



## **1.0 Executive Summary**

### **1.1 Introduction**

**Chhattisgarh State Power Generation Company Limited (CSPGCL)** is emerging as the epicentre of "Power" of the nation it is constituted on 15<sup>th</sup> November 2000. Ministry of Coal and Mines, Government of India has allotted Gidhmuri & Paturia coal blocks to CSPGCL located in Hasdeo-Arand coalfield area on 13<sup>th</sup> October 2015 (order no: 103/28/2015/NA) to meet the requirement of 5.6 MTPA coal for proposed coal based power plant at Bhaiyathan which is now changed to ICPL Premnagar.

Gidhmuri and Paturia coal blocks under the command area of South Eastern Coalfields Ltd were allocated to CSEB (now CSPGCL) by Ministry of Coal & Mines, Department of coal vide letter no. 47011/1(22)/2002-CPAM/CA dated 23<sup>rd</sup> September 2004 and again reallocated vide letter no. 103/28/2015/NA dated 13<sup>th</sup> October 2015 by the Nominated Authority, Ministry of Coal, GoI.

For the rated output of 5.6 MTPA of ROM coal and with the extractable reserves of 241.72 million tonnes, the life of the open cast mine is estimated at 48 years. However, 158.40 million tonnes of coal is proposed to be mined in phase-I (upto 30 years). Balance reserves of 83.32 million tonnes are proposed to be mined beyond 30<sup>th</sup> year upto 48<sup>th</sup> year. The life has been estimated from the year of start of excavation.

Although, the life of mine based on coal reserve is 48 years, however the first phase mine plan is proposed for 30 years period only. However, the mine closure plan will be reviewed two years before end of lease period & if necessary, the same will be extended to 48 years with necessary amendments.

#### **➤ Identification of Project & Project Proponent**

Chhattisgarh State Power Generation Company Limited (CSPGCL) is proposing Gidhmuri & Paturia coal blocks opencast mining with capacity of 5.6 MTPA at Hasdeo Arand Coalfield, Korba District, Chhattisgarh to meet requirement for the thermal power plant of a capacity of 2 X 660 MW at Bhaiyathan in Chhattisgarh State.

Chhattisgarh State is fortunate that it has immense possibilities of coal based thermal power generation. At the national level one finds several States suffering from serious power crisis. Looking to abundant availability of coal in the state. Chhattisgarh would be developed as a 'Power Hub' of the nation from where power would be exported to other needy States.

The mining plan (April, 2007) of Gidhmuri & Paturia coal blocks of Hasdeo Arand Coalfield, 5.6 MTPA has been approved by Ministry of Coal, Govt. of India vide its letter No. 47011/1(22)/2002-CPAM/CA-1 dated 6<sup>th</sup> September 2007 and its amendment was granted on 15<sup>th</sup> June 2021. The approval conveyed under section 5(2) (b) of the Mines & Minerals (Development & Regulation) Act, 1957.

#### **➤ Project Description**

proposing Gidhmuri & Paturia coal blocks opencast mining with capacity of 5.6 MTPA at Hasdeo Arand Coalfield, Korba District, Chhattisgarh to meet requirement for the thermal power plant of a capacity of 2 X 660 MW at Bhaiyathan in Chhattisgarh State.

For the rated output of 5.6 MTPA of ROM coal and with the extractable reserves of 241.72 million tonnes, the life of the open cast mine is estimated at 48 years. However, 158.40 million tonnes of coal is proposed to be mined in phase-I (upto 30 years). Balance reserves of 83.32 million tonnes are proposed to be mined beyond 30<sup>th</sup> year upto 48<sup>th</sup> year. The life has been estimated from the year of start of excavation. The capital cost of the project is Rs 2,010 crores including environment protection measures.

## 1.2 Environmental Setting

The Gidhmuri & Paturia blocks is located at about 75 km from Ambikapur on Ambikapur-Bilaspur highway in Korba district of Chhattisgarh state. The Gidhmuri & Paturia blocks, are explored by Mineral Exploration Corporation Limited (MECL), occupies an area of about 17.51 Sq.km and is situated in the western part of the Hasdeo-Arand coal field and as per vesting order, block area of Gidhmuri and Paturia Coal Block is 22.86 Sq.Km. The details of environmental setting is given in **Table-1**. The index map and study area map is shown in **Figure-1** & **Figure-2**.

**TABLE-1  
ENVIRONMENTAL SETTING**

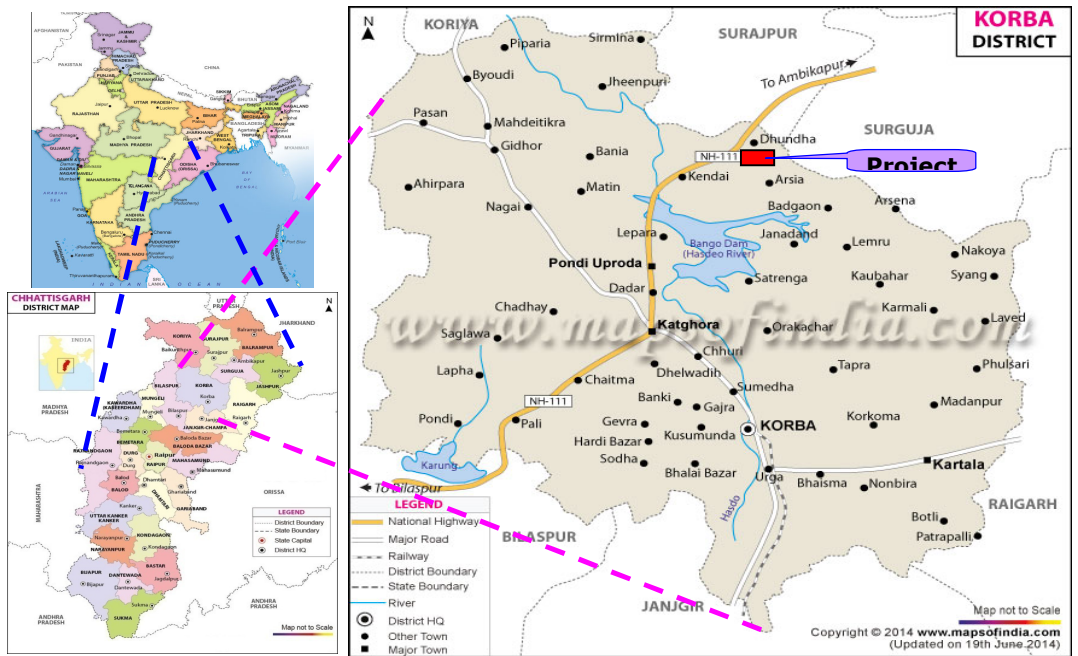
Sr. No.	Particulars	Details															
1	Location	Western part of Hasdeo-Arand coalfield															
A	Coordinates (Coal mine block)	<table border="1"> <thead> <tr> <th>Code</th> <th>Latitude</th> <th>Longitude</th> </tr> </thead> <tbody> <tr> <td>G1</td> <td>22°45'33.83" N</td> <td>82°43'47.30" E</td> </tr> <tr> <td>G2</td> <td>22°47'15.92" N</td> <td>82°45'58.46" E</td> </tr> <tr> <td>P1</td> <td>22°45'21.31" N</td> <td>82°39'49.00" E</td> </tr> <tr> <td>P2</td> <td>22°48'05.94" N</td> <td>82°44'03.76" E</td> </tr> </tbody> </table> <p>G1 = Gidhmuri, P1 = Paturia</p>	Code	Latitude	Longitude	G1	22°45'33.83" N	82°43'47.30" E	G2	22°47'15.92" N	82°45'58.46" E	P1	22°45'21.31" N	82°39'49.00" E	P2	22°48'05.94" N	82°44'03.76" E
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P2	22°48'05.94" N	82°44'03.76" E															
B	Villages	Core zone covers the following villages: i. Gidhmuri ii. Paturia iii. Madnpur iv. Uchelnga															
C	District	Korba															
D	State	Chhattisgarh															
2	Elevation above MSL	Varies from 459 m to 525 m															
3	Toposheet no.	F44E8, F44E12, F44K5 & F44K9															
4	Land use for the Mine	The total area of mine is 1751.920 ha: <ul style="list-style-type: none"> <li>• Forest area – 1495.332 ha (85.35%)</li> <li>• Private land – 250.112 ha (14.28%)</li> <li>• Government land – 6.476 ha (0.37%)</li> </ul>															
5	Nearest highway	NH-111 (0.1 km, W)															
6	Nearest railway station	Korba (100 km, SE)															
7	Nearest airport	Raipur (200 km, SW)															
8	Nearest town/city	Korba (100 km, SE)															
9	Nearest water bodies	1) Bisrar Nala -Within ML area 2) Dokka Nala-0.1 km, ESE 3) Bamhni Nala-0.3 km, N															



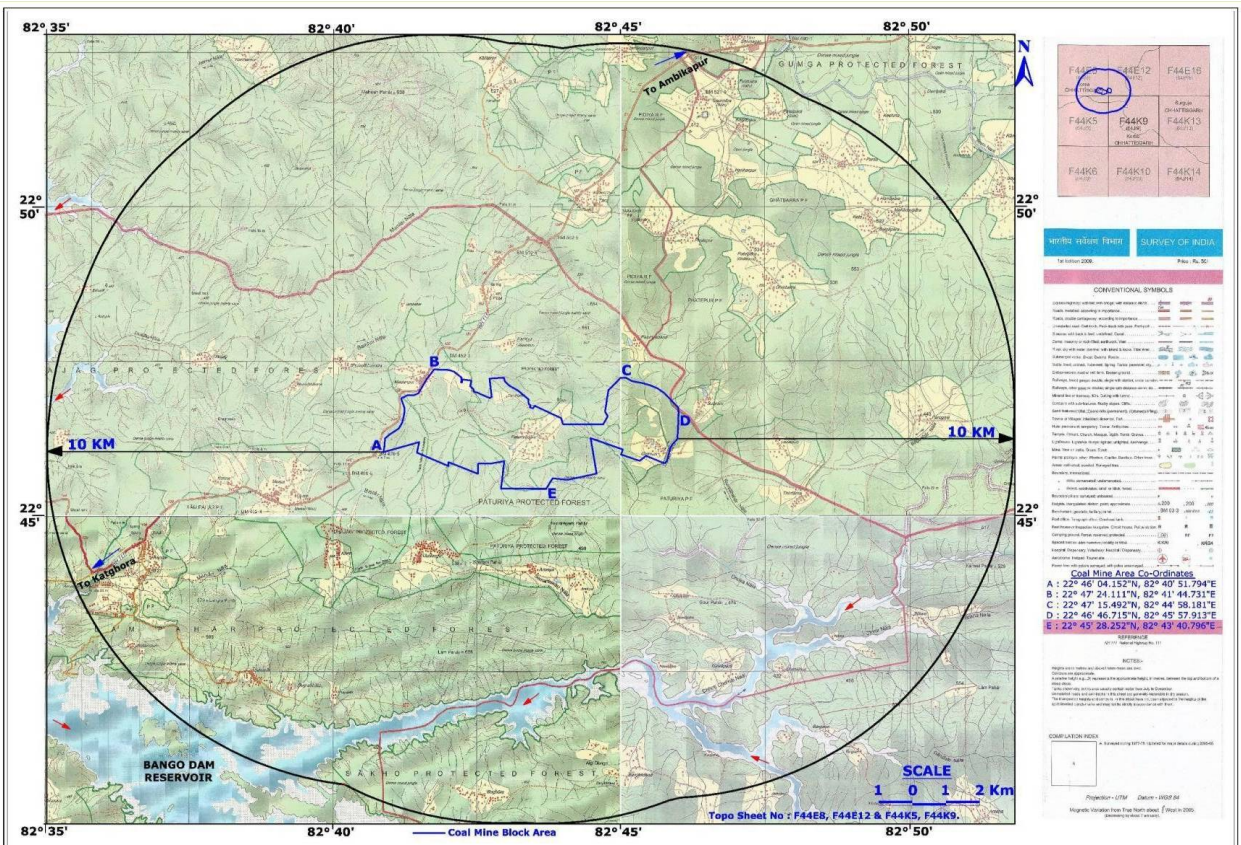
**Environmental Impact Assessment for the Proposed Gidhmuri & Paturia Opencast Coal Mining Project of 5.6 MTPA Capacity in Mine Lease Area of 1751.92 ha in Villages Gidhmuri, Paturia, Madanpur and Uchlenga, District Korba, Chhattisgarh**

**Executive Summary**

Sr. No.	Particulars	Details
		4) Rumrabahar Nala-1.4 km, ESE 5) Semarduwari Nala-2.5 km, S 6) Manasi Nala-3.8 km, NNW 7) Maniari Nala-4.0 km, SW 8) Chhoti Chornal Nadi- 5.3 km, SSE 9) Bongo Reservoir-6.0 km, S 10) Bagabahar Nala - 6.8 km, E 11) Chornai Nadi-7.7 km, SE 12) Atem Nadi-9.7 km, NE
10	Reserve / Protected forest	<b>Reserve Forest (RF):</b> 1) Pidiya R.F (1.0 km, N)  <b>Protected Forest (PF):</b> 1) Forest Dhajag P.F-Within ML area 2) Paturiya P.F-Within ML area 3) Phatepur P.F-Adjacent, NE 4) Matringa P.F-1.4 km, E 5) Lampahar P.F-2.6 km, S 6) Ghatbarra P.F-5.8 km, NE 7) Sakho P.F-6.0 km, S 8) Gumga P.F-8.7 km, NE
11	Other historical and archaeological places	Nil within 10 km radius
12	Ecology sensitive/ Protected areas as per Wild Life Protection Act 1972 (National Park/ Wild life Sanctuary/ Bio-sphere reserves)	Nil within 15 km radius
13	Defence installations	Nil within 10 km radius
14	Industries	Nil within 10 km radius
15	Other Industries/Mines	Nil within 10 km radius
16	Seismic zone	Zone-II as per IS-1893 (Part-1)-2002



**FIGURE-1**  
**INDEX MAP OF THE PROJECT**



**FIGURE-2**  
**STUDY AREA MAP OF 10 KM RADIUS**

## 2.0 Project Details in Brief

### 2.1 Salient Features of Coal Mine

The applied mine lease extends over an area of 1751.92 ha. The salient features of the proposed mine are given in **Table-2**.

**TABLE-2  
SALIENT FEATURES OF THE PROPOSED MINE**

Sr. No.	Description	Details
1	Name of the Project	Paturia & Gidhmuri open cast coal mine
2	Total land requirement for the project	ML area of 1751.92 ha for 30 years
3	Mineable reserves	Open cast: 158.40 million tonnes for 30 years
4	Total overburden generation	1161.67 million m <sup>3</sup>
5	Quantity of external dump	23.94 million m <sup>3</sup>
6	Quantity of internal dump	1137.73 million m <sup>3</sup>
7	Total external dump area	93.580 ha
8	Top soil thickness	5-60 m including overburden
9	Average stripping ratio (coal:overburden)	1:4.25
10	Method of mining	Opencast mining by shovel-dumper
11	Ultimate depth	130 m bgl
12	Maximum production capacity	5.6 MTPA
13	Expected life of mine	30 years
14	Working hours	3 shift per day of 8 hrs in 330 days of operation in a year
15	Quarry floor area	1751.92 ha
16	Quarry surface area	2020 ha (Q1-378 + Q2-547 + Q3-741 + Q4-354 ha)
17	Number of seams/sections	4 coal seams
18	Average seam gradient	2 <sup>o</sup> to 5 <sup>o</sup>
19	Maximum bench height	10 - 35 m
20	Bench width	Coal: 60 m
21	Water requirement (Mine)	1,223 m <sup>3</sup> /day
22	Power requirement & source	80 MVA of power is required for the mine and will be sourced from Chhattisgarh State Power Distribution Company Limited.
23	Manpower requirement	1088 nos.
24	Colony area	1500 sq. ft per family (1088)
25	Rehabilitation and Resettlement	About 699 numbers of household involving about 2498 project person living within 444 structures will be affected and suitable R&R package will be implemented as per norms of Government of Chhattisgarh.

Source: Mine Plan

## 2.2 Resources and Requirement

### ➤ Land Requirement

The total requirement of land for Gidhmuri & Paturia opencast coal mine has been estimated as 1751.92 ha including 1495.332 ha of forest land. The land lease hold area details is given in **Table-3 (A)**, **Table-3 (B)** and **Table-3 (C)**.



**TABLE-3 (A)  
PRE-MINING LAND USE**

Ownership	Type of Land	Area (Ha)
Tenancy Land	Agricultural	266.280*
	Grazing	-
	Barren	-
	Water bodies	-
	Road	-
	Community	-
	Village/Habituated	-
<b>Sub Total</b>		<b>266.280</b>
Govt Land	Road/Rail	-
	Water body	-
	Other	7.160*
<b>Sub Total</b>		<b>7.160</b>
Forest Land	Protected Forest land	1669.313
	<b>Rev Forest (CJB)</b>	343.572
Free hold		-
<b>Sub Total</b>		<b>2012.885</b>
<b>Grand Total</b>		<b>2286.325</b>

Source: Mining Plan

**TABLE-3 (B)  
LAND REQUIREMENT (INDICATIVE) FOR INITIAL 30 YEARS**

Ownership	Type of Land	Area (Ha)
Tenancy Land	Agricultural	250.112
	Grazing	-
	Barren	-
	Water bodies	-
	Road	-
	Community	-
	Village/Habituated	-
<b>Sub Total</b>		<b>250.112</b>
Govt Land	Road/Rail	-
	Water body	-
	Other	6.476
<b>Sub Total</b>		<b>6.476</b>
Forest Land	Protected Forest land	1177.301
	<b>Rev Forest (CJB)</b>	318.031
Free hold		-
<b>Sub Total</b>		<b>1495.332</b>
<b>Grand Total</b>		<b>1751.920</b>

Source: Mining Plan

**TABLE-3 (C)  
DURING AND POST MINING LAND USE**

Mining Activity	Proposed Land Use Area (Ha)	Land Use (End of Life) Area	Post Mining Land Use (Ha)						Total
			Agri Land	Plantation	Water Body	Public Use	Forest land (Returned)	Un-disturbed	
Excavation Area	1,509.75	1,509.75	-	884.81	624.94(Void)	-	884.81	-	1,509.75
Backfilled Area (in Excavation Area)	1,183.59	1,183.59	-	884.81	298.78(Void)	-	884.81	-	1,183.59
Excavated	326.16	326.16	-	-	326.16(V)	-	-	-	326.16



Mining Activity	Proposed Land Use Area (Ha)	Land Use (End of Life) Area	Post Mining Land Use (Ha)						
			Agri Land	Plantation	Water Body	Public Use	Forest land (Returned)	Un-disturbed	Total
Void (in Excavation Area)					oid)				
Top Soil Dump *	30.90(Upto 4th Year)	30.90(Upto 4th Year)	-	-	-	-	-	-	-
External Dump	93.58	93.58	-	93.58	-	-	93.58	-	93.58
Safety Zone	13.43	13.43	-	13.43	-	-	13.43	-	13.43
Haul Road between quarries	-	-	-	-	-	-	-	-	-
Road diversion	5.54	5.54	-	-	-	5.54	-	-	5.54
Settling pond	9.54	9.54	-	-	9.54	-	-	-	9.54
Road & Infrastructure area	4.23	4.23	-	-	-	-	-	4.23	4.23
CHP & Washery	3.56	3.56	-	-	-	-	-	3.56	3.56
Coal Evacuation Route & Approach Road	20.74	20.74	-	-	-	-	-	20.74	20.74
Garland drains			-	-	-	-	-	-	-
Embankment	10.01	10.01	-	10.01	-	-	10.01	-	10.01
Green Belt	18.31	18.31	-	18.31	-	-	18.31	-	18.31
Water Reservoir	-	-	-	-	-	-	-	-	-
Rationalization area	63.22	63.22	-	-	-	-	-	63.22	63.22
Total (exclude back filled void & topsoil area)	<b>1,751.92</b>	<b>1,751.92</b>	-	<b>1,020.15</b>	<b>634.48</b>	<b>5.54</b>	<b>1,020.15</b>	<b>91.75</b>	<b>1,751.92</b>

Source: Mining Plan

➤ Water Requirement

The estimated requirement of water for mining activities and domestic activities would be around 1,223 KLD will met from ground water for construction, drinking and sanitation as well as mine operation, at the initial stage of 2-3 years. After that mine quarry will collect sufficient water which will meet the industrial demand. However, the potable water demand at mine, mine facilities will be met through ground water by bore wells. The water requirement breakup is given in **Table-4**.

**TABLE-4**



**WATER REQUIREMENT BREAKUP**

<b>Sr.No.</b>	<b>Particulars</b>	<b>Water Demand KL/day</b>
<b>A</b>	<b>Industrial Water Requirement</b>	
1	Road DSS	381
2	CHP - DSS & Fire Fighting	390
3	Plantation	137
4	HEMM & Vehicle Wash	40
5	Township	255
	<b>Sub-Total of Industrial Water</b>	<b>1203</b>
<b>B</b>	<b>Potable Water Requirement</b>	
1	Mine (Including mine worker & canteen)	100
	<b>Sub-Total of Potable Water</b>	<b>100</b>
	<b>Total Water Demand</b>	<b>1303</b>
<b>C</b>	<b>Recycle Water Generation</b>	
1	Mine domestic use (80% of water supply as per CPHEEO manual)	80
<b>D</b>	<b>Net Water requirement</b>	
1	Industrial water (Road & other area DSS + CPP + CHP+ Plantation + Vehicle washing - Recycle water form STP.)	868
2	Potable Water (Potable water to Mine)	355
	<b>Total Water requirement (Industrial + Potable)</b>	<b>1223</b>

Source: Mine Plan

➤ Power Requirement

The proposed mine will get power from Chhattisgarh State Power Distribution Company Limited (CSPDCL) substation and power will be distributed by 33 KV line.

Electric power will be supplied for pumping and illumination for the opencast mine as the major equipment of Gidhmuri & Paturia. The power requirement for the mine will be 80 MVA. Standby DG Sets of adequate capacity in case of emergency. Fuel requirement will be about 172 KL/day of HSD.

➤ Manpower Requirement

The mine will be supervised and controlled by a team of technically and statutory qualified personal apart from the operating staff of skilled, semi-skilled and other categories.

The total man power requirement will be as per mine plan option-2: 1088 nos.

The employment generation details is given in **Table-5**.

**TABLE-5**  
**EMPLOYMENT GENERATION DETAILS**

<b>Sr.No.</b>	<b>Designation</b>	<b>No.</b>	<b>Percentage of Total Manpower</b>
1	Workers	614	66.10%



2	Monthly Paid Staff	249	26.80%
3	Officers	66	7.10%
<b>Total</b>		<b>929</b>	<b>100%</b>

### 2.3 Proposed Method of Mining

The Geological & Mining Characteristics of the Gidhmuri & Paturia geological block under consideration are favorable for open cast upto III (Bottom) seam and due to very high stripping ratio for seams below seam III it is proposed to mine seam-I and seam-II by underground method. A total no. of 4 coal seams are favorable for opencast mining. Out of these, seam-III Top (Merged) is the thickest and most prominent seams and the coal horizons are dipping at a gradient of 20-50 towards the south.

#### Strategy and Sequence of Mining Quarriable areas and boundaries

The mine has been planned to be worked in four quarries with independent box-cut entry at the floor of seam III (Bottom)/ III (Top) merged i.e. Quarry-1 (Gidhmuri block), Quarry-2 (Paturia block extended into Gidhmuri block), Quarry-3 (Paturia block) and Quarry-4 (Paturia Block). Quarries 1, 2 & 3 are proposed to be started simultaneously to achieve the targeted coal production of 5.6 MTY at the earliest.

Quarry-4 has been proposed to be worked from 16<sup>th</sup> year of mining under the present proposal of mining plan due to relatively high stripping ratio. Initial high stripping ratio and huge requirement of space for external dumps attributes postponement of operation of quarry-4 to 16<sup>th</sup> year. Void for internal dumping is created from 16<sup>th</sup> year onwards in quarry-3 for internal dumping.

The mine will start from the in crop of IIIB/IIIT (Merged) and gradually advance to dip side making haul road at the usual gradient of 1:16.

All the Quarries are proposed to be worked with by shovel and dumper only.

A central haul road of 30 m width has been proposed in Quarry-1,2 & 3 for coal transport whereas flank road shall be used for coal transport in quarry-4. OB shall be transported through flank roads.

#### **Boundary of Quarry-I (Gidhmuri Block)**

Northern Boundary: To the extent possible leaving a safety barrier of 7.5 m respectively from the block boundary and keeping minimum safety barrier of 35 m from southern bank of Diverted Dokka Nalla.

Southern Boundary: To the extent possible leaving a safety barrier 7.5 m respectively from the block boundary and keeping minimum safety barrier of 15 m from Diverted Village Road.

Eastern Boundary: To the extent possible leaving a safety barrier of 7.5 m respectively from the block boundary.



Western Boundary: In crop of seam III Top Merged

### **Boundary of Quarry-II (Gidhmuri Block & Paturia Block)**

Northern Boundary: In crop of seam III Bottom

Southern Boundary: To the extent possible leaving a safety barrier of 7.5 m respectively from the block boundary and keeping minimum safety barrier of 15 m from Diverted Village Road.

Eastern Boundary: Fault F1 – F1 (Paturia)/Fault F2 – F2 (Gidhmuri)

Western Boundary: Fault F3 – F3 (Paturia)

### **Boundary of Quarry-III (Paturia Block)**

Northern Boundary: In crop of seam III Bottom seam

Southern Boundary: To the extent possible leaving a safety barrier of 7.5m respectively from the block boundary.

Eastern Boundary: Fault F3 – F3 (Paturia)

Western Boundary: Fault F4 (Paturia) and Fault F12 – F12

### **Boundary of Quarry-IV (Paturia Block)**

Northern Boundary: In crop of seam III Bottom

Southern Boundary: To the extent possible leaving a safety barrier of 7.5m respectively from the block boundary.

Eastern Boundary: Fault F4

Western Boundary: To the extent possible leaving a safety barrier of 7.5 m respectively from the block boundary and maintaining a safety distance of 45 m from National highway.

### *Calendar Programme of Excavation*

For the rated output of 5.6 MTPA of ROM coal and with the extractable reserves of 241.72 MT, the life of the open cast mine is estimated at 48 years. However, 158.40 MT of coal is proposed to be mined in phase-I (upto 30 years). Balance reserves of 83.32 MT are proposed to be mined beyond 30<sup>th</sup> year upto 48<sup>th</sup> year. The life has been estimated from the year of start of excavation.

Although, the life of mine based on coal reserve is 48 years, however the mine closure plan is proposed for 30 years period only as M/s Chhattisgarh State Power Generation Company Ltd (CSPGCL) has been allotted the mining block for 30 years period only. However, the mine closure plan will be reviewed two years before end of lease period & if necessary, the same will be extended to 48 years with necessary amendments.

### *Coal Handling Plant*

The coal handling plant for this project is envisaged to handle total production (5.6 MTY) of coal from the mine. The coal handling plant shall have facilities for receiving coal from rear discharge dumpers, crushing of coal to desired size, conveying, storing, reclamation and loading into evacuation network of conveyor. Sufficient storage has been provided in the coal handling system to meet the eventualities of disrupted coal production in the mine or dispatch irregularities.

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

## **3.0 Baseline Environmental Status**

The baseline data monitoring studies have been carried out during post-monsoon and partly winter season (1<sup>st</sup> October 2018 to 31<sup>st</sup> December 2018) covering a period of three months to determine existing conditions of various environmental attributes.

### **3.1 Soil Quality**

Ten soil samples were collected and analyzed in and around the proposed mine lease area to assess the present soil quality of the region. The pH of the soil samples ranged from 5.23 to 6.89 ranging from very strongly acidic to the neutral nature. The electrical conductance of the soil samples varied from 65  $\mu$ S/cm to 218  $\mu$ S/cm. Based on the Conductivity results it can be concluded that the ionic content of the soil samples are within the limits that does not harm the crops. Bulk densities of the soil samples varied from 1.0 to 1.2 g/cc.

Available nitrogen in the soil samples varied from 29.3 kg/ha to 70.6 kg/ha and indicating very less to less in the soil samples. Available phosphorus in the region varied from 12.4 kg/ha to 53.1 kg/ha revealing the distribution from very less to average sufficient quantities.

Available potassium levels in the samples ranged from 115.6 kg/ha to 235.6 kg/ha, which is indicating from very less to medium quantities in the soil samples.

Water soluble chlorides in the region varied from 113.3 mg/kg to 255.1 mg/kg. Organic carbon concentrations ranged from 0.16% to 0.35%. Very less to less organic carbon content is noticed in the soil samples.

### **3.2 Meteorology**

Maximum temperature of 34.6°C and minimum temperature of 9.4°C was recorded during the study period. During the period of observation, the relative Humidity recorded ranged from 55 to 82%. Maximum humidity was observed during the month of October.

The rainfall of 102.4 mm was recorded during the months of October to December in the study period. Predominant winds are mostly from N (29.6%) followed by W (13.9%) and NW (11.7%). Calm condition prevailed for 27.0% of the total time

### 3.3 Ambient Air Quality

Ambient Air Quality Monitoring (AAQM) was carried out at 11 locations with a frequency of two days per week for three months during post-monsoon and partly winter season.

The minimum and maximum values of PM<sub>10</sub> were observed in the range of 33.5 - 64.7 µg/m<sup>3</sup> and values of PM<sub>2.5</sub> was observed in the range of 21.4 - 36.5 µg/m<sup>3</sup>. The maximum and minimum value for SO<sub>2</sub> were observed to be 16.8 µg/m<sup>3</sup> - 9.7 µg/m<sup>3</sup>. The maximum and minimum value for NO<sub>2</sub> is observed in the range of 12.5-22.4 µg/m<sup>3</sup> respectively.

The results indicate that the concentrations of PM<sub>10</sub>, PM<sub>2.5</sub>, SO<sub>2</sub>, NO<sub>2</sub> and other parameters in the ambient air are well within the National Ambient Air Quality (NAAQ) standards for residential and rural areas.

### 3.4 Water Quality

To assess the physical and chemical properties of water in the region, water samples five ground water and five surface water locations were collected and analysed from various water sources around the project site.

- **Ground Water**

The pH ranges in between 6.69 to 7.52 which are well within the specified standard of 6.5 to 8.5. Conductivity of the samples lies between 157 µS/cm to 392 µS/cm. Total Dissolved Solids (TDS) concentrations were found to be ranging in between 98 to 246 mg/l. Total Hardness was observed to be ranging from 55.0 to 112.7 mg/l. Chlorides were found to be in the range of 13.5 mg/l to 44.5 mg/l. Sulphates were found to be in the range of 2.6 mg/l to 17.3 mg/l.

The physico-chemical and biological analysis revealed that most of the parameters are well within the permissible limits when there is no alternative choice as per IS: 10500. The analysis indicates that there is no evidence of any industry related contamination in the groundwater within the study area.

- **Surface Water**

The pH ranges in between 6.72 to 7.3 which are well within the specified standard of 6.5 to 8.5. Conductivity of the samples lies between 121 µS/cm to 162 µS/cm.

The Total Dissolved Solids (TDS) concentrations were found to be ranging in between 72 to 97 mg/l. Total Hardness was observed to be ranging from 37.5 to 50.3 mg/l. Chlorides were found to be in the range of 12.7 mg/l to 21.2 mg/l. Sulphates were found to be in the range of 2.4 mg/l to 5.2 mg/l.



### 3.5 Noise Levels

Ambient noise levels were measured at ten locations around the project site. The daytime and night time noise levels in all locations were observed to be within the permissible limits. The daytime noise levels at the residential locations ranged between 44.6 - 54.2 dB (A). The night time noise levels were ranged between 40.8 - 44.5 dB(A).

### 3.6 Ecological Environment

The study area is fragmented owing to the anthropogenic pressures and the floristic diversity and faunal diversity of the study area enumerated. The scheduled-I fauna such as Elephant, Sloth bear which are occasionally reported in the study area, Indian Peafowl and by the king vulture which are found in the 10 km radius of the buffer zone of the study area. There are no endangered flora and fishes found in the 10 km radius of the buffer zone.

### 3.7 Social Environment

The configuration of male and female indicates that the males constitute to about 51.05% and females to 48.95% of the total population as per 2011 census records. The sex ratio i.e. the number of females per 1000 males indirectly reveals certain sociological aspects in relation with female births, infant mortality among female children and single person family structure, a resultant of migration of industrial workers. The study area on an average has 957 females per 1000 males as per 2011 census reports. The study area experiences a literacy rate of 83.36% (2011). In the study area, as per 2011 census, 2.81% of the population belongs to Scheduled Castes (SC) and 78.06% to Scheduled Tribes (ST).

## **4.0 Anticipated Environmental Impacts and Mitigation Measures**

The opencast mining operations involve development of benches, approach roads, haul roads, excavation and handling followed by waste materials. The environmental impacts due to the proposed mining project, associated activities like drilling, blasting, overburden, loading, overburden & coal transportation have been assessed and adequate management plan has been developed to mitigate the impacts.

### 4.1 Air Quality

The source of emissions from the proposed mining operations will be from active mine pit and its activities like drilling, blasting, hauling, loading/unloading and due to coal crushing in the coal handling plant. The emissions will be mainly Particulate Matter (PM). To control dust from various operations following measures will be restored.

- Dust due to drilling will be minimized by using wet drilling methods:

- Regular maintenance of vehicles and machinery will be carried in order to control emission;
- Cabins for shovel and dumper and dust respirators to workmen should be provided;
- Depending on the water availability, sprayer system will be incorporated with shovel loaders, which can also wet the coal during loading and unloading.
- Dust suppression will be done on exposed area using water trucks and sprinkler;
- Dust generated due to traffic on haul roads will be reduced by water spraying at regular interval;
- Greenbelt development will be taken up all along the haul roads and overburden dumps;
- A good housekeeping and proper maintenance will be practiced which will be help in controlling pollution.
- All blast hole drills are to be fitted with dust collection arrangements;
- Proper layout of project to minimize truck movement between mine, CHP & coal load out point;
- Dust suppression & extraction system in CHP;
- Deployment of dragline to minimize road transport & handling of OB;
- Two 28 KL wide spray system water sprinklers to be deployed for dust suppression in mining area. Provision of Rs 174.42 lakh has been kept for this purpose;
- Provision of Rs 20.0 lakh has been kept for green belt development & dust attenuation; and
- Green belt development along project boundary.

- **Controlling CO Levels**

The concentration of CO in the ambient air is found to be below permissible levels at all the air quality monitoring locations. Expected increase in the CO concentration is very low as CO emissions from mining operations are less as compared to other pollutants. Heavy and light vehicles are the major sources of CO in the mine. All vehicles and their exhausts will be well maintained and regularly tested for pollutants concentration.

- **Controlling NO<sub>2</sub> Levels**

NO<sub>2</sub> emissions in the mine mainly occur during blasting operations. The main reasons for NO<sub>2</sub> emissions are:

- Poor quality of explosives having large oxygen imbalance;
- Manufacturing defect;
- Use of expired explosives in which ingredients have disintegrated; and
- Incomplete detonation, which may be due to low Primer to Column ratio.

To ensure low NO<sub>2</sub> levels following control measures will be adopted:

- Use of good quality explosives having proper oxygen balance with regular monitoring; and
- Regular updating of the date of manufacture/expiry to avoid confusions. A normal procedure should be formulated to check/visually inspect all explosives, and if disintegrated ingredients are spotted, the explosives won't be used, even if the date has not expired.

#### 4.2 Noise Levels and Ground Vibrations

Ground vibration, fly rock, air blast, noise, dust and fumes are the deleterious effects of blasting on environment. The explosive energy sets up a seismic wave in the ground, which can cause significant damage to structures and disturbance to human occupants. It causes major damages to the pit configuration too.

When an explosive charge is fired inside the blast hole, it is instantly converted into hot gases, which exert intense pressure on the blast hole walls. High intensity shock waves propagate radially in all directions and cause the rock particles to oscillate. This oscillation is felt as ground vibration. The proposed mining operations using deep hole drilling and blasting using delay detonators are bound to produce ground vibrations.

By adopting controlled blasting, the problems will be greatly minimized at mines. The impacts are also minimized by choosing proper detonating system, optimizing total charge and charge/delay. Noiseless trunk delays to minimize the noise due to air blast, non-electric (NONEL) system of blasting for true bottom hole initiation, muffling mats to arrest the dust and fly rock will be adopted. Hence, the impact due to ground vibration will be significantly reduced.

##### ➤ **Mitigation Measures for Noise Control**

- Secondary blasting will be totally avoided;
- Controlled blasting with proper spacing, burden and stemming will be maintained;
- Minimum quantity of detonating fuse will be consumed by using alternatively excel non-electrical initiation system;
- The blasting will be carried out during favorable atmospheric condition and less human activity timings;
- The prime movers/diesel engines will be of proper designed and will be properly maintained;
- The operators chamber will be safe guarded with proper enclosures to reduce the noise levels;
- A thick tree belt will be provided in phased manner around the periphery of the mine to attenuate noise;
- Trees will be planted on both sides of hauls roads;



- Personal Protective Equipment (PPE) like ear muffs/ear plugs will be provided to the operators of HEMM and person working near HEMM;
- Provision of sound insulated chamber for the workers deployed on machines (HEMM) producing higher levels of noise; and
- Reducing the exposure time of workers to the higher noise levels.

➤ **Vibration Abatement and Fly Rocks**

Ground vibrations are caused by blasting operations, deployment of mobile equipment, rock bursts and rock bumps. Blasting also generates air vibration waves. Vibration may cause structural damages, which depend on periodical acceleration due to vibration. Air blasts can damage structurally unsound buildings and cause window shattering. Blasting is associated with fly rock hazard.

The vibrations by the mechanical effects act on existing rocks and subject them to tensile, compressive and shearing stresses, which spoil their mechanical characteristics with an immediate consequence. The vibrations are caused due to the permanent installation like crushers, screens, compressors, traffic and blasting. Among all these, blasting is the major source of vibration.

The measures that are generally followed and currently proposed for abatement of ground vibration, air blasting and fly rock are detailed below:

- Blasting will be performed strictly as per the guidelines specified under blasting technology;
- Overcharging will be avoided;
- Supervision of drilling and blasting operations to ensure design blast geometry;
- Sub-drilling will be kept just adequate to tear-off the bench bottom; and
- The charge per delay will be minimized and preferably more number of delays will be used per blasts.

#### 4.3 Water Resources

➤ **Impact on Surface Water Quality**

The potential impact on the surface water quality is likely to be due to higher load of suspended solids. The waste dumping area will be properly planned, shaped, capped and graded drains, so as to prevent soil erosion along with the run-off. By providing garlands drains, the possibility of surface water contamination due to wash off water from dumps is not envisaged.

➤ **Impact on Ground Water Quality**

Ground water pollution can take place only if the mining rejects contain chemical substances. There will not be any release of harmful chemicals from the coal mine. Regular monitoring of ground water quality is essential to prevent and control the pollution of the nearby ground water contamination. The ground water getting contaminated are very rare.

➤ **Surface Water Pollution Control Measures**

- Retaining walls will be provided at the toe of dumps and the unstable overburden benches within the mine to prevent wash off from dumps and sliding of material from benches. This will help in preventing silting of water drains/channels;
- The water channels/drains carrying the rain water from the mine will be provided with baffles and settling pits to arrest the suspended solids, if any, present in this water;
- The worked out slopes will be stabilized by planting appropriate shrub/grass species on the slopes;
- The mine water will be regularly tested for presence of any undesirable elements and appropriate measures will be taken in case any element is found exceeding the limits; and
- Seepage water and rain water collected in the open pits will be pumped out and discharged with natural drainage system after de-silting in settling ponds.

➤ **Ground Water Pollution Control Measures**

- The domestic sewage from the canteen and toilets will be routed to septic tanks followed by soak pits. The domestic wastewater from the colony will be treated in sewage treatment plant and used for horticulture;
- The workshop effluent will be routed through oil and grease trap and treated to the discharge standards and reused for mining operations; and
- Regular monitoring of water levels and quality in the existing open wells and bore well in the vicinity will be carried out both with reference to area spread and time intervals so as to study the hydrology of the area. If found necessary, additional observation wells will be sunk for monitoring the water table levels and quality around the mine representing both upstream and downstream conditions.

4.4 Soil Environment

The coal mine developmental activities will result in loss of topsoil to some extent in the crushing plant and other facilities in mine lease area. In addition to that preparation of coal excavation area also leads to loss of topsoil in this region. The topsoil requires proper handling like separate stacking so that, it can be used for greenbelt development. Apart from much localized impacts at the crushing plant site, no significant adverse impact on soil in the surrounding area is anticipated.

*Top Soil Management*

The salvaging, stockpiling and re-application of topsoil to be used as growth medium in the reclamation of internal & external overburden dumps within the mining area is a measure environment protection programme. Soil management in opencast mine is necessary to re-establish the stability & productivity of lands disturbed due to mining activity.

4.5 Solid Waste

Solid wastes that will be generated in course of coal mining are overburden material consisting of fragments of sandstone/shale of assorted size. They have not been found to generate acid mine drainage or leach high quantity of heavy metals.

Several mitigation measures are proposed to for stabilisation of external dump and prevent siltation and erosion.

- A Toe wall is proposed at the foot of the external dump;
- A series of open drains to be provided on dump body to arrest surface run-off and prevent siltation; and
- Grasses are to be grown on dump slopes to minimise soil erosion.

#### 4.6 Flora and Fauna

As the mining activity is restricted to the core zone, no significant impact on the flora of the buffer zone due to the proposed mining is anticipated. With afforestation on overburden dumps and proper management of forest and development of greenbelt around the mine, the aesthetics will be adopted. There are no endangered flora and fauna species within the core area.

#### 4.7 Socio-Economic Aspects

This project will have an impact on the population growth, as it will provide some direct and indirect employment to the people from the nearby villages. Preference will be given to local unemployed youth for employment during development of mine and in operation of mine depending upon their suitability, which will enhance substantially the income status of population of the area and due to migration of people from outside area will be having impact on the area.

### **5.0 Environmental Monitoring Program**

Post project environmental monitoring is important in terms of evaluating the performance of pollution control equipment installed in the project. The sampling and analysis of the environmental attributes will be as per the guidelines of CPCB/ (CECB). The frequency of air, noise, surface water and ground water sampling and location of sampling being as per the directives of Chattishgarh Environment and Conservation Board (CECB).

### **6.0 Risk Assessment and Disaster Management Plan**

Risk assessment has been carried out to quantify the extent of damage and suggest recommendations for safety improvement for the proposed project. Risk mitigation measures based on consequence analysis and engineering judgments are incorporated in order to improve overall system safety and mitigate the effects of major accidents.

This plan defines the responsibilities and resources available to respond to the different types of emergencies envisaged. Training exercises will be held to ensure that all personnel are familiar with their responsibilities and that communication links are functioning effectively.



## **7.0 Project Benefits**

**Thematic Areas of CSR Activities:** Keeping in view the requirement of community around project, the CSR programs under this project have been developed in the following thematic areas:

- Rural Infrastructure development;
- Health & Sanitation;
- Education;
- Skill and entrepreneurship development; and
- Livelihood Development & farmers productivity.

### *Budget for CER*

As per the office memorandum about Corporate Environment Responsibility (CER) issued by Ministry of Environment, Forest and Climate Change dated 1<sup>st</sup> May, 2018, (0.5 % for Green field projects) of the total cost (Rs.2010 crore Rupees) of the project to be earmarked towards the corporate environment responsibility (CER) based on local needs. The project proponent kept Rs. 1005 lakhs (0.5 %) of the total cost of the project based on local needs.

## **8.0 Conclusion**

The proposed opencast coal mine project will have impacts on the local environment but with proper mitigation measures with the effective implementation of the environment management measures as suggested in the EIA/EMP report and as recommended by MoEF&CC, CPCB and State Pollution Control Board, the negative impacts will be minimized to a great extent. However, development of this project has beneficial impact/effects in terms growth in regional economy, transform the region's economy from predominantly agricultural to significantly industrial, increase Government earnings and revenues and accelerate the pace of industrial development in the region. Proposed Environmental Management cost is Rs. 6459.43 Lakhs (Capital) & Rs. 325 Lakhs (recurring).

The proposed mine will provide direct employment to a large number of personnel. This project will also generate indirect employment to a considerable number of families, who will render their services for the employees of the project.

The project will also encourage ancillary industries in the region, which will not only increase the employment potential but also the economic base of the region will be further strengthened.

Thus, in view of considerable benefits from the project, the proposed mine is most advantageous to the region as well as to the nation.