CENTRAL COALFIELDS LIMITED (CCL)

DETAILED PROJECT REPORT
OF
AMRAPALI OCP
(12.0 MTY)
(WITH UPDATED COST ESTIMATES APPROVED BY CIL BOARD ON 13/02/2012)

REGIONAL INSTITUTE-III
CENTRAL MINE PLANNING & DESIGN INSTITUTE LIMITED
(A Subsidiary of Coal India Limited)
GONDWANA PLACE, KANKE ROAD, RANCHI – 834 031,
JHARKHAND, INDIA

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Ref No. CIL:XI(D):04112:2012: 23/74

Date 13th Feb. 2012

To
General Manager (PMD),
Coal India Limited,
10, N.S.Road,
Kolkata - 1

Sub: Minutes of 278th CIL Board Meeting held on 13th Feb. 2012

Dear Sir,

Reproduced below is the relevant extract from the minutes of 278th meeting of Board of Directors of Coal India Limited held on 13th Feb.'2012 at New Delhi with regard to the following item:

"ITEM NO.278:4 (H)

Sub : Project Report of Amrapali OCP (12.0 MTY), CCL.

4.8 A presentation was made by RI-III & CCL officials. After detailed deliberations, Board accorded its approval for the Project Report of Amrapali OCP for a rated capacity of 12.0 MTY at an estimated initial capital investment of Rs.858.11 crore (base date January'2012) with outsourcing of both coal production and OB removal as brought out in the agenda note.

During the course of discussions, CCL officials had pointed out that the project could be able to produce 1.5 MT of coal in the next year. Hence Board advised the company to place an Action Taken Report to its Board on how to achieve 1.5 MT in 2012-2013 on fast track basis from this project."

This is for your information and necessary action please.

Yours faithfully,

(M Viswanathan)
Company Secretary

UPDATED COST ESTIMATES WITH APPENDICES

(JANUARY 2012)

UPDATED COST ESTIMATES (JANUARY'12)

SUMMARISED DATA

1.	Name of the Project	:	Amrapali OCP (12.00 MTY)
2.	Coalfield	:	North Karanpura Coalfield
3.	Location	:	Chatra District, Jharkhand
4.	Company	:	Central Coalfields Limited
5.	Seamwise Coal Reserves	:	

Sl. No.	Seam	Mineable Reserves (M.tes.)		
		East Section	West Section	Total
a)	I (B)/I(B+M)/ I (B+M+T)	88.47	40.41	128.88
b)	I (M)	3.46	6.75	10.21
c)	I (T)/I(T+M)	23.11	23.26	46.37
d)	II (B)	12.93	1.81	14.74
e)	II(T)	9.05	2.25	11.3
f)	III (C)	29.73	18.1	47.83
g)	IV	22.28	9.49	31.77
h)	TOTAL	189.03	102.73	291.1
i)	Total OBR(Mm^3)	265.95	193.73	459.68
j)	S. Ratio (m^3/te.)	1.41	1.90	1.58
k)	Quarry Parameters			
l)	Dip of seams (Degree)	6-8	3-6	
m)	Strike Length (Km)	2.2	2.4	4.6
n)	Width (Km)	1.4	1.4	
o)	Maximum depth (m)	135	135	
p)	Area of Excavation (Ha.)	337.25	493.7	830.95

6.	Av. Grade of Coal (ROM)	Gr F
7.	Main Consumer	Barh STPS
8.	Method of Mining	Shovel-Dumper & Dragline
9.	Main Equipment Configuration	Both outsourcing with Departmental CHP

a	- Dragline, 20/90
b	- Elect. Rope Shovel, 20 m^3
c	- Elect. Hyd. Shovel, 8.3 m^3
d	- Rear Dumper, 170T
e	- Rear Dumper, 85T
f	-Elect. RBH Drill, 250 mm (Long Mast)
g	- Elect. RBH Drill, 160 mm
h	- Dozer 410 HP
i	- Wheel Dozer- 460 HP
k	-Grader –280 HP
l	-Water Sprinkler- 28KL
m	-Diesel Hydraulic BH shovel(1.2Cum)

OUTSOURCED

Techno-Economic Parameters

Sl No	Description	Both outsourcing with Departmental CHP
1	Target Output (COAL)	
	at 100% level (Mte/Year)	12.00
	at 85% level (Mte/Year)	10.20
	Peak OBR (in Mcum/year)	21.81
2	Life of the Mine (Years)	30.00
3	Initial Capital (Rs. Crore)	858.11
4	Initial Capital Outlay	
	at 100% level (Rs/te)	715.09
	at 85% level (Rs/te)	841.28
5	Initial Capital on P& M (Rs. Crore)	402.16
	Initial Capital outlay on P& M (Rs/te)	335.13
6	Cost of Production	
	at 100% level (Rs/te)	471.38
	at 85% level (Rs/te)	515.86
7	Profit	
	at 100% level (Rs/te)	255.62
	at 85% level (Rs/te)	211.14
8	Ave Selling Price (Rs/te)	727.00
9	Financial IRR	
	at 100% level (Rs/te)	31.03
	at 85% level (Rs/te)	24.34
10	Economic IRR	
	at 100% level of rated output	39.46
	at 85% level of rated output	32.29
11	Completion Capital (Rs. Crore)	1160.10
12	Completion IRR (Fin.)	
	at 100% level of rated output	25.58
	at 85% level of rated output	19.70
13	Completion IRR (Eco)	
	at 100% level	33.22
	at 85% level	26.80
14	EMS (Rs.)	1950.03
15	OMS (Old) (Te)	132.52
16	No. of Personnel	343

1.0 UPDATED COST ESTIMATES (Jan'2012):

Reasons for updating the cost estimates: The DPR was last prepared in April, 2005 and subsequently updated in July'2006. The UCE (July'2006) was sent along with the Draft CCEA note in November'2006 for approval. As per the relevant directives on the subject, there have been changes in the price of inputs (P&M, Civil, Salaries & Wages etc.). These changes necessitate updating of cost estimates in March'09. The Project Report for Amrapali OCP (12.0MTY) was discussed in the 360th (Item No.4 (16) meeting of CCL Board on 30.07.2009 and the Board approved the proposal envisaging outsourcing of both coal production and OB removal, to CIL board for approval of the PR. The PR was updated in Oct,2009 for consideration in ESC of CIL Board.

Since the last updating, more than six months have elapsed and before placing it to CIL Board for approval the same has been updated.

1.1 The estimated economics as per this UCE (Jan'12) have been discussed in the subsequent paragraphs.

Initial capital investment as per the updated estimates (Jan'12) have been provided in the proposal till the year of achieving rated coal production. The capital investment, both Initial as well as beyond target year, has been proposed from the internal resources of the Company. The capital requirement for the proposed PR for Amrapali OCP (12 Mty), is given below:

Sl. No	Particulars	AAP		Total Amount (Upto 7th Target Yr)
		Approved	Existing 03/11	
1	Land	150.00		2071.94
2a	Residential	28.97		1070.07
2b	Service			1015.48
3a	HEMM			1305.49
3b	Other than HEMM			38910.39
4	Furniture			125.00
5	Railway Siding	150.00		19735.00
6	Vehicles	10.75	3.58	846.30
7	Prospecting & Boring			165.34
8	Development			
(a)	Capital Outlay in Mines	260.00	5125.08	10329.82
(b)	Roads & Culverts	90.00	5.01	4460.18
(c)	Water Supply	25.00		523.69
(d)	PR preparation Cost			402.79
(9)	Net REC			4849.09
Total Estimated Initial Capital Investment		889.72	5164.17	85810.57
Specific Investment Rs./te				715.09

Expenditure against AAP will be ultimately part of the total sanctioned capital of Rs. 858.11 crores.

The details of capital investment under various heads viz. Land (A.1), Buildings (A.2), Vehicles (A.6), Prospecting & Boring (A.7) and Development (A.8), are given in the appendices mentioned against each of them.

1.2 Capital Investments for P&M

Capital investment on P&M is given in Appendix-A.3. The detailed break-up for HEMM, Electrical, Pump & Pipes, Workshop and Other P&M etc. are given in Appendix-A.3.1 to A.3.5 for all the options separately.

The specific capital investment on P&M worked out for the options is given below:

A	HEMM for Reclamation	1305.49
B	Pumps & Pipes	
C	C. H. P	31651.69
D	Workshop	
E	Electrical	6806.11
F	Other P & M	314.29
G	Float Engines	73.03
H	Contingencies	65.27
	TOTAL (B-H)	38910.39
I	**Specific investment in Rs./te of coal**	
I.i	P&M	324.25
I.ii	HEMM alone	10.87

Method of Estimation of Capital Cost

The method of estimation of capital investment for P&M, Civil estimates, Development Capital, Revenue expenditure capitalised etc. is as follows.

Prices of Plant & Machinery

For the plant and machinery, as far as possible, the prices have been taken from the Standard Price List of Mining Equipment published by CMPDI and the price of Surface Miners has been taken as per budgeted price as per discussion with the manufacturer and whenever information regarding price was not available, a broad estimate was made.

1.3 Estimated Cost of Civil Construction

The basis for the estimation of the cost of civil construction viz. residential buildings, service buildings, roads etc. has been given in Appendices - A.2.1, A.2.2 & A.8.2.

1.4 Capital Investment on Vehicles

The total estimated capital investment on vehicles has been shown in Appendix- A.6 and the total estimated investment is Rs. 8.46 crores.

1.5 Development

Under this head, estimated investment is given for (a) capital outlay in mines (Appendix A.8.1), (b) Roads and culverts, including haul roads (A.8.2), (c) Water Supply & Sewerage (A.8.3). The details of each item are given in the Appendices.

1.6 Opening of Revenue Account

The proposed Amrapali OCP (12.00 MTY) has been planned to come under revenue account from the 4th yr of coal production with the mine designed to produce 1.50 Mty in this year.

1.7 Estimates of Operating Cost

Appendix-C gives the details of average cost and profitability for the target production of 12.00 MTY. The method adopted in estimating the costs are briefly explained as follows:

(a) Wages

The requirement of manpower for the targeted production of 12.0 MTY of coal, is estimated category wise/ scale wise. Prevalent pay scales for executives and non- executives (NCWA-VIII) are adopted. End points of the relevant pay scales of executives & non-executives have been considered in estimating the salary and wages cost. The average wages cost per Tonne has been shown in Appendix – C and is also shown in Table C below.

(b) **Stores**

Stores cost consists (1) diesel and lubricants, (2) explosives and detonator, (3) spares for routine repairs etc. Prevalent norms have been followed in estimating stores cost. The average store cost per tonne has been shown in Table C below.

(c) **Power**

The average Power cost per Tonne has been shown in Table C below based on annual KWH consumed.

(d) **Miscellaneous Expenditure**

This covers the expenditure on printing & stationery, postages, telephone, repairs and maintenance of assets other than P&M, workshop debits for annual servicing and overhauling of HEMM, insurance and taxes for vehicles, normative contractual cost of major maintenance of HEMM. The average Miscellaneous cost /Tonne has been shown in Table C below.

(e) **Final Mine closure Cost**

A fund equal to Rs. 6 lakhs/hectare of land is proposed to be created towards a fund for final mine closure. This rate has been escalated based on WPI as per directives in the Final Mine closure guidelines. The fund has been distributed over the revenue life of mine in the project with a yearly escalation of 5%.

(f) **Administrative Charges**

This includes area overhead, apex overhead etc. and the cost has been taken as per the actual administration cost of CCL .

(g) **Cost of Coal & OB Outsourcing**

The coal outsourcing cost includes **excavation cost** (Rs. 25/t) as per prevailing contracts in CCL, **transportation cost** as per the applicable distance ranges at ESM rates, and **Pay loader** (Rs. 7.40/t) charge. Diesel escalation has been considered for excavation and transportation costs. These costs are likely to change in future.

The OB outsourcing cost includes **Excavation and transportation** of OB as per the prevailing contracts in CCL. The composite rate adopted in the proposal is Rs. 55.11/cu.m for an average lead of 1-2 Kms, which does not include explosive costs and includes diesel escalation clause. These costs are likely to change in future.

Over and above these costs applicable service tax has been provided.

(g) **Interest on Working Capital**

Rate of the interest on working capital is taken as 14.50% per annum.

(h) **Interest on Loan Capital:**

As the investment for the project is proposed to be met from the internal resources of the Company, there is no impact due to interest on loan capital.

(j) **Depreciation**

Depreciation on assets is computed as per the prevalent norms. The straight-line method of charging depreciation has been adopted.

(k) **Cost & Profitability**

The details of the average cost and profitability estimates, at 100% capacity and at 85% capacity are given in **Appendix-C &C1**. These have been summarised in the table below

TABLE C

Option COAL & OB BOTHOUTSOURCED	100% Capacity	85% Capacity
Year	Average Cost/ Rs TONNE	
Salaries & Wages	17.87	21.03
Stores cost	33.31	36.84
Power cost	10.71	12.12
Miscellaneous cost	29.09	31.15
Final Mine Closure Cost	7.62	8.96
Administrative Expenses	140.00	164.71
Coal Outsourcing Cost	53.97	53.97
OB Outsourcing Cost	121.76	121.76
Interest on working capital	20.03	21.78
Depreciation	37.02	43.55
Total Cost	471.37	515.86
Selling Price (In Rs.)	727.00	727.00
Profit/Loss Per Tonne (In Rs.)	255.62	211.14

The declared Selling Price of coal has been taken for the geological Grade-F i.e. Rs.630/- per tonne with additional charges of Rs.77/- per tonne for sizing of coal up to (-) 50 mm and Rs. 20/ for envisaged rapid loading system.

1.8 Financial Analysis

The year-wise cash-flows at 100% and 85% capacity utilisation have been estimated and are detailed in Appendix-D & D.1, respectively. The cash-flows exclude depreciation and interest on loan capital. The financial IRR on total capital of the project at 100% and 85% level of the rated output have been worked out based on the estimates of the aforesaid cash flows. These have been worked out for both the variants and have been summarised in the table below.

Sl No	Particulars	
1	Internal Rate of return %	
	a) at 100% Capacity	31.03
	b) at 85% Capacity	24.34

1.9 ECONONIC ANALYSIS

The year wise cash flow for the economic analysis at 100% and 85% capacity utilization have been estimated and are detailed in Appendix- D2 and D.3, respectively. In estimating the economic prices, all taxes, duties and levies have been excluded from cost of inputs and the shadow rate for wages and salaries have been taken as 1.00. The economic price of coal has been assumed to be same as its ruling price. Based on the above methodology, the economic IRR of the project, at 100% and 85% rated output, for both variants has been summarised in the table below:

Sl No	Particulars	
1	Economic Internal Rate of return %	
	a) at 100% Capacity	39.46
	b) at 85% Capacity	32.29

1.10 SENSITIVITY ANALYSIS

The following parameters have been identified for assessing their impact on the profitability of the project.

a) Capital investment
b) Operating cost
c) Capacity utilisation
d) Selling price of coal

The above parameters have been increased / decreased in Steps of 5% to a maximum of 25% over the base case and the IRR have been computed. The following table summarises the results of sensitivity analysis:

Sl No	Variable Parameter	IRR AT DIFFERENT STAGES OF					
		0%	5%	10%	15%	20%	25%
1	Increase in Capital	31.03	29.87	28.78	27.77	26.83	25.94
2	Increase in Cost of Production	31.03	29.41	27.73	25.99	24.16	22.25
3	Decrease in Capacity	31.03	28.90	26.68	24.34	21.87	19.24
4	Decrease in Selling Price	31.03	28.06	24.89	21.44	17.61	13.22

1.11 Completion cost of the project

Completion cost of the project is up to targeted year. Financial and Economic IRR of the project, based on the estimated completion capital have been worked out, for both 100% and 85% capacity utilization.

Sl No	Particulars	
1	**Completion Capital (Rs Crs)**	1160.10
2	**Internal Rate of return**	
	a) at 100% Capacity	25.58
	b) at 85% Capacity	19.70
3	**Economic Internal Rate of return**	
	a) at 100% Capacity	33.22
	b) at 85% Capacity	26.80

APPENDIX-A

UCE FOR AMRAPALI OCP (12.00 MTY)
STATEMENT SHOWING ESTIMATED INITIAL INVESTMENT

(Rs IN LAKHS)

Sl. No.	Particulars	AAP		Total Amount (Upto Target Yr)	1	2	3	4	5	6	7	Y8	Y9
		Approved	Existing 03/11										
1	Land	150.00		2071.94	600.00	528.94	400.00	200.00	200.00	143.00	0.00		
2	Buildings												
	(a) Residential	28.97		1070.07	119.36	119.36	119.36	119.36	119.36	238.71	234.57		
	(b) Service			1015.48		119.36	119.36	119.36	238.71	238.71	170.99		
3	Plant and Machinery												
	(a) HEMM			1305.49					1305.49				
	(b) Other than HEMM			38910.39	2303.94	5430.92	14193.49	11144.16	5231.73	364.60	241.56	48.19	31.56
	Total Plant & Machinery	175.00	30.50	40215.88	2303.94	5430.92	14193.49	11144.16	6537.22	364.60	241.56	48.19	31.56
4	Furniture			125.00		10.00	15.00	25.00	25.00	25.00	25.00	25.00	
5	Railway Siding	150.00		19735.00			14.00	2493.00	7778.00	7500.00	1950.00		
6	Vehicles	10.75	3.58	846.30	57.91	57.91	51.02	197.24	227.06	255.16			
7	Prospecting & Boring			165.34	165.34								
8	Development												
(a)	Capital Outlay in Mines	260.00	5125.08	30329.82	2635.00	2000.00	1829.80	1220.00	1399.16	696.02	549.84		
(b)	Roads & Culverts	98.00	5.01	4460.18		206.23	425.49	1201.53	756.19	705.91	1164.83		
(c)	Water Supply	25.00		523.69	99.09	99.09	140.45	96.05	34.86	27.21	26.93		
(d)	PR preparation Cost			402.79	150.00	252.79							
	Sub Total (8)			15716.48	2884.09	2558.12	2395.74	2517.57	2190.20	1429.14	1741.60		
	Sub Total (01 to 08)			80961.48	6130.63	8824.59	17307.97	16815.69	17315.55	10194.33	4372.72	73.19	31.56
(9)	Revenue Exp Capitalised during development			5160.41	769.54	1028.99	3361.88						
	LESS: Depreiation capitalised			311.32			311.32						
	Total initial Capital Investment	889.72	5164.17	85810.57	6900.18	9853.58	20358.53	16815.69	17315.55	10194.33	4372.72	73.19	31.56

Note: Expenditure already made on Prospecting & Boring has been shown in the 1st Year.
Expenditure against AAP will be ultimately part of the total sanctioned capital of Rs 858.11

APPENDIX-A

UCE FOR AMRAPALI (12.0 MTY)

Statement Showing Estimated Revenue Expenses Capitalised

(Amt in Rs. Lakh)

S.No.	Particulars	Yoar-wise Phasing			Total
		Y1	Y2	Y3	
1	Salaries & wages	592.64	649.95	1204.51	2447.11
2	Stores	146.20	308.86	684:24	1139.30
3	Power	0	0	19.79	19.79
4	Misc.Expenses	30.70	70.17	171.10	271.98
5	Coal & OB outsourcing cost	0.00	0.00	970.91	970.91
	Revenue Expenditure in cash (a)	769.54	1028.99	3050.56	4849.08
6	Depreciation			311.32	311.32
7	Interest on Loan capital	0.00	0.00	0.00	0.00
8	Total Revenue Expenditure (b)	769.54	1028.99	3361.88	5160.41
9	Less sales Realisation				0.00
10	TOTAL REVENUE EXPENDITURE Capitalised net sales	769.54	1028.99	3361.88	5160.41
11	Less depreciation			311.32	311.32
12	Net Revenue expenditure Capitalised	769.54	1028.99	3050.56	4849.08

APPENDIX - A'

UCE FOR AMRAPALI OCP (12.0 MTY)
STATEMENT SHOWING ESTIMATED COMPLETION CAPITAL WITH PHASING

(Amt in Rs. Lakhs)

Sl. No.	Particulars	Adiitional Amount (Upto Target Yr)	YEARS						
			1	2	3	4	5	6	7
1	Land	2568.37	654.00	624.15	508.00	272.00	290.00	220.22	0.00
2	Buildings								
	(a) Residential	1524.91	130.52	141.68	152.84	164.00	175.16	372.63	388.10
	(b) Service	1479.24		141.68	152.84	164.00	350.31	372.63	297.79
3	Plant and Machinery								
	(a) HEMM	1892.96					1892.96		
	(b) Other than HEMM	50775.03	2514.52	6432.46	18079.78	15207.06	7586.01	561.48	393.74
	Total Plant & Machinery	**52667.99**	**2514.52**	**6432.46**	**18079.78**	**15207.06**	**9478.96**	**561.48**	**393.74**
4	Furniture	180.35		11.80	19.05	34.00	36.25	38.50	40.75
5	Railway Siding	29414.86			17.78	3390.48	11278.10	11550.00	3178.50
6	Vehicles	1186.68	63.12	68.33	64.79	268.25	329.24	392.95	
7	Prospecting & Boring	165.34	165.34						
8	Development								
(a)	Capital Outlay in Mines	13212.09	2872.15	2360.00	2323.85	1659.20	2028.78	1071.87	896.24
(b)	Roads & Culverts	6547.64		244.22	543.05	1644.17	1104.41	1096.00	1915.80
(c)	Water Supply	673.71	108.22	117.35	179.26	131.43	50.91	42.25	44.29
(d)	PR preparation Cost	461.79	163.50	298.29					
	Sub Total (8)	**20895.24**	**3143.87**	**3019.86**	**3046.16**	**3434.80**	**3184.10**	**2210.12**	**2856.33**
	Total Initial Capital before REC	**110082.98**	**6571.36**	**10439.95**	**22041.23**	**22934.58**	**25122.12**	**15718.54**	**7155.21**
9	Revenue Expenditure Capitalised	6322.59	838.80	1214.20	4269.59				
10	Less Depreciation	395.38			395.38				
	Total Initial Completion Capital	**116010.19**	**7510.16**	**11654.15**	**25915.44**	**22934.58**	**25122.12**	**15718.54**	**7155.21**

UCE FOR AMRAPALI OCP (12.00 MTY)

Appendix-A.1

Estimated Investment on Land

(Amt. in Rs. Lakhs)

Sl. No.	Particulars	Area (Ha)	Amount	Yearwise Phasing						
A				Y-1	Y-2	Y-3	Y-4	Y-5	Y-6	Y-7
1	GMK Land	358.54	885.59	200.00	200.00	200.00	100.00	100.00	85.59	
2	Tenancy Land	198.36	857.41	200.00	200.00	200.00	100.00	100.00	57.41	0.00
3	Forest Land	690.18	7376.66							
Total		1247.08	1743.00	400.00	400.00	400.00	200.00	200.00	143.00	0.00
B (Railway Siding)*										
1	Tenancy Land	76.10	328.94	200.00	128.94					
2	Forest Land	102.90	1099.80							
Total		179.00	328.94	200.00	128.94					
Grand Total		1426.08	2071.95	600.00	528.94	400.00	200.00	200.00	143.00	0.00

* Tentative figures subject to survey by East Central Railways.

Note:

In addition to the land requirement of 1247.08 ha, an area of 179 ha exclusively for railway siding is to be aquired .This piece of land has been considered in chapter - IX . Out of 179 ha , 102.9 ha is forest land i.e. forest land required for compensatory afforestation (690.18+ 102.9)=793.08 ha

APPENDIX A-2

UCE FOR AMRAPALI OCP (12.0 MTY)

SUMMARY OF THE CAPITAL INVESTMENT ON BUILDINGS.

(AMOUNT IN RS LAKH)

PARTICULARS.	TOTAL PROV.	PHASING										REFERENCE
		Y.1	Y.2	Y.3	Y.4	Y.5	Y.6	Y.7	Y.8	Y.12	Y.17	
RESIDENTIAL BUILDINGS	1070.07	119.36	119.36	119.36	119.36	119.36	238.71	234.57	0.00	0.00	0.00	APP A2-1
SERVICE BUILDINGS	1015.49	0.00	119.36	119.36	119.36	238.71	238.71	179.99	0.00	0.00	0.00	APP A2-2
TOTAL	**2085.56**	**119.36**	**238.71**	**238.71**	**238.71**	**358.07**	**477.43**	**414.56**	**0.00**	**0.00**	**0.00**	

APPENDIX-A.2.1.

UCE FOR AMRAPALI O.C.P.(12.00 MTY)

STATEMENT SHOWING THE ESTIMATED CAPITAL INVESTMENT ON RESIDENTIAL BUILDINGS.

(AMOUNT IN Rs.'000')

SL. NO.	CATEGORY/SCALE	TYPE OF QTRS.	NO. OF PERS -ONS	%age SATISF -ACTION	TOTAL QTRS. REQD.	UNIT COST AT 100 CI IN RS.	UNIT COST AT 2485 CI(IN RS.)	TOTAL COST
1.	CAT.I to V and GRADE E	MQ	136	28.68	39	12282	305208	11903.10
2.	CAT.VI to GR.C.D.	MQ						
3.	Rs.3384-4464 & 3457-4663 Rs.3506-4856 & 3545-5111	A	66	65.00	43	15009	372974	16037.87
4.	Rs.3698-5878 to 6000-8400 & GR. A, B & SPECIAL GRADE	HOSTEL B	97	65.00	13	9310	231354	3007.60
5.	Rs.8600-14600 to 10750-16750	C	34	100.00	50	21713	539568	26978.40
	Rs.13750-18700 to 16000-20800				23	31717	788167	18127.85
6.	Rs.17500-23300 AND ABOVE	D	10	100.00	11	36116	897483	9872.31
					10	72284	1796257	17962.57
	SUB-TOTAL		343	55.00	189			103889.70
	CONTINGENCIES 3% OF ABOVE							3117.69
	GRAND TOTAL (IN Rs. LAKHS.)							**1070.07**

UCE FOR AMRAPALI O.C.P (12.00 MTY)
ESTIMATED CAPITAL EXPENDITURE ON SERVICE BUILDINGS.

(AMOUNT IN Rs.LAKH)

SL NO.	PARTICULARS	NO	PLINTH AREA (sq.mt)	PLINTH AREA RATE(Rs)	COST AT 100 C.I.	COST AT 2485 C.I
A.	OFFICE					
1	G.M./P.O. OFFICE	1	461	450	207450	51.55
2	SITE OFFICE	1	139	450	62550	15.54
3	TOWN ADMINISTRATION OFFICE	1	50	450	22500	5.59
4	BOUNDARY WALL(IN METRE)		200	150	30000	7.46
	SUB TOTAL(1 TO 4)					80.14
B	STORE					
1.	STORE	1	542	410	222220	55.22
2.	BOUNDARY WALL (IN METER)		395	150	59250	14.72
	SUB TOTAL(1-11)					69.95
C	MAGAZINE					
1.	MAGAZINE BUILDING	1	574	550	315700	78.45
2.	BOUNDARY WALL (IN METER)	1	400	150	60000	14.91
	SUB TOTAL(1-2)					93.36
D	SUB STATIONS					
1.	SUB STATION	3	600	400	720000	178.92
2.	BOUNDARY WALL (IN METER)	3	320	150	144000	35.78
	SUB TOTAL(1-2)					214.70
E	STATUTORY BUILDINGS					
1.	FIRST AID CENTRE	1	17	410	6970	1.73
2.	REST SHELTER	1	39	340	13260	3.30
3.	TOILET	1	30	700	21000	5.22
4.	CANTEEN	1	106	450	47700	11.85
5.	PIT HEAD BATH	1	134	400	53600	13.32
6.	TRAINING CENTRE	1	74	380	28120	6.99
7.	BOUNDARY WALL (IN METER)		400	150	60000	14.91
	SUB TOTAL(1-7)					57.32
F	COMMUNITY BUILDINGS					
1.	COMMUNITY HALL	1	450	650	292500	72.69
2.	OFFICERS' CLUB	1	158	450	71100	17.67
3.	SHOPPING CENTRE	1	193	360	69480	17.27
4.	GARAGE	1	235	240	56400	14.02
5.	CYCLE STAND	1	90	160	14400	3.58
6.	DISPENSARY	1	147	450	66150	16.44
7.	BUS SHEDS	1	-	L.S.	-	1.80
8.	WORKERS' INSTITUTE	1	148	450	66600	16.55
9.	SCHOOLS (I) PRIMARY	1	277	380	105260	26.16
10.	BANK BUILDING	1	202	450	90900	22.59
11.	POST OFFICE	1	56	375	21000	5.22
12.	HOSPITAL	1	595	450	267750	66.54
13.	OFFICERS' REST HOUSE	1	276	450	124200	30.86
14.	STAFF REST HOUSE	1	189	450	85050	21.13
15.	STADIUM	1	-	L.S.		17.60
16	LIBRARY	1		L.S.		3.50
17.	CHILDREN'S PARK	1		L.S.		8.80
18.	CHAIN LINKED FENCING	1	5000	57	285000	70.82
19.	BOUNDARY WALL(IN METRE)		1000	150	150000	37.28
	SUB TOTAL(1-19)					470.50
	TOTAL					985.97
	CONTINGENCIES 3%					29.52
	GRAND TOTAL					1015.49

UCE FOR AMRAPALI OCP (12.00 MTY)

COAL & OB BOTH OUTSOURCED

ALT - 1

(Amt in Rs. Lakhs)

Sl. No.	Particulars	Size/Capacity	TOTAL PROVISION			PHASING OF PROVISION																	
						Y1		Y2		Y3		Y4		Y5		Y6		Y7		Y8		Y9	
			No.	Unit Cost	Amt	No.	Amt	No.	Amt	No.	Amt	No.	Amt	No.	Amt	No.	Amt	No.	Amt	No.	Amt	No.	Amt
A.1	H. E. M. M For Coal																						
(a)	Elect.Hyd. Shovel	8.3 cu.m																					
(b)	Rear Dumper	85T																					
(c)	R.B.H.Drill	160 mm																					
(d)	Dozer	410HP																					
(f)	Wheel Dozer	450HP																					
	TOTAL COAL																						
A.2	H. E. M. M For OB																						
(a)	Dragline	20/90																					
(b)	Elect Rope Shovel	20 cu.m																					
(c)	Elect Hyd Shovel	8.3 / 8.6 cu.m																					
(e)	Rear Dumper	170 T																					
(f)	Rear Dumper	85T																					
(g)	R.B.H.Drill	250 mm																					
(h)	R.B.H.Drill	160 mm																					
(i)	Dozer	410 HP																					
	TOTAL O. B																						
A.3	HEMM For Common																						
a	Crane	70T																					
b	Crane	35T																					
c	Crane	10T																					
d	Grader	280HP																					
e	Wheel Dozer	450HP																					
f	Water Sprinkler	28KL																					
g	FE Loader	1.5-2.0 Cum																					
h	Hyd BH Shovel(Diesel)	1.2 Cum																					
i	Dump Truck	10T																					
j	Vibratory Compactor	30T																					
k	Fuel Trucks	16KL																					
l	Hyd. Rock Breaker																						
m	Cable Handler																						
n	Fire Tender																						
o	Wagon Drill	100mm																					
	TOTAL COMMON																						
	HEMM FOR RECLAMATION																						
a	FE Loader	8.6Cum	1	433.71	433.71									1	433.71								
b	Dozer	320HP	2	184.79	369.58									2	369.58								
c	Water Sprinkler	28KL	3	95.86	287.57									3	287.57								
d	Dumper	35T	3	91.54	274.63									3	274.63								
	TOTAL RECLAMATION				1365.49										1365.49								
	Total HEMM(A)	1305.48			1305.49										1305.49								
B.	Other than HEMM																						
(a)	Pumps & Pipes																						
(b)	C. H. P				31151.69				3424.58		11233.33		11538.68		4035.[illegible]								
(c)	Workshop																						
(d)	Electricals				6986.13		2303.94		1091.36		946.96		142.71		814.41		278.73		287.09				
(e)	Other P & M				364.29				13.38		13.21		42.77		79.21		84.[illegible]		53.56		48.56		[illegible]
(f)	Plant Engineer				73.88										73.[illegible]								
(g)	Contingencies				53.27										53.27								
	TOTAL (B)	38910.39			3[illegible]10.39		2303.94		5430.92		14093.49		11144.16		5231.73		364.69		341.56		48.56		[illegible]
	GRAND TOTAL (A+B)	40215.88			40215.88		2303.94		5430.92		14093.49		11144.16		6537.22		364.06		341.56		48.5[illegible]		[illegible]

UCE FOR AMRAPALI OCP (12.00 MTY)

UCE FOR AMRAPALI OCP (12.00 MTY)
COAL & OB BOTH OUTSOURCED

ESTIMATED PHASED CAPITAL EXPENDITURE ON P&M - ELECTRICALS
(SUMMARY)

(AMOUNT RS. IN LAKHS)

Sl. No.	PARTICULARS	Total Cost Upto Target Year	YEAR WISE PHASING							
			1	2	3	4	5	6	7	8
			Construction Period				Production Built-Up period			Beyond Target Year
I.	POWER SUPPLY & QUARRY DISTRIBUTION	3137.23	971.07	109.32	847.08	109.64	870.75	204.36	25.02	0.00
II.	ILLUMINATION	340.10	52.51	13.31	39.53	26.07	27.76	58.18	122.73	0.00
III.	COMMUNICATION	49.75	8.50	0.00	11.25	5.50	12.50	1.00	11.00	0.00
IV.	MEASURING AND TESTING EQUIPMENT	8.00	0.00	2.50	1.50	1.50	0.00	1.25	1.25	0.00
V.	COLONY & OFFICE ELECTRIFICATION	110.40	27.60	0.00	27.60	0.00	27.60	0.00	27.60	0.00
VI.	EDP SYSTEM	50.00	0.00	0.00	20.00	0.00	20.00	10.00	0.00	0.00
VII.	Apportioned cost of: (A)132/33 KV, 2x50 MVA sub-Station, Incoming 132 KV double circuit OHTL & 33 KV Switching station'. (B) Extention of 33 KV Switching station at Piparwar & 33 KV Double circuit OHTL(For Initial period).	3110.64	1244.25	1866.38						
	GRAND TOTAL	6806.11	2303.94	1991.51	946.96	142.71	958.61	274.79	187.59	0.00

UCE FOR AMRAPALI DCP (12.00 MTY)
ESTIMATED PHASED CAPITAL EXPENDITURE ON P&M - ELECTRICALS

(AMOUNT IN RS. '000)

Sl. No.	PARTICULARS	Qty	Unit Cost	Total Cost	YEAR WISE PHASING (Upto Target Year)														Beyond Trg Yr	
					1.0		2.0		3.0		4.0		5.0		6.0		7.0		8.0	
					Qty	COST	Qty	COST	Qty	COST	Qty	COST	Qty	COST	Qty	COST	Qty	COST	Qty	COST
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21
I	POWER SUPPLY & QUARRY DISTRIBUTION																			
A.	Power & Distribution Transformers																			
1	10 MVA 33/6.6 KV Out door type, 50Hz, D/D/Y 11 Power Transformer (One No. 10 MVA, 33/6.6KV Transformer will be used for Initial Power supply system.)	6.0	7143.7	42862.1	1.0	7143.7	1.0	7143.7	1.0	7143.7	1.0	7143.7	1.0	7143.7	1.0	7143.7				
2.0	160 KVA 230/433-6.3 KV, 3Ph, 50Hz, D/Y 11, out door type, pole mounting type transformer	3.0	316.1	948.2	1.0	316.1			1.0	316.1			1.0	316.1						
B.	SWITCH GEAR																			
1.0	33 KV, SF-6, 1600 MVA, 1200 Amp. outdoor type circuit breaker.	10.0	1101.1	11011.3	4.0	4404.5			2.0	2202.3			2.0	2202.3	2.0	2202.3				
2.0	6.6 KV, VCB, 150 MVA, 1200 Amp. indoor type circuit breaker for secondary control of 10 MVA transformer	8.0	460.0	4140.0	3.0	1380.0			3.0	1380.0			2.0	1380.0						
3.0	6.6 KV, VCB, 150 MVA, 800 Amp. indoor type circuit breaker	30.0	441.8	8826.0	12.0	5292.0			4.0	1764.0			4.0	1764.0						
4.0	Assembling cost for 6.6 KV circuit breaker @ 30% of the circuit breaker	LS		9482.8		5336.0				1572.0				1572.0						
5.0	415 V (3-4) lighting switch board with 3 nos. 400 A incomers, MCCB, 8 nos. outgoing MCB, 63 A	3.0 Nos	52.8	158.0	1.0	52.8			1.0	52.8			1.0	52.8						
7.0	415 V switch board comprising of 1 no. incomer CB 400 A and outgoing 4 nos. 100A CB	4.0 Nos	253.8	1020.0	1.0	253.8									1.0	253.8	2.0	515.5		

UCE FOR AMRAPALI OCP (12.00 MTY)
ESTIMATED PHASED CAPITAL EXPENDITURE ON P&M - ELECTRICALS

(AMOUNT IN RS. '000)

Sl. No.	PARTICULARS	Qty	Unit Cost		Total Cost	YEAR WISE PHASING (Upto Target Year)														Beyond Trg Yr	
						1.0		2.0		3.0		4.0		5.0		6.0		7.0		8.0	
						Qty.	COST	Qty.	COST	Qty.	COST	Qty.	COST	Qty.	COST	Qty.	COST	Qty.	COST	Qty.	COST
1	2	3	4		5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21
I	POWER SUPPLY & QUARRY DISTRIBUTION																				
A.	Power & Distribution Transformers																				
1.	10 MVA 33/6.6 KV Out-door type, 50Hz, 3ϕ,DY-11 Power Transformer (One No. 10 MVA,33/6.6KV Transformer will be used for Initial Power supply system).	6.0	7143.7		42862.1	1.0	7143.7	1.0	7141.7	1.0	7143.7	1.0	7143.7	1.0	7143.7	1.0	7143.7				
2.0	160 KVA, 33/0.433-0.25 KV, 3Ph,50Hz,DY-11, out-door type, pole mounting type transformer	3.0	316.1		948.2	1.0	316.1			1.0	316.1			1.0	316.1						
B.	SWITCH GEAR																				
1.0	33 KV, SF-6, 1000 MVA, 1200 Amp. outdoor type circuit breaker.	10.0	1101.1		11011.3	4.0	4404.5			3.0	3302.3			2.0	3302.3	2.0	3302.3				
2.0	6.6 KV, VCB, 150 MVA, 1250 Amp. Indoor type circuit breaker for secondary control of 10 MVA transformer	9.0	460.0		4140.0	3.0	1380.0			3.0	1380.0			3.0	1380.0						
3.0	6.6 KV, VCB, 150 MVA, 800 Amp. Indoor type circuit breaker.	29.0	441.0		8829.0	12.0	5292.0			4.0	1764.0			4.0	1764.0						
4.0	Assembling cost for 6.6 Kv circuit breaker @ 50% of total circuit breaker	LS			5460.0		3336.0				1572.0				1572.0						
5.0	230 V (L-L) lighting switch board with 1 no. 400 A incoming MCCB, 5 nos. outgoing MCB, 63 A,	3.0 Nos	52.0		156.0	1.0	52.0			1.0	52.0			1.0	52.0						
7.0	440 V switch board comprising of 1 no. incoming CB 400 A and outgoing, 4 nos. 100A CB.	4.0 Sets	255.0		1529.0	1.0	255.0									1.0	216.0	3.1	612.5		

UCE FOR AMRAPALI OCP (12.00 MTY)

UCE FOR AMRAPALI OCP (12.00 MTY)

ESTIMATED PHASED CAPITAL EXPENDITURE ON P&M - ELECTRICALS

(AMOUNT IN RS '000)

SL No.	PARTICULARS	Qty		Unit Cost		Total Cost	YEAR WISE PHASING (Upto Target Year)														Beyond Trg Yr	
							1.0		2.0		3.0		4.0		5.0		6.0		7.0		8.0	
							Qty.	COST	Qty.	COST	Qty.	COST	Qty.	COST	Qty.	COST	Qty.	COST	Qty.	COST	Qty.	COST
1	2	3		4		5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21
F	CAPACITOR BANKS																					
1	200 KVAR, 6.6 KV, complete with discharge resistors & automatic control bank.	14.0	Set	466.0		6524.0					4.0	1864.0			7.0	3262.0	3.0	1398.0				
G	OTHER ITMES																					
1	Substation (2 nos., 2x10 MVA) Steel structures, Building , road , drain , earthing, fencing, lighting , Power & control cable etc.	LS				46252.0	LS	15422.3			LS	15422.3			LS	15422.3		0.0				
2	Items such as fire extinguishers, furniture, insulation mat, hand gloves, tool kits, telescopic ladder etc.	LS				8998.0	LS	4500.0			LS	1799.0			LS	1799.0	-				LS	
3	110 V battery and battery charger set for sub-station and even gantry lighting arranged inside the sub-station and control room.	LS				2410.0	LS	600.0			LS	600.0			LS	600.0				600.0		
4	Installation charges , Over head cost , works contract & service taxes, including erection and commissioning of Project Substations & other items of [A+B+D+F+G+H(1& 3)]	LS			LS		LS		LS		LS		LS		LS		LS					
						77716.2		24009.2		2933.5		21249.3		2650.9		21885.6		4870.2	LS	388.5		0.0
	Sub-Total item - F					313123		97107		10932		84708		10964		87675		20436		2307		
II.	ILLUMINATION																					
A.	QUARRY ILLUMINATION																					
1	5 KVA, 6.6/0.25 KV, 3Ph, 50 Hz, outdoor type lighting transformer	18.0	No.	14.0		252.0	2.0	28.0		0.0	2.0	28.0			2.0	28.0	2.0	28.0	10.0	140.0		
4	Flood lighting towers 15m. high	18.0		125.0		2250.0	2.0	250.0		0.0	2.0	250.0		0.0	2.0	250.0	2.0	750.0	10.0	1250.0		
5	Flood light fixtures with 400 watts HP-SV lamps, switch fuse units, switch, cables etc.	LS				1246.0	LS	226.0			LS	226.0			LS	226.0		226.0	LS	342.0		

UCE FOR AMRAPALI OCP (12.00 MTY)
ESTIMATED PHASED CAPITAL EXPENDITURE ON P&M - ELECTRICALS

AMOUNT in RS. '000

Sl. No.	PARTICULARS	Qty		Unit Cost		Total Cost	YEAR WISE PHASING (Upto Target Year) 1.0 Qty.	1.0 COST	2.0 Qty.	2.0 COST	3.0 Qty.	3.0 COST	4.0 Qty.	4.0 COST	5.0 Qty.	5.0 COST	6.0 Qty.	6.0 COST	7.0 Qty.	7.0 COST	Beyond Target Year 8.0 Qty.	8.0 COST
1	2	3		4		5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21
A.	Mobile mast lighting, 1000W 4 nos for tower, 5 KVA DG set trolley type tower height 18 m. mast type operation, Sigma make.	11.0	No.	850.0		9350.0	1.0	850.0	1.0	850.0	2.0	1700.0	1.0	850.0	1.0	850.0	2.00	1700.0	3.0	2550.0		
B.	HAUL ROAD ILLUMINATION																					
i.	100 KVA 6.6/0.25 KV, 3Ø, 50 Hz outdoor type lighting transformer.	3.0		170.0		510.0	1.0	170.0					1.0	170.0					1.0	170.0		
ii.	6.6 KV OHTL with ACSR 'DOG' conductor simple Ckt.	4.5	Km.	1200.0	/Km	5400.0	1.0	1200.0					1.0	1200.0			1.0	1200.0	1.5	1800.0		
iii.	440 Volts OHTL with ACSR 'Mink' conductor simple Ckt.	5.5	Km.	700.0	/Km	3850.0	1.0	700.0		0.0	1.0	700.0		0.0	1.0	700.0	1.0	700.0	1.5	1050.0		
iv.	Other items like street lighting fixture with 250 W HPSV lamps, isolation, fuses, switches, cables etc.	LS				1050.0	LS	300.0					LS	150.0				125.0	LS	475.0		
C.	SPOIL DUMP ILLUMINATION																					
i.	Spoil dump illumination with 400 watts flood lighting fixtures, 15 KVA, 6.6/0.25 KV transformer OHTL, Cables, switches etc.	LS				3525.0	LS	360.0	LS	360.0	LS	120.0			LS	360.0	LS	765.0	LS	1560.0		
D.	GENERAL ILLUMINATION	LS				1430.0	LS	110.0			LS	220.0			LS	110.0	LS	110.0	LS	880.0		
E.	Emergency illumination with 20 KVA D.G Set and other accessories.	LS				1745.0	LS	580.0			LS	290.0					LS	295.0	LS	580.0		
F.	Installation Cost @ 10%	LS				3092	LS	477	LS	121	LS	359	LS	227	LS	252	LS	525 316	LS	1116		
	Sub-Total item - II					34009.8		5251.4		1331.6		3953.4		2607.0		2776.4		5817.9		12272.7		

UCE FOR AMRAPALI OCP (12.00 MTY)

ESTIMATED PHASED CAPITAL EXPENDITURE ON P&M - ELECTRICALS

APPENDIX-A.3.1

(AMOUNT IN RS '000)

Sl. No.	PARTICULARS	Qty	Unit Cost		Total Cost	YEAR WISE PHASING (Upto Target Year)														Beyond Trg Yr	
						1.0		2.0		3.0		4.0		5.0		6.0		7.0		8.0	
						Qty.	COST	Qty.	COST	Qty.	COST	Qty.	COST	Qty.	COST	Qty.	COST	Qty.	COST	Qty.	COST
1	2	3	4		5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21
III	COMMUNICATION																				
1.0	Surface mine communication comprising of :																				
a	EPABX 400 lines .	1.0			1250.0	LS	500.0							LS	300.0			LS	450.0		
b	P & T lines .	LS	-		150.0	LS	100.0							LS	50.0						
c	DECT	LS	-		1000.0	LS	250.0							LS	500.0			LS	250.0		
2.0	Internet .	LS	-		475.0					LS	225.0	LS	250.0								
3.0	Cables & Overhead lines etc.	LS			1200.0					LS	200.0	LS	200.0	LS	400.0	LS		LS	400.0		
4.0	Testing & measuring equipment .	LS	-		300.0					LS	100.0	LS	100.0			LS	100.0				
5.0	Jeep for E &T maintenance team .	1.0	600.0		600.0					1.0	600.0										
	Sub-Total Item - III				4975.0		850.0		0.0		1125.0		550.0		1250.0		100.0		1100.0		
IV.	MEASURING AND TESTING EQUIPMENT																				
	Measuring and testing equipment like 500/1000 V megger, bridge megger 500 V, Earth resistance tester oil testing set, 15 GPM oil filter M/C, relay testing apparatus with timer, tachometer 300 to 3000 rpm, tong tester 550 V / 6.6. KV, Avometer, cable fault detector, crimping tools, lux meter upto 500 lux, discharge rods, vibration meter, sound level meter rubber hand gloves, condition monitor.	LS			800.0	LS		LS	250.0	LS	150.0	LS	150.0			LS	125.0	LS	125.0		
	Sub-Total Item - IV				800.0		0.0		250.0		150.0		150.0		0.0		125.0		125.0		

UCE FOR AMRAPALI OCP (12.00 MTY)
ESTIMATED PHASED CAPITAL EXPENDITURE ON P&M - ELECTRICALS

(AMOUNT IN RS '000)

Sl. No.	PARTICULARS	Qty.	Unit Cost	Total Cost	YEAR WISE PHASING (Upto Target Year)														Beyond Trg Yr	
					1.0		2.0		3.0		4.0		5.0		6.0		7.0		8.0	
					Qty.	COST	Qty.	COST	Qty.	COST	Qty.	COST	Qty.	COST	Qty.	COST	Qty.	COST	Qty.	COST
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21
V.	COLONY & OFFICE ELECTRIFICATION Colony electrification with incoming HT line, distribution transformer, LT Over head line, street lighting, complete office electrification, etc. poles, insulators, clamps, arms including earthing of over head lines / transformers / sub-station etc.	LS		11040.0	LS	2760.0	LS		LS	2760.0	LS		LS	2760.0			LS	2760.0		
	Sub-Total Item -V			11040.0		2760.0		0.0		2760.0		0.0		2760.0		0.0		2760.0		
VI.	EDP SYSTEM	LS		5000.0					LS	2000.0			LS	2000.0	LS	1000.0				
a.	Hardware Intel Pentium 4 processor 3GHz or more, 512 MB RAM, intel chipset,3D accelerator Graphic display card 64 MB VRAM (Geforce 4 or more), CD-writer , 2x40 GB HDD ULTRA SCSI 160 10000 rpm or more, FDD, LAN card 10/100, Inkjet plotter A0 Size, Laser printer A4 Size, Scanner 36" 600 dpi																			
b.	Software Mines Software, Autocad Map-2000,MS-Office-2000, Windows Xp professional,Mine scheduling Software, Antivirus Software,MicroSoft project 2000																			
C.	ANCILLARIES One servo control, UPS (10 KW), Air conditioner used for following facilities like pay rolling, financial accounting, inventory control, production and despatch schedules, project monitoring, resource utilisation, management information etc.																			
	Sub-Total Item -VI			5000.0		0.0		0.0		2000.0		0.0		2000.0		1000.0		0.0		
VII	(a) Apportioned cost of 132/33 KV, 2x50 MVA sub-Station, Incoming 132 KV double circuit OHTL & 33 KV Switching station . (b) Extension of 33 KV Switching station at Pipanwar & 33 KV Double circuit OHTL(For initial period).	LS		311064	LS	124425.4	LS	186638.1												
	Sub-Total Item -VII			311063.5		124425.4		186638.1												
	GRAND TOTAL			690011		230394		199151		94696		14271		95861		27479		18759		

5X-g

Appendix : A. 3. 4. 0

UCE FOR AMRAPALI OCP [12.0 MTY]

SUMMARY STATEMENT OF CAPITAL EXPENDITURE ESTIMATE FOR P&M

COAL HANDLING PLANT

[Amount in Rs.Lakhs]

Sl. No.	PARTICULARS	COST	PHASING				
			1	2	3	4	5
A	Mechanical System						
	i) P & M / Equipment	8143.90	0.00	0.00	4239.00	3412.00	492.90
	ii) Conveyors	2058.00	0.00	411.60	823.20	823.20	0.00
	iii) Belting						
	a) Nylon Nylon Belting	0.00					
	b) Steel Cord Belting	1210.00	0.00	0.00	303.00	484.00	423.00
1	**Total of 'A'**	11411.90	0.00	411.60	5365.20	4719.20	915.90
2	Electrical & Control System	2489.40	0.00	102.90	1247.30	1034.30	104.90
3	Erection and Commissioning	1390.13	0.00	51.45	661.25	575.35	102.08
4	Civil & Structral Works (Including Over Head construction cost and design & Engg.)	9637.50	0.00	2513.30	3317.00	2344.00	1463.20
5	Design & Engineering	764.57	0.00	28.30	363.69	316.44	56.14
6	Over Head Construction Cost	2408.40	0.00	89.14	1145.62	996.79	176.85
7	Insurance	114.69	0.00	4.24	54.55	47.47	8.42
8	**Sub Total (1) to (7)**	**28216.59**	**0.00**	**3200.93**	**12154.61**	**10033.55**	**2827.50**
9	Contingency	650.27	0.00	24.07	309.32	269.13	47.75
10	Training of O&M Staff	14.43	0.00	1.61	6.23	5.15	1.44
11	Spares	486.55			0.00	0.00	486.55
12	**Sub Total (10) + (11) +(12)**	**29367.83**	**0.00**	**3226.61**	**12470.15**	**10307.84**	**3363.23**
13	Misc.Work Contract tax etc.	587.36	0.00	64.53	249.40	206.16	67.26
14	Service tax .	1209.95	0.00	132.94	513.77	424.68	138.57
15	**Grand Total**	**31651.69**	**0.00**	**3424.08**	**13233.33**	**10938.68**	**4055.61**

UCE FOR AMRAPALI OCP [12.0 MTY]

[A].STATEMENT SHOWING THE PHASED CAPITAL EXPENDITURE ON P&M :CHP

[CONVEYOR]

[Amount in Rs.'C

SL. No.	PARTICULARS		TOTAL QTY.	UNIT COST	TOTAL COST	PHASING				
						1	2	3	4	5
1	Conveyor Dgn.	: C1	3	8200	24600		4920	9840	9840	
	Width in mm	: 1600								
	Length in m	: 175								
	Power in kW	: 1X150								
2	Conveyor Dgn.	: C2	2	9600	19200		3840	7680	7680	
	Width in mm	: 1600								
	Length in m	: 300								
	Power in kW	: 2X250								
4	Conveyor Dgn.	: C3	4	9200	36800		7360	14720	14720	
	Width in mm	: 1600								
	Length in m	: 180								
	Power in kW	: 2X150								
5	Conveyor Dgn.	: C4	4	15100	60400		12080	24160	24160	
	Width in mm	: 1600								
	Length in m	: 330								
	Power in kW	: 2X300								
6	Conveyor Dgn.	: C5	2	14000	28000		5600	11200	11200	
	Width in mm	: 1600								
	Length in m	: 250								
	Power in kW	: 2X250								
7	Conveyor Dgn.	: C6	2	14000	28000		5600	11200	11200	
	Width in mm	: 1600								
	Length in m	: 250								
	Power in kW	: 2X250								
3	Conveyor Dgn.	C7	2	4400	8800		1760	3520	3520	
	Width in mm	1600								
	Length in m	50								
	Power in kW	1X90								
	T OTAL	::			205800		41160	82320	82320	

Appendix : A.3.4.2

UCE FOR AMRAPALI OCP [12.0 MTY]

[B].STATEMENT SHOWING THE PHASED CAPITAL EXPENDITURE ON P&M :CHP
[BELTING]

[Amount in Rs.'000]

SL. No.	PARTICULARS			TOTAL QTY (m)	UNIT COST	TOTAL COST	PHASING				
							1	2	3	4	5
1.	Width of Belt,mm	:	1600	9200	13.15	121000			30300	48400	42300
	Type of Belt	:	SC								
	Type of Carcass	:	ST 1250								
	TOTAL	::				121000			30300	48400	42300

UCE FOR AMRAPALI OCP [12.0 MTY]
[C].STATEMENT SHOWING THE PHASED CAPITAL EXPENDITURE ON P&M:CHP
[SIZER MODULE]

[Amount in Rs.'000]

SL. No.	PARTICULARS	TOTAL QTY.	UNIT COST	TOTAL COST	PHASING				
					1	2	3	4	5
1	Twin Shaft Sizer(Primary), Output Capacity 2000 tph, Feed size 1200mm, Product Size 200mm	3	49000	147000			98000	49000	
2	Twin Shaft Sizer(Secondary), Output Capacity 2000 tph, Feed Size 200mm, Product Size -50 / 100 mm	3	46000	138000			92000	46000	
3	Apron Feeder (2000 tph)	3	23500	70500			47000	23500	
4	Fright, Insurance, Transport, Duty Charges etc.	LS		160000			71100	88900	
5	Magnetic Separator, for 1600 mm belt.	3	2030	6090			0	4060	2030
6	Metal Detector	3	500	1500			500	500	500
7	Motorised Hoist, 10 / 20 te	3	800	2400			800	800	800
TOTAL				525490			309400	212760	3330

UCE FOR AMRAPALI OCP [12.0 MTY]

[C].STATEMENT SHOWING THE PHASED CAPITAL EXPENDITURE ON P&M:CHP
(AUXILIARY EQUIPMENT]

[Amount in Rs.'000]

SL. No.	PARTICULARS	TOTAL QTY.	UNIT COST	TOTAL COST	PHASING				
					1	2	3	4	5
1	Rail Weigh Bridge 100t Digital Display & Recordor	2	1450	2900			0	1450	1450
2	Plough Feeder 2000 tph	6	18500	111000			55500	55500	0
3	Motorised Flap or Sector Gate	6	400	2400			1200	1200	0
4	Non-clogging Pump 20 lps x 60 m.x 22 kW	8	450	3600			900	1800	900
5	Motorised Hoist, 5 / 10 t	3	600	1800			600	1200	0
6	Wear Resistent liner, machine-tools,Chute etc.	LS	---	5000			2000	2000	1000
7	Plant Safety and Fire Fighting System	LS	---	5000			0	2000	3000
8	Dust Suppresion	LS	8600	8600			2150	3440	3010
9	Dust Extraction	LS	6000	6000			1500	2400	2100
10	E.O.T Crane,Cap.20 t With Structure	2	2550	5100			2550	2550	0
11	Rapid Loadout with Silo, with P.W.Hopper & Auto.Sampler.	2	68000	136000			47600	54400	34000
12	Belt Weighing Scale	3	500	1500			500	500	500
13	Misc. tools & tauckles etc.			24430			7300	9800	7330
	TOTAL			288900			114500	128440	45960

UCE FOR AMRAPALI OCP [12.0 MTY]

[F].STATEMENT SHOWING THE PHASED CAPITAL EXPENDITURE ON P&M :CHP [CIVIL & STRUCTURALS]

[Amount in Rs.'000]

SL. No.	PARTICULARS	TOTAL QTY.	UNIT COST	TOTAL COST	PHASING				
					1	2	3	4	5
1	Conveyor Gantries Inclined Roof Type	LS	---	180000		36000	63000	54000	27000
2	Transfer Houses / Drive House	LS	28800	28800		5800	10100	7200	5700
3	Receiving Pit-cum-Crusher House (Primary Sizers)	LS	195000	195000		58500	68300	39000	29200
4'	Ground Bunker, Cap.25000 te	2	165000	330000		99000	115500	82500	33000
5	Silo with sampler house for Rapid Loading, Capacity 4000 Te	2	75500	151000		37800	52900	30200	30100
6	Civil structure for sizers & other equipments	LS	---	19750		5930	6900	4900	2020
7	General Development in CHP Area	LS	---	3500		2100	1100	300	0
8	Survey, Soil Investigation & Hydrogeological Data	LS	---	1600		1000	500	100	0
9	CHP Office Building, Road,Drain, Water supply, Sanitation etc	LS	---	26000		5200	7800	7800	5200
10	Contingencies & Misc.	LS	---	28100			5600	8400	14100
TOTAL				963750		251330	331700	234400	146320

Estimated Capital Requirement on other P&M

Amount in Rs. Lakh.

Sl. No.	Description	Total			Capital Phasing till Target year of coal production														Capital Requirement beyond target year			
					Y1		Y2		Y3		Y4		Y5		Y6		Y7		Y8		Y10	
									P1		P2		P3		P4		P5		P9		P10	
					Construction Period								Capacity Buildup Period									
		No.	Unit Cost	Cost	No.	Amt.	No.	Amt.	No.	Amt.	No.	Amt.	No.	Amt.	No.	Amt.	No.	Amt.	No.	Amt.	No.	Amt.
1	Exploder with continuity tester	6	0.06	0.36					3	0.18	3	0.18										
	for 200 shots			0.00																		
2	Road Roller (10T) & Tar Boiler	2	15.33	30.65			1	15.33			1	15.33										
3	Survey Instrument			0.00																		
a)	Total Station(short Range 2 km	1		13.00								13.00										
	with Accessories)			0.00																		
b)	Theodolite	1		0.00												0.00						
c)	Auto set leveller	1		1.00												1.00						
d)	1 PC Core 2 Duo,3 Ghz,2GB RAM	11		4.00												2.00		2.00				
	Combo,160 GB HDD,			0.00																		
	Graphics Card 64 MB			0.00																		
e)	Soft ware			0.00																		
	Autocad			1.00									1.00									
	MS office			0.25									0.25		1							
	Mines			1.50									1.50									
f)	AD Plotter	1		4.00									4.00									
g)	Digital Planimeter	1		0.50									0.50									
4	Mechanised explosive handler	LS		20.00									LS	10.00	LS	10.00						
5	F.E. Loader 0.5 Cum.	2	6.77	17.53									1	6.77			1	6.77				
6	Explosive Van	6	13.03	52.11					1	13.03			1	13.03	1	13.03	1	13.03	1	13.03	1	13.03
7	Boom Truck	7	9.27	37.07							1	9.27	1	9.27	1	9.27	1	9.27	1	9.27	2	18.54
8	Line truck with hydraulic boom	2	18.26	18.26									1	18.26					1	18.26		
9	Miscellaneous Equipment	LS		45.00							LS	10.00	LS	5.00	LS	20.00	LS	10.00				
10	RT Mobile Crane	1	19.51	19.51											1	19.51						
11	Fuel Truck 7500 litre capacity	2	7.63	7.63									1	7.63					1	7.63		
12	Fire Truck	1	10.90	10.90													1	10.90				
13	Mobile Light Plants	2	15.00	30.00							1	15.00			1	15.00						
	Total			314.29				15.33		13.21		62.77		79.21		69.51		53.98		48.19		31.57

Appendix-A.4

UCE FOR AMRAPALI OCP (12.0 MTY)

Estimated Investment On Furniture & Fittings

(Amount in Rs. Lakhs)

Particulars	Total amount	Yearwise Phasing						
		2	3	4	5	6	7	8
General furniture, Air conditioner,Dispensary, Hospital, and other equiment including personal comuters	150.00	10.00	15.00	25.00	25.00	25.00	25.00	25.00

Note: 7th Year is the Target Year

APPENDIX - A.5

UCE FOR AMRAPALI OCP [12.0 MTY]

STATEMENT SHOWING THE ESTIMATED CAPITAL EXPENDITURE ON RAILWAY SIDING

(Amount in Rs. Lakhs)

SL. NO.	PARTICULARS	TOTAL COST	PHASING					
			2	3	4	5	6	7
1	Preliminary cost of survey	35.00	0.00	14.00	18	3.00	0.00	
2	Civil Engineering cost Link portion 4.8 Km.Approx	5000.00			1000.00	2000.00	1750.00	250.00
3	Civil Engineering cost Yard Portion 15.10 Km.Approx	12800.00			1280.00	5120.00	5120.00	1280.00
4	Signalling and Telecommunication	600.00			60.00	240.00	150.00	150.00
5	Electrification	900.00			135.00	315.00	360.00	90.00
6	EMP Measures	400.00				100.00	120.00	180.00
	TOTAL	19735.00	0.00	14.00	2493.00	7778.00	7500.00	1950.00

UCE FOR AMRAPALI OCP (12.0 MTY)
Estimated Capital requirement on Vehicles

(Amount in Rs. Lakhs)

Sl. No.	Description	Total			Yearwise Phasing											
		No.	Unit Cost	Total Cost	C-1 / Y1		C-2 / Y2		1st Year / Y3		2nd Year / Y4		3rd Year / Y5		4th Year / Y6	
1	Diesel Jeep	15	5.34	80.15	1	5.34	1	5.34	0	0	4	21.37	4	21.37	5	26.72
2	Car	2	6.82	13.65		0.00		0.00	0	0	0	0.00	1	6.82	1	6.82
3	Ambulance	2	5.01	10.01		0.00		0.00	0	0	1	5.01		0.00	1	5.01
4	Staff/School Bus	6	16.91	101.43		0.00		0.00	1	16.9053	1	16.91	2	33.81	2	33.81
5	Shift Bus	3	10.36	31.08		0.00		0.00		0	1	10.36	1	10.36	1	10.36
6	Pick-up Van	8	7.54	60.29		0.00		0.00	1	7.53649	2	15.07	2	15.07	3	22.61
7	Mobile Canteen Van	2	7.54	15.07		0.00		0.00		0		0.00	1	7.54	1	7.54
9	Tipping Truck	8	19.94	159.55	2	39.89	2	39.89		0	2	39.89	1	19.94	1	19.94
10	Truck	10	12.68	126.75	1	12.68	1	12.68	2	25.3504	2	25.35	2	25.35	2	25.35
11	Welding Truck	1	8.17	8.17		0.00		0.00		0		0.00	1	8.17		0.00
12	Maintenance Van	4	18.39	73.56		0.00		0.00		0	1	18.39	1	18.39	2	36.78
13	Mobile Service Van	2	5.11	10.22		0.00		0.00		0		0.00	1	5.11	1	5.11
14	Tractor Trailer(60T)	3	12.00	35.99		0.00		0.00		0	1	12.00	1	12.00	1	12.00
15	Motor Cycle	8	0.61	4.90		0.00		0.00	2	1.22604	2	1.23	2	1.23	2	1.23
16	Heavy duty tow Truck	2	10.22	20.43		0.00		0.00		0		0.00	1	10.22	1	10.22
17	Fork lift Truck(5T)	3	19.60	58.79		0.00		0.00		0	1	19.60	1	19.60	1	19.60
18	Fork lift Truck(3T)	3	12.08	36.23		0.00		0.00		0	1	12.08	1	12.08	1	12.08
	Total			**846.30**		**57.91**		**57.91**		**51.02**		**197.24**		**227.06**		**255.16**

Appendix A.7

UCE FOR AMRAPALI OCP (12.0 MTY)

Estimated Investment in Prospecting & Boring

(Amount in Rs. Lakhs)

S.N.	Block	No. of Boreholes	Meterage	Amount	Yearwise Phasing
1	Amrapali	95	11897.4	165.34	1st year
2	Kishanpur	59	8515.6		
3	Total	154	20413		

Appendix-A.8.1

UCE for AMRAPALI OCP (12.00 MTY)

Estimated Capital for Capital Outlay in Mines

EOTH OUTSOURCED

Amount in Rs. lakhs

Sl.No	Particulars	Total Provision	Phasing						
			1st. Yr.	2nd Yr.	3rd Yr.	4th Yr.	5th Yr.	6th Yr.	Balance
1	Rehabilitation cost for 451 families	473.55	100.00	100.00	80.00	70.00	50.00	50.00	23.55
2	Compensatory Afforestation	8476.46	2500.00	1900.00	1699.80	1000.00	1000.00	376.66	0.00
3	Biological reclamation of OB dump	270.00	0.00	0.00	0.00	0.00	0.00	0.00	270.00
4	Arboriculture	35.00	0.00	0.00	0.00	0.00	15.00	20.00	0.00
5	Baseline environmental data generation	35.00	35.00	0.00	0.00	0.00	0.00	0.00	0.00
6	Nala diversion, garland drain & check dam etc.	641.74				100.00	200.00	150.00	191.74
7	Cost of land development in colony area at Cl 2485	64.64	0.00	0.00	0.00	0.00	54.16	0.00	10.48
8	Cost of land development in colony area at Cl 2485	333.43	0.00	0.00	50.00	50.00	80.00	99.36	54.07
	Total	10329.83	2635.00	2000.00	1829.80	1220.00	1399.16	696.02	549.85

APPENDIX-A.8.2.

UCE FOR AMRAPALI O.C.P.(12.0 MTY)
SUMMARY OF THE CAPITAL INVESTMENT ON ROADS & CULVERTS.

(AMOUNT IN Rs LAKHS)

Sl. NO.	PARTICULARS.	TOTAL PROV.	PHASING									
			Y.1	Y.2	Y.3	Y.4	Y.5	Y.6	Y.7	Y.8toY11	Y.12toY16	Y.17toY25
			Construction Years				Capacity Builtup Year			Beyond Target Year		
1.	APPROACH ROAD TO PROJECT	323.50		86.23	86.23	151.03						
2.	COLONY ROADS	70.65				13.82	13.82	13.82	29.19			
3.	HAUL ROAD	2233.52				420.74	420.74	420.74	971.30			
4.	APPROACH ROAD TO MAGAZINE	116.20			29.42	29.42	57.36					
5.	APPROACH ROAD TO COLONY	244.68			79.84	79.84	85.00					
6.	DIVERSION OF P.W.D. ROAD'	359.68				89.16	89.16	181.35				
7.	STRENTHENING & WIDENING OF PIPARWAR -TANDWA ROAD	494.54			60.00	90.10	90.10	90.00	164.34			
8	BRIDGES	617.41		120.00	170.00	327.41						
	TOTAL	4460.18		206.23	425.49	1201.53	756.19	705.91	1164.83			

UCE FOR AMRAPALI O.C.P.(12.00 MTY.)
STATEMENT SHOWING THE ESTIMATED CAPITAL INVESTMENT ON APPROACH ROAD TO PROJECT.

(AMOUNT IN Rs.'000')

SL NO.	PARTICULARS	LENGTH KM/NO	COST AT 100 CI	COST AT 2485 CI	TOTAL COST
1	APPROACH ROAD TO PROJECT.				
	7.50 mt wide 225 mm boulder soling				
	7.50 mt wide 75 mm W B M (50-63 mm)				
	7.50 mt wide 75 mm W B M (40-50 mm)				
	7.50 mt wide 40 mm premix carpet	4.00	290.00	7206.50	28826.00
2.	CULVERTS				
	4.57 mt span R C C culvert	1	34.00	844.90	844.90
	3.05 mt span R C C culvert	1	29.00	720.65	720.65
	1.83 mt span R C C culvert	2	15.00	372.75	745.50
	1.0 mt dia hume pipe culvert	4	11.00	273.35	1093.40
3	TREE GUARDS (@ 40 /KM)	160	0.03	0.75	119.28
	TOTAL				32349.73
	TOTAL AMOUNT IN Rs. LAKHS.				323.50

APPENDIX-A.8.2.2.

UCE FOR AMRAPALI O.C.P. (12.00 MTY)
STATEMENT SHOWING THE ESTIMATED CAPITAL INVESTMENT ON COLONY ROADS.

(AMOUNT IN Rs.'000')

Sl. No.	Particulars	Length Km/No.	Cost At 100 CI	Cost At 2465 CI	Total Cost
1.	**COLONY ROADS**				
	3.75 mt wide 75 mm sand/moorum				
	3.75 mt wide 150 mm boulder soling				
	3.75 mt. wide 150 mm W.B.M.				
	3.75 mt. wide 20 mm premix carpet	1.60	132.00	3280.20	5904.36
2.	**CULVERTS.**				
	4.57 mt. span R.C.C. culvert	0	17.00	422.45	0.00
	3.05 mt. span R.C.C. culvert	1	16.00	397.60	397.60
	1.83 mt. span R.C.C. culvert	1	9.20	228.62	228.62
	1.0 mt.dia hume pipe culvert	2	8.60	213.71	427.42
3.	**TREE GUARDS (@ 40/Km.)**	72	0.03	0.75	53.68
4.	**R.C.C. DRAIN CROSSING SLABS**				
	40% of the total nos. of quarters.	71	0.03	0.75	52.93
5.	TOTAL				7064.61
6.	**TOTAL AMOUNT IN Rs. LAKHS.**				**70.65**

APPENDIX A.8.2.3.

UCE FOR AMRAPALI O.C.P.(12.0 MTY.)
ESTIMATED CAPITAL INVESTMENT ON HAUL ROAD (LW 170 T)

(AMOUNT IN Rs.'000')

Sl. No.	PARTICULARS	LENGTH/ NO./KM	COST AT 100 CI	COST AT 2485 CI	TOTAL COST
A.	HAUL ROAD (LW 170 T)				
1.	mt. wide mm moorum				
2.	mt wide mm moorum + sand				
3.	mt wide mm w.b.m.				
4.	mt wide mm w.b.m.				
5.	mt wide mm bituminous macadam				
	Less 30% for providing moorum instead of mm bituminous macadam				90652.80
	SUB-TOTAL				211523.20
B.	CULVERTS				
1.	Cost of 4.57 mt span R.C.C culvert	1	172.00	4274.20	4274.20
2.	Cost of 3.05 mt span R.C.C culvert	2	100.00	2485.00	4970.00
3.	Cost of 1.50 mt span R.C.C culvert	2	52.00	1292.20	2584.40
	TOTAL				223351.80
	TOTAL AMOUNT IN Rs. LAKHS				2233.52

UCE FOR AMRAPALI O.C.P. (12.00 MTY)

STATEMENT SHOWING THE ESTIMATED CAPITAL INVESTMENT ON APPROACH ROAD TO MAGAZINE.

(AMOUNT IN Rs.'000')

Sl. No.	PARTICULARS	Length Km/No.	Cost At 100 CI	Cost At 2485 CI	Total Cost
1.	APPROACH ROAD TO MAGAZINE				
	3.75 mt wide 75 mm sand/moorum				
	3.75 mt wide 150 mm boulder soling				
	3.75 mt. wide 150 mm W.B.M.				
	3.75 mt. wide 20 mm premix carpet	3.00	132.00	3280.20	9840.60
2.	CULVERTS.				
	4.57 mt. span R.C.C. culvert	1	17.00	422.45	422.45
	3.05 mt. span R.C.C. culvert	1	16.00	397.60	397.60
	1.83 mt. span R.C.C. culvert	1	9.20	228.62	228.62
	1.0 mt.dia hume pipe culvert	3	8.60	213.71	641.13
3.	TREE GUARDS (@ 40/Km.)	120	0.03	0.75	89.46
4.	TOTAL				11619.86
5.	TOTAL AMOUNT IN Rs. LAKHS.				116.20

APPENDIX-A.8.2.5.

UCE FOR AMRAPALI O.C.P.(12.0 MTY.)

STATEMENT SHOWING THE ESTIMATED CAPITAL EXPENDITURE ON APPROACH ROAD TO COLONY.

(AMOUNT IN Rs.'000')

SL. NO.	PARTICULARS	LENGTH KM/NO.	COST AT 100 CI	COST AT 2485 CI	TOTAL COST
1.	APPROACH ROAD TO COLONY.				
	7.50 mt wide 225 mm boulder soling				
	7.50 mt. wide 75 mm W.B.M.(50-63mm)				
	7.50 mt. wide 75 mm W.B.M.(40-50mm)				
	7.50 mt. wide 40 mm premix carpet	3.00	290.00	7206.50	21619.50
2.	CULVERTS				
	4.57 mt. span R.C.C. culvert	1	34.00	844.90	844.90
	3.05 mt. span R.C.C. culvert	1	29.00	720.65	720.65
	1.83 mt. span R.C.C. culvert	1	15.00	372.75	372.75
	1.0 mt.dia hume pipe culvert	3	11.00	273.35	820.05
3.	TREE GUARDS (@ 40/ Km.)	120	0.03	0.75	89.46
	TOTAL				24467.31
	TOTAL AMOUNT IN Rs. LAKHS.				244.68

APPENDIX-A.8.3.

UCE FOR AMRAPALI O.C.P. (12.0 MTY)

SUMMERY OF THE CAPITAL INVESTMENT ON WATER SUPPLY & SEWERAGE.

(AMOUNT IN Rs.LAKHS)

Sl. NO.	PARTICULARS.	TOTAL PROV.	PHASING							REFERENCE
			Y.1	Y.2	Y.3	Y.4	Y.5	Y.6	Y.7	
1.	SOURCE OF WATER	353.24	99.09	99.09	99.09	55.96	0.00	0.00	0.00	L.S.
2.	COLONY WATER SUPPLY	63.57	0.00	0.00	12.58	12.58	12.58	12.58	13.26	APP.A.8.3.1.
3.	COLONY SEWERAGE	64.06	0.00	0.00	12.60	12.60	12.60	12.60	13.67	APP.A.8.3.2.
4.	INDUSTRIAL WATER SUPPLY	31.09	0.00	0.00	9.68	9.68	9.68	2.04	0.00	APP.A.8.3.3.
5.	INDUSTRIAL SEWERAGE	11.73	0.00	0.00	6.50	5.23	0.00	0.00	0.00	APP.A.8.3.4.
	T O T A L	**523.69**	**99.09**	**99.09**	**140.45**	**96.05**	**34.86**	**27.21**	**26.93**	

APPENDIX - A.6.3.1.

UCE FOR AMRAPALI O.C.P.(12.00 MTY)

STATEMENT SHOWING THE ESTIMATED CAPITAL INVESTMENT
ON COLONY WATER SUPPLY SCHEME.

(AMOUNT IN Rs.'000)

SL. NO.	PARTICULARS	UNIT OF MEASURE	UNIT COST(RS)	QUANTITY	COST AT 100 CI	COST AT 2435 CI
1.	GROUND RESERVOIR 0.25 LAKHS GALLON CAPACITY	GALLON	3.00	25000	75.00	1864.75
2.	OVERHEAD TANK 0.10 LAKHS GALLON CAPACITY	GALLON	5.00	10000	50.00	1242.50
3.	PUMP HOUSE ,2 NOS 20.00 SQ.METER X 2	SQ.METER	260.00	20	10.40	258.44
4.	PUMPS & MOTORS	L.S				353.00
5.	1440 M PIPE LINE					
a.	216 M (DIA 200 MM)	R.M.	83.75	216	18.09	449.54
b.	288 M (DIA 150 MM)	R.M.	57.35	288	16.52	410.44
c.	936 M (DIA 100 MM)	R.M	35.32	936	33.06	821.53
6.	VALVES & SPECIALS (15%OF THE ABOVE ITEM)					252.23
7.	COLONY DISTRIBUTION SYSTEM(@ RS.150/UNIT)		150.00	189	28.35	704.50
	TOTAL COST					6056.92
	GRAND TOTAL (IN Rs.LAKHS)					63.57

APPENDIX - A.8.3.2.

UCE FOR AMRAPALI O.C.P.(12.00 MTY)

STATEMENT SHOWING THE ESTIMATED CAPITAL INVESTMENT ON COLONY SEWERAGE .

(AMOUNT IN Rs.'000')

SL. NO.	PARTICULARS	UNIT OF MEASURE	UNIT COST(RS)	QUANTITY	COST AT 100 CI	COST AT 2485 CI
1.	COMBINED OPEN SURFACE DRAIN					
	a)MAIN DRAIN (60CMx90CM)	R.M.	104.00	675	70.20	1744.47
	b)CONNECTING DRAIN (30CMx45CM)	R.M.	57.00	675	38.48	956.10
2.	SEPTIC TANK,SOAKPIT &INSPECTION CHAMBER @RS 700/UNIT		700.00	189	132.30	3287.66
3.	S.W. PIPE & PROVIDING CEMENT CONCRETE @Rs. 89 /UNIT		89.00	189	16.82	418.00
	TOTAL COST					6406.23
	GRAND TOTAL (IN Rs.LAKHS.)					64.06

APPENDIX - A.8.3.4.

UCE FOR AMRAPALI O.C.P.(12.00 MTY)

STATEMENT SHOWING THE ESTIMATED CAPITAL INVESTMENT ON INDUSTRIAL SEWARAGE.

(AMOUNT IN Rs.'000')

SL. NO.	PARTICULARS	UNIT OF MEASURE	UNIT COST(RS)	QUANTITY	COST AT 100 CI	COST AT 2485 CI
1.	COMBINED OPEN SURFACE DRAIN					
a.	60 CM. X 90 CM.	METER	104.00	100	10.40	258.44
b.	SURFACE DRAIN 30 CM. X 45 CM.	METER	57.00	100	5.70	141.65
2.						
a.	200 MM DIA S.W.PIPE OF GRADE A	METER	32.85	100	3.29	81.63
b.	200 MM DIA C.I. PIPE FOR INDUSTRIAL COMPLEX	METER	196.80	100	19.68	488.05
3.	PROVIDING & LAYING CEMENT CONC. (1:5:10) UP TO HUNCHES OF S.W. PIPE					
	FOR 200 MM. S.W. PIPE	METER	14.05	100	1.41	34.91
4.						
a.	CIRCULAR TYPE MANHOLE	NO.	597.50	5	2.99	74.24
b.	INSPECTION CHAMBER	NO.	25.30	10	0.25	6.29
5.	SEPTIC TANK		L.S.			88.00
	TOTAL COST					1173.21
	GRAND TOTAL (IN Rs.LAKHS.)					11.73

APPENDIX - A.8.3.3.

UCE FOR AMRAPALI O.C.P.(12.00 MTY)
STATEMENT SHOWING THE ESTIMATED CAPITAL INVESTMENT ON INDUSTRIAL WATER SUPPLY SCHEME.

(AMOUNT IN Rs.'000')

SL. NO.	PARTICULARS	UNIT OF MEASURE	UNIT COST(RS)	QUANTITY	COST AT 100 CI	COST AT 2485 CI
1.	GROUND RESERVOIR					
a.	0.15 LAKHS GALLON CAPACITY	GALLON	3.00	15000	45.00	1119.25
2.	PUMP HOUSE,2 NOS.					
a.	20.00 SQ.METER X 2	SQ.METER	260.00	20	10.40	258.44
3.	OVER HEAD TANK					
a.	0.05 LAKHS GALLON CAPACITY	GALLON	5.00	5000	25.00	621.25
b.	0.04 LAKHS GALLON CAPACITY (FOR POTABLE WATER)	GALLON	5.00	4000	20.00	497.00
4.	PUMPS & MOTORS	NO.			L.S.	176.00
5.	200 M PIPE LINE					
	100 M (DIA. 150 MM.)	R.M.	83.00	100	8.30	206.26
	100 M (DIA. 80 MM.)	R.M.	70.00	100	7.00	173.95
6.						
a.	VALVES & SPECIALS					
b.	(15%OF THE ABOVE ITEM)					57.03
	TOTAL COST					3109.18
	GRAND TOTAL (IN Rs.LAKHS.)					**31.09**

UCE FOR AMRAPALI O.C.P.(12.00 MTY)

COMPUTATION OF INDUSTRIAL WATER DEMAND

1.	WATER REQUIRED FOR WASHING OF DUMPERS, DOZERS,SCRAPERS AND OTHER HEMM(0 NOS.) 0 X 400 G.P.D.	0	G.P.D.
2.	WATER REQUIRED FOR ROAD WATERING @ 15000 GPD/MTY COAL PRODUCTION/YEAR	0	G.P.D.
3.	WATER REQUIRED FOR FIRE FIGHTING IN COAL @ 10000 GPD/MTY COAL PRODUCTION/YEAR	0	G.P.D.
4.	WATER REQUIRED FOR FLOOR WASHING IN WORKSHOP AND OTHER INDUSTRIAL COMPLEX @ 1500 GPD/MTY COAL PRODUCTION/YEAR	18000	G.P.D.
5.	LOSSES, 10% OF ALL ITEMS	1800	G.P.D.
	TOTAL QUANTITY OF INDUSTRIAL WATER REQUIRED	**19800**	**G.P.D.**
	TOTAL WATER REQUIRED	**0.020**	**M.G.P.D.**

UCC for Amrapali OCP (12.0 MTY)

BOTH OUTSOURCED

MANPOWER

Particulars	Category	Total (Max)	1	2	3	4	5	6	7
			Construction Period				Production Build Up Period		
OB									
OB Direct Manpower									
Pumani/Dumpman/Foreman									
Mining Sardar	3548 - 5111	10			4	4	6	8	10
	2598 - 5978	6			4	4	6	6	6
Sub Total of OB Direct		16	0	0	8	8	12	14	16
Total of OB		16	0	0	8	8	12	14	16
COAL									
Coal Direct									
Pumani/Dumpman/Foreman									
Mining Sardar	3548 - 5111	7				4	4	7	7
	2598 - 5978	7				4	4	7	7
Sub Total of Coal Direct		14	0	0	0	8	8	14	14
COAL HANDLING PLANT									
Dy S E (E&M)									
SR E E (E&M)	15500-20930	1		1	1	1	1	1	1
EE (E&M)	15000-20930	1		1	1	1	1	1	1
Engr (E&M)	13750-16700	1			1	1	1	1	1
Foreman Incharge (E&M)	10750 - 16750	3			2	2	2	2	2
Foreman (E&M)	6000-8400	1			1	1	1	1	1
Sr PA	4317 - 7257	3			1	2	3	3	3
S.K.	4652 - 7602	1		1	1	1	1	1	1
CONTROL ROOM ATTENDENT	3998-6578	1			1	1	1	1	1
ASST S.K.	V	4					2	4	4
SUB-STATION ATTENDENT	3998-5978	1				1	1	1	1
FITTER (ELECT.)	IV	4			1	2	4	4	4
FITTER (ELECT.)	V	2				2	2	2	2
FITTER (MECH.)	VI	2				2	2	2	2
FITTER (MECH.)	V	2				2	2	2	2
FITTER (HELPER)	VI	2				2	2	2	2
CRUSHER / APRON / PLOUGH FEEDER ATTENDANT	II	8				6	8	8	8
RAPID LOADING OPERATOR	IV	22					12	22	22
PLANT ATTENDENT	V	7					4	7	7
WELDER / GAS CUTTER	III	19				8	10	19	19
GENERAL MAZDOOR	V	1				1	1	1	1
GENERAL MAZDOOR	I	7				4	7	7	7
PEON	II	7				4	7	7	7
	3384-4484	1		1		1	1	1	1
Sub-Total of CHP		100	0	4	10	45	85	130	100
LOADING/DESPATCH									
LOADING SUPERVISOR	3998-6578	1				1	1	1	1
LOADING MUNSHI	3545-5111	8				8	8	8	8
Sub-Total of Loading & Despatch		9	0	0	0	9	9	9	9
Total of Coal		123	0	4	10	62	102	123	123
E&M SUPERVISION									
S.E. (E&M)	17500 - 22300	1				1	1	1	1
Engr. (E&M)	10750 - 16750	1	1	1	1	1	1	1	1
Foreman (Elect.)	4317 - 7257	1	1	1	1	1	1	1	1
SR PA	4652-7602	1	1	1	1	1	1	1	1
Peon	3384-4484	1	1	1	1	1	1	1	1
Sub-Total of E&M Supervision		5	4	4	5	5	5	5	5
E&M MAINTENANCE									
Fitter (Elect.)	V	1	1	1	1	1	1	1	1
Fitter (Elect.)	VI	1	1	1	1	1	1	1	1
Helper (E&M)	II	4	1	1	2	3	4	4	4
Electrician	V	2	1	1	2	2	2	2	2
Tyndal Jamadar	V	1	1	1	1	1	1	1	1
Tyndal	III	2	1	1	2	2	2	2	2
Mazdoor	I	2	1	1	2	2	2	2	2
Sub-Total of E&M Maintenance		13	7	7	11	12	13	13	13
OTHER OPERATIONS									
S/S Attendant	II	4	1	2	4	4	4	4	4
Sub-Total of Other Operations		4	1	2	4	4	4	4	4

VCE for Amrapali OCP (12.0 MTY)

BOTH OUTSOURCED

MANPOWER

Particulars	Category	Total (Max)	1	2	3	4	5	6	7
			Construction Period				Production Build Up Period		
PROJECT / G.M.'S OFFICE									
CME	18500-22500	1	1	1	1	1	1	1	1
DY. CME	18500-22500	1	1	1	1	1	1	1	1
DY PM	16600-20800	1	1	1	1	1	1	1	1
COLLIERY MANAGER/ SALES MANAGER	16600-20800	1	1	1	1	1	1	1	1
PRIVATE SECRETARY	10750-16750	1	1	1	1	1	1	1	1
O.S	4652-7802	1	1	1	1	1	1	1	1
SR. CLERK	4317-7257	3	3	3	3	3	3	3	3
LDC/TYPIST	3668-5878	3	3	3	3	3	3	3	3
SR. CASHIER	4317-7257	1	1	1	1	1	1	1	1
PEON	3384-4484	3	3	3	3	3	3	3	3
STAFF OFFICER(MINING)	18500-22500	1	1	1	1	1	1	1	1
STAFF OFFICER(EXCV.)	18500-22500	1	1	1	1	1	1	1	1
STAFF OFFICER(E & M)	16500-20600	1	1	1	1	1	1	1	1
SR. FE(CIVIL)	16000-20800	1	1	1	1	1	1	1	1
REVENUE OFFICER	10500-16750	1	1	1	1	1	1	1	1
REVENUE INSPECTOR	4652-7802	1	1	1	1	1	1	1	1
CASHIER	3668-5528	1	1	1	1	1	1	1	1
Sub-Total of Project Office		33	33	33	33	33	33	33	33
TRAINIG CENTRE									
Traing Officer/C.M	16000-20800	1			1	1	1	1	1
Instructor	4317-7257	1			1	1	1	1	1
Projector Operator	3668-5528	1			1	1	1	1	1
LDC/Typist	3668-5878	1			1	1	1	1	1
Peon	3384-4484	1			1	1	1	1	1
Sub-Total of Training Centre		5	0	0	5	5	5	5	5
MINING/SAF. DESP. & QUA. CONTRO.									
DY. CME	18500-22500	1	1	1	1	1	1	1	1
COLLIERY MANAGER/SAF. OFFICER	16500-20600	3	1	1	3	3	3	3	3
ASST. COLLIERY MANAGER	13750-18700	3	1	1	3	3	3	3	3
UNDER MANAGER	10750-16750	3	1	1	3	3	3	3	3
BLASTING FOREMAN	4317-7257	2			1	1	2	2	2
FIRE FIGHTING SUPERVISOR	4317-7257	1			1	1	1	1	1
SR. OVERMAN	8000-8400	2			1	1	2	2	2
OVERMAN	4317-7257	4			2	2	4	4	4
MINING SIRDAR	3668-5528	4			2	2	4	4	4
PA	4317-7257	1			1	1	1	1	1
JR. STENO	3668-5528	1			1	1	1	1	1
FIRE FIGHTING MAZDOOR	II	4			4	4	4	4	4
PEON	3384-4484	2	1	1	2	2	2	2	2
Sub-Total of MINING/SAF. DESP. &QUA. CONTRO.		31	5	5	27	27	31	31	31
PLANNING OFFICE									
DY. CME (PLG)	18500-22500	1	1	1	1	1	1	1	1
ASST. COLLIERY MANAGER (PLG)	13750-18700	1	1	1	1	1	1	1	1
SR. GEOLOGIST	13750-18700	1	1	1	1	1	1	1	1
SR. PA	4652-7802	1	1	1	1	1	1	1	1
Sub-Total of PLANNING OFFICE		4	4	4	4	4	4	4	4
COMMUNICATIONS									
EE (COMMUNICATION)	13750-18700	1	1	1	1	1	1	1	1
Foreman (Communication)	4317 - 7257	1	1	1	1	1	1	1	1
EXCHANGE OPERATOR	V	2	1	1	2	2	2	2	2
Lineman	V	2	1	1	2	2	2	2	2
Lineman Helper	II	2	1	1	2	2	2	2	2
Sub-Total of Communications		8	5	5	8	8	8	8	8
ACCOUNTS									
Finance Manager	17500 - 22500	1	1	1	1	1	1	1	1
Sr.Finance Officer	13750-18700	1			1	1	1	1	1
Finance Officer	10750-16750	1	1	1	1	1	1	1	1
Accountant	4652 - 7802	2	1	1	2	2	2	2	2
LDC/Typist	3668 - 5878	1	1	1	1	1	1	1	1
Sub-Total of Accounts		6	4	4	6	6	6	6	6

UCE for Amrapali OCP (12.0 MTY)

BOTH OUTSOURCED

MANPOWER

Particulars	Category	Total (Max)	1	2	3	4	5	6	7
			Construction Period				Production Built-Up Period		
WATCH & WARD									
Security Officer	13750-18700	1	1	1	1	1	1	1	1
Sub-Total of WATCH & WARD		1	1	1	1	1	1	1	1
PERSONNEL/WELFARE									
Sr. Personnel Officer	13750-18700	1	1	1	1	1	1	1	1
Pit Head Bath Attendants	I	2			1	2	2	2	2
Sub-Total of Personnel/Welfare		3	1	1	2	3	3	3	3
STORES									
SK	3698-6528	1	1	1	1	1	1	1	1
ASK/ MAGAZINE CLERK	3698 - 5878	2			1	2	2	2	2
LDC/TYPIST	3698-5878	1	1	1	1	1	1	1	1
STORE MAZDOOR	I	1	1	1	1	1	1	1	1
TYNDAL	IV	1	1	1	1	1	1	1	1
Sub-Total of Stores		6	4	4	5	6	6	6	6
CIVIL & WATER SUPPLY									
EE (Civil)	13750-18700	1	1	1	1	1	1	1	1
Overseer (Civil)	3698 - 6528	1	1	1	1	1	1	1	1
Estimator	4317-7257	1	1	1	1	1	1	1	1
LDC/Typist	3698 - 5878	1	1	1	1	1	1	1	1
Pump Attendant	II	4	1	1	2	3	4	4	4
Pipe Fitter	III	2	1	1	2	2	2	2	2
Filter Plant Attendant	IV	3			2	3	3	3	3
Fitter Helper	II	3			3	3	3	3	3
Valve Man		1			1	1	1	1	1
Sub-Total of Civil & Water Supply		17	6	6	15	16	17	17	17
MEDICAL & SANITATION									
Sr. Medical Officer	13750-18700	1			1	1	1	1	1
M.O (Lady)	10750-16750	1			1	1	1	1	1
Compounder	3698 - 5878	2			1	1	1	2	2
Dresser	3545-5111	2			1	1	1	2	2
Ward Boy /Attendent	3384 - 4464	1			1	1	1	1	1
Ayah/ Ward Attendent (Female)	3384-4464	1			1	1	1	1	1
Sanitary Inspector	3698 - 6528	1			1	1	1	1	1
Peon	3384 - 4464	1			1	1	1	1	1
Driver	3545-5111	1			1	1	1	1	1
Sub-Total of Medical & Sanitation		13	0	0	11	11	11	13	13
SURVEY									
Dy. Chief Survey Officer	16000-20800	1			1	1	1	1	1
Sr. Survey Officer	13750-18700	2	1	1	2	2	2	2	2
Head Surveyor	4832-7802	2	1	1	2	2	2	2	2
Surveyor (Incl. Revenue)	3698 - 6528	2	1	1	2	2	2	2	2
Draftsman	4317-7257	2	1	1	2	2	2	2	2
Chainman	3506 - 4056	8	3	6	8	8	8	8	8
Ferro Printer / Xerox Operator	3506 - 4856	2	1	1	2	2	2	2	2
Sub-Total of Survey		19	8	11	19	19	19	19	19
TRANSPORT									
H.V. Driver	3698 - 5878	5	2	2	3	4	5	5	5
L.V. Driver	3545 - 5111	15	5	5	8	10	12	15	15
Sub-Total of Transport		20	7	7	11	14	17	20	20
TOTAL FOR COMMON		178	75	79	155	164	173	178	178
RECLAMATION & ENVIRONMENT									
Environment & Reclamation Officer	16000 - 20800	1					1	1	1
Dozer Operator	II	5					5	5	5
F. E. Loader Operator	II	3					3	3	3
Dumper Operator	II	5					5	5	5
Reclamation Mazdor	I	5					5	5	5
Water Sprinkler Operator	II	7					7	7	7
Sub-Total of Reclamation & Environment		26	0	0	0	0	26	26	26
GRAND TOTAL		343	75	83	173	234	313	341	343

STATEMENT SHOWING YEARWISE MANPOWER AND SALARY & WAGES

Appendix-B.1

Sl	Category	Unit wage	Y7	
			No.	Amount
1	sp	5.58	0	0
2	A	5.33	0	0
3	B	5.03	20	101
4	C	4.83	0	0
5	D	4.41	0	0
6	E	4.14	0	0
7	I	3.89	17	66
8	II	3.98	25	99
9	III	4.09	35	143
10	IV	4.17	30	125
11	V	4.33	24	104
12	VI	4.77	5	24
13	5691-8247	3.99	11	44
14	5896-8542	4.13	10	41
15	5962-8644	4.17	45	188
16	6219-9009	4.34	30	130
17	6724-10360	4.95	14	69
18	7260-11184	5.32	21	112
19	7824-12054	5.71	9	51
20	10091-13727	6.47	3	19
21	16400-40500	11.38	0	0
22	20600-46500	12.73	11	140
24	24900-50500	13.95	13	181
25	29100-54500	14.95	10	150
26	32900-58000	15.26	2	31
27	36600-62000	16.19	7	113
28	43200-66000	18.27	1	18
Grand Total			**343**	**1950**
Total Manshift			90552	
OMS			132.52	
EMS			2153.50	

APPENDIX-B1

UCE FOR AMRAPALI OCP (12.0 MTY)

CASH FLOW STATEMENT FOR FINANCIAL ANALYSIS (AT 85% CAPACITY UTILISATION)

Amt in Rs. Lakhs

Year	Initial Capital	Replacement Capital	Operating Cost	Int.On W. Capital	Total Cash Outflow	Annual Sales	Annual Production (Lte)	Net Cash Flow
Y1	6900.18	0.00	0.00	0.00	6900.18	0.00	0.00	-6900.18
Y2	9853.58	0.00	0.00	0.00	9853.58	0.00	0.00	-9853.58
Y3	20358.53	0.00	0.00	0.00	20358.53	0.00	0.00	-20358.53
Y4	16815.69	0.00	7640.67	369.30	24825.66	9269.25	12.75	-15556.41
Y5	17315.55	0.00	17285.49	835.47	35436.50	27807.75	38.25	-7628.75
Y6	10194.33	0.00	30896.81	1493.35	42584.49	49436.00	68.00	6851.51
Y7	4372.72	0.00	41019.70	1982.62	47375.04	74154.00	102.00	26778.96
Y8	73.19	0.00	42199.18	2039.63	44312.00	74154.00	102.00	29842.00
Y9	31.56	0.00	43015.95	2079.10	45126.62	74154.00	102.00	29027.38
Y10	0.00	24.41	43125.90	2084.42	45234.73	74154.00	102.00	28919.27
Y11	0.00	602.04	44538.04	2152.67	47292.75	74154.00	102.00	26861.25
Y12	0.00	506.93	45868.36	2216.97	48592.26	74154.00	102.00	25561.74
Y13	0.00	1550.38	45454.90	2196.99	49202.27	74154.00	102.00	24951.73
Y14	0.00	193.06	45591.92	2203.61	47988.59	74154.00	102.00	26165.41
Y15	0.00	127.62	45840.35	2215.62	48183.59	74154.00	102.00	25970.41
Y16	0.00	0.00	46238.08	2234.84	48472.92	74154.00	102.00	25681.08
Y17	0.00	278.80	46396.44	2242.49	48917.74	74154.00	102.00	25236.26
Y18	0.00	3.93	46869.07	2265.34	49138.34	74154.00	102.00	25015.66
Y19	0.00	2639.45	47623.63	2301.81	52564.88	74154.00	102.00	21589.12
Y20	0.00	5939.33	47930.14	2316.62	56186.09	74154.00	102.00	17967.91
Y21	0.00	14343.42	48253.77	2332.27	64929.46	74154.00	102.00	9224.54
Y22	0.00	10756.69	48383.77	2338.55	61479.00	74154.00	102.00	12675.00
Y23	0.00	6241.25	48470.12	2342.72	57054.09	74154.00	102.00	17099.91
Y24	0.00	478.22	48498.99	2344.12	51321.32	74154.00	102.00	22832.68
Y25	0.00	241.56	48603.50	2349.17	51194.23	74154.00	102.00	22959.77
Y26	0.00	48.19	47829.53	2311.76	50189.48	74154.00	102.00	23964.52
Y27	0.00	31.56	46003.28	2223.49	48258.33	74154.00	102.00	25895.67
Y28	0.00	0.00	29993.45	1449.68	31443.13	51701.82	71.12	20258.69
Y29	0.00	0.00	30570.53	1477.58	32048.11	51701.82	71.12	19653.71
Y30	0.00	0.00	30639.21	1480.90	32120.11	51701.82	71.12	19581.71
		-24447.73			-24447.73			24447.73
Total	85915.32	19559.11	1114780.79	53881.07	1274136.30	1798852.45	2474.35	524716.15

IRR	24.34%

UCE FOR AMRAPALI OCP (12.0 MTY)

CASH FLOW STATEMENT FOR ECONOMIC ANALYSIS (AT 100% CAPACITY UTILISATION)

Amt in Rs. Lakhs

Year	Initial Capital	Replacement Capital	Operating Cost	Int.On W. Capital	Total Cash Outflow	Annual Sales	Annual Production (Lte)	Net Cash Flow
Y1	5658.14	0.00	0.00	0.00	5658.14	0.00	0.00	-5658.14
Y2	8079.93	0.00	0.00	0.00	8079.93	0.00	0.00	-8079.93
Y3	16693.99	0.00	0.00	0.00	16693.99	0.00	0.00	-16693.99
Y4	13788.86	0.00	7368.62	307.03	21464.51	10905.00	15.00	-10559.51
Y5	14198.75	0.00	16768.17	698.67	31665.59	32715.00	45.00	1049.41
Y6	8359.35	0.00	30322.51	1263.44	39945.30	58160.00	80.00	18214.70
Y7	3585.63	0.00	40110.69	1671.28	45367.60	87240.00	120.00	41872.40
Y8	60.02	0.00	41357.04	1723.21	43140.26	87240.00	120.00	44099.74
Y9	25.88	0.00	42226.92	1759.45	44012.25	87240.00	120.00	43227.75
Y10	0.00	20.02	42341.81	1764.24	44126.07	87240.00	120.00	43113.93
Y11	0.00	493.68	43838.51	1826.60	46158.79	87240.00	120.00	41081.21
Y12	0.00	415.68	45251.80	1885.49	47552.97	87240.00	120.00	39687.03
Y13	0.00	1271.32	44804.34	1866.85	47942.50	87240.00	120.00	39297.50
Y14	0.00	158.31	44945.29	1872.72	46976.31	87240.00	120.00	40263.69
Y15	0.00	104.65	45205.08	1883.55	47193.27	87240.00	120.00	40046.73
Y16	0.00	0.00	45623.35	1900.97	47524.33	87240.00	120.00	39715.67
Y17	0.00	228.62	45787.04	1907.79	47923.45	87240.00	120.00	39316.55
Y18	0.00	3.22	46284.52	1928.52	48216.27	87240.00	120.00	39023.73
Y19	0.00	2164.35	47081.49	1961.73	51207.57	87240.00	120.00	36032.43
Y20	0.00	4870.25	47402.88	1975.12	54248.24	87240.00	120.00	32991.76
Y21	0.00	11761.61	47742.24	1989.26	61493.11	87240.00	120.00	25746.89
Y22	0.00	8820.48	47874.99	1994.79	58690.26	87240.00	120.00	28549.74
Y23	0.00	5117.82	47959.60	1998.32	55075.74	87240.00	120.00	32164.26
Y24	0.00	392.14	47982.33	1999.26	50373.73	87240.00	120.00	36866.27
Y25	0.00	198.08	48087.38	2003.64	50289.09	87240.00	120.00	36950.91
Y26	0.00	39.52	47259.47	1969.14	49268.13	87240.00	120.00	37971.87
Y27	0.00	25.88	45310.56	1887.94	47224.38	87240.00	120.00	40015.62
Y28	0.00	0.00	29119.15	1213.30	30332.45	60825.67	83.67	30493.22
Y29	0.00	0.00	29726.47	1238.60	30965.07	60825.67	83.67	29860.59
Y30	0.00	0.00	29788.97	1241.21	31030.18	60825.67	83.67	29795.49
	0.00	-20047.14	0.00	0.00	-20047.14	0.00	0.00	20047.14
Total	70450.56	16038.47	1097571.20	45732.13	1229792.36	2116297.00	2911.00	886504.64

IRR	39.46%

APPENDIX-D3

UCE FOR AMRAPALI OCP (12.0 MTY)

CASH FLOW STATEMENT FOR ECONOMIC ANALYSIS (AT 85% CAPACITY UTILISATION)

Amt in Rs. Lakhs

Year	Initial Capital	Replacement Capital	Operating Cost	Int.On W. Capital	Total Cash Outflow	Annual Sales	Annual Production (Lte)	Net Cash Flow
Y1	5658.14	0.00	0.00	0.00	5658.14	0.00	0.00	-5658.14
Y2	8079.93	0.00	0.00	0.00	8079.93	0.00	0.00	-8079.93
Y3	16693.99	0.00	0.00	0.00	16693.99	0.00	0.00	-16693.99
Y4	13788.86	0.00	6953.01	280.71	21031.58	9209.25	12.75	-11762.33
Y5	14198.75	0.00	15729.80	655.41	30583.95	27807.75	38.25	-2776.20
Y6	8359.35	0.00	28116.10	1171.50	37646.95	49436.00	68.00	11789.05
Y7	3585.63	0.00	37327.93	1555.33	42468.89	74154.00	102.00	31685.11
Y8	60.02	0.00	38401.26	1600.05	40061.33	74154.00	102.00	34092.67
Y9	25.88	0.00	39144.51	1631.02	40801.42	74154.00	102.00	33352.58
Y10	0.00	20.02	39244.57	1635.19	40899.78	74154.00	102.00	33254.22
Y11	0.00	493.68	40529.61	1688.73	42712.02	74154.00	102.00	31441.98
Y12	0.00	415.68	41740.21	1739.18	43895.06	74154.00	102.00	30258.94
Y13	0.00	1271.32	41363.90	1723.50	44358.77	74154.00	102.00	29795.23
Y14	0.00	168.31	41438.65	1728.69	43375.65	74154.00	102.00	30778.35
Y15	0.00	104.65	41714.72	1738.11	43557.48	74154.00	102.00	30596.52
Y16	0.00	0.00	42076.66	1753.19	43829.85	74154.00	102.00	30324.15
Y17	0.00	228.62	42220.76	1759.20	44208.58	74154.00	102.00	29945.42
Y18	0.00	3.22	42650.86	1777.12	44431.20	74154.00	102.00	29722.80
Y19	0.00	2164.35	43337.50	1805.73	47307.57	74154.00	102.00	26846.43
Y20	0.00	4870.25	43616.43	1817.35	50304.03	74154.00	102.00	23849.97
Y21	0.00	11761.61	43910.93	1829.62	57502.16	74154.00	102.00	16651.84
Y22	0.00	8820.48	44029.23	1834.55	54684.26	74154.00	102.00	19469.74
Y23	0.00	5117.82	44107.81	1837.83	51063.46	74154.00	102.00	23090.54
Y24	0.00	392.14	44134.08	1838.92	46365.14	74154.00	102.00	27788.86
Y25	0.00	198.08	44229.19	1842.88	46270.15	74154.00	102.00	27883.85
Y26	0.00	39.52	43524.87	1813.54	45377.93	74154.00	102.00	28776.07
Y27	0.00	25.68	41962.98	1744.29	43633.16	74154.00	102.00	30520.84
Y28	0.00	0.00	27294.04	1137.25	28431.29	51701.82	71.12	23270.53
Y29	0.00	0.00	27819.19	1159.13	28978.32	51701.82	71.12	22723.50
Y30	0.00	0.00	27881.68	1161.74	29043.42	51701.82	71.12	22658.40
	0.00	-20047.14	0.00	0.00	-20047.14	0.00	0.00	20047.14
Total	70450.56	16038.47	1014450.52	42268.77	1143208.33	1798852.45	2474.35	655644.12

IRR	32.29%

APPENDIX-D4

UCE FOR AMRAPALI OCP (12.0 MTY)

CASH FLOW STATEMENT FOR FINANCIAL ANALYSIS ON COMPLETION CAPITAL (AT 100% CAPACITY UTILISATION)

Amt in Rs. Lakhs

Year	Initial Capital	Replacement Capital	Operating Cost	Int.On W. Capital	Total Cash Outflow	Annual Sales	Annual Production (Lte)	Net Cash Flow
Y1	7510.16	0.00	0.00	0.00	7510.16	0.00	0.00	-7510.16
Y2	11654.15	0.00	0.00	0.00	11654.15	0.00	0.00	-11654.15
Y3	25915.44	0.00	0.00	0.00	25915.44	0.00	0.00	-25915.44
Y4	22934.58	0.00	7691.77	391.37	31017.72	10905.00	15.00	-20112.72
Y5	25122.12	0.00	18000.66	890.62	44013.39	32715.00	45.00	-11298.39
Y6	15718.54	0.00	32674.25	1610.54	50203.32	58160.00	80.00	7956.68
Y7	7155.21	0.00	43608.13	2130.42	52893.76	87240.00	120.00	34346.24
Y8	73.19	0.00	44954.26	2196.62	47224.07	87240.00	120.00	40015.93
Y9	31.56	0.00	45885.52	2242.82	48159.91	87240.00	120.00	39080.09
Y10	0.00	24.41	45985.89	2248.92	48259.23	87240.00	120.00	38980.77
Y11	0.00	602.04	47603.44	2328.42	50533.91	87240.00	120.00	36706.09
Y12	0.00	506.93	49127.97	2403.48	52038.38	87240.00	120.00	35201.62
Y13	0.00	1550.38	48606.29	2379.72	52536.39	87240.00	120.00	34703.61
Y14	0.00	193.06	48729.72	2387.20	51309.98	87240.00	120.00	35930.02
Y15	0.00	127.62	48982.17	2401.00	51510.79	87240.00	120.00	35729.21
Y16	0.00	0.00	49407.12	2423.22	51830.34	87240.00	120.00	35409.66
Y17	0.00	276.80	49550.58	2431.91	52261.29	87240.00	120.00	34978.71
Y18	0.00	3.93	50059.02	2458.34	52521.28	87240.00	120.00	34718.72
Y19	0.00	2639.45	50894.66	2500.67	56034.77	87240.00	120.00	31205.23
Y20	0.00	5939.33	51205.66	2517.74	59662.72	87240.00	120.00	27577.28
Y21	0.00	14343.42	51534.31	2535.76	68413.50	87240.00	120.00	18826.50
Y22	0.00	10756.69	51633.71	2542.81	64933.21	87240.00	120.00	22306.79
Y23	0.00	6241.25	51677.88	2547.30	60466.43	87240.00	120.00	26773.57
Y24	0.00	478.22	51651.61	2548.51	54678.34	87240.00	120.00	32561.66
Y25	0.00	241.56	51713.24	2554.09	54508.88	87240.00	120.00	32731.12
Y26	0.00	48.19	50746.94	2510.12	53305.25	87240.00	120.00	33934.75
Y27	0.00	31.56	48545.96	2406.60	50984.12	87240.00	120.00	36255.88
Y28	0.00	0.00	30690.91	1546.62	32237.53	60825.67	83.67	28588.13
Y29	0.00	0.00	31292.89	1578.88	32871.76	60825.67	83.67	27953.90
Y30	0.00	0.00	31292.89	1582.20	32875.08	60825.67	83.67	27950.58
	0.00	-24447.73	0.00	0.00	-24447.73	0.00	0.00	24447.73
Total	116114.94	19559.11	1183947.43	58295.91	1377917.39	2116297.00	2911.00	738379.61

IRR	25.58%

APPENDIX-D5

UCE FOR AMRAPALI OCP (12.0 MTY)

CASH FLOW STATEMENT FOR FINANCIAL ANALYSIS ON COMPLETION CAPITAL (AT 85% CAPACITY UTILISATION)

Amt in Rs. Lakhs

Year	Initial Capital	Replacement Capital	Operating Cost	Int.On W. Capital	Total Cash Outflow	Annual Sales	Annual Production (Lte)	Net Cash Flow
Y1	[illegible]	0.00	0.00	0.00	7510.16	0.00	0.00	-7510.16
Y2	[illegible]	0.00	0.00	0.00	11654.15	0.00	0.00	-11654.15
Y3	[illegible]	0.00	0.00	0.00	25915.44	0.00	0.00	-25915.44
Y4	[illegible]	0.00	7235.05	369.30	30538.93	9269.25	12.75	-21269.68
Y5	[illegible]	0.00	15859.55	835.47	42817.17	27807.75	38.25	-15009.42
Y6	[illegible]	0.00	30449.62	1493.35	47661.50	49436.00	68.00	1774.50
Y7	[illegible]	0.00	40550.15	1952.62	49687.98	74154.00	102.00	24466.02
Y8	[illegible]	0.00	41706.15	2039.63	43818.97	74154.00	102.00	30335.03
Y9	[illegible]	0.00	42498.27	2079.10	44608.93	74154.00	102.00	29545.07
Y10	0.00	24.41	42582.33	2084.42	44691.16	74154.00	102.00	29462.84
Y11	0.00	502.04	43957.29	2152.67	46722.01	74154.00	102.00	27431.99
Y12	0.00	505.83	45299.08	2216.97	47992.98	74154.00	102.00	26161.02
Y13	0.00	1550.38	44825.65	2195.99	48573.02	74154.00	102.00	25580.98
Y14	0.00	193.06	44931.21	2203.61	47327.88	74154.00	102.00	26826.12
Y15	0.00	127.62	45145.61	2215.62	47489.85	74154.00	102.00	26664.15
Y16	0.00	0.00	45509.65	2234.84	47744.49	74154.00	102.00	26409.51
Y17	0.00	278.80	45631.59	2242.49	48152.89	74154.00	102.00	26001.11
Y18	0.00	3.83	46065.98	2265.34	48335.25	74154.00	102.00	25818.75
Y19	0.00	2539.45	46780.38	2301.81	51721.63	74154.00	102.00	22432.37
Y20	0.00	5839.33	47244.73	2316.62	55300.68	74154.00	102.00	18853.32
Y21	0.00	14343.42	47324.09	2332.27	63999.78	74154.00	102.00	10154.22
Y22	0.00	10756.89	47407.60	2336.55	60502.84	74154.00	102.00	13651.16
Y23	0.00	8241.25	47445.14	2342.72	58029.11	74154.00	102.00	16124.89
Y24	0.00	476.22	47422.76	2344.12	50245.10	74154.00	102.00	23908.90
Y25	0.00	241.56	47473.47	2349.17	50064.19	74154.00	102.00	24089.81
Y26	0.00	46.19	46642.99	2311.76	49002.94	74154.00	102.00	25151.06
Y27	0.00	31.56	44757.41	2223.49	47012.47	74154.00	102.00	27141.53
Y28	0.00	0.00	29885.29	1449.68	30134.97	51701.82	71.12	21566.84
Y29	0.00	0.00	29196.97	1477.58	30674.54	51701.82	71.12	21027.27
Y30	0.00	0.00	29196.97	1480.90	30677.86	51701.82	71.12	21023.95
	0.00	-24447.73	0.00	0.00	-24447.73	0.00	0.00	24447.73
Total	[illegible]	19559.11	1092606.03	53881.07	1282161.15	1798852.45	2474.35	516691.30

[illegible]	[illegible]

APPENDIX-D.6

UCE FOR AMRAPALI OCP (12.0 MTY)

CASH FLOW STATEMENT FOR ECONOMIC ANALYSIS ON COMPLETION CAPITAL (AT 100% CAPACITY UTILISATION)

Amt in Rs. Lakhs

Year	Initial Capital	Replacement Capital	Operating Cost	Int.On W. Capital	Total Cash Outflow	Annual Sales	Annual Production (Mt)	Net Cash Flow
Y1	4158.33	0.00	0.00	0.00	4158.33	0.00	0.00	-4158.33
Y2	9556.40	0.00	0.00	0.00	9556.40	0.00	0.00	-9556.40
Y3	21250.56	0.00	0.00	0.00	21250.56	0.00	0.00	-21250.56
Y4	15806.33	0.00	8996.51	291.65	25097.51	10905.00	15.00	-14192.51
Y5	20600.14	0.00	13380.50	582.52	37963.26	32715.00	45.00	-4948.26
Y6	12880.23	0.00	29915.57	1246.48	44051.28	58150.00	80.00	14108.75
Y7	5557.27	0.00	39693.40	1553.47	47204.14	87240.00	120.00	40035.86
Y8	40.00	0.00	40906.36	1724.52	42672.51	87240.00	120.00	44567.09
Y9	26.36	0.00	41756.83	1736.83	43521.53	87240.00	120.00	43718.47
Y10	0.00	20.22	41847.16	1743.53	43610.81	87240.00	120.00	43626.19
Y11	0.00	493.58	43916.13	1804.36	45617.77	87240.00	120.00	41522.23
Y12	0.00	415.58	44736.45	1862.77	45964.90	87240.00	120.00	41255.10
Y13	0.00	1271.30	44331.72	1842.39	47345.03	87240.00	120.00	39893.97
Y14	0.00	156.31	44344.34	1847.57	46360.22	87240.00	120.00	40885.98
Y15	0.00	104.86	44573.77	1857.24	46535.86	87240.00	120.00	40704.34
Y16	0.00	0.00	44950.48	1873.36	46823.83	87240.00	120.00	40406.17
Y17	0.00	228.82	45091.22	1878.79	47198.44	87240.00	120.00	40041.56
Y18	0.00	3.22	45665.70	1896.07	47455.00	87240.00	120.00	39785.00
Y19	0.00	2154.36	45314.14	1926.75	50406.24	87240.00	120.00	36831.76
Y20	0.00	4570.25	45571.15	1941.55	53406.36	87240.00	120.00	33831.05
Y21	0.00	11751.61	45896.23	1964.01	50611.84	87240.00	120.00	26628.16
Y22	0.00	8820.45	45986.55	1967.73	57754.84	87240.00	120.00	29475.06
Y23	0.00	5117.82	47126.57	1969.45	54124.14	87240.00	120.00	33135.96
Y24	0.00	352.14	47302.57	1962.46	49583.56	87240.00	120.00	37656.44
Y25	0.00	196.06	47259.24	1960.79	49217.91	87240.00	120.00	38022.09
Y26	0.00	36.52	48175.72	1924.15	48145.36	87240.00	120.00	39096.81
Y27	0.00	25.86	44176.80	1840.73	46543.40	87240.00	120.00	41196.60
Y28	0.00	0.00	27925.75	1162.73	29052.43	50826.57	83.67	31733.24
Y29	0.00	0.00	25475.53	1186.52	26662.05	50826.57	83.67	31162.52
Y30	0.00	0.00	25475.53	1186.52	26662.05	50826.57	83.67	31162.52
	0.00	-22047.14	0.00	0.00	-22047.14	0.00	0.00	22047.14
Total	96214.25	15038.47	1277362.15	44861.34	1223636.22	2116297.00	2911.00	862750.78

IRR	33.22%

APPENDIX-0.7

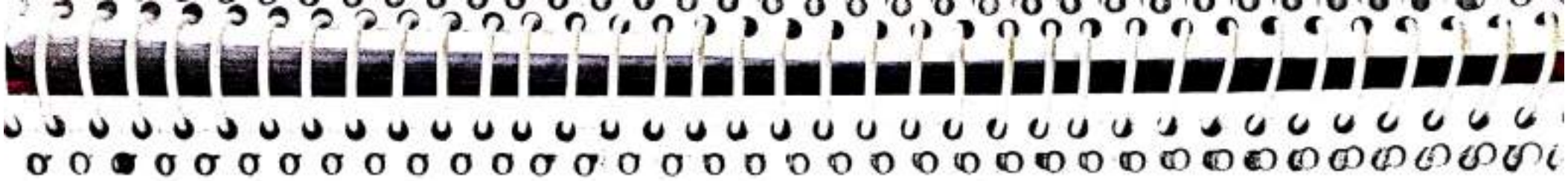
UCE FOR AMRAPALI OCP (12.0 MTY)

CASH FLOW STATEMENT FOR ECONOMIC ANALYSIS ON COMPLETION CAPITAL (AT 85% CAPACITY UTILISATION)

Amt in Rs. Lakhs

Year	Initial Capital	Replacement Capital	Operating Cost	Int.On W. Capital	Total Cash Outflow	Annual Sales	Annual Production (Lte)	Net Cash Flow
Y1	6158.33	0.00	0.00	0.00	6158.33	0.00	0.00	-6158.33
Y2	9556.40	0.00	0.00	0.00	9556.40	0.00	0.00	-9556.40
Y3	21250.66	0.00	0.00	0.00	21250.66	0.00	0.00	-21250.66
Y4	16806.35	0.00	6583.90	274.33	25664.58	9269.25	12.75	-16395.33
Y5	20600.14	0.00	15342.23	639.26	36581.62	27807.75	38.25	-8773.87
Y6	12889.20	0.00	27709.15	1154.55	41752.90	49436.00	68.00	7683.10
Y7	5867.27	0.00	36900.54	1537.53	44305.43	74154.00	102.00	29848.57
Y8	60.02	0.00	37952.60	1581.36	39593.97	74154.00	102.00	34560.03
Y9	25.88	0.00	38673.42	1611.39	40310.70	74154.00	102.00	33843.30
Y10	0.00	20.02	38749.92	1614.58	40384.52	74154.00	102.00	33769.48
Y11	0.00	493.64	40010.24	1667.09	42171.01	74154.00	102.00	31982.99
Y12	0.00	415.68	41194.86	1716.45	43327.00	74154.00	102.00	30827.00
Y13	0.00	1271.32	40791.34	1699.64	43762.30	74154.00	102.00	30391.70
Y14	0.00	158.31	40887.40	1703.64	42749.35	74154.00	102.00	31404.65
Y15	0.00	104.65	41083.41	1711.81	42899.87	74154.00	102.00	31254.13
Y16	0.00	0.00	41413.78	1725.57	43139.36	74154.00	102.00	31014.64
Y17	0.00	228.62	41524.75	1730.20	43483.57	74154.00	102.00	30670.43
Y18	0.00	3.22	41920.04	1748.67	43669.93	74154.00	102.00	30484.07
Y19	0.00	2164.35	42570.14	1773.76	46508.24	74154.00	102.00	27645.76
Y20	0.00	4870.25	42810.70	1783.78	49464.73	74154.00	102.00	24689.27
Y21	0.00	11761.61	43064.92	1794.37	56620.90	74154.00	102.00	17533.10
Y22	0.00	8820.48	43140.92	1797.54	53758.94	74154.00	102.00	20395.06
Y23	0.00	5117.82	43175.08	1798.96	50091.86	74154.00	102.00	24062.14
Y24	0.00	392.14	43154.71	1798.11	45344.97	74154.00	102.00	28809.03
Y25	0.00	196.08	43200.86	1800.04	45198.97	74154.00	102.00	28955.03
Y26	0.00	39.52	42445.12	1768.55	44253.19	74154.00	102.00	29900.81
Y27	0.00	25.88	40729.25	1697.06	42452.18	74154.00	102.00	31701.82
Y28	0.00	0.00	26103.61	1087.65	27191.26	51701.82	71.12	24510.55
Y29	0.00	0.00	26569.24	1107.05	27676.29	51701.82	71.12	24025.52
Y30	0.00	0.00	26569.24	1107.05	27676.29	51701.82	71.12	24025.52
	0.00	-20047.14	0.00	0.00	-20047.14	0.00	0.00	20047.14
Total	96214.29	16038.47	994271.45	41427.98	1148952.19	1749252.45	2474.35	651900.26

IRR	26.80%



APPENDIX - E

UCE FOR AMRAPALI OCP (12.0 MTY)

STATEMENT SHOWING THE ESTIMATED INVESTMENT ON LAND RECLAMATION

Amt. in Rs. Lakh

S.N.	Particulars	PR PROVISION		5 th year	
		Nos.	Amount	Nos.	Amount
A	Capital Investment				
1	FE loader-5.6 cu.m	1	433.71	1	433.71
2	Dozer- 320 HP	2	309.58	2	309.58
3	Water sprinkler - 28 KL	3	287.57	3	287.57
4	Dumper - 35 Te	3	274.63	3	274.63
5	Spare Engines		73.03		73.03
6	Contingent Equipment		65.27		65.27
	Total		**1443.79**		**1443.787769**
II	Operating cost				
1	Wages				135.06
2	Stores				204.78
3	Misc.cost				32.25
4	Administrative charge				
5	Interest on working capital				17.98
6	Depreciation				167.99
	Total				**558.07**

Appendix F

ESTIMATED CAPITAL EXPENDITURE ON ENVIRONMENTAL PROTECTION MEASURES

A-CAPITAL EXPENDITURE

Name of the Project: UCE for AMRAPALI OCP (12.0 MTY)

		BOTH OUTSOURCED	
i	COST OF REHABILITATION		
a	Total no of families to be rehabilitated before the start of the project	451	
b	No of families rehabilitated to date	0	
c	No of families required to be rehabilitated	451	

CAPITAL ESTIMATES

(Amount in Rs Lakhs)

Sl No	Description	Amount	Remarks
1	Compensation of land to be aborted for rehabilitation		
2	Cost of development of tallot plots including Schools Township Roads etc		
3	Shifting allowance		
4	Lump sum grant		
5	Payment of lump sum grant of Rs 1,00,000/- each for such family who want to shift at the place of their own choice instead of the above mentioned in sl nos 1 to 4	451.00	Appendix-A 8.1
6	Lumpsum assistance to eligible PAPs to establish self employment thrugh the provisions of infrastructures or formation of co-operatives @5% of rehabilitation cost	22.55	Appendix-A 8.1
	SUB TOTAL	473.55	

ii	COST OF COMPENSATORY AFFORESTATION		
a	Forest Land Required For the Project in Ha	927.40	
b	Forest land already acquired	0.00	
c	Forest land in safety zone	134.32	
d	Net forest land to be acquired	793.08	
e	Density of forest	0.70	
f	No. of trees at 100% density	2,400.00	

CAPITAL ESTIMATES

(Amount in Rs Lakhs)

Sl No	Description	Amount	Remarks
1	Cost of forest growth & capital NPV (for forest density 0.3) for 793.08 Ha @ Rs 9.00 Lakh/Ha	7137.72	
2	Cost of afforestation @ Rs 72000/- per Ha for double the forest land of 793.08 Ha that is 1560.16 ha @ Rs 72000	1122.04	
3	Cost of afforestation in safety zone is 1.5 times of the safety zone area that is 1.5x134.32=201.48 Ha @ Rs 72000	145.07	
4	Cost of enrichment of forest, fencing and maintenance of 7.5m strip of outer safety zone @ Rs 516.41 per running metre that is 10000 m	51.64	
	SUB TOTAL	8476.46	Appendix A.1

iii	CAPITAL FOR RESTORATION		
	HEMM for Reclamation		
1	FE loader 3.5 cu m - 1 no	433.75	Appendix-E
2	Dozer 320 HP 2 Nos	308.58	Appendix-E
3	Dumper - 35 Te - 3 no	274.53	Appendix-E
4	Water sprinkler (28 KL) 3 Nos	287.87	Appendix-E
5	Spare engine	73.03	Appendix-E
6	Contingency	65.27	Appendix-E
7	Biological reclamation of area@ Rs 60,000/- per ha for 450.00 ha	270.00	Appendix A 8.1
	SUB TOTAL	1713.73	

Appendix-F

ESTIMATED CAPITAL EXPENDITURE ON ENVIRONMENTAL PROTECTION MEASURES

A-CAPITAL EXPENDITURE

Name of the Project: UCE for AMRAPALI OCP (12.0 MTY) — BOTH OUTSOURCED

IV	CAPITAL FOR ANTI-POLLUTION MEASURES IN MINE AND INDUSTRIAL AREA		
1	Industrial sewage treatment in workshop	11.73	Appendix-A 8.3.4
2	Water supply distribution system	31.09	Appendix-A 8.3.3
3	Dust suppression & extraction in coal handling plant & feeder breaker	146.00	Appendix-A.3.4
4	Nala diversion/ sedimentation lagoon/ check dam/ protective embankment/ storm water drain etc.Development of green belt	641.74	Appendix-A.8.1
	SUB-TOTAL	830.56	
V	CAPITAL FOR ANTI-POLLUTION MEASURES IN TOWNSHIP		
1	Colony Sewage treatment	64.06	Appendix-A 8.3.2
2	Storm water drain	27.02	Appendix-A 8.3.2
3	Water treatment plant & Distribution system	416.81	Appendix-A 8.3
	SUB-TOTAL	507.89	
VI	OTHER PROVISIONS		
1	Base line data generation and monitoring works	35.00	Appendix-A.8.1
2	Cost of arboriculture	35.00	Appendix-A 8.1
3	Housing for 14 nos.of personnel for pollution control	87.76	Appendix-A 8.2.1
	SUB-TOTAL	157.76	
VII	Compensation for Non-Forest land	2071.95	
VII	FINANCIAL IMPACT		
	CAPITAL		
1	Cost of rehabilitation	473.55	
2	Cost of compensatory afforstation	8476.46	
3	Cost of restoration	1713.79	
4	Cost of Anti-pollution measures in mine & Industrial area	830.56	
5	Cost of Anti-pollution measures in township	507.89	
6	Other provisions	157.76	
	TOTAL CAPITAL	12160.00	

VIII	COMPENSATION FOR NON- FOREST LAND		
	TENANCY LAND @4.32 LAKHS/ Ha	1186.35	274.46
	GMK LAND@2.47 lakhs/Ha	885.59	358.54
	TOTAL FOR NON FOREST LAND	2071.95	Appendix-A 1

Detailed Project Report

Of

AMRAPALI OCP
(12.0 MTY)

Of

Central Coalfields Limited

April 2005
Regional Institute-III

PLANNER'S COPY
OPENCAST DEPTT.
RI-3,CMPDI

SUMMARISED DATA

1. Name of the Project : Amrapali OCP (12.00 MTY)
2. Coalfield : North Karanpura Coalfield
3. Location : Chatra District, Jharkhand
4. Company : Central Coalfields Limited
5. Seamwise Coal Reserves :

Sl. No.	Seam	Mineable Reserves (M.tes.)		
		East Section	West Section	Total
a)	I (B)/I(B+M)/ I (B+M+T)	88.47	40.41	128.88
b)	I (M)	3.46	6.75	10.21
c)	I (T)/I(T+M)	23.11	23.26	46.37
d)	II (B)	12.93	1.81	14.74
e)	II(T)	9.05	2.25	11.3
f)	III (C)	29.73	18.1	47.83
g)	IV	22.28	9.49	31.77
h)	TOTAL	189.03	102.73	291.1
i)	Total OBR(Mm^3)	265.95	193.73	459.68
j)	S. Ratio (m^3/te.)	1.41	1.90	1.58
k)	Quarry Parameters			
l)	Dip of seams (Degree)	6-8	3-6	
m)	Strike Length (Km)	2.2	2.4	4.6
n)	Width (Km)	1.4	1.4	
o)	Maximum depth (m)	135	135	
p)	Area of Excavation (Ha.)	337.25	493.7	830.95

6. Av. Grade of Coal (ROM) : Gr F
7. Main Consumer : Barh STPS
8. Method of Mining : Shovel-Dumper & Dragline
9. Main Equipment Configuration (FOR TOTAL MINE LIFE)

		Coal outsourcing with CHP Main Variant	Departmental option with CHP Variant-I	Both outsourcing with CHP Variant-II
a	- Dragline, 20/90	1	1	OUTSOURCED
b	- Elect. Rope Shovel, 20 m^3	3	3	
c	- Elect. Hyd. Shovel, 8.3 m^3	8	12	
d	- Rear Dumper, 170T	20	20	
e	- Rear Dumper, 85T	48	78	
f	-Elect. RBH Drill, 250 mm (Long Mast)	11	11	
g	- Elect. RBH Drill, 160 mm	3	7	
h	- Dozer 410 HP	18	20	
i	- Wheel Dozer- 460 HP	2	4	
k	-Grader –280 HP	6	6	
l	-Water Sprinkler- 28KL	6	6	
m	-Diesel Hydraulic BH shovel(1.2Cum)	2	2	

Sl No.	Description	Fully Departmental option with CHP) Variant-I	Coal outsourcing with CHP Main Variant	Both outsourcing with CHP Variant-II
1	Target Output (COAL)			
	at 100% level (Mte/Year)	12.00	12.00	12.00
	at 85% level (Mte/Year)	10.20	10.20	10.20
	Peak OBR (in Mcum/year)	21.81	21.81	21.81
2	Life of the Mine (Years)	30.00	30.00	30.00
3	Initial Capital (Rs. Crore)	1311.25	1178.31	496.81
4	Initial Capital Outlay			
	at 100% level (Rs/te)	1092.71	981.93	414.01
	at 85% level (Rs/te)	1285.54	1155.21	487.07
	per cu m at 100% level (Rs/CuM)	491.07	441.28	186.06
5	Initial Capital on P& M (Rs. Crore)	914.34	793.22	232.97
	Initial Capital outlay on P& M (Rs/te)	761.95	661.02	194.14
6	Cost of Production			
	at 100% level (Rs/te)	329.90	342.96	302.43
	at 85% level (Rs/te)	377.19	385.47	324.29
7	Profit			
	at 100% level (Rs/te)	262.10	249.04	289.57
	at 85% level (Rs/te)	214.81	206.53	267.71
8	Ave Selling Price (Rs/te)	592.00	592.00	592.00
9	Financial IRR			
	at 100% level (Rs/te)	31.44	31.92	51.84
	at 85% level (Rs/te)	24.40	25.01	44.63
10	Economic IRR			
	at 100% level of rated output	39.69	40.40	61.16
	at 85% level of rated output	32.01	32.68	53.38
11	Completion Capital (Rs. Crore)	1691.44	1523.34	661.42
12	Completion IRR (Fin.)			
	at 100% level of rated output	24.35	24.82	42.96
	at 85% level of rated output	18.44	19.00	36.46
13	Completion IRR (Eco)			
	at 100% level	31.52	32.05	51.47
	at 85% level	24.83	25.47	44.37
14	EMS (Rs.)	772.21	771.38	793.00
15	OMS (Old) (Te)	40.33	46.01	132.52
16	No. of Personnel	1127	988	343

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Text

CHAPTER-I

1.0 INTRODUCTION:

1.1 Preamble:

Two power projects are proposed to be set up by NTPC under the Mega Power Policy of Govt. of India. The two power projects are (i) North Karanpura/Tandwa STPS (3X660 MW) and (ii) Barh STPS (3X660 MW). These STPS, North Karanpur/Tandwa STPS and Barh STPS have been linked to North Karanpura Coalfield of CCL, which has huge reserves of power grade coal. The Hon'ble Prime Minister of India has already laid the foundation stone of these mega power projects on 6th March'99.

Two Opencast Projects in N.K. Coalfield have been identified for supplying coal to above two STPS. The opencast projects are Magadh OCP, which is envisaged to feed coal to North Karanpura /Tandwa STPS and Amrapali OCP, which is envisaged to feed coal to Barh STPS. The requirement of power grade coal will be around 10 M.te per annum for each STPS and with these objective in view, the above two OCP's have been prepared for a rated capacity of 12 MTPA each. It is envisaged that these two OCPs will be worked at an operating efficiency of not less than 85%.

Amrapali Opencast Project has been identified for a rated capacity of 12.0 MTY for supplying coal to Barh STPS (3X660 MW). The proposed mining area is remote and no basic infrastructure likes Road, Power, Railway, Water Supply arrangement is available in this project. To develop the area, these facilities are to be made available, which normally take a long period.

1.2 PR For Amrapali OCP (4.5 MTY):

A Project Report for Amrapali OCP for a rated capacity of 4.50 MTY was prepared in Jan.'92 for an estimated capital investment in Rs.210.99 crores. As per this PR, the mineable reserves were estimated as 91.70 M.te. with an OBR of 107.00 Mm^3 at an average stripping ratio of 1.17 m^3 /te. The projected life of the mine was estimated as 24 years. The PR for Amrapali OCP was prepared and submitted to

CCL. No firm linkage was identified for this OCP and there was no railway heads for the coal evacuation from this project. So this PR was not processed for sanction and kept as a shelved report.

1.3 Need for the Project Report of Amrapali OCP (12.0 MTY):

(a)Amrapali OCP, including the two geological blocks i.e. Amrapali block and Kishanpur block, has been identified for feeding coal to proposed STPS at Barh near Patna, which is located at a distance of about 300 Km from this OCP.

(b)The two geological blocks as mentioned above are fully explored and geological information are available to plan a large scale Opencast Mine.

The geo-mining parameters of Amrapali OCP are favourable for planning and implementing a large scale Opencast Mine

1.4 Advance Action Proposal against the proposed Amrapali OCP(12.0 MTY):

Amrapali Opencast Project has been identified for a rated capacity of 12.0 MTY for supplying coal to Barh STPS (2000 MW). The proposed mining area is remote and no basic infrastructures like Road, Power, Railway, and Water Supply arrangement are available in this project. To develop the area, these facilities are to be made available, which normally take a long period. Besides, the construction period of an opencast project to the tune of 12.0 MTY is minimum 4 years after the PR sanctioned by the competent authority.

Keeping above in view, this advance action proposal has been prepared at an estimated initial capital investment of Rs.889.72 Lakhs. The activities, which are to be completed prior to the construction of the project, have been covered through this advance action proposal. The main activities are:

(a)Land acquisition & (b) Village Rehabilitation - Land acquisition is a time consuming and critical activity. Five villages, namely Binglat, Hohne, Kumarang Khurd, Kumarang Kalan & Ursu fall within the core zone of the quarry. These villages have to be rehabilitated in different phases of mine activity.

(c) Transmission line for power supply arrangement - Presently, there is no power supply arrangement in vicinity of the proposed mine take area. The power is to be

drawn from Piparwar feeder, located at a distance of about 30 Km from the mine site, for which transmission line is to be erected and sub-station is to be established near the mine site.

(d) An approach road is to be constructed to bring men and materials to the mine site. A fair weather road is to be constructed initially, which will be metalled subsequently.

The total capital envisaged in the Advance Action Proposal was Rs.949.5 Lakhs. The Board of Directors approved the Advance Action Proposal, CCL in the 295th meeting held on 28.9.2000. The extract from the minutes of the above meeting in respect of Advance Action Proposal is appended below:

"After discussion at length, the Board approved the AAP in principle. However, the Board directed to ensure whether expenses on P&M etc.(other than land), included in the AAP, are as per the recent guidelines of the Govt. If so, the necessities of such expenditure, other than land, be substantiated and possibilities of further reduction in those proposed expenditures, to keep them to bare minimum, be explored before sending the AAP to Empowered Sub-Committee of CIL."

As per the direction of the Board of Directors, CCL, the Advance Action Proposal was re-examined in order to keep the proposed expenditures to bare minimum. The total capital is now estimated as Rs.889.72 Lakhs.

The Advance Action Proposal was sanctioned by Government of India at an estimated capital of Rs. 889.72 Lakhs vide letter no. 43011/24/2001-CPAM dt.25 th September, 2001 as shown in table-I:

Table-I

Sl No	Item	Capital(Rs Lakhs)
1	Land	150.00
2	Buildings-Service	28.97
3	Railway Siding	150.00
3	Plant & Machinery	175.00
4	Vehicle	10.75
5	Development 1.Capital Outlay in Mines 2.Roads & Culverts 3.Water Supply	 260.00 90.00 25.00
6	Total	889.72

Advance Action Proposal is under implementation. Alignment for Railway line between Tori to Hazaribagh via Shivpur has already been finalised by East Central Railway, Dhanbad Division in consultation with RI-3, CMPDI.

2. PREPARATION, EVALUATION OF VARIOUS ALTERNATE OPTIONS OF THE PR

A Project Report for Amrapali OCP was prepared by CMPDI, RI-3 in Sep'2000 for a rated capacity of 12.00 MTY. The total minable reserves was estimated as [illegible] Mt [illegible] corresponding to a volume of OBR of 453.66 Mm³ at an average stripping ratio of [illegible]. The life of the project was estimated as [illegible] years and the average grade of coal was assessed as Grade [illegible].

Techno-Economic Parameters of the various variants of technology and equipment configuration studied before arriving at the final variant selected for implementation in Amrapali OCP. The detail is given in Table-II.

Table-II

Sl. No.	Particulars	Initial Estimate (Sep'2000): Variant I (Main Variant)	Variant II	Variant III	Variant IV
	[illegible]				
	At 100% level of rated output	12.00		[illegible]	
	At [illegible] level of rated output	[illegible]			
	[illegible]	[illegible]			
	[illegible] (Rs. Crores)	[illegible]	[illegible]	[illegible]	[illegible]
	[illegible]			[illegible]	[illegible]
	At [illegible]% level of rated output	[illegible]	[illegible]	[illegible]	
	At 85% level of rated output	[illegible]	[illegible]	[illegible]	[illegible]
	[illegible]	[illegible]		[illegible]	[illegible]
	[illegible]			[illegible]	[illegible]
1	[illegible]	[illegible]			
	[illegible]	[illegible]		[illegible]	[illegible]
2	[illegible]			[illegible]	[illegible]
	At [illegible] level of rated output	[illegible]			
	At 85% level of rated output	[illegible]	[illegible]	[illegible]	[illegible]
3	[illegible]	[illegible]		[illegible]	[illegible]
	[illegible]			[illegible]	[illegible]
	At [illegible]% level of rated output	[illegible]	[illegible]	[illegible]	[illegible]
	At [illegible]% level of rated output	[illegible]	[illegible]	[illegible]	[illegible]

Variant I – Main Variant

[illegible] Shovels + ROCH [illegible] for coal production, [illegible] Shovels [illegible] Rope Shovels + [illegible] dumpers for removing partings & [illegible] 20/90 Dragline for parting between [illegible] & [illegible] 20 m³ Rope Shovels + [illegible] dumpers for [illegible] working.

Variant-II

8.3m^3 Hyd. Shovels + RD85T for coal production & intervening partings &. 20 m^3 Rope Shovels + 170T dumpers for main OB workload

Variant-III

4.5 m^3 Hyd. Shovels + RDCH 50T for coal production, 4.5m3 Hyd. Shovels + RD50T for intervening partings & 1 no.20/90 Dragline, 20 m^3 Rope Shovels + 170T dumpers for top OB workload

Variant-IV

8.3 m^3 Hyd. Shovels + RDCH 85T for coal production, 4.5 m^3 Hyd. Shovels/10 m^3 Rope Shovels + 50T dumpers for intervening partings, 1no dragline 20/90 &. 20 m^3 Rope Shovels + 170T dumpers for main OB workload.

Further, four additional options were prepared in May'2002. In all these options Railway Siding and CHP were not considered. Major maintenances of HEMM were also proposed for outsourcing. The equipment configuration was 10cum Electric Rope shovel with 120T rear dumpers for both coal & overburden. The techno-economics parameters (May'2002) of various options are placed in table –III

Table-III

Sl No.	Particulars	Option-I	Option-II	Option-III	Option-IV
1.	Target Output (M.tes/Year)				
	- at 100% level of rated output	12.00	12.00	12.00	12.00
	- at 85% level of rated output	10.20	10.20	10.20	10.20
2.	Life (Years)	28	28	28	28
3.	Initial Capital Outlay (Rs. Crore)	1434.14	1090.84	544.03	147.52
4.	Specific Investment (Rs./te)	1195.12	909.03	453.36	122.93
5.	Capital Cost for P&M (Rs. Crore)	1265.87	943.36	401.65	29.47
6.	Manpower Requirement (Nos.)	1283	1014	855	403
7	O.M.S. (Te) (old)	35.43	44.83	53.16	112.79
8.	Cost of Production (Rs./te)				
	- at 100% level of rated output	317.84	307.54	255.24	255.87
	- at 85% level of rated output	356.62	341.90	281.92	280.24
9.	Av. Selling Price (Rs./te)	431	431	431	431
10	Profit (Rs./te)				
	- at 100% level of rated output	113.16	123.46	175.76	175.13
	- at 85% level of rated output	74.38	89.10	149.08	150.76
11.	Financial IRR (%)				
	- at 100% level of rated output	20.10	28.25	59.50	81.55
	- at 85% level of rated output	13.07	19.05	48.45	69.32

Option –I Both coal and OB to be worked departmentally with 10 Cum. Rope Shovel and 120T Rear Dumper.

Option – II Outsourcing of coal (OB to be worked departmentally by 10 Cum. Rope Shovel and 120T rear dumpers for all other partings).

Option – III Outsourcing of OB (Coal to be worked departmentally by 10 Cum. Rope Shovel with 120T Rear Dumpers.)

Option – IV Outsourcing of both coal and OB.

Various alternative options, as mentioned above of Amrapali OCP (12.0 Mty) were discussed with CMD, CCL, on 12.5.2002 wherein Dir (T)/(P&P), D (F) and CGM (P&P) were also present. After long deliberation, CCL desired the following:

- Coal to be outsourced and OB to be worked departmentally considering the operational and administrative feasibility in implementing the different options.
- Departmental OB removal by 10 Cum Rope Shovel with 120T dumpers for thick partings and 3.2 Cum Hyd. Shovel with 50 Te. Dumper for thin partings
- CHP and its operations are to be excluded from project's capital cost.
- Railway siding has to be included.

Accordingly CMPDI, RI-3 prepared an additional addendum (alternative option –9) prepared in May'2002 considering following parameters:

- Maintenance of HEMM to be outsourced. Only running maintenance of HEMM to be considered.
- Power supply will be departmental except for equipment deployed by outside party as coal is to be outsourced.
- Main facilities in store and workshop are proposed to be reduced only to cater for the need of running maintenance of departmental equipment.

The above work instructions of CCL have been considered while working out this option. A brief summary of this option is given in Table IV.

Table -IV

Sl. No.	Particulars	Option-IX
1.	Total Capital (Rs. In Crores)	1030.01
2.	Estimated Cost of Prodn(Rs./te.)	303.06
3.	Average Selling Price (Rs./te)	431.00
4.	Profit(Rs./te.)	127.94

This proposal was discussed and approved by CCL Board in its 305th meeting held on 21.06.2002.After approval of the option (alternative option-9) by the CCL Board,

CGM (P&P), CCL requested to prepare the PR of the above option (alternative option-9) for approval by CIL Board & the Government considering the following assumptions vide his note-sheet no. CGM (P&P)/470-N dated 1.7.2002:

- Outsourcing of coal winning.
- Outsourcing major maintenance of HEMM to OEMs of equipment.
- Construction & operation of CHP on B-O-O basis.
- Inclusion of Railway siding.

Accordingly CMPDI, RI-3 had prepared an addendum (option-9) in detail to the PR considering the above assumptions in September 2002. Techno-economics of the report is placed below in table- V

Table-V

Sl No.	Particulars	Value (Sept'2002)
1	Target Output(MTY)	
	- at 100% level of rated output	12.00
	- at 85% level of rated output	10.20
2	Life (Years)	28
3	Initial Capital Outlay (Rs. Crore)	1120.65
4	Specific Investment (Rs./te)	
	- at 100% level of rated output	933.87
	- at 85% level of rated output	1098.68
5	Capital Cost for P&M (Rs. Crore)	880.94
6	Manpower Requirement (Nos.)	918
7	O.M.S. (Te) (old)	49.51
8	Cost of Production (Rs./te)	
	- at 100% level of rated output	295.09
	- at 85% level of rated output	326.93
9.	Av. Selling Price (Rs./te)	453
10.	Profit (Rs./te)	
	- at 100% level of rated output	157.91
	- at 85% level of rated output	124.07
11	Financial IRR (%)	
	- at 100% level of rated output	28.97
	- at 85% level of rated output	21.15
12	E.M.S. (Rs.)	589.14

In all the options of the project report, it had been considered that the mine would be worked for 300 days per annum.

Further, it has been advised by Chief General Manager (CP&PM), CIL vide Fax no. CIL/PM/294 dated 30th september'2002 to recast the Project report based on 330 working days in reference of letter no. CIL/DT/ dated 14thSept'02 from Director (Technical), Coal India Ltd. As advised that the productivity of the HEMM has been

enhanced by 10%, the requirement of manpower has been calculated accordingly and sufficient provision has been made for Auxiliary Equipment.

Accordingly CMPDI, RI-3 has prepared this addendum (option-9) in detail to the PR considering 330 working days per annum i.e.7 days per week round the year in Oct'2002. A brief summary of the report is given in Table-VI.

Table-VI

Sl No.	Particulars	Value (Oct'2002)
1.	Target Output (MTY)	
	- at 100% level of rated output	12
	- at 85% level of rated output	10.20
2.	Life (Years)	28
3.	Initial Capital Outlay (Rs. Crore)	1050.24
4.	Specific Investment (Rs./te)	
	- at 100% level of rated output	875.20
	- at 85% level of rated output	1029.65
5.	Capital Cost for P&M (Rs. Crore)	809.92
6.	Manpower Requirement (Nos.)	979
7.	O.M.S. (Te) (old)	46.43
8.	Cost of Production (Rs./te)	
	- at 100% level of rated output	291.54
	- at 85% level of rated output	324.43
9.	Av. Selling Price (Rs./te)	453.00
10.	Profit (Rs./te)	
	- at 100% level of rated output	161.46
	- at 85% level of rated output	128.57
11.	Financial IRR (%)	
	- at 100% level of rated output	29.94
	- at 85% level of rated output	21.94
12	E.M.S. (Rs.)	581.59

Further, CIL desired an exercise with the use of 20cum Elect Rope shovel +170T RD dumpers and 8.3cum hyd. Shovel+85TRD dumpers with Dragline for OB removal as envisaged in the Project Report prepared in Sept'2000 keeping all other conditions same as detailed in the option-9 of the report.

Accordingly, RI-III CMPDI prepared a draft exercise considering the above stated configuration of HEMM for OB removal. A brief Summary of the report is placed below:-

Sl.	Particulars	Option for 20cumShovel + 170 RD dumpers (Dec'02) draft
1.	Total Capital (Rs. In Crores)	921.36
2.	EstimatedCost of Prodn.(Rs./te.)	262.99
3.	Average Selling Price (Rs./te)	453.00
4.	Profit (Rs./te.)	190.01

The above draft exercise was discussed in ESC of CIL Board on 20/12/2002. The ESC of CIL Board recommended the above HEMM configuration for OB removal. Subsequently, RI-III CMPDI prepared the detailed Project Report considering the recommended configuration of HEMM. A brief summary of the report is given in Table-VII.

Table-VII

Sl No.	Particulars	(Dec'2002)
1.	Target Output (MTY)	
	- at 100% level of rated output	12
	- at 85% level of rated output	10.20
2.	Life (Years)	28
3.	Initial Capital Outlay (Rs. Crore)	969.13
4.	Specific Investment (Rs./te)	
	- at 100% level of rated output	807.61
	- at 85% level of rated output	950.13
5.	Capital Cost for P&M (Rs. Crore)	683.96
6.	Manpower Requirement (Nos.)	982
7.	O.M.S. (Te) (old)	46.29
8.	Cost of Production (Rs./te)	
	- at 100% level of rated output	265.41
	- at 85% level of rated output	295.99
9.	Av. Selling Price (Rs./te)	453
10.	Profit (Rs./te)	
	- at 100% level of rated output	187.59
	- at 85% level of rated output	157.01
11.	Financial IRR (%)	
	- at 100% level of rated output	33.30
	- at 85% level of rated output	25.37
12.	E.M.S. (Rs.)	575.28

Various equipment configurations were studied before reaching to a conclusion. Equipment configuration of 20cum rope shovel+170 T dumpers for Top OB and 8.3 cum hyd. Shovel + 85 T dumpers and a Dragline (20/90) for inter burden between seam II (Bot) & I (Top/Comb) were finally selected because of the reasons mentioned below:

1)The shovel dumper working is an established mining method in CCL.

2)Selected configuration is economical from point of view of capital requirement, operating cost and IRR.

3)Least equipment fleet and easy to manage.

4)Require less manpower and hence more productive.

5) ***Dragline deployment is found amenable in eastern sector of quarry only on parting between I(B+M+T) & IIB from 3rd year of operation with average***

parting thickness of 24m. No other place has been found appreciable for dragline deployment due to inconsistent thickness of parting.

An addendum to the above project report is required to be prepared in reference to the letter dated 30th April'2003 from Advisor (Projects), Ministry of Coal, Govt. of India addressed to the Chairman-cum-Managing Director of all subsidiaries of CIL. The letter states that CCL may revise Amrapali & Magadh OCP proposals as per revised HEMM productivity norms prepared by CMPDIL before these are sent for consideration of IMG.

In view of the above, an addendum has been prepared to the Project Report of Amrapali OCP prepared in December'2002 and CIL Board approved the same on 20.02.2003, as per the revised HEMM productivity norms of HEMM. A brief summary of the report is given in Table-VIII.

Table-VIII

Sl	Particulars	Value (June'2003)
1.	Target Output (MTY)	
	- at 100% level of rated output	12
	- at 85% level of rated output	10.20
2.	Life (Years)	28
3.	Initial Capital Outlay (Rs. Crore)	1000.95
4.	Specific Investment (Rs./te)	
	- at 100% level of rated output	834.13
	- at 85% level of rated output	981.32
5.	Capital Cost for P&M (Rs. Crore)	676.03
6.	Manpower Requirement (Nos.)	1001
7.	O.M.S. (Te) (old)	45.41
8.	Cost of Production (Rs./te)	
	- at 100% level of rated output	271.96
	- at 85% level of rated output	300.35
9.	Av. Selling Price (Rs./te)	453.00
10.	Profit (Rs./te)	
	- at 100% level of rated output	181.04
	- at 85% level of rated output	152.65
11.	Financial IRR (%)	
	- at 100% level of rated output	33.41
	- at 85% level of rated output	26.01
12.	E.M.S. (Rs.)	592.18

The above Project Report with Coal outsourcing option & CHP on 6 O.C basis was forwarded to Planning Commission by Department of Coal, Govt. of India vide letter no. OM No. 43011/19/2003 CPAM dated 17.9.2003 seeking " In Principle " approval of Planning Commission.

Reasons for preparation of Detailed Project Report April, 2005:

a) In-principle' approval of Planning Commission for Amrapali OC Project of CCL has been conveyed subject to certain additional information/clarifications (having bearing on capital cost to be sanctioned, operating cost and viability of the project), vide letter no. M-12026/19/2003-Coal, dated 2nd April, 2004.In the above letter Planning Commission desired that a revised project proposal incorporating clarifications raised is required to be prepared and submitted before the same is processed for investment decision of the Government.

b)Preparation of two additional options i.e. Fully departmental option & both outsourcing option with CHP departmental in all the three options as per decision taken in IMG meeting held on 4th November'2004 for Magadh OCP The minutes of meeting was circulated vide letter no. 43011/20/2003 CPAM dated Ist Dec'2004.

(c)Norms of bringing coal projects into revenue, circulated by Ministry of coal & mines, Dept of coal vide letter no. 43011/5/2001-CPAM dated 24th Nov.2004

Considering the points mentioned above detailed Project Report has been prepared for consideration.

Scope of the Project Report:

The Project Report envisages three alternative options of mine operation & capital investment for consideration and to take investment decision.

I. **Fully Departmental option:**

The option envisages all mining operations including coal handling & dispatch to be carried out internally (departmental) for which capital requirement till the year of achieving the rated capacity of coal production and the corresponding OB removal in that year have been provided in the investment proposal. The

capital requirement beyond the year of achieving the rated capacity is proposed to be provided from the retained earnings of the project.

II. **Outsourcing options:**

Outsourcing is an agreement where an external agency provides services for a client that were previously carried out internally. The coal sector has been posed to embrace outsourcing due to high initial capital. Outsourcing has been seen as a cost-reduction strategy. Although we will reduce costs, our far-reaching agreement is much broader. Keeping in mind of rapid growth acceleration in coal demand in near future in the country, "following alternative outsourcing options considering outsourcing of different mine operation & Coal Handling and dispatch has proposed departmentally.

i. **Coal Outsourcing option:**

The option envisages outsourcing of total coal production which includes:

a. Drilling face preparation.
b. Blast-hole drilling as per requirement dealt in Project Report.
c. Heavy Blasting operation under supervision of Mine Officials.
d. Coal loading at face and transportation of coal from coal face to pit top CHP.
e. Stray pumping, coal haul road maintenance including dust suppression and coal quality control measures.
f. Major Maintenance of HEMM deployed for OB removal.
g. All the above operations must be compatible with envisaged mining system, HEMM configuration and excavation calendar plan as proposed in the Project Report.

All the balance activities to achieve rated capacity of coal production & dispatch to customer on sustainable basis are proposed to be carried out departmentally for which initial capital investment has been provided in the proposal till the year of achieving rated coal production. The capital requirement beyond the year of achieving rated coal production has been proposed from retained earnings of the Project. The major activities to be carried out departmentally are listed below:

a. Total Overburden removal, which includes drilling, blasting, excavation, dumping, haul road maintenance including dust suppression.

b. Stray dumping in OB benches and main sump dumping.

c. Quarry lighting including OB dumps and at all other places where mining activities or mining related activities are carried out.

d. Storage & handling of explosives required for blasting.

e. Main Electrical Substation at full load with incoming power supplies arrangement.

f. Coal Handling Plant.

g. Implementation of approved Environmental Management Plan.

h. HEMM & Manpower for reclamation.

i. Land acquisition & rehabilitation of Project Affected Families.

j. All statutory clearances and lawful requirement.

ii.Both outsourcing option:

The option envisages outsourcing of total coal production & OB removal including mine dumping, which includes:

a. Drilling & face preparation.

b. Blast hole drilling as per requirement dealt in Project Report.

c. Heavy blasting operation under supervision of Mine Officials.

d. Coal loading at face and transportation of coal from coalface to pit top CHP.

e. Total Overburden removal that includes drilling, blasting, loading transport and dumping as per requirement of Project.

f. Stray dumping in coal & OB benches and main sump dumping.

g. Coal & OB haul road maintenance including dust suppression and coal quality control measures.

h. All the above operations must be compatible with envisaged mining system, HEMM configuration and excavation calendar plan as proposed in the Project Report.

In this proposal broadly, total mine operation has been outsourced except coal handling and dispatch to customer on sustainable basis for which initial investment has been provided in the proposal till the year of achieving rated coal production. The capital requirement beyond the year of achieving rated coal production is proposed from retained earnings of the Project. The activities to be carried out departmentally are listed below

a. Quarry lighting including OB dumps and at all other places where mining activities or mining related activities are carried out.
b. Storage & handling of explosives required for blasting.
c. Main Electrical Substation at full load with incoming power supplies arrangement.
d. Coal Handling Plant.
e. Implementation of approved Environmental Management Plan.
f. Reclamation HEMM.
g. Land acquisition & rehabilitation of Project Affected Families.
h. All statutory clearances and lawful requirement.

Company preferred to implement the project considering the Coal Outsourcing option (Coal Outsourced and OB removal departmental) due to Socio- Political reasons prevailing in the geographical area under consideration. Above all, the company has experience in outsourcing coal loading and transportation from face to dispatch point. This option had been successfully tried in the past in the company.

In all these options, where outsourcing is envisaged, it is presumed that all the statutory requirements are fully met with. No proposal, under any circumstances, should be considered which might be viewed/deemed to be against law or is appearing to be circumventing the provisions of applicable statute.

3.0 Reserves, mine boundaries and Mining Method:

Different variants have been considered for working this mine before reaching to selected option of coal outsourcing with shovel dumper combination and one

20/90dragline.The selected variant (main variant) has been proposed to work this mine considering 330 working days per annum. Coal winning has been proposed to be outsourced. Outsourcing of coal winning shall be done compatible with the proposed mining system of coal and OB removal.

The main OB (Top OB) will be mined and transported by 20 cu.m Rope. Shovel + RD-170T (EWD) Dumpers.

Intervening small partings will be mined and transported by 8.3 cu.m Hyd. Shovel+ RD-85T Dumpers & 20/90 Dragline for Parting between Seams II(B) & I(B+M+T).

CHP has been proposed to be constructed on departmental basis in all the three variants.

This variant of HEMM configuration is economical from the point of view of capital requirement, operating cost, IRR and less manpower. CCL & CIL Board, (considering the operational and administrative feasibility of implementing the different variants), has approved this variant. However, two additional variants :

1. Fully Departmental-Variant-I
2. Both Outsourcing-Variant-II,
   - Coal & OB outsourced
   - CHP & Railway Siding departmental

have also been given in the proposal.

3.1 Mine Boundaries:

Although 3 alternative mine boundary have been examined in the PR whereas in the selected alternative, the northern floor boundary has been fixed along the incrop of seam-I (B)/(IB+IM+IC) Combined. The eastern surface boundary has been fixed leaving a surface barrier of 60m from Barki River. The western surface boundary has been fixed leaving a surface barrier of 60m from Bahut Chuha nala.The Southern floor boundary has been fixed along the FRL of 340m (on seam I(B)/(IB+IM)/(IB+IM+IT) floor, corresponding to a maximum depth of 135m. This alternative has been selected because of the better economical viability even if life of mine is less compared to other alternative. There is potential to extend mine life in dip side considering techno-economics at that time horizon. A geological map (1:10000) has been enclosed showing mine boundaries of all the three alternatives for appreciation in choosing the most optimal alternative mine boundary.

Mine boundary with Koyed block was rejected as this alternative involves shifting of highly populated Koyad village and diversion of Bahut Chuha Nallah. The detail of all the three alternatives has been shown in chapter –V of the Project Report.

The reserve beyond 135m depths is opencastable. The depth of the mine has been fixed keeping in mind the economic life in the range of 25-35years at the targeted production depending on the availability of reserves, selection of mining technology and coal evacuation plan. Planning beyond 30-35 years may become superfluous even if the reserve is available and economical in to-days context. It is suggested that reserves available beyond southern boundary shall be exploited by opencast method in 2nd phase after exploring the techno economic feasibility of the mine at that time horizon.

3.2 Reserve Estimation :

Total Excavation method – Total volume of a mine within defined boundary is calculated by total iso-excavation lines as mentioned in total excavation plan of project report. Volume of coal is calculated from isochore plans of coal seams considered for mining. The difference between volume of total excavation and volume of coal gives volume of OB.

Sector wise and seam wise/parting wise volumes within mine boundary of both coal & OB are calculated from isochore plans for coal seam & iso-parting plans of overburden/inter-burden. The results of these calculations are compared with the result of total excavation method.

Further, these results are also compared with results of sector-wise volume calculated by cross-sectional method.

The reserves have been cross checked, later using MINEX software.

3.3 Introduction of Dragline :

Amrapali opencast project is the first project of CCL selected for dragline operation. The parting between IT I(B+M+T)-II(B)will be handled by 1 no. of dragline of 20m³ /90m as this parting in eastern quarry is amenable to be worked by dragline. Dragline operation has been restricted in the area of average parting thickness of 23m. There is very small area in eastern quarry proposed to be handled by dragline where the parting thickness betweenIT/ I(B+M+T)-II(B) exceeds from 23m to

31m.There is no other area in the quarry where dragline can be deployed gainfully. It is proposed that the dragline will handle OB of 60 m cut-width and side cast into exposed coal floor of IB/I(B+M)/I(B+M+T) seam. A coal rib will be left to guard the dragline dump, which will result a coal loss of 2.7% of seam-I (B). 40 m wide side berm is proposed for movement of dragline at the end of cut.. The dragline will be deployed from 3rd year of quarry operation and it will work along the strike direction.

3.4 Construction Period:

Location of Amrapali Opencast project is completely in a green field area and hence various development activities are required to be undertaken to produce and despatch coal on sustainable basis. However, some activities e.g. land acquisition, temporary power supply arrangement, survey route finalisation for Nallah diversion, route alignment for approach road have been under taken under Advance Action Proposal but all the above activities can not be completed within the Advance Action Proposal due to capital requirement and time constraint. It is therefore prudent to keep four years of construction period for infrastructure development. Most of the basic infrastructure facilities like CHP, railway siding, development activities, service buildings, water supply, power supply etc. would need to be completed within the construction period.

3.5 Capacity Built up period:

The capacity built up period has been optimised and the rated capacty of the project shall be achieved in 7th year from date of approval.

3.6 Grade of Coal :

Even though grade of coal varies from E to G, the product Mix quality of the Amrapali OCP will be grade F (. Avg. UHV 2659 KCal/Kg & Avg Gross Cv 4038KCal/Kg) with corresponding average ash of 40.61 %. With the assumed dilution while mining 0.15 m of non-combustible material (0.15 m at roof and floor with 75% Ash) there will be dilution of ash to 42.16 %. Even with this dilution the product mix quality is likely to be grade F (UHV around 2447 K Cal/Kg). Hence uniform sales realization has been considered based on grade F.

4.0 Present Status of the Project:

4.1 Approval Status of the Project Report:

Sl.	Particulars	Date
1	Approval by CCL Board	21.6.2002
2	Approved by ESC of CIL Board with certain directives in the 60th meeting	20.12.2002
3	PR formulated accordingly and again approved by CCL Board	27.12.2002
4	Approved by CIL Board (206th meeting)	20.2.2003
5	Addendum to PR made as per directive incorporating revised productivity norms and sent to MOC along with IMG note	31.7.03
6	For obtaining IN PRINCIPLE APPROVAL PR sent to Planning Commission	Oct'2003
7	IN PRINCIPLE APPROVAL obtained subject to additional information/clarification	2.4.2004

4.2. Land Acquisition:

(a)Forest Land (690.17 Ha.excluding 102.90Ha required for Rly. Siding.):

Revised application for Ist 10 years of forest land (495.65 Ha) has been submitted on 30.04.04. Site inspection has been done by DFO on 17.06.04 and subsequently his recommendation to CFC Hazaribagh has been sent. Application has reached to RCCF level.

(b)Non-Forest Land (556.9 Ha. excluding 76.10Ha. land required for Rly. Sidind):

Land proposal for authentication of ownership of 1297.43 Ha. Submitted. Authentication report of 157.67 Ha. Of land have been received. For balance 1137.76 Ha. Of land authentication of ownership is to be received from state Govt.

4.3 Rehabilitation (451 Families):

About 451 Project affected families have been estimated based on preliminary survey in the PR from various villages falling in the mine. The detail of PAFs village wise is placed below:

Sl.	Village	No. Of PAFs
1	Ursu	58
2	Bingalat	31
3	Kumrang Kalan	155
4	Kumrang Khurd	111
5	Honhe	96
	Total	451

4.4 Sanction of EMP:

NOC has been obtained from Jharkhand Govt. on dt. 9.6.2003. EMP has been sent to MOEF on dt. 19.6.2003. Application for site clearance submitted to MOEF in Sept'03. Site clearance granted by MOEF vide no. J. 11016362004-IA.II (M) dated 20.8.04. Revised EMP incorporating one season AAQ prepared.

4.5 Other Infrastructural Development:

Basic infrastructures such as alignment of Railway Siding, approach road, initial power supply arrangement, water supply arrangement etc. are being carried out.

CHAPTER – II

2.0 LOCATION,COMMUNICATION, TOPOGRAPHY AND CLIMATE:

2.1 Location:

The proposed Amrapali OCP is located in the northern fringe of the N.K. coalfield and lies in the Chatra District of Jharkhand. The Amrapali block covering an area of 10.11 sq.Km (coal bearing 9.28 sq. Km) is bounded by Latitude 23° 51' 31" & 23° 53' 38" N and Longitude 85° 00' 05" & 85° 02' 07" E. The Kishanpur block (5.89 sq. Km) having coal bearing area of 5.45 Sq.Km is limited by the Latitude 23° 51' 56" & 23° 53' 30" N and Longitude 84° 58' 55" and 85° 00' 05" E. The Amrapali OCP is enclosed by Pachra block on the east and Koed block on the west. The block is covered by Survey of India Topo Sheet No.73-A/13(RF 1:50000) and special sheet no. 12 & 13 (RF 1:10000). The surface contours and other surface features of the OCP have enlarged photographically from the above topo sheets.

2.2 Communication:

The metalled road connecting Tandwa with Hazaribagh (80 Km.) via Semaria passes through the block. Another metalled road connects Tandwa with Hazaribagh (50 Km.) via Barkagaon. Tandwa is also connected to Ranchi (92 Km.) via Khalari (28 Km.) and Bijupara by metalled road.

Nearest railhead is Ray Station at a distance of about 34 Km. from the block on Barkakana Dehri-on-sone loop line of the eastern railway. Tori is another nearby Railway Station located south of the block at a crow fly distance of about 52 km.

2.3 Topography

The Amrapali and Kishanpur blocks are characterised by more or less flat terrain with gentle undulation. In general ground slopes towards south. The maximum and minimum elevation is 497, 440m and 501m, 449m respectively.

Chundru and Barki rivers flowing west to east and north to south respectively control the drainage of the block. The Chundru River marks the Southern boundary of the block whereas Barki River is the eastern limit of the property. Besides, there are some small seasonal nalas, which discharge their load into main nalas of the block.

All the nalas of the block are seasonal except Chundru and Barki River, which are perennial

The drainage of Kishanpur Block is controlled be Chundru river and Bahutchua nala flowing west to east and north to south respectively

2.4Climate:

The climate is tropical with severe summer. The temperature during summer (March to June) goes as high as 45° C. The summer is very hot and dusty. But nights are generally pleasant. The winter (November to February) is cold and minimum temperature is 1°C. The rainy season is generally from June to October. The total rainfall in a year on an average is about 1011 mm of which 69% precipitation is during rainy season.

CHAPTER – III

3.0 GEOLOGY:

3.1 Introduction:

The northern part of North Karanpura comprising Magadh and Amrapali Blocks with an area of about 30 sq. km each were identified as potential blocks for detailed exploration. These two blocks constitute major blocks with substantial reserve potentialities, which required further drilling. Sequel to initial drilling the area was divided in to smaller geological blocks, The reference of Amrapali before initiating detailed drilling is a reference of the original major block covering an area of around 30 Sq Km.

Accordingly, detailed drilling in Amrapali block (area 30 sq Km) was taken up by CMPDI in December'83. The drilling data generated for the block by end of the Dec.'1986 indicated the block is sub-divisible into four smaller sub- blocks viz. Manatu (4.45 Sq.Km) Koyad (7.86 Sq. Km), Kishanpur (5.89 Sq.Km) Amrapali (10.11 Sq.Km) based on major faults, nalas and other surface and sub -surface information's. The positions of these blocks have been shown in the location plan of North Karanpura coalfield.

Amrapali geological block is located between longitude 85^0 00' 05" and 85^0 02' 07" E and Latitude 23^0 51' 31" and 23^0 53' 38"N covering an area of 10.11 Sq Km. Kishanpur block is situated between 84^0 58' 55" and 85^0 00' 05"E and Latitudes 23^0 51' 58" and 23^0 53' 30"N covering an area of 5.89 Sq Km. Amrapali block is contiguous to Kishanpur block in the west, Pachra block in the east and Kasiadih UG block in the north.

The detailed exploration in Amrapali geological block was undertaken by CMPDI during June 1984 to June 1991 and in Kishanpur geological block during September 1984 to November 1990 in different phases. The Geological Report on Amrapali block was submitted by CMPDI in October, 91 and Geological Report for Kishanpur block was submitted in March, 91byCMPDI . Amrapali OCP (4.5 MTY) comprising area of Amrapali and Kishanpur geological blocks was prepared in January 1992. The project was planned to mine the reserves up to a

depth limit of around 75-80m in both Amrapali and Kishanpur blocks keeping seam-I Bottom as base seam.

Keeping the increasing demand of power grade coal and simple structure in both Amrapali and Kishanpur geological blocks it has now been planned to exploit the down dip reserves up to a depth of around 130-140m keeping seam-I Bottom as base seam & I Middle +Bottom/I Top+ I Middle +I Bottoms where the I Bottom seam combines with upper seams to form the composite seam .The base seam I Bottom has been proved in Amrapali block up to a depth of 255 m and up to 225 m depth in Kishanpur block respectively .

The Amrapali geological block falling in the east of Kishanpur geological block is contiguous blocks, which have been separated by an arbitrary line. The northern boundary of both Amrapali & Kishanpur geological block is separated by Kasiadih U/G, the southern boundary of both the blocks are limited by Chundru Nadi which flows close to Barakar /Barren Measure contact .The eastern limit of Amrapali geological block is separated from Pachra block by Barki Nadi.The western boundary of the Kishanpur geological block is along Bahutchua Nala, which separates Koyad geological block.

The quarry envisaged in the Amrapali geological block is designated as **East quarry** of Amrapali OCP and the quarry falling in the Kishanpur geological block has been designated as **West quarry** of the proposed Amrapali OCP (12 MTY). Both the quarries are planned keeping seam I Bottom as base seam and I Midlle and Bottom &I Top+Middle +Bottom composite where I Bottom combines with upper seams The base seam and is proposed to exploit the seam up to 135 m depth on techno –economical consideration. The balance reserve in both Amrapali and Kishanpur geological blocks beyond the planned quarry shall be mined in second phase on completion of the proposed OCP .A safe barrier with the proposed quarry has been left along the Barki River in the east and Bahutchua Nala in the west.

3.2 Geological Structure:

The surface and sub-surface data generated from Amrapali and Kishanpur Blocks indicate a simple geological structure. Almost entire block has been covered by the Barakar formations containing five coal seams, which are designated as seam-I to seam-V in the ascending order. Seam-V occurs in two splits, V top & V Bottom in Kishanpur block only. This seam is less than 1m and lies with substantial parting of 120 to 130m with seam IV hence seam V does not have opencast potentiality. Seam. I to IV within Barakar formation are potential quarriable seams.

The Barakar formation rest directly on Metamorphics in the Kishanpur block where the Karharbari formations are inconclusively deciphered. However, The Talchir formations are developed in both Amrapali and Kishanpur blocks. Karharbari formations occur in the adjoining Amrapali block but do not contain any potential coal seam One Dolerite dyke occurring in adjoining Koyad block disappears on reaching Kishanpur block. However, a small segment of the incrop of Seam-I Bottom seam is found to have been affected by the dyke in the northwestern part of Kishanpur block.

Strike:

The strike of the formations in the Amrapali and Kishanpur Blocks are roughly E-W in the major part of the area. Local swings in strike to WNW-ESE have been observed in the western part of the Amrapali block.

Dip:

The dip of the formation generally varies from 5^0 to 10^0 towards south in Amrapali and Kishanpur blocks.

The local variations in the dip and strike observed in the block are mainly due to rolls and increase and decrease in the intervening partings between the seams.

Faults:

The details of the faults in Amrapali & Kishanpur geological blocks are summarized in table below

Table No.3.1

Fault No.	Trend	Dip Direction	Throw (m)
Amrapali Block			
F1 – F1	NNE–SSW	North-Westerly	0-20
F2 – F2	NE – SW	North-Westerly	0-8
F3 – F3	NE – SW	North-Westerly	15-20
F4 – F4	NE – SW	North Westerly	30-40
F5 – F5	NE – SW	South-Easterly	30-40
F6 – F6	NE-SW	Northerly	50-130
Kishanpur Block			
F1 – F1	N – S	Westerly	5-25
F2 – F2	This fault represents continuation of fault (F6) from Amrapali block located in the southern part.		

The proposed Amrapali OCP is almost free from faults except fault F1, F2, &F3 of Amrapali block which are located in the eastern part of the proposed OCP.

3.3 Drilling:

The details of drilling in the Amrapali and Kishanpur geological blocks are summarized in the Table below: -

Table No.3.2

Details of drilling in the Amrapali and Kishanpur Blocks

Blocks	Agency	Period of Drilling	No of Boreholes	Meterage Drilled
Amrapali	G.S.I	1968-69	2	400.85
		1980-81	2	335.7
	Total		**4**	**736.55**
	CMPDI	June 1984-June1991	82	9295.85
	Sub-Total		**86**	**10032.4**
	B.H.Drilled outside Block		13	2601.55
	Grand Total		**99**	**12633.95**
Kishanpur				
		1980-81	1	241.25
	Total		**1**	**241.25**
	CMPDI	March 1983-June 1988	58	8515.6
	Sub-Total		**59**	**8756.85**
Amrapali and Kishanpur	**Grand Total**		**158**	**21390.8**

Out of 82 boreholes drilled by CMPDI in the Amrapali geological block only 2 boreholes (CNKM-5-7) are non-coring and rest of other boreholes were coring. The Non coring boreholes have been logged geophysicaly. All the 59 boreholes drilled in the Kishanpur geological block are coring in nature. The composite geological plan of Amrapali and Kishanpur blocks indicate borehole location, incrop position and other relevant features.

Out of 158 boreholes with a total of 21390.80m drilled in Amrapali and Kishasnpur geological blocks 7676.25m were drilled in 85 boreholes in Amrapali OCP covering an area of 8.31 Sq. Km. The average density of boreholes in the Amrapali OCP is 11 boreholes per Sq. Km.

A total of 4101.95m of drilling was done 47 boreholes in **East-quarry** (4.94 Sq Km) and a total of 3574.30m were drilled in 38 boreholes in the **West – quarry** (3.37 Sq Km) of the proposed Amrapali OCP.

Proved category of reserve along with sufficient number of boreholes analysed for the Proximate, Ultimate, and Special test give assured qualitative and quantitative assessment within Amrapali and Kishanpur geological blocks as well as in the East and West quarries of Amrapali OCP planned within these geological blocks.

3.4 Sequence of Coal seam and Parting:

The sequence of coal seams and partings as established in East-quarry and West-quarry are summarized in Table 3 .3 are based on the sub surface information of 85 boreholes drilled in Amrapali OCP of which 47 boreholes falling in East-quarry from the Amrapali geological block in 38 boreholes in the West – quarry falling in the Kishanpur geological block.

The table 3.3 shows the range of variation of thickness and parting in the Amrapali and Kishanpur geological block as well as in the East and West quarries of Amrapali OCP

Table no.3.3

Amrapali Geological Block				East -Quarry		Kishanpur Geological Block				West -Quarry	
Seam/ Parting	Intersection	Thickness Range (Inband)	General Th (Metre)	Thickness/ Parting	Intersection	Seam/ Parting	Thickness Range (Inband)	Intersection	General Th (Metre)	Thickness/ Parting	Intersection
V Top							0.26-0.45	2			
Parting							5.69				
V Bottom							0.8-0.87	3			
Parting							121.69-131.84				
IV	44	3.99-7.15	5.0-6.5	4.40-7.15	27	IV	3.54-7.77	27	5.0-7.0	3.54-7.45	11
Parting*		1.65-9.47		3.0-7.15		Parting*	5.55-18.68			5.55-6.36	
III Top	3	2.83-4.55	3.5	2.83	1	III Top	2.09-2.58	2	2.0	2.09-2.58	2
Parting		Nil-2.22		0-1.20		Parting	0-2.27			0-2.27	
III Bottom	3	3.62-4.55	4	3.62	1	III BOT	3.23-5.23	3	4.0-5.0	3.23-5.23	3
III Comb.	42	4.68-10.24	6-8	5.0-10.24	28	III Com.	5.78-12.31	29	7.0-9.0	5.78-9.95	14
Parting		5.24-16.72		6.51-16.72		Partings	1.17-18.1			1.17-3.78	
II Top	50	1.09-3.42	2-3	1.65-3.34	34	II Top	0.21-4.50	30	0.5-2.0	0.16-2.77	15
Parting		1.80-18.90		1.80-14.01		Parting	1.28-17.39			6.99-17.39	
II Bottom	50	0.44-5.67	2-4	0.45-5.67	35	II BOT	0.20-4.16	42	0.7-2.0	0.20-4.16	27
Parting**		4.35-32.97		4.35-30.87		Parting**	0.51-17.91			1.24-17.91	
I Top	20	1.53-9.44	3-6	1.53-9.44	9	I Top	1.85-9.33	43	4-.0-7 .0	1.85-9.33	26
Parting***		Nil-22.64		Nil-2.16		Parting	0-18.47			0-18.47	
I Top & Middle	24	8.28-17.13	11-14	12.42-17.13	18	I Top & Middle	11.16-13.58	4	11.5-12.5	11.16-13.58	4
I Middle	14	0.90-8.53	3.5-7.0	5.41-7.61	4	I Middle	0.26-7.61	46	1.0-4.0	0.26-7.61	31
Parting#		Nil-6.02		NIL-4.92		Parting	1.47-33.62			2.13-29.65	
I Bottom	43	3.87-11.98	6-9	5.0-11.68	22	I BOT	4.85-12.61	52	7.0-10	4.85-12.61	35
I Middle + Bottom	10	13.51-19.59	14-16	13.51-19.59	4						
ITop +I Middle + Bottom	20	19.36-27.14	23-25	20.19-27.14	12						
Parting#				63.5-71.53							
Karharbari				3 impersistent thin coal seam							

* Also includes parting between IV and III (Comb.).
** Also includes parting between II Bottom and I Top & Middle Comb./I Top, Middle & Bottom Combined.
*** Also includes parting between I Top and I Middle and Bottom Combined.
# Also includes parting between I Bottom and I Top and Middle combined.

3.5 Seam Description:

Barakar formation in the Amrapali contains only 4 seams (I to seam-IV) and Kishanpur geological blocks contain five coal seams, which are designated as seam-I to seam-V in the ascending order. Seam-V occurs in two splits, V Top & V Bottom in Kishanpur block only. This seam is less than 1m and lies with substantial parting of 120 to 130m with seam IV hence seam V does not have opencast potentiality. Seam I to IV within Barakar formation are potential quarriable seams in Amrapali and Kishanpur geological blocks.

Seam-I is the most important seam from thickness point of view in the proposed quarry area. It occurs in three splits i.e. Top, Middle and Bottom. The seam I Bottom seam is thickest and has thickness of 5 to 9 m in major part of Amrapali OCP. The seam-I Middle has a thickness varying from 3.5 m to 7m in East quarry and 1-4 m in West Quarry. The seam-I Top has thicknesses of 3-6 m in the eastern part of Amrapali OCP. The Middle section has combined with Top section in major part of East Quarry. in few boreholes in the west quarry with a composite thickness of around 11 to 14m. Similarly I Middle and Bottom seams have combined in some isolated portions of East Quarry with a thickness of around 14 to 18m. All the sections of seam-I are observed to have combined in a small area in the central part of the East Quarry having a thickness of around 23 to 25m.

Seam-II occurs in 2 splits, designated as II Top and II Bottom seams. The seam-II Bottom has normal thickness of about 2 to 4m in the entire Amrapali OCP with some exception where the thickness' has been reduced to less than 1 m Seam-II Top has thickness of 2 to 3 m in the East Quarry, but in West Quarry the thickness of the seam is less than 1 m in major part of the area.

The seam-III occurs as unsplitted composite seam in the almost in the entire Amrapali OCP with a general thickness of about 6 to 9m. The splitting of the seam in Top and Bottom section has also been observed in a small area located in south central part in the East Quarry and west central part in the West quarry.

Seam-IV is the top most seam in Amrapali OCP. The seam does not show any splitting like underlying seams and has thickness varying from 5 to 6m. The range of thickness and parting Amrapali OCP has been given in table 3.3.

3.6 Details of Dirt-Band:

The details of dirt bands in the East and West Quarry of Amrapali OCP have been summarized in the Table-3.4. It is observed that by and large seams considered in the proposed opencast do not contain dirt bands >1m except for some isolated cases. Seam-I and their splits and seam-II Bottom seams are highly interbanded where the band forms up to 25 to 34% of total seam thickness both in East and West quarry.

Table no. 3.4

Details of Dirt Bands

Seam	Dirt Bands < 1m			Non Combustible Dirt Bands			Avg. Band %
	No	Thickness	%	No	Thickness	%	
East Quarry							
IV	1-8	0.15-0.87	3.41-13.5	Nil-2	Nil-0.68	Nil-13.41	12.2
III T	2	0.16	6.72	-	-	-	6.72
III Bott.	4	0.64-1	17.68	-	-	-	17.67
III Comb	Nil-11	Nil-1.58	Nil-20.95	Nil-4	Nil-0.90	Nil-11.63	14.18
II Top	Nil-3	Nil-0.25	Nil-11.79	-	-	-	4.78
II Bott.	1-14	0.05-1.74	2.35-32.7	Nil-2	Nil-0.34	Nil-15.34	18.13
I Top	1-5	0.09-2.07	5.88-34.08	Nil-1	Nil-0.27	Nil-4.65	22.15
I Midd.	1-9	0.2-1.24	2.84-16.10	Nil-1	Nil-0.26	Nil-3.38	10.59
I Top+I Mid.	2-25	0.84-4.28	5.83-30.55	Nil-4	Nil-3.23	Nil-22.89	22.28
I Bot.	1-19	0.25-3.92	4.19-32.72	1-8	0.45-2.26	4.17-22.71	21.49
I Mid.+ IBot Comb.	4-17	1.35-4.97	9.22-25.88	1-3	0.06-0.95	0.41-5.67	23.45
ITop+IMid +IBot. Comb.	13-27	4.0-7.14	17.96-26.31	1-8	0.47-1.57	1.88-6.47	27.66
West Quarry							
IV	2-7	0.37-1.39	4.97-26.63	Nil-3	Nil-0.37	Nil-7.96	19.37
III T	1	0.09-0.16	4.31-6.21	-	-	-	5.35
III Bott.	2-7	0.32-0.88	9.91-19.26	Nil-3	Nil-0.29	Nil-5.54	17.11
III Comb.	3-12	0.92-1.73	11.18-21.54	-	-	-	16.01
II Top	1-3	0.06-0.33	3.73-11.91	-	-	-	8.90
II Bott.	1-4	0.17-1.14	15.04-15.06	Nil-1	Nil-0.07	Nil-6.19	27.61
I Top	Nil-9	Nil-1.27	Nil-30.27	Nil-3	Nil-0.26	Nil-5.71	17.38
I Midd.	Nil-8	Nil-1.65	Nil-32.28	Nil-3	Nil-0.61	Nil-20.83	22.68
I Top+I Mid.	6-19	2.12-3.51	18.20-26.59	Nil-2	Nil-0.34	Nil-3.05	11.69
I Bot.	1-13	0.06-2.46	1.11-31.82	Nil-4	Nil-0.68	Nil-8.79	16.13

3.7 Quality of Seams:

The Table-3.5 and Table –3.6 gives summarized details of Proximate analysis / Ultimate Analysis, Special Test within the East quarry (Amrapali) and West quarries (Kishanpur) covering both the quarries of the Amrapali Opencast. Almost all the boreholes (except faulted, incrop boreholes) falling within the proposed quarry were analysed for the proximate analysis required for grade determination of different seams.

The quality details of different seams in East and West quarry based on boreholes falling within the quarry limits have been given in table 3.5 and in table 3.6 respectively.

Summarised details of Quality in East-Quarry

Table no.3.5

Parameters	II Top	II Bott.	I Top	I Midd.	I Top + I Midd.	I Bott.	I Midd. +I Bott.	I Top + I Midd. + I Bott.
Proximate Analysis On 60% RH & 40°C Including Bands								
B.H Analysed	32	33	9	4	17	20	4	11
Moisture%	3.6-7.8	3.2-5.5	3.5-3.9	3.8-4.8	3.5-6.0	3.0-6.6	3.5-3.8	3.6-5.1
Ash %	29.0-42.5	35.6-47.7	39.5-49.6	35.0-40.0	37.5-48.40	34.6-50.7	42.7-47.1	38.6-47.6
V. M%	21.6-25.5	19.8-24.5	18.4-21.6	23.1-24.6	20.3-22.5	19.8-23.9		21.4-23.0
U.H.V K. Cal/Kg	2495-3750	1780-3350	1515-2940	2855-3405	1655-2895	1390-3185	1915-2485	1835-2925
Grade	E-F	E-G	F-G	E-F	F-G	F-G	F-G	F-G
BCS Quality								
Moisture%	3.6-7.8	3.4-6.7	4.0-5.6	4.4-5.6	3.6-6.4	3.4-7.1	4.0-4.6	4.3-5.7
Ash %	29.0-42.5	32.4-47.0	30.9-39.8	33.3-36.3	33.7-38.3	33.9-47.3	33.8-40.9	32.5-39.5
V. M%	21.9-25.5	20.2-25.5	21.7-25.5	23.4-24.6	21.5-25.7	20.8-24.0		23.1-24.9
CV K. Cal/Kg	3990-4760	3480-4760	4050-4960	4325-4760	4130-4715	3380-4680	4125-4705	4210-4785
U.H.V K. Cal/Kg	2495-3710	1875-3740	2715-3985	3115-3670	2950-3615	1780-3575	2705-3160	2855-3740
Grade	E-F	E-G	E-F	E-F	E-F	E-G	F	E-F
Ultimate Analysis								
C%	81.5-86.7	82.1-85.2	82.9-85.4	82.9-85.3	82.9-85.3	82.1-86.5	*	82.3-85.1
H%	4.5-5.5	4.7-5.36	4.8	4.9	4.5-5.3	4.5-5.6		4.9-5.5
N%	1.7-2.1	1.6-2.0	1.6-1.8	1.5-2.0	1.9-2.0	1.6-2.0		1.7-2.1
S%	0.5-0.7	0.5-0.8	0.6-0.8	0.6-0.7	0.38-0.60	0.6-0.8		0.5-0.7
O%	7.4-11.1	7.8-10.7	7.4-9.9	7.7-10.0	9.8-9.9	7.6-10.7		9.9-10.5
CO_2	0.06-1.69	0.06-1.59	0.08-0.98	0.06-1.67	1.57-1.68	0.04-1.74		0.1-1.62
P%	0.028-0.08	0.62-0.111	0.2-0.59	0.065-0.16	0.097-0.102	0.033-0.09		0.035-0.06
HGI	55-59	55-61		55-82	58	58-60	*	58-60
Ash Fusion Range C°								
I.D.T	1170-1325	1190-1380	1270-1390	1170-1380	1270-1360	1150-1390		1170-1380
H.T	1280->1400	1340 -1400	1360->1400	1310->1400	1360->1400	1270->1400		1340->1400
F.T	>1400	>1400	>1400	>1400	>1400			>1400
Ash-Analysis								
Si02%	61.01-64.72	59.8-65.72	55.4-63.7	56.2-65.12	63.74-64.52	58.7-64.07	*	59.4-63.72
Al_2O_3%	24.74-28.42	23.96-28.4	23.3-30.5	24.79-29.2	26.12-26.42	25.01-29.4		26.47-30.40
Fe_2O_3%	2.72-4.92	3.42-7.0	5.8-8.6	2.11-7.2	2.52-4.12	2.04-6.9		3.17-5.2

TiO_2%	49-1.9	1.42-1.81	1.5-1.9	1.69-2.1	1.62-	1.67-1.89		1.58-1.9
Fe_2O_3%	0.20-0.67	0.1-0.47	0.47-2.4	0.42-1.0	0.37-	0.32-1.47		0.31-0.47
SO_3%	Traces-0.57	Traces-0.47	Traces-0.41	0.05-0.37	0.34-0.47	0.05-0.52		Traces-0.39
CaO%	0.30-2.84	0.4-2.1	1.61-3.0	1.09-1.5	1.32-1.71	1.0-1.87		1.0-2.07
MgO%	0.69-1.52	0.41-1.1	0.67-0.9	0.67-1.00	0.67-0.69	0.5-0.9		0.65-0.9
Na_2O%	0.62-0.79	0.31-0.59	0.64	0.49-0.62	0.48-0.78	0.46-0.49		0.42-0.68
K_2O%	1.05-1.42	0.59-1.6	1.12	0.74-0.98	0.68-1.44	0.69-0.82		0.75-1.22

*Not Available

Table No.3.5 (Continued)

Parameters	IV	III Comb.	III Top	III Bott.
Proximate Analysis On 60% RH & 40°C Including Bands				
B.H. Analysed	25	25	1	1
Moisture%	4.3-6.9	4.1-8.4	4.8	4.3
Ash %	28.1-39.9	29.7-42.4	33.2	38.5
V.M%	23.0-24.8	20.4-27.4	23.70	
CV- K Cal/Kg	4175-5185	3970-4835	4730	4305
U.H.V- K. Cal/Kg	2800-4330	2485-3620	3655	2995
Grade	D-F	E-F	E	F
BCS Quality				
Moisture%	4.7-7.5	4.9-8.4	4.8	4.3
Ash %	25.4-35.1	29.7-35.6	33.2	38.5
V.M%	22.5-25.2	20.4-24.9		
CV- K Cal/Kg	4535-5365	4420-4845	4730	4305
U.H.V- K. Cal/Kg	3405-4535	3475-3945	3655	2995
Grade	D-E	E	E	F
Ultimate Analysis				
C%	81.8-84.1	82.6-84.9	82.64-8.3	82.67-83.2
H%	4.5-5.2	4.5-5.0	4.6-5.0	4.6-5.0
N%	1.7-2.0	1.6-2.0	1.9	2
S%	0.5-0.7	0.6-0.8	0.8	0.8
OXYGEN%	8.7-10.4	8.3-10.2	9.7	9.4
CO_2	0.05-1.59	0.06-1.67	1.32	1.71
P%	0.066-0.79	0.07-0.178	0.59	0.07
HGI	54-59	55-59	57	60
Ash Fusion Range C°				
I.D.T	1160-1290	1150-	1170-1330	1200
H.T	1300->1400	>1400	1320->1400	1360
F.T	>1400	>1400	>1400	>1400
Ash Analysis				
SiO2%	54.7-65.92	56-64.32	62.98	64.11
Al_2O_3%	22.42-26.02	24.72-30.4	24.32	25.12
Fe_2O_3%	2.57-7.3	3.07-6.2	4.69	3.74
TiO_2%	1.52-1.62	1.6-2.0	1.71	1.61
P_2O_5%	0.41-2.8	0.34-1.4	0.43	0.47
SO_3%	Traces-0.37	Traces-0.47	0.37	0.32
CaO%	0.82-4.8	1.27-2.3	2.44	1.81
MgO%	0.37-1.4	0.5-1.0	1.72	1.24
Na_2O%	0.42-0.65	0.39-0.61	0.54	0.64
K_2O%	0.83-1.0	0.72-0.90	0.8	0.94

Table No.3.6

Summarised details of Quality In West-Quarry

Parameters	IV	III Top	III Bot	III	II Top	II Bot	I Top +Imid.	I Top	I Mid.	I Bot.
Proximate Analysis										
B.H Analysed	11	2	2	11	5	22	4	23	22	35
Moisture%	4.6-8.9	6.5	5.1-5.7	4.8-7.2	6.4-7.5	4.5-5.9	4.1-4.7	2.9-6.4	3.7-7.4	3.4-5.9
Ash %	29.7-40.4	28.6-32.2	37.1-39.7	35.9-44.6	32.2-35.3	40.1-47.7	42.5-46.6	28.0-47.3	26.0-49.8	31.4-49.2
V.M%	22.3-23.9	25.4	22.9	20.3-23.1	21.8-24.0	21.0-22.3	20.2-21.2	17.6-23.2	19.9-27.4	20.6-24.8
CV K Cal/Kg	3790-4465	4580-4780	4010-4080	3600-4170	4300-4435	3395-3900	3575-3870	3360-4990	3240-5030	3285-4775
UHV K.Cal/Kg	2415-3575	3560-4055	2660-3020	2025-3285	3145-3420	1660-2745	1905-2385	1890-4150	1450-4290	1505-3850
Grade	E-F	E	F	F-G	E-G	f-G	G	E-G	D-G	E-G
BCS Quality										
Moisture%	5.1-9.1	6.7-8.6	5.3-6.4	5.1-7.7	6.7	4.9-6.6	5.1-6.4	3.8-6.4	4.1-6.0	4.6-6.5
Ash %	27.8-39.1	26.2-30.8	33.6-36.3	31.2-39.8	30.2-30.8	33.3-42.3	35.0-38.9	28.0-43.8	28.4-45.8	29.6-41.3
V.M%	22.5-24.8	26.0	22.3-23.9	21.4-23.8	23.6-26.1	22.3-22.9	23.4-24.4	22.4-24.4	20.6-27.4	22.0-25.0
CV K Cal/Kg	3970-4810	4665-4970	4180-4425	3860-4515	4680-4740	3805-4505	3965-4520	3735-4990	3580-5010	3970-4785
UHV K.Cal/Kg	2870-3945	3710-4360	2885-3450	2580-3805	3725-3805	2330-3435	2650-3365	2195-4150	1960-4150	2540-4100
Grade	E-F	D-E	E-F	E-F	E-F	E-G	E-F	E-G	E-G	F-G
Ultimate Analysis (DMF Basis)										
C%	80.1-83.9	80.9	80.9	80.9-84.1	81.9-82.1	79.5-84.4	83.3	79.8-84.5	80.0-82.6	80.2-84.7
H%	4.4-5.3	4.5	4.4	4.6-5.3	4.4-5.2	4.4-4.6	5.0	4.4-5.27	4.5-5.1	4.4-5.2
N%	1.0-1.8	1.8	1.9	1.02-1.9	0.76-1.9	1.6-1.8	1.4	0.86-1.9	0.96-1.8	1.2-1.9
S%	0.4-0.5	0.6	0.5	0.39-0.6	0.54-1.0	0.5-0.6	0.8	0.47-0.8	0.5-1.1	0.6-1.2
OXYGEN%		12.2	12.3	8.8-12.7	11.1-11.5	8.8-14.0	9.5	8.7-13.5	10.6-13.2	6.2-13.1
CO_2	0.35-1.2	0.17	1.4	0.16-1.0	0.37-1.0	0.8-1.1		0.12-1.3	0.43-1.4	0.36-1.2
P%	0.19	0.17	0.09	0.167-0.24	0.037-0.17	0.08-0.18		0.04-0.20	0.16-0.27	0.11-0.27
HGI	59-64	58	55	60-62	59	59-62		54-62	57-59	58-62
Ash Fusion Range										
I.D.T	1160-1260	1150	1140	1160-1280	1250-1280	1150-1280		1180-1280	1170-1360	1150-1380
H.T	1220->1400	1290	1300	1310->1400		1310->1400		1320->1400	1290->1400	1290->1400
F.T	>1400	>1400	>1400	>1400	>1400	>1400		>1400	>1400	>1400
Ash-Analysis										
SiO_2%	63.56-6441	63.72	60.47	55.6-62.37	59.64-63.1	57.3-63.94		61.37-64.17	57.9-64.56	59.74-65.28
Al_2O_3%	23.98-24.11	24.32	26.89	23.68-29.8	26.79-27.6	24.47-29.6		23.47-27.87	24.72-29.7	23.12-29.12

Fe$_2$ 0$_3$%	3.89-5.12-	4.79	5.79	5.82-6.8	4.3-5.89	3.92-7.12		3.72-6.47	4.56-7.6	5.12-7.24
Ti 0_2%	1.55-1.59	1.62	1.54	1.65-2.0	1.62-2.0	1.19-2.1		1.32-1.59	1.54-2.1	1.42-1.72
P_2 0_5%	0.47-0.74	0.37	0.42	0.89-1.2	0.3-0.34	0.32-1.01		0.13-0.52	0.28-0.60	0.29-0.82
SO_3%	0.27-0.28	0.17	0.11	0.5-0.87	Traces-0.42	0.14-0.89		0.13-0.52	Traces-0.46	0.22-0.47
MnO%	1.79-2.67	Traces	Traces	Traces	Races	Traces		Traces	Traces-0.07	Traces-0.2
CaO%	0.07-Tr	2.54	1.98	1.89-1.9	0.7-2.18	0.82-2.64		0.84-2.42	1.1-2.46	1.32-2.61
MgO%	1.37-1.57	1.47	1.68	0.9-1.49	0.8-1.01	0.34-1.52		0.39-1.74	0.82-1.28	0.54-1.56
Na2O%	0.33-0.57	0.39	0.38	0.48	0.69	0.34-0.87		0.30-0.87	0.39-0.78	0.34-0.70
K2 O%	0.75-0.91	0.61	0.74	0.86	1.42	0.48-0.99		0.60-1.27	0.50-1.06	0.48-1.04
Maceral Composition										
Vitrinite%	43.5 (35.9)			48.0 (39.6)		54.5 (43.8)		57.1 (46.9)	56.2 (44.6)	39.1 (31.3)
Sub-Vitrinite%	2.3 (1.9)			0.8 (0.6)		1.1 (0.9)		0.6 (0.5)-	4.2 (3.3)	1.1 (0.9)
Exinite%	3.6 (3.0)			5.2 (4.3)		8.6 (7.1)		9.2 (7.6)	6.8 (5.4)	7.2 (5.8)
Inertinite%	50.6 (41.8)			46.0 (37.9)		35.6 (28.6)		33.1 (27.2)	32.8 (26.0)	52.6 (42.1)
Mineral Matter%	- (17.4)			- (17.6)		- (19.6)		- (17.8)	- (20.7)	- (19.9)

16 boreholes in the Amrapali Geological block were analysed for Ultimate analysis out of which 11 boreholes fall within the East Quarry. 7 boreholes were analysed for Ultimate analysis in Kishanpur Geological block out of which 6 boreholes fall within the West Quarry.

Sufficient number of boreholes were analysed for the Proximate, Ultimate, and special test in Amrapali and Kishanpur block and in East and West quarries of Amrapali OCP planned within these blocks.

3.8 Product Mix Quality:

The product mix quality of the Amrapali OCP will be grade F (Avg. UHV 2659 K. Cal/Kg & Avg. CV 4038 K.Cal/Kg) with corresponding average ash of 40.61%. With the assumed dilution while mining 0.15m of non-combustible material at roof and floor, there will be addition of ash and the weighted average ash of the product mix will be 42.16%. Even with this dilution the Product Mix Quality is

likely to be grade-F (UHV around 2447 K.Cal/Kg). The details of seam wise average quality/quality Mix Product is summarized in Table No.3.7.

Table No.3.7

Average Including Band Quality Details in Amrapali Quarry

Seam	Avg. M %	Avg. Ash%	Avg. VM%	Avg.CV (K.Cal/Kg)	Avg. UHV (K.Cal/Kg)	Avg. Grade	Avg. Band %
East Quarry							
I Bottom	4.3	42.11	22.1	3945	2496	F	21.49
I Middle	4.2	37.9	23.8	4378	3088	F	10.59
I Top	3.7	43.27	20.0	3953	2425	F	22.15
I Top+I Mid.	4.3	42.51	21.5	3913	2434	F	22.28
IMid.+IBot	3.6	45.14		3781	2170	G	23.45
I Top+IMid+IBot	4.3	43.75	22.1	3799	2273	G	27.66
II Bot	4.1	43.44	21.5	3857	2342	F	18.13
II Top	4.9	36.51	23.5	4354	3136	F	4.78
III	5.5	36.37	22.1	4328	3126	F	14.18
III Bot.	4.3	38.5		4305	2995	F	17.67
III Top	4.8	33.2		4730	3655	E	6.72
IV	5.2	33.43	23.5	4647	3570	E	12.2
Avg.East-Quarry	4.4	40.73	22.2	4069	2668	F	
West Quarry							
I Bottom	4.8	40.13	22.8	4051	2758	F	16.13
I Middle	4.6	41.7	22.4	3944	2505	F	22.68
I Top	4.9	40.6	21.5	3988	2613	F	17.38
I Top + I Mid.	4.5	44.96	20.8	3674	2072	G	11.69
II Top	6.9	33.75	22.9	4367	3282	F	27.61
II Bot	5.1	43.42	21.8	3659	2198	G	8.9
III Bot	5.4	38.76	22.9	4055	2798	F	17.11
III Top	6.5	30.4	25.4	4780	4055	E	5.35
III Com	5.8	39.82	21.5	3924	2603	F	16.01
IV	6.4	36.68	22.8	4132	2978	F	19.37
Avg.West-Quarry	5.1	40.4	22.2	3979	2641	F	
Avg.Amrapali Quarry	4.6	40.61	22.1	4038	2659	F	

It is evident from the table that all the major contributor seams of Amrapali OCP) falls in grade F except for seam IV in East Quarry.

3.9 BCS (barring carb shale) Quality:

It is quite evident from the above table that seams in the Amrapali Quarry are highly banded in nature. The BCS (barring carb shale) quality of different seams have been averaged to give the likely BCS quality of different seams in the East and West quarry. The summarized details of the BCS quality have been given in Table No.3.8.

Table No.3.8

Average BCS Quality details in Amrapali – Quarry

Seam	Avg. M %	Avg. Ash%	Avg. VM%	Avg.CV (K.Cal/Kg)	Avg. UHV (K.Cal/Kg)	Avg. Grade
East-Quarry						
I Bottom	4.7	37.28	23.1	4344	3101	F
I Middle	4.8	34.36	24.0	4598	3471	E
I Top	4.5	36.6	23.6	4452	3225	F
I Top+I Mid.	4.9	36.0	23.4	4433	3250	F
IMid.+IBot	4.0	38.04		4356	2974	F
I Top+IMid+IBot	5.0	35.5	23.94	4460	3308	F
II Bot	4.6	39.27	22.7	4172	2846	F
II Top	5.1	35.4	23.6	4416	3252	F
III	6.0	32.1	22.7	4645	3677	E
III Bot.	4.3	38.5		4305	2995	F
III Top	4.8	33.2		4730	3655	E
IV	5.6	29.86	23.6	4918	4.7	E
West-Quarry						
I Bottom	5.3	35.2	23.3	4408	3300	F
I Middle	5.0	37.6	23.0	4265	3018	F
I Top	5.4	36.2	23.1	4316	3156	F
I Top + I Mid.	5.5	36.70	23.8	4304	3080	F
II Top	6.7	30.5	24.6	4710	3765	E
II Bot	5.8	36.8	22.6	4098	2905	F
III Bot	5.8	35.3	23.1	4315	3220	F
III Top	6.7	28.5	26.0	4818	4035	E
III Com	6.6	34.6	22.6	4293	3214	F
IV	7.1	32.4	23.7	4429	3451	E

3.10 Physico-Mechanical properties:

Borehole cores of CNKA-59 were tested for various Physico-mechanical properties. These borehole falls in the southeastern part in the/Amrapali Block The test results of various physico-Mechanical properties viz., Uniaxial

Compressive strength, Sheer strength, Tensile strength, Bulk density have been summarized in the table no.3.9.

Table No.3.9

Particulars	Compressive Strength Kg/cm²		Tensile Strength Kg/Cm2		Shear Strength Kg/Cm2		Bulk Density T/cu.m	
	Range	Avg.	Range	Avg.	Range	Avg.	Range	Avg.
Conglomerates	28.60-65.52	41.82	7.02-11.47	9.1	24.49-54.88	39.68	1.90-2.09	2
Course grained Sandstone	83.58-122.91	99.83	4.81-13.0	8.94	53.58-71.11	62.34	2.11-2.26	2.16
Medium grained Sandstone	154.85-212.2	183.52	15.93-19.86	17.89	60.13-84.88	72.50	2.12-2.16	2.14
Fine grained Sandstone	63.73-162.85		7.29-28.43	15.07	115.91-162.61	139.4	1.87-2.17	2.04
Interbanded shale & sandstone	134.10-245.0	193.07	13.23-26.52	19.57	139.75-172.2	158.22	1.37-2.28	2.0
Sandy Shale	148.02-203.37	168.78	21.27-28.41	25.02	123.17-167.53	145.02	1.69-2.35	2.15
Grey Shale	99.63-268.02	188.27	12.96-38.10	23.9	52.14-180.18	124.44	1.43-2.30	2.11
Carbonaceous Shale	112.68-209.36	156.09	11.84-28.66	17.34	81.45-170.94	116.71	1.27-2.10	1.76
Shaly Coal	83.81-243.13	156.1	8.02-26.48	14.44	55.92-183.11	103.67	1.24-2.15	1.53
Coal	92.34-198.16	141.56	5.01-24.51	11.67	22.51-146.49	72.07	1.04-1.64	1.3

3.11 Reserves:

A total of 486.50 M.Tes of reserve has been proved in Amrapali geological block up to a depth of around 255.m & a total of 203.31 of M.Tes of geological reserve has been proved in Kishanpur geological block up to a depth of around 225 m.

A total of 689.81 mt of net quarriable reserve (486.50 mt o from Amrapali Geological block +203.31 mt of net quarriable reserve from kishanpur Geological block) is available from these two geological blocks up to southern leasehold

boundaries of these blocks. The quarriable reserve for both geological blocks has been considered up to the dip most geological boundary of the block.

From the available combined 689.89 Mt of net quarriable reserve from these two above blocks of which 291 mt of mineable reserve is planned in Amrapali OCP up to a depth of 135 m . The balance reserve falling in the dip side of the quarry may be planned for exploitation in second phase subject to techno economical viability of mining.

The seam-wise, Cut-off wise details of the proved net quarriable reserve available from the above two geological blocks along with Sp Gr considered for different seams have been summarized in Table No.3.10.

Table No.3.10

Seam-wise Quarriable Reserves in Amrapali and Kishanpur Geological Blocks:

Seam	Net Geological Reserve	Cut-off wise Net Geological Reserves					Sp Gr
		<1:2	1:2-1:3	1:3-1:4	1:4-1:5	>1:5	
Amrapali							
IV	58.83	16.34	21.42	11.37	5.14	4.64	1.61
III	78.84	23.1	27.75	14.64	6.81	6.54	1.65
III Top	1.8	0.13	1.12	0.32	0.23		1.63
III Bot.	1.98	0.16	1.29	0.33	0.2		1.68
II Top	23.04	8.64	7.28	3.66	1.64	1.82	1.66
II Bot.	30.64	14.51	10.57	3.56	1.6	0.4	1.71
I Top	29.75	6.5	5.63	7.42	5.32	4.88	1.72
I Mid.	25.97	7.9	6.81	6.22	3.59	1.45	1.69
ITop+I Mid.	60.25	27.6	21.17	10.57	0.91		1.71
I Bot.	72.48	31.31	20.84	12.91	6.02	1.4	1.71
I Mid+IBot	19.45	9.48	1.72	4.7	2.97	0.58	1.72
I Top+iMid+IBot.	83.47	38.67	38.1	4.47	1.53	0.7	1.72
Total	**486.5**	**184.34**	**163.7**	**80.17**	**35.96**	**22.33**	
Kishanpur							
IV	25.893	1.379	3.234	7.809	5.786	7.78	1.62
III Top	1.431		0.272	0.963	0.196		1.58

III Bot.	2.651		0.59	1.528	0.533		1.66
III Com.	42.539	2.632	5.886	12.489	8.524	13.008	1.66
II Top	4.126	0.66	0.535	1.214	0.83	0.887	1.65
II Bot.	4.219	0.356	0.673	1.689	0.678	0.823	1.70
I Top	31.395	2.181	5.194	10.752	6.967	6.301	1.69
I Mid.	14.813	2.711	4.249	4.596	1.576	1.681	1.70
ITop+I Mid.	6.66	3.893	2.745	0.022			1.72
I Bot.	69.49	8.409	13.263	21.842	11.334	14.641	1.68
Total	**203.31**	**22.221**	**36.641**	**62.904**	**36.424**	**45.116**	

The brief detail covering cut off wise Net Quarriable geological reserve and OB Amrapali & Kishanpur Geological blocks are summarized below:

Block	Total Quarriable net Geo Reserves	<1.2		1:2-1:3		1:3-1:4		1:4-1:5		>1:5	
		Coal Mt.	OB Mm3	Coal Mt.	OB Mm3	Coal Mt.	OB Mm3	Coal Mt.	OB Mm3.	Coal Mt.	OB Mt.
Amrapali	486.50	184.54	174.65	163.7	264.69	80.17	186.57	35.96	101.90	22.13	109
Kishanpur	203.31	22.221	25.149	36.641	61.821	62.904	149.313	36.424	109.435	45.116	1801

3.12 Surface Burning:

Surface burning has been noticed in the Amrapali block in two isolated patches. The first patch is around borehole CNKA-8,10,107 which has affected the incrop region of seam-I in Amrapali block. The other larger patch is around the boreholes CNKA-7, 64,277,318 and 325, which has affected the incrop region of seam-II Top, III and IV. In Kishanpur block burning has been noticed in a small patch around the borehole CNKA-19 & CNKA-20. The borehole wise depth of burning is given in table no. 3.11.

Table No.3.11

Depth of Burning in the Amrapali & Kishanpur Blocks

Block	Borehole No.	Depth of Burning (m)
Amrapali Block		
	CNKA-7	10.0
	CNKA-8	23.15
	CNKA-10	18.90
	CNKA-64	10.65
	CNKA-104	17.35
	CNKA-107	10.9
	CNKA-277	6.0
	CNKA-318	20.1
	CNKA-325	14.0
Kishanpur Block		
	CNKM-19	12.20
	CNKM-20	17.40

The depth of burning is seen to vary from 6.0 m to 23.15 .The burnt surface is characterized by fused mass of sandstone, shale etc, and has been considered as O.B. The incrop in the burnt zone is placed below the burnt zone forming OB and do not affect the reserve considered in proposed OCP.

Table- 4.1

Demand & Availability of Coal on CCL

Sl. No	Particulars	X Plan			XI Plan
		04-05	05-06	06-07	11-12
1	Demand Raw Coal	42.25	43.90	47.02	72.75
2	Availability(Raw Coal)				
	Existing Mines				
	UG	1.31	1.35	1.30	1.09
	OC	3.19	3.42	1.92	1.18
	Total	4.50	4.77	3.22	2.27
	Completed Projects				
	UG	0.55	0.55	0.52	0.26
	OC	27.76	28.80	27.64	25.68
	Total	28.31	2935	28.16	25.94
	On Going Projects				
	UG	0.68	0.69	0.93	0.97
	OC	1.12	1.19	1.29	1.57
	Total	2.00	2.08	2.22	2.54
	Future Projects				
	UG	0.00	0.00	0.00	0.00
	OC	5.20	5.80	10.40	36.25
	Total	5.20	5.80	10.40	36.25
	Grand Total CCL				
	UG	2.74	2.79	2.75	2.32
	OC	37.27	39.21	41.25	64.68
	Total	40.00	42.00	44.00	67.00
3	Surplus/Shortage				
	Raw Coal	-2.25	-1.90	-3.02	-5.75

4.2 Linkage

The total production of the proposed Amrapali OCP has been linked to Barh STPS of NTPC which is proposed to be located at a distance of 300 Km from the mine site. The commissioning schedule for Barh STPS(3x660MW) as per the letter no 01/FM/CCL/NK-Barh dated Feb-17 2004 from NTPC is given in table-4.2

CHAPTER IV

4.0 MARKETABILITY AND LINKAGE

4.1 Demand

Liberalisation of power sector by Govt. of India has generated wide spread interests for Private and Public sector investments in power generation. As such, there is an appreciable increase in the number of upcoming new thermal power projects in both Private and Public Sectors. This has resulted in a sharp increase in the demand of power grade coal in CCL. Opening of this Amrapali OCP is, therefore, proposed with a view to fulfil the above-indicated growth in demand.

Two power projects are proposed to be set up by NTPC under the Mega Power Policy of Govt. of India. The power projects are :-

(i) North Karanpura/Tandwa STPS (2000 MW)

(ii) Barh STPS (2000 MW)

Foundation stone of these mega power projects has already been laid on 6th March'99 by the then Prime Minister of India . Tandwa and Barh STPS have been linked to North Karanpura Coal field of CCL, which has huge reserves of power grade coal. The open cast projects are Magadh OCP, which is envisaged to feed coal to North Karanpura/Tandwa STPS and Amrapali OCP, which is envisaged to feed coal to Barh STPS. The requirement of power grade coal will be around 10 Mt. per annum for each STPS and with these objective in view, the above two OCP's have been prepared for a rated capacity of 12 MTPA each. It is envisaged that these two OCPs will be worked at an operating efficiency not less than 85%.

The total demand for CCL is projected as 47.02M.tes & 72.75 M.tes for the year 06-07, & 11-12 respectively where as the projected availability of coal for the year 06-07 & 11-12 is 44 M.tes and 67 Mtes respectively. The anticipated demand of coal for different thermal power stations & other sector demand in different plan periods on CCL, is given in table no.4.1.

Table-4.2

Commissioning schedule of Barh STPS & Projected Production Plan of Amrapali OCP

Calendar year	Amrapali Project Commissioning		Coal Prod.in MTY	Coal requirement for NTPC's Barh Power Project as discussed in the meeting between CCL & NTPC officials held on 8th/9th Feb'2005 at Ranchi.	Commn Sch of Barh STPS as per letter no. 01/FM/CCL/NK-Barh dated Feb-17,2004 from NTPC	Coal req. in MTY as per the letter no OS/PM/NP-Coal dated Aug,24,2000 from Director(Tech),NTPC
2004-05	Project Sanction		0.00			
2005-06	Y1		0.00			
2006-07	Y2		0.00			
2007-08	Y3	P1	0.00			
2008-09	Y4	P2	1.5	2.22	Ist Unit -June-2008	1.2
2009-10	Y5	P3	4.5	7.78	2nd Unit – March-2009	3.8
2010-2011	Y6	P4	8.0	10.0	3rd Unit –Dec-2009	6.8
2011-2012	Y7	P5	12.0	10.0		8.97
2012-13	Y8	P6	12.0			9.74
2013-14	Y9	P7	12.0			10

Amrapali OCP is a linked mine for the Barh STPS and hence, the schedule of opening of the Amrapali OCP was planned as per schedule of commissioning of power plant supplied by NTPC earlier. In the meeting held on 8th/9th February 2005, NTPC indicated increased year-wise demand of coal, hence there is likely to be shortfall in coal availability vis-à-vis requirement of Barh STPP during 2009-10 and 2010-11. This shortfall shall be made from the projected production schedule of Magadh Block after meeting coal requirement of NK STPP and other alternative sources of CCL. It was further indicated by CCL that for coal evacuation from Magadh Block for supply to Barh STPP, the necessary logistics/linking with the rail line shall be required, which need to be studied and finalised.

CHAPTER - V

5.0 MAIN TECHNICAL DECISIONS FOR THE QUARRY:

5.1 Rated Capacity:

The Project Report for Amrapali OCP has been prepared for a rated capacity of 12.0 MTY. of ROM coal. The rated capacity of 12.0 MTY of coal has been found technically feasible from this mine because of its favourable geo-mining parameters like long strike length(about 4.0 Km.) of the quarry, flat gradient of the seams(about3^0-7^0), deployment of higher size equipment, free from major geological distutbances, sufficient mineable reserves etc.

5.2 Design criteria:

The following design criteria have been adopted for the mining operations:

No. Of annual working days- 330

No. Of daily shifts- 3

Duration of each shift- 8 hours

The open cast mine would be worked on the 3-shifts/ day and seven days/week round the year.

5.3 Boundaries of the Mining Block:

5.3.1 Different Alternatives for the Fixation of Mine Boundaries:

Alternative-I

In this alternative, the northern floor boundary has been fixed along the incrop of seam-I (B)/(IB+IM+IT) Combined. The eastern surface boundary has been fixed leaving a surface barrier of 60m from Barki River. The western surface boundary has been fixed leaving a surface barrier of 60m from Bahut Chua nala. The Southern floor boundary has been fixed along the FRL of 300m (on seam I B/(IB+IM+IT) Combined floor), corresponding to a maximum depth of 170m.

Alternative-II

In this alternative, the northern floor boundary has been fixed along the incrop of seam-I (B)/(IB+IM+IT) Combined. The eastern surface boundary has been fixed leaving a surface barrier of 60m from Barki River. The western surface boundary has been fixed leaving a surface barrier of 100m from Koed village. In this alternative, the eastern part of Koed Geological block has also been considered for

exploitation. Koed village is an extensive village and it will not be possible to shift the village.

The Bahut Chuha nala flowing between Koed and Kishanpur Geological block will need to be diverted. The Southern floor boundary has been fixed along the FRL of 340m (on seam I B/(IB+IM+IT) Combined floor), corresponding to a maximum depth of 135m.

Alternative-III

In this alternative, the **northern floor boundary** has been fixed along the incrop of seam-I (B)/(IB+IM+IT) Combined. **The eastern surface boundary** has been fixed leaving a surface barrier of 60m from Barki River. The **western surface boundary** has been fixed leaving a surface barrier of 60m from Bahut Chuha nala.**The Southern floor boundary** has been fixed along the FRL of 340m (on seam I (B)/(IB+IM+IT)Combined floor), corresponding to a maximum depth of 135m.

The mineable reserves, volume of OBR and S.R. of the three alternatives mentioned above are as follows:

Particulars	Depth (m)	Strike Length (Km)	Coal (M.tes)	OBR (Mm^3)	S.R.. (M^3/te.)
Alternative-I	170	4.6	335.55	587.58	1.75
Alternative-II	135	6.2	337.10	573.56	1.70
Alternative-III	135	4.6	291.10	459.73	1.58

From the above table, it may be seen that the stripping ratio of alternative-III is the lowest, though the mineable reserves is also less as compared to the other two Alternatives.

Hence, the mine boundaries as per alternative-III have been considered in this project report because of the better economical viability. The life of the project as per this alternative will be 28 years; where as same as per the other two alternatives will be more than 30 years. More reserves are available in further dip side of the southern boundary. The dip side mine boundaries of the alternative-III can be extended to exploit the dip side reserves in phase-II. No external dumping/surface infrastructure will be formed/constructed in the dip side. The plan showing the final stage quarry boundaries are given vide Drg. No. RI-3/OC/2000/14.

5.4 Geological and Mining Characteristics:

The Geological & Mining Characteristics of the proposed Amrapali open cast (12.0 MTY) mine are given in table no. 5.1. A total no. of 8 coal seams are occurring within the above quarriable area. Out of these, seam-I(B),seam-I(C),& seam-III(C) are the thickest and most prominent seams. The coal horizons are dipping at a gradient of 3^0-7^0 towards the south.

Table 5.1

GEOLOGICAL AND MINING CHARACTERISTICS

Sl.	Particulars	Unit	Sections	
			Eastern	Western
I.	Thickness of Coal Seams (Ex- band thickness)	m		
1	I (B.)	m	4-8	6-10
2	I (M.)	m	5-7	6-7
3	I (T)	m	3-8	2-4
4	I (C)	m	14-20	-
5	II (B.)	m	1-2	1-2
6	II (T)	m	1-2	1-2
7	III (C)	m	6-10	6-10
8	IV	m	4-6	3-6
II	Thickness of OB & Parting			
1	Top OB	m	5-80	6-70
2	Part. betI (B) & I(M)	m	4-16	0-3
3	Part. betI (M) & I (T)	m	0-2	0-2
4	Part. betI (T) & II (B)	m	5-27	5-31
5	Part. bet II (B) & II (T)	m	10-14	2-12
6	Part. bet II (T) & III (Comb.)	m	6-10	6-8
7	Part. bet III (Comb.) & IV	m	6-9	5-8
III	Quarry Parameters			
1	Dip of the seams	Degree	3-6	6-8
2	Strike length	Km	2.4	2.2
3	Width	Km	1.4	1.4
4	Area of Excavation	Ha.	493.7	337.25
5	Maximum depth	m	135	135

5.5 Mineable Reserves - Volume of OBR - Stripping Ratio:

The total mineable reserves are estimated as 291.10 M.tes with a corresponding volume of OBR of 459.68 Mm^3 at an average stripping ratio of 1.58m^3/te. The break-up of the section wise seam wise coal reserves and total volume of OB/partings are given in table no. 5.2.

Mineable Reserves - Volume of OBR - Stripping Ratio — Table no.5.2

Sl. No.	Seam	Mineable Reserves (M.tes.)		
		Sections		Total
		East	West	
1	I (B)/I(B+M)/I(B+M+T)	88.47	40.41	128.88
2	I (M)	3.45	6.75	10.21
3	I (T)/I(T+M)	23.11	23.26	46.37
4	II (B)	12.93	1.81	14.74
5	II(T)	9.05	2.25	11.30
6	III (C)	29.73	18.1	47.83
7	IV	22.29	9.49	31.77
8	TOTAL	189.03	102.07	291.1

Sl.No.	Partings	Volume of OBR (Mm^3)		
		East	West	Total
1	I(B) - I(M)	7.69	26.26	33.95
2	I (M) - I(T)	0.56	15.40	15.96
3	I (T) -II (B)	66.29	18.02	84.36
4	II (B) - II (T)	20.62	26.31	46.93
5	II(T)-III(C)	20.81	15.94	36.75
6	III-IV	15.12	15.52	30.64
7	Top OB	134.86	76.28	211.14
8	Total	265.95	193.73	459.68
14	Stripping Ratio(m^3/te.)	1.41	1.90	1.58

The mineable reserves have been estimated by isochore method from the isochore plans of the different seams. OB volume of the different partings has been estimated by cross-section method (the quarry cross sections have been given vide Drg.No. RI-3/OC/2000/15-16).

5.6 Life of the Mine:

For the rated output of 12.0 MTY of ROM coal and with the mineable reserves of 291.10 M.tes, the life of the open cast mine is estimated as 28 years including the construction period. The life has been estimated from the year of start of excavation (year-3) excluding two initial years of construction without any excavation.

5.7 Sequence of Mining and Opening of Minefield:

The strike length of the proposed Amrapali OCP is about 4.6 Km. The quarry is envisages to work in two sections i.e. western section and eastern section. Eastern section will be started first. From the 5th year both quarries will work simultaneously.

It is proposed to make an initial box cut in the eastern section because of the following reasons:

(a)The stripping ratio of eastern section (1.41m^3/te) is less as compared to that of western section (1.90m^3/te).

(b)A small area of non-forest land is available beyond the northern eastern boundary of the quarry for the formation of external dump.

During the initial 3 years, only eastern section will be worked. Western section will be opened up from 4th year onwards. From 4th year, both the sections will be worked simultaneously with eastern section ahead of western section.

5.8 Mining System:

The mining and geological conditions of the mine are as follows:

(a)Multiple seams (8 no. Of coal horizons) to be worked.

(b)Moderately flat gradient of 3^0 to 7^0 of the coal seams.

(c)Variable thickness of OB/partings.

OB Removal

Considering the above mining and geological conditions, the mine is proposed to be worked by dragline and shovel-dumper combination of mining systems. The parting between I(T) & II(B) is proposed to be handled by the dragline. The average height of the dragline bench will be about 24m. The rest of the OB/parting is proposed to be excavated by shovel-dumper combination. The following type and size of dragline, shovel- dumper combination has been considered to work this mine.

The intervening partings will be mined and transported by 8.3 cu.m Hyd. Shovel alongwith RD-85T Dumpers. The Top OB will be mined and transported by 20 cu.m Rope. Shovel alongwith RD-170T (EWD) Dumpers. The parting between I(T)-II(B)will be handled by 1 no. of dragline of 20m^3 /90m.It is proposed that the dragline will handled OB of 60 m cut-width and side cast into exposed coal floor of I(B) seam. A coal rib will be left to guard the dragline dump, which will result a coal loss of 2.7% of seam-I (B). 40m wide side berm is proposed for movement of dragline at the end of cut. The transeverse gradient of dragline bench surface is 0.5^0. The dragline will be deployed in the 3rd year of quarry operation and it will work along the strike direction. There will be a central haul road of 30m width. The haul road will progress towards the dip direction with the advance of mine. The dragline will be operating only in the eastern section of the quarry, as the parting between I(T)-II(B) is reducing in thickness in western section of the quarry. The

sump will be provided in the central part of the quarry in down dip direction of the haul road. The sump will be kept in advance of the dragline cut.

The intervening parting benches would be formed parallel to the coal seams and would be mined by inclined slicing method. The top O.B. benches would be formed horizontally along particular horizons of 15m thick and would be mined by horizontal slicing method. However the O.B. benches immediately above the roof of the top most seams would be formed parallel to the coal seam roof to avoid the formation of triangular rib of O.B. which is likely to mix up with the coal after blasting. The maximum top OB bench height would be maintained at 15m and coal and intervening parting bench height at 10-15m.

Coal Winning

Loading and transportation of coal using machines, blast hole drilling in coal and face preparation have been proposed to be outsourced and hence HEMM for coal winning have not been provided in this PR. However, common equipment such as grader, water sprinkler, crane etc. is considered in this project. Further it is proposed to carry out a detail exercise to decide the mode of coal winning compatible with the calendar programme of OB removal.

Some major system parameters for both coal winning & OB removal are given below: -

1. Maximum Bench Height

Dragline bench -	23m
TopO.B -	15m.
Coal and intervening parting	10-15 m.
Proposed minimum Bench Width	
Working Bench Width for 20cum Shovel-	60m
Non-working Bench width for 20cum Shovel-	40m
Working Bench Width for 8.3cum Hyd Shovel-	50m
Non-working Bench width for 8.3cum Hyd Shovel-	30m
Dragline Bench-	60m
2. Width of the permanent haul road-	30 m.
3. Width of the temporary transport ramp-	20 m.
4. Usual height of the spoil dump bench-	30 m.

5. The width of the active dump bench- 60 m.

6. Bench Slope (working)

O.B. bench-70^0 Coal bench-70^0

Dump bench -37^0

7. Overall pit slope (for 150-160m depth) - 42^0.

In this Project Report, it has been considered that the mine will be worked for 330 days per annum i.e.7days per week.

5.10 Calendar Programme of Excavation:

The calendar programme has been formulated based on the adopted sequence of opencast minefield development at optimum condition of mining operation for the entire life of the mine. The period of construction shall be up to year 4 from date of approval of project report. Total overburden removal in construction year shall be 3.84 million cum. The project shall be commercially ready during 4th year from year of approval to deal with 1.5 million te of coal to be produced during year 4. The capacity built up period has been optimized and the rated capacity of the project shall be achieved in 7th year from date of approval. The summarised calendar programme of excavation has been given in Table No. 5.3 (a).

Summarised Calendar Programme of Excavation

Table no.5.3(a)

Period of operation	Year of mine operation	D/L Load in East Section	OBR in Mm³					Total Coal(E+W) (M.Tes)	Str. Ratio (CuM/To)
			OB Load for 20CuM			Total Small Parting s (E+W)	Total OBR (E+W)		
			East	West	Total				
Construction Period	1								
	2								
	3		1.50		1.50	0	1.5		
	4		2.13		2.13	0.21	2.34	1.50	1.56
Capacity Built-up Period	5	1.70	3.20		3.20	1.13	6.03	4.50	1.34
	6	2.87	6.40	2.75	9.15	2.04	14.06	8.00	1.76
	7	2.87	6.40	2.75	9.15	3.43	15.45	12.00	1.29
Balance Production Life of the mine	8	2.87	6.40	3.20	9.60	4.93	17.4	12.00	1.45
	9	2.87	6.40	3.20	9.60	4.90	17.37	12.00	1.45
	10	2.87	6.40	3.20	9.60	4.59	17.06	12.00	1.42
	11	2.87	6.40	3.20	9.60	6.45	18.92	12.00	1.58
	12	2.87	6.40	3.20	9.60	7.55	20.02	12.00	1.67
	13	2.87	6.40	3.20	9.60	7.55	20.02	12.00	1.67
	14	2.87	6.40	3.20	9.60	7.67	20.14	12.00	1.68
	15	2.87	6.40	3.20	9.60	7.82	20.29	12.00	1.69
	16	2.87	6.40	3.20	9.60	8.16	20.63	12.00	1.72
	17	2.87	6.40	3.20	9.60	8.16	20.63	12.00	1.72
	18	2.87	6.40	3.20	9.60	8.57	21.04	12.00	1.75
	19	2.87	6.40	2.25	8.65	10.28	21.80	12.00	1.82
	20	2.87	6.40	1.59	7.99	10.94	21.80	12.00	1.82
	21	2.87	6.40	0.90	7.3	11.63	21.80	12.00	1.82
	22	2.87	6.40	1.11	7.51	11.24	21.62	12.00	1.80
	23	2.87	4.80	4.26	9.06	9.69	21.62	12.00	1.80
	24	2.87	3.20	6.40	9.60	9.14	21.61	12.00	1.80
	25	2.70	3.20	6.40	9.60	9.00	21.30	12.00	1.78
	26	1.98	3.20	6.40	9.60	8.03	19.61	12.00	1.63
	27	1.85	3.20	4.80	8.00	7.03	16.88	12.00	1.41
	28-30	3.53	1.63	1.47	3.10	12.11	18.74	25.10	0.74
66.34	134.86	76.28	211.14	182.25	459.73	291.10	1.58		

Calendar Programme of Excavation for Coal (Table 5.30)
30 MMTPA COAL OUTPUT (M Tes)

Year / MINE LIFE	Eastern Quarry S(B+M+T)	S(M)	S(T) (T+M)	II (B)	II (T)	III (C)	IV	Total	Western Quarry III	IV	II	II (B)	II (T)	III (C)	IV	Total	Total Coal (E+W)(M.Tes)
1																	
2	1.25	0.01	0.56					1.6									1.6
3	3.6	0.22	0.35	0.2	0.13			4.6									4.6
4	3.65	0.42	0.6	0.61	0.24			8									8
5	7.08	0.42	1.1	0.71	0.56	0.55	0.3	10.5	1.75	0.50						1.5	12
6	4.17	0.55	1.6	0.65	0.51	1.44	1.05	10.5	1.11	0.15	0.7					1.5	12
7	4.5	0.55	1.6	0.6	0.53	1.94	1.05	10.8	1.11	0.15	0.20					1.2	12
8	4	0.03	1.44	0.66	0.48	1.07	1.71	9.8	1.55	0.18	0.37					2.2	12
9	3.4		1.21	0.52	0.37	1.35	1.05	8.4	1.95	0.42	1.02	0.15	0.01			3.6	12
10	3.16		1.12	0.48	0.35	1.25	1.44	7.8	1.93	0.56	1.53	0.21	0.01			4.2	12
11	3.14		1.00	0.47	0.35	1.2	1.26	7.6	2.35	0.56	1.07	0.12	0.05	0.49	0.12	4.4	12
12	2.83		1.01	0.41	0.31	1.12	1.3	7	2.70	0.25	0.85	0.07	0.06	0.77	0.21	5	12
13	2.88		0.9	0.42	0.33	1.26	1.15	6.8	2.65	0.24	0.87	0.07	0.06	0.78	0.21	5.2	12
14	2.88		0.78	0.34	0.33	1.44	0.9	6.7	2.05	0.25	0.9	0.07	0.3	0.81	0.22	5.3	12
15	2.88		0.78	0.34	0.33	1.44	0.9	6.7	2.05	0.25	0.9	0.07	0.3	0.81	0.22	5.3	12
16	2.88		0.78	0.34	0.33	1.44	0.9	6.7	2.14	0.25	0.85	0.09	0.08	0.85	0.15	5.3	12
17	2.88		0.78	0.34	0.33	1.44	0.9	6.7	1.32	0.3	1.20	0.12	0.08	1.3	0.82	5.3	12
18	2.88		0.78	0.34	0.33	1.44	0.9	6.7	1.32	0.3	1.20	0.12	0.08	1.3	0.82	5.3	12
19	2.95	0.05	0.8	0.45	0.32	1.31	0.87	6.7	1.32	0.3	1.24	0.12	0.08	1.3	0.82	5.3	12
20	3.05	0.12	0.75	0.40	0.35	1.11	0.86	6.7	1.32	0.3	1.24	0.12	0.08	1.3	0.87	5.3	12
21	3.05	0.12	0.75	0.40	0.35	1.11	0.86	6.7	1.16	0.26	1.2	0.12	0.25	1.42	0.85	5.3	12
22	3.05	0.12	0.75	0.40	0.35	1.11	0.86	6.7	1.13	0.27	1.10	0.09	0.3	1.52	0.85	5.3	12
23	2.98	0.14	0.78	0.42	0.35	1.13	0.85	6.7	1.13	0.27	1.16	0.09	0.3	1.52	0.85	5.3	12
24	2.91	0.20	0.74	0.4	0.46	1.06	0.87	6.7	1.13	0.27	1.16	0.09	0.3	1.52	0.85	5.3	12
25	2.91	0.26	0.74	0.4	0.46	1.06	0.87	6.7	1.6	0.32	1.13	0.09	0.2	1.25	0.76	5.3	12
26-28	8	0.51	1.53	1.26	0.88	2.10	1.76	15.61	3.0	0.60	2.24	0.09	0.04	1.10	0.6	9.47	22.2
Total	88.41	3.46	25.11	12.86	9.05	20.13	22.28	189.03	40.41	6.76	23.26	1.85	2.25	18.1	8.49	102.87	241.1

Calendar Programme of Excavation for OBR(Mm³)

Mine Life	Eastern Section											Western Section										
	Top OB	I(T)- II(B) D/L	II(B)- I(M)	I(T)- I(M)	III(T)- II(B)	III(C)- II(T)	IV- III(C)	Total Partin	Total OB	Total Coal	S.R.	Top OB	II(B)- I(M)	I(T)- I(M)	I(T)- II(B)	I(T)- II(B)	III(C)- II(T)	IV- III(C)	Partin	Total OB	Total Coal	S.R.
1	1.5							0	1.5		-											
2	2.13		0.18	0.03				0.21	2.34	1.5	1.55											
3	3.2	1.7	0.3	0.02	0.81			1.13	5.03	4.5	1.34											
4	6.4	2.87	0.53	0.04	1.47			2.04	11.31	8	1.41	2.75										
5	6.4	2.87	0.37	0.03	1.02	1.16	0.85	3.43	12.7	10.5	1.21	2.75								2.75		
6	6.4	2.87	0.45	0.03	1.25	1.41	1.03	4.17	13.44	10.5	1.28	3.2	0.49	0.28						2.75	1.5	1.83
7	6.4	2.87	0.45	0.03	1.24	1.4	1.02	4.14	13.41	10.5	1.28	3.2	0.48	0.28					0.75	3.96	1.5	2.64
8	6.4	2.87	0.38	0.03	1.05	1.2	0.87	3.53	12.8	9.9	1.29	3.2	0.67	0.39					0.75	3.96	1.5	2.64
9	6.4	2.87	0.34		0.92	1.04	0.76	3.06	12.33	8.4	1.47	3.2	1	0.59	0.73	1.07			1.06	4.26	2.1	2.03
10	6.4	2.87	0.31		0.86	0.98	0.71	2.86	12.13	7.8	1.56	3.2	1.38	0.81	1.01	1.49			3.39	6.59	3.6	1.83
11	6.4	2.87	0.3		0.82	0.93	0.67	2.72	11.99	7.5	1.6	3.2	1.01	0.59	0.74	1.07	0.72	0.7	4.69	6.89	4.2	1.64
12	6.4	2.87	0.28		0.77	0.87	0.63	2.55	11.82	7.0	1.69	3.2	1.07	0.63	0.79	1.14	0.76	0.74	4.53	8.03	4.5	1.78
13	6.4	2.87	0.29		0.79	0.89	0.64	2.6	11.87	6.9	1.72	3.2	1.09	0.64	0.8	1.15	0.78	0.76	5.12	8.32	5	1.66
14	6.4	2.87	0.3		0.82	0.93	0.68	2.73	12	6.7	1.79	3.2	1.13	0.66	0.83	1.21	0.81	0.79	5.22	8.42	5.1	1.65
15	6.4	2.87	0.3		0.82	0.93	0.68	2.73	12	6.7	1.79	3.2	1.13	0.66	0.83	1.21	0.81	0.79	5.43	8.63	5.3	1.63
16	6.4	2.87	0.3		0.82	0.93	0.68	2.73	12	6.7	1.79	3.2	1.13	0.66	0.83	1.21	0.81	0.79	5.43	8.63	5.3	1.63
17	6.4	2.87	0.3		0.82	0.93	0.68	2.73	12	6.7	1.79	2.25	1.57	0.92	1.15	1.68	1.13	1.1	7.55	9.8	5.3	1.85
18	6.4	2.87	0.3		0.82	0.93	0.68	2.73	12	6.7	1.79	1.59	1.11	1	1.35	1.83	1.23	1.19	8.21	9.81	5.3	1.85
19	6.4	2.87	0.29	0.05	0.81	0.92	0.68	2.73	12	6.7	1.79	0.9	1.55	1.09	1.35	1.85	1.33	1.28	8.9	9.8	5.3	1.85
20	6.4	2.87	0.27	0.05	0.75	0.86	0.62	2.55	11.82	6.7	1.76	1.11	1.82	1.06	1.32	1.83	1.3	1.26	8.69	9.8	5.3	1.85
21	4.8	2.87	0.27	0.05	0.75	0.86	0.62	2.55	10.22	6.7	1.53	4.26	1.49	0.87	1.09	1.59	1.05	1.04	7.14	11.4	5.3	2.15
22	3.2	2.87	0.27	0.05	0.75	0.86	0.62	2.55	8.62	6.7	1.29	6.4	1.37	0.81	1	1.47	0.98	0.96	8.59	12.99	5.3	2.45
23	3.2	2.7	0.27	0.04	0.74	0.83	0.6	2.48	8.38	6.7	1.25	6.4	1.36	0.8	0.99	1.45	0.97	0.95	8.52	12.92	5.3	2.44
24	3.2	1.98	0.19	0.03	0.54	0.59	0.43	1.78	6.96	6.7	1.04	6.4	1.3	0.77	0.95	1.39	0.94	0.9	8.25	12.65	5.3	2.39
25	3.2	1.65	0.18	0.03	0.48	0.54	0.4	1.63	6.68	6.7	1	4.8	1.12	0.66	0.82	1.2	0.81	0.79	5.4	10.2	5.3	1.92
26-28	1.63	3.53	0.27	0.05	0.71	0.82	0.59	2.48	7.65	15.63	0.5	1.47	2.01	1.18	1.48	2.15	1.44	1.41	9.57	11.13	9.47	1.18
Total	134.86	66.34	7.69	0.56	20.62	20.81	15.12	64.8	265.95	189.03	1.41	76.28	26.26	15.4	18.02	26.31	15.94	15.52	117.45	193.73	102.37	1.9

5.11 Drilling & Blasting:

The Top OB, the parting between Seam-III and seam-IV (in western section) and the parting between Seam-II and seam-III (in eastern section), where dragline/20M^3 Rope Shovel will be deployed, would be drilled using 250 mm RBH drills.

250 mm/ 160 mm RBH drills will drill the other intervening small partings.

The ground vibration due to blasting can be controlled by: -

I) Reducing the amount of explosives charged per delay

II) Reducing spacing and burden of blast holes,

iii) Reducing the amount of explosives charged per blast,

iv) Proper strata movement during blasting by using suitable firing sequence.

Since above parameters are site specific, the exact blasting pattern will be designed after conducting field trials.

5.12 Annual Productivity of Shovel & Dumpers:

The Year wise lead of coal and OB has been calculated. These leads have been considered for calculating the no. of dumpers. The weighted average lead comes to be 2.5 Km & 2.4 Km for coal & OB respectively.

The annual productivity of dragline, shovels and dumpers combination as per the prevalent norm are given in the following tables. The productivity has been calculated as per the design criteria mentioned in para 5.2.

S.N.	Particulars of HEMM	Unit	Value
I	For OBR		
1	Walking dragline 20m^3/90m	M.Cum	2.83
2	20 m^3 Elect. Rope Shovel + 170 T Rear Dumper (EWD)	Mcum.	4.09
3	8.3 m^3 Hyd. Shovel + 85 T Rear dumper	Mcum.	2.13

	Lead in Km.	1.0	1.5	2.0	2.5	3.0	3.5
I	For OBR (Mcum.)						
1	170 T Rear dumper(EWD) + 20 M^3 Rope shovel	0.7684	0.6398	0.5671	0.5181	0.4606	0.4322
2	85T Rear dumper + 8.3 m^3 Hyd. shovel	0.3667	0.3090	0.2745	0.2515	0.2281	0.2100

5.12 Proposed HEMM:

HEMM have been provided as per the workload of OBR indicated in calendar programme of excavation. Two different sizes of shovels & dumpers i.e. 20 M^3 Rope Shovel + RD-170T Dumpers for main OB workload and 8.3 M^3 Hyd. Shovel + RD-85T for intervening partings have been considered. The requirement of HEMM has been shown in table no. 5.4.

Table Showing Phased HEMM requirement

Table-6

Sl.No.	Particulars	Size/cap.			1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
No.																													
A.1	H. E. M. M For Coal																												
(a)	Elect Rope Shovel	6.3 Cum.																											
(b)	Rear Dumper	85T																											
(c)	R.B.H.Drill	160mm																											
(d)	Dozer	410 HP																											
(e)	Wheel Dozer	460 HP																											
	TOTAL COAL																												
	H. E. M. M For OB																												
(a)	Dragline	20 /90	1				1																						
(b)	Elect Rope Shovel	20 cu.m	3				1	2																					
(c)	Elect. Hyd. Shovel	6.3 Cum.	6		1	1			1	1			1	1	1						1								
(d)	Rear Dumper	170 T	19				6	11		1	1									1									
(e)	Rear Dumper	85T	24		5	3			6	4	2		4				5	2		2	8	3	4						
(f)	R.B.H.Drill(Diesel)	160 mm	3						2	1																			
(g)	Elect.R.B.H.Drill(long-mast)	250 mm	9		1	1	3	2					1	1	1						1								
(h)	Dozer	410HP	16		3	2	3	3	2	1			1	1	1						1								
	TOTAL O. B																												
A.3.	HEMM For Common																												
(a)	Crane	70 T	2				1			1																			
(b)	Crane	30 T	2		1		1																						
(c)	Crane	10 T	2		1		1																						
(d)	Grader	280 HP	6		1	1		1		1	1		1																
(e)	Wheel Dozer	410 HP	2					1			1																		
(f)	Water Sprinkler	28 KL	6		1	1	1	1		1	1																		
(g)	FE Loader	1.5-2.0 Cum.	2		1		1																						
(h)	Hyd.B H Shovel(Diesel)	1.2 Cum.	2		1		1																						
(i)	Dump Trucks	10T	8		4		4																						
(j)	Vibratory Compactor	30T	1		1																								
(k)	Fuel Trucks	16KL	1		1																								
(l)	Hyd. Rock Breaker		1		1																								
(m)	Cable Handler		1		1																								

Coal Outsourced

5.13 O.B. Dumps:

The plan showing location & capacity of OB dumps has been given vide drg. no. RI-3/OC/2000/23. The total volume of OBR is estimated as 459.68 M cum. Including 265.95 Mcum. from east section and 193.73 Mcum. from west section. . The external dump A with an area of 82 ha. would have a capacity of 41.10Mcum. The top R.L. of this dump would be + 530 m, which is 50 m above the general topography. This external dump has been merged with internal dump in the eastern quarry in order to reduce the area of the external dumpThe balance OB of 418.63 Mcum. Would be placed as internal dumps. 2 locations , namely B & C, have been identified for the same. Internal dump 'B' will be formed in the western section. Internal dump 'C' will be formed in the eastern section. The top RL. of both the internal dumps will be +530 m. Out of total quarry area, about 66% area will be backfilled. The capacity & area of different dumps are given below: -

Location of the Dump	Capacity in Mcum.	Area in Ha.
At 10th year stage		
External dump A	41.10	82
Internal dump		
Internal dump B	78.38	165
Internal dump C	9.67	41
Total Internal Dump	88.05	206
Total(External+Internal)	129.15	
At 20th year stage		
External dump A	41.1	82
Internal dump		
Internal dump B	223.13	290
Internal dump C	74.7	165
Total Internal Dump	297.83	455
Total(External+Internal)	338.93	
At final stage		
External dump A	41.10	82
Internal dump		
Internal dump B	278.58	325
Internal dump C	140.00	220
Total Internal Dump	418.58	545
Total(External+Internal)	459.68	

LIST OF HEMM

Arrival Schedule considering new equipment only

Sl.	Particulars	Size / Capacity	Total Prov. Upto Target Year	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27
A.1	*H. E. M. M For Coal*																													
(a)	Elect.Hyd. Shovel	8.3 cu.m	4				1	1	1	1																				
(b)	Rear Dumper	85T	25				2	5	7	11			1	1	1													2		
(d)	R.B.H.Drill	160 mm	4				1	1	1	1																				
(e)	Dozer	410HP	2					1		1																				
(f)	Wheel Dozer	460HP	1				1		1																					
A.2.	*H. E. M. M For OB*																													
(a)	Dragline	20/90	1					1																						
(b)	Elect Rope Shovel	20 cu.m	3					1	2																					
(c)	Elect Hyd Shovel	8.3 / 9.5 cu.m	3			1	1			1	1			1	1	1						1								
(e)	Rear Dumper	170 T	17					6	11		1	1									1									
(f)	Rear Dumper	85T	14			5	3			6	4	2		4				5	2		2	8	3	4						
(g)	R.B.H.Drill	250 mm	7			1	1	3	2					1	1	1						1								
(h)	R.B.H.Drill	160 mm	2							1	1																			
(i)	Dozer	410 HP	13			3	2	3	3	2	1			1	1	1						1								
A.3.	*HEMM For Common*																													
a	Crane	70T	1					1			1																			
b	Crane	30T	2			1		1																						
c	Crane	10T	4			1		1		2																				
d	Grader	280HP	3			1	1		1		1	1		1																
e	Wheel Dozer	460HP	1						1			1																		
f	Water Sprinkler	28KL	4			1	1	1	1		1	1																		
g	FE Loader	1.5-2.0 Cum	2			1		1																						
h	Hyd Bill Shovel(Diesel)	1.2 Cum	2			1		1																						
i	Dump Trucks	10T	8			4		4																						
j	Vibratory Compacter	30T	1			1																								
k	Fuel Trucks	16KL	1			1																								
l	Hyd. Rock Breaker		1			1																								
m	Cable Handler		1			1																								
n	Fire Tender		1			1																								
o	Wagon Drill	100mm	2			1		1																						
	RHMM FOR RECLAMATION																													
a	FE Loader	5.6Cum	1					1																						
b	Dozer	320HP	2					2																						
c	Water Sprinkler	28KL	3					3																						
d	Dumper	35T	3					3																						

COAL OUTSOURC

LIST OF HEMM

Arrival Schedule considering new equipment only

Sl.	Particulars	Size/ Capacity	Total Proc. Upto Target Year	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26
A.1	*H. E. M. M For Coal*																												
(a)	Elect Hyd. Shovel																												
(b)	Rear Dumper																												
(d)	R.B.H Drill																												
(e)	Dozer																												
(f)	Wheel Dozer																												
A.2.	*H. E. M. M For OB*																												
(a)	Dragline	20/90	1					1																					
(b)	Elect Rope Shovel	20 cu m	1					1																					
(c)	Elect Hyd Shovel	8.3 / 9.5 cu m	1			1	1	1	2																				
(e)	Rear Dumper	170 T	17							1	1				1	1	1					1							
(f)	Rear Dumper	85T	14			4	1	6	11	1	1	1									1							
(g)	R.B.H Drill	250 mm	7			1	1	3	2		1	2			4	1					2	3	3	1					
(h)	R.B.H Drill	160 mm	2							1					1	1	1					1							
(i)	Dozer	410 HP	13			3	2	3	3	2	1				1	1	1					1							
A.3.	*HEMM For Common*																												
a	Crane	70T	1					1			1																		
b	Crane	30T	2			1		1																					
c	Crane	10T	1			1		1																					
d	Grader	280HP	5			1	1		1		1	1		1															
e	Wheel Dozer	4x4HP	1						1		1	1																	
f	Water Sprinkler	20KL	4			1	1	1	1		1	1																	
g	FF Loader	1.6 2.0 Cum	2			1		1																					
h	Hyd Bll Shovel(Diesel)	1.2 Cum	2			1		1																					
i	Dump Trucks	10T	8			4		4																					
j	Velocimy Computer	30T	1			1																							
k	Fuel Trucks	16KL	1			1																							
l	Hyd. Rock Breaker		1			1																							
m	Cable Handler		1			1																							
n	Tire Loader		1			1																							
o	Wagon Drill	100mm	2			1		1																					

COAL OUTSOURCED

DPR FOR AMRAPALI OCP (12.00 MTY)

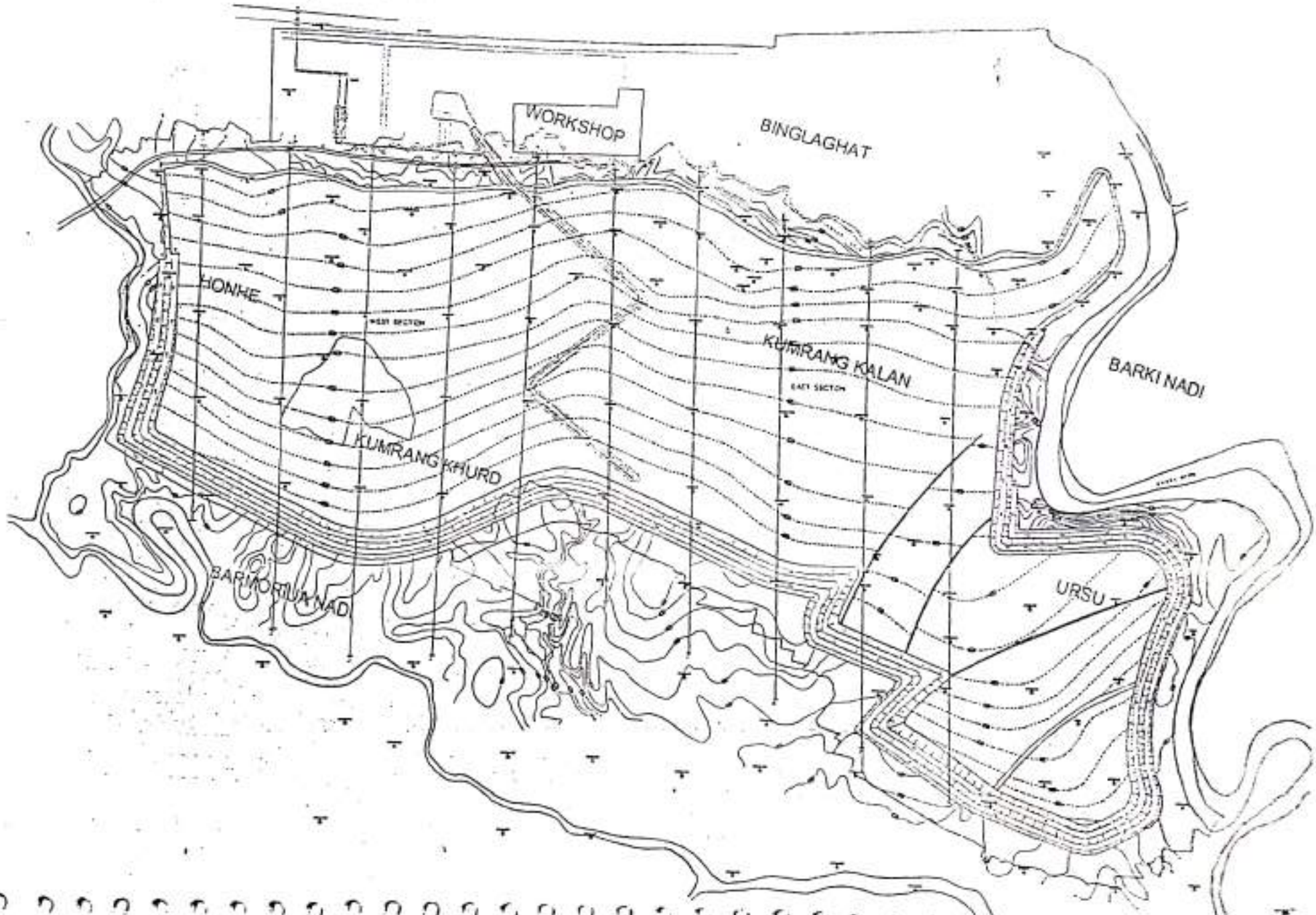
BOTH OUTSOURCED

LIST OF HEMM

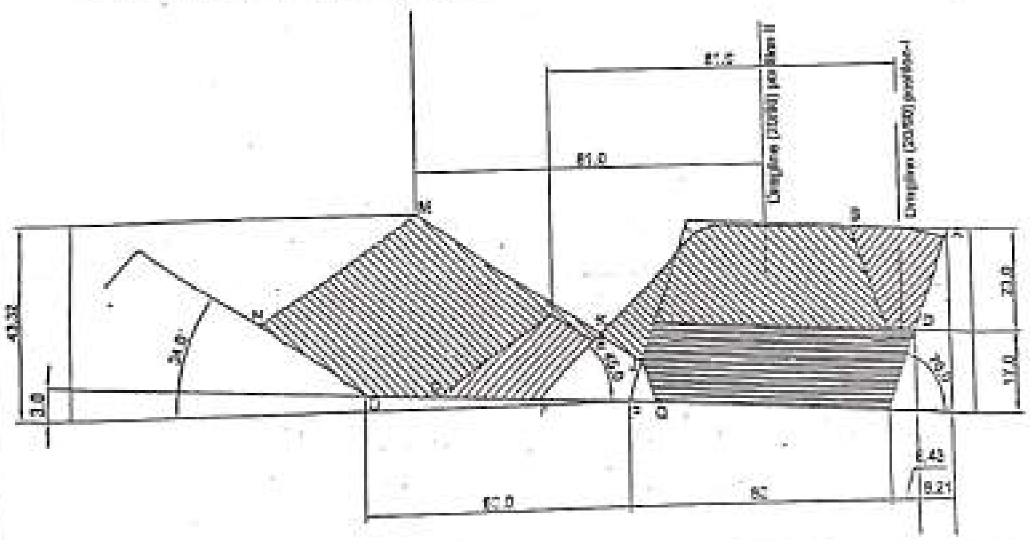
Arrival Schedule considering new equipment only

Sl.	Particulars	Size/ Capacity	Total Prov. Upto Target Year	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27
A.1	*H. E. M. M For Coal*			COAL OUTSOURCED																										
(a)	Elect Hyd. Shovel																													
(b)	Rear Dumper																													
(d)	R.B.H.Drill																													
(c)	Dozer																													
(f)	Wheel Dozer																													
A.2	*H. E. M. M For OB*			OB OUTSOURCED																										
(a)	Dragline	20/90																												
(b)	Elect Rope Shovel	20 cu.m																												
(c)	Elect Hyd Shovel	8.3 / 9.5 cu.m																												
(e)	Rear Dumper	170 T																												
(f)	Rear Dumper	85T																												
(g)	R.B.H.Drill	250 mm																												
(h)	R.B.H.Drill	160 mm																												
(i)	Dezer	410 HP																												
A.3.	*HEMM For Common*			OUTSOURCED																										
a	Crane	70T																												
b	Crane	30T																												
c	Crane	10T																												
d	Grader	280HP																												
e	Wheel Dozer	460HP																												
f	Water Sprinkler	28KL																												
g	FE Loader	1.5-2.0 Cum																												
h	Hyd BH Shovel(Diesel)	1.2 Cum																												
i	Dump Trucks	10T																												
j	Vibratory Compactor	30T																												
k	Fuel Trucks	16KL																												
l	Hyd. Rock Breaker																													
m	Cable Handler																													
n	Fire Tender																													
o	Water Drill	100mm																												

AMRAPALI OCP



DRAGLINE BALANCING DIAGRAM



Balancing diagram of 20/90 Dragline

Sl	Dragline Operation staged schemes				
	Cut type	Digging	Dump	Area (Sqm) SoSd	Annual Productivity Mcum
1	Key cut	ABCD	EFGH	283	0.62
2	First Cut	CIJKLBC	MNOGFEKM	525	2.23
3	Rehandle	(Additional)		118	0.32
4	Coal rib	JFQ			
5	TOTAL			1256	3.19
6	Coal exposed = (17 x 60 - 27) x 2060 x 1.6 x 0.87 = 2.57 Mty				
7	Percentage Rehandle = 5%				

(10)

Customer: CENTRAL COALFIELDS LIMITED

Job Title: Jarangdih Opencast Project

Job No. 340280

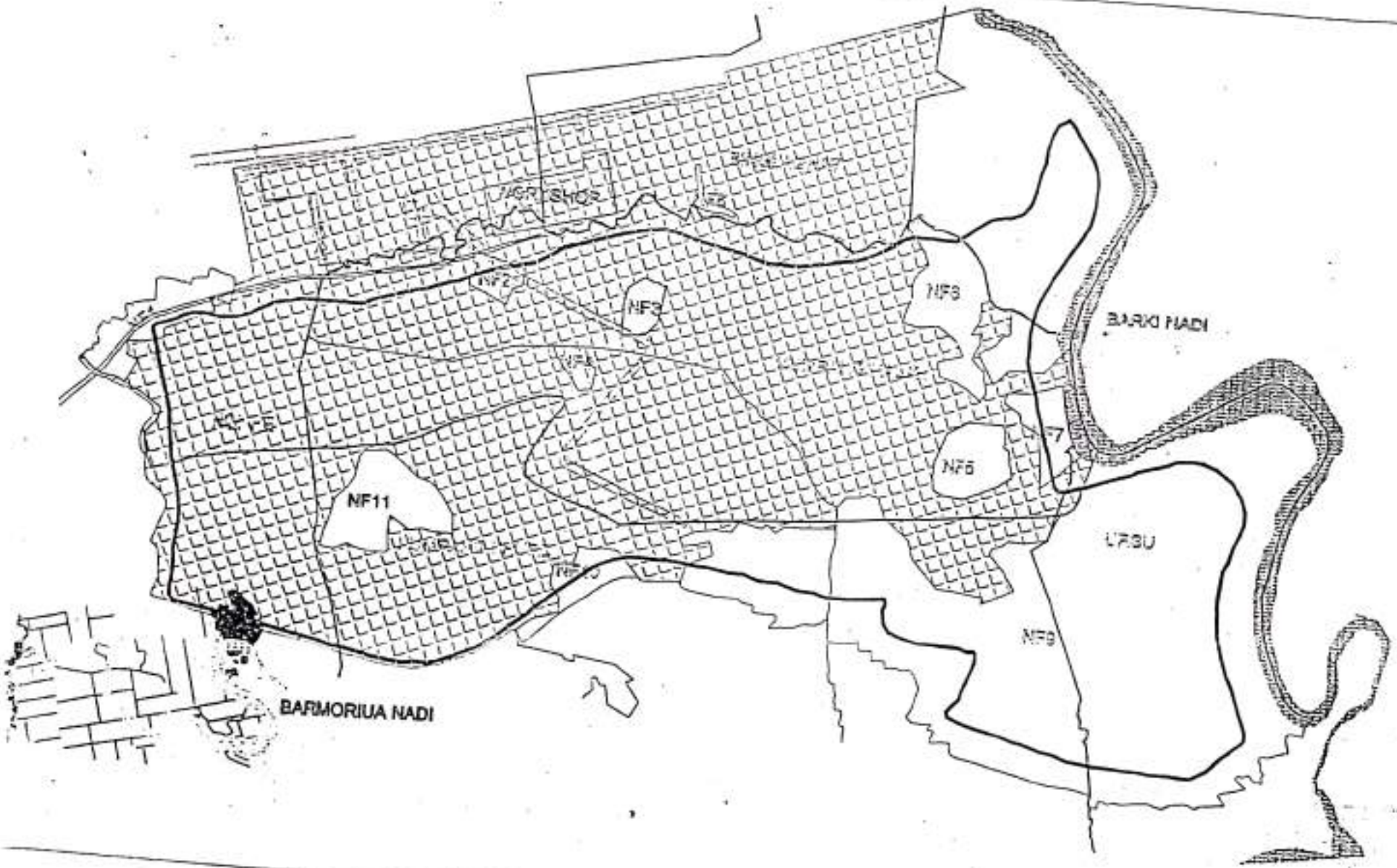
Subject: Dragline Balancing Diagram

Activity	Name	Designation	Signature	Date
Created	A. Banerjee			
Drawn	A.Roy			
Checked				
Approved	S.K.MITRA			

Scale: 1: 1000 Sheet: 1 of 1

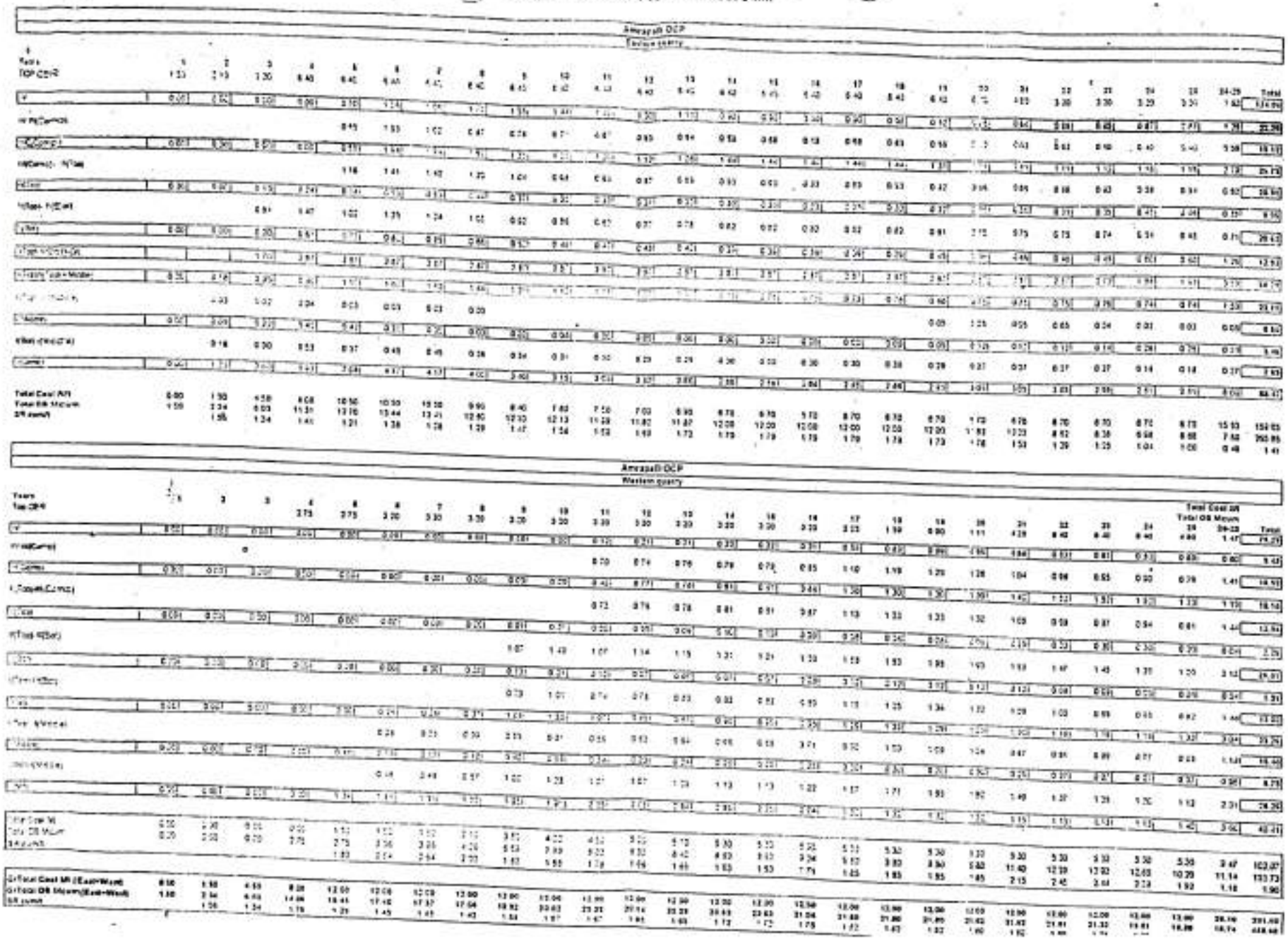
Drg. No. Rev. No. 1

CMPDI
ISO 9001 Company



NTS

Detailed Calendar Plan Of Excavation



CHAPTER – VI

6.1 PUMPING AND DRAINAGE: (For Coal Outsource & Departmental)

The Amrapali OCP is a new mine of Central Coal Field Limited. There will be Two sectors viz. eastern and western sector in the proposed mine.

The pumping system has been planned separately for the two sectors of mine Considering simultaneous working in these sectors. The planning of dewatering the mine has been done in such a way that the working faces and haul roads will remain dry as far as possible in both the working sectors. The layout of the Quarries provides suitable gradient along the quarry floors and the benches to facilitate self drainage of water to the sump at the lowest level of the quarry. During the heavy monsoon period, the work in lower most bench may have to be stopped as it will not be possible to pump out the entire make of water on the wettest day. Therefore, it is proposed to drawn a part of the lower-most bench which would then act as sump in both the sectors.

Water accumulated in the sump will be pumped out and discharged into the nearby nallah / river. It is proposed to create a sedimentation lagoon by constructing a series of check dams across the nallah/river. Water overflowing the check dams would join the nala/river flowing nearby. The lagoon will help to separate suspended solids from the mine water.

6.2 GENERAL CONSIDERATION

The pumping requirement has been calculated on the basis of the following general consideration:

- The geographical location of the opencast working.
- Meteorological data from the area concerning rainfall.
- Life of the mine and percentage probability of maximum rainfall in one

- Life of the mine and percentage probability of maximum rainfall in one day during the life of the mine.
- Surface feature of the area surrounding the opencast working.
- Catch-ment Area , mined out area, area beyond excavation and internal dumped area.
- Run-off characteristics of the area.
- Depth of the quarry.
- Inflow / percolation to the quarry of underground water.
- Desired location at the surface where the quarry water can be discharged.
- Surface drainage system and garland drains.
- Effective working hours - 20 hours/day for pumping calculation, but in monsoon period pumping may be done round the clock.

6.3 BASIC DATA

The following data has been taken into consideration for arriving at the size of the pump:

i) Recorded maximum annual rainfall - 1926.16mm

ii) Recorded maximum rainfall in a day - 151.80 mm

iii) Percentage probability - 3.70

iv) Maximum probable rainfall in a day in the monsoon period from the probability curve for 3.70% probability - 152 mm

v) Ultimate depth of the mine - 135 m

vi) Run-off coefficient

(a) for mined out area - 0.9

(b) for area beyond excavation - 0.7

(c) for internal dumped area - 0.4

vii) Inflow of water to the mine due to seepage and underground precipitation - 10% of the water accumulated in the mine due to rainfall.

viii) The rainfall data recorded at BACHRA rain gauge station has been adopted due to its proximity to Amrapali Project.

6.4 PUMPING CALCULATION

The pumping calculation given below has been done taking into consideration the surface area of excavation of the two sectors separately.

Eastern Sector :

- Area of excavation (approx.) - 4.94 sq km
- Area beyond excavation - 0.25 sq km
- Internal dumped area - 3.75 sq km
- Probable water accumulation in the mine on the day of maximum rainfall - 417390 cu m
- Taking 10 % of accumulated water for seepage and underground precipitation, the total make of water - 459120 cu m
- Assuming 20 hrs. pumping per day, pumping capacity required to pump out the total make of water in six days - 3825 cum / hr.
- Providing 50% standby pumping capacity and selecting 540 cum/hr pump,

no. of pumps provided - 10.

Western Sector :

- Area of excavation (approx) - 3.370 sq km
- Area beyond excavation - 0.170 sq km
- Internal dumped area - 2.750 sq km
- Probable water accumulation in the mine on the day of maximum rainfall - 270100 cu m
- Taking 10 % of accumulated water for seepage and underground precipitation, the total make of water - 297100 cu m
- Assuming 20 hrs. pumping per day, pumping capacity required to pump out the total make of water in six days - 2475 cum / hr
- Providing 50% standby pumping capacity and selecting 540 cum/hr pump, no. of pumps provided - 6.

6.5 PROVISION OF PUMP

The pumping provision has been made up for entire life of mine working. On the basis of the pumping calculation and keeping standby capacity for pumping the following pumps have been provided :

Main Pump :

Ten nos. of 540 cum / hr x 180 m head pump for eastern sector and six nos. of 540 cum/hr x 180 m head pump for western sector have been provided to dewater both sector of the mine.

For the intial years of mine operation when the depth of the mine will be low, eight nos. of 300 cum x100 m head pumps and nine nos.150 cum/ hr x100 m head pumps have been provided.

Diesel Pump :

Two nos. 540 cum/hr x180 m head and two nos. of 300 cum/hr x 100 m head dies pumps have been provided for any emergency requirement.

Priming pump:

Eleven nos. of 50 cum/hr x16 m head priming pump have been provided to prime th higher capacity main pumps.

Face Pump :

Thirteen nos. of 50 cum/hr x 45 m head face pump have been provided to pump ou the water accumulated near the working faces.

Slurry Pump :

Six nos. 250 cum/hr x 45 m head slurry pump have been provided to pump out the slurry accumulated near the working faces.

6.6 SELECTION OF DELIVERY RANGES :

The delivery ranges have been selected on the basis of the pumping capacity durir probable maximum rainfall and velocity of flow within the reasonable limit. The suctic and delivery pipes and its fittings ranges thus selected for different pumps are 0f 3(mm, 250 mm, 200 mm,150 mm and 100 mm internal diameter.

6.7 ESTIMATED CAPITAL COST :

The detailed list of Pumping P&M, pipes, fittings and phased estimated capi requirement have been given in Appendix - A.3.3.

CHAPTER – VII

POWER SUPPLY, DISTRIBUTION, ILLUMINATION & COMMUNICATION

7.1 Introduction

The proposed Amrapali OCP is located in a green field area. Another new project Magadh, will also be located near this block. The maximum power demand for these two opencast projects will be about 40MVA. For meeting this huge power demand, no immediate source of power supply is available nearby these mining projects. The nearest source of power is DVC's 132/33KV, 2x50 MVA sub-station, which is situated at Piparwar at a distance of about 25 Km from these two projects. But there is also no scope of availability of drawing power to meet the integrated demand of 57 MVA (approx.) for these two proposed projects, likely future anticipated load and also other infrastructure.

For over-coming the above stated power supply constraint, it is proposed to establish one no. 132/33KV, 2x50 MVA sub-station, which will be centrally located from the proposed Amrapali and Magadh mining projects and Proposed Regional 33KV switching station , at Magadh & Amrapali.

Provision of initial power supply has been made from existing Piparwar 33KV switching station of CCL as there is no other alternative. Hence, the switching station at Piparwa shall have to be extended by two numbers of feeders for drawing power at 33KV b erecting one number of 33KV double circuit overhead transmission line upto Amrapa and Magadh Projects. Power will be received at 33KV by individual through a independent feeder.

The cost involved for construction of the proposed 132/33KV sub- station, Region 33KV switching station, incoming 132 KV OH line and 33KV overhead transmissio line from Piparwar 33KV switching station of CCL and extension of 33KV switchin station of Piparwar will be equally shared by the Magadh and Amrapali projects.

7.2 Details of Integrated Incoming Power System

CCL has to pursue with DVC, the power supply agency of this mining area, for erecting a 132/33KV, 2x50MVA sub-station having 2 nos. 132KV incoming and 4 nos. 33KV outgoing feeders, which will be centrally located from the proposed Amrapali and Magadh Projects. This proposed sub-station will receive power from Piparwar 132/33KV, 2x50MVA sub-station of DVC through a 25Km long (approx.) 132KV double circuit overhead transmission line. In next phase, it is proposed to erect 33KV Regional Switching Station having 4 Nos. 33KV incoming and 8 nos. outgoing feeders which will be situated just near the proposed 132/33KV sub-station. This Regional Switching Station will receive power at 33KV from proposed 132/33KV sub-station through 4 nos. of incoming feeders. Magadh and Amrapali projects will receive power from this proposed 33KV Regional sub-station. Out of 8 nos. outgoing 33KV feeders, 3 nos. of feeders will be engaged for Magadh projects and also 3 nos. for Amrapali project, respectively, other two feeders will be spare. This Regional switching station will be situated at a distance of about 4Km away from both Magadh & Amrapali projects.

The power supply Arrangement including Main substation 2x50 MVA 132/33KV, Regional 33KV Switching Station,132 KV OHTL& 33 KV OHTL from Piparwar as described in para -7.1 & 7.2 would be in Common infrastructure for all the three Variants proposed below :

Coal out sourcing option	**: Main Variant**
Fully departmental option	**: Variant-I**
Both out sourcing option	**: Variant-II**

7.3 Maximum Power Demand & Energy Consumption

The table VII(1) indicates the estimated maximum demand and annual energy consumption at optimum production level in OCP after considering power factor improvement by static capacitors and thus :

Descriptions	Coal out sourcing option Main Variant	Fully departmental option Variant-I	Both out sourcing option Variant-II
Load in operation	33.264 MW	36.994 MW	10.53 MW
Maximum power demand	18.921 MVA	20.937 MVA	6.579 MVA
Initial power factor	0.76	0.76	0.72
Improved power factor	0.96	0.96	0.96

7.4 Project Sub-station Capacity

Coal out sourcing option : Main Variant

To meet the requirement of power demand of Amrapali opencast project, there would be 3 nos. of 33/6.6KV sub-stations namely sub-station no.1, sub-station no.2 & sub-station no.3. The installed transformer capacity of each sub-station would be 2x10MVA.

Fully departmental option : Variant-I

To meet the requirement of power demand of Amrapali opencast project, there would be 3 nos. of 33/6.6KV sub-stations namely sub-station no.1, sub-station no.2 & sub-station no.3. The installed transformer capacity of each sub-station would be 2x10MVA.

Both out sourcing option : Variant-II

To meet the requirement of power demand of Amrapali opencast project, one no. 2x10MVA, 33/6.6KV Project sub-stations would be installed for feeding power to CHP, Colony and general illumination of this Project.

7.5 Distribution and Utilization Voltages

The distribution and utilization voltages for Amrapali OCP are summarized as :

Supply voltage to	Coal out sourcing option (Main Variant)	Fully departmental option (Variant-I)	Both out sourcing option (Variant-II)
Colony	6.6 KV	6.6 KV	6.6 KV
CHP	6.6 KV	6.6 KV	6.6 KV
to Workshop	6.6 KV	6.6 KV	6.6 KV
to main pumps (above 100KW)	6.6 KV	6.6 KV	N.A
to pumps (100 KW & below)	0.415 KV	0.415 KV	
Shovels	6.6 KV	6.6 KV	N.A
Drills	6.6 KV	6.6 KV	N.A
to Dragline	6.0 KV	6.0 KV	N.A
Quarry lighting	0.230 (L-L) KV	0.230 (L-L) KV	0.230 (L-L) KV

7.6 System Earthing

(Common for all three Variants)

Restricted Earthed Neutral System has been envisaged for 6.6KV side and quarry distribution. Solidly earthed neutral system has been envisaged for surface lighting, Workshop and others.

The Restricted Earthed Neutral System in quarry is being envisaged as per the recommendations made in "National Workshop on Choice and Standardization of Electrical Power System in Mines (May-1990)" and re-circulated by Dy. Director General of Mines Safety (Elect.), Dhanbad.

7.7 Incoming Power Supply Arrangement

Coal out sourcing option : Main Variant

It is proposed that three numbers of independent 33KV overhead feeders with ACSR WOLF conductor shall be drawn separately from 33KV Regional Switching station to each of the (2x10MVA, 33/6.6KV) sub-station Nos. 1,2 & 3 to cater the load of Amrapali OCP. Both sub-station Nos. 2 & 3 shall again be interconnected separately with sub-station No.1 by means of 33KV overhead transmission lines. This will facilitate alternate source of power supply to all the three sub-stations. For details Ref. Drg. No. RI-3/ELECT/2189 showing the block diagram.

Fully departmental option : Variant-I

It is proposed that three numbers of independent 33KV overhead feeders with ACSR WOLF conductor shall be drawn separately from 33KV Regional Switching station to each of the (2x10MVA, 33/6.6KV) sub-station Nos. 1,2 & 3 to cater the load of Amrapali OCP. Both sub-station Nos. 2 & 3 shall again be interconnected separately with sub-station No.1 by means of 33KV overhead transmission lines. This will facilitate alternate source of power supply to all the three sub-stations. For details Ref. Drg. No. RI-3/ELECT/2189 showing the block diagram.

Both out sourcing option : Variant-II

It is proposed that one number 33KV overhead feeder with ACSR WOLF conductor shall be drawn from 33KV Regional Switching station to 2x10MVA, 33/6.6KV Project sub-station to cater the various loads of CHP, Colony and general illuminations.

7.8 Metering Arrangement

(Common for all three Variants)

For the purpose of proper allocation of energy charges for Amrapali opencast project, the 33KV circuit breakers controlling the 33KV OHTL outgoing feeder of 33KV

Receiving Station to Amrapali OCP would be equipped with necessary metering facilities.

7.9 Power Cost

Coal out sourcing option : Main Variant

Considering on current DVC tariff, Annual power bill would be in order of Rs. 32.038 Crores based on the maximum power demand in the year,Y20 of quarry operation as shown in table no. VII(11).

Fully departmental option : Variant-I

Considering on current DVC tariff, Annual power bill would be in order of Rs. 34.86 Crores based on the maximum power demand in the year,Y20 of quarry operation as shown in table no. VII(11)

Both out sourcing option : Variant-II

Considering on current DVC tariff, Annual power bill would be in order of Rs. 13.76 Crores based on the maximum power demand in the year,Y10 of quarry operation as shown in table no. VII(11)

7.10 Power Factor

Coal out sourcing option : Main Variant

To maintain a high system power factor of around 0.9 even during maximum demand hours, 6.6KV capacitors having a capacity of 4500 KVAR are to be installed in the 6.6KV switch board of sub-station no.1. In each of sub-station nos. 2 and 3, provision has been made for installation of capacitor banks of 6.6KV with capacity of 3000 KVAR & 3000 KVAR respectively. The capacitor banks shall have the facility to connect and disconnect required number of units depending upon the loading pattern of sub-stations. The capacitor bank shall be provided with automatic control facility.

Fully departmental option : Variant-I

To maintain a high system power factor of around 0.96 even during maximum demand hours, 6.6KV capacitors having a capacity of 4500 KVAR are to be installed in the 6.6KV switch board of sub-station no.1. In each of sub-station nos. 2 and 3,

provisionhas been made for installation of capacitor banks of 6.6KV with capacity of 3600 KVAR & 3600 KVAR respectively. The capacitor banks shall have the facility to connect and disconnect required number of units depending upon the loading pattern of sub-stations. The capacitor bank shall be provided with automatic control facility.

Both out sourcing option : Variant-II

To maintain a high system power factor of around 0.96 even during maximum demand hours, 6.6KV capacitors having a capacity of 4200 KVAR are to be installed in the 6.6KV switch board of Project sub-station. The capacitor bank shall be provided with automatic control facility.

7.11 Power Distribution System (Surface & Quarry)

Coal out sourcing option : Main Variant

Project Sub-station no.1 would be installed near the initial entry of the mine. This sub-station would feed power to CHP, workshop and colony by providing 3 nos of 6.6KV feeders for CHP, one no of 6.6KV feeder for colony and other 6.6KV feeders shall be drawn along the quarry periphery. Power for different equipment of quarry will be obtained by tapping these periphery quarry feeders through air break switches. Shovels, drills and pumps will be fed from these quarry feeders by means of cables and field switches.

On year Y4 the Substation No. II would be established in Eastern part of the quarry from where the Dragline would receive power at 6.0 KV . One transformer of 10 MVA , 33 / 6.6 KV , would be specially engaged for supplying power to the dragline by providing separate OHTL. By selected tapping the transformer utilization voltage of dragline would be available at 6 KV. It is proposed that this substation may be shifted 6 year , Y7/Y8 (or as an when required) to suitable location , so that , the voltage regulation could be maintained .

After year, Y5 onwards, when power demand would increase, the sub-station no. 3 would be established. This sub-station would feed power to the major quarry loads, like OB removal equipment, HT pumps and quarry lighting fixtures.

For power feeding these equipment from each of the sub-station nos. 2&3, four numbers 6.6KV feeders with DOG ACSR conductors would be drawn along quarry.

For details, refer Drawing Nos. RI-3/Elect./2194, RI-3/Elect./2195 & RI-3/Elect./2196.

Fully departmental option : Variant-I

Project Sub-station no.1 would be installed near the initial entry of the mine. This sub-station would feed power to CHP, workshop and colony by providing 3 nos of 6.6KV feeders for CHP, one no of 6.6KV feeder for colony, one no of 6.6KV feeder for workshop and other 6.6KV feeders shall be drawn along the quarry periphery. Power for different equipment of quarry will be obtained by tapping these periphery quarry feeders through air break switches. Shovels, drills and pumps will be fed from these quarry feeders by means of cables and field switches.

On year, Y4 the Substation No. II would be established in Eastern part of the quarry from where the Dragline would receive power at 6.0 KV . One transformer of 10 MVA , 33 / 6.6 KV , would be specially engaged for supplying power to the dragline by providing separate OHTL. By selected tapping the transformer utilization voltage of dragline would be available at 6 KV. It is proposed that this substation may be shifted year, Y7/Y8 (or as an when required) to suitable location , so that , the voltage regulation could be maintained .

After year, Y5 onwards, when power demand would increase, the sub-station no. 3 would be established. This sub-station would feed power to the major quarry loads, like coal winning equipment, OB removal equipment, HT pumps and quarry lighting fixtures.

For power feeding these equipment from each of the sub-station nos. 2&3, four numbers 6.6KV feeders with DOG ACSR conductors would be drawn along quarry.

For details, refer Drawing Nos. RI-3/Elect./2194, RI-3/Elect./2195 & RI-3/Elect./2196.

Both out sourcing option : Variant-II

Project Sub-station 2x10MVA, 33/6.6KV would be installed near the initial entry of the mine. This sub-station would feed power to CHP, workshop and colony by providing 3

nos. of 6.6KV feeders for CHP, one no of 6.6KV feeder for colony and other 6.6KV feeders shall be drawn along the quarry periphery.

Quarry illumination would be done by tapping these Quarry feeders.

For details, refer Drawing Nos. RI-3/Elect./2194, RI-3/Elect./2195 & RI-3/Elect./2196.

7.12 Pumping

(Common for Coal out sourcing option and Fully departmental option)

All main pumps are rated at 6.6KV. For supplying power to main pumps 6.6KV overhead lines would be drawn from sub-station nos. 2&3. Power distribution to main pumps would be done by means of 6.6KV panels.

L.T. pumps are rated at 415V. Power to L.T. pumps would be fed by tapping 6.6KV feeder by means of cable and airbreak switches. The transformation and distribution of power at 415V would be done by field switches & transportable sub-station.

7.13 Illumination

(Common for all three Variants)

7.13.1 Quarry Illumination

For general illumination high pressure sodium vapour lamps 400W shall be mounted on suitable supports fixed along quarry periphery. The permanent type of illumination in haul road, and inside quarry shall also be done by 400W/250W HPSV lamps. These lights are to be supplied from 230V (L-L) system.

Haul roads from quarry to CHP and workshop etc. will also be illuminated by 400/250W HPSV light fittings.

Provision for mobile lighting towers have also been made for illumination in the working of quarry. The tower consists of 4x1000W metal helide fittings with 6KVA DG set mounted on a trolley and a mast of 18m height. The lighting tower can also take power from normal power supply system.

7.13.2 Emergency Illumination

Two nos. of 20 KVA generator sets have been provided to meet the emergency lighting requirement.

- Standard discharging rod
- Danger notice plate
- First aid box complete with necessary content
- Electric shock treatment chart
- Rubber matting tested for an insulation level of 1100V
- Trolley mounted ladder, safety belt etc.

7.14.6 MAINTENANCE & TESTING TOOLS AND TACKLES

The following tools & tackles shall be used:

- Insulation tester 500V, 6000V & 2.5KV and intrinsically safe megger
- Earth resistance tester
- Clip volt ampere meter (Tong tester)
- AVO meter
- Transformer oil tester
- Cable jointer kit
- Portable ammeter, Voltmeter etc.
- Oil filtering machine for transformer oil
- Analog multi-meter
- Lux meter
- High voltage cable testing apparatus
- Hand operated crimping tool

7.15 COMMUNICATIONS

(Common for all three Variants)

For effective management of different production, service units and for ensuring safety, the following communication facilities have been envisaged:

- Administrative communication
- DECT voice/Data Communication System

7.15.1 Administrative Communication

Following different types of administrative communication systems have been envisaged:

7.15.1.1 Automatic Telephone Exchange

Automatic telephone communication system has been envisaged for the effective communication between various production units, quarry workings, workshops, main and site offices, stores and sub-stations etc. This would be of 300-line capacity. This would be located near the colony. One DECT 100 line Radio EPABX (WILL) shall be located near the mine site office. Pairs of tie lines would interconnect both the exchanges.

7.15.1.2 Integrating Voice/Data Communication System (DECT)

DECT system shall employ WILL (Wireless in Local Loop) technology so as to eliminate the unreliability associated with wired local loops. The system shall be end to end digital in nature. This shall ensure to minimize transmission errors thereby improving the signal quality. The system shall provide integrated communication so that the system shall be used for telephone communication as well as for providing WAN links for the system. The system shall be expandable so as to add sub-systems and terminals as and when required. The system shall be compatible with the established Telecom Standard, so as to be sufficiently future proof.

DECT Compliant wireless in local loop with 200 lines equipped with 100 subscriber hardware is proposed. The main Central Station (DECT interface unit) shall be installed at P.O. office and shall be interfaced with proposed colony EPABX. The system consists of following sub-system:

i) DECT interface system
ii) Central base station (BS)
iii) Remote base station
iv) Multi wall set
v) Wall set
vi) Modem
vii) Directional antenna
viii) Network Management System

7.15.1.3 Paging System

Paging system having 50 subscribers is envisaged for locating key personnel as and when required.

7.15.1.4 **External P&T Telephone Communication System**

Twenty-five telephone lines with a EPABX interface have been provided for P&T communication and access to public communication grid. These telephones sets would be located in the residence and office of key personnel of the project, sub- station, railway siding, CHP, workshop, magazine, stores, hospital and water supply etc.

7.15.1.5 **Fax Facility**

FAX facility alongwith EMAIL is provided for this project having connection from Piparwar P&T Exchange.

7.15.1.6 **Fire Alarm and Signalling System**

Various structures and buildings of industrial site would be equipped with fire-alarm signaling facilities. Hand operated fire alarm warning signaling boxes would be installed on the walls of buildings and structures at all strategic places.

7.15.1.7 **Automatic Truck Despatching & Allocation System**

(Common for Coal out sourcing option and Fully departmental option)

The main feature of the system shall be as follows:

i) Real time continuous monitoring of activities and operational status of HEMMs viz. spotting, loading, dumping, breakdown etc.

ii) Real time monitoring of production and performance of HEMMs.

iii) Display of production status (Coal & OB), equipment, and equipment status, shovel dumper assignment, individual and average cycletime etc.

iv) Automatic dumper despatching, optimum shovel dumper assignment.

v) Management information generation and reporting comprising production reports, stand still report availability report, utilization report detailed operational analysis reports etc.

vi) Bi-directional voice and data communication between different operational locations.

The above TMMS system shall be based on global positioning system (GPS). A radio trunking system is envisaged to accomplish the voice communication part of the truck despatching system.

7.16 EDP System Facilities

(Common for all three Variants)

It is proposed to deploy electronic data processing facilities for production planning, control and project management etc. The system envisages to plan a key role in establishment of highly effective data base management system (DBMS) and Management Information System (MIS) etc.

The type of computer would be small business computer with broad facilities and also have specific facilities to carry out:

- Pay rolls
- Financial accounting
- Inventory control
- Material management
- HEMM utilization, breakdown analysis, idle time analysis etc.
- Production, dispatch schedule and variances
- Accident records etc.
- Resource utilization & MIS

The estimated capital investment required for the above facilities has been indicated in Appendix-A.3.1.

Before initiating action for installation and implementation of the above EDP system, a detailed system study would have to be carried out, with clearly defined system objectives for identifying the data processing needs and management information system needs of the project. Based on the results and findings of the study, the system configuration and specification have to be decided.

7.17 Capital Investment for Plant & Machinery – Electricals

(Common for all three Variants)

The total capital investment for Amrapali OCP for electrical power supply, distribution, illumination, communication and EDP facilities have been estimated and is given in Appendix-A.3.1.

DPR FOR AMRAPALI OCP(12.0 MTY)
BOTH DEPARTMENTAL

STATEMENT SHOWING THE CONNECTED LOAD, MAXIMUM DEMAND AND ANNUAL ENERGY CONSUMPTION

TABLE NO. VII.1

SL. NO.	DESCRIPTION	VOLT	POPULATION	/OPER.	UNIT POWER KW	CONNECTED LOAD KW	LOAD IN OPERATION KW	D.F	ACTIVE KW	REACTIVE KVAR	FULL KVA	P.F	ANNUAL ENERGY CONSUMPTION Mkwh
A	OB EQUIPMENT												
1	WALKING DRAGLINE 20/90	6.6 KV	1	1	2624	2624	2624	0.40	1050	-345		0.95 Lead	5.49
2	ELECT. ROPE SHOVEL 20.0 CU.M	6.6 KV	3	3	1723	5169	5169	0.65	3360	3429		0.70	14.67
3	ELECT. HYD. SHOVEL 8.3 CU.M	6.6 KV	8	8	530	4240	4240	0.60	2544	2595		0.70	11.11
4	ELECT. RBH DRILL 250 MM	6.6 KV	11	11	386	4246	4246	0.50	2123	2168		0.70	4.48
B	COAL EQUIPMENT												
1	ELECT. ROPE SHOVEL 8.3 CU.M	6.6 KV	4	4	530	2120	2120	0.65	1378	1406		0.70	6.02
2	PUMPING	6.6-44 KV				5445	5005	0.80	4004	3003		0.80	17.54
3	CHP	6.6 KV				14440	9490	0.70	6643	6777		0.70	39.45
C	COMMON												
1	COLONY	6.6-44 KV				3000	2100	0.90	1890	915		0.90	6.65
2	WORKSHOP	6.6 KV				2100	1680	0.50	840	857		0.70	2.26
3	ILLUMINATION	0.44-0.23 KV				400	320	0.90	288	139		0.90	1.26
	TOTAL					46764	36994		24119	20543	31542	0.76	108.94

DIVERSITY FACTOR	: 1.2			
IMPROV. POWER FACTOR	: 0.95			
LOAD IN OPERATION (Kw)	: 36994		20100	17452	26619
MAXIMUM DEMAND (KVA)	: 20937		20100	5952	20937
INITIAL P.F.	: 0.76	Required KVAR		-11569	
ANNUAL ENERGY CONSUMP (Mkwh)	: 108.94				

DPR FOR AMRAPALI OCP(12.0MTY)

BOTH DEPARTMENTAL OPTION

Yearwise power Bill

Table No. VII-III

Tariff: Rs. 3.20/KWh

Amount In Rs, Lakhs

YEAR		O.B.	Coal	Common	Total
1	Construction Period	0.0	0.0	0.0	0.0
2		0.0	0.0	0.0	0.0
3		78.68	0.00	53.82	132.50
4		122.74	238.05	107.65	468.44
5	Production Built-up Period	316.29	601.89	172.74	1090.92
6		737.49	1082.50	223.15	2043.14
7		810.40	1623.74	273.57	2707.71
8	Beyond Target Year	912.68	1736.00	315.36	2964.04
9		911.11	1792.13	321.41	3024.64
10		894.85	1848.26	325.44	3068.54
11		992.41	1904.38	325.44	3222.23
12		1050.11	1904.38	325.44	3279.93
13		1050.11	1960.51	325.44	3336.06
14		1056.40	2016.64	325.44	3398.48
15		1064.27	2016.64	325.44	3406.35
16		1082.11	2016.64	325.44	3424.19
17		1082.11	2016.64	325.44	3424.19
18		1103.61	2016.64	325.44	3445.69
19		1143.48	2016.64	325.44	3485.56
20		1144.00	2016.64	325.44	3486.08
21		1143.48	2016.64	325.44	3485.56
22		1134.03	2016.64	325.44	3476.11
23		1134.03	2016.64	325.44	3476.11
24		1133.51	2016.64	325.44	3475.59
25		1117.25	2016.64	325.44	3459.33

DPR FOR AMRAPALI OCP(12.0MTY)

(BOTH DEPARTMENTAL OPTION)

Annual power Bill

Tariff: Rs. 3.20/KWh

Sl.No.	Power Consumers	Annual Power consumption MKWh	KWh per tonne of coal production (KWh/te)	Power charges per tonne of coal production (Rs)
10	O.B.	35.75	2.060	9.53
20	+ Coal	63.01	5.251	16.80
30	Common	10.17	0.847	2.71
	Total	108.94	9.078	29.05

Annual power Cost (Rs): 34.86 Crores

TABLE NO. VII-1

STATEMENT SHOWING THE CONNECTED LOAD, MAXIMUM DEMAND AND ANNUAL ENERGY CONSUMPTION

SL. NO.	DESCRIPTION	VOLT	POPULATION	OPER.	UNIT POWER KW	CONNECTED LOAD KW	LOAD IN OPERATION KW	D.F	ACTIVE KW	REACTIVE KVAR	FULL KVA	P.F	ANNUAL ENERGY CONSUMPTION Mwh
A	OB EQUIPMENT												
1	WALKING DRAGLINE 20/90	6.6 KV	1	1	2624	2624	2624	0.40	1050	-345		0.95 Lead	5.49
2	ELECT. ROPE SHOVEL 20.0 CU.M	6.6 KV	3	3	1723	5169	5169	0.65	3360	3428		0.70	14.67
3	ELECT. HYD. SHOVEL 8.3 CU.M	6.6 KV	8	8	530	4240	4240	0.60	2544	2595		0.70	11.11
4	ELECT. RBH DRILL 250 MM	6.6 KV	11	11	385	4245	4246	0.50	2123	2166		0.70	4.45
B	COAL EQUIPMENT												
1	PUMPING	6.6-.44 KV				8445	5006	0.80	4004	3003		0.80	17.54
2	CHP	6.6 KV				14440	9490	0.70	6643	6777		0.70	39.46
C	COMMON												
1	COLONY	6.6-.44 KV				2500	1750	0.90	1575	763		0.90	6.64
2	WORKSHOP	6.6 KV				525	420	0.50	210	214		0.70	0.59
3	ILLUMINATION	0.44-0.23 KV				400	320	0.90	288	139		0.90	1.26
	TOTAL					42589	33054		21736	18741	28745	0.76	100.12

DIVERSITY FACTOR	:	1.0			18164	15617	23988
IMPROV. POWER FACTOR	:	0.86			18164	8088	19921
LOAD IN OPERATION (Kw)	:	33054	Reactive	KVAR		-10320	
MAXIMUM DEMAND (KVA)	:	19921					
INTIAL P.F.	:	0.76					
ANNUAL ENERGY CONSUMP (Mwh)	:	100.12					

COAL OUTSOURCED

Annual Power Bill

TABLE NO. VII-II

Tariff: Rs. 3.20/KWh

Sl.No.	Power Consumers	Annual Power consumption MKWh	KWh per tonne of coal production (KWh/te)	Power charges per tonne of coal production (Rs)
1.0	O.B.	35.75	2.980	9.53
2.0	Coal	57.00	4.750	15.20
3.0	Common	7.37	0.614	1.96
	Total	100.12	8.343	26.70

Annual power Cost (Rs) : 32.038 Crores

AMRAPALI OCP (12.0MTY)

(COAL - OUTSOURCED OPTION)

Yearwise power Bill

Tariff: Rs. 3.20/KWh

Amount in Rs, Lakhs

YEAR	O.B.	Coal	Common	Total
1				
2				
3	78.68	0.00	41.30	119.98
4	122.74	213.97	82.60	419.31
5	316.29	529.65	129.75	975.69
6	737.49	954.07	164.00	1855.56
7	810.40	1431.10	198.24	2439.74
8	912.68	1543.36	225.64	2681.68
9	911.11	1599.49	231.70	2742.30
10	894.85	1655.62	235.74	2786.21
11	992.41	1711.74	235.74	2939.90
12	1050.11	1711.74	235.74	2997.60
13	1050.11	1767.87	235.74	3053.73
14	1056.40	1824.00	235.74	3116.15
15	1064.27	1824.00	235.74	3124.02
16	1082.11	1824.00	235.74	3141.85
17	1082.11	1824.00	235.74	3141.85
18	1103.61	1824.00	235.74	3163.36
19	1143.48	1824.00	235.74	3203.22
20	1144.00	1824.00	235.74	3203.74
21	1143.48	1824.00	235.74	3203.22
22	1134.03	1824.00	235.74	3193.78
23	1134.03	1824.00	235.74	3193.78
24	1133.51	1824.00	235.74	3193.25
25	1117.25	1824.00	235.74	3176.99

STATEMENT SHOWING THE CONNECTED LOAD, MAXIMUM DEMAND AND ANNUAL ENERGY CONSUMPTION

TABLE NO VII-1

SL. NO.	DESCRIPTION	VOLT	POPULATION /OPER.	UNIT POWER KW	CONNECTED LOAD KW	LOAD IN OPERATION KW	D.F	ACTIVE KW	REACTIVE KVAR	FULL KVA	P.F	ANNUAL ENERGY CONSUMPTION Mkwh
A	COAL EQUIPMENT											
1	CHP	6.6 K V			14440	9490	0.70	6643	6777		0.70	39.46
B	COMMON											
1	COLONY	6.6-.44 K V			900	720	0.90	648	314		0.90	2.28
3	ILLUMINATION	0.44-0.23 K V			400	320	0.90	288	139		0.90	1.25
	TOTAL				15740	10530		7579	7231	10475	0.72	43.00

DIVERSITY FACTOR	:	1.2
IMPROV. POWER FACTOR	:	0.95
LOAD IN OPERATION (Kw)	:	10530
MAXIMUM DEMAND (KVA)	:	6579
INITIAL P.F.	:	0.72
ANNUAL ENERGY CONSUMP (Mkwh)	:	43.00

	6316	6025	9729
	6316	1842	6579
Required KVAR		-4183	

DPR FOR AMRAPALI OCP(12.0MTY)

(BOTH OUTSOURCED OPTION)

TABLE NO. VII-II

Annual power Bill

Tariff: Rs. 3.20/KWh

Sl.No.	Power Consumers	Annual Power consumption MKWh	KWh per tonne of coal production (KWh/tc)	Power charges per tonne of coal production (Rs)
1.0	Coal	39.46	3.285	10.52
2.0	Common	3.54	0.295	0.94
	Total	43.00	3.58	11.47

Annual power Cost (Rs) : 12.760 Crores

AMRAPALI OCP(12.0MTY)

(BOTH OUTSOURCED OPTION)

Table No VI

Tariff: Rs. 3.20/KWh

Amount In Rs. Lakhs

YEAR	Coal	Common	Total
1	0.0	0.0	0.0
2	0.0	0.0	0.0
3	0.00	18.62	18.6
4	157.84	37.25	195.1
5	473.52	59.90	533.4
6	841.81	74.88	916.7
7	1262.72	89.86	1352.6
8	1262.72	103.20	1365.9
9	1262.72	109.25	1371.0
10	1262.72	113.28	1376.0
11	1262.72	113.28	1376.0
12	1262.72	113.28	1376.0
13	1262.72	113.28	1376.0
14	1262.72	113.28	1376.0
15	1262.72	113.28	1376.0
16	1262.72	113.28	1376.0
17	1262.72	113.28	1376.0
18	1262.72	113.28	1376.0
19	1262.72	113.28	1376.0
20	1262.72	113.28	1376.0
21	1262.72	113.28	1376.0
22	1262.72	113.28	1376.0
23	1262.72	113.28	1376.0
24	1262.72	113.28	1376.0
25	1262.72	113.28	1376.0

CHAPTER-VIII

8.0 COAL HANDLING PLANT:

8.1 INTRODUCTION:

The Coal Handling Plant for this project is envisaged to handle total producti (12.0 MTY) of coal from the mine.

The coal handling plant shall have facilities for receiving coal from rear dischar dumpers, crushing of coal to (-) 50 mm size, conveying, storing, reclamation a loading into railway wagons through SILO. Sufficient storage has been provided the coal handling system to meet the eventualities of disrupted coal production the mine or delay in off-take of NTPC.

Considering the fact that a very high tonnage of coal has to be despatched witl the stipulated time, a rapid loading system for loading into railway wagons has be adopted.

The plant will be operated in synchronisation with the production of the mine. Ti coal handling plant has also been provided with suitable repair, communication a other auxiliary facilities to meet the day-to-day requirement in the plant operation.

8.2 LOCATION

The layout Plan of CHP is shown in the Drawing No: RI 3 / Mech. / 002266

The CHP has been planned keeping in view the rugged terrain. The followi factors have been considered in finalising the location of CHP:

a) Mine boundary
b) Mine entry
c) Topography
d) Availability of free space
e) External dumps of the mine
f) Proposed Railway siding / MGR
g) Overall economy of the system

8.3 System Parameters As Per Project Report

The system parameters taken while formulation of project report was as follows: -

Sl.No.	Particulars	Considered Summarised Data
(a)	Coal production of mine in MTY	12.00
(b)	Number of working days/year	330
(c)	Number of working shift/day	3
(d)	Number of effective working hours/day	15
(e)	Feed size of ROM. coal (in mm)	(-) 1200
(f)	Product size (in mm)	(-) 50
(g)	Type of loading desired	By Rapid loading System @5500 TPH
(h)	Wagon Marshalling arrangement	By creep control loco of Customer
(i)	Loading hours	Round the clock.
(j)	Grade of coal	F
(k)	H.G.I.	59-69
(l)	Consumer	Power House of NTPC
(m)	Mode of Despatch	By rail / MGR
(n)	Rake capacity	58 Nos. of Box 'N' wagons.

8.4 System Capacity

The system capacity of the coal handling plant has been designed in such a way so that it can cater fluctuations in the coal production within an overall rated production of 12.0 MTY from the mine. The system capacity of crushing and conveying has been kept as 4000 TPH, distributed equally in two circuits. However, one circuit of crushing has been kept as standby considering the high production of mine a set of conveyors have been provided to carry crushed coal. Storage capacity of the bunker has been kept as 2x25000 Te to meet the fluctuation in loading and despatch. The capacity of silos in rapid loading system has been kept as 2x4000 Te where from wagon will be loaded @ 5500 TPH.

8.4 System description of CHP as per Project Report

The CHP will have the following functional units as shown in layout of CHP Plan D No: RI-3 / Mech / 002266.

- Receiving.
- Primary Crushing from (-) 1200 mm to (-) 200 mm.
- Secondary Crushing from (-) 200 to (-) 50 mm.
- Storage & reclamation.
- Rapid loading with SILO.
- Dust suppression, Extraction, fire-fighting etc. & other Auxiliary facilities.
- Belt weighing.

8.4.1 Receiving and Crushing

The necessary control over fragmentation of coal will be exercised in the quarry itself b designing suitable blasting parameters to maintain the lump size within (-) 1200 mr Heavy duty sizers of 2000 TPH capacity have been envisaged to crush ROM co from (-) 1200 mm to (-) 50 mm size. For this three numbers of primary Sizers ar three numbers of secondary sizers have been provided. The ROM coal will b unloaded into the receiving hoppers of primary sizers.

The coal will be reclaimed by apron feeder and fed to primary sizers for crushing t specified size of (-) 200 mm. Crushed coal of (-) 200 mm will be collected by th conveyor installed underneath the primary sizers and fed to the secondary sizers fo sizing to (-) 50 mm. Three such circuits comprising of crushing and conveying hav been provided so that two circuits will be in operation and one circuit will be kept a standby.

8.4.2 Conveying

Two nos. conveyors of 1600 mm belt width will be installed below the secondary sizers and feed to the elevating conveyors for onward transportation to bunkers. The elevating

Conveyor will have two circuits in which coal from any Sizer can be fed. The elevating conveyors will carry coal to ground bunker. The capacity and size of reclaim and

loading conveyors have been selected to match the desired loading rate of Rapid loading System in combination with Silo.

8.4.3 Storage and Reclamation

Provision has been made for two numbers of double-slit self-flowing ground bunkers having capacity of 25000 Tonnes each. Each ground bunker has two nos. of tripper conveyor installed over it. The elevating conveyor carries the crushed coal (-) 50 mm size and discharge on tripper conveyor installed over the bunkers for spreading of coal in bunker.

The tripper conveyor will uniformly spread the crushed coal in the bunkers. Arrangement of tripper conveyor will be such that it can move from one end to other to discharge the coal into the bunker in the form of layers, so that proper blending of coal takes place. Since the height of fall of coal mass is very high, so a suitable cascading arrangement at any terminal point of the bunker will be provided to avoid the impact of free fall of coal mass on the bowl face of the bunker. Continuous bin level indicators will be provided to gauge the level of coal in the bunkers.

Suitable measures will be taken for the smooth flow of (-) 50 mm coal at bunkers / chutes.

The bunker opening is fitted with plough feeders with a capacity of 2000 TPH for reclaiming crushed coal for onward transportation to reclaim conveyor. Three number of plough feeders have been provided in each ground bunkers. Out of three, two will be working and one will be kept as stand by. Sufficient space will be provided for repair, maintenance of the plough feeders. A motorized hoist will be used for handling feeders and its components.

8.4.4 Rapid Loading and Despatch

Provision has been made for dispatch of coal through Rail. Since the coal production and dispatch of coal is interlinked, hence handling of 40000 tonnes per day of coal is done. Considering a rake of 58 Box 'N' wagon, the total capacity of coal loaded into a rake will be 3300 tes. and thus minimum of 13 rakes will be loaded daily. For such a huge quantity off take of coal, two nos. of rapid load out system have been envisaged along with two nos. of Silo. The capacity of Silo will be 4000 te. each. The two rail lines

along with Silo have been envisaged so that simultaneous loading on both lines cou be done.

8.4.5 Auxiliary Facilities

In auxiliary facilities the following arrangements have been provided:

- Tramp iron removal
- Dust suppression / Extraction.
- Fire fighting
- Weigh-ment of coal

Provision has been made for metal detection to detect ferrous and non-ferrou materials coming in the CHP. An electronic tramp iron remover has been made. Th will facilitate removal of magnetic materials from the belt conveyor. These devices w be located suitably.

The dust suppression and dust extraction units have also been provided to contr dust in the working zones of CHP area as per environmental requirement.

For plant safety elaborate fire fighting system have been provided.

There shall be a common control room for all equipment in accordance with pr determined sequence for starting and stopping. But provision for local control of ar equipment has also been provided for emergency purpose. Sequence inter-lockin between different equipments shall also be provided.

A set of belt weighing scale has been envisaged. This will be suitably located on th conveyors discharging coal onto the tripper conveyor over the bunker.

Two nos. in-motion rail weighbridges have also been provided.

8.5 Capital Estimates & Economics

The capital estimates for coal Handling plant have been given in the append (A.3.4.0).

CHAPTER - IX

9.0 RAILWAY SIDING

9.1 Coal evacuation from Amrapali OCP

The proposed Amrapali OCP is located in a green field area and at present there is no arrangement for coal evacuation from this OCP. The coal from Amrapali OCP is proposed to be linked to Barh STPS, located at a distance of about 300 Km from the mine site, near Patna. Hence, for the transportation of coal from this OCP to the proposed STPS, a railway siding is to be constructed and commissioned. For this purpose CCL as already appointed RITES for the preliminary survey work. It has been assumed that till this siding is constructed, alternative arrangement of loading the coal temporarily through Piparwar siding may be arranged.

9.2 Preliminary Traffic Survey Report by RITES

RITES was engaged by CCL for conducting study relating to the development of Railway infrastructure for Ashok OCP, Magadh OCP and Amrapali OCP, located in the northern fringe of N.K. Coalfield, in such a way that it can be extended and integrated in future for the development of other blocks of this coalfield. RITES has already submitted its report of Phase-I in Feb.'88 and Phase-II in Feb.'90.

9.3 Arterial Line from Tori to Shivpur

In Phase-I report, RITES has proposed to construct an Arterial line from Tori to Shivpur. It was further proposed that a siding will be branched off from Jogiadih Station, on Tori Shivpur line for linking Ashok/Purnadih/Piparwar OCP's.The distance from Tori to Jogiadih is about 17 Km and double line has been proposed to construct in this section.Presently, a line has been/is being constructed from Mckluskieganj to Piparwar, for the evacuation of coal from existing Piparwar OCP. From Jogiadih, a single line section has been proposed to construct and the line will meet the existing Mckluskieganj-Piparwar line near Khuntitoli Station (the track length from Jogiadih to Khuntitoli Station is 16.9 Km) for the evacuation of additional coal from the proposed Ashok/Purnadih OCP. Subsequently, this Arterial line will be extended from Jogiadih to Shivpur for a route length of 24.70 Km with single line section and crossing stations at

Phulbasia and Shivpur.As per the RITES report, prepared in Feb.'88 the cost of the arterial line upto Shivpur for a track length of 43.00 Km was estimated as Rs.100.81 crores.

9.4 RITES Phase-II Report

Seven non-coking coal blocks located between Amrapali and Badam Blocks,located in the North-Eastern fringe of N.K. Coalfield, can be linked to consumers of non coking coal by extending the Tori-Shivpur Arterial line along the Northern boundary of coal field for a route length of 39.8 Km upto Ambajit Station (81.50 Km from Tori) in the distant future.

The RITES report has further suggested that ultimately this Arterial Railway line can be linked to the Barkakana-Dehri-on-sone section at Bhurkunda Rly. station (122.7 Km from Tori via Shivpur)via Ambajit station so as to provide a connection for despatch of coking coal from Badam and Rohne and other blocks to steel plants.

9.5 Railway siding of Amrapali

For evacuation of coal from N.K. coalfield, an Arterial line from Tori to Shivpur (41.7 Km route) in Phase-I and from Shivpur to Bhurkunda via Ambajit in Phase-II is proposed to be constructed. At present, a railway line from Ranchi to Kodarma via Barkakana /Hazaribagh is under construction.

Coal from Amrapali OCP will be despatched to proposed Barh STPS by Rail. The route to be followed will be Amrapali - Shivpur - Ambajit - Hazaribagh - Kodarma. From Kodarma the coal will be despatched by Gaya - Kiul line to Barh through Mokama Railway Junction.

The daily requirement of Box'N' wagons and No. of trains are as below :-

Daily loading in tonnes	Daily requirement of no. of Box'N'wagon	Daily train to be run	
		In single unit of 58 Box'N' rake	In long unit of 116 Box'N' rake
40,000	690	12	6

9.6 Yard Layout

A yard has been proposed which can cater to the loading of two long trains from two silos. The wagons are proposed to be loaded from the silos @ 5000 TPH. The proposed siding will take-off from the proposed Shivpur Station. The link portion will have a route length of 4.8 Km and the yard portion will have a track length of 15.10 Km. For smooth loading and despatch of coal , it is proposed that the coal will be loaded from two loading points. By this, the reliability of loading will increase and it will be possible to load and despatch a long train(116. 'N' Box) within the stipulated duration of 110 minutes.

9.7 Characteristics of Railway Siding

(a) Two empty receiving lines of full rake length of 116 Box'N' wagons

(b) Two after load lines of full rake of 116 Box N wagons through M G R bulb. The bulb arrangement would provide the movement of train without detaching the engine with provision of creap control loco during the loading at 0.80 Km/hour.

(c) Two small stores have also been provided to facilitate the siding.

(d) The provision of in-motion electronic weigh bridge for weighing both empties and loaded wagons has been made. A pre-weigh hopper system of loading into wagons has been adopted.

9.8 Sequence of operation with Box'N' wagons.

Empty rake will be brought by railway loco for loading the rake, from terminal station Shivpur. Wagons will be placed on the receiving line below silo. Rake will

attached to the pilot for getting the wagons loaded. After loading the wagons the pilot will move through MGR bulb and will take the rake to Shivpur station.

9.9 **Land**

The total requirement of land for Railway Siding is 179 Ha. including 28.80 Ha. for link portion and 105.70 Ha. for yard portion and 44.50 Ha. for inside MGR bulb.

9.10 **Capital Estimates.**

Pending detailed instrumental suyrvey, design and estimates by the railway,the provision on railway siding has been estimated and given in Appendix-A.5.

CHAPTER - X

WORKSHOP & STORE

10.0 (COAL & OB DEPARTMENTAL)

10.1 INTRODUCTION

Amrapali opencast project report has been planned for a targeted production of 12.00 MTY. HEMM like 20 cum shovel with 170 T dumpers, 8.3 cum shovel with 85 T dumpers & 20/90 dragline for OBR & 8.3 cum shovel with 85 T dumpers for Coal have been envisaged in this project.

A full fledged Unit workshop has been envisaged for Amrapali OCP to cater to the need of daily maintenance, scheduled maintenance, lubrication, routine inspection, minor repair and replacement of parts/sub-assemblies of HEMM to be deployed in this project such as shovels, drills, dumpers, dozers, crane, grader etc. Minor repair of assemblies and sub-assemblies of pumps, electrical, light vehicles etc. deployed in the project will also be performed in a separate E&M workshop proposed in the same premises.

Any major overhaul of equipment and manufacture of spares on large scale are beyond the scope of this workshop.

However, restoration of worn-out parts and manufacture of few spares which are in short supply and are critical in nature, will be carried out in the Machine shop of this unit workshop.

M/S National Industrial Development Corporation Ltd. New Delhi was instructed by Central Coalfields Ltd. Ranchi for preparing a' Perspective Plan for ... workshop facilities ' in the year 1993. In their report M/S NIDC have proposed a "Central workshop" for North Karnpura Coalfields taking into consideration the potential of major/capital overhauls of HEMM of mega projects like Magadh, Ashoka, Amrapali etc. to come in near future.

Till such time, this unit workshop will cater to the need of minor & medium repairing load of HEMM & other mining equipment of this mine and major overhaul of equipment will be carried out in Central workshop, Barkakana.

No separate Field workshop has been proposed for this mine, as the Unit workshop is located near the mine entry.

This Unit workshop will have two parts- Excavation and E&M workshop. Apart from this, Project store and other common facilities have been provided. A schematic layout plan of the workshop is shown in Drawing No. RI-III/E&M/002295.

10.2 Excavation Workshop

The part of workshop will have the facilities for attending to the scheduled maintenance daily maintenance, minor and medium repair or replacement of parts/ sub assemblies of face and transport equipment such as shovels, drills, dozers, cranes, grader and other miscellaneous equipment used for mining operation.

All dumpers and dozers coming to workshop for their daily as well as scheduled maintenance will be first washed at the washing stations provided in the workshop and then brought to the respective maintenance shops like Dumper daily maintenance shop, Dumper scheduled maintenance (lubrication & inspection) shop and Dozer repair shop.

In Daily maintenance shop, the equipment will be checked for lubrication, tyre inflation, oil levels etc.

The equipment for scheduled preventive maintenance as per recommended schedule of the manufacturers will be directed to Schedule maintenance shop where their complete lubrication will be taken care of along with diagnosis of their technical state. After evaluation of the condition, they will be sent to the Dumper repair shop for medium repairs and / or to Regional Workshop / Central workshop for major repairs.

The equipments, which experiences incidental problem in the field and require medium repair will also be directed Dumper/ Dozer repair shops.

Maintenance and minor repairs of shovels & drills will be carried out at the site of their working as far as possible.

Broadly this workshop will have the following functional shops: -

i) Machine shop
ii) Electrical repair shop
iii) Assembly & Sub-assembly shop
iv) Engine repair shop
v) Radiator repair shop
vi) Welding & Structural shop
vii) Dumper repair shop
viii) Dumper daily maintenance shop
ix) Dumper schedule maintenance shop
x) Heavy repair shop
xi) Dozer repair shop
xii) Washing stations
xiii) Smithy shop
xiv) Stores and Common facilities

(i) Machine shop

This shop will have the necessary tools for restoration of worn out parts and manufacture of small non-complicated spare parts, which are in short supply and are

required for the repairs of HEMM. There will be a common 20Te floor operated EOT crane, which will serve Machine shop as well as other repairing shops.

(ii) **Electrical repair shop**
This shop will have the facilities for carrying out the minor and medium repairs of the electrical components of the mining equipment. The repair facilities have been limited to the parts replacement and repair of Self-starter, Dynamo, Battery charging etc. However, certain facilities have also been provided for re-winding of small electric motors, testing of relays and instruments etc.

(iii) **Assembly & Sub-Assembly shop**
Here there will be facilities for repairing the assembly and sub-assembly of Motor transport equipment. Since most of the machines will be similar make and model, they will be treated under unit replacement method The repaired assemblies will be drawn from the store and fitted to the equipment of same make and model.

(iv) **Engine repair shop**
Engine repair shop will have the facilities for minor and medium repairs and adjustment of diesel engines fitted on all types of dumpers, scrapers etc. working in the mine.

(v) **Radiator repair shop**
Here the repair and overhauling of radiators will be carried out. It is equipped with water tap for proper flushing and cleaning of radiators, testing stand and other repair tools and equipment.

(vi) **Welding and structural shop**
This shop will take-up the work of welding of buckets of shovels and other jobs of dumpers, dozers, drills etc. It will also undertake other non-standard welding works.

(vii) **Dumper repair shop**
This shop will cater to the need of repair / replacement of parts / components of the dumpers needing repair after their proper inspection & diagnosis of defects in the Schedule maintenance shop.

The dumpers, which experience incidental problem in the field and require minor & medium repair will also be attended in this shop.

All dumpers coming for repair must be first washed at the washing station before entering this shop. The entry and exit of dumpers will be from one side only. A Tyre Section is provided beside the Dumper repair shop. This shop will be equipped with floor operated EOT crane of 40 Te & 20 Te capacities.

(viii) **Dumper daily maintenance shop**
Checking of water and oil levels, greasing of lubrication points, changing of air and fuel

filters as per maintenance schedule and checking of tyre inflation will be performed in this shop.

(x) **Dumper schedule maintenance shop**
The schedule maintenance (lubrication & inspection) of the dumpers as per schedule recommended by the manufacture will be done in this shop.
For this purpose greasing and lubrication equipment has been provided.

(x) **Heavy repair Shop**
This shop will deal with the medium repair / replacement of component and sub assemblies of shovels, drills etc. that will be dismantled from the equipment working in the mine brought to this shop. One no. Of 40 Te capacity EOT crane has been provided in this shop.

(x) **Dozer repair shop**
The Dozer repair shop is meant for carrying out the maintenance and minor repairs of dozers. The repairs will be done mainly by the replacement of parts, units and sub-assemblies. The entrance and exit of dozers will be from one side only. One no. Of 10/5 Te capacity EOT crane has been provided in this shop.

(xii) Washing station
High-pressure multijet washing units for dumper & high-pressure water and steam jet washing unit for dozer have been envisaged for washing.

(xiii) **Smithy Shop**
A smithy shop has also been provided to manufacture small hand forging components required for the repair need of HEMM. It is located in one side of the workshop.

(xiv) **Stores & Common facilities**
A small store is provided for storing the spares and consumables required for repair and maintenance of HEMM and other mining equipment.
The different repair shops will draw day-to-day requirement of spares and other consumables from this store.
A fully equipped fuelling station has also been provided for fuelling the vehicles and transport equipment.

10.3 E&M Workshop
Considering the nature of repair and maintenance of E&M equipment, which is different from that of the HEMM, a separate workshop has been provided.
This part of the workshop will have the facilities for scheduled maintenance, day-to-daymaintenance and minor & medium repair by parts / units replacement method of all E&M equipment deployed in the project such as Pumps, CHP equipment, Electrical and Light vehicles etc.

Broadly this workshop will have the following functional shops.

i) Machine Shop
ii) Mechanical repair shop
iii) Electrical repair shop
iv) Smithy shop
v) CHP equipment shop
vi) Light motor vehicle repair shop
vii) Stores and Common equipment

(i) Machine Shop

This shop will undertake machining and reconditioning of spares. It will also manufacture small spares, which are in short supply and required for the repair of E&M equipment.

(ii) Mechanical repair shop

The equipment like pumps and pumping installation experiencing incidental problem in the field and requiring minor repair will be brought to this shop where they will be inspected and repaired. Apart from this the normal maintenance, repair of the pumps will be done in this shop.

(iii) Electrical repair shop

This shop will deal with the testing and minor repairing of electrical components of CHP equipment, Pumps, Switch Gears etc. This shop will undertake rewinding of small motors, charging of batteries, repairs of self-starters, dynamos of light & medium duty vehicles.

(iv) Smithy shop

This shop will deal with the manufacture of small hand forging components required for the repair need of E& M equipment.

(v) CHP equipment shop

This shop will deal with the minor and medium repair of CHP equipment. Any equipment that needs repairing will be dismantled from the equipment and brought to this shop.

(vi) Light motor vehicles repair shop

This shop will cater to the need of scheduled maintenance, minor & medium repair and replacement of components of light and medium duty vehicles such as Jeeps, Cars, Ambulances, Trucks, and School buses etc.
The vehicles will be thoroughly washed at the washing stations (meant for light & medium duty vehicles) before going to this shop for repairs.

(vii) Stores & Common equipment

A small store is provided for storage of 10 days consumption of spares & consumables required for repair & maintenance of E&M equipment.

10.4.Project Store

This workshop will have a project store to meet the total requirement of proposed workshop as well as additional requirement of the project. A full fledged store is provided adjacent to the workshop boundary with a view to minimize the time for collection of spares and consumables required for the repair and maintenance of HEMM in this unit workshop.
Only day-to-day requirement of spares and consumables will be kept in the workshop store for smooth functioning of workshop.

10.5 Working Schedule

This workshop will work mainly in two shifts of 8 hrs. but a group of technical personnel will also be provided in the third shift to look after the field repairs of mining equipment deployed in this shift.

10.6 Capital Investment

The details of P&M provided for the workshop along with their estimated cost have been in Appendix-A.3.2

(COAL OUTSOURCING OPTION)

10.0 This alternative has been prepared for the removal of coal by outsourcing agency.

This unit workshop will have two parts – Excavation and E&M workshops. Apart from this, Project store and other common facilities have been provided. A schematic layout plan of the workshop is shown in Drawing No. R 3 E&M 002306.

10.1 Excavation Workshop

In this case only running maintenance of HEMM deployed for OB removal will be carried out in this workshop. Any medium & major repair of HEMM are beyond the scope of this workshop

Broadly this workshop will have the following functional shops:

i) Machine shop
ii) Electrical Repair shop
iii) Smithy shop
iv) Welding & Structural shop
v) Dumper Repair shop
vi) Dumper Daily Maintenance shop
vii) Schedule Maintenance (Inspection and lubrication) shop
viii) Dozer Repair shop
ix) Field Service equipment
x) Washing Station
xi) Stores & common facilities

10.2 E&M Workshop

Considering the nature of repair and maintenance of E&M equipment, which is different from the HEMM, a separate E&M workshop has been envisaged.

This part of the workshop will have the facilities for schedule maintenance, day to day maintenance and minor & medium repair by parts/units replacement method of all E&M equipments deployed in the project such as- pumps, electrical equipment, light vehicles etc.

Broadly this workshop will have the following functional shops:

i) Machine shop
ii) Mechanical Repair shop
iii) Electrical Repair shop
iv) Smithy shop
v) Light Motor Vehicle Repair shop
vi) Stores & common equipment

10.3 Project Store

This workshop will have a project store to meet the total requirement of proposed workshop as well as additional requirement of the project.

10.4 Working Schedule

This workshop will work in two shifts of 8 hrs. but a group of technical personnel will also be provided in the third shift to look after the field repairs of mining equipment deployed in this shift.

10.5 Capital Investment

The details of P&M provided for the workshop along with their estimated cost have been given in Appendix-A.3.2.

CHAPTER - XI

14.0 LAND

The total requirement of land for Amrapali Opencast Project of 12.0 MTY has been estimated as 1247.08 Ha. Including 690.18 Ha of forestland and 556.90 Ha of non-forest land (excluding land for Railway Siding). The break-up of land on different heads is shown in the following table.

Sl. No.	Item	Forest Land (Ha.)	Non-forest land (Ha.)	Total Land (Ha.)
1.	Quarry	577.9	283.46	861.36
	Nala Diversion	2.85	0.25	03.10
2.	W/S, S/S Office etc.	14.56	0	14.56
3.	Colony including approach road	2.00	44.70	46.70
4.	OB Dump	41.2	47.96	89.16
5.	CHP	20.33	0	20.33
6	Haul Road	30.00	4.00	34.00
7	Embankment/Garland drain	0.67	6.68	07.35
8	Diversion of public road	0.67	7.58	08.25
9.	Safety Zone	134.32	162.27	296.59
10.	Total	824.50	556.90	1381.4
11	Less forest in safety zone	(-) 134.32	-	(-) 134.32
12	**Net Total**	**690.18**	**556.90**	**1247.08**

Land required for Railway Siding

Sl. No.	Item	Forest Land (Ha.)	Non-forest land (Ha.)	Total Land (Ha.)
1.	Railway Siding	102.90	76.10	179.00

CHAPTER - XII

CIVIL CONSTRUCTION

12.1 Introduction

The life of Amrapali Opencast Project with a rated capacity of 12.0MTY has bee estimated as 28 years and so permanent type of construction has been propose for residential and service buildings. The cost estimate for civil construction ha been worked out based on the cost index of 1408 with respect to 100 base a Delhi as on 1.10.1976. Three variants namely, coal outsourcing option, coal & OI departmental option & coal & OB both outsourcing option have been prepared i the DPR. The details have been given in respective Appendix-A.2.3.

12.2 Buildings

12.2.1 Residential Buildings

The manpower requirement for this project is estimated at 55% housing satisfaction. The details are given in Appendix-A.2.1.

12.2.2 Service Buildings

Provision has been made in this report for the construction of a GM/P.O. Office, Store, Electrical Sub-station, Magazine and Excavation Workshop suitable for the repair and maintenance of 170T/85T Dumper and other HEMMs deployed in this Project. Other welfare buildings like first aid centre, rest shelter, dispensary, Primary, school, officers' club bank building, post office, shopping centre etc. have also been provided. Details of service buildings have been given in Appendix-A.2.2.

12.3 Roads & Culverts

12.3.1 Approach Road to Project

A 4.0 Km. Long approach road has been proposed from Tandwa-Chatra road to the Amrapali project. The estimated capital expenditure for this road and details has been furnished in Appendix-A.8.2.1.

12.3.2Colony Road

The length of the colony road inside the township and estimated capital investment for colony roads along with culverts have been furnished in Appendix A.8.2.2.

12.3.3Haul Road

The total estimated capital expenditure on haul road and details have been given in Appendix-A.8.2.3.

12.3.4Approach Road to Magazine

The estimated capital investment for 3.0 KM long approach road to Magazine is furnished in Appendix-A.8.2.4.

12.3.5Approach Road to Colony

The estimated capital investment for approach road to colony has been estimated and the details have been given in Appendix-A.8.2.5.

12.3.6Strengthening and Widening of Piparwar-Tandwa Road

The existing PWD road connecting Piparwar to Tandwa needs strengthening and widening. A lump sum amount has been provided for this. Half of this amount has been charged to Magadh OCP and remaining half has been charged to Amrapali OCP. The details have been given in Appendix-A.8.2

12.3.7Bridges

A lump sum amount has been provided for the construction of bridges over river as shown in Appendix-A.8.2.

CHAPTER- XVIII

18.0 MINE CLOSURE:

Mine closure operations is proposed to be undertaken after examination and detailed study that there is no further expansion possibility of the mine and the void is to be suitably filled up so that the land is utilized gainfully by the society. Intermediate stoppages of operations due to any reasons for a period of time do not come under the proposed scheme of mine closure. This chapter proposes following aspects:-

A. Technical Aspects
B. Environmental Aspects
C. Social Aspects
D. Financial Aspects

18.1 TECHNICAL ASPECTS:

- ✓ Safety aspects.
- ✓ Pit slopes and waste dumps.
- ✓ Hydrology and hydrogeology.
- ✓ Details of decommissioning of the infrastructures.
- ✓ Closure of entries like pits and entry to the mine.

18.1.1 Safety:

After attaining the final stage dump (including internal Dump) the remaining portion between dump toe and final stage Quarry floor should be fenced properly so that no human being or stray animals should be trapped within. Internal dumps are proposed to be suitably re-graded to avoid deep trenches.

18.1.2 Pit Slopes and waste dumps:

The final pit slopes are designed to avoid any slope failure. Technical study is proposed to be conducted before deciding upon the final slope. Both the external and internal Dumps are designed in such a way that there are minimal chances of slope failure. The external Dump is sloped ultimately in the overall range of 25 degree to 28 degrees. The internal dump slopes are designed at milder gradient so

that even with the percolation of water in the dip side of the quarry, the dumps remain stable. It is proposed that the internal and external dump must be provided with toe walls/ silt arrestors and garland drains. Vegetation cover on surface of these dumps is proposed to be ensured as a final closing operation.

18.1.3 Hydrology and Hydrogeology:

In the mine closure plan, the surface flow pattern of precipitation and mine water drainage is envisaged to be examined and the water channel suitably laid down so that this is acceptable to the local community and it do not disturb the general hydrology of the area. Efforts are proposed to be made to regenerate the ground water resources.

18.1.4 Decommissioning of the infrastructure:

The coal project develops lot of infrastructure for sustaining their operations. These include Workshop, Coal Handling Plant, Railway Siding, Office Complex, Residential Complex, Roads, Pipe Lines and Transmission Line. Decommissioning of the infrastructure should be planned in such a way that the Land occupied by these infrastructures is released. However these infrastructure is proposed to be reused for the neighboring projects /mine.

18.1.5 Closure of entry to the mine:

All entries to the mine must be effectively sealed. This will prevent illegal mining, entry of fire and water etc.

18.2 ENVIRONMENTAL ASPECTS

- ✓ Management of Final voids
- ✓ Reclamation of forest/vegetation.
- ✓ Management of recharge areas.
- ✓ Acceptable surface and ground water flows.
- ✓ Alternative use of land

18.2.1 Management of Final Voids

The total volume of overburden is estimated as 459.68 M cum; including 265.95 Mcum. from east section and 193.73 Mcum. from west section in this mine. The mine dumping plan has been designed in such way that about 418.63 Mcum of overburden out of total volume of 459.68 M cum. shall be dumped internally in the void so that land degraded due to mining is taken well care of. Out of total quarry area, about 66% area will be backfilled and planted for land reclamation. The balance area(34%) may be proposed for hydro-reclamation. Creation of water body ,which is termed as hydro-reclamation is,very useful final land use plan and hence conceived in this mine. Since there is no neighbouring opencast or underground mine, creation of water body may not pose any safety problem. The final closure plan will involve provision of effective fencing and graded approach to reduce the depth of water body for safeguard to neighbouring community.

A total of 486.05 mt of reserve has been proved in Amrapali geological block up to a depth of 250 m out of which 189.03 mt has been planned for mining from the Eas Quarry of this block up to a depth of 135 m. The balance reserve 297.47 mt from the Amrapali block falls in the down dip portion of the quarry between the depth 135 m to250 m .

Similarly a total of 203.31 mt of net geological reserve has been proved in Kishanpu geological block up to a depth of 250 m out of which 102.07 mt has been planned from West quarry up to a depth of 135 m. The balance reserve 101.24 mt falls in the down dip portion of the west quarry between the depth 135 m to250 m in the Kishanpu block .

This additional reserve falling in the down dip portion of the quarry may be exploited in the second phase i.e. after28 years (life of present quarry) and hence final mine closure plan may not required in this case.

18.2.2 Reclamation of Forests/vegetation:

It is proposed that major portion of the project area is covered with vegetation. This will involve both forest land as well as non-forest land. Certain areas, mostly industrial areas, where service building are proposed to be located and to be used are not proposed for plantation.

18.2.3 Management of recharge areas:

It is proposed that the recharge areas are fully utilized and sufficient availability of water, if feasible, is ensured to enhance ground water availability.

18.2.4 Surface and ground water flows:

In the final stage, wherever the mine water is likely to flow out to surface and meet the natural drainage system, the quality of water is proposed to be assessed and flow pattern for mine water be properly modified/ redesigned. Alternately, the water treatment arrangements may be considered depending upon the local site conditions.

18.2.5 Alternative use of land:

During the mining operation, the land usage changes from its pre-mining scenario. The final stage land use plan shows the use of land in a post-mining scenario when coal-mining operations have completed. Alternative use of land, specially released from infrastructure areas and vacant areas, as proposed to be planned and properly designated for post-mining land uses depending on the existing conditions prevailing at that point of time. While for OB dumps and acquired forest areas, vegetation and afforestation has been proposed as a final land use. While agriculture may be the best land use, if feasible, and if it is supported by some irrigation facilities.

18.3 SOCIAL ASPECTS:

- ✓ Re-deployment of work force.
- ✓ Management of community facilities
- ✓ Canalization of available water

18.3.1 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 achieved their peak.

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 operations. The reduction of manpower could be done as per the following options:

- Natural retirement.
- 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 years to other projects.

Retrenchment of people with suitable compensation after exhausting all the above options.

18.3.2 Management of Community Facilities:

The community facilities are proposed to be developed by coal projects for betterment of the neighboring community. The project management provides or assists 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 neighboring communities to the possible extent. The closure plan will envisage interaction of mining company with the state or local bodies who will take over these facilities and run the same for the community. The coal companies towards running these facilities, which is proposed to be taken care of by the local/state bodies, may make a onetime payment.

18.3.3 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 this water for surrounding community for their irrigational/domestic uses may be taken up.

18.4 FINANCIAL ASPECTS:

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

18.4.1 Creation of a corpus fund for the final mine closure:

It is proposed that a corpus fund for final mine closure to be created from the retained earnings of the project. The fund creation is proposed to be started after the project starts earning revenue, which is in surplus, after deducting all the negative cash flows. Preferably the corpus fund should be created after the mine comes under revenue. However, in case of shortage of funds, corpus fund creation may be deferred till the mine attains target production. This fund should be judiciously created so that the objective of the final mine closure can be smoothly met. This will depend on the local site conditions, requirement of mine closure, mine closure plan. Site specific mine closure plan is proposed to be prepared and approval of the company board may be obtained. It is proposed that 10% of annual OB removal would need to be regarded at the end of the mine. A Corpus fund @ Rs.2/- per cum of the OB to be finally re-graded is envisaged to be created and kept under separate head with the project. This fund will not only cater for re-grading but will also cover other ancillary expenditure.

18.4.2 Cost of Closure Activities :

As proposed above, many activities are proposed to be undertaken after the closure of the mines, which naturally will involve expenditure. Some of the closure activities will,

in fact, form part of normal mining operations. However, some activities are propose to be addressed only after completion of the coal mining operations. The cost for a those activities, which are to be executed after coal winning, is proposed from th retained earning of the project for meeting the expenses.

18.4.3 Cost of Organization for executing the closure activities:

After the completion of the coal mining, an organization consisting of persons o different disciplines is proposed to be maintained to undertake and implement the closure activities. The organization may be provided with a vehicle for discharging day to-day duties. Maintenance cost of this organization is proposed from the retair earnings of the project. A small team consisting of 2-3 technical people may be required to oversee the efficacy of the closure activities. This monitoring may be conducted for 4-5 years after the mine closure activities

18.4.4 Cost of the post project monitoring:

After the closure activities have been implemented the project is proposed to be monitored regularly for 4 to 5 years. During this period of 4-5 years, cost towards project monitoring is proposed from the retain earnings of the project.

All the above cost may be funded from corpus fund created for the purpose.

CHAPTER-XIV

14.0 MANPOWER AND PRODUCTIVITY

The manpower requirement for Amrapali OCP for a rated capacity of 12 MTY of ROM coal has been estimated as 988 resulting an overall OMS of 46.01Te (old), for main variant(coal outsourcing option). The no. of working days per year is adopted as 330. The manpower includes 29 persons for land reclamation/ EMP. Earning per manshift (EMS) is estimated as Rs. 771.38.

The detailed categorywise/scalewise manpower requirement has been given in Appendix-B & B.1.

The skillwise break-up of workers is given below :-

Coal Outsourcing Option

Sl. No	Particulars	Category	Nos	Percentage of total worker
1.	Unskilled	I	77	12
2.	Semi-skilled	II, E	111	17
3.	Skilled	C,D,III,IV,V,VI	233	35
4	Highly Skilled	Scl A,B	244	36
	Total		665	**100**

The break-up of total manpower in groups i.e. workers, monthly paid staff & officers is given below :

Sl. No	Particulars	No	Percentage of total manpower
1.	Workers	665	67
2.	Monthly Paid Staff	245	25
3.	Officers	78	8
	Total	988	100

The manpower would be posted from the internal resources of the company. The unskilled/ semi-skilled manpower may be trained to make them skilled/highly skilled in order to avoid recruitment.

Two other variants have also been studied, namely Coal & OB both departmental option & Coal & OB both outsourcing option. The details of these two options are as follows.

Coal & OB Departmental Option

Sl. No.	Particulars	Category	Nos.	Percentage of total worker
1.	Unskilled	I	77	9
2.	Semi-skilled	II, E	111	14
3.	Skilled	C,D,III,IV,V,VI	254	32
4.	Highly Skilled	Spl.A,B	359	45
	Total		801	100

The break-up of total manpower in groups i.e. workers, monthly paid staff & officers is given below ;

Sl. No.	Particulars	No.	Percentage of total manpower
1.	Workers	801	71
2.	Montly Paid Staff	248	22
3.	Officers	78	7
	Total	1127	100

OMS-40.33
EMS-772.21.

Coal & OB Outsourcing Option

Sl. No.	Particulars	Category	Nos.	Percentage of total worker
1.	Unskilled	I	17	11
2.	Semi-skilled	II, E	25	16
3.	Skilled	C,D,III,IV,V,VI	94	60
4.	Highly Skilled	Spl.A,B	20	13
	Total		156	100

The break-up of total manpower in groups i.e. workers, monthly paid staff & officers is given below ;

Sl. No.	Particulars	No.	Percentage of total manpower
1.	Workers	156	45
2.	Montly Paid Staff	143	42
3.	Officers	44	13
	Total	343	100

OMS-132.52
EMS-797.17.

CHAPTER-XV

15.0ENERGY CONSERVATION

15.1Introduction:

Conservation of energy in any form is assuming greater importance in mechanised mines with rapid industrialisation and increase in per capita consumption of energy resulting in insatiable demand of energy. The time is not far off when with the existing quantum of energy; the coal mining industry would be facing a bleak future. Hence it is of paramount importance that the existing quantum of energy is put to optimum and economical use with a high degree of conservation. Special emphasis is laid at the project formulation stage to take all steps for conservation of electrical energy including power consumption and power demand or fuel consumption. All efforts have been made to incorporate energy conservation system and equipment to achieve this in the planning and installation stage itself. At the stage of planning of the equipment of the opencast mine, a careful study has been made with regard to location of power sub-station for the mine, selection of equipment, conductor size, and operating power factor with special reference to the conservation of energy.

15.2Managerial Control:

To reduce occurrence of maximum power demand of certain group of equipment at a time and improve the effective load factor, demand meters have been proposed in each circuit breaker controlling the feeders.

This would reduce power demand of the project at the same level of power consumption and also relieve the system of transmitting useless power.

15.3Energy Audit:

It is suggested that energy audit in the mine would be done regularly to even out maximum demand, as far as possible. Such an energy audit would not only pin point the defined areas but also would highlight the areas so that improvement can be implemented immediately.

15.4Maintenance:

A special emphasis would be laid on the preventive maintenance of all electrical, mechanical and HEMM equipment. Energy conservation is very much related to preventive maintenance. Therefore the preventive maintenance would never be over looked.

As part of management system, a feed back is necessary for better performance of equipment and statistical information of breakdowns would help in upgrading maintenance practices, after meaningful and purposeful analysis resulting in saving of diesel and electric power.

15.5Distribution Network:

In the power distribution network, care has been taken to select suitable size of conductors and cables to minimise losses and voltage drop. It is suggested that the conductor sizes recommended in the P.R are drawn at the construction stage of the project itself to avoid duplication of work later on. The size should not be changed either with higher or lower size of the conductor.

Utilisation of voltage for the HEMM within the mine has been recommended as 6.6/3.3 KV. The transformer has been selected to operate at maximum efficiency. Each transformer has been selected to cater to the total load. However, all the transformers under normal conditions would share the load of the mine.

15.6Lighting:

For the purpose of illumination in dump areas, and mine sodium vapour lamps have been recommended to reduce the energy consumption and to achieve the desired lux level.

15.7Haul Road:

Dumpers used for transportation of O.B and coal, consume lot of energy inform of consumption of diesel. For effective fuel conservation, it is suggested that haul roads, which play an important role in the use of dumpers and fuel consumption are made better to reduce group resistance. To save energy, therefore, it is absolutely necessary to maintain good haul roads especially at ramps and turnings.

The important areas in the opencast mine working where there is scope of energy saving, have been indicated above. This emphasizes the followings: -

(1)The necessity for going in new system technology and equipment.

(2)Even during planning, the aspect of energy conservation with respect to equipment size is considered.

(3)During operation, it is imperative to conduct energy audit.

(4)Complete monitoring by proper communication and instrumentation would identify the areas where there is energy wastage so that corrective measures are taken.

(5)If it deviates from the standard, causes should be identified and corrective action may be taken.

(6)Maximisation of utilisation within the load allocated by supply agencies by flattening thepeak demand.

(7)Provision of adequate size of pumps in the mine especially during monsoon.

(8) Staggering of mining activitiesduring usual peak hours.

CHAPTER-XVI

ECONOMICS

16.0 Total Capital Investment

Initial capital investment has been provided in the proposal till the year of achieving rated coal production. Economics for three options, namely coal outsourcing option, both departmental option & both outsourcing option have been estimated. The capital requirement beyond the year of achieving rated coal production has been proposed from retained earnings of the Project. The capital requirement for all the options proposed are given below:

Sl.	Particulars	Capital Requirement in Rs. Crs.		
		Coal Outsourcing option	Departmental option	Both Outsourcing option
1	Initial Capital (Up to target year)	1178.31	1311.25	498.81
2	Capital beyond target year	223.29	239.31	2.29

The details of capital investment under various heads viz Land (A.1), Buildings (A.2), Vehicles (A.6), Prospecting & Boring (A.7) and Development (A.8), are given in the appendices mentioned against each of them.

16.1 Capital Investments for P&M

Capital investment on P&M is given in Appendix-A.3. The detailed break-up for HEMM, electrical, pump, pipes, workshop and other P&M etc. are given in Appendix-A.3.1 to A.3.5 for all the options separately.

The specific capital investment on P&M worked out for this options is given below:

Sl.	Particulars	Specific investment in Rs./te of coal		
		Coal Outsourcing option	Departmental option	Both Outsourcing option
1	P&M	661.02	761.95	194.14
2	HEMM alone	398.29	490.55	6.45

Mothod of Estimation of Capital Cost

The method of estimation of capital investment for P&M, Civil estimates, Development Capital, Revenue expenditure capitalised etc. is as follows.

Prices of Plant & Machinery

For the plant and machinery, as far as possible, the prices have been taken from the Standard Price List of Mining Equipment published by CMPDI whenever information regarding price was not available, a broad estimate was made.

16.2 **Estimated Cost of Civil Construction**

The basis for the estimation of the cost of civil construction viz. residential buildings, service buildings, roads etc. has been given in Appendices - A.2.1, A.2.2 & A.8.2.

16.3 **Capital Investment on Vehicles**

The total capital investment on vehicles is estimated as Rs. 436.13 Lakhs and the details are given in Appendix- A.6.

16.4 **Development**

Under this head, investment on (a) capital outlay in mines (Appendix-A.8.1), (b) Roads and culverts, including haul roads

(A.8.2). The details of each item are given in the respective Appendix indicated in bracket.

16.5 **Opening of Revenue Account**

The proposed Amarapali OCP (12.0 MTY) has been planned to come under revenue account from 4th year (Y-4) onwards. During the initial two years construction period and 1st year of coal production (Y-3), the revenue expenditure has been capitalised. The statements showing revenue expenditure capitalised during development period is shown in Appendix-A.9 and A.9.1, respectively.

16.6 **Estimates of Operating Cost**

Appendix-C gives the details of average cost and profitability for the target production of 12.0 MTY. The method adopted in estimating the costs are briefly explained as follows:

(a) **Wages**

The requirement of manpower for the targeted production of 12.0 MTY of coal is estimated as 988 for coal outsourcing option, 1127 for both departmental option & 343 for both outsourcing option . The category wise/ scale wise details of manpower are given in Appendix - B & B1.

Prevalent pay scales for executives and non- executives (NCWA-VI) are adopted. Mid points of the relevant pay scales of executives & non-executives have been considered in estimating the salary and wages cost.

(b) **Stores**

Stores cost consists (1) diesel and lubricants, (2) explosives and detonator, (3) spares for routine repairs etc. Prevalent norms have been followed in estimating stores cost. The average stores cost at 100% capacity level is estimated as Rs. 69.90 per tonne for coal

outsourcing option, Rs. 87.26 per tonne for both departmental option & Rs. 20.55 per tonne for both outsourcing option.

(c) **Power**

The average power cost at 100% capacity level is estimated as Rs. 25.39 per tonne for coal outsourcing option, Rs. 28.84 per tonne for both departmental option & Rs. 11.90 per tonne for both outsourcing option.

(d) **Miscellaneous Expenditure**

This covers the expenditure on printing & stationery, postages, telephone, repairs and maintenance of assets other than P&M, workshop debits for annual servicing and overhauling of HEMM, insurance and taxes for vehicles, normative contractual cost of major maintenance of HEMM. The average misc. cost at 100% capacity level is estimated as Rs. 30.99 per tonne for coal outsourcing option, Rs. 28.35 per tonne for both departmental option & Rs. 20.40 per tonne for both outsourcing option.

(e) **Administrative Charges**

This includes area overhead, apex overhead etc. and the cost has been taken as per the actual administration cost of CCL during 2003-04, which works out to Rs. 54.46 per tonne.

(f) **Cost of Coal & OB Outsourcing**

The normative cost of OB removal; as estimated by CCL in Oct.,2001 is Rs. 62.84 per cum. Updating the above cost of OB removal on Feb' 2005 WPI, is estimated as Rs. 75.00 per cum. For calculation of normative cost of coal outsourcing the volume is converted into tones which comes to Rs. 50.00 per tonnes of coal for average lead.

(g) **Interest on Working Capital**

Rate of the interest on working capital is taken as 12.00% per annum.

(h) **Depreciation**

Depreciation on assets is computed as per the prevalent norms. The straight-line method of charging depreciation has been adopted. The average depreciation cost per tonne at 100% level is estimated as Rs. 66.00 for coal outsourcing option, Rs. 76.56 for both departmental option & Rs. 21.49 per tonne for both outsourcing option.

(i) **Cost & Profitability**

Coal Outsourcing Option

Appendix-C &C1 gives the details of the average cost and profitability estimates. At 100% capacity, the cost per tonne of coal is estimated as Rs. 342.96 including reclamation cost. At 85% capacity, the cost per tonne is estimated as Rs. 385.47. The project is estimated to yield a profit of Rs. 249.04 and Rs. 206.53 per tonne at 100% and 85% level of production respectively at an estimated selling price of Rs. 592.00 per tonne of coal.

Departmental Option

Appendix-C & C1 gives the details of the average cost and profitability estimates. At 100% capacity, the cost per tonne of coal is estimated as Rs. 329.90 including reclamation cost. At 85% capacity, the cost per tonne is estimated as Rs. 377.19. The project is estimated to yield a profit of Rs. 262.10 and Rs. 214.81 per tonne at 100% and 85% level of production respectively at an estimated selling price of Rs. 592.00 per tonne of coal.

Both Outsourcing Option

Appendix-C &C1 gives the details of the average cost and profitability estimates. At 100% capacity, the cost per tonne of coal is estimated as Rs. 302.43 including reclamation cost. At 85% capacity, the cost per tonne is estimated as Rs. 324.29. The project is estimated to yield a profit of Rs. 289.57 and Rs. 267.71

per tonne at 100% and 85% level of production respectively at an estimated selling price of Rs. 592.00 per tonne of coal.

16.7 Financial Analysis

Coal Outsourcing Option

The yearwise cashflow at 100% and 85% capacity utilisation have been estimated and are detailed in Appendix-D. & D.1, respectively. The cashflows exclude interest during construction period, depreciation and interest on loan capital. The financial IRR on total capital of the project at 100% and 85% level of the rated output is estimated as 31.92% and 25.01%, respectively.

Departmental Option

The yearwise cashflow at 100% and 85% capacity utilisation have been estimated and are detailed in Appendix-D & D1, respectively. The cashflows exclude depreciation and interest on loan capital. The financial IRR on total capital of the project at 100% and 85% level of the rated output is estimated as 31.44% and 24.40%, respectively.

Both Outsourcing Option

The year wise cash flow at 100% and 85% capacity utilisation have been estimated and are detailed in Appendix-D & D.1, respectively. The cashflows exclude interest during construction period, depreciation and interest on loan capital. The financial IRR on total capital of the project at 100% and 85% level of the rated output is estimated as 51.84% and 44.63%, respectively.

16.8 ECONONIC ANALYSIS

Coal Outsourcing Option

The year wise cash flow for the economic analysis at 100% and 85% capacity utilization have been estimated and are detailed in Appendix- D2 and D.3, respectively. In estimating the economic

prices, all taxes, duties and levies have been excluded from cost of inputs and the shadow rate for wages and salaries have been taken as 1.00. The economic price of coal has been assumed to be same as its ruling price. Based on the above methodology, the economic IRR of the project at 100% and 85% rated output has been estimated as 40.40% and 32.68%, respectively.

Departmental Option

The yearwise cashflow for the economic analysis at 100% and 85% capacity utilisation have been estimated and are detailed in Appendix-D2 and D3, respectively. In estimating the economic prices, all taxes, duties and levies have been excluded from cost of inputs and the shadow rate for wages and salaries have been taken as 1.00. The economic price of coal has been assumed to be same as its ruling price. Based on the above methodology, the economic IRR of the project at 100% and 85% rated output has been estimated as 39.89% and 32.01%, respectively.

Both Outsourcing Option

The year wise cash flow for the economic analysis at 100% and 85% capacity utilization have been estimated and are detailed in Appendix- D2 and D.3, respectively. In estimating the economic prices, all taxes, duties and levies have been excluded from cost of inputs and the shadow rate for wages and salaries have been taken as 1.00. The economic price of coal has been assumed to be same as its ruling price. Based on the above methodology, the economic IRR of the project at 100% and 85% rated output has been estimated as 61.16% and 53.38%, respectively.

16.9 SENSITIVITY ANALYSIS

The following parameters have been identified for assessing their impact on the profitability of the project.

a) Capital investment

b) Operating cost

c) Capacity utilisation

d) Selling price of coal

The above parameters have been increased / decreased in Steps of 5% to a maximum of 25% over the base case and the IRR have been computed. The following table summarised the results of sensitivity analysis:

Coal Outsourcing Option

SN	Variable Parameters	IRR of the Project for change in parameters by					
	IRR in different stages	0%	5%	10%	15%	20%	25%
1	Increase in Capital	31.92	30.45	29.08	27.81	26.63	25.52
2	Increase in Cost of Prodn	31.92	30.86	29.79	28.70	27.60	26.48
3	Decrease in Capacity	31.92	29.68	27.39	25.01	22.55	20.00
4	Decrease in Sales Price	31.92	29.25	26.49	23.62	20.61	17.43

Departmental Option

SN	Variable Parameters	IRR of the Project for change in parameters by					
	IRR in different stages	0%	5%	10%	15%	20%	25%
1.	Increase in Capital	31.44	29.94	28.56	27.27	26.07	24.95
2.	Increase in Cost of Prodn.	31.44	30.54	29.63	28.72	27.80	26.85
3.	Decrease in Capacity	31.44	29.16	26.82	24.40	21.90	19.30
4.	Decrease in Sales Price	31.44	28.91	26.31	23.61	20.80	17.86

Both Outsourcing Option

SN	Variable Parameters	IRR of the Project for change in parameters by					
	IRR in different stages	0%	5%	10%	15%	20%	25%
1.	Increase in Capital	51.84	50.17	48.62	47.16	45.78	44.49
2.	Increase in Cost of Prodn.	51.84	50.4	48.93	47.43	45.9	44.33
3.	Decrease in Capacity	51.84	49.53	47.13	44.63	42.02	39.29
4.	Decrease in Sales Price	51.84	48.58	45.14	41.5	37.61	33.43

16.10 Completion cost of the project

Coal Outsourcing Option

Completion cost of the project is up to targeted year estimated as Rs. 1523.34 crores and shown in Annexure-I. Financial and Economic IRR of the project at 100% and 85% capacity utilization is given in Appendix- D.4, D.5, D.6 & D.7, respectively.

SN	Particulars	Financial IRR (%)	Economic IRR (%)
1.	At 100% capacity utilisation	24.82	32.05
2.	At 85% capacity utilisation	19.00	25.47

Departmental Option

Completion cost up to targeted year of the project is estimated as Rs. 1691.44 crores and shown in Annexure-I. Financial and Economic IRR of the project at 100% and 85% capacity utilisation is given in Appendix- D4, D5, D6 & D7, respectively.

S No.	Particulars	Financial IRR (%)	Economic IRR (%)
1.	At 100% capacity utilisation	24.35	31.52
2.	At 85% capacity utilisation	18.44	24.83

Both Outsourcing Option

Completion cost of the project up to targeted year is estimated as Rs. 661.42 crores and shown in Annexure-I. Financial and Economic IRR of the project at 100% and 85% capacity utilisation is given in Appendix- D.4, D.5, D.6 & D.7, respectively.

S No.	Particulars	Financial IRR (%)	Economic IRR (%)
1.	At 100% capacity utilisation	42.96	51.47
2.	At 85% capacity utilisation	36.46	44.37

CHAPTER-XVII

17.0 SAFETY & CONSERVATION:

Outside agency deploying HEMM or any equipment in the mine for excavation of co shall plan their activities in confirmation with the prevailing statutory provisions as p Mines Act 1952 and CMR 1957 applicable for safety in opencast mines. However, statutory rules, regulations, applicable laws etc. and statutory requirement related Govt. licenses, workers compensation, Insurance, etc., including minimum wage act f workers employed by the outside agency shall have to be adhered to. Rules if a imposed by local/State/Central authorities should also be complied by leaser HEMM/equipment and then shall have to supply various protective equipments v helmet, shoes etc. to the workmen at their cost.

All the regulations & schedules of coal mines Regulations 1957 relating to openca mining have to be adhered to and implemented in order to maintain day to day safe precautions as per stature.

SAFETY ASPECTS FOR OUTSOURCING/HIRING OF HEMM/EQUIPMENT:

Special precaution should be taken while deploying workers in the mine. Befo employing any labour to the mine proper vocation training should be imparted ar recommendations of VIII Safety Conference should be strictly followed. Manageme for deployment of labours by outside agency shall fix terms and conditions. Some the major aspects are as follows: -

A) **For persons**:

i) No persons shall be deployed unless he is trained at VTC

ii) Records in Form-B Form-D shall be maintained.

iii) Records of Vocational training Certificate and driving license of operator shall be kept by HEMM outsourcing agency and shall be made readily availabl for inspection by management.

iv) No person shall be employed unless person holds VTC certificate and Management is informed. A record of it shall be maintained.

v) Qualified competent persons shall maintain adequate supervision.

vi) Outside agency shall follow safety guidelines and safety instructions from Project Authorities.

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

i) All the machineries to be deployed in mines should be checked before deployment by competent authority.

ii) Regular checking of m/c deployed by outside agency shall be done. No unfit machine shall be deployed before the defect is rectified.

iii) A proper record of repair and maintenance along with inspection done by management and defect pointed out shall be maintained and signed by authorized person.

iv) The trucks deployed outside agency shall be provided with Audio visual alarms, proper light for use at night and period when natural light is not sufficient. Also audio-visual alarms for reversing on trucks shall be provided.

Other Precautions for machines

i) RTO certificate photo copies of all vehicles shall be submitted to management

ii) Daily welding, monitoring, inspection shall be done by the agency's mechanic as directed by management.

iii) Machine manufacturers should be asked to give risk analysis details in respect machines deployed by outside agencies.

iv) Suitable type of the fire extinguishers shall be provided in every machine.

C) **General:**

i) No person/vehicle shall be deployed at any place other than authorize place.

ii) All workers should obey lawful instruction of mine management.

iii) Risk Management Plan of tipper/pay loader shall be made an implemented.

iv) All drivers shall obey systematic traffics rules prepared by management

v) Before deploying workers they must be trained and briefed about safet aspects in opencast mine. However during course of execution of the work, if an accident occurs whether major or minor, the matter shall have to be immediatel informed to mine management i.e. Colliery Manager/Agent/GM of Area so tha Notices of accidents in a accordance of (Reg.9 of CMR 1957) and Section 23 c Mines Act 1952 may be given and other necessary steps may be taken i accordance with the Mines Act 1952.

vi) Outside Agency shall operate transport system in such a was so as t minimize pollution in the mine.

Stability of Benches, Quarry Highwalls and Spoil Dumps :

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

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

Precautions Against Danger of Inundation from Surface Water.

1) A careful assessment is to be made against the danger from surface water before the onset of rainy season. The necessary precautions should be clearly laid down and implemented. A garland drain needs to be provided to drain away the surface rainwater from coming into the mine.

2) Inspections for any accumulation of rainwater, obstruction in normal drainage and weakening in embankment.

3) Standing order; for withdrawal of working persons in case of apprehended danger.

4) During heavy rain inspection of vulnerable points is essential. In case of any danger persons are to be withdrawn to safer places.

5) Nallah or water inlets may be diverted or isolated by embankments if so required.

Prevention of Flooding of Equipment Deployed at Bottom Horizons :

During the heavy monsoon period, the mining operation in the lower-most bench may have to be stopped. Therefore, it is proposed to drown the lower-most bench, which would work as a sump. The water will be pumped out and discharged into the nearby nallah. For ensuring safety of the equipment while working out bottom horizons with no access to surface profile, the following measures should be taken:

1) Drivage of initial trenches and coal cutting on bottom benches should done during the dry period of the year.

2) Ramps should be made for quick shifting of equipment from bottc horizons, liable to be flooded during monsoon period, to the top horizons.

Prevention of Electric Shocks:

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

1) For protection from electric shocks to persons, from electrical equipmer with voltage up to 1000V Earth Leakage Relay should be provided which w automatically disconnect electrical circuits.

2) Closed mobile substations and switchgears should be mechanicall interlocked which exclude the possibility of opening the door when oil switch an air circuit breakers are in operation.

3) All metal parts of electrical equipment should be properly earthed to avoi failure of insulation.

4) All H.T lines and cables located within the blasting zones should be disconnected during blasting operations.

5)

Dust Suppression & Dilution of Exhaust Fumes:

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

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

2) While drilling holes, it is necessary to use dust extraction devices.

3) Installation of local dust suppression and air conditioning devices in cabins of excavators and drilling rigs may be considered.

4) Leveling of spoil dump surface.

5) Separate dust suppression arrangement should be provided for CHP.

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

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

2) Drilling & blasting operations should be timed for periods of maximum wind activity during the day.

3) Dumpers may be provided with purifiers for exhaust gases.

Measures to be taken for Fire Fighting and Fire Prevention :

In addition to statutory provisions, the measures for fire fighting and prevention of fires are as follows:

1) Organization of special cell for systematic observations to examine and prevent fire.

2) Removal of spillage of coal on benches and cleaning of coal horizons to prevent cases of coal heating.

3) Storage of lubricants and cotton waste in enclosed fireproof containers in working places.

4) Provision of fire extinguishers

Measures to be taken while Drilling Blasting :

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

1) Drilling and Blasting in quarry should be done in accordance with the provisions of Mines Safety Act, rules and regulations.

2) Adequate safety measures have to be taken during blasting operation in the quarry so that men/machine are not affected.

Conservation:

The project considers exploitation of all the seams from I (B)/I(B+M)/I(B+M+T), I (M), I (T)/I(T+M), II (B), II(T) ,III (C) and IV as per calendar plan

CHAPTER- XVIII

18.0 MINE CLOSURE:

Mine closure operations is proposed to be undertaken after examination and detailed study that there is no further expansion possibility of the mine and the void is to be suitably filled up so that the land is utilized gainfully by the society. Intermediate stoppages of operations due to any reasons for a period of time do not come under the proposed scheme of mine closure. This chapter proposes following aspects -

A. Technical Aspects
B. Environmental Aspects
C. Social Aspects
D. Financial Aspects

18.1 TECHNICAL ASPECTS:

- ✓ Safety aspects.
- ✓ Pit slopes and waste dumps.
- ✓ Hydrology and hydrogeology.
- ✓ Details of decommissioning of the infrastructures.
- ✓ Closure of entries like pits and entry to the mine.

18.1.1 Safety:

After attaining the final stage dump (including Internal Dump) the remaining portion between dump toe and final stage Quarry floor should be fenced properly so that no human being or stray animals should be trapped within. Internal dumps are proposed to be suitably re-graded to avoid deep trenches.

18.1.2 Pit Slopes and waste dumps:

The final pit slopes are designed to avoid any slope failure. Technical study is proposed to be conducted before deciding upon the final slope. Both the external and internal Dumps are designed in such a way that there are minima chances of slope failure. The external Dump is sloped ultimately in the overall range of 25 degree to 28 degrees. The internal dump slopes are designed at milder gradient so

that even with the percolation of water in the dip side of the quarry, the dumps remain stable. It is proposed that the internal and external dump must be provided with toe walls/ silt arrestors and garland drains. Vegetation cover on surface of these dumps is proposed to be ensured as a final closing operation.

18.1.3 Hydrology and Hydrogeology:

In the mine closure plan, the surface flow pattern of precipitation and mine water drainage is envisaged to be examined and the water channel suitably laid down so that this is acceptable to the local community and it do not disturb the general hydrology of the area. Efforts are proposed to be made to regenerate the ground water resources.

18.1.4 Decommissioning of the infrastructure:

The coal project develops lot of infrastructure for sustaining their operations. These include Workshop, Coal Handling Plant, Railway Siding, Office Complex, Residential Complex, Roads, Pipe Lines and Transmission Line. Decommissioning of the infrastructure should be planned in such a way that the Land occupied by these infrastructures is released. However these infrastructure is proposed to be reused for the neighboring projects /mine.

18.1.5 Closure of entry to the mine:

All entries to the mine must be effectively sealed. This will prevent illegal mining entry of fire and water etc..

18.2 ENVIRONMENTAL ASPECTS

- ✓ Management of Final voids
- ✓ Reclamation of forest/vegetation.
- ✓ Management of recharge areas.
- ✓ Acceptable surface and ground water flows.
- ✓ Alternative use of land

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13.1.5 Closure of entry to the mine:

All entries to the mine must be effectively sealed. This will prevent illegal mining, entry of fire and water etc.

13.2 ENVIRONMENTAL ASPECTS

- ✓ Management of Final voids
- ✓ Reclamation of forest/vegetation.
- ✓ Management of recharge areas.
- ✓ Acceptable surface and ground water flows.
- ✓ Alternative use of land

18.2.1 Management of Final Voids

The total volume of overburden is estimated as 459.68 M cum. including 265.95 Mcum. from east section and 193.73 Mcum. from west section in this mine. The mine dumping plan has been designed in such way that about 418.63 Mcum of overburden out of total volume of 459.68 M cum. shall be dumped internally in the void so that land degraded due to mining is taken well care of. Out of total quarry area, about 66% area will be backfilled and planted for land reclamation. The balance area(34%) may be proposed for hydro-reclamation. Creation of water body ,which is termed as hydro-reclamation is very useful final land use plan and hence conceived in this mine. Since there is no neighbouring opencast or underground mine, creation of water body may not pose any safety problem. The final closure plan will involve provision of effective fencing and graded approach to reduce the depth of water body for safeguard to neighbouring community.

A total of 486.05 mt of reserve has been proved in Amrapali geological block up to a depth of 250 m out of which 189.03 mt has been planned for mining from the East Quarry of this block up to a depth of 135 m. The balance reserve 297.47 mt from the Amrapali block falls in the down dip portion of the quarry between the depth 135 m to250 m .

Similarly a total of 203.31 mt of net geological reserve has been proved in Kishanpur geological block up to a depth of 250 m out of which 102.07 mt has been planned from West quarry up to a depth of 135 m. The balance reserve 101.24 mt falls in the down dip portion of the west quarry between the depth 135 m to250 m in the Kishanpur block .

This additional reserve falling in the down dip portion of the quarry may be exploited in the second phase i.e. after28 years (life of present quarry) and hence final mine closure plan may not required in this case.

18.2.2 Reclamation of Forests/vegetation:

It is proposed that major portion of the project area is covered with vegetation. This will involve both forest land as well as non-forest land. Certain areas, mostly industrial areas, where service building are proposed to be located and to be used are not proposed for plantation.

18.2.3 Management of recharge areas:

It is proposed that the recharge areas are fully utilized and sufficient availability of water, if feasible, is ensured to enhance ground water availability.

18.2.4 Surface and ground water flows:

In the final stage, wherever the mine water is likely to flow out to surface and meet the natural drainage system, the quality of water is proposed to be assessed and flow pattern for mine water be properly modified/ redesigned. Alternately, the water treatment arrangements may be considered depending upon the local site conditions.

18.2.5 Alternative use of land:

During the mining operation, the land usage changes from its pre-mining scenario. The final stage land use plan shows the use of land in a post-mining scenario when coal-mining operations have completed. Alternative use of land, specially released from infrastructure areas and vacant areas, as proposed to be planned and properly designated for post-mining land uses depending on the existing conditions prevailing at that point of time. While for OB dumps and acquired forest areas, vegetation and afforestation has been proposed as a final land use. While agriculture may be the best land use, if feasible, and if it is supported by some irrigation facilities.

18.3 SOCIAL ASPECTS:

- ✓ Re-deployment of work force.
- ✓ Management of community facilities
- ✓ Canalization of available water

18.3.1 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 achieved their peak. 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 operations. The reduction of manpower could be done as per the following options:

- Natural retirement.
- 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 years to other projects.

Retrenchment of people with suitable compensation after exhausting all the above options.

18.3.2 Management of Community Facilities:

The community facilities are proposed to be developed by coal projects for betterment of the neighboring community. The project management provides or assists 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 neighboring communities to the possible extent. The closure plan will envisage interaction of mining company with the state or local bodies who will take over these facilities and run the same for the community. The coal companies towards running these facilities, which is proposed to be taken care of by the local/state bodies, may make a onetime payment.

18.3.3 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 this water for surrounding community for their irrigational/domestic uses may be taken up.

18.4. FINANCIAL ASPECTS:

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

18.4.1 Creation of a corpus fund for the final mine closure:

It is proposed that a corpus fund for final mine closure to be created from the retain earnings of the project. The fund creation is proposed to be started after the project starts earning revenue, which is in surplus, after deducting all the negative cash flows. Preferably the corpus fund should be created after the mine comes under revenue. However, in case of shortage of funds, corpus fund creation may be deferred till the mine attains target production. This fund should be judiciously created so that the objective of the final mine closure can be smoothly met. This will depend on the local site conditions, requirement of mine closure, mine closure plan. Site specific mine closure plan is proposed to be prepared and approval of the company board may be obtained. It is proposed that 10% of annual OB removal would need to be regarded at the end of the mine. A Corpus fund @ Rs.2/- per cum of the OB to be finally re-graded is envisaged to be created and kept under separate head with the project. This fund will not only cater for re-grading but will also cover other ancillary expenditure.

18.4.2 Cost of Closure Activities :

As proposed above, many activities are proposed to be undertaken after the closure of the mines, which naturally will involve expenditure. Some of the closure activities will,

in fact, form part of normal mining operations. However, some activities are proposed to be addressed only after completion of the coal mining operations. The cost for all those activities, which are to be executed after coal winning, is proposed from the retained earning of the project for meeting the expenses.

18.4.3 Cost of Organization for executing the closure activities:

After the completion of the coal mining, an organization consisting of persons of different disciplines is proposed to be maintained to undertake and implement the closure activities. The organization may be provided with a vehicle for discharging day-to-day duties. Maintenance cost of this organization is proposed from the retain earnings of the project. A small team consisting of 2-3 technical people may be required to oversee the efficacy of the closure activities. This monitoring may be conducted for 4-5 years after the mine closure activities

18.4.4 Cost of the post project monitoring:

After the closure activities have been implemented the project is proposed to be monitored regularly for 4 to 5 years. During this period of 4-5 years, cost towards project monitoring is proposed from the retain earnings of the project.

All the above cost may be funded from corpus fund created for the purpose.

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(कोल इंडिया की अनुषंगी कम्पनी)
एक मिनि रत्न कम्पनी

Central Mine Planning & Design Institute Limited

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