चेक लिस्ट क्रमांकः– 23

रिक्लेमेशन प्लान

Forest Clearance under section 2 of FCA 1980 for coal mining within GARE PALMA SECTOR-II Allotted to M/s MSPGCL wide order NO. 103/30/2015/NA, Date 31.08.2015 REVENUE FOREST= 115.134 Ha. Forest land = 99.735 ha. Total Forest area= 214.869 ha.

CHIEF ENGINEER (COAL)
MSPGCL MUMBAI,
MAHARASHTRA

रिक्लेमेशन प्लान

आवेदक महाराष्ट्रा स्टेट पावर जनरेशन कंपनी लिमि. (महाजेनको) द्वारा रायगढ़ जिले के रायगढ़ वनमण्डल अंतर्गत गारे पेलमा सेक्टर–2 कोल ब्लाक में कोयला खनन कार्य हेतु रायगढ़ जिले के रायगढ़ वनमण्डल अंतर्गत व्यपवर्तन हेतु आवेदित क्षेत्र रकबा 214.869 हे. वन भूमि प्रभावित हो रहा है। उक्त व्यपवर्तन प्रस्ताव का रिक्लेमेशन प्लान पृष्ठ क्रमांक.....से.....तक में संलग्न है।

CHIEF ENGINEER
(CIVIL COAL)
MSPGCL
MUMBAI, MAHARASHTRA

वनमण्डलाधिकारी
रायगढ़ वनमण्डल रायगढ़

CHAPTER 15

MINE CLOSURE PLAN

15.1 INTRODUCTION

The overall area which will ultimately come under mine planning is termed as Gare Palma Sector – II coal mine has been allotted to M/s Maharashtra State Power Generation Company Limited (MSPGCL) by Ministry of Coal vide allotment order no.103/30/2015/NA, dated 31-08-2015.

The Coal mine lies in Mand Raigarh Coalfield of Raigarh district in Chhattisgarh state. This coal block (Extent of area 2583.486 Ha) is proposed to produce coal at the rate of 23.60 MTPA (22.00 MT from OC +1.6 MT from UG) though the peak capacity of OC will be 23.6 MTPA before the UG becomes operational.

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

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	Maharashtra State Power Generation Company Limited
Address	"Prakashgad" Plot No. G-9, Anant Kanekar Marg, Bandra (East), Mumbai, Maharashtra-400051.
Phone	022 – 26476231; 022-26474211
Fax	022 – 26581400
E- mail	md@mahagenco.in
Official Website	http://www.mahagenco.in

II). Status of the applicant

MSPGCL is a State owned PSU of Govt. of Maharashtra. It was incorporated in India under Company's Act1956 with Corporate Identity no. **U400100MH2005SGC153648**

Maharashtra State Power Generation Company Limited (MSPGCL) is engaged in power generation with total Installed capacity of 12077 MW as on 31.01.2016, as below:

Thermal	:	8640 MW
Gas Turbine	:	672 MW
Hydro	:	2585 MW
Solar	:	180 MW
Total	**:**	**12077 MW**

The company has 2570 MW of ongoing projects and 7870 MW in planning stage, and is also planning to install 2500 MW of solar power projects in 5 years.

Ministry of Coal vide, letter no. 13016/ 26/2004-CA-I/CA-III(Pt.)(Vol.II) Dt. 24.02.2016 also allotted Mahajanwadi Coal Block to Mahagenco for captive use only under Rule 4 of the Auction by Competitive Bidding.

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

Coal

IV). Information about Enduse Plants

a. As Per Allotment order

TABLE 15.2
NAME WITH LOCATION AND REQUIREMENT OF COAL AS PER ALLOTMENT ORDER DT 31-08-2015

Sl. No.	Name of specified End Use Plant	Location/ Address	Configuration	Capacity
1.	Chandrapur Thermal Power Station Unit 8 & Unit 9	Chandrapur Thermal Power Station Unit 8 & 9(2x500MW), Expansion Project, Nirman Bhavan, Urja Nagar, Chandrapur-442404. Distance from mine 800 km	2x500 MW	1000 MW
2.	Koradi Thermal Power Station Unit 8, Unit 9 and Unit 10	Koradi Complex, Chindwara Road, Koradi-441111, Distt. Nagpur, Maharashtra. Distance from mine 595 km	3x660 MW	1980 MW

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Sl. No.	Name of specified End Use Plant	Location/ Address	Configuration	Capacity
3.	Parli Thermal Power Station Unit 8	Taluka parli Vaijnath, Dist. Beed-431520, Maharashtra Distance from mine 1147 km	250 MW	250 MW
	Total			**3230 MW**

b. Additionally Proposed

MSPGCL have requested MOC/NA vide letter No. CMD Mahagenco/ED(Coal/Fuel)/34C (a copy of the letter enclosed at **Annexure-1-2**) proposing to extract coal from Gare Palma Coal Mine up to its full capacity, i.e. 23.6 Mty, and utilise extra coal for other thermal plants of Mahagenco and surrender an equal amount of linkage coal from CIL to the extent the demand for other EUPs will be met from the coal mine.

MOC/NA vide letter no.103/32015/ NA dt. 19.02.2016 (**Annexure 1-3**) clarified that the issue of diversion arises after the commencement of production and advised that Mahagenco may submit the Mining Plan to Ministry of coal for approval and tender intimation towards proposed diversion as per clause 8.4 of Allotment Agreement (**Annexure 15-1**) as and when required.

Taking the above into consideration, the Mining Plan has been prepared for the full capacity of the mine, i.e. 23.6 Mtpa.

V). Annual coal requirement

The coal requirement calculation with norms used for computing consumption is given in Table 15.3.

TABLE 15.3
NORMS USED FOR COMPUTING CONSUMPTION

Sl. No.	Particulars	Name of power plant			Total
		Chandrapur	Koradi	Parli	
1	Capacity, MW	2x500=1000	3x660=1980	1x250	**2330**
2	Station Heat Rate "KCal/KWhr"	2375	2250	2375	**2308**
3	Avg Calorific value "KCal/kg)"	4350	4350	4350	**4350**
4	Specific consumption "Kg/kWhr"	0.5460	0.5172	0.5747	**0.5306**
5	Plant Load Factor	85%	85%	85%	**85%**

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Sl. No.	Particulars	Name of power plant			Total
		Chandrapur	Koradi	Parli	
6	Total Coal Requirement "MTPA"	2x2.0327 = 4.065	3x2.5419 = 7.626	1X1.12 = 1.070	**12.761**
7	Coal availability from this project "MTPA"	4.061	7.626	1.070	**12.761**
8	Linkage/e-Auction from CIL"MTPA"	Nil	Nil	Nil	**Nil**
9	Other blocks of the company "MTPA"	Nil	Nil	Nil	**Nil**
10	Percentage of end use requirement to be met from this mine	100%	100%	100%	**100%**

The total coal requirement for already linked power plants as per allotment order and as per specific heat consumption norms comes to 12.761 MTPA. The balance coal out of the total production of 23.6 MTPA will be used for other thermal plants of Mahagenco as explained in the paragraph 1.8.2.

VI). Annual target coal production

Based on the above explanation this block is proposed to produce Opencast Normative- 22MTPA & Peak-23.6 MTPA and Underground- 1.6 MTPA.

VII). Name of RQP preparing mining plan

The particulars of RQP are given in Table 15.4.

TABLE 15.4
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 are attached as **Certificate I**).

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RQP NO. 34012/03/2014-CPAM

VIII). Location

The "Gare Palma Sector – II Coal Block area lies in Mand Raigarh Coalfield in Raigarh district of Chhattisgarh state. The mine site is located in Tihli Rampur, Kunjemura, Gare, Saraitola, Mudagaon, Rodopali, Pata, Chitwahi, Dholnara, Jhinka Bahal, Dolesara, Bhalumura, Sarasmal and Libara of District Raigarh in Chhattisgarh. The area is covered in the Survey of India Toposheet No. 64 N/8 & 12 (R.F. 1:50,000) and is bounded by:

As per Allotment Letter:

Latitude : 22° 06' 23.55" N to 22° 10' 37.04" N
Longitude : 83° 26' 22.18" E to 83 ° 31' 19" E

As per Nominated Authority letter F.No.104/28/2015/NA dt. 13-10-2015 (Copy at **Annexure 3-2A**), the coordinates in WGS 84 system are given below. As mentioned in the letter, the earlier coordinates were using reference system based on modified Everest datum but presently CMPDI is following WGS 84 System which is the standard reference system followed globally. It is to be need that the respective position of any point does not change physically on the ground.

Latitude : 22° 06' 24.215" to 22° 30' 49.891" N
Longitude : 83° 26' 15.433" to 83° 31' 12.632" E

(Refer location plan and key plan - Plate I & II)

IX). Communication & accessibility

The Gare Palma area is situated around 35 km away from Raigarh Township, which is also the nearest railway station on Mumbai-Howrah main line of SE Railway. The block is connected by road from Raigarh via Punjipathara by State Highway. Punjipathara village is situated on Raigarh-Ghargoda main road. The distance from Raigarh to Ghargoda is around 40 km. The road distance between Raigarh to Punjipathara is about 20 Km. and Punjipathara to Ghargoda is 20 Km towards north. From Punjipathara the road leads to the Gare Palma area via Tamnar TPP Area situated at a distance of 10 Km. on Punjipathara- Milupara road, which passes through the block. Tamnar is situated in the south-western part of the Gare Palma Sector-I area in the sub block 'F'. A network of road is present within the block.

X). Summary details of the coal block area

Land Use and Ownership / Occupancy

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The present land use of the area required for the project is given below in Table 15.5.

TABLE 15.5
PRESENT LAND USE OF THE AREA REQUIRED FOR THE PROJECT

Sl. No.	Village	Private Land			Govt. Land				Total Area	Total Area (Private + Govt. Land)
		Agriculture	Non Agriculture	Total Area	Populated	Water body	Other	CBJ**		
A. As per Revenue Departments Records										
1	Tihlirampur	97.902	62.685	160.587	6.83	21.225	39.094	0	67.149	227.736
2	Dholnara	59.64		59.64	6.833	0.376	3.317	2.788	13.314	72.954
3	Murogaon	302.393		302.393	8.256	1.303	4.29	23.504	37.353	339.746
4	Libra	121.416	7.621	129.037	2.897	0.439	4.694	15.943	23.973	153.01
5	Kunjemura	199.715		199.715	14.221	13.596	8.308	30.17	66.295	266.01
6	Jhinkabahal	3.844		3.844	0	0	0	0	0	3.844
7	Radopali	351.676		351.676	8.336	5.895	19.955	0.125	34.311	385.987
8	Dolesara	20.748		20.748	0	0	1.242	0	1.242	21.99
9	Bhalumura	16.297		16.297	0	0	0.704	0.622	1.326	17.623
10	Sarasmal	56.869	9.158	66.027	0	1.332	3.563	15.236	20.131	86.158
11	Pata	316.064	13.166	329.23	13.314	5.529	14.47	15.326	48.639	377.869
12	Chitwahi	142.461		142.461	0.252	0.867	8.153	0	9.272	151.733
13	Gare	157.224		157.224	10.482	4.241	11.596	1.957	28.276	185.5
14	Saraitola	156.228	13.722	169.95	8.395	1.364	7.969	29.703	47.431	217.381
Total of A		**2002.477**	**106.352**	**2108.829**	**79.816**	**56.167**	**127.355**	**135.374**	**398.712**	**2507.541**
B. As per Forest Departments Record										
Government Forest Land										*75.945
Grand Total										**2583.486**

Note: * *75.945 Ha of Protected Forest land and 135.374 Ha of Revenue Forest land is present within the mine lease area, which needs to be diverted for mining purpose after obtaining forestry clearance from the Ministry of Environment and Forest, Govt. of India under the Forest (Conservation) Act 1980.*

** *Small/ big trees forest*

15.1.1 Reasons for closure

It is a new allotted block. 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

I. Statutory Obligations already received

The following letters/ permissions/approvals have been received:

1. Allotment Order vide Ministry of Coal letter No.103/30/2015/NA, dated 31-08-2015 (**Annexure 1-1**)

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2. The Agreement signed with the Nominated Authority on 30th March 2015 (**Annexure 15-1**)

15.1.2.1 Compliance to various conditions mentioned in the letters/ permissions issued so for is tabulated below:

1. Allotment Order vide Ministry of Coal letter No.103/30/2015/NA, dated 31-08-2015 (Annexure 1-1)

Sl. No.	Obligations	Compliance
1	To depute an Authorised Representative to execute the Allottee Agreement (the "Agreement") on its behalf as per the following schedule: Date : 30th March 2015	The Agreement Signed on 30th March 2015 The First Amendment Agreement signed on 30th March 2015

2. The Agreement signed with the Nominated Authority on 30th March 2015 (Annexure 15-1)

Sl. No.	Conditions and Obligations Related to Mining/ Safety Closure and Conservation	Compliance
1.	Within 30 days allotee shall submit detailed plan towards commencement of mining operation (Commencement Plan) including mining lease and required and revision of mining plan, if any.	Complied
2.	Make an application to state Govt. for grant of mining lease in the name of Allottee.	Shall be complied
3.	Coal extracted from the coal mine shall be utilized strictly in the specified end use plant.	Out of the 23.6 Mtpa planned production, 12.761 Mtpa coal will be utilized in existing 3 plants as per the allotment order. For the balance production, the procedures of tendering intimation towards proposed diversion as per clause 8.4 of Allotment Agreement will be followed as and when required, when such capacity of mine is reached (refer MOC letter **Annexure 1-4**).
4.	Reduce Generation of Middllings and washery rejects, which in any case shall not exceed	In the Mining Plan, provision for space for a washery has been

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Sl. No.	Conditions and Obligations Related to Mining/ Safety Closure and Conservation	Compliance
	normative limit, and utilize them in any captive power plant of the allottee. Any Middllings and washery rejects, may be sold by the allottee.	made. The decision regarding capacity and layout of washery will be reached after thorough investigation. MSPGCL has approached CMPDIL for generation of data (washability tests, cleaning possibilities etc) and report preparation. Being thermal coal, no middlings are anticipated to be generated. The washery rejects shall be within the normative limits and will be disposed off strictly as per rules and regulation framed by Ministry of Environment & Forest and change from time to time
5.	In the event that the allottee is desirous of utilizing the coal in his other plant or subsidiary company then he shall provide written intimation (Diversion Notice) to Central Govt, at least thirty days prior to the such intended utilization., with mechanism for transportation of coal.	The procedures of tendering intimation towards proposed diversion as per clause 8.4 of Allotment Agreement will be followed as and when required, when such capacity of mine is reached.
6.	The allotee shall comply with all applicable laws and observe Good Industry Practice for the protection of the general health, safety, welfare, social security and minimum wages of employees engaged including contractor or sub contractor.	Shall be complied with
7.	The Allottee shall install and utilize such recognized modern safety devices and observe such recognized modern safety precautions as are provided and observed under Good Industry Practice. The allotee shall maintain in a safe and sound condition all infrastructure and equipment constructed or acquired in connection with mining operations and required for ongoing operations.	Shall be complied with

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Sl. No.	Conditions and Obligations Related to Mining/ Safety Closure and Conservation	Compliance
	The allottee shall train employees engaged at the Coal Mine including employees of any contractor or sub-contractor and of all other person having legal access to the area covered by this Agreement in accordance with the Good Industry Practice. The allottee shall construct maintain, and operate health programs and facilities to serve the employees engaged at the Coal Mine including employees of any contractor or sub-contractor and of all other person having legal access to the area covered by this Agreement which programs and facilities shall install, maintain and use modern health devices and equipment and shall practice modern health procedures and precautions in accordance with Good Industry Practice.	
8.	In the event allottee provides housing, the same shall be built to a standard that provides suitable living environments adequate for health and well being and which meets applicable sanitation standards in term of good industry practice.	Shall be complied with.
9.	The Mine Plan approved in relation to the prior allottee, if any shall also be applicable to the allottee. Upon allocation of coal mine, the allottee may revise the Mine Plan for extraction of more coal as compared to mine plan subject to revision. Allottee may increase the production to the maximum possible extent and utilize the coal as per clause 8 (i.e. in specified end use plants)	MOC vide letter no. 103/30/ 2015- NA, dt. 11.01.2016, intimated that the Mining Plan submitted by the earlier allottee did not receive MOC approval and MSPGCL need to apply afresh seeking approval of Mining Plan. Fresh Mining Plan has been prepared. The capacity of the mine has been optimised to the maximum.
10.	Upon exhaustion of the extractable reserves, coal mine shall be closed in the manner provided in the mine closure plan and the applicable laws.	Mine Closure Plan and the applicable Laws shall be adhered to

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II. Statutory obligations still to be received

Other obligations will be there as a result of the following approvals:

a. Mining Plan approval letter from MOC

b. Environmental clearance letter from MOEF

c. Forestry clearance letter from Forest Dept. MOEF

d. No objection certificate from State Pollution Control Board

e. Permission from CGWB for withdrawal of ground water

f. Permission for mine opening from coal controller

g. Permission letter from Controller of Explosives

h. Letter from DGMS for use of HEMM and drilling /blasting

All the obligations spelt out in the above letters/ clearances and also in other letters which may be issued in future will be complied by the Company.

15.1.3 Closure plan preparation

The Progressive Mine Closure Plan and Mine Closure Plan have the approval of the Board of Directors of the Company and the relevant document is attached as **Annexure 15-2**.

15.2 MINE DESCRIPTION

Mine description comprises Geology, Reserves, Mining Method and Coal Beneficiation. Geology and reserves are already covered under Chapter 4 and Mining method under Chapter 5.

15.3 MINE CLOSURE PLAN

15.3.1 Mined out land

i Land degradation and aesthetic environment

The year wise position of mining is given below in Table 15.6.

TABLE 15.6
YEAR WISE POSITION OF MINING AREA

Year	Excavation Area Ha.	
	Progressive	Cumulative
1st Year	26.16	26.16
2nd-3rd year	103.81	129.97
4th - 5th year	250.73	380.70

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Year	Excavation Area Ha.	
	Progressive	Cumulative
6th - 10th year	718.67	1099.37
11th - 15th year	647.69	1747.06
16th - 20th year	202.79	1949.85
21st - 25th year	322.57	2272.42
End of mine 26th - 29th	168.13	2440.55
OC Closure plan 30th -32nd	0.00	2440.55
Total	**2440.550**	

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 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 core zone shows that all the disturbed areas will be reclaimed before abandoning the mine excluding the small void.

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

After the levelling of OB heaps is completed by the dozers, laying of topsoil will be undertaken. 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 levelling the top soil. It is proposed to lay about 0.5m-1m thick layer of top soil during levelling.

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Biological reclamation

After levelling 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

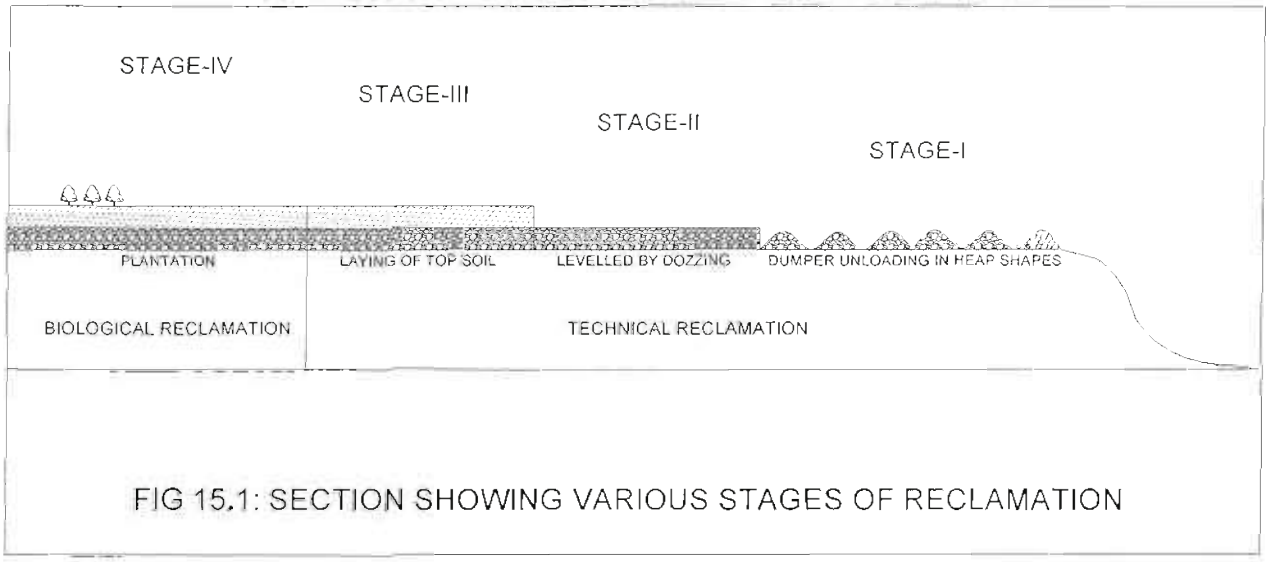

FIG 15.1: SECTION SHOWING VARIOUS STAGES OF RECLAMATION

Arrangement of Plants/ saplings

To fulfil 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.

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Year wise reclamation programme is as shown in Table 15.7.

TABLE 15.7
PROGRAMME OF EXCAVATED AND BACKFILLED AREA, CUMULATIVE (HA)

Upto the end of year	Area mined	Backfilled area	Remark
1st	26.16	0.00	No backfilling
3rd	129.97	0.00	No backfilling
5th	380.70	0.00	No backfilling
10th	1099.37	358.27	Part Direct Backfilling and Part from rehandled surface Dump
15th	1747.06	673.05	Part Direct Backfilling and Part from rehandled surface Dump
20th	1949.85	1122.31	Part Direct Backfilling and Part from rehandled surface Dump
25th	2272.42	1536.00	Part direct backfilling and part from rehandled surface dump
End of Mine 29th	2440.55	2109.49	Part direct backfilling and part from rehandled crown dump
Post Mine Closure Stage 30-32nd	2440.55	2440.55	Backfilling from rehandled crown dump*

* *During the post mine closure period (30th to 32nd year), part of the crown dump will be fully rehandaled and backfilled into the residual void (below surface level) while part of the crown dump (with an extent of 138 ha) will be reduced in height from 100m to 80m and backfilled.*

In the Mining Plan, provision for space for a washery has been made. The decision regarding capacity and layout of washery will be reached after thorough investigation.

The rejects generated from the washery could also be backfilled into the quarry voids after taking permission from the relevant authorities.

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).

TABLE 15.8
YEAR / STAGE WISE DUMPED AND RECLAIMED AREA (HA)

Year	Dump Area (ha)	Dump Reclamation Area (ha.)
	Cumulative	Cumulative
1st year	36.19	0.00
3rd year	129.97	0.00
5th year	380.00	0.00
10th year	292.72	194.76
15th year	190.59	190.59
20th year	0.00	0.00

Year	Dump Area (ha)	Dump Reclamation Area (ha.)
	Cumulative	Cumulative
25th year	0.00	0.00
End of mine 29th	0.00	0.00
Closure Plan 32nd (OC)	0.00	0.00
Total		

* *The surface dump constructed during the initial years (1st to 6th year) over the coal bearing area will be rehandled between 7th and 20th year and backfilled.*
It is advisable to plant cash crops/ trees on it for such a short period of existence like bamboo, Semal, Eucalyptus etc.

15.3.2 Post reclamation land use

The first step in a successful reclamation programme is to decide the post reclamation land use. The post mining land use with environment management is given in **Table 15.9**.

TABLE 15.9
POST OPENCAST MINING (30TH YEAR TO 32ND YEAR) LAND USE WITH ENVIRONMENT MANAGEMENT

Sl. No.	Description of ML Area	Land use (Ha.)						
		Bund	Void	Public use	Company use	Un-disturbed	Plantation/ agriculture including GB	Total
1.	Backfill	0	0	0	0	0	2440.55	**2440.55**
2.	Void/water body	0	0	0	0	0	0	**0**
3.	Surface dump	0	0	0	0	0	0	**0**
4.	Bund	5.2	0	0	0	0	0	**5.2**
5.	Green belt #	0	0	0	0	0	36.07	**36.07**
6.	Top soil dump*	0	0	0	0	0	0	**0**
7.	Settling pond**	0	5	0	0	0	0	**5**
8.	Road diversion	0	0	30.3	0	0	0	**30.3**
9.	Facilities Retained part (West part: CHP Incline, Shaft, Pit, office, lamp room, attendance office, rest room, parking, first aid room, substation etc.)	0	0		0	50.94	0	**50.94**
10.	Under Kelo River	0	0	0	0	15.42	0	**15.42**
11.	Undisturbed (others)	0		0	0	0	0	**0**
	Total	**5.2**	**5**	**30.3**	**0**	**66.36**	**2476.62**	**2583.48**

The post mine closure plan stage land use is given in Table 15.10 as applicable at the overall post mine closure (OC+UG) stage (78th to 80th year) (Refer Plate XXXVI).

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TABLE 15.10
TOTAL (OC+UG) MINE CLOSURE LAND USE (HA) (END OF 80TH YEAR)
(THE PRE MINING, DURING MINING AND POST CLOSURE (OC AND UG) LAND USE AND POST CLOSURE MANAGEMENT)

Pre Mining Land use " Ha"				Land use "Ha"										land use "Ha"						
				Type	During Mining 15th year stage	End of Life (OC 29th year)	Post Closure OC mine 32nd year							Post Closure UG mine 80th year						
							Agricul-tural land	Planta tion	Water Body	Public Use / Company use	Forest Land (Returned)	Undist-urbed	Total	Agricultural land	Planta tion	Water Body	Public Use	Forest Land (Returned)	Undistur-bed	Total
Tenancy	i	Agricultural & Non-agriculture including sl no. ii to vi)	2108.829	Excavation Area	1747.06	2440.55														
	ii	Township/ Populated	0	Backfilled Area	673.05	2109.49	2265.301				175.249		2440.55	2265.301				175.249		2440.55
	iii	Grazing	0	Excavated Void	1074.01	331.06							0							0
	iv	Barren	0	Top Soil Dump									0							0
	v	Water body	0	Bund	5.2	5.2				5.2			5.2				5.2			5.2
	vi	Road	0										0							0
		Sub Total	2108.829	External Dump	190.5								0							0
Govt Non Forest		Agricultural	0	Safety Zone 7.5m (Green belt)									0							0
		Township/ populated	79.816	Haul Road between quarries									0							0
		Others (Grass/ road/	127.355	Road diversion									0							0

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Pre Mining Land use " Ha"				Land use "Ha"										land use "Ha"						
				Type	During Mining 15th year stage	End of Life (OC 29th year)	Post Closure OC mine 32nd year							Post Closure UG mine 80th year						
							Agricul-tural land	Planta tion	Water Body	Public Use / Company use	Forest Land (Returned)	Undist-urbed	Total	Agricultural land	Planta tion	Water Body	Public Use	Forest Land (Returned)	Undistur-bed	Total
		community land/ barren)																		
		Barren (included in others)		Kelo River	15.42	15.42			15.42				15.42			15.42				15.42
		Water body	56.167	Approach Road and diversion	30.3	30.3				30.3			30.3				30.3			30.3
		Road		Setting pond	10	5	5						5	5						5
		Community land		Infrastructure area	50.94	50.94	0			50.94			50.94	45.94			5			50.94
		Sub Total	263.338	Office and Workshop	68.54								0							0
Forest		Protected Forest	75.945										0							0
		Revenue Forest (Chhote Bade Jhad ka Jungle)	135.374										0							0
		Sub Total	211.319	Rationalisation area									0							0
Free hold				Garland drains									0							0
				Embankment									0							0
				Green Belt	36.07	36.07					36.07		36.07					36.07		36.07

Pre Mining Land use " Ha"				Land use "Ha"										land use "Ha"						
				Type	During Mining 15th year stage	End of Life (OC 29th year)	Post Closure OC mine 32nd year							Post Closure UG mine 80th year						
							Agricul-tural land	Planta tion	Water Body	Public Use / Company use	Forest Land (Returned)	Undist-urbed	Total	Agricultural land	Planta tion	Water Body	Public Use	Forest Land (Returned)	Undistur-bed	Total
				Water Reservoir near pit									0							0
				UG entry									0							0
				Undisturbed/Mining right for UG	429.45	0							0							0
Grand Total			2583.486		2583.48	2583.48	2270.301		15.42	86.44	211.319	0	2583.48	2316.241		15.42	40.5	211.319	0	2583.48

Notes : * *Top soil dump of 60 Ha. was over the coal bearing area before 10th year after which it reduced to zero by 15th year as area under it was excavated, the topsoil in subsequent years was stacked over the backfilled area*

** *Surface water reservoir in facilities area measuring 5.0 Ha will be backfilled in the post mine closure stage (OC+UG combined)*

*** *Surface dump will be rehandled from 7th year to 20th year and area below it excavated*

#. Green Belt of 36.07 ha = 23.63 ha along Kelo river 45 m west side and 15 m east side + 12.44 ha over 7.5 m along ML boundary.

During post mine closure plan period, agriculture is proposed instead of plantation over the rehandled crown dump area as well as over the backfilled area obtained as a result of reducing the void except over 211.319 ha including the crown dump of 138 ha which will be left for forest use as in pre-mining scenario.

- The surface dump will be planted with short life cash crops (bamboo, Semal, Eucalyptus) as it is to be rehandaled and backfilled between 7th and 20th year.
- The infrastructure area of 55.94 ha includes 5 ha settling tank, 5 ha left for public use and the remaining 45.94 ha dismantled facilities and reclaimed.
- During the period of OC post mine closure (30th to 32nd year), the East Pit void will be reduced from 191.78 ha to zero ha by rehandling part of the West Pit crown dump of 100m height will be reduced to 0 m (general ground level) from over the backfilled area to backfill the remaining void except over 138 ha area where the crown height will reduce to 80m to contain a residual OB volume of 72.37 mcum(B).Similarly remaining 135.91 ha (60m depth) void in West Pit area will be completely backfilled.

15.4 AFFORESTATION

a) Plantation during mining

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. The yearly requirement of plants during the various years and stages of the mining project is as shown in the Table 15.11.

TABLE 15.11
YEAR/STAGE WISE AND LOCATION WISE RECLAMATION, PROPOSED AGRICULTURE AND FOREST AFTER POST MINE CLOSURE STAGE (HA.)

Year	Backfilled reclm. Area	Dump reclm. area	Green belt area	Total plantation area in ha	Backfilled area for agriculture without plantation	Made Fit for Agriculture in Post Mine Closure after cutting trees	Dismantled area for agriculture without plantation	Settling pond area filled for agriculture without plantation	Total fit for agriculture	Fit for Forest in Post Mine Closure
1	2	3	4	5	6	7	8	9	10	11
1st year	0.00	-	7.21	7.21					0.00	
2nd-3rd year	0.00	-	14.43	14.43					0.00	
4th - 5th year	0.00	-	14.43	14.43					0.00	
6th - 10th year	198.97	194.76		393.73					0.00	
11th - 15th year	281.30			281.30					0.00	
16th - 20th year	514.51			514.51					0.00	
21st - 25th year	418.95			418.95					0.00	
End of mine 29th	612.04			612.04					0.00	
Closure plan 80th year		-		0.00	414.78	1850.52	45.94	5.00	**2316.24**	211.32
Total*	2025.77	194.76	36.07	2256.60	414.78	1850.52	45.94	5.00	**2316.24**	211.32

* ***Total backfilled area of 2440.55 comprises of 2025.77 ha planted (out of which 175. 249 ha will be returned as forest land and 1850.52 ha will be for agriculture use) +414.78 ha area made fit for agriculture. Thus, total agriculture land in backfilled area of 2265.30 ha comprises 1850.52 ha made fit for agriculture after cutting trees + 414.78 ha directly converted to agriculture after backfilling.***

Out of 2583.48 ha ML area, 2440.55ha will be backfilled. Out of backfilled area of 2440.55ha, 211.319 ha (during pre-mining *75.945 Ha of Protected Forest land and 135.374 Ha of Revenue Forest land)* will be converted into forest use while the rest 2265.30 ha will be useable as agriculture land where as in facilities area 45.94 ha and in backfilled settling pond 5 ha will also be useable as agriculture land. Hence the total land useable as

agriculture land will be 2265.30 + 45.94 + 5.0 = 2316.24 ha. The plan showing mine closure at the abandoned stage is given Plate XXXVI.

Green Belt details

The year/stagewise green belt details are given in column no. 4 of Table 15.11 above. The total area under green belt will be 36.07 ha. 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.

15.4.1 Water quality management

Hydro-geological Study has not yet been done. It will be commissioned shortly and the study submitted to MOC.

a) Surface water regime

The area has flat to undulating topography. The ground elevation ranges from 242 m to 303 m. General slope of the ground is towards South. The easterly flowing Kelo River constitutes the main drainage system of the block. Kelo River is flowing across the coal block towards East and its diversion is not proposed. It will be protected by leaving statutory barriers. A number of small streamlets drain the terrain in various directions giving a sub dendritic drainage pattern. Other than nalas and rivers, there exist a number of surface water bodies like rainfall fed ponds/dug wells etc. within the buffer zone.

b) Ground water

The district is mainly underlain by crystalline rocks of Proterozoic age belonging to Chota Nagpur gneissic complex. Presence of sandstone of Lameta Formation (infratrappeans) and Deccan trap basalt though insignificant, have also been reported. Extensive Lateritisation with occasional bauxite deposits are also found.

Ground water occurs under water table condition in, laterite and weathered mantle. It occurs under semi-confined to confined conditions in the deeper fractured basalts. The depth of water level varies from 4.67 to 12.34 m bgl during pre-monsoon period and from 1.43 to 9.35 m bgl during post-monsoon period in the shallow aquifers. The long term (decadal) trend analysis of water level indicates that about 13% of the wells in pre monsoon and none of the wells in post monsoon period show a significant (20 cm/year) falling trend. The exploration by Central Ground Water Board had indicated presence of potential fractures upto 90 m bgl. The optimum depth of bore wells in the district is found to be between 50 to 90 m bgl. (http://cgwb.gov.in/nccr/Raigarh1.htm)

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c) *Water quality*

Water quality survey to assess the quality of both surface & ground water has been conducted during the summer season. The results of 2 surface water samples and 2 ground water samples are given for assessing the water quality in core and study area. The samples were tested as per the drinking water standards (IS:10500) and the test results show that all the elements concentration is below permissible limits. The details of water test analysis are given in Table 15.12.

TABLE 15.12
WATER QUALITY TEST RESULTS

Parameters	Specifications as per IS : 10500:1991		Gare Core zone (GW-1)	Dhaurabhanta (GW-2)	Tehlirampura Kelo River (SW 1)	Kelo nadi U/S near Khamaharia (SW-2)
	Desirable limit	Permissible limit				
Colour, Hazen units	5	25	<5	<5	<5	<5
Taste	Agreeable	---	Agreeable	Agreeable	Agreeable	Agreeable
Odour	Unobjectionable	---	Unobjectionable			
Turbidity, NTU	5	10	38.6	17.6	82.7	220.9
pH value	6.5-8.5	No relaxation	5.3	5.15	6.54	6.66
Total Dissolved solids, mg/l	500	2000	106	85	195	173
Total hardness (as $CaCO_3$) mg/l	300	600	52	48	120	104
Alkalinity, mg/l	200	600	56	48	56	48
Chlorides (as Cl) mg/l	250	1000	20	20	28	12
Iron (as Fe) mg/l	0.3	1.0	2.1	0.5	0.6	2.6
Fluoride (as F) mg/l	1.0	1.5	0.3	0.04	0.03	0.04
Sulphate (as SO_4) mg/l	200	400	7	2	62	4
Nitrate (as NO_3) mg/l	45	100	3.9	1.7	0.8	84.6
Calcium (as Ca), mg/l	75	200	13	11	45	13
Magnesium (as Mg)	30	100	5	5	2	17
Copper (as Cu) mg/l	0.05	1.5	BDL	BDL	BDL	BDL
Manganese (as Mn) mg/l	0.1	0.3	0.1158	0.75	BDL	0.0058
Mercury (as Hg) mg/l	0.001	No relaxation	BDL	BDL	BDL	BDL
Cadmium (as Cd) mg/l	0.01	No relaxation	BDL	BDL	BDL	BDL
Selenium (as Se), mg/l	0.01	No relaxation	BDL	BDL	BDL	BDL

Parameters	Specifications as per IS : 10500:1991		Gare Core zone (GW-1)	Dhaurabhanta (GW-2)	Tehlirampura Kelo River (SW 1)	Kelo nadi U/S near Khamaharia (SW-2)
	Desirable limit	Permissible limit				
Arsenic (as As), mg/l	0.05	No relaxation	BDL	BDL	BDL	BDL
Lead (as Pb), mg/l	0.05	No relaxation	BDL	BDL	BDL	BDL
Zinc (as Zn), mg/l	5	15	0.1011	0.6532	BDL	BDL
Chromium (as Cr^{6+}), mg/l	0.05	0.05	BDL	BDL	BDL	BDL
Aluminum (as Al)	0.03	0.2	BDL	BDL	0.27	1.08
Boron, mg/l	1	5	0.040	0.0076	0.0854	0.1736

Note: BDL of Cu is 0.0032; Mn is 0.0026; Hg is 0.0008; Cd is 0.0027; Al is 0.0046; Se is 0.0031; As is 0.0029; Pb is 0.0037; Cr is 0.0009; Zn is 0.0048 mg/l

i) 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 after adequate water is available in the mine. However, in the initial stage, the requirement will have to be met from the ground water through bore wells/ Kelo river.

The drinking water will be supplied from bore well 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 1995 m^3/day. Out of this 1239 m^3/day will be potable water and the rest 756 KLD will be required for industrial use in addition to the 790 cum/day reclaimed water from colony STP which will be reused.

The break up of the required water for different activities is as follows:

TABLE 15.13
WATER REQUIREMENT

i. Potable water	Daily requirement, cum
Drinking at working place @ 45 lpd/head for 3400 workers etc. (Total 3400)	153.00
*Colony (for 50% employees)= 3400/2=1700*4 members in family @ 135 lpd	986
For peripheral villages	100.00
Total of (i)	**1239**

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ii. Industrial water	
Sprinkling @ 30 m^3/km of road length (10km)	300.00
Plantation @ 20 cum/hac {1509.12 ha/22.5 years=59.18 ha (say 60 ha)	1200.00
Vehicles washing @ 2.0 m^3/vehicle/day {washable vehicles about (400X2 times a weak)/7 days=115 veh/day(Water required 115x2-80%*230 re-circulation=46)	46.0
Total (ii)	**1546**
Grand total (i + ii)	**2785**
Reclaimed water from STP of colony (80% of 986 cum) which can be used in watering the plantation	**790**
Net water requirement	**1995**

** Colony site will be outside the ML area.*

As the water seepage into the OC mine workings is expected to be more than the requirement from 5th year onwards (refer table 7.2 in Chapter 7), the water requirement projected above can be easily met from the mine water after 5th year.

ii) 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

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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.

iii) 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.

iv) 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 outside dump may contribute to the pollution of surface water in terms of suspended solids. Since dumping location proposed to be carried out is at a safe distance (2 km) from existing surface water channels i.e. Kelo River, it will have limited impact on water quality. 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

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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.

v) 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

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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.

15.4.2 Air quality management

i. Air quality

Ambient air quality monitoring results of 5 different stations including 1 station within the core area is given in Table 15.14. The monitoring results

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indicated that the air quality is good and conforms to the standards stipulated for rural areas.

TABLE 15.14
AIR QUALITY OF THE STUDY AREA

	PM 10	PM 2.5	SO_2	NO_x	PM 10	PM 2.5	SO_2	NO_x	PM 10	PM 2.5	SO_2	NO_x
	Kunjemura (CA1)				Kosampali (BA1)				Khamharia (BA2)			
Max.	65	46	8.5	17.0	78	45	11.0	19.5	76	53	11.0	19.0
Min.	58	34	6.0	14.0	65	32	8.0	17.5	63	38	7.5	16.0
Avg.	61	40	7.2	15.5	71	38	9.5	18.5	69	45	9.2	17.5
98%tile	65	46	8.5	17.0	78	45	11.0	19.5	76	53	11.0	19.0
	Kerakhol (BA3)				Gorhi (BA4)							
Max.	65	46	8.0	16.0	67	51	10.0	18.0				
Min.	55	30	5.5	13.0	60	33	6.5	15.0				
Avg.	60	38	6.7	14.5	63	42	8.2	16.5				
98%tile	65	46	8.0	16.0	67	51	10.0	18.0				

The Indian Ambient Air Quality Standards permitting the maximum concentration of contaminants for ambient air quality, set for different categories of areas are given in Table 15.15 for the sake of comparison.

TABLE 15.15
AMBIENT AIR QUALITY STANDARDS

Area	Category	24 hours average concentrations, $\mu g/m^3$				
		PM10	PM2.5	SO_2	NO_X	CO (8 hourly)
A	Industrial, Residential, Rural and Other Area	100	60	80	80	02 mg/m^3
B	Ecologically Sensitive Area (notified by Central Government)	100	60	80	80	02 mg/m^3

Source: National Ambient Air Quality Standards vide CPCB Notification B-29016/20/90/PCI-L dated 18th November 2009

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.

ii. Ambient noise quality

Noise level survey has been conducted and results at 5 locations including 1 at core zone and 4 in the buffer zone is given in Table 15.16. The noise level monitoring data was recorded round the clock for 24 hours. The ambient noise levels were found within the permissible limits as per the statutory norms.

TABLE 15.16
AMBIENT NOISE LEVELS IN THE STUDY AREA, LEQ DB(A)

Hours	Kunjemura	Kosampali	Khamharia	Kerakhol	Gorhi
	(N1)	(N2)	(N3)	(N4)	(N5)
Day time Leq.	48.10	68.20	49.60	52.40	58.5
Night time Leq.	36.40	55.40	38.70	44.50	49.3
Average Leq.	42.20	61.80	44.10	48.40	53.9
Permissible (Day)	55	65	55	55	65
Permissible (Night)	45	55	45	45	55

Impact on air quality

The opencast mining operations are prone to generation of higher levels of SPM and to a limited extent of SO_2, NO_x and CO due to blasting, fuel, oil combustion, burning of coal etc. However, there are no point source emissions. The OB will be transported by 150 T and 100 T R.D. trucks to surface dumps and later on, as soon as decoaled area is available suitable for backfilling, to the site of back-filling. The coal will be transported by 85T/100 T R.D.(CB) trucks to the coal receiving pit/crusher and further transported to the plant by conveyors. This may cause increased air pollution along the roads, if adequate control measure like regular maintenance of road, tree plantation along road and maintenance of leak proof truck bodies are not taken.

Impact on noise level

Noise is unwanted and unpleasant sound which causes distraction, disturbance and annoyance. Continuous exposure to high level of noise can impair human hearing power.

The mining activities generate noise mainly on account of:

- Operating mining machinery
- Use of explosives
- Moving road vehicles

The impact of this airborne noise will be more on the operating personnel and on the persons working nearby and not so much on the surroundings. The noise of activities may also disturb animals/birds living in the surroundings forcing them to change their habitat. In the present case, the noise caused will be mainly restricted to the core zone. The noise level data recorded at various places in the study area is well within the desired limit. But, the future establishment of noise due the proposed project activity may pose some problem if project management does not adopt appropriate control measures.

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Air and dust pollution control measures

The SPM, CO, SO_2 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

b) Dust extraction systems will be used in 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:

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- 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.

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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.

15.4.3 Noise and blasting

a) Measures to control noise pollution

The following control measures will be adopted to keep the ambient noise levels below permissible limits of 75 dB (A).

i. Provision and maintenance of thick tree belts to screen noise.

ii. Avenue plantation within the project area to dampen the noise.

iii. Proper maintenance of noise generating machinery including the transport vehicles will be ensured.

iv. Provision of the air silencer to modulate the noise generated by the machines will be made wherever required.

To protect the workers from exposures to higher noise levels, the following measures will be adopted:

i. Provision of protective devices like ear muffs/ear plugs to those workers who cannot be isolated from the source of noise.

ii. Confining the noise by isolating the source of noise.

iii. Reducing the exposure time of workers to the higher noise levels.

15.4.4 Waste management

i. The surface dumps

There is only one surface dump proposed which will be located over the coal bearing area in the southern portion of the West pit area. This dump will be spread over an area 380 ha by 5th year end and will accommodate 197.50 mcum (L) OB waste upto that year. The Dumping will start from 1st year and continue upto 6th year however the exclusive dumping into this surface dump will be upto 5th year after which part of the OB will be backfilled in 6th year. The full height of the dump will be 90m in 6th year. No OB will be required to be disposed over the surface dump after 6th year.

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ii. Backfill dump

Backfilling will start from 6th year of the project operation with a quantity of 54.13 mcum(L). During 6th year partial backfilling will be done and then upto final year full backfilling will take place concurrent with mining.

iii. Top soil dump

The total topsoil generated will be 14.64 mcum (B) during the life of the mine. Unutilised part of the same will be stacked separately in a soil stack pile located beyond the surface dump over the coal bearing area within West Pit area of 60.00 Ha. It will be used for growing plants along the fringes of the site roads and reclamation of surface dump and backfilled area. The top soil 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.

Year wise top-soil generation and disposal is given in the table 15.17 below.

TABLE 15.17
YEAR WISE TOP-SOIL GENERATION AND UTILISATION

Year	Top Soil Genration		Top soil Utilisation		Balance Stack
	Progressive	Cumulative	Progressive	Cumulative	Cumulative
Const. (0)	0.00	0.00	0.00	0.00	0.00
1st Year	0.16	0.16	0.00	0.00	0.16
2nd to 3rd Year	0.62	0.78	0.00	0.00	0.78
4th to 5th Year	1.50	2.28	0.00	0.00	2.28
6th to 10th Year	4.31	6.60	2.05	2.05	4.54
11th to 15th Year	3.89	10.48	2.41	4.46	6.02
16th to 20th Year	1.22	11.70	2.25	6.72	4.98
21st to 25th Year	1.94	13.63	2.19	8.90	4.73
26th Year to of OC Mine/ 29th Year	1.01	14.64	3.83	12.74	1.91
Closure Plan 30th to 32nd	0.00	14.64	1.90	14.64	0.00
Total	**14.64**		**14.64**		

15.4.5 Void

The remaining void area of 331.06 ha (195.15ha in east pit with 170m depth upto pit floor + 135.91 ha in west pit with reduced depth of 60m as a result of partial backfilling) of the excavated pits will be at the end of mine life 29th year. The voids will be completely backfilled during post mine closure period 30th to 32nd both in East as well as West pit. Plate XXVI shows the final

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stage at the end of mine operations with external dump rehandled and final void.

15.4.6 Tailing dam management

In the Mining Plan, provision for space for a washery has been made. The decision regarding capacity and layout of washery will be reached after thorough investigation. The rejects generated from the washery could also be backfilled into the quarry voids after taking permission from the relevant authorities. However, quantification of rejects and tailings is not possible at this stage as the washability study is still under preparation. Therefore, the question of tailing dam management after the study is completed and circuit is frozen.

15.4.7 Infrastructure

Important surface features can be seen in Plate-I and IV.

i. Habitation within the block:

Habitation of following villages is lying within the block (Refer Table 15.18).

TABLE 15.18
HABITATION OF VILLAGES LYING WITHIN THE BLOCK

Villages	Population
Libra	757 (7.89)
Bhalumuda	314 (3.27)
Dholnara	408 (4.25)
Chitwahi	747 (7.78)
Dolesara	1061 (11.05)
Radopali	688 (7.17)
Kunjemura	1054 (10.98)
Gare	741 (7.72)
Pata	1189 (12.39)
Murogaon	520 (5.42)
Saraitola	564 (5.88)
Sarasmal	508 (5.29)
Tihli Rampur	448 (4.67)
Jhinku Bahal	599 (6.24)
Total	**9598* (100)**

A perusal of Plate-IV shows the location of all the above village habitations within the block.

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ii. The following road network is lying within the block:

Road from Bajarmura to Ghargoda (approx 11.6KMs) and Milupara to Tamnar (approx 3 Kms) are passing through the block.

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

Kelo River is flowing across the coal block towards.

iv. Forest within Block

75.945 Ha of Protected Forest land and 135.374 Ha of Revenue Forest land is present within the mine lease area.

(A) Surface reorganization required (refer Plate IV)

a. Roads from Bajarmura to Ghargoda (approx 11.6 KMs) and Milupara to Tamnar (approx 3 Kms) will be diverted.

b. Kelo River is flowing across the coal block towards East - Diversion is not proposed- will be protected by leaving statutory barriers.

c. 75.945 Ha of Protected Forest land and 135.374 Ha of Revenue Forest land is present within the mine lease area, which needs to be diverted for mining purpose after obtaining forestry clearance from the Ministry of Environment and Forest, Govt. of India under the Forest (Conservation) Act 1980.

d. A proposed alignment of railway line is passing though the block. The length of railway line passing through the block is 4.7 km. The width of the corridor for proposed railway line is 90 m (45 m on either side of tracks). During Public hearing held on 29.01.2016, MSPGCL has given the proposal for re-routing the alignment along periphery out side the block boundary citing the reason of blocking of 30 Mt of coal reserves. (Refer **Annexure 3-4**)

(B) Need of dismantling the present facilities

There are no such existing facilities which will require to be dismantled. However there are some villages to be rehabilitated for which due care will be taken.

(C) Future proposed use

The coal mined will be loaded on to the closed conveyor for onwards transpoertation to the TPP located within 10 km of the mine.

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(D) Maintenance of facilities

Roads from Bajarmura to Ghargoda (approx 11.6KMs) and Milupara to Tamnar (approx 3 Kms) will be diverted.

15.4.8 Safety and security

The life of the OC mine operations is 29 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 OC workings are to be effectively protected by a chain link with masonary pillars.

v. Isolation stoppings will be constructed underground.

vi. The shafts and inclines will be sealed in the post mine closure stage.

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 and the routes will be thrown open for the public.

15.5 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.

During the life of the mine, the communities in the surrounding villages come to depend on the same for some of their economic activities due to development of small business linked to the mine and its employees.

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.

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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 provision apart from financial settlement would also include retention of the company house provided during the employment.

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

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facilities before handling 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.

- Project affected families will be 1679 of fourteen villages which need rehabilitation.
- Land oustees will also be given rehabilitation and resettlement benefits according to the Govt. of Chhattisgarh Policies and prevailing practice in industries in the vicinity.
- We will pay annual instalment to the PAP for the area of actual excavation operation in line with the R&R Policy of the State Govt.
- 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. Overhead tank will be constructed to supply pure drinking water.
- The Company will help in improving water supply and irrigation facilities
- Encourage and motivate the Gram Sabha to form co-operative groups and all assistance will be provided by us.
- We will negotiate with villagers for a proper place for local market and we are prepared to provide all financial and technical assistance.
- Job will be provided to the PAFs after successful completion of training and availability of vacancy irrespective of area of land.
- We will adopt some primary schools of the area
- Medical facilities will be available to the villagers in the dispensary of the Company. Mobile dispensary will also be provided for the villages. Serious cases will be referred to a hospital of metropolitan city for better treatment.

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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 pisiculture 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

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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 be something new for the society. But, 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
- 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

Re deployment of work force

The peak work force required for mine operations is in the first few years of the mine when construction activities as well as operational activities achieve their peak.

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This work force slowly goes down with completion of development and when only the operational work remains. Again near the end of the mine life say 4-5 years before closure the activity of the mine starts getting reduced and therefore management gets opportunity to taper the operational manpower. After closure skeleton service people are proposed to be left for continuing with the actual closure operation. The reduction of manpower could be done as per the following options.

- Natural requirement
- Implementation of VRS schemes for age group of +50
- Retraining and redeployment of younger groups -40
- Transfer of experienced middle aged groups between 40-50 year to other projects

Management of community facilities

Community facilities are proposed to be developed for betterment of the neighbouring community. The mine management will provide and assist in developing educational facilities, health facilities, community halls and also some communication facilities. After the mine closure, these facilities are to be continued for the neighbouring communities to the possible extent. The closure plan will envisage interaction with the state of local bodies who will take over these facilities and run the same for the community. The local / state bodies may propose/ may make a one time payment towards running these facilities.

Canalization of available water

If it is found that the mine is having sufficient water and on closure, the mine water flows into the surface watercourses, canalizing the water for surrounding community for their irrigational / domestic uses may be taken up.

Manpower as available at the closure stage will be absorbed at alternative locations of the company if available. Those required to be relieved, will be compensated in line with the applicable laws at that time. Gain from development activities in the region will be additional opportunity for local people.

The disturbed land would be made fertile by use of top soil and fertilisers under expert's guidance and use of available water in the void firstly for the land which remained undisturbed and also for the land which will partly be recovered after dismantling infrastructures and implemented.

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These all areas along with the surface level backfilled area will be possible to utilise for agriculture. The areas which can be used for agriculture are given in Table 15.19.

TABLE 15.19
AREAS WHICH COULD BE USED FOR AGRICULTURE, FOREST AND OTHER USES IN POST MINE CLOSURE STAGE

Sl. No.	Particulars	Area (ha.)	Agriculture, ha	Forest	Others
i	Surface level area over the backfill dump and the area made level after removing the crown dump	2440.55	2265.30	175.25	0
ii	Facilities area including set. pond	55.94	Facilities area 45.94 ha and backfilled settling pond 5 ha.	0	5 ha facilities for public use
iii	Undisturbed / indirectly affected	86.99		36.07 Green Belt	50.92 others (30.3 road+5.2 ha bund+ +15.42 ha under Kelo river).
	Total	**2583.48**	**2316.24**	**211.32***	**55.92**

* *During pre-mining 75.945 Ha of Protected Forest land and 135.374 Ha of Revenue Forest land = Total 211.319 ha*

A perusal of above table shows that the total land useable as agriculture 2316.25 ha, forest 211.319 ha while the rest will be under other land uses as explained under the last column above.

15.6 TIME SCHEDULING FOR ABANDONMENT

The abandonment activities of the OC mine will start 5 years prior to the abandoning of the mine i.e. from 24th year. 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.

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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) All the excavated area will be backfilled and there will not be any 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 24th year. The execution of abandonment activities of the OC mines will be started about four years before the mines get abandoned i.e. 25th 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 15.20.

TABLE 15.20
FACILITIES/ INFRASTRUCTURE TO BE RETAINED AND DISMANTLED

Sl. No.	Particulars	To be Retained (Area in Ha)	To be Dismantled (Area in Ha)
I	**Facilities to be retained**		
i	Office, VT Center, Canteen, dispensary, Parking, Essential quarters near the shaft and inclines	5.00	
ii	Diverted road	30.30	
	Total-I (to be retained)	**35.30**	
II	**Facilities to be dismantled**		
i	C.H.P		5.00
ii	Facilities including inclines, shaft, Store, Security post, weigh bridge		1.50
iii	Indirectly affected area within facilities		5.0

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Sl. No.	Particulars	To be Retained (Area in Ha)	To be Dismantled (Area in Ha)
iv	Coal stack yard		4.00
v	Road		**0.14**
	Total-II (to be dismantalled)		**15.64**
	Total-I and II	**35.30**	**15.64**
	Grand total	**50.94**	

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 Rs 20 lakh will be provided which will easily earn an annual interest of Rs 2 lakh to maintain the retained facilities.

The year wise abandonment activities details have been furnished in the Bar Chart given as Annexure 15-3. Year wise Maydays requirement for carrying out progressive and final mine closure activities have also been given in that Annexure.

15.7 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/underground mine (Refer Plate XXVI and XXXVI). Indicative cost of implementation is given below in Table 15.21, while the schedule of implementation in bar chart form is given with duration of each activity in **Annexure 15-3**.

TABLE 15.21
TENTATIVE ABANDONMENT COST

Heads		Activities		Unit	Vol. of work	Rate, Rs./Unit	Total amt., Rs. Lakh
PROGRESSIVE CLOSURE							
02.	Safety and Security	a)	Barbed wire fencing	M	39668	212	84.10
		f)	Toe wall around the dump	m	9010	1000	90.10
		g)	Garland drain around the dump	m	9028	500	45.14
		h)	Drainage channel from main OB dump and main sump to nala	m	6010	5000	300.50
		i)	Settling pond	Lakh Cum	4	2000000	80.00

Heads	Activities	Unit	Vol. of work	Rate, Rs./Unit	Total amt., Rs. Lakh
	j) Securing Air Shaft and installation of bore well pump		2	1000000	20.00
	k) Securing of Incline 1 &2		2	500000	10.00
	l) Fire stoppings	Lakh Cum	1898	70000	1328.60
04. Top soil management		Lakh Cum	112.56	5000000	5628.00
05. Technical and biological reclamation of mined out land and OB dump	a1) Reclamation	Ha.	2221	400000	8884.00
	a2) Rehandling of crown dump to East Pit	Lakh Cum	428.60	3000000	12858.00
	b2) Rehandling of crown dump to West pit	Lakh Cum	2414.40	3000000	72432.00
06. Plantation over virgin area including Green Belt	a) Plantation/ Green Belt over Virgin Area	Ha.	35.86	400000	143.44
09. Water quality management		LS	0		340.00
10. Air quality management		LS	0		340.00
11. Subsidence monitoring for		LS			19.09
12. Manpower cost and supervision		LS	0		163.50
FINAL CLOSURE					
01. Dismantling of Infrastructure, disposal/ rehabilitation of mining machinery	a) Dismantling of workshop	LS	0		300.00
	b) Dismantling of CHP	LS	0		500.00
	c) Dismantling of facilities	LS	0		1000.00
	d) Dismantling of pumps and pipes	LS	0		45.00
	f) Dismantling of UG facilities including main fan		0		100.00
	g) Dismantling of UG Conveyors		0		300.00
	h) Dismantling of UG Rail tracks		0		150.00
	i) Dismantling of UG equipment		0		200.00
	j) Re-arranging of water pipelines to dump top, park	LS	0		15.00

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Heads	Activities	Unit	Vol. of work	Rate, Rs./Unit	Total amt., Rs. Lakh
	k) Dismantling of power line	LS	0		30.00
	l) Rehabilitation over area of dismentaled facilities	Ha.	50.94	400000	203.76
04. Top soil management		Lakh Cum	19.10	5000000	955.00
05. Technical and biological reclamation of mined out land and OB dump	a1) Reclamation	Ha.	414.8	400000	1659.12
	a2) Rehandling of crown dump to East Pit	Lakh Cum	1027.40	3000000	30822.00
	b2) Rehandling of crown dump to West pit	Lakh Cum	298.1	3000000	8943.00
07. Landscaping and plantation	a) Peripheral road, gates, view point, cemented steps on bank		0		40.00
	b) Beautification and landscaping over dump	LS	0		20.00
	c) Plantation				35.00
08. Power cost		LS	0		40.00
09. Water quality management		LS	0		12.00
10. Air quality management		LS	0		12.00
11. Subsidence monitoring for		LS	0		0.91
12. Manpower cost and supervision		LS	0		4.50
13. Others	a) Entrepreneurship development (vocational skill development, training for sustainable income of affected people	LS	0		100.00
	d) One time financial grant to society/ institution/ organisation which is dependent upon the project	LS	0		50.00
	f) Continuation of other services like running of schools etc	LS	0		150.00
	Grand Total				**148453.76**

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

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 **1484.54** 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 the 1st major activity is to rehandle 241.44 Mcum(B) OB from the crown dump of 100m height from west to west pit during the 4 years (26th to 29th).

The 2nd major activity is to rehandle 132.55 Mcum(B) or 152.43 mcum(L) of OB from the crown dump of 100m height from west to east pit during the 3 closure years (30th to 32nd) for which the HEMM comprising existing shovel and dumpers will be utilised for dealing with the said volume.

As the underground operation would be continued long after cessation of opencast operation, certain closure activities especially dismantling of facilities as envisaged for opencast may need to be deferred till the end of underground operation. The status will be reviewed and submitted while submitting the final closure plan for the opencast.

b.) Escrow account amount/ Annual Closure cost

Annual Closure cost computed considering the total project areas at the estimated rates mentioned in the Guidelines and deviding the same by the entire life of the mine in the years. An amount equal to the annual cost is to be deposited each year through out the mine life compounded @5% annually.

As estimated in the Guidelines that typically closure cost for an opencast mine will come around six lakhs per hectare of the total project area and it would be rupees one lakh per hectare for underground project area at price level of August 2009 and these rates has been modified based on the whole Sale Price Index as notified by Government from time to time.

The leasehold area of the block is 2583.48 hectares. The opencast mining will be undertaken over 2583.48 Ha whereas underground mining will be undertaken only over 2208.18 Ha. area. A part of the area on western side is not workable by UG and the same has not been considerd for UG mine.

Since the total project area of 2583.48 Ha has been taken into consideration for mine closure cost calculation of OC, the cost calculation for Escrow fund

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for UG i.e for 2208.18 Ha has been done from 30th year i.e after closure of the OC mine.

Base date of the WPI has been considered as January 2016.for calculation of Escrow Amount.

The amount of mine closure cost with WPI at 175.4 (January 2016) works out Rs. 8.12037 Lakh/ha for opencast mining and Rs. 1.3534 Lakh/ha for belowground mining as per guidelines issued by MOC. The calculations for the needed funds are detailed in Table 15.22 and the yearly amount to be deposited in Table 15.23.

TABLE 15.22
DERIVATION OF ESCROW AMOUNT RELATED TO OC & UG MINING

Monthly Wholesale Price Index "Aug. 2009"	129.600
WPI as on base date "January 2016"	175.400
Escalation rate of Closure cost	**1.3534**
Rate of compounding of Annual Closure Cost	5.00%
Amount to be deposited into Escrow Account after compounding @ of 5% "Rs. in Crs"	**932.7141**

	OC	UG
Base rate of closure cost - August 2009 (Rs. Crore/Ha.)	0.0600	0.0100
Closure cost as on base date January 2016 (Rs. Crores/Ha.)	0.08120	0.01353
Project Area (Ha.)	2583.48	2208.18*
Amount to be deposited into Escrow Account "Rs.Cr."	209.7881	29.8855
Amount already deposited into Escrow Account "Rs. Cr."	0.00	0.00
Net Amount to be deposited into Escrow Account "Rs. Cr."	209.7881	29.8855
Starting year for Escrow deposit	1	30
Ending year for Escrow deposit	29	77
Balance Life of the project For Escrow Account "in Yrs"	29	48
Annual Closure Cost (Rs. Cr.)	7.2341	0.6226
Annual Closure Cost escalated @ 5% as on first year of deposit "Rs. Cr"	7.2341	2.5628

* *A part of the area on western side is not workable by UG and the same has not been considerd for UG mining and the UG project area is only 2208.18 Ha.*

TABLE 15.23
AMOUNT TO BE DEPOSITED IN ESCROW ACCOUNT ANNUALLY

Year	Amount, Rs. Crore		
	OC	UG	Total
1	7.2341	-	7.2341
2	7.5958	-	7.5958
3	7.9756	-	7.9756

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Year	Amount, Rs. Crore		
	OC	UG	Total
4	8.3743	-	8.3743
5	8.7931	-	8.7931
6	9.2327	-	9.2327
7	9.6944	-	9.6944
8	10.1791	-	10.1791
9	10.6880	-	10.6880
10	11.2224	-	11.2224
11	11.7835	-	11.7835
12	12.3727	-	12.3727
13	12.9914	-	12.9914
14	13.6409	-	13.6409
15	14.3230	-	14.3230
16	15.0391	-	15.0391
17	15.7911	-	15.7911
18	16.5806	-	16.5806
19	17.4097	-	17.4097
20	18.2801	-	18.2801
21	19.1942	-	19.1942
22	20.1539	-	20.1539
23	21.1616	-	21.1616
24	22.2196	-	22.2196
25	23.3306	-	23.3306
26	24.4971	-	24.4971
27	25.7220	-	25.7220
28	27.0081	-	27.0081
29	28.3585	-	28.3585
30	-	2.5628	2.5628
31	-	2.6909	2.6909
32	-	2.8255	2.8255
33	-	2.9667	2.9667
34	-	3.1151	3.1151
35	-	3.2708	3.2708
36	-	3.4344	3.4344
37	-	3.6061	3.6061
38	-	3.7864	3.7864
39	-	3.9757	3.9757
40	-	4.1745	4.1745
41	-	4.3832	4.3832

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Year	Amount, Rs. Crore		
	OC	UG	Total
42	-	4.6024	4.6024
43	-	4.8325	4.8325
44	-	5.0741	5.0741
45	-	5.3278	5.3278
46	-	5.5942	5.5942
47	-	5.8739	5.8739
48	-	6.1676	6.1676
49	-	6.4760	6.4760
50	-	6.7998	6.7998
51	-	7.1398	7.1398
52	-	7.4968	7.4968
53	-	7.8716	7.8716
54	-	8.2652	8.2652
55	-	8.6784	8.6784
56	-	9.1124	9.1124
57	-	9.5680	9.5680
58	-	10.0464	10.0464
59	-	10.5487	10.5487
60	-	11.0761	11.0761
61	-	11.6299	11.6299
62	-	12.2114	12.2114
63	-	12.8220	12.8220
64	-	13.4631	13.4631
65	-	14.1363	14.1363
66	-	14.8431	14.8431
67	-	15.5852	15.5852
68	-	16.3645	16.3645
69	-	17.1827	17.1827
70	-	18.0418	18.0418
71	-	18.9439	18.9439
72	-	19.8911	19.8911
73	-	20.8857	20.8857
74	-	21.9300	21.9300
75	-	23.0265	23.0265
76	-	24.1778	24.1778
77	-	25.3867	25.3867
Total*	**450.8471**	**481.8652**	**932.7123**

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Thus the total amount which will be deposited upto the end of post mine closure plan will be Rs 932.7123 crores (450.8471 Crores for OC mine + 481.8652 Crores for UG mine) and will stand security for proper implementation of Mine Closure Plan.

15.8 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 amount 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.

15.9 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).

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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.

15.10 PROVISION FOR MINE CLOSURE

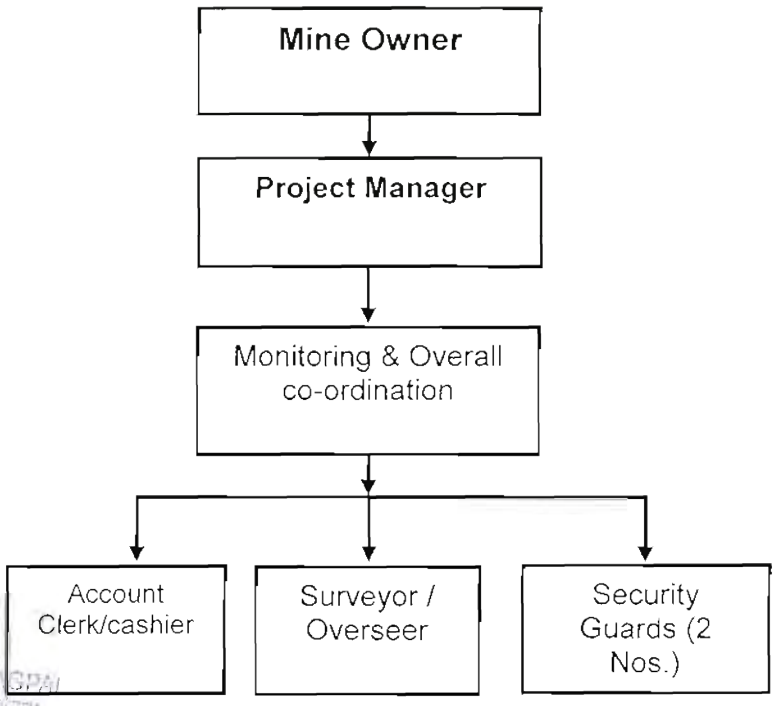
The mine owner will obtain a mine closure certificate from Coal Controller to the effect that the protective, reclamation and rehabilitation works in accordance with the approved mine closure plan/ Final mine Closure Plan have been carried out by the mine owner for surrendering the reclaimed land.

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.

15.11 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



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15.12 CSR ACTIVITIES

Under CSR, developmental programmes will be implemented as per the needs of the community since development of the Mine to completion of the project. A detailed study will be conducted to identify the actual needs of the people in the area to formulate CSR Policy. The SCR policy of the Company is attached as **Annexure 15-4**.

- The CSR activities will be implemented over and above R&R package.
- Company CSR will be based in general on the following :
- Education Development Activities
- Sport Art and Culture promotion activities
- Health & Sanitation (aarogya) programme
- Financial Assistance for self sustenance and other need based activities.
- Infrastructure development

However the following CSR activities have already been conducted in the project area:

i. 20 self help groups have been formed in villages and training has been imparted in Vermi Compost activity and Poultry farming.

ii. 2 Cricket tournaments have been conducted.

iii. Training on mushroom farming has bee imparted to villagers.

In future more CSR activities will be charted out for creation of employment/vocational opportunities for local people with education, skill development & training programme.

/L.P. NAGPAL
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