

**PROJECT REPORT FOR AMGAON OPENCAST PROJECT (1.00Mty)****SUMMARISED DATA**

Sl. No.	Particulars	Unit	Value	
			Quarry-1	Quarry-2
<b>I.</b>	<b>Coal Seams</b>			
	<b>Thickness of coal seam-I</b>			
1	a) Merged/composite	m	2.38 to 3.04 (2.71 m)	1.10 to 4.41 (2.61 m)
	b) Splitted section			
	i) Seam-I(top)	m	0.31 to 0.74 (0.51 m)	0.15 to 1.25 (0.65 m)
	ii) Seam-I(Bot)	m	2.21 to 3.89 (3.12 m)	1.74 to 3.52 (2.70 m)
2.	Total overall coal in seam I	m	2.38 to 4.51 (3.04 m)	1.10 to 4.41 (3.03 m)
3	Specific gravity of coal seams			1.52
	a) For Grade D			1.58
	b) For Grade E			
<b>II.</b>	<b>Overburden / partings</b>			
4.	<b>Thickness</b>			
	a) Top OB	m	8.61 to 50.05 (25.34)	8.55 to 45.74 (26.57)
	b) Total OB	m	8.61 to 51.04 (25.72)	8.55 to 46.51 (27.26)
	c) Parting OB	m	0.32 to 1.76 (1.06)	0.52 to 2.21 (1.23)
	d) Specific Gravity			2.40
	e) Excavation Category			50% cat.III and 50% cat.IV
<b>III.</b>	<b>Other Parameters</b>			
5.	Maximum depth	m	52	53
6.	Gradient		Av. 1 in 24	1 in 45
7.	Grade of coal		Gr.D (Longflame)	Gr.D Longflame to Gr.E
8.	Geological Reserves (seam I) within mine area	Mt	25.47	
9.	Mineable Reserves (seam I)	Mt	5.74	18.46
10.	Volume of OB	M.cum	39.65	131.51
11.	Stripping Ratio (Av.)	Cum/t	6.91	7.12
12.	Target output	Mty	1.00	
13.	Overall Mineable Reserves	Mt	24.20	
14.	Overall OB Volume	M cum	171.16	
15.	Overall Stripping Ratio	Cum/t	7.07	
16.	Project life	Year	26	
17.	Main Customers		Miscellaneous	

S.No.	Particulars	Unit	Value
18.	a) Initial capital requirement	Rs. cr.	39.28
	b) Capital outlay per tonne	Rs.	392.80
19.	a) Capital requirement of P&M	Rs. cr.	5.67
	b) Per tonne of annual output	Rs.	56.74
20.	Selling price	Rs./t	727.02
21.	Estimated cost of production :		
	a) at 100% level of production	Rs./t	498.28
	b) at 85% level of production	Rs./t	519.06
22.	Profit / loss		
	a) at 100% level of production	Rs./t	228.74
	b) at 85% level of production	Rs./t	207.96
23.	Foreign Exchange	Rs. crores	NIL
24.	Break-even-point(%)		33.99
	(Mt)		0.34
25.	No. of persons		119
27.	OMS		
	a) Conventional	t	31.83
28.	EMS	Rs.	631.01
29.	No. of houses		65
30.	Water Demand	MLD	0.149
31.	IRR at 100% level of production	%	387.29
32.	IRR at 85% level of production	%	202.45
33.	The estimated completion capital of project estimated on variable cost basis	crores	43.731
34.	Anticipated year of achieving target	Year	4 <sup>th</sup>
35.	Year of opening revenue account	Year	1 <sup>st</sup>
36.	Project affected persons	No.	454
37.	Project affected families	No.	253
38.	Total Land	Ha	801.22
	a) Tenancy Land	Ha	640.31
	b) Forest Land	Ha	86.12
	c) Govt. Land	Ha	74.79
39.	Average cost of production		
	a) at discounted 0%	Rs./t	505.37
	b) at discounted 12%	Rs./t	529.18
	c) at discounted 16%	Rs./t	537.81
	d) at discounted 17%	Rs./t	539.94
40.	Cost of EMP	Rs./t	12.76
41.	Grade of coal despatch for		
	a) 1 <sup>st</sup> year to 20 <sup>th</sup> year		D (L/F)
	b) From 21 <sup>st</sup> year to 26 <sup>th</sup> year		E

## EXECUTIVE SUMMARY

## 1.0 INTRODUCTION

## 1.1 LOCATION

The proposed Amgaon Opencast is situated in geological block named Amgaon Block within Lakhanpur Coalfield which forms a part of the large Sohagpur basin in the Surguja district of Chhattisgarh. The project falls under the jurisdiction of Bistrampur Area of SECL. The Project Report is based on the "GR on Coal Exploration : Amgaon Block prepared by MECL in January 1993

The geological block has four numbers of coal seams from Seam-IV to Seam-I in descending order. On perusal of geological block in detail i.e. distribution of mineable coal reserve in different patches and grade, underground mining method was not found to be economically viable proposition for exploitation of any seam.

In view of the above, a suitable reasonable area has been selected to start an opencast mining for exploitation of Seam I only. The proposed mining block has an area of 621.00 Ha and proposed to be exploited by opening two quarries

The mine is being planned with target capacity of 1.0 Mty. The total mineable reserve and OB removal are 24.20 Mt and 171.16 Mcum respectively.

## 1.2 OTHER RELEVANT PROJECT SPECIFIC INFORMATION

In the geological Amgaon Block at present there are no mining activities so far. However, presently there are two ongoing underground projects in the Lakhanpur Coalfield in the name of Rehar and Gayatri Underground Mines. Recently, Project Report on Ketki Underground Project (0.36 Mt) was recasted with new technology and approved in the year 2003. Project Report on *Amera Opencast* (1.00 Mty) also prepared and the same was approved. The proposed quarry area involves four villages in which 454 land oustees and 253 families are involved. There are reserves further on the dip side of south eastern side and also on the north eastern side of quarry at comparatively higher stripping than that considered in this report. This area may be worked if it is techno-economically viable in future.

**1.3 NEED FOR THE PROJECT**

This project named Amgaon OCP has been envisaged for a targeted capacity of 1.0 Mty coal. The need for this project is to meet the demand of superior grade coal in CIC coalfield. It may be mentioned that this project has been identified as future project for contribution of production.

**1.4 OBSERVATION ON DRAFT PROJECT REPORT**

Draft Project Report for Amgaon O/C was prepared with **departmental shovel-dumper option for both Coal & OB** for annual targeted production of 0.50 Mty in March 2003 with initial capital investment of Rs.81.27 crores. Economics of this option was poor. The cost of production at 100% level of production was Rs.871.28 per tonne, resulting into a loss of Rs.119.78 per tonne. The IRR of the project at 100% level of production and 85% level of production was (-) 14.92% and (-) 29.93% respectively.

**1.5 OBSERVATION OF TECHNICAL SUB-COMMITTEE AND SECL BOARD**

As per minutes (item No. 8.2) of 8th meeting of TSC of SECL for projects held on 8.1.2004 at Bilaspur, it was decided that conventional method of coal extraction (by tipper and pay loader) through outsourcing should be considered against coal extraction by deploying leased surface miner proposed earlier in the PR. Accordingly, the same exercise was done and presented before TSC of SECL held on 18.2.2004. After going through the economics of the option (i.e. with conventional method of coal extraction through outsourcing), it was found that operating revenue cost per tonne is increased by Rs.43.57 due to impact of additional capital of Rs.9.0 crores (mainly Rs.6.58 crores in CHP & contingencies, Rs.2.04 crores in dumper & ripper and Rs.0.34 crores in residential buildings) and increase in manpower by 36 numbers in comparison to coal extraction deploying leased surface miner proposed earlier in the project report.

This has resulted in decrease in profit margin as well as IRR in case of conventional method of coal extraction through outsourcing. TSC recommended that earlier PR with leased surface miner for coal extraction along with additional capital for wharf wall loading separately at Bistrampur Railway Siding may be finalized. Based on this

decision, Project Report for Amgaon Opencast for targeted capacity of 0.90 Mty prepared at estimated initial capital investment of Rs.208.87 crores and discussed in the 139<sup>th</sup> meeting of SECL Board held on 28<sup>th</sup> Feb, 2004. The board took the decision that PR should be withdrawn and the report should be re-submitted incorporating outsourcing option for both coal and OB, with enhanced annual target production. Accordingly, this PR with targeted production of 1.00 Mty incorporating both coal production and OB removal through outsourcing is submitted for approval.

### **1.6 BROAD MINE ECONOMICS**

Within the proposed area, a Project Report for Amgaon Opencast for targeted capacity of 1.00 Mty is prepared at estimated initial capital investment of Rs.39.28 crores. The cost of production at 100% level of production is Rs.498.28 per tonne, resulting into a profit of Rs.228.74 per tonne. The IRR of the project at 100% level of production and 85% level of production is 387.29% and 202.45% respectively. The grade of coal is ROM 'D' grade longflame upto 20<sup>th</sup> years of mine operation. From the 21<sup>st</sup> year of mine operation, the grade of coal will be ROM 'C' grade.

### **2.0 MARKETABILITY**

The demand projection of coal from CIC Coalfield for the year 2006-07 is 26.91 Mt against 21.63 Mt of coal produced in the year 2002-03. Only 0.18 Mt surplus coal is estimated even after including 1.00 Mty coal production of Amgaon Opencast Project in the year 2006-07. The overall demand of superior grade coal will be met by opening this project.

### **3.0 LOCATION**

Amgaon Opencast Project is located adjacent to Ketki block in which PR for Ketki Underground has been formulated. It is situated in Lakhanpur Coalfield of CIC coalfield. The Amgaon block is bounded by latitudes from 23°06'45" to 23°09'39" (N) and longitude from 82°47'38" to 82°51'58" (E). The block is covered in the Survey of India Toposheet No. 64 I/16.

### 3.1 COMMUNICATION

The block is about 14 km away from the Surajpur Tehsil town. The nearest Railway Station is Bistrampur. The block is about 28 km away from Bistrampur Railway Station. However, the aerial distance of Bistrampur Railway Station from Amgaon Block is just 13 km.

An all weather tarred road connecting Ambikapur with Manendragarh runs parallel to the northern boundary of the field at a distance of about 8 km.

### 3.2 CLIMATE

The climate is tropical. The temperature varies from  $8^{\circ}\text{C}$  to  $39.6^{\circ}\text{C}$ . Following are the main meteorological data :-

Maximum annual rainfall : 1475.50 mm

Minimum annual rainfall : 975.05 mm

Average annual rainfall : 1181.44 mm

Most of the precipitation occurs between July to August.

### 3.3 TOPOGRAPHY

The Amgaon Block has gentle undulation with general elevation varying from 538 m to 604 m. The Rehar River flowing south, south-eastwards in the middle of the coalfield constitute the main drainage of the coalfield and divides it into two segments. A nala named Satiya is located in the northern part and having westerly flow constitutes the main drainage system of the Amgaon Block.

### 3.4 LAND USE

The total land requirement for the project has been estimated as 801.22 Ha. Out of which 86.12 Ha of forest land is involved. The details of existing land use is as follows:-

Tenancy land	:	640.31 Ha
Non-forest Govt. land	:	74.79 Ha
Govt. forest land	:	86.12 Ha

Total	:	801.22 Ha
-------	---	-----------

## Executive Summary

454 land oustees and 253 families belonging to four villages involved within the minetake area are to be rehabilitated.

4.0

## GEOLOGY AND DEPOSIT APPRAISAL

4.1

### GEOLOGY OF AMGAON BLOCK

Barakar formation under the thick cover of soil and alluvium, mostly of residual nature, comprising sandstones with subordinate shale and coal seams occur in the block. Sandstone is dominantly light grey varying from fine to gritty. The shale is typically grey. Coal seams, however, define prominent horizons within the sandstone dominated cycles. The thickness of this formation within the block varies from 1.13m (MLA-104) to 209.20 m (MLK-14).

A total of 157 boreholes have been drilled in the 20.00 sq. km. of the block area involving a total meterage of 9995.60 m at a borehole density of 7.85 per sq. km. Within the quarry area of 6.21 sq. km 66 nos. of borehole has been drilled which gives a borehole density of 10.63 per sq. km.

4.2

### STRUCTURE OF THE BLOCK

The structural interpretation of the Amgaon Block is largely based on the sub-surface data, coupled with the geological mapping of the area.

#### STRIKE

Over the larger part of Amgaon block the strike of the coal seam bearing formation is NW-SE with localised swing in the north west where strike tends to become N-S.

#### DIP

The strata are in general having 2° to 4° northerly dip.

4.3

### FAULTS

Twenty three faults numbered F1 to F23 with throw varying from 0 to more than 100m have been deciphered. All the faults hade towards south except five faults numbered F2, F3, F6, F9 & F23 which had towards north.

**COAL SEAMS INFORMATION**

There are four major seams, namely, IV, III, II and I in descending order in the Amgaon Block. Within the quarry area proposed, only Seam-I exists. Other seams incrops 2.8 km away from the incrops of Seam-I. The Seam-IV and I split into two sections in certain patches.

**4.3.1 SEQUENCE OF SEAMS WITH PARTING WITHIN THE BLOCK****TABLE -4.5: SEQUENCE OF SEAMS WITH PARTING**

Sequence of seam/ Parting	Range of Thickness (m)			No. of borehole Intersection
	Min.	Max.	Av.	
Seam IV(Top)	1.59	3.85	2.00	6
Parting	0.34	0.95		
Seam IV(Bottom)	0.50	1.12	0.85	6
Parting	---	---		
Seam V(Merged)	1.08	6.09	3.64	4
Parting	5.35	9.89		
Seam III	1.85	3.00	2.26	10
Parting	19.31	24.67		
Seam II	0.11	1.66	0.95	17
Parting	65.11	80.27		
Seam I(Top)	0.06	2.12	0.46	83
Parting	0.31	2.39		
Seam I(Bottom)	0.87	4.14	2.67	59
Parting	---	---		
Seam I(Merged)	0.46	4.57	2.47	56
Parting	---	---		
Seam I(Bottom)(Top)	0.16	1.85	0.70	23
Parting	0.31	1.41		
Seam I(Bot)(Bottom)	0.32	3.32	1.73	23
Seam I(Bot) (T+B)	1.09	3.59	2.42	21

**Executive Summary**

**4.3.2 SEAM-I**

This is the oldest seam intersected in the block. The Seam-I has been fully intersected in 130 boreholes. The Seam-I is split into two sections over the entire block except all along near the incrop. The two sections of Seam-I are designated as I (Top) and I (Bottom). In certain patches, the Seam-I (Bottom) is again split into two sections designated as I Bottom (Top) and I Bottom (Bottom).

The thickness of parting between Seam-II and the underlying Seam-I (Top) in the split area of Seam-I varies from 65.11 m to 80.27 m.

I-30 thickness of the Seam I (Top) varies from 0.06 m to 2.12 m (MLK-48). The thickness of the seam was increased in the north-west around borehole MLA-48. I-30 thickness of the Seam-I (Merged) varies from 0.46 m (MLA-42) to 4.57 m (MLA-64). The thickness of the seam has increased in north-west part of the block. I-30 thickness of the Seam-I Bottom (Top) shows variation from 0.16 m to 1.85 m while that of Seam-I Bottom (Bottom) varies from 0.32 m to 3.32 m.

**4.3.3 QUALITY**

The grade for I-30 thickness of Seam-I (Top) normally varies from F to D. The grade for I-30 thickness of Seam-I (Merged) varies from F to B. The grade of the seam has improved in the south-western part of the block. The normal variation of grade of Seam-I Merged is from E to C. The Seam I (Bottom) shows variation in grade for I-30 seam thickness from F to C. Range of quality parameter of Seam-I is given in table No. 4.3 and 4.4.

Table No. 4.3  
Range of quality parameters of Seam I (top/bot/mer)

Quality Parameters	Seam-I (Top)		Seam-I (Bot)		Seam-I (Merge)	
	Min.	Max.	Min.	Max.	Min.	Max.
Thickness in m.	0.20	3.51	0.71	4.14	0.83	4.57
Moisture %	4.00	9.20	5.30	8.10	5.90	8.50
Ash%	10.60	59.50	19.90	40.00	13.60	38.50
VM%	14.40	32.00	19.50	28.30	18.70	31.10
UIV K.Cal./Kg	1338	6181	2538	5119	2690	5850
Grade	G	B	F	C	F	B
Samples	63.00	63.00	58.00	58.00	53.00	53.00

Table 4.4

Range of quality parameters of Seam I Bot (Top/Bot)

Quality Parameters	Seam-I Bot (Top)		Seam-I Bot (Bot)	
	Min.	Max.	Min.	Max.
Thickness in m.	0.17	1.77	0.39	3.22
Moisture %	5.30	8.50	5.60	9.50
Ash%	17.20	52.80	9.80	34.50
VM%	19.60	31.50	17.70	32.50
UHV K.Cal./Kg	855	5353	3366	6237
Grade		C	E	A
Samples	17	17	15	15

The result of ultimate analysis, ash fusion temperature range and ash analysis carried out on coal samples from selected boreholes are given in table No. 4.5, 4.6 and 4.7.

Table No. 4.5

## a. Ultimate Analysis

Borehole No.	NAME OF SEAMS	On 60% K11 and 40°C Basis						GCV Kcal/kg
		Sample	C%	H%	N%	S%	O%	
MLK-65	I-Top	50(E)	63.90	3.90	1.30	0.30		6175
MLK-66	I-Bot	D(C3-C6)I	45.90	2.60	0.90	0.20		54
MLK-161	I-Merge	C1 to C3 +E1+D2	40.20	2.50	0.80	0.50	7.20	
MLK-121	I-Bot(Bot)	C1 to C4 +D2+D3+D5	45.00	2.80	0.90	0.60	7.20	4520
MLK-114	I-Top+Bot	C1 to C3 +D2	45.70	2.80	3.90	0.50	7.50	4600

Table No. 4.6

## b. Ash Fusion Temperature (°C)

Borehole	Name of Seam	Sample	IDT	HT	FT
MLK-65	I-Top	50(E)	1100	>1400	>1400
MLK-66	I-Bot	D(C3-C6)I	1260	>1400	>1400
MLK-161	I-Merge	C1 to C3 +D1+D2	1200	>1400	>1400
MLK-121	I-Bot(Bot)	C1 to C4+D2+D3+D5	1190	>1400	>1400
MLK-114	I-Top+Bot	C1 to C3 +D2	119	>1400	>1400

Table No. 4.7

## c. Ash Analysis

Bore hole No.	Sample	Constituents %									
		SiO <sub>2</sub>	Al <sub>2</sub> O <sub>3</sub>	Fe <sub>2</sub> O <sub>3</sub>	TiO <sub>2</sub>	P <sub>2</sub> O <sub>5</sub>	SO <sub>3</sub>	MnO	CaO	MgO	Alk. by diff.
MLK- 182 I-top	D1+ D2+ C1+C2	58.62	31.00	5.42	1.45	0.04	0.50	0.11	1.02	0.96	0.85
MLK- 112 I-bot	C2+ D1+ C3	59.46	30.65	4.85	1.60	0.05	0.40	0.12	1.04	1.00	0.83
MLK- 161 I-Mer	C1 to C3 +D1+D2	59.60	30.54	4.65	1.50	0.06	0.14	0.50	1.00	0.95	1.06
MLK- 65 I- bot (bot)	C4 + C5 + D4	53.02	29.74	2.10	1.54	0.02	0.15	0.11	1.81	0.86	0.63

## 4.4 LONGFLAME CHARACTERISTICS

In seam-I (Merge) total 5 boreholes (MLK-139, MLA-7,11,68,75) tested for determination of longflame characteristics and in 4 boreholes the seam is found to be longflame B5.

Total 9 boreholes exist within the proposed quarry area that has been tested for longflame characteristics. 18 samples were tested, collected from the above 9 boreholes and 8 samples found to be longflame.

## 4.5 GEOLOGICAL RESERVES WITHIN THE PROPOSED QUARRY AREA

The geological coal reserve within the quarry is 25.47 Mt in the seam-I proposed for extraction.

## 5.0 MINE BOUNDARIES

**QUARRY BOUNDARY** - The quarriable area for the opencast mining is shown on Plate No.III & IV . Two quarries will be opened for exploitation of coal seams to minimise the length of quarry, lead of tipper/dumper and to maximise backfilling of OB within manageable extent. The boundary of quarries has been fixed as follows :-

Quarry No.	Boundary				Floor of quarry
	West	East	North	South	
Quarry-1	Incrop of Seam I & Line between MLA91&42	100m away from forest , Line between MLA97 & MLK177	Line between borehole MLA 44 & 62, Line of Depth of excvn. 50m.	Incrop of Seam I	On the floor of Seam-I(bot)
Quarry-2	Line between borehole MLA 12 & MLA75	Line of Depth of excavation 50m.	Line between borehole MLA 98 & 99 and Fault F19F19	Incrop of Seam I	On the floor of Seam-I bot)

In the left out areas, on the dip side and adjoining area of quarries, exploitation of seam by opencast mining method may be considered in future as expansion, if found economical. The extraction of coal blocked under the barrier between the quarries is also envisaged.

## 5.1 GEOLOGICAL AND MINING CHARACTERISTICS

The geological and mining characteristics of quarry has been summarised in Table No. 5.1.

## Executive Summary

P.R. for Angkor OCT

**Table No. 5.1**  
**Geological and Mining Characteristics**

SL No.	Particulars	Unit	Value	
			Quarry-1	Quarry-2
I.	<b>Coal Seams</b>			
1	<b>Thickness of coal seam-I</b>			
1	a) Merged/composite	Metre	2.38 to 3.04 (2.71 m)	1.10 to 4.41 (2.61 m)
	b) Splitted section			
	i) Seam-I(top)	Metre	0.31 to 0.74 (0.51 m)	0.15 to 1.25 (0.65 m)
	ii) Seam-I(Bot)	Metre	2.21 to 3.89 (3.12 m)	1.74 to 3.52 (2.70 m)
2.	Total overall coal in seam-I	Metre	2.38 to 4.51 (3.04 m)	1.10 to 4.44 (3.03 m)
2	Dip		1 in 24	1 in 45
3	Specific gravity of coal seams		1.52	1.52
4	Excavation category of coal		-----III----->	
II.	<b>Overburden / partings</b>			
1	<b>Thickness</b>			
	Top OB	m	8.61 to 50.05 (25.34)	8.55 to 45.74 (26.57)
	Total OB	m	8.61 to 51.04 (25.72)	8.55 to 46.51 (27.26)
	Parting OB	m	0.32 to 1.76 (1.06)	0.52 to 2.21 (1.23)
2	Specific Gravity		2.40	
3	Excavation Category		50% cat.III and 50% cat.IV	
III.	<b>Quarry Parameters</b>			
1	Maximum length along strike			
	- at surface	m	1860	2080
	- at floor	m	1800	2000
2	Maximum width along dip			
	- at surface	m	660	2080
	- at floor	m	600	1935
3	Maximum depth	m	52	53
4	Minimum depth	m	8	10
5	Maximum lift	m	54	50
6	Area of excavation			
	- at surface	Ha	157.73	463.27
	- at floor	Ha	143.61	436.84

## 5.2 MINEABLE RESERVES AND VOLUME OF OBR

The total mineable reserves within the quarry have been estimated as 24.20 Mt with a corresponding OB volume of 171.16 Mcum. While, calculating mineable reserves, a geological loss of 10% and a mining loss of 5% have been considered.

The quarrywise, sectorwise mineable reserves, volume of OBR and stripping ratio are summarised in the following table No 5.2.

Table No. 5.2

Sl. No.	Name of Quarry	Sector	Coal Reserves (Mt)	Total OB (Mcum)	Stripping Ratio (cum/t)
1	Quarry-1	Sector-I	0.34	2.16	6.35
2		Sector-II	3.26	21.62	6.63
3		Sector-III	2.14	15.87	7.42
	<b>Quarry-1 TOTAL</b>		<b>5.74</b>	<b>39.65</b>	<b>6.91</b>
5	Quarry-2	Sector-IV	1.01	6.60	6.53
6		Sector-V	5.06	37.80	7.47
7		Sector-VI	11.14	76.59	6.88
8		Sector-VII	1.25	10.52	8.42
	<b>Quarry-2 TOTAL</b>		<b>18.46</b>	<b>131.51</b>	<b>7.12</b>
	<b>GRAND TOTAL</b>		<b>24.20</b>	<b>171.16</b>	<b>7.07</b>

For calculation of reserves, following consideration has been made :-

The reserves has been calculated for Seam 1 by excluding dirt bands of >0.10 m thickness.

## 5.3 SELECTIVE MINING FOR EXPLOITATION OF COAL

Considering the geo-mining parameters and consistency of dirt bands continuous loading machines i.e. surface miner is the most appropriate equipment required for the purpose. It will mine and load coal and waste separately, thereby giving the improved quality of coal.

#### **5.4 METHOD OF MINING FOR OB REMOVAL**

OB removal has been proposed to be done by leased equipment through outsourcing.

The salient feature of the mining system are as follows :-

(i) Height & width of the benches OB will depend upon the size of the leased equipment. The provision of Coal Mine Regulation and related circulars shall be strictly followed for designing bench parameters in coal and OB.

(ii) Dump height - 30 m

(iii) Bench Slope

Coal - 70°

Spoil Heap - 37°

Considering the average mine floor gradient of about 1°-2°, the coal benches are proposed parallel to seam floor and self-draining. The top OB benches are also proposed parallel to the seam floor.

#### **5.5 COAL WINNING**

Coal will be exploited by leased surface miner. For transportation of coal from the face to the surface coalstockyard/Railway siding, 10-20T Tipper may be deployed.

#### **5.6 SURFACE CONSTRAINTS ON MINE DEVELOPMENT**

Following main constraints will have to be taken care of -

- 1) The minetake area involves four villages. There are 253 project affected families and 454 land oustees. They are to be rehabilitated; in addition, two villages exist besides the proposed quarry. A 60 m barrier has been maintained against these villages. Adequate care should be taken to avoid any further expansion of the village towards the quarry area.
- 2) In the south-eastern side of the quarry, at a distance of about 300m, there is a nalla. Its HFL line 548m has been shown in the geological plan. Proper care should be taken to avoid the problem of inundation from that nalla.
- 3) The total quarriable area is 621 Ha. Forest land is involved within the quarriable area. Acquisition of cultivated tenancy and forest land is to be ensured.

## 5.7 CALENDAR PROGRAMME

The mine will be advanced towards dip direction exposing the floor of Seam-I (Merge) along the sector lines shown in the final stage quarry plan. In the first year of mine operation, 0.20 Mty of coal will be produced with a corresponding volume of 1.50Mcum of OB removals. The targeted level of the production 1.00 Mty will be achieved in the 4th year. The peak natural volume of OB at targeted level of production has been estimated as 7.47 Mcum/year. It will be brought down to 7.15Mcum/year by advance stripping ratio of top OB, which will start from the 4th year of mine operation.

Table No. 5.3

NAME OF QUARRY	YEAR	COAL(Mt)		Parting OB by SM	Top OB	Total OB
		YEARLY	CUMULATIVE			
QUARRY-1	1	0.20	0.20		1.50	1.50
	2	0.50	0.70		3.50	3.50
	3	0.80	1.50		5.50	5.50
	4	1.00	2.50		7.15	7.15
	5	1.00	3.50	0.07	7.08	7.15
	6	1.00	4.50	0.15	7.00	7.15
	7	1.00	5.50	0.15	7.00	7.15
QUARRY-2	8	1.00	6.50	0.15	7.00	7.15
	9	1.00	7.50	0.15	7.00	7.15
	10	1.00	8.50	0.15	7.00	7.15
	11	1.00	9.50	0.15	7.00	7.15
	12	1.00	10.50	0.15	7.00	7.15
	13	1.00	11.50	0.15	7.00	7.15
	14	1.00	12.50	0.15	7.00	7.15
	15	1.00	13.50	0.15	7.00	7.15
	16	1.00	14.50	0.15	7.00	7.15
	17	1.00	15.50	0.15	7.00	7.15
	18	1.00	16.50	0.15	7.00	7.15
	19	1.00	17.50	0.15	7.00	7.15

**Executive Summary***P.R. for Amgaon OCP*

NAME OF QUARRY	YEAR	COAL(Mt)		Parting OB by SM	Top OB	Total OB
		YEARLY	CUMULATIVE			
	20	1.00	18.50	0.15	7.00	7.15
	21	1.00	19.50	0.15	7.00	7.15
	22	1.00	20.50	0.15	7.00	7.15
	23	1.00	21.50	0.15	7.00	7.15
	24	1.00	22.50	0.15	7.00	7.15
	25	1.00	23.50	0.15	7.00	7.15
	26	0.70	24.20	0.08	3.28	3.36
	<b>TOTAL</b>	<b>24.20</b>				<b>171.16</b>

**5.8 OPERATING SCHEDULE**

The main HEMM will be operated on the following working schedule :-

Number of working hours per shift	=	8
Number of working shifts per day	=	3
Number of working days per year	=	330

**5.9 EXCAVATION CATEGORY OF ROCK**

- i) Coal - III
- ii) OB - 50% III and 50% IV
- iii) Alluvium - I + II

**5.10 INSITU VOLUME WEIGHT**

- i) Coal - 1.52 t/cum for D grade Seam-I.
- ii) Coal - 1.58 t/cum for E grade Seam-I.
- iii) OB - 2.40 t/cum
- iv) Parting OB - 2.00 t/cum
- v) Top soil - 2.00 t/cum

**5.11 LEAD FOR OB & COAL**

The lead for OB (peak) transport to the dump site and that for coal transport from the coal face to the stock yard has been estimated as 2 – 2.50 km and 1.50 km respectively.

**5.12 DRILLING & BLASTING**

Pattern for drilling of blast holes in overburden benches will depend upon the height of the bench and may be designed as follows

Height of Bench = H

Burden (B) ~ H/2

Spacing (S) ~ B\*1.25

The suggested drilling patterns are for average mining conditions. These may be suitably modified during actual mining operations as per the site conditions.

The average explosives consumption has been estimated as 0.35 kg per cubic metre of OB. For secondary blasting, a 10% of additional explosives will be required for OB. SMS system of blasting should be used where ever possible.

**5.13 WASTE DISPOSAL TECHNIQUES**

In the initial years i.e. upto 2nd year of mine operation all the OB quantities will go to the external dumps. Internal dumping will start from the 3rd year onwards. From this year onward, all OB will be backfilled in the quarry. Most of OB will be transported through side roads to dump. Initially, the soil/alluvium from top bench of OB will be stacked and stored separately.

The spoil dump benches in the internally backfilled OB will be in the form of benches. With the sufficient advance of coal production bench, the backfilled OB will be levelled with dozers. Dumper / tipper will transport soil/alluvium OB from the top alluvium bench and will dump the soil directly on the levelled backfilled OB.

About 5.0 Mcum OB will be externally dumped for which 30 Ha land will be required. There will be two benches one upon another. Plate No. XIII shows the proposed design and location of internal and external dumps at the end of mining operations.

The break-up of OB quantity accommodated in various dumps are as follows:-

<u>Dump</u>	<u>OB accommodated in Mcum</u>
1. Internal dump	166.16
2. External dump	5.00

## Executive Summary

P.R. for Amgaon OCP

To the extent possible, top soil of thickness around 5.0 m will be removed separately. This soil will be directly spread over the levelled, graded backfilled spoil for reclamation of the quarried out land.

### 6.0 PUMPING AND DRAINAGE (WATER MANAGEMENT)

The pumping system of Amgaon Opencast Project has been designed to dewater the inflow of water due to precipitation falling during monsoon season to enable mining activity of continues round the year. A diesel pump has been provided for use in case of emergency. The details of pumps, pipes alongwith estimated cost and phasing are shown in Appendix-A.3.4.

### 7.0 SURFACE COAL HANDLING & DESPATCH ARRANGEMENT

The crushed coal (-100 mm) by the surface miner will be despatched by road or through nearby railway siding of Bishrampur railway siding, located at a distance of about 28 km. The estimated capital provisions towards weighing arrangement at pit head and separate wharf wall loading arrangement at Bishrampur Railway Siding are shown in Appendix-A.3.5.

### 8.0 POWER SUPPLY, ILLUMINATION & TELECOMMUNICATION

Amgaon Opencast Project will receive power at 33 kV by means of a overhead line by tapping 33 kV feeder feeding power to 33 kV main sub-station of SECL at Gayatri Underground Project situated at a distance of 7 km. The estimated maximum demand of the project, including pumping, lighting etc. has been derived at 497 kVA with corrective power factor of 0.98 (lagging).

To meet this demand, a substation has been proposed in the project. Capacity of the proposed substation is as under :-

33/3.4 kV, 630 kVA - 2 Nos.

Necessary provision has been made for circuit breakers, overhead lines & labels etc. for distribution of power in the project. For illumination of quarry and other working places of the project, provision has been made at 230 V (L-L). Similarly, necessary provision has been made for telecommunication requirement of the project.

Estimated capital requirement is Rs.2.45 crores which is given in Appendix-A.3.2.

**SPECIFIC ENERGY CONSUMPTION**

The specific energy consumption of the project has been estimated at 1.06kWh/t for targeted production of 1.00 Mt per year.

**9.0 WORKSHOP & STORES**

Amgaon OC Project will be provided with a unit workshop for repair and maintenance of E&M equipment. The workshop will have facilities to carry out incidental minor repairs and preventive maintenance of the equipment.

The estimated capital requirement on P&M of workshop is provided in Appendix-A.3.3.

**10.0 CIVIL CONSTRUCTION, WATER SUPPLY & SEWERAGE**

The civil cost index is calculated as 1139 for July 2003. The total cost towards service building comes to Rs.224.11 lakhs. For 119 manpower, 65 houses have been provided with an overall housing satisfaction of 55%. The total cost of residential building works out to Rs.168.07 lakhs.

The total water demand has been assessed as 0.149 MLD. The total cost of water supply scheme has been provided in appendix-A.8.3.

The provision of service road of length 2.0 km and 8.5 km approach road to the project site has been made in the P.R.

The cost of sewage disposal scheme has been provided in Appendix-A.8.3(A).

**11.0 CAPITAL OUTLAY IN MINES**

The provision for capital outlay in mines have been summarised in Appendix-A.8.1.

The estimated capital involved for rehabilitation and resettlement of land oustees and families are also given.

**12.0 MANPOWER, PRODUCTIVITY**

The requirement of manpower for the rated capacity of 1.00 Mt coal, and 7.15 Mcum of OB removal per year has been broadly estimated as 119 resulting in an overall OMS of 31.83 t.

**13.0 LAND**

The total requirement of land has been assessed as 801.22 Ha for the project. The break-up of land use is as follows :-

Tenancy Land	640.31 Ha
Non-Forest Govt. Land	74.79 Ha
Forest Land	86.12 Ha

---

Total 801.22 Ha

---

The land involves 253 families and 454 land oustees to be rehabilitated.

**14.0 ENVIRONMENTAL MANAGEMENT**

Pollution control due to mining operations like dust suppression effluent treatment and tree plantation etc. is covered in this report.

Initially, 5.00 Mcum of OB will be dumped in the external dumping space.

A capital provision of Rs.830.28 lakh has been made for environmental protection and land reclamation measures.

**15.0 ECONOMICS EVALUATION**

**15.1** The mine economics has been worked out considering total capital as equity capital. Since the mine comes under the revenue account from the first year of quarry option, there is no revenue expenditure capitalised.

Capital investment pattern would be as under:-

Particulars	Without Loan capital	With Loan capital
1. Equity	Rs.39.28 crores	Rs. 20.92 crores
2. Loan	Rs. 0.00 crores	Rs. 18.36 crores
3. Total	Rs. 39.28 crores	Rs. 39.28 crores

If loan capital is considered, the cost per tonne will be increased by Rs. 5.29. Specific investment per tonne of annual output is Rs. 392.79.

**15.2 PLANT AND MACHINERY**

The capital investment of plant and machinery is estimated as Rs.5.67 crores as shown in Appendix-A.3. The specific investment of P&M works out to Rs.36.74 per tonne.

**15.3 BASIS OF PRICE ESTIMATION OF P&M**

The estimate for the HEMMs and other P&M are based mainly on the standard pricelist June 2003 of mining equipment published by CMPDIL, Ranchi. Considering the escalation rate per month, the price of P&M has been updated upto March 2004. The basis for estimation of civil construction cost has been given in Appendix-A.2.3 i.e. Cost Index Jul. 2003 at Bihampur Area.

**15.4 OPENING OF REVENUE ACCOUNT**

The project is proposed to be brought under revenue account w.e.f. 1st year of quarry operation when it attains a production level of 0.20 Mt. The criteria adopted for closure of the account is the first occurrence of either of the following events:-

- a) From the financial year in which the value of production is more than the expense i.e. the revenue earned is more than the revenue nature of expenditure in respect of that project.
- b) Attainment of 25% of target coal output.
- c) From the financial year in which the project is scheduled for completion.

The mine is declared as in revenue account as per criteria (a).

**15.4.1 CONSIDERATION OF RATE FOR OFF LOADING  
PROPOSITION OF COAL AND OB**

The project is proposed to be worked by off loading proposition for coal winning by surface miner. OB loading and transportation upto external dump and in backfilled area is proposed through outsourcing. But, coal winning by leased surface miner will be done throughout the mine life. The parting OB will also be removed by Surface Miner. The rates has been considered based on the escalated rates table received from SECL, which are as follows :-

**Executive Summary**

P.R. for Angam OCP

- i) Coal - @ Rs.38.35 per tonne for lead of 1.5 km (with surface Miner)
- ii) Top OB - @ Rs.40.00 per cum for lead of 2 km.
- iii) Parting OB - @ Rs.76.70 per cum to be removed through Surface Miner

The scope of work by outsourcing will include - loading, transportation and dumping. All statutory rules, regulations and applicable laws are to be followed. The rate of coal winning per tonne includes transportation of coal from face to pit head stockyard.

**15.5 MANPOWER, EMS & OMS**

The total requirement of manpower for this project is 119 numbers which gives an overall OMS of 31.83 tonne in a year. The overall EMS works out to Rs.631.01, the details of manpower is shown in Appendix-B and B.1.

Salary and wages has been estimated as per NCWA - VII, June'03, @ 15% increase of basic pay as interim relief has been considered.

**15.6 COST OF PRODUCTION OF COAL**

The cost of production has been worked out considering the following:-

**15.6.1 INTEREST ON WORKING CAPITAL**

The rate of interest on working capital is taken as 15.5% per annum and quantum of working capital has been assumed as equivalent of 4 months cash revenue costs.

**15.6.2 INTEREST ON LOAN CAPITAL**

The interest on loan capital is considered 15.5%. But, in case of capital considered as total equity, this is not considered.

**15.6.3 FOREIGN EXCHANGE**

The requirement of foreign exchange has been estimated as nil.

**15.7 SELLING PRICE**

The weighted average selling price of coal for this project has been taken as Rs.727.02 per tonne, calculated considering different grade of coal being produced during different years of quarry operation including Rs.20.00 for sizing of the coal and Rs.21.00 for crushing coal below (-)100mm.

Actually, the selling price of coal upto 20<sup>th</sup> year of mine operation will be Rs.772.50 per tonne as in this period, the grade of coal will be grade 'D' LF. The grade of coal from 21<sup>st</sup> year to 26<sup>th</sup> year of mine operation will be grade 'E' and so average selling price of coal in this period will be Rs.558.75 per tonne. The overall selling price of coal during 25 years of initial mine operation which is considered for estimating economics of the project is estimated as Rs.727.02 per tonne.

#### 15.8 ESTIMATED UNIT COST AND PROFITABILITY

The Appendix-C shows the unit cost and profitability for a rated output of 1.0 Mt of coal and 7.15 Mcum of OB removals per annum. The overall cost of production at 100% and at 85% operating level has been worked out as Rs.498.28 and Rs.519.06 per tonne which results profit of Rs.228.74 and Rs.207.96 per tonne respectively at the calculated average selling price of Rs.727.02 per tonne. The project, however, fails to result any profit below 33.99 % of the rated output level which is its break-even-point.

The estimated cost of production and profitability at 80%, 85% & 90% level of operation is shown in Appendix-C.1.

The above cost/tonne is inclusive of EMP cost, the impact of which is Rs.12.76 per tonne as shown in Appendix-C.2.

#### 15.9 IRR OF THE PROJECT

The internal rate of return at 100% and 85% level of production works out to be 387.29 % and 202.45 % respectively.

#### 15.10 CONCLUSION

The proposed project will give an annual profit of Rs.22.87 crores with a profit of Rs.228.74 per tonne at 100% level of production (i.e. 1.0 Mty). The financial IRR of the project at 85% is 202.45 %. Considering the above factors, the project seems economically sound and may be approved.

\*\*\*\*\*