Coal India Limited
A MAHARATNA COMPANY
Registered Office:- Coal Bhawan, Core-2, 3rd Floor,
Premises No.04 MAR, Plot No.AF-III,
Action Area-1A, New Town, Rajarhat, Kolkata 700156.
PHONE: 033 - 23246526, FAX:033 - 23246510
Email – mviswanathan2.cil@coalindia.in
WEBSITE: www.coalindia.in
CIN – L23109WB1973GOI028844

Ref. No.CIL:XI (D):04112:2016: 13148. Dated 30th March'2016

To
GM(PMD),
Coal India Limited,
Coal Bhawan, Plot No.AF-III, Action Area-1A,
New Town, Rajarhat, Kolkata 700156.

Sub: Minutes of 325th CIL Board Meeting held on 5th March'2016.

Dear Sir,

Reproduced below is the relevant extracts from the minutes of 325th meeting of Board of Directors of Coal India Limited held on 5th March'2016 at CIL(HQs), Kolkata with regard to the following item:-

"ITEM No.325: 4(I)

Sub:- Project Report of Gevra Expansion OCP (from 35 Mty to 70 Mty), SECL

Director (Technical) apprised the Board that this project was recommended by ESC of CIL board for evaluation in its meeting held on 10th Feb.'16. He also apprised the salient features of the Project Report. This project would be the biggest coal mine project in India and the estimated life would be around 22 years. The average stripping ratio is 1.62 Cum./Te and the entire OB will be dumped internally with a maximum height upto 90 Mtrs above ground level. Development of East-West Rail Corridor is the critical activity for the project. The calender programme for excavation and dispatch of coal from the proposed Gevra Expansion had been planned matching with the implementation of East-West Rail Corridor Rail Project.

The Board also deliberated funding of highly profitable project and opined that company should avail loan for financing the project which will give better financial leverage. Board advised a concept paper be placed for its review for financing the project.

It was also apprised to the Board that the project was financially evaluated by M/s. Pricewaterhouse Coopers Pvt. Ltd. who had recommended the project is financially viable. However, they have opined that project is sensitive to capacity utilisation, selling price and increase in capital. The IRR at 85% capacity for Option-II i.e. coal contractual and OB removal by departmental comes to 28.45%.

In view of the above and as recommended by ESC of CIL Board, Board accorded its approval for Project Report of Gevra OCP for a rated capacity of 70 MTY at an estimated capital investment of Rs.9943.55 crores (Rupees Nine thousand nine hundred forty three crores and fifty five lakhs) for implementation by Option-II partial outsourcing i.e. coal by out-sourcing and OB by departmental means as brought out in the agenda note."

This is for your information and taking necessary action please.

Yours faithfully,

30/3/11

(M. Viswanathan),
Company Secretary

PROJECT REPORT

FOR

GEVRA OC EXPANSION (35.0-70.0MTY)

GEVRA AREA

SOUTH EASTERN COALFIELDS LIMITED
(A Mini Ratna Company)

JUNE 2015

REGIONAL INSTITUTE - V
CENTRAL MINE PLANNING & DESIGN INSTITUTE LIMITED
A Mini Ratna & ISO 9001 Company
(A Subsidiary of Coal India Limited)
SECL COMPLEX, SEEPAT ROAD
BILASPUR - (C.G.) 495006

EXECUTIVE SUMMARY

EXECUTIVE SUMMARY

1.1 BACKGROUND OF THE PROJECT REPORT

Gevra OCM is an existing mega opencast mine in the thick seam zone of Korba coalfields with a normative capacity of 35Mty and a peak capacity of 41.0Mty. The mine is under administrative control of Gevra Area of SECL. The Gevra OCM is flanked by another two mega opencast mines i.e. Kusmunda OCM (50Mty) in East and Dipka OCM (25Mty) in West. All these mines are located in the thick seam zone of Korba coalfields.

Project Report for Gevra Opencast Project for an annual capacity of 6.0 Mt of coal was prepared by CMPDI in March 1979. This was to meet the coal requirement of Korba Super Thermal Power Stations (KSTPS) of NTPC (first stage) for 1100 MW, amounting to about 4.25 Mty of coal. The excess capacity was envisaged to meet a part of the demand for expansion of KSTPS by 1000 MW. However, the Government approved the Project Report in December 1979 for an annual capacity of 5 Mt at an estimated capital of Rs.50.08 crores.

Later, after the approval of Gevra Opencast Project, coal clearance was given to NTPC for expansion of the MSTPS by 2 x 500 = 1000 MW. Thus, the total capacity of the power house became 2100 MW and the ultimate annual coal requirement was estimated at about 8 Mt. PR for Gevra Opencast Project (Expansion) was prepared in March 1982 for an annual production of 10.0 Mt, to meet the ultimate requirement of coal of KSTPS and to bridge the general shortfall of coal supply in Western India. The report was approved by Government of India on 18.9.85 for a capital investment of Rs.224.39 crores.

In the year 1992-93, a scheme for Gevra OCM was prepared for augmentation of production by another 2.0 Mty with a proposed capital investment of Rs.39.62 crores. This scheme was sanctioned on 19.9.92 by CIL Board.

The balance reserves as per the scheme (as on 1.4.92) were estimated as 496.31 Mt. The corresponding OBR was estimated as 533.79 Mcum at an average stripping ratio of 1.08 cum/t. The scheme incorporated the additional provision of HEMM for removing the additional volume of overburden. The balance life of the project was estimated as 42 years at the enhanced capacity of 12 Mty). The scheme was declared completed on 31.3.95.

A capacity augmentation scheme for Gevra CHP (from 10 Mty to 12 Mty) was also prepared and sanctioned on 31.7.92 for a capital investment of Rs.13.63 crores. **Thus, the total sanctioned capital for Gevra OC (12 Mty) became Rs.277.64 crores (Rs.224.39 cr. + Rs.39.62 cr. + Rs.13.63 cr.).**

The Project report for Gevra O/C Expansion (25 Mty) was prepared by CMPDI and approved by GOI on 12.07.05. The salient features of this sanctioned Project Report (25 Mty) project is as follows:-

- **D**ate of sanction - 12.7.2005
- **M**ineable reserves(As on 1.04.01) - 778.12 Mt
- **T**otal OBR(As on 1.04.01) - 987.98 Mcum
- **A**v. Stripping Ratio - 1.27 cum/t
- **T**arget production - 25.00 Mty
- **L**ife - 28 years
- **S**eams to be worked Thickness range
  - a) E&F - 8.57 m – 14.87 m
  - b) Upper Kusmunda (UK) - 15.96 m – 30.20 m
  - c) Lower Kusmunda (LK) - 27.11 m - 42.65 m
  - d) Lower Kusmunda Bottom (LKB) - 3.14 m – 8.67 m
- **G**radient - 1 in 6 - 1 in 12
- **M**aximum quarry depth - 220m
- **C**apital outlay - 1667.55 crores
- **M**anpower - 2725 Nos.
- **O**MS - 34.75t
- **L**inkage - Korba STPS, Bhilai TPS, CSEB.

- **Quality parameters** (I-100 samples)

Seam	Quality Parameters			
	M (%)	Ash (%)	UHV (K.cal./kg)	Grade (Av.)
E&F	6.6-8.6	22.6-37.4	2803-4677	F to D
Lower Kusmunda (B)	5.7-7.8	24.6-35.4	3145-4428	E
Upper Kusmunda	6.1-7.6	27.6-39.1	2607-4042	E/F
Lower Kusmunda (T)	4.9-7.4	28.3-42.2	2400-3973	E/F

Working group/X Plan document had indicated the demand of non-coking coal for XI Plan as 580 Mt and indigenous supply of non-coking coal from CIL as 445 Mt. The updated production of May 2005 have indicated the demand of non-coking coal for the XI plan as 622 Mt and indigenous supply of non-coking coal from CIL as 508 Mt. Projection of total indigenous supply of non-coking coal as 562.32Mt leaves a gap of 59.68 Mt for which Emergency Coal Production Plan of CIL has been formulated. Gevra Opencast has been identified as one of the project in the Emergency Coal Production Plan of CIL. Thus the Expansion project report(25.0-35.0Mty) for Gevra OC was prepared. The incremental capital estimated for Project Report (25 to 35 Mty) dated October 2006 was Rs.618.16 crores. The updated capital estimated for the approved project was **Rs.1008.12 crores** in the month of September 2009. The salient features of this sanctioned Project Report (25-35 Mty) project is as follows:-

- **D**ate of sanction - 01.06.2010
- **M**ineable reserves(As on 1.04.06) - 975.00Mt
- **T**otal OBR(As on 1.04.06) - 1266.98 Mcum
- **A**v. Stripping Ratio - 1.30 cum/t
- **T**arget production - 35.00 Mty
- **L**ife - 29 years
- **S**eams to be worked Thickness range
  - a) Composite D - 6.13 -12.26
  - b) E&F - 8.57 m -14.87 m
  - c) Upper Kusmunda (UK) - 15.96 m - 30.20 m
  - d) Lower Kusmunda (LK) - 27.11 m - 42.65 m
  - e) Lower Kusmunda Bottom (LKB) - 3.14 m - 8.67 m
  - f) Lower Kusmunda (Composite) - 55.05 - 57.86
- **G**radient - 1 in 6 -1 in 12

As on 1/04/2014 the total coal and OB extracted from the mine since its inception is

- Coal - 589.545Mt OB - 385.59Mm^3.

Balance coal and OB within the 35Mty boundary (including Laxman OC Mine boundary) as on 1/04/2014 is

- Coal- 651.93Mt. OB- 1040.29Mm^3.

PR for Gevra OC Expansion(25.0 Mty) and Gevra OC Expansion(35.0Mty) may be treated as dovetailed with PR for Gevra OC Expansion Project (35.0-70.0 Mty) for the purpose of implementation. In this PR all the balance activities and financial provisions of PR for Gevra OC Expansion (25.0 Mty) and Gevra OC Expansion (35.0Mty) have been dovetailed.

1.2 EXPLORATION STATUS

The details of drilling in the geological area is as follows: -

Block wise, agency wise drilling details in Gevra, Dipka, Hardi, Ponri, Naraibodh-I & Naraibodh-II combined block, Korba CF.

Block	CMPDI		NCDC		GSI		DGM		MECL	
	BH	Mtr.	BH	Mtr.	BH	Mtr.	BH	Mtr.	BH	Mtr.
Gevra	105	11132.00	5	1417.00						
Gevra P/S	31	8002.00								
Dipka	51	6786.00			3	1029.00			3	435.00
Hardi	119	22866.00					4	955.00	2	498.00
Ponri	102	20890.00								
Naraibodh-I	19	3363.00			1	300.00	1	209.00	3	386.00
Naraibodh-II	101	26730.00	1	216.00	2	882.00	1	146.00	7	1815.00
Total	**528**	**99769.00**	**6**	**1633.00**	**6**	**2211.00**	**6**	**1310.00**	**15**	**3134.00**

The density of the borehole in the combined block is about 14 boreholes / sq. km.

1.3 JUSTIFICATION FOR PREPARATION OF PR

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 demand for power grade coal. Due to increase in the demand for power grade coal, Gevra OC has been identified as one of the coal mines where production can be enhanced. Moreover, it has been projected that SECL as a whole has to produce about 250Mt in the year 2019-20. As such it was decided to prepare an Expansion Project Report for Gevra OC and the same was included in the Annual Action Plan for the year 2014-15.

Salient Features of the Present PR (35.0Mty-70.0Mty), (May, 2015)

Sl. No.	Particulars	Unit	Option-I (Total Departmental)	Option-II (Coal Contractual OB Deptt.)
1	Total Mineable Reserves(As on 1/04/2014)	M Te.	1337.68	
2	GCV/Band	Kcal/kg	4338.00/G-10	
3	Volume of OB(including inseam band)(As on 1/04/2014)	M.Cum	2166.61	
4	Stripping Ratio (Av.)	Cum/t	1.62	
5	Target Output	Mt/Yr.	70.00	
6	Peak OBR	Mcum/yr.	122.00	
7	Peak OBR(including inseam band)	Mcum/yr.	125.54	
8	Project life	Year	22	
9	a) Total add.capital investment b) Capital outlay /te of annual output	₹. crores ₹./t	11304.26 1756.40	9943.55 1562.02
10	a) Capital requirement of P&M b) Per tonne of annual output	₹. crores ₹./t	8832.27 1261.75	7535.78 1076.54
11	Selling price (95% of notified selling price) of processed ROM Coal.(G-10)	₹./ t	922.00	
12	Estimated cost of production a) at 100% level b) at 85% level	 ₹./t ₹./t	 570.84 651.00	 566.02 634.00
13	Profit per tonne a) at 100% level b) at 85% level	₹./t ₹./t	351.16 275.42	355.98 289.64
14	Break-even-point (%) (Mty)		55.00 38.50	51.36 35.95
15	No. of personnel		5286	4391
16	OMS	Te	46.38	55.57
17	EMS	₹.	3190.30	3185.30
18	Anticipated year of achieving target	Year	7^{th}	
19	IRR at 100% level of production	%	37.45	42.16
20	IRR at 85% level of production	%	24.68	28.45
21	Completion capital	₹. crores	13673.69	12109.27
22	NPV @ 12% at 100% level of production	₹. crores	9247.31	9837.23
23	NPV @ 12% at 85% level of production	₹. crores	4775.12	5644.97

The flexibility in the implementation stage may be exercised within the approved cost estimates to respond to improvements in technology and equipment which would result in improved profitability and productivity measures. Following points may be considered under the flexibility: -

a) Re-alignment of project boundaries for better working layout / dump etc.
b) Change in the specification of HEMM to higher/lower capacity at the time of procurement of new equipment or replacement of the equipment.
c) To procure state-of-the-art safety equipment, whenever they are introduced, even if the same is not provided in approved Project Report.
d) Relocation of site for infrastructure facilities depending upon techno-economic reasons and availability of land / forest area etc.
e) Hiring of equipment for loading, transportation etc., at a competitive price, so as to cater to the needs of increased demand of coal and subsequent removal of higher OB and for augmentation of coal production.
f) For up gradation of new technology in mining method for improving performance and reduction in manpower, at a subsequent date before and after project completion.
g) In this PR it is proposed that coal would be mined by surface miner. However, in circumstances where Operational/Geotechnical difficulties persist small quantity of coal may be mined out by alternative technology such as ripping/drilling etc. Prior approval may be obtained for use of alternative technology citing the circumstances/operational difficulties.
h) In option I (Deptt. Option) of the PR, it is proposed that the surface miner to be procured will be able to cut about 8MT of coal annually. Presently in the neighbouring Kusmunda OC mine procurement of surface miner for coal is in the process. Depending upon the finalization of procurement and the performance of the surface miner in Kusmunda OC change in of capacity surface miner may be thought of in future.

2.1 UTILITY OF MARKET FOR THE COAL FROM MINE / PROJECT

Liberalisation of power sector by Government 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 demand for power grade coal. This project will help to compensate for increase in the demand for power grade coal.

2.2 AVAILABLE LINKAGE

The opening of this project has been planned to a targeted capacity of 70.0Mty. This additional production will be linked to various Thermal Power Stations, and among basket linkages for miscellaneous customers. As such, there will be no problem to market the coal from this project.

3.1 LOCATION

Gevra Opencast Block is located in the South-Central part of Korba Coalfield in Korba District of Chhattisgarh. The Gevra Mining Block having an area of about 19.03 sq.km. is located in the Central part of Korba Coalfield. It is included in the Survey of India Topo-sheet No. 64 J/11 and is bounded by latitudes $22^0$18'00" and $22^0$21'42" and longitudes $82^0$32'0" to $82^0$39'30".

3.2 COMMUNICATION AND ACCESSIBILITY

The block is well connected by rail and road. Gevra Road and Korba Railway Stations on Champa-Gevra Road branch line of S.E. Railway are at a distance of 10 km and 16 km respectively. Railway Siding has been extended upto and beyond Gevra OCP and coal is being transported from the pit head CHP through rail/MGR to the various consumers. SECL headquarters, Bilaspur, is at a distance of about 90 km by road.

Important distance by Rail to Gevra Road Station -

From Bilaspur (Company HQ) - 93 km

From Howrah (CIL HQ) - 708 km

4.0 BLOCK BOUNDARIES AND MINE BOUNDARIES

Mine boundary has been delineated on the basis of Revised Geological Report of Combined Block namely Gevra, Dipka, Ponri, Hardi, Naraibodh I and Naraibodh II on Minex model, comprising an area of 38.87 sq. Km. with a borehole density of 14.0 boreholes per sq. Km.

The quarry boundary for the complete mine have been fixed in the following manner:-

- West - Based on the existing boundaries between Gevra Mine and Dipka Mine.
- North - Based on out-crop of LK Seam and boundary Fault F10-F10.

- East - Based on 50 m barrier distance from the Western geological block boundary of Resdi and Amgaon.
- South - Based on the combined Southern most geological block boundary of Ponri and Naraibodh II.

5.1 GEOLOGICAL AND MINEABLE RESERVES

Apart from Gevra OC mine with in the Gevra mine block, Laxman OC was also working earlier in the incrop region of UK seam in Naraiboth-I geological block. Presently Laxman OC mine has stopped producing coal as proposed reserved in UK seam of approved mine boundary has exhausted. It is now proposed that the Seam beneath the UK seam in Laxman OC patch would be extracted by Gevra OC. While calculating mineable reserves the deduction of OB and coal extracted from closed Laxman OC has also being considered.

The mineable reserves and volume of OB have been estimated by Minex Software. The estimation of reserves is based on a minimum mineable seam thickness of 0.5 m. A geological loss of 10% and a mining loss of 5% have been considered in the estimation of mineable reserves. Inseam bands within the Coal seam have been deducted from the reserves.

The Mineable reserves and volume of OB estimated for Gevra OC Exp (25.0-35.0Mty) was 975.00 Mt and 1266.99Mm^3 as on 1/04/2006.The coal and OB extracted from 1/04/2006 to 1/04/2014 from Gevra OC (35Mty) is as follows:-

- Gevra OC - Coal - 267.07 Mt ; OB- 174.70Mm^3.

Additional Coal and OB extracted from Laxman OC is as follows:-

- Coal - 57.07Mt ; OB- 54.94Mm^3.

Balance Mineable reserves and Volume of OB in Gevra OC Exp (25.0-35.0Mty) as on 1/04/2014 is 651.93Mt and 1040.29Mm^3. Additional 685.75 Mt of coal and 1126.32.MM^3 of OB has being included in the project by extending the mine boundaries. Seam wise Geological and Mineable reserves within the PR boundary is as shown below:-

Coal Seam / Parting	Thickness Range (m)		Geological Reserves(In Mm^3) within PR boundary as on 1/04/2014	Mineable Reserves (In MT)/Parting(In Mm^3) within PR boundary as on 1/04/2014	Inseam band (In Mm^3) within PR boundary as on 1/04/2014
	Min.	Max.			
TOP OB				594.91	
C	0.90	4.34	1.64	0.96	0.04
Parting	9.96	20.46		4.59	
DT	0.70	7.97	9.67	7.52	0.04
Parting	2.07	12.55		14.97	
DB	5.31	25.02	58.86	46.68	1.31
Parting	60.12	90.05		102.67	
EF	2.95	19.95	101.43	80.27	4.82
Parting with DB	63.64	78.69		100.54	
E	0.90	13.60	33.06	21.63	0.32
Parting	2.42	7.08		8.69	
F	1.53	6.30	8.49	5.76	0.22
Parting with EF	24.98	83.81		366.10	
Parting with F	55.35	93.70			
UK	23.33	36.65	455.42	327.21	17.18
Parting with EF	24.75	59.10		16.17	
UTM	11.60	17.95	11.68	9.29	0.71
Parting with EF	8.11	37.70		31.58	
Parting with F	15.20	23.10			
UT	0.69	5.85	11.32	8.35	0.17
Parting	3.15	29.84		18.08	
UMB	19.00	31.76	37.29	29.85	5.54
Parting with UT	5.81	32.29		5.95	
UM1	1.85	3.75	2.85	1.26	0.09
Parting	3.10	21.60		2.04	
UM2	1.17	4.55	3.28	1.27	0.12
Parting with UM2	2.90	17.85		5.57	
Parting with UTM	3.43	13.10			
UB	7.27	17.25	19.18	10.90	1.14
Parting with UK	39.80	87.25		404.61	
LK	43.78	70.34	729.14	474.11	19.23
Parting with UK	45.14	94.00		230.70	
Parting with UMB	39.70	53.40			
Parting with UB	36.05	70.25			
LKT	27.85	43.73	243.12	174.89	3.80
Parting with UK	23.31	60.19		82.38	
Parting with UMB	15.18	53.55			
Parting with UB	10.18	55.64			

Coal Seam / Parting	Thickness Range (m)		Geological Reserves(In Mm^3) within PR boundary as on 1/04/2014	Mineable Reserves (In MT)/Parting(In Mm^3) within PR boundary as on 1/04/2014	Inseam band (In Mm^3) within PR boundary as on 1/04/2014
	Min.	Max.			
LT1	12.78	29.08	75.14	48.54	2.48
Parting with LT1	3.30	22.73		14.55	
LT2	6.49	17.86	45.33	29.49	0.83
Parting with LKT	3.27	38.00		101.86	
Parting with LT2	10.93	40.25			
LKB	3.28	23.19	94.06	59.68	2.60
TOTAL GEOLOGICAL RESERVES(MT)					**1940.98**
TOTAL COAL(MT)					**1337.68**
TOTAL OB(Mm^3)					**2105.95**
TOTAL INSEAM BAND(Mm^3)					**60.66**
TOTAL OB INCLUDING INSEAM BAND(Mm^3)					**2166.61**

6.0 TARGET OUTPUT & MINE LIFE

The mine is proposed for coal production of 70.0 Mty (attained in 7th year) and peak OB removal is of 122.0 Mcum (attained in 7th year).

Mine Life

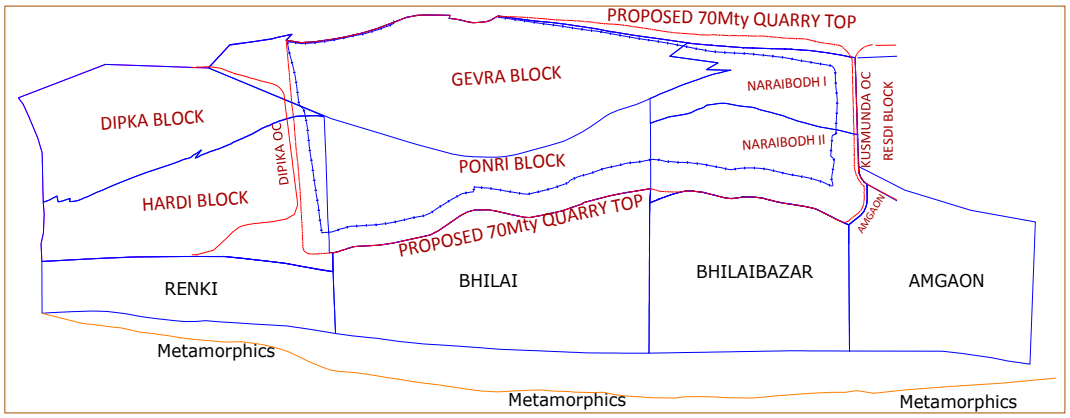
The mine life for nominal production is 22 years. The break-up is as under:

- Construction period - 0 Years
- Production build-up period - 6 years
- Production period - 14 years
- Tapering period - 2 years
- Total period - 22 years

7.0 FUTURE EXPANSION POTENTIAL

Presently the mine has been proposed to in the geological blocks namely Gevra, Ponri, Naraibodh I, Naraibodh II & Part of Hardi block.

In future the mine has been proposed to be expanded upto line of metamorphic formation (limit of coal bearing area) incorporating the additional geological blocks, namely Bhilai and Bhilaibazar as shown in the plan below. The combined total indicated and inferred reserves in both the blocks are 1600MT.



The cost of land and rehabilitation for future expansion also i.e. upto line of metamorphic formation (limit of coal bearing area) has been provided in this PR. The Future expansion of the mine for the blocks within the PR boundary along with the additional blocks namely Bhilai, Bhilai bazar and land upto Metamorphic is as shown in the plan.

8.0 DETAILS OF SEQUENCE OF COAL SEAM AND THEIR PARTING

The sequence of coal seams with their thickness and parting range, grade is as shown below:-

Coal Seam/ Section	Thickness range		Nos. of intersection	At 60% RH & 40°C				UHV (K. cal./ kg.)		GCV (K. cal./ kg.)		GCV Grade	Average Grade
				M%		A%							
	Min.	Max.		Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.		
C	0.90 CMKN028	4.34 CMKN032	6	7.30	10.80	24.10	46.20	1406	4078	2969	4709	G15 –G9	G13
DT	0.74 CMGE024	5.95 CMKL024	34	6.20	9.10	28.70	51.90	868	3679	2735	4525	G16-G10	G14
DB	2.42 CMKN069	25.02 CMGE015	70	5.60	8.90	**29.90**	**55.80**	**426**	**3540**	**2489**	**4442**	G17-G10	G13
EF	1.99 CMKN037	19.95 CKDP089	119	5.70	10.30	**19.80**	**44.90**	**1907**	**4929**	**3489**	**5388**	G13– G7	G10
E	4.99 CKPR003	11.27 CMKN040	50	5.70	8.50	**23.50**	**45.60**	**1779**	**4484**	**3334**	**5104**	G14- G8	G11

F	1.53 CMKN044	3.94 CKDP167	44	6.90	9.20	**20.00**	**41.00**	**2289**	**4873**	**3692**	**5335**	G13- G7	G10
UK	6.10 CMKK029	36.65 CKDP100	185	4.40	8.60	**21.30**	**43.30**	**2165**	**4817**	**3618**	**5342**	G13– G7	G10
UTM	11.60 CMGE012	17.95 CKDP088	9	6.20	7.40	**29.60**	**42.20**	**2082**	**3793**	**3395**	**4693**	G14- G9	G11
UT	0.69 CMKK013	5.85 CMGE017	45	5.60	8.70	**28.40**	**47.00**	**1564**	**3775**	**3134**	**4612**	G14- G9	G12
UMB	19.00 CKPR050	31.76 CKDP165	27	5.20	7.20	**28.50**	**45.40**	**1834**	**3977**	**3502**	**4828**	G13 - G9	G10
UM1	1.85 CKDP168	3.75 CKDP125	16	6.50	8.60	**27.50**	**42.10**	**2198**	**3943**	**3652**	**4743**	G13– G9	G11
UM2	1.17 CMKK013	4.55 CKDP125	17	5.40	8.00	**26.30**	**47.20**	**1642**	**4176**	**3329**	**4925**	G14-G8	G10
UB	7.27 CKPR028	17.25 CKDP088	24	5.70	7.90	**23.20**	**48.90**	**1337**	**4617**	**3084**	**5230**	G15-G7	G10
LK	7.99 CMKK184	70.34 CMKN033	145	4.80	6.70	**26.50**	**40.30**	**2496**	**4320**	**3874**	**5088**	G12-G8	G10
LKT	20.60 CKPR022	43.73 CMKN058	50	3.50	6.90	**25.00**	**42.20**	**2400**	**4505**	**3800**	**5203**	G12-G7	G10
LT1	17.90 CMGE5,9	29.08 CKHD002	38	5.30	7.00	**28.90**	**42.50**	**2234**	**3945**	**3711**	**4817**	G12- G9	G10
LT2	6.49 CMGE004	17.86 CMGE012	38	4.40	7.00	**28.30**	**49.80**	**1420**	**4029**	**3228**	**4874**	G14-G9	G11
LKB	3.28 CKHD011	23.19 CKDP032	57	4.70	6.90	**26.80**	**47.00**	**1760**	**4248**	**3384**	**5026**	G14-G8	G11

9.0 MINE PARAMETERS

The Mining characteristics of the quarry have been tabulated as follows: -

1	Maximum width along strike		
	- at surface	m	9180
	- at floor	m	8795
2	Minimum width along strike		
	- at surface	m	9050
	- at floor	m	8380
3	Maximum length along dip		
	- at surface	m	3290
	- at floor	m	3000
4	Maximum depth	m	340
5	Present Maximum Depth	m	170
6	Minimum depth	m	10m
7	Present Minimum Depth		85m
8	Maximum lift	m	340
9	Area of excavation		
	- at surface	Ha	2635.35
	- at floor	Ha	2022.25
10	Mineable Coal (as on 01.04.2014)	Mt	**1337.68**
11	Total OB (Incl. parting & inseam band) (as on 01.04.2014)	Mm^3	**2166.61**
12	Stripping Ratio(as on 01.04.2014)	m^3/t	**1.62**

10.0 CONSTRAINTS ON MINE DEVELOPMENT

The quarriable property involves following main constraints e.g. –

- **VILLAGE**

The rehabilitation of the following villages is in progress namely Amgaon, Bahanpat, Bhatora, Ralia, Bhilaibazar and Naraibodh. In addition to these Gevra ,part of Khodri,Churail,Pandripani,Salora villages and Laxman Nagar rehabilitation site also needs to be evacuated. These villages are to be shifted and properly rehabilitated. SECL should take appropriate action for early rehabilitation.

- **EVACUATION OF HUGE QUANTITY OF COAL**

3 mega projects are situated adjacent to each other resulting in huge quantity of coal production (presently about 90 Mty). The present setup of all three mines are just sufficient to cater the need of coal evacuation of present coal production.

Any further enhancement in production would require alternate arrangement for coal evacuation. Proposed East West Rail corridor is one of such alternative. The construction of it needs to be expedited, which would result in timely & smooth evacuation of coal from the mine.

- **FOREST LAND**

Out of the total quarriable area 2635.3598 Ha, it is envisaged that around 124.289 Ha of forest land need to be acquired further before commencing mining operation.

- **DIVERSION OF ROADS**

The Metalled Road from Hardi Bazar to Korba, passing from the dip side property and South East property of proposed Gevra OC mine, needs to be diverted. The Capital provisioning for the same has been made.

- **SLOPE STABILITY OF QUARRY BENCHES & OB DUMP**

As the maximum depth of the proposed quarry is going to be about 340m and faults are there, it is envisaged to undertake scientific study for stability of benches. Adequate precautions should be taken while working near fault planes.

As the maximum dump height above the surface level is 90m it is also envisaged to undertake scientific study for the stability of internal dumps. Financial provisions for the same have been made accordingly.

11.0 MINING STRATEGY/MINING SEQUENCE

Presently two set of Inpit belt conveyors are existing for conveying coal from inpit to surface in Gevra OCM.

- **LR series** :- Aligned perpendicular to the strike of the mine and situated in the Western portion of the mine (towards Dipika OCM).
- **JK Series** :- aligned oblique to the strike of the mine and running toward Eastern end of the mine(towards Kusmunda OCM).

In the western sector two set of belt conveyors namely **PQ Series** is being installed. Mining strategy has been planned based on the dumping strategy and considering alignment of the belt conveyors. In the 35 Mty project report the mine strategy proposed comprised of belt series as mentioned above. This has resulted in formation of three internal dumps namely Eastern, Western and Central.

In the proposed PR the following mining strategy is proposed due to internal dump constraints. This will result in formation of two internal dumps i.e Eastern and Western.

The mine has being planned to be extracted up to the lowermost workable seam (i.e. Seam LK) or bottom split of the Lower Kusmunda Seam, whose minimum depth presently is 85m. Mine will continue to progress in the south direction as is envisaged in the approved PR (25-35 Mty) as well as in the East direction for extraction to be carried out in Naraibodh I and Naraibodh II block. The main haul roads will be all along the floor of the Seam LK or LKB. These haul roads will follow the alignment of the conveyor belt laid along the floor of the bottom most seam.The mine will be worked in horizontal slices from top downwards. Conventional loading machines such as Hydraulic shovels will be used for extraction of OB in conjunction with dumpers. For extraction of coal surface miners and F.E.L will be used. The PQ series belt conveyor and LR series belt conveyors would continue to operate for another seven to eight years. Later on it will be dismantled to create space for internal dump. An additional belt conveyor namely AB series will be laid parallel to the JK Series to handle the coal evacuation.The coal from the LK seam and its split will be fed to the existing JK series belt conveyors and the

newly to be installed AB series belt conveyor along the existing JK series belt conveyor. Shiftable conveyors will be used for transport of coal from the western side coal benches of Lower Kusmunda seam to the JK series belt conveyors and the newly to be installed conveyor.As the mine will progress the JK Series belt conveyors and the proposed AB series belt conveyor will be extended as shown in the final stage quarry plan (Plate No.III). The coal from other seams (apart from LK Seam and its split) will be transported to the surface from the face via flanks with the help of the dumpers and fed on to the conveyors laid all along the surface on the Eastern and Western batter ,as is shown in the final stage quarry plan(Plate-III) .

Access road to Coal and OB benches

While deciding the alignment for the main access roads to different benches following major points have been taken into account.

i) The average width of the quarry along its strike will be 9.0 KM.

ii) The maximum depth of the quarry 340m.

iii) The mine has been planned for a very high rate of production.

iv) Due to greater depth at the Eastern side of the quarry it is not possible to provide separate haul road on the Eastern side (Naraibodh I and Naraibodh II geological blocks).

v) Total dumps has to be accommodated internally.

Roads on the Western quarry batter and Eastern quarry batter has been planned mainly to cater OB transport internally. The flank roads provided for internal dump will be connected to different benches by many semi-permanent, temporary ramps. For entry from the Eastern and Western side approach roads will be provided at suitable intervals. These approach road will be shifted as the mine advances so as to accommodate the dumps internally. Roads on the Eastern and Western quarry batter will also be used for transporting the coal of the UK seam and above upto the surface for onward transportation via conveyor belts to the loading stations (Silos).

Sequence of development

The mine will advance towards dip direction exposing the floor of seam LK or the bottommost split of seam LK.

The alignment of the face has been planned as to facilitate the drainage of water to one or two places.The sequence of development has been as shown by the sector lines marked on the final stage quarry plan as well as on the plans showing Quarry cross sections. The proposed sequence has been chosen to maximize the internal dumping. To maintain the production the mining will be carried out all along the defined sectors. After completion of one sector next sector will be mined and so on. As the total depth difference between the Eastern and Western side quarry is 100m on an average, the sequence of mining mentioned in the plan in the next page will help to average the total OB to be excavated per year.

This would benefit in the cash flow in the early stages of the expansion and creation of additional mine void for accommodation of OB dump internally.

The provision of Major HEMM for the project is as Tabulated below :-

S.No	HEMM	Deptt Option	Partial Outsourcing Option
1	**For OB**		
	Rope/Electric Hydraulic Shovel-42/15/10m^3	10/7/2	10/7/2
	Dumper- 240/150/100t	140/95/20	140/95/20
	Drill- 381/250mm	10/9	10/9
	Dozer and Wheel Dozer-850/450/410HP	26/6/19	19/6/19
2	**For Coal**		
	Surface Miner (8.0MT)	9	-
	Payloader (10.0cum.)	25	-
	Diesel Hydraulic backhoe- 5m^3	-	2
	Coal body dump truck- 60t	189	12

	Drill- 160mm	7	7
	Dozer and Wheel Dozer-450/410HP	6	5

It is suggested here that while procuring the 240T dumper it should be ensured that 240T dumper should accommodate minimum three passes of 42m^3 Shovel bucket load.

12.0 DUMPING STRATEGY

Total volume of OB has been estimated as 2166.61(including 60.66 m^3 inseam band). The proposed sequence of mining is ideally suited for achieving the objective of placing maximum possible waste in the internal dumps. By adopting the proposed sequence of mining, as the quarry advances, the amount of external dump will be negligible and that of internal dump will increase as more space for the economic dumping is created.

Presently, internal backfilling is being done in the quarry and considerable volume of OB is also being dumped in the external dump. The total quantity of OB dumped till 01/04/2014 internally and externally is 220.97Mm^3 and 219.56Mm^3(including Laxman OC External dump) respectively. In coming years, all the volume of OB will be internally backfilled.

Internal dump, due to the position of haul road, has been divided into two parts i.e. Eastern dump and Western dump. A plan showing location and capacity of dumps has been given in Plate No. XXXII.

Additional Volume of OB to be dumped in different dumps is as follows.

Dump	**Total Volume of OB (Mcum) to be accommodated in different dumps**
A. External	Nil
B. Internal	
Eastern Dump	1060.40
Western Dump	1106.21
Total	2166.61
Grand Total (A+B)	2166.61

It is estimated that maximum RL of the surface is 328m. The maximum height of the proposed internal dumps has been designed up to 90m above the ground level. Hence internal dump is proposed to be dumped upto 400m RL. Some of the existing dumps have to be rehandled in order to accommodate infrastructure of proposed mine. Capital provision for this purpose has been made in Appendix 8.1.

13.0 LEAD FOR OB AND COAL

The lead for OB & Coal works out to 5.0 km and 3.0 km respectively.

14.0 CALENDAR PROGRAMME OF EXCAVATION

The summarised calendar programme of excavation for coal, OB and inseam band is given in following table. The targeted level of the production for coal and OB will be achieved in the 7th year.

Considering the average width of quarry and annual advance of quarry floor, the calendar programme has been prepared as given in the following table: -

YEAR	Coal	OB	Inseam Band	Total OB
1	40.00	71.00	1.69	72.69
2	41.00	71.00	1.67	72.67
3	41.00	72.00	1.80	73.80
4	45.00	80.00	2.12	82.12
5	45.00	80.00	2.82	82.82
6	65.00	110.00	2.70	112.70
7	70.00	122.00	3.06	125.06
8	70.00	122.00	3.53	125.53
9	70.00	122.00	3.51	125.51
10	70.00	122.00	3.17	125.17
11	70.00	122.00	3.09	125.09
12	70.00	122.00	3.51	125.51
13	70.00	122.00	3.54	125.54
14	70.00	122.00	2.82	124.82
15	70.00	122.00	2.95	124.95
16	70.00	104.50	3.31	107.81
17	70.00	104.50	3.16	107.66
18	70.00	86.00	3.34	89.34

YEAR	Coal	OB	Inseam Band	Total OB
19	70.00	79.00	2.96	81.96
20	70.00	82.00	3.18	85.18
21	50.00	39.30	1.50	40.80
22	30.68	28.65	1.24	29.89
Total	1337.68	2105.95	60.66	2166.61

The calendar programme has been prepared based on the mineable reserves and OB as on 1.04.14 , considering 2014-15 as first year for above calendar programme for targeted production of 70.0 Mty. All the OB backlog in the past has been neutralized in this calendar programme. The project has produced 41.00 MT of coal and 45.44Mm^3 of OB in the year 2014-15. In case of any delay in the procurement of additional HEMM's, Coal/OB backlog since 1.04.2014 can be outsourced till the procurement of additional HEMM's.

15.0 PROJECTED COAL QUALITY

The weighted average GCV of coal seams considered together works out to **4338.00 KCAL/KG (G-10)**. The weighted average grade has been estimated for economic evaluation of this PR only.

16.0 WATER MANAGEMENT

Pumping system for Gevra Opencast Expansion Project (35-70 Mty) has been designed to dewater the inflow of water due to precipitation falling within the active pit limit during the monsoon season to enable the mining activity to continue round the year.

General topography of the project area shows that the surface drainage is not likely to pose any major problem. The surface within the mine intake is gently undulating and the area is traversed by a seasonal nala namely Laxman nala. This drains into the river Ahiran located towards north east. In addition, there are quite a few ponds in the area. Planning for dewatering of the mine has been done in such a way that the working places, haul roads etc. remain dry as far as possible. Layout of the quarry provides suitable gradients along the quarry floors and the benches shall be suitably contoured to facilitate self-drainage of water to the lowest level of the quarry.

Rain water intake of the mine is non-uniform during the year. Most of the rain water intake occurs during the period from June to September. During the dry season i.e. from October to May, seepage of water from the strata is expected to be moderate to low and can be dealt with by running a few number of pumps out of the total number of pumps provided for monsoon period. During the non-monsoon period repair and overhauling of the pumps and motors may be done by rotation.

Presently, the mine is being dewatered by the existing pumps in the mine operating at 6.6kV / 3.3kV / 415V. The existing pumps and sumps will become insufficient in dealing with the pumping requirements of the mine as the expansion of the mine takes place.

16.1 MAKE OF WATER & PUMPING REQUIREMENT

In general the sources of water inside the quarry are as given below:

- Direct rainfall in the excavated area.
- Inflow of water from back filled area due to rain fall on it.
- Inflow of water from area beyond excavation due to rainfall on it.
- Seepage of water from strata water/Ground Water.

16.2 Assessment of maximum rainfall in a day

The assessment of maximum rainfall in a day during the life of the project has been made by drawing a probability curve (fig. 10.1) based on calculated/ theoretical values and observed values of the maximum rainfall in a day, life of the project etc. The maximum daily rainfall at probabilities of 10% and 4.76% which corresponds to 10 years and 21 years (life of the project) respectively has been found out from the bribability curve, which are approximately 187 mm and 205 mm respectively.

Calculated data (on daily rainfall of 205 mm)

Sl. No	Description	5th year	10th year	15th year	Final stage
1	Inflow due to direct rainfall in exposed area (cu.m.)	1381831	1961702	2236755	2056904
2	Inflow due to direct rainfall on internal	101291	115682	152625	197431

Sl. No	Description	5th year	10th year	15th year	Final stage
	dump area (cum)				
3	Inflow due to direct rainfall on area beyond excavation (cum.)	16580	22132	26271	27012
4	Seepage from ground water (cum.)	149970	209952	241565	228135
5	Total water collected in a day (cum.)	1649671	2309467	2657215	2509483
6	Sump cap. provided at 10% probability (cum)	1504822	2106684	2423899	2289138
7	Water lying outside the sump	144849	202782	233316	220345
8	Pumping capacity (lps) to dewater the water lying outside sump in 18hrs. including 10% pump losses	2459	3442	3961	3740
9	Pumping capacity (lps) to dewater entire water including 10% pump losses in 100 hrs.	5041	7057	8119	7668
10	No of 225 lps capacity pumps required to pump out the water lying outside the sump in 18 hrs.	11	15	18	17
11	No of 225 lps capacity pumps required to dewater the entire water in 100 hrs	22	31	36	34
	No. of 225 lps capacity pumps reqd. to dewater 2/3rd water in 100 hrs.	**15**	**21**	**24**	**23**
	No. of 190 lps capacity pumps reqd. to dewater 1/3rd water in 100 hrs.	**9**	**12**	---	---
	No. of 190 lps capacity pumps reqd. to dewater entire water in 100 hrs.	---	---	**43**	**40**
	No. of 225 lps capacity pumps reqd. to transfer 1/3rd water from lower sump to eastern main sump in 100 hrs.	---	---	**12**	**11**

16.3 SUMP

For dewatering the mine, sumps has been envisaged at the deep most points of the eastern, western and central part of the mine. Initially dewatering will be done

independently from sumps of all the three sectors. However, as the mine advance deeper, water from the central sump will be pumped to the main sump in the eastern sector, from where it will be pumped out to the surface. As the mine advances beyond the fault F1, possibility of locating the main sump of the eastern sector just north of the fault may be explored. Water of the mine south of the fault F2 will be collected in temporary sumps and will be pumped to the main eastern sump and from there it will be pumped to the surface drainage system. The layout of the quarry provides suitable gradient along the floor of the benches to facilitate self drainage of water into the sump.

Water from the main sump/ intermediate sump as per requirement will be pumped to surface which will pass through sedimentation ponds before being discharged into natural drainage system. Sumps will be cleaned periodically to avoid silting and muck accumulation. Sump location has to be so maintained that it allows total backfilling of OB in the decoaled area.

16.4 PUMPS

Presently, planning for pumping is being done with 250 m head 225 lps (3000 gpm) multistage pumps at the western sector main sump upto 15 years from start of the 70 Mty expansion project and 330 to 350 m head and 180 to 190 lps (2500 gpm) discharge capacity pumps at the eastern sector main sump and water to be pumped out from these sumps through pipe ranges lad along the western and eastern batters respectively. After 15 years, all existing 250 m head 225 lps of the mine will be almost completing their lives and hence will be replaced by 330 to 350 m head and 180 to 190 lps (2500 gpm) discharge capacity pumps. Pumps with about 120 to 130 m head and 3000 gpm discharge capacity will be used to transfer water from the lower sumps of the central sector to the main sump of the western sector and from the lower sumps of the eastern sector to the main sump of the eastern sector. Non-slam high pressure check valves will be used in the delivery ranges of the main pumps to eliminate occurrence of run back/water hammer.

In future, if availability of pumps of higher head in the range of 400 to 425 m and sufficient discharge is ensured than the main sumps of the eastern and western sectors may be moved southwards and water can be directly pumped out from there with those pumps. Availability of hose pipes for connecting the pumps to the fixed GI pipe ranges, which can withstand the pressure of such high water heads will also have

to be ascertained. Alternatively, use of booster pumps with the main pumps of medium heads may also be explored to avoid the use of very high head pumps.

17.0 COAL HANDLING PLANT (CHP)

17.1 Present System of Coal Handling & Dispatch

The Gevra OCP is divided into three sectors namely Eastern sector, Central sector and Western sector. At present, Lower Kusmunda and Upper Kusmunda seams are being worked in the mine. Average parting between Kusmunda Lower and Kusmunda Upper seams is around 60 m. Presently, J-K series/ streams of conveyors and L/R stream of conveyors are working in Central sector. The J-K stream consists of J1/K1, J2/K2 and C1/C2, C3/C4 & C5/C6 conveyors, while L/R stream consists of L1, L2, L3, R1, R2, R3 and R4 conveyors. These conveyor systems feed coal to two number of silos i.e. Silo No.1 and Silo No.2 for loading of coal into rail wagons. Silo No.1 and Silo No.2 are having storage capacity of 2400 te each and are attached to a MGR system for dispatch of coal to NTPC korba.

Both, J-K series and L/R stream of belt conveyors feed coal to Silo No.1&2 via a 30000 te ground bunker with C-series of conveyors and a 5000 te surge bunker respectively. Designed coal handling capacity of this system is 15 Mty.

There are five number of sidings with wharf wall loading system in the project. Junadih Siding Nos. I&II are used by SECL for dispatch of coal to various consumers whereas Siding Nos. III&IV (ACB sidings) and Siding No. V (GEB siding) have been leased out to the washery holders for dispatch of washed coal by them. Each wharf wall siding has coal handling capacity of around 5 Mty. In addition, there are eight number of mini CHPs with Feeder Breaker/ crusher and road weigh bridges for dispatch of coal to various consumers by trucks through road sales.

Gevra project produced around 38.70 Mt & 41 Mt and dispatched around 37.42 Mt & 37.15 MT of coal during the years 2013-14 and 2014-15 respectively.

17.2 CHP under Construction

Silo No. 3&4 with Bunker : Silo No. 3&4 with storage capacity of 4000 te each and RLS at the rate of 5500 TPH each are under construction. An overhead RCC bunker with storage capacity of 10000 te is also being constructed along with the silos. It is envisaged

that around 10 Mty of coal will be dispatched from these silos. Apart from the silos, two numbers of truck loading stations are also being attached to the overhead bunker for dispatch of coal through trucks to various consumers.

Inpit Conveyor System : The inpit conveyor system is being installed on the floor of Lower Kusmunda seam. In the central sector, two streams of belt conveyors (J and K series) consisting of J1, J2 and K1, K2 already exist. These are of 1400 mm wide belt conveyors. These conveyors are being replaced by 1600 wide belt conveyors at their existing places. In addition, conveyors J3 and K3 each of 1600 mm belt width are being installed at an angle of 175° (i.e. almost in-line) to the alignment of J1, J2 and K1, K2 respectively. In the western sector, two new streams of belt conveyors (P and Q series) consisting of P1, P2, P3 and Q1, Q2, Q3 conveyors of 1600 mm belt width are being installed. P-Q stream of belt conveyors will discharge coal into a 1500 te transfer hopper (TH2) from where coal will be fed to either Silo No. 1&2 or Silo No. 3&4.

Conveyor K1 of J-K series of conveyors will discharge coal into the transfer house TH3 whereas conveyor J1 will continue to discharge in the existing transfer house TH1. Coal form TH3 will be discharged onto M1/M2 belt conveyors for feeding it to Silo No. 3&4 via an overhead RCC bunker of 10000 te capacity.

Total designed coal handling capacity of J-K and P-Q series combined will be 25 Mty (peak capacity 20% extra) which will be dispatched through the four number of silos - Silo No. 1&2 (existing) and Silo No. 3&4 (under construction). Construction of Silo No. 3&4 along with the 10000 te overhead bunker and the inpit conveyor systems (J1/K1, J2/K2 & J3/K3 and P1/Q1, P2/Q2 & P3/Q3) is expected to be completed by the end of 2015.

17.3 COAL HANDLING AND DISPATCH SYSTEM

In-pit Conveying System (Central Sector)

Coal won by surface miners in the lower Kusmunda seam will be transported by two pairs of series of belt conveyors viz. J-K series and A-B series located in the central corridor left for belt conveyors and haul road in the central sector.

J-K Series : J-K series will consist of conveyors J1/K1, J2/K2, J3/K3, J4/k4, J5/K5 and J6/K6. All the conveyors of this series will be with 1600 mm belting. Modified J1/K1 & J32/K2 and new J3/k3 is expected to be commissioned by the end of 2015. Conveyors

J4/K4, J5/K5 and J6/K6 will be additional provision for the 70 Mty expansion project and will be installed in phases. Each of J and K series will be of 2300 TPH capacity.

A-B Series : A-B series will be a new set of conveyors consisting of A1/B1, A2/B2, A3/B3, A4/B4 and A5/B5 conveyors with 2000 mm width belting and 5000 TPH capacity. A-B series will be installed in the central corridor adjacent to the J-K series. Conveyors A4/B4 will be fed by shiftable conveyors from the face. Provision will be there to feed conveyors A4/B4 also directly by Chain Feeders installed near the tail of the conveyors A4/B4 which will be shifted to the tail of A5/B5 after its installation at a later stage. Conveyor A1 will discharge coal either on TH-2 through a fixed tripper or on the existing L-series of conveyors of 1400mm belt width and 3 m/s speed, whereas conveyor B1 after crossing the L-series will discharge coal to conveyor B0 of 2000 mm belting and 5000 TPH capacity. Conveyor B0 will discharge coal through a two-way chute to the tripper conveyors D7/D8 over the 50000 te overhead RCC bunker of the western circuit.

Shiftable Face Conveyors : Shiftable conveyors S1, S2 and S3 will be installed in series at the face for transportation of coal from face to A-B series of conveyors. S1 and S2 will be of fixed length whereas length of S3 will vary according to the position of the conveyors S1 and S2 with respect of the transfer point at the A-B series of conveyors. Conveyor S3 will be provided with a radial swiveling belt conveyor S0 with discharge chute which can be set to discharge coal onto either A or B conveyor. The radial swiveling belt conveyor for transfer of coal from conveyor S3 to A or B conveyor will be shifted from A4/B4 conveyors to A5/B5 conveyors after few extensions of the shiftable conveyor S3. All the shiftable conveyors will mounted on slippers and rail tracks will be laid along the conveyors to facilitate their shifting. Shifting of the conveyors will be done with the help of crawler mounted conveyor shifting machine.

Surface Conveying System

Two circuits of surface belt conveyors along with bunkers and silos have been envisaged along the western and eastern boundaries of the mine in the western and eastern sectors respectively for transportation of coal won by surface miners in the Upper Kusmunda seam and other upper seams viz. D (Bottom) & D (Top) seams and E, F & EF seams.

17.3.2 Western Circuit

Western circuit of surface conveyors will consist a truck receiving station with two sets of 5 x 8m x 8m x 120 te steel hoppers (4 working & 1 standby) along with 1000 TPH vibratory feeders, two series of belt conveyors (D1/D2, D3/D4, D5/D6, D7/D8 & D9/D10) of 2000 mm belting parallel to each other, one overhead RCC bunker of 50000 te capacity and two silos of 4000 te capacity each. Coal from the bunker will be reclaimed by plough feeders of 5000 TPH capacity and will be discharged onto the reclaim conveyors of 5000 TPH capacity. Two number plough feeders will be installed over each of the two reclaim conveyors for discharge coal into Silo No.5 through two-way chutes. Two conveyors of 5000 TPH capacity each will receive coal from the two-way chutes at Silo No.5 and discharge it to the adjoining Silo No.6. Both the silos i.e. Silo No.5 and Silo No.6 will be fitted with double discharge chutes and pre-weigh hoppers. Minimum self-flowing capacity of the pre-weigh hoppers will be 72 te each. Double railway lines will pass under each of the silos such that each of the chutes of the silos will be placed over separate railway lines.

17.3.3 Eastern Circuit

Eastern circuit of surface conveyors will consist a truck receiving station with two sets of 4 x 8m x 8m x 120 te steel hoppers (3 working & 1 standby) along with 1000 TPH vibratory feeders, two series of belt conveyors (G1/G2, G3/G4, G5/G6 & G7/GG8 and G9/G10) of 1600 mm belting and 2800 TPH capacity parallel to each other, one overhead RCC bunker of 30000 te capacity and two numbers rail load out systems with 500 te capacity surge bin and 100 te capacity weigh bin each. Conveyors G3/G4 will discharge coal onto the tripper conveyors G5/G6 over the 30000 te bunker. Conveyors G1/G2 & G3/G4 will come after about ten years, the tripper conveyors G5/G6 will be fed by another pair of belt conveyors G9/G10 which will reclaim coal from a nearby truck receiving station consisting of two sets of 4 x 8m x 8m x 120 te steel hoppers (along with 1000 TPH vibratory feeders). This truck receiving station will be dismantled after installation of conveyors G1/G2 & G3/G4 and reinstalled at the tail end of G1/G2. Coal from the bunker will be reclaimed by plough feeders of 4000 TPH capacity and will be discharged onto the reclaim conveyors G7/G8. Conveyors G7/G8 will be of 4000 TPH nominal capacity. Two number plough feeders of 4000 TPH nominal capacity each will be installed over each of the two reclaim conveyors G7 & G8. Conveyors G7/G8 will discharge coal into the surge

bins of the two numbers rail load out systems. The surge bins will be fitted with weigh bins and traversing/telescopic chutes for discharge of coal into rail wagons.

17.3.4 Coal Storage and Dispatch System

Overhead RCC Bunkers

Two no. of overhead RCC bunkers of 50000 te and 30000 te capacity have been envisaged in the western and eastern sectors of the mine respectively. The tripper conveyors, reclaim conveyors and plough feeders of the 50000 te bunker will of 5000 TPH capacity whereas tripper conveyors for the 30000 te bunker will be of 2800 TPH capacity and the plough feeders and the reclaim conveyors of this bunker will be of 4000 TPH capacity. The 50000 te bunker will be attached to Silo No. 5&6 whereas the 30000 te bunker will be attached to two numbers 500 te surge bins of two numbers rail load out systems.

Rapid Loading Systems

Western Sector

Rapid Loading Systems in the western sector will consist of two numbers of silos i.e. Silo No.5&6 of 4000 te capacity each. The silos will be of RCC construction and fitted with double discharge chutes on double railway tracks and pre-weigh hoppers for weighment of coal. The RLS will load coal into railway wagons.

Eastern Sector

Rapid Loading Systems in the eastern sector will consist of two numbers of load out systems each primarily consisting of one surge bin of 500 te capacity, one weigh bin of 100 te capacity and a traversing/telescoping chute. Coal will flow into the weigh bin from the surge bin through four numbers bin charging gates and will be loaded into rail wagons through the telescopic chute. The telescopic chute will be of traversing type and will be parked aside for allowing loco to pass and then will be brought to the central position for facilitating coal loading into the wagons.

It is assumed that dispatch arrangement to the tune of atleast additional 4.0Mty(i.e total 45.0Mty) would be created by year 2017-18 through MGR or other means.

18.0 WORKSHOP AND STORES

An additional workshop is also provided to cater the maintenance of pumps, CHP, equipment of HEMM, power supply arrangement etc. have been provided along with store .

19.0 POWER SUPPLY,ILLUMINATION AND COMMUNICATION

Presently the existing 132/33 kV Central sub-station (Installed capacity : 3x20/40 MVA) in the Gevra Area of SECL is the source of power supply to Gevra OCP (including CHP and pump loads), Central Workshop, supply to mines of Korba Area (through Ghordewa feeders) and Colony of Gevra Opencast Project. The average recorded maximum demand on this substation is around 33 MVA. The limiting contract demand for 132 kV substation is 40 MVA as restricted by CSPDCL.The existing 132 kV central substation is around 29 years old. Power demand shall increase after installation and commissioning of additional HEMM and Gevra Inpit and silo system. The power demand shall also increase due to increase in pumping loads. The estimated power demand for 70 Mty production shall be around 80 MVA. In the light of above, it is proposed to construct an additional 220/33 kV (installed capacity: 2x100 MVA) substation, to meet the increased load. The existing132 kV substation can be phased out after commissioning of 220/33 kV substation.

In order to feed power to HEMM,Pumps,Silo and inpit , CHP etc. , six nos. 33 kV substations (3 nos. proposed in 25-35 Mty exp. PR shall continue and 3 nos. new) have been proposed. The capacity of proposed 33 kV substations are as follows:

Substaion Nos.	Installed Capacity	Maximum Demand at 0.98 pf lagging in kVA
CHP S/S No. 1 (proposed in 35 Mty exp. PR)	2x5 MVA,33/6.6 kV	5718
CHP S/S No. 4	2x16000 kVA,33/6.6 kV	12078
Quarry S/S No. 2 (proposed in 35 Mty exp. PR)	2x16000 kVA,33/6.6 kV	12562
Quarry S/S No. 3 (proposed in 35 Mty exp. PR)	2x16000 kVA,33/6.6 kV	12168
Quarry S/S No. 5	2x16000 kVA,33/6.6 kV	16996
Quarry S/S No. 6	2x16000 kVA,33/6.6 kV	17405

The energy consumption has been calculated considering active power, annual number of working hours of equipment/ installation wise. The specific energy consumption will be approximately 4.93 kWh / tonne at the targeted production of 70Mt/yr . Provision of mobile lighting masts/towers has been made in this report for

illumination in the working zones of quarry and dump area in addition to illumination for outdoor and indoor.

The proposed communication system should cater the need of voice communication among personnel related to mine operation, administration and equipment maintenance. The system also takes into account the data communication requirement for mine operation and planning alongwith the latest safety, security and office automation system/facilities

20.0 LAND REQUIREMENT

In this project, Provision has been made for further dip side property beyond the quarry boundary upto Metamorphics as shown in the Land use plan (Plate- XXXV). This land is to be acquired for future mining in addition to the land acquisition for the proposed Quarry. The project envisages 7484.307 Ha of total land for Quarry, Industrial and Residential complex, Safety zone, Rehabilitation colonies, Future mining etc for Departmental option (Option-I) and 7474.577 Ha for Partial Outsourcing option (Option-II). Land already in physical possession is 3448.605 Ha. The break-up of the land is as follows:-

REQUIREMENT OF LAND IN Ha (OPTION-I)							
SL. NO.	PARTICULARS	LAND ALREADY ACQUIRED/ IN PHYSICAL POSSESSION	LAND TO BE ACQUIRED				TOTAL LAND REQUIREMENT
			TENANCY / AGRICULTURE LAND	FOREST LAND	GOVT. LAND	TOTAL	
1	LAND FOR QUARRY	1401.369	996.536	124.289	113.156	1233.981	2635.350
2	LAND BETWEEN QUARRY AND UPTO METAMORPHIC ON DIP SIDE (FOR FUTURE MINING)	-	1442.160	200.00	657.640	2299.800	2299.800
3	TOTAL LAND UPTO METAMORPHIC	1401.369	2438.696	324.289	770.796	3533.781	4935.150
4	SURFACE INDUSTRIAL DEVELOPMENT RLY. SIDING,COLONY,APPROACH ROAD,REHABILITATION SITE ETC.	1713.392	92.760	42.691	1.586	137.037	1850.429
5	LAND FOR HOMESTEAD/FAMILY	Included in row 4 above	127.427	-	-	127.427	127.427
6	SAFETY ZONE	333.844	237.457	-	-	237.457	571.301
	TOTAL LAND	**3448.605**	**2896.340**	**366.980**	**772.382**	**4035.702**	**7484.307**

REQUIREMENT OF LAND IN Ha (OPTION-II)							
SL. NO.	PARTICULARS	LAND ALREADY ACQUIRED/ IN PHYSICAL POSSESSION	LAND TO BE ACQUIRED				TOTAL LAND REQUIREMENT
			TENANCY / AGRICULTURE LAND	FOREST LAND	GOVT. LAND	TOTAL	
1	LAND FOR QUARRY	1401.369	996.536	124.289	113.156	1233.981	2635.350
2	LAND BETWEEN QUARRY AND	-	1442.160	200.00	657.640	2299.800	2299.800

	UPTO METAMORPHIC ON DIP SIDE (FOR FUTURE MINING)						
3	TOTAL LAND UPTO METAMORPHIC	1401.369	2438.696	324.289	770.796	3533.781	4935.150
4	SURFACE INDUSTRIAL DEVELOPMENT RLY. SIDING,COLONY,APPROACH ROAD,REHABILITATION SITE ETC.	1713.392	83.030	42.691	1.586	127.307	1840.699
5	LAND FOR HOMESTEAD/FAMILY	Included in row 4 above	127.427	-	-	127.427	127.427
6	SAFETY ZONE	333.844	237.457	-	-	237.457	571.301
	TOTAL LAND	**3448.605**	**2886.610**	**366.980**	**772.382**	**4025.972**	**7474.577**

21.0 STATUS OF LAND ACQUISITION

The total acquired land is 4184.486 Ha. Out of the total acquired land of 4184.486 Ha, 735.810 Ha is yet to be taken into physical possession.

22.0 MINE CLOSURE PLANNING

The mine closure cost will cover the following activities for which a corpus escrow account @ Rs. 6.0 lakhs per Ha for OCP & @ Rs. 1.0 lakh per Ha. for UG mine of the project area shall be opened with the coal controller organization. In case of mines having acid mine drainage, post closure acid mine drainage management cost shall also be included in the total closure cost.

As per the guidelines of the MoC, the cost of the mine closure is to be computed based on the basis of the project area involved in the project.

In Gevra OCP, the total project area is **5057.08 Ha and 5047.35 Ha** for Option I and Option II respectively. Considering the wholesale price index as 175.60 as on Feb. 2015, the updated cost of the mine closure is estimated to be Rs. 8.13 lakhs per hectare considering the admissible escalation over Rs. 6.00 lakh per Ha as on August 2009 when wholesale price index was 129.60.

Total Final mine closure cost (@ Rs. 8.13 Lakhs /Ha.)**: Rs.41114.060 lakhs and Rs.41034.96 lakhs** for Option I and Option II respectively.

23.0 MANPOWER ASSESSMENT

The manpower requirement for proposed Gevra OC Expansion Project (35.0-70.0Mty) is 5286 in Departmental option and 4391 in Partial outsourcing option. The manpower requirement for proposed project has been calculated on the basis of 3 shift operation for 330 days in a year. The breakup of the manpower requirement of this project has been summarised as follows:

Sl. No.	Particulars	Departmental Option(Nos.)	Partial Hiring Option (Nos.)
1.	Executives	194	183
2.	Non-executives:		
i)	Monthly rated staff	754	636
ii)	Daily rated staff	4338	3572
	Total	**5286**	**4391**

24.0 PROJECT IMPLEMENTATION SCHEDULE

It is well known fact that for timely implementation of a project, it is essential that all the activities related with project construction are properly planned, closely monitored and effectively supervised.

All implementing departments have their own implementation manuals which are followed for monitoring and construction of the project, so that, man, materials and money are made available to the project in time as spelt in the project report, with a view to prevent cost and time over-run.

Responsibility, power for each executive has also been included in the implementation manual to prevent overlapping of operational areas. Sufficient administrative and financial power has been defined for key executive to take timely and effective decisions for the implementation of the project. Technically, zero date has been adopted as the date of approval of Project.

25.0 CRITICAL ACTIVITY

Diversion of road, preparation of infrastructures near mine site and East West rail corridor is the critical activity of the project.

26.0 PROJECT ECONOMICS

In this Para financial evaluation of Departmental option and Outsourcing has been detailed. The additional capital required for the project in departmental option(Option-I) and Coal Outsourcing and OB Departmental option(Option-II) works out to be **₹ 11304.26** crores and **₹ 9943.55** crores respectively. The phasing of additional capital has been given in para 27.1. The summarised form of Appendix-A is given in Table below.

Summary of Capital Expenditure (Departmental Option and Partial hiring option) (*May,2015)*

A/c Head	Particulars	Capital Provisions (₹ Crs.)	
		Departmental	Partial Hiring
01	Land	838.02	835.58
02	Civil Structure	248.10	195.27
03	Plant & Machinery	8832.26	7535.78
04	Furniture & Fittings	5.45	5.25
05	Railway Siding	171.95	171.95
06	Vehicles	27.10	22.40
07	Prospecting & Boring	0.37	0.37
08	Mine Development	1124.53	1120.48
09	PR Preparation cost	56.43	56.43
	Total	**11304.26**	**9943.55**

26.1 Capital investment and its phasing

(₹. In lakhs)

	Phasing of capital (₹. In lakhs)										Total capital
Year	1st	2nd	3rd	4th	5th	6th	7th	8th	10th	15th	
Option-I	446052.15	145780.51	57232.25	87182.48	28941.65	194784.49	111442.49	22763.31	34308.25	1938.70	1130426.28
Option-II	376134.33	138886.26	59391.74	87681.78	33718.99	157635.29	101199.56	19763.31	18004.91	1938.70	994354.87

26.2 METHOD OF ESTIMATION OF CAPITAL COST:

a) Land

Rate of Govt land and forest land considered is ₹ 10.0 lakhs per Ha.and for agriculture land ₹ 25.0 lakhs per Ha.

b) Civil Construction (along with Cost Index)

The preparation of cost estimates for civil infrastructure is based on prevailing cost index of the area up to May 2015. The cost index value has been calculated from the market rate of the area. Considering the prevailing rates of materials and labour in Gevra Area, the cost index works out to 2865 w.r.t. 100 base in Delhi as on 1.10.1976.

c) P&M

Price of P&M has been taken from the standard price list published by CMPDI, HQ in August 2014. Prices have been updated upto May 2015 as per escalation rate given in the price list.

26.3 COST OF PRODUCTION

The cost of production for total departmental option and Partial hiring option is as shown in the table below:-

COST OF PRODUCTION AT DIFFERENT LEVELS OF PRODUCTION				
			Option-I	Option-II
Sl.No.	Particulars	Unit	(Total Departmental)	(Partial hiring)
1	Salaries and wages cost	₹./t	68.78	57.32
2	Stores cost	₹./t	217.79	173.08
3	Power cost	₹./t	34.46	33.42
4	MiscellaneousExpenditure	₹./t	40.53	36.93
5	Administrative Expenses	₹./t	64.00	64.00
6	Outsourcing Cost			
6.1	Coal	₹./t	-	73.00
6.2	OB/Rehandled OB	₹./t	-	-
7	Interest on Loan capital	%	-	-
8	Interest on working capital	%	20.83	21.42
9	Depreciation	₹./t	119.08	101.49
11	Mine closure cost	₹./t	5.38	5.37
	TOTAL	**₹./t**	**570.84**	**566.02**
12	Environment related cost	₹./t	28.55	28.35

26.4 SELLING PRICE

The weighted average GCV of coal is 4338.00 KCal/Kg (G-10 grade). The weighted average grade has been estimated for economic evaluation of this PR only. The project economics has been calculated based on the selling price of coal for power utility. The calculation of selling price of coal for both the alternatives is as follows.

CALCULATION OF SELLING PRICE (₹./t)

S.no	Particulars	Power Utility
1.	Base price	860.00
2.	5 % grade slippage	817.00
3.	Crushing charges for -100 mm	79.00
4.	Rapid loading Charges	26.00
	Total	**922.00**

26.5 OUTSOURCING COST (FOR PARTIAL HIRING OPTION)

The rates have been arrived based on the prevailing rates at the mines of SECL under same lead and compensating for diesel escalation based on escalation rates table received from SECL.

The outsourcing cost of Coal considered for economic evaluation is as shown in the table:-

- Coal - Rs 73.00/t.

Outsourcing rates are exclusive of Service Tax.

The scope of work by outsourcing will include drilling, loading and transportation, dozing and maintenance of haul roads. All statutory rules, regulations and applicable laws are to be followed.

26.6 FINANCIAL EVALUATION RESULTS:-

The proposed project is expansion of existing Gevra Opencast mine. The written down value of existing assets have been considered in this project while working out economics. The financial evaluation results for Total Departmental Option(Option-I) and Partial Hiring Option(Option-II) is as shown in the table below:-

Sl.No	Particulars	Unit	Option-I (Total Departmental)	Option-II (Partial hiring)
	a) Total additional capital investment	₹. crores	11304.26	9943.55
1	b) Capital outlay /t of annual output	₹./t	1756.40	1562.02
	a) Capital requirement of P&M	₹. crores	8832.27	7535.78
2	b) Per tonne of annual output	₹./t	1261.75	1076.54
3	Selling price (95% of notified selling price) of processed ROM Coal.	₹./ t	922.00	922.00
	Estimated cost of production			
	a) at 100% level	₹./t	570.84	566.02
4	b) at 85% level	₹./t	651.00	634.00
	Profit per tonne a) at 100% level	₹./t	351.16	355.98
5	b) at 85% level	₹./t	275.42	289.64
	Break-even-point (%)		55.00	51.36
6	(Mty)		38.50	35.95
7	No. of personnel		5286	4391
8	OMS	t	46.38	55.57
9	EMS	₹.	3190.30	3185.30
10	Anticipated year of achieving	Year	7^{th}	7^{th}

Sl.No	Particulars	Unit	Option-I (Total Departmental)	Option-II (Partial hiring)
	target			
11	IRR at 100% level of production	%	37.45	42.16
12	IRR at 85% level of production	%	24.68	28.45
13	Completion Cost	₹. crores	13673.69	12109.27
14	NPV @ 12% at 100% level of production	₹. crores	9247.31	9837.23
15	NPV @ 12% at 85% level of production	₹. crores	4775.12	5644.97

27.0 CONCLUSION

The project has been planned in line with the present technology and forthcoming changes in neighbouring mines as well as in other parts of the country. The techno-economics have been worked out based on the prevalent norms of productivity, operating cost, spares consumption etc.

Following two options have been worked out in this PR.

1	OPTION I	Total Departmental Option	Mining of Coal and OB by Departmental HEMM.
2	OPTION II	Partial Hiring Option	Mining of Coal by Outsourcing HEMM and OB by Departmental HEMM.

In Total Departmental option (Option-I), the proposed project is yielding a profit of ₹. 351.16/t at 100% and ₹. 275.42/t at 85% level of production. The financial IRR of the project at 85% is 24.68 % and as such it is meeting the criteria of approval i.e. 12% IRR at 85% capacity level.

In Partial Hiring option (Option-II), the proposed project is yielding a profit of ₹. 355.98/t at 100% and ₹.289.64/t at 85% level of production. The financial IRR of the project at 85% is 28.45 % and as such it is also meeting the criteria of approval i.e. 12% IRR at 85% capacity level.

Option-II may be considered for approval as per the decision taken in planning committee meeting held for Draft PR of Gevra Expn. OCP (35.0 - 70.0 Mty).

****