C.L.'s quarters without obtaining permission under Regulation 170 for doing controlled blasting.	
(7)	The quarry working shall not be extended to within 45m. of the P.W.D. road and C.C.L.'s quarters without obtaining permission under Regulation 105 or else, the road and quarter shall be diverted/vacated./ shifted to atleast away from the quarry	Noted
(8)	If at any time any one of the condition subject which this permission has been granted, is violate or not complied with this permission shall be deemed to have been revoked with immediate effect.	
(9)	The above permission may be amended or withdrawn	Noted

Sl. No.	Conditions	Compliances
	at any time, if considered necessary and is being issued without prejudice to any other provisions of the law which may become applicable at any time.	
(10)	In the event of any change in the circumstances connected with this permission which is likely to endanger the life of persons employed in the mine or the mine the mining operations for which this permission has been granted shall be stopped forth with and intimation given to this Directorate. The said mining operation shall not be resumed without express and fresh written permission from this Directorate.	Noted and will be complied
(11)	This Directorate shall be informed as soon as mining operations are commenced in accordance with the above permission. Intimation about completion of the mining operations should also be sent promptly and in any case not later than one month thereof.	Noted and will be complied

Annexure 'B': Letter No. RR/Perm/64-66 dtd. 7.11.1989

Schedule of conditions for permission under Regulation 100 of CMR, 1957 to extract pillars by Opencast method

Sl. No.	Conditions	Compliances
1.	No person shall be allowed at any place in the Opencast workings where the thickness of overburden and/or Coal over any gallery has been reduced to 1.5m or less.	Being complied and will be complied
2.	All galleries and junctions of galleries wherever the thickness of overlying overburden and/or Coal is less than 6m. be supported by cogs at intervals of 3m. in a systematic manner. OR Where Heavy Machineries are in use; these machineries shall not be brought over galleries having parting less than 6m. unless the underground galleries are completely filled in by blasting.	
3.	Except for the purpose of inspection and support work no person shall be allowed in the Underground workings beneath and within 20m. of the Opencast excavation.	
4.	Where the underground workings are accessible, the same shall be surveyed and cleaned of all coal dust and	

Sl. No.	Conditions	Compliances
	thickly stone dusted before commencement of extraction of pillars.	
5.	All persons from Underground in the same working seam or any other seams or section connected there with shall be withdrawn before commencement of blasting operation in the Quarry, and no work persons shall be readmitted into the said underground workings unless and until the same have been inspected by a competent person duly authorised for the purpose and found free from any noxious gases and/or signs of fire etc. OR The underground workings to be quarried shall be isolated by explosion proof stoppings or by any other approved manner from any active workings area either in the same seam or different seam or section as the case may be, so as to prevent transference of danger to the said active working area.	
6.	The spacing of holes in the bench lying immediately above the coal seam (referred to herein after as last OB) shall be so adjusted that the holes do not lie immediately above the galleries as far as possible in order to ensure that blast holes do not directly fire into gallery	Being complied and will be complied
7.	LOX explosives shall not be used in shot hole which have been drilled to within 3.0 M of coal seam.	
8.	The depth of hole in the last OB shall be such as to leave at least 3.0 Metrs. Thickness of OB above the coal seam, and to ensure compliance with this requirement a pilot hole shall be put for each round of blasting to determine the total thickness of OB over the Coal Seam.	
9.	Where there is any doubt and particularly where there are cracks and crevices the bottom 2 metrs. Lengths of the hole shall be filled with sand.	
10.	Unless otherwise permitted by DGMS in writing and subject to such conditions as may be imposed, no delay action detonators shall be used in Coal and the manner of extraction of pillars shall be by drilling and blasting holes in Coal pillars only from top downwards.	
11.	Where more than one section of the seam had been developed on pillars, the shot holes shall not be drilled to within 3 mtrs. Of a lower section, and care be taken that, as far as possible the blast holes do not directly fire into any Underground-gallery. To ensure compliance	Being complied and will be complied

Sl. No.	Conditions	Compliances
	with this requirement, a pilot hole shall be put for each round of blasting.	
12.	All holes in the last OB beneath and/or coal shall be charged with water ampoules or with moist sand of at least 0.6m. in length at the bottom of the hole.	Being complied and will be complied
13.	No person including shotfirer shall take shelter within 100m. of the quarry openings and such shelter shall be of an approved design.	
14.	The open-cast working and underground set of working shall be under the administrative and technical direction and control of the same manager and /or agent.	

Annexure to Letter No. RR/Perm/83/64-66 Ranchi, the 7.11.1989

Sl. No.	Conditions	Compliances
1.	GENERAL:	
(1)	Except where otherwise provided for in this conditions perm all provisions of the Coal Mines Regulations 1957 relating to opencast workings, use of explosives and machinery shall be strictly complied with.	Noted
(2)	(a) (i) Adequate general lighting shall be provided at the work sites and in the opencast workings after sun set; (ii) In addition, flood lights shall be provided for proper inspection of the quarry faces and work sites at night.	Being complied and will be complied
	(b) After sun set, all work persons employed in the opencast workings shall be provided individually with electric cap lamps.	
(3)	Suitable arrangements shall be made for proper inspection at night at suitable intervals of all work places and sites in order to guard against the fall of rock or material.	
2.	(a) No coal or carbonaceous mater or debris or overburden shall be stacked within 100m, around the periphery of the opencast workings.	
	(b) Blasting operations shall be so regulated that broken coal is removed/transported out of the quarry expeditiously.	
	(c) Pipe range containing water under pressure with taps at 20m. apart shall be laid in and around the quarry workings. Such pipe range shall be connected to a water reservoir of adequate capacity so that water in the pipe range is available under pressure of not less than	

Sl. No.	Conditions	Compliances
	75 lbs/sq. inch, Adequate number of water hoses of 120m. length shall be kept stored at suitable places in the quarry.	
	(d) All part of the quarry including places within the quarry limit shall be inspected daily for detection of heating or fire. As soon as heating or a fire is detected, suitable measures to quench it and to dig it out shall be adopted. All heated debris/coal shall be removed by machines and deposited outside the premises of the opencast workings.	Being complied and will be complied
	(e) No persons shall be employed either directly below or near the spot on fire within 30m. of it except for the purpose of removing the hot material or quenching it. The employment of persons so engaged for dealing with the fire shall be governed by provisions of Reg. 119(1)(a) and 2(a) of the Coal. Mines Regulations, 1957.	
3.	(a) All damages to the lives and property not belonging to the management of the mine and damages or injuries to persons as a result of blasting or mining operations shall be adequately indemnified. Should there be any controversy in this respect, the decision of the D.G.M.S. shall be final and binding on the management	Being complied and will be complied
	(b) No workings shall be extended to any point within 45m. of a village, dwellings, Roadway, Railway, Public structure.	
4.	(a) No work whatsoever shall be done where the provision of Regulation 126 are attracted due to the presence of jore and nullah in the vicinity. The entire ground lying within 15m. of all the nullahs and jores shall be filled up and raised and consolidated to a R.L. of atleast three metres above the highest flood level	Being complied and will be complied
	(b) Blasting operations shall be under the direct charge of one Assistant Manager in strict compliance of Regulation 170A of the Coal Mines Regulations. 1957.	
2.	OPENCAST WORKINGS:	
	(a) Opencast workings shall be worked in benches so that maximum height of the bench shall not exceed the length of the boom of the shovel and width thereof shall not be less than twice the height of benches or 5 times the length of the largest machine whichever is more unless otherwise permitted in writing.	Being complied and will be complied
	(b) (i) Tipping trucks or similar carries if employed for	

Sl. No.	Conditions	Compliances
	transportation of coal. Separate roads for such trucks or carriers shall be provided and safe loading practices shall be adopted avoiding plying of trucks or carriers on the same floor where men are to work, travel or rest.	
3.	FENCING AROUND OPENCAST WORKINGS:	
	(a) The periphery around the limits of opencast workings shall be kept fenced with a masonry wall not less than 0.40 m. thick and not less than 1.2 metre high, with a parapet top.	Will be complied
	(b) The edges of benches of the opencast workings shall be kept fenced with wire ropes strand or barbed wire supported by moveable posts (wooden, iron or concrete). The gap between the adjacent rope strands or wires shall not be more than 0.30m. and the bottom most rope strand wire shall not be 0.25m and the top most rope strand or wire not less than 1.00 m. from ground level.	
4.	SPOIL OVERBURDEN OR DEBRIS BANKS	
(1)	(a) Spoils, overburden, or debris shall be deposited at places belonging to the mine and duly approved by the manager in writing.	Being complied and will be complied
	(b) Spoils overburden or debris shall not be deposited, beneath transmission, telephone or power lines or near any public structure.	
	(c) The slope of a spoil bank face shall not exceed the natural angle of repose of the material being deposited or 37½ degree from the horizontal whichever is less. The spoil bank face shall not be retained by artificial means.	
	(d) Any Spoil-bank exceeding 3.0 metres in height shall be benched so that no bench exceeds. 3.0 metres in height and width of benches is not less than 1.5 times the height and general slope does not exceed 1 vertical to 1.5 horizontally.	
(2)	(a) The spoils overburden or debris shall not be deposited within 45m. of a railways or other structures and it shall not be permitted to approach any of the above said structures closer than a distance equal to 1.5 times the vertical height of its face.	
	(b) A suitable barrier shall be constructed between any	

Sl. No.	Conditions	Compliances
	railway, public works, road, building or structure and the toe of an active spoil bank so as to prevent materials rolling down beyond the limit.	Being complied and will be complied
(3)	No person shall or shall be permitted to approach the toe of an active spoil bank.	
5.	ROADS FOR TRUCK AND DUMPERS ETC.	
(1)	All haul roads for dumpers or other mobile machinery shall be constructed to suit its load capacity and maintained in good condition. No vehicles, other than heavy transport vehicles shall use haul roads except between designated points and when permitted in writing by the manager.	Being complied and will be complied
(2)	All roads from the opencast workings shall be arranged to provided one way traffic and no road shall be of a width less than three times the width of the largest vehicle plying on that road. Where it is not practicable, definite crossing points, turn outs and waiting points shall be designated for use of vehicles.	
(3)	All corners and bends in roads, shall be made in such a way that the operators and drivers of vehicles have clear view for a distance of not less than 30m. along the road.	
(4)	Except with the express permission (in writing) no road shall have a gradient steeper than 1 in 20 at any place.	
(5)	Where any road exists above the level of the surrounding areas, it shall be provided with strong parapet walls to prevent any out-of-control vehicles from getting off the road.	
(6)	ADDITIONAL DUTIES OF ASSISTANT MANAGER INCHARGE OF OPENCAST WORKINGS	
(1)	During every shift, the opencast workings shall be places under the charge of a qualified experience Assistant Manager to have overall control and guidance of all operations.	Being complied and will be complied
(2)	During his shift the Assistant Manager shall:-	
	(a) Make frequent inspection for evidence of any unsafe conditions including evidence of slide of material from high wall and shall guide that operations are conducted in a safe and efficient manger.	
	(b) Not allow any person to work under overhanging ledges or where there is evidence of slides, until such danger has been removed.	

Sl. No.	Conditions	Compliances
	(c) Ensure that every person engaged in dressing operations on high walls is provided with, and uses, a safety belt of a type approved by the Chief Inspector.	
	(d) Ensure that all loose material is removed from high walls before drillers are engaged there; and	
	(e) Ensure that parapet walls along truck roads are properly maintained.	
7.	ADDITIONAL DUTIES OF ENGINEERS PLACED IN CHARGE OF MACHINES AND EQUIPMENTS IN OPENCAST WORKINGS.	
	During each shift the machines and equipments at work shall be placed under the charge of qualified and experienced engineer to effect inspection, examination, safe operations and maintenance of the machines, equipments and accessories. During his shift the engineer/engineers shall	Being complied and will be complied
	(a) Inspect, examine machines, equipments and accessories and satisfy himself that they are in sound and safe working order;	
	(b) Not allow any machine, equipment to be used if it is found defective;	
	(c) ensure that every machine, equipment, accessory used is in a safe and efficient manner;	
	(d) Ensure that each operation, activity is carried on in safe and efficient manner.	
8.	EXAMINATION, REPAIR AND MAINTENANCE OF MACHINES:	
(1)	(a) A code of practice for inspection, examination and repair of all breakdowns and repairs etc. shall be drawn up and practices.	
	(b) Every drilling and earth moving machinery or equipment or accessory (herein after called machine) shall be thoroughly examined at least once in each shift and maintained in good and safe working conditions.	
	(c) A record of all such examinations and maintenances shall be maintained in a bound paged register and shall be signed by the engineer in charge of the shift and counter signed by the colliery engineer.	
(2)	(a) Every machine shall be allocated atleast on day in every week for examination and maintenance, when it shall be thoroughly examined and inspected by the	

Sl. No.	Conditions	Compliances
	Engineer, who shall satisfy himself that it is mechanically sound and is in efficient working order before it is allowed to be re-used.	Being complied and will be complied
	(b) A report of every maintenance made under closure (a) Shall be recorded in a bound paged book kept for the purpose, and shall be signed and dated by person making the inspection and countersigned by the engineer.	
	(c) If the engineer, mechanical foreman or other competent person making an inspection under clause(1)(a) notices any defect in any machinery the said machinery shall not be used until the defect has been remedied.	
	(d) Any defect in a machinery reported by its operator shall be promptly attended to.	
(4)	(a) Any machinery found to be in an unsafe operating condition shall be tagged at the operator's position; "Out of Service, Do not Use" and its use shall be prohibited until the unsafe conditions has been corrected.	
	(b) All repairs to a machine shall be done at a location which will provide a safe place for the persons engaged on repairs.	
	(c) Except for testing, trial or adjustment, which must necessarily be done while the machine is in motion, every machine shall be shut down and positive means taken to prevent its operation while any repair or manual lubrication is being done.	
	(d) Power shall be disconnected when repairs are made to any electric machine.	
	(e) Any machinery, equipment or part thereof which is suspended or held apart by use of slings, hoists jacks shall be substantially blocked or cribbed before men are permitted to work underneath or between the same.	
	(f) The operator or driver shall not leave the machine while it is running unless it is placed under the charge of a competent person.	
9. (1)	General Lighting:	
	Where natural lighting is insufficient, adequate general lighting shall be provided during working hours, in the opencast working and along road etc.	Being complied and will be complied
(2)	Protective Equipment:	
	Every person working in the opencast working shall be	Being complied and

Sl. No.	Conditions	Compliances
	provided with, and shall use, a hard hat and reinforced safety boots of a type approved by the Chief Inspector of Mines.	will be complied
(3)	Precautions Against Dust:	
	Adequate arrangements, to allay dry dust by wetting shall be made on roads and benches where trucks and dumpers operate.	Being complied and will be complied
10.	DRILLING AND BLASTING OF DEEP HOLES:	
	Precautions while drilling:	
1.	The position of every deep hole to be drilled shall be distinctly marked by the overman so as to be readily seen by the drillers.	Being complied and will be complied
2.	(a) No drilling shall be commenced in an area where shots have been fired, until the shotfirer has made a thorough examination at all places, including remaining butts of old deep holes, for unexploded charges that the drill may strike.	
	(b) No drill or bore red or pick shall be inserted in butts of old deep holes even if an examination under clause (a) has failed to reveal presence of explosives	
3.	(a) Drilling and charging of deep holes shall not be carried out in the same area at the same time.	
	(b) Drilling operations shall not be carried on simultaneously on two benches, at places directly one above the other.	
11.	DUTIES OF DRILL OPERATIONS:	
(1)	At the beginning of his shift, the drill operator shall examine the drilling equipment and satisfy himself that-	Being complied and will be complied
	(a) Crown blocks are mounted securely;	
	(b) Where compressed air drills are used, all holes connections are in order; and	
	(c) The drilling equipment is in safe working condition.	
(2)	The drill operator shall ensure that-	
	(a) Work persons keep clear of auger and drill stem while the drill is in motion;	Being complied and will be complied
	(b) Work persons do not work under suspended tools, when tools are removed from the holes, these shall be lowered on the platform;	
	(c) All finished drill holes are properly plugged so as to avoid possible leg injuries to any one accidentally	

Sl. No.	Conditions	Compliances
	stepping into the hole.	
12.	GENERAL:	
(1)	All conditions specified by the Chief Inspector of Mines in the documents granting permission to carry a larger quantity of explosives in a single case or canister or for the use at one time in one place of more than one such case or canister, in relaxation of Regulation 163 of the Coal Mines Regulations, 1957, shall be strictly complied with.	Being complied and will be complied
(2)	Notwithstanding, anything contained in the Coal Mines Regulations, 1957, the preparation of charges and the charging and stemming of holes shall be carried out under the personal supervision of an Overman who shall fire the shorts in deep holes himself.	
13.	CHARGING OF DEEP HOLES	
1.	Explosives shall be delivered first to the hole farthest from the 'Priming Station' so as to avoid persons walking among piles of explosives.	Being complied and will be complied
2.	Not more than one hole shall be in the process of being charged at any one face at any one time.	
3.	All charging, stemming and connecting up shall be done while. Standing on the solid, that is to say, on the side of holes remote from the quarry face.	
14.	PRECAUTIONS DURING FIRING:	
(1)	(a) Shots shall not be fired except during the hours of day light. All holes charged on any one day shall be fired on the same day.	Being complied and will be complied
	(b) As far as practicable the shot firing shall be carried out either between shifts, or during the rest interval, or at the end of work for the day.	
(2)	The danger zone shall be distinctly demarcated (by means of red flags properly arranged and supported) at least 30 minutes before firing of holes is to commence.	
(3)	Ten minutes before firing, a siren installed for the purpose shall be blown three times for one minute each at intervals of one minute; and no shots shall be fired unless the blasting foreman with assistance of sufficient number of persons appointed in writing by the manager for the purpose has ensured that all persons have left the danger zone or have taken adequate shelter.	
(4)	No shot shall be fired when there is traffic on any road or Railway track within the danger zone.	

Sl. No.	Conditions	Compliances
15.	PRECAUTIONS AGAINST ELECTRICAL STORM:	
(1)	During the approach and progress of an electric storm, the following precautions shall be taken.	Being complied and will be complied
	(a) No explosives, particularly detonators, shall be handled,	
	(b) If charging, operations have begun, the work shall be discontinued until the storm has passed,	
	(c) If the blast is to be fired electrically, all exposed wires shall be coiled up and, if possible placed in the mouth of the holes, or kept covered by something other than a metal plate.	
	(d) All wires shall be removed from contact with the steel rails of a haulage track so as to prevent the charge being exploded prematurely by a local strike of the lighting.	
16.	DESIGN, OPERATION AND MAINTENANCE OF SHOVELS (AND DRAGLINE):	
(A)	Design:	
(1)	(a) Every Shovel (and dragline) shall be so designed as to afford the operator clear and uninterrupted vision all around.	Being complied and will be complied
	(b) Every shovel (and dragline) shall be provide with:-	
	i) Efficient warning devices;	
	ii) Adequate front and rear lights and a portable lamp for emergency, unless the shovel is not used after day-light hours; and	
	iii) An efficient portable fire extinguisher so placed as to be within easy reach of the operator.	
	iv) A special retracting ladder mounted on the excavation machine.	
(B)	Operations :	
(1)	Every shovel (and dragline) shall be under the charge of a competent person authorised in writhing by the manager, herein called the 'Operator'.	Being complied and will be complied
(2)	(a) No person other than the operator or his helper if any, or the manager or any person so authorised in writing by the manager shall ride on a shovel or dragline	
	(b) No person shall be permitted to ride in the bucket of a shovel.	
(3)	Shovel dippers (and dragline buckets) shall be lowered	

Sl. No.	Conditions	Compliances
	to the ground during greasing operations.	
(4)	(a) No shovel (or dragline) shall be operated in apposition where any part of the machine suspended and leads or lines are bought closer than 3 metres to exposed high voltage lines, unless the current has been cut off and positive means taken to prevent the lines from being energised. A notice of this requirement shall be posted at the operator's position.	Being complied and will be complied
	(b) Electrical cables, if any, shall be laid in such a manner that they are not endangered either by falling rocks or by any mobile equipment.	
(5)	The shovel bucket shall be pulled out of the bank as soon as it is full.	
(6)	(a) When being operated in soft or unstable ground, every shovel (and dragline) shall be supported by mats, heavy planks or poles so as to distribute the load of the machinery over larger area and to prevent any danger of the shovel (or dragline) overturning itself.	
	(b) When not in use, the shovel (or dragline) shall be moved to and stood on stable ground.	
(7)	If more than one stripping machines are in use in any area either on the same bench or on different benches the machines shall be so spaced that there is no danger of accident from flying or falling objects etc. from one machine to the other.	Being complied and will be complied
(C)	Duties of Shovel (and Dragline) Operators:	
(1)	(a) At the commencement of every shift, the operator shall personally inspect and test the machine, paying special attention to the following details.	Being complied and will be complied
	i) That every warning device is in working order; and	
	ii) If the machine is required to work after day-light hours. He shall not take out the machine for work nor shall he work the machine unless he is satisfied that it is mechanically sound and in efficient working order including the lighting fixtures.	
	(b) The operator shall maintain are cord of every inspection made under clause(a) in abound paged book kept for the purpose and shall sign every entry made therein.	
(2)	(a) The operator shall keep the cab window clean so as	

Sl. No.	Conditions	Compliances
	to ensure clear vision at all times.	
	(b) The walkways in or about the cab of any shovel/dragline shall be kept free of loose tools, grease containers or other materials that might fall or present a following or tripping hazard.	Being complied and will be complied
(3)	(a) The operator shall not operate the machine when persons are in such proximity as to be endangered.	
	(b) He shall not swing the bucket over passing haulage unit when the trucks/dumpers are being loaded, he shall swing over the body of the truck/dumpers and not over the cab, unless the cab is protected by a substantially strong cover.	Being complied and will be complied
(4)	Before leaving the machine, the operator shall lower the bucket to the ground.	
(5)	The operator shall not allow any unauthorised person to ride on the machine.	
17.	DESIGN, OPERATION AND MAINTENANCE OF TRUCKS OR DUMPERS:	
(A)	Design:	
	Every truck or dumper shall be provided with-	
	i) Efficient brakes;	
	ii) Efficient audible warning devices; and	
	iii) Efficient head-lights, if the truck or dumper is required to work after day light hours.	Being complied and will be complied
(B)	Operation:	
(1)	Every truck or dumper shall be under the charge of a competent person authorised in writing by the manager herein called the 'driver'.	
(2)	(a) No person other than the driver or his helper, if any or the manager or any person authorised in writing by the manager shall ride on a truck or dumper.	
	(b) No person shall be permitted to ride on the board of a running truck or dumper.	
(3)	(a) As far as possible, loaded trucks or dumpers shall not be reversed on gradients.	
	(b) Sufficient stop blocks shall be provided at every tipping point and these shall be used on every occasions, material is dumped.	
	(c) Standard traffic rules shall be adopted and followed during movement of all trucks and dumpers. They shall be prominently displayed at relevant places in the	Being complied and will be complied

Sl. No.	Conditions	Compliances
	opencast workings and truck/dumpers roads.	
(4)	When not in use, every truck or dumper shall be moved to and stood or proper parking places.	Being complied and will be complied
(5)	No person shall be permitted to work on the chassis of a truck or dumper, with the body in a raised position until after the truck or dumper body has been securely blocked in position. The mechanical hoist mechanism shall not be depended upon to hold the body of the truck or dumper in a raised position.	
(C)	Duties of Truck/Dumper Operators:-	
(1)	(a) Before commencing work, the driver shall personally inspect and test the vehicle, paying special attention to the following details:-	Being complied and will be complied
	i) That brakes are in working order;	
	ii) That the warning devices are in working order; and	
	iii) If the vehicles is required to work after daylight hours that the lights are in working order. He shall not take out the vehicle for work nor shall be drive the vehicle unless he is satisfied that it is mechanically sound and in efficient working order.	
	(b) The driver shall maintain a record of every inspection made under clause(a) in a bound paged book kept for the purpose and shall be signed and dated by the person making the inspection.	
(2)	The drier shall keep the cab window clean so as to ensure clear vision at all times.	
(3)	(a) The driver shall ensure that the gear is in neutral position before stopping the engine.	
	(b) The driver shall handle the truck/dumper carefully and keep it under control at all times. He shall negotiate downhill gradients in low gear so that minimum of braking is required.	
	(c) He shall not drive too fast, shall avoid distractions and shall drive defensively. He shall not attempt to overtake another vehicle unless he can see clearly for enough ahead to be sure that he can pass it safely. He shall also sound audible warning signal before overtaking.	
	(d) When approaching a stripping equipment, the driver of the truck or dumper shall sound the audible warning signal and shall not attempt to pass the stripping	

Sl. No.	Conditions	Compliances
	equipment until he has received a proper audible signal in reply.	Being complied and will be complied
	(e) Before crossing a road or railway line, he shall reduce his speed, look in both directions along the road or line, and shall proceed across the road or line only if it is safe to do so.	
	(f) The driver shall not operate the truck or dumper in reverse unless he has a clear view of the area behind the vehicle or he has the assistance of a 'spotter' or 'pitmen' duly authorised in writing for the purpose by the manager. He shall give an audible warning signal before reversing a truck or dumper.	
	(g) The driver shall be sure of clearance before driving through tunnels, archways, plant structure, etc.	
	(h) The driver shall not driver 'nose to tail' particularly behind a vehicle with twin rear wheels from which a stone piece wedged between the tyres may play back into the windscreen of his vehicle.	
(4)	The driver shall see that the vehicle is not overloaded and that material is not loaded in a truck or dumper as to project horizontally beyond the sides of its body and that any material projecting beyond the front or rear is indicated by a red flag during day a red light after daylight hours.	Being complied and will be complied
(5)	The driver shall not allow any unauthorised person to ride on the vehicle. He shall also not allow more than the authorised number of persons to ride on the vehicle.	
(D)	Testing of Brake	
	At least once in two weeks the brakes of the truck, dumper or any such other vehicles shall be tested as indicated below:-	Being complied and will be complied
(1)	(a) Service Brake Test:-	
	The brake shall be tested on a specified gradient and speed when the vehicle is fully loaded. The vehicle shall stop within a specified distance when the brake is applied. The specified stopping distance shall be obtained by the distance travelled by the vehicle.	Being complied and will be complied
	(b) Parking Brake Test:	
	The parking brake shall be capable to hold the vehicle when it is fully loaded and placed at the maximum gradient of roadway which is permitted for a period of at least ten minutes.	

Sl. No.	Conditions	Compliances
	(c) A record of such test shall be maintained in a bound paged book and shall be signed by the person carrying out the test and the engineer and manager.	Being complied and will be complied
(E)	Inspection and other precautions:	
(1)	Surprise inspection shall be carried out by the Engineer/superior official at an interval not exceeding 15 days to ensure that the examination schedule of machinery/equipment are carried out.	Being complied and will be complied
(2)	While inflating tyres. Suitable protective cages shall be used. Tyres shall never be inflated by sitting either in the front or on the top of the same.	
(3)	While the vehicle is being loaded/unloaded on gradient. The same shall be secured stationary by parking brake and other means such as suitably designed stopper blocks which would be placed below the tyres.	
(4)	Operation and maintenance of heavy machineries such as shovel, dumpers, etc shall be done strictly in accordance with the operation instruction. The operation instructions and maintenance schedule shall be obtained from the manufactures.	
(5)	(a) Automatic fire protection system shall be provide and maintained in working order for surface heavy machinery such as coal haulers, mine haulage vehicles, ash haulers dozers, front end loaders, draglines, bucket wheel excavators, blast hole drills, hydraulic and electric shovels etc. It is also necessary that the recommended procedure for testing of such fire protection system at a given schedule by the manufacturer is also adopted. The automatic fire systems. Consist of one or more containers of fire suppressant (usually a dry chemical) connected by a fixed plumbing network to nozzles directed at specific predetermined fire hazard areas of the machinery.	Being complied and will be complied
	(b) Optical, thermal or any other suitable type of sensing device shall be suitably located to sense the fire and actuate the suppressant to come out through the nozzles already fixed to deal with the fires, an over riding manual system along with fire alarm shall also be additionally provided for better effectiveness of the system.	
18	INSPECTION, EXAMINATION AND MAINTENANCE OF ELECTRICALLY OPERATED HEAVY EARTH MOVING MACHINES, EQUIPMENT AND ACCESS	

Sl. No.	Conditions	Compliances
(1)	No machine, equipments or accessory of any electrically operated heavy earth moving machine shall be installed commissioned and used without carrying out the following tests:-	OK
(I)	Electrical Shovel:	
	i) All the H.V. tests as given in I.E. Rule 65,	Being complied and will be complied
	ii) Insulation test with H.V. megger,	
	iii) Oil test and	
	iv) E/L & O/L and single phase preventer and stall protection relays.	
	(b) Trailing Cable:	
	i) Insulation test with H.V. megger.	Being complied and will be complied
	ii) Earth continuity test;	
	iii) Earth loop resistance test	
	(c) Shovels EKG-4.6	
	All tests enumerated in the instruction manual of manufacturers.	
(II)	Drilling Equipment (CBW-250)	
	(a) Field Switch:	Being complied and will be complied
	i) Insulation test;	
	ii) Earth continuity;	
	iii) Earth loop resistance	
(III)	Trailing Cable:	
	i) Insulation test;	Being complied and will be complied
	ii) Earth continuity: &	
	iii) Earth loop resistance	
(IV)	Drilling Equipments:	
(1)	i) Insulation test of all auxiliary motors i.e. rotor compressor, caterpillar drive, hydraulic pump motor etc.	Being complied and
	ii) Efficacy of Asym-meter for earth fault in the drill machine body.	
	iii) Emergency tripping when required.	
	iv) All the hydraulic valves, pressure slide valve etc. for their efficacy.	
(2)	(a) If the results of tests enumerated in I to IV above do not conform to limits prescribed in I.E. Rules, 1956 (Revised 1982), I.S.I. specifications and directions issued in this respect from time to time the machine,	

Sl. No.	Conditions	Compliances
	equipments switch or cable shall not be energised and used.	will be complied
	(b) The above test results shall be recorded in a bound paged book and shall be signed and dated by the Electrical Supervisor or Senior Electrician holding H.V. Certificate issued by the State Licensing Board and shall be countersigned by the Colliery Engineer.	
(V)	Electrical:-	
	The efficacy of earth leakage relays protecting the trailing cables of heavy earth moving machines shall be tested in the beginning of each shift by a competent person (senior electrician or supervisor) and if they are found inoperative, power shall not be switched on till the defects are removed. The results of all such tests shall be kept recorded.	Being complied and will be complied
(VI)	Maintenance:-	
	(a) All bearings, hydraulic system lubrication system etc. shall be examined at least once in each shift and adjustments effected as per the directives in the instruction manual of the manufacturers log-book.	Being complied and will be complied
	(b) The record of all shift-wise daily, weekly and fortnightly examinations, maintenances, adjustments and repairs effected shall be kept in a bound register duly signed by the person making the examinations and countersigned by the Engineer.	
	(c) General overhaul of all cutting and drilling and Heavy Earth Moving Machines shall be effected as per instruction provided in the manufacturers instruction sheets.	
(VII)	General:-	
	No electrically operated machine, equipment and accessories shall be energised, commissioned and used without prior approval of the competent authority under the relevant provisions of Indian Electricity Rules.	Being complied and will be complied
19.	It shall be the duty of the Manager to issue duty charts (in the language which is understood by the person concerned) to various operators/Supervisors connected with the use of Heavy Earth Moving Machinery and both the Manager and the Engineer shall be responsible to ensure that all the precautions and guidelines listed in this permission are strictly followed.	

6. DGMS Ref no./Kodrama-825409 Dated 15-01-2008 regarding Restoration of permission under Regulation 170(1A) & 170(1B) of the Coal Mines Regulations, 1957 granted vide this Directorate's letter no. KR/Perm/170/1620 dated 18.10.1995 & subsequently modified vide letter no. KR/1012 dated 23.08.2004 to conduct deep hole blasting within danger zone but beyond 100m of surface structures of opencast workings of DVC Bermo mine of M/s DVC Ltd. (Annexure XXI)

Sl. No.	Conditions	Compliances
1.0	Condition No. 1 of letter No. KR/Perm/170/1620 dated 18/10/95. The diameter of blast hole shall not exceed 100 mm, the burden shall not exceed 2.75m and spacing not more than 3.5m the depth of hole shall not exceed 6m and the number of holes to be fired in a round shall not exceed 12. The maximum charge per hole shall vary from 19 to 26 Kg so as to maximum charge per delay at 100m distance from dwellings shall not exceed 36 Kg to keep the vibration value within 10mm/sec. However, maximum charge per delay shall not exceed 56 Kg at 125, 81.7 Kg at 150m, 111Kg at 175m. 145 Kg at 200. 184 Kg at 225m. 227 Kg at 250m. 275 Kg at 275 m and 327 Kg at 300m distance.	Being complied and will be complied
2.0	The blasting pattern and charge per hole vis-à-vis distance from dwellings/structure shall be as per the recommendation of CIMFR, Dhanbad vide their letter No. GC/MT/1/2007.08 dated September 2007.	Being complied and will be complied
3.0	Other conditions of permission letter bearing No. KR/Perm/170/1620 dated 18/10/1995 and subsequently modified vide letter No. KR/1012 dated 23.08.2004 shall remain unaltered.	Noted

7. **Consent to operate from JSPCB dt 10-12-2009 (Annexure XXII)**

Sl. No.	Conditions	Compliances
1.	That, he(they) shall make no any alteration, addition, deletion or modification in the plant without the prior clearance from the Board.	
2.	That, he(they) shall abide by the obligations provided under section 24, 31 and 33A of the Water (Prevention & Control of Pollution) Act. 1974 and shall extend co-operation to the Board	

Sl. No.	Conditions	Compliances
	in performing its functions entrusted under section 20, 21, 23, 30 and 32 of the Act.	Is being complied and will be complied
3.	That, he(they) shall comply with the requirements of the Water (Prevention & Control of Pollution) Cess Act. 1977 read with the Water (Prevention & Control of Pollution) Cess Rules, 1978	
4.	That, he(they) shall abide by the obligations provided under section 22, 23 and 31A of the Air (Prevention & Control of Pollution,) Act, 1981 and shall extend co-operation to the Board in performing its functions entrusted under sections 24, 25 and 26 of the Act.	
5.	That, he(they) shall abide by the obligations provided under sections 5, 7, 8 and 9 of the Environment (Protection) Act 1986 and shall extend co-operation in performing the functions entrusted under section 3, 10 and 11 of the Act.	
6.	That, he(they) shall abide by the applicable provisions of the Environment (Protection) Rules, 1986, the Hazardous Wastes (Management, Handling & Trans boundary Movement) Rules, 2008, the Manufacture, Storage and Import of Hazardous Chemicals Rules, 1989; the Bio-medical Waste (Management & Handling) Rules, 1998; the Municipal Solid Wastes (Management & Handling) Rules, 2000 and the Batteries (Management & Handling) Rules, 2001.	Is being complied and will be complied
7.	That, he(they) shall maintain the quality of discharge and (or) emission and (or) noise level of environmental pollutants in conformity with the standards as laid under Rule 3 of the Environment (Protection) Rules, 1986	
8.	That, he(they) shall monitor his(their) effluent(s), emission(s) and the ambient air, noise, level regularly and shall submit the report to the Board in compliance of the condition laid in paragraph 7.	
9.	That, he(the) shall establish well equipped environmental laboratory with the facilities of system(s) of continuous monitoring of effluent(s), emission(s) ambient water quality(ies), ambient air quality(ies) and ambient noise level(s) and transferring them (monitoring results) to his(their) website(s) and to the e-mail address(es) of the key persons of Jharkhand State Pollution Control	The work of monitoring the environmental parameters and pollutants is being outsourced (presently to ISM) and this practice

Sl. No.	Conditions	Compliances
	Board, Zonal Office, Kolkata and Ministry of Environment & Forests, Regional Office, Bhubneshwar with simultaneous displaying at prominent locations in front of his(their) premises [*Unit(s) of medium and large scale under 17 categories of polluting industries of category A of EIA Notification 2006]	will be continued in future
10.	That, he(they) shall submit the environmental statement every year by 30 th September and shall harvest all rain water precipitating in the premises and do three tier tree plantation in the premises as air barrier.	Is being complied and will be complied
11.	That, he(the) shall submit application for consent under section 25/26 of the Water (Prevention & Control of Pollution) Act 1974 and that under section 21 of the Air (Prevention & Control of Pollution) Act. 1981 again 120 days before the expiration of the consent order 31.12.2009 or within 120 days from the date of receipt of the order, whichever is earlier.	Is being complied and will be complied
12.	He/they shall implement Rain Water Harvesting Plan within consent period	Is being complied and will be complied
13.	He/they shall submit report of OB management & mines reclamation of the consent period	
14.	He/they shall submit Environmental Statement during relevant period	
15.	He/they shall keep the effluent in closed circuit	
16.	He/they shall conform the quality of effluent to the standard prescribed by the Board.	
17.	He/they shall do the sprinkling of Water regularly on darty space.	

Also, the obligations in future clearances letters which may be issued by various authorities, will be complied by the Company.

15.1.3 Closure plan preparation

The Progressive Mine Closure Plan and Post Mine Closure Plan have the approval of the Board of Directors of the Company and the relevant document is attached as **Annexure XIV** and Authorization to RQP by the allottee is given in **Annexure XV**. Power of Attorney to A. K. Tahkur, dt. 28-11-2014 by Board of Directors is attached as **Annexure XI**.

15.2 MINE DESCRIPTION

Mine description comprises Geology, Reserves, Mining Method and Coal Beneficiation. Geology and reserves are already covered under Chapter 4 while mining method is covered under Chapter 5. Beneficiation of coal is not involved in the project as the coal is directly useable in end use TPP.

15.3 CLOSURE PLAN

15.3.1 Mined out land

i Land degradation

The cumulative stage-wise excavated area, backfilled area, and balance void area is given in Table 5.12 under Chapter 5.

ii. Land degradation control measures

Land degradation is one of the major adverse outcomes of opencast mining activities and any effort to control adverse impacts is considered incomplete when appropriate land reclamation strategy is not adopted. Since the land degradation in this mine is partly in the form of excavated void and partly in the form of temporary external and internal dumps, the reclamation strategy must include a programme for the reclamation of the disturbed land.

iii. Mined area reclamation

The lessee will take necessary steps to keep the area under disturbance at any stage of mining operation to a minimum. This can be achieved by carrying out the reclamation programme simultaneously with excavation. The gap can be reduced between degradation and the reclamation by this programme. The post mining land use of project area shows that all the disturbed areas will be reclaimed before abandoning the mine excluding a void left at the end of the mining operations and in post mine closure stage. The year/ stage-wise area backfilled and reclaimed is given in Table 15.4 later under para 15.3.1.v.

iv. Reclamation procedure

Reclamation procedure has been described stage wise in the following paragraphs. Transportation and unloading of top soil at reclamation dump site/spoil bank and levelling of top soil heaps will be undertaken.

After the leveling of OB heaps is completed by the dozers, topsoil will be laid. The topsoil will preferably be directly brought from the freshly excavated area for the purpose of maximum benefit. In case it is not adequate, the top soil deficiency will be made up from the top soil stack, for

which provision has been made. The top soil brought to the reclamation dump site and unloaded will also be in the form of heaps.

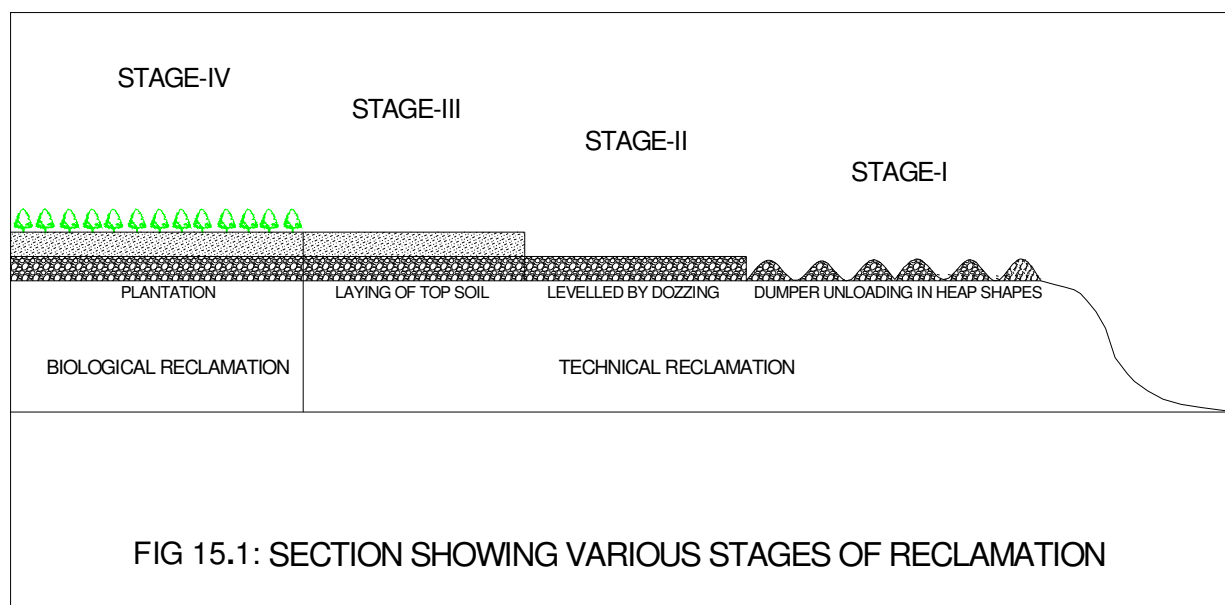
Dozers will be deployed for leveling the top soil. It is proposed to lay about 0.5m-1m thick layer of top soil during leveling.

Biological reclamation

After leveling of top soil, the technical reclamation is complete. The next step will be biological reclamation comprising plantation of grasses, legumes, herbs and trees. All these species will preferably be local. Before planting the trees, dug pits will be made and filled with top soil mixed with manure. Thus the area will be prepared for plantation before the onset of monsoon. The plantation will then be done during June/July after the 1st rain showers.

All the above steps have been explained by a section presented in Fig 15.1 below:

DEPICTION OF METHOD OF PHYSICAL AND BIOLOGICAL RESTORATION/ RECLAMATION/ REHABILITATION



Arrangement of Plants/ saplings

To fulfill the requirements of nursery plants, a nursery will be established at the site. During peak requirements, additional plants will be transported from Govt./Forest nurseries located around the area. Local species will be opted for plantation.

Protection of Reclaimed Area

The reclaimed and afforested area has to be protected from cattle menace, soil erosion, plant diseases, etc. Plants will be protected from diseases by the application of proper pesticides. Soil working, manuring, etc. will be done whenever necessary. Plants will be protected from cattle menace by proper watch and ward or fencing. Watering will be done periodically as per requirement to support the normal growth of the plants.

v. Surface OB Dump Reclamation

The surface dump being of temporary nature is proposed to be planted with cash crop type trees (eucalyptus, semal, bamboo and fruit trees (banana, orange, etc).

Stage wise reclamation programme is as shown in Table 15.4.

TABLE 15.4
YEAR / STAGE WISE RECLAIMED AREA OF SURFACE DUMPS AND
BACKFILLED DUMP (HA)

Year	Excavation Area		Backfilled Area (Ha.)		Backfilled Reclam. Area (ha.)		Dump Area (ha.)		Dump Reclam. Area (ha.)		Green Belt Area (ha.)	
	Prog.	Cuml.	Prog.	Cuml.	Prog.	Cuml.	Prog.	Cuml.	Prog.	Cuml.	Prog.	Cuml.
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
Past 2016-17	48.62	48.62	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1st year (2017-18)	19.62	68.24	0.00	0.00	0.00	0.00	15.33	15.33	0.00	0.00	1.23	1.23
3rd year (2019-20)	19.81	88.05	0.00	0.00	0.00	0.00	18.29	33.62	12.10	12.10	2.44	2.44
5th year (2021-22)	1.50	89.55	0.00	0.00	0.00	0.00	15.62	49.24	21.52	33.62	2.44	2.44
10th year (2023-27)	7.77	97.32	0.00	0.00	0.00	0.00	23.33	72.57	38.95	72.57	0.00	2.44
15th year (2028-32)	4.38	101.70	27.59	27.59	9.13	9.13	-16.08	56.49	-16.08	56.49	0.00	2.44
20th year (2033-37)	10.23	111.93	44.29	71.88	48.16	57.29	-56.49	0.00	-56.49	0.00	0.00	2.44
25th year (2038-42)	41.00	152.93	22.52	94.40	26.50	83.79	0.00	0.00	0.00	0.00	0.00	2.44
27th year (2043-44)	3.53	156.46	6.95	101.35	17.56	101.35	0.00	0.00	0.00	0.00	0.00	2.44
PMC (2045-47)	0.00	156.46	0.00	101.35	0.00	101.35	0.00	0.00	0.00	0.00	0.00	2.44

vi. Post reclamation land use

The first step in a successful reclamation programme is to decide the post mine closure stage land use. The pre-mining land use, present landuse (2016-17), during-mining landuse (end of mining 27th year) and post mining (30th year) land use with environment management is given in Table 15.5. (Refer Plate XIV). Mine cross sections at the end of mine (27th year) and at Post mine closure stage (30th year) are given in Plate XV & XVI respectively.

TABLE 15.5
PRE MINING, PRESENT, DURING MINING AND POST CLOSURE LAND USE AND POST CLOSURE MANAGEMENT

Pre Mining Land use "Ha"			Land use "Ha"										
			Type	Present	During Mining (End of Life)	Agricultural land	Plantation	Water Body	Public Use	Comp any use	Forest Land (Returned)	Undisturbed	Total
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)
I	Within ML/Block	ha	Within ML										
Tenancy	Agricultural	27.166	A. Quarry area										
	Township		Excavation Area	42.85		0	0	0	0	0	0	0	0
	Grazing		Backfilled Area	5.77	101.35		0	1.00	0	0	100.35	0	101.35
	Barren		Excavated Void		55.11	0	0	55.11	0	0	0	0	55.11
	Water body		Top Soil Dump	2	0	0	0	0	0	0	0	0	0
	Road		Facilities incl. Coal stack, road	2	3.22		0	0	0.82	0	2.4	0	3.22
			Coal Stack (included in facilities)	0	0	0	0	0	0	0	0	0	0
	Sub Total	27.166	External Dump	42.02	0	0	0	0	0	0	0	0	0
Govt. Non Forest	Agricultural		Safety Zone 7.5m (Green belt)		5.54	0		0	0	0	5.54	0	5.54
	Township		Road (included in facilities)		0	0	0	0	0	0	0	0	0
	Grazing		Road diversion		0	0	0	0	0	0	0	0	0
	Barren	18.292	Nala	1.00	0	0	0	0	0	0	0	0	0
	Water body	0.935	Setting pond	1.5	0	0	0	0	0	0	0	0	0
	Road		Rationalisation area (non-forest)		2.214		0	0	0	0	2.214	0	2.214
	Community land	0.73	Garland drains		0	0	0	0	0	0	0	0	0
	Sub Total	19.955	Embankment		0	0	0	0	0	0	0	0	0

Pre Mining Land use " Ha"			Land use "Ha"										
			Type	Present	During Mining (End of Life)	Post Closure							
						Agricultural land	Plantation	Water Body	Public Use	Company use	Forest Land (Returned)	Undisturbed	Total
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)
Forest	Protected Forest	0	Other Green Belt		0	0	0	0	0	0	0	0	0
	Revenue Forest	120.313	Habitation	70.294	0	0	0	0	0	0	0	0	0
	Sub Total	120.313	Undisturbed area		0	0	0	0	0	0	0	0	0
Free hold						0	0	0	0	0	0	0	0
Total ML/Block		167.434		167.434	167.434	0.000	0	56.11	0.82	0	110.504	0	167.434
II	Outside the block area away from block		Outside the block area away from block										
Tenancy	Agriculture	0	Facilities including magazine as follows										
	Barren	1.66	Industrial	0	0	0	0	0	0	0	0	0	0
Govt. Non Forest	Agriculture	0	Colony including road	0.44	0.74	0	0	0	0.74	0	0	0	0.74
	Barren	0.25	R&R	0	0	0	0	0	0	0	0	0	0
Forest	Protected	0	Green Belt (10m wide)	0	0.57	0	0.57	0	0	0	0	0	0.57
			Magazine with approach road	0.25	0.25	0.25	0	0	0	0	0	0	0.25
		0	Undisturbed	1.22	0.35	0.35	0	0	0	0	0	0	0.35
Total II		1.91	Sub-Total	1.91	1.91	0.60	0.57	0	0.74	0	0	0	1.91
Grand Total (I+II)	Project Area	169.344	G. Total	169.344	169.344	0.600	0.570	56.110	1.560	0.000	110.504	0.000	169.344

Note: During PMC, the 110.504 ha area under plantation within ML will be returned to the Forest Deptt. Though it is less than the forest area within ML during Pre-Mining stage which was termed as GMK Jungle.

vii. Plantation

A plantation program over life of the mine has been planned in a phase wise manner. The plantation will be started from first year of mining along the boundary of ML area. A 7.5 m width of green belt development around the ML area will be carried out and more width of green belt will be taken up wherever space is available. Plantation over backfilled area will be commenced from 8th year of mining. A thick plantation is proposed to be provided and maintained around the mining area and along the roads.

Out of 156.46 ha of excavation area (within 167.434 ha ML/block area), 101.35 ha will be backfilled while 55.11 ha will be left as void.

Green Belt details

The year/stage wise green belt details are given in column no. 12 & 13 of Table 15.4 above. The total area under green belt will be 6.11 ha.

15.3.2 Water quality management**(a) Surface water regime**

The topography is gently undulating and marked by the absence of any high hill or deep depressions. The pre-mining elevation (based on boreholes drilled during 1950s) was between 233.17 and 243.84 m.

A considerable part of the block (in X-X area) is affected by opencast mine of Bermo seam. The RL on its floor has a low of 180 m. There is an OB dump area at the northern half portion. The highest contours are 280m.

The general slope of the ground is towards south. The drainage of the area is controlled by the Damodar River flowing from west to east, located south of the mines at a distance of around 1.0 km. Its tributary Karo nala flows from north to south in the eastern part of the Block dividing it into “XX” and “YY” areas. It then flows east to west parallel to the block and joins the Damodar River south of the mine. Further east to Karo nala, Emlo nala also passes through the property. Baid karo nala flows from north to south in the west of the mine and joins Karo nala in the south of the Mines, at a distance of more than 200m.

The HFL of the Karo nala as recorded in the vicinity of the project is 229.70 m above MSL. The HFL of the Baid karo nala as recorded in the vicinity of the project is 221.555 m above MSL.

The eastern portion of the block (“Y-Y” Area) is occupied by Miners quarter of Kargali colliery (Jawahar Nagar: between the Karo Nallah and Emlo Nallah and Subhash Nagar: beyond Emlo Nala).

(b) Water quality

Water quality data have been furnished in the previous chapter under para 14.2.4(c) (refer Tables 14.8 to 14.9).

i) Effluent from mine

- i. To prevent surface and ground water contamination by oil/grease and sewage waste, following control measures are proposed to be implemented.
 - Leak proof containers will be used for storage and transportation of oil/grease. In the store also, the container containing oil/grease will be kept in empty safe open containers of higher volume than the containers to avoid oil/grease spillage. The area over which oil/grease is handled will be kept effectively impervious. Any wash off from the oil/grease handling area or workshop will be drained through impervious drains, collected in specially constructed pit and treated appropriately to remove any oil/grease and the water will be recycled. The oil grease will be sold to authorized vendors and sludge disposed off in specially constructed pit.
 - The sewage waste generated will be drained by underground impervious drains, lead to appropriately designed septic tanks and soak pits to prevent any pollution of surface or ground water.
- ii. The surface and ground water in and around the mine, loading plant and infrastructure will be regularly tested and appropriate control measures adopted in case of any pollutant is detected above the prescribed limit.
- iii. All stacking and loading areas will be provided with proper garland drains equipped with baffles to prevent wash offs from reaching the downstream natural channels.
- iv. A domestic waste water treatment plant will be provided in colony so that the water after treatment can be reused.

ii) Storm water

Control measures to be adopted are briefly discussed below:

- Check dams will be provided to prevent solids from wash off and screen if any from the mine related activities.
- Peripheral bunds will be erected on the outer edge of the abandoned benches before reclamation so that the soil is not carried away by storm water.

- A water gradient of about 1 in 100 will be kept at every bench towards inside of the bench to prevent formation of gullies in the bench slopes causing serious erosion.
- Chutes will be constructed by using local stone or masonry to guide the water in areas with loose soil to prevent erosion and uncontrolled descent of water wherever necessary.
- Construction of garland drains around freshly excavated and dumped areas so that flow of water with loose material is prevented. The mine water will be passed through specially constructed settling ponds to arrest any loose material being carried away with water.
- Any areas with loose debris within the lease hold will be planted.

iii) Impact on water quality

The surface water quality is likely to be affected with higher load of suspended solids by the following:

- Wash off from dumps
- Soil erosion from mine and roads
- Pumping out mine water to surface water channels

The dumps are proposed only within the ML area and no flow is expected to join the natural drainage channels as any such water will be channeled through the settling ponds.

The pumped out water during dewatering may carry higher levels of suspended solids. Other sources of pollution are by oil spillage at the pit head and at the mine site infrastructure viz. light vehicle workshop, lubricant and oil storage area resulting in oil and grease contamination of surface water if appropriate control measures are not adopted. Control measures like check dams will be adopted to counter any solids being carried away by precipitation.

Ground water pollution can take place only if dumps and stock piles contain harmful chemical substances, which may get leached by precipitation of water and percolate to the ground water table, thus causing water pollution. However, this is not the case with this mine, as neither the coal nor the OB, contains any harmful ingredients which may leach down to the water table and pollute it. Therefore, no adverse impact on ground water quality is anticipated considering this aspect. The leaching down of pollutants (oil, grease etc.) to the ground water may render the water un-potable and hence cannot be used by the local people.

The percolation of sewage waste from the pit head as well as mine area can also pollute the ground water if control measures are not adopted as envisaged in the management plan. Meager amount of sanitary waste,

expected to be generated from various facilities will be treated properly through septic tanks and soak pits and is not anticipated to cause any water pollution.

iv) Measures to minimise adverse effects on water regime

a) Effluent from mine

- i. To prevent surface and ground water contamination by oil/grease and sewage waste, following control measures are proposed to be implemented:
 - Leak proof containers will be used for storage and transportation of oil/grease. In the store also, the container containing oil/grease will be kept in empty, safe and open containers of higher volume than the containers to avoid oil/grease spillage. The area over which oil/grease is handled will be kept effectively impervious. Any wash off from the oil/grease handling area or workshop will be drained through impervious drains, collected in specially constructed pit and treated appropriately to remove any oil/grease and the water will be recycled. The oil grease will be sold to authorized vendors and sludge disposed off in specially constructed pit.
 - The sewage waste generated will be drained by underground impervious drains, lead to appropriately designed septic tanks and soak pits to prevent any pollution of surface or ground water.
- ii. The surface and ground water in and around the mine, loading plant and infrastructure will be regularly tested and appropriate control measures adopted in case of any pollutant is detected above the prescribed limit.
- iii. All stacking and loading areas will be provided with proper garland drains equipped with baffles to prevent wash offs from reaching the downstream natural channels.
- iv. A domestic waste water treatment plant will be provided in mine office area so that the water after treatment can be reused.

b) Storm water

Control measures to be adopted are briefly discussed below:

- Check dams will be provided to prevent solids from wash off and screen if any from the mine related activities.

- Peripheral bunds will be erected on the outer edge of the abandoned benches before reclamation so that the soil is not carried away by storm water.
- A water gradient of about 1 in 100 will be kept at every bench towards inside of the bench to prevent formation of gullies in the bench slopes causing serious erosion.
- Chutes will be constructed by using local stone or masonry to guide the water in areas with loose soil to prevent erosion and uncontrolled descent of water wherever necessary.
- Construction of garland drains around freshly excavated and dumped areas so that flow of water with loose material is prevented. The mine water will be passed through specially constructed settling ponds to arrest any loose material being carried away with water.
- Any areas with loose debris within the lease hold will be planted.

c) Measures to minimise adverse effects on water regime

During the process of mine rehabilitation and with the completion of backfilling, a water body will be created in the mined out pit which will act as water reservoir improving the ground water recharge, source of attraction for fauna and will help in the maintenance of afforested areas. To enhance aesthetic appearance, parks and lawns will be made around the water body.

Hydrogeological study

Hydrogeological study has been carried out by CMPDIL as part of the Geological Report in 2016-17 and the same is attached as **Annexure XI** for ready reference.

Water balance

Industrial water required for washing, sprinkling on mine roads for dust suppression and for watering the mine site plantations, will be supplied from pumping installation at mine sump and its surface reservoir. It is already being practiced as the mine is operational since long.

The drinking water will be supplied from piped supply and stored in overhead tank near the facilities area and distributed through pipe lines to different facilities area for drinking and domestic purposes.

Total net requirement of water for mining and allied activities are estimated as 581 m³/day. Out of this 242 m³/day will be potable water and the rest 339 KLD will be required for industrial use.

Requirement of Water and water balance has been detailed out in Table 15.6 below while the water balance diagram is given under para 12.4 in Chapter 12.

**TABLE 15.6
REQUIREMENT OF WATER AND WATER BALANCE**

Sl. No.	Particulars	Round KLD
I	Potable	
1	Drinking at work place @ 45lpd/head	26
2	*Colony for 70% employees @4 members in family and @ 135 lpd/head	216
3	For peripheral villages (assumed)	0
	Total (I)	242
II	Industrial	
1	Water required for coal washery	0
2	Sprinkling @ 30 m ³ /km of road length (5km asumed)	150
3	Coal handling Plant and related operation @21.7 cum/MT of annual coal production	131
4	Plantation (ref Table 15.8, Chapter 15) on over backfill and dump =101.35 ha +72.57 ha= 173.92 ha @ 5 cum/ha total excavation for 27 year life = 6.44 ha/year average)	32
5	HEMM washing @ 2.0 m ³ /vehicle/day*washable vehicles(about 80% of population)twice a week with 50% reclamation	14
6	Fire fighting @ 45.4 KLD/ MT (10% compensation for evaporation)	12
	Total (II)	339
	Total (I+II)	581

Acid Drainage

Water quality monitoring results given by ISM {refer para 14.2.4(c) of Chapter 14}.

15.3.3 Air quality management

A. Air quality

The existing ambient air quality data monitored at four stations monitored by ISM, Dhanbad during the year 2014-15 is presented in previous Chapter 14 {refer Tables 14.3 to 14.6 under para 14.2.4(a)}.

As is apparent from the analytical data, the ambient air quality in the region is well within the standards specified as per the Air (Prevention & Control of Pollution) Act, 1981.

B. Air and dust pollution control measures

The SPM, CO, SO₂ and NO_x concentrations are within limits as already discussed earlier. The mining operations and related activities are anticipated to increase the levels of SPM and gaseous pollutants to a limited extent. The control measures to be adopted are mentioned in the following paragraphs:

i. Controlling fugitive dust

Dust particles, which are normally generated during mining operation and transportation, deteriorate the ambient air quality. Adequate control measures are, therefore, proposed to be taken during mining operations, transportation and loading operations. These control measures are discussed as follows:

a) Mines

- a) Dust suppression systems (like water spraying) will be adopted at:
 - Faces before and after blasting
 - Faces while loading of Coal and OB.
- b) Dust extraction systems will be used in Coal and OB drill machines and coal handling systems.
- c) Dust generation will also be reduced by using sharp drill bits for drilling holes and drills with flushing system.

b) Haul roads and stock-piles

- Dust suppression system (like water spraying) would be adopted at roads, which are used for transportation. Fixed sprinklers (Whirling) have been proposed with timers to be installed along the haul roads and coal transportation roads to suppress the dust.
- Transport vehicles shall be maintained leak proof.
- Suitable dust suppression systems such as mist sprays with or without chemical will be provided at appropriate places for preventing dust pollution during handling and stockpiling of coal.
- Transfer points of coal will be provided with appropriate hoods/chutes to prevent fugitive dust emission.

ii. Preventing dispersal of air borne dust

In addition to the control measures proposed during mining and transportation operations, following steps will be taken to prevent air pollution due to airborne dust:

- Dense tree belts will be planted around the mine and sites housing handling/ loading facilities.
- Plantation over already mined out area will be done after backfilling as per schedule (with minimum gap between excavation and afforestation).
- Dust masks will be provided as safety measure to the workers, engaged at dust generation points like drills, loading/ unloading points, etc.

iii. Measures to mitigate CO levels

It has already been discussed that the concentration of CO in the ambient air is negligible and is far below the prescribed limit of CPCB and is not anticipated to exceed it in future.

Still all heavy and light vehicles shall be tested for pollutants concentration in their exhausts regularly and well maintained. Strict vigil will be kept in and around the operational area for any fire which shall be immediately controlled.

iv. Measures to mitigate NO_x levels

The main reasons of production of NO_x gases are:

- a. Poor quality of explosive having large oxygen imbalance which can be due to following reasons:
 - Manufacturing defect
 - The use of expired explosives in which disintegration of ingredients has taken place.
- b. Incomplete detonation is caused mainly due to low primer: column ratio.

To ensure that NO_x levels do not increase during the proposed mining operations, the following control measures will be adopted:

- a. Good quality explosives will be used for which the oxygen balance will be checked from time to time. The expired explosives will not be used

for which a strict vigil will be kept on the date of manufacture. Even as a normal procedure, all explosives will be subjected to a visual inspection and if disintegrated ingredient are spotted, the explosives will not be used even if it is within expiry date.

- b. Primer: Column ratio will be rationalised. The ratio thus established, for producing minimum NO_x, will be adhered to.

The mine ambient air quality will be regularly tested to detect the presence of any pollutants above prescribed limits and appropriate measures will be adopted.

15.3.4 Waste management

I. Type, Quality and Quantity of waste

As per GR prepared by CMPDI, there are no toxic materials in the waste material. The waste material is in the form of weathered mantle, sandstone etc. Year/stage wise waste generation with break into Pure OB & Top Soil is given in Table 15.7 below.

TABLE 15.7
YEAR/ STAGE WISE WASTE GENERATION WITH BREAKUP INTO
PURE OB & TOPSOIL IN M.CUM

Year	OB+TS removal		Topsoil generated from excavation		Pure OB from excavation, Mcum	
	Prog.	Cuml.	Prog.	Cuml.	Prog.	Cuml.
Actual 2016-17	0.19	0.19	0.09	0.09	0.10	0.10
1 st Year (2017-18)	5.11	5.30	0.12	0.21	4.99	5.09
2 nd & 3 rd Year (2019-20)	10.33	15.63	0.12	0.33	10.21	15.30
4 th & 5 th Year (2021-22)	8.50	24.13	0.01	0.34	8.49	23.79
6 th to 10 th Year (2023-27)	19.20	43.32	0.05	0.39	19.15	42.93
11 th to 15 th Year (2028-32)	20.39	63.71	0.03	0.41	20.36	63.30
16 th to 20 th Year (2033-37)	18.46	82.17	0.06	0.47	18.40	81.70
21 st to 25 th Year (2038-42)	23.82	105.99	0.25	0.72	23.57	105.27
26 th & 27 th Year (2043-44)	4.80	110.79	0.02	0.74	4.78	110.05
Grand Total	110.79		0.74		110.05	

There are no rejects generated from the coal. The waste material is not utilisable for any gainful purpose hence it is proposed to be disposed of into surface dumps and backfill dumps.

ii. The surface dumps

Due to non-availability of space, the temporary surface dumps will be formed over the coal bearing area till 10th year, as shown in Table 15.8 below. Eventually, as the mine advances, the surface dumps will be rehandled and backfilled into the quarry when sufficient voids are generated.

**TABLE 15.8
YEAR/ STAGE WISE WASTE DISPOSAL INTO SURFACE DUMPS IN
M.CUM ALONG WITH AREA (TOTAL AND PLANTED) AND HEIGHT**

Year	OB Dump-1				OB Dump-2				Total OB Dump-1+2			
	Area in ha	Plantation	Height	Vol. Mcum	Area in ha	Plantation	Height	Vol. Mcum	Area in ha	Plantation	Height	Vol Mcum
Past 2016-17				0.10					0	0	0	0.10
1 st Year (2017-18)	15.33	0	50	4.99					15.33	0	50	4.99
3 rd Year (2019-20)	18.29	12.1	90	10.21					18.29	12.1	90	10.21
5 th Year (2021-22)		21.52	90	4.11	15.62	0	30	4.38	15.62	21.52	90	8.49
10 th Year (2023-27)					23.33	38.95	90	12.04	23.33	38.95	90	12.04
15 th Year (2028-32)									0	0	0	0.00
20 th Year (2033-37)									0	0	0	0.00
25 th Year (2038-42)									0	0	0	0.00
27 th Year (2043-44)									0	0	0	0.00
PMC (2045-47)									0	0	0	0.00
Grand Total	33.62	33.62	230.00	19.41	38.95	38.95	120.00	16.42	72.57	72.57	350	35.82

iii. Backfill dump

Backfilling will start from 8th year with a quantity of 1.00 Mcum(B). During 8th and 9th year partial backfilling will be done and then from 10th year full backfilling will take place concurrent with mining and till the end of mining operation in 27th year out of the total excavation area of 156.46 ha, 101.35 ha will be backfilled thus leaving a void of 55.11 ha only.

Crown dumps and surface dumps will be rehandled during the course of mining for eventually backfilling into quarry as given in Table 15.9 below.

TABLE 15.9
YEAR/ STAGE WISE WASTE DISPOSAL INTO THE BACKFILL
(DIRECT AS WELL AS FROM REHANDLING OF SURFACE DUMP AND
CROWN DUMP) ALONG WITH TOP SOIL IN M.CUM

Year	Backfilled OB, mil.cum		Direct Surface Dump		Direct Crown Dump		Rehandaled Crown Dump and Backfilled, mil.cum		Rehandaled Sur Dump D1&D2 and Backfilled, mil.cum		Rehandling of Backfill from East of Diverted Nala		Top Soil		Total OB Including Rehandling		Total Rehandling OB Mcum	
	Prog.	Cuml.	Prog.	Cuml.	Prog.	Cuml.	Prog.	Cuml.	Prog.	Cuml.	Prog.	Cuml.	Prog.	Cuml.	Prog.	Cuml.	Prog.	Cuml.
Past 2016-17	0.00	0.00	0.10	0.10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.10	0.10	0.00	0.00
1 st Year (2017-18)	0.00	0.00	4.99	5.09	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	4.99	5.09	0.00	0.00
3 rd Year (2019-20)	0.00	0.00	10.21	15.30	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.05	0.05	10.26	15.35	0.00	0.00
5 th Year (2021-22)	0.00	0.00	8.49	23.79	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.08	0.13	8.57	23.92	0.00	0.00
10 th Year (2023-27)	7.11	7.11	12.04	35.82	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.15	0.28	19.30	43.22	0.00	0.00
15 th Year (2028-32)	16.16	23.26	0.00	35.82	4.21	4.21	0.00	0.00	13.96	13.96	0.00	0.00	0.04	0.32	34.36	77.57	13.96	13.96
20 th Year (2033-37)	18.40	41.66	0.00	35.82	0.00	4.21	0.00	0.00	21.87	35.82	0.00	0.00	0.13	0.45	40.39	117.97	21.87	35.82
25 th Year (2038-42)	23.57	65.24	0.00	35.82	0.00	4.21	2.86	2.86	0.00	35.82	0.00	0.00	0.17	0.62	26.61	144.57	2.86	38.69
27 th Year (2043-44)	4.78	70.02	0.00	35.82	0.00	4.21	0.00	2.86	0.00	35.82	7.39	7.39	0.12	0.74	12.29	156.87	7.39	46.08
PMC (2045-47)	0.00	70.02	0.00	35.82	0.00	4.21	0.00	2.86	0.00	35.82	0.00	7.39	0.00	0.74	0.00	156.87	0.00	46.08
Grand Total	70.02		35.82		4.21		2.86		35.82		7.39		0.74		156.87		46.08	

iv. Top soil dump

The total topsoil generated will be 0.74 Mcum (B) during the life of the mine. As the mine is already operating, the top soil generated will be spread over the reclaimed dump concurrent with mining. Top soil will be used for growing plants along the fringes of the site roads and reclamation of surface dump and backfilled area.

Any temporary topsoil stockpile will be of low height not exceeding 6 m and will be grassed to retain fertility. Besides this, there would be temporary stacks near the excavation area and area to be reclaimed which will be made use of for concurrent filling without bringing the topsoil to the soil stack near the OB dump.

Year wise top-soil generation and disposal is given in the Table 15.10 below.

TABLE 15.10
YEAR WISE TOP-SOIL GENERATION AND UTILISATION

Year	Topsoil generated		Top Soil utilised		Balance TS cumulative
	Prog.	Cuml.	Prog.	Cuml.	
Past 2016-17	0.09	0.09	0.00	0.00	0.09
1 st Year (2017-18)	0.12	0.21	0.00	0.00	0.21

Year	Topsoil generated		Top Soil utilised		Balance TS cumulative
	Prog.	Cuml.	Prog.	Cuml.	
3 rd Year (2019-20)	0.12	0.33	0.05	0.05	0.28
5 th Year (2021-22)	0.01	0.34	0.08	0.13	0.21
10 th Year (2023-27)	0.05	0.39	0.15	0.28	0.10
15 th Year (2028-32)	0.03	0.41	0.04	0.32	0.09
20 th Year (2033-37)	0.06	0.47	0.13	0.45	0.03
25 th Year (2038-42)	0.25	0.72	0.17	0.62	0.10
27 th Year (2043-44)	0.02	0.74	0.12	0.74	0.00
PMC (2045-47)	0.00	0.74	0.00	0.74	0.00
Grand Total	0.74		0.74		

15.3.5 Void

The remaining void area of 55.11 ha will remain over the Y-Y are with 150m depth. The floor RLs will range between 80m and 95m. Plate XVI shows the final stage at the end of closure with external dump rehandled and final void.

The void will ultimately become a water body useful for ground water recharge and can also be used for agriculture purpose and other house hold needs by the surrounding population for which two ghats have been provided.

15.3.6 Tailing dam management

No washery is being proposed. As such issue of trailing dump management will not be faced by the mine.

15.3.7 Infrastructure

As it is a producing coal mine, the existing infrastructure will continued to be used with some modification and periodical replacement upgradation for enhanced production target.

Plan showing surface layout Plate VIII and Conceptual plan showing infrastructure facilities including colony, boundary of mining area, mine entries, roads including road diversion alignment etc is shown in Plate IX. The need for surface reorganization is described below.

i. Habitation within the block:

The mine surface of the DVC leasehold area is heavily built-up with CCL colonies and DVC quarters. The details of existing colonies within the leasehold area are given in the following Table 15.11.

TABLE 15.11
DETAILS OF HABITATIONS WITHIN THE ML AREA*

Sl. No.	Particulars	Area	No.
Colonies within the Leasehold area			
1	DVC Quarters	XX	245
2	Habitation	YY	
2.a	CCL Quarters	Subhash Nagar	1502*
2.b	CCL Quarters	Jawahar Nagar	662*
	Sub Total		2164
	Grand Total		2409

* *Source: Report of the joint survey committee comprising of officials of DVC and CCL dt. 14-05-2007*

The above colonies (of CCL) will be vacated by Central Coalfields Ltd./ DVC.

ii. The road network is lying within the block:

No public road passes through the block or ML.

iii. The following network of drainage and canals is lying within the block:

Karo nallah flows north to south, through the middle of the block. Emlo Nallah, further east to Karo nala, also flows through the block.

Another nallah, namely, Baidkaro Nallah flows adjoining (outside the ML) to the boundary near the south western corner of the property.

During the course of mining Karo and Emlo Nala will be diverted and redirected within the block boundary in order to release coal blocked below these nalas for mining.

iv. Forest within Block:

Out of 167.434 ha ML area, 120.313 ha GMK land was previously recorded as GMK Jungle which comes to 71.86%. Mining operation is going on in the block for over 65 years and this area, at present, is either under habitation or under mining.

As per the letter no.1669 dt. 02-06-2016 (**Annexure X**) issued by Divisional Forest Officer, Bokaro regarding "No Objection", the plots of Mining Lease are outside the Forest Land.

Accordingly, it is proposed in the post mine closure plan that no part of the project area will be designated for forest use so that the surrounding population can use the area as agriculture land or water body (refer Table 15.5 above).

15.3.8 Safety and security

The life of the OC mine operations is 27 years. During mining operations some of the safety precautions will be implemented are as under:

- i. Erecting barbed wire fencing around the areas being excavated
- ii. Erecting barbed wire fencing around the areas being dumped
- iii. Erecting bunds / toe walls around the surface dumps to prevent damage to property or injury to persons by rolling stones.
- iv. After abandoning mine, the water body and high walls are to be effectively protected by boundary wall.

After finishing the mining operations, all areas which are inaccessible and are dangerous will be fenced. In the post mining scenario, proper approach to the water body will be made for men and animals for which 2 ghats have been envisaged and the routes will be thrown open for the public.

15.4 ECONOMIC REPERCUSSIONS OF CLOSURE OF MINE AND MANPOWER RETRENCHMENT

Mine closure always has environmental, social and economic impacts associated with it. While the environmental impact is largely addressed, the socio-economic aspects do not receive the same degree of attention. However this mine is already operational since 65 years, the matter is new and limited effect will be there due to expansion.

The closure of the mine brings about not only loss of jobs for the direct employees but also affects the likelihood of those who have come to depend upon it indirectly. We thus have two classes of affected people.

The direct employees shall be offered jobs at alternate sites of the organization and those willing to relocate shall be transferred there. Skill up-gradation training would also be imparted to such willing employees to make them suitable for alternate jobs where required.

Mine closure is an inevitability and it is anticipated that by the time the closure occurs, the community shall have become self sustainable.

For those, who due to their advanced age or other constraint, cannot relocate to alternate site or alternate employment, the company will explore

the possibility of offering them an opportunity to opt for voluntary retirement with commensurate benefits.

The indirectly affected persons would also be rehabilitated by offering them alternate means of livelihood by undertaking plantation and cultivation in the reclaimed land, poultry, craft, handloom, pisciculture etc.

To effectively implement the SHG projects, the company shall provide following facilities to the affected persons.

- Training for skill improvement
- Financial assistance for procurement of land, plant and machinery and raw material required, If any
- Assistance for undertaking market surveys, marketing of the finished products etc.

It is proposed to maintain the following facilities at the mine site post mine closure.

1. Training Centre with required staff
 2. Warehouse facility of storage of agriculture and other projects as and when required.
 3. Local market place.
- i. **Number of local residents employed in the mine, status of the continuation of family occupation and scope of joining the occupation back**

Employment of the local residents in the mine will depend on requirement of the project. Preference will be given to the project affected people (PAP). Training will be provided to the eligible PAP and after successful completion of the training they will be placed in the project according to their trade subject to vacancy. The families have ample scope to take up the agriculture activity after the closure of mines as the reclaimed land will be handed over to the PAFs through the District Administration / state Govt. The reclaimed land will be made suitable for agriculture with irrigation facilities before handing over. We will encourage the local people to start the activities on their own.

- ii. **Compensation given or to be given to the employees concerning their sustenance and their family member**

Rehabilitation package to be given to the project affected people with a view to improve living standard for the people of the affected area, a meticulous

plan will be chalked out as under, in presence of district administration and the local people.

The details of compensation and benefits to be given to the PAFs are mentioned below.

- There are 3 colonies (2 belonging to CCL and one to DVC) which will be shifted in line with the R&R to be prepared.
- Other out siders / Unauthorised occupants will also be given rehabilitation and resettlement benefits according to the Govt. of Jharkhand Policies and prevailing practice in industries in the vicinity.
- To provide hand pumps of sufficient depth to cover up the depression of water table during the summer season. Also water tankers will be provided to supply water to the villages.
- Encourage and motivate the Gram Sabha to form co-operative groups and all assistance will be provided by us.
- Medical facilities will be available to the villagers in the dispensary of the Company.

iii. Satellite occupations connected to the mining industry – Number of persons engaged therein – continuance of such business after mine closure

Satellite occupations connected to mining industry will flourish in the area and skill development programme of the company will equip the people of the area to participate in economic activity on a sustainable basis. Local infrastructure will be developed to service social and economic needs. Social investment projects and employee welfare programs will cater effectively to human needs into the indefinite future.

Some of the satellite occupations connected to the mining industry are.

- ⇒ Off loading of maintenance jobs of HEMM and other equipment
- ⇒ Coal transportation on cooperative basis
- ⇒ Civil construction and maintenance on cooperative basis
- ⇒ Supply of items used in mining
- ⇒ Services like running canteen on cooperative basis
- ⇒ Hiring of bus services for school
- ⇒ Hiring of jeep and taxis

- ⇒ Set up nursery for supply of sapling, flowering plants, bio-composts to garden and reclamation program for afforestation
- ⇒ Running services for mess and transit hostel
- ⇒ Agro based production unit like Sericulture, Horticulture and pisciculture in unused mining and plantation area
- ⇒ Photocopying, typing and printing which are otherwise off loaded to outside agency
- ⇒ Supply of daily wages labourer on cooperative basis
- ⇒ Electrical maintenance of the company
- ⇒ Skill development programme
- ⇒ Tyre repairing workshop
- ⇒ Tea staff and hotels
- ⇒ Private transportation
- ⇒ Retail grocery shop
- ⇒ Gardening and house keeping

iv. Continued engagement of employees in the rehabilitated status of mining lease area and any other remnant activities

While providing education to local youths and in the process of planning different agro based livelihood activities, it has been observed, in general, that the local population initiates different activities in the area like hotels, transportation, repairing shop and other allied activities. It is envisaged that these activities will flourish in days to come. Commitment to local economic development and capacity building will be provided by requiring that contractors also target their training and employment opportunities to the local community, and by giving preference to a local supply chain.

v. Envisaged expectation of the society on closure of mine

Agriculture and coal mining are the basic sectors of employment of the people of the leasehold and adjoining area. People are engaged in coal mines and coal based industries. There are many coal based and other industries in nearby areas which provide many employment opportunities to these people.

Closure of this coal block will not be something new for the society. They are quite aware of the fact that closure of a mine is inevitable and logical culmination of the mining activity.

On its part, the Company will strive to minimize the social impact of the closure by offering attractive rehabilitation package, training for upgrading skills, incentive and assistance for self employment and by generally involving the local people in the post closure utilization of assets of the mine.

It undertakes to give full effort for the following important issues inter-alia many other.

- Re-deployment of work force to eligible employees
- Management of community facilities
- Canalization of available water
- Reclamation of the worked out area for agro forestry and agriculture
- Returning of the reclaimed land to the raiyats through the District / State authorities

15.5 TIME SCHEDULING FOR ABANDONMENT

The abandonment activities of the OC mine will start 5 years prior to the end of mining operation i.e. from 23rd year; and will complete by the end of 30th year, i.e. 3 years after the end of mining operation. Study Report of the existing status of the project and tasks required for final abandonment will be identified along with their possible time frame for implementation will be undertaken. Items among others could be as under:

- i) Some machinery having, remaining life will be utilised in the other coal mines of the company if operative at that time. The other machineries will be e-auctioned after decommissioning.
- ii) Dismantling schedule of permanent and temporary structures excepting few which may have utility in the revised scheme for managing abandoned area.
- iii) Winding up all H. T & L.T electrical lines, delivery pipe lines for sprinklers and other varied uses other than those which may be required for development of the abandoned area.
- iv) Most part of the excavated area will be backfilled and only 55.11 ha will remain as water body/ lagoon.
- v) Scheme for undisturbed and recovered land development programme for making the land more fertile by use of fertilisers and other measures under expert's guidance to sustain affected population after abandonment of the mine.

- vi) Related matter of land development is also developing irrigation system by following drip irrigation system.
- vii) Any other matter related for gainful development.

The minute details will be worked out in the 22nd year. The execution of abandonment activities of the OC mines will be started about four years before the mines get abandoned i.e. 23rd year. One year time is assigned for study of items as indicated above in i to vii and for preparation of detailed schemes and reports for implementation. Many of the required activities will be carried out during last four years of the mine operation. Some abandonment activities will have to be continued for about two to three years more after the mine operations get fully closed by retaining only few temporary essential office / residential structures.

The facilities infrastructure to be retained and dismantled are given in Table 15.12 and Table 15.13 respectively.

TABLE 15.12
FACILITIES/ INFRASTRUCTURE TO BE RETAINED

Sl. No.	Name of Area	To be Retained (Area in Ha)
1	Safety Office	0.007
2	Admn. Office & accounts	0.007
3	Record Section	0.007
4	First Aid & Dispensary	0.008
5	Canteen	0.009
6	Vocational Training Center	0.025
7	GM Office	0.029
8	Road	0.5
9	Misc	0.230
	Total	0.82

TABLE 15.13
FACILITIES/ INFRASTRUCTURE TO BE DISMANTLED

Sl. No.	Name of Area	To be Dismantled (Area in Ha)
1	Store	0.031
2	Workshop	0.103
3	ETP	0.009
4	Sludge Pit	0.010
5	Washing ramp for Dumper	0.039

Sl. No.	Name of Area	To be Dismantled (Area in Ha)
6	Surveyor office	0.008
7	Wash Room	0.002
8	Toilets	0.003
9	Manager (CHP) office	0.009
10	Mine Manager office	0.009
11	Shift Operator/Manager office	0.009
12	Diesel Bunk	0.012
13	Coal Stack Yard	0.395
14	Ground Bunker	0.210
15	Conveyor Belt	0.088
16	Emergency Truck Loading Point	0.009
17	TP	0.002
18	Ramp 1 : 16	0.944
19	Security Room	0.003
20	Road	0.500
	Total	2.39

It is proposed that the residential quarters can be given on rent to the people which may be engaged at that time by the future mines in the surrounding area which will sustain the maintenance of the facilities proposed to be retained at site. However, it is proposed that a corpus fund of ₹ 20 lakh will be provided which will easily earn an annual interest of ₹ 2 lakh to maintain the retained facilities.

The year wise abandonment activities details have been furnished in the Bar Chart given in Table 15.14. Year wise Mandays requirement for carrying out progressive and final mine closure activities have also been given in same table.

15.6 ABANDONMENT COST

a) Activities and Cost

Detailed Final Mine Closure Plan will be prepared 5 years prior to the anticipated actual closure of the opencast mine. Indicative cost of implementation of Progressive Mine Closure as well as Final Post Mine Closure is given below in Table 15.14 along the schedule of implementation in bar chart form.

TABLE 15.14
TIME SCHEDULE BAR CHART OF PROGRSSIVE AND POST MINE CLOSURE ACTIVITIES

HEADS		ACTIVITIES	Unit	Vol. of work	Total amt., Rs. Lakh	YEARS																																	
						1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30				
PROGRESSIVE CLOSURE																																							
01. Dismantling of Infrastructure, disposal/ rehabilitation of mining	c) Dismantling of facilities	LS Mandays			104.38	104.38	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-			
	k) Dismantling of power line	LS Mandays		0	20.00	20.00	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-				
02. Safety and Security	a) Barbed wire fencing	Mandays m	17606		37.32	9.88	2.39	2.39	2.96	2.96	1.13	1.13	1.13	1.13	1.13	0.08	0.08	0.08	0.08	0.08	0.54	0.54	0.54	0.54	0.54	1.24	1.24	1.24	1.24	1.24	0.93	0.93	-	-	-				
	d) Garland drain around the mine	Mandays m	2373		11.87	8.37	1.18	1.18	0.58	0.58	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-					
	f) Toe wall around the dump	Mandays m	6191		61.91	18.23	6.85	6.85	7.98	7.98	2.81	2.81	2.81	2.81	2.81	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-					
	g) Garland drain around the dump	Mandays m	5929		29.65	9.20	2.69	2.69	4.03	4.03	1.40	1.40	1.40	1.40	1.40	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-					
	i) Settling pond	Mandays M Cum	5.45		1090.00	116.00	-	224.00	-	200.00	-	-	-	-	-	-	-	-	-	150.00	-	-	-	-	-	-	-	-	-	-	400.00	-	-	-	-				
	j) Concrete wall to protect mine from Baldkaro Nala	Mandays m	300		30.00	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	30.00	-	-	-	-	-	-	-	-	-	-	-	-	-	-				
	k) Connecting Amlo nala to Karo nala along Northern boundary	Mandays m	600		120.00	-	-	-	-	120.00	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-				
	l) Diversion of Karo nala from y-y'area to X-X' area	Mandays m	540		270.00	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	270.00	-	-	-	-	-	-	-	-	-				
	04. Top soil management		Mandays M Cum	1		360.00	-	12.50	12.50	20.00	20.00	15.00	15.00	15.00	15.00	15.00	4.00	4.00	4.00	4.00	4.00	13.00	13.00	13.00	13.00	13.00	17.00	17.00	17.00	17.00	17.00	25.00	25.00	-	-	-			
	05. Technical and biological reclamation of mined out land and OB dump	a1) Reclamation	Mandays Ha.	101.35		405.40	-	-	-	-	-	-	-	-	-	-	-	-	-	-	9.13	9.13	9.13	9.13	38.53	38.53	38.53	38.53	21.20	21.20	21.20	21.20	35.12	35.12	-	-	-		
b2) Rehandling of crown dump to West pit		Mandays M Cum	46.10		13830.00	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2.2825	2.2825	2.2825	2.2825	9.632	9.632	9.632	9.632	5.3	5.3	5.3	5.3	8.78	8.78	-	-	-		
c) Terracing, Blanketing with soil and vegetation of external OB dump		Mandays Ha.	72.57		290.28	-	-	-	48.40	43.04	31.16	31.16	31.16	31.16	31.16	-	-	-	-	-	3.49	3.49	3.49	3.49	4.374	4.374	4.374	4.374	0	0	0	1.44	1.44	3.7	3.69	-	-		
						-	-	-	12.1	10.76	10.76	7.79	7.79	7.79	7.79	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-			
06. Plantation over virgin area including Green Belt	a) Plantation/ Green Belt over Virgin Area	Mandays Ha.	6.11		24.44	4.92	4.88	4.88	4.88	4.88	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-				
09. Water quality management		LS Mandays	0		135.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00				
10. Air quality management		LS Mandays	0		135.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00				
12. Manpower cost and supervision		LS Mandays	0		81.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00				
		SUB TOTAL (Progressive Closure)			17036.25	304	43	316	96	416	64	64	64	64	64	17	1073	1073	1073	1223	1407	1377	1377	1377	1647	52	52	52	484	884	1184	1181	0	0	0				
		Estimated mandays required			224544	21793	3240	21160	4036	29636	2429	2429	2429	2429	2429	1127	1858	1858	1858	13858	7366	4966	4966	4966	26566	3955	3955	3955	3955	3955	5685	5685	0	0	0				
						9998	2585	2598	3128	3729	1101	1101	1101	1101	1101	36	42	42	42	43	567	267	267	267	807	588	588	588	589	591	451	451	0	0	0				
FINAL CLOSURE																																							
01. Dismantling of Infrastructure, disposal/ rehabilitation of mining	a) Dismantling of workshop	LS Mandays		0	30.00	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	15.00	15.00	-				
	b) Dismantling of CHP	LS Mandays		0	90.00	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	45.00	45.00	-				
	c) Dismantling of facilities	LS Mandays		0	150.00	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	75.00	75.00	-				
	d) Dismantling of pumps and pipes	LS Mandays		0	15.00	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	7.50	7.50	-				
	j) Re-arranging of water pipelines to dump top, park	LS Mandays		0	10.00	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	5.00	5.00	-				
	k) Dismantling of power line	LS Mandays		0	15.00	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	7.50	7.50	-				
	l) Rehabilitation over area of dismantled facilities	Mandays Ha.	2.4		9.60	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	4.80	4.80	-				
02. Safety and Security	c) Boundary wall around the water body	Mandays m	3790		94.75	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	31.58	31.58	31.58				
	e) Stabilisation (viz. benching, pitching etc) of outside wall of the water body	LS Mandays		0	30.00	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	15.00	15.00	-				
04. Top soil management		Mandays M Cum	0.02		10.00	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	5.00	5.00	-			
07. Landscaping and plantation	a) Peripheral road, gates, view point, cemented steps on bank	Mandays		0	60.00	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	20.00	20.00	20.00				
	b) Beautification and landscaping over dump	LS Mandays		0	15.00	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	5.00	5.00	5.00				
	c) Plantation	LS Mandays Ha.		0	6.00	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2.00	2.00	2.00				
08. Power cost		LS Mandays		0	20.00	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	6.67	6.67	6.67			
09. Water quality management		LS Mandays																																					

It may however be noted that there are colonies of CCL and DVC located over the DVC Bermo ML area, the cost involved for their R&R has not been included in the above abandonment cost as it will be taken up separately by CCL and DVC.

Indicative costs for Mine closure activities are based upon data collected from various sources including discussion with actual mine operators, internet, quotations from vendors.

A perusal of above Table shows that the expenditure on implementation of the mine closure activities will be ₹ 178.08 crore.

Adoption of safety measures and monitoring of safety aspects for a maximum period of 3 years could be considered pertinent.

It may be noted that one major activity is to rehandle 46.10 Mcum(B) OB from the temporary surface dumps and crown dumps.

There is a large list of activities which are to be undertaken for mine closure plan during the mining period and at the end of the mining operations. All the related details of activities have been tabulated in Table 15.14 along with volume of work and cost of each activity along with their year of implementation. The summary is given below in Table 11.16

b.) Escrow account amount/ Annual Closure cost

The closure cost of an opencast mine has been prescribed as Rs. 6.00 lakh/ha (as on August, 2009) of Project Area as per guidelines circulated by MOC, Govt. of India vide letter dt. 07-01-2013. The guidelines also prescribe that these rates will stand modified based on the Whole Sale Price Index (WPI) as notified by Govt. of India time to time.

Base Date and Balance Life of the Mine

The life of the mine as per AMP is 27 years as on 1.4.2017 which is the base date of this Mining Plan.

Annual closure cost

Annual closure cost is to be computed considering the closure cost for total project area at the above mentioned rates and dividing the same by the entire life of the mine in years for the new projects and for the balance life of the project for operating/ existing mines. An amount equal to annual cost is to be deposited each year throughout the mine life compounded at 5% annually.

In case of DVC Bermo coal mine, The Block/ ML area is 167.434 Ha and 1.91 Ha area is proposed to be used for facilities adding up to 169.344 Ha of Total Project Area which has been considered for calculation for the Escrow amount.

The following Table 15.15 shows the calculations to reach at the payment to be made in the 1st year.

**TABLE 15.15
CALCULATIONS OF AMOUNT TO BE DEPOSITED IN ESCROW
ACCOUNT IN 1ST YEAR**

Type of the Mine	OC
Base rate of closure cost - August 2009 (Cr. □./Ha.)	0.06
Monthly Wholesale Price Index	Aug. 2009 129.6
Monthly Wholesale Price Index*	November 2016 183.1
Escalation factor of Closure cost	1.41281
Rate of compounding of Annual Closure Cost	5.00%

* **Source: WPI has been adopted from the web site of Chief Economic Advisor, Govt. of India.**

Closure cost as on November 2016 (Cr. □./Ha.)	0.0847685
Project Area (Ha.)	169.344
Amount to be deposited into Escrow Account at Nov. 2016 WPI "□Cr."	14.3550
Amount already deposited into Escrow Account "□Cr."	0
Net Amount to be deposited into Escrow Account at Nov. 2016 WPI "□Cr."	14.3550
Starting year for Escrow deposit	1
Ending year for Escrow deposit	27
Balance Life of the project For Escrow Account "in Yrs"	27
Annual Closure Cost (□Cr.)	0.5317
TOTAL Escrow amount (□Cr.) :	29.0658

Year Wise Provision For Total Escrow amount

Table 15.16 shows the year wise provision for total escrow amount.

**TABLE 15.16
YEAR WISE PROVISION FOR ESCROW ACCOUNT**

Year	Amount (□ Crores)
	OC
1	0.5317
2	0.5583
3	0.5862

Year	Amount (₹ Crores)
4	0.6155
5	0.6462
6	0.6786
7	0.7125
8	0.7481
9	0.7855
10	0.8248
11	0.8660
12	0.9093
13	0.9548
14	1.0025
15	1.0527
16	1.1053
17	1.1606
18	1.2186
19	1.2795
20	1.3435
21	1.4107
22	1.4812
23	1.5553
24	1.6330
25	1.7147
26	1.8004
27	1.8904
Total	29.0658

Thus the total amount which will be deposited upto the end of post mine closure plan will be ₹ **29.0658** Crores.

15.7 FINANCIAL ASSURANCE

- i) For financial Assurance the mining company shall open an Escrow account, with any Scheduled Bank, with the Coal Controller Organisation (on behalf of the Central Govt.) as exclusive beneficiary. The mining company shall cause payments to be deposited in such Escrow account at the rate computed as indicated in table given above. The owner of the company may select the Scheduled Bank where the Escrow account is to be opened and inform the same to Coal Controller, Kolkata. The Escrow account has to be opened as per the Guidelines of the Mine Closure Plan. The amount being deposited will be reviewed with such periodicity as deemed fit by Coal Controller.

- ii) Up to 80% of the total deposited amount including interest accrued in the Escrow Account may be released after every 5 years in line with the periodic examination of the Closure Plan. Amount released shall be equal to the expenditure incurred on the progressive mine closure in the past 5 years or 80% which ever is less. The balance amount at the end of final mine closure shall be released to mine owner on compliance of all statutory Rules, Regulations, Orders made by Central or State Govt., Statutory Organisations, Courts, etc. and duly certified by the Coal controller.
- iii. An agreement, outlining the detailed terms and conditions of operating the Escrow account, shall be executed between the Mining company, Coal Controller and the concerned bank in order to give effect to this. The agreement will be executed before the grant of the permission by the Coal Controller to open the mine.

15.8 RESPONSIBILITY OF THE MINE OWNER

It is the responsibility of the mine owner to ensure that the protective measures contained in the Mine Closure Plan including reclamation and rehabilitation works have been carried out in accordance with the approved mine Closure Plan and Final Mine Closure Plan.

The owner shall submit yearly report to the Coal Controller before 1st July of every year setting forth the extent of protective and rehabilitative works carried out as envisaged in the approved Mine Closure Plan (Progressive and Post mine Closure Plan).

The prime responsibility of mine closure shall always lie with the mine owner, and incase the funds deposited are found to be insufficient to cover the cost of final mine closure, the mine owner undertakes to provide additional fund equivalent to gap in funding before five years of mine closure.

15.9 PROVISION FOR MINE CLOSURE

1. The mine owner shall be required to obtain a mine closure certificate from Coal Controller to the effect that the protective, reclamation and rehabilitation works in accordance with the approved mine closure plan/final mine closure plan have been carried out by the mine owner for surrendering the reclaimed land to the State Government concerned.
2. The balance amount at the end of the final Mine Closure shall be released to mine owner on compliance of all provisions of Closure Plan duly signed by the mine owner to the effect that said closure of mine complied with all statutory rules, regulations, orders made by the

Central or State Government, statutory organizations, court etc. and duly certified by the Coal Controller. This should also indicate the estimated extractable coal reserves and coal actually mined out.

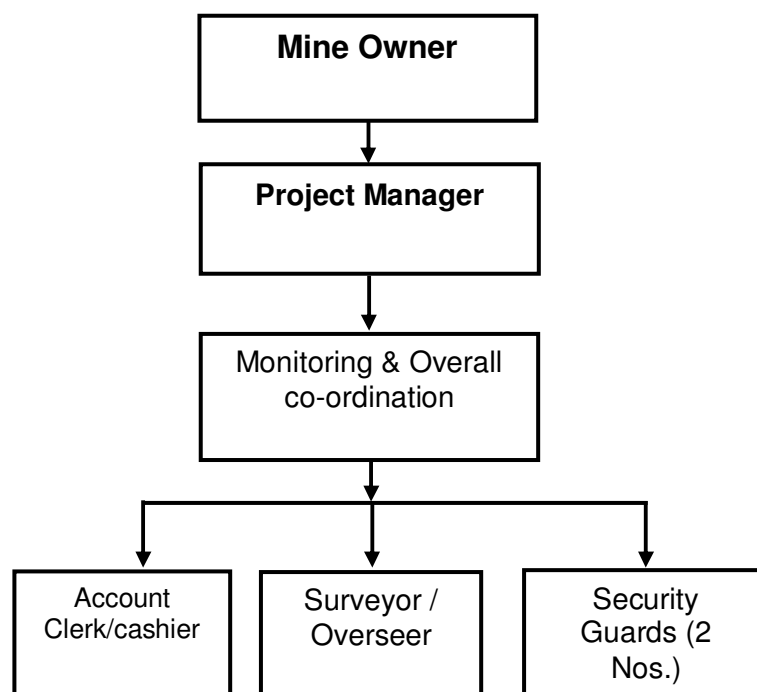
3. If the Coal Controller has reasonable grounds for believing that the protective, reclamation and rehabilitation measures as envisaged in the approved mine closure plan in respect of which financial assurance was given has not been or will not be carried out in accordance with mine closure plan, either fully or partially, the coal controller shall give the mine owner a written notice of his intention to issue the orders for forfeiting the sum assured at least thirty days prior to the date of the order to be issued after giving an opportunity to be heard.

After the closure of mine, the reclaimed leasehold area and any structure thereon, which is not to be utilized by the mine owner, shall be surrendered to the State Govt. concerned following a laid down procedure as in vogue at that point of time.

15.10 IMPLEMENTATION PROTOCOL

Progressive mine closure activities will be taken care of by a team as shown in Fig 15.2.

FIG 15.2: ORGANISATION FOR POST MINE CLOSURE ACTIVITIES



ANNEXURES

16

Stamp under 9, No. 577 on 10/1/51

Stamp -
 Having No. 577, for 1951
 Cartridge paper white 2
 * Copying fee ordinary
 Copying fee urgent
 Charges for map or plan

exempted

1951 B. special adhesive stamp collector seal B.N.
 1951 B. as 1951 adhesive
 stamp collector seal B.N. to Rs. Special Adhesive stamp
 1951 B. special adhesive Collector Seal B.N.
 1951 collector seal B.N.
 1951 B. special adhesive
 stamp affixed by
 S. Subbaraj, 10.1.51
 Comp. Superintendent
 Calcutta collectorate

Stampable under Rule 21 only stamped
 under the Indian Stamp Act 1899
 Schedule IA No. 35(C) & Sec. 4
 Fee paid as under

A	307
E	2
I	30
A {a}	70
A {b}	2
A	4

550-

5d/-

Registrar of Calcutta

10.1.51

Renounced from 1st day of January 1951 as follows:-

THIS AGREEMENT ^{was} made this 19th of January One thousand nine hundred and Fiftyone BETWEEN THE PRESIDENT OF INDIA hereinafter called the Lessor (which term shall unless excluded by or repugnant to the subject or context be deemed to include his successor or successors and/or assigns) of the One part and the DANMODAR VALLEY CORPORATION, a Corporation established under the Danmodar Valley Corporation Act 1948 and having its Head Office at Anderson House, Alipore in the suburbs of Calcutta hereinafter called the Lessee (which term shall unless excluded by or repugnant to the subject or context be deemed to include its successor or successors) of the other part is supplemental to an Indenture of sub-lease bearing date the 26th day of September 1950 and made between the said Lessor of the one part and Lessee of the other part and is supplemental to an Indenture of sub-lease bearing date the 26th day of September 1950 and made between the said Lessee of the one part and Lessee of the other part and registered at Calcutta in Book I volume 88 pages 108 to 113 being number 31 for the year 1950 whereby the said Lessor demised to the Lessee the underground coal mining rights of and in the land forming part of villages Kargali, Baidkero, Kero and Emlo in the Bokaro and Ramgarh Coalfields in the District of Hazaribagh limited however the coal seam or seams known as "Derma Seam" or other seams lying on the top of the Derma seam within the area mentioned therein, containing an area of 1251 Bighas 11 Kottahs and 5 Chhatteks or thereabouts fully described therein as also in part I to III of First Schedule hereto for a term of 35 years with effect from 1st day of January 1951 and subject to the terms and conditions mentioned in the said Indenture of sub-lease WHEREAS the Lessee required certain ^{existing} rights and concessions and in order to enable the Lessor to grant the same to the Lessee the Lessor ^{engaged} the immediate Superior Landlords viz. Messrs. Bokaro Ramgarh Ltd. to grant him certain further rights and concessions which they agreed to do AND WHEREAS by an Agreement bearing date the 9th day of January 1951 and made between Messrs. Bokaro & Ramgarh Ltd. of the one part and the Lessor of the other part and registered at Calcutta it was, for the consideration therein mentioned, agreed inter alia between the parties that the principal Indentures viz. the sub-leases dated respectively 4th day of November 1915, 3rd day of April 1919 and 14th day of Oct 1944 shall with respect to each area or areas (hereinafter referred to as the "said areas" or the "said seams") as have been sublet by the said Lessor to the Lessee as aforesaid be and are thereby varied and modified for a period of 35 years commencing from 1st day of January 1951 as follows:-

- 2 -

(1) With effect on and from the date of these presents in respect of coal raised, gotten and despatched from the mines and premises comprising the said seams in the form of run of mine coal royalty shall be payable thereon to the said Bokaro & Banger Ltd. at the rate of eight annas per ton.

(1a) Notwithstanding anything contained in the principal indentures to the contrary, the lessor shall be at liberty and have power exercisable in respect of or in relation to the said seams or seams :-

(a) to crush and/or wash all or any coal raised and gotten from the mines and premises comprising the said seams and to submit all or any coal so raised and gotten to any special process which the lessor may in his absolute discretion consider necessary or expedient;

(b) to dispatch and/or raise and gotten from the mines and premises comprising the said seams in the form of run of mine coal or at his discretion to dispatch coal separately classed as steam coal or rubbish coal or slack coal or dust coal;

(c) To dispatch and effect deliveries of the coal and coke raised gotten and manufactured from the mines and premises comprising the said seams partly or wholly by means of carts, lorries or any other vehicles or by ropeway or by such other means as the lessor may in his absolute discretion consider necessary or expedient;

(d) The following words contained in clause 3 of the covenants in the principal indentures shall be deleted, namely :-
"So as to obtain the largest possible quantity of best steam coal and"

(e) The respective covenants set out in the first and second parts of the second schedule to the said agreement shall be substituted in the Principal Indentures in place of the respective covenants on the part of the said lessor set out in clauses 8 and 9 of the Lessee's covenants in the Principal Indentures.

AND WHEREAS the lessor has agreed to grant to the lessee the said further rights and concessions on the same terms and conditions as are contained in the said agreement dated the 9th day of January 1951 NOW THIS INDENTURE WITNESSETH that in pursuance of the said agreement and in consideration of the payment by the lessee to the said lessor of the said sum of Rs. 75,000/- (the receipt of the whereof the lessor hereby acknowledges

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IT IS HEREBY AGREED AND DECLARED as follows:-

1. The sublease dated the 26th day of September 1950 shall with respect to each area of areas (hereinafter referred to as the 'said areas' or the 'said seams') be have been sublet by the said lessor to the lessee and be affirmed be and are hereby varied and modified for a period of 15 years commencing from the 1st day of January 1951 as follows:-

(i) With effect on and from the said date in respect of coal raised gotten and despatched from the mines and premises comprising the said seams in the form of run of mine coal royalty shall be payable thereon to the lessor at the rate of eight annas per ton.

(ii) Notwithstanding anything contained in the Indenture dated the 26th day of September 1950 to the contrary, the lessee shall be at liberty and have power exercisable in respect of or in relation to the said areas or seams:-

- (a) to crush and/or wash all or any coal raised and gotten from the mines and premises comprising the said seams and to submit all or any coal so raised and gotten to any special process which the lessee may in his absolute discretion consider necessary or expedient.
- (b) to despatch coal raised and gotten from the mines and premises comprising the said seams in the form of run of mine coal or at its discretion to despatch coal separately cleaned as steam coal or rubble coal or slack coal or dust coal.
- (c) to despatch and effect deliveries of the coal and coke raised gotten and manufactured from the mines and premises comprising the said seams partly or wholly by means of carts lorries or other vehicles or by ropeway or by such other means as the lessee may in his absolute discretion consider necessary or expedient.
- (d) The respective covenants set out in the first and second parts of the second schedule hereto shall be substituted in the Indenture dated the 26th day of September 1950 in place of the respective covenants on the part of the said lessee set out in Clauses 8 and 9 of the lessee's covenants in the Indenture dated the 26th day of September 1950.

The Indenture dated the 26th day of September 1950 and all the terms thereof shall continue in full force and be binding on and between the parties hereto save as expressly and specifically varied and modified hereby and all the terms covenants stipulations conditions and provisions contained in the said Indenture as hereby varied and modified shall continue in full force and effect and the said Indenture shall accordingly be construed and take effect as though the provisions (or provisions similar thereto) contained

- 14 -

in Clause 4 and 3 hereof read with the clauses set out in the First and second parts of the second schedule hereto had been originally contained in the said Indenture.

3. It is further agreed and declared as follows:-

(a) The lessee, shall, with effect from the date of these presents pay cess calculated at the rate of one anna in the rupee on the royalties payable to the lessor.

(1) In the event of the rate of cess mentioned in Clause 3(a) above being increased or reduced above or below the present rate of one anna in the rupee the sum payable by the lessee to the lessor pursuant to the provisions of sub-clause 3(a) above shall be correspondingly increased or reduced.

(ii) That the lessee shall pay to the lessor such sum calculated as aforesaid along with the royalties at the time or times when such royalties shall become payable by the lessee and all the provisions contained in the said Indenture as regards payment of royalties and the consequences of non payment thereof when the same become due shall apply with regard to the payment by the lessee of the said cesses also.

PROVIDED HOWEVER that notwithstanding anything herein contained the liability if any to pay taxes, impositions and cess other than what has been mentioned above, created by the Indenture dated the 26th day of September 1950 shall not in any manner be affected except as specifically provided herein.

4. The expression "Superior Landlords" shall mean Bokaro & Ranpur Ltd. & immediate Superior Landlords and also the party in whom the reversion expectant on the termination of the Head Leases mentioned in the Indenture dated the 26th day of September 1950 is for the time being duly vested.

5. The lessee shall observe and perform the terms covenants and conditions contained in the said agreement dated the 9th day of January 1951 and shall absolve and indemnify the lessor of all liabilities at all times which may at any time hereafter arise during the continuance of this agreement and in connection with the agreement dated the 9th day of January 1951 or with regard to any claim made by the superior landlord.

THE FIRST SCHEDULE ABOVE REFERRED TO
Part. I.

All these several pieces or parcels of land containing a total area of 439 bighas 9 kottahs and 10 1/2 chhattaks more or less in Thana Nausah, Pergana Ranpur, Sub-registration Office Giridih

~: 5 :-

in the district Hazaribagh and comprising the undermentioned plots and in respect whereof and other areas royalty is payable to Bokaro and Ramgur limited of No. 7 Wellesley place in Calcutta.

Distt.	Pargana	Thana	Thana No.	Village	Acres	Area Bighas	K. Ch.
Hazari- bagh.	Rampur	Nawadih	20	Baidkaro	26.00	76	13.00
"	"	"	66	Kargali	129.20	390	16.10
"	"	"	65	Karo	x	x	x x
Total					155.20	469	9.10

Part. II.

All those several pieces or parcels of land containing a total area of 363 bighas more or less in thana Nawadih, Pargana Rampur Sub-registration office Giridih in district Hazaribagh and comprising the undermentioned plots and in respect of whereof and other royalty is payable to Bokaro and Ramgur Ltd. of no. 7, Wellesley place in Calcutta.

Distt.	Pargana	Thana	Thana No.	Village	Acres	Area Bighas	K. Ch.
Hazari- bagh.	Rampur	Nawadih	65	Karo	48.00	145.	4.00
"	"	"	64	Emlo	72.00	217	16.00
Total					120.00	363	00.00

Part III.

All those several pieces of land containing total area of 419 Bighas 1 Kottah and 11 Chhattacks more or less in Thana Nawadih Pargana Rampur Registration office Hazaribagh forming part of Bokaro Coal Field in district Hazaribagh and comprising the undermentioned plots and in respect whereof royalty is payable to Bokaro and Ramgur Limited of 7 Wellesley Place, in Calcutta.

Distt.	Pargana	Thana	Thana No.	Village	Acres	Area Bighas	K. Ch.
Hazari- bagh.	Rampur	Nawadih	20	Baidkaro	34.24	103	11-8
"	"	"	66	Kargali	98.20	297	1-2
"	"	"	65	Karo	6.10	18	9-1
Total:					138.54	419	1-11

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THE SECOND SCHEDULE ABOVE REFERRED TO
First Part.

That the lessee shall enter or cause to be entered in proper books of account to be provided and kept for the purpose (and which books shall at all mutually convenient times during office hours be open to the inspection of the lessor, the Superx superior landlords and/or any agent of the lessor or the superior landlords authorised in writing in that behalf who will be at liberty to take copies or extracts therefrom) true and correct account of all the coal raised gotten and despatched as aforesaid and all coke despatched as aforesaid and manufactured out of the coal so raised together with all such particulars of dates quantities and weights as shall be necessary or proper to be entered therein in the usual and regular course of business, and the lessee will during the continuance of this agreement make out accounts monthly comprising therein all the coal raised gotten and despatched as aforesaid and the royalties cesses and other monies (if any) due and payable to the lessor and will thereupon deliver to the lessor a true copy of such account and verify the same (if required) by the production of books and vouchers and will at the same time pay to the lessor the amount of royalties cesses and other monies (if any) then due or owing. For the purpose of verifying such accounts as aforesaid there shall be accepted by the lessor as conclusive proof of the quantities of coal and/or coke despatched the relative railway wagon challans or receipts PROVIDED that where despatches from the demised mines are partly or wholly by cart lorry or other vehicles or by ropeway or any other means to destination and not by railway as the quantity of coal gotten raised and despatched from the demised mines and premises shall be ascertained as follows:-

1. (a) Where the coal is despatched by ropeway.

The quantity of coal despatched shall be verified by reference to the number of buckets which pass from the loading terminal of the aerial ropeway at the quarry end. The buckets used for carrying coal away from the said seams shall be of uniform size and capacity. The weight of the average contents of an agreed number of such buckets shall as soon as possible after the commencement of despatches, be ascertained in the presence of the representatives of the lessor, Bokaro & Ramgur Ltd. and of the lessee and the same shall be accepted as the standard weight of coal per bucket. For the purpose of counting the number of buckets loaded with coal and despatched from the loading terminal

in the books
of the lessee
it is required
that the lessee
shall maintain
a true and correct
account of the coal
raised gotten and
despatched as
aforesaid and
the royalties
cesses and other
monies (if any)
due and payable
to the lessor

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of the aerial ropeway, at least two automatic counting machines popularly known as tacheometers shall be installed and maintained by the lessee on the ropeway at or near to the loading or despatching point and at a reasonable distance from each other. Readings as recorded on the tacheometers shall be taken at regular intervals and entered in the proper books of account to be maintained by the lessee in the usual and regular course of business. It shall be lawful for the lessor and/or the superior landlords or their respective agents authorised in writing in this behalf to inspect the said tacheometers and to take readings thereof at any time, for the purpose of verifying the accounts of the lessee as aforesaid, the relative reading the tacheometers shall, if the tacheometers are found on inspection by the lessor or the superior landlords to be in perfect working order, be accepted by the lessor as conclusive proof of the quantities of coal so despatched.

Provided that in case both tacheometers cease working or working partially for any reason whatsoever, or are found by the lessor or the superior landlords to be not in perfect working order, the lessee shall on each such occasion forthwith stop any further despatches by means of Ropeway and shall recommence despatches only after the tacheometers have been repaired to the satisfaction of the lessor and/or its superior landlord or replaced.

The lessor and the superior landlords or their respective agents authorised in writing in this behalf shall inspect and test the tacheometers at least once a month. If upon any such inspection or testing as aforesaid of the tacheometers any error shall be discovered or if they are found not to be working properly to the prejudice of the lessor, such error or improper working, shall be regarded as having existed from the time of the last inspection by Bokaro and Ramgur Ltd. or its superior land lords or their authorised agents whichever is later and for the purpose of verifying the amount of coal despatched during the said period the daily average despatched by the ropeway over the three months immediately preceding the last inspection shall be accepted by all the parties concerned as the actual amount of coal despatched per day during the said period.

(b) When the coal is despatched by means other than Railway or Aerial Ropeway :-

If owing to breakdown of the Ropeway or the Tacheometers as mentioned in the proviso to (a) above or nonavailability of Railway transport, the lessee is required to despatch coal by means such as carts, trucks or lorries, the lessee shall make suitable and mutually satisfactory arrangements with the lessor and the superior landlords for ascertaining the weight of the coal so despatched before the work of despatching the coal is commenced. The lessee shall in that event continue to maintain regular books of accounts as aforesaid.

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2. A deduction of 1/2% shall be made for coal consumed in the Boilers or Engines of the mines or for burning bricks or like in connection with the working of the mines and/or given to servants workmen or agents of the lessee employed in the mines for the mines for their personal consumption on which no royalty is payable as provided in the sub-lease dated the 26th day of September 1950.

Second Part.

The lessee shall at all times during the continuance of this agreement keep true and correct plans and sections of the mines hereby demised and the working thereof upon which the exact position and actual condition of the works shall at least once in every half year be accurately set forth and delineated (such plans to be kept at the office of the said mines) and will permit his lessor and/or the Superior Landlord or their respective agents authorised in writing in that behalf at all reasonable times to have access to and inspect and verify the same and take copies of or extracts from the plans so to be kept and shall supply to the lessor and to Bokaro & Ramgarh Ltd. copies of such plans once in every half year if they shall so require.

IN WITNESS whereof the Common Seal of the lessee has hereunto been affixed and these presents have been executed on behalf of the president the day and years first above written.

Signed
SEUND- AND DELIVERED on behalf
of the Lessor by L.S. Corbett
Chief Mining Engineer, Railway
Board in the presence of :-

For & on behalf of the
President of India by

Sd/- S.C. Nanday
Secretary to Coal Commr

Sd/- L.S. Corbett
Chief Mining Engineer Railway
Board

The Common Seal of the Lessee
is affixed hereunto and these
presents are signed on behalf
of the lessee in the presence of :-

Damodar Valley Corporation

Sd/- N.N. Nay
Under Secretary
Damodar Valley Corporation

Sd/- S. Sen
Secretary
Damodar Valley Corporation

21.5.51

Presented for Registration at 12.30 p.m. at the Calcutta
Registration office on the 18th day of January, 1951 by Dr. S. Sen
and at the Examiners.

Sd/- S. Sen

Sd/- A.M.N. Mookerjee
Registrar of Calcutta
18.1.51

Examination is conducted by Dr. S. Sen, Secretary, Damodar Valley
Corporation, Anderson House, Alipore, Calcutta.

Sd/- S. Sen, Secretary
Damodar Valley Corporation

Transmitted by Mr. A.M. Roy, Under Secretary, Damodar Valley Corp.,
Anderson House, Alipore, Calcutta.

Sd/- A.M. Roy.

Thence impression of the specimen specimen is displayed with

Sd/- A.M.N. Mookerjee
Registrar of Calcutta
18.1.51

examined by Mr. L.B. Cornett, Chief Mining Engineer, Railway
Board who is now engaged from personal appearance in this
office under section 24 of Act XVI of 1908 is proved by his
signature.

Sd/- A.M.N. Mookerjee
Registrar of Calcutta
18.1.51

- 1 10 :-

A, B,
Blank

Dated the day of
 Between
 The President of India
 And
 Dumodar Valley Corporation
 Agreement
 S.K. Mondal
 Solicitor to the Central
 Government at Calcutta

Copied by Haripada Sarker

C. 20.1.51

Comp by Sd/- 20/1/51

Read by Mahesh N. Nay

T.C. 20/1/51

Fee paid

Certified to be a true copy

Under Art. F.

(Seal)

Under Art. G.

Value of stamp

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Mark Value of C. Paper

Cost for map or plan

Total cost for copy

Copy prepared, signed,
 sealed and delivered to
 N.N. Roy Under order No.
 27 d/20.1.51

Sd/-
 Joint Sub-Registrar of Assurances,
 Calcutta 20.1.51

Sd/- 20.1.51
 Joint Sub-Registrar
 Calcutta,

- 1 -

THIS INDENTURE made this twenty sixth day of September one ~~thousand nine hundred and fifty~~ thousand nine hundred and fifty BETWEEN THE PRESIDENT OF INDIA hereinafter called the LESSOR (which term shall unless excluded by or repugnant to the subject or context be deemed to include his successor or successors and/or assigns) of the One part and the DANODAR VALLEY CORPORATION, a Corporation established under the Danodar Valley Corporation Act 1948 and having its Head Office at Anderson House, Alipore in the suburbs of Calcutta hereinafter called the ~~XXXXXX~~ LESSEE (which term shall unless excluded by or repugnant to the subject or context be deemed to include its successor or successors and permitted assigns) of the other part.

WHEREAS by a Lease dated the 1st day of November, 1915 and made between Bokaro & Ramgarh Limited (hereinafter called the Superior Landlords) and Great Indian Peninsular Railway Co., (hereinafter called the G.I.P. Railway Co.) the said superior landlords for consideration therein mentioned did thereby grant and demise unto the said G.I.P. Railway Co., for the term of nine hundred and ninety nine years less one day the underground rights in certain pieces or parcels of land forming part of Mouzae Korgali, Baidkero, Phagun and Bhara Dighai ^{phor} fully described in the said Lease (hereinafter called the Head Lease No. 1) a portion whereof is intended to be hereby granted and demise.

AND WHEREAS by another Lease dated the 3rd day of April 1919 and made between the same parties mentioned above the said superior landlords for the consideration therein mentioned did thereby grant and demise unto the said G.I.P. Rly. Co., for the term of 999 years less one day the underground rights in the 926 Bighas of theabouts in the said Mouzae Emlo and Koro fully described in the said Lease (hereinafter called the Head Lease No. 2) a portion whereof is intended to be hereby granted and demise.

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AND WHEREAS by the said lease dated the 1st day of November ~~1915~~ ¹⁹¹⁵ and 3rd day of April 1919 the said C.I.P. Rly. Co., was entitled to grant a sub-lease of the said underground ~~rights~~ rights in respect of the said land or any portion thereof.

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AND WHEREAS all the rights of the said C.I.P. Rly. Co., under the said leases dated the 1st. day of November 1915 and 3rd day of April 1919 have now vested in the said Lessor.

AND WHEREAS by virtue of a lease dated the 6th day of June 1945 (hereinafter called the Head Lease No. 3) between the Bokaro & Ramgarh Limited (hereinafter called the Superior Landlords) and the Governor General in Council the Lessor is entitled to the underground rights in 419 Bighas 1 cuttah and 11 chatta of land in the villages of Baidkaro, Kargali and Karo and on the terms and conditions contained in the said Lease.

AND WHEREAS by the said Head lease No. 3 dated the 6th day of June 1945, the Lessor is entitled to grant a sub-lease of the said underground rights in respect of the said land or portion thereof.

AND WHEREAS the Lessee has approached the Lessor for a lease of the underground coal mining rights of 469 bighas 9 cuttaha 10 chatta out of Head Lease No. 1 and for underground coal mining rights out of Head Lease No. 3 and for underground coal mining right of 363 bighas out of Head lease No. 2 fully described in schedules No. 1A, 1B and 2 hereunder and delineated in plan 467 A1 attached to these presents.

AND WHEREAS the Government of India has spent large sum of money in acquiring the coal lands mentioned in the head leases, in prospecting ^{and} the construction and installation of machinery buildings and structures etc. thereon and for electrification etc.

AND WHEREAS the Lessee has agreed to pay the said expenses incurred by the Government of India in respect of the lands the coal mining rights whereof are to be sub-demised to the Lessee under these presents the amount and manner of payment of which will be decided by the Government of India.

AND WHEREAS the Lessor has agreed to the proposal of the Lessee on the terms and conditions herein contained.

NOW THIS INSTRUMENT WITNESSETH AS FOLLOWS:-

1. In pursuance to the said Agreement and in consideration of the payment to be made to the Railway Board of the Government of India of a sum to be fixed as aforesaid and of the Royalties covenants and agreements hereinafter reserved and contained and on the part of the Lessee to be paid performed and observed the Lessor hereby grant and demise unto the Lessee (subject as herein mentioned) the underground coal mining rights in All These pieces parcels of land and premises fully described in the schedules hereunder written together with all those coal mines beds veins and seams of coal lying there or under the same AND all the estate right title interest claim and demand of the Lessor into out of and upon the same and every part thereof with full liberty and power to the Lessee to search for work make merchantable and carry away the coal

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the coal there found provided always that the Lessee shall not enjoy more liberties, rights, privileges and powers than are given to the Lessor in the said Head Leases No. 1, 2 and 3 and Provided further that this sub-lease shall comprise only the coal seam or seams known as Barua Seam and other seams lying on the top of the Barua Seam within the area comprised in this sub-lease but shall not include the coal seams below the Barua seam.

2. There are included in the said demise under these present and for the purposes thereof the following liberties powers and privileges to the Lessee.

PROVIDED however that the Lessee will not have any surface rights in respect of the area marked YY in the said plan hereto annexed.

- (a) To enter upon the lands referred to in the schedule hereinafter except the area marked YY in the plan (hereinafter referred to as "the said lands") and to search for, win, work, get, raise, convert, carry away and dispose of all coal from the said mines and seams hereby demised.
- (b) To sink, drive, make, maintain and use in the said lands any pits, shafts, inclines, drifts, levels, shaft waterways, airways and other works (and to use, maintain, deepen or extend any existing works of the like nature in the said lands).
- (c) To erect, construct, maintain and use on or under said lands any Thermal Stations, engines, machinery, plants, chimneys, flues, furnaces, coke ovens, brick-kilns, lime-kilns, workshops, storehouses, bungalows, godowns and other buildings and other works and conveniences (and to use, maintain and extend any existing works and conveniences of the like nature on or under the said lands).
- (d) To make, any tramways, railways, roads, and other ways in or over the said lands and to use, maintain extend and go and repeat with or without horses, cattle, wagon or locomotives over the same (or existing tramways, railways, roads and other ways in or over the said lands).
- (e) To quarry and get stone, sand, gravel and other building and road materials and clay and to use and employ the same and to manufacture such clay into bricks or tiles and to use such bricks or tiles but not to sell any such materials, bricks or tiles.

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- (f) To appropriate and use any streams, water courses, springs or water in or upon the said lands and to divert, stop up or dam any such stream or water course and collect or impound any water and to make construct and maintain any water courses, culverts, drains and reservoirs but not so as to deprive any cultivated lands, village, buildings or watering places for livestock or lands of the lessor of a reasonable supply of water as before accustomed nor in any way to foul or pollute any streams or springs.
- (g) To enter upon and use a sufficient part of the surface of the said lands adjacent to any pits or works for the purpose of stacking heaping or depositing thereon any produce of the mines or works carried on and any earth, materials and substances dug or raised under the liberties and powers ~~as mentioned from the said lands~~ herein.
- (h) Upon the said lands to convert into coke any coal or coal dust produced from the said lands and carry away such coke.
- (i) To demolish quarters and dhows within 500 ft. of the Quarry and also to cut down and fell timber and brush wood which interferes with the due ~~exercise~~ exercise of the liberties and privileges above granted, provided however that the rights and privileges given to the Lessee by this clause shall be exercised subject to the condition that the Lessee shall pay the Lessor the ~~market value~~ ~~as assessed~~ assessed by the Land Acquisition Officer of the area or other Agency mutually agreed upon and also shall pay for the timber and brush wood cut down or felled by it at the rate ordinarily charged for such timber and brush wood at the nearest reserve forest.
- (j) All the liberties which are now or hereafter shall or may be included in the said three head leases.
3. There are excepted and reserved to the Lessor out of this demise the following:-
- Liberty and Power for the Lessor or any person authorised by him in that behalf to enter into and upon the said lands and the area marked 'A' in the said plan and to search for win, dig, get, raise convert and carry away any minerals (other than the said coal) and other substances and for these purposes to sink, drive, make erect, construct, maintain and use such pits, shafts, inclines, drifts, levels, irrigation work, waterways, airways, water-courses, drains, reservoirs, engines, machinery, plants buildings, canals, tramways, roads, ways and other works and conveniences as may be deemed necessary or convenient and also to get from the said lands stone, gravel,

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- (6) That the agents, servants and workmen authorized by the lessor or its superior landlords shall be at liberty at all reasonable times during the said term, to inspect and examine all mines and work carried on by the Lessee in or under the said lands and make surveys or plans thereof and the Lessee shall depute proper persons employed by the Lessee and acquainted with the Mines and works to effectually assist such agents, servants and workmen in conducting every such inspection and shall afford them all information connected with the working of the mines which they may reasonably require and also shall and will conform to and observe all orders and regulations which the Lessor as a result of such inspection or otherwise, may from time to time, see fit to impose, in the interests of public health and safety.
- (7) That whenever the Lessee shall find in the said lands any mineral or product other than the said coal and other substance to which the lessee is entitled under the liberties and powers hereinbefore contained, the Lessee shall immediately report such discovery in writing to the Lessor with full particulars of the nature and position of each find.
- (8) That the Lessee shall enter or cause to be entered in proper books of account to be provided and kept for that purpose (and which books shall at all reasonable time be open to the inspection of any agent of the Lessor or of its superior landlords authorized in writing in that behalf whom shall be at liberty to take copies or extracts therefrom) true and correct entries of all the coal raised and gotten out of and despatched from the premises and of all coke despatched and aforesaid and manufactured out of the coal so raised together with all such particulars of dates quantities and weights as shall be necessary or proper to be entered therein in the usual and regular course of business and the Lessee will during the continuance of this lease make out account monthly comprising therein all the coal and dust raised and gotten and despatched as aforesaid during the said month and the royalty due and payable to the Lessor and will thereupon deliver to the Lessor a true copy of such accounts and verify the same (if required) by the production of books and vouchers (Railway wagon challans or receipt being accepted by the Lessor as conclusive) and the Lessee shall not despatch coal from the premises otherwise than by Rail or in the first instance by cart or tramway

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or the railway and will at the same time pay to the Lessor the amount of Royalty (if any) then due and owing.

- (9) That the Lessee shall at all times during the continuance of this lease cause all steam coal and other descriptions and classes of coal coke or dust raised or manufactured to be kept ~~distinct~~^{distinct} and separate according to their class and to be despatched separately and will keep the premises and mines and every part thereof distinct and separate from other mines and workings and will not raise any coal or dust from the premises except from quarries or through pits inclines or shafts opened on the premises and will keep true and correct plan and sections of the mines hereby demised and the workings thereof upon which the exact position and actual condition of the works shall at least once in every half year be accurately set forth and delineated such plans to be kept at the offices of the said mines and will permit the Lessor and its superior landlords and its or his agents duly authorised in writing in that behalf at all reasonable times to have access to and inspect and verify and take copies of or extracts from the plans so to be kept and shall supply to the Lessor copies of such plans once in every half year if it so require.

- (10) The Lessee shall make and pay reasonable satisfaction and compensation for all damage or injury to persons or property which may be done by or on the part of the Lessee in exercise of the liberties and power granted by these presents and shall at all times save harmless and keep indemnified the Lessor and the superior landlords from and against all suits, claims and demands which may be brought or made by any person ^{or persons} in respect of any such damage or injury.

- (11) The lessee will exercise the liberties and powers hereby granted in such manner as to offer no unnecessary or reasonably avoidable obstruction or interruption to the development and working of any minerals not included in this lease and will at all times afford to the Lessor and to the holders of prospecting licenses or mining leases in respect of any such minerals or any minerals within any lands adjacent to the said lands reasonable means of access and safe and convenient passage upon and across the said lands to such minerals for the purpose of getting, working

developing and carrying away the same without causing however any undue interference with the powers and privileges hereby granted to the lessee.

- (12) The lessee shall not grant any sub-lease or assign this lease or transfer or part with possession of the whole or any part of his interest hereunder without the previous written sanction of the Lessor to any person, company or body.
- (13) The lessee shall, at the expiration or ^{determination} sooner determination of the said term, delivery upto the lessor on payment of fair compensation, all mines, pits, shafts, inclines, drifts, levels, waterways, airways and other works (now existing or) hereafter to be sunk or made under the said lands (except such as may have been abandoned in an ordinary and fair course of working) and all engines, machinery, plant, buildings, structures and other works and conveniences which at the commencement of the said term were upon or under the said lands and all engines, machinery, plants and fixtures set up by the Lessee below ground level which cannot be removed without causing injury to any mines or works under the said lands (except such of the same as may with the sanction of the lessor have become disused) and all buildings and structures of brick or stone erected by the Lessee above ground level in good repair, ~~other~~ order and condition and fit in all respects for further working of the said minerals.
- (14) That no building or thing shall be erected set up or placed and no surface operations shall be carried on in or upon any public pleasure ground, burning or burying ground or place held sacred by any class or persons or any house or village site public road or other place which the Lessor may determine on public grounds to bring within this restriction or in such a manner as to injure or prejudicially affect any buildings, works, property or rights of other persons and no land shall be used for surface operation which is already occupied by persons other than the Lessor or the superior landlords for works or purposes not included in this lease if any other land not so occupied is suitable and available for such surface operations. In case no other land be suitable for the purposes of the Lessee, the Lessee may, if legally entitled, occupy such surface lands in occupation of other persons on payment of reasonable compensation.

- (15) No mining operations or workings shall be carried on or permitted to be carried on by the Lessee in or under the said lands at or to any point within a distance of fifty (50) yards from any railway, reservoir, canal or other public works or any building or inhabited site shown on the plan hereto annexed except with the previous permission in writing of the Lessor or some officer authorised by him in that behalf or otherwise than in accordance with such restrictions and conditions either general or special which may be attached to such permission.
- (16) Workings in the beds of nullahs shall be confined to quarrying only and no underground galleries shall be driven from such quarries. No underground workings under the nullah beds or quarries in the beds of nullah shall be made except with the previous permission in writing of the Lessor which may be subject to such restrictions as the Lessor thinks fit.
- (17) That the Lessee shall during the continuance of the term hereby demised or until the same shall be determined as hereinafter provided, duly observe and perform such of the Lessee's covenants contained in the said three Head Leases so far as the same relate to the premises hereby demised except the covenants therein contained for payment of rent and royalties and will keep the Lessor indemnified against any non-observance or non-performance of any such covenants and shall not at any time omit, commit or do any act, deed, matter or thing whereby or by means or reason whereof the said lease may be or become forfeited, surrendered or void or voidable or whereby the Lessor may be or become liable in damages or otherwise to his superior landlords.
- (18) To prevent heavy accumulation of water and thereby to endanger the future dip workings of the Berma Seam the Lessee shall, as far as possible, uniformly backfill the void, that would be created by stripping the ~~seam~~ overburden and coal by the Lessee, by the Overburden and coal by the Lessee, by the Overburden removed from the leasehold, provided however, that all exposed coal faces, within the leasehold shall not be covered by loose overburden but always kept clear of it. (loose overburden)

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overburden)

- (19) That the Lessee shall not charge any ground rent for the land which now belongs to lessee and on which the lessor has already constructed buildings and other structures until such time as compensation for such buildings and other structures will have been paid by the Lessee according to the market value as assessed by the land acquisition officer or other agency mutually agreed upon or until the Lessor will get such buildings, structures, etc., removed and also constructed elsewhere if he or the Government of India think fit.
- (20) That Lessee shall allow the Lessor or Lessor's representatives access without any charge whatsoever to the bottom seam or seams within the lease-hold or to any other property lying adjacent to the lease-hold and also allow the Lessor or his employees to pass and re-pass and to take in or take out any minerals or materials in such a way as may be convenient to the Lessor free of charge from the bottom seam or seams or from any property over the lease-hold without however causing any interference with the powers and privileges hereby granted to the Lessee.
- (21) The Lessee shall give the Lessor all facilities for making suitable roads ways and other works or conveniences as may be deemed necessary by the Lessor for winding and thereafter transporting any coal and other minerals from the bottom seam or seams within the lease-hold or from other property or properties without causing any undue interference to the powers and privileges of the Lessee hereunder and for giving these facilities the Lessee shall not levy any charge in the shape of day-leave, or any charges whatsoever.
- (22) That the Lessee shall allow the Lessor all responsible facilities to gain access to the said lands and mines for moving any machinery or materials belonging to the Lessor and lying within the area hereby granted but no demised to the lessee under these presents.
- (23) The Lessee shall at the termination of the lease leave the coal faces in such condition that if any coal in the Berma Seam within the area hereby demised remains to be won it can be readily worked by the Lessor or his duly authorised agents.
- (24) The Lessee shall leave a solid barrier upto the floor of Berma Seam, starting from the existing surface level, of not less than 200' ft. in width measured horizontally.

- protection a wall against inundation of the dip area not covered by the sub-lease.
- (25) The Lessee shall absolve and indemnify the Lessor of, all liabilities at all times which may at any time hereafter arise during the continuance of this lease and in connection with the said three Head leases or with regard to any claim made by the Superior landlords due to acts or negligence of the lessee its servants and agents.
- (26) The Lessee shall pay to the Lessor or to the Superior landlords as may be arranged proportionate Mouza rent for the area comprised in this lease.
- (27) The Lessee shall allow the Lessor all reasonable facilities to take water if available in the quarry or quarries or in the wells, pits and/or ponds existing in the lease-hold covered by the sub-lease or used by the Lessor or by the employees of the Government of India and that the Lessee shall not levy and charge for such supply of water to the Lessor or the employees of the Government of India.
- (28) If the Lessee becomes aware of any proceedings to recover the property herein comprised or any part thereof or any encroachment made upon or any interference with the right of the Lessor or the superior landlords concerning such property, it shall be bound with reasonable diligence to give notice thereof to the Lessor.

COVENANTS

COVENANTS BY THE LESSOR:

The Lessor hereby covenants with the Lessee as follows:-

- (1) That the Lessee paying the royalties hereby reserved and observing the performing all the covenants and agreements herein contained and on the part of the Lessee to be observed and performed shall and may quietly hold and enjoy the rights and promises hereby devised for and during the term hereby granted without any lawful interruption from or by the Lessor or any persons rightfully claiming under him.
- (2) That the Lessor will duly pay the rent and Royalties by the Head Leases reserved in accordance with the covenants therein contained and will not do omit or suffer or permit to be done omitted or ~~suffered~~ suffered anything whereby the said Head Leases or any of them may be avoided or forfeited.

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- (3) That the Lessor shall as far as possible make available to the Lessee all such surface rights as are held by the former in respect of the area marked "XX" in the said plan No. 467/R-1 attached to these presents for the consideration mentioned in Clause 1 of the agreement and will if he thinks fit hereafter furthermore make available to the Lessee for consideration to be mutually agreed upon at the time such of the surface rights as the Lessor already has in respect of area "X" of the said plan AND will also endeavour to procure from the superior landlords by ordinary means and when so procured grant or devise unto the Lessee the said superior landlords interest in so much of the surface rights of and in the said lands as may be required for colliery purposes subject to the payment of suitable rent in case of wasteland a rent and salami in case of cultivated land as may be customary in the village or villages in which the said lands are situate and on such other terms and conditions as may be reasonable provided always that upon the Lessee coming to require any such surface right for such colliery purpose it shall forthwith at its own cost surrender the same to the Lessor or to the superior landlord or landlords as the Lessor may direct.
- (4) The Lessee shall pay the Lessor adequate compensation in respect of the minimum royalty payable for the area devised under this Indenture after the expiry of the lease period of 35 years. Such compensation shall be fixed by the Government of India before the expiry or sooner termination of this Indenture and shall also be paid by the Lessee to the Lessor before such expiry or termination. The decision of the Government of India as to the amount of compensation shall be final and binding on the Lessee.

THE LESSOR AND THE LESSEE MUTUALLY COVENANT IN THE MANNER FOLLOWING:-

- (1) That any royalty hereby reserved shall be in arrear or unpaid for the space of two calendar months next after the day whereon the same ought to be paid (whether the same shall have been formally demanded or not) or if Lessee shall fail or neglect to perform or observe any of the covenants and agreements contained in these presents and on the part of the Lessee to be observed

- 14 -

~~and performed then and in any such case it shall be lawful~~

and performed then and in any such case it shall be lawful for the Lessor at any time thereafter and although advantage may not have been taken of some previous defaults of a like nature ~~or~~ to re-enter into and upon the said premises or any part thereof in the name of the whole and to reupon this present lease and the said terms and the liberties, powers and privileges hereby granted shall absolutely ~~cease~~ cease and determine but without prejudice to any right or remedy of the Lessor in respect of any breach or any of the covenants and agreements contained in these presents or for the recovery of any royalty remaining unpaid or otherwise whatsoever.

- (2) That if the Lessee shall any time during the said term commit a breach of any covenant or agreement contained in these presents and on the part of the Lessee to be observed and performed, it shall be lawful for the Lessor, for the consideration of the non-exercise of the power of re-entry contained in the last preceding clause hereof to receive from the Lessee such penalty for the breach not exceeding the amount if any that the Lessor may have paid to his superior landlords.
- (3) That the Lessee (having first paid and discharged the royalties and other monies payable by virtue of these ~~present~~ presents) may at the expiration or sooner determination of the said term or within six calendar months hereafter (unless the lease shall be determined under sub-clause (1) of this clause and in that case at any time not less than three calendar months or more than six calendar months after such determination) take down, take up and remove for the benefit of the Lessee all or any engines, machinery, plant, buildings, structures, tramways, railways and other works, erections and conveniences which may have been erected, set up or placed by the Lessee in or upon the said lands and which the Lessee is not bound to deliver up to the Lessor under sub-clause (13) of Lessee's covenants and the Lessor shall not desire to purchase under the provisions of sub-clause (4) of this clause and also minerals and mineral ore ~~own~~ won by the Lessee under the authority of these presents and then remaining in or upon the said lands making reasonable compensation for all damage done to the said lands by such removal.

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- (4) That if, at the ~~x~~ expiration or sooner determination of the said term, the Lessor shall desire to purchase all or any of the engines, machinery, plants buildings structures, tramways, railways and other works, erections and conveniences which may have been erected, set up or placed by the lessee in or upon the said lands and which the Lessee is not bound to deliver up under sub-clause (3) of Lessee's covenants and if the Lessor shall give notice of such desire in writing to the Lessee four Calendar months before expiration or sooner determination of the said term or if the lease shall be determined under sub-clause (1) of this clause some-time within ~~year~~ calendar months after such determination then and in such case the articles and things specified in such ~~xxx~~ ~~xxxx~~ notice shall not be removed by the Lessee but shall be purchased by the Lessor at a price equivalent to the same at the time of their erection upon the said land after deducting from such cost a sum ~~xx~~ equal to 2% thereof for every year which shall have elapsed since that time.
- (5) That if, at the expiration of six calendar months after the expiration of ~~or~~ sooner determination of the said term there shall remain in or upon the said lands engines, machinery, plant, buildings, structures, tramways, railways and other works, erections and ~~x~~ conveniences or minerals or mineral ores or other property which the Lessee be entitled to remove from the said lands, the same shall if not removed by the Lessee within one calendar month after notice in writing requiring their removal be given to the Lessee by the Lessor, be deemed to become the property of the Lessor and may be sold or disposed of for the benefit of the Lessor in such manner as it shall deem fit without liability to pay and compensation or to account to the Lessee in respect thereof.
- (6) That the Lessee may, at any time determine this lease by giving not less than twelve calendar months notice provided however that the Lessee shall, upon such expiration, of such notice render and pay all royalties

-: 16 :-

compensation for damage and other moneys which may then be due and payable under these presents to the Lessor or any other person or persons and shall deliver up these presents to the Lessor and thereupon these presents lease and the said term and the liberties, powers and privileges hereby granted shall absolutely ~~cease~~ and determine but without prejudice to any right or remedy of the Lessor in respect of any breach of the covenants or agreements contained in these presents.

- (7) That if, at any time during the continuance of this demise, any mines or works on the said lands shall become destroyed or rendered substantially and permanently unfit for the purpose of this demise by fire, ~~tempest~~ tempest or flood or violence of any army or mob or other irresistible force, these presents shall, at the option of the Lessee, be void provided that if the destruction or unfitness be occasioned by the wrongful act or default of Lessee or the servants or agent of the Lessee, the Lessee shall not be entitled to the benefit of this provision. And provided also that if this lease shall become void ~~or~~ or by reason of any of the causes aforesaid ~~as~~ it shall be without prejudice to the rights and remedies of the Lessee under or by virtue of these presents for the recovery of any royalty or other sum which may then remain unpaid or in respect of any breach which may have been committed of any of the covenants herein contained on the part of the Lessee.

- (8) That in the event of war or on the occasion of a state of emergency, (of which the President of India shall be the sole judge and the notice next hereinafter mentioned shall be conclusive evidence thereof) and on the Lessor giving notice in writing to the Lessee of his intention so to do, the Lessor may take possession or assume control of the works, plant, machinery and premises of the Lessee at or in connection with the said mines and the Lessee shall conform to and obey all directions given by or on behalf of the Lessor regarding the use or employment of such works, plant and premises

: 17 :-

PROVIDED that fair compensation which shall be determined in default of agreement by arbitration under the provision in that behalf hereinafter contained shall be paid to the Lessee for all loss or damage sustained by it by reason or in consequence of the exercise of the powers conferred by this clause provided also that the exercise of such powers shall not determine the said term hereby granted - effect the terms and provisions of these presents further than that may be necessary to give effect to the provisions of this clause.

- (9) That every notice by these presents required or authorized to be given to the Lessee may be given to the agent of the Lessee or such person resident on the said lands as the Lessee may appoint for the purpose of receiving such notices or if there shall be no such persons then to any person in the employ of the Lessee who may be found upon the said lands or if no such person be found then the same may be left at the said office of the Lessee upon the said lands or if no such person be found then the same may be left at the said office of the Lessee upon the said lands or affixed in conspicuous position upon some building or erection in the occupation of the Lessee upon the said lands.
- (10) All the rights and powers of the Lessor hereunder may be exercised by the Chief Mining Engineer, Railway Board or such Officer of the Government of India as may be authorized in that behalf.
- (11) All compensation for buildings and other structures and lands and mines belonging to the Lessor, whether within or outside the area comprised by this lease and not otherwise provided for in this Indenture, will be determined by the Land Acquisition Officer or by such other agency as may be agreed upon by both the parties (i.e. Lessor and the Lessee) at the time when the said buildings structures lands and mines or any of them are vacated and such compensation shall be wholly paid and borne by the Lessee.
- (12) The Lessee shall also absolve and indemnify the Lessor from all liabilities arising out of claims

-: 18 :-

preferred by any other owner or owners of buildings, structures, lands mines etc., which might be affected as a result of mining or any other operations within or outside the area comprised in these presents whether such buildings structures, lands mines etc., are within the said area or not, and the Lessee shall pay all dues to the claimants to the latter's satisfaction.

- (13) That if and whenever any question or dispute shall arise in regard to the construction, meaning or effect of these presents or any clause or thing herein contained or in regard to the manner or sufficiency of the observance or performance by the Lessee of any covenant or agreement herein contained or in regard to the mode of working of the said minerals or the maintenance or condition of any works in or upon the said lands or in regard to any valuation to be made under these presents or in regard to the amount of payment of any rent, royalty compensation or other money payable by the Lessee or in regard to any other matter or thing relating to or arising out of these presents such questions or dispute shall (except as to any matter the decision of which is specially provided for by these presents) be referred to and determined by the sole arbitration of an Arbitrator to be appointed by the Govt. of India from time to time and the provisions of the Arbitration Act 1940 shall apply to such arbitrations.

THE SCHEDULE 4A ABOVE REFERRED TO.

All those several pieces or parcels of land containing a total area of 469 Bighas 9 Cuttahi and 10 Chattecke more or less in Thana Nawadih, Pergana Rampur, Sub-registration Office Ghaidih in the district Hazaribagh and comprising the undermentioned plots and in respect of whereof and other areas royalty is payable to Bokaro and Ramgarh Limited of No. 7, Wellesley Place in Calcutta.

24. Schedule '1A' from XXXX lease hold of 1915.

District	Pergana	Thana	Village	A R E A		
				No.	Acres Bighas	K. Ch.
Hazaribagh	Rampur	Nawadih	20	Gaidkaro	26.00 78	13.0
"	"	"	66	Kargali	129.20 390	16 10
"	"	"	65	Koro	x x	x x
Total:-					155.20 469	9. 10

-: 19 :-

THE SCHEDULE 1B ABOVE REFERRED TO, *

All those several pieces of land containing total area of 419 Bighas 1 Cuttah and 11 Chatacks more or less in Thana Nawadih, Pargana Rampur, Registration Office Hazaribagh Sub-Registration Office Giridih forming part of Bokaro Coal Field in District Hazaribagh and comprising the undermentioned plots and in respect whereof royalty is payable to Bokaro and Ramgarh Limited of 7, Wellesley Place in Calcutta.

Schedule (1B) from lease hold of 1945.

District	Pargana Thana	Thana Village No.	Village	A R E A			
				Acres	Bighas	K.	Ch.
Hazaribagh	Rampur Nawadih	20	Doldkaro	34.24	103	11	8
"	"	60	Kargali	98.20	297	1	2
"	"	65	Karo	6.10	18	9	1
Total:				138.54	419	1	11

THE SCHEDULE 2 ABOVE REFERRED TO

All those several pieces or parcels of land containing a total area of 363 bighas more or less in Thana Nawadih Pargana Rampur, Sub-registration Office Giridih in district Hazaribagh and comprising the undermentioned plots and in respect of whereof and other royalty is payable to Bokaro and Ramgarh Ltd., of No. 7, Wellesley Place in Calcutta.

Schedule '2' from lease hold of 1919.

District	Pargana Thana	Thana Village No.	Village	A R E A			
				Acres	Bighas	K.	Ch.
Hazaribagh	Rampur Nawadih	65	Karo	48.00	145	4	0
"	"	64	Emlo	72.00	217	16	0
Total:				120.00	363	0	0

-: 20 :-

IN WITNESS WHEREOF the common seal of the Lessee was hereunto affixed and these presents signed on its behalf and also on behalf of the Lessor the day month and year first above written.

Signed and delivered for and on behalf of the LESSOR BY THE Ministry Secretary, Railway Board Ministry of Railways, Government of India, at in the presence of

Sd/- S.S. Ramasubban
Secretary, Railway Board
Ministry of Railways,
Government of India

Sd/- Hire Lal
Stenographer, Railway Board

The common seal of the LESSEE is affixed hereunto and these presents are signed on behalf of the Lessee in the presence of

Sd/- S. Sen
Secretary
Damodar Valley Corporation

Sd/-N.N. Roy
Assistant Secretary
Damodar Valley Corporation

: 21 :-

1000 Rs. Special Adhesive
Stamp collector's seal BM

1000 Rs. Special adhesive BM

1000 Rs. special adhesive
stamp collector's seal

1000 Rs. special adhesive BM

1000 Rs. special adhesive BM

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stamp collector's seal BM

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1000 Rs. special adhesive
stamp collector's seal BM.

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1000 Rs. special adhesive BM

500 Rs. Special adhesive.

Stamp affixed by B. Mukherjee 26.9.50

Stamp Superintendent Calcutta collectorate Admissible

under Rule 21 only stamped under the Indian Stamp Act 1899

Schedule 18 No. 35A (vi)

Fee paid as under

A	1442/-
I	20/-
M(a)	20/-
M(b)	2/-
N	6/-

1490/-

Sd/- Yali

Registrar of Calcutta
27.9.50

23 :-

Fee paid

Under Art. F.....

Under Art. G five

Value of stamp

supplied Bonafied

Value of C. paper Govt.

Cost for map or plan

Total cost for copy.....

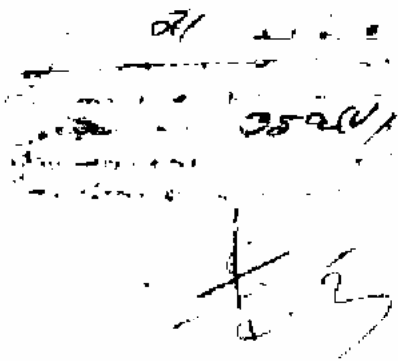
, Copy prepared, signed,

Sealed and delivered

to Sd/- Illegible

Under order No. 1124 dated 4.9.52

Sd/- Illegible
Joint Sub-Registrar
Calcutta,
6.9.52



Per Paid:
A3441 25,268-25
J- 42 --
M 10-30
M 200 --
25,990-75

Paid via Bank Draft No.
01/20-141364 DR. 201-87
of State Bank of New York

80
43

Henderson

Ray

Dinner/26 June 1976

B E T W E E N

1



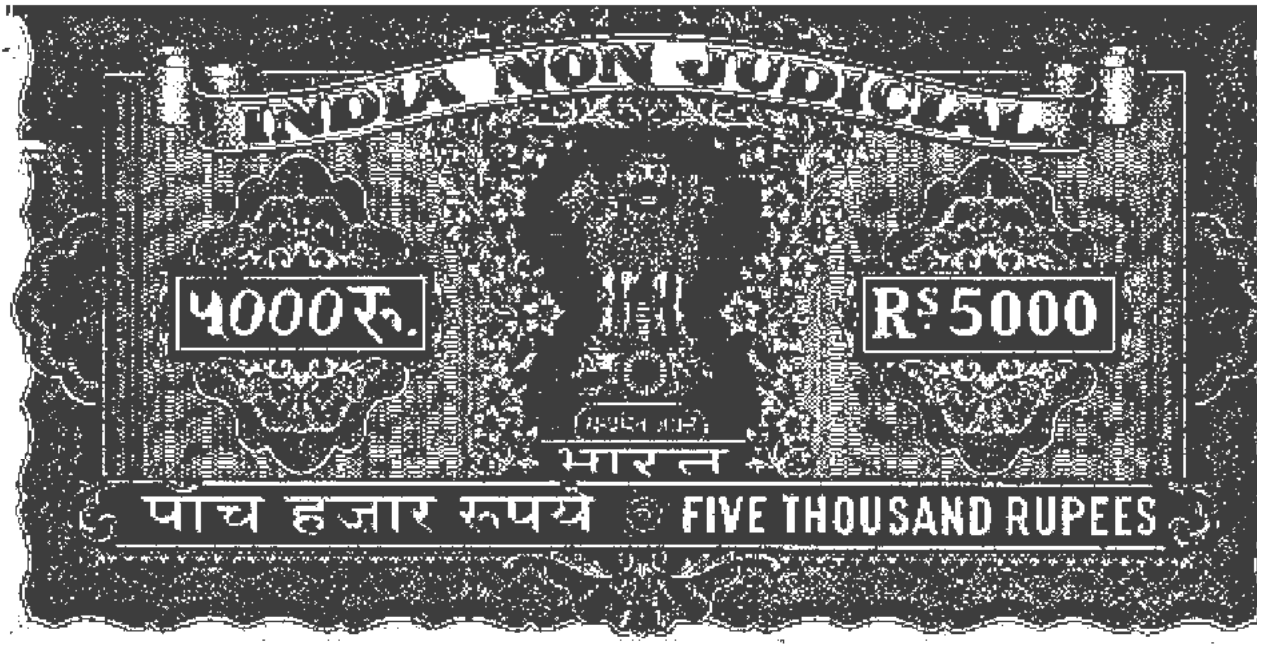
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A N D

DAMDAR VALLEY CORPORATION, having its Head Office at D.V.C. BHAWANI BHAWAN, Alipore, Calcutta -27 and Colliery Office at D.V.C. Berma Colliery, P.O. Berma District and District Registration Office Giridih through the Coal Superintendent & Agent; D.V.C. Berma Colliery; by Occupation extraction of Coal (hereinafter referred to as the "LESSEE" which expression shall where the context so admits be deemed to include all his respective heirs, executors, administrators representatives and permitted assigns of the OTHER PART:-

WHEREAS the Lessee has applied to the State Government in accordance with the Mineral Concession Rules, 1960 for FIRST RENEWAL of MINING LEASE FOR COAL only in respect of the lands described in PART I of the Schedule hereunder written and has deposited with.

...page..3/-



-3-

the State Government the sum of Rs.1000/- (Rupees One thousand) only as Security and the sum of Rupees 500/- (Rupees Five hundred) only for meeting the Preliminary expenses for a Mining Lease.

WITNESSETH that in consideration of the rents and royalties, covenants and agreements by and in these presents and the Schedule hereunder written reserved and contained on the part of the Lessee to be paid observed and performed the State Government hereby grants and demises unto the Lessee;

ALL those the Mines beds/veins seams of COAL (here-in-after referred in the Schedule referred to as the said Mineral) situated lying and being in or under the lands which are referred to in Part I of the said Schedule, TOGETHER WITH the liberties, powers and privileges to be exercised or enjoyed in connection



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herewith which are mentioned in PART II of the said Schedule subject to the restrictions and conditions as to the exercise and enjoyment of such liberties, powers and privileges which are mentioned in PART III of the said Schedule Except and reserving out of this demise unto the State Government the liberties, powers and privileges mentioned in PART IV of the said Schedule to HOLD the premises hereby granted and demised unto the Lessee from the 1st. day of January, 1986 to 31st. day of December, 2016 for the terms of 30 (Thirty) years thence next ensuing and yielding and paying thereof unto the State Government the several rents and royalties mentioned in Part V of the said Schedule at the respective times therein specified subject to the provisions contained in Part VI of the said Schedule and the Lessee hereby covenants with the State Government as in Part VII of the said Schedule is expressed and the State Government hereby covenants with the Lessee as in Part VIII of the



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the said Schedule as expressed and it is hereby mutually agreed between the parties hereto as in Part IX of the said Schedule is expressed;

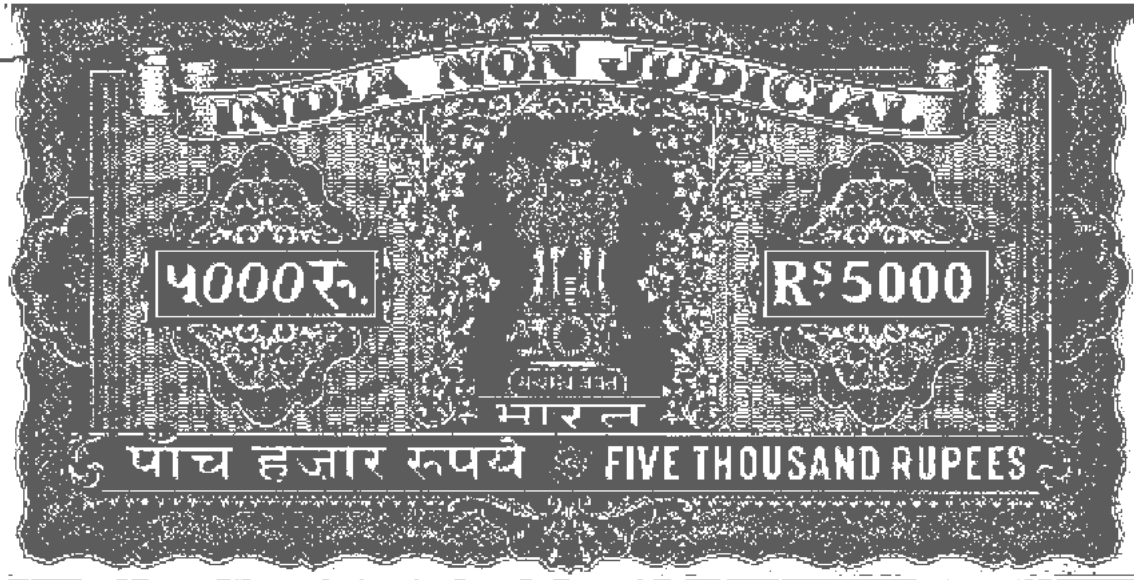
IN WITNESS WHEREOF these presents have been executed in manner hereunder appearing the day and year first above written.

THE SCHEDULE ABOVE REFERRED TO

PART -I.

THE AREA OF THE LEASE.

ALL that tract of lands situated at KARGALI : KARG; AMLO ; AND BAIDKARD; within the District at Giridih Registration district Giridih within Thana Nawadih (old) now Thana Bermo(New) as detailed below:-

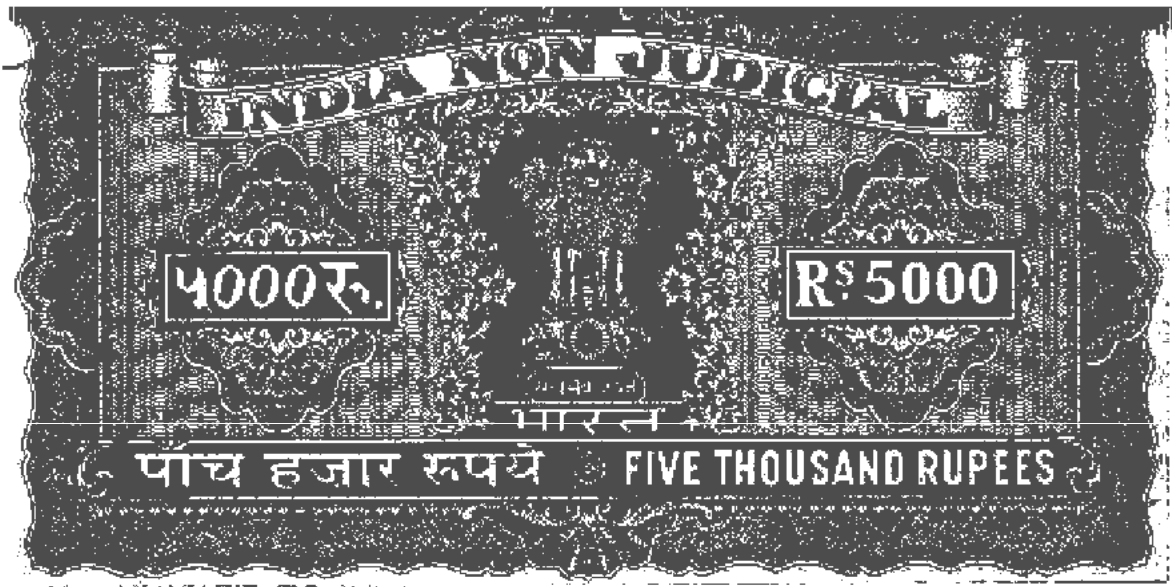


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below:-

Sl.No.	Name of village.	Thana no.	Thana Old.	New	Plot numbers.	Area in Hect.	in Ac.
1.	BAIDKARO	20	Nawadih	Bermo.	81, 81, 70, 73 77, 74, 75, 76 83, 84, 85, 86 87, 88, 93, 94, 95, 96, 97, 99, 82, 100, 101, 102, 103, 104, 105, 106, 107, 108, 109, 110, 111, 112, 113, 115, 117, 118, 119, 120, 121, 122, 123, 126, 129, 130, 131, 132, 133, 134, 135, 137, 140, 141, 146, 149, 150, 151, 152, 153, 154, 155, 156, 157, 158, 159, 160, 161,		

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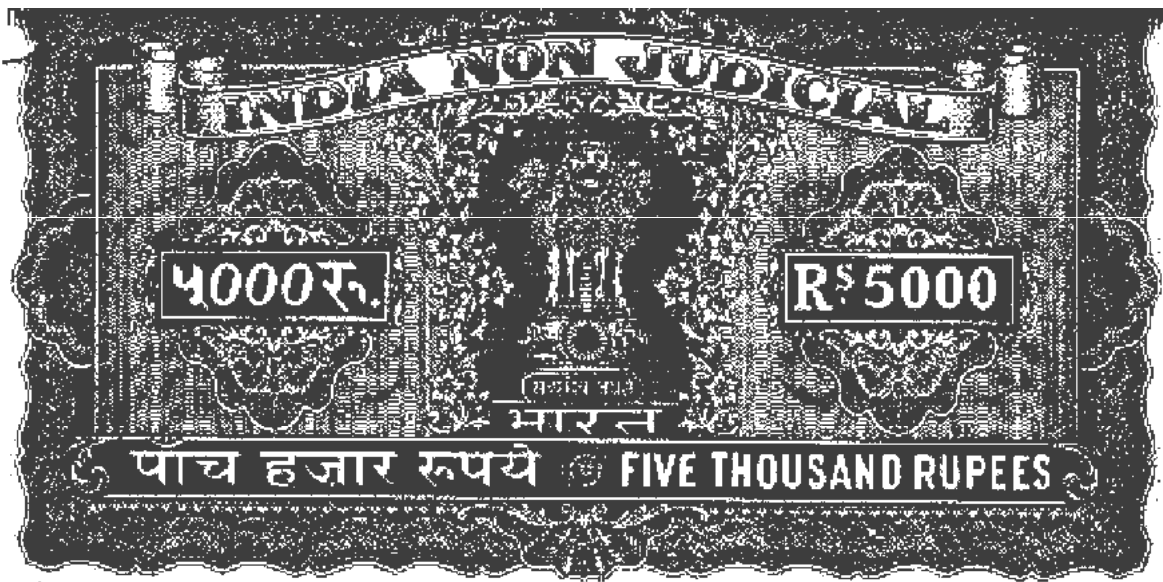
-7-

Sl. no.	Name of Thana	Thana no.	Thana Village no.	Plot numbers.	Area in Hect. in Ac.

1	BAIKARD	20	Nawadih Bermo.	162,163,164, 165,166,167, 168,169,170, 171,172,173, 64, 12, and 75	24.378 60.24

2	KARGALI	66	Nawadih Bermo.	132,133,134, 135,116,1, 2, 3,4,5,6,7,8,9, 10,11,12,13,14, 15,16,17,18,20, 21,22,23,24,26, 27,262,273.	92.026 227.40
	KARD	65	Nawadih Bermo	239,242,243, 259,277,244, 261,374,384, 386,385	21.893 54.10

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Sl. No.	Name of Village.	Thana		Plot numbers	Area	
		No.	Old. New.		in Hect.	in Acres.
do-	EMLO	64	Nawadih Barma	501, 463, 461, 460, 464, 465, 499, 497, 498, and 549.	29.137	72.00
Total Area:					167.434 H.	413.74 ac.

Boundary Area: 'X-X' & 'Y-Y'

Total area 413.74 acres i.e. 167.434 Hectare or thereabouts delineated on the plan hereto annexed and thereon coloured in red and bounded as

On the North:- Khas Land.

On the South:- Kargali Colliery.

On the East:- Dhuri Colliery.

On the West:- Bokaro Colliery

C.C.L.

(hereinafter referred to as the "SAID LANDS")

(cont'd ..page...10/-)



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PART II

LIBERTIES POWERS AND PRIVILEGES TO BE EXERCISED AND ENJOYED
BY THE LESSEE SUBJECT TO THE RESTRICTIONS AND CONDITIONS
IN PART III,

Shri
1. TO ENTER UPON LAND AND SEARCH FOR MIN WORK ETC;

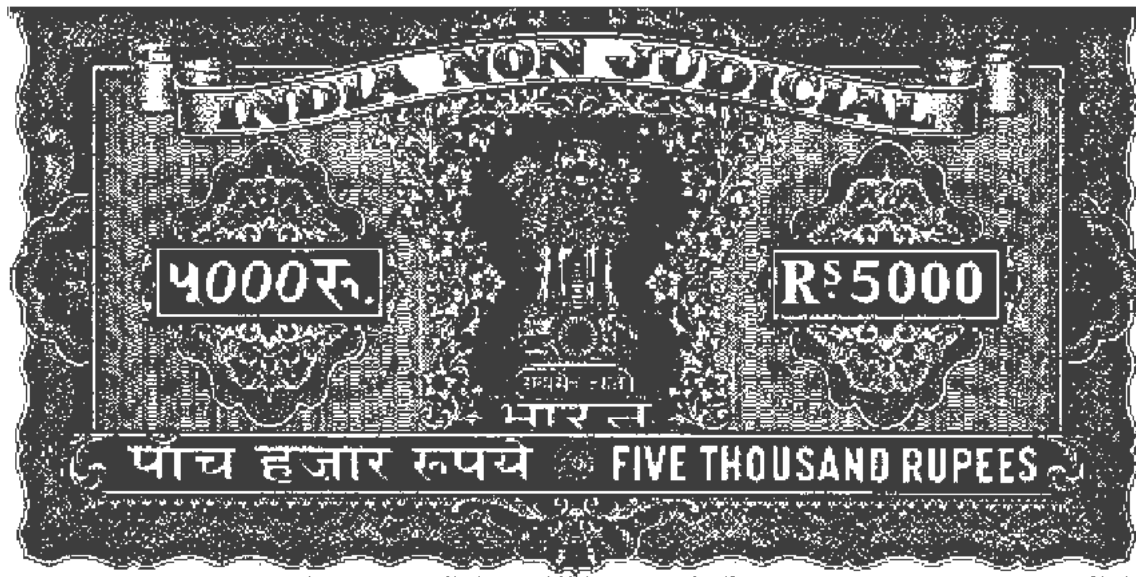
Liberty and power at all times during the said term hereby demised to enter upon the said lands and to search for mine, bore dig, drill or win, work, dress process, convert carry and dispose of the said mineral.

2. TO SINK, DRIVE, AND MAKE PITS, SHAFTS AND INCLINES;

Na
Liberty and power for or in connection with any of the purposes mentioned in this Part to sink drive, make maintain and use into the said lands any pits, shafts, inclines drifts, levels, waterways, airways and other works (and to use maintain deepen or extend any existing works of the like nature in the said lands)

3. TO BRING TO USE MACHINERY EQUIPMENTS ETC;

Liberty and power for or in connection with any of the purposes mentioned in this part to erect, construct, maintain and use on or under the said lands any engines, machinery, plant, dressing, floors, furnaces, coke, ovens,



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brick-kilns, workshops, stores, houses, bungalows, godowns, sheds and other buildings and other works and conveniences of the like nature on or under the said lands.

4. To make road and ways etc. and use existing roads and ways;

Liberty and power for or in connection with any of the purposes mentioned in this part to make any tramways, railways, roads, aircrafts, landing grounds and other ways in or over the said lands and to use, maintain and go and repose with or without horses cattle wagons, aircrafts, locomotives or other vehicles over the same (or any existing tramways, railways, roads and other ways in or over the said lands) on such conditions as may be agreed to.

5. To get building and road materials etc;

Liberty and power for or in connection with any of the purposes mentioned in this part to quarry and get stone, gravel and other building and road materials and clay and to use and employ the same to manufacture such clay into bricks or tiles and to use such bricks or tiles but



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not esto sell any such materials,bricks or tiles.

6. TO USE WATER FROM STREAMS ETC.

Liberty and power for or in connection with any of the purposes mentioned in this part subject to the rights of any existing or future lessee and with the written permission of the Deputy Commissioner or appropriate and use water from any stream water courses, springs or other sources in or upon the said lands and to divert store or dam any such stream or water course and collect or impound any such water and to make, construct and maintain any water course, culverts, drains or reservoirs, but not as to deprive any cultivated lands, villages buildings or watering places for livestock of a reasonable supply of water as before accustomed nor in any way to foul or pollute any streams or springs.

PROVIDED that the Lessee shall not interfere with the Navigation in any navigable streams nor shall divert such streams without the previous written permission of the State Government.



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7. To use land for stocking,heaping,depositing purposes;

Liberty and power to enter upon and use a sufficient part of the surface of the said lands for the purposes of stacking,heaping,storage or depositing therein and produce of the mines or works carried on and any tools,equipments, earth and materials and substances dug or raised under the liberties and powers mentioned in this part;

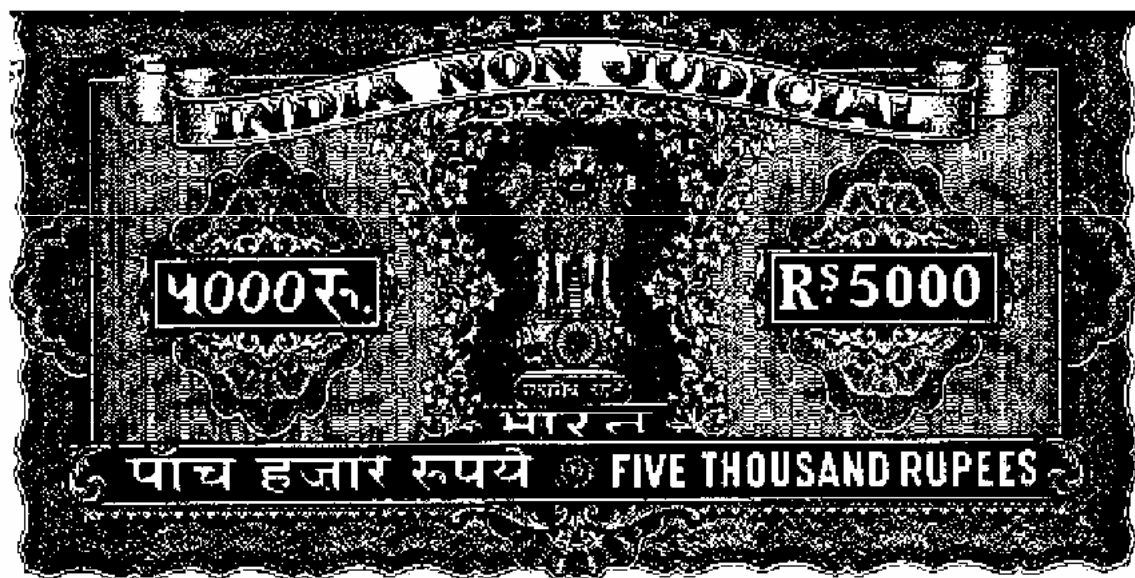
8(a) Beneficiation and conveying away of products;

Liberty and power to enter upon and use a sufficient part of the said lands to be beneficiate any ore produced from the said lands and to carry away such beneficiated ore.

9. To clear brushwood and to fell and utilise tree etc.

Liberty and power for or in connection with any of the purposes mentioned in this part and subject to the existing right of others and save as provided in clause of Part III of this Schedule to clear undergrowth and brushwood and to fell and utilise any trees or timbers standing

Coal Survey Officer, 17/1/1951
17/1/1951



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standing or found on the said lands; Provided that the State Government may ask the lessee to pay for any trees or timber felled and utilised by him at the rate specified by the Deputy Commissioner or the State Government.

PART -III

RESTRICTIONS AND CONDITIONS AS TO THE EXERCISE OF THE LIBERTIES, POWERS AND PRIVILEGES IN PART II.

1. No building etc. upon certain places;

No building or thing shall be erected, set up or placed and surface operation shall be carried on in or upon any - public pleasure ground, burning or burial ground or place held sacred by any class of persons or any house or village sites, public road or other places which the State Government may determine as public ground nor in such a manner as to injure or prejudicially affect any building, work, property or rights of other persons and no land shall be used for surface operations which is already occupied by persons other than the State Government for works or purposes not included in this lease. The lessee shall not also interfere with any right of way, well or tank.



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2. Permission for surface operations in a land not already in use:-

Before using for surface operations any land which has not already been used for such operations, the Lessee shall give to Deputy Commissioner of the district two calendar months previous notice in writing specifying the names or other descriptions of the situation and the extent of the land proposed to be so used and the purpose for which the same is required and the said lands shall not be so used if objection is issued by the Deputy Commissioner within two months after the receipt by him of such notice unless the objection so stated shall on reference to the State Government been nulled or waived.

- 2(a) The agricultural lands will not be acquired strictly beyond the purpose of prospecting and mining which would be determined by the District Officers or by any other officer authorised in this behalf.
- (b) Where ever agricultural lands have not been permanently acquired and Mining operations have been conducted by any private



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private arrangements care will be taken to fill up the ditches etc. caused on the agricultural lands in course of prospecting or Mining operations to the satisfaction of the District officer or any other officer authorized in this behalf.

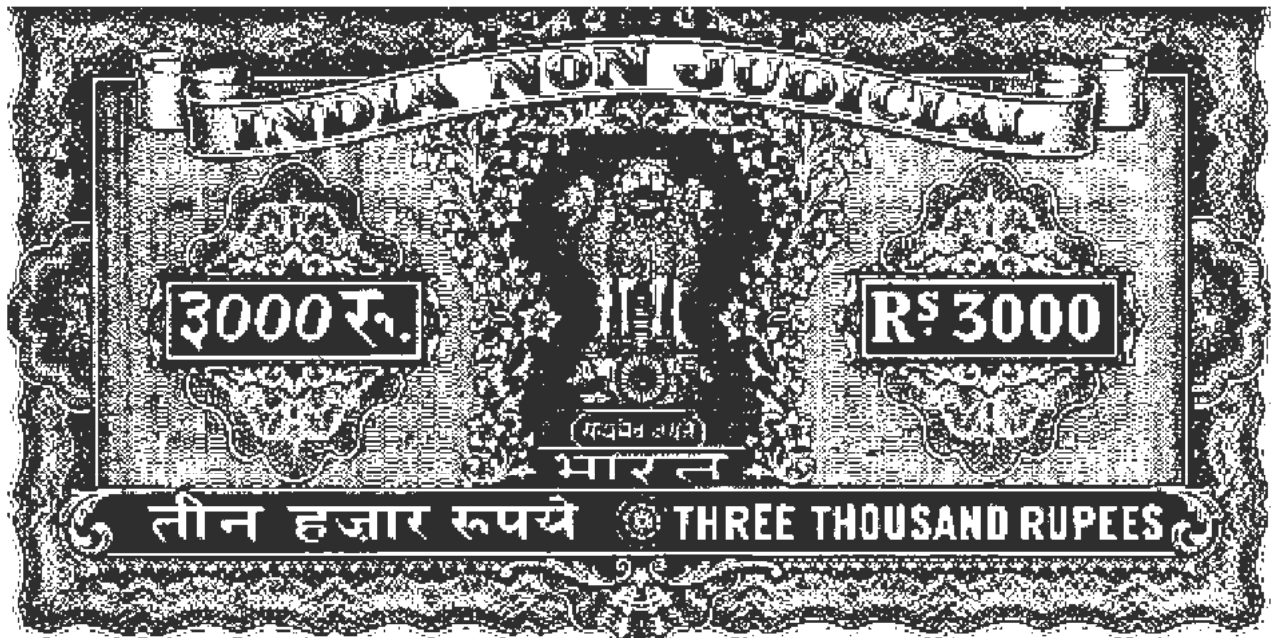
c) The Agriculturist and their dependents who are affected in any way either by acquisition or otherwise will be provided employment or minimum fair wages as soon as Mining operations are undertaken in the agricultural lands to the satisfaction of the district Officer or any officer or may officer authorized in this behalf.

d) The Lessee will not claim remission of dead rent from the State Government in case they are not allowed by the raiyats concerned to do Mining work in the raiyati lands within the lease hold areas.

3. To cut trees in unreserved lands;

The lessee shall not without the express sanction of the Deputy Commissioner cut down or injure any timber or trees on the said lands but he may without such sanction clear any brushwood or undergrowth which interfere with any operations authorized by these presents.

The Deputy Commissioner or the State Govt. may require the lessee to pay for any trees or timber felled and



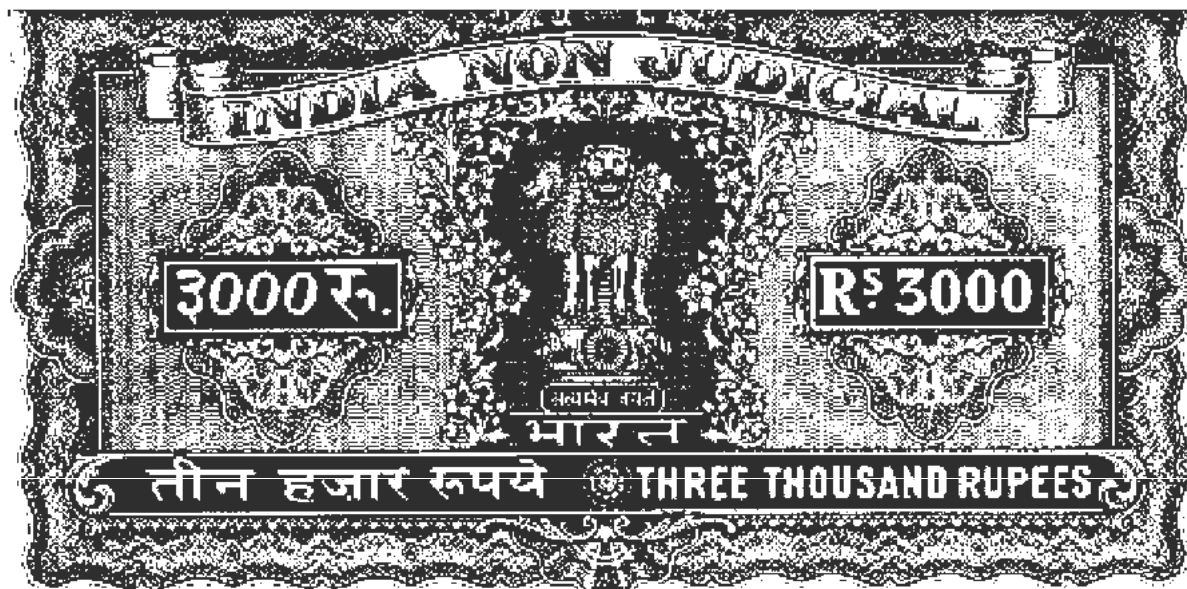
-17-

and utilised by them at the rates specified by the Deputy Commissioner of the district.

4. To enter upon reserved forest;

Notwithstanding anything in this Schedule contained the lessee shall not enter upon any reserved forest including in the said lands without previous sanction in writing of the district forest officer, nor fell, cut, and use any timber or trees without obtaining the sanction in writing of that officer nor otherwise than in accordance with such conditions as the State Government may prescribe.

4(1) The Mining lessee or their agents and workmen shall after the Divisional Forest officer's permission has been awarded under clause 4 Part III of the form of Mining lease has the right and liberty to enter upon any part of the private protected forest or reserved forest or Government product forest under his lease without the loss or hindrance for purposes of prospecting quarrying or mining but shall do nothing in respect of on forest produce nor shall they disturb the surface in any way except as hereinafter provided;



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(ii) Where prospecting quarrying or operations does not involve the clearing or cutting of any forest growth it may be done without the permission or without reference to the Divisional Forest Officer.

(iii) Whether prospecting, Mining Quarrying or Mining involve clearance of undergrowth such as shrubs or bushes over an area not exceeding one tenth of an acre but does not involve the cutting of any trees or pole or sampling of bamboo the clearance may be done without the permission of the Divisional Forest officer but a report thereof shall immediately be submitted to Divisional Forest Officer. This right of the lessee to clear the bushes and shrubs shall be exercised only once in every year.

(iv) Where prospecting or quarrying or Mining may necessitate undergrowth over an area exceeding one tenth of an acre of the cutting down of the trees or poles or bamboos, the previous permission in writing of the forest officer shall be necessary and the clearance shall not be cut until these have been marked by the Forest Department, for felling and the royalty thereon assessed and paid;

PROVIDED That in case the Forest Officer decided to refuse such permission they shall consult the Mining officer of the District before doing so and if they agree the permission may be refused, but if they disagree

Cost Superintendent & Agent
10, 12, 14, 16, 18, 20, 22, 24, 26, 28, 30, 32, 34, 36, 38, 40, 42, 44, 46, 48, 50, 52, 54, 56, 58, 60, 62, 64, 66, 68, 70, 72, 74, 76, 78, 80, 82, 84, 86, 88, 90, 92, 94, 96, 98, 100, 102, 104, 106, 108, 110, 112, 114, 116, 118, 120, 122, 124, 126, 128, 130, 132, 134, 136, 138, 140, 142, 144, 146, 148, 150, 152, 154, 156, 158, 160, 162, 164, 166, 168, 170, 172, 174, 176, 178, 180, 182, 184, 186, 188, 190, 192, 194, 196, 198, 200, 202, 204, 206, 208, 210, 212, 214, 216, 218, 220, 222, 224, 226, 228, 230, 232, 234, 236, 238, 240, 242, 244, 246, 248, 250, 252, 254, 256, 258, 260, 262, 264, 266, 268, 270, 272, 274, 276, 278, 280, 282, 284, 286, 288, 290, 292, 294, 296, 298, 300, 302, 304, 306, 308, 310, 312, 314, 316, 318, 320, 322, 324, 326, 328, 330, 332, 334, 336, 338, 340, 342, 344, 346, 348, 350, 352, 354, 356, 358, 360, 362, 364, 366, 368, 370, 372, 374, 376, 378, 380, 382, 384, 386, 388, 390, 392, 394, 396, 398, 400, 402, 404, 406, 408, 410, 412, 414, 416, 418, 420, 422, 424, 426, 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828, 830, 832, 834, 836, 838, 840, 842, 844, 846, 848, 850, 852, 854, 856, 858, 860, 862, 864, 866, 868, 870, 872, 874, 876, 878, 880, 882, 884, 886, 888, 890, 892, 894, 896, 898, 900, 902, 904, 906, 908, 910, 912, 914, 916, 918, 920, 922, 924, 926, 928, 930, 932, 934, 936, 938, 940, 942, 944, 946, 948, 950, 952, 954, 956, 958, 960, 962, 964, 966, 968, 970, 972, 974, 976, 978, 980, 982, 984, 986, 988, 990, 992, 994, 996, 998, 1000, 1002, 1004, 1006, 1008, 1010, 1012, 1014, 1016, 1018, 1020, 1022, 1024, 1026, 1028, 1030, 1032, 1034, 1036, 1038, 1040, 1042, 1044, 1046, 1048, 1050, 1052, 1054, 1056, 1058, 1060, 1062, 1064, 1066, 1068, 1070, 1072, 1074, 1076, 1078, 1080, 1082, 1084, 1086, 1088, 1090, 1092, 1094, 1096, 1098, 1100, 1102, 1104, 1106, 1108, 1110, 1112, 1114, 1116, 1118, 1120, 1122, 1124, 1126, 1128, 1130, 1132, 1134, 1136, 1138, 1140, 1142, 1144, 1146, 1148, 1150, 1152, 1154, 1156, 1158, 1160, 1162, 1164, 1166, 1168, 1170, 1172, 1174, 1176, 1178, 1180, 1182, 1184, 1186, 1188, 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3514, 3516, 3518, 3520, 3522, 3524, 3526, 3528, 3530, 3532, 3534, 3536, 3538, 3540, 3542, 3544, 3546, 3548, 3550, 3552, 3554, 3556, 3558, 3560, 3562, 3564, 3566, 3568, 3570, 3572, 3574, 3576, 3578, 3580, 3582, 3584, 3586, 3588, 3590, 3592, 3594, 3596, 3598, 3600, 3602, 3604, 3606, 3608, 3610, 3612, 3614, 3616, 3618, 3620, 3622, 3624, 3626, 3628, 3630, 3632, 3634, 3636, 3638, 3640, 3642, 3644, 3646, 3648, 3650, 3652, 3654, 3656, 3658, 3660, 3662, 3664, 3666, 3668, 3670, 3672, 3674, 3676, 3678, 3680, 3682, 3684, 3686, 3688, 3690, 3692, 3694, 3696, 3698, 3700, 3702, 3704, 3706, 3708, 3710, 3712, 3714, 3716, 3718, 3720, 3722, 3724, 3726, 3728, 3730, 3732, 3734, 3736, 3738, 3740, 3742, 3744, 3746, 3748, 3750, 3752, 3754, 3756, 3758, 3760, 3762, 3764, 3766, 3768, 3770, 3772, 3774, 3776, 3778, 3780, 3782, 3784, 3786, 3788, 3790, 3792, 3794, 3796, 3798, 3800, 3802, 3804, 3806, 3808, 3810, 3812, 3814, 3816, 3818, 3820, 3822, 3824, 3826, 3828, 3830, 3832, 3834, 3836, 3838, 3840, 3842, 3844, 3846, 3848, 3850, 3852, 3854, 3856, 3858, 3860, 3862, 3864, 3866, 3868, 3870, 3872, 3874, 3876, 3878, 3880, 3882, 3884, 3886, 3888, 3890, 3892, 3894, 3896, 3898, 3900, 3902, 3904, 3906, 3908, 3910, 3912, 3914, 3916, 3918, 3920, 3922, 3924, 3926, 3928, 3930, 3932, 3934, 3936, 3938, 3940, 3942, 3944, 3946, 3948, 3950, 3952, 3954, 3956, 3958, 3960, 3962, 3964, 3966, 3968, 3970, 3972, 3974, 3976, 3978, 3980, 3982, 3984, 3986, 3988, 3990, 3992, 3994, 3996, 3998, 4000, 4002, 4004, 4006, 4008, 4010, 4012, 4014, 4016, 4018, 4020, 4022, 4024, 4026, 4028, 4030, 4032, 4034, 4036, 4038, 4040, 4042, 4044, 4046, 4048, 4050, 4052, 4054, 4056, 4058, 4060, 4062, 4064, 4066, 4068, 4070, 4072, 4074, 4076, 4078, 4080, 4082, 4084, 4086, 4088,



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the matter may be referred to the Chief Conservator of forest, Bihar who will consult the Director of Mines, Bihar and if both of them agree the permission may be refused, but if the Chief Conservator of forests and the Director of Mines disagree the matter shall be referred to the Government for orders.

v) If the Mining lessee desires to construct any road building or any other works or structure for purposes of Mining or quarrying they shall obtain the previous permission of the Forest Officer and shall pay compensation so assessed by the Forest Officer and abide by the conditions and regulations issued by the Forest Officer in this behalf.

vi) The lessee must carry on Mining or quarrying operation down to the maximum economic depth in the area already taken upon and obtain a certificate from the Mining officer of the district that the economic depth has been reached before proceeding to any other areas.

5. No Mining operations within 50 metres of Public Works etc;

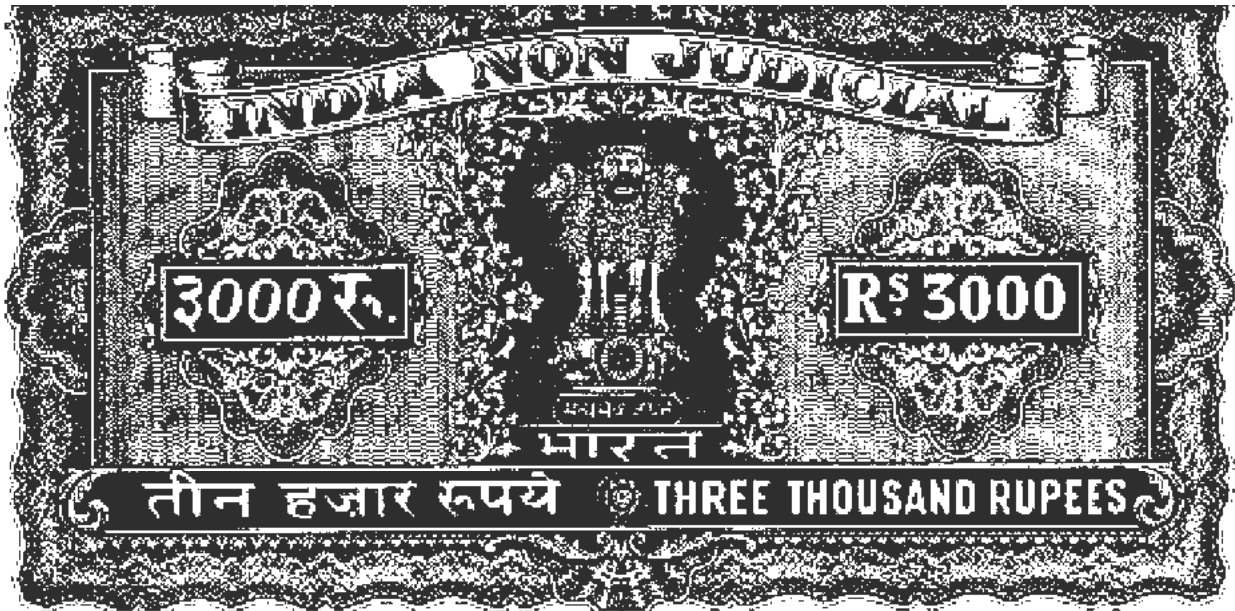
The Lessee shall not work or carry on or allow to be worked or carried on any Mining operations at or to any point within a distance of 50 metres from any Railway lines except with the previous written permission of the Railway



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Railway Administration concerned or from any reservoir canal or other public works, such as public roads and buildings or inhabited site except with the previous written permission of the Deputy Commissioner or any other officer authorised by the State Government. On this behalf and otherwise than in accordance with the instructions, restrictions and conditions either general or special which may be attached to such permission. The said distance of 50 metres shall be measured in the case of railway reservoir or canal horizontally from the outer toe of the bank or the outer edge of the cutting, as the case may be and in case of a building horizontally from the plinth thereof. In the case of village roads no working shall be carried on within a distance of 10 metres of the outer edge of the cutting except with the previous permission of the Deputy Commissioner or any other officer duly authorised by the State Government in this behalf and otherwise than in accordance with such directions, restrictions and additions, either general or special which may be attached to such permission.

EXPLANATION:- For the purposes of this clause the expression "Railway Administration" shall have the same meaning as it is defined to have in the Indian Railway Act 1890, by clause (6) of Section 3 of the Act "Public Road shall mean a road which has been constructed by artificially surfaced as distinct from a track resulting from repeated use Village Roads will include any track shown in the revenue records as village road.



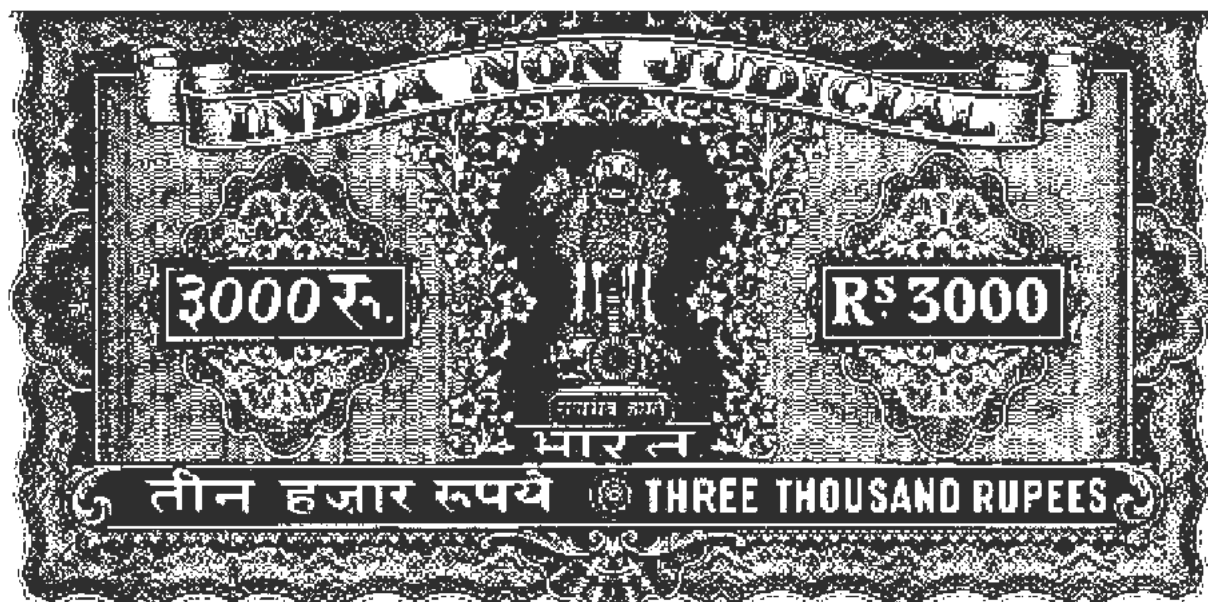
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6. Facilities for adjoining Government licenses and leases;

The lessee shall allow existing and future holders of Government licenses or leases over any land which is comprised in or adjoining or is reached by the land held by the lessee reasonable facilities to access thereto.

Provided that no substantial hindrance or interference shall be caused by such holders of licences or leases to the operations of the lessee under these presents and fair compensation as may be mutually agreed upon or in the event of disagreement as may be decided by the State Government shall be made to the lessee for all loss or damage sustained by the lessee by reasons of the exercise of this liberty.

The Lessee shall have to employ either a qualified geologist or Mining Engineer to look after the Mining operations as required by Rule 12 of the Mineral Conservation and Development Rules 1958.



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क- पट्टाधारी को खनन कार्य को निगरानी के लिये मिनिस्टर ऑफ रीजनल एण्ड डेवलपमेंट बल्स 1958 के नियम 21 के अनुसार ग्रांथित खनन अभ्यंता : माइनिंग इंजिनियर अथवा भूतत्ववेत्ता : जिपोलोयिस्ट : की नियुक्ति अनिवार्यतः करनी होगी ।

ख- पट्टाधारी को जब क्षेत्र में खनन कार्य करते समय राज्य सरकार द्वारा किये गये नियमों का पालन अनिवार्यतः करना होगा ।

ग- अन्य सर्व माइन्स एण्ड मिनरल्स : रायल्टी एण्ड डेवलपमेंट : एक्ट 1957 तथा एम० सी० बल्स 1960 के अनुसार होगी ।

घ- पट्टाधारी जिहा पदाधिकारी अथवा उनके बदले में अधिकृत अन्य पदाधिकारी द्वारा खनन कार्य के लिये निर्धारित सीमा के अतिरिक्त कृषि योग्य भूमि का अर्जन नहीं करेंगे ।

ड- जहाँ कहीं कृषि योग्य भूमि स्थायी रूप से अधिगत नहीं की गयी है और खनन कार्य ग्राइवेट एरेंजमेंट द्वारा किया गया है वहाँ खनन कार्य के सिलसिले में रुखे हुए मट्टे आदि को

जिहा पदाधिकारी अथवा बदले में अधिकृत अन्य पदाधिकारी की इच्छा

नुसार पट्टाधारी भर देंगे ।



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ण- पट्टाधारी भूमि अर्जन से अथवा अन्य प्रकार के प्रभावित कृषकों तथा उनके आश्रितों की न्यूनतम उचित पारिश्रमिक पर नियोजन के लिये जिला पदाधिकारी अथवा उनके बदले में अधिकृत अन्य पदाधिकारी की हान्यानुसार प्रबन्ध करेंगे ।

त- अगर रैयतों की अपरिचित के कारण पट्टाधारी क्षेत्र में काम नहीं करेंगे तो वे जमान की माफ़ी के लिये सरकार से न तो दावा करेंगे और न इसके लिये किसी तरह का दावा मान्य होगा ।

ध- यदि खनिज का स्वामित्व उसकी कोटि और क्षेत्र पर निर्धारित है और पट्टाधारी उसे संपत्ति कोटि का घोषित करते हैं तो किसी प्रकार के जब्ज प्रमाण पत्र की आवश्यकता नहीं होगी ।

यदि पट्टाधारी खनिजों निम्नकोटि का घोषित करते हैं तो उन्हें तब आख्या का टेस्ट सर्टिफिकेट राजकीय भूतन्त्रित्वक प्रयोगशाला हजारीनाम से प्राप्त कर प्रस्तुत करना होगा खनिज के विश्लेषण का तब पट्टाधारी को भेदन करना होगा । खनिज के हिसाब के 60 दिनों के अन्दर पट्टाधारी उक्त कार्य प्रमाण पत्र प्रस्तुत नहीं करेंगे तो यह समझा जायेगा कि हिसाब किया गया सभी खनिज स्वर्णिम कोटि का है ।

द- 1. अधिनियम या इन नियमों से भिन्न किसी अन्य नियम में उल्लिखित प्रावधानों के रहते हुए भी राज्य सरकार 15 प्रतिशत वार्षिक की दर से किसी भी लगान स्वामित्व या हक 1 नियम 54 के अन्तर्गत देय कर को बढ़ाकर 1 या अधिनियम या इन नियमों या किसी प्रासंगिक लाइसेंस या खनिज पट्टा के सही के अन्तर्गत अन्य रकम को सरकार का बाकी भुक्तान द्वारा भुक्तान के लिये निश्चित का गया जाता है 60 दिन बाद जहाँ से भुक्तान से आधाराय सप्त चार्ज कर जाता है जबतक कि बाकी स्वामित्व भुक्तान हक या अन्य रकम का भी भुक्तान नहीं हो जाता है ।



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8. The lessee shall give preference to local people in the matter of employment and further shall provide facilities for the training of the candidates.

9. Other terms as per Mines and Minerals (Regulation and Development) Act 1957 and Mineral Concession Rules 1960 corrected upto date.

PART IV.

LIBERTIES POWERS AND CONDITIONS RESERVED TO THE STATE GOVT.

1. To work other minerals;

Liberty and power for the State Government or to any lessee or person authorised by it in that behalf to enter into and upon the said lands and to search for win, work dig, get raise, dress, process, convert and carry away mineral other than the said minerals and any other substances, and for these purposes to sink, drive, make erect, construct, maintain and use such pits, shafts, inclines, drifts, levels, and other lines, water ways, airways, water course, drains, reservoirs, engines, machinery, plants, buildings, canals,

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N. V. G. Barma Colliery



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tramways, railways, roadways and other works and conveniences, as may be deemed necessary or convenient.

Provided that in the exercise of such liberty and power, no substantial hindrance or interference shall be caused to or with the liberties, powers and privileges of the lessee under these presents and that fair compensation as may be mutually agreed upon or in the event of disagreement as may be decided by the State Government shall be made to the lessee for all loss or damage sustained by the lessee by reason or in consequence of the exercise of such liberty and power.

2. To make Railways and Roads;

Liberty and power for the State Government or any lessee or persons authorized by it in that behalf to enter into and upon the said lands to make upon over or through the same and any Railway, tramways, roadways or pipelines for any purpose other than those mentioned in Part II of these presents and to get from the said lands stones, gravel

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D. V. HARMON, CLERK

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gravel, earth and other materials for making, maintaining and repairing such railways, tramways and roads or any existing railways and roads and to go and repass at all times with or without the horses, cattle or other animals, carts, wagons, carriages locomotives or other vehicles, over or along any such railways, tramways, road, lines and other ways for all purposes and as occasion may require; Provided that in the exercise of such liberty and power by such other lessee or persons no substantial hindrance interference shall be caused to or with the liberties, powers and privileges of the lessee under these presents and that fair compensation as may be mutually agreed upon or in the event of disagreement as may be decided by the State Government shall be made to the lessee for all loss or damage, substantial hindrance or interference shall be caused to or with the exercise by such lessee or person of such liberty and power.

PART V.

RENTS AND ROYALTIES RESERVED BY THIS LEASE.



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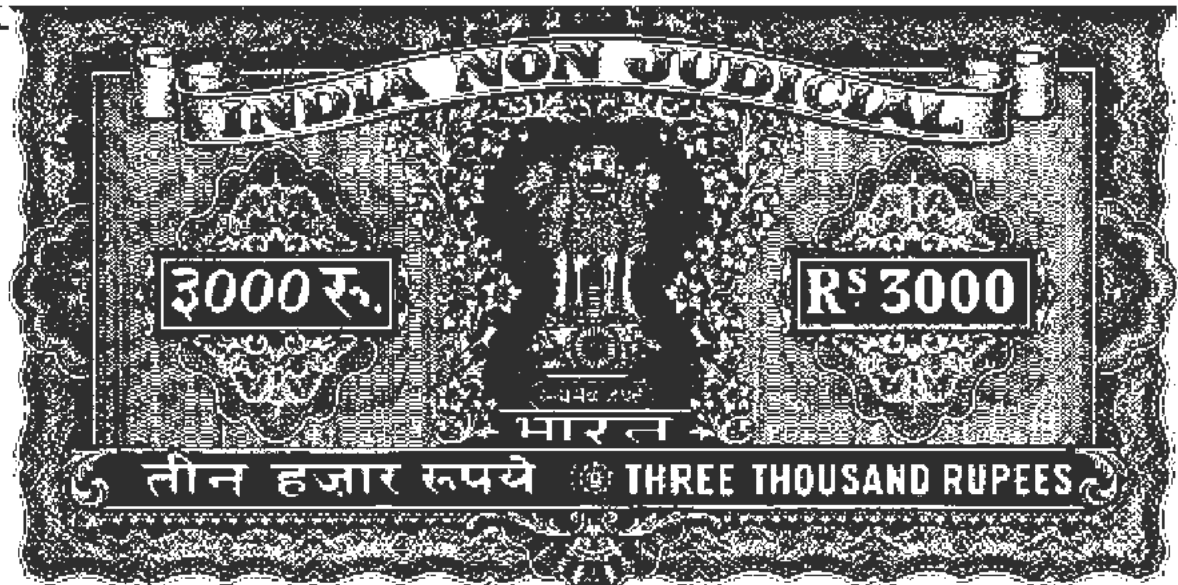
1. To pay dead rent or royalty which ever is greater;

The lessee shall pay for every year for the lessee yearly Dead Rent as specified in clause 2 of this Part in respect of each mineral;

Provided that the lessee shall be liable to pay the dead rent or royalty in respect of each mineral which ever is higher in amount but not both.

2. Rate and mode of payment of dead rent.

Subject to the provisions of clause 1 of this part during the subsistence of the lessee; the Lessee shall pay to the State Government Annual Dead rent at the following rate or at such revised rate which may be communicated in writing to the lessee by the State Government per mineral per Hectar of the lands demised and described in Part I of this Schedule



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Schedule.

Name of Mineral.	Dead rent per Hectar per annum.

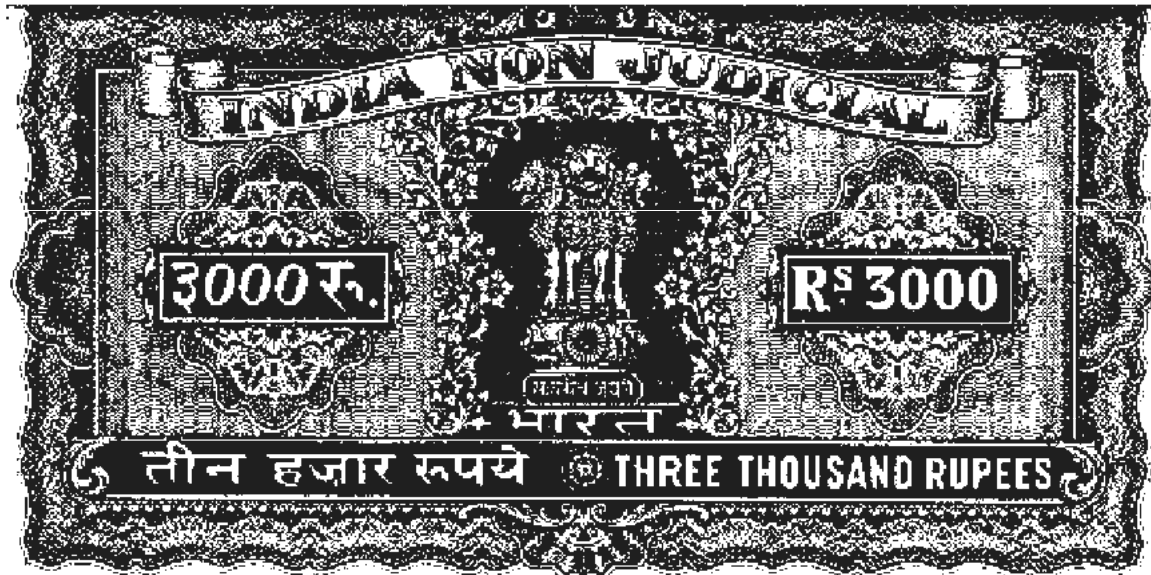
COAL	37.50 per Hect.per annum.

The above rate of dead rent shall be changed according to the Mines and Mineral Regulation and Development) Act 1957 and Mines and Mineral (Regulation & Development) Amendment Act 1972 and the same shall be applicable to the lessee also.

The lessee shall pay the above dead rent, surface rent in monthly equal instalments payable to first day of next each month.

5. Rate and mode of payment of royalty:-

The lessee shall pay rent, royalty, surface rent etc. for each month in the next months or in the manner as prescribed by the State Government from time to time.



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Subject to the provisions of clause I of this part the lessee shall during the subsistence of this lease pay to the State Govt. at such time and in such manner as the State Govt. may prescribe royalty in respect of any mineral removed by him from the leased area at the rate for the time being specified in the Second Schedule to the Mines and Minerals (Regulations and Development) Act 1957.

Conf. Secy. to Govt. of Assam
 Dated: 10/06/2010

RATE OF ROYALTY.

COAL

I. Group I Coals

a) Coking Coal

steal Grade I

,, Grade II

Washery Grade I

b) Hand picked Coal

produced, in

Assam, Arunachal,

Pradesh, Meghalaya

and Nagaland.

Rs. 7.00 (Seven rupees)
per Tonne.

Handwritten signature
 १०/०६/२०१०
 १०/०६/२०१०

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II) Group -II Coals;

- a) Coking Coal Washery-Grade II.
Coking Coal Washery Grade III.

Rs.6.50
(Rupees Six
and paise
fifty) only
per tonne.

- b) Semi Coking Coal Grade I.
Semi Coking Coal Grade II.

- c) Non Coking Coal Grade -A.
Non Coking Coal Grade B.

- d) Ungraded R.O.M.Coal produced
in Assam Andhrapradesh,
Naghalaya and Nagaland.

III- Group III-Coals:

- a) Coking Coal Washery grade IV.
b) Noncoking coal Grade C.

Rs.5.50 paise
(Rupees five and fifty
paise only.
per tonne.

IV- Group IV. Coals:

- a) Non coking coal grade D.
b) Non Coking Coal Grade E.

Rs. 4.30 paise
(Rupees four and thirty paise only)
per tonne.

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विभाग



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V- Group V Coals:

Noncoking Coal Grade F.	Rs.2.50 paise
Non Coking Coal Grade G.	(Rupees two and paise fifty only) per tonne.

VI. Group VI Coals;

Coal produced in Andhra Pradesh Singhrami Collieries Company Ltd.	Rs.5.00 (rupees five) per tonne.

The above rate of royalty is subject to revision from time to time by the Central Government under Mines and Minerals (Regulation & Development Amendment Act 1957 as referred under section 9 of Schedule IV of the revised rate will be applicable to this lease also from the date of the same is given effect to.

4. Payment of surface rent and water rate;

The lessees shall pay rent and water rate to the State Government in respect of all parts of the surface of the said lands which from time to time be accepted or used by the lessees under the authority of these presents at the rate specified by the Govt. in Revenue Department from time to time equal to the land revenue and cesses assessable on the land respectively per annum per hect.



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hect. of the areas so occupied or used and so in proportion for any area less than a hect. during the period from the commencement of such occupation or used until the area shall cease to be so occupied lands so used to its original condition. Surface rent and water rate shall be paid as hereinbefore detailed in clause (2): provided that no such rent/ water rate @ Rs.150/- (Rupees one hundred fifty) only per acre per annum shall be payable in respect of the occupation and use of the area comprised in any roads or ways to which the public have full right of access.

PART VI.

PROVISIONS RELATING TO THE RENTS AND ROYALTIES.

1. Rent and royalties to be free from deduction etc;

The rent water rate and royalties mentioned in Part V of this Schedule shall be paid free from any deduction to the State Government of Bihar at and in such manner as the State Government may prescribe; Provided Always that it is hereby agreed that Rs.1000/- the balance standing to the credit of the lessee on account of the deposit made by them as a licensee over an area which included the said lands shall be retained and accepted by the State Government in satisfaction of the rents and royalties mentioned in Part V until they reach that amount.



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2. Mode of computation of royalty:-

For the purposes of computing the said royalties the lessee shall keep a correct account of the mineral produced and despatched. The accounts as well as the weight of the mineral in stock or in the process of export may be checked by an officer authorised by the Central or State Govt.

3. Course of action if rents and royalties are not paid in time:-

Should any rent, royalties or other sums due to the State Government under the terms and conditions of these presents be not paid by the lessee within the prescribed time, the same may be recovered by a Certificate of such officer as may be specified by the State Government by general or special order, in the same manner as an arrear of land revenue.

3(a) The lessee shall pay interest @ 15% per annum on all arrears including the arrear of interest.

PART VII.

THE COVENANTS OF THE LESSEE.

1. Lessee to pay rents and royalties, taxes etc;



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The Lessee shall pay the rent, water rate and royalties reserved by this lease at such time and in the manner provided in Part V and VI of these presents and shall also pay and discharge all taxes, rates, assessments and impositions whatsoever being in the nature of public demands which shall from time to time be charged, assessed or imposed by the authority of the Central Government and State Government upon or in respect of the premises and works of the lessee in common with other premises and works of a like nature except demands for land revenue.

2. To maintain and keep boundary marks in good orders;

The lessee shall at their own expenses erect and all times maintain and keep in repair boundary marks and pillars according to the demarcation to be shown in the plan annexed to this lease. Such marks and pillars shall be sufficiently clear of the shrubs and other obstruction as to allow easy identification.

3. To commence operations within an year and work in workman like manner:-

Unless the State Government for good cause permits, otherwise, the lessee shall commence operations within one

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one year from the date of execution of the lease and shall thereafter at all times during the continuance of this lease search for, win, work and develop the said mineral without voluntary intermission in a skilful and workman like manner and as prescribed under clause 12 hereinafter without doing or permitting to be done any unnecessary or avoidable damage to the surface of the said land or the crops build-
ings structures or other property thereon. For the purpose of this clause operation shall include the erection of machinery, laying of tramways or the construction of a road in connection with the mine.

4. To indemnify Government against all claims:-

The lessee shall make and pay such reasonable satisfaction and compensation as may be assessed by lawful authority in accordance with the law in force on the subject for all damage, injury or disturbance which may be done by them in exercise of the powers granted by this lease and shall indemnify and keep indemnified full and completely the State Government against all claims which may be made by any person in respect of any such damage, injury or disturbance and all costs and expenses in connection therewith.



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5. To secure and keep in good condition ,pits shafts etc;

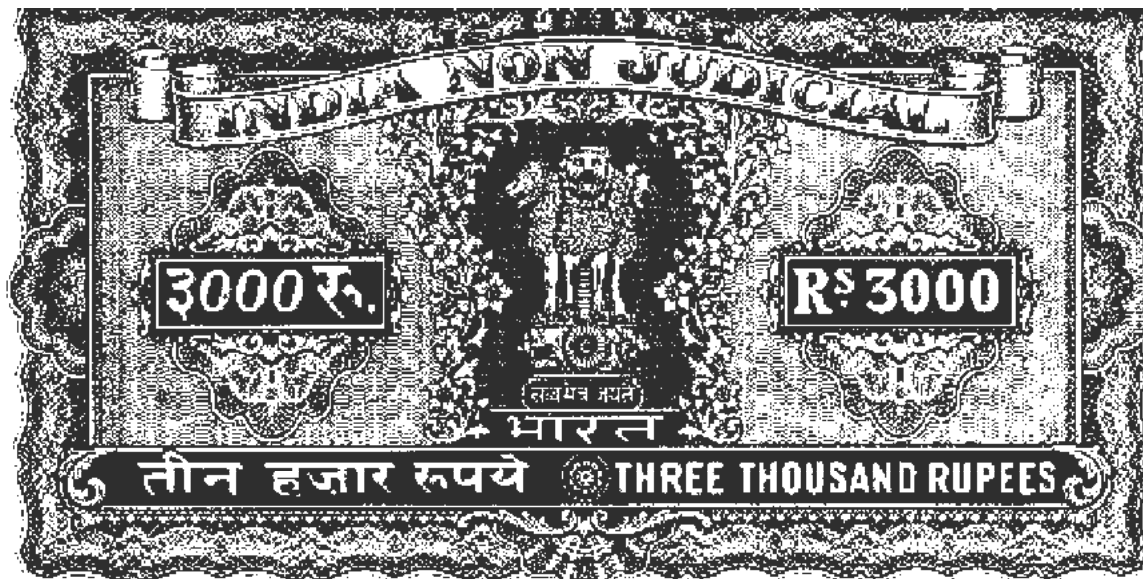
The lessee shall during the subsistence of this lease well and sufficiently secure and keep open with timber or other durable means all pits, shafts and workings that may be made or used in the said lands and make and maintain sufficient fences to the satisfaction of the State Government round every such pits, shafts or working whether the same is abandoned or not and shall during the same period keep all workings in the said lands except such as may be abandoned assessable free from water rent and foul air as far as possible.

6. To strengthen and support the mine to necessary extent:-

The lessee shall strengthen and support to the satisfaction of the Railway Administration concerned or the State Government as the case may be any part of the mine which in its opinion requires such strengthening or support for the safety of any railway, reservoir, canal road and any other public works or structures.

7. To allow inspection of workings:-

The lessee shall allow any officer authorised by



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the Central Government or State Government in that behalf to enter upon the premises including any building, excavation or land comprised in the lease for the purpose of inspecting, examining surveying, prospecting and making plans thereof, sampling and collecting any data and the lessee shall with proper person employed by the lessee and acquainted with the mines and works effectually assist such officer, agent, servants and workmen in conducting every such inspection and shall afford them all facilities, information connected with the working of the mines which they may reasonably require and also shall and will conform to and observe all orders and regulations which the Central Government or State Government as the result of such inspection or otherwise may from time to time see fit to impose.

(No.169(44)66 dated 7.9.1961).

B. To report accidents:-

The lessee shall without delay send to the Deputy Commissioner a report of any accident causing death or serious bodily injury or serious injury to property or seriously affecting or endangering life or property which may occur in the course of the operation under this lease.



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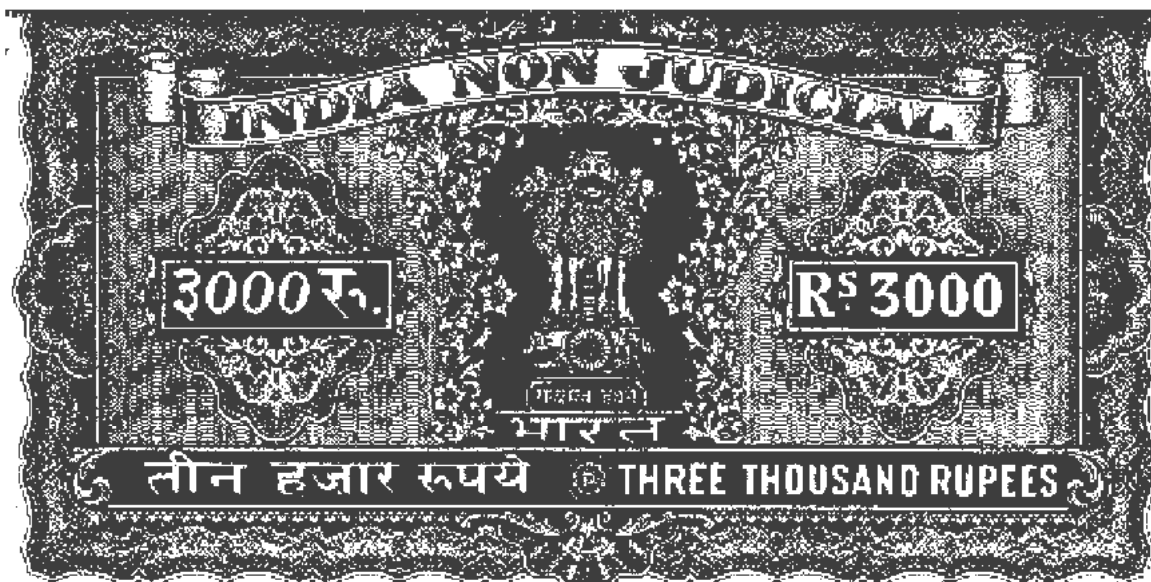
9. To report discovery of other minerals;

The lessee shall report to the State Government the discovery in the leased area of any mineral not specified in the lease within sixty days of such discovery alongwith full particulars of the nature and position of each such find. If any mineral not specified in the lease is discovered in the lease area, the lessee shall not win and dispose of such minerals unless such mineral is included in the lease or a separate lease is obtained thereof.

10. To keep records and accounts regarding production and employees etc.

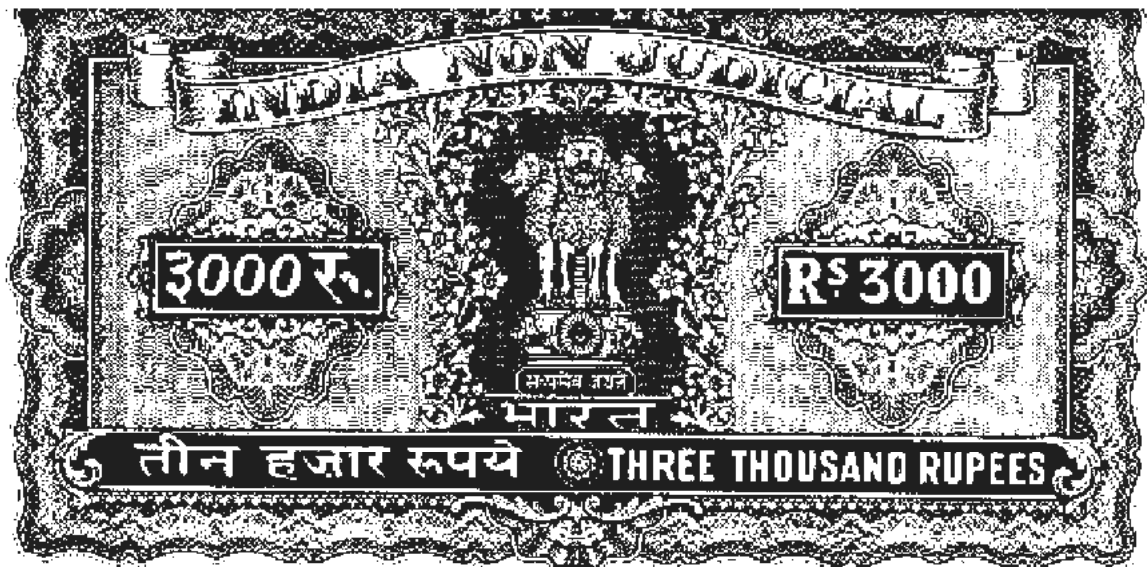
The lessee shall at all times during the said terms keep or cause to be kept at an office to be situated upon or near the said lands correct and intelligible books (bound and pages) or accounts which shall contain accurate entries showing from time to time;

1. Quantity and quality of the said mineral realised from the said lands;
2. Quantity of the various qualities of ores beneficiated or converted (for example Coal converted into coke)



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3. Quantities of the various qualities of the said minerals sold and exported separately.
4. Quantities of the various qualities of the said minerals otherwise disposed of and the manner and purpose of such disposal;
5. The prices and all other particulars of all sale of the said mineral;
6. The number of persons employed in the mines, works or upon the said lands specifying nationality qualification and pay of the technical personnel.
7. Such other facts, particulars and circumstances as the Central or the State Government may from time to time required and shall also furnish free of charge to such officers and at such times and as the Central or State Government may appoint true and correct abstract of all or any such books of accounts and such information and returns to all or any of the matters aforesaid as the State Government may prescribe and shall, at all reasonable times, allow such officers as the Central Government or State Government shall in that behalf appoint to enter into and have free access to the said offices for the purpose of examining and inspecting the said books of accounts, plans and records and to make copies thereof and make extract therefrom.



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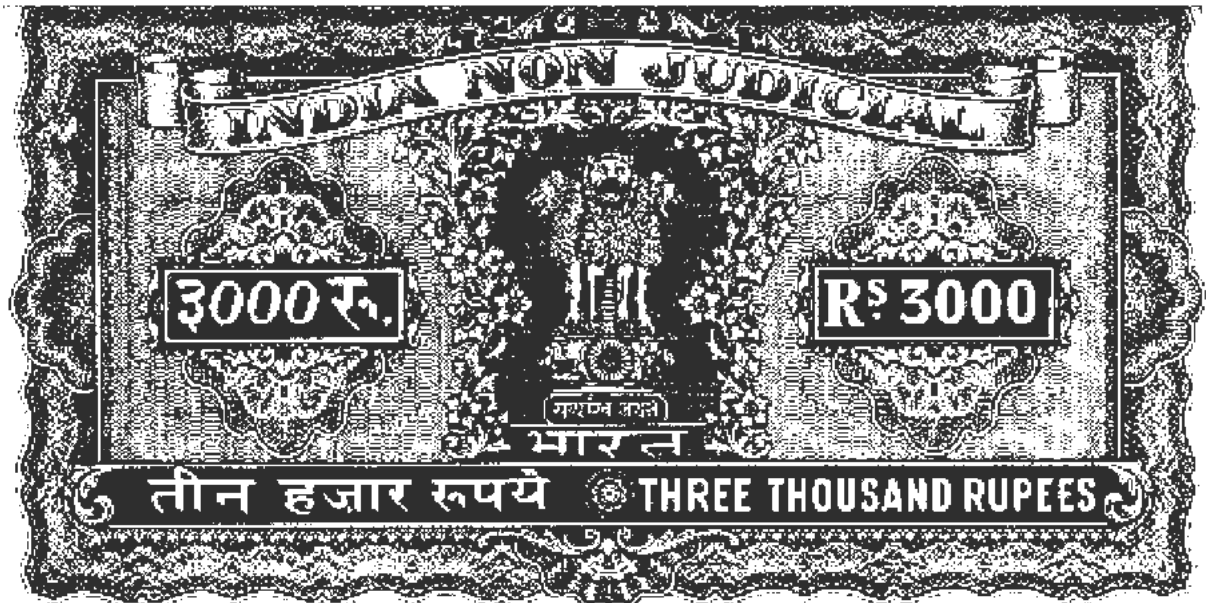
8. The lessee shall submit to the State Government monthly returns of raising and despatching of the mineral by the 7th of each month.

11. To maintain plans etc;

The lessee shall at all times during the said term maintain at the mines office, correct, intelligible, up-to-date and complete plans and sections of the mine in the said lands. They shall show all the operations and working and all trenches, pits and drilling made by them in the course of operations carried on by them under the lease, faults and other disturbances encountered and geological data and all such plans and section shall be amended and filled up by and from actual survey to be made for that purpose at the end of twelve months or any period specified from time to time and the lessee shall furnish free of charge to the Central and State Government true and correct copies of such plans and section whenever required accurate records of all trenches, pits and drillings shall show;

- a) The sub-soil and strata through which they pass.
- b) Any mineral encountered.
- c) Any other matter of interest and all data required by Central and State Government from time to time.

The lessee shall allow any officer of the Central or the State Government authorised in this behalf by



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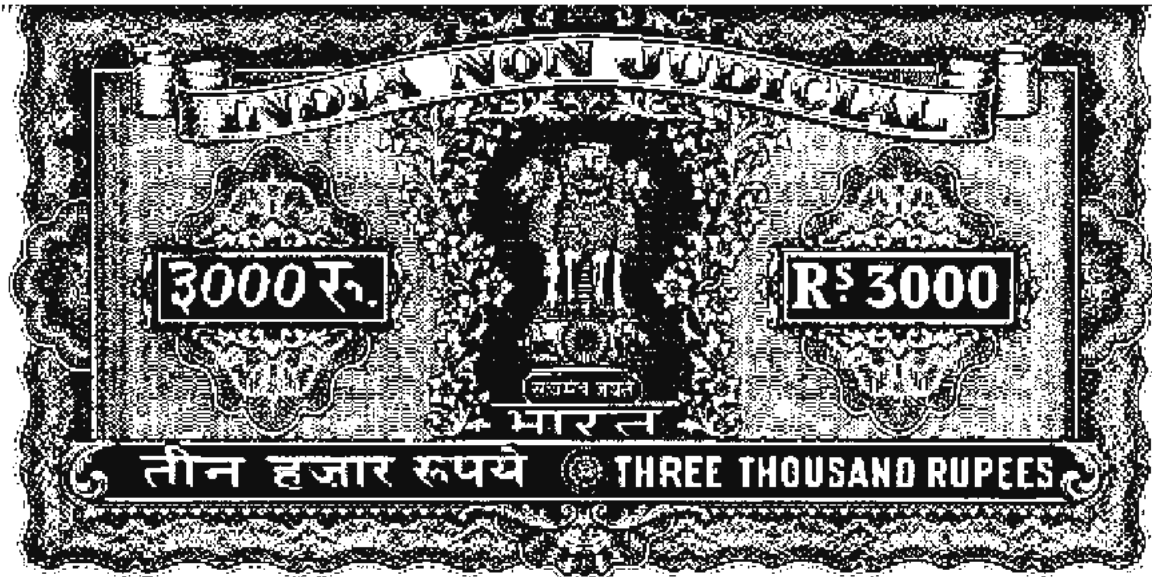
the Central Government to inspect the same at all reasonable times. He shall also apply when asked for by the State/Central Government the Coal controlling authority. The Director Geological Survey of India/ Director, Indian Bureau of Mines, a composite plan of the area about the thickness, dip inclination etc. of all the seams as also quantity of reserve quality also.

12. ACT 67 OF 1957.

The lessee shall be bound by such rules as may be issued from time to time by the Government of India Section 18 of the Mines and Minerals (Regulation and Development) Act 1957 (67) of 1957) and shall not carry on Mining or other operation under the said lease in any way other than as prescribed under these rules.

13. TO PROVIDE WEIGHING MACHINES;

Unless specifically exempted by the State Govt. the Lessee shall provide and at all times keep at or near the pit head or each of the pit head at which the said mineral shall be brought to bank a properly constructed and efficient weighing machines and shall



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weigh or cause to be weighed thereon all the said minerals from time to time brought to Bank, sold, exported and converted and also the converted products and shall at the close of each day cause the total weights, ascertained by such means of the said minerals, ores, products, raised, sold, exported and converted during the previous twenty four hours to be entered in the aforesaid books of accounts. The lessee shall permit the State Government at all times during the said term to employ any person or persons to be present at the weighing of the said minerals as aforesaid and keep accounts thereof and to check up the accounts kept by the lessee. The lessee shall give ten days previous notice in writing to the Deputy Commissioner of every such measuring or weighing in order that he or some officer on his behalf may be present there at.

14. To allow test of weighing machines;

The lessee shall allow any person or persons appointed in that behalf by the State Government any time during the said term to examine and test every weighing machines to be provided and kept as aforesaid and the weights used there with in order to ascertain whether the same respectively are correct and in good repair and order and if upon any such examination or test in such weighing machine or weight shall be found incorrect or out of repair or order



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the State Government may require that the same be adjusted, repaired and put in order by at the expense of the lessee, or the same lessee and if such requisition be not complied with within fourteen days after the same shall have been made, the State Government may cause such weighing machine or weights to be adjusted, repaired and put in order and the expense if so doing shall be paid by the lessee to the State Government on demand and if upon any such examination and testing as aforesaid, any error shall be discovered in any weighing machine or weights the prejudice of the State Government such error shall be regarded as having existence for three calendar months previous to the discovery of the same or from the last occasion of so examining and testing the same weighing machine and weights and testing in case such occasion shall be within such period of three months.

15. To pay compensation for injury of third parties;

The lessee shall make and pay reasonable satisfaction and compensation for all damage, injury or disturbance of person or property which may be done by or on the part of the lessee in exercise of the liberties and power granted by these presents and shall at all times have harmless and keep indemnified the State Government from and against all suite claims and demands which



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may be brought or made by any person in respect of any such damage, injury or disturbance.

16. Not to obstruct working of other minerals;

The Lessee shall exercise the liberties and power hereby granted in such a manner as to offer no unnecessary or reasonable avoidable obstructions or interruption to the Development and working within the said lands of any mineral not included in this lease and shall at all times afford to control and State Government and to the holders of prospecting licence or Mining leases in respect of any such minerals or any other minerals within any land adjacent to the said lands, as the case may be reasonable means of access and safe, convenient passage upon and across the said land to such minerals for the purpose and getting, working, developing and carrying away the same;

Provided that the lessee shall receive reasonable compensation for any damage or injury which they may sustain by reason or in consequence of the use of such passage by such lessee or holders of prospecting licence.

17(a) Transfer of Lease;

The lessee shall not without previous consent in writing of the State Government which in the case of a Mining lease, in respect of any mineral specified in the



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the first schedule to the Act shall not be given except after previous approval of the Central Government.

- a) Assign, sub-let, mortgage, or in any other manner, transfer the Mining lease or any right, title or interest therein or;
- b) Enter into or make any arrangement contract or understanding whereby the lessee will or may be directly or indirectly financed to a substantial extent by or under which the lessors operations or undertakings will or may be substantially controlled by any person or body of persons other than the lessee;
Provided that the State Government shall not give the written consent unless;
- a) The lessee has to furnish an affidavit alongwith the application for transfer of Mining lease specifying the amount that has already been taken or proposed to be taken as consideration from the transferee.
- b) The transfer of Mining lease is to be made to a person or body directly undertaking the Mining



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operation no.1(33)67 NII dated 20.3.68.

- c) Without prejudice to the above provisions the lessee may, subject to the provisions specified in the provisions to rule 35 of the said rules transfer this lease or any right, title or interest therein to a person holding a certificate of Approval and an Income tax clearance certificate from the Income tax Officer concerned, on payment of a fee of rupees one hundred to the State Government.

Provided that the lessee shall make available to the transferee the original, or certified copies of all plans of abandoned workings in the area and in belt 65 metres wide surrounding it.

The State Government may by orders in writing determination the lease at any time, if the lessee has in the opinion of the State Government committed a breach of any of the above provisions or has transferred the lease or any right, title or interest therein otherwise than in accordance with clause (2).

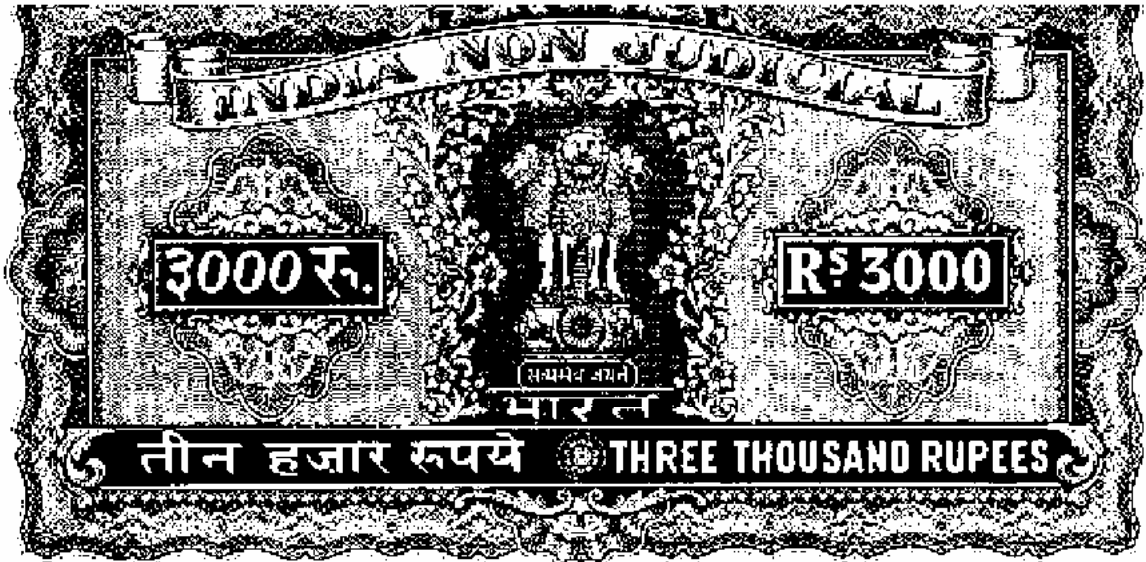
Provided that no such order shall be made without giving the lessee or reasonable opportunity of stating their case.



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18. Not to be financed or controlled by a Trust Corporation firm or persons;

✓ The lessee shall not be controlled and the lessee shall not allow themselves to be controlled by any trust, syndicate, corporation, firm or person except with the written consent of the Central Government. The lessee shall not enter into or make any arrangement compact or understanding whereby the lessee will or may be directly or indirectly financed by or under which the lessee operations or undertakings will or may be carried on directly or indirectly by or for the benefit of or subject to the control of any trust, syndicate, corporation, firm or persons unless with the written sanction given prior to such arrangement, compact or understanding being entered into or made of the Central Government and any or every such arrangement compact or understanding as aforesaid (entered into or made with such sanction as aforesaid) shall only be entered into or made and shall always be subject to an express condition binding upon the other party or parties thereto that on the occasion of a State of emergency of which the president of India in his direction shall be the Judge it shall be terminable if so required in writing by the State Government and shall on the event of any such requisition being made be forthwith thereafter determined by the lessee accordingly.



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19. Lessee shall deposit any additional amount necessary:-

Whenever the security deposit of Rs. or any part thereof or any further sum hereafter deposited with the State Government in replenishment thereof shall be forfeited or applied by the Central or State Government pursuant to the power hereinafter declared in that behalf the lessee shall deposit with the State Government such further sum as may be sufficient with the unappropriated part thereof to bring the amount in deposit with the State Government upto the sum of Rs.1,000/-

20. Delivery of working in good order to State Government after determination of Lease;

The lessee shall at the expiration or sooner determination of the said term or any renewal thereof deliver upto the State Government all mines, pits, shafts, inclines, drifts, levels, waterways, airways and other works now existing or hereafter to be sunk or made on or under the said lands except such as have been abandoned with the sanction of the State Government and in any ordinary and fair course of working all engines, machinery, plants, buildings, structures, other works and convenience which at the commencement of the said terms were upon or under the said lands and all such machinery set up by the



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lessee below ground which cannot be removed without causing injury to the mines or works under the said lands (except such of the same as may with the sanction of the State Government have become disused) and all buildings and structures of bricks or stones erected by the lessee above ground level in good repair order and condition and fit in all respects for further working of the said mines and the said minerals.

21. The right of pre-emption;

- a) The State Government shall from time to time and at all times during the said term have the right (to be exercised by notice in writing to the lessee) or pre-emption of the said minerals and all products thereof) lying in or upon the said lands hereby demised or elsewhere under the control of the lessee and the lessee shall, with all possible expedition, deliver all minerals or products or mineral purchased by the State Government under the power conferred by this provision in the quantities at the times in the manner and at the place specified in the notice exercising the said right.
- b) Should the right of pre-emption conferred by this present provision be exercised and a vessel chartered to carry the mineral or products thereof procured on



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on behalf of the State Government or Central Government be detained or demurrage at the part of loading the lessee shall pay the amount due for demurrage according to the terms of the charter party of such vessel unless the State Government shall be satisfied that the delay is due to causes beyond the control of the lessee.

c) The price to be paid for all mineral or products of minerals taken in pre-emption by the State Govt. In exercise of the right hereby conferred shall be the fair market price prevailing at the time of pre-emption. Provided that in order to arrive at the said fair market price the lessee shall if so required, furnish to the State Government for confidential information of the State Government particulars of the quantities, description and prices of the said mineral or products thereof sold to other customers and of charters entered into for freight for carriage of the same and shall produce to such officer or officers as may be directed by the State Government original or authenticated copies of contracts and charter, entered into for the sale or freightage of such mineral or products.

d) In the event of the existence of a State of War or emergency (of which existence the President of India shall be the sole Judge and a notification to this effect in the Gazette of India shall be conclusive



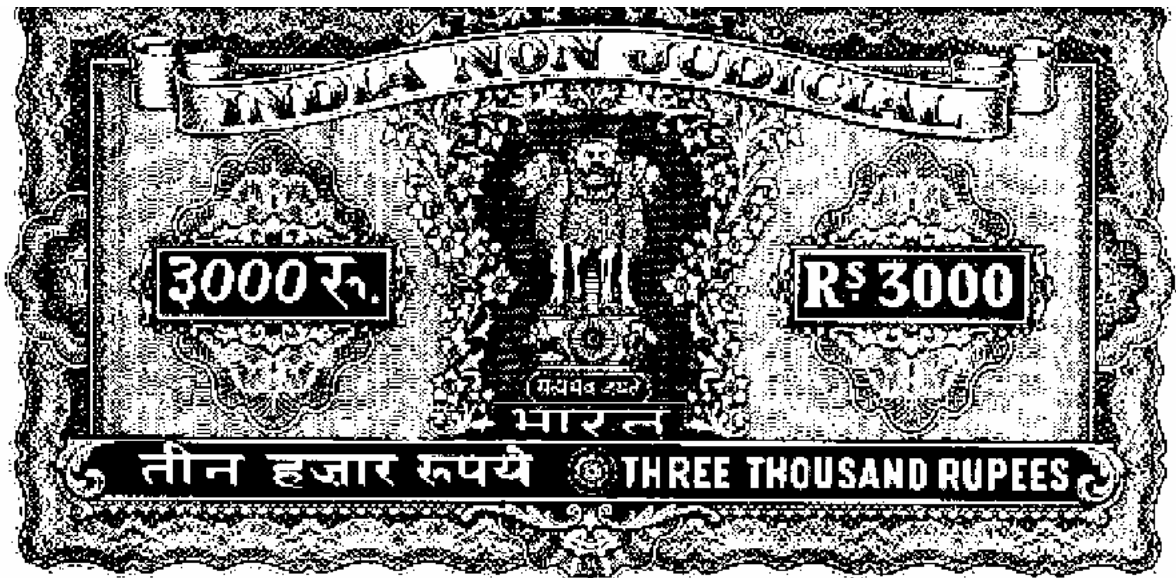
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proof) the State Government with the consent of the Central Government shall from time to time and at all times during the said term, have the right, (to be exercised by a Notice in writing to the lessee) forthwith take possession and control of the works, plants, machinery, and premises of the lessee on or in connection with the said lands or operations under this lease and during such possession or control the lessee shall conform to and obey all directions given by or on behalf of the Central Government or State Government regarding the use or employment of such works, plants, premises and minerals;

Provided that fair compensation which shall be determined in default of agreement by the State Government shall be paid to the lessee for all loss or damage sustained by the lessee by reason or in consequence of the exercise of the power conferred by this clause and provided also that the exercise of such powers shall not determine the said term hereby granted or affect the terms and provisions of these presents further than may be necessary to give effect to the provisions of this clause.

22. Employment of foreign national;

The Lessee shall not employ, in connection with the Mining operations any person who is not an Indian



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National except with the previous approval of the Central Government .

23. Recovery of expenses incurred by the State Government.

If any of the works or matter which in accordance with the covenants in that behalf herein before contained, are to be carried or performed by the Lessee be not so carried out or performed within the time specified in that behalf, the State Government may cause the same to be carried out or performed and the Lessee shall pay the State Government on demand all expenses which shall pay the State Government on demand all expenses which shall be incurred in such carrying out performance of the same and the decision of the State Government as to such expenses shall be final.

24. Furnishing of Geophysical Data.

The Lessee shall Furnish:

a) All Geophysical Data relating to Mining fields of engineering and ground water surveys such as anomaly maps section, plans, structures contour maps logging collected by them during the course of Mining operations the Director Geological Survey of India, Calcutta.

b) All information pertaining to investigation of radioactive mineral collected by them during the course of Mining operation to the Secretary department of Atomic Energy, New Delhi.



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Data or information referred to above shall be furnished every year reckoned from the date of commencement of the period of the Mining lease.

PART VIII.

THE COVENANTS OF THE STATE GOVERNMENT.

1. Lessee may hold and enjoy rights quietly;

The Lessee having paying the rents, water rate and royalties hereby reserved and observing and performing all the covenants and agreements herein contained and on the part of the lessee to be observed and performed shall and may quietly hold and enjoy the rights and premises hereby demised for and during the said term hereby granted without any unlawful interruption from or by the State Government or any person rightfully claiming under it.

2. Acquisition of land of third parties and compensation thereof;

IF in accordance with the provisions of clause (4) of Part VII of this Schedule the lessee shall offer to pay to an occupier of the surface of any part of the said lands compensations for any damage or injury which may arise from the proposed operations of the lessee and the said occupier shall refuse his consent to the exercise of the right and powers reserved to the State Government and demised of the



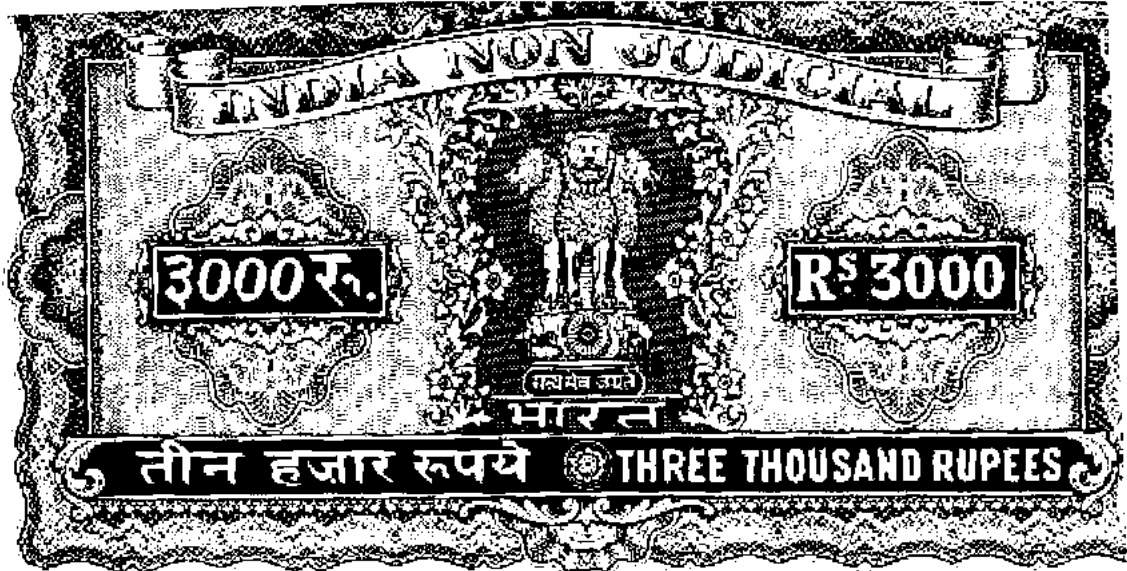
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lessee by these presents and the Lessee shall report the matter to the State Govt. and shall deposit with it the amount offered as compensation and if the Central/State Government are satisfied that the amount of compensation offered is fair and reasonable or if it is not so satisfied and the Lessee shall have deposited with it such further amount as the State and Central Government shall consider fair and reasonable the State Government shall order the occupier to allow the lessee to enter the land and to carry out such operations as may be necessary for the purpose of this lease. In assessing the amount of such compensation the State Government shall be guided by the principles of the Land Acquisition Act.

3. To Renew:- Deleted.

4. Liberty to determine the Lease;

The lessee at any time may determine this lease by giving not less than 12 calendar months notice in writing to the State Government or to such officer or authority as the State Government may specify on this behalf and upon the expiration of such notice. Provided that the lessee shall upon such expiration tender and pay all rents and water rate royalties, compensation for damage and other moneys which may then be due and payable under these presents to the



-55-

the Lessor or any other person or persons and shall deliver these presents to the State Government then this lease and the said terms and the liberties, powers and privileges hereby granted shall absolutely cease and determine but without prejudice to any right or remedy of the Lessor in respect of any breach of any of the covenants or agreements contained in these presents;

Provided that the State Government or the Officer or the authority appointed as aforesaid may declare the lease to be determined after the period of 12 Calendar months notice is ever irrespective of whether all the dues payable have been paid up or not without prejudice to any effects for realisation of such dues under statute or otherwise and shall be free to advertise the area under rule 58 of the Mineral Concession Rules, or any other laws existing at the time.

4(a) The State Government may on an application made by the lessee permit him to surrender one or more minerals from his lease which is for a group of minerals on the ground that the deposit of that minerals have since exhausted or delapidated to such an extent that it is no longer possible to work the mineral economically subject to the conditions that the lessee,

Coal Superintendent & Agent
D. S. Sharma
D. S. Sharma

1/11/2011
11/11/2011
11/11/2011



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- a) Make an application for each surrender of mineral at least six months before the intended date of surrender and;
- b) Give an undertaking that he will not cause any hindrance in the working of the mineral so surrendered by any other person who is subsequently granted a Mining lease for that Mineral (No. MII-152(1B)/61 dated 4.12.1962.

5. Refund of Security deposit;

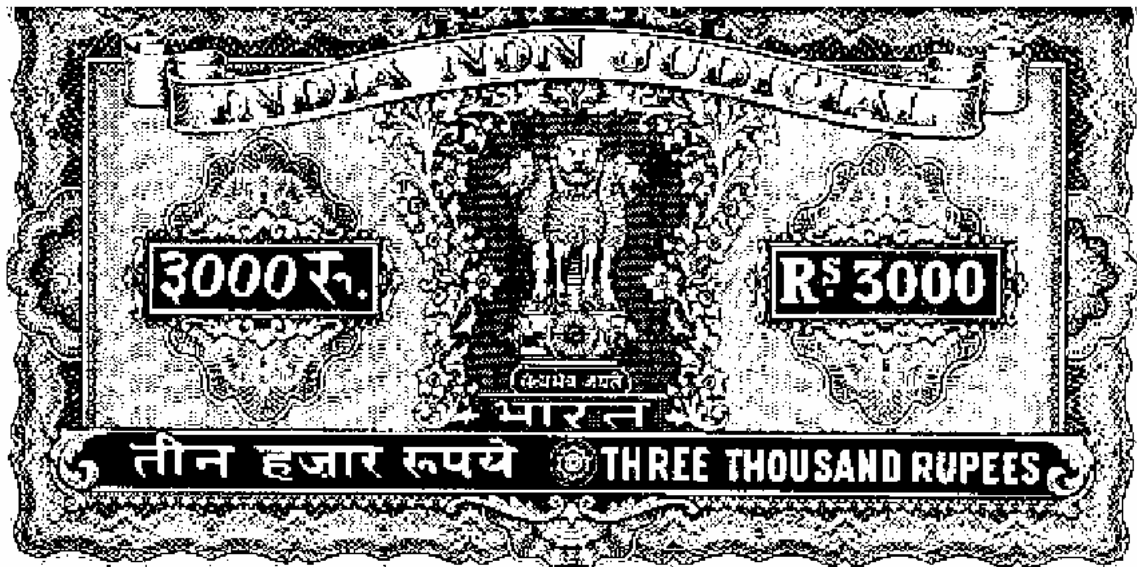
On such date as the State Government may elect within 12 Calendar months after the determination of this lease or of any renewal thereof, the amount of the security deposit with the State Government and not required to be applied to any of the purposes mentioned in this lease shall be refunded to the Lessee. No interest shall run on the Security deposit.

PART IX.

GENERAL PROVISIONS.

1. Obstruction to inspection:-

In case the Lessee or their transferees does not allow entry to inspection by the officer authorized by the



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officer authorised by the Central or State Government under clauses (i)(j) of (1) of Sub rule (i) of rule 27 of the said rules, the State Govt. shall give notice in writing to the lessee requiring them to show cause within such time as may be specified in the notice why the lease should not be determined and their security deposit forfeited and if the lessee fail to show cause within the aforesaid time to the satisfaction of the State Govt. the State Govt. may determine the lease and forfeit the whole or part of the security deposit.

2. Penalty in case of default in payment of royalties and breach of covenants;

If the Lessee or his transferees or assigns makes any default in payment of rent or water rate or royalties as required by section 9 of the Act or commits a breach of any of the conditions and covenants other than those referred to in covenants(1) above, the State Govt. or their officer or officers authorised in this behalf, shall give notice to the lessee requiring them to pay the rent, water rate, royalty, or remedy the breach as the case may be within sixty days from the date of receipt of the Notice if the rent, water rate and royalty are not paid or the breach is not remedied within such period, the State Government may without prejudice to any proceeding that may be taken against him determine the lease and forfeit the whole or part of the security deposit.

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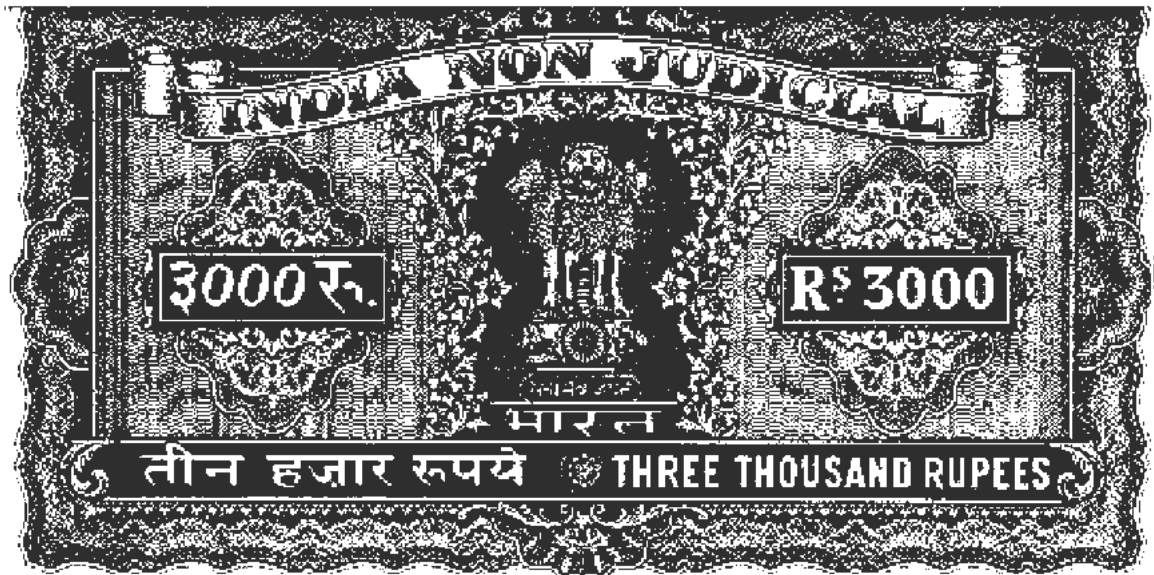
- 58 -

Penalty for repeated breaches of covenants;

3. In case of repeated breaches of covenants and agreements made by the lessee for which notice has been given by the State Government or officer or officers authorised in this behalf accordance with clauses (1) and (2) aforementioned on earlier occasions the State Government without giving any further notice may impose penalty not exceeding twice the amount of annual dead rent specified in clause 2 of Part V.

Failure to fulfil the terms of lease due to "force Majure"

4. Failure to fulfil the terms of lease due to "force Majure" Failure on the part of the Lessee to fulfil any of the terms and conditions of this lease shall not give the Central or State Government any claim against the Lessee or be deemed to breach of this lease, in so far as such failure is considered by the said Govt. to arise from force majeure, and if through force Majure the fulfilment by the lessee of any of the terms and conditions of this lease be delayed the period of such delay shall be added to the period fixed by this lease.



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In this clause the expression "Force Majeure" means act of God, War insurrection, riot, Civil Commotion, strike, earthquake, tide, storm, tidal, wave, flood, lightening, explosion, fire earthquake and any other happening which the lessee could not reasonably prevent or control.

Lessee to remove his properties on the
expiry of lease.

5. The lessee having first paid and discharged rents, rates and royalties payable by virtue of these presents may at the expiration or sooner determination of the said term or within six calendar months thereafter (unless the lease shall be determined under clauses 1 and 2 of this part and in that case at any time not less than three calendar months nor more than six calendar months after such determination take down and remove for their own benefit all or any engines, machinery, plant building structures tramways railways and other



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works erections and covenants which may have been erected, set up or placed by the Lessee in or upon the said lands and which the Lessee are not bound to deliver to the State Government under clause 20 of Part VII of this Schedule and which the State Government shall not desire to purchase.

Forfeiture of property left more than six months after termination of lease.

6. If at the end of six calendar months after the expiration or sooner determination of the said term under the provisions contained in clause 4 of Part VIII of this Schedule becomes effective there shall remain in or upon the said lands any engines, machinery, plant, buildings, structures, tramways,

3000Rs



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railways and other work erection and conveniences or other property which are not required by the lessee in connection with operation in any other land held by them under prospecting licence or Mining lease or Mining lease the same shall if not removed by the Lessee within one calendar month after notice in writing requiring their removal has been given to the Lessee by the State Government be deemed to become the property of the State Government and may be sold or disposed of in such manner as State government shall deem fit without liability to pay any compensation or to account to the Lessee in respect thereof.

7. NOTICE.

Every notice by these presents required to be given to the Lessee shall be given in writing to such person resident on the said lands as the

Coal Superintendent & Agent
D.V. Chandra Sekhary

[Signature]

[Signature]
कोयला अधीक्षक
श्रीधर

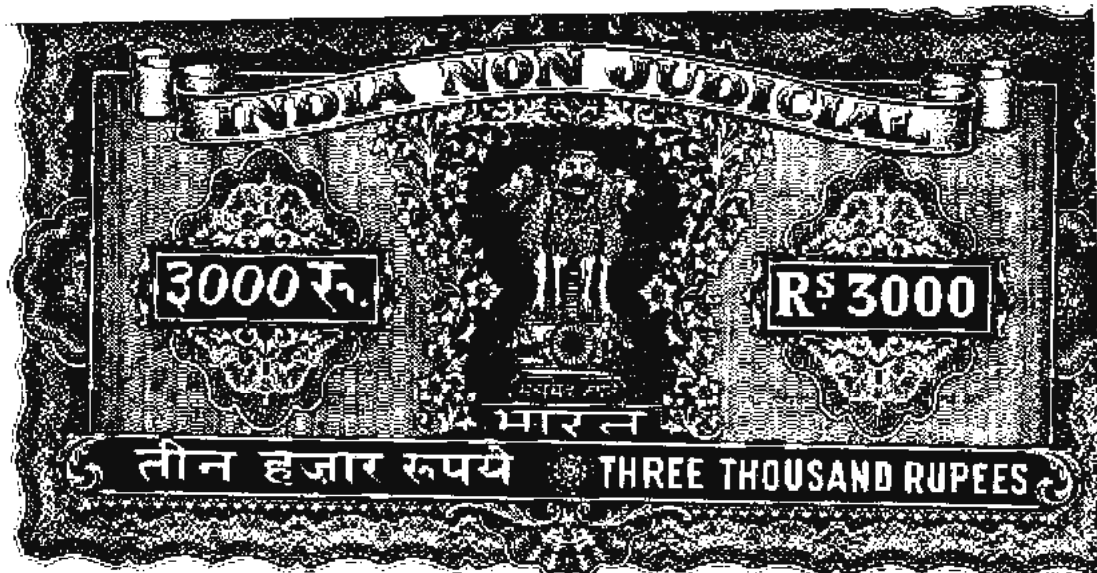


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such notice and if there shall have been no such appointment, then every such notice shall be sent to the Lessee by registered post at the address recorded by them in this lease or at such other address in India as the Lessee may from time to time in writing to the State Government designate for the receipt of notices and every such services shall be deemed to be proper and valid services upon the lessee and shall not be questions for challenge by them.

8. Immunity of State Government from liability
to pay compensation.

In any event the orders of the State Government are revised, reviewed or cancelled by the Central Government in pursuance of proceedings under Chapter VII of the Mineral Concession Rules, 1960, the Lessee shall not be entitled to compensation for any loss


$$\rightarrow \left[\begin{array}{c} \pi \\ \downarrow \\ \downarrow \end{array} \right] \rightarrow$$

maintained by the L.A. County Board of Supervisors
and providing a nonstop service on the above
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कार्यालय पृष्ठ नं० ५४/२

संख्या १०००/१९९९
दिनांक १९/११/९९



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पक्षों की स्वीकृत वृत्ति के अन्तर्गत धर्मोपदेश की शोध्य

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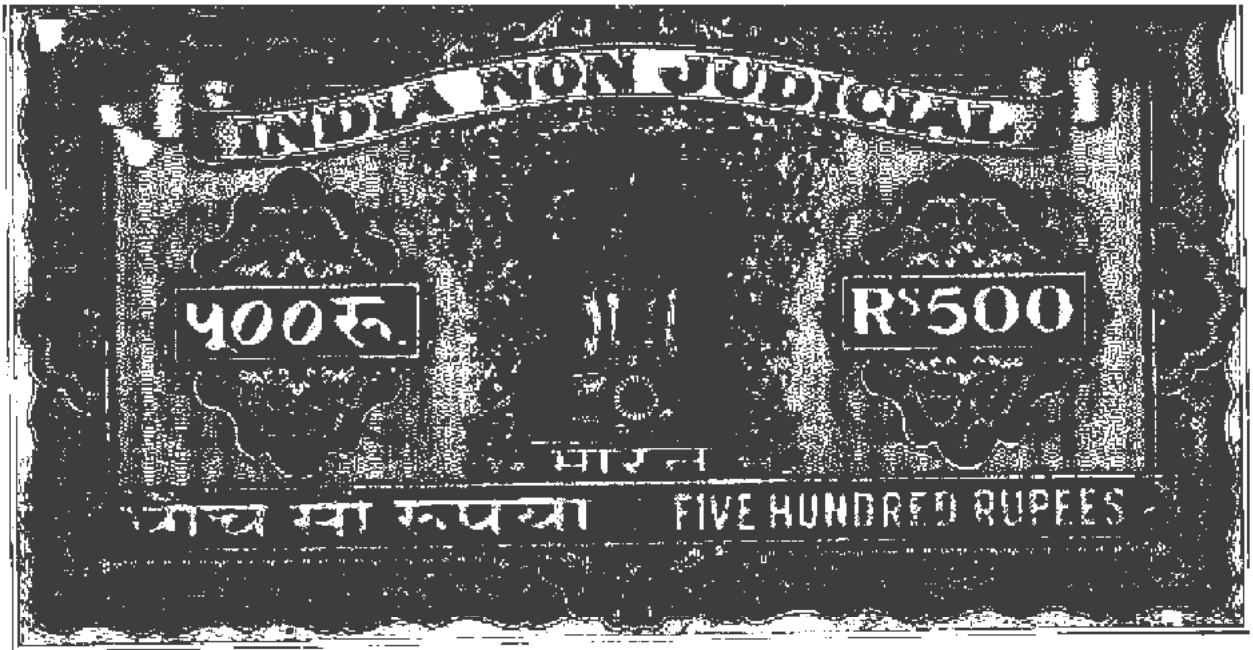
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अन्य वस्तु: अनिवार्य आये वा

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दामोदर घाटी निगम / DAMODAR VALLEY CORPORATION
बोकारो ताप विद्युत केन्द्र / BOKARO THERMAL POWER STATION
अधीक्षण अभियंता (यां०), अनुरक्षण योजना स्कन्ध का कार्यालय / OFFICE OF THE SE(M), MPC
बोकारो थर्मल, बोकारो (झारखण्ड) / Bokaro Thermal, Bokaro (Jh.)-829107

No: BT/B (O&M)/SE (MPC)/M-12/384

Date: 01/02/2016

To
The Chief Engineer-I & HOP
DVC, BTPS,
Bokaro Thermal

Sub: Requirement of coal on the basis of station heat rate.

Ref: No: Letter No. BM/71 dt. 21.01.16 of SE (Mining) & Agent, DVC Bermo Mines.

Dear Sir,

The yearly requirement of coal for the 1x500 MW on the basis of station coal rate is as follows.

Projected Coal rate	:	0.6 Kg/KWH
Yearly Coal requirement	:	26,20,000 MT

This is for your kind information.

भवदीय/Yours faithfully,

अधीक्षण अभियंता(यां०), दामोदर घाटी निगम

SE (M), DVC, BTPS,

अनुरक्षण योजना स्कन्ध/Maintenance Planning Cell

Copy to:

→ The SE (Mining) & Agent, DVC Bermo Mines.

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5/4/07

By Speed Post

No.J- 13011/21/2006-IA.II(T)
Government of India
Ministry of Environment & Forests

Paryavaran Bhawan
CGO Complex, Lodi Road
New Delhi-110 003.

Dated 30th March, 2007

To

The Chief Environment Officer (EM&PC)
M/s.Damodar Valley Corporation,
Electricity Department, 10th Floor
DVC Towers, VIP Road,
Kolkata – 700 054.

**Sub: Bokaro Thermal Power Station 'A' (1x500 MW) at BTPS,
Bokaro, Jharkhand by M/s Damodar Valley Corporation –
Environmental clearance reg.**

Sir,

The undersigned is directed to refer to your communication No. EDCON/EM&PC/BTPS'A'/2599 Dated 4th January, 2007 regarding the subject mentioned above. Subsequent information submitted vide letter dated 31st Jan, 2007 has also been considered.

2. It is noted that the proposal is for grant of environmental clearance under the provisions of EIA Notification, 2006 to set up 500 MW thermal power plant as an expansion of the existing power plant at Bokaro, Jharkhand. The land requirement is 70 ha which is already available within the existing complex and no additional land would be acquired except 65 ha for ash pond which is a forest land. Coal with sulphur content of 0.4% and ash content of 40% will be used. The requirement of coal has been estimated as 2.5 Million TPA at 100% PLF. Coal will be transported through road and rail in the ratio of 60:40. The water requirement is estimated as 2015 m³/hr and will be met from the existing allocation from river Konar. No National Park/wildlife sanctuary, ecologically sensitive area is within 10 km radius. R&R is not involved. Public hearing for the project was held on 29.12.2006. The project cost is Rs 2312.60 crores including Rs 129.5 crores for environmental protection measures.

3. The proposal has been considered in accordance with the EIA Notification dated 14th September, 2006 and environmental clearance is hereby accorded under the provisions thereof subject to implementation of the following terms and conditions:

- (i) No additional land for any facilities/activities shall be acquired for the project except 65 ha for ash pond.
- (ii) No new facilities relating to the proposed project shall be setup within 50m of the HFL of the river.
- (iii) Ash and sulphur content in the coal to be used in the project shall not exceed 40% and 0.4% respectively.
- (iv) One single flue stack of 275 m height shall be provided with continuous online monitoring equipments. Exit velocity of 22 m/sec shall be maintained.
- (v) High efficiency Electrostatic Precipitators (ESPs) with efficiency not less than 99.9 % shall be installed to ensure that particulate emission does not exceed 100 mg/Nm³.
- (vi) Space provision shall be made for Flue Gas De-sulphurisation (FGD) unit, if required at a later stage.
- (vii) Water consumption in the expansion project shall not exceed 2015 m³/hr and this quantity shall be met from the existing allocation.
- (viii) Closed Cycle Cooling system with natural draft cooling tower shall be provided. Measures shall also be adopted to reduce the water demand through increasing COC and rain water harvesting.
- (ix) The ash pond shall be provided with impervious lining.
- (x) Adequate dust extraction system such as bag filters and water spray system in dusty areas such as coal and ash handling areas, transfer areas and other vulnerable areas shall be provided.
- (xi) Fly ash shall be collected in dry form and ash generated shall be used in a phased manner as per provisions of the notification on Fly Ash Utilization issued by the Ministry in September, 1999 and its amendment. By the end of 9th year full fly ash utilization should be ensured. Unutilized ash shall be disposed off in the ash pond in the form of High Concentration Slurry.
- (xii) The effluents to be discharged into the river shall conform to the standards prescribed by the State Pollution Control Board.
- (xiii) Rain water harvesting shall be practiced. A detailed scheme for rain water harvesting to recharge the ground water aquifer shall be prepared in consultation with Central Ground Water Authority/State Ground Water Board and a copy of the same shall be submitted within three months to the Ministry.
- (xiv) Greenbelt shall be raised all around the ash pond area. Green belt development shall be started along with the construction activity.

- (xiv) First aid and sanitation arrangements shall be made for the drivers and other contract workers during construction phase.
 - (xv) Leq of Noise level should be limited to 75 dBA and regular maintenance of equipment be undertaken. For people working in the high noise areas, personal protection devices should be provided.
 - (xvi) Regular monitoring of the ambient air quality shall be carried out in and around the power plant and records maintained. The location of the monitoring stations and frequency of monitoring shall be decided in consultation with SPCB. Periodic reports shall be submitted to the Regional Office of this Ministry.
 - (xvii) The project proponent shall advertise in at least two local newspapers widely circulated in the region around the project, one of which shall be in the vernacular language of the locality concerned, informing that the project has been accorded environmental clearance and copies of clearance letters are available with the State Pollution Control Board/Committee and may also be seen at Website of the Ministry of Environment and Forests at <http://envfor.nic.in>.
 - (xviii) A separate environment monitoring cell with suitable qualified staff should be set up for implementation of the stipulated environmental safeguards.
 - (xix) Half yearly report on the status of implementation of the stipulated conditions and environmental safeguards should be submitted to this Ministry, Regional Office, CPCB and SPCB.
 - (xx) Regional Office of the Ministry of Environment & Forests located at *Bhubaneswar* will monitor the implementation of the stipulated conditions. Complete set of Environmental Impact Assessment Report and Environment Management Plan shall be forwarded to the Regional Office for their use during monitoring.
 - (xix) Separate funds should be allocated for implementation of environmental protection measures along with item-wise break-up. This cost should be included as part of the project cost. The funds earmarked for the environment protection measures should not be diverted for other purposes and year-wise expenditure should be reported to the Ministry.
 - (xx) Full cooperation should be extended to the Scientists/Officers from the Ministry/Regional Office of the Ministry at *Bhubaneswar* /the CPCB/the SPCB who would be monitoring the compliance of environmental status.
4. The Ministry reserves the right to revoke the clearance if conditions stipulated are not implemented to the satisfaction of the Ministry.

5. The environmental clearance accorded shall be valid for a period of 5 years to the start of production operations by the power plant.

6. In case of any deviation or alteration in the proposed project from that submitted to this Ministry for clearance, a fresh reference shall be made to the Ministry to assess the adequacy of the condition(s) imposed and to incorporate additional environmental protection measures required, if any.

7. The above stipulations shall be enforced along with others as under the Water (Prevention and Control of Pollution) Act, 1974, the Air (Prevention and Control of Pollution) Act, 1981, the Environment (Protection) Act, 1986 and rules there under, The Manufacture, Storage and Import of Hazardous Chemical Rules, 1989, Hazardous Wastes (Management and Handling) Rules, 1989, the Public Liability Insurance Act, 1991 and rules there under and the EIA Notification, 2006 and the amendments made therein from time to time.



(Dr. S.K. AGGARWAL)
DIRECTOR

Copy to:

1. The Secretary, Ministry of Power, Shram Shakti Bhawan, Rafi Marg, New Delhi-110001.
2. The Secretary, Forests & Environment Department, Government of Jharkhand, Nepal House, Dordandor, Ranchi, Jharkhand.
3. The Chairman, Central Electricity Authority, Sewa Bhawan, R.K. Puram, New Delhi-110066.
4. The Chairman, Jharkhand State Pollution Control Board, T.A. Building HEC, P.O. Dhurwa, Ranchi-834 004 - with a request to display a copy of the clearance letter at the Regional Office, District Industries Centre and Collector's office for 30 days.
5. The Chairman, Central Pollution Control Board, Parivesh Bhawan, CBD-cum-Office Complex, East Arjun Nagar, Delhi-110032.
6. The Chief Conservator of Forests, Eastern Regional Office, Ministry of Environment & Forests, 194, Kharvela Nagar, Bhubaneswar-751001.
7. Director (EI), MOEF.
8. Guard file.
9. Monitoring file.

(Dr. S.K. AGGARWAL)
DIRECTOR



J-13011/21/2006 - IA. II (T)
Government of India
Ministry of Environment & Forests

Tel no: 011- 2436 4067

Parvathan Bhavan, C.G.O. Complex,
 Lodi Road, New Delhi -110003.

Dated: 04.12.2012

To

M/s Damodar Valley Corpn. Ltd.
 Electricity Department, 10th Floor
 DVC Towers, VIP Road
 Kolkatta - 700 054.

**Sub: Bokaro Thermal Power Station-A (1x500 MW), at Bokaro, in
 Jharkhand- reg.**

Sir,

This has reference to your letters dated 02.06.2012 requesting the Ministry for extension of validity period of environmental clearance accorded Bokaro Thermal Power Station-A (1x500 MW), at Bokaro, in Jharkhand.

2. The request has been examined and the matter was placed before the Expert Appraisal Committee (Thermal Power) in its 54th Meeting held during August 6-7, 2012. It is now hereby informed that in view of the information / clarification furnished by you with respect to the implementation of the above mentioned expansion power project and in acceptance of the recommendation of the Expert Appraisal Committee (Thermal Power), the validity period of the environmental clearance letter issued by this Ministry's letter of even no., dated 30.03.2007 is now extended for a further period till 28.03.2017.

3. It is also further informed that under para no.3 of this Ministry's letter of even no., dated 07.06.2007, after clause no. (xx), the following additional conditions shall be implemented:

- (xxi) The project proponent shall upload the status of compliance of the conditions stipulated in the environmental clearance issued vide this Ministry's letter of even no. dated 30.03.2007 in its website and updated periodically and also simultancously send the same by e-mail to the Regional Office of the Ministry of Environment and Forests.
- xxii) Criteria pollutants levels including NO_x, RSPM (PM₁₀ & PM_{2.5}), SO_x (from stack & ambient air) shall be regularly monitored and results displayed in your website and also at the main gate of the power plant.

- xxiii) A three tier thick green belts on either side of the Ash Pond shall be developed and status of implementation shall be reported to the Regional Office of the Ministry regularly.
- xxiv) An amount of Rs 9.3 Crores shall be earmarked as one time capital cost for CSR programme. Subsequently a recurring expenditure of Rs 1.9 Crores per annum till the life of the plant shall be earmarked as recurring expenditure for CSR activities. Details of the activities to be undertaken shall be submitted to the regional Office of the Ministry along with road map for implementation.
- xxv) CSR scheme shall be identified based on need based assessment in and around the villages within 5 km of the site and in constant consultation with the village Panchayat and the District Administration. Income generating projects consistent with the traditional skills of the people shall be undertaken. Development of fodder farm, fruit bearing orchards, vocational training etc. can form a part of such programme. Company shall provide separate budget for community development activities and income generating programmes. Vocational training programme for possible self employment and jobs shall be imparted to identify villagers free of cost.
- xxvi) It shall be ensured that in-built monitoring mechanism for the schemes identified is in place and annual social audit shall be got done from the nearest government institute of repute in the region. The project proponent shall also submit the status of implementation of the scheme from time to time.
- (xxvii) The project proponent shall formulate a well laid Corporate Environment Policy and identify and designate responsible officers at all levels of its hierarchy for ensuring adherence to the policy and compliance with conditions stipulated in this clearance letter and other applicable environmental laws and regulations.
4. This issues with the approval of the Competent Authority.

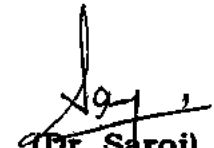
Yours faithfully,


(Dr. Saroj)
Scientist 'F'

Copy to:

1. The Secretary, Ministry of Power, Shram Shakti Bhawan, Rafi Marg, New Delhi 110001.
2. The Secretary (Environment), Environment Department, Government of Jharkhand.

3. The Chairman, Central Electricity Authority, Sewa Bhawan, R.K. Puram, New Delhi-110066.
4. The Chairman, Jharkhand Pollution Control Board, TA Building, HEC Complex, P.O. Dhurwa, Distt. Ranchi- with a request to display a copy of the clearance letter at the Regional Office, District Industries Centre and Collector's office for 30 days.
5. The Chairman, Central Pollution Control Board, Parivesh Bhawan, CBD-cum-Office Complex, East Arjun Nagar, Delhi-110032.
6. The Chief Conservator of Forests, Eastern Regional Office, Ministry of Environment & Forests, A/3, Chandersekharpur, Bhubaneswar 751023.
7. The District Collector, Bokaro District, Govt. of Jharkhand.
8. Guard file.
9. Monitoring file


(Dr. Saroj)
Scientist 'F'

ENVIRONMENTAL STATEMENT FOR



DVC BERMO MINES FOR THE YEAR 2014-15



Prepared by



Centre of Mining Environment
Dept. of Environmental Science & Engineering
INDIAN SCHOOL OF MINES, DHANBAD- 826004

SEPTEMBER, 2015

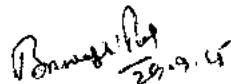
(NABET/ELA/01/12/005 Dt.31.01.2012)
JSPCB Accredited

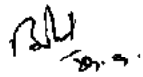
Ref. No: ESE/Bermo Mines/BP/01/2015

Dated: 29/09/2015

CERTIFICATE

This is to certify that Environmental Statement for the Bermo Mines of DVC for the financial year 2014-15 has been prepared by Centre of Mining Environment (CME), Department of Environmental Science & Engineering (ESE), Indian School of Mines (ISM) Dhanbad after Site Inspection, Monitoring and Measurements, Verification of the records/ facts etc.


(Dr Biswajit Paul)
Associate Prof/ESE
EIA Coordinator
(NABET/EIA/01/12/005 Dt.31.01.2012)
JSPCB Accredited


Head of Dept (CD)
~~Professor & Head~~
Centre of Mining Environment
Department of Environmental Sc. & Engg.
Indian School of Mines
Dhanbad-826004

ENVIRONMENTAL STATEMENT FOR DVC BERMO MINES
FOR THE YEAR 2014-15

TABLE OF CONTENTS

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EXECUTIVE – SUMMARY

This Environmental Statement is prepared with a view to fulfill the statutory obligations laid down by Ministry of Environment & Forests (MoEF), Government of India vide Gazette Notification No. G.S.R. 329 (E) dated 13th March 1992. The Environmental Audit has been made mandatory through this Notification. The Environmental Audit has subsequently been renamed as Environmental Statement vide MoEF Gazette Notification No. G.S.R.386 (E) dated 22nd April 1993.

DVC started its mining activities in 1952 by acquiring captive coalmine at Bermo from the Indian Railway to meet the coal requirement of Bokaro 'A' Thermal Power Station. The Bermo Mine is operating under the administrative control of Damodar Valley Corporation (DVC). The production limit of coal is 0.36 MTY as per EC for this project. Total coal produced in the Assessment Year (2014-2015) was 0.0661 MT. To produce this quantity of coal, no overburden has been removed. Coal mining were being done on contractual basis. The water although not used directly during the coal mining process, is being consumed mainly for domestic purpose. Water is also being consumed for industrial activities like dust suppression, and washing of Heavy Earth Moving Machineries (HEMMs). The water consumption for the Assessment Year 2014-15 has been 440 KL/day. The resources used are mainly i.e. Diesel and Lubricants (POL) for automobiles and machines while electricity and explosives for the Assessment Year 2014-15 were 0.0729 L/T, 0.0360 L/T, 46.660 KWH/T and 1.600 Kg/T, respectively.

The environmental monitoring of DVC Bermo Mine has been done by Centre of Mining Environment (CME), Department of Environmental Science & Engineering (ESE), Indian School of Mines (ISM), Dhanbad as per the guidelines of Ministry of Environment & Forests. Results of the monitoring reflected that concentration levels of parameters i.e. SPM, PM₁₀, SO₂ and NO_x in ambient air are found to be within the permissible limits. The quality of mine water at the disposal point observed to be within the prescribed limits. OB wastes generated for this financial year is 1.32 Lakh m³. At present following measures are being practiced for environment management in the project:

- Water sprinkling is being done regularly on the haul roads and loading points to suppress the dust.
- Tree plantation is being done every year in and around the project area.
- The mine water and rainwater are collected in the reservoir. This water is supplied to the nearby colony and local people to meet their daily requirements. For drinking purpose, water after being treated is obtained from Central Coalfields Ltd. (CCL) and supplied to the colony.
- All domestic water is partially reused by diverting to the low-lying area, which is then used by the local people / farmers for irrigation.

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CHAPTER -I

1.1. GENERAL

DVC started its mining activities in 1952 by acquiring captive coalmine at Bermo from the Indian Railway to meet the coal requirement of Bokaro 'A' Thermal Power Station. The Bermo Mine is operating under the administrative control of Damodar Valley Corporation (DVC). Hence this is a captive mine for Bokaro Thermal Power Station of DVC in East Bokaro Coalfields.

Mission

The assigned mission of the Damodar Valley Corporation under Section 12 of the DVC Act, 1948:

- Flood control
- Promotion and operation of schemes for irrigation.
- Water supply for industrial and domestic use.
- Navigation and drainage
- Generation, transmission and distribution of electrical energy.
- Promotion of afforestation and control of soil erosion in valley area.
- Promotion of public health, agriculture, industrial, economic and general well being in Damodar valley.

Vision

To foster integrated development of Damodar Valley Command Area and achieve par excellence in its multifaceted activities of control of floods, provision of irrigation, generation, transmission and distribution of electrical energy and also soil conservation, unified tourism, fisheries, socio-economic & health development of villages within a radius of 10 KM of its projects.

1.2 LOCATION

The DVC Bermo mine is located 3 km away from Bermo Railway Station on Barkakana – Netaji Subhas Chandra Bose (Gomoh) loop Line of Eastern Railway. Coordinates 23°46'53"N 85°57'37"E. The Mine is well connected with Bokaro Thermal Power Station (BTPS) of DVC by Road Network.

Postal Address: Damodar Valley Corporation, Bermo Mines, P.O. Bermo, (Via Phusro), Dist. Bokaro, PIN-829104 (Jharkhand).

1.3 ABOUT THE COALFIELDS, TOPOGRAPHY , DRAINAGE AND CLIMATE

The East Bokaro Coalfields lies between Latitudes 23° 44' N and 23° 49' N and Longitudes 85° 42' E and 86° 04' 30" E. These coalfields incorporate the Bermo Mine of DVC and

surrounded by Mining Areas of Central Coalfields Limited like the Dhorri Area, Bokaro and Kargali (B&K)/Kargali Area and Kathara Area /BCW Area.

The coalfields contain a number of thick and thin, persistent regional Barakar as well as thin, interbanded regional Raniganj coal seams along with a continuous deposition from Talchir to Supra-Panchet (Mahadeva) formations. The coalfield is east-west trending elongated basin lying within Koel-Damodar Valley Basin Belt.

There are several coal seams within the Barakar Formation. Lower coal seams are grouped as Karo Group in which there are 11 coal seams. Out of these seams Karo Lower Measures (19-64m) and Karo Upper Measures (8-16m) are worth mentioning. The moisture content of this coal is low and the coals are medium quality coking coals.

Important railway stations like Phusro, Amlo Block Halt, Bermo, Jarandih and Bokaro Thermal lie over these coalfields, in the Dhanbad-Chandrapura-Gomia railway line. Due to presence of a number incroping medium-coking, metallurgical coal seams and small-scale coal consuming industries like the thermal power plants, brick kilns, sponge iron plants, hard coke plants, the area is affected by industrial pollution.

Topography : Topography is gentle, no high hills or deep depression being present. However the area has a footprint of mining due to presence of coal mines of Central Coalfields Ltd and DVC in the coalfields. The undulation of the buffer zone varies from 312m to 211m MSL.

Drainage: Nallah flows in the Western most part of the property almost parallel to the boundary. The general slope of the ground is towards South. The Damodar river flows along the south in west to east direction.

Climate : The climate is extreme with maximum temperature of about 45°C during May-June and minimum temperature of 6-8°C during Winter season. Annual rainfall is about 1200mm to 1260 mm, major portion of which occurs during Monsoon period (June – September).

1.4 METHOD OF MINING

The method of mining in DVC Bermo mines is open cast mining method. The overburden and the coal are excavated by drilling and blasting method. The OB and the coal is removed by shovel, loader and dumper combination. The coal is transported by dumpers to the thermal power plant by road network.

1.5 PRODUCTION

The Production capacity is 0.36 MTY. The production achieved during the financial year 2014-15 was 0.0661MT. OB wastes generated was 1.32 lakh m³ for this financial year. The mining wastes are generally utilized for land filling and reclamation.

CHAPTER –II**FORM –V****ENVIRONMENTAL STATEMENT**

Environmental Statement for the Financial Year ending on 31st March, 2015
(April, 2014- March, 2015)

Part –A

(i)	Name and address of the owner/occupier of the industry operation or process	: Shri K K Singh Executive Director (Fuel) Damodar Valley Corporation DVC Towers VIP Road Kolkata -700 054
(ii)	Industry category	: Primary (Coal Mining Operations)
(iii)	Production capacity	: 0.36 MTPA (Production Limit; EC)
	Actual Coal Produced	: 66100.940 T ≅ 0.0661 MT
(iv)	Year of establishment	: 1952
(v)	Date of the last Environmental Statement submitted	: September, 2014

PART – BWater and Raw Material Consumption

(i) Water Consumption KL/d

1.	Industrial /Mining	Consumption in KL/d
a	Haul Road Dust Suppression	65KL/d
b	Dust Suppression at CHP	Nil
c	Dust Suppression at Siding	Nil
d	Fire Fighting	Nil
e	Workshop	Nil
f.	Others	Nil
2.	Domestic	375 KL/d (The supply of filtered water from CCL)
3.	Total water consumption in KL/day	440 KL/Day

Name of the product	Water Consumption per unit of product	
	2013-2014	2014-2015
Coal	2.94KL/T	2.43 KL/T

(ii) Raw Material Consumption:

Name of Raw Material	Consumption of raw Material (per unit of coal produced)	
	2013-2014	2014-2015
H.S. Diesel (L/ton)	0.08556	0.0729
Petrol (L/ton)	Nil	Nil
Lubricants (l/ton)	0.02236 (Servicing of vehicles is outsourced)	0.0360 (Servicing of vehicles is outsourced)
Electricity (Unit/ton)	53.338	46.66
Explosive (kg/ton)	0.1088	1.600

Note : Average water consumption (KL/day) for whole year is given .Raw material consumption is given per unit of coal produced.

PART –C**Pollution Discharged to Environment / unit of output**

(Parameter as specified in the Consent's issued)

Pollutants	Quantity of pollutants Discharged (mass/day)	Concentration of Pollutants in Discharges (mass/volume)	Percentage Variation from Prescribed Standards with Reasons
(a) Water (Mine drainage water-annual average)			
pH (mg/l)	Not possible to quantify	8.23	Analysis Report reveals that all required parameters are below the limits prescribed by JSPCB
TSS (mg/l)		57	
BOD (mg/l)		0.4	
COD (mg/l)		37	
Oil & Grease (mg/l)		<1.00	
(b) Water supplied for domestic purpose			
pH (mg/l)	Not possible to quantify	7.61	Analysis Report reveals that all required parameters are below the limits prescribed by JSPCB
TSS (mg/l)		32	
BOD (mg/l)		Nil	
COD (mg/l)		Nil	
Oil & Grease (mg/l)		Nil	
(C) Air (Ambient air quality of Project office –annual average)			
SPM (µg/m³)	Not possible to quantify	239.71	Serial No.90 to 93 and entries relating thereto were inserted by Rule 2(1) of the Environment (Protection) Amendment Rules, 2000 notified vide notification G.S.R. 742(E), dated 25.9.2000.
PM ₁₀ (µg/m³)		108	
SO ₂ (µg/m³)		19	
NO _x (µg/m³)		26	
CO (µg/m³)		Not Detected	
(d) Air (Ambient air quality of Guest House /Colony –annual average)			
SPM (µg/m³)	Not possible to quantify	212	As above, Environment (Protection) Amendment Rules, 2000 notified vide notification G.S.R. 742(E), dated 25.9.2000
PM ₁₀ (µg/m³)		94	
SO ₂ (µg/m³)		16	
NO _x (µg/m³)		21	
CO (µg/m³)		Not Detected	
(e) Air (Ambient air quality of Mine area –annual average			
SPM (µg/m³)		241	As above, Environment

PM ₁₀ (µg/m ³)	Not possible to quantify	102	(Protection) Amendment Rules, 2000 notified vide notification G.S.R. 742(E), dated 25.9.2000
SO ₂ (µg/m ³)		17	
NO _x (µg/m ³)		25	
CO (µg/m ³)		Not Detected	

PART – DHazardous Wastes*(As specified under Hazardous Wastes (Management and Handling) Rules, 2008)*

Hazardous Waste	Total Quantity (kg)	
	During the previous financial Year (2013-2014)	During the current Financial Year (2014-2015)
(a) From process (Burnt oil recovered in workshop)	NIL	NIL
(b) From pollution control Facilities (Recovery from Oil & Grease Trap and oily sludge)	NIL	NIL

PART – ESolid Wastes (Other than Hazardous wastes)

Solid Waste	Total Quantity ,m ³	
	During the current financial Year (2013-14)	During the current financial Year (2014-15)
From process	NIL	NIL
(a) Top soil		
(b) Over Burden	NIL	NIL
(b) From Pollution Control Facilities (STP & MDTP Sludge)	NIL as No STP and MDTP exists	NIL as No STP and MDTP exists
(C)1-Quantity cycled or reutilized	NIL	NIL
2-Sold	NIL	NIL
3-Disposed	NIL	NIL

PART –F

Please Specify the Characterization (in terms of composition and quantum) of Hazardous as well as Solid Wastes and indicate Disposal Practices adopted for both these Categories of Wastes

(I) Hazardous Wastes :

Name of Hazardous Waste	Quantity generated in the year 2014-2015	Disposal Practices
Oil & Grease (from ETP) (kg)	NIL	NA
Oily Sludge (tonne)	NIL	NA
Battery (nos.)	NIL	NA
Burnt Oil, etc (from W/S) (L)	NIL	NA

Note : A detailed note on disposal practices of the above should be given separately.

Since the coal transportation activities are being outsourced while deploying the Contractor's Equipments and as such the Contractor is maintaining and servicing the same at his own facility outside the project area. Hence there is no discharge of above hazardous wastes within the Mine site/ Project Area.

(II) Solid wastes :

Solid waste	Quantity generated in the year 2014-15	Disposal practices
Top Soil (m ³)	NIL	NA
OB (m ³)	1.32 lakh m ³	Back filled
STP & MDTP sludge	NIL	NA

Note: A detailed note of disposal practices of the above should be given separately indicating the area and volume of External OB dump whether it is still continuing , area and volume of back filled void , status of biological reclamation of External as well as internal dumps, machinery used for the technical reclamation.

There is no STP and MDTP facilities in the plant hence the generation of STP and MDTP sludge is nil The details on progressive OB disposal are given below.

OB Disposal –progressive till- March , 2015

	Area	Volume
1) External OB Dump	NIL	NIL
2) Back filled	145 acre	≅ 17708000 Cum
3) Biological reclamation:		
External:	NIL	NIL
Internal:	15 acre	18,75,000Cum

PART –G**Impact of the pollution Abatement Measures Taken up on Conservation of Natural Resources and Consequently on the Cost of Production.**

In order to carry out mining in an eco-friendly manner, a detailed Environmental Management Plan (EMP) was prepared. The main pollution control measures suggested in EMP along with the measures implemented so far have been summarized in the Tables 1.1 to 1.3.

Table 1.1
Air pollution Control Measures

Sl. No	EMP Provisions	Whether Provided or not	Remarks
1	Watering and grading of all roads to minimize dust nuisance from vehicle	Provided	By using 1 No. of Mobile Water Sprinkler
2	Biological reclamation of spoil heaps	NA as no spoil heaps are dynamic in nature	Plantation done at backfilled area.
3	Green belt around mine infrastructures	Provided	Plantation done at the boundary of coal mine area.
4	Overburden and coal drills will be fitted with dust control device	Provided	Wet drilling is done
5	Dust suppression/dust extraction system to be provided in CHP	NA	There is no CHP in Mine. Dust suppression is done only at coal dump
6	Improved maintenance of plant and machinery	Provided	Vehicle and maintenance is being regularly done by Contractor at his own facility outside the project area.
7	Mechanized coal transportation system	NA	By road

Table 1.2

Water Pollution Control Measures

Sl. No.	EMP Provision	Whether Provided or not	Remarks
1.	Mine water is to be collected in the central sump on dip side of pit. This will act as sedimentation lagoon combination	Provided	Mine quarry area is being utilized for this purpose
2.	Run- off around reclamation area will be controlled by providing catch drains and sedimentation lagoon combination	Provided	Run off is diverted to sedimentation lagoon by natural drainage
3.	Since run -off from external dump would be collected through a series of contour drains which would be connected to a water retention pond. The clear water from this pond will be discharged to the natural water course.	Provided	Run off is diverted to sedimentation lagoon by natural drainage
4.	Domestic waste water will be treated in screens, oxidation pond/aerated lagoon. Sanitary waste to be disposed off into septic tank & soak pit.	Provided	Sanitary wastewater is treated into Septic Tanks and Soak Pits.
5	Workshop effluents will be treated in oil & grease trap & sedimentation tank.	Provided by the outsourcing agency	Vehicle and machineries maintenance is being regularly done by Contractor at his own facility outside the project area. The contractors are instructed to reuse the used lubricant for different purpose.

Table -1.3**Land Reclamation**

Sl No.	EMP Provisions	Whether Provided or not	Remarks
1	Top soil Management Proper stripping , Storage and Relocation of top soil	Provided	Top soil is available in scarcity and at insignificant quantity. Topsoil in whatever, quantity as available, is used for reclamation of OB Dump.
2	Technical Reclamation of OB: Proper reshaping and regarding of top surface, providing drainage arrangement and top soil spreading for external and internal dumps.	Not envisaged as there was no external OB dump generation. Total OB generated is recycled for backfilling of mine voids	Proper compaction with stability aspects are taken care of.
3	Biological Reclamation: Plantation of suitable species of herbs, shrubs & indigenous trees over technically reclaimed dumps.	Provided	Extensive plantation around mine as well as over OB dump has been done.

IMPACT OF POLLUTION CONTROL MEASURES ON COST OF PRODUCTION

Cost of environment management during 2014-15 was Rs. 4.00 Per Tonne of coal (approx). Pollution control measures result an overall positive impact in the project area which also provides the societal development of the community and as such there is no significant impact on the cost of production.

PART – H

Additional Measures / Investment Proposal for Environmental Protection Abatement of Pollution, Prevention of Pollution.

1. Plantation over backfilled and other barren areas using locally available suitable species like Jamun (*Syzygium cumini*), Shishum (*Dalbergia sissoo* or the Indian Rosewood), Babul (*Acacia nilotica*), Chakundi (*Cassia siamea*), Gamhar (*Gmelina arborea*), Peltroforum (*Peltrophorum Ferrugineum*), Karanj (*Pongamia pinnate*), Acacia (*Acacia Arabica*), Siris (*Albizzia lebeck*), Bakain (*Mehazedarach*), Sal (*Shorea rubusta*), Neem (*Azadarichta indica*), Teak (*Tectona grandosa*), Subabul (*Leucaena leucocephala*), etc have been done.
2. Water spaying by using one Mobile Water Sprinkler is practiced regularly for fugitive dust suppression & control.
3. All the mine water and rainwater is collected in a reservoir. This water is supplied to the colony and local people to meet their daily requirements.
4. The domestic water is being discharged at low lying area / reservoir which is being used by the local people / farmers for irrigation of their farms.
5. Rainwater harvesting system has been proposed to utilize the quarry for surface runoff storage reservoir. The surface runoff is collected in the reservoir for recharging the ground water aquifers in the surrounding area. For the improvement in the quality of stored water, Various activities such as treatment plant, plantation and garland drains are proposed. The rooftop so vesting and its recharge through the percolation wells in the colony area have also been proposed. An investment plan of Rs. 15 lakhs for improvement in the existing rainwater harvesting structure have been proposed, yet to be materialized.
6. Green belt development around the mine quarry and roadside has been proposed and carried out. 1000 saplings per km of road in two rows on both sides of the road of 3 m width have been planted. Around the colony and infrastructure, 2500 saplings per ha area in 3 rows have been planned. It has also been planned to cover the vacant lands with the green belt at the rate of 2500 saplings per ha.

Any Other Particulars for Improving the Quality of the Environment.

Each year World Environment Day, Earth Day and Van Mahotsav are being celebrated involving not only the employees of the project area of DVC but also the local community to create environmental awareness.

ANNEXURE – I

Statement of Month – wise Coal Production (T)

Month	Year 2013-14 (in Tonne)	Year 2014-15 (in Tonne)
April	10471.00	Nil
May	21461.00	Nil
June	355.00	Nil
July	11295.00	Nil
August	10165.00	Nil
September	Nil	Nil
October	Nil	Nil
November	Nil	1642.00
December	Nil	15058.00
January	Nil	6787.43
February	Nil	9731.35
March	Nil	32882.16
Total	53748.00T $\approx$ 0.053MT	66100.94 $\approx$ 0.0661MT

Statement of Month –wise Top soil & Ob removal (Cum , M³)

Month	Year 2014-15 (in M ³)
April 2014	Nil
May 2014	Nil
June 2014	Nil
July 2014	Nil
August 2014	Nil
September 2014	Nil
October 2014	Nil
November 2014	10000.000
December 2014	30590.375
January 2015	26712.400
February 2015	27180.350
March 2015	37285.750
Total	131768.875 M3

KHASRA WISE LAND USE DETAILS

Tenancy Plots of Karo Mouza under the lease hold of DVC Bermo Mines:-

Sl. No.	Name of Village	Thana & Thana No.	Khata No.	Plot No.	Total area in acres	Acquired area in acres	Type of Land
01.	Karo	Bermo, 65	09	239	0.98	0.59	Parti Kadim
02.	do	do	04	242	0.15	0.15	Dhan Khet II
03.	do	do	07	247	2.11	2.11	Dhan Khet-III
04.	do	do	12	244	0.56	0.21	Tand-III
05.	do	do	10	251	0.96	0.50	Tand-II
06.	do	do	12	384	0.38	0.20	Dhan Khet-III
Total						3.76	

GMK land details of Karo Mouza in the leasehold of DVC Bermo Mines:-

Sl. No.	Name of Village	Thana & Thana No.	Khata No.	Plot No.	Total area in acres	Acquired area in acres	Type of Land
01.	Karo	Bermo, 65	01	385	1.54	1.00	Nadi (River)
02.	Karo	Bermo, 65	01	200	59.55	11.45	GMK
Total						12.45	

GMK plots recorded as 'Jungle' in Karo Mouza in the leasehold of DVC Bermo Mines:-

Sl. No.	Name of Village	Thana & Thana No.	Khata No.	Plot No.	Total area in acres	Acquired area in acres	Type of Land
01.	Karo	Bermo, 65	01	243	6.74	3.00	GMK Jungle
02.	do	do	01	386	43.85	33.90	GMK Jungle
Total						36.90	

GM-Aam land details of Karo Mouza in the leasehold of DVC Bermo Mines:-

Sl. No.	Name of Village	Thana & Thana No.	Khata No.	Plot No.	Total area in acres	Acquired area in acres	Type of Land
01.	Karo	Bermo, 65	30	259	1.54	0.46	Rasta
02.	do	do	30	374	0.53	0.53	Rasta
Total						0.99	

Tenancy Plots of Baidkaro Mouza under the lease hold of DVC Bermo Mines:-

Sl. No.	Name of Village	Thana & Thana No.	Khata No.	Plot No.	Total area in acres	Acquired area in acres	Type of Land
01.	Baidkaro	Bermo, 20	49	80	0.08	0.08	Dhan Khet-III
02.	do	do	03	73	0.31	0.31	Tand-III
03.	do	do	52	77	0.06	0.06	Parti pind
04.	do	do	17	74	0.21	0.21	Parti
05.	do	do	49	75	0.04	0.04	Dhan Khet-III
06.	do	do	49	76	0.89	0.89	Dhan Khet-II
07.	do	do	56	83	0.27	0.27	Tand-II
08.	do	do	49	84	0.29	0.29	Dhan Khet-II
09.	do	do	03	86	0.08	0.08	Dhan Khet-II
10.	do	do	03	87	0.12	0.12	Dhan Khet-II
11.	do	do	03	88	0.41	0.41	Tand-III
12.	do	do	56	95	0.03	0.03	Dhan Khet-III
13.	do	do	56	96	0.12	0.12	Dhan Khet-II

ANNEXURE : VI Contd..

Sl. No.	Name of Village	Thana & Thana No.	Khata No.	Plot No.	Total area in acres	Acquired area in acres	Type of Land
14.	do	do	59	97	0.13	0.13	Dhan Khet-II
15.	do	do	56	99	0.15	0.15	Dhan Khet-II
16.	do	do	52	82	0.04	0.04	Parti pind
17.	do	do	54	100	0.11	0.11	Dhan Khet-II
18.	do	do	50	101	0.17	0.17	Dhan Khet-III
19.	do	do	50	102	0.04	0.04	Parti kadim
20.	do	do	63	103	0.17	0.17	Dhan Khet-III
21.	do	do	59	104	0.16	0.16	Dhan Khet-III
22.	do	do	61	105	0.16	0.16	Dhan Khet-III
23.	do	do	54	106	0.09	0.09	Dhan Khet-III
24.	do	do	50	107	0.08	0.08	Dhan Khet-III
25.	do	do	56	108	0.05	0.05	Dhan Khet-III
26.	do	do	59	109	0.05	0.05	Dhan Khet-III
27.	do	do	61	110	0.07	0.07	Dhan Khet-III
28.	do	do	65	111	0.37	0.37	Dhan Khet-III
29.	do	do	65	112	0.21	0.21	Tand-II
30.	do	do	44	117	0.53	0.53	Dhan Khet-II
31.	do	do	44	118	0.12	0.12	Dhan Khet-III
32.	do	do	18	119	0.31	0.31	Tand-III
33.	do	do	18	120	0.05	0.05	Dhan Khet-III
34.	do	do	18	121	0.18	0.18	Tand-III
35.	do	do	18	122	0.17	0.17	Dhan Khet-III
36.	do	do	18	123	0.30	0.30	Dhan Khet-II
37.	do	do	18	126	1.46	1.22	Dhan Khet-II
38.	do	do	14	129	0.07	0.07	Dhan Khet-II
39.	do	do	01	130	0.21	0.21	Dhan Khet-II
40.	do	do	14	131	0.15	0.15	Dhan Khet-II
41.	do	do	14	132	0.14	0.14	Dhan Khet-II
42.	do	do	01	133	0.27	0.27	Dhan Khet-II
43.	do	do	01	134	0.27	0.27	Dhan Khet-II
44.	do	do	14	137	0.13	0.13	Dhan Khet-II
45.	do	do	14	140	0.08	0.08	Dhan Khet-II
46.	do	do	14	141	0.09	0.09	Dhan Khet-II
47.	do	do	14	146	0.06	0.06	Dhan Khet-II
48.	do	do	14	149	0.36	0.36	Dhan Khet-II
49.	do	do	14	150	0.17	0.17	Dhan Khet-II
50.	do	do	14	151	0.12	0.12	Dhan Khet-II
51.	do	do	14	152	0.23	0.23	Dhan Khet-II
52.	do	do	14	153	0.24	0.24	Dhan Khet-II
53.	do	do	14	154	0.11	0.11	Dhan Khet-II
54.	do	do	14	155	0.33	0.33	Tand-II
55.	do	do	61	156	0.20	0.20	Dhan Khet-II
56.	do	do	54	157	0.25	0.25	Dhan Khet-II
57.	do	do	56	158	0.35	0.35	Dhan Khet-II
58.	do	do	59	159	0.37	0.37	Dhan Khet-II
59.	do	do	54	160	0.30	0.30	Tand-II
60.	do	do	59	161	0.31	0.31	Dhan Khet-III
61.	do	do	61	163	0.58	0.58	Dhan Khet-II

ANNEXURE : VI Contd..

Sl. No.	Name of Village	Thana & Thana No.	Khata No.	Plot No.	Total area in acres	Acquired area in acres	Type of Land
62.	do	do	01	164	0.82	0.82	Dhan Khet-II
63.	do	do	03	166	0.08	0.08	Dhan Khet-III
64.	do	do	01	167	0.12	0.12	Dhan Khet-II
65.	do	do	49	170	0.29	0.29	Dhan Khet-II
66.	do	do	01	171	1.20	1.20	Dhan Khet-I
67.	do	do	29	173	3.33	0.29	Dhan Khet-I
Total						16.03	

GMK plots recorded as 'Jungle' in Baidkaro Mouza in the leasehold of DVC Bermo Mines:-

Sl. No.	Name of Village	Thana & Thana No.	Khata No.	Plot No.	Total area in acres	Acquired area in acres	Type of Land
01.	Baidkaro	Bermo,20	83	81	8.88	8.88	GMK Jungle
02.	do	do	83	70	0.46	0.46	GMK Jungle
03.	do	do	83	113	5.92	5.92	GMK Jungle
04.	do	do	83	135	0.70	0.70	GMK Jungle
05.	do	do	83	168	3.24	3.24	GMK Jungle
06.	do	do	83	64	258.50	10.24	GMK Jungle
07.	do	do	75	85	0.37	0.37	GMK Jungle
Total						29.81	

GMK land details of Baidkaro Mouza in the leasehold of DVC Bermo Mines:-

Sl. No.	Name of Village	Thana & Thana No.	Khata No.	Plot No.	Total area in acres	Acquired area in acres	Type of Land
01.	Baidkaro	Bermo,20	75	93	0.01	0.01	Parti kadim
02.	do	do	75	94	0.16	0.16	Parti kadim
03.	do	do	75	115	1.05	1.05	Bandh
04.	do	do	75	162	0.06	0.06	Parti pind
05.	do	do	75	165	0.25	0.25	Parti aar
06.	do	do	83	169	0.05	0.05	Parti aar
07.	do	do	83	172	0.17	0.15	Parti aar
08.	do	do		1275		12.67	
Total						14.40	

Tenancy Plots of Kargali Mouza under the lease hold of DVC Bermo Mines:-

Sl. No.	Name of Village	Thana & Thana No.	Khata No.	Plot No.	Total area in acres	Acquired area in acres	Type of Land
01.	Kargali	Bermo,20		133	0.93	0.13	
02.	do	do	01	134	2.47	1.12	Jirat
03.	do	do	01	02	0.29	0.19	Jirat
04.	do	do	01	04	0.14	0.14	Jirat
05.	do	do	39	06	0.43	0.43	Jirat
06.	do	do	01	08	1.12	1.12	Jirat
07.	do	do	01	10	0.26	0.26	Jirat
08.	do	do	04	11	3.01	3.01	Dhan Khet-I
09.	do	do	04	12	0.10	0.10	Dhan Khet-III
10.	do	do	04	13	0.29	0.29	Dhan Khet-III
11.	do	do	03	15	1.27	1.27	Dhan Khet-III
12.	do	do	03	16	0.05	0.05	Parti Bandh

ANNEXURE : VI Contd..

Sl. No.	Name of Village	Thana & Thana No.	Khata No.	Plot No.	Total area in acres	Acquired area in acres	Type of Land
13.	do	do	22	20	0.24	0.24	Dhan Khet-I
14.	do	do	22	21	0.43	0.43	Dhan Khet-II
15.	do	do	11	22	0.31	0.22	Dhan Khet-I
16.	do	do	22	23	0.15	0.15	Dhan Khet-I
17.	do	do	22	24	0.27	0.12	Parti kadim
18.	do	do	26	26	0.05	0.05	Dhan Khet-III
19.	do	do	11	27	0.34	0.22	Tand-II
20.	do	do	09	262	0.05	0.05	Makan sahan
Total						9.72	

GMK plots recorded as 'Jungle' in Kargali Mouza in the leasehold of DVC Bermo Mines:-

Sl. No.	Name of Village	Thana & Thana No.	Khata No.	Plot No.	Total area in acres	Acquired area in acres	Type of Land
01.	Kargali	Bermo,20	27	135	3.92	1.12	GMK Jungle
02.	do	do	27	116	79.00	54.03	GMK Jungle
03.	do	do	27	01	237.50	125.60	GMK Jungle
04.	do	do	27	03	0.16	0.16	GMK Jungle
05.	do	do	27	273	46.50	34.59	GMK Jungle
Total						215.50	

GMK land details of Kargali Mouza in the leasehold of DVC Bermo Mines:-

Sl. No.	Name of Village	Thana & Thana No.	Khata No.	Plot No.	Total area in acres	Acquired area in acres	Type of Land
01.	Kargali	Bermo,20	27	132	3.17	0.45	Parti kadim
02.	do	do	27	05	0.02	0.02	Parti aar
03.	do	do	27	07	0.04	0.04	Parti aar
04.	do	do	27	09	0.03	0.03	Parti aar
05.	do	do	27	14	0.05	0.05	Parti aar
06.	do	do	27	17	0.28	0.28	Parti pind
07.	do	do	27	18	1.31	1.31	Pokhar
Total						2.18	

Tenancy Plots of Emlo Mouza under the lease hold of DVC Bermo Mines:-

Sl. No.	Name of Village	Thana & Thana No.	Khata No.	Plot No.	Total area in acres	Acquired area in acres	Type of Land
01.	Emlo	Bermo,20	17	289	1.01	0.45	Tand-III
02.	do	do	08	290	0.24	0.19	Dhan Khet-III
03.	do	do	16	291	1.94	1.94	Dhan Khet-II
04.	do	do	16	294	1.03	1.03	Dhan Khet-II
05.	do	do	16	296	0.59	0.59	Dhan Khet-II
06.	do	do	16	298	1.12	1.12	Dhan Khet-II
07.	do	do	16	299	0.49	0.49	Dhan Khet-II
08.	do	do	31	300	0.31	0.31	Dhan Khet-II
09.	do	do	13	302	0.38	0.38	Tand-III
10.	do	do	14	304	0.68	0.68	Tand-III
11.	do	do	18	305	0.39	0.39	Tand-II
12.	do	do	17	306	0.26	0.26	Tand-III

ANNEXURE : VI Contd..

Sl. No.	Name of Village	Thana & Thana No.	Khata No.	Plot No.	Total area in acres	Acquired area in acres	Type of Land
13.	do	do	01	308	0.95	0.95	Tand-III
14.	do	do	03	309	0.39	0.39	Tand-III
15.	do	do	17	310	0.40	0.40	Tand-III
16.	do	do	27	311	0.57	0.57	Tand-III
17.	do	do	24	312	2.39	2.39	Tand-III
18.	do	do	01	313	2.53	2.53	Tand-III
19.	do	do	20	314	0.46	0.26	Tand-III
20.	do	do	24	362	0.36	0.36	Dhan Khet-II
21.	do	do	24	363	0.22	0.22	Dhan Khet-II
22.	do	do	14	365	0.28	0.28	Bandh
23.	do	do	16	352	1.29	1.29	Dhan Khet-II
24.	do	do	01	351	2.06	2.06	Tand-III
25.	do	do	24	354	0.16	0.16	Dhan Khet-II
26.	do	do	04	355	0.39	0.39	Dhan Khet-II
27.	do	do	24	346	0.33	0.33	Dhan Khet-II
28.	do	do	01	347	1.74	1.74	Tand-III
29.	do	do	01	349	1.85	1.85	Tand-III
30.	do	do	12	316	0.60	0.20	Tand-III
31.	do	do	09	317	0.61	0.60	Tand-III
32.	do	do	12	222	0.20	0.15	Dhan Khet-III
33.	do	do	12	221	0.74	0.50	Dhan Khet-II
34.	do	do	04	340	0.17	0.17	Dhan Khet-II
35.	do	do	24	339	0.09	0.09	Dhan Khet-III
36.	do	do	11	335	0.15	0.15	Dhan Khet-III
37.	do	do	03	333	0.08	0.08	Dhan Khet-III
38.	do	do	21	322	0.42	0.42	Dhan Khet-III
39.	do	do	12	220	0.23	0.23	Dhan Khet-II
40.	do	do	12	217	0.14	0.14	Dhan Khet-II
41.	do	do	18	216	0.04	0.04	Dhan Khet-III
42.	do	do	12	214	0.50	0.50	Dhan Khet-II
43.	do	do	18	325	0.14	0.14	Dhan Khet-III
44.	do	do	24	336	0.09	0.09	Dhan Khet-II
45.	do	do	24	331	0.04	0.04	Dhan Khet-II
46.	do	do	18	327	0.08	0.08	Dhan Khet-II
47.	do	do	18	212	0.50	0.50	Dhan Khet-II
48.	do	do	37	211	0.04	0.04	Dhan Khet-II
49.	do	do	37	210	0.26	0.26	Dhan Khet-II
50.	do	do	37	206	0.47	0.47	Dhan Khet-II
51.	do	do	37	205	0.28	0.28	Dhan Khet-II
52.	do	do	04	203	0.91	0.55	Dhan Khet-II
53.	do	do	24	330	0.42	0.42	Dhan Khet-II
54.	do	do	17	453	0.29	0.29	Dhan Khet-II
55.	do	do	18	450	1.02	1.02	Dhan Khet-II
56.	do	do	24	342	0.01	0.01	Dhan Khet-III
57.	do	do	18	343	0.08	0.08	Dhan Khet-II
58.	do	do	24	345	0.05	0.05	Dhan Khet-II
59.	do	do	03	449	0.45	0.45	Dhan Khet-II
60.	do	do	04	447	0.02	0.02	Dhan Khet-II

ANNEXURE : VI Contd..

Sl. No.	Name of Village	Thana & Thana No.	Khata No.	Plot No.	Total area in acres	Acquired area in acres	Type of Land
61.	do	do	04	445	0.01	0.01	Dhan Khet-II
62.	do	do	04	504	0.13	0.13	Dhan Khet-II
63.	do	do	04	458	0.33	0.33	Dhan Khet-II
64.	do	do	16	208	1.79	1.70	Dhan Khet-II
65.	do	do	24	209	0.09	0.09	Dhan Khet-II
66.	do	do	04	207	0.31	0.31	Dhan Khet-II
67.	do	do	02	440	0.01	0.01	Dhan Khet-II
68.	do	do	04	508	0.17	0.17	Dhan Khet-II
69.	do	do	16	439	0.44	0.44	Dhan Khet-II
70.	do	do	24	507	0.02	0.02	Dhan Khet
71.	do	do	24	503	0.46	0.46	Dhan Khet-II
72.	do	do	27	502	0.11	0.11	Dhan Khet-II
73.	do	do	17	546	0.05	0.05	Makan sahan
74.	do	do	24	463	0.17	0.17	Dhan Khet-III
75.	do	do	24	461	0.22	0.22	Dhan Khet-III
77.	do	do	21	465	0.19	0.15	Dhan Khet-II
78.	do	do	04	499	0.61	0.61	Dhan Khet-II
79.	do	do	24	497	0.59	0.24	Dhan Khet-II
80.	do	do	16	498	0.36	0.34	Dhan Khet-II
Total						37.62	

GM-Aam land details of Emlo Mouza in the leasehold of DVC Bermo Mines:-

Sl. No.	Name of Village	Thana & Thana No.	Khata No.	Plot No.	Total area in acres	Acquired area in acres	Type of Land
01.	Emlo	Bermo,20	40	348	0.26	0.26	Rasta
02.	do	do	40	549	0.59	0.55	Rasta
Total						0.81	

GMK land details of Emlo Mouza in the leasehold of DVC Bermo Mines:-

Sl. No.	Name of Village	Thana & Thana No.	Khata No.	Plot No.	Total area in acres	Acquired area in acres	Type of Land
01.	Emlo	Bermo,20	39	295	0.31	0.31	Parti pathar
02.	do	do	39	318	0.06	0.06	Parti pathar
03.	do	do	39	319	0.07	0.07	Parti pathar
04.	do	do	39	338	0.15	0.15	Parti pathar
05.	do	do	39	334	0.38	0.38	Parti pathar
06.	do	do	39	323	0.03	0.03	Parti pathar
07.	do	do	39	218	0.16	0.08	Parti pathar
08.	do	do	39	324	0.04	0.04	Parti kadim
09.	do	do	39	326	0.04	0.04	Parti pathar
10.	do	do	39	213	0.04	0.04	Parti kadim
11.	do	do	39	344	1.64	1.30	Parti pathar
12.	do	do	39	446	0.01	0.01	Parti kadim
13.	do	do	39	448	0.03	0.03	Parti kadim
14.	do	do	39	457	0.01	0.01	Parti pathar
15.	do	do	39	464	0.66	0.36	Parti pathar
16.	do	do		451	0.95	0.95	
17.	do	do		456	0.98	0.98	

ANNEXURE : VI Contd..

Sl. No.	Name of Village	Thana & Thana No.	Khata No.	Plot No.	Total area in acres	Acquired area in acres	Type of Land
18.	do	do		264	0.48	0.48	
19.	do	do		265		0.38	
20.	do	do		266		0.09	
21.	do	do		267	0.12	0.12	
22.	do	do		268	0.32	0.32	
23.	do	do		269	0.24	0.24	
24.	do	do		270	0.34	0.34	
25.	do	do		273	0.97	0.97	
26.	do	do		274	0.05	0.05	
27.	do	do		275	0.06	0.06	
28.	do	do		276	2.77	2.40	
29.	do	do		219	2.99	1.65	
30.	do	do		187	1.35	1.00	
31.	do	do		201	0.70	0.10	
32.	do	do		202	0.30	0.09	
33.	do	do		262	0.09	0.05	
34.	do	do		263	0.10	0.09	
35.	do	do		260	0.09	0.05	
36.	do	do		545	1.05	0.35	
37.	do	do		509	0.69	0.69	
38.	do	do		544	0.20	0.14	
39.	do	do		539	0.09	0.09	
40.	do	do		541	0.60	0.60	
41.	do	do		500	0.54	0.54	
42.	do	do		506	0.03	0.03	
43.	do	do		462	0.60	0.60	
44.	do	do		542	0.05	0.05	
45.	do	do		540	0.18	0.10	
46.	do	do		536	0.35	0.10	
47.	do	do		505	0.04	0.04	
48.	do	do		366	2.30	0.96	
49.	do	do		364	0.30	0.28	
50.	do	do		460	0.22	0.22	
51.	do	do		501	0.37	0.37	
Total						18.48	

GMK plots recorded as 'Jungle' in Emlo Mouza in the leasehold of DVC Bermo Mines:-

ANNEXURE : VI Contd..

Sl. No.	Name of Village	Thana & Thana No.	Khata No.	Plot No.	Total area in acres	Acquired area in acres	Type of Land
01.	Emlo	Bermo,20	39	297	10.99	10.99	GMK Jungle
02.	do	do	39	301	0.50	0.50	GMK Jungle
03.	do	do	39	303	4.24	3.60	GMK Jungle
Total						15.09	

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OPTIMISATION OF BLASTING PARAMETERS FOR CONTROLLING FLY-ROCKS AND GROUND VIBRATION WITHIN DESIRABLE LIMITS DUE TO DEEP HOLE BLASTING OPERATION IN BERMO COLLIERY OF D. V. C. BOKARO



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EXECUTIVE SUMMARY

This report relates to the scientific investigations on the assessment of ground vibration, air overpressure and fly-rock problems due to blasting operation in Bermo Colliery of DVC, Bokaro. It also enlightens subsequent advice for suitable measures to control them. It covers laboratory test values of rock samples, measurements of peak particle velocity (mm/s), dominant frequency (Hz), air overpressure (dB) and other relevant documents. CMRI-established vibration standards along with optimum blast designs are also suggested for fruitful blasting operation.

On investigation and subsequent analyses of data collected, following recommendations are made for smooth, fruitful and safe blasting practices.

1. The present study recommends CMRI-established vibration standards as given in tables-3 which should be followed in any blast.
2. Zone of disturbance as well as safe zones for industrial buildings and domestic houses are given in Table-5 with 87% confidence level. This may also be calculated from equation (1).
3. Maximum permissible charges at various distances of the structures to be saved are given in Table-4.
4. Blast design parameters suggested by CMRI for overburden benches are given in Table-6. These parameters were verified in experimental blasts.
5. Muffle blasting should be done wherever any blasting is to be taken within 100m of any structure.
6. Length of stemming column should be greater than 0.6 times the burden. For better protection, it may be taken as greater than or equal to the burden.
7. Before loading, blasting officials should always check the hole depths and ensure that the holes are drilled as per the blast design.
8. All loose pieces of rock from the blasting site should be cleared before charging.

INTRODUCTION :

The Bermo Colliery is a captive mine of Bokaro Thermal Power Station of D.V.C. It is located about 3 km from Bermo railway station on Barkahana-Gomoh loopline. The mine is well connected with Bokaro Thermal Power Station by a metalled road.

The mine is being worked for the last three to four decades. Opencast mining was done in this property in the past in low cover area on the outcrop side. This operation was later abandoned and coal mining continued exclusively by underground method. Presently the coal is again being excavated by opencast mining.

The property presently possesses the decoaled area in the northern side and the rest of the area is developed by underground working. The eastern boundary of the mine is surrounded by CCL quarters and some private houses. In the southern and the western boundary, the mine is enveloped by DVC and CCL quarters and offices.

Keeping in view of the faster growth of the mine and at the same time safety of the surrounding locality, the Coal Superintendent and Agent, vide his letter no. No. CM-OCP/-892 dated 1st April 1994 requested the Director, CMRI, Dhanbad to conduct scientific study at the Bermo Colliery for optimum blast design parameters to control fly-rock and ground vibration so that the mine can be extended to about 50m from the residential buildings. In response to his letter, the blasting research team of CMRI carried out the investigation between 18th May, 1994 and 21st May, 1994. During that period, eight experimental blasts were conducted at the various places of interest and measurements were taken at several sensitive places in and around the mine. This report covers the measurement of ground vibrations including other subsequent parameters and their analyses for the establishment of safe and efficient blast design. It also contains thorough survey on the possible causes of fly-rock and the operational measures to control them.

GENERAL INFORMATION ABOUT THE MINE :

The mine is run by the contractual labours in drilling operation, and transport of waste and coal. The gradient of the deposit is about 8°. The following equipment are deployed in loading and blasting operations.

Shovel : There are two shovels of capacity 3m³ each. Both of them are L & T Poclain 300.

Dumpers: There are 12 dumpers each of 25 tonnes capacity. Out of the available dumpers, it was found that 8 were in working condition and 4 were in repair.

Dozer : There are two dozers out of which only one was in working condition.

Drill Machine : There is only one drill machine of 150 mm diameter of make Ingersoll-Rand.

Air Compressor: The mine management possesses one air compressor of Atlas Copco make.

GEOLOGIC INFORMATION AND GEOLOGIC CONDITIONS:

Geologic condition play very significant role on blast performance. The most important geologic consideration is geologic structure. The joint system, dip angle, dip amount, strike of bedding planes, and seam condition can have serious influence on the blasting process both from performance and safety standpoint. The local joint pattern can influence both the breakage and overbreak in the blast. Regardless of the number of joint sets in a rock mass, one set of joints will be the weakest or dominant and will control the breakage process.

The general topography of the area is gentle having no hills nor any depression. A nallah flows in the western part of the property almost running parallel to the mine boundary. The mining block lies on the northern limb of the main synclinal basin of East Bokaro Coalfield. The rock formations are mostly coarse to medium grained sandstone with thick coal horizon. The thickness of the coal seam varied between 11.9 to 13.7m and averaging about 13m. The average gradient is about 8° and sloping towards South.

BRIEF DESCRIPTION ABOUT THE MONITORING INSTRUMENTS :

The measurements of ground vibration was carried out by two instruments viz., a) SINCO-6 Seismograph (U.S.A. make), b) Vibration meter SMU-31 (German make). The former one is a recording type and the later one is the indicator type. SINCO-6 is a digital recorder which prints 'PPV' in three axial directions namely longitudinal, transverse and vertical of the transducer and their vector sum. It also computes energy distributions at different frequency bands ranging from 5 to 213 Hz. It has also the option of measuring air-overpressure and band energy distribution. 'SMU-31' indicates displacement and acceleration in the vertical direction only.

EXPERIMENTAL BLASTS:

During the visit of CMRI scientists from 18th May, 1994 to 21st May, 1994, eight experimental blasts were conducted in overburden benches. Vibration, dominant frequency, air-overpressure levels of all such blasts were monitored at different locations in CCL colony, nearby village houses and DVC quarters. To get the attenuation characteristic of the propagating waves, some measurements were also taken on the rock benches at fixed distances from the blasting source. The depth of the hole drilled varied between 6.2 and 6.4m except for one round which was about 8.4m. The bench height and hole diameter were 6.0m and 150mm respectively. The burden and spacing in experimental blasts were 2.2 - 2.6m and 2.3 - 3.0m respectively. The maximum and minimum

vibrations recorded at distances of 50m and 442m were respectively 101.4mm/s (at 300 kg maximum charge per delay) and 0.671mm/s (at 225kg maximum charge per delay). Charging pattern as used in different experimental blasts are shown in Figures 1 and 2.

Table-1: Drilling and blasting parameters used in experimental blasts(Drill hole diameter=150 mm)

Date of Blast and face location	Burden (m)	Spacing (m)	Depth of hole (m)	No. holes	Total Charge (Kg)	Max. chg./delay (kg)
18.05.94 I Bench West Face	2.2 to 3.3	2.7 to 2.3	6.0	11	481.25	262.5
18.05.94 II Bench South West	2.7	3.0	6.3	11	468.75	131.25
19.05.94 II Bench West	2.2	2.7	6.2	11	462.50	175.00
19.05.94 II Bench West	2.6	2.7	8.2 to 8.6	15	731.25	300.00
19.05.94 I Bench	2.2 to 2.5	2.8 to 3.2	6.2	12	525.00	306.25
20.05.94 II Bench, South	2.0 to 2.4	2.6 to 2.8	6.3	21	775.0	225.00
21.05.94 II Bench West-South	2.0 to 3.0	2.3 to 2.8	6.2	21	525.00	300.00
21.05.94 II Bench South	1.0 to 3.8	2.9 to 3.3	6.2	29	925.00	306.25

Table-2: Values of PPV(mm/s), Frequency (Hz), and Air-overpressure (dB) which were monitored in different experimental blasts at different locations

Date of Blast and face location	Instrument location	Dist. (m)	PPV (mm/s)	Freq. (Hz)	Air over-pressure (dB)
18.05.94 West Face	House of Mr.N.P Sinha On the ceiling of window (1.5m) Dhanaswar's House	418 425 435	< 0.75 1.49 0.8	90	130.2
18.05.94 II Bench South Face	House of Nasir Khan Near House of A. Bhattacharaya House of Ram Avatar	439 430 487	0.984 < 0.75 2.00	15 -- --	129.7
19.05.94 II Bench West	Bawa's House	295	3.2	--	x
19.05.94 II Bench West	Firat's House Papu's House Bawa's House	262 264 280	8.80 7.31 6.00	12 8	136
19.05.94 I Bench	Ramnamia Kali Temple Roof of the Ramnamia Kali Temple 25m away from the Temple	311 312 314	3.43 8.9 2.0	17 15	135.4
20.05.94 II Bench South	House of Rajeshwar On Soil at a Distance of 15m House of Promod Singh	457 442 530	1.312 0.6714 0.8	17 25 --	<124.5 x
21.05.94 II Bench South West	Near Quarry at a distance of 50m Near Quarry at a distance of 75m Near Quarry at a distance of 100m	50.0 75.0 100.0	101.4 59.6 16.0	17 15 --	148
21.05.94 II Bench South	In Quarry Area In Quarry Area In Quarry Area	50.0 75.0 100.0	64.1 38.8 13.0	17 15 --	x 153.6

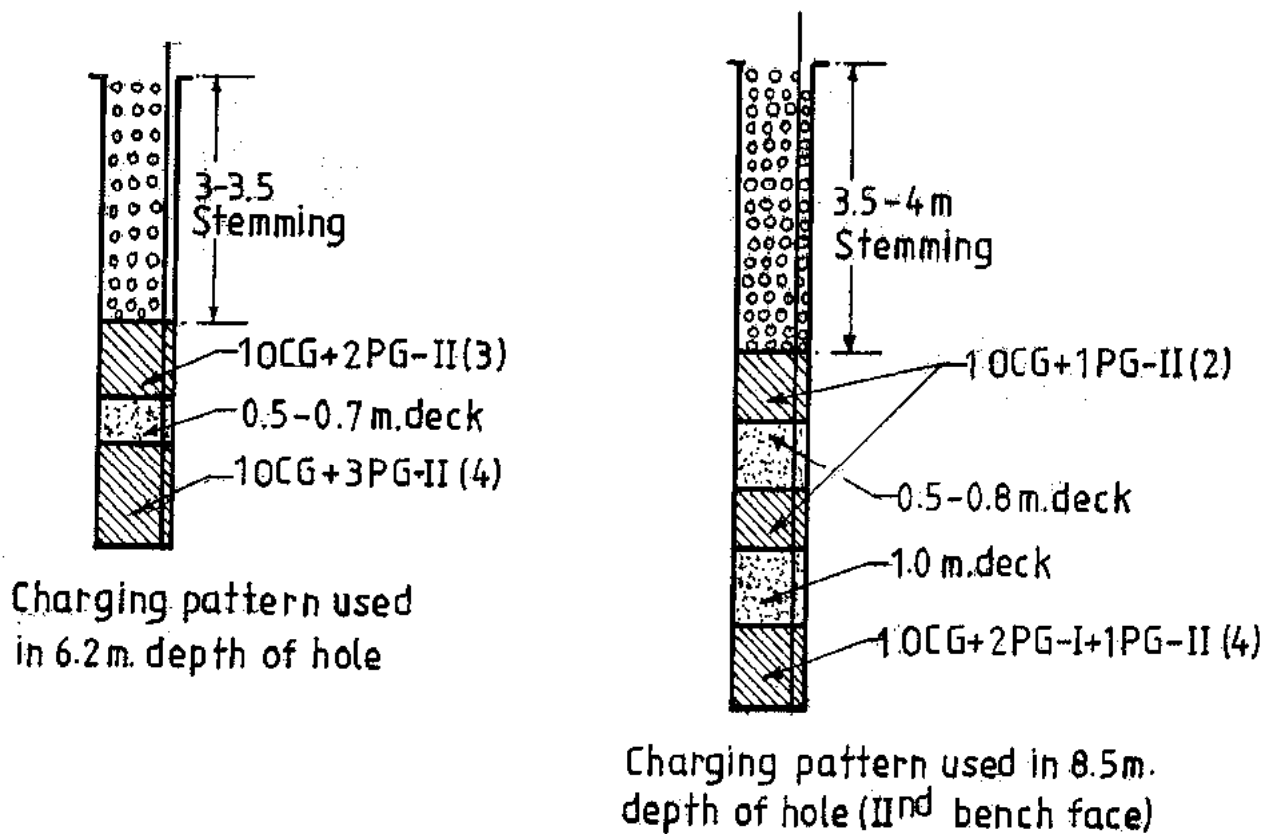


Fig.1. Charging pattern of holes used in experimental blasts.

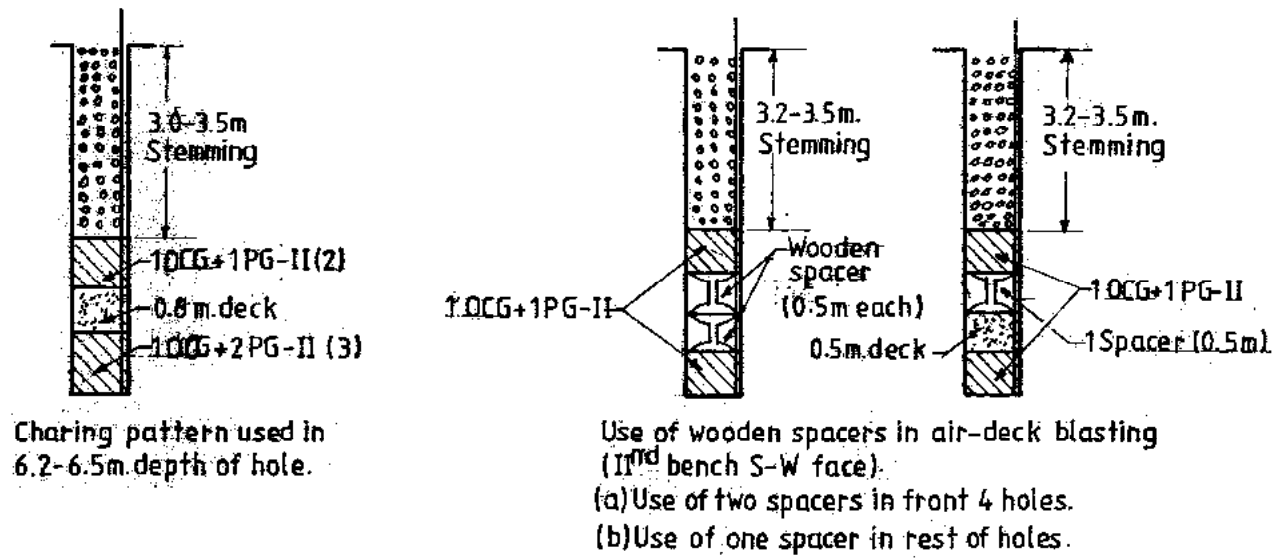


Fig.2. Charging pattern of holes used in experimental blasts.

On 18.05.94, two experimental blasts were carried out. The site of blast was of Ist bench of overburden . The blast patterns were as given Table- 1. The charging and blasting patterns used were the conventional one which the management usually followed before this investigation. The explosives used in these blasts were OCG and PG-(II). The charge was distributed in two lifts with 1-OCG and 3-PG(II) in the first lift and 1-OCG and 2-PG(II) in the second. There was a 0.5m deck in between the two lifts. The maximum stemming length was approximately 3.5m. The maximum vibrations observed in these two rounds were 1.49mm/s and 2mm/s at distances of 425m and 487m respectively. The maximum charge per delay in these rounds were 262.5kg and 131.25kg respectively.

On 19.05.94, three experimental blasts were carried out. The first two rounds were in the Western face of II bench and the third was in I bench. The first round comprised of 11 holes and the second of 15 holes. In the first round, the depth of holes varied between 6.2 and 6.4m except one hole which was 4.8m. In the second round, the depth of the holes were about 8.2 to 8.5m. The maximum charge per hole in the first round comprised of seven cartridges (1-OCG + 3-PG(II) & 1-OCG + 2-PG(II)) distributed in two lifts with 0.7 to 0.8m of decking. In the second round, eight cartridges (1-OCG + 3-PG(II), 1-OCG + 1-PG(II), 1-OCG + 1-PG(II)) were loaded in three lifts with two decks of 1m and 0.5 to 0.7m respectively. The rock breakage was good in both the blasts in this bench. In the third round, 12 holes were blasted. Holes were of 6.0 to 6.1m in depth and the burden and spacing varied between 2.2-2.5m and 2.8-3.2m respectively. Although the strata was highly fractured with insitu boulders, the fragmentation was good . The muck was thrown to about 40-45m.

On 20.05.94, one experimental blast was conducted in the Southern direction of II Bench . Twentyone number of holes were blasted in that round. The depth of holes ranged from 6.2 to 6.4m. The maximum charge per hole was about six cartridges each of 6.25 kg by weight. The total charge in a hole was distributed in three lifts (1-OCG + 2-PG(II), 1-OCG + 1-PG(II), 1-OCG) with two decks of 0.5m in between. The strata was highly fractured with insitu bedded boulders. The fragmentation was moderately good. The throw was about 30-35m.

On 21.05.94, two experimental blasts were conducted. The first was in West-South direction in II bench and the second blast was in the same bench but in the Southern side. In the first round, the blast was conducted with wooden spacers of 0.5m length. The specifications of wooden spacer is as shown in the figure-5. The charge loading of holes were done as shown in the figure-2. The maximum charge per hole was 25kg in two lifts with about 0.5 air decking and 0.5m deck with drill cuttings in between the two explosive columns. The following observations were made in air-deck blasting.

- a) Muck profile was better where burden was greater than 3.0m
- b) Throw was more where burden was less than 2.4m
- c) Fragmentation was moderate.

In the second round 29 holes were blasted. The average depth of the holes varied between 6.10m and 6.3m. The loading was carried out in two lifts (1-OCG + 2PG(II), 1-OCG + 1-PG(II)) with 0.8m deck in between. The top stemming column was about 3.0 - 3.5m. The breakage was good except some toe appeared in front of three holes. On the surface of the muck, no oversize boulders were noticed. Throw was about 25-30m.

Table-3 : Threshold value of ground vibration at foundation level at low (≤ 24 Hz) and high (>24 Hz) frequency ranges.

Structure's Specification	Threshold value of PPV(mm/s)	
	≤ 24 Hz	> 24 Hz
Domestic houses, dry wall interior, construction structures with plasters, bridge	5	10
Industrial buildings, steel or reinforced concrete structures	12.5	25
Objects of historical importance, very sensitive structures, more than 50 years old construction and structures with poor state of repair	2	5

ANALYSIS OF THE RESULTS:

The vibration data recorded were grouped together for statistical analysis to establish an empirical relationship correlating the maximum charge per delay (Q in kg), the distance of the measuring transducer (D in metre) and the peak particle velocity (V in mm/s). Out of all conventional predictors, CMRI developed predictor equation was found to be the most suitable for the data set collected. Unlike other predictor equations, CMRI equation has the unique feature of determining the zone of disturbance for any particular blast using any particular amount of charge per delay. This has been calculated in table-5.

Figure-3 shows the plot of equation (1) against scaled distance. This figure clearly shows the validity zone of equation (1). Figure-4 depicts the safe vibration levels for different type of constructions and the possibility of damage which could have occurred in production blasts.

The established vibration predictor equation is given in equation (1). This equation is site specific and thus only be applicable for the mine concerned.

$$V = -9.151 + 242.624 (D / \sqrt{Q})^{-1} \quad \text{----- (1)}$$

r = correlation coefficient = 0.94
 Id = Index of determination = 0.87
 SEE = Standard Error of Determination = 9.767

The I_d value indicates that in 87 per cent cases the actual value may be predicted from equation (1). Equation (1) may be used to obtain the permissible charge per delay at any desirable distance taking any particular value of PPV. Some of these values are obtained in table -4 taking PPV = 5.0mm/s. This value of PPV is chosen from table-3 as it may be noticed that the blast induced frequency in all most all cases was less than or equal to 24Hz. This range actually matches with the natural frequency of residential structures. When this condition occurs then due to resonance, the value of ground vibration near any structure may amplify up to 3-5 times in the structures and lead to damage in such structures.

Table : 4 Maximum Charge per Delay with the variation of Distance

Distance (m)	Maximum Charge per Delay (Kg)
50	8.5
75	19.1
100	34.0
125	53.1
150	76.5
175	104.2
200	136.1
225	172.2
250	212.6
275	257.2
300	306.1
325	359.3
350	416.7
375	478.3
400	544.2

Table-5 : Determination of zone of disturbance due to blasting
(Confidence level = 87%)

Calculation made on the basis of the CIBS standards of ground vibrations (Ref.2)

Maximum charge per delay (Kg)	UNSAFE ZONES IN METRES		Boundary of zero Vibration zone (m)
	For Industrial Buildings	For Domestic Buildings	
100	112	170	265
200	158	242	375
300	194	297	459
400	224	343	530
500	250	383	593
600	275	420	650

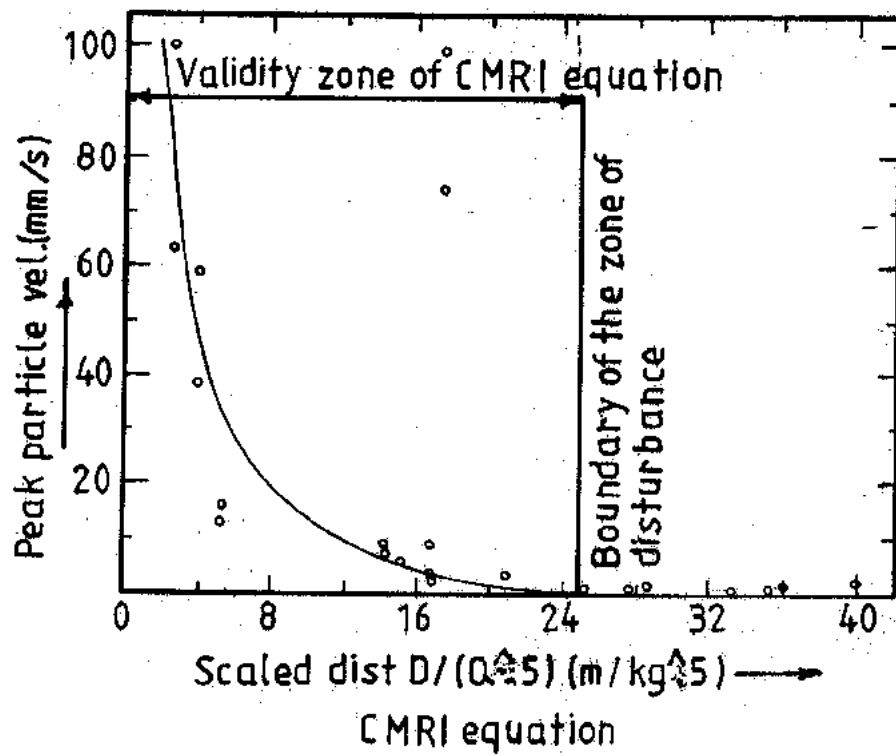


Fig. 3. Plot of ppv against scaled distance.

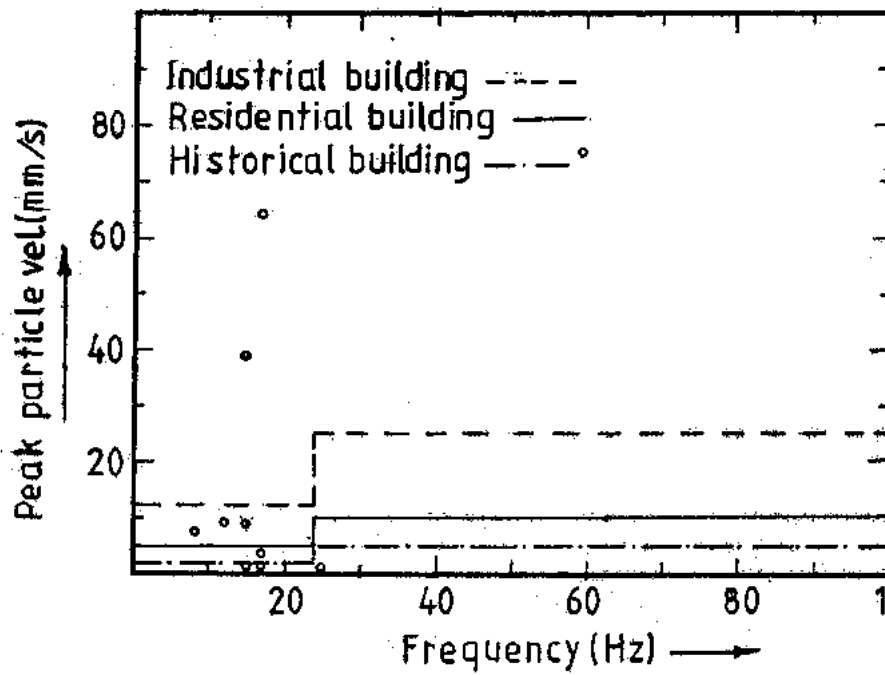


Fig.4. CMRI standards of safe vibration levels for different type of constructions.

BLASTING PATTERN SUGGESTED BY CMRS:

Based on the results of analysis of the experimental blasts, the following blast patterns may suitably be implemented for efficient and fruitful blasting operations. The patterns are suggested in accordance with the available machinery and other equipment which the mine will procure in near future.

Table-6a : Blasting pattern suggested by CMRI for different benches

Drill hole Dia (mm)	Burden (m)	Spacing (m)	Depth (m)	Charge per hole (kg)	No. of Intermediate decks
100	2	2.4	4.0	12.5	No deck
100	2.4	2.6	6.0	25	One deck of 0.5m
150	2.5	3.0	5.0	25	One deck of 0.8m
✓150	2.5	3.2	6.0	31.25	One deck of 0.8-1.0m
150	3.5	4.2	8.0	68.75	Two decks of 0.5m each
150	4.0	4.8	10.0	118.75	Two decks each of 0.5m

Table-6b : Blasting pattern suggested by CMRI with Air-decking.

Drill hole Dia (mm)	Burden (m)	Spacing (m)	Depth (m)	Charge per hole (kg)	No. of Intermediate decks
150	3	3.5	6.0	25.0	Decking should be done with stemming material for 0.5m and air decking with wooden spacer of 0.5m length.
150	3.5	4.2	8.0	50.0	Two decks with wooden spacers of 0.5m in length

CMRI conducted significant experiments in which delay periods of detonators were measured using a digital electronic timer. The system was designed to test detonators one by one. It was pre calibrated by using a sequential blasting machine and a digital storage oscilloscope. The detonators were connected one by one and their resistances were recorded before firing and delay intervals were recorded using the electronic timer. The gist of CMRS investigations are noted in the following paragraphs (Ref: Blasting in Ground Excavations and Mines by B. Singh & P. Pal Roy et al. published by Oxford and IBG Publishing Co. Pvt. Ltd. New Delhi p 177.)

- a) Scattering in delay interval of Al-tube short delay detonators was significant and, therefore, there was a strong probability of overlapping in their delay timings. The percentage of misfires was 2.8 to 14.2.
- b) The probability of overlapping of delay timings and misfires of copper-coated steel detonators was negligible.
- c) Delay interval of copper tube, non-incendive, short delay detonators had low probabilities of overlapping and the misfires in delay numbers 2 and 3 were 6 and 7% respectively.
- d) Delay interval of detonating relays (IDL make) of 25 ms fired at minimum time 17 ms and maximum time 33ms.
- e) Post-blast observations in several open-pit and underground mines and tunnelling indicated that the single factor responsible for variation in results was overlapping of delay periods of most commonly used Al-tube short and long delay detonators.

LABORATORY DETERMINATION OF ROCK PARAMETERS:

The most important rock parameters that need to be considered in understanding the fragmentation process include density, propagation velocity, characteristic impedance, compressive strength, tensile strength, Young's modulus. Density is widely used as a general indicator of the difficulty to be expected in breaking a rock. More denser materials will require explosives with high detonation pressures. However, less dense, more porous rocks seem to absorb energy in ways that make desirable fragmentation quite difficult. In-situ strength of rocks in general show low values than laboratory measured values.

The following parameters as given in table-7 were determined in the CMRI rock testing laboratory for the estimation of rock strength of the sample collected from second bench rock deposit.

Table-7: Laboratory determination of rock properties

Rock properties and other parameters	Observed test value in the laboratory	Length : Diameter ratio of the sample tested
1. Block size (cm ³)	30 x 25 x 20	
2. Bulk Density (g/cc)	2.90	
3. Young's modulus (in kg/cm ²)	7.8x10 ⁴	1.5 : 1.0
4. Uniaxial Compressive strength (kg/cm ²)	587.00	1.5 : 1.0
5. Uniaxial Tensile Strength (kg/cm ²)	94.00	0.5 : 1.0

FLY ROCK -- OCCURANCE AND CONTROL

Fly rock is produced when explosive energy is excessive for the amount of burden, stemming is inadequate or the energy is too rapidly vented through a zone of weakness in the rock. When this happens, much of the explosive energy is used to throw rock, rather than to create fragmented rock and controlled displacement of the burden material. Geology, improper blast design, or carelessness can cause unwanted fly-rock. Other factors such as powder factor, pattern layout, delay sequence, stemming height, drilling accuracy, and hole-loading methods should also be evaluated if any excessive fly-rock is generated.

All blasts can be expected to generate some fly-rock. The distance that flyrock travels can range from a few metre to more than 1km with poorly controlled shots. In surface mine blast there is a desired muckpile displacement or cast. There is always a normal fly-rock range, and a secured blast area. The normal fly-rock range is about 2.5 times the bench height and that the secured area is nearly 4 times of the bench height. Fly-rock beyond the secured blast area is excessive fly-rock. Excessive fly-rock is a major cause of injury and damage to mine equipment.

The amount of desired rock movement or muckpile displacement depends on the type of mining operation and the equipment used to load or strip the blasted rock. Various sizes of front end loaders, shovels have desired muckpile shapes. Muckpiles for front end loaders should be well fragmented with significant displacement and a more compact muckpiles.

Fly-rock projected beyond the blast area is excessive fly-rock. This kind of fly-rock is generated when there is too much explosive energy for the amount of burden or stemming. When the delay pattern is incorrect, or when the explosive energy is vented through a plane of weakness. Excessive fly-rock can be the result of blast site geology and or rock condition, improper blast design, or carelessness. Fly-rock control is achieved by careful attention to blast design, blast site inspection, blasthole layout, blasthole drilling, and blasthole loading practices.

Fly rock Causes :

a) Geology and rock Condition :

Geologic features such as mud seams, natural joints, or bedding planes, fractures, or cavities in the rock can result in too much fly-rock. Mud seams and fractures are planes of weakness through which explosive gases can rapidly vent and accelerate rock fragments. Cavities can accidentally become filled with too much explosive for the amount of rock burden, resulting in large fly-rock distance.-

b) Blast Design :

Blast design errors such as too high a powder factor, an inadequate burden, too short a stemming region, improper delays between rows, or wrong blasthole delay sequence can cause in unwanted fly-rock. Catering and blowouts can occur when back holes fire before front holes. A very short delay can also result in too much confinement and again catering and blowouts.

c) Carelessness :

Unfortunately carelessness is the leading cause of excessive fly-rock. Carelessness during any part of the blast design, the loading of the blastholes, or the hook-up of the initiation system can create a serious situation. The loading of explosive too near the top of the blasthole is a common cause of fly-rock.

d) Blasthole Drilling :

Accuracy in drilling is essential. The holes must be located in accordance with the blast design and drilled at the correct angle and to the proper depth. With a high face and smaller diameter holes, extra care should be taken to ensure that holes are drilled at the proper angle. Deviated blastholes can result in burden much larger or smaller than the planned. The driller should provide a 'log' of each hole that includes depth drilled, problem in the drilling zones, and any changes in penetration rate. This indication could indicate voids or zones of weakness.

e) Blasthole loading :

All holes must be checked during loading of explosives to ensure that their location and depth are in accordance with the blast design and the driller's 'log'. Before attempting to load a partially blocked hole, corrective actions such as re-drilling, changing the planned explosive load, or abandoning and backfilling of the hole should be considered. Open joints and cracks can extend into a blasthole. The presence of cracks can usually be detected by a lack of drill cuttings at the top of the hole. However, unless corrective action is taken during the loading of bulk products, these open fractures can be loaded with explosives, resulting in excessive energy for the hole. There will also be less confinement of the explosive charge. This may affect the performance of some explosive products as well as provide a weak zone which may blowout.

f) Secondary Blasting :

Secondary blasting can produce dangerous fly-rock even though the charges are small. Determining the blast area for this kind of shooting is very difficult, and careful planning and guarding are required. Although secondary blasting is frequently done in shifts and as needed, it is best to shoot at a fixed time such as during shift change. Secondary blasting can be done at the same time as primary blasting if the same or immediate area is involved. If the blasts are widely separated, there will be two sources of fly-rock to guard against.

CONCLUSIONS AND RECOMMENDATIONS:

Present day blasting is highly technological, carefully engineered and well regulated. For successful blasting operations, the driller has a very significant role on whether or not the blast holes will function properly, and whether they will release their full energy or not. Poor drilling such as closely spaced holes can subject neighbouring holes to extremely high stress levels, and can cause problems such as dead pressing, precompression, and can propagation. Bridging of bulk explosives or cartridge hang up can also lead to loss of energy or unexploded explosive within the blast hole. Care during hookup to ensure that all initiators are properly tied, is extremely important. Another factor which has caused serious problems in blasting is the improper hookup of initiators.

Following recommendations may be followed for day-to-day blasting practices.

1. The present study recommends CMRI vibration standards as given in tables-3 which should be followed during any blast.

2. Zone of disturbance, safe zone for industrial buildings and domestic houses are given in Table-5 with 87% confidence level. This may also be calculated from equation (1).
3. Maximum permissible charge are given in Table-4. They may be calculated from equation (1) as well.
4. Blasting patterns suggested by CMRI for different bench faces are given in Table- 6. These patterns were verified in experimental blasts.
5. Length of stemming column should be greater than 0.6 times the burden. For better protection, it may be taken as greater than or equal to the burden.

NOTE

This report is meant for internal use of your organisation only and it should not be published in full or part by your organisation. It should not be communicated or circulated to outside parties except concerned departments. However, CMRI reserves the right to publish the results of the investigation for the benefit of the industry.

The recommendations are based on the results of investigations. It is hoped that the recommendations will be implemented to get the optimum results without hampering production and productivity. The recommendations are the guidelines which should be implemented in letter and spirit.

Since the day-to-day blasting operations will not be in control of CMRI, the research team cannot be held responsible for any untoward incidence caused by blasting.

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9. Sri S. N. Choubey, Mining Sirdar.

REFERENCES:

1. B. Singh, P. Pal Roy et al. "Blasting in ground excavations and mines", Oxford & IBH Publishing Co. Pvt. Ltd., New Delhi, 1993, p.177.
2. B. B. Dhar, P. Pal Roy and R. B. Singh. "Optimum blasting for Indian Geomining conditions - suggestive standards and guidelines", CMRS publication, 1994, p.40.

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अनुज्ञापित प्ररूप एन. ई.-3 | LICENCE FORM LE-3

(विस्फोटक नियम, 2008 की अनुसूची 4 के भाग 1 के अनुच्छेद 3(क) से (घ) द्वारा)

(See article 3(a) to (d) of Part I of Schedule IV of Explosives Rules, 2008)

(ग) उपयोग के लिए एक समय पर वर्ग 1, 2, 3, 4, 5 या वर्ग 7 के विस्फोटक या किसी मैगजीन में वर्ग 6 के विस्फोटक रखने के लिए।
Licence to possess - (c) for use explosives of class 1, 2, 3, 4, 5, 6 or 7 in a magazine.

अनुज्ञापित सं. (Licence No.): E/HQ/JH/22/146(E1234)

वार्षिक फीस रूप (Annual Fee Rs): 10600/-



1. Licence is hereby granted to

THE COAL SUPPLY AGENT, BYC BERMU COLLIERY (अधिष्ठाता : Occupier : Shri A.K. Thakur), P.O. - BERMU, Town/Village - , District - BOKARO, State - Jharkhand, Pincode -

को अनुज्ञापित अनुज्ञापित की जाती है।

2. अनुज्ञापितारी की परिस्थिति : Status of licensee : Company

3. अनुज्ञापित निम्नलिखित प्रयोजनों के लिए विधिमान्य है।

Licence is valid only for the following purpose

4. अनुज्ञापित विस्फोटकों के निम्नलिखित किस्मों, प्रकार और मात्रा के लिए विधिमान्य है।

Licence is valid for the following kinds and quantity of explosives :- (क) (a)

Sr. No.	नाम और विवरण Name and Description	वर्ग और प्रभाग Class & Division	उप-प्रभाग Sub-division	मात्रा किसी एक समय में Quantity at any one time
1	Nitrate Mixture	2.0	0	4536 Kg
2	Safety Fuse	6.1	0	48000 Mtrs
3	Detonating Fuse	6.2	0	10000 Mtrs
4	Detonators	6.3	0	48000 Nos.

(ख) किसी एक कैलेंडर मास में खरीदे जाने वाले विस्फोटक की मात्रा (अनुच्छेद 3(ख) और (ग) के अधीन अनुज्ञापित के लिए)

10 times
as above.

(b) Quantity of explosives to be purchased in a calendar month applicable for licence under article 3(b) and (c)

5. निम्नलिखित रेखाचित्र (रेखाचित्रों) से अनुज्ञापित परिसर की पुष्टि होती है।

The licensed premises shall conform to the following drawing(s).

रेखाचित्र नं. (Drawing No.) E/HQ/JH/22/146(E1234)

दिनांक (Dated) 02/07/1990

6. अनुज्ञापित परिसर निम्नलिखित पते पर स्थित है। The licensed premises are situated at following address:

Survey No(s). 64&83 दाम (Town/Village) - BAIDKARO

जिला (District)

BOKARO

राज्य (State)

Jharkhand

पिनकोड (Pincode)

000000

दूरभाष (Phone)

00000000

ई-मेल (E-Mail)

फैक्स (Fax)

00000000

पुलिस थाना (Police Station) : BOKARO

7. अनुज्ञापित परिसर में निम्नलिखित सुविधाएं अंतर्भूत हैं।

The licensed premises consist of following facilities.

A MAIN MAG. ROOM A LOBBY and A DETONATOR ROOM.

8. अनुज्ञापित समय - समय पर यथासंशोधित विस्फोटक अधिनियम, 1884 और उनके अधीन विरचित विस्फोटक नियम, 2004 के उपबंधों, शर्तों और अतिरिक्त शर्तों और निम्नलिखित उपावधों के अधीन रहते हुए अनुज्ञापित की जाती है।

The licence is granted subject to the provision of Explosives Act 1884 as amended from time to time and the Explosives Rules, 2008 framed there under and the conditions, additional conditions and the following Annexures.

1. उपर्युक्त क्रम सं 5 में यथा कथित रेखाचित्र (स्थान, सन्निर्माण संबंधी और अन्य विवरण दर्शाते हुए)।

Drawings (showing site, constructional and other details) as stated in serial No. 5 above.

2. अनुज्ञापित प्राधिकारी द्वारा हस्ताक्षरित इस अनुज्ञापित की शर्तों और अतिरिक्त शर्तों।

Conditions and Additional Conditions of this licence signed by the licensing authority.

3. दूरी प्ररूप DE-2 Distance Form DE-2.

9. यह अनुज्ञापित तारीख 31 मार्च 1992 तक विधिमान्य रहेगी। This licence shall remain valid till 31st day of March 1992.

यह अनुज्ञापित अधिनियम या उसके अधीन विरचित नियमों या अनुसूची V के भाग 4 के प्रति निर्दिष्ट सेट-VII के अधीन तथा उपवर्णित इस अनुज्ञापित की शर्तों का अधिकरण करने या यदि अनुज्ञापित परिसर योजना या उससे संलग्न उपबंध में दर्शात विवरण के अनुरूप नहीं पाए जाने पर निलंबित या प्रशिक्षण की जा सकती है, जहां वह लागू हो।

This licence is liable to be suspended or revoked for any violation of the Act or Rules framed there under or the conditions of this licence as set forth under Set VIII, wherever applicable, referred to in Part 4 of Schedule V or if the licensed premises are not found conforming to the description shown in the plans and Annexure attached hereto.

तारीख : The Date - 02/07/1990

Sd/-
मुख्य विस्फोटक नियंत्रक | Chief Controller of Explosives

Amendments :

Change in Authorized Signatory/Occupier/Partners/Directors dated - 03/11/2014

नवीनीकरण के पुष्टिकरण के लिए स्थान
Space for Endorsement of Renewalनवीनीकरण की तारीख
Date of Renewalसमाप्ति की तारीख
Date of Expiryअनुज्ञापन प्राधिकारी के हस्ताक्षर और स्टाम्प
Signature of licensing authority and stamp

30/06/2016

31/03/2017

Dy. Chief Controller of Explosives, Ranchi

उप मुख्य विस्फोटक नियंत्रक, राँची
Dy. Chief Controller of Explosives, Ranchiकायनी चेतावनी : विस्फोटकों को गलत ढंग से चलाने या उनका दुरुपयोग विधि के अधीन गंभीर दंडित अपराध होगा।
Statutory Warning : Mishandling and misuse of explosives shall constitute serious criminal offence under the law.

Endorsed as required under
rule 161(2) of E.R. 1933

anjan
26/7/90
मुख्य विस्फोटक निरीक्षक, बी.एच.डी.
Dy. Controller of Explosives, B.H.D.

प्रकृ. 22/FORM 22

(नियम 155 देखिए/See Rule 155)

16754

[अनुसूची IV का अनुच्छेद 3 (क) और 3 (ख)/Article 3 (a) and 3 (b) of Schedule IV]

प्रयोगार्थ विस्फोटकों को कब्जे में रखने के लिए अनुज्ञप्ति/LICENCE TO POSSESS EXPLOSIVES FOR USE

सं./No. B1-1919/Ex

फीस/Fee Rs 360/- रुपये (प्रतिवर्ष, per year)

को अतिरिक्त शर्त सं. 1 (क) में विनिर्दिष्ट मात्रा में विस्फोटकों को कब्जे में रखने और उसके प्रयोग के लिए अनुज्ञप्ति अनुदान की जाती है। यह अनुज्ञप्ति समय-समय पर यथासंशोधित विस्फोटक अधिनियम, 1884 और उसके अधीन बनाए गए नियमों के उपबंधों तथा इस अनुज्ञप्ति की शर्तों के अधीन है। विस्फोटकों का भण्डारकरण नीचे दिये गए परिचय में किया जाएगा :—

Licence is hereby granted to the Coal Supdt. & Agent, DVC Bermo Colliery, P.O. Bermo, Giridih for possession and use of explosives of the quantities specified in Additional Condition No. 1 (a) subject to the provisions of Explosives Act, 1884 as amended and the rules made thereunder and to the conditions of this licence. The explosives shall be stored at the premises described below :—

अनुज्ञप्त परिसरों का वर्णन/DESCRIPTION OF THE LICENSED PREMISES

अनुज्ञप्त परिसर इससे सम्बन्ध रेखाचित्र/The licensed premises are shown on drawing :—

- (i) सं./No. B1-1919/Ex (Site) तारीख/dated 2/7/90
(ii) सं./No. B1-1919/Ex (Constn.) तारीख/dated 2/7/90
(iii) सं./No. _____ तारीख/dated _____

द्वारा दक्षित किए गए हैं। उक्त परिसर _____ में स्थित है और उनमें _____ समाविष्ट है।
attached hereto and situated at Baidkaro, Dist. Giridih
and consist of Explosives magazine.

अनुज्ञप्ति 31 मार्च, 19—तक प्रवृत्त रहेगी।

This licence shall remain in force till 31st day of March, 1992.

यदि इस अधिनियम या उसके अधीन बनाए गए नियमों का अथवा इस अनुज्ञप्ति की शर्तों में से किसी शर्त का उल्लंघन होता है अथवा यदि अनुज्ञप्त परिसर सम्बद्ध रेखांक में दिए गए वर्णन के अनुरूप नहीं पाए जाते हैं तो यह अनुज्ञप्ति निरस्त या प्रतिबंधित की जा सकती है।

This licence is liable to be suspended or revoked for any violation of the Act, or Rules framed thereunder or the conditions of this licence or if the licensed premises are not found conforming to the description as per attached plans.

अनुज्ञप्तिधारी का डाक पता _____

Postal Address of Licensee :

The Coal Supdt. & Agent, DVC

Bermo Colliery, P.O. Bermo,

Dist. Giridih (Bihar)

Anjan
मुख्य विस्फोटक निरीक्षक

for Dy. Chief Controller of Explosives
East Circle, Calcutta

तारीख _____

(ग) वर्ग 6 (गोला बारूद) के द्वितीय प्रभाग के विभिन्न ऐसे विस्फोटकों को जिनमें कोई खुला लोहा या इस्पात है, एक दूसरे के साथ, बिना किसी मध्यवर्ती विभाजक या स्थान के, रखा जा सकता है ;

(g) such of the various explosives of the 2nd Division of the 6th (Ammunition) Class as contained any exposed iron or steel, may be kept with each other without any intervening partition or space ;

(घ) वर्ग 6 (गोला बारूद) के तृतीय प्रभाग के विभिन्न विस्फोटकों को बिना किसी मध्यवर्ती विभाजक या स्थान के एक दूसरे के साथ रखा जा सकता है ;

(d) the various explosives of the 3rd Division of the 6th (Ammunition) Class may be kept with each other without any intervening partition or space ;

(ङ) वर्ग 7 (आतिशबाजी) के विभिन्न विस्फोटकों को, ऐसे विस्फोटकों में भिन्न जिनमें क्लोरेट है, बिना किसी मध्यवर्ती विभाजक या स्थान के साथ-साथ रखा जा सकता है ।

(e) the various explosives of the 7th (Fireworks) Class other than those containing chlorate may be kept with each other without any intervening partition or space.

(2) पूर्वोक्त के सिवाय, दो या अधिक प्रकार के विस्फोटकों को इस बात के होने हुए भी मैगजीन/भण्डारगृह में नहीं रखा जाएगा कि वे अतिरिक्त शर्त सं० 1 (क) के उपबन्धों के अनुरूप हैं ।

(2) Save as aforesaid, two or more descriptions of explosives shall not be kept in the magazine/store house notwithstanding the provision of Additional Condition No. 1 (a).

(3) (क) वर्ग 3 (नाइट्रो-योगिक) के विस्फोटकों को, उनके विनिर्माण की तारीख से एक वर्ष बीत जाने के पश्चात्, मैगजीन में तब के सिवाय, नहीं रखा जाएगा जबकी किसी विस्फोटक नियंत्रक ने इसके लिए विशेष मंजूरी दे दी हो ।

(3) (a) Explosives of the 3rd (Nitro-Compound) Class shall not be kept in the magazine after the expiration of one year from the date of their manufacture except with the special sanction of a Controller of Explosives.

ख) जब ऐसी मंजूरी दे दी गई हो तो प्रत्येक निरीक्षण पर किसी विस्फोटक नियंत्रक से ऐसा लिखित प्रमाण-पत्र अभिप्राप्त कर लिया जाए जिसमें दी गई मंजूरी के अन्तर्गत आने वाली अवधि दर्शित की गई हो और ऐसे प्रमाण-पत्र को अनुज्ञतिधारी अपने पास रखेगा और मांग की जाने पर प्रस्तुत करेगा ।

(b) When such sanction has been given, a written certificate showing the period covered by the sanction must be obtained from a Controller of Explosives at each inspection, and must be kept by the licensee and produced on demand.

5. जब कोई विस्फोटक, मानक गुणवत्ता या शक्ति होने के कारण अथवा द्रवनीकरण या नाइट्रो-ग्लिसरीन के या द्रव नाइट्रो-योगिक के निकल जाने के बिना प्रकट होने के कारण या मैगजीन में भण्डारित किए जाने के लिए उपयुक्त न रह जाने के कारण अनुपयोगी हो गया है तो अनुज्ञतिधारी अपने ही व्यय पर ऐसे विस्फोटक के निपटारे के लिए ऐसे निर्देशों का अनुपालन करेगा जो मुख्य नियंत्रक या विस्फोटक नियंत्रक जारी करे ।

When an explosive owing to its being no longer of standard purity or owing to signs of liquefaction or of exuded nitro-glycerine or liquid nitro compound is no longer for storage in the magazine/store house, the licensee shall comply, at his own expense, with such directions as to its disposal as the Chief Controller or Controller of Explosives may issue.

6. मैगजीन/भण्डारगृह के भीतरी भाग या उसमें की बेंचों, शेल्फों और फिटिंग को इन प्रकार मन्निर्माण या अस्तरित या आवरित किया जाएगा कि कोई लोहा या इस्पात खुला न रहे या कोई ग्रिट, लोहा या इस्पात या कोई समान पदार्थ इस प्रकार विलग न हो सके कि वह विस्फोटकों के सम्पर्क में आ जाए । ऐसा भीतरी भाग, बेंच शेल्फों और फिटिंग यथामध्य ग्रिट से मुक्त और अन्यथा रखे जाएंगे तथा ऐसे किसी विस्फोटकों की दशा में, जो जल से खतरनाक रूप में प्रभावित हो सकते हैं, इस बात पर सम्यक् सावधानी बरती जाएगी कि वहां कोई जल मौजूद न रहे ।

परन्तु किसी लोहे या इस्पात के खुले रहने के विरुद्ध सावधानी से संबंधित इन शर्तों का वह भाग ऐसे किसी भवन में बाध्यकर नहीं होगा जिसमें वर्ग 6 (गोला बारूद) के प्रथम प्रभाग के विस्फोटक में भिन्न कोई विस्फोटक रखा गया है ।

The interior of the magazine/store house and the benches, shelves and fittings therein, shall be so constructed or so lined or covered as to prevent the exposure of any iron or steel and the detaching of grit, iron, steel or similar substances in such manner as to come into contact with the explosives. Such interior, benches, shelves and fittings shall so far as is reasonably practicable, be kept free from grit and otherwise clean ; and, in case of any explosive liable to be dangerously affected by water, due precautions shall be taken to exclude water therefrom :

Provided that so much of this condition as relates to precautions against the exposure of any iron or steel shall not be obligatory in a building in which no explosives other than explosives of the 1st Division of 6th (Ammunition) Class is kept.

7. यदि तड़ित चालक का परीक्षण विस्फोटक नियंत्रक ने किया है तो अनुज्ञापिकाारी ऐसे परीक्षण के लिए विहित फीस का संदाय करेगा। यदि परीक्षण असमाधानकारी साबित होता है तो उतनी ही फीस अनुज्ञापिकाारी द्वारा पश्चात्कर्तों प्रत्येक परीक्षण के लिए तब तक दी जाती रहेगी जब तक कि परीक्षण अधिकारी तड़ित चालक को समाधानप्रद घोषित नहीं कर देता।

परन्तु किसी एक परीक्षण के लिए देय फीस, किसी एक दिन के दौरान किसी चालक के किए गए सभी परीक्षणों के लिए प्रभावी होगी :

परन्तु यह और कि यदि दो या अधिक तड़ित चालक एक ही मैगजीन से सम्बद्ध हैं तो ऐसे सभी चालकों के परीक्षण के लिए फीस ऐसी किसी फीस से अधिक नहीं होगी जो किसी एक तड़ित चालक के परीक्षण के लिए डम घर्न में विहित की गई है।

If the lightning conductor is tested by a Controller of Explosives, the licensee shall pay the fees prescribed for such test. In the event of the test proving unsatisfactory, the same fees shall be payable by the licensee for each subsequent test until the lightning conductor is passed by the testing officer as satisfactory :

Provided that the fees payable for a single test shall be charged for all tests made on a conductor during any one day :

Provided further that where two or more lightning conductors are attached to one and the same magazine, the fee for the testing of all such conductors shall not exceed the fee prescribed in this condition for testing a single lightning conductor.

8. उपर्युक्त तथा जेवरहित कार्यकरण वस्त्रों, उपयुक्त जूतों के प्रयोग द्वारा तथा तत्प्राप्ति लेकर या अन्यथा ऐसे किसी माध्यमों द्वारा इन वाक्य सम्बन्ध किया जाएगा कि मैगजीन में अग्नि, दिव्यामलाई अथवा ऐसी कोई वस्तु या पदार्थ, जिससे विस्फोट हो सकता हो या आग लग सकती हो, अथवा कोई छिद्र, लोहा या इस्पात प्रविष्टि न हो सके।

परन्तु डम घर्न का वह भाग जो लोहे या इस्पात के अपवर्जन को लागू होता है, ऐसे किसी भवन के सम्बन्ध में बाध्यकर नहीं होगा जिसमें वर्ग 6 (गोला बाह्य) के प्रथम प्रभाग के किसी विस्फोटक से भिन्न कोई विस्फोटक नहीं रखा गया है।

Due provision shall be made by the use of suitable working clothes without pockets, suitable shoes, and by searching or otherwise, or by some such means for preventing the introduction into the magazine/store house of fire, lucifer matches or any substance ; or article likely to cause explosion or fire, or of any grit, iron or steel but this condition shall not prevent the introduction of an artificial light of such construction, position or character as not to cause any danger of fire or explosion :

Provided that so much of this condition as applies to the exclusion of iron or steel, shall not be obligatory in a building in which no explosive other than an explosive of the 1st Division of the 6th (Ammunition) Class is kept.

9. अनुज्ञापिकाारी ऐसे सभी विस्फोटकों का, जो भण्डार में हैं तथा प्रयुक्त हुए हैं, अभिलेख और लेखा अपने कार्यालय में प्रारूप 32 और 34 में रखेगा और भण्डार वस्तुओं और अभिलेखों को, नियम 179 के अधीन ऐसे किसी प्राधिकृत अधिकारी के समक्ष, उसके द्वारा ऐसा करने की मांग की जाने पर प्रस्तुत करेगा।

The licensee shall kept records and accounts of all explosives in stock and used in Forms 32 and 34 in his office and produce the stock books and records to any officer authorised under Rule 179 whenever such officer may call office upon him so to do.

10. किसी दुर्घटना और विस्फोटकों की सभी हानियों, भण्डार में कमी और चोरीयों की रिपोर्ट अश्विम्ब निकटवर्त पुलिस स्टेशन को तथा अनुज्ञापन प्राधिकारी को की जाएगी।

Any accident and all losses, shortage of stock and thefts of explosives shall be reported without delay to the nearest police station and licensing authority.

11. किसी निरीक्षण या नमूना लेने वाले अधिकारी को अनुज्ञप्त परिसरों पर सभी उपलब्ध समयों पर अबाध पहुँच प्राप्त होगी और ऐसे प्राधिकारी को यह सुनिश्चित करने के लिए प्रत्येक सुविधा दी जाएगी कि सभी नियमों और अनुज्ञप्ति की शर्तों का सम्बन्ध अनुपालन किया जा रहा है।

Free access to the licensed premises shall be given at all reasonable times to any inspecting or sampling officer and every facility shall be given to such officer for ascertaining that the rules and conditions of the licence are duly observed.

12. परिसरों में कोई परिवर्तन या वृद्धि, अनुज्ञापन प्राधिकारी के पुनर्निर्माण के बिना, नहीं की जाएगी और अनुज्ञापिकाारी ऐसे किसी कार्य का अनुपालन करता जो इस निमित्त अनुज्ञापन अधिकारी विनिरिष्ट करे।

No changes or alterations shall be carried out to the premises without prior approval of the licensing authority and the licensee shall comply with any condition that may be specified by the licensing authority in this behalf.

13. यदि अनुज्ञापन प्राधिकारी ऐसी कोई कार्रवाई करने के लिए, जो ऐसे प्राधिकारी की राय में ऐसे परिमरों या जनता की सुरक्षा के लिए आवश्यक है, लिखित रूप में कोई सूचना देकर अनुज्ञापिधारी से मांग करता है जो अनुज्ञापिधारी ऐसी अवधि के अन्दर जो ऐसी सूचना में नियत की जाए, ऐसी कार्रवाई करेगा। किन्तु उक्त अवधि सूचना की प्राप्ति की तारीख से एक मास से कम नहीं होगी।

If the licensing authority calls upon the holder of the licence by a notice in writing to take any action which may in the opinion of such authority be necessary for the safety of the premises or the public, the holder of licence shall take such action within such period, not being less than one month from the date of receipt of the notice, as may be fixed by the notice.

14. मैगैजीन/भण्डारगृह सभी समयों पर आवश्यक मरम्मत करके अच्छी द्दानत में रखा जाएगा। यदि किसी कारणवश किसी विस्फोटक के भण्डारकरण के लिए मैगैजीन/भण्डारगृह अनुपयुक्त हो जाता है तो अनुज्ञापिधारी उस बात की सूचना अनुज्ञापन प्राधिकारी को तुरन्त देगा।

Magazine/store house shall at all times be kept in state of good repair (or maintained in good condition). The licensee shall report to licensing authority forthwith if the magazine/store house becomes unfit for storage of any explosive for any reason whatsoever.

15. अनुज्ञापिधारी प्रत्येक मास के अन्त में अनुज्ञापन प्राधिकारी को तथा नवीकरण प्राधिकारी को भी, समय-समय पर प्ररूप 36 में एक विवरणी प्रस्तुत करेगा। इस विवरणी में विस्फोटकों की प्राप्ति और निर्गमनों को दर्शित किया जाएगा तथा यह विवरणी इस प्रकार दी जाएगी कि वह ठीक आगामी मास की दश तारीख तक प्राधिकारियों के सम पहुंच जाए।

The licensee shall submit to the licensing authority as well as the renewal authority at the end of every month a return in Form 36 showing receipts and issue of explosives so as to reach the above authorities by 10th day of the succeeding month

16. यदि सुरक्षा दूरी का कोई अतिक्रमण होता है तो उसकी सूचना अनुज्ञापन प्राधिकारी को, आवश्यक सलाह और कार्रवाई के लिए दी जाएगी।

Any encroachment of the safety distance shall be immediately communicated to the licensing authority for necessary advice and action.

17. यदि कोई विस्फोटक बिनष्ट हुआ अथवा अनुपयोगी पाया जाता है तो उसकी सूचना अनुज्ञापन प्राधिकारी को, सलाह के लिए तुरन्त दी जाएगी।

The licensing authority shall be immediately informed for advice if any explosive is found deteriorated or serviceable.

18. विस्फोटकों के पैकेजों के षट्टई इस प्रकार लगाए जाएंगे जिससे कि कम से कम एक व्यक्ति को भण्डार किए गए सभी पैकेजों की हालत की जांच करने और प्रत्येक पैकेज की विनिर्माण विशिष्टियों को पढ़ने के लिए पहुंच प्राप्त हो सके।

The explosive packages shall be stacked in such a way so as to allow movement of at least one person to check the condition of all packages stored and to read the manufacture particulars of each package.

19. तड़ित चालकों का भूमि के लिए प्रतिरोध यथासम्भव न्यूनतम होगा और किसी भी दशा में 10 आम से अधिक नहीं होगा।

The resistance of the lightning conductor to earth shall be as low as possible and in no case more than 10 ohms.

20. मैगैजीन/भण्डारगृह के चारों ओर 15 मीटर की दूरी के अन्तर्गत कोई शुष्क घास या झाड़ी या ज्वलनशील सामग्री नहीं रहने दी जाएगी।

A distance of 15 metres surrounding the magazine/store house shall be kept clear of dried grass or bush of flammable materials.

21. विस्फोटकों के प्रत्येक पैकेज की, जब उसे मैगैजीन के भीतर लाया जा रहा हो, उसकी दशा जानने के लिए परीक्षा की जाएगी।

Every packet of explosive at the time of bringing inside the magazine shall be examined for its sound condition

22. किसी मैगैजीन में किसी एक समय में चार व्यक्तियों से अधिक को नहीं रहने दिया जाएगा।

Not more than 4 persons shall be allowed inside the magazine at any one time.

23. विस्फोटकों के खाली पैकेजों को शीघ्रतः हटाकर नष्ट कर दिया जाएगा।

Empty Packages of the explosives shall be removed at the earliest and destroyed.

24. विस्फोटन प्रयोजनों के लिए विस्फोटकों का प्रयोग ऐसे किसी क्षेत्र में जो खान अधिनियम की परिधि के अन्तर्गत नहीं आते हैं, तब तक नहीं किया जाएगा जब तक कि अनुज्ञापिधारी किसी ऐसे अर्ध-शोट-फायरकर्ता को जिसके पास, विस्फोटक नियमों के अधीन अनुदत्त शोट-फायरकर्ता प्रमाण-पत्र है अथवा ऐसे किसी व्यक्ति को नियोजित नहीं करता जिसके पास मुख्य नियमक द्वारा यथा मान्यता प्राप्त समतुल्य अर्हताएं नहीं हैं।

The explosives shall not be used for blasting purposes in the areas not coming within the purview of Mines Act, unless the licensee employs a qualified shot-firer holding a shot-firer's permit granted under the Explosives Rules or the person having equivalent qualifications as recognised by the Chief Controller.

25. अनुज्ञापितधारी और शाट-फायरकर्ता चार्जों की तैयारी, छिद्रों के चार्ज किए जाने और शाटों के फायर किए जाने के लिए उत्तरदायी होंगे और वे ऐसी सभी अग्नी और दुर्घटनाओं को रोकने के लिए सभी सावधानियां बरतेंगे जो विस्फोटकों के साथ हो सकती हों।

The licensee and the shot-firer shall be responsible for preparation of charges, the charging of holes and the firing of shots and shall take all precautions against fire and accident involving the explosives.

26. ऐसे किसी स्थान में या उसके आसपास जिनमें विस्फोटक चार्ज तैयार किए जा रहे हैं या रखे गए हैं, धूम्रपान या प्रकाश अथवा किसी प्रकार की कोई अग्नि नहीं रहने दी जाएगी।

No smoking or any source of light or fire shall be allowed in or near the place where explosives charges are being prepared or kept.

27. किसी शाट छिद्र को चार्ज करने के लिए या स्टैमन के लिए कोई भी व्यक्ति, लोहे या इस्पात के किसी औजार, स्केपर या टैम्पिंग राड का प्रयोग नहीं करेगा और न अप्रयुक्त आकार के किसी छिद्र में विस्फोटक पर दबाव डालकर उसे अन्दर डालेगा। पूर्णतः लकड़ी की बनी टैम्पिंग राड का ही प्रयोग किया जाएगा।

For charging or stemming a shot hole, no person shall use an iron or steel tools, scraper or tamping rod, nor shall forcibly press the explosive into a hole of insufficient size. A tamping rod made entirely of wood shall be used.

28. किसी विस्फोटक चार्ज का विस्फोट करने के पूर्व इस बात पर पर्याप्त उपाय किए जाएंगे कि सम्भाव्य विस्फोटक चार्ज के विस्फोट से पत्थर के टुकड़े प्रक्षेपित न हो सकें।

Before exploding any blasting charge, adequate measures shall be taken so as to prevent as far as possible, the projection of fragments of stone by the explosion of the blasting charge.

29. कोई भी व्यक्ति ऐसे किसी छिद्र को पुनः वैधिय या उसमें हस्तक्षेप नहीं करेगा जैसे एक बार चार्ज किया जा चुका है अथवा वह फायर करने के पूर्व अथवा अविस्फोटन के पश्चात् चार्ज को निकालने का या विस्फोटन के पश्चात् दबे गिरे छिद्रों या साकेटों को अधिक गहरा करने का या उनमें हस्तक्षेप करने का प्रयत्न नहीं करेगा।

No person shall re-bore or tamper a hole that has once been charged or attempt to withdraw a charge either before firing or after a misfire or deepen or tamper with empty holes or sockets left after blasting.

30. शाट फायर करना प्रारम्भ करने से पूर्व अनुज्ञापितधारी जनता को दश मिनट प्रणामी द्वारा तथा खतरनाक जोन में लाल क्षणिकता लगाकर पर्याप्त चेतावनी देगा। वह यह भी देखेगा कि आसपास के क्षेत्रों में सभी व्यक्तियों को उचित आश्रय प्राप्त कर लिया है और इस बात पर उपयुक्त कदम उठाएगा कि शाट तक कोई व्यक्ति न पहुंच सके।

Before commencing shot firing, the licensee shall give sufficient warning to the public by an efficient system of signals and by putting up red flags in the danger zone. He shall see that all persons in the vicinity have taken proper shelter and shall also take suitable steps to prevent any person approaching the shot.

31. अनुज्ञापितधारी जनता को इस बात भी चेतावनी देगा कि जनता विस्फोट सक्रिय के स्थल के पास, विस्फोट के पश्चात् कम से कम एक घण्टे के भीतर, न जाए अथवा किसी खुले खदान को दश मिनट प्रणामी के पश्चात् कम से कम आधे घण्टे के भीतर, ऐसी खदान तक न जाए।

The licensee shall warn the public not to approach the site of blasting operation at least within an hour after explosion or in the case of an open quarry, not to approach such quarry within half an hour after explosion.

32. छोड़े गए शाटों का संख्या रखा जाएगा और जब तक यह सुनिश्चित नहीं हो जाता कि सभी शाट छोड़ दिए गए हैं, कोई व्यक्ति उस स्थान तक, शाटों के फायर किए जाने के पश्चात् जब तक तीस मिनट बीत न जाए, न तो जाएगा और न उसे जाने को अनुज्ञा हो दी जाएगी।

The number of shots which explode shall be counted and unless it is certain that all the shots have been exploded no person shall approach or be permitted to approach the place until 30 minutes after the firing of shots.

33. अविस्फोटक की दशा में यदि निर्मोचन छिद्र को द्रिज किया जाता है तो उसे अविस्फोटन छिद्र से 30 सेंटीमीटर के अन्दर नहीं रखा जाएगा। निर्मोचन छिद्र अविस्फोटन छिद्र के समानान्तर नहीं होगा।

In the event of a misfire, if a relieving hole is to be drilled, it shall not be placed within 30 cm. from the misfired hole. The relieving hole shall run parallel to the misfired hole.

अतिरिक्त शर्तें/Additional Conditions

1. (क) परिसर में किसी भी समय विस्फोटकों की मात्रा निम्नलिखित से अधिक नहीं होगी :—
- (a) The maximum quantity of explosives on the premises at any one time shall not exceed :—
- | | | | | |
|------------------------------------|-------|---|------------|---------------|
| वर्ग 1/Class 1 | — X — | — | — | कि० ग्रा०/Kg. |
| वर्ग 2/Class 2 | — X — | — | — | कि० ग्रा०/Kg. |
| वर्ग 3/Class 3 | — | — | 1850 Kgs | कि० ग्रा०/Kg. |
| वर्ग 6 प्रभाग 1/Class 6 Division 1 | — | — | 25000 Mtrs | मीटर/Metres |
| वर्ग 6 प्रभाग 2/Class 6 Division 2 | — X — | — | — | मीटर/Metres |
| वर्ग 6 प्रभाग 3/Class 6 Division 3 | — | — | 10,900 Nos | संख्या/Nos. |
| वर्ग 7 प्रभाग 2 उप-प्रभाग 1 | — | — | — | कि० ग्रा० |
| Class 7 Division 2 Sub-Divn. 1 | — | — | — | Kg. |
| वर्ग 7 प्रभाग 2 उप-प्रभाग 2 | — | — | — | कि० ग्रा० |
| Class 7 Division 2 Sub-Divn. 2 | — | — | — | Ks. |
- (ख) प्रत्येक मास में अनुज्ञप्ति पर विस्फोटक सामग्री खरीदने की अधिकतम मात्रा.....
- से अधिक नहीं होगी।
- (b) The maximum quantity of explosives purchased in one calendar month shall not exceed.
Class = 18500 Kgs
2. मैगजीन का उपयोग विस्फोटकों भण्डारकरण के लिए अनुज्ञप्ति के विस्फोटक नियंत्रक द्वारा पृष्ठांकन अथवा इस आशय की अनुज्ञापन प्राधिकारी से लिखित अनुज्ञप्ति प्राप्त करने के पश्चात् ही किया जाय।
The magazine shall not be taken into use until this licence is endorsed by a Controller of Explosives or written permission for the same is otherwise obtained from the licensing authority.
3. परिसर के चारों ओर संलग्न फार्म 18 में दर्शायी गई अपेक्षित दूरियां हर समय बनाई रखी जाएं।
The premises shall at all times maintain the distance required to be kept clear as shown in enclosed Form 18.
4. अनुज्ञप्तिधारी ऐसे कारतूतों का भरण कर सकेगा, जाज तैयार कर सकेगा या अन्यथा किसी विस्फोटक को प्रयोग के लिए अनुकूलित या तैयार कर सकेगा जिसको वह इस अनुज्ञप्ति के अधीन कब्जे में रखने के लिए प्राधिकृत है, परन्तु—
The licensee may be filling cartridges, making charges filling or otherwise adapt or prepare for use any explosive he is authorised to possess under this licence provided that—
- (क) कर्मशाला, जिसमें ऐसा अनुकूलन या तैयारी की जाती है, में रखे जाने वाले विस्फोटकों की कुल मात्रा अनुज्ञापन अधिकारी द्वारा कर्मशाला में रखने के लिए प्राधिकृत की गई मात्रा से अधिक नहीं होगी ;
- (ख) The quantity of explosives in the workshop in which such adaptation or preparation is carried on shall not be more than that is prescribed by the licensing authority in this behalf ;
- (ग) अनुज्ञप्त परिसरों पर जिनके अन्तर्गत वह कर्मशाला भी है, विस्फोटकों की कुल मात्रा उस अधिकतम मात्रा से अधिक नहीं होगी जिसके लिए अनुज्ञप्तिधारी कब्जे में रखने के लिए प्राधिकृत है ;
- (घ) The total quantity of explosives on the licensed premises including the workshop shall not exceed the quantity the licensee is authorised to possess ;
- (ङ) ऐसे अनुकूलन या तैयार में अन्तर्गत कोई कार्य उक्त कर्मशाला में उस समय नहीं किया जायगा जब ऐसा अनुकूलन या तैयारी वहां की जा रही हो ;
- (च) No work unconnected with such adaptation or preparation shall be carried on in the said workshop while such adaptation or preparation is being carried on ;
- (ज) ऐसी कर्मशाला टर्म में मरबुद रेखांकन में.....मीटर की दूरी पर स्थित होगी ;
- (झ) The said workshop shall be situated at a distance of metres as shown in drawing.....dated attached herewith ;
- (ड) किसी वर्णन के विस्फोटक को किसी अन्य वर्णन के विस्फोटक के रूप में परिवर्तित नहीं किया जायगा और किसी भी विस्फोटक को अकृत या उसके संघटकों में विभाजित नहीं किया जायगा ; और
- (e) An explosive of one description shall not be converted into another description and an explosive shall not be converted into another description

(च) अनुज्ञापितधारी ऐसी अनुज्ञप्ति अनुदान करने वाले प्राधिकारी की इस बात की सूचना देगा कि वह इस शर्त द्वारा अनुज्ञान अनुकूलन या तैयारी करना चाहता है।

(f) The licensee shall give notice to the authority which granted his licence that he intends to carry on such adaptation or preparation as is allowed by this condition.

5. विस्फोटकों के पैकेज खोलने व बन्द करने के उपयोग में लाए जाने वाले सभी औजार/उपकरण केवल लकड़ी तांबा पीतल व अन्य किसी अनुरूप नरम धातु के बने हों अथवा किसी सुरक्षित और उपयुक्त पदार्थ से पूर्णतः ढके हों।

All tools and implements kept or used in opening/closing of packages of explosives shall be made only of wood, copper, brass or other similar soft metal or shall be covered with some safe and suitable material.

6. (1) निम्नलिखित वस्तुएं परिसर में हर समय रखी जाएं:—

The following articles shall at all times be provided—

(क) एक बाल वाला झाड़ू ;

(a) a hair broom ;

(ख) एक नारियल के रेवेचाला पायदान लगभग 750 मि० मि० × 500 मि० मि० माइन का ;

(b) a coir mat about 750 mm × 500 mm in size ;

(ग) विस्फोटकों के पैकेज के खोलने के लिये उपयुक्त मात्रा में तांबा, पीतल या लकड़ी के बने हुए औजार व उपकरण ;

(c) a sufficient number of suitable copper, brass or wooden tools or implements for opening packages ;

(घ) मैगैजिन में प्रवेश करने वाले व्यक्तियों के लिए प्रवेश द्वार पर उचित संख्या में ऐसे ओवर शूज जिनमें कि लोहा व इस्पात/लगा हो।

(d) where persons are to enter the magazine, a sufficient number of overshoes not having any exposed iron or steel for use by those persons

- (2) उपरोक्त निर्धारित पायदान, औजार/उपकरण व ओवर शूज जब प्रयोग में न हों तब अनुज्ञापन परिसर में यथावित स्थान पर रखी जाए।

The mat, tools or implements and overshoes prescribed above shall at all times, when they are not in use be kept in suitable place within the licensed premises.

- (3) परिसर में हर समय प्रमुखता से स्पष्ट सुचारु अक्षरों में निम्नलिखित लिखा जाय:—

~~There shall at all times be kept prominently exhibited in clearly legible writing—~~

(क) परिसर की अनुज्ञप्ति संख्या ;

(a) Licence No. of the premises ;

(ख) भण्डारण के लिए विभिन्न विस्फोटकों की प्राधिकृत मात्रा ;

(b) The quantity of the various explosives authorised for storage.

(ग) विभिन्न विस्फोटकों की दैनिक आदि अभिवेश।

(c) The daily opening stock of various explosives.

- (4) भवन के बाहरी हिस्से में परिसर के मुख्य अक्षरों में परिसर की अनुज्ञप्ति संख्या दर्शायी जाए।

Licence No. of the premises shall also be exhibited in clearly legible writing on outer side of the building.

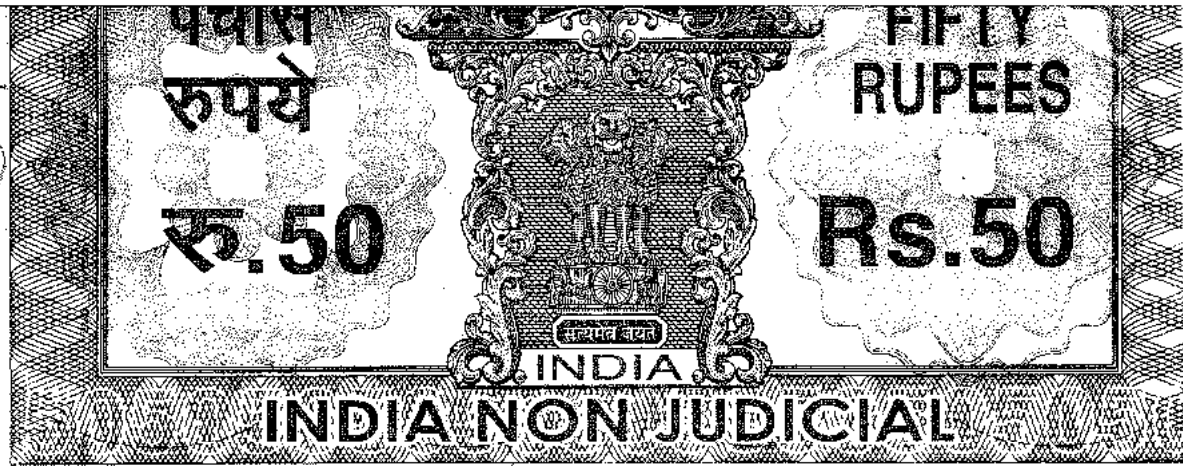
7. विस्फोटक प्रक्रिया केवल में समय तक ही की जाय।

Blasting operations shall be carried out between hours ~~sunrise to sunset~~

8. किसी भी समय पर से अधिक ब्लास्टिंग होतस की विस्फोटकों से सदाई तथा कार्यांग न की जाय।

Not more than holes shall be loaded and fired at any one time.

Signature



পশ্চিমবঙ্গ পশ্চিম বঙ্গাল WEST BENGAL

N 872156

POWER OF ATTORNEY

I, KASHI NATH SINGH, aged 59 years, of Indian Nationality, resident of Qtr. No. C-2, DVC Maithon Dam, Jharkhand in the capacity of Executive Director (Fuel) of Damodar Valley Corporation having its Head Quarter at DVC TOWERS, V.I.P. Road, Ultadanga, Kolkata-700054, and the Nominated Owner of DVC Bermo Mines, by virtue of the Powers vested in me by the Corporation

B. C. SAHA
NOTARY
West Bengal
Kolkata
B. C. Saha
Notary
West Bengal
Kolkata

Contd..^r/2.

28 NOV 2014

Executive Director (Fuel).

B. C. SAHA
NOTARY
West Bengal
Kolkata

Signature of
K. N. Singh

(2)



do hereby confer upon Mr. Arbind Kumar Thakur, Son of
 Shri G.K. Thakur, aged 48 years, of Indian Nationality,
 in his capacity as Superintending Engineer (Mining) &
 DVC BERMO MINES,
 Agent, residing at DVC Bermo Mines, P.O. Bermo District.
 Bokaro, Pin No. 829104, the following powers :-

1. To sign and file application on behalf of the Corporation for renewal of the Mining Lease of Bermo Mines ;
2. To respond to queries and submit clarification etc ;
3. To execute the Mining Lease Deed for Bermo Mines;
4. Any other matter incidental to renewal of mining lease.

In witness whereof I have signed this POWER OF ATTORNEY at
 Kolkata on 28th day of November, 2014.

ACCEPTED

(ARBIND KUMAR THAKUR)

For Damodar Valley Corporation

(KASHI NATH SINGH)

Executive Director (Fuel)

A. N. SANA
NOTARY
 Bikanth Bhawan
 4th Block, Gr. Floor
 Salt Lake, Kolkata

A. N. SANA
 28 NOV 2014

28 NOV 2014



कार्यालय :- वन प्रमण्डल पदाधिकारी, बोकारो वन प्रमण्डल, बोकारो।

E-mail : dfobokarodivision@rediffmail.com

Phone/Fax No : +91-6542-265142

पत्रांक :-

दिनांक :-

सेवा में,

सहायक खनन पदाधिकारी,
बोकारो।

विषय :- बोकारो जिलान्तर्गत सर्वश्री दामोदर घाटी निगम द्वारा धारित कोयला खनन पट्टा के बाबत अनापत्ति प्रमाण-पत्र निर्गत करने के संबंध में।

प्रसंग :- आपका पत्रांक 1292 दिनांक 02.04.2016.

महाशय,

उपर्युक्त विषयक प्रासंगिक पत्र के संबंध में सूचित करना है कि विषयक मामले में बोकारो जिलान्तर्गत सर्वश्री दामोदर घाटी निगम द्वारा धारित कोयला खनन पट्टा के नवीकरण के प्रस्तावित प्लॉट (सूची संलग्न) वनभूमि से बाहर है, परंतु प्रस्तावित स्थल के खतियान में भूमि का किस्म जंगल-झाड़ दर्ज होने की स्थिति में माननीय सर्वोच्च न्यायालय के I.A. No. 202/1995 में दिनांक 12.12.1996 को पारित आदेश के अनुसार कोई भी गैर वानिकी कार्य भारत सरकार की पूर्वानुमति के बिना नहीं किया जाएगा।

अनु०:-यथोक्त।

विश्वासभाजन,

ह०/-

वन प्रमण्डल पदाधिकारी,
बोकारो वन प्रमण्डल, बोकारो।

ज्ञापांक 1669 दिनांक 02/04/16

प्रतिलिपि :- अधीक्षण अभियंता (खनन) एवं अभिकर्ता, दामोदर घाटी निगम,
बेरमो खान को सूचनार्थ एवं आवश्यक कार्रवाई हेतु प्रेषित।

वन प्रमण्डल पदाधिकारी,
बोकारो वन प्रमण्डल, बोकारो।

Rock type	Statistical Parameters	Density (Kg/m ³)	Compressive Strength (MPa)	Tensile Strength (MPa)	Young's Modulus (GPa)	Apparent Cohesion (MPa)	Internal Friction Angle (°)
	Standard Deviation	157	14.62	3.84	2.91	1.99	6.07

6.2.5 RESULTS

Table - 6.2.5

**Weighted Average Density & Strength of major Partings in borehole
CMDV-17, DVC Bermo Mines, East Bokaro Coalfield**

Sl. No	Parting	Depth (m)		Thick. (m)	Bulk Density gm/cc	Uniaxial Compressive strength (MPa)	Tensile strength (MPa)	RQD range (weighted average)	Lithotype
		From	To						
1	Weathered Mantle to Seam BERMO	3.00	35.20	32.20	2.40	31.01	7.24	4.80 – 100.00 (79.58)	SSMG, SANDYSH, ISH>SS, SSCG
2	Seam BERMO to Seam XI	46.80	67.24	20.44	2.48	45.09	2.01	93.31 – 100.00 (95.31)	ISS>SH, SSMG, SSCG, SANDYSH, ISH>SS
3	Seam XI to Seam X+IX	70.00	99.44	29.44	2.45	37.35	8.26	81.63 – 100.00 (95.71)	ISS>SH, SSMG, SSCG, SANDYSH, ISH>SS
4	Seam X+IX to Seam VIII	111.64	119.14	7.50	2.66	49.18	13.93	86.42 – 100.00 (94.66)	ISS>SH, SANDYSH, ISH>SS, SHALYSST
5	Seam VII+VI to Seam V	154.03	183.35	29.32	2.41	32.25	6.88	72.31 – 100.00 (96.85)	SSMG, SSCG, SANDYSH, ISH>SS
6	Seam V to Seam III	185.00	204.00	19.00	2.35	28.52	10.21	81.43 – 100.00 (91.22)	SSMG, SSCG, SANDYSH, ISH>SS

6.3 HYDROGEOLOGICAL STUDIES

6.3.1 Physiography

The topography of DVC Bermo Mines is gently undulating and considerable part of the block is affected by open cast mine of Seam BERMO and over burden dump. The general elevation in the block ranges between a low of 180

m around Bh no. CMDV-08 at the floor of Seam BERMO quarry to around 280m at the top part of over burden dump at northern part of the block. There is an OB dump area at the northern half portion.

6.3.2 Climate

The East Bokaro Coalfield bears a tropical climate. During summer months (April to June) the day temperature reaches around 45°C. During winter months (November to January) the weather is comparatively pleasant with day temperature around 24°C. Night-time temperature often falls to 4°C. The average rainfall during rainy season (July to September) is around 1200 mm.

6.3.3 Surface Hydro-Geology

DVC Bermo Mines of Damodar Valley Corporation (DVC) is situated in the East Bokaro Coalfields in Bokaro district of Jharkhand state. It is about 2.50 km northeast of Jarangdih Railway station on the Gumia - Chandrapura main line of the Eastern Railway. It lies between latitude 23° 46' 42.6288" to 23° 47' 24.0324" N and longitude 85° 57' 28.9008" to 85° 59' 9.5784" E. The area is covered by Survey of India Toposheet no. 72 E/9 (R.F. 1: 50,000). The location map of the area is enclosed as Plate No.— I.

The DVC Bermo Mines is characterized by gently undulating topography with depression and sandstone ridges. The maximum and minimum elevation of the pre-mining condition of the block is 237m and 225m above MSL respectively. Presently considerable area of the block is affected by open cast mine and over burden dump.

The drainages of the area is controlled by the Damodar River flowing from west to east, located south of the mines at a distance of around 1.0 km from the leasehold boundary. It's tributary **Karo nala flows** from north to south in the eastern part of the Mines and joins the Damodar River in the south of the mines at a distance of around 850m. The Shortest distance of Karo nala from the old worked quarry in the east is about 50 m. **Baid Karo nala** which is the tributary of Karo nala flows from north to south in the west of the mines and joins Karo nala in the south of the Mines, at a distance of more than 200m. The nearest distance of **Baid Karo nala** from the present quarry edge in the

west is around 335 m. There are some other seasonal tributaries of Damodar River and Karo nala which flows around the project. The easterly flowing Damodar River is the master drainage and perennial source of water for the area. Several small nalas emerging from the main upland traverses the area and flow towards Karo nala and Damodar River. The HFL of the Karo nala as recorded in the vicinity of the project is 229.70m above MSL. The HFL of the Baid Karo nala as recorded in the vicinity of the project is 221.56m above MSL. The drainage pattern of the area is mostly dendritic. Drainage map of the area is provided in Plate No. XIV-1.

6.3.4 Hydrogeology

The proposed mining area lies in the northern limb of main synclinal basin of East Bokaro Coalfield. This Coalfield displays a complete sequence of Gondwana rocks from the Talchir to the Mahadeva Formation. Rock formations here are represented mostly by coarse to medium grained sandstone with thick coal horizon. In the absence of a detailed geological report of the area and taking into account the available geological data of this Coalfield, the geological sequence of different formations has been assumed broadly to be the similar to that of the adjacent explored Block. The Formations encountered in the DVC Bermo Mines are Barakars and Metamorphics. The various hydrogeological units developed in the Mines area are as follows (as per Geological Plan (Plate No.: III), Graphic Litholog (Plate No.: IV) and Geological Cross-section (Plate No.: V)):

Table - 6.3.4

Hydrogeological units developed in DVC Bermo Mines, East Bokaro Coalfield

Coal Seams/Parting	Thickness Range (m)		Parting Range (m)		No. of Intersections
	Min	Max	Min	Max	
LOCAL-IV (Aquiclude)	0.33	0.40			2
	CMDV-01	CMDV-05			
Parting (Semi Confined Aquifer)			16.12	16.12	
			CMDV-01	CMDV-01	
LOCAL-III (Aquiclude)	0.32	0.83			3
	CMDV-20	CMDV-01			

Coal Seams/Parting	Thickness Range (m)		Parting Range (m)		No. of Intersections
	Min	Max	Min	Max	
Parting (Semi Confined Aquifer)			5.87	15.22	
			CMDV-24	CMDV-01	
BERMO (Aquiclude)	8.15	17.11			12
	CMDV-13	CMDV-05			
Parting (Semi Confined Aquifer)			13.50	23.63	
			CMDV-01	CMDV-06	
LOCAL-II (Aquiclude)	0.23	1.35			11
	CMDV-03	CMDV-09			
Parting (Semi Confined Aquifer)			8.31	11.52	
			CMDV-11	CMDV-22	
LOCAL-I (Aquiclude)	0.35	1.64			23
	CMDV-01	CMDV-18			
Parting (Semi Confined Aquifer)			4.45	12.89	
			CMDV-15	CMDV-18	
XI	0.43	3.00			24
XI (Aquiclude)	CMDV-19	CMDV-07, CMDV-12, CMDV-16, CMDV-24			
Parting (Semi Confined Aquifer)			17.55	33.88	
			CMDV-13	CMDV-19	
X+IX (Aquiclude)	8.03	15.07			24
	CMDV-14	CMDV-07			
Parting (Semi Confined Aquifer)			4.23	37.50	
			CMDV-18	CMDV-11	
VIII (Aquiclude)	17.00	27.59			24
	CMDV-14	CMDV-04			
Parting (Semi Confined Aquifer)			1.22	7.65	
			CMDV-13	CMDV-19	
VII+VI (Aquiclude)	8.11	16.32			22
	CMDV-24	CMDV-12			
Parting (Semi Confined Aquifer)			28.00	39.00	
			CMDV-10, CMDV-21	CMDV-24	
V	0.80	2.48			24

Coal Seams/Parting	Thickness Range (m)		Parting Range (m)		No. of Intersections
	Min	Max	Min	Max	
(Aquiclude)	CMDV-01, CMDV-21	CMDV-15			
Parting (Semi Confined Aquifer)			8.14	19.37	
			CMDV-04	CMDV-08	
IV (Aquiclude)	0.10	3.00			21
	CMDV-01, CMDV-03, CMDV-06	CMDV-10			
Parting (Semi Confined Aquifer)			3.34	8.90	
			CMDV-16	CMDV-06	
III (Aquiclude)	0.49	1.85			11
	CMDV-04	CMDV-12			

6.3.5 Aquifer Parameter

Detailed Aquifer Performance Test (APT) was not carried out in the DVC Bermo Mines. However, Aquifer Performance Test (APT) had been carried out in the nearby Makoli area of East Bokaro Coalfield situated at a distance of 4.72 km east of the project where permeability of the aquifer is determined as ranging from 0.38 to 0.50 m/d.

6.3.6 Pumping Test

Pumping Test has not been carried out in DVC Bermo.

6.3.7 Slug Injection Test

Slug Injection Test to evaluate Aquifer parameters have not been done in DVC Bermo Mines, East Bokaro Coalfield.

6.3.8 Water Quality

To determine the water quality in the area two representative samples of each effluent water sample, surface water sample, and drinking water samples were tested in Environmental Laboratory in CMPDI. The results shows toxic elements and elements within permissible limit. (As per MOEF SCH- VI STANDARDS CLASS-A & IS: 10500 Drinking water standard). The pH of the mine water and drinking water is varies in the ranges of 7.90 to 7.88 and 7.73 to 7.84 respectively. However, the TDS (Total Dissolved Solid) and Total

Hardness of dug well near DVC old colony (RCC Quarter of Umesh Singh) is marginally higher i.e. 524 and 264, (mg/L) respectively. The descriptive lithologs indicate that the OB materials do not contain any Pyrite. Hence, there is no possibility of acid mine drainage which is proven by pH of the mine water. Since no processing activity is involved in coal mining, the mine water is free from any pollutant. However, movement of HEMM for transportation of overburden and coal, may result in high TSS (Total Suspended Solid) in mine discharge. Since, the coal mining activity does not induce any unwanted chemical or elements into the groundwater affecting the water chemistry except for TSS; no serious pollutant has been observed in the mine water discharge.

Table - 6.3.8.A

**Details of Samples Collected for Water Quality Determination in DVC
Bermo Mines, East Bokaro Coalfield**

Sl. No.	Sample	Sample No.	Location
1	Effluent water sample	S1	Mine Dewatering Through Submersible Pump from UG Stored Water
2		S2	Mine Dewatering from Main sump of DVC Bermo OCP
3	Surface water sample	S3	Down Stream of Karo nala, S-W of Periphery of DVC Bermo Mine
4		S4	Up stream of Karo Nala , East of Periphery of DVC Bermo Mine near Culvert
5	Drinking Water sample	S5	At the floor of Bermo Seam at Exploratory BH no. CMDV-02
6		S6	Dugwell near DVC Old Colony (RCC Quarter, Qtr of Umesh Singh)

Table - 6.3.8.B

Effluent Water Quality Data in DVC Bermo Mines, East Bokaro Coalfield

Sl.No.	Parameter	Sample		Detection Limit	MOEF - SCH-VI STANDAR DS Class 'A'	BIS Standard & Method
		S1	S2			
1	Ammonical Nitrogen, mg/l, Max	0.08	0.10	0.02	50.0	IS 3025/34:1988, R : 2009, Nessler's
2	Arsenic (as As), mg/l, Max	<0.002	<0.002	0.002	0.2	IS 3025/37:1988 R : 2003, AAS-VGA
3	B.O.D (3 days 27°C), mg/l, Max	2.00	2.00	2.00	30.0	IS 3025 /44:1993,R:2003 3 day incubation at 27°C

Sl.No.	Parameter	Sample		Detection Limit	MOEF - SCH-VI STANDARDS Class 'A'	BIS Standard & Method
		S1	S2			
4	Cadmium(as Cd), mg/l, Max	<0.0005	<0.0005	0.0005	2.0	APHA, 22 nd Edition, AAS-GTA
5	COD, mg/l, Max	32	44	4.00	250.0	APHA, 22 nd Edition, Closed Reflux, Titrimetric
6	Copper (as Cu), mg/l, Max	<0.03	<0.03	0.03	3.0	IS 3025/42: 1992 R : 2009, AAS-Flame
7	Dissolved Phosphate, mg/l, Max	<0.30	<0.30	0.30	5.0	APHA, 22 nd Edition Molybdovanadate
8	Fluoride (as F) mg/l, Max	0.74	0.78	0.02	2.0	APHA, 22 nd Edition, SPADNS
9	Free Ammonia, mg/l, Max	<0.02	<0.02	0.02	5.0	IS:3025/34:1988, Nessler's
10	Hexavalent Chromium, mg/l, Max	<0.01	<0.01	0.01	0.1	APHA, 22 nd Edition, Diphenylcarbohydrazide
11	Iron (as Fe), mg/l, Max	<0.06	<0.06	0.06	3.0	IS 3025 /53 : 2003, R : 2009 , AAS-Flame
12	Lead (as Pb), mg/l, Max	<0.005	<0.005	0.005	0.1	APHA, 22 nd Edition, AAS-GTA
13	Manganese(as Mn), mg/l, Max	<0.02	<0.02	0.02	2.0	IS-3025/59:2006, AAS-Flame
14	Nickel (as Ni), mg/l, Max	<0.01	<0.01	0.01	3.0	IS-3025/54:2003, AAS-Flame
15	Nitrate Nitrogen, mg/l, Max	8.9	7.4	0.50	10.0	APHA, 22 nd Edition, UV-Spectrophotometric
16	Oil & Grease, mg/l, Max	<2.00	<2.00	2.00	10.0	IS 3025/39:1991, R : 2003, Partition Gravimetric
17	pH value	7.90	7.88	0.2	5.5 to 9.0	IS-3025/11:1983, R-1996, Electrometric
18	Phenolic compounds (as C ₆ H ₅ OH), mg/l, Max	<0.001	<0.001	0.001	1.0	APHA, 22 nd Edition 4-Amino Antipyrine
19	Selenium (as Se), mg/l, Max	<0.002	<0.002	0.002	0.05	APHA, 22 nd Edition, AAS-GTA
20	Sulphide (as SO ₃), mg/l, Max	<0.005	<0.005	0.005	2.0	APHA, 22 nd Edition Methylene Blue
21	Temperature (°C)	23.7	23.7	Shall not exceed 5° C above the receiving temp.		IS-3025/09:1984, Thermometric
22	Total Chromium (as Cr), mg/l, Max	<0.04	<0.04	0.04	2.0	IS-3025/52:2003, AAS-Flame
23	Total Kjeldahl Nitrogen, mg/l, Max	<1.00	<1.00	1.00	100.0	IS:3025/34:1988, Nessler's
24	Total Residual Chlorine, mg/l, Max	<0.02	<0.02	0.02	1.0	APHA, 22 nd Edition, DPD
25	Total Suspended Solids, mg/l, Max	22	40	10.00	100.0	IS 3025/17:1984, R :1996, Gravimetric
26	Zinc (as Zn), mg/l, Max	0.01	<0.01	0.01	5.0	IS 3025 /49 : 1994, R : 2009, AAS-Flame

Table - 6.3.7.C

Surface Water Quality Data in DVC Bermo Mines, East Bokaro Coalfield

Sl. No.	Parameter	Sampling Stations		Detection Limit	BIS Standard & Method
		S3	S4		
1	Arsenic (as As), mg/l, Max	<0.002	<0.002	0.002	IS 3025/37:1988 R : 2003, AAS-VGA
2	BOD (3 days 27°C), mg/l, Max	2.40	2.80	2.00	IS 3025 /44: 1993, R : 2003 3 day incubation at 27°C
3	Cadmium(as Cd), mg/l, Max	<0.0005	<0.0005	0.0005	APHA, 22 nd Edition AAS-GTA
4	Chlorides (as Cl), mg/l, Max	80	64	2.00	IS-3025/32:1988, R-2007, Argentometric
5	Copper (as Cu), mg/l, Max	<0.03	<0.03	0.03	IS 3025 /42 : 1992 R : 2009, AAS-Flame
6	Dissolved Oxygen, min.	4.40	4.70	0.10	IS 3025/38:1989, R : 2003, Winkler Azide
7	Fluoride (as F) mg/l, Max	0.78	0.55	0.02	APHA, 22 nd Edition SPADNS
8	Hexavalent Chromium, mg/l, Max	<0.01	<0.01	0.01	APHA, 22 nd Edition, 1,5 - Diphenylcarbohydrazide
9	Iron (as Fe), mg/l, Max	<0.06	<0.06	0.06	IS 3025 /53 : 2003, R : 2009, AAS-Flame
10	Lead (as Pb), mg/l, Max	<0.005	<0.005	0.005	APHA, 22 nd Edition AAS-GTA
11	Nitrate (as NO ₃), mg/l, Max	23.03	10.63	0.50	APHA, 22 nd Edition, UV-Spectrophotometric
12	pH value	7.74	7.01	0.2	IS-3025/11:1983, R-1996, Electrometric
13	Phenolic compounds (as C ₆ H ₅ OH), mg/l, Max	<0.001	<0.001	0.001	APHA, 22 nd Edition 4-Amino Antipyrine
14	Selenium (as Se), mg/l, Max	<0.002	<0.002	0.002	APHA, 22 nd Edition AAS-GTA
15	Sulphate (as SO ₄) mg/l, Max	104	48	2.00	APHA, 22 nd Edition Turbidity
16	Total Dissolved Solids, mg/l, Max	684	498	25.00	IS 3025 /16:1984 R : 2006, Gravimetric
17	Total Suspended Solids, mg/l, Max	52	34	10.00	IS 3025 /17:1984, R : 1996, Gravimetric
18	Zinc (as Zn), mg/l, Max	0.01	<0.01	0.01	IS 3025 /49 : 1994, R : 2009, AAS-Flame

Table - 6.3.7.D

Drinking water quality data in DVC Bermo Mines, East Bokaro Coalfield

Sl.No	Parameter	Sampling Stations		Detect-ion Limit	IS:10500 Drinking Water Standards	Standard / Test Method
		1	2			
1	Boron (as B), mg/l, Max	<0.20	<0.20	0.20	0.5	APHA, 22 nd Edition, Carmine
2	Cadmium (as Cd), mg/l, Max	<0.0005	<0.0005	0.0005	0.003	APHA, 22 nd Edition, AAS-GTA
3	Calcium (as Ca), mg/l, Max	36.8	64.0	1.60	75	IS-3025/40:1991, EDTA
4	Chloride (as Cl), mg/l, Max	24	64	2.00	250	IS-3025/32:1988, R-2007, Argentometric
5	Copper (as Cu), mg/l, Max	<0.03	<0.03	0.03	0.05	IS 3025/42 : 1992 R : 2009, AAS-Flame
6	Fluoride (as F) mg/l, Max	0.48	0.54	0.02	1.0	APHA, 22 nd Edition, SPADNS
7	Free Residual Chlorine, mg/l, Min	<0.02	<0.02	0.02	0.2	APHA, 22 nd Edition, DPD
8	Iron (as Fe), mg/l, Max	<0.06	<0.06	0.06	0.3	IS 3025 /53 : 2003, R : 2009, AAS-Flame
9	Lead (as Pb), mg/l, Max	<0.005	<0.005	0.005	0.01	APHA, 22 nd Edition, AAS-GTA
10	Manganese (as Mn), mg/l, Max	0.02	<0.02	0.02	0.1	IS-3025/59:2006,AAS-Flame
11	Nickel (as Ni), mg/l, Max	<0.01	<0.01	0.01	0.02	IS 3025/54:2003, AAS-Flame
12	Nitrate (as NO ₃), mg/l, Max	11.96	9.92	0.5	45	APHA, 22 nd Edition, UV-Spectrophotometric
13	Odour	Agreeable	Agreeable	Qualitative	Agreeable	IS 3025 /05:1983, R-2012, Qualitative
14	pH value	7.73	7.84	0.2	6.5 to 8.5	IS-3025/11:1983, R-1996, Electrometric
15	Phenolic compounds (as C ₆ H ₅ OH), mg/l, Max	<0.001	<0.001	0.001	0.001	APHA, 22 nd Edition, 4-Amino Antipyrine
16	Selenium (as Se), mg/l, Max	<0.002	<0.002	0.002	0.01	APHA, 22 nd Edition, AAS-GTA
17	Sulphate (as SO ₄) mg/l, Max	84	114	2.00	200	APHA, 22 nd Edition, Turbidity
18	Total Alkalinity (CaCO ₃), mg/l, Max	136	144	4.00	200	IS-3025/23:1986, Titration
19	Total Arsenic (as As), mg/l, Max	<0.002	<0.002	0.002	0.01	IS 3025/ 37:1988 R : 2003, AAS-VGA
20	Total Chromium (as Cr), mg/l, Max	<0.04	<0.04	0.04	0.05	IS-3025/52:2003, AAS-Flame
21	Total Dissolved Solids, mg/l, Max	314	524	25.00	500	IS 3025 /16:1984 R : 2006, Gravimetric

Sl.No	Parameter	Sampling Stations		Detect-ion Limit	IS:10500 Drinking Water Standards	Standard / Test Method
		1	2			
22	Total Hardness (CaCO ₃), mg/l, Max	152	264	4.00	200	IS-3025/21:1983, R-2002, EDTA
23	Turbidity, NTU, Max	2	3	1.0	1	IS-3025/10:1984 R-1996, Nephelometric
24	Zinc (as Zn), mg/l, Max	0.01	0.01	0.01	5.0	IS 3025/ 49 : 1994, R : 2009, AAS-Flame

6.3.8 Ground Water Levels

6.3.8.1 Existing Groundwater Levels

To assess the water table configuration, 64 dug wells, covering most of the villages are taken into considerations for water level monitoring. The details of these monitoring wells and water levels monitored during Pre-monsoon (2011) and Post-monsoon period (2015) are given in Table - 6.3.8.1. The selected wells are mostly used for domestic purposes. Water table contour map of the study area has been shown in Plate No. XIV-2.

Table - 6.3.8.1

Ground Water Monitoring Data from Dug Wells in the Study Area of DVC Bermo Mines, East Bokaro Coalfield

Sl. No.	Well No.	Village	Owner	Formation	Utility	Depth	Diameter	MP	Water Level (meters) BGL									
									Pre	Post	Pre	Post	Pre	Post	Pre	Post	Pre	Post
						Meter	AGL	2011	2011	2012	2012	2013	2013	2014	2014	2015	2015	
1	EB-1	Tonia Basti	Hiru Mahato	Barakar	Domestic	12.60	2.00	GL	4.50	1.75	4.20	1.70	3.05	1.30	1.40	1.10	2.13	2.10
2	EB-4	Tami Basti	Durga Mahato	Metamorphic	Domestic	10.70	4.50	0.30	9.95	5.00	8.57	5.70	8.96	5.20	7.10	6.50	8.40	-
3	EB-5	Gunjardih	Durga Mahato	Metamorphic	Domestic	8.40	1.40	1.00	7.90	5.70	4.70	2.75	4.90	2.40	4.60	3.85	5.20	4.40
4	EB-6	Mungo (Gunjardih)	Sangram Mahato	Metamorphic	Domestic	9.60	2.45	0.45	9.15	5.10	7.92	5.70	8.90	5.15	6.90	6.20	8.05	7.65
5	EB-8	Makoli More	CCL	Barakar	Domestic	6.50	3.60	0.90	1.92	1.85	1.80	1.65	2.10	1.90	2.80	2.00	2.60	1.65
6	EB-9	Lahariatand	DVC BTPS	Barakar	Domestic	11.65	2.03	0.50	8.13	2.90	8.20	2.80	7.50	3.10	3.45	3.20	4.30	-
7	EB-10	Garma Jarwa Basti	Charku Prajapati	Barakar	Domestic	7.90	3.80	0.80	8.00	3.35	6.97	3.55	6.15	4.15	5.40	5.05	6.60	-
8	EB-11	Govindpur	CCL	Barakar	Domestic	5.20	3.25	0.65	4.43	2.55	3.72	2.60	3.60	2.60	3.23	2.70	4.00	-
9	EB-13	Jarwa Basti	Community Well	Metamorphic	Domestic	5.10	2.09	0.50	1.70	0.75	1.93	1.00	2.60	0.50	2.50	0.90	-	1.40
10	EB-15	Kurkpaniya Basti	Public Well	Barakar	Domestic	7.40	2.09	0.45	5.08	3.35	6.75	3.20	6.75	3.05	6.95	3.20	6.75	-
11	EB-16	Kurkpaniya	Public Well	Metamorphic	Domestic	4.50	1.92	0.70	1.38	1.25	2.63	1.35	3.60	2.40	2.95	1.76	2.50	2.40
12	EB-17	Gandhi Nagar	Jagdish Mallah	Barakar	Domestic	7.34	2.09	GL	3.83	1.70	6.13	1.85	6.35	2.00	4.50	3.05	4.63	-
13	EB-18	Chalkari Colony	Public Well	Barakar	Domestic	7.50	3.00	1.00	4.70	4.34	6.25	4.90	4.95	4.60	5.40	4.65	4.37	-
14	EB-21	Karo Basti	CCL	Barakar	Domestic	7.50	1.50	0.45	6.42	2.48	5.52	2.65	6.80	2.80	-	7.05	-	-
15	EB-22	Amlo Basti	Chandra Deo Singh	Barakar	Domestic	7.04	2.06	0.30	3.52	2.45	4.70	3.50	5.00	3.47	3.20	2.90	2.95	3.00
16	EB-24	Phusro	Mohan Lal Keshri	Barakar	Domestic	7.90	2.00	1.05	3.65	2.25	3.45	2.85	4.40	2.90	4.10	2.40	4.95	3.75
17	EB-25	Jarangdih	CCL	Barakar	Domestic	8.93	3.04	0.45	6.29	5.85	6.90	5.95	6.85	5.80	-	6.25	6.70	-
18	EB-25A	Jarangdih	CCL	Barakar	Domestic	5.98	1.44	0.37	2.03	1.58	1.63	1.58	2.03	1.53	2.28	1.73	1.23	1.28
19	EB- 26	Kathara	CCL	Barakar	Domestic	13.25	3.08	0.65	3.35	3.25	5.45	3.90	4.25	3.42	3.55	2.85	4.20	2.65
20	EB-29	Naya Basti	DVC/Public Well	Metamorphic	Domestic	9.25	2.00	0.60	8.65	4.25	7.90	4.12	8.60	4.50	7.40	6.47	-	7.20
21	EB-30	Kanjikro	Public Well	Metamorphic	Domestic	7.56	1.87	0.55	6.55	2.95	5.30	3.50	6.05	3.75	4.45	4.35	5.75	

Sl. No.	Well No.	Village	Owner	Formation	Utility	Depth	Diameter	MP	Water Level (meters) BGL									
									Pre	Post	Pre	Post	Pre	Post	Pre	Post	Pre	Post
						Meter		AGL	2011	2011	2012	2012	2013	2013	2014	2014	2015	2015
22	EB-31	Lukubad	Dinu Ganju	Metamorphic	Domestic	8.40	2.68	GL	8.27	5.05	7.73	5.40	8.30	5.05	7.00	6.30	8.05	7.30
23	EB-32	Jarangdih Project Area	CCL	Barakar	Domestic	7.57	2.28	1.25	0.90	0.55	1.02	0.85	1.80	1.05	2.05	1.45	1.07	1.15
24	EB-33	Bemo Colliery	Dagan Prasad	Barakar	Domestic	9.24	2.20	0.70	8.27	3.50	8.40	3.45	8.40	2.85	8.15	5.13	8.07	-
25	EB-34	Rath Mandir Basti	Temple authority	Barakar	Domestic	10.74	2.94	0.90	9.60	5.90	9.59	6.60	9.60	6.60	9.35	8.35	-	-
26	EB-35	Sunday Bazar	CCL	Barakar	Domestic	5.65	3.08	0.60	4.15	2.70	3.10	1.90	3.65	1.70	3.60	3.00	3.10	-
27	EB-36	Pahadi Dhouda	CCL	Barakar	Domestic	11.10	3.00	0.66	5.17	1.19	2.44	1.34	5.34	2.74	5.24	1.74	1.76	2.44
28	EB-37	Ramnagar Colony	CCL	Barakar	Domestic	5.63	3.08	0.60	2.78	2.03	3.45	2.20	3.40	2.25	2.70	2.23	3.60	3.12
29	EB-38	Kargali	CCL	Barakar	Domestic	6.68	2.70	0.60	-	-	6.08	4.15	6.00	2.60	4.05	2.20	3.25	5.90
30	EB-39	Kargali	CCL	Barakar	Domestic	10.30	2.34	0.66	1.62	1.29	2.29	2.04	1.74	1.59	2.05	1.64	1.64	-
31	EB-40	Kalyani (Toryo)	CCL	Barakar	Domestic	4.26	2.73	0.20	3.75	1.45	3.27	1.60	2.50	1.30	1.60	1.50	5.22	-
32	EB-41	Chirudih (Tami)	Temple Authority	Metamorphic	Domestic	8.66	2.00	1.00	7.65	2.40	5.60	2.50	6.35	2.44	4.50	3.50	5.63	6.60
33	EB-42	Alargo	Dhaneshwar Turi	Barakar	Domestic	7.33	1.50	0.36	6.61	3.10	5.61	3.64	5.89	3.79	4.59	4.09	5.14	5.24
34	EB-43	Jaridih Up. Bazaar	Public Well	Barakar	Domestic	9.60	2.60	0.70	7.68	2.75	7.90	3.00	6.60	2.35	7.50	6.75	6.50	-
35	EB-44	Jaridih Bazaar	Public Well	Barakar	Domestic	7.88	2.52	0.80	5.83	3.70	5.80	2.30	4.30	1.85	2.50	1.75	1.73	-
36	EB-45	Bemo Rly Station	Abyash Yadav	Barakar	Domestic	3.07	1.00	0.25	1.90	1.40	1.65	1.30	1.70	1.55	1.65	1.55	1.75	2.25
37	EB-46	Khasmahal Colony	CCL	Barakar	Domestic	7.67	3.32	1.00	2.12	1.80	2.97	1.87	3.00	1.60	1.80	1.62	1.80	-
38	EB-47	Pilpilo Road	CCL	Metamorphic	Domestic	6.10	4.76	1.00	1.80	0.25	2.08	0.80	1.40	1.00	1.25	1.00	1.25	1.90
39	EB-48	Pilpilo Basti	Hari Narayan	Metamorphic	Domestic	12.78	2.14	GL	9.33	6.80	11.95	8.90	11.50	6.00	9.30	7.50	-	10.20
40	EB-49	Bhurkundwa Basti	CCL	Barakar	Domestic	9.00	3.00	0.80	3.38	2.40	4.65	2.70	2.80	1.85	2.80	2.60	2.30	2.30
41	EB-50	Mahali Bandh	Public Well	Barakar	Domestic	12.80	3.12	0.70	6.60	4.08	5.95	4.10	6.35	4.80	5.30	4.65	5.87	3.55
42	EB-51	Mahali Bandh	Temple authority	Barakar	Domestic	7.55	2.70	0.75	6.00	2.05	6.80	1.75	6.80	1.75	2.08	1.85	2.00	-

CMPDI

Sl. No.	Well No.	Village	Owner	Formation	Utility	Depth	Diameter	MP	Water Level (meters) BGL							
									Pre	Post	Pre	Post	Pre	Post	Pre	Post
									2011	2011	2012	2012	2013	2013	2014	2014
						Meter		AGL								
43	EB-54	Chapri	U.S.Viswakarma	Metamorphic	Domestic	8.00	1.25	0.32	-	-	7.08	3.83	6.68	3.48	7.00	6.31
44	EB-57	Sarubera	Jivadhar Mahato	Metamorphic	Domestic	10.70	2.05	0.45	-	-	8.25	5.25	8.75	5.40	8.55	6.60
45	EB-58	Palamu	Govinda Mahato	Metamorphic	Domestic	8.75	2.00	0.38	-	-	-	-	-	-	8.10	-
46	EB-59	Phuljharia	Govt	Metamorphic	Domestic	7.10	1.90	0.45	-	-	-	-	3.80	-	-	-
47	EB-60	Kodwadih	Arjun Mahato	Metamorphic	Domestic	11.70	2.50	0.30	-	-	10.60	7.65	10.80	7.55	10.50	9.05
48	EB-61	Lemodih	Hulash Mahato	Metamorphic	Domestic	9.35	3.70	0.40	-	-	5.70	-	4.90	2.00	4.20	3.42
49	EB-62	Majhlitand	Bharat Mahto	Metamorphic	Domestic	10.20	3.10	0.40	-	-	-	-	-	-	-	7.30
50	EB-63	Jamunpania	Chettal Mahto	Metamorphic	Domestic	9.90	3.00	0.25	-	-	-	-	7.55	3.85	-	-
51	EB-64	Baradih	Govt	Metamorphic	Domestic	10.40	1.60	0.60	-	-	-	-	10.10	-	-	-
52	EB-75	Pichhri	Govt Well	Barakar	Domestic	7.70	3.10	0.80	-	-	-	2.45	4.10	2.25	3.83	2.80
53	EB-82	Kuamara	Hiralal Manjhi	Metamorphic	Domestic	8.15	3.10	0.43	-	-	6.57	4.40	6.87	-	-	-
54	EB-84	Totadih	Sibu Manjhi	Metamorphic	Domestic	10.50	3.10	GL	-	-	9.00	4.40	4.90	-	6.80	4.10
55	EB-85	Khero	Babua Manjhi	Metamorphic	Domestic	9.35	3.55	0.35	-	-	8.45	6.55	8.90	6.55	8.40	7.10
56	EB-86	Ramsingh- ra	Vishnu Manjhi	Metamorphic	Domestic	10.65	3.00	0.40	-	-	9.80	7.95	9.65	3.15	9.00	3.10
57	EB-87	Behragora	Brijlal Rajwar	Metamorphic	Domestic	9.00	2.70	0.25	-	-	7.35	5.30	-	-	5.00	4.70
58	EB-88	Angwalli	Leele Devi	Barakar	Domestic	7.80	2.95	0.33	-	-	4.67	3.54	4.62	3.17	4.35	4.05
59	EB-89	Barwapani	Govt. Well	Metamorphic	Domestic	6.90	2.90	0.30	-	-	4.70	3.00	3.45	2.85	-	-
60	EB-92	Tupkadih	Butan Mahato	Metamorphic	Domestic	9.95	2.60	0.15	-	-	9.05	4.35	7.55	4.45	7.22	5.75
61	EB-101	Nawadih	Govt Well	Metamorphic	Domestic	4.85	2.00	0.40	-	-	-	-	-	-	-	-
62	EB-115	Pipardi Village	Dilchand Thakur	Metamorphic	Domestic	14.00	3.37	0.25	-	-	-	-	-	-	-	-
63	EB-116	Narayapur	Constructed by CCL	Metamorphic	Domestic	10.00	2.50	0.40	-	-	-	-	-	-	-	-
64	EB-117	Bansi	Govt.	Metamorphic	Domestic	30.00	2.00	0.00	-	-	-	-	-	-	-	-

*MP – Measuring Point

*Pre – Pre Monsoon

*Post – Post Monsoon

*All the Parameters are in meter.

*AGL – Above Ground Level

6.3.8.2 Artesian Condition

Four artesian wells are encountered on the floor of Bermo seam (i.e. roof of Karo group of seams) in Borehole nos. CMDV-02, CMDV-08, CMDV-21 & CMDV-22. The closing depth of CMDV-02 (RL: 182.54m) is 150m, with piezometric head of 1.15m above ground level. RL of piezometric head being 183.69m on Bermo seam floor and flow of the well measured on 18.01.2016 is 0.80 lps. The closing depth of CMDV-08 (RL: 181.50m), CMDV-21 (RL: 185.15m), CMDV-22 (RL: 218.30m) are 188m, 166m, and 194m respectively.

6.3.8.3 Historical Groundwater Levels

Ground water level by Permanent Observation Well (PoW) of the area is continuously monitored by CMPDI. There is no Permanent Observation Well (PoW) of CGWB (Central Ground Water Board) in the study area of DVC Bermo Mines. The pre-monsoon and post-monsoon historical groundwater levels for the last few years (2002 to 2015) recorded by CMPDI at the nearest permanent hydrograph stations (Well No.: EB-17) at Bokaro Colliery Office (Gandhi Nagar) which is at a distance of 650 m towards West of the Bermo Mines and at Amlo Basti (Well No.: EB-22) at 1.9 km east of the DVC Bermo Mines area are given below:

Table - 6.3.8.3.A
Historic Pre-monsoon and Post-monsoon groundwater levels for Well
No. EB-17 at Bokaro Colliery Office,
Gandhi Nagar

Station/ Year	Historic groundwater levels (in metres bgl.)		
	Pre-Monsoon	Post-Monsoon	Fluctuation
2002	1.24	1.0	0.24
2003	7.34	-	-
2004	2.98	2.48	0.50
2009	-	2.50	-
2010	7.34	1.87	5.47
2011	3.83	1.70	2.13
2012	6.13	1.85	4.28
2013	6.35	2.0	4.35
2014	4.50	3.05	1.45

Station/ Year	Historic groundwater levels (in metres bgl.)		
	Pre-Monsoon	Post-Monsoon	Fluctuation
2015	4.63	-	-
Average	4.93	2.06	2.87

Table - 6.3.8.3.B

**Historic Pre-monsoon and Post monsoon groundwater levels for Well
No. EB-22 at Amlo Basti**

Station/ Year	Historic groundwater levels (in metres bgl.)		
	Pre-Monsoon	Post-Monsoon	Fluctuation
2002	-	2.65	-
2003	3.98	-	-
2004	5.60	5.40	0.20
2005	-	2.45	-
2009	3.50	2.93	0.57
2010	3.90	2.58	1.32
2011	3.52	2.45	1.07
2012	4.70	3.50	1.20
2013	5.0	3.47	1.53
2014	3.20	2.90	0.30
2015	2.65	2.0	0.65
Average	4.01	3.03	0.98

Avg. Pre-monsoon water level = 4.47 m

Avg. Post-monsoon water level = 2.55 m

Avg. Water level fluctuation in the study area= 1.93 m

6.3.8.4 Water Level Trend

The above data shows that the Pre-monsoon water levels vary from 7.34m (2010, Bokaro Colliery Office, Gandhi Nagar) to 1.24m (2002, Bokaro Colliery Office, Gandhi Nagar, with an average of 4.47m and the Post-monsoon water levels vary from 5.40m (2004, at Amlo Basti) to 1.00m (2002, at Bokaro Colliery Office, Gandhi Nagar) with an average of 2.55m.

The water level fluctuation varies from 5.47m (2010, at Bokaro Colliery Office, Gandhi Nagar) to 0.20m (2004 at Amlo Basti) with an average fluctuation of 1.93m in the area. The Pre-monsoon and Post-monsoon water level trends of the above hydrograph stations are shown in Fig 6.3.8.4.A and Fig 6.3.8.4.B.

The Pre-monsoon and Post-monsoon water levels at Bokaro Colliery Office (Gandhi Nagar) hydrograph station shows a marginally declining trend. This may be attributed to the increase in the population of Bermo area leading to increase in groundwater draft by local people. The pre-monsoon and post-monsoon water levels at Amlo Basti shows increasing trend. This may be attributed to the constant recharge from mine water discharge in the area and recharge from nearby abandoned mine pit. Overall groundwater utilization with the increasing population and by mining has not affected the local groundwater regime. Studies reveal that the general water table gradient for the top aquifer in the study area is 1.05×10^{-3} from west to east.

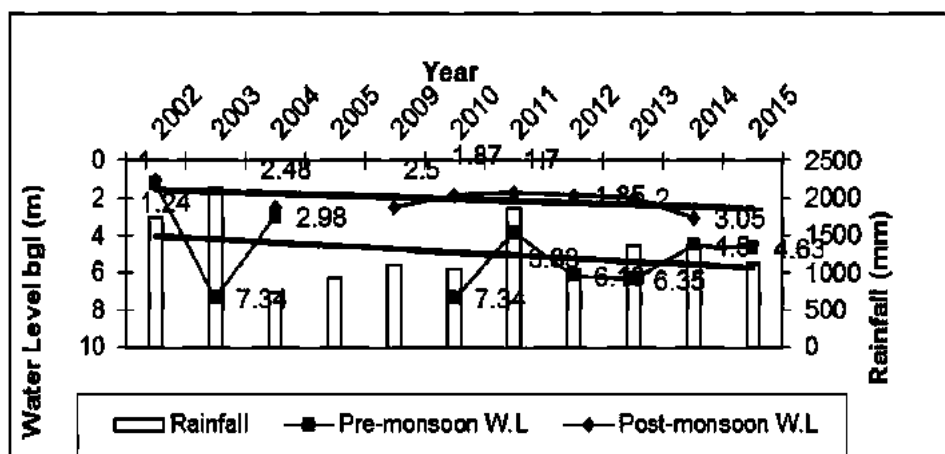


Fig 6.3.8.4.A: Hydrograph of Well No: EB-17 at Bokaro Colliery Office, Gandhi Nagar.

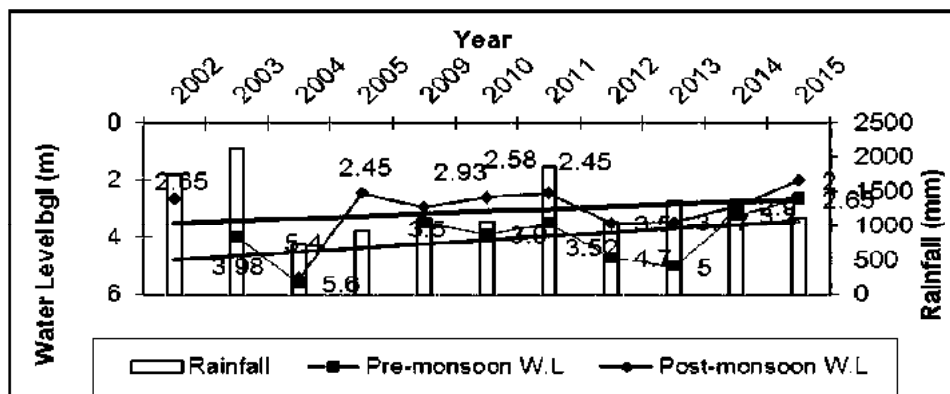


Fig 6.3.8.4.B: Hydrograph of Well No: EB-22 at Amlo Basti.

6.3.8.5 Present Water Discharge

To meet the safety of the mine and create good working conditions, it is necessary to discharge the mine water collection onto the surface. However, no significant mine water seepage is observed in existing opencast mine during non-monsoon period. As per the Project Authority, present mine water seepage during non-monsoon is about 278 m³/day, which after de-siltation is being utilized for domestic supply of Bermo project. During non-monsoon period, due to non-availability of sufficient mine water, Project Authority also withdraws water from nearby Kargali project of CCL. To handle the rainwater accumulation during monsoon period, two centrifugal pumps 125 HP/ 850 GPM and 100 HP/ 800 GPM have been installed.

6.3.8.6 Groundwater Stage Development

Coal mining is the major industrial activity in the study area. CGWB, Mid-Eastern Region, Patna has reported the stage of ground water development in Bermo development Mines as 43.93 % and identified the region with category "Safe". The ground water development in Bokaro district was reported as 34.50 % and identified under the category of "Safe".

6.3.8.7 Watershed Description

The project area lies in the catchment area of the Karo nala, which is the tributary of the master drainage Damodar River in the study area. Karo nala flows from north to south, in the NE and west of the Mines, to meet master drainage Damodar River. The Karo nala is a 5th order stream, which flows towards south of the project to meet Damodar river at a distance of around 850

m. The Karo nala consists of 55 first order streams, 14 second order streams, 4 third order streams and 2 fourth order streams.

The leasehold area of Bermo Mines is 1.69 sq.km (169 Ha) whereas the present quarriable area is about 0.9717 sq.km (97.17 Ha). The total present excavated mining area of the Bermo Mines (97.17 Ha) is significantly small as compared to the catchment area of the Karo nala (23.05 sq. km). Mining of this small portion (4.22% of Karo nala watershed) will hardly have any impact on the topography and drainage of the area.

6.3.8.8 Impact on Topography and Drainage

In the present Bermo Mines, opencast mining has already been initiated due to its quarriable potentiality. Mining of coal by open cast method causes changes in topography. The change of ground relief in a mine area influences the local drainage. This may alter the drainage at the micro level. The important river controlling the drainage of the project area is Damodar River and its tributary Karo nala. The drainage of the Mines is controlled by master drainage Damodar River which flows from west to east and south of the Mines at a safe distance of around 1.0 km from leasehold boundary. It's tributary Karo nala flowing from north to south in the east of the Mines and joins Damodar River in the south of the project at a distance of around 850m. The nearest distance of Karo nala from old worked quarry in the east is around 50m. Baid Karo nala which is the tributary of Karo nala flows from north to south in the west of the Mines and joins Karo nala in the south of the Mines, at a distance of more than 200m. The distance of Baid Karo nala from present quarry edge in the west is around 335m. Karo nala is a 5th order seasonal stream, which flows in the north, east and west of the project. There are some other seasonal tributaries of Damodar River and Karo nala flows around the project. The easterly flowing Damodar River is the master drainage and perennial source of water for the area. Several small nalas emerging from the main upland traverses the area and flow towards Karo nala and Damodar River. The other major stream flows near the study area is Amlo nala (which is the tributary of Karo nala, in the east of the Mines). The HFL of the Karo nala as recorded in the vicinity of the project is 229.70m (Date: 25.07.2000) whereas the nearby surface RL of the project

is 234.60m. The HFL of the Baid karo nala as recorded in the vicinity of the project is 221.55m (Date: 25.07.2000) whereas the nearby project surface RL is 222.50m. There is no problem of surface water inrush into the mine as Pre-mining elevation of topography varies from 237.0 m and 225.0 m above MSL. Rainwater and groundwater which seeps into the mine should be accumulated into the lower most sump, after desiltation and treatment, it may be utilized to meet the domestic and industrial demand of the project and surplus rainwater accumulation in the mine may be discharged into the nearby drainage system. Hence, there will be no impact on drainage quantitatively.

6.4 GASSINESS STUDIES

Since the majority of the coal seams occur within the depth of 200 m gassiness studies are not taken into consideration for this Mines.

6.5 TEMPERATURE GRADIENT

As temperature gradient study is specially designed for coal seams occurring beyond 300 meter depth and proposed for underground mining. Hence, this study is not required here.

6.6 WASHABILITY STUDIES

No washability test of borehole cores has been carried out in DVC Bermo Mines.

Govt. of Jharkhand
Department of Mines & Geology

Letter No.-Kha.Ni(Bokaro)-01/2015 - 2260 /M., Ranchi,

Dated - 28.10.2015

From,

Anand Mohan Thakur,
Joint Secretary to the Govt.

To,

Sri K.K. Singh
Executive Director (Fuel),
DVC Towers, VIP Road,
Kolkata - 700054

Sub :- Application for renewal of coal mining lease area on 413.74 acre of Village - Baidkaro, Kargali, Karo & Amlo of Bermo circle by M/s. DVC, Bermo Mines.

Ref :- Your letter no.-HQ/Mining/30/896, dated - 31.08.2015 and letter no.-982/Mining, dated - 21.03.2015 of Deputy Commissioner, Bokaro.

Sir,

In reference to the subject stated above it is to state that the Bermo Mines, having mining lease upto 31.12.2015, cannot be extended beyond the date i.e. 31.12.2015 in the light of the Rule-24A(6) of Mining Rule, 1960. The mining lease automatically will come to an end after 31.12.2015. The power to extend the mining lease after 31.12.2015 lies with Govt. of India. In this regard we have to make correspondence with Ministry of Coal, Gol.

The application of DVC pertaining to the renewal of the lease of Bermo area of 413.74 acre in Village - Baidkaro, Kargali, Karo & Amlo of Bermo circle has been forwarded to the Department by the Deputy Commissioner, Bokaro with all enclosures (vide letter no. 982, dated 21.03.2015). The category and the land list of mining lease area along with the application forwarded by Deputy Commissioner, Bokaro and Geo-referenced Cadastral Map of the land applied for "in triplicate" and Approved Mine Plan of Leasehold Area, Environmental Clearance of Leasehold Area, Consent to Operate of Pollution Control Board, Jharkhand, List of Technical Person, List of Board of Directors, Expenditure report of lease period done by M/s DVC for Social Welfare and Particulars of area mineral wise in the State of Jharkhand under Rule-22(3)(g) of Mining Rules 1960 have not been sent.

Therefore, it is requested to make available the above documents to District Mining Office, Bokaro through the Department so that action can be taken as early as possible on the application for renewal the same.

Enclosure :- As above.

Shri. Sinha

Important

CE (Mining)

Yours faithfully,
Sd/-

May like to see file

ED (Fuel)

pl. take immediate action, as asked for.
CE (Mining)

(Anand Mohan Thakur)
Joint Secretary to the Govt.

BY SPEED POST

**No. 34012/03)/2014-CPAM
Government of India
Ministry of Coal**

New Delhi, the th29 May, 2015

To Shri B. D. Sharma (Renewal)
A-121, Paryavaran Complex,
IGNOU Road,
New Delhi-110030
(FAX : 29532568 (Ph.011-29532236 / Mob:9811030881
(E-mail:min_mec@vsnl.com, minmec@bol.net.in)

**Subject Grant of recognition as competent person to prepare
Mining Plan for Coal/Lignite block.**

Sir,

I am directed to refer to your letter No. MM/BD/RQP/21534 dated 29.11.2013 on the above cited subject and to convey approval of the Central Government to the grant of recognition under Rule 22 (c) of Mineral Concession Rule, 1960 in your favour as competent person to prepare Mining Plan/Mine closure Plan for Coal/Lignite block(s) up to 10 years from the date of issue of this letter.

2. RQP is required to comply with the provisions of all the concerned statutes and guidelines / circulars of the Govt. issued from time to time in regard to preparation of Mining Plans.

Yours faithfully


(I.P. Nagpal)

Under Secretary to the Govt. of India

Copy to : TD, NIC; Ministry of Coal for including in the list of RQP
in Ministry of Coal's Web Site.

Extract from the Minutes of the 630th Meeting of the Corporation held on 6th January, 2017.

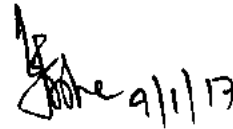
FILE NO: BERMO/002

RESOLUTION NO.8737 (Out of Agenda - 4): Approval of Mine Plan and Mine Closure Plan in respect of Bermo Mines.

Corporation accorded approval to the following:

1. Bermo Mine will be developed as per the approval of the Mining Plan from Ministry of Coal and all other approvals, as required will be obtained from relevant authorities.
2. The Protective Measures and Mine Closure Activities including Reclamation and Rehabilitation shall be carried out in accordance with approved Mining Plan and Mine Closure Plan and any amendments or modifications which may be made by the Ministry of Coal from time to time.
3. Damodar Valley Corporation is committed to open an Escrow Account in one of the Scheduled Bank with the Coal Controller Organization (on behalf of Government of India) as exclusive beneficiary and DVC shall make payments in such Escrow Account at the rate computed and finalized by Ministry of Coal as per Mine Closure Guidelines issued and amended from time to time.
4. Shri Arbind Kumar Thakur, Superintending Engineer (Mining) & Agent, Bermo Mines is authorized to sign application and all documents as may be required for the purpose.

Note: - The Implementation Report on the above Resolution or the progress made, if any towards its implementation may kindly be communicated to the undersigned within 7 (seven) days from the date of issue of the Resolution. Subsequent progress in the matter may be communicated on fortnightly basis.



(R.J. K. Sinha)
Jt. Secretary (Co-ord.)

→ To,
The Executive Director (Fuel)
DVC, Kolkata

CONFIDENTIAL
APPROVALDAMODAR VALLEY CORPORATION
630TH MEETING
AGENDA NOTE

Item No. (Out of Agenda-4) **Approval of Mine Plan and Mine Closure Plan in respect of Bermo Mines.**

Background:

1. Bermo Mines is in operation since 1951 acquired from the Indian Railways. Subsequently, the mining lease was renewed by Govt. of Bihar for 30 years w.e.f. 01.01.1986. In order to process further for renewal of mining lease, it was statutorily required that the Mine should have a Mine Plan and Mine Closure Plan and also should have Environment Clearance issued by the concerned Ministry of Government of India.
2. As a pre-requisite for preparation of the Mine Plan, a Geological Report was required which was not available. Accordingly, M/s Central Mine Planning and Design Institute Limited, Ranchi (a subsidiary of M/s Coal India Limited) was engaged for undertaking detail exploration and preparation of the Geological Report. The Agency completed the work and submitted the Geological Report in November, 2016.
3. Based on the Geological Report, M/s Min Mec Consultancy Pvt. Ltd., New Delhi, a consultant organization appointed by DVC for the purpose, prepared a draft of the Mine Plan and Mine Closure Plan in December, 2016. The Mine Plan is prepared as per the Guidelines dated 04.04.2011 issued by Ministry of Coal, Government of India.
4. As per the Mine Plan, out of the coal reserve of 131.319 Million tonnes, about 60.66 Million Tonnes of coal can be extracted in 27 years at a peak rated capacity of 2.62 Million tonnes per annum. A copy of the Mining Plan and Mine Closure Plan for DVC Bermo coal mine is enclosed as Annexure.
5. The Mine Plan and Mine Closure Plan need to be placed by DVC's authorized representative before the Expert Committee of Ministry of Coal, Government of India for recommending to the competent authority of Ministry of Coal for its approval.
6. The activities at Bermo Mines shall be carried out as per the Mine Plan and Mine Closure Plan approved by the Ministry of Coal and conditions as stipulated in other clearances and approvals issued by concerned authorities at State and Central Government including opening and maintenance of Escrow Account as per Guidelines issued by Ministry of Coal, Government of India.

Issues:

Along with application to be submitted by the authorized representative of DVC to the Ministry of Coal, Government of India for approval of the Mine Plan and Mine Closure Plan, the

Corporation is required to accord approval for undertaking activities as per the approved Mine Plan and Mine Closure Plan and as per the terms and conditions of the clearances and approvals issued by the concerned state and Central Government authorities including opening and maintaining Escrow Account as per the Guidelines issued by Ministry of Coal, Government of India from time to time.

Delegation of Power:

Power of acceptance rests with the Corporation.

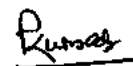
OBSERVATION OF FINANCE:

The DAN has been vetted by Finance.

POINTS FOR DECISION:

Corporation is requested to accord approval to the following:

1. Bermo Mine will be developed as per the approval of the Mining Plan from Ministry of Coal and all other approvals, as required will be obtained from relevant authorities.
2. The Protective Measures and Mine Closure Activities including Reclamation and Rehabilitation shall be carried out in accordance with approved Mining Plan and Mine Closure Plan and any amendments or modifications which may be made by the Ministry of Coal from time to time.
3. Damodar Valley Corporation is committed to open an Escrow Account in one of the Scheduled Bank with the Coal Controller Organization (on behalf of Government of India) as exclusive beneficiary and DVC shall make payments in such Escrow Account at the rate computed and finalized by Ministry of Coal as per Mine Closure Guidelines issued and amended from time to time.
4. Shri Arbind Kumar Thakur, Superintending Engineer (Mining) & Agent, Bermo Mines is authorised to sign application and all documents as may be required for the purpose.



(P. Kumar)
Executive Director (Fuel)



(D. Pattanayak)
Additional Secretary

FILE NO. BERMO/002

No.BM/Auth/Min Mec/- 833

Date: 2/12/2015

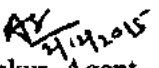
To
B.D. Sharma
Min Mec Consultancy Pvt. Ltd.
A-121, Paryavaran Complex,
IGNOU Road, New Delhi-110030, India
Ph : 91-11-29534777, 29532236, 29535891;
Fax : 91-11-29532568
email : mining@minmec.com

Sub: Authorisation to RQP for preparing Mining Plan and Mine Closure plan of our DVC Bermo Mines, Bermo, Bokaro, Jharkhand.

Sir

We hereby authorise you as RQP (Recognised Qualified Person) for preparation, discussion, presentation and submission of clarifications, if any, required to Ministry of Coal, for the purpose of approval of Mining Plan and Mine Closure plan of DVC Bermo Mines, Bermo, Bokaro, Jharkhand.

Yours


AK Thakur, Agent
(Authorised Signatory)

CERTIFICATE OF ACCEPTANCE BY THE RQP TO FORMULATE THE MINING PLAN AND (MP) MINE CLOSURE PLAN (MCP) OF DVC BERMO COAL MINE ON BEHALF OF THE PROJECT PROPONENT, THAT HIS RECOGNITION IS VALID AND THAT MCP HAS BEEN PREPARED AS PER MOC GUIDELINES

I, B. D. Sharma, hereby certify that I have been duly authorized by the Mining Company, M/s Damodar Valley Corporation (DVC) to prepare Mining Plan and Mine Closure Plan of **DVC Bermo Mines**, district Bokaro, Jharkhand, on their behalf and that I have accepted to formulate the Mine Closure Plan for this mine.

And that I have a valid recognition from MOC under MCR, 1960 to prepare the Mining Plans/ Mine Closure Plans and that provisions of all relevant rules and regulations made there under have been considered in the preparation of Mine Closure Plan.

B.D. Sharma

RQPno. 34012/03/2014-CPAM dt. 29-05-2015

(Valid upto 28-05-2025)

**CONFIRMATION FROM RQP STATING THAT HE HAS VERIFIED THE
BLOCK AREA WITH THE RELEVANT PLANS SUPPLIED BY CMPDIL AND
AREA COVERED BY THE MINING PLAN DOES NOT ENCROACH on any
OTHER COAL BLOCK**

It is to confirm that I have verified the block area (same as ML area) of Bermo coal mine, Distt. Bokaro, Jharkhand from Plan No. III (Geological Plan, DRG No. RI-III 7275, Rev. No.1) of "Geological Report on DVC Bermo Mines" October 2016 prepared by CMPDIL and also from plan enclosed with CMPDI Letter no. CMPDI/BD/C(886A)/1-1307 dt. 25.04.2017 (Annexure XXIII to MP & MCP) and area covered by the Mining Plan does not encroach on any other coal block.

B.D. Sharma

RQP no. 34012/03/2014-CPAM dt. 29-05-2015
(Valid till 28-05-2025)

कार्यालय अधीक्षण अभियंता (खनन) एवं अभिकर्ता
दामोदर घाटी निगम

बेरमो खान
पत्रा. : बेरमो, जिला : बोकारो
पिन : 829104 (झारखण्ड)
दूरभाष : 06549-220101 (कार्या.)
06549-220245 (आ.)



OFFICE OF THE SUPDT. ENG. (MINING) & AGENT
DAMODAR VALLEY CORPORATION

Bermo Mines
P.O. - Bermo, Dist.-Bokaro
Pin - 829104 (Jharkhand)
Phone : 06549-220101 (Off.)
06549-220245 (Res.)

संदर्भ सं. :

Ref. No. : NO. BML 65

दिनांक :

Date : 23/01/17.

It is to certify that DVC Bermo mines, Distt. Bokaro, Jharkhand will be developed by Damodar Valley Corporation (DVC) as per approval of the Mining plan from Ministry of Coal and all other approvals as required, will be obtained from relevant authorities.

AK
23/1/2017
AK Thakur, Agent
(Authorised Signatory)
For & on behalf of DVC

कार्यालय अधीक्षण अभियंता (खनन) एवं अभिकर्ता
दामोदर घाटी निगम

बेरमो खान
पत्रा. : बेरमो, जिला : बोकारो
पिन : 829104 (झारखण्ड)
दूरभाष : 06549-220101 (कार्या.)
06549-220245 (आ.)



OFFICE OF THE SUPDT. ENG. (MINING) & AGENT
DAMODAR VALLEY CORPORATION

Bermo Mines
P.O. - Bermo, Dist.-Bokaro
Pin - 829104 (Jharkhand)
Phone : 06549-220101 (Off.)
06549-220245 (Res.)

संदर्भ सं. :

Ref. No. : ND-BM/- 66

दिनांक :

Date : 23/01/17

It is to certify, that reclamation and rehabilitation in DVC Bermo Mines, Distt. Bokaro, Jharkhand will be carried out in accordance with the approved Mine Closure Plan and any modification/ amendments which may be made in the Mine Closure Plan by Ministry Of Coal from time to time.

A.K. Thakur
23/1/2017

(A.K. Thakur)
SE (Mining) & Agent
(Authorised Signatory)
For & on behalf of DVC

Registered.

Bharat Sarkar/Govt. of India
Khan Suraksha Mahanideshalaya
Directorate-General of Mines Safety
Koderma Region.

No. KR/ 2134 /Karma, dated, the 19/10 2000.

From

The Director of Mines Safety
Koderma Region
P.O. Karma, "Jhumri-Telaiya"
Dist. Koderma (BIHAR)
PIN: 825409

To

The Agent
DVC Bermo Mines
M/s. Damodar Valley Corporation.
P.O. Bermo, Dist. Bokaro (BIHAR)
PIN: 829104

Sub : Permission Under Regulation 100(1) of the Coal Mines Regulation 1957, to extract developed pillars of Bermo seam by opencast method and relaxation from the provisions of Regulation 98(1) & 98(3) of the Coal Mines Regulation 1957 in respect of height and width of benches while working Bermo seam by using Heavy Earth Moving Machinery and deep hole blasting in DVC Bermo Colliery of M/s. Damodar Valley Corporation.

Dear Sir,

Please refer to your letter No. BM/DGMS/Permission-3060 dated 26.10.1999 and the plan(s)/Section(s) enclosed therewith on the above subject.

The matter has since been examined in the light of what has been stated in your application and shown on the accompanying plans.

By virtue of the powers conferred on the Chief Inspector of Mines (also designated Director-General of Mines Safety) and by virtue of the authorization granted to me by the Chief Inspector of Mines (also designated Director-General of Mines Safety) under section 6(1) of the Mines Act 1952, I hereby grant you permission under Regulation 100(1) of the Coal Mines Regulation 1957 to extract developed pillars of Bermo seam by opencast method and relaxation from the provisions of Regulations 98(1) & (3) of the Coal Mines Regulation 1957, in respect of height and width of benches while working Bermo seam by using heavy earth moving machinery and deep hole blasting as shown on plan No. Nil dated 29.10.1999 submitted by you at D.V.C. Bermo colliery, of M/s. Damodar Valley Corporation, subject to the following conditions and the conditions stipulated in the annexure to this letter, being strictly complied with :-

1.0 Before starting any quarrying operations, the buildings and other structures likely to be affected shall be vacated and rendered uninhabitable and/or removed from the area.

2.0 Quarrying operation by using Heavy Earth Moving Machinery and deep hole blasting shall be done strictly in accordance with the schedule of conditions appended herewith.

3.1 No heavy machinery or vehicles except drilling machines shall be deployed when the thickness of overburden above the underground galleries as proved by advance bore hole or other suitable means is reduced to 6m.

3.2 Blasting shall be done in such a manner so that the underground galleries are completely filled up. Otherwise mutti/overburden shall be dozed to fill up the galleries completely.

3.3 Each coal pillar shall be exposed completely by removing the overburden overlying the pillar and the adjoining galleries on all sides.

4.1 The distance between mechanised quarry and manual quarry shall not be less than 60m.

5.1 The water level shall be maintained at 60m away from the quarry face.

6.1 Provisions of Regulation 170 of the Coal Mines Regulation 1957 shall be strictly complied with.

6.2 No blasting shall be done in crushed/broken ground.

7.0 The quarrying operations shall be done from rise to the dip.

8.0 Overburden containing carbonaceous material shall not be dumped within 15m of the exposed side of coal.

9.0 At the time of blasting operations in the quarry, no persons shall be employed below ground either in the same or any other seams or sections interconnected with the seam where pillars are being extracted by opencast method. Further the work persons shall not be readmitted underground after blasting operations are completed, unless and until the seam has been inspected by a competent person and found free from any danger due to noxious gases or fire etc.

10.0 If at any time any one of the conditions subject to which this permission has been granted, is violated or not complied with this permission shall be deemed to have been revoked with immediate effect.

11.0 The above permission may be amended or withdrawn at any time, if considered necessary in the interest of safety and is being issued without prejudice to any other provisions of the law which may or may become applicable at any time.

12.0 In the event of any change in the circumstances connected with this permission which is likely to endanger the life of persons employed in the mine or the mine, the mining operations for which this permission has been granted shall be stopped forth with and intimation sent to this Directorate. The said mining operations shall not be resumed without express and fresh written permission from this Directorate.

13.0 This Directorate shall be informed as soon as mining operations are commenced in accordance with the above permission. Intimation about completion of the Mining operations shall also be sent promptly and in any case not later than one month thereof.

Yours faithfully,


16.10.2000
Director of Mines Safety
Koderma Region.

Sandip/
25.9.2K/

ANNEXURE - Permission letter No KR2134 dt - 19/10/2000

CONDITIONS FOR RELAXATION UNDER REGULATION 98 OF THE COAL MINES REGULATIONS 1957 FOR WORKING THE OPENCAST MINE WITH HEAVY EARTH MOVING MACHINERY AND/OR ADOPTING A SYSTEM OF DEEP-HOLE BLASTING AT MECHANISED OPENCAST MINE

D.V.C.Bermo Mine.

I. GENERAL

- 1.0 a) Except where otherwise provided for in this conditional permission, all provisions of the Coal Mines Regulations 1957, relating to opencast workings, use of Explosives and Machinery etc. shall be strictly complied with.
- b) It may be amended, modified or withdrawn at any time should it be considered necessary in the interest of safety.

II. OPENCAST WORKING

2.0 Height and width of benches:

- 2.1 The height of the benches shall not exceed the maximum reach of the machines used for digging, excavation or removal.
- 2.2 The width of any bench shall not be less than :
 - a) The width of the widest machine plying on the bench plus two metres.
 - or b) If dumpers ply on the bench - three times the width of the dumpers.
 - or c) The height of the bench, whichever is more.

3.0 GENERAL

- 3.1 Quarrying operations shall be conducted from top downwards.
- 3.2 The provisions of sub-regulations (4) and (5) of the Regulation 98 shall be complied with.
- 3.3 When persons are employed within 5m. of the working face, adequate precautions shall be taken to ensure their safety by dressing the sides of the benches.
- 3.4 Special care shall be taken when any slip or other planes of weakness or other geological disturbances exist, so as to prevent danger to the work persons.
- 3.5 No persons shall be engaged or allowed to travel close to high sides/benches, from which he is likely to fall more than 1.8 metres vertically down, unless he is provided with and uses a safety belt or rope.

3.6 The sides in overburden & coal shall be kept sloped to prevent danger from fall of sides.

4.0 FENCING AROUND OPENCAST WORKING:

4.1 The top edge of the Opencast working shall be kept fenced with wire rope strands or barbed wire, supported by (movable) posts of timber, iron or concrete. The gap between the adjacent rope strands or wires shall not be more than 0.30 metre & bottom most rope, strand or wire shall not be more than 0.25 metre and top most rope or wire shall not be less than 1.00 metre from ground level.

4.2 At the finishing stage opencast working shall be fenced with masonry wall using lime mortar not less than 0.4m. thick and not less than 1.2 metres high with a parapet.

5.0 SPOIL BANK:

5.1 a) The slope of spoil bank face shall be determined by the natural angle of repose of the material being deposited but shall in no case exceed 45 degrees from the horizontal. The spoil bank face shall not be retained by artificial means at an angle in excess of its natural angle of repose.

b) Any Spoil bank exceeding 30 metres in height shall be benched so that no bench exceeds 30 metres in height and the general slope does not exceed 1 vertical to 1.5 metres horizontal.

5.2 a) The toe of spoil bank face shall not be permitted to approach Railway or other public works, public road, buildings or other permanent structure not belonging to the owner of mine for more than a distance equal to the vertical height of its face.

b) A suitable fence shall be erected between any railway, public works or road or Building or structure and the toe of an active spoil bank so as to prevent unauthorised persons from approaching the spoil bank.

5.3 No person shall, or shall be permitted to approach the toe of an active spoil bank where he may be endangered from material rolling down the face.

6.0 ROADS FOR TRUCK AND DUMPERS ETC:

6.1 All roads for trucks, dumpers or other mobile machinery shall be maintained in good condition.

6.2 Where practicable, all roads from the opencast working shall be arranged to provide one way traffic. Where this is not practicable, no road shall be of a width less than three times the width of the largest vehicle plying on that road unless, definite turnouts and waiting points are designated.

6.3 All corners and bends of the roads shall be made in such a way that the operators and drivers of vehicles have a clear view for a distance of not less than 30

metres, along the road. Wherever it is not possible to ensure a visibility for a distance of 30 metres, there shall be provided two roads for the up & down traffic.

- 6.4 Ordinarily, no road shall have a gradient steeper than 1 in 16 at any place. Provided that in case of Ramps over small stretches a gradient up to 1 in 10 may be permitted.

- 6.5 Where any road exists above the level of the surrounding area, it shall be provided with strong parapet walls or embankments not less than 1 metre in height to prevent any vehicle from getting off the road.

7.0 PRECAUTIONS AGAINST DUST:

- 7.1 Adequate arrangements, to allay dry dust by wetting shall be made if, during any operation of drilling, loading, unloading, crushing, dressing etc. dust is likely to be produced in such quantity as may be injurious to health of persons, and also on roads and benches where trucks and dumpers operate. The directives contained in DGMS (Tech.) Circular No.16 of 75 should be complied with.

8.0 GENERAL LIGHTING:

Where natural lighting is insufficient, adequate general lighting as per standards laid down in Notification No.G.S.R.804 dated 18.6.75, Part III-Section 3(i) (Reproduced in DGMS (Legis.) Circular No.1 of 1975), issued under Regulation 154(2) shall be provided during working hours, in the opencast working and along roads, etc. for proper inspection of high sides and benches of the Opencast working at night suitable search lights shall be provided. The individual workers should also be provided with electric caplamps to use when they have to go in poorly illuminated places.

9.0 SUPERVISION:

- 9.1 During every production shift the opencast working shall be placed under the charge of an Assistant Manager and during maintenance shift, the working shall be placed under the charge of an Overman who shall be responsible to see that, all the regulations and the orders made thereunder are strictly complied with.

- 9.2 He shall in particular

a) Make frequent inspections for avoidance of slides or of materials that may slide or roll from the high walls (including the face and sides) or spoil banks.

b) Not allow any persons to work under overhanging ledges or where there is chance of slides, until such danger has been removed.

c) Ensure that every person engaged in dressing operations, on high walls is provided with, and uses a safety belt of a type approved by the Director-General of Mines Safety.

d) Ensure that all loose material is removed from high walls before drillers are engaged there and

e) Ensure that parapet walls along truck roads are properly maintained.

10.0 PROTECTIVE EQUIPMENT:

Every person working in the opencast working shall be provided with, and shall use, protective footwears, hard hat of a type approved by the Director-General of Mines Safety and such other protective equipment as may be prescribed by the Director-General Of Mines Safety in accordance with the provisions of Regulation 191, 191-A and 191-B respectively.

11.0 PRECAUTIONS WHILE DRILLING:

11.1 The position of every deep hole to be drilled shall distinctly marked by the overman so as to be readily seen by the drillers.

11.2 i) No drilling shall be commenced in an area where shots have been fired, until the Shot-firer has made a thorough examination at all places, including remaining butts of old deep holes, for unexploded charges that the drill may strike.

ii) No drill or bore rod or pick shall be inserted in butts of old deep holes even if an examination under clause(a) has failed to reveal presence of explosives.

12.0 BULK TRANSPORT OF EXPLOSIVES:

Where explosives are transported in bulk for deep hole blasting the precautions laid down in Regulation 164(4) of the Coal Mines Regulation 1957 shall be strictly complied with.

13.0 PRECAUTIONS DURING SHOT FIRING:

13.1 a) Shots shall not be fired except during the hours of day light or until adequate artificial light is provided. All holes charged on any one day shall be fired on the same day.

b) Shots, if fired beyond day light hours, should be muffled so that, flying fragments from blasting cannot project beyond a distance of 10 metres from the place of firing. In this connection your attention is drawn to DG(Tech.), Circular No.8 of 1976 for compliance.

c) As far as practicable the shotfiring shall be carried out either between shifts or during the rest interval or at the end of work for the day.

- 13.2 During the approach and progress of a storm, the following precautions shall be taken -
- a) No explosives, particularly detonators shall be handled.
 - b) If charging operations have begun, the work shall be discontinued until the storm has passed.
 - c) If the blast is to be fired electrically all exposed wires shall be coiled up and if possible placed in the mouth of the holes, or kept covered by something other than a metal plate.
 - d) All wires shall be removed from contact with the steel rails or a haulage track so as to prevent the charge being exploded prematurely by a local strike of the lightning.
- 13.3 a) Precautions with regards to taking shelter etc. as laid down in Regulation 170 of Coal Mines Regulations 1957 shall be complied with.
- b) Notwithstanding what is contained in Coal Mines Regulation 170, no persons other than Shotfirer and his assistants, if any, shall be permitted to remain within a radius of 20 metres or within 60 metres on the same bench where charging of holes with explosives is being carried out.
- 13.4 Notwithstanding anything contained in the Coal Mines Regulations 1957, the preparation of charges and the charging and stemming of holes shall be carried out under the personal supervision of an Overman who shall fire the shots in deep holes himself.
- 14.0 DESIGN MAINTENANCE & OPERATION OF MACHINERY & VEHICLES:
- 14.1 Every piece of drilling and earth moving machinery or equipment (hereinafter called machine) and every truck, dumpers etc. (hereinafter called vehicle) shall be maintained in good and safe working condition.
- 14.2 a) Every machinery or vehicle shall be provided with efficient warning devices, adequate front and rear lights and efficient brakes.
- b) Audio-visual alarms shall be fitted in all the Heavy Earth Moving machinery and vehicles.
- c) Every shovel or dragline shall be so designed as to afford the operator clear and uninterrupted vision all around and shall be provided with portable lamp, suitable portable fire extinguishers and retracting ladder for emergency.
- 14.3 a) The code of instructions furnished by the manufacturers in the matter of maintenance of various machinery and vehicles and preventive maintenance schedules for each type of machinery and vehicle shall be strictly followed.

b) Every machine and vehicle shall be allocated atleast one day in every week for maintenance. Before the machine or vehicle is sent out for work after maintenance, it shall be thoroughly inspected by the Engineer, Mechanical Foreman or other competent person appointed by the manager in writing who shall satisfy himself that the machine and vehicle is mechanically sound and in efficient working order.

c) A report of every inspection made under clause(c) be recorded in a bound paged book kept for the purpose and shall be signed and dated by the person making the inspection.

d) Every machine in use shall be thoroughly inspected once atleast in every 24 hours by a competent person. Any damaged or wornout cable shall be replaced immediately.

e) A report of every inspection made under clause(e) shall be recorded in a bound paged book kept for the purpose and shall be signed and dated by person making the inspection.

14.4 If the Engineer, Mechanical Foreman or other competent person, making an inspection, notices any defect in any machinery or in a dumper, the said machinery or the dumper shall not be used until the defect had been remedied.

14.5 Any defect in a machinery or vehicle reported by its operator shall be promptly attended to.

14.6 Any machine or vehicle found to be in unsafe operating condition shall be tagged at the operating position " OUT OF SERVICE DO NOT USE " and its use shall be prohibited until the unsafe condition has been corrected.

14.7 All repairs to a machinery or vehicle shall be done at a location which will provide a safe place for the persons engaged on repairs.

14.8 Except for testing trial or adjustment which must necessarily be done while the machine or vehicle is in motion, every machine or vehicle shall be shut down and positive means taken to prevent its operation while any repair or manual/lubrication is being done.

14.9 Any Machinery, equipment or part there of which is suspended or held apart by use of slings, hoists or jacks shall be substantially blocked or cribbed before men are permitted to work underneath or between such machinery, equipment or part thereof.

14.10 Power shall be disconnected when repairs are made in any electric machine.

14.11 DAILY EXAMINATION OF MACHINERY AND VEHICLE :

a) At the commencement of every shift, the Engineer, Mechanical Foreman or other authorised competent person shall personally inspect and test every machine and vehicle paying special attention to the following details :-

i) That the brakes and horn or other warning devices are in working order.

ii) If the vehicle or machine is required to work after day light hours, that the lights are in working order. He shall not permit the vehicle or machinery to be taken out for work nor shall he drive the vehicle unless he is satisfied that it is mechanically sound and in efficient working order.

B) He shall also maintain a record of every inspection in a bound paged book kept for the purpose. Every entry in the book shall be signed and dated by the person making the inspection.

15.0 OPERATION OF MACHINERY :

a) No person other than the operator or his helper, if any, or the manager or any person so authorised in writing by the manager shall ride on a shovel (or dragline).

b) No person shall be permitted to ride in the bucket of a shovel.

c) No shovel (or dragline) shall be operated in a position where any part of the machine, suspended loads or lines are brought closer than 3 mtrs. to exposed high voltage lines, unless the current has been cut off and the line de-energized. A notice of this requirement shall be posted at the operator's cabin.

d) Electrical cables, if any, shall be laid in such a manner that they are not endangered either by falling object or by mobile equipment.

15.2 The shovel bucket shall be pulled out of the bank as soon as it is full.

15.3 When not in operation, the bucket shall be kept resting on stable ground and shall not be left hanging.

15.4 When being operated in soft or unstable ground, every shovel (and dragline) shall be supported by heavy planks or poles so as to distribute the load of the machine over larger area to prevent any danger of the shovel (or dragline) overturning. When not in use, the shovel or dragline shall be moved to and kept on stable ground.

15.5 If more than one stripping machine is in use in any area, either on the same bench or on different benches, the machine shall be so spaced that there is no danger of accident from flying or falling objects etc. from one machine to the other.

16.0 DUTIES OF MACHINE OPERATORS :

- 16.1 a) Every shovel (and dragline) shall be under the charge of a competent person authorised in writing by the manager, herein called the 'Operator'.
- b) At the commencement of every shift, the operator shall also personally inspect and test the machine, paying special attention to the following details.
- i) That brakes and every warning device are in working order and,
- ii) If the machine is required to work after day lights hours, that lights are in working order.
- He shall not take out the machine for work nor shall he work the machine unless he is satisfied that it is mechanically sound and in efficient working order.
- 16.2 a) The operator shall not operate the machine when persons are in such proximity as to be endangered.
- b) He shall not swing the bucket of a shovel over passing haulage units. While trucks/dumpers are being loaded, he shall swing over the body of the truck/dumper and not over the cab, unless the cab is protected by a substantially strong cover.
- 16.3 The operator shall not allow any unauthorised person to ride on the machine.

17.0 OPERATION OF TRUCKS-DUMPERS AND OTHER VEHICLES :

- 17.1 No person shall be permitted to ride on the running board of a truck or dumper.
- 17.2 a) As far as possible, loaded trucks or dumpers shall not be reversed on gradient.
- 17.2. c) Standard traffic rules shall be adopted and followed during movement of all trucks and dumpers. They shall be prominently displayed at the relevant places in the open cast workings and truck/dumper road.
- 17.3 When not in use every truck or dumper shall be moved to and stood on proper parking places.
- 17.4 No person shall be permitted to work on the chassis of a truck or dumper with the body in a raised position until after the truck or dumper body has been securely blocked in position.
- 17.5 No unauthorised person shall be permitted to enter or remain in any dumping yard or turning points.

18.0 DUTIES OF TRUCK / DUMPER OPERATORS :-

- 18.1 Before commencing work the driver shall generally inspect and test the vehicle for its roadworthiness paying special attention to the tyre air-pressure, brakes, horn and lights. If he finds any defect which is likely to make the driving unsafe, he shall report the matter to the competent person and shall not operate the vehicle till the defects are remedied.
- 18.2
- a) He shall not drive too fast, shall avoid distractions and shall drive defensively. He shall not attempt to overtake another vehicle unless he can see clearly far enough ahead to be sure that he can pass it safely. He shall also sound the audible warning signal before overtaking.
 - b) When approaching a stripping equipment, the driver of the truck or dumper shall sound the audible warning signal and shall not attempt to pass the stripping equipment until he has received a proper audible signal in reply.
 - c) Before crossing road or railway line, he shall reduce his speed, look in both directions along the road or line and shall proceed across the road or line only if it is safe to do so.
 - d) The driver shall sound the audible warning signal while approaching blind corner or any other points from where person may walk in front unexpectedly.
 - e) The driver shall not operate a truck or dumper in reverse unless he has clear view of the area behind the vehicle and/or he has the assistance of a (Spotter or Pitman) duly authorised in writing for the purpose by the Manager. He shall also give an audible warning signal before reversing a truck or dumper.
 - f) The driver shall be sure of clearance before driving through tunnels, archways, plants, structures etc.
- 18.3 The driver shall not allow any unauthorised person to drive the vehicle. He shall also not allow more than the persons allowed with the vehicle.
- 18.4 The driver shall see that the vehicle is not overloaded and that the material is not loaded in truck or dumper so as to project horizontally beyond the sides of its body and that any material projecting beyond the front or rear, is indicated by a red flag during day and by red light after day light hours.

19.0 PROTECTION OF WORKERS AGAINST NOISE AND VIBRATION IN THE
WORKING ENVIRONMENT :

Suitable steps should be taken by all appropriate means to reduce the exposure of workers to any excessive noise and vibration. In this connection, the requirements of DGMS (Tech.) Circular No.18 of 1975 should be complied with.


16.10.2000
Director of Mines Safety,
Koderma Region

Sandip/
31.7.2K/

Ministry of Labour
 Man Suraksha Maha Nideshalaya
 Directorate-General of Mines Safety
 Kodarma Khetra/ Kodarma Region

Nov. *(Aul)*

No.KR/ 63 / Ranchi, the 7th / October, 1989.

From

Shri S.K.Banerjee,
 Director of Mines Safety,
 Kodarma Region, Jhumritelaiya
 P.O.Jhumritelaiya(Hazaribagh).

To

The Agent,/Coal Superintendent,
 M/s Damodar Vally Corpn.
 DVC Bermo Colliery,
 P.O.Bermo,Giridih.

Subject:Permission under Regulation 98 and 100(1) of Coal
 Mines Regulations,1957 to do deep hole drilling/
 blasting in overburden deploying H.E.M.M. and to
 extract pillar of Bermo seam manually adopting O/C
 method at DVC Bermo Colliery.

Sir,

Please refer to your letter Nos.CM-1/7-9192 dated
 17th/ 31st August,1988 and CM-1/7-9830 dated 7.10.88 and plan
 No.CM/502/88 dated 30.6.88 on the subject noted above.

The matter has since been examined on the basis of the
 informations and details submitted by you. By virtue of the
 powers conferred on the Chief Inspector of Mines(also designated
 as Director-General of mines Safety) and by virtue of the autho-
 -risation granted to me by the Chief Inspector of Mines(also
 designated as Director-General of Mines Safety) under Section 6(1)
 of the Mines Act,1952 I hereby grant you permission under Regula-
 -tion 98 of the Coal Mines Regulations,1957 for doing deep hole
 drilling/ blasting in overburden deploying H.E.M. and to extract
 pillars of Bermo seam manually in the area as shown on plan No.CM
 502/88 dated 30.6.88 submitted with the application subject to the
 following conditions being strictly complied with.

- (1) The conditions detailed in Annexures A & B attached with
 this letter shall be strictly followed.
- (2) Height of benches in coal shall strictly comply with Reg.98(3)
 of Coal Mines Regulations,1957.
- (3) Height of bench in overburden shall not exceed digging height
 of the machines working on it.
- (4) Adequate precautions shall be observed while working at an
 near any fault plane to guard against danger of sliding of
 sides .
- (5) Accumulation of water shall not be allowed within 60m.of the
 quarry.
- (6) Blasting shall not be done within 300m.of the P.W.D. road
 company quarters as well as C.C.L.'s quarters without obtaining
 permission under Regulation 170 for doing controlled blasting.
- (7) The quarry working shall not be extended to within 45m.of the
 P.W.D. road and C.C.L.'s quarters without obtaining permission
 under Regulation 105 or else, the road and quarters shall be
 diverted/vacated/showered to atleast 150m. away from the quarry

(2)

- (8) If at any time any one of the conditions subject which this permission has been granted, is violated or not complied with this permission shall be deemed to have been revoked with immediate effect.
- (9) The above permission may be amended or withdrawn at any time, if considered necessary and is being issued without prejudice to any other provisions of the law which may become applicable at any time.
- (10) In the event of any change in the circumstances connected with this permission which is likely to endanger the life of persons employed in the mine or the mine the mining operations for which this permission has been granted shall be stopped forth with and intimation sent to this Directorate. The said mining operation shall not be resumed without express and fresh written permission from this Directorate.
- (11) This Directorate shall be informed as soon as mining operations are commenced in accordance with the above permission. Intimation about completion of the mining operations should also be sent promptly and in any case not later than one month thereof.

Yours faithfully,

Encl: Annexure 'A' and 'B'.

S/-

(S. S. Sankarjee)
Director of Mines Safety.Memo No. K2/ 64-66 / Ranchi, the 7th / October, 89.

Copy forwarded for information and necessary action to:-

- (1) The Dy. General Manager, DVC, Calcutta- 27.
 (2) The Safety Officer, DVC Bermo Colliery, P.O. Bermo (Ciridih)
 (3) The Manager, DVC Bermo Colliery, P.O. Bermo (Ciridih).

21.3.89
Director of Mines Safety.

GOVT. OF INDIA/BHARAT SARKAR
 DIRECTORATE GENERAL OF MINES SAFETY
 KHAN SURAKSHA MAHANIDESHALAYA
 RANCHI REGION

ANNEXURE - 'B'

Letter No. RR/Perm/ 64-66 dtd. 7.11.1989

Schedule of Conditions for permission under
 Reg. 100 of CMR, 1957 to extract Pillars by
 Opencast Method at _____
 Seam of _____ Colliery.

1. No person shall be allowed at any place in the Opencast workings where the thickness of overburden and/or Coal over any gallery has been reduced to 1.5m or less.
2. All galleries and junctions of galleries wherever the thickness of overlying overburden and/or Coal is less than 6m. be supported by cogs at intervals of 3m. in a systematic manner.

OR

Where Heavy Machineries are in use; these machineries shall not be brought over galleries having parting less than 6m. unless the Underground galleries are completely filled in by blasting.

3. Except for the purpose of inspection and support work no person shall be allowed in the Underground workings beneath and within 20m. of the Opencast excavation.
4. Where the Underground workings are accessible, the same shall be surveyed and cleaned of all coal dust and thickly stone dusted before commencement of extraction of Pillars.
5. All persons from Underground in the same working Seam or any other seams or section connected therewith shall be withdrawn before commencement of blasting operation in the Quarry, and no work persons shall be readmitted into the said Underground workings unless and until the same have been inspected by a competent person duly authorised for the purpose and found free from any noxious gases and/or signs of fire etc.

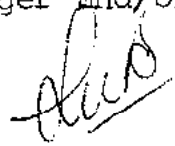
OR

The Underground workings to be quarried shall be isolated by explosion proof stoppings or by any other approved manner from any active workings area either in the same seam or different seam or section as the case may be, so as to prevent transference of danger to the said active working area.

6. The spacing of holes in the bench lying immediately above the coal seam (referred to herein after as last OB) shall be so adjusted that the holes do not lie immediately above the galleries as far as possible in order to ensure that blast holes do not directly fire into

/2/

7. LOX explosives shall not be used in shot hole which have been drilled to within 3.0 M of Coal Seam.
8. The depth of hole in the last OB shall be such as to leave at least 3.0 Metrs. thickness of OB above the Coal seam, and to ensure compliance with this requirement a pilot hole shall be put for each round of blasting to determine the total thickness of OB over the Coal Seam.
9. Where there is any doubt and particularly where there are cracks and crevices the bottom 2 metrs. length of the hole shall be filled with sand.
10. Unless otherwise permitted by DCMS in writing and subject to such conditions as may be imposed, no delay action detonators shall be used in Coal and the manner of extraction of pillars shall be by drilling and blasting holes in Coal pillars only from top downwards.
11. Where more than one section of the seam had been developed on Pillars, the shot holes shall not be drilled to within 3 mtrs. of a lower section, and care be taken that, as far as possible the blast holes do not directly fire into any Underground-gallery. To ensure compliance with this requirement, a pilot hole shall be put for each round of blasting.
12. All holes in the last OB beneath and/or coal shall be charged with water ampules or with moist sand of at least 0.6 m. in length at the bottom of the hole.
13. No person including shotfirer shall take shelter within 100 m. of the quarry openings, and such shelter shall be of an approved design.
14. The Open-cast working and Underground set of working shall be under the administrative and technical direction and control of the same Manager and/or Agent.


DIRECTOR OF MINES SAFETY,
RANCHI REGION

.....

Government of India/Bharat Sarkar
Ministry of Labour/ Shram Bihag
Khan Suraksha Maha Nide-shalya,
Directorate-General of Mines Safety
Ranchi Khetra/. Ranchi Region

Annexure to Letter No.RR/Perm/83/ 64-66
Ranchi, the 7.11.1987

1. GENERAL:

- (1) Except where otherwise provided for in this conditional permission all provisions of the Coal Mines Regulations 1957 relating to opencast workings, use of explosives and machinery shall be strictly complied with.
 - (2) (a) (i) Adequate general lighting shall be provided at the work sites and in the opencast workings after sun set;
(ii) In addition, flood lights shall be provided for proper inspection of the quarry faces and work sites at night.
(b) After sun set, all work persons employed in the opencast workings shall be provided individually with electric cap lamps.
 - (3) Suitable arrangements shall be made for proper inspection at night at suitable intervals of all work places and sites in order to guard against the fall of ~~work~~ rock or material.
2. (a) No coal or carbonaceous mater or debris or overburden shall be stacked within 100m. around the periphery of the opencast workings.
- (b) Blasting operations shall be so regulated that broken coal is removed/transported out of the quarry expeditiously.
 - (c) Pipe range containing water under pressure with taps at 20m. apart shall be laid in and around the quarry workings. Such pipe range shall be connected to a water reservoir of adequate capacity so that water in the pipe range is available under pressure of not less than 75 lbs/sq. inch. Adequate number of water hoses of 120m. length shall be kept stored at suitable places in the quarry.
 - (d) All part of the quarry including places within the quarry limit shall be inspected daily for detection of heating or fire. As soon as heating or a fire is detected, suitable measures to quench it and to dig it out shall be adopted. All heated debris/coal shall be removed by machines and deposited outside the premises of the opencast workings.
 - (e) No persons shall be employed either directly below or near the spot on fire within 30m. of it except for the purpose of removing the hot material or quenching it. The employment of persons so engaged for dealing with the fire shall be governed by provisions of Reg. 119(1)(a) and 2(a) of the Coal Mines Regulations, 1957.

contd....2(P.T.O.)

(2)

- 3.(a) All damages to the lives and property not belonging to the management of the mine and damages or injuries to persons as a result of blasting or mining operations shall be adequately indemnified. Should there be any controversy in this respect, the decision of the D.G.M.S. shall be final and binding on the management.
- (b) No workings shall be extended to any point within 45 m. of any village, dwellings, Roadway, Railway, Public structure.
- 4.(a) No work whatsoever shall be done where the provision of Regulation 126 are attracted due to the presence of jore and nullah in the vicinity. The entire ground lying within 15m. of all the nullahs and jores shall be filled up and raised and consolidated to a R.L. of at least three metres above the highest flood level.
- (b) Blasting operations shall be under the direct charge of one Assistant Manager in strict compliance of Regulation 170A of the Coal Mines Regulations, 1957.

2. OPENCAST WORKINGS:

- (a) Opencast workings shall be worked in benches so that maximum height of the bench shall not exceed the length of the boom of the shovel and width thereof shall not be less than twice the height of benches or 5 times the length of the largest machine whichever is more unless otherwise permitted in writing.

- (b)(i) Tipping trucks or similar carriers if employed for transportation of coal.

Separate roads for such trucks or carriers shall be provided and safe loading practices shall be adopted avoiding plying of trucks or carriers on the same floor where men are to work, travel or rest.

3. FENCING AROUND OPENCAST WORKINGS:

- (a) The periphery around the limits of opencast workings shall be kept fenced with a masonry wall not less than 0.40 m. thick and not less than 1.2 metre high, with a parapet top.
- (b) The edges of benches of the opencast workings shall be kept fenced with wire rope strand or barbed wire supported by moveable posts (wooden, iron or concrete). The gap between the adjacent rope strands or wires shall not be more than 0.30 m. and the bottom most rope strand wire shall not be 0.25 m. and the top most rope strand or wire not less than 1.00 m. from ground level.

4. SPOIL OVERBURDEN OR DEBRIS BANKS:

- (1) (a) Spoils, overburden, or debris shall be deposited at places belonging to the mine and duly approved by the manager in writing.
- (b) Spoils overburden or debris shall not be deposited, beneath transmission, telephone or power lines or near any public structure.

contd.....3.

- (c) The slope of a spoil bank face shall not exceed the natural angle of repose of the material being deposited or $37\frac{1}{2}$ degree from the horizontal whichever is less. The spoil bank face shall not be retained by artificial means.
- (d) Any spoil-bank exceeding 3.0 metres in height shall be benched so that no bench exceeds 3.0 metres in height and width of benches is not less than 1.5 times the height and general slope does not exceed 1 vertical to 1.5 horizontally.
- (2) (a) The spoils overburden or debris shall not be deposited within 45m. of a railways or other structures and it shall not be permitted to approach any of the above said structures closer than a distance equal to 1.5 times the vertical height of its face.
 (b) A suitable barrier shall be constructed between any railway, public works, road, building or structure and the toe of an active spoil bank so as to prevent materials rolling down beyond the limit.
- (3) No person shall or shall be permitted to approach the toe of an active spoil bank.

(5) ROADS FOR TRUCK AND DUMPERS ETC.

- (1) All haul roads for dumpers or other mobile machinery shall be constructed to suit its load capacity and maintained in good condition. No vehicles, other than heavy transport vehicles shall use haul roads except between designated points and when permitted in writing by the manager.
- (2) All roads from the opencast workings shall be arranged to provide one way traffic and no road shall be of a width less than three times the width of the largest vehicle plying on that road. Where it is not practicable, definite crossing points, turn outs and waiting points shall be designated for use of vehicles.
- (3) All corners and bends in roads, shall be made in such a way that the operators and drivers of vehicles have clear view for a distance of not less than 30m. along the road.
- (4) Except with the express permission (in writing) no road shall have a gradient steeper than 1 in 20 at any place.
- (5) Where any road exists above the level of the surrounding areas, it shall be provided with strong parapet walls to prevent any out-of-control vehicles from getting off the road.
- (6) ADDITIONAL DUTIES OF ASSISTANT MANAGER INCHARGE OF OPENCAST WORKINGS
 - (1) During every shift, the opencast workings shall be placed under the charge of a qualified experienced Assistant Manager to have overall control and guidance of all operations.
 - (2) During his shift the Assistant Manager shall:-
 - (a) make frequent inspections for evidence of any unsafe conditions including evidence of slide of material from high wall and shall guide that operations are conducted in a safe and efficient manner.

- (b) not allow any person to work under overhanging ledges or where there is evidence of slides, until such danger has been removed.
- (c) ensure that every person engaged in dressing operations on high walls is provided with, and uses, a safety belt of a type approved by the Chief Inspector.
- (d) ensure that all loose material is removed from high walls before drillers are engaged there; and
- (e) ensure that parapet walls along truck roads are properly maintained.

7. ADDITIONAL DUTIES OF ENGINEERS PLACED IN CHARGE OF MACHINES AND EQUIPMENTS IN OPENCAST WORKINGS.

During each shift the machines and equipments at work shall be placed under the charge of qualified and experienced engineer to effect inspection, examination, safe operations and maintenance of the machines, equipments and accessories.

During his shift the engineer/engineers shall

- (a) inspect, examine machines, equipments and accessories and satisfy himself that they are in sound and safe working order;
- (b) not allow any machine, equipment to be used if it is found defective;
- (c) ensure that every machine, equipment, accessory used is in a safe and efficient manner;
- (d) ensure that each operation, activity is carried on in safe and efficient manner.

8. EXAMINATION, REPAIR AND MAINTENANCE OF MACHINES:

- (1) (a) A code of practice for inspection, examination and repair of all breakdowns and repairs etc. shall be drawn up and practiced.
- (b) Every drilling and earth moving machinery or equipment or accessory (herein after called machine) shall be thoroughly examined at least once in each shift and maintained in good and safe working conditions.
- (c) A record of all such examinations and maintenances shall be maintained in a bound/paged register and shall be signed by the engineer in charge of the shift and counter signed by the colliery engineer.
- (2) (a) Every machine shall be allocated at least one day in every week for examination and maintenance, when it shall be thoroughly examined and inspected by the Engineer, who shall satisfy himself that it is mechanically sound and is in efficient working order before it is allowed to be re-used.

(5)

- (b) A report of every maintenance made under clause(a) shall be recorded in a boundpaged book kept for the purpose, and shall be signed and dated by person making the inspection and countersigned by the engineer.
- (c) If the engineer, mechanical foreman or other competent person making an inspection under clause(1)(a) notices any defect in any machinery the said machinery shall not be used until the defect has been remedied.
- (d) Any defect in a cachinery reported by its operator shall be promptly attended to.

- (4) (a) Any machinery found to be in an unsafe operating condition shall be tagged at the operator's position; "Out of Service, Do not Use" and its use shall be prohibited until the unsafe condition has been corrected.
- (b) All repairs to a machine shall be done at a location which will provide a safe place for the persons engaged on repairs.
- (c) Except for testing, trial or adjustment, which must necessarily be done while the machine is in motion, every machine shall be shut down and positive means taken to prevent its operation while any repair or manual lubrication is being done.
- (d) Power shall be disconnected when repairs are made to any electric machine.
- (e) Any machinery, equipment or part thereof which is suspended or held apart by use of slings, hoists jacks shall be substantially blocked or cribbed before men are permitted to work underneath or between the same.
- (f) The operator or driver shall not leave the machine while it is running unless it is placed under the charge of a competent person.

9. (1) GENERAL LIGHTING:

Where natural lighting is insufficient, adequate general lighting shall be provided during working hours, in the opencast working and along roads etc.

(2) PROTECTIVE EQUIPMENT:

Every person working in the opencast working shall be provided with, and shall use, a hard hat and reinforced safety boots of a type approved by the Chief Inspector of Mines.

(3) PRECAUTIONS AGAINST DUST:

Adequate arrangements, to allay dry dust by wetting shall be made on roads and benches & where trucks and dumpers operate.

contd.....P/6

(d)

(10) DRILLING AND BLASTING OF DEEP HOLES:Precautions while drilling:

1. The position of every deep hole to be drilled shall be distinctly marked by the overman so as to be readily seen by the drillers.
2. (a) No drilling shall be commenced in an area where shots have been fired, until the shotfirer has made a thorough examination at all places, including remaining butts of old deep holes, for unexploded charges that the drill may strike.
- (b) No drill or bore rod or pick shall be inserted in butts of old deep holes even if an examination under clause(a) has failed to reveal presence of explosives.
3. (a) Drilling and charging of deep holes shall not be carried out in the same area at the same time.
- (b) Drilling operations shall not be carried on simultaneously on two benches, at places directly one above the other.

11. DUTIES OF DRILL OPERATORS:

- (1) At the beginning of his shift, the drill operator shall examine the drilling equipment and satisfy himself that-
 - (a) Crown blocks are mounted securely;
 - (b) Where compressed air drills are used, all holes connections are in order; and
 - (c) the drilling equipment is in safe working condition.
- (2) The drill operator shall ensure that-
 - (a) Work persons keep clear of auger and drill stem while the drill is in motion;
 - (b) Work persons do not work under suspended tools, when tools are removed from the holes, these shall be lowered on the platform;
 - (c) all finished drill holes are properly plugged so as to avoid possible leg injuries to any one accidentally stepping into the hole.

12. G E N E R A L:

- (1) All conditions specified by the Chief Inspector of Mines in the documents granting permission to carry a larger quantity of explosives in a single case or canister or for the use at one time in one place of more than one such case or canister, in relaxation of Regulation 163 of the Coal Mines Regulations, 1957, shall be strictly complied with.
- (2) Notwithstanding anything contained in the Coal Mines Regulations, 1957, the preparation of charges and the charging and stemming of holes shall be carried out under the personal supervision of an Overman who shall fire the shots in deep holes himself.

13. Charging of Deep Holes:

1. Explosives shall be delivered first to the hole furthest from the 'Priming Station' so as to avoid persons walking among piles of explosives.

contd.....P/7

(7)

2. Not more than one hole shall be in the process of being charged at any one face at any one time.
3. All charging, stemming and connecting up shall be done while standing on the solid, that is to say, on the side of holes remote from the quarry face.

14. PRECAUTIONS DURING FIRING:

- (1) (a) Shots shall not be fired except during the hours of day light. All holes charged on any one day shall be fired on the same day.
- (b) As far as practicable the shotfiring shall be carried out either between shifts, or during the rest interval, or at the end of work for the day.
- (2) The danger zone shall be distinctly demarcated (by means of red flags properly arranged and supported) at least 30 minutes before firing of holes is to commence.
- (3) Ten minutes before firing, asiren installed for the purpose shall be blown three times for one minute each at intervals of one minute; and no shots shall be fired unless the blasting foreman with assistance of sufficient number of persons appointed in writing by the manager for the purpose has ensured that all persons have left the danger zone or have taken adequate shelter.
- (4) No shot shall be fired when there is traffic on any road or milway track within the danger zone.

15. PRECAUTIONS AGAINST ELECTRICAL STORM:

- (1) During the approach and progress of an electric storm, the following precautions shall be taken.
 - (a) No explosives, particularly detonators, shall be handled.
 - (b) If charging, operations have begun, the work shall be discontinued until the storm has passed.
 - (c) If the blast is to be fired electrically, all exposed wires shall be coiled up and, if possible placed in the mouth of the holes, or kept covered by something other than a metal plate.
 - (d) All wires shall be removed from contact with the steel rails of a haulage track so as to prevent the charge being exploded prematurely by a local strike of the lighting.

16. Design, Operation and Maintenance of Shovels(And dragline) :

(A) Design:

- (1) (a) Every shovel(and dragline) shall be so designed as to afford the operator clear and uninterrupted vision all around.
- (b) Every shovel(and dragline) shall be provided with:-
 - i) efficient warning devices;
 - ii) adequate front and rear lights and a portable lamp for emergency, unless the shovel is not used after day-light hours; and
 - iii) an efficient portable fire extinguisher so placed as to be within easy reach of the operator.
 - iv) A special retracting ladder mounted on the excavating machine.

contd.....P/8

(8)

(B) OPERATION:-

- (1) Every shovel(and dragline) shall be under the charge of a competent person authorised in writing by the manager, herein called the 'Operator'.
- (2) (a) No person other than the operator or his helper if any, or the manager or any person so authorised in writing by the manager shall ride on a shovel or dragline
(b) No person shall be permitted to ride in the bucket of a shovel.
- (3) Shovel dippers(and dragline buckets) shall be lowered to the ground during greasing operations.
- (4)(a) No shovel(or dragline) shall be operated in a position where any part of the machine suspended and leads or lines are brought closer than 3 metres to exposed high voltage lines, unless the current has been cut off and positive means taken to prevent the lines from being energised. A notice of this requirement shall be posted at the operator's position.
(b) Electrical cables, if any, shall be laid in such a manner that they are not endangered either by falling rocks or by any mobile equipment.
- (5) The shovel bucket shall be pulled out of the bank as soon as it is full.
- (6) (a) When being operated in soft or unstable ground, every shovel(and dragline) shall be supported by mats, heavy planks or poles so as to distribute the load of the machinery over larger area and to prevent any danger of the shovel(or dragline) overturning itself.
(b) When not in use, the shovel(or dragline) shall be moved to and stood on stable ground.
- (7) If more than one stripping machines are in use in any area either on the same bench or on different benches the machines shall be so spaced that there is no danger of accident from flying or falling objects etc. from one machine to the other.

(C) DUTIES OF SHOVEL(AND DRAGLINE) OPERATORS:

- (1) (a) At the commencement of every shift, the operator shall personally inspect and test the machine, paying special attention to the following details.
 - i) that every warning device is in working order; and
 - ii) if the machine is required to work after day-light hours, he shall not take out the machine for work nor shall he work the machine unless he is satisfied that it is mechanically sound and in efficient working order including the lighting fixtures.
- (b) The operator shall maintain a record of every inspection made under clause(a) in a bound paged book kept for the purpose and shall sign every entry made therein.
- (2) (a) The operator shall keep the cab window clean so as to ensure clear vision at all times.
(b) The walkways in or about the cab of any shovel/dragline shall be kept free of loose tools, grease containers or other materials that might fall or present a falling or tripping hazard.

contd....P/9

(b)

- (3) (a) The operator shall not operate the machine when persons are in such proximity as to be endangered.
- (b) He shall not swing the bucket over passing haulage unit when the trucks/ dumpers are being loaded, he shall swing over the body of the truck/dumpers and not over the cab, unless the cab is protected by a substantially strong cover.
- (4) Before leaving the machine, the operator shall lower the bucket to the ground.
- (5) The operator shall not allow any unauthorised person to ride on the machine.

17. DESIGN, OPERATION AND MAINTENANCE OF TRUCKS OR DUMPERS:

(A) DESIGN:

Every truck or dumper shall be provided with-

- i) efficient brakes;
- ii) efficient audible warning devices; and
- iii) efficient head-lights, if the truck or dumper is required to work after day light hours.

(B) Operation:

- (1) Every truck or dumper shall be under the charge of a competent person authorised in writing by the manager herein called the 'driver'.
- (2) (a) No person other than the driver or his helper, if any or the manager or any person authorised in writing by the manager shall ride on a truck or dumper.
- (b) No person shall be permitted to ride on the board of a running truck or dumper.
- (3) (a) As far as possible, loaded trucks or dumpers shall not be reversed on gradients.
- (b) Sufficient stop blocks shall be provided at every tipping point and these shall be used on every occasion, material is dumped.
- (c) Standard traffic rules shall be adopted and followed during movement of all trucks and dumpers. They shall be prominently displayed at relevant places in the opencast workings and truck/ dumpers roads.
- (4) When not in use, every truck or dumper shall be moved to and stood or proper parking places.
- (5) No person shall be permitted to work on the chassis of a truck or dumper, with the body in a raised position until after the truck or dumper body has been securely blocked in position. The mechanical hoist mechanism shall not be depended upon to hold the body of the truck or dumper in a raised position.

(C) DUTIES OF TRUCK/DUMPER OPERATORS:-

- (1)(a) Before commencing work, the driver shall personally inspect and test the vehicle, paying special attention to the following details:-
 - i) that brakes are in working order;
 - ii) that the warning devices are in working order; and
 - iii) if the vehicle is required to work after daylight hours that the lights are in working order.

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(10)

He shall not take out the vehicle for work nor shall he drive the vehicle unless he is satisfied that it is mechanically sound and in efficient working order.

- (b) The driver shall maintain a record of every inspection made under clause(a) in a bound paged book kept for the purpose and shall be signed and dated by the person making the inspection.
- (2) The driver shall keep the cab window clean so as to ensure clear vision at all times.
- (3) (a) The driver shall ensure that the gear is in neutral position before stopping the engine.
- (b) The driver shall handle the truck/dumper carefully and keep it under control at all times. He shall negotiate downhill gradients in low gear so that minimum of braking is required.
- (c) He shall not drive too fast, shall avoid distractions and shall drive defensively. He shall not attempt to overtake another vehicle unless he can see clearly for enough ahead to be sure that he can pass it safely. He shall also sound audible warning signal before overtaking.
- (d) When approaching a stripping equipment, the driver of the truck or dumper shall sound the audible warning signal and shall not attempt to pass the stripping equipment until he has received a proper audible signal in reply.
- (e) Before crossing a road or railway line, he shall reduce his speed, look in both directions along the road or line, and shall proceed across the road or line only if it is safe to do so.
- (f) The driver shall not operate the truck or dumper in reverse unless he has a clear view of the area behind the vehicle or he has the assistance of a 'spotter' or 'pitmen' duly authorised in writing for the purpose by the manager. He shall give an audible warning signal before reversing a truck or dumper.
- (g) The driver shall be sure of clearance before driving through tunnels, archways, plant structure, etc.
- (h) The driver shall not drive 'nose to tail' particularly behind a vehicle with twin rear wheels from which a stone piece wedged between the tyres may play back into the windscreen of his vehicle.
- (4) The driver shall see that the vehicle is not overloaded and that material is not loaded in a truck or dumper as to project horizontally beyond the sides of its body and that any material projecting beyond the front or rear is indicated by a red flag during day and a red light after daylight hours.
- (5) The driver shall not allow any unauthorised person to ride on the vehicle. He shall also not allow more than the authorised number of persons to ride on the vehicle.

(D) TESTING OF BRAKE

At least once in two weeks the brakes of the truck, dumper or any such other vehicles shall be tested as indicated below:-

(1)(a) Service Brake Test:-

The brake shall be tested on a specified gradient and speed when the vehicle is fully loaded. The vehicle shall stop within a specified distance when the brake is applied. The specified stopping distance shall be obtained from the vehicle.

(11)

(b) Parking Brake Test:

The parking brake shall be capable to hold the vehicle when it is fully loaded and placed at the maximum gradient of roadway which is permitted for a period of at least ten minutes.

- (c) A record of such test shall be maintained in a bound pagebook and shall be signed by the person carrying out the test and the engineer and manager.

(E) INSPECTION AND OTHER PRECAUTIONS:

- (1) Surprise inspection shall be carried out by the Engineer/ Superior official at an interval not exceeding 15 days to ensure that the examination schedule of machinery/ equipment are carried out.
- (2) While inflating tyres, suitable protective cages shall be used. Tyres shall never be inflated by sitting either in the front or on the top of the same.
- (3) While the vehicle is being loaded/unloaded on gradient, the same shall be secured stationary by parking brake and other means such as suitably designed stopper blocks which could be placed below the tyres.
- (4) Operation and maintenance of heavy machineries such as shovel, dumpers, etc. shall be done strictly in accordance with the operation instructions. The operation instructions and maintenance schedule shall be obtained from the manufacturers.
- (5) (a) Automatic fire protection system shall be provided and maintained in working order for surface heavy machinery such as coal haulers, mine haulage vehicles, ash haulers, dozers, front end loaders, draglines, bucket wheel excavators, blast hole drills, hydraulic and electric shovels etc. It is also necessary that the recommended procedure for testing of such fire protection system at a given schedule by the manufacturer is also adopted. The automatic fire systems consist of one or more containers of fire suppressant (usually a dry chemical) connected by a fixed plumbing network to nozzles directed at specific predetermined fire hazard areas of the machinery.
- (b) Optical, thermal or any other suitable type of sensing device shall be suitably located to sense the fire and actuate the suppressant to come out through the nozzles already fixed to deal with the fires. An overriding manual system along with fire alarm shall also be additionally provided for better effectiveness of the system.

(18) INSPECTION, EXAMINATION AND MAINTENANCE OF ELECTRICALLY OPERATED HEAVY EARTH MOVING MACHINES, EQUIPMENT AND ACCESSORIES

- (i) No machine, equipments or accessory of any electrically operated heavy earth moving machine shall be installed commissioned and used without carrying out the following tests:-

(I) Electrical Shovel:

- i) All the H.V. tests as given in I.E Rule 65,
- ii. Insulation test with H.V megger,
- iii. Oil test and
- iv E/L & O/L and single phase preventer and stall protection relays.

contd.....12.

(12)

(b) Trailing Cable:

- i) Insulation test with H.V. megger,
- ii) Earth continuity test;
- iii) Earth loop resistance test.

(c) Shovels EKC- 4.6

All tests enumerated in the instruction manual of manufacturers.

(II) Drilling Equipment(CBW-250):(a) Field Switch:

- i) Insulation test;
- ii) Earth continuity;
- iii) Earth loop resistance

(III) Trailing Cable:

- i) Insulation test;
- ii) Earth continuity: &
- iii) Earth loop resistance.

(IV) Drilling Equipments:

- (1) i) Insulation test of all auxilliary motors i.e., rotor compressor, caterpillar drive, hydraulic pump motor etc.
- ii) Efficacy of Asym-meter for earth fault in the drill machine body.
- iii) Emergency tripping when required.
- iv) All the hydraulic valves, pressure slide valve etc, for their efficacy.
- (2) (a) If the results of tests enumerated in I to IV above do not conform to limits prescribed in I.E. Rules, 1956 (Revised 1982), I.S.I. specifications and directions issued in this respect from time to time the machine, equipments switch or cable shall not be energised and used.
- (b) The above test results shall be recorded in a bound pagged book and shall be signed and dated by the Electrical Supervisor or Senior Electrician holding H.V. Certificate issued by the State Licensing Board and shall be countersigned by the Colliery Engineer.

(V) Electrical:-

The efficacy of earth leakage relays protecting the trailing cables of heavy earth moving machines shall be tested in the beginning of each shift by a competent person (senior electrician or supervisor) and if they are found inoperative, power shall not be switched on till the defects are removed. The results of all such tests shall be kept recorded.

(VI) MAINTENANCE:

- (a) All bearings, hydraulic system lubrication system etc, shall be examined at least once in each shift and adjustments effected as per the directives in the instruction manual of the manufacturers log-book.
- (b) The record of all shift-wise daily, weekly and fortnightly examinations, maintenances, adjustments and repairs effected shall be kept in a bound register duly signed by the person making the examinations and countersigned by the Engineer.
- (c) General overhaul of all cutting and drilling and Heavy Earth Moving Machines shall be effected as per instructions of the manufacturers instruction sheets.

(14)

(VII) GENERAL:

No electrically operated machine, equipment and accessories shall be energised, commissioned and used without prior approval of the competent authority under the relevant provisions of Indian Electricity Rules.

- (19) It shall be the duty of the Manager to issue duty charts (in the language which is understood by the person concerned) to various operators/Supervisors connected with the use of Heavy Earth Moving Machinery and both the Manager and the Engineer shall be responsible to ensure that all the precautions and guidelines listed in this permission are strictly followed.



Director of Mines Safety,
Ranchi Region.

Registered.



भारत सरकार / Govt. of India
 श्रम एवं रोजगार मंत्रालय / Ministry of Labour & Employment
 खान सुरक्षा महानिदेशालय / Directorate General of Mines Safety
 कोडरमा क्षेत्र / Koderma Region



संख्या को/

कोडरमा - 825409, दिनांक

2008

प्रेमक,

खान सुरक्षा निदेशक
 कोडरमा क्षेत्र, पोस्ट 0 करमा, जिला 0 कोडरमा,
 झारखण्ड ।

सेवा में,

अधिकारी
 डि०मि०सि० बेरमा माइन,
 मेसर्स दामोदर भेलि कॉरपोरेशन,
 पो. बेरमा जि. बाँकारो, झारखण्ड

Sub. Restoration of permission under Regulation 170(1A) & 170(1B) of the Coal Mines Regulations, 1957 granted vide this Directorate's letter no. KR/Perm/170/1620 dated 18.10.1995 & subsequently modified vide letter no. KR/1012 dated 23.08.2004 to conduct deep hole blasting within danger zone but beyond 100m of surface structures at opencast workings of DVC Berma mine of M/s DVC Ltd.

Sir,

Please refer to your letter No. BM/DGMS/Blasting permission/744 dated 14.09.2007 and enclosed plan on the above subject

The matter has since been considered in the light of what has been stated in your application under reference and shown on the enclosed plan.

By virtue of powers conferred on the Chief Inspector of Mines (also designated as Director-General of Mines Safety) under Regulations 170(1A) & 170(1B) of the Coal Mines Regulations, 1957 and by virtue of the authorization granted to me by the Chief Inspector of Mines (also designated as Director-General of Mines Safety) under Section 6(1) of the Mines Act, 1952. I hereby restore the permission under Regulation 170(1A) & 170(1B) of the Coal Mines Regulations, 1957 granted vide this Directorate's letter no. KR/Perm/170/1620 dated 18.10.1995 & subsequently modified vide letter no. KR/1012 dated 23.08.2004 to conduct deep-hole blasting within danger zone but beyond 100m of surface structures at opencast workings of DVC Berma mine of M/s DVC Ltd as indicated on the plan No. BM-524/05 dated 05.09.2007 subject to the following conditions being strictly complied with:

1.0 Condition No. 1 of letter No. KR/Perm/170/1620 dated 18/10/95: The diameter of blast hole shall not exceed 100 mm, the burden shall not exceed 2.75m and spacing not more than 3.0m. The depth of hole shall not exceed 6m and the number of holes to be fired in a round shall not exceed 12. The maximum charge per hole shall vary from 19 to 26 Kg so as to maximum charge per delay at 100m distance from dwellings shall not exceed 36 Kg to keep the vibration value within 10mm/sec. However, maximum charge per delay shall not exceed 56 Kg at 125, 81.7 Kg at 150m, 111Kg at 175m, 145 Kg at 200m, 184 Kg at 225m, 227 Kg at 250m, 275 Kg at 275m and 327 Kg at 300m distance.

- 2.0 The blasting pattern and charge per hole vis-à-vis distance from dwellings/structure shall be as per the recommendation of CIMFR, Dhanbad vide their letter No.GC/MT/1/2007/08 dated September 2007.
- 3.0 Other conditions of permission letter bearing No.KR/Perm/170/1620 dated 18.10.1995 and subsequently modified vide letter No.KR/1012 dated 23.08.2004 shall remain unaltered.

भवदीय,

Sd/-

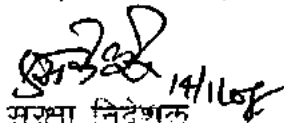
(एस0 कृष्णमूर्ति)
खान सुरक्षा निदेशक,
कोडरमा क्षेत्र

ज्ञापन संख्या को/ 1261 कोडरमा - 825409, दिनांक

15/1/2008

प्रतिलिपि सूचना एवं आवश्यक कार्यवाई के लिए निम्नलिखित को प्रेषित है:-

1. डा0 सुब्रत बिश्वास, मनोनित मालिक, डिभिंसि बेर्मो माइर्न, मेसर्स दामोदर धाटी निगम, डिभिंसि टौवार, बिधाननगर, कोलकाता, प.ब.।
2. प्रवन्धक डि0भिंसि0 बेर्मो माइर्न, मेसर्स दामोदर धाटी निगम, गो. बेर्मो, जि. बोकारो, झारखण्ड।


खान सुरक्षा निदेशक,
कोडरमा क्षेत्र



झारखण्ड राज्य प्रदूषण नियंत्रण पर्वद
JHARKHAND STATE POLLUTION CONTROL BOARD
 [CONSTITUTED UNDER SECTION 4 OF THE WATER (PREVENTION & CONTROL OF POLLUTION) ACT, 1974]
 T.A.DIVISION BUILDING (GROUND FLOOR),HEC COMPLEX, DHURWA, RANCHI-834004.
 Phone No:-0651- 2400852, 2400851, Fax No:- 2400850.

Ref No. LN-128

Date 10.12.2009

CONSENT TO OPERATE

With reference to the application dated 15.12.2008 of M/S Bermo Mines D.V.C, Bermo, Bokaro for consent under section 25/26 of the Water (Prevention & Control of Pollution) Act, 1974 and that under section 21 of the Air (Prevention & Control of Pollution) Act, 1981, he (they) is (are) granted consent to bring into use his(their) new/altered/existing outlet(s) for discharge of trade effluent and (or) domestic sewage and to operate his (their) Bermo Mines D.V.C, Bokaro for the period from 01.01.2009 to 31.12.2009 with the following conditions

1. That, he(they) shall make no any alteration, addition, deletion or modification in the plant without the prior clearance from the Board.
2. That, he(they) shall abide by the obligations provided under section 24, 31 and 33A of the Water (Prevention & Control of Pollution) Act, 1974 and shall extend co-operation to the Board in performing its functions entrusted under section 20, 21, 23, 30 and 32 of the Act.
3. That, he(they) shall comply with the requirements of the Water (Prevention & Control of Pollution) Cess Act, 1977 read with the Water (Prevention & Control of Pollution) Cess Rules, 1978
4. That, he(they) shall abide by the obligations provided under section 22, 23 and 31A of the Air (Prevention & Control of Pollution) Act, 1981 and shall extend co-operation to the Board in performing its functions entrusted under sections 24, 25 and 26 of the Act.
5. That, he(they) shall abide by the obligations provided under sections 5, 7, 8 and 9 of the Environment (Protection) Act, 1986 and shall extend co-operation in performing the functions entrusted under section 3, 10 and 11 of the Act.
6. That, he(they) shall abide by the applicable provisions of the Environment (Protection) Rules, 1986, the Hazardous Wastes (Management, Handling & Transboundry Movement) Rules, 2008; the Manufacture, Storage and Import of Hazardous Chemicals Rules, 1989; the Bio-medical Waste (Management & Handling) Rules, 1998; the Municipal Solid Wastes (Management & Handling) Rules, 2000 and the Batteries (Management & Handling) Rules, 2001.
7. That, he(they) shall maintain the quality of discharge and (or) emission and (or) noise level of environmental pollutants in conformity with the standards as laid under Rule 7 of the Environment (Protection) Rules, 1986
8. That, he(they) shall monitor his(their) effluent(s), emission(s) and the ambient air, noise level regularly and shall submit the report to the Board in compliance of the condition laid in paragraph 7.
9. That, he(they) shall establish well equipped environmental laboratory with the facilities of system(s) of continuous monitoring of effluent(s), emission(s) ambient water quality(ies), ambient air quality(ies) and ambient noise level(s) and transferring them (monitoring results) to his(their) website(s) and to the e-mail address(es) of the key persons of Jharkhand State Pollution Control Board, Zonal Office, Kolkata and Ministry

M Xess/07 12.09

Pm

of Environment & Forests, Regional Office, Bhubneshwar with simultaneous displaying at prominent locations in front of his(their)premises. [*Unit(s) of medium and large scale under 17 categories of polluting industries of category A of EIA Notification, 2006.]

10. That, he(they) shall submit the environmental statement every year by 30th September and shall harvest all rain water precipitating in the premises and do three tier tree plantation in the premises as air barrier.
11. That, he(they) shall submit application for consent under section 25/26 of the Water (Prevention & Control of Pollution) Act 1974 and that under section 21 of the Air (Prevention & Control of Pollution) Act, 1981 again 120 days before the expiration of the consent order 31.12.2009, or within 120 days from the date of receipt of the order, whichever is earlier.
12. *He/ they shall implement Rain Water Harvesting Plan within consent period*
13. *He/they shall submit report of OB management & Mines reclamation of the consent period*
14. *He/they shall submit Environmental Statement within consent period*
15. *He/ they shall keep the effluent in closed circuit.*
16. *He/ they shall conform the quality of effluent to the standard prescribed by the Board.*
17. *He/ they shall do the sprinkling of Water regularly on darty space.*

To,

Sri M. Das,

M/S Bermo Mines, D.V.C. .

P.O. Bermo, Distt- Bokaro.

PnSmha
8/12/2009
Member Secretary

MR



सेन्ट्रल माइन प्लानिंग एण्ड डिजाइन इंस्टीच्युट लिमिटेड
(कोल इण्डिया लिमिटेड की सहायक कम्पनी/ भारत सरकार का एक लोक उपक्रम)
गोन्दवाना प्लेस, कान्के रोड, राँची - 834 031, झारखंड (भारत)
Central Mine Planning & Design Institute Limited
(A Subsidiary of Coal India Limited/ Govt. of India Public Sector Undertaking)
Gondwana Place, Kanke Road, Ranchi - 834 031, Jharkhand (INDIA)
Corporate Identity Number - U14292JH1975GOI001223

फैक्स / स्पीड डाक द्वारा

पत्रांक : सीएमपीडीआई/बी.डी./ C(886-A) / [- 1307

दिनांक: 25.04.2017

सेवा में,

The S.E. (Mining) & Agent,
D.V.C. Bermo Mines,
PO- Bermo,
Bokaro, Pin - - 829 104
Dist.: Bokaro, Jharkhand.

विषय: Certification of Geological Coordinates used in preparation of Mining Plan of DVC Bermo Mine in accordance with the vesting order (Job No. 511016286) - Reg. Submission Certificate

संदर्भ : i) CMPDI's offer letter no. सीएमपीडीआई/बी.डी./ए (003)ऑफर मॉ -XXIII / 101
दिनांक 27.02.17

ii) Your work order no. BM/180 dtd. 28.02.2017

महोदय,

This has reference to the CMPDI offer letter no. 101 dtd. 27.02.2017 & your work order no. 180 dtd. 28.02.2017 pertaining to the subject assignment.

Plan showing the Geological co-ordinates (Latitude, Longitude) used in the preparation of **Mining Plan of DVC Bermo Mine**, which was submitted by you, was examined by the committee constituted for the same. Accordingly, the two copies of plans having CMPDI's certification with its observation is enclosed herewith.

We are also enclosing a 'Customer Feedback form' for your overall perception. The duly filled in form may kindly be returned to 'Management Representative (QMS), Management System Division, CMPDI, Ranchi'.

धन्यवाद एवं सदैव अपनी सर्वोत्तम सेवाओं के आश्वासन सहित ।

Encl : As above

भवदीय,

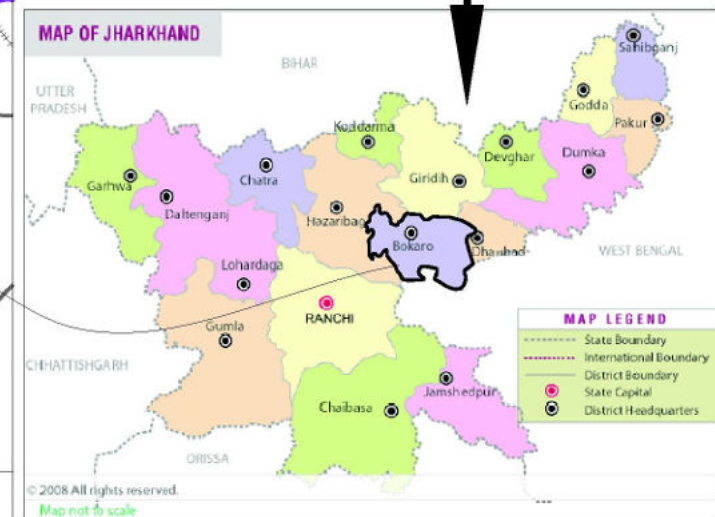
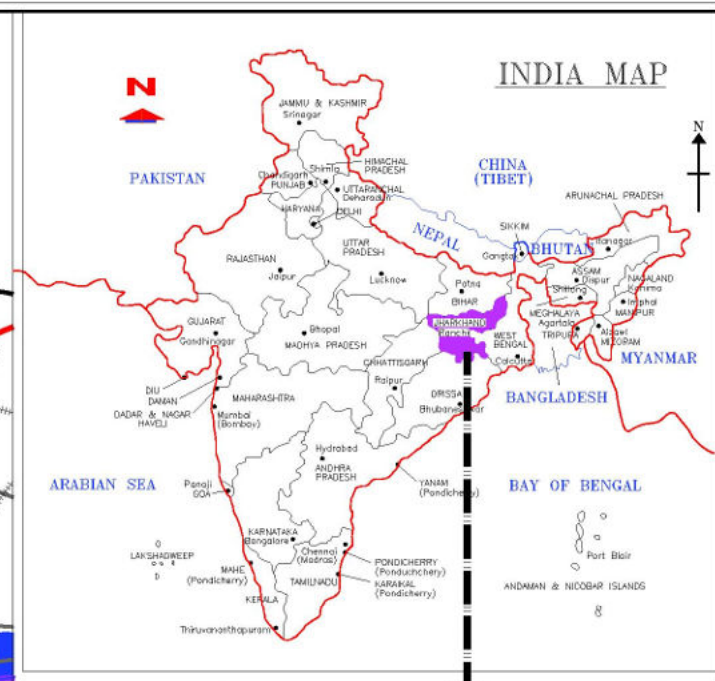
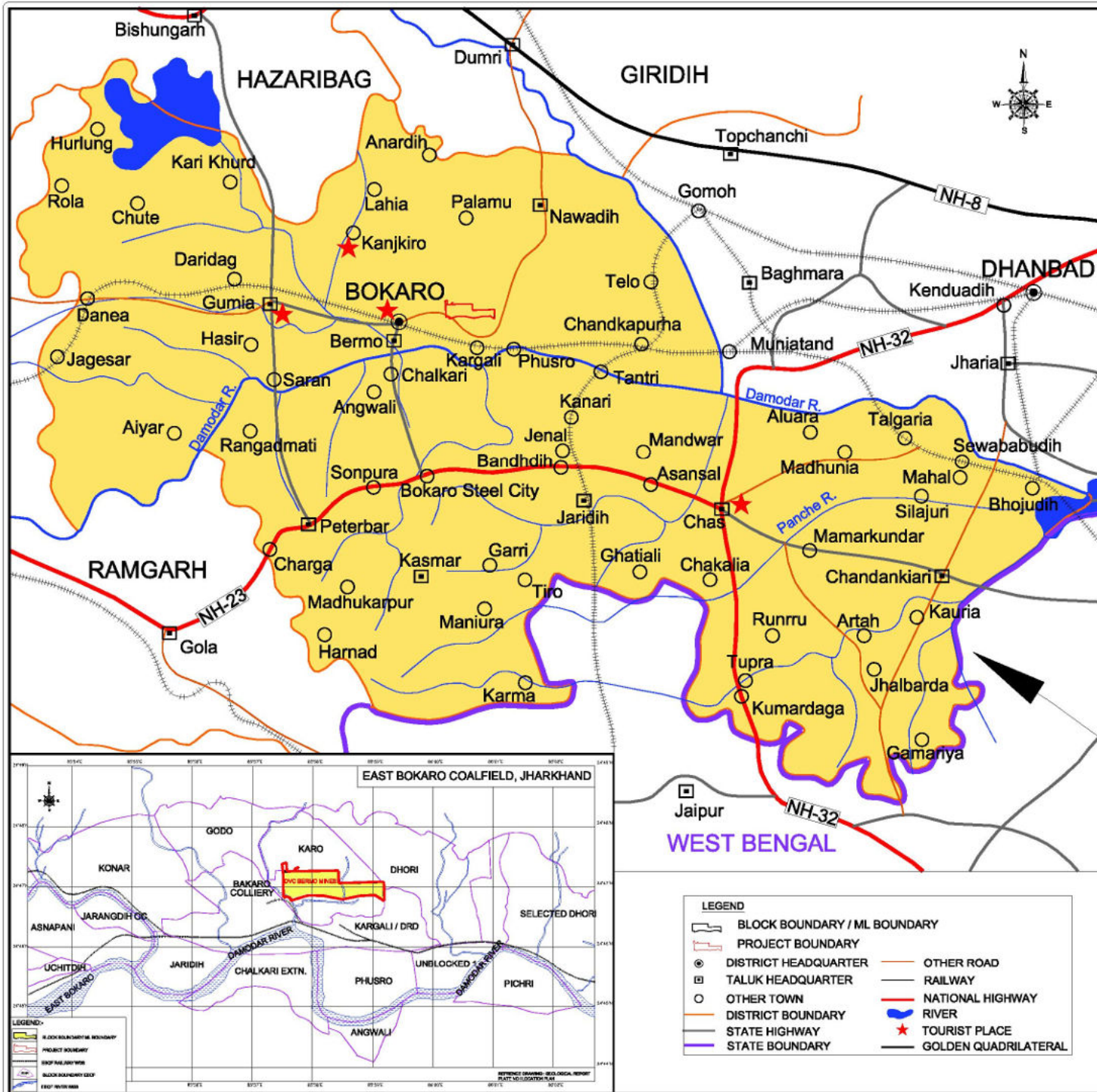
महाप्रबंधक

(व्यवसाय विकास)



फोन/ Ph : +91 651 2230116 फैक्स/ Fax: +91 651 223249, 2231447
ईमेल/ email: gmdbd.cmpdi@coalindia.in वेबसाइट/ Website :http://www.cmpdi.co.in

PLATES



MIN MEC CONSULTANCY PVT. LTD.
NEW DELHI, PH. 29534777, 29535891
An ISO 9001 : 2008 Approved Company

CLIENT: DAMODAR VALLEY CORPORATION (DVC)

PROJECT: DVC Bermo Mine

TITLE: MINING PLAN & MINE CLOSURE PLAN
LOCATION PLAN, INDICATING THE RAIL AND ROAD LINKS

PREPARED BY: B.R. MATLOTIA

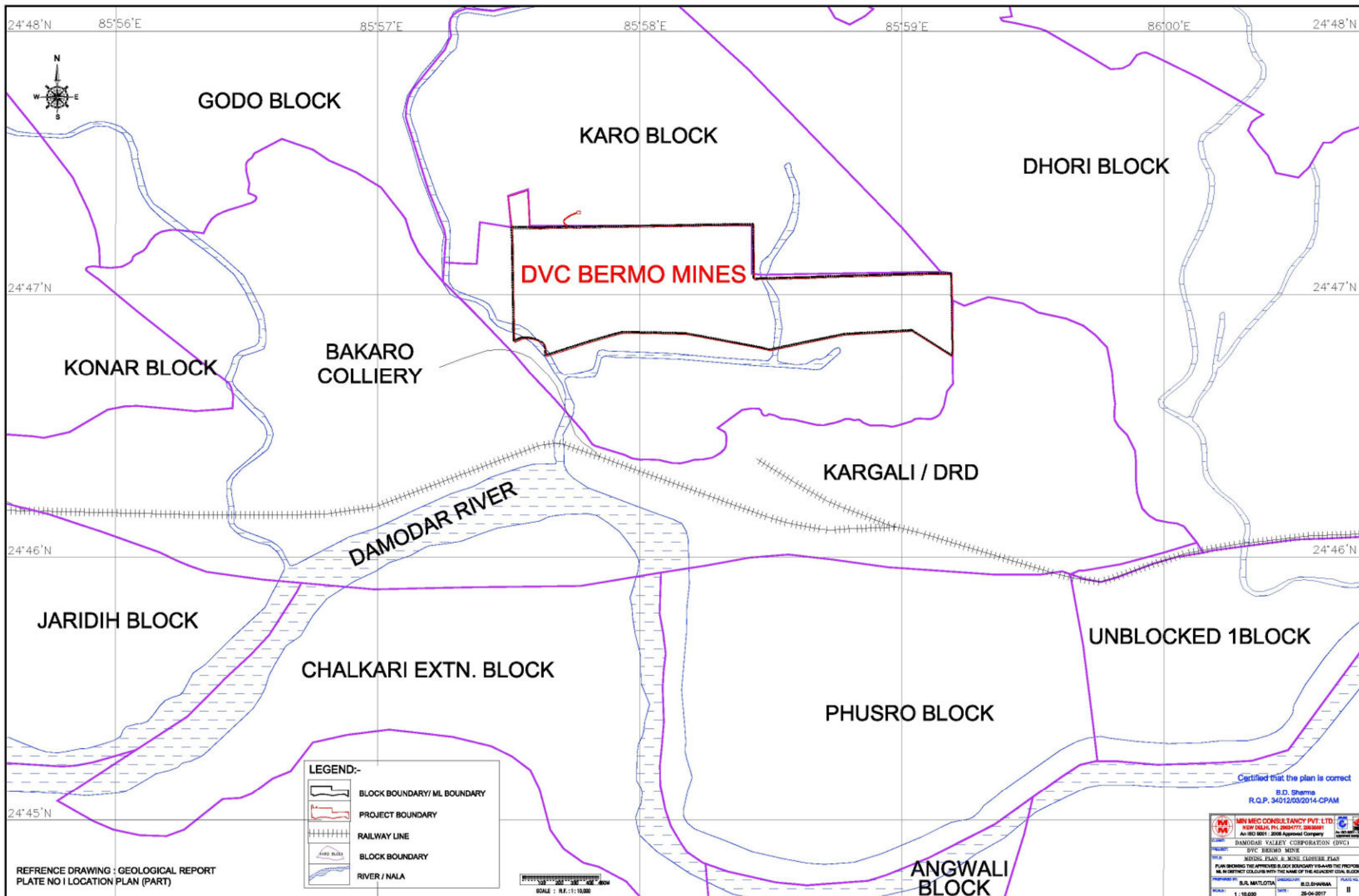
CHECKED BY: B.D. SHARMA

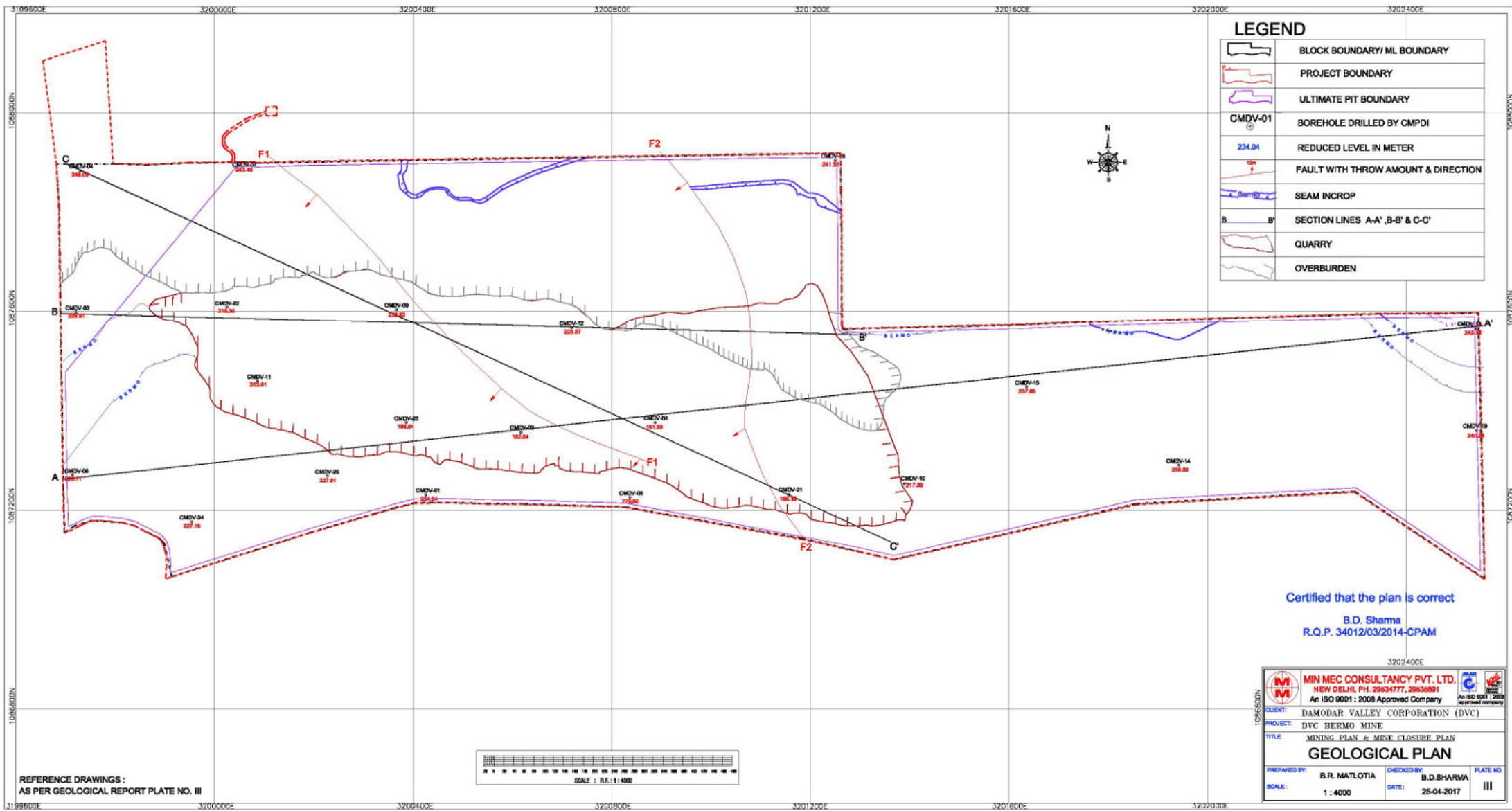
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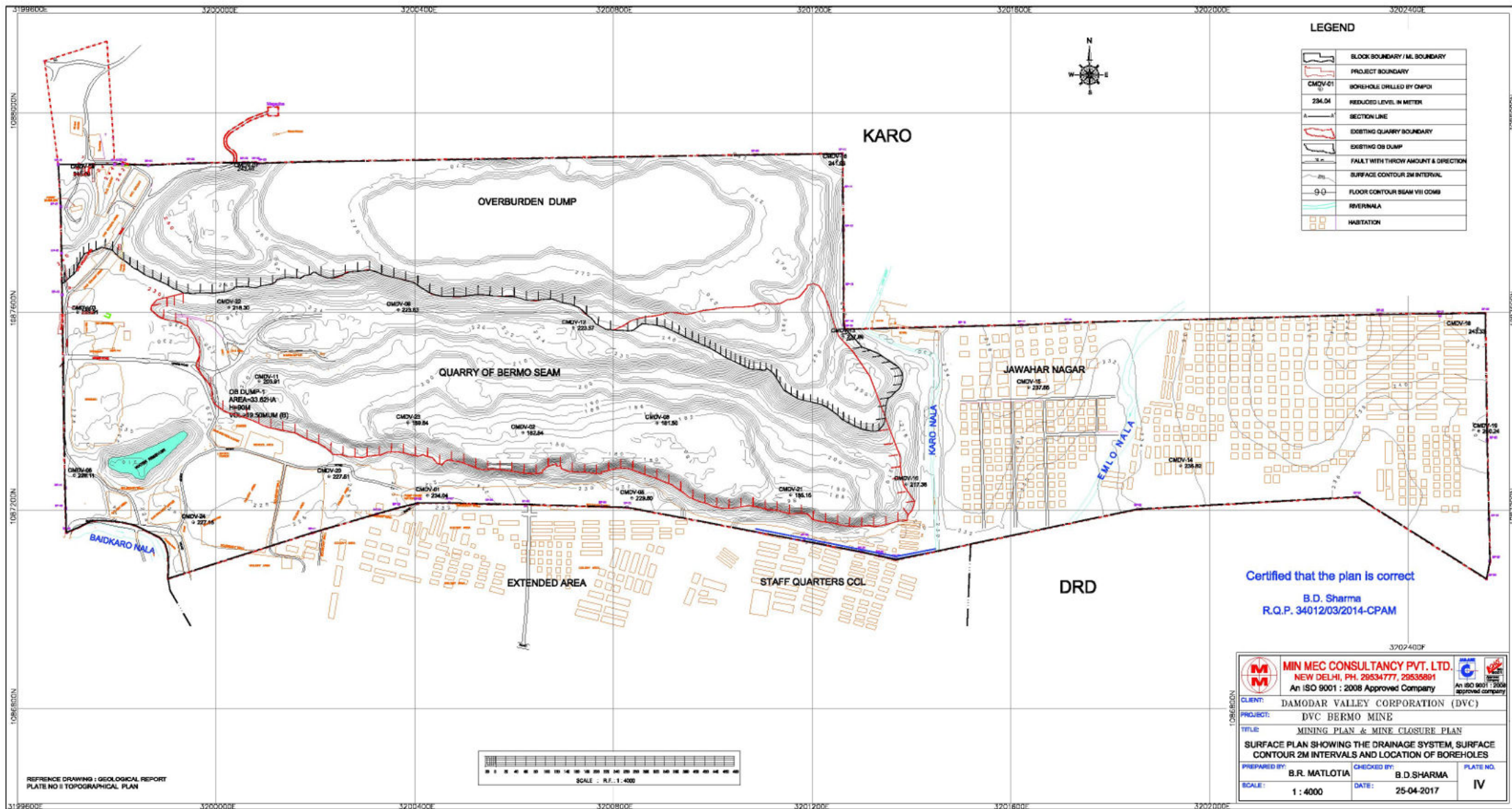
DATE: 06-03-2017

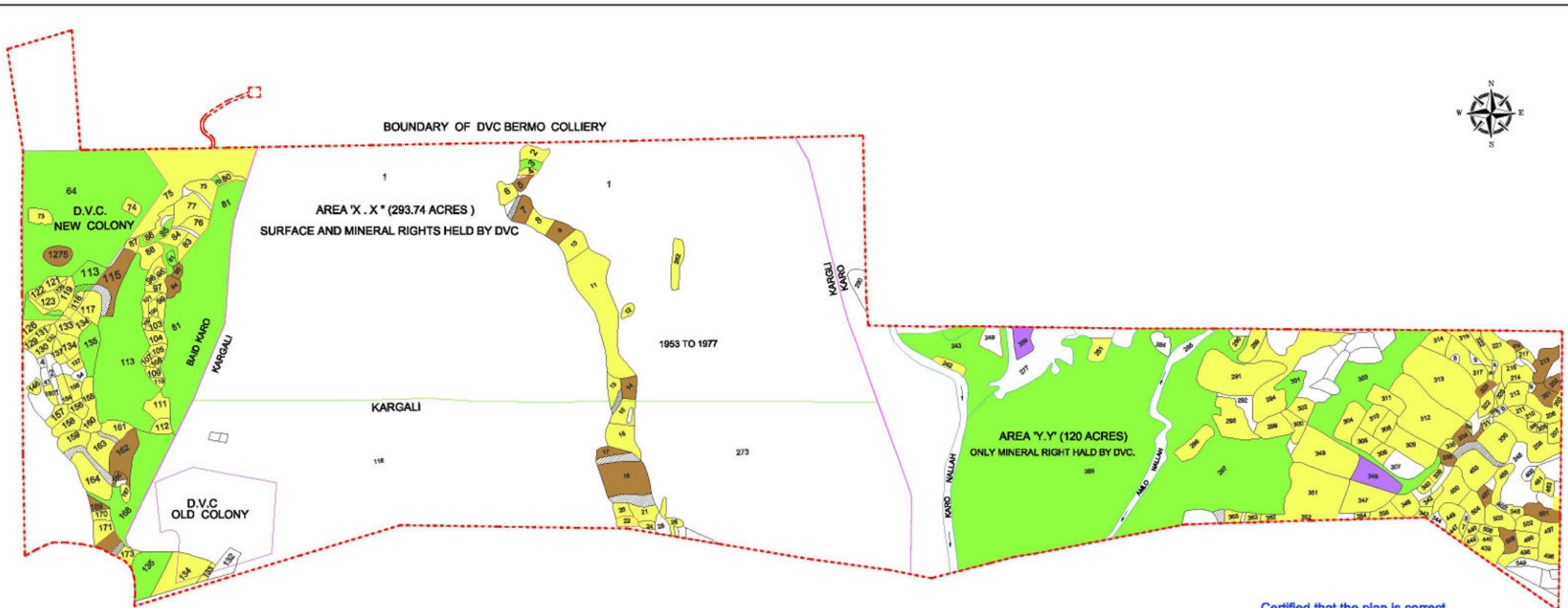
PLATE NO. I

Certified that the plan is correct
B.D. Sharma
R.O.P. 347125/2014-CHW



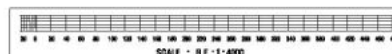






LEGEND

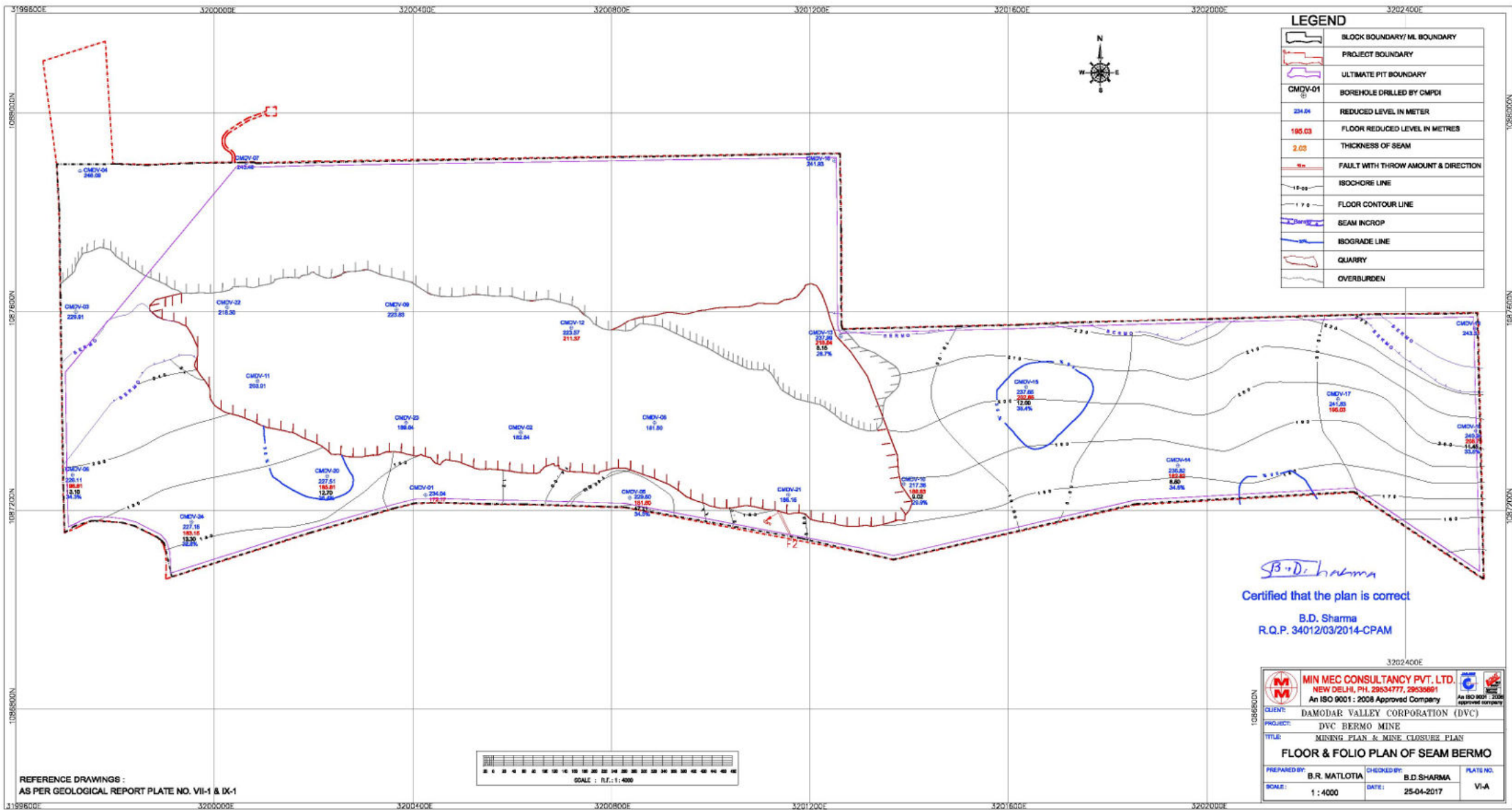
	PROJECT BOUNDARY
	PATTA NO
	PATTA BOUNDARY
	RIVER/NALA
	GM-Aam (other)
	GMK JUNGLE
	GMK Govt. land/waste land
	AND USE AGRICULTURAL (TENANCY)

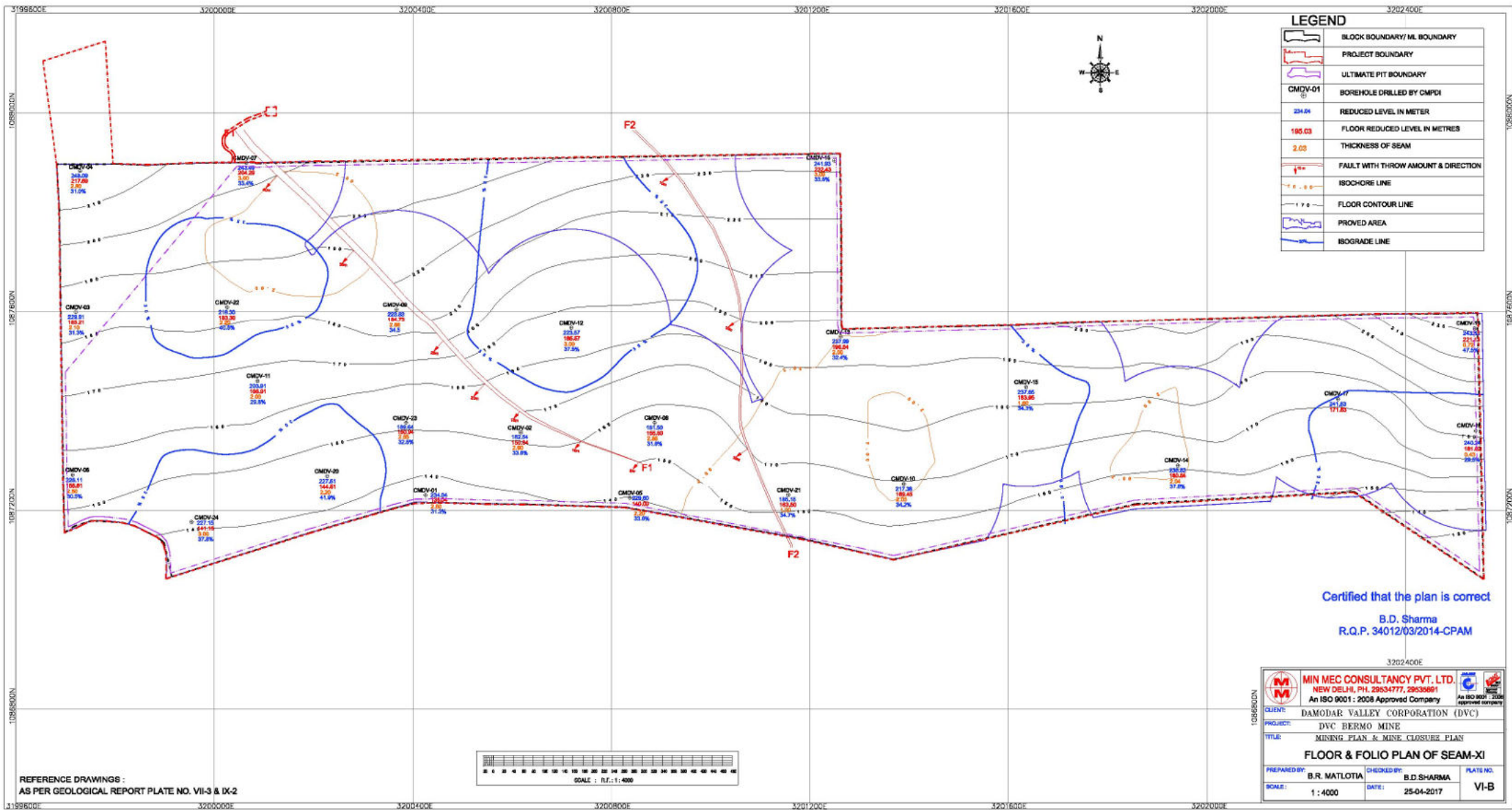


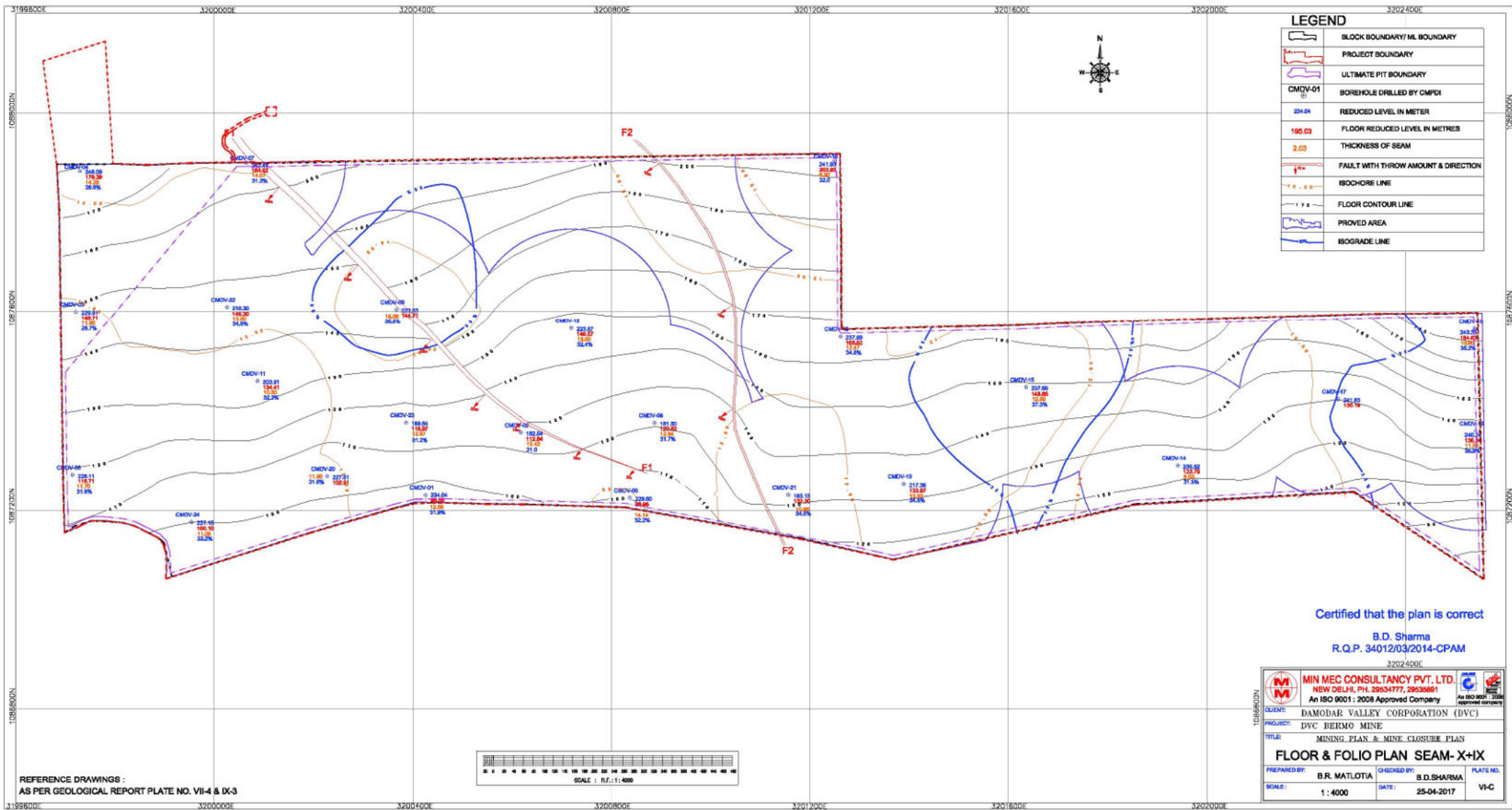
Certified that the plan is correct

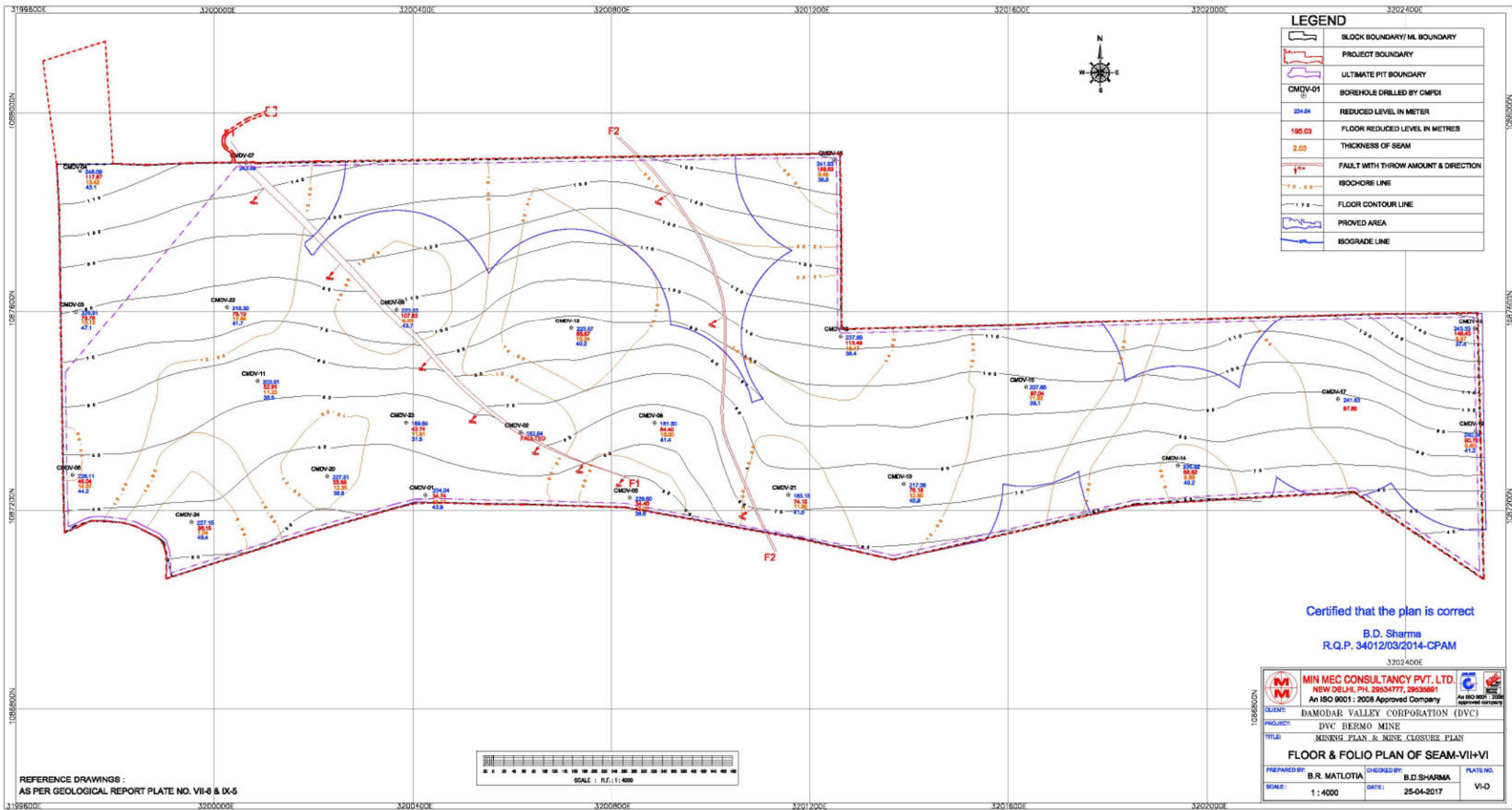
B.D. Sharma
R.Q.P. 34012/03/2014-CPAM

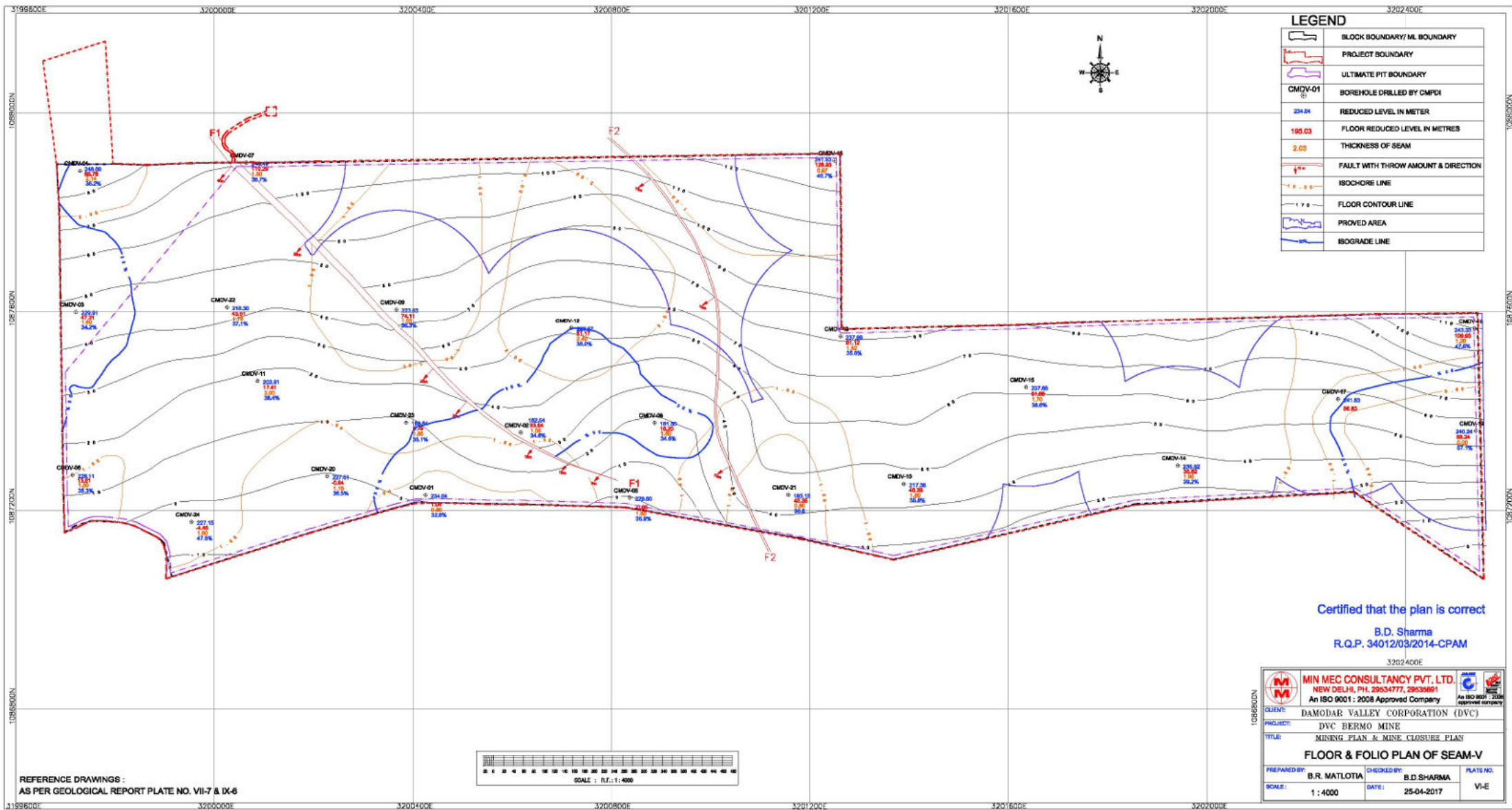
	MIN MEC CONSULTANCY PVT. LTD. NEW DELHI, PH. 29534777, 29535891 An ISO 9001 : 2008 Approved Company	
CLIENT:	DAMODAR VALLEY CORPORATION (DVC)	
PROJECT:	DVC BERMO MINE	
TITLE:	MINING PLAN & MINE CLOSURE PLAN PRE-MINING LAND USE PATTERN, CLEARLY DEMARCATING THE INVOLVEMENT OF FOREST LAND	
PREPARED BY:	B.R. MATLOTIA	CHECKED BY: B.D. SHARMA
SCALE:	1 : 4000	DATE: 25-04-2017
		PLATE NO: V

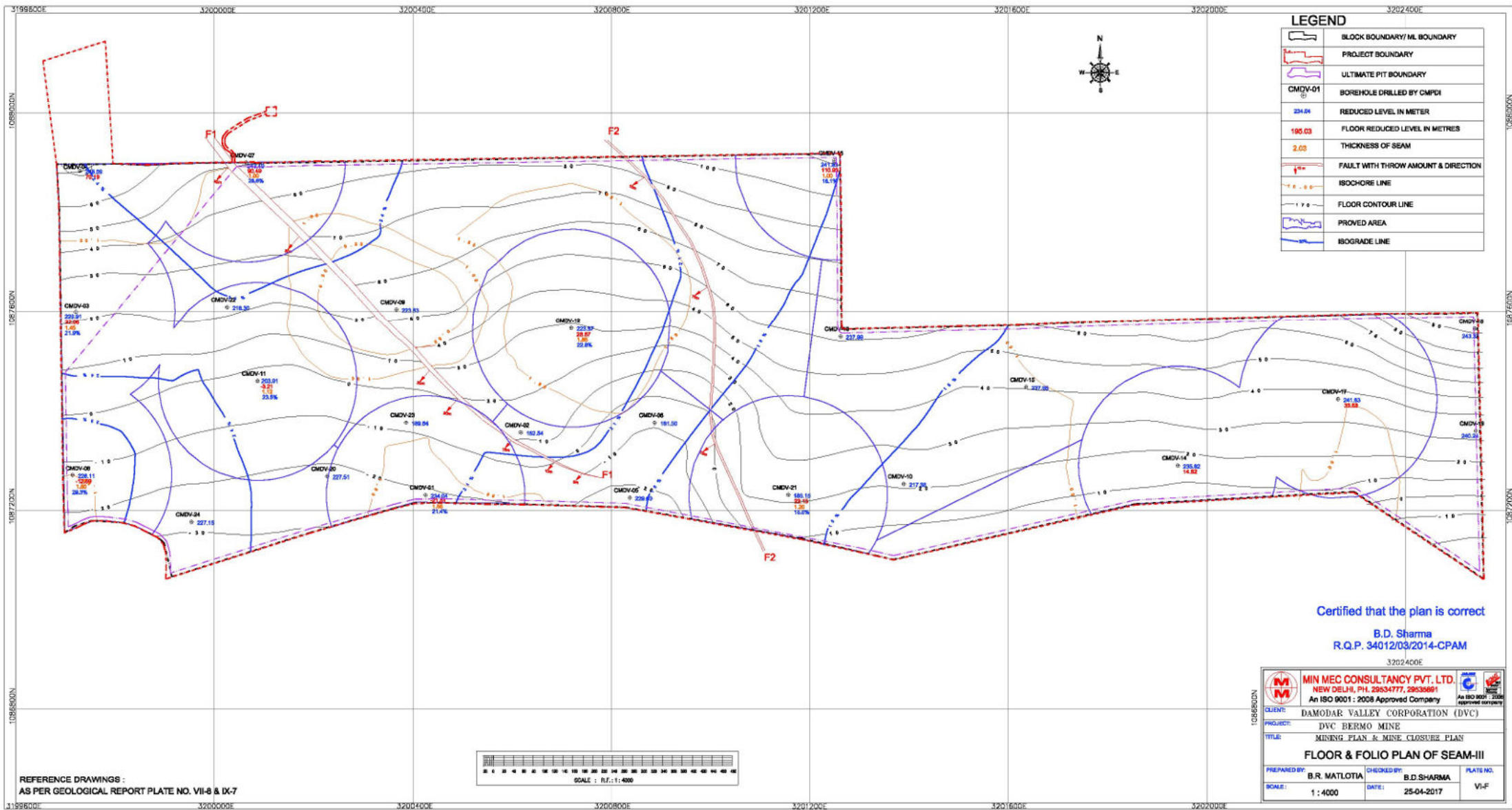


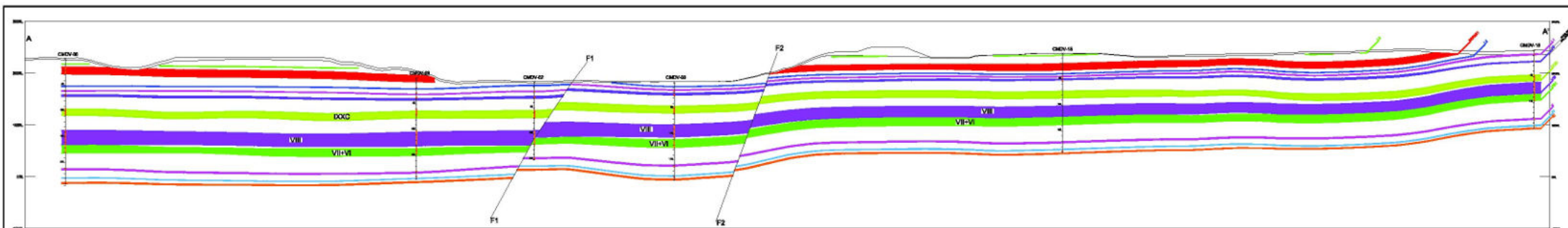




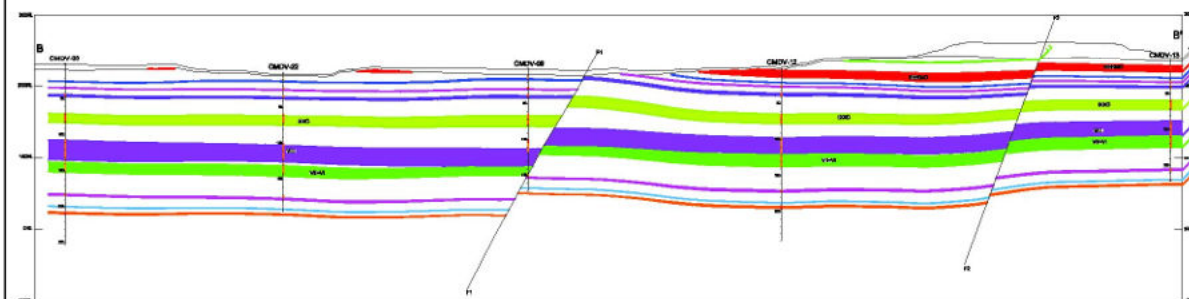




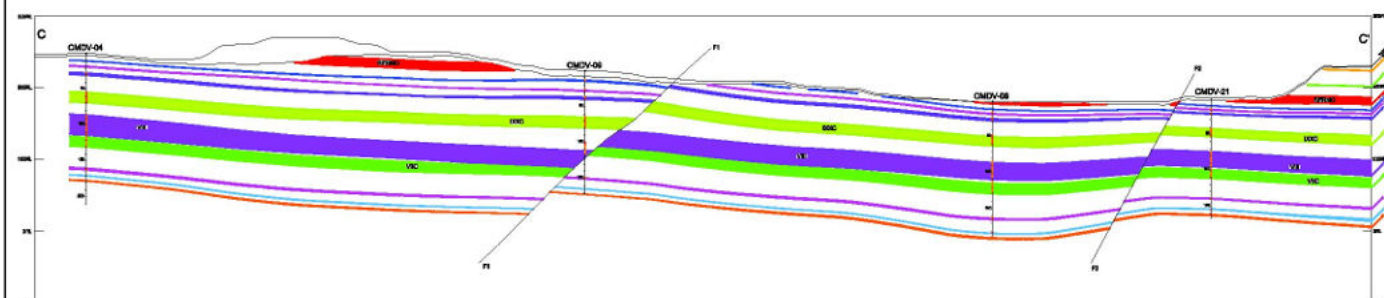




CROSS SECTIONS ON SECTION LINE A - A'



CROSS SECTIONS ON SECTION LINE B - B'



CROSS SECTIONS ON SECTION LINE C - C'

- Seam BERMO
- Seam LOCAL-1
- Seam XI
- Seam X+IX
- Seam VIII
- Seam VII+VI
- Seam V
- Seam III

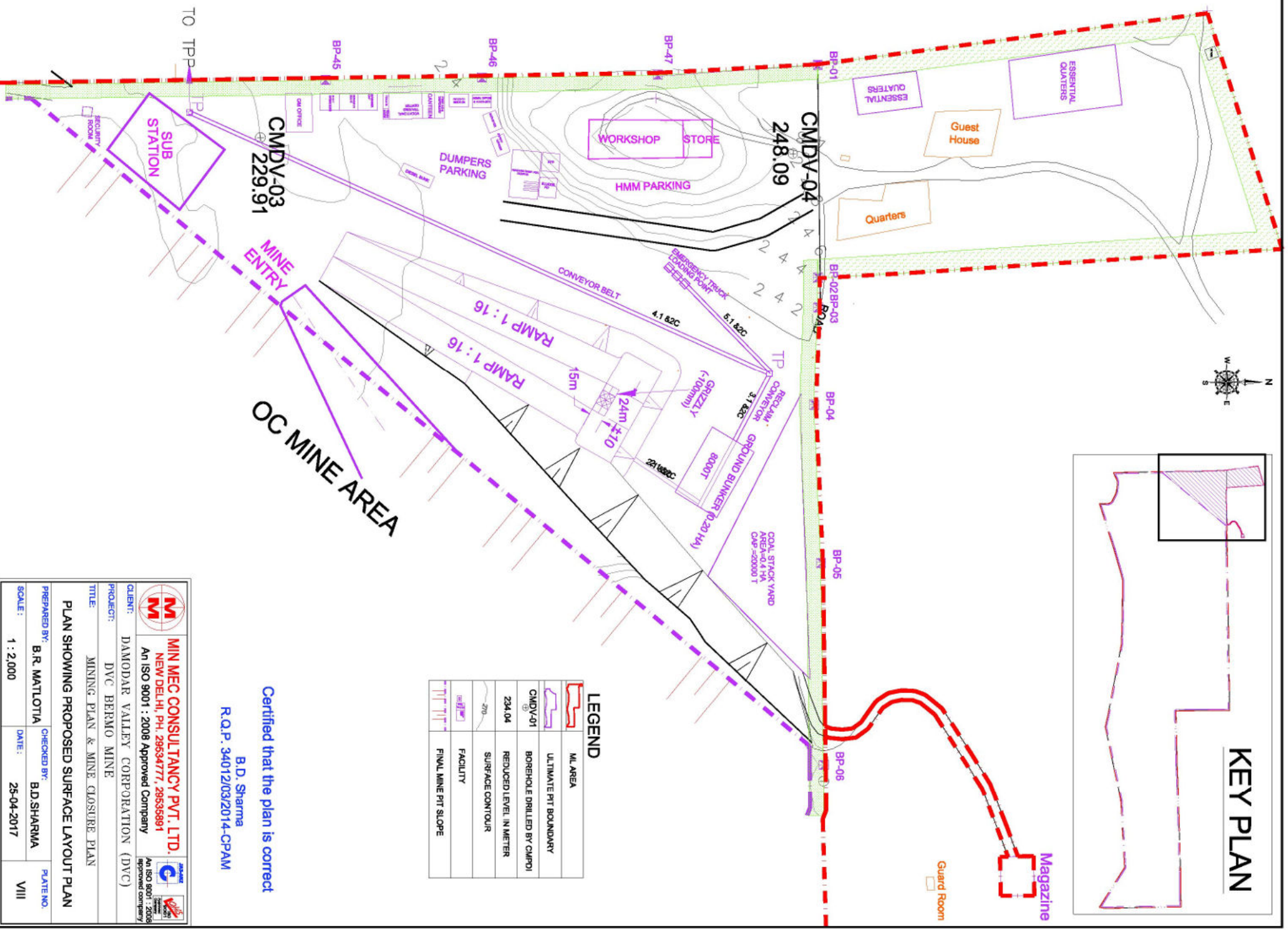
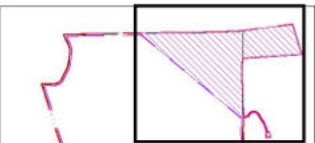
Certified that the plan is correct

B.D. Sharma
R.Q.P. 34012/03/2014-CPAM

REFERENCE DRAWINGS :
AS PER GEOLOGICAL REPORT PLATE NO. VI-1, VI-2 & VI-3

 MIN MEC CONSULTANCY PVT. LTD. NEW DELHI, PH. 29534777, 29535891 An ISO 9001 : 2008 Approved Company			
CLIENT: DAMODAR VALLEY CORPORATION (DVC)			
PROJECT: DVC BERMO MINE			
TITLE: MINING PLAN & MINE CLOSURE PLAN			
GEOLOGICAL CROSS SECTIONS SHOWING COAL SEAM			
PREPARED BY:	B.R. MATLOTIA	CHECKED BY:	B.D. SHARMA
SCALE:	1 : 4000	DATE:	25-04-2017
			PLATE NO. VII

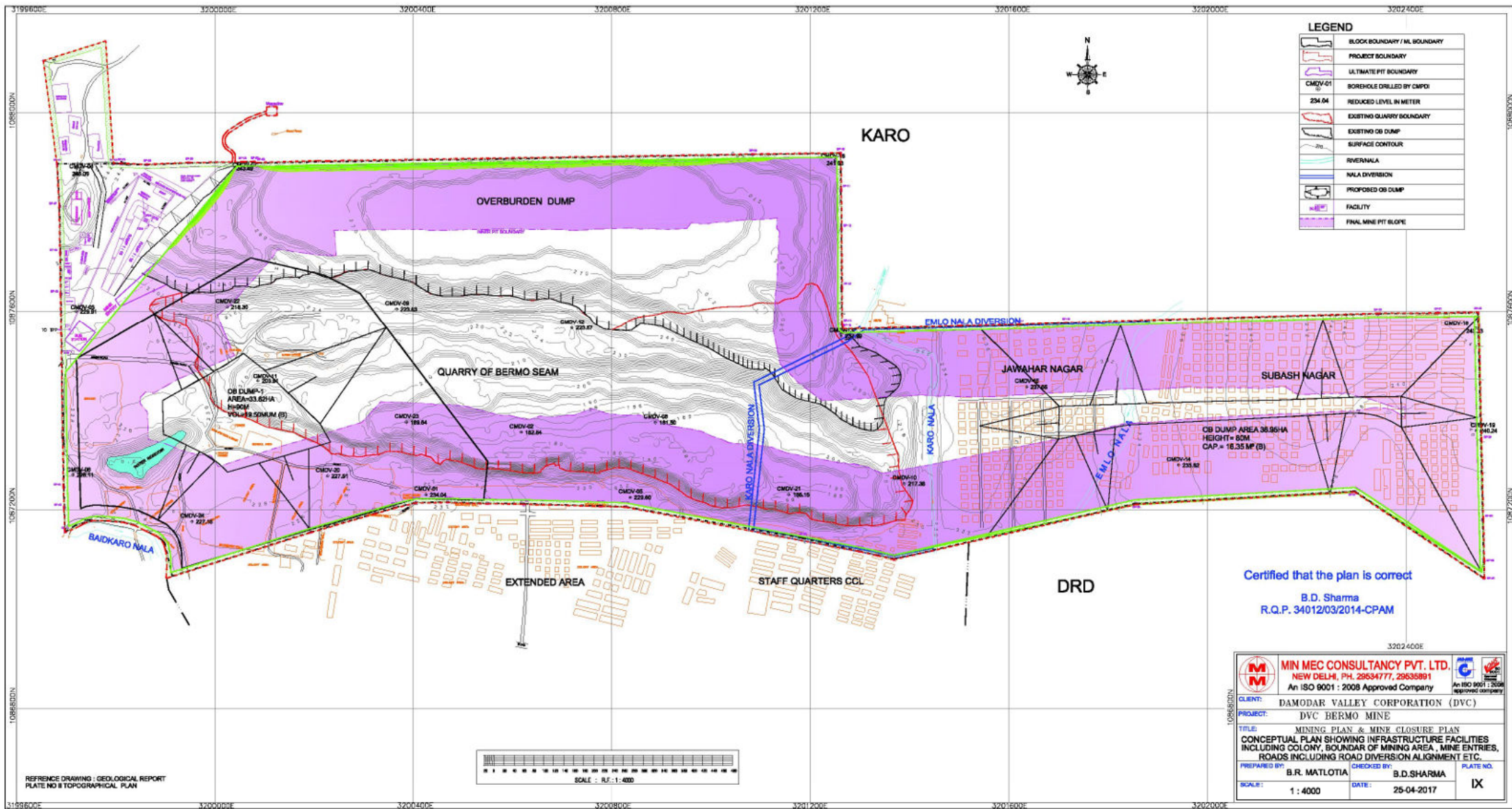
KEY PLAN

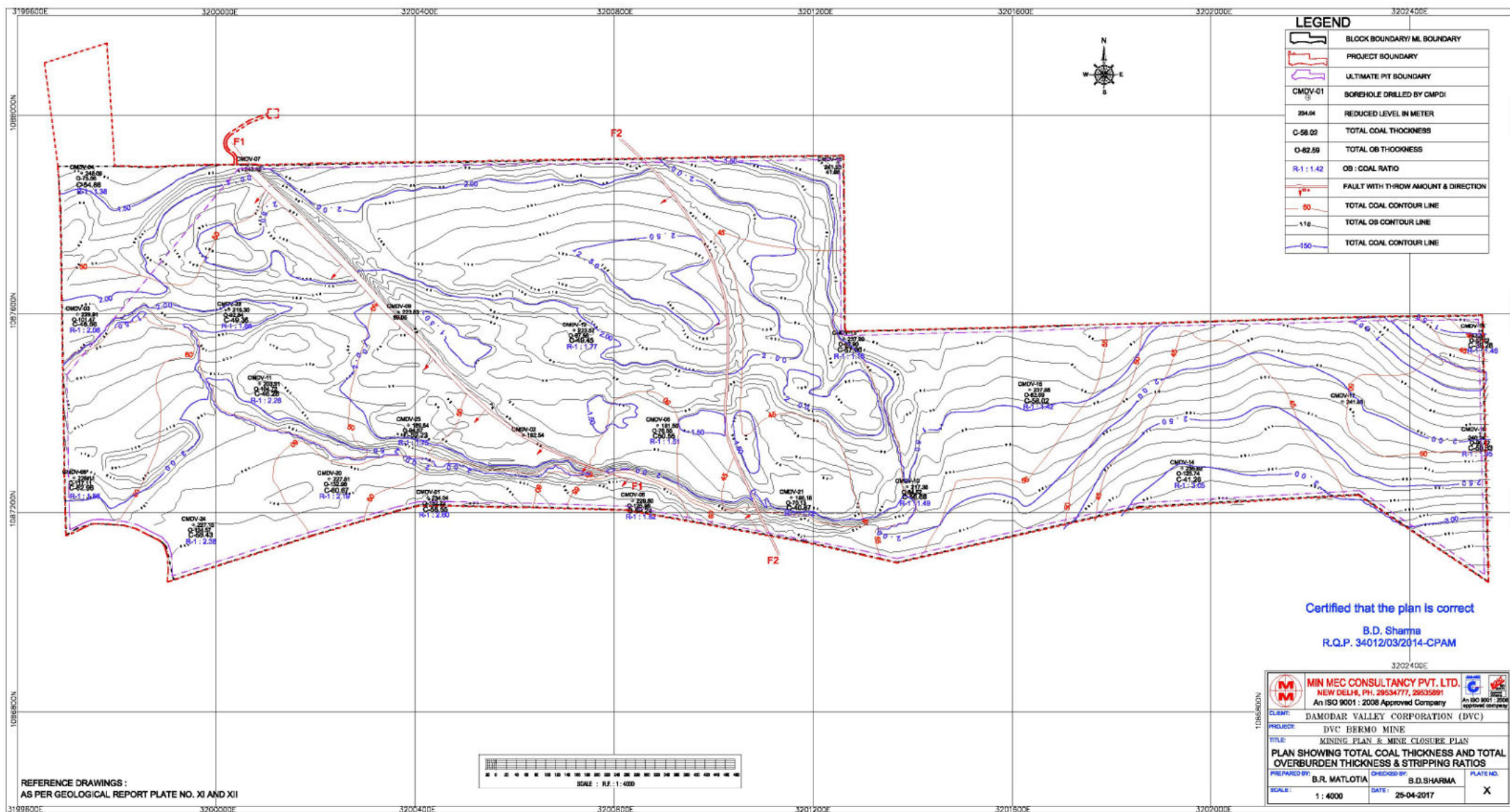


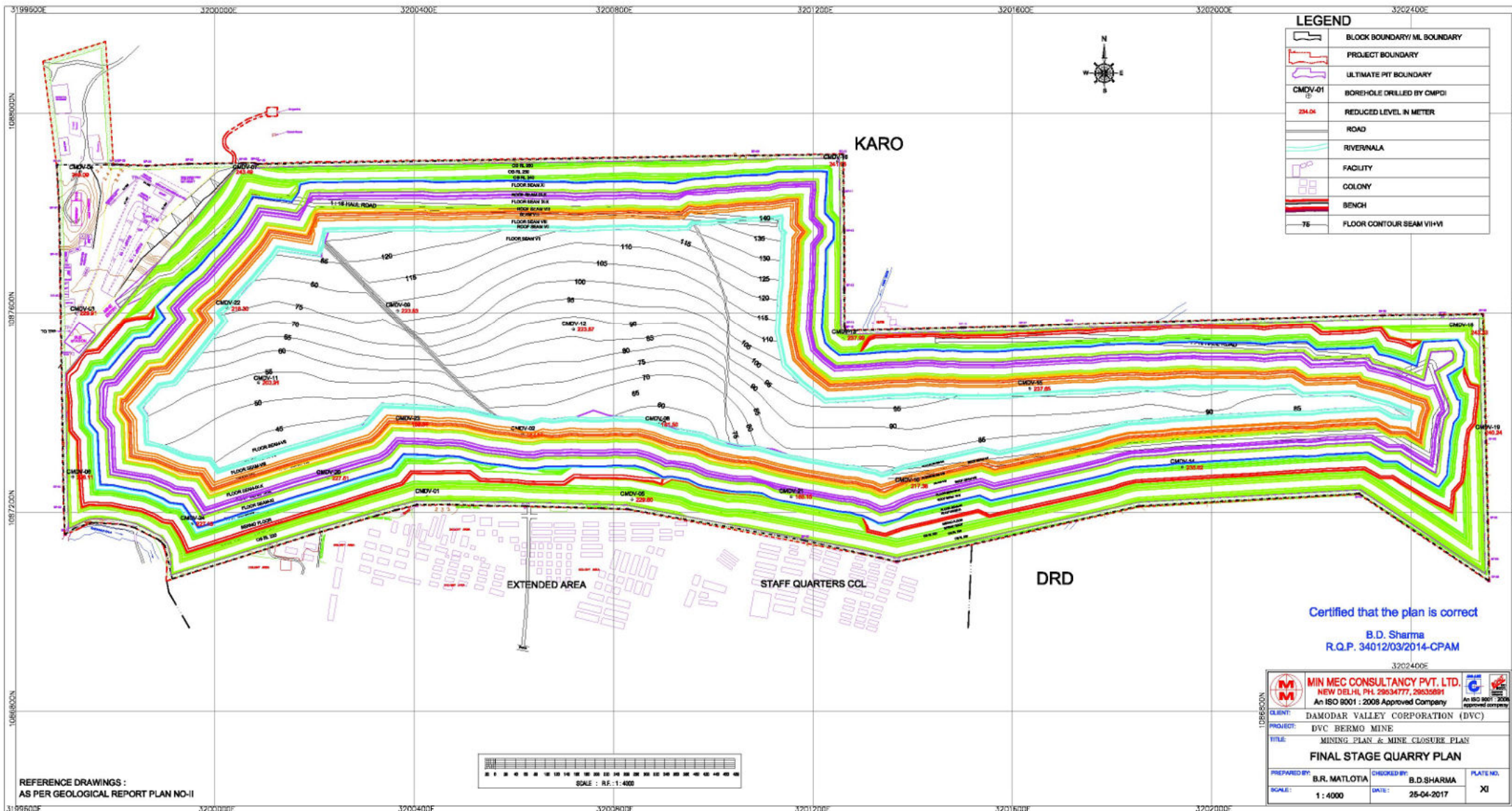
LEGEND	
	ML AREA
	ULTIMATE PIT BOUNDARY
CMDY-01 ^①	BORERHOLE DRILLED BY CIPRO
234.04	REDUCED LEVEL IN METER
	SURFACE COUNTOUR
	FACILITY
	FINAL NAME PIT SLOPE

Certified that the plan is correct
B.D. Sharma
R.Q.P. 34012/03/2014-CPAM

	
MIN MEC CONSULTANCY PVT. LTD. NEW DELHI. PH. 29634777, 29635691 An ISO 9001 : 2008 Approved Company	
CLIENT: DAMODAR VALLEY CORPORATION (DVC)	
PROJECT: DVC Bermo Mine	An ISO 9001 : 2008 approved company
TITLE: MINING PLAN & MINE CLOSURE PLAN	
PLAN SHOWING PROPOSED SURFACE LAYOUT PLAN	
PREPARED BY: B.R. MATLOTIA	PLATE NO. VIII
CHECKED BY: B.D. SHARMA	
SCALE: 1 : 2,000	DATE: 25-04-2017







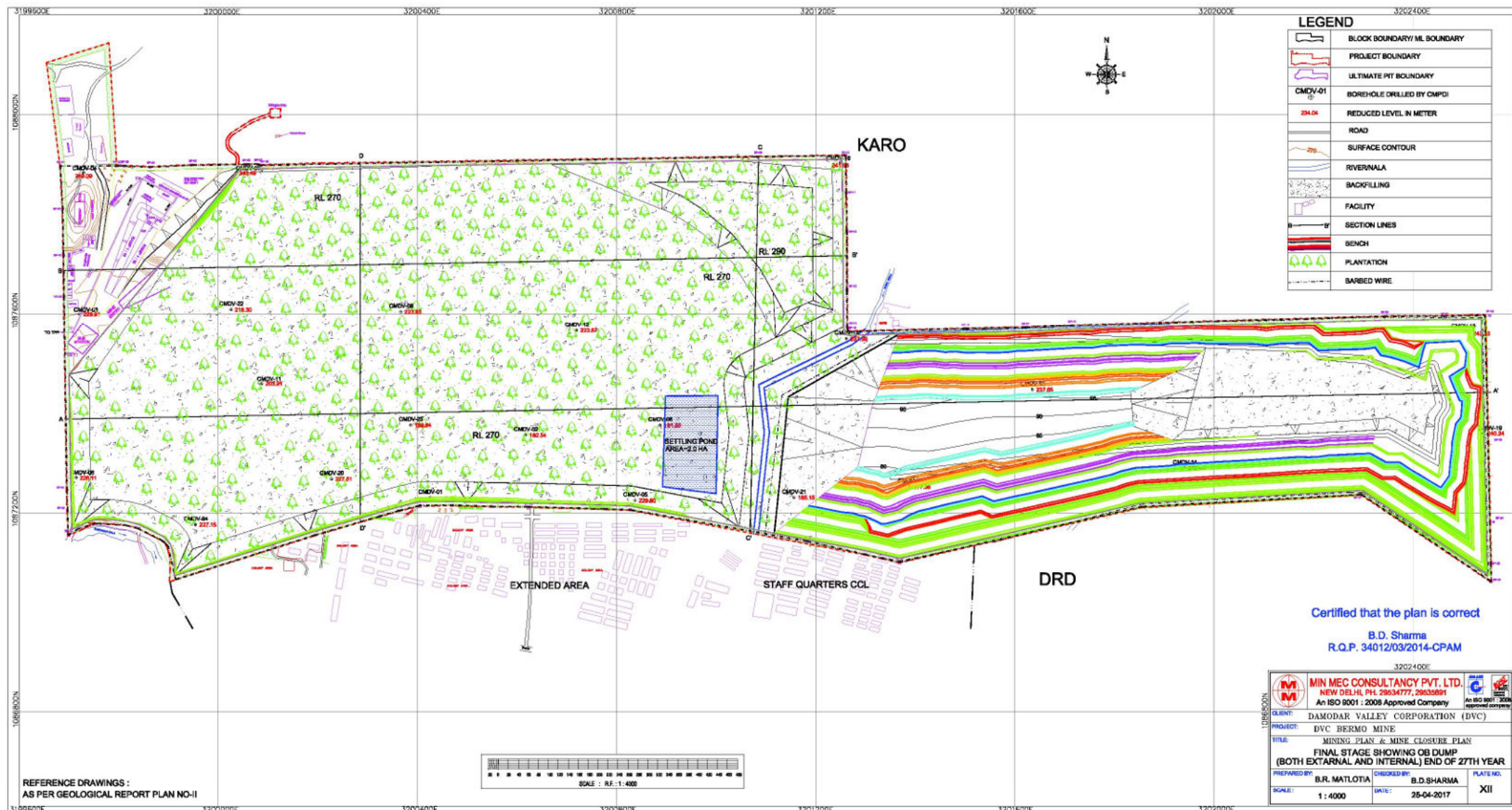
LEGEND	
	BLOCK BOUNDARY/ ML BOUNDARY
	PROJECT BOUNDARY
	ULTIMATE PIT BOUNDARY
	BOREHOLE DRILLED BY CMPGI
	REDUCED LEVEL IN METER
	ROAD
	RIVER/NALA
	FACILITY
	COLONY
	BENCH
	FLOOR CONTOUR SEAM VII-VI

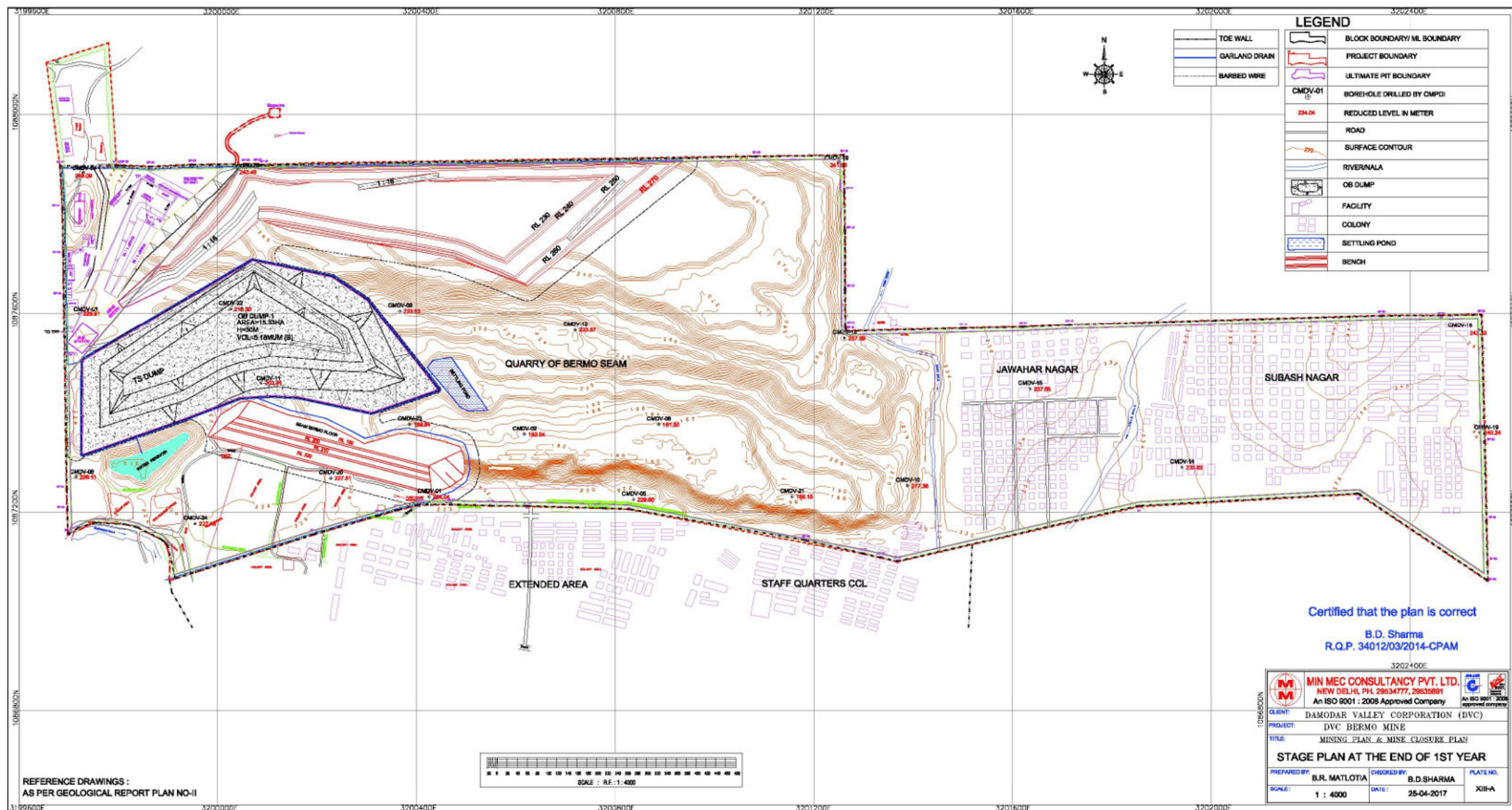
Certified that the plan is correct

B.D. Sharma
R.Q.P. 34012/03/2014-CPAM

3202400E

	MIN MEC CONSULTANCY PVT. LTD. NEW DELHI, PH. 29534777, 29535891 An ISO 9001 : 2008 Approved Company	
CLIENT:	DAMODAR VALLEY CORPORATION (DVC)	
PROJECT:	DVC BERMO MINE	
TITLE:	MINING PLAN & MINE CLOSURE PLAN	
FINAL STAGE QUARRY PLAN		
PREPARED BY:	B.R. MATLOTIA	CHECKED BY: B.D. SHARMA
SCALE:	1 : 4000	DATE: 25-04-2017
		PLATE NO. XI



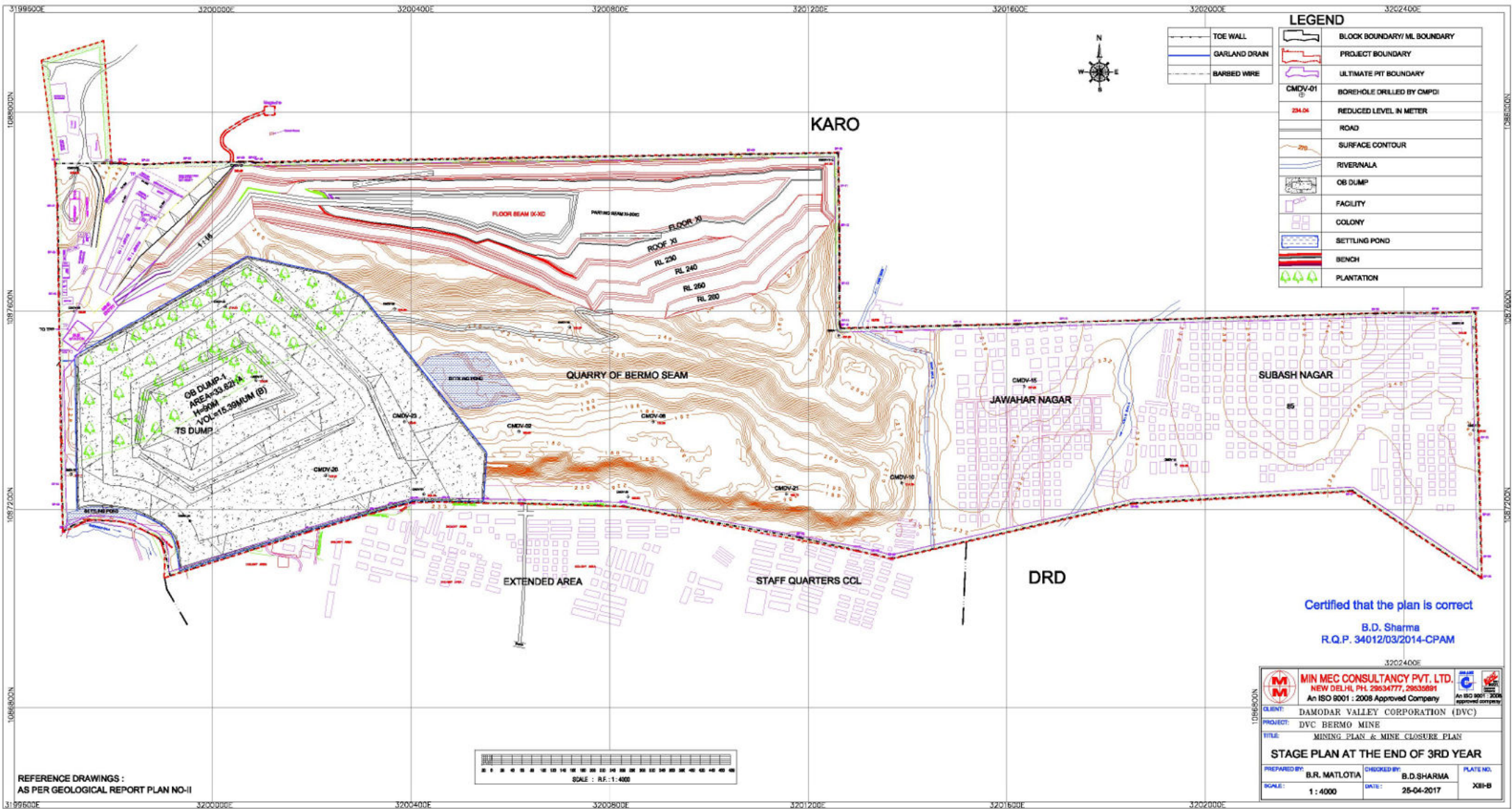


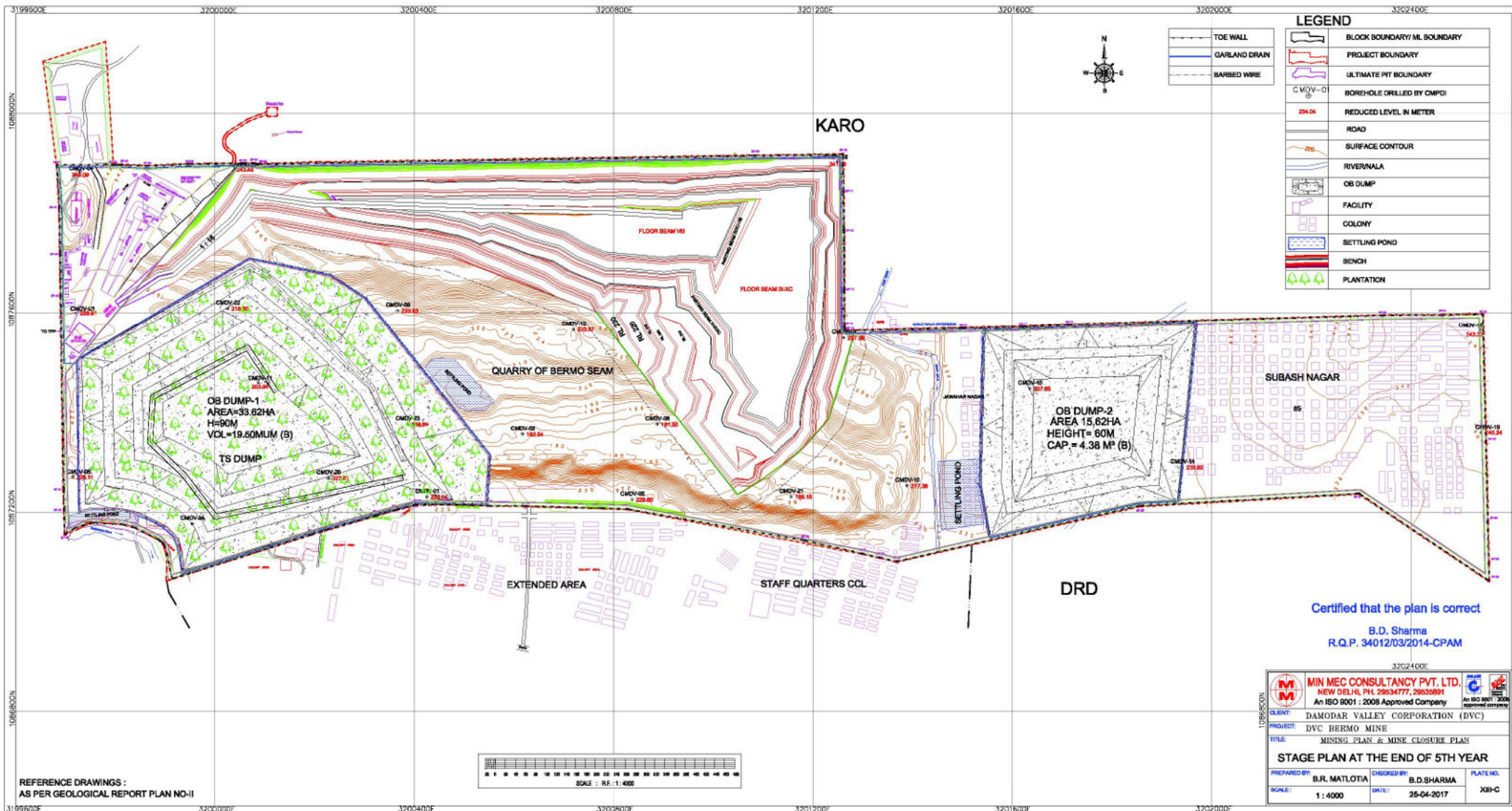
Certified that the plan is correct

B.D. Sharma
R.Q.P. 34012/03/2014-CPAM

3202400E

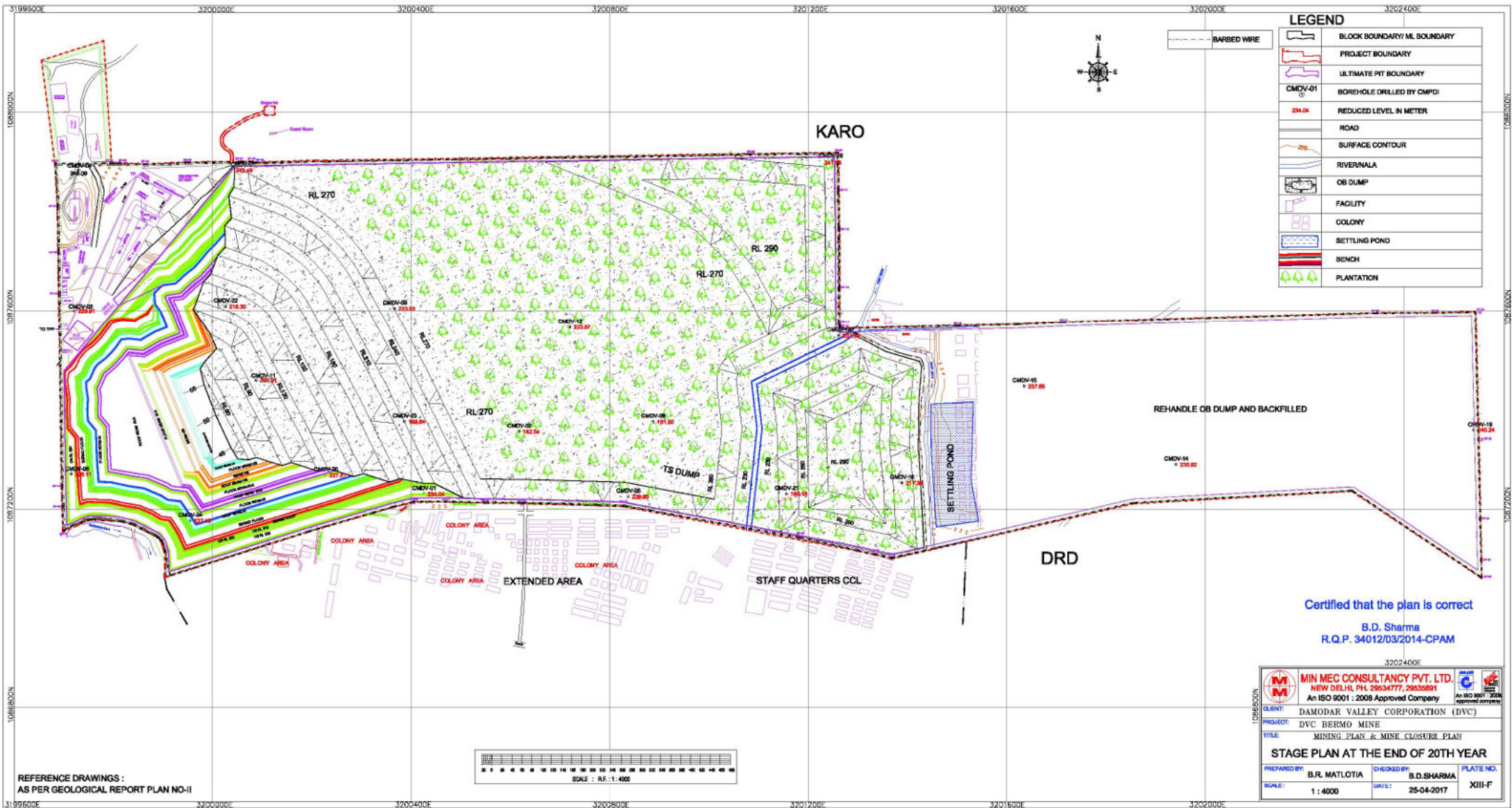
	MIN MEC CONSULTANCY PVT. LTD. NEW DELHI, PH. 29534777, 29535891 An ISO 9001 : 2008 Approved Company		
	CLIENT: DAMODAR VALLEY CORPORATION (DVC)		
	PROJECT: DVC BERMO MINE		
	TITLE: MINING PLAN & MINE CLOSURE PLAN		
	STAGE PLAN AT THE END OF 1ST YEAR		
PREPARED BY: B.R. MATLOTIA	CHECKED BY: B.D. SHARMA	PLATE NO.: XIII-A	
SCALE: 1 : 4000	DATE: 25-04-2017		



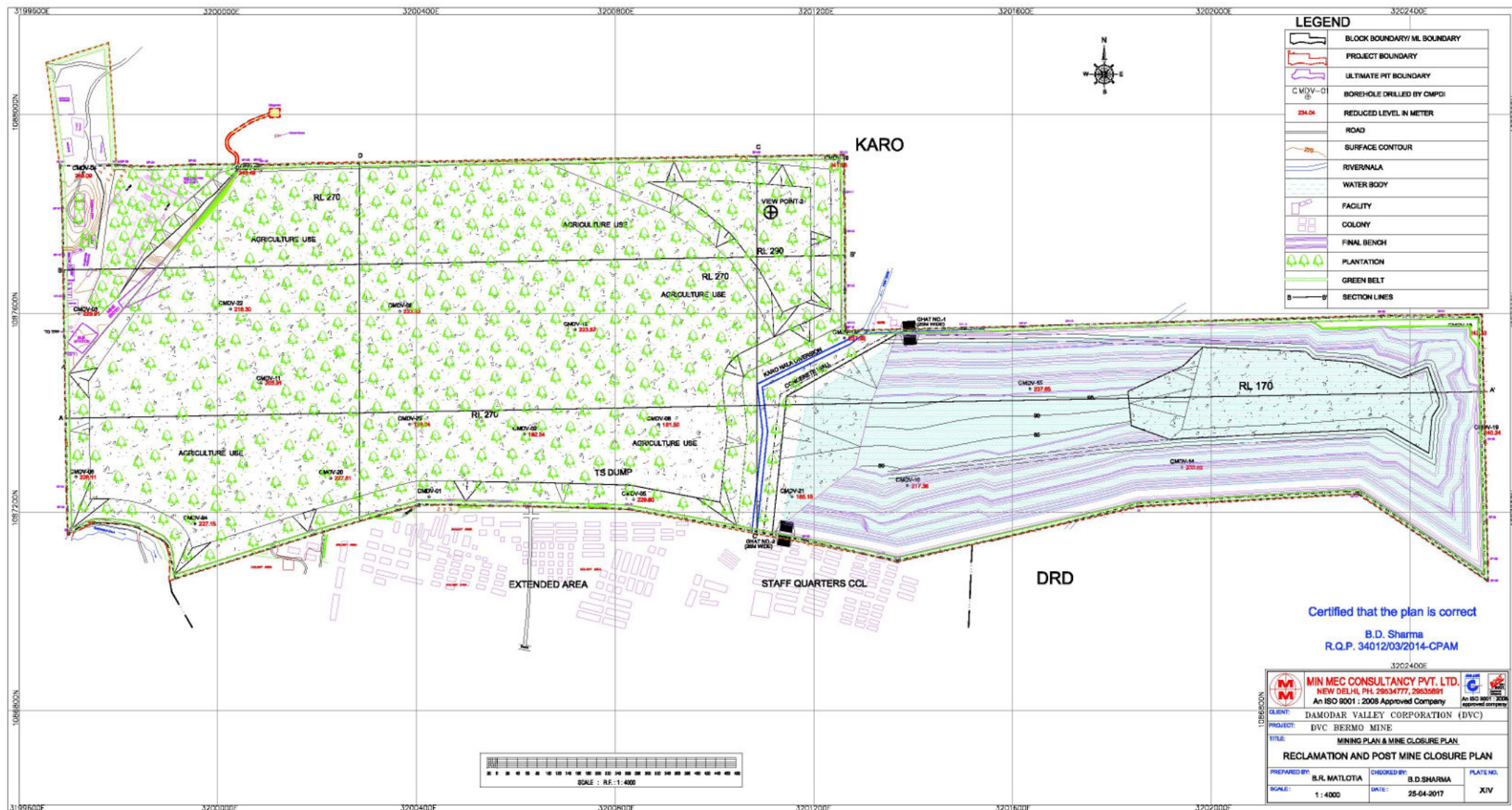








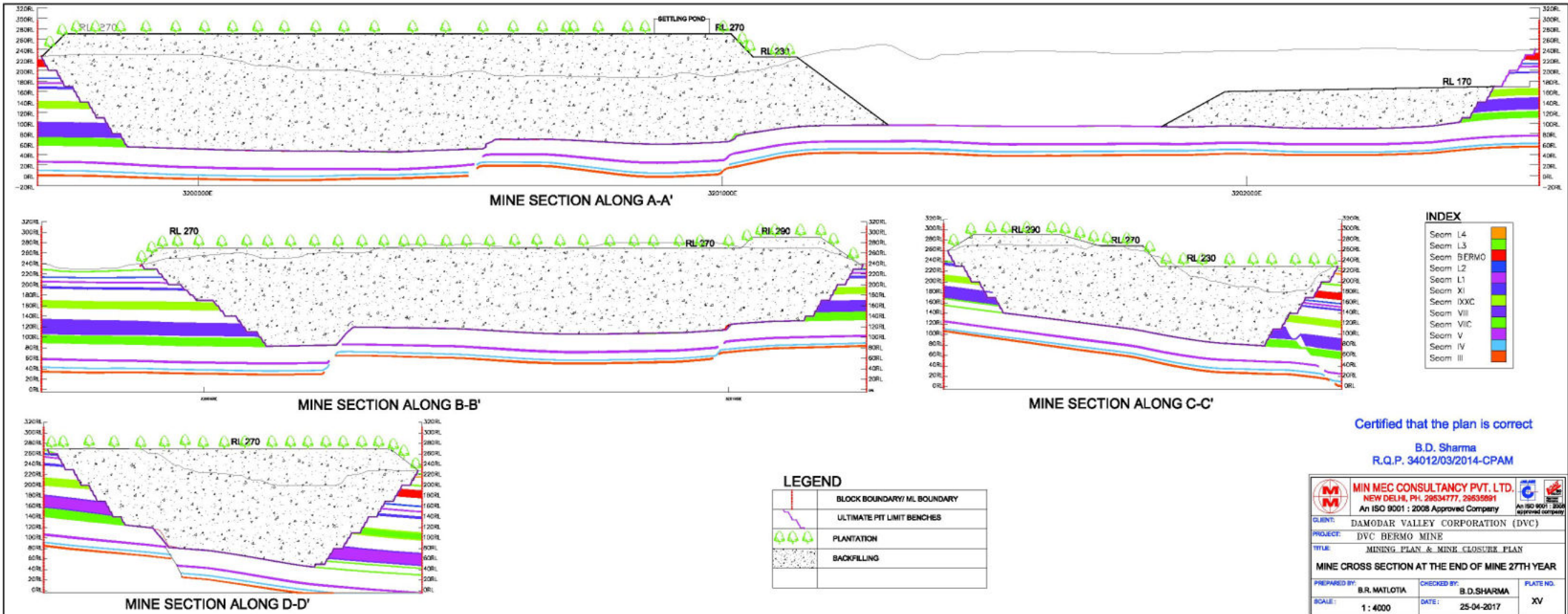




Certified that the plan is correct

B.D. Sharma
R.Q.P. 34012/03/2014-CPAM

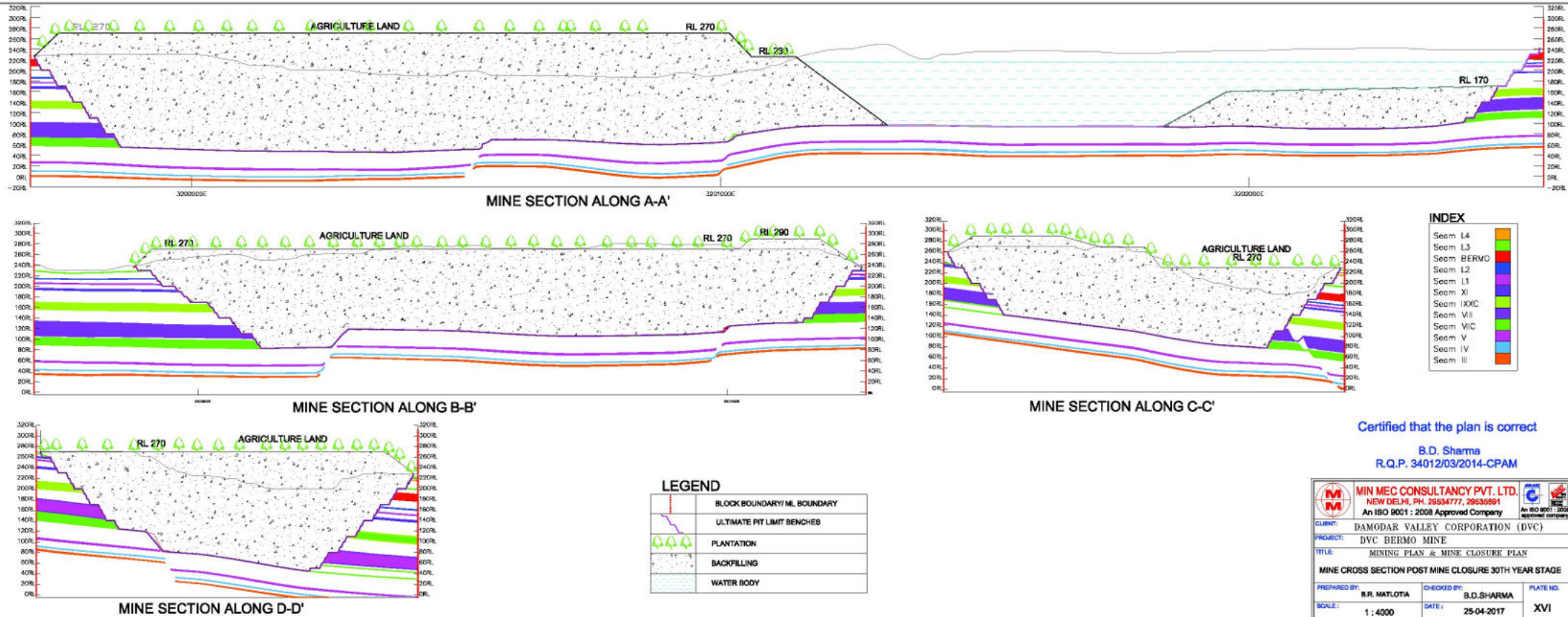
MIN MEC CONSULTANCY PVT. LTD. NEW DELHI, PH. 29534777, 29535891 An ISO 9001 : 2008 Approved Company		
CLIENT:	DAMODAR VALLEY CORPORATION (DVC)	
PROJECT:	DVC BERMO MINE	
TITLE:	MINING PLAN & MINE CLOSURE PLAN	
RECLAMATION AND POST MINE CLOSURE PLAN		
PREPARED BY:	CHECKED BY:	PLATE NO.
S.R. MATLOTIA	B.D. SHARMA	XIV
SCALE:	DATE:	
1:4000	25-04-2017	



Certified that the plan is correct

B.D. Sharma
R.Q.P. 34012/03/2014-CPAM

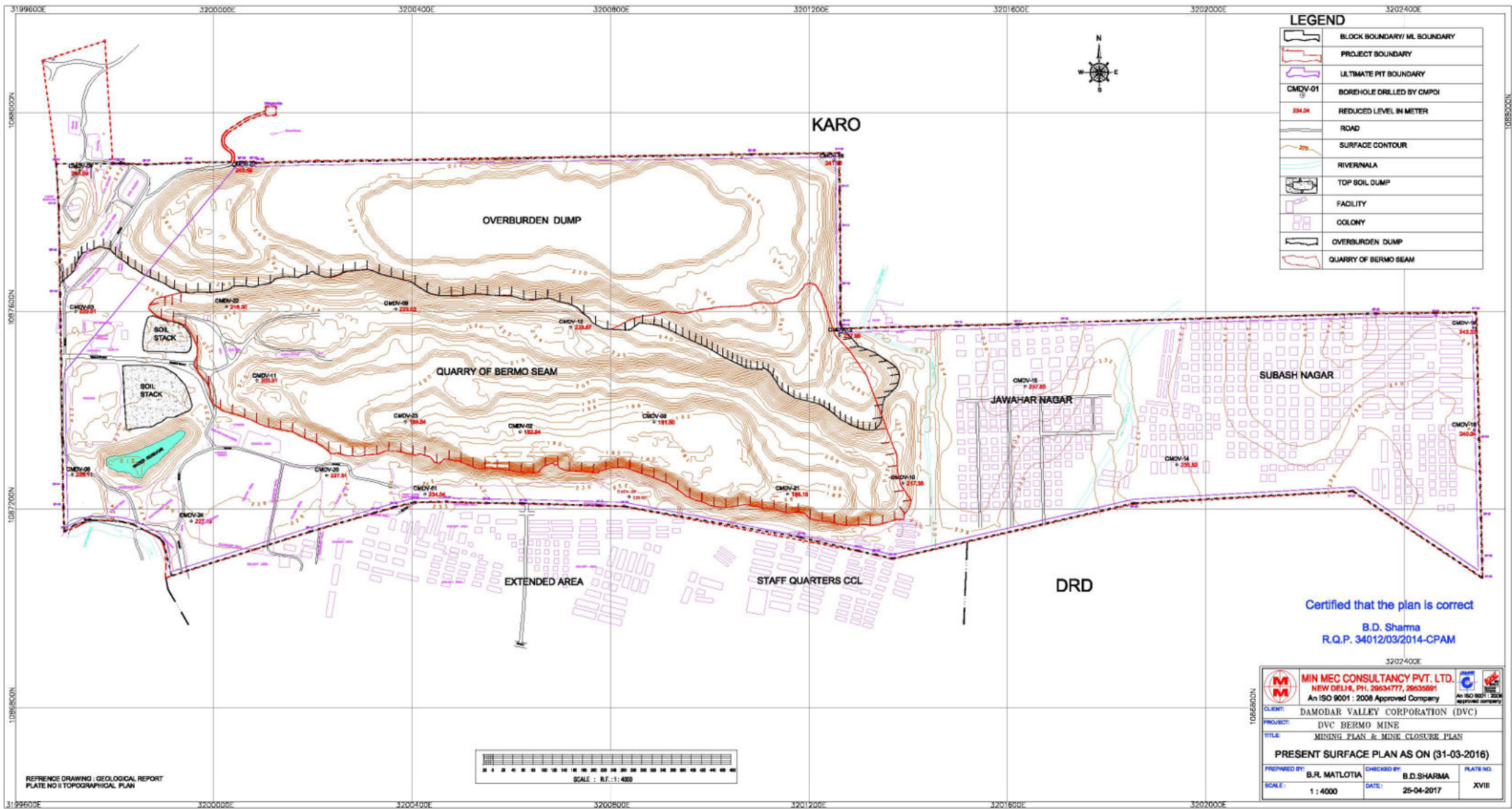
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	CLIENT: DAMODAR VALLEY CORPORATION (DVC)			
	PROJECT: DVC BERMO MINE			
	TITLE: MINING PLAN & MINE CLOSURE PLAN			
	MINE CROSS SECTION AT THE END OF MINE 27TH YEAR			
PREPARED BY:	B.R. MATLOTIA	CHECKED BY:	B.D. SHARMA	PLATE NO.
SCALE:	1 : 4000	DATE:	25-04-2017	XV

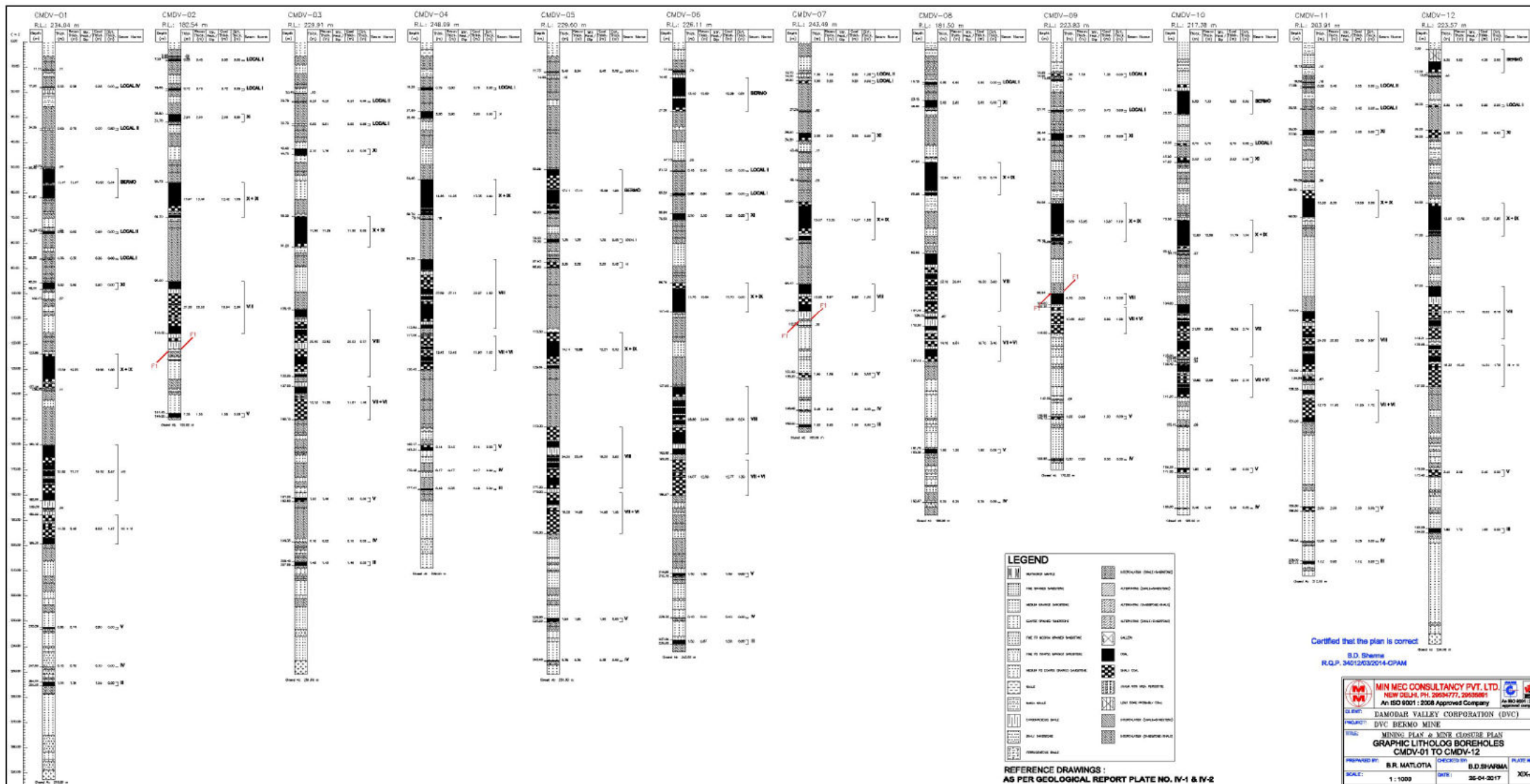


Certified that the plan is correct

B.D. Sharma
R.Q.P. 34012/03/2014-CPAM

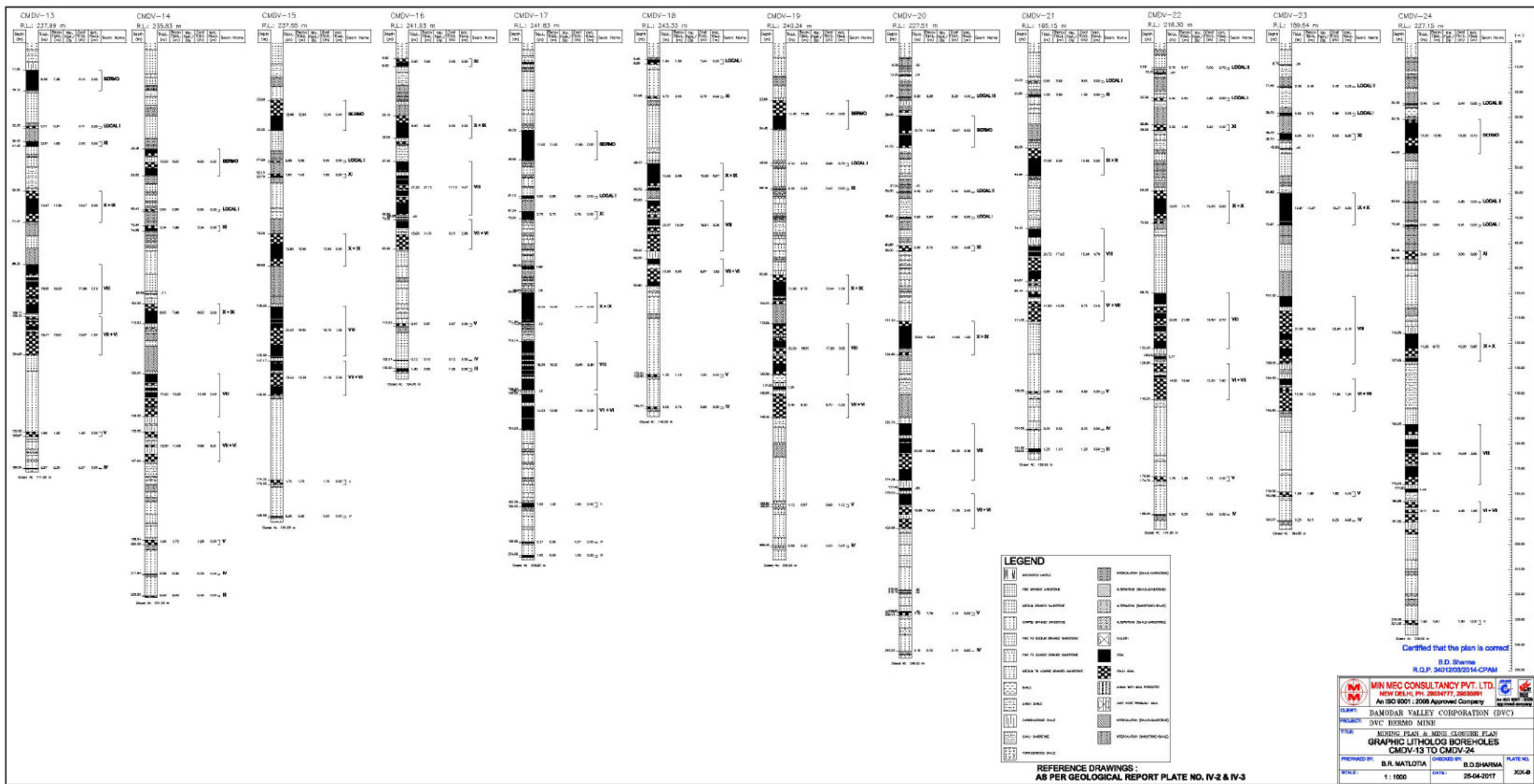
	MIN MEC CONSULTANCY PVT. LTD. NEW DELHI, PH. 29534777, 29535891 An ISO 9001 : 2008 Approved Company		
	CLIENT: DAMODAR VALLEY CORPORATION (DVC) PROJECT: DVC Bermo Mine TITLE: MINING PLAN & MINE CLOSURE PLAN MINE CROSS SECTION POST MINE CLOSURE 30TH YEAR STAGE PREPARED BY: B.R. MATLOTA SCALE: 1 : 4000		
CHECKED BY: B.D. SHARMA DATE: 25-04-2017		PLATE NO. XVI	





R.Q.P. 3401203/2014

	MIN MEC CONSULTANCY PVT. LTD. NEW DELHI, Ph. 29534777, 2953581 An ISO 9001 : 2008 Approved Company		
	CLIENT: DAMODAR VALLEY CORPORATION (DVC) PROJECT: DVC BEKMO MINE TITLE: MINING PLAN & MINR CLOSURE PLAN GRAPHIC LITHOLOG BOREHOLES CMDV-01 TO CMDV-12		
PREPARED BY:	B.R. MATLOTIA	CHECKED BY:	B.D. SHARMA
SCALE:	1 : 1000	DATE:	25-04-2017
		PLATE NO:	XXX



PLAN SHOWING SCHEDULE OF IMPLEMENTATION WITH DURATION OF IMPORTANT ACTIVITIES IN RESPECT OF DVC BERMO COAL MINE

Sl. No.	Nature of work	Time schedule																										
		1 st	2 nd	3 rd	4 th	5 th	6 th	7 th	8 th	9 th	10 th	11 th	12 th	13 th	14 th	15 th	16 th	17 th	18 th	19 th	20 th	21 st	20 nd	23 rd	24 th	25 th	26 th	27 th
i	Continuation of Coal Production from Old Pit* in X-X area, where Bermo seam is being worked at present (2016-17) in the dip side towards south west for initial 2 years	■	■																									
ii	Dumping of OB generated from Old Pit will be done over the rise side of the Old Pit operation over the exposed floor of Bermo seam.	■	■																									
iii	Drivage of New Trench/Boxcut for creating New Pit** in X-X area along the northern boundary (towards east) which will eventually reach to the proposed New Pit floor of Seam VI+VII within X-X area.	■	■	■	■	■	■																					
iv	Dumping of OB generated from New Pit over south west side of X-X area for about first 3 and half years (where the OB from the Old quarry is also envisaged for dumping.	■	■	■	■																							
v	Diversion of Emlo nala along northern boundary of Y-Y area to join Karo nala located on west of Karo nal			■	■																							
vi	Dumping of OB generated from New Quarry 4th year onwards: From 4th year (part) onward the OB generated will be dumped on the virgin Y-Y area (coal bearing area) upto 10th year				■	■	■	■	■	■	■																	
vii	Rehandling of OB of X-X area and backfilling the same in the West Pit (X-X area)												■	■	■													
viii	Rehandling of OB of Y-Y area and backfilling the same in the West Pit (X-X area)														■	■	■	■	■									
ix	Mining in Y-Y area: Mining in Y-Y area will be started as separate Quarry after over 20 years. working of Y-Y area enabling longer strike length and also unlocking the coal below the nala for extraction.																					■	■	■	■	■	■	■
x	Diversion of Karo Nala: Karo Nala, which bifurcates the mine into X-X and Y-Y areas, will be eventually diverted through the worked out areas of X-X part (over the backfilled area) such that no coal is left blocked as barrier under the nala.															■	■											

*Old Pit: The pit which has been operational in the past till date in X-X area

**New Pit: The Pit which is planned to be created and operated in future (2017-18 onwards) over X-X area

Certified that the plan is correct

B.D. Sharma
R.Q.P. 34012/032014-CPAM

	MIN MEC CONSULTANCY PVT. LTD. NEW DELHI, PH. 29534777, 29535891 An ISO 9001 : 2008 Approved Company	
CLIENT: DAMODAR VALLEY CORPORATION (DVC)		
PROJECT: DVC BERMO MINE		
TITLE: MINING PLAN AND MINE CLOSURE PLAN PLAN SHOWING SCHEDULE OF IMPLEMENTATION WITH DURATION OF IMPORTANT ACTIVITIES IN RESPECT		
PREPARED BY: S.R. MATLOTIA	CHECKED BY: S.D. SHARMA	PLATE NO. XX
SCALE: NOT TO SCALE	DATE: 25-04-2017	