

**SUMMARISED DATA**

SI. No.	Particulars	Unit	Value		
<b>A.</b>	<b>GENERAL</b>				
1	Name of Project		KDH OCP (4.50/5.00 MTPA)		
2	Type of Project		Existing		
3	Name of Area / Company		N.K. Area/Central Coal Field Ltd.		
4	Nearest Railway Station from project	Name km	Khalari Railway Station 1km		
5	Nearest National / State Highway / Approach road	Name	State Highway 7		
<b>B.</b>	<b>GEOLOGICAL</b>				
1	Name of geological blocks considered	Name	K D South & Karkata		
2	Area of the geological blocks	sq. km	1.45 sq. km+ 0.715sq km		
3	Borehole Density within blocks	BHs / sq.km	18.6		
4	Description of all coal seams within block				
Stratigraphic Sequence	Thickness (m)		No. of borehole intersections	Net Geological Reserves (MT)	Remarks
	Min.	Max.			
K5	5.25	5.85	4	-	Reserve not considered
Parting	28.79	33.20			
K4	2.95	5.70	7	2.82	
Parting	26.79	42.91			
K3	0.23	1.45	8	1.42	
Parting	5.86	10.00			
K2	1.65	7.04	10	6.38	
Parting	2.43	18.00			
K1	1.74	4.53	11	4.13	
Parting	3.42	14.61			
Karkata	2.12	6.15	9	4.75	
Parting	17.35	40.90			
Bisrampur	1.60	6.15	23	24.07	
Parting	5.58	22.87			
Bukbuka	10.12	22.38	25	40.70	
Parting	25.46	34.90			
Parting (Between Dakra Top and Bukbuka)	16.25	29.54			
Dakra Top	0.72	11.89		21.33	
Parting	1.44	7.24			
Dakra Bot	15.57	21.37		59.32	

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<b>TOTAL</b>						164.93			
<b>C.</b>	<b>TECHNICAL</b>								
1	Area of the proposed mine block			sq. km		1.75			
2	Borehole density within mine area			BHs/sq. km		16			
3	Mine parameters: Extent along strike (Avg.) Extent along dip (Avg.)			km km		1.43 0.75			
4	Description of coal seams proposed to be worked along with the parting details								
<i>Name of seam</i>	<i>Thickness range considered (m)</i>		<i>Av. Thickness/Parting Thickness (m)</i>	<i>Av. Grade (U.H.V.) K. Cal/Kg</i>	<i>Av. gradient (deg)</i>	<i>Mineable Reserves (Mt)</i>		<i>Volume of OB (Mcum)</i>	
	<i>Min</i>	<i>Max</i>				<i>PH-1</i>	<i>PH-2</i>		
Top OB			34.10					5.79	37.02
K3	1.00	1.45	1.05	2830	6-8	0	0.84		
Parting	5.86	10.00	8.90					3.75	3.59
K2	1.65	7.04	4.88	3905-4140	6-8	1.40	3.09		
Parting	2.43	18.00	6.60					1.57	2.16
K1	1.74	4.53	2.25	4185-5215	6-8	0.74	1.71		
Parting	3.42	14.61	8.10					2.89	5.12
Karkata	2.12	6.15	4.37	3670-4650	6-8	1.31	2.87		
Parting	17.35	40.90	23.00					9.15	13.57
Bisrampur	1.60	6.15	4.26	2995-4290	6-8	2.63	11.91		
Parting	5.58	22.87	13.00					0.0	17.94
Bukbuka Top	0.82	2.00	1.00	2995-4290	6-8	0	4.80		
Parting			0.50					0.0	9.61
Bukbuka Bottom	9.30	20.40	16.5	2995-4290	6-8	0	30.77		
Parting			21.40					0.0	36.59
Upper Dakra	1.00	11.89	4.93	3695-4515	6-8	0	7.81		
Parting	1.44	7.24	2.60					0.0	18.28
Lower Dakra	15.57	21.37	20.03	2550-3545	6-8	0	37.25		
<b>Total Coal OB</b>						<b>6.08</b>	<b>101.07</b>	<b>23.14</b>	<b>141.85</b>
5	Av. Stripping Ratio			m <sup>3</sup> /t		<b>1.54</b>			

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6	Method of Mining	Opencast by Shovel-Dumper Combination	
7	Target Output		
	Normative production capacity	Mt	4.50
	Peak production capacity	Mt	5.00
8	Year of achieving Target Production (from zero date)		1 <sup>st</sup> Year
9	Year of start of Internal Dumping		1 <sup>st</sup> Year
10	Production Phasing (from zero date upto target year) in Phase-I	Mt	Existing capacity will continue
11	Total Mine Life	Years	29
12	Major HEMM Deployed for Coal	Capacity	(Up to Tgt Yr)
	Electric Rope Shovel	(5 Cum)	3
	Rear Dumper	(50/60T)	19
	Drill	(160 mm)	4
	Dozer	(410 HP)	4
13	Major HEMM Deployed for OB (Up to Tgt Yr)	Capacity	(Up to Tgt Yr)
	Electric Rope Shovel	(10 Cum)	3
	Electric Rope Shovel	(5 Cum)	1
	Rear Dumper	(100T)	23
	Rear Dumper	(60T)	6
	Elec. RBH Drill	(250 mm)	4
	Dozer	(410 HP)	8
14	Total Manpower (Up to Tgt Yr)		(Up to Target Year)
	Existing	Nos.	1023
	Additional	Nos.	Nil
15	Overall Output per manshift (OMS)		Main Variant
		Tonnes	16.66
16	Seam-wise weighted average grade of coal (non-coking/coking)		Grade 'E'
17	Presence of Major Surface Constraints (nallas, road, power line, etc.)	(type)	Sonadoba Nala in Eastern side, Kendua nala in western side Jehlitand and Barkitand village
18	Coal Transport within the mine (In-pit belt conveying system or by Truck)		By Dumpers
19	Surface Coal Transport to Siding/Despatch Point and Mode of Despatch		By Truck & Rail
20	Any Railway Siding and distance		Dakra Siding at 1.5km
21	Name of any Specific Customer/Industry		-
<b>D.</b>	<b>ENVIRONMENTAL &amp; OTHERS</b>		
1	Civil Construction		
	Residential houses	Nos.	563

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	Housing satisfaction	%	55
2	Water Demand	Klpd	
	Colony		513.75
	Industrial		773.32
3	Total Land required	Ha	195.96
	Forest land	Ha	101.06
	GMK Land	Ha	25.66
	Tenancy land	Ha	69.24
4	Land to be acquired for external dumping	Ha	Nil
5	Net Present Value of Forest Land	Rs.Lakhs/Ha	7.84
	Total Area	Ha	101.06
	Total Value	Rs.Lakhs	792.31
6	Habitation & Rehabilitation		
	No. of villages within mine boundary	Nos.	2
	No. of PAFs to be rehabilitated		800
7	Average annual rainfall	mm	1250
8	Make of Water on the day of Maxm Rain fall	cum/day	208310
9	Total installed pumping capacity	lps	530
10	Drainage of the Area (Name of river/nalla)		Through Sonadoba Nala & Kendua Nala to Damodar River
11	Any proposed diversion of nala or power line		None
E.	<b>FINANCIAL</b>		-
1	Total Capital Investment	Rs. crores	
		Existing	268.03
		Additional	201.43
		Total	469.46
2	Specific Investment	Rs. / tonne	
		Total	1043.24
		Additional	447.62
		Rs./m3	
		Total	670.66
		Additional	287.76
3	Total Capital Investment on P&M	Rs. crores	
		Existing	228.55
		Additional	140.25
4	Specific Investment on P&M	Rs. / tonne	
		Total	819.54
		Additional	312.97
5	Capital requirement upto target year	Rs. Crores	469.46
6	Year of opening of Revenue account (from zero date)		1st year
7	Earnings per manshift (EMS) (target year)	Rs.	1548.28

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8	Estimated Cost of Production	Rs. / tonne	
	At 100% production level		508.85
	At 85% production level		585.40
9	Estimated average selling price	Rs. / tonne	849.00
10	Estimated Profit	Rs. / tonne	
	At 100% production level		340.15
	At 85% production level		263.60
11	Financial Internal rate of return (FIRR)	%	
	At 100% production level		37.80%
	At 85% production level		24.33%
12	Economic rate of return (only for projects to be approved by Govt.)	%	
	At 100% production level		47.61%
	At 85% production level		32.68%
13	Desired av. Selling Price to yield 12% FIRR	Rs. / tonne	
	At 100% production level		645.54
	At 85% production level		744.15
14	Break-even point		
	Production	Mty	2.49
	Production level	%	55.39

## **INTRODUCTION**

### **1.0 Present Proposal**

The Extension Project Report of KDH OCP (4.5MTY) has been proposed in order to sustain the level of production from the existing KDH OCP and also to fulfill the demand of power grade coal from N.K. Coalfield and to reduce the gap to some extent of demand and production of CCL for XI plan period.

The projectised area of the sanctioned KDH OCP is nearing exhaustion. From the sanctioned boundary of KDH Expn OCP (4.5MTY), a balance of about 14.51 MT of coal and 22.50 Mcum of OB at a stripping ratio of 1.55cum/te is left. So it is proposed to exploit the coal seams in the dip side of the existing KDH Expn OCP from K3 Seam to Lower Dakra Seam which is demarcated by the KD South Geological Block and a part of Karkata Geological Block (upto Kendua Nala in the West). The proposed Project Report has been prepared by extending the dip side boundary of the existing KDH Expn OCP (4.5MTY) into the above area without any expansion in the mine capacity.

The Project Report has been formulated considering departmental production of coal and overburden removal throughout the life of the mine. The proposed normative capacity is 4.5 MTY at an additional investment of Rs 197.68 crore. The mine can achieve peak capacity of about 5.00 MTY in any one or more years during its production plan period.

The proposal envisages for shovel dumper combination of mining with departmental Coal Handling Plant. Product size of (-) 200 mm has been proposed. The crushed coal is proposed to be dispatched through Railway Siding having RLS.

### **1.1 Difficulties and constraints in mining with associated risk.**

- a) The proposed mining block contains old underground workings (developed/ depillared) in K2 and Karkata seams. Suitable statutory

precautions need to be taken during the extraction of upper seams while working over developed pillars/ goaf.

- b) The mining in the proposed mining block has a starting depth of 130m and the maximum depth of the mine goes upto 200m. It is envisaged to have an efficient sump management plan to avoid any water logging in the working area.
- c) An extensive built up area is located within the proposed quarry, which includes miners' quarters, hutments and two villages known as Jehlitand village and Barkitand village. These needs to be shifted and/or rehabilitated.

## **1.2 Location**

The KDH Opencast project falls within Hesalong and KD South geological blocks. It is located in the south central part of North Karanpura Coalfields and is included in Survey of India toposheet no. 73 E/2 and 73 A/14 in Ranchi district of Jharkhand. KDH Opencast project is bounded between latitude 23°39' 21" to 23°42'0" and longitude 84°59'15" to 85°00'24".

Area of the Project in sq. kms.

- a) Quarry area of the project: 1.75 sq km.
- b) Additional leasehold area of the project: 1.96 sq km.

## **1.3 Accessibility and Communication:**

The area is connected to Ranchi by State Highway no 7. The distance between Ranchi and the block is around 65km. The Khalari railway station on the Gomoh-Dehri-on-Sone loop line of the Eastern Railway is about 1 km from the southern extremity of the KD South block.

## **1.4 Climate and Rainfall Data:**

The climate is tropical with severe summer. The temperature during summer (March-June) goes as high as 45<sup>0</sup>C. Summer days are hot with dusty wind, but nights are generally pleasant. The minimum summer temperature is 20<sup>0</sup>C. The winter (November-February) is cold and the minimum temperature recorded is 10<sup>0</sup>C. The Rainy season is generally from June to October. The average monthly rainfall during monsoon season (June to October) has been

198.7 mm. During non-monsoon period, the average monthly rainfall has been 17.83 mm.

### 1.5 Topography with drainage pattern of area:

The topography of the Hesalong block is undulating and rolling. There are small ridges aligned in nearly N60°W to S60°E direction which is influenced by the general strike of the underlying strata. The ridges are formed by the sandstones occurring above thick coal seams. The intervening valleys and low flat grounds are generally coincident with the outcrops of the coal seams. The maximum and minimum elevations are 466m (situated to the NE of the abandoned Bistrampur incline) and 418m (near Sonadoba jore) respectively. A very flat low ground of about 27 hectares area is noticed in the NE corner of the block, adjacent to Sonadobajore. The topography of the K.D South block is gently undulating. The maximum and minimum elevations are 465 m and 430 m respectively.

The area is drained mainly by seasonal Kendua Nala in the west of the block and Sonadoba jore in the east. Both the nalas, flowing south to north carries the run-off to the Damodar River flowing in the north of the property.

### 1.6 Present Land Use Pattern

The additional land requirement for KDH Open Cast Extension Project has been estimated as 195.96 Ha excluding 9.19 Ha land in safety zone. The detail of the status of land is given in the following table:

(Fig in Ha)

Sl.No.	Particulars	Total land	Status	
			Land acquired	Land to be acquired
1	Tenancy land	69.24	47.63	21.61
2	GMK land	25.66	15.40	10.26
3	Forest Land	101.06		101.06
4	Forest land in safety zone (not to be acquired)	9.19	-	-
	<b>TOTAL</b>	<b>195.96</b>	<b>63.03</b>	<b>132.93</b>

## GEOLOGY

### 2.1 Limit of Geological blocks under consideration

**Different GRs prepared at different period for the blocks under reference:**

SI No	Name of the GR	Year of preparation
1	Geological Report of Hesalong Block, North Karanpura Coalfield.	Nov, 1974
2	Geological Report of KD South Block, North Karanpura Coalfield.	Mar, 1989
3	Geological Report on Karkata Block, North Karanpura Coalfield.	August, 1979

### Block Boundaries

Boundary	Hesalong Geological Block	KD South Geological Block
Northern	Damodar River	Floor incrop of Bisrampur seam and southern edge of Bukbuka quarry.
Eastern	Sonadoba jore flowing south to north.	Limited by western boundary of Dakra colliery and leasehold boundary of M/s ACC Ltd.
Southern	Approx up-dip limit of underground workings of the Karkata seam	Northern leasehold boundary of M/s ACC Ltd.
Western	Kendua Nala flowing south to north.	Karkata block.

### 2.2 Drilling

Drilling in the blocks was taken up by CMPDI at various periods of time. The details are as follows:

Year	Agency	Block Name	Number of boreholes	Meterage
1	2	3	4	5
1972-73	CMPDI	Hesalong	36	3271.75
1973-80	CMPDI	K D South	16	2519.03
1988-89	CMPDI	K D South	11	1526.80

## 2.3 Geological Structure

The coal bearing rocks and the coal seams occurring within the projectised area belong to the Barakar Formation of the Lower Gondwana Group. The contact between the coal bearing rocks and metamorphics in the South is faulted. The general strike of the beds in the KD South swings from NW-SE in the West to almost E-W in the east and south east part. Whereas, in the part of Karkata block under consideration, the general strike of the beds is in WNW-ESE. The gradient varies from 1 in 9 to 1 in 4 due South.

The K D South geological block under consideration has been traversed by 6 no. of faults. These have been numbered from F1-F1 to F6-F6. The details are given in the table below:

**Brief Description of Faults in the K D South block**

<b>Fault</b>	<b>Location</b>	<b>General Trend of fault trace</b>	<b>Amount of throw &amp; direction</b>
F1	Northern part of the block.	E-W	Northerly (20m)
F2	Northern part of the block.	NW-SE	North easterly (0-15m)
F3	Northern part of the block.	NW-SE	North easterly (0-25m)
F4	Southern part of the block.	NW-SE to WNW-ESE	Southerly (10-25m)
F5	Southern part of the block.	E-W to WNW-ESE	Southerly (30-70m)
F6	Southern part of the block.	E-N	Southerly (15-30m)

Additional faults pertaining to Karkata block has also been encountered in the projectised area. They are detailed as under:

<b>Fault</b>	<b>Location</b>	<b>General Trend of fault trace</b>	<b>Amount of throw &amp; direction</b>
F8	Between boreholes NNKK-1 & 27.	NNW-SSE	NNE to East (0-30m)
F21	North of boreholes NNKK-29 & south of NNKH-29.	WNW-ESE	SSW (0-5m)
F22	North of boreholes NNKK-3 & NNKD-1.	WNW-ESE	SSE (5m)

## 2.3 Sequence & parting of coal seams

The sequence & parting as established by Geological mapping and drilling are given below: -

### Sequence and brief description of Coal Seams in the block

Seam	Thickness range (m)		U.H.V. (kcal/kg)	Borehole intersection (s)	Geological Reserve (MT)
	Min	Max			
K5	5.25	5.85		4	-
Parting	28.79	33.20			
K4	2.95	5.70	1695-2070	7	2.817
Parting	26.79	42.91			
K3	0.23	1.45	2830	8	0.827
Parting	5.86	10.00			
K2	1.65	7.04	3905-4140	10	3.536
Parting	2.43	18.00			
K1	1.74	4.53	4185-5215	11	2.671
Parting	3.42	14.61			
Karkata	2.12	6.15	3670-4650	9	3.814
Parting	17.35	40.90			
Bisrampur	1.60	6.15	2995-4290	23	15.949
Parting	5.58	22.87			
Bukbuka	10.12	22.38	2995-4290	25	39.028
Parting	25.46	34.90			
Dakra (Combined)	15.20	34.65	3495-3905	22	25.886
P (Bet Dakra Top and Bukbuka)	16.25	29.54			
Upper Dakra	0.72	11.89	3695-4515		9.559
Parting	1.44	7.24			
Lower Dakra	15.57	21.37	2550-3545		22.698
Total					126.785

## 2.4 Geological Coal Reserves

The net coal reserve in the projectised area of KDH OCP is given in the following table:

	Karkata block	C	D	E	F	G	Total
K3	0.60	-	-	-	0.83	-	1.42
K2	2.85	-	-	3.54	-	-	6.38
K1	1.45	0.87	1.81	-	-	-	4.13
Karkata	0.93	-	2.44	1.37	-	-	4.75
Bisrampur	8.12	-	4.20	11.75	-	-	24.07
Bukbuka	1.67	-	0.56	29.96	8.50	-	40.70
Dakra Comb	9.02	-	-	25.89	-	-	34.90
Upper Dakra	2.54	-	-	9.56	-	-	12.10
Lower Dakra	10.95	-	-	7.41	15.28	-	33.65
Total	38.14	0.87	9.01	89.48	24.61	0.00	162.11

**2.5 Recommendation-** An additional net geological reserve of 38.14MT of has been added from Karkata block in the KD South block reserve to arrive at the total net geological reserve.

## **MINING**

### **3. MAIN TECHNICAL DECISIONS**

#### **3.1 BOUNDARIES OF THE MINING BLOCK**

a) Northern Boundary:

The northern floor boundary of the quarry has been fixed along the floor of Lower Dakra seam in the existing KDH OCP.

b) Eastern Boundary:

The eastern surface boundary has been fixed leaving a surface barrier of about 60m from Sonadoba Jore.

c) Western Boundary:

The western floor boundary has been fixed leaving a surface barrier of about 60m from Kendua Nala in Karkata block.

d) Southern Boundary:

The southern surface boundary has been fixed leaving a barrier of about 60m from Sonadoba Jore and upon the F4 fault.

#### **3.2 Targeted Capacity of the Mine**

The mine has been planned for a nominal production capacity of 4.50MT per annum of coal and peak production 5.00MTY. The target has been assessed based on geological constraints, optimization of mining operations, size of the quarry, rate of advance, etc.

#### **3.3 Coal Reserves and Life of the Mine:**

The mineable reserves within the proposed quarriable block have been estimated as 107.15MT of coal corresponding to a volume of OBR of 164.99 Mcum at an average stripping ratio of 1.54 cum/te. The life of the project is estimated as 25 years for a rated output of 4.5 Mtes of 'E' grade coal per annum.

**Seamwise Details of Mineable Reserves:**

Name of seam	Thickness variation 'm'	Net Geological Reserve (MT)	Mineable Reserve (MT)
K3	0.35-1.45	1.42	0.84
K2	2.75-7.04	6.38	4.49
K1	1.74-4.03	4.13	2.45
Karkata	2.12-6.15	4.75	4.18
Bisrampur	1.60-3.15	24.07	14.54
Bukbuka Top	0.82-1.00	40.70	4.80
Bukbuka Bottom	9.30-20.40		30.77
Upper Dakra	0.72-11.89	80.65	7.81
Lower Dakra	15.57-21.37		37.25
Total		162.11	107.15

\*: About 35.00 MT coal has been left out in the barrier left against Sonadoba jore in the East and area to the south of fault F4-F4.

**3.4 MINING CHARACTERISTICS**

The mining parameters of the proposed KDH OCP (4.50 MTY) mine are given below. Total 9 numbers of coal seams are occurring within the quarriable area.

**Mine Parameters**

**Phase-1**

Particulars	Minimum(m)	Maximum(m)
Dimension of the quarry along strike (on floor)	278	513
Depth of quarry	44	74
Dip rise length (on floor)	100	275
Final Quarry Floor area (in Ha)	9.56	
Final Quarry Surface area (in Ha)	18.53	
Mineable reserves (Mt)	6.08	
Total OB (Mcum)	23.14	
Average Stripping Ratio (Cum/Tonne)	3.8	
Seam gradient (Avg. gradient of the quarry floor)	6 - 8 deg	

## **Phase-2**

Particulars	Minimum(m)	Maximum(m)
Dimension of the quarry along strike (on floor)	1100	1750
Depth of quarry	130	200
Dip rise length (on floor)	500	980
Final Quarry Floor area (in Ha)	129.85	
Final Quarry Surface area (in Ha)	175.22	
Mineable reserves (Mt)	101.07	
Total OB (Mcum)	141.85	
Average Stripping Ratio (Cum/Tonne)	1.40	
Seam gradient (Avg. gradient of the quarry floor)	6 - 8 deg	

### **3.5 Mining and Technical Capabilities:**

The targeted capacity of 4.5 MTY is proposed to be achieved from the 1<sup>st</sup> year of mining operation.

The time to achieve target production has been fixed on the basis of:

- a) Estimated schedule of delivery and erection of main HEMM.
- b) Time required for opening of strike length.
- c) Construction period required for coal handling plant, evacuation system and other infrastructure development.
- d) Land acquisition.

### **3.6 Life of the Mine**

The project will sustain a mine life at nominal production for a period of 29 years of mining operations.

### **3.7 Mining System**

KDH OCP is an existing mine. The quarry is proposed to be worked by inclined slicing method by shovel-dumper combination. A haul road has been proposed in the western side of the quarry on the floor of base seam (Lower Dakra). This will also facilitate future accessibility in Karkata block from the floor of Lower Dakra

seam. The proposed haul road should be made by diverting the existing sump and rehandling a part of the existing OB dump.

### **3.8 Calendar Programme of Excavation**

The mining schedule has been formulated based on the adopted sequence of opencast mine development at optimum conditions of mining operations for the entire life of KDH Extension opencast mine. The KDH Expn OCP (4.5MTY) is a running mine. The property within the sanctioned mine boundary of KDH Expn OCP will sustain for another 4 (four) years at the rated capacity. Additional land acquisition and construction work related to rehabilitation of PAFs, construction of infrastructure (roads, buildings, CHP, etc) can be taken up during these four years. As such no construction period for the project has been considered. Likewise, no production built-up period has been proposed.

The total extractable reserves have been estimated as 107.15Mtes corresponding to a volume of OBR of 164.99 Mcum at an average stripping ratio of 1.54 cum/te.

The Summarised Calendar programme is given in the Table below:

Particulars	Existing	Proposed Extension		Proposed Total	
		Phase-I	Phase-II	Phase-I	Phase-II
Normative Production (MTPA)	4.50	4.50	4.50	4.50	4.50
Peak Production (MTPA)	4.50	5.00	5.00	5.00	5.00

### **3.9 Equipment configuration**

The list of HEMM proposed for EPR for KDH OCP (4.5/ 5.0 MTY) is given below:

Population of Equipment - MAIN VARIANT (FULLY DEPARTMENTAL)				
Particulars	Size/Cap	Total	Existing	Additional
<b>Coal</b>				
Electric Rope Shovel	5 cum	3	4	-
Rear Dumper	50/60 T	19	15	4
Drill	160 mm	4	4	-
Dozer	320 HP	-	4	-
Dozer	410 HP	4	-	4 (Replacement)
<b>OB</b>				

Electric Rope Shovel	10 Cum	3	3	-
Electric Rope Shovel	5 Cum	1	1	-
Rear Dumper	85/100 T	23	28	-
Rear Dumpers	50/60 T	6		6
Elec RBH Drill	250 mm	4	4	-
Dozer	320 HP	-	4	-
Dozer	410HP	8	4	4 (Replacement)
<b>Common</b>				
Hyd. Shovel (with backhoe)	1.2 Cum	2	2	-
Dump Truck	10T	4	4	-
Grader	280HP	3	3	-
RT crane	50T	1	1	-
RT crane	20T	1	1	-
FE Loader	5-6 Cum	2	2	-
Wagon Drill	100-120mm	2	2	-
Tyre Handler	35kN	1		1
Water Sprinkler	28 KL	3	4	-
Wheel Dozer	460 HP	2	2	-
Vibratory Compactor	30T	1	1	-
Fuel Truck	16KL	1	1	-
Cable Handler		1		1
Fire Truck		1	1	-
<b>Reclamation</b>				
F E Loader	5-6Cum	1		1
Water Sprinkler (wide spray system)	28 KL	2		2
Dozer	410 HP	2		2
Dumper	35T	2		2

### **3.10 Drilling and Blasting Operations**

Drilling of top OB, Partings and Coal envisages to be done by 250/160mm drills. Drilling of coal & OB benches is recommended to be done vertically at 90<sup>0</sup>. It is suggested to use slurry explosive in cartridge/site mixed slurry for better result and enhance safety with proper stemming material. Secondary blasting is not suggested in any circumstances. Mine shall create proper explosive storage capacity to cater daily explosive requirement to meet the annual coal target.

#### **Powder Factor**

- For OB -0.3 Kg/Cum of OB
- For Coal-0.2 Kg/Te of Coal

### 3.11 Spoil Dump

Total volume of overburden of the proposed OCP has been estimated as 164.99 Mcum. Total overburden is proposed to be dumped internally.

		Volume of OB (M cum)
1	Internal Dump	164.99
	Total	164.99

The maximum RL of the internal dump is +460m.

### 3.14 Product Mix quality

Seam-wise, grade-wise distribution of mineable reserves:

Name of seam	Grade-wise distribution of reserve					Total	Sp. Gr. Overall	U.H.V. Overall
	C	D	E	F	G			
K3	0.00	0.00	0.00	0.84	0.00	<b>0.84</b>	<b>1.66</b>	2830
K2	0.00	0.00	4.49	0.00	0.00	<b>4.49</b>	<b>1.59</b>	3905-4140
K1	0.80	1.66	0.00	0.00	0.00	<b>2.45</b>	<b>1.50</b>	4185-5215
Karkata	0.00	2.68	1.50	0.00	0.00	<b>4.18</b>	<b>1.55</b>	3670-4650
Bisrampur	0.00	3.83	10.71	0.00	0.00	<b>14.54</b>	<b>1.56</b>	2995-4290
Bukbuka Top	0.00	0.07	3.68	1.04	0.00	<b>4.80</b>	<b>1.60</b>	2995-4290
Bukbuka Botom	0.00	0.00	30.77	0.00	0.00	<b>30.77</b>	<b>1.60</b>	2995-4290
Upper Dakra	0.00	0.00	7.81	0.00	0.00	<b>7.81</b>	<b>1.59</b>	3695-4515
Lower Dakra	0.00	0.00	12.17	25.09	0.00	<b>37.25</b>	<b>1.64</b>	2550-3545
Total	<b>0.80</b>	<b>8.24</b>	<b>71.14</b>	<b>26.97</b>	<b>0.00</b>	<b>107.15</b>		

The overall grade of the product mix of project will be "E".

## **MAIN FACILITIES**

### **4.1 Pumping and Drainage**

The planning of dewatering the mine has been done in such a way that the working faces and haul roads in all quarries will remain dry as far as possible. The layout of the quarry provides suitable gradient along the quarry floors and the benches to facilitate self-drainage of water to the sump at the lowest level of the quarry.

It is proposed to provide garland drain around the quarry boundary to arrest water flowing into the mine from area beyond excavation. 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 drown a part of the lower-most bench, which would, then act as sump.

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

#### **4.1.1 SELECTION OF PUMPS**

a) On the basis of the calculation and providing standby pumping capacity, the main pumps have been provided for each quarry.

Four nos. of 540 cum/hr x 240m head pumps and three nos. of 300 cum/hr x 240m head pumps have been provided.

#### **Diesel Pumps**

One numbers of 300 Cum./hr x 240 m head & one no. 300 Cum./hr x 150 m head diesel pumps have been provided for emergency requirement.

#### **b) SELECTION OF DELIVERY RANGES**

The delivery ranges have been selected on the basis of the pumping capacity during probable maximum rainfall and velocity of flow within the

reasonable limit. The delivery ranges for different capacity of pumps have been selected for nominal diameters as 300mm, 250mm, 200mm, 150mm and 100mm for the pumps as per manufacturer's standard.

#### **4.2 Power Supply**

The existing source of power for K. D. Hesalong OCP, is 2X50 MVA, 132/33 KV sub-station of DVC, located at Piparwar. This sub-station, in turn, feeds power to one 33 KV switching station of CCL, located adjacent of the above mentioned DVC sub-station. Two numbers of 33 KV OHTL feeders (one of 9.7 Kms. and other of 7 Kms.) with ACSR "Wolf" conductor, originating from this switching station, feeds power to two central sub-stations, namely KDH(old) and KDH(new), established near K.D. Hesalong Project of CCL. Both the central sub-stations are also interconnected by an O.H. Tie Line for reliable and uninterrupted incoming power.

Presently, power is distributed to all the consuming areas of KDH project from the above mentioned two central sub-stations i.e. KDH (new) & KDH (old).

#### **Salient Electrical Features:**

Max. Demand (At an Improved P.F of 0.98): 8438 KVA.

Maximum Annual Power Consumption: 27.064 MKWH.

Maximum Annual Power Bill: Rs 9.202 Crore.

Specific Power Consumption: 6.014 KWH / t.

Power Cost: Rs. 20.448 / t.

Capacitor Bank Provided: (2X2000) KVAR.

Capacity of Existing Transformer: 2 x 7.5 MVA, 33 / 6.6 KV &  
1 x 5 MVA, 33 /11 KV

#### **4.3 Coal Handling Plant**

The Coal Handling Plant for this project has been envisaged to handle 4.5MTY coal production from this mine.

The proposed coal handling plant shall have facilities for receiving of ROM coal from rear discharge dumpers, crushing of ROM coal from (-) 1200mm to (-)200 mm size, conveying, storing, reclamation and loading into railway wagons through Rapid Loadout System. The coal handling plant has also been provided with suitable repair & maintenance, communication and other auxiliary facilities to meet the day to day requirement in the plant operation.

For this size of coal handling plant other supporting infrastructures and suitable repair facilities have also been provided.

#### **Basic Data**

Production capacity of the mine	4.5 MTY
No. of working days / Year	330
No. of working shifts/day	3
No. of effective working hours/shift	5
Feed size of coal in (mm)	(-) 1200
Product size of coal in (mm)	(-) 200
Mode of despatch	By Rail
Consumer	Basket linkage
Type of loading	By Rapid loading system

#### **4.4 Railway Siding**

Presently, two railway lines with wharf wall loading arrangement exist, in which loading of coal is being carried out through Front End loaders. It has been proposed to load the coal through RLS. To facilitate RLS with hopper, one additional engine escape rail line will be required with necessary arrangements. This RLS would also require provision of Creep-controlled locomotive from the Indian Railways.

#### **4.5 Workshop & Store**

KD Hesalong OCP, is a working mine of Central Coalfields Ltd. The mine is working as per the sanctioned Expansion Project Report of 4.50 MTY with the help of 10 Cu.M. Rope Shovels and 85/100T Rear Dumpers for OB removal and 5.0 Cu.M. Rope Shovels and 50/60T Rear Dumpers for coal winning.

A Unit Workshop exists in this project. This Workshop is suitable to cater to the need of Daily Maintenance, Schedule Maintenance, Lubrication and Routine Inspection. Minor Repairs & Unit replacement of parts/Sub-Assemblies of HEMM and other E&M Equipment deployed in the project. Only some additional P&M has been provided for strengthening this workshop.

A new field workshop has been proposed near the mine. The existing workshop will be utilized as Base workshop. In the field workshop only excavation workshop will be provided or the running repair & maintenance of HEMM. Any major/ medium repair will be done at the Base workshop. This field workshop will be dependent on the Base workshop. This arrangement will save the time & fuel consumption considering the long lead of HEMM from quarry to Base workshop. The repair & maintenance facilities which are not provided in the field workshop will be done at the Base workshop.

Any major overhaul of equipment and manufacturing of spares on large scale are beyond the scope of this workshop. These works will be carried out in Regional Repair Shop or Central Workshop, Barkakana.

#### 4.6 Manpower & Productivity

The manpower requirement for KDH Expn OCP for a rated capacity of 4.50 MTY of ROM coal from the 1<sup>st</sup> year has been estimated as 1042 resulting an overall OMS of 16.36 Te for coal & OB both departmental option. The no. of working days per year is adopted as 330. Earning per man shift (EMS) is estimated as Rs. 1548.28.

The skill wise break-up of requirement of workers is given below:-

Sl. No.	Particulars	Category	Requirement	Percentage	Existing
1.	Unskilled	I	88	11.2%	114
2.	Semi-skilled	II, E	122	15.6%	206
3.	Skilled	C,D,III,IV,V,VI	272	34.7%	306
4.	Highly Skilled	Spl, A,B	302	38.5%	197
	<b>Total</b>		<b>784</b>	<b>100%</b>	<b>834</b>

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

Sl. No.	Particulars	Requirement	Percentage	Existing
1.	Workers	784	76.6%	834
2.	Monthly Paid	191	18.7%	191
3.	Officers	48	4.7%	48
	<b>Total</b>	1023	100%	1073

The manpower already present in the existing KDH Expn OCP will suffice the manpower requirement. The unskilled/semi-skilled manpower may be trained to make them skilled/highly skilled in order to avoid additional recruitment.

#### **4.7 Housing**

For residential buildings 55% housing satisfaction has been provided. The manpower provision for this project upto target year is 1023 and only 147 nos. of B-type additional quarters is required to be constructed keeping in view of the existing different types of quarters.

#### **4.8 Service Buildings**

Almost all service and welfare buildings exist there. Provision has been made in this report for construction of site office, Excv. and E&M workshop, sub-station and some statutory buildings.

#### **4.9 Road & Culverts**

Provision has been made for construction of 4.2 km long approach road to the Project from GM(NK) office, 5.0km long diversion road, 2.0 km haul road, 1.0 km long road for magazine and 1.5 km road for colony. A bridge of span 30m has been provided over Barki River for movement of the dumper.

#### **4.10 Water Demand**

The potable and industrial water requirement for the project has been assessed up to target year as follows:

- (i) Portable Water Demand : 513.75 Klpd  
(ii) Industrial Water Demand : 773.32 Klpd

#### 4.11 Land

The additional land requirement for KDH Open Cast Extension Project has been estimated as 195.96 Ha excluding 9.19 Ha land in safety zone. The detail of the status of land is given in the following table:

(Fig in Ha)

Sl.No.	Particulars	Total land	Status	
			Land acquired	Land to be acquired
1	Tenancy land	69.24	47.63	21.61
2	GMK land	25.66	15.40	10.26
3	Forest Land	101.06		101.06
4	Forest land in safety zone	9.19	-	-
	<b>TOTAL</b>	<b>195.96</b>	<b>63.03</b>	<b>132.93</b>

**ECONOMICS**

**5.1** The proposal of the Extension of KD Hesalong Opencast has been prepared considering the actual existing capital expenditure upto 31.3.09 and departmental coal winning and departmental OB removal has been considered.

The estimated economics has been discussed in the subsequent paragraphs.

**5.2 Total Capital Investment**

The total capital investment for KDH opencast upto 4<sup>th</sup> year of achieving the production of 4.50 Mty, after considering the existing capital expenditure as on 31.3.09, is summarised below. The capital investment upto achieving the production level of 4.50 Mty in the 4<sup>th</sup> year and beyond has been proposed from the internal resources of the Company. The capital requirements are given below:

Particulars	Unit	Amount
ADDITIONAL CAPITAL FOR SANCTION	Rs. Crs	201.43
ACTUAL CAPITAL EXPENDITURE UPTO 31.3.09 CONSIDERED	Rs. Crs	268.03
TOTAL ESTIMATED PROJECT CAPITAL	Rs. Crs	469.46
CAPITAL OUTLAY PER TONNE OF ANNUAL OUTPUT	Rs/t	1043.24
CAPITAL REQUIREMENT BEYOND 4 <sup>th</sup> YEAR	Rs. Crs	15.43

Phasing of additional capital requirement in Rs. Lakhs is :

	1	2	3	4	Total
Additional capital	6960.63	6830.05	6055.15	297.05	20142.88
Production Mty	4.50	4.50	4.50	4.50	

Capital requirement beyond target year is for:

Capital Beyond target year

Electricals	0.59
Rehabilitation, Compensatory Afforestation etc.	14.84
Total	15.43

### **5.3 Capital Investments for P&M**

Capital investment on P&M is given in Appendix-A.3. A summary of the proposed capital investment on P&M for all the variants is given below:

	Units	Amount
CAPITAL FOR P&M	Rs. Crs	368.79
CAPITAL FOR HEMM	Rs. Crs	228.74
VALUE OF EXISTING HEM M CONSIDERED	Rs. Crs	198.34
CAPITAL FOR P&M PER TONNE OF ANNUAL OUTPUT	Rs/t	819.54

#### **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 whenever information regarding price was not available, a broad estimate was made.

### **5.4 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. The Civil Cost Index adopted in the RCE is 2082.

### **5.5 Capital Investment on Vehicles**

The total estimated existing capital expenditure on vehicles is Rs. 0.74 crs and an additional provision of Rs. 1.05 crs. has been provided.

### **5.6 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 respective Appendix.

### **5.7 Opening of Revenue Account**

KDH opencast is an existing mine.

### **5.8 Estimates of Operating Cost**

Appendix-C of all the variants give the details of cost per tonne (29 years average) and profitability for the target production of 4.50 MTY. The method adopted in estimating the costs are briefly explained as follows:

#### **(a) Wages**

The requirement of manpower for the targeted production of 4.50 MTY of coal is estimated category wise/ scale wise and details of manpower are given in Appendix - B1. Prevalent pay scales for executives and non-executives are adopted. End 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.

#### **(c) Power**

The Power cost is worked out on the basis of KWH for the machines and other electrical requirements.

#### **(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.

(e) **Incidence of Corporate Social Responsibility:**

It is proposed to create a corpus fund for final mine closure for which a provision is kept in the cost of production. The estimated fund has been computed as 2% of the total capital over the life of the project. Based on total reserves the per tonne incidence of this fund on cost of production has been absorbed as year-wise cost in the cost of production on the basis of yearly production.

(f) **Final Mine closure Cost**

A fund equal to Rs. 6 lakhs/hectare of land (195.96 Ha) is proposed to be created towards a fund for final mine closure. The fund has been distributed over 29 years with a yearly escalation of 5%.

(g) **Administrative Charges**

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

(h) **Interest on Working Capital**

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

(i) **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 year-wise details of the cost and profitability estimates till the achievement of 4.50 MTY .

Elements of Cost	Variant 1	
	100%	85%
Salaries & Wages	96.44	113.45
Stores cost	128.28	141.87
Power cost	20.30	22.99
Miscellaneous cost	23.78	25.46
Cost Incidence of corpus	0.91	0.91
Final Mine Closure Cost	2.20	2.59
Administrative Expenses	120.00	141.18
Interest on working capital	18.84	21.55
Total Cash cost	410.74	469.98
Depreciation	98.11	115.42
Total Cost	508.85	585.40
Selling Price/Te	849.00	849.00
Profit/Loss / Te	340.15	263.60

The declared Selling Price per tonne of coal has been taken for Grade E which is Rs. 790/- with additional charges of Rs. 39/ per tonne for sizing of coal up to -200mm and Rs. 20/t for despatch through rapid loading system.

## 5.9 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 summarised in the table below.

	Variant1
IRR at 100%	37.80
IRR at 85%	24.33

## 5.10 ECONOMIC 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% level of the rated output for all the variants have been summarised in the table below.

	Variant1
IRR at 100%	47.61
IRR at 85%	32.68

## 5.11 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:

S No	Variable Parameter	IRR at different stages of					
		0%	5%	10%	15%	20%	25%
1	Increase in Capital	37.80	36.47	35.19	33.96	32.77	31.62
2	Increase in Cost of Production	37.80	35.44	33.10	30.78	28.49	26.21
3	Decrease in Capacity	37.80	33.21	28.72	24.33	20.05	15.88
4	Decrease in Selling Price	37.80	32.79	27.90	23.12	18.47	13.95