PRE-FEASIBILITY REPORT

Tara (East) and Tara (West) Coal Mine
Raniganj Coalfield

District – Paschim Bardhaman, State – West Bengal

August – 2018

Project Proponent:
The West Bengal Power Development Corporation Limited
Bidyut Unnayan Bhaban, Plot No. 3/C, LA-Block, Sector – III, Salt Lake City,
Kolkata – 700 098, West Bengal

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1. EXECUTIVE SUMMARY

Sr. No.	Description	Details
1.	Name of the Project	Tara (East) and Tara (West) Coal Mine
2.	Total land requirement for the project	937.44 Ha
3.	Mineable reserves	17.78 MT
4.	Total overburden generation	190.56 million Cum
5.	Quantity of external dump	34 million Cum
6.	Quantity of internal dump	190.56 million Cum
7.	Average stripping ratio (coal:overburden)	1: 10.72
8.	Method of mining	Overburden by shovel-dumper and Coal by surface miner
9.	Ultimate depth	255 m
10.	Maximum production capacity	4 million tonnes in 6^{th} year
11.	Expected life of mine	11 years including one years of construction period
12.	Working hours	3 shift per day - 330 days of operation in a year
13.	Quarry floor area	248.10 Ha
14.	Quarry surface area	405.06 Ha
15.	Number of seams	11
16.	Average seam gradient	12^{o} to 15^{o}
17.	Strike length-along floor-(maximum)	4.10 Km
18.	Strike length-along floor (minimum)	1.50 Km
19.	Strike length- along surface (maximum)	4.50 Km
20.	Strike length- along surface (minimum)	2.00 Km
21.	Maximum bench height	Top OB (for 7 cum Hyd. Shovel) - 15 m

Sr. No.	Description	Details
		Top OB (for 3.5 cum backhoe Shovel) - 6 m
22.	Bench width	for 7 m3 Hyd. Shovel - 40m for 3.5 cum backhoe - 6 m
23.	Water requirement	853 m^3/day
24.	Power requirement & source	2-3 MVA at 33 kV
25.	Manpower requirement	1161 (Up to target achieving year)
26.	Colony area	10 Ha

2. INTRODUCTION OF THE PROJECT/ BACKGROUND INFORMATION

2.1 Identification of project and project proponent.

Tara (East) & Tara (West) Coal Mine, covering an area of about 8 sq.km. lies in the northern part of the Raniganj Coalfield in Paschim Bardhaman District, West Bengal. It falls between latitudes N 23°45'30" & N 23°47'45" and longitudes E 87°04'00" & E 87°07'15" and is included in the Survey of India Topo sheet no. 73 M/1 and also in the sheet no. 12 of the Geological map of Raniganj Coalfield published by the Geological Survey of India (GSI).

Government of India, Ministry of Coal, allotted Tara (East) & Tara (West) Blocks located in the south bank of Ajoy River in Paschim Bardhaman district of West Bengal to West Bengal State Electricity Board (WBSEB) and West Bengal Power Development Corporation Limited (WBPDCL) as captive mining Block for exclusive supply of coal to their Power houses vide letter nos. 47011/7/(281)/03-CPA dated the 14th July 1995 and 47011/15/86-CPA dated 26th February 1996 from Ministry of Coal, Government of India.

Consequent upon the amendment of Coal Mines (Nationalization) Act, 1973, WBSEB and WBPDCL had jointly opted for operation of the coal mines in joint venture with M/s Eastern Minerals & Trading Agency and accordingly a joint venture company named as M/s Bengal EMTA Coal Mines Limited was formed and registered under Company's Act 1956 with the main objective of coal mining and exclusive supply of coal to the Thermal Power Stations of WBSEB & WBPDCL.

Bengal EMTA Coal Mines Limited (BECML), a joint venture company of WBSEB and WBPDCL was formed in January 1996 with M/s Eastern Minerals & Trading Agency (EMTA) for mining of coal and exclusive supply of coal to the Power Houses of WBSEB and WBPDCL.

Since March 1997 the Joint Venture Company, namely BECML has been producing coal from Tara (East) and Tara (West) Blocks and supplying the same exclusively to the Power Plants of WBSEB and WBPDCL.

The allotment of these blocks was cancelled by Hon'ble Supreme Court along with other blocks in September, 2014. Subsequently, WBPDCL has been allotted Tara (East) and Tara (West) Coal Mine vide Ministry of Coal Allotment Order no. 103/10/2015/NA dated. March 31, 2015 under clause (c) of sub-rule (2) of rule 7 and sub-rule (1) of rule 13.

The West Bengal Power Development Corporation Limited (WBPDCL) is a Govt. of West Bengal Undertaking and the largest power generating utility in the state of West Bengal. It has an existing capacity of 4865 MW with 5 (five) power plants.

NAME AND ADDRESS OF THE COMPANY

Registered & Corporate Office: The West Bengal Power Development Corporation Limited (A Govt. of WB Enterprise).

Address: Bidyut Unnayan Bhaban, Plot No.: 3/C, LA-Block, Salt Lake city, Sector - III,
Kolkata: 700 098.
Phone: 033-2339-3325
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The details of the existing End Use Plants (EUPs) are given in Table below (refer allotment order dated. 31-03-2015). All the EUPs, for which this mine has been allotted, are in place and already operational.

Sl. No.	Name of Specified End Use Plant	Address	Configuration Capacity	Capacity
1	Santaldih TPS	Santahldih, Purulia, West Bengal-723146	2 x 250 MW	500 MW
2	Kolaghat TPS	Mecheda Medinipur, West Bengal 721137	6 x 210 MW	1260 MW
3	Bakreswar TPP	Birbhum, West Bengal 712503	5 x 210 MW	1050 MW
4	Bandel PS,	Tribeni, Hooghly, West Bengal 712503	4 x 60 MW 1 x 215 MW	455 MW
5	Sagardighi TPP Unit 1 & 2	PO-Manigram, Distt.-Murshidabad, West Bengal 742237	2 x 300 MW	600 MW
6	Sagardighi TPP Unit 3 & 4		2 x 500 MW	1000 MW

2.2 Brief description of nature of the project.

The Raniganj Coalfield covering an area of about 1550 Sq.km is somewhat elliptical in shape with major part falling within Purba & Paschim Bardhaman and some parts in Birbhum, Bankura & Purulia Districts of West Bengal and minor parts in Dhanbad and Santhal Paragana Districts, of Jharkhand. The coalfield is bound by the lines of latitude 23°30' & 23°52' and of longitude 86°25' & 87°37'. The Raniganj Coalfield represents the eastern-most coal basin amongst the several outliers of the Gondwana sediments grouped into Gondwana Supergroup within the Archaeans in the Damodar Valley Region.

All reserves are assessed in the Proved category. Total gross geological reserves estimated for the block stand at 209.69 million tonnes, out of which 107.02 million tonnes has been considered for underground working and 102.67 million tonnes has been considered for opencast working.

This proposal envisages for opencast working only and a separate Mining Plan and proposal shall be submitted for underground working. Out of 102.67 million tonnes which is considered for opencast, only 71.61 million tonnes is the mineable reserve taking into account losses due to coal blocked in barriers, batter and mining loss.

The mine was opened in the year 1997 and operational till the de-allocation by Hon'ble Supreme court along with other blocks in September 2014.

During operation from 1997 to 2015, 53.83 million tonnes of coal has been extracted and extraction of balance reserve of 17.78 million tonnes of coal has been envisaged under this proposal.

2.3 Need for the project and its importance to the country and or region

Coal is regarded as the backbone of power generation in India. There is huge demand for power in India. Power is essential and most important factor for industrial and business set up. India's coal position is quite encouraging and it offers good prospects for the development of this industry. During 2011, India was the third largest coal producing country in the world. Hence, coal is an important constituent of the present Indian economy. The total reserves of coal in India have

been over 290 billion metric tons. The coalfields in India are located mostly in Jharkhand, Odisha, Madhya Pradesh, Chhattisgarh, Uttar Pradesh, Meghalaya, Telangana, West Bengal, Sikkim, Arunachal Pradesh and Bihar. India has the fifth largest coal reserves in the world. Of the total reserves, nearly 88% are non-coking coal reserves, while tertiary coals reserves account for a meager 0.5% and the balance is coking coal. The Indian coal is characterized by its high ash content (45%) and low sulphur content. The power sector is the largest consumer of coal followed by the iron and steel and cement segments. India is the world's fifth largest energy consumer, accounting for 4.1% of the global energy consumption. Maharashtra is the leading state in electricity generation. The current per capita consumption of energy in India is 0.5 toe against the global average of 1.9 toe, indicating a high potential for growth in this sector. Of the total electricity consumed in the country, approximately 80% is produced from coal.

In West Bengal coal found at Bardhaman, Bankura, Birbhum, Darjeeling, Jalpaiguri and Purulia districts; total reserve of coal in West Bengal is 30615.72 million tonnes; out of which at Raniganj 24155.41 MT, at Barjora 114.27 MT, at Birbhum 6331.04 MT, and at Darjeeling 15.00 MT coal reserve has been estimated.

The proposed mining project will cater to supply of 20% of the coal requirement for WBPDCL operated thermal power plants.

Apart from need for supply of coal to the power plants, mining in the area provides direct and indirect employment opportunities, infrastructure development, communication, and development of socio-economic infrastructure. The important benefits from the project can be thus stated as boost to local and regional economy, direct contribution to the state exchequer.

2.4 Demand-Supply Gap.

The report of the Working Group of Coal and Lignite for the 12th Five Year Plan projects the coal demand in India to grow at a CAGR of 7.1% till 2016-17 and reach 980.5 MT annually under realistic demand. At a CAGR of 7.0%, the demand is expected to reach 1,373 MT by 2021-22.The current shortage of coal stands at 84 MT and the same is expected to rise to 300 MTPA in medium term if all the letters

of assurance issued by the state-owned coal companies materialise.

As of March 2018, out of total installed capacity of 10,490.23 MW in the state of West Bengal, 8555.77 MW of electricity is being generated through coal based thermal power plants, 100 MW by Gas based power plants, 1396 MW by Hydropower and 438.46 MW by renewable power. WBPDCL, a state owned power generation company caters to approximately 55% of the state electricity demand which is mainly from its non-coking coal based thermal plants.

At the State level, the overall energy requirement is projected to grow from existing 52,358 MU in FY15 to 62,926 MU in FY19, representing an annual growth of 5% during the period. This translates into increase in peak demand from existing 7,544 MW in FY15 to 11,172 MW in FY19.

WBPDCL owned thermal power plants requires 20 Million tonnes per annum of coal at present load factor of 85%. Tara (East) and (West) coal mine will cater to 20% of supply requirement for WBPDCL.

2.5 Export Possibility.

This project is exclusively for supply of coal to thermal plants operated by WBPDCL as per Allotment Order dated 31.03.2015 issued by Ministry of Coal and no coal will be exported.

2.6 Domestic / export Markets.

West Bengal peak electricity demand at the end of 12th Plan will increase from 7544 MW in FY15 to 11,172 MW by the year FY19. In order to bridge the gap between power demand and supply generating project will have to be planned and executed as mentioned above.

2.7 Employment Generation (Direct and Indirect) due to the project.

About 1161 persons will get direct employment in various services upto target achieving year and about 5000 person will get indirect employment, which will develop due to the project and the persons employed in the project.

3. PROJECT DESCRIPTION

3.1 Type of project including interlinked and interdependent projects, if any.

Tara (East) and Tara (West) Coal mine is allocated by the Nominated Authority to West Bengal Power Development Corporation limited vide Allotment Order No. 103/10/2015/NA dated March 31, 2015 for exclusive supply to End Use Plants (EUPs)

i. Santaldih TPS, Purulia, West Bengal – 500 MW
ii. Kolaghat TPS, Medinipur, West Bengal – 1260 MW
iii. Bakreswar TPP, Birbhum, West Bengal – 1050 MW
iv. Bandel PS, Hoogly, West Bengal – 450 MW
v. Sagardighi TPP Unit 1 & 2, Murshidabad, West Bengal – 600 MW
vi. Sagardighi TPP Unit 3 & 4, Murshidabsd, West Bengal – 1000 MW

3.2 Location

Tara (East) & Tara (West) block, covering an area of about 8 sq.km. lies in the northern part of the Raniganj Coalfield in Paschim Bardhaman District, West Bengal. It falls between latitudes N 23°45'30" & N 23°47'45" and longitudes E 87°04'00" & E 87°07'15" and is included in the Survey of India Topo sheet no. 73 M/1 and also in the sheet no. 12 of the Geological map of Raniganj Coalfield published by the Geological Survey of India (GSI).

The boundary of block is given below:
North: Out crop of B-IV seam (combined).
South: Churulia Block
East: Fault line of F7
West: Sarsathali Block

The coal mine is ideally located and is well connected by both rail and road. The Andal – Gourangdih section of the Eastern Railway passes through the eastern and north-eastern part of the block in a south-east to north-west direction. The Churulia

– Dohomani Road which connects the G.T. Road with Ajoy Ghat passes through the western part of coal mine. Asansol, a major town in the Raniganj Coalfield, is situated at a distance of about 20 km by road to the south-west to the coal mine.

Note: Location Map has been shown in Annexure-I.

3.3 Details of alternate sites considered and the basis of selecting the proposed site, particularly the environmental considerations gone into should be highlighted.

No alternative site for this project could be envisaged due to site specific location of deposition of coal deposit.

3.4 Size or magnitude of operation.

Mining Plan for Tara (East) and Tara (West) has been prepared for a rated capacity of 4 MTPA of power grade ROM Coal. This output is prima facie considered technically feasible because of its favorable geo-mining conditions like:

- Thickness of various seams,
- Their disposition,
- Comparatively long strike length
- Free from major geological disturbances
- Sufficient mineable coal reserves etc.

3.5 Project description with process details

3.5.1. Exploration

Tara (East) and Tara (West) coal mine covers an area of 8 Sq km, which has been allotted to WBPDCL for their captive coal mining purpose.

The drilling operation in the block commenced in August, 1978 and was completed with the drilling of 13,711.15m in 77 boreholes in August, 1982. The usual spacing of the boreholes was at 400m, grid interval along dip direction while in the strike direction the interval was more than 400m. The infilling boreholes have been drilled either to delineate fault or to prove incrop. The deepest borehole drilled in the area is TR-37 with a depth of 462.90m, Whereas TR-59 is the shallowest

borehole having a depth of 21.35 m. The core recovery was generally high and it is usually above the stipulated 90% for coal and 70% for non-coal. However, in case the core recovery was below the stipulated limit, deviation drilling was resorted to for better core recovery.

From the above MECL have done extensive drilling with the drilling of 12,061.55m in 70 boreholes within the block at interval of 400m carried out almost full range of tests of overburden and coal for mining studies. Area covered by „detailed" exploration within the block as per AMP is 800 Ha. Overall borehole density within the block (no./sq. km) is 8.75. These exploration studies are quite sufficient for preparation of Mining Plan and also for its revision. Area covered by detailed exploration outside the block is 73.09 Ha with 1649.60m of drilling and No. of boreholes drilled outside the block is 07 (Seven). Bore hole density for outside area (no./sq. km) is 9.58.

Quantum of drilling in Tara (East) and Tara (West) coal mine

Agency	**Tara (East)**		**Tara (West)**	
	Meterage	No of BH	Meterage	No of BH
GSI	-	2	1649.60	5
CMPDIL/MECL	5715.40	32	6346.15	38
Total	**Meterage**		**13711.15**	
	No of BH		**77 (70 Nos within the block + 7 Nos outside the block)**	

The entire sequence of the sediments above the metamorphics is recognized as the Barakars. This essentially consists of pebbly to very coarse to medium grained sandstone, shales, shaly sandstone, carbonaceous shale and coal seams.

The outcrops of the Barakar sandstones, which are dominantly belonging to coarse arenaceous facies, occur in parts of the area. On the basis of borehole data, five distinctly correlative and persistent coal horizons have been identified in the Barakars. However, exposures of the seams are very rare and the presence of outcrops is indicated in the quarries. The seams B-VI to B-IV and B-III (Top) are exposed in a number of small quarries in the northern part of the block. The close association of para lava with the outcrop of B-VI seam in the north-central part of the block is noteworthy. It is represented by the creamy to white, locally brownish, fine granular to clayey material intimately associated with devitrified or silicified

ferruginous sandstone. It is thought to be produced as a result of burning of the coal seam under oxidizing conditions.

As mentioned earlier, the entire block is largely covered by a mantle of alluvium and laterite. Hence, the geological structure of the block has been deciphered mainly on the basis of the sub-surface data from mine plan and the boreholes supplemented by surface geological observations. The strata show a gradual swing in strike from N60°W – S60°E in the western and central parts to N50°W – S50°E in the south-eastern part of the block with a dip of 12° to 15° towards southwest. The local variation in the strike and dip are thought to have been caused by incidence of faulting.

3.5.2. Reserves And Overburden

The total geological reserves are estimated as 209.69 Mt up to the requisite block boundary. The corresponding OBR has been envisaged as 373.81 Mcum.

Seam wise Coal Reserves as per Geological reports of Tara (East) and Tara (West) coal mine are summarized in the following Table:

Seam	Geological Reserve	Geological Reserve considered for U/G	Geological Reserve considered for OCM	Blocked Reserve below Batter and Barrier	Balance Geological Reserve	As on date Extracted Reserve			Balance Reserve (Net)			Total Extractable Coal Reserve for OCM
						UG	OC	Total	UG	OC	Total	
1	2	3	4	5	6	7	8	9	10	11	12	13
			(2) - (3)		(4) - (5)			(7) +(8)	(3) - (7)	(6) - (8)	(10) +(11)	(12) x 90%
VI	45.98	7.56	38.42	9.31	29.11		19.50	19.50	7.56	9.60	17.16	8.64
V	41.38	14.53	26.85	6.84	20.01		15.83	15.83	14.53	4.18	18.71	3.76
IV + V	2.68	2.68	-	-	-		-	-	2.68	-	2.68	-
IV	31.04	17.98	13.06	4.30	8.76		7.39	7.39	17.98	1.37	19.34	1.23
IV TOP	27.38	15.86	11.52	3.80	7.72		6.52	6.52	15.86	1.20	17.06	1.08
IV BOT	9.55	5.53	4.02	1.32	2.69		2.27	2.27	5.53	0.42	5.95	0.38
IV B2	0.65	0.38	0.27	0.09	0.18		0.15	0.15	0.38	0.03	0.41	0.03
III	8.97	5.83	3.14	1.26	1.88		0.79	0.79	5.83	1.09	6.92	0.98
III TOP	13.65	8.88	4.77	1.91	2.86		1.21	1.21	8.88	1.65	10.53	1.49
III T1	0.50	0.50	-	-	-		-	-	0.50	-	0.50	-
III BOT	1.75	1.14	0.61	0.25	0.37		0.15	0.15	1.14	0.21	1.35	0.19
II TOP	17.03	17.03	-	-	-		-	-	17.03	-	17.03	-
II T2	2.39	2.39	-	-	-		-	-	2.39	-	2.39	-
II T1	2.79	2.79	-	-	-		-	-	2.79	-	2.79	-
II BOT	3.95	3.95	-	-	-		-	-	3.95	-	3.95	-
TOTAL	209.69	107.02	102.67	29.08	73.59	-	53.83	53.83	107.02	19.75	126.77	17.78

Due to multiple seams of different thickness, mining Loss has been estimated for each seam separately to arrive at Mineable Coal reserves. Mining Loss depends on:

a) Loss of coal in roof and floor of seam
b) Loss of coal while cleaning roof of bench
c) Loss of coal during selective mining for >1m bands
d) Loss of coal during transportation

Summary of Coal Reserves

1	Gross Geological Reserves (MT)	209.69
2	Geological Reserve considered for U/G	107.02
3	Geological Reserve considered for OCM	102.67
4	Blocked Reserve below Batter and Barrier – OCM	29.08
5	Balance Geological Reserve – OCM	73.59
6	Extracted reserve till date – OCM	53.83
7	Net Balance reserve – OCM	19.76
8	Mining Loss of 10% - OCM	1.98
9	Balance extractable coal reserve for OCM	17.78

The total balance mineable balance coal reserves for opencast mining have been estimated as 17.78 Mt at the corresponding OBR of 190.56 Mm3 at an average SR of 10.72 m3/t.

Seam-wise Coal reserve with corresponding Overburden quantity

Seam	Extracted Coal Reserve for OCM		Deployed Reserve		Total	
	Coal (Mte)	OB (MCum)	Coal (Mte)	OB (MCum)	Coal (Mte)	OB (MCum)
VI	19.50	70.45	8.64	139.87	28.14	210.32
V	15.83	82.49	3.76	34.56	19.59	117.05
IV + V	-	-	-	-	-	-
IV	7.39	8.52	1.23	3.52	8.62	12.04
IV TOP	6.53	7.52	1.08	3.11	7.61	10.63
IV BOT	2.28	2.62	0.38	1.08	2.66	3.7
IV B2	0.15	0.18	0.03	0.07	0.18	0.25
III	0.79	4.22	0.98	3.07	1.77	7.29
III TOP	1.21	6.43	1.49	4.68	2.7	11.11
III T1	-	-	-	-	-	-
III BOT	0.15	0.82	0.19	0.6	0.34	1.42
Total	**53.83**	**183.25**	**17.78**	**190.56**	**71.61**	**373.81**

3.5.3. Mining Technology

The following options have been considered for selection of equipment for the project

1) Dragline
2) Bucket wheel excavator
3) Surface miners
4) Shovel dumper combination

Option 1 – Deployment of Dragline.

The possibility of deploying dragline(s) at the project was examined. Dragline deployment has not been considered feasible due to:-

— Dragline is suitable for flat deposits, to permit back dumping of OB in de- coaled area. The OB is usually dumped on seam floor very near the coal bench, leaving

space sufficient only for water drainage and also to reduce mixing of OB with coal. If the coal seam gradient is not flat, the dumped OB will slide towards the coal area preventing coal extraction besides being dangerous.

- The Strike length of the property should be 1.5 to 2 kms and more so that the dragline is not required to be frequently shifted from one end to the other.
- The property should be free from geological disturbances. A dragline system works with a rigid operational geometry and frequent changes in the geometry may be difficult to implement without heavy loss of efficiency.
- Not suitable for Multi – Seam working
- The property should be large enough to ensure the life of about 25 years or more so that heavy capital investment can be recovered.

The block has sufficient strike length, favourable gradient but due to occurrence of multiple coal horizons, limited balance OC reserve with limited life of the OC mine as compared to life of a Dragline of 25 years, and high capital investment, deployment of dragline is ruled out.

Option 2 – Bucket wheel excavator

Bucket wheel excavator has been ruled out due to multi seam deposit and high capital investment.

Option 3 – Deployment of Surface Miner for Coal Mining

Reasons for planning Surface Miner for coal seams are:

- With the help of automatic grade and slope control system, correct slope for drainage and coal seam with gradient 12deg to 15 deg can be maintained. Width of coal bench is 150m.
- Surface Miner 2200SM has been chosen. Milling width 2200mm and depth

300mm,no. of cutting tools 76, 4 track, 708kw 12 cylinder diesel engine with gradability operating gear 90%.

— There are number of thin coal horizons, which can be extracted in a clean way yielding better quality ROM, eliminating need for coal washing.

— Elimination of drilling - blasting and production of minus100mm coal, obviating need for crushing before loading in wagons are environment friendly.

— Less fire hazard to the coal seam, as it does not leave behind free or loose material, prone to spontaneous heating.

Option 4 – Deployment of Shovel dumper for Coal Mining

This option considers use of shovel dumper combination with inclined as well as horizontal slicing pattern for coal and intervening parting. This will also facilitate water drainage to sump formed along with haul road. Top OB benches would be developed in horizontal slicing pattern for complete life of the mine. It can be seen that coal seams are flat. It has been proposed to remove interburden parting by incline slicing method.

The system is flexible and can be used in conditions of varying thickness of seams and partings and also steep gradients. The flexibility of the operations enables geological disturbances to be negotiated without much loss of efficiency. Shovel-dumper system is very flexible and also offers convenient mining operations to deal with sudden occurrences of unworkable or poor quality patches. It also offers flexibility for easy transition to any other technology or equipment configuration.

The technology is well known and advantageous to get skilled manpower. Given the geological conditions of the block, this system suits best and has, therefore, been adopted in this project for Overburden removal.

3.5.4. O.B. Removal

The type and size of Shovel-dumper combination has been considered optimum as set out in details in two Options, Option I and Option II in list of HEMM as detailed in

Section 3.5.7

The top OB will be mined and transported by Hydraulic shovel in conjunction with Rear Dumper, as per the List of HEMM. The intervening parting including thin partings will be mined along and transported by Hydraulic Shovel and Rear Dumper as per List of HEMM.

The coal and intervening parting benches would be formed parallel to the coal seams and would be mined by inclined slicing method. The top OB benches will be formed horizontally above roof of top seam and will be mined by horizontal slicing method. However the OB benches immediately above the roof of topmost seams would be formed parallel to the coal seams roof to avoid the formation of triangular rib of OB, which is likely to mix-up with coal after blasting. The maximum top OB benches height would be maintained at 15m and in case of coal and intervening parting benches the height will be 10m or as the parting thickness permits.

3.5.5. Coal Winning

Surface miner will be deployed in combination with 35 T Dump truck along with auxiliary HEMM like 4.5 cum front end loader are provided in the project for coal extraction.

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

A. For Overburden working in the coal seam.

Top OB	-	15m
1. Proposed minimum Bench Width		
Working Bench Width for 7.0 m^3 Hyd. Shovel	-	40m
Non-Working Bench Width for 7.0 m^3 Hyd. Shovel	-	20m
Working Bench Width for 3.5 m^3 Hyd. Shovel	-	40m
Non-Working Bench Width for 3.5 m^3 Hyd. Shovel	-	20m
2. Width of the permanent haul road	-	30m

3. Width of the temporary transport ramp	-	20m
4. Usual height of the spoil dump bench	-	30m
5. The width of the active dump bench	-	60m
6. Bench Slope		
OB Bench	-	70°
Coal Bench	-	70°
Dump Bench	-	37°
7. Overall (ultimate) pit slope (for 155m depth)	-	41°

B. For Surface miner working in the coal seam.

a) Height of the bench - equal to thickness of coal seam

b) Width of the working bench -150 m

c) Length of the bench - 600 m

d) High wall angle of the bench -70°

The above parameters may be modified according to the actual working condition. The high wall angle for the soft OB bench will not be steeper than 45^{o}.

In this mining plan report, it has been envisaged that the mine will be worked for 330 days per annum i.e. 7 days per week.

3.5.6. Calendar Plan

The summarized calendar programme of excavation is given in Table below which has been developed based on adopted sequence of open cast mine development at optimum condition of mining operation in the block. Detailed calendar programme (year wise) is given in table below:-

Year	Coal	Cumulative Coal	Overburden	Cumulative Overburden	Running SR	Cumulative SR
	Mt	Mt	Mcum	Mcum	Cum/t	Cum/t
1	-	-	16.91	16.91	-	-
2	0.50	0.50	21.82	38.73	43.64	77.46
3	2.00	2.50	25.66	64.39	12.83	25.76
4	2.00	4.50	27.85	92.24	13.93	20.50
5	2.00	6.50	29.41	121.65	14.71	18.72
6	4.00	10.50	29.41	151.06	7.35	14.39
7	2.00	12.50	10.85	161.91	5.43	12.95
8	2.00	14.50	10.85	172.76	5.43	11.91
9	1.50	16.00	8.14	180.90	5.43	11.31
10	1.00	17.00	5.43	186.33	5.43	10.96
11	0.78	17.78	4.23	190.56	5.42	10.72
Total	**17.78**		**190.56**		**10.72**	

3.5.7. Selection of HEMM

The lead of coal and lead of partings/OB have been considered as 3.0-4.0 Km & 1.0 - 2.0 Km respectively.

The annual productivity of shovel with matching dumper combination adopted in this project as per the prevalent norm in Indian coal Industry is given below on 330 working days basis.

Sl.No.	Particulars	Unit	Annual productivity
1.	OBR 7.0 Cum hydraulic Back-hoe +RD 100 T 3.5 Cum hydraulic Back-hoe +RD 35 T	Mcu Mcum	2.03 0.95
2	Coal Surface Miner	Mt	2.80

Productivity of Rear dumpers with matching shovels at different lead in km is given in table below.

	1.0km	2.0km	3.0km	4.0km	5.0km
7.0 Cum Electric hydraulic Back-hoe + RD 100 T	0.63	0.47	0.37	0.31	0.26
3.5 Cum hydraulic Back-hoe + RD 35 T	0.21	0.14	0.11	0.09	0.07
4.5 Cum FEL + RD 35 T (Coal)	0.40	0.25	0.20	0.14	0.11

Because of geo-mining conditions of the proposed quarry, inclined slicing system of mining is adopted. As this mine is proposed to be outsourced, two options of equipment configuration have been proposed. In option I, it is proposed to deploy 3-3.5 cum Hyd. shovel in combination with 35T dump truck. In option II, it is proposed to deploy 3-3.5 cum Hyd. shovel in combination with 35 T dump truck and 7- cum Hyd. shovel in combination with 100 T dumper. Based on site condition, one option out of two will be selected. Requirement of HEMM in the project for achieving the target capacity of coal production is given in table below:

LIST OF HEMM

Sl. No.	Equipment	Size	Peak Requirement	Yr-06 Peak Capacity Option – I	Yr-06 Peak Capacity Option – II
A. OVERBURDEN					
1.	Diesel Hydraulic Back-hoe	7.0 Cum	3	-	3
2.	Dumper	100 T	20	-	20
3.	Diesel Hydraulic Back-hoe	3.0 to 3.5 Cum	31/25	31	25
4.	Dumper	35 T	165/137	165	137
5.	Diesel Drill	250 mm	1	-	1

6.	Diesel Drill	160 mm	8	9	8
7.	Dozer	450 hp	4	4	4
B. COAL					
1.	Surface Miner	2200 mm	2	2	2
2.	Dumper	35 T	19	19	19
3.	Front end loader	4.5 Cum	3	3	3
C. COMMON					
1.	Grader	280 hp	2	2	2
2.	Crane	50 T	1	1	1
3.	Crane	30 T	1	1	1
4.	Crane	8 / 5 T	1	1	1
5.	Diesel Back-hoe	1 Cum	1	1	1
6.	Front end loader	1-2 Cum	1	1	1
7.	Diesel Drill	100 mm	1	1	1
8.	Dozer	450 hp	2	2	2
9.	Diesel browser		1	1	1
10.	Fire tender		1	1	1
11.	Boom Truck		1	1	1
12.	Heavy duty toe truck		1	1	1
13.	Fork Lift truck		1	1	1
14.	Tipping truck	8 T	2	2	2
15.	Vibratory Compactor	25 T	1	1	1
16.	Tyre handler		1	1	1
17.	Mobile maintenance van		2	2	2
18.	Water Sprinkler	28 kl	3	3	3
D. RECLAMATION					
1.	Grader	280 hp	1	1	1
2.	Dozer	410 hp	1	1	1
3.	Water Sprinkler	28 kl	1	1	1
4.	Farm Truck		1	1	1

3.5.8. Coal Transportation from Mine

Overburden transportation

Over burden will be transported by dumpers to respective OB dumps as explained in Section 3.5.4. Haul road has been provided for movement of dumpers.

Coal Transportation

It has been planned to bring coal from coal face to surface by dumpers to Coal stock yard. From stock yard, Coal will be transported by tipper to the designated Railway Siding and will be loaded on the wagons by front loaders. From Railway Siding to the Coal will carried by railway rakes to the designated End User Plants (EUPs).

3.6 Raw material required along with estimated quantity, likely source, marketing area of final product/s, Mode of transport of raw material and final product.

No raw material is required. Diesel is required for transport vehicles, operation of HEMM and generators in case of emergency. Explosives will be used for blasting operations. Eventually, Coal will be dispatched by road and rail to the End Use Plants (EUP's).

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3.7 Resource optimization/recycling and reuse envisaged in the project

3.7.1. Top Soil

Top soil will be scrapped by dozer before the ground preparation for drilling and blasting. Scraped top soil will be transported to the top soil storage area. During initial period of mining the top soil shall be directly utilized for plantation of saplings along the proposed roads and barren land. As and when the internal waste dump gets stabilized the stored top soil will be spread over the area of dump to facilitate plantation.

3.7.2. Backfilling

As no external OB dumps are proposed to be constructed in future, all the OB generated will be backfilled into the excavated area.

3.7.3. Water

To meet the industrial water demand of the Project, mine water has been envisaged for water supply system. A provision of a storage tank has been made to supply the needs of industrial purposes. From this tank water will be distributed to the office complex and such other places wherever required after treatment. The pumped out water will be led into a sedimentation Pond for proper treatment before it is used for industrial purposes like washing of equipments, utilities, sprinkling for dust suppression etc. and afforestation on the reclaimed area.

Waste water will be generated in the workshop where the Dumper & other mining equipment will be washed regularly. It is proposed to provide an Effluent Treatment Plant for treatment of effluent from workshop. Treated water will be recycled for washing in the workshop. This will reduce fresh water requirement.

3.8 Availability of water its source, Energy/ power requirement

3.8.1. Power

Heavy Earth Moving Machines consume significant power in opencast project. Mine dewatering, workshop, offices, colony etc. add to the total power demand of the project. On achieving the targeted coal production and commissioning of Workshop and Main pumps, the power demand is expected to touch the maximum demand.

- Based on Rated capacity of 4.0 MTY ROM Coal form Tara(East) & Tara(West) coal Block tentative requirement of power shall be in the range of 2-3 MVA at 33 kV.
- Provision of DG sets has been made for emergency power supply for

important services like pumping, workshop etc.

- Restricted earthing has been envisaged for Electrical System. All electrical system will have protection from lightning and high voltage surge.
- Switching station and substation shall be equipped with all safety features firefighting system.

3.8.2. Water Supply & Sewerage

It has been envisaged that the requirement for the potable water demand for the colony shall be met from deep bore well. Water will be stored in a ground reservoir envisaged in the colony area. This water is proposed to be treated and supplied to colony through gravity after being pumped to an overhead tank, located within the colony. To meet the industrial water demand of 1st year of the Project, deep well boring has been envisaged for water supply system. A provision of an overhead tank has been made to cater the needs of potable water as well as water for industrial purposes. This overhead tank will be fed with treated water from the proposed bore wells. From this tank water will be distributed to the office complex and such other places wherever required through gravity flow. From this tank, water for industrial purposes has also been considered to be delivered to the various industrial buildings, administrative complex & quarry sites and is proposed to be distributed by gravity to the point of consumption through a distribution network. However, provision of ground sumps with necessary pumps, at places, has also been envisaged as per technological needs. Pumped out water from mine will be used for industrial use after its treatment. For Industrial purpose like workshops, stores and quarry area, fire fighting separate distribution networks have been proposed from the ground reservoir. Provision towards requirement of water for public utilities like garden, afforestation etc. has been made. It has been envisaged that the distribution network for fire fighting purposes shall also be utilised for these purposes. Colony sewage has been proposed to be dealt through Sewage Treatment Plant. It has been considered that the industrial wastes from workshop and other industrial establishments would be led through oil & grease traps. The effluent coming out of the industrial premises is proposed to be treated and led to the settling tank and to be recycled for various

industrial uses for this project. The domestic sewage generated in industrial premise has been considered to be dealt in septic tanks and soak pits.

3.9 Quantity of wastes to be generated and scheme for their Management/disposal.

The opencast mine is planned up to 255 m depth with overall average stripping ratio of 10.72 cum/tonne.

The total volume of OB for balanced reserve of 17.78 MT has been estimated as 190.56 Mcum.

From start of Mining operation from 1997, 53.83 MT of coal excavated in the process generating 183.25 Mcum of OB, Out of which 149.25 Mcum has been backfilled in internal dumps and 34 Mcum has been dumped in external surface dumps. The surface area of backfill dump (corresponding to local original level 100-130mRL) is 115.68 ha.

Further, 190.56 Mcum of OB generated during 11 years of mine life will be accommodated in internal dumps by backfilling and no external dumps will be created. After stabilization of internal dumps, top soil will be spread and plantation will be carried out as part of progressive closure activity.

At the end of mine closure, external dumps will be reclaimed and backfilled in the internal dumps as part of final closure activity.

DETAILS OF EXTERNAL OB DUMPS

Dump No	Bottom Area, (Ha)	Height m	Volume MCum
OB Dump – 1	35.35	60	14.20
OB Dump – 2	35.68	60	14.96
OB Dump – 3	9.53	30	2.73
OB Dump – 4 and Embankment	15.65	30	2.82
Total	**96.21**		**34.00**

Year wise Internal and External dump with elevation wise are given in table below:-

Elevation wise Internal Dump OB Quantity (Mcum)						Elevation wise External Dump OB Quantity (Mcum)					Total
Elevations	Current	Yr-01	Yr-03	Yr-05	Final	OB dump-1	OB dump-2	OB dump -3	OB dump –4		
150 to 180	-	-	1.9	4.43	4.51						4.51
120 to 150	0	10.15	10.78	25.1	28.95						28.95
90 to 120	16.49	23.25	25.66	38.26	47.85						47.85
60 to 90	40.16	40.16	49.74	50.83	63.65						63.65
30 to 60	38.68	38.68	47.37	48.56	60.93	5.12	7	-	-	12.12	73.05
0 to 30	29.97	29.97	37.89	39.61	49.95	8.73	7.6	2.73	2.82	21.88	71.83
-30 to 0	17.74	17.74	24.65	27.36	34.99						34.99
-60 to -30	5.99	5.99	11	15.65	20.66						20.66
-90 to -60	0.22	0.22	3.19	8.97	12.2						12.2
-120 to -90	0.00	0	1.35	6.47	8.7						8.7
Up to -120	0	0	0.11	5.66	7.42						7.42
Total	149.25	166.16	213.64	270.9	339.81	13.85	14.6	2.73	2.82	34	373.81

Elevation wise backfilled in Internal Dump from external dump and above ground level (+120m) OB Quantity (Mcum) at the time of mine closure				
Elevations	**Closure year – 01 (12th year)**	**Closure year – 02 (13th year)**	**Closure year – 03 (14th year)**	**final mine closure**
150 to 180				
120 to 150				
90 to 120				
60 to 90				
30 to 60			11.33	11.33
0 to 30		10.74		10.74
-30 to 0		0.59		0.59
-60 to -30	8.49			8.49
-90 to -60	2.85			2.85
-120 to -90				
Up to -120				
Total	**11.34**	**11.33**	**11.33**	**34.00**

Elevation wise final Internal Dump OB Quantity (Mcum)				
Elevations	**Closure year – 01**	**Closure year – 02**	**Closure year – 03**	**final mine closure**
150 to 180	4.51	4.51	4.51	4.51
120 to 150	28.95	28.95	28.95	28.95
90 to 120	47.85	47.85	47.85	47.85
60 to 90	63.65	63.65	63.65	63.65
30 to 60	60.93	60.93	72.26	72.26
0 to 30	49.95	60.69	60.69	60.69
-30 to 0	34.99	35.58	35.58	35.58
-60 to -30	29.15	29.15	29.15	29.15
-90 to -60	15.05	15.05	15.05	15.05
-120 to -90	8.70	8.70	8.70	8.70
Up to -120	7.42	7.42	7.42	7.42
Total	**351.15**	**362.48**	**373.81**	**373.81**

4. SITE ANALYSIS

4.1. Connectivity.

The coal mine is ideally located and is well connected by both rail and road. The Andal – Gourangdih section of the Eastern Railway passes through the eastern and north-eastern part of the coal mine in a south-east to north-west direction. The Churulia – Dohomani Road which connects the G.T. Road with Ajoy Ghat passes through the western part of coal mine. Asansol, a major town in the Raniganj Coalfield, is situated at a distance of about 20 km by road to the south-west to the coal mine.

4.2. Land Form, Land use and Land ownership

4.1. Land Form

The Tara (East) and Tara (West) Coal Mine of project area 937.44 Ha of land distributed 5 villages and are non-forest land. It administratively falls under the Jhamuria Block and P.S. of Paschim Bardhaman district, West Bengal. The revised mining plan covers excavation area of 405.06 Ha within the vested block boundary, 50.58 Ha of safety zone, 137.44 ha of area outside block boundary for infrastructure, existing external dumps, explosive magazine, employee's colony etc.

4.2. Land Use Pattern

4.3. Land ownership

Type of Land	Sub-type	Area in Ha.
Tenancy	Agriculture	795.12
	Barren	96.21
Govt Non	Water Body	4.88
	Others	31.23
Forest		-
Free Hold		10
Total		**937.44**

4.3. Topography and drainage

The area has a gently undulating topography with the general slope towards south largely being controlled by southernly dipping Gondwana sediments. In the north-eastern and north-central part of the block, compact coarse grained sandstone have given rise to small mounds. The ground elevation varies from 133 m around the boreholes TR-6, 68 & - 52 in the northern part of the block to about 92m around borehole TR-35 in the eastern part.

A perennial nala traverses across the block and passes through the central part and drains the area to Ajoy river flowing in the eastern proximity of the block. River Ajoy is the main drainage channel flowing from north-west to south-east. There are some shallow ponds within the block.

Note: Surface topography of the area has been shown in Annexure-III.

4.4. Existing land use pattern, shortest distances from the periphery of the project to periphery of the forests, water bodies.

The total area of Tara (East) & Tara (West) Coal Block project is 937.44 hectares which is Non- forest.

Pre mining and proposed land use requirement and its breakup have been given in table below:

Land use Pattern

Pre- Mining Land Use (Ha)			Type	Land Use	Land Use	Land Use (Post Closure)								
				(During Mining)	(End of Life)	Agricultural Land	Plantation	Water Body	Public/ Company Use	Water Harvesting	Dismantled area	Forest Land Returned	Undisturbed	Total
Tenancy	Agricultural	795.12	Excavation Area	405.06										
	Township		Backfilled Area		350.03		350.03							350.03
	Grazing		Excavated Void		55.03			55.03						55.03
	Barren	96.21	Without Plantation											
	Waterbodies		Top Soil Dump											
	Road		External Dump	96.21	96.21		96.21							96.21
	Community		Safety Zone/ Rationalisation area	50.58	50.58		50.58							50.58
	Inhabitated		Road Diversion	3.59	3.59				3.59					3.59
	Village		Diversion /below river / Nala/ canal	6.1	6.1			6.1						6.1
Govt. Non-Forest	Agricultural		Road and Infrastructure	21.27	21.27				21.27					21.27
	Township		Garland drains											
	Grazing/Others		Embankment											
	Road		Green Belt	9.96	9.96		9.96							9.96
	Water body	4.88	Water reservoir near pit / Water body	4.88	4.88			4.88						4.88
	Other	31.23	UG entry											
Forest	Reserve		Pit head power plant											
	Protected		Resettlement											
	C-J-B-J		Undisturbed/ Mining right for UG	329.79	329.79								329.79	329.79
Free Hold		10	Others (Colony)	10	10				10					10
Total		937.44	Total	937.44	937.44		506.78	66.01	34.86				329.79	937.44

4.5. Existing infrastructure

Mine has been operational since 1997-98. All facilities and infrastructures like office buildings, workshop, stores, coal depot, workers colony, restrooms, diesel dispensing units, maintenance area for HEMM, residential colony for employees etc. are already available on project area outside geological block boundary.

4.5.1. Services

The company will use existing infrastructure for its operations. It is also expected from the company to provide infrastructure improvement for the local community. Among the infrastructure that will be provided are roads, workshops and stores, water management structures and machinery, potable and industrial water supplies, offices, communications, and housing for the workforce, and transport to and from work site for most employees.

Workshop

Work-Shop will consists of 3 sections and described below

Field Work

Shops for carrying daily routine checkup and Oiling/greasing of HEMM like Dumper, Dozer, Shovel, Surface Miner etc.

Excavation Workshop

For Scheduled maintenance, including minor and major repairs of HEMM Dumper, Dozer and, Shovel, Surface miner etc.

Electrical and Mechanical Workshop

Daily Scheduled maintenance, minor & major repair of pumps, Power distribution system etc

Repair and Maintenance of light vehicles

Scheduled major repair and capital overhauls, besides breakdown repairs will be undertaken.

4.5.2. Project Store

The project store is for all kinds of materials, spares, equipment and consumables required for mine operation and maintenance of mining, mechanical and electrical equipment. The storage capacity has been planned for 1 to 2 months consumption of materials. Proper working environment, cleanness and safety measures equipment and material handling facilities have also been provided.

4.5.3. Road

Colony roads

Provision for culverts, tree guards and drains would be provided.

Haul road

Haul roads suitable for rear dumpers with side drains and dozer path would be provided within the mining area.

Heavy duty road

Provision for heavy duty road has been made for the dumpers arranged in the benches will go to the workshop for maintenance as well as dump for dumping. The type of road suitable for 100T & 35T class rear dumpers would be connecting with workshop, fuel station and dumps etc.

Project approach road

Approach road for project area is already available and further repair will be done to access project office, workers residence and explosive magazine etc

4.5.4. Water supply and sewage

Colony water supply

It has been envisaged that the requirement for the potable water demand for the

workers residential area shall be encountered by bore well after taking necessary clearance from concerned authority. This water is proposed to be treated and supplied to workers residential area through gravity after lifting by pump to an overhead tank, located within the area.
Workers residential area sewage has been proposed to be distributed through septic tanks, soak pits as well as Sewage Treatment Plant.

Industrial water supply

To meet the industrial water demand of the Project, mine water has been envisaged for water supply system. A provision of a storage tank has been made to supply the needs of industrial purposes. From this tank water will be distributed to the office complex and such other places wherever required after treatment.

From this tank, water for industrial purposes has also been considered to be delivered to the various industrial buildings, administrative complex & quarry sites and is proposed to be distributed to the point of consumption through a distribution network. Pumped out water from mine will be used for industrial use after its treatment.

For firefighting purposes in the industrial areas like workshops, stores and quarry area, separate distribution networks have been proposed from the ground reservoir. Provision towards requirement of water for public utilities like garden, afforestation etc. has been made.

In course of mining, waste water will be collected in the sump constructed in the dip most area. Source of mine water will be rainwater and ground water seepage. The pumped out water will be led into a sedimentation Pond for proper treatment before it is used for industrial purposes or discharged into natural drains.

Waste water will be generated in the workshop where the Dumper & other mining equipment will be washed regularly. It is proposed to provide an Effluent

Treatment Plant for treatment of effluent from workshop. Treated water will be recycled for washing in the workshop. This will reduce fresh water requirement.

4.5.5. Buildings

The Workers residential colony consists of type quarters, community and welfare building set for the proposed Project. The colony has been envisaged as shown in surface plan.

The Service buildings include community buildings like dispensary, staff rest houses etc. apart from offices, workshop & stores, sub-stations, shovel erection yard, magazine & other statutory buildings like canteen, first aid centre, rest shelter, training centers, pit head bath, fire station etc.

4.5.6. Sub-Station

Sub-station has been considered to provide for the requirements of the Project & township.

4.5.7. Explosive Mangzine

Required provision for explosive magazine has been made within project area.

4.5.8. Statutory buildings

There are provisions for canteen, first aid centre, rest shelter, training center, pit head bath etc.

4.5.9. Electrical power supply

Mine dewatering, workshop, offices, colony etc. add to the total power demand of the project. On achieving the targeted coal production and commissioning of Workshop and Main pumps, the power demand is expected to touch the maximum demand.

Based on Rated capacity of 4.0 MTY ROM Coal form Tara(East) & Tara(West) coal Block tentative requirement of power shall be in the range of 2-3 MVA at 33

kV.

4.5.10. Lighting

Providing of DG sets has been made for emergency power supply for important services like pumping, workshop etc.

The lighting systems are envisaged to cover Mine Area, Haul Road, Coal Handling Plant, Workshops, Service & Residential buildings and electrical rooms etc.

4.6. Soil classification

Different types of soil are encountered in different topographical biological and hydrological as well as geological condition within the Paschim Bardhaman district. In the west, coarse gritty soil blended with rock fragments is formed from the weathering of pegmatites, quartz veins and conglomeratic sandstones, where as sandy soil characteristic of granitic rocks and sandstones. This soil is of reddish colour, medium to coarse in texture, acidic in reaction, low in nitrogen, calcium, phosphate and other plant nutrients. Water holding capacity of this soil increases with depth as well as with the increase of clay portions.

Towards the east alluvial soil attains an enormous thickness in the low level plains to the east. This alluvial soil is formed of alluvium brought down by the Ajay, Damodar, Bhagirathi and numerous other rivers. These soils are sandy, well drained and slightly acidic in nature.

Soil quality of the area has been monitored with respect to physical and chemical parameters. The bulk density of the soil samples is found to vary from 1.15 to

1.63 g/cc, which indicates favorable physical condition. The particle density varies from 2.18 to 3.43. The moisture contents are found to vary from 1.18 to 2.15%. The water holding capacity also varies from 19.50 to 39.25% being maximum in the case of agricultural soil, which may be due to its high clay

content. All the soil samples are analyzed for the chemical parameters namely pH, organic carbon, available nitrogen, phosphorous, potassium content. No adverse impact on soil quality is anticipated.

4.7. Climate data from secondary sources

Environmental study was conducted by CSIR, Dhanbad in May-2014 sponsored by prior allottee. The detailed studies with respect to air, water and noise have been carried out four times in year 2013.

4.7.1. Quality of ambient Air

The topographical information of project site as well as of the study area detail about different activities related to the coal mining and associated activities were collected.

Different air pollution parameters like PM2.5, PM10, CO, SO2, and NOx were identified as related to the project activities for representing baseline status of ambient air quality with the study area. Fugitive emissions were also estimated with reference to mining operation.

Air quality monitoring in core zone and buffer zone of the Tara (East & West) mine has been carried out in post monsoon seasons (Oct to December, 2013) to assess the impact of coal mining as well as coal transport on the ambient air quality in buffer zone and core zone. In this study the sampling location for ambient air quality are BA1, BA2, BA3 (buffer zone) and CA1 & CA2 (Core zone) as described in Table below.

LOCATION OF AMBIENT AIR QUALITY STATIONS

Stn. Code	Location	Source of Air Pollution
Core Zone		
CA1	Near Mine Office	Mining area and transportation of coal, poor condition of road, heavy vehicular
CA2	Near Mine Face	Mining area and transportation of coal, haulage road, vehicular movement, etc.
Buffer zone		
BA1	Churulia Village (Near N.K. High School)	Close proximity of mining area, Household coal burning and vehicular movement, etc.
BA2	Jay Nagar Village	Close proximity of mining area, household coal burning and vehicular movement, etc.
BA3	Chinchurbill Village	Close proximity of mining area, Household coal burning and vehicular movement, etc

The results of air quality in these locations are summarized below:

Villages in and around the mining site are least affected by the mining activities, which is obvious from the ambient air quality at these locations.

Results and Discussions (Environment Study Report, Post Monsoon Season, 2014 by CSIR-CIMFR)

During post-monsoon season, PM2.5 concentration in core zone varies from 40.8µg/m3 to 54.3 µg/m3 near Mine Office (CA1) which is well below to the threshold limit value and 52.2 µg/m3 to 65.3 µg/m3 at near Mine Face (CA2) which is slightly above the threshold limit value of 60 µg/m3 during 3rd week of the month December. The PM10 concentration level varies from75.5 µg/m3 to 92.1 µg/m3 near the Mine Office (CA1) which is well below the threshold value and 95.2

µg/m3 to 112.5 µg/m3 near Mine Fact (CA2) which is slightly above the threshold limit value of 100 µg/m3.

During post-monsoon season, the PM2.5 concentration in buffer zone is in the range of 38.9 µg/m3 to 52.1 µg/m3 at Churulia village (BA1), 41.2 µg/m3 to 46.7 µg/m3 at Jay Nagar Village (BA2) and 37.2 µg/m3 to 45.3 µg/m3 at Chinchurbil Village (BA3) which is well below to the threshold limit value of 60 µg/m3 as per the guideline of NAAQS, 2009. The concentration of PM10 ranges from 68.2 µg/m3 to 85.4 µg/m3 at Churulia village (BA1) 70.7 µg/m3 to 80.5 µg/m3 at Jay Nagar Village (BA2) and 65.2 µg/m3 to 79.4 µg/m3 at Chenchurbill Village (BA3) which is well below to the threshold limit value of 100 µg/m3 as per the guideline of NAAQS, 2009.

Concentration of SO2 and NO2 are also found within the limit 80 µg/m3 as per the guideline of NAAQS at all the sites in both buffer and core zone areas during the entire monitoring period.

No adverse impact on air quality is anticipated as the production in future will be same (4MTPA) than done in the past (4MTPA) and also due to the reason that no external dump will be required to be constructed in future.

Ambient Air Quality of Tara (East) and Tara (West) Mine area

Area: Core Zone		**Season:** Pre-monsoon & Monsoon			
Sampling Location: Near Mine Office		**Duration of Sampling:** 24 hours			
Sampling Period		**Parameters (µg/m^3)**			
Month	**Week**	$PM_{2.5}$	PM_{10}	SO_2	NO_2
October – 2013	2nd Week	40.8	75.5	21.4	32.5
	4th Week	45.5	79.8	22.2	33.6
November – 2013	1st Week	48.1	81.6	23.2	34.1
	3rd Week	46.5	80.1	22.7	35.2
December 2013	1st Week	54.3	92.1	21.4	32.5
	3rd Week	50.6	85.8	22.2	48.9
Standard as per NAAQS-2009		**60**	**100**	**80**	**80**

Area: Core Zone		**Season:** Pre-monsoon & Monsoon			
Sampling Location: Near Mine Face		**Duration of Sampling:** 24 hours			
Sampling Period		**Parameters (µg/m^3)**			
Month	**Week**	$PM_{2.5}$	PM_{10}	SO_2	NO_2
October – 2013	2nd Week	52.4	95.2	22.8	41.5
	4th Week	52.2	93.5	21.4	39.6
November – 2013	1st Week	56.8	96.2	21.8	40.2
	3rd Week	62.8	108.2	22.5	41.1
December 2013	1st Week	52.9	96.2	22.8	41.5
	3rd Week	65.3	112.5	21.4	45.3
Standard as per NAAQS-2009		**60**	**100**	**80**	**80**

Area: Buffer Zone		**Season:** Pre-monsoon & Monsoon			
Sampling Location: Churulia Village		**Duration of Sampling:** 24 hours			
Sampling Period		**Parameters (µg/m^3)**			
Month	**Week**	$PM_{2.5}$	PM_{10}	SO_2	NO_2
October – 2013	2nd Week	38.9	68.2	20.7	23.1
	4th Week	42.9	70.4	22.1	23.8
November – 2013	1st Week	45.1	76.5	22.7	24.2
	3rd Week	47.2	81.4	21.5	23.9
December 2013	1st Week	44.6	78.2	20.7	23.1
	3rd Week	52.1	85.4	22.1	23.8
Standard as per NAAQS-2009		**60**	**100**	**80**	**80**

Area: Buffer Zone		**Season:** Pre-monsoon & Monsoon			
Sampling Location: Joynagar Village		**Duration of Sampling:** 24 hours			
Sampling Period		**Parameters (µg/m^3)**			
Month	**Week**	$PM_{2.5}$	PM_{10}	SO_2	NO_2
October – 2013	2nd Week	41.7	70.7	20.5	23.5
	4th Week	42.1	72.5	20.9	24.2
November – 2013	1st Week	45.1	77.8	21.4	24.6
	3rd Week	41.2	73.5	22.2	25.1
December 2013	1st Week	44.4	75.2	20.5	23.5
	3rd Week	46.7	80.5	20.9	24.2
Standard as per NAAQS-2009		**60**	**100**	**80**	**80**

Area: Buffer Zone		**Season:** Pre-monsoon & Monsoon			
Sampling Location: Chinchurbill Village		**Duration of Sampling:** 24 hours			
Sampling Period		**Parameters (µg/m^3)**			
Month	**Week**	$PM_{2.5}$	PM_{10}	SO_2	NO_2
October – 2013	2nd Week	37.2	65.2	20.4	22.5
	4th Week	40.1	70.3	21.3	23.6
November – 2013	1st Week	38.7	67.9	21.5	22.8
	3rd Week	42.1	71.3	21.8	23.3
December 2013	1st Week	44.2	77.6	20.4	22.5
	3rd Week	45.3	79.4	21.3	23.6
Standard as per NAAQS-2009		**60**	**100**	**80**	**80**

(Source: Environmental Study of Tara (East) and Tara (West) Captive Opencast Coal Mine by CSIR – May 2014)

4.7.2. Quality of ambient noise

Noise often defined as unwanted sound, interferes with speech communication, causes annoyance, distracts from work, disturb sleep thus deteriorating quality of human environment. Noise levels were measured at several locations in the human settlements around the mining site by using precision noise level meter (Mip-OY Integrated Sound Level meter IEC- 179A).

Detailed analysis of noise has revealed that there is no noticeable impact of noise in the surrounding environment. All the study sites in the residential areas exhibited a noise level well within the corresponding threshold limit value as prescribed by CPCB, both during the day and night time. At Churulia the noise level is slightly higher as compared to the other sites. It is mainly due to the traffic and commercial activity of the town area. The result along with monitored location and sound levels are given in Tables below:-

AMBIENT NOISE LEVEL IN THE BLOCK

NOISE LEVEL IN CORE ZONE OF THE STUDY AREA (JANUARY – 2013)

Noise Level dB(A) average							
Stn Code	**Location**	**Day. Time**			**Night time**		
		Min.	**Max.**	**Average**	**Min.**	**Max.**	**Average**
N1	Near Mine Office	42.6	65.8	57.2	38.2	59.8	50.2
N2	Mining Area	54.5	76.5	70.6	41.2	66.8	60.4
N3	Near OB dump	47.2	70.8	61.7	39.6	57.8	48.2
N4	Near Workshop	50.2	78.2	71.4	40.2	65.4	58.4

Standards as per CPCB 75 70

NOISE LEVEL IN BUFFER ZONE OF THE STUDY AREA (JANUARY 2013)

Noise Level dB(A) average							
Stn Code	**Location**	**Day. time**			**Night time**		
		Min.	**Max.**	**Average**	**Min.**	**Max.**	**Average**
N5	Churulia village near	36.5	56.2	48.6	34.1	48.8	42.3

	High School						
N6	Jay Nagar Village	36.0	55.7	47.5	35.4	52.2	42.0
N7	Chinchurbill Village	35.5	52.5	45.2	33.4	51.6	40.4

Standards as per CPCB 55 45

No adverse impact on noise levels is anticipated as the production in future will be same (4 MTPA) than done in the past (4MTPA) which will require deployment of less equipment than in past. Blasting in coal will be eliminated as in future surface miners will be deployed unlike shovels in involving drilling blasting.

4.7.3. Quality of Water

Information on water resource in the study area was collected. The water resources in the study area are mainly river and groundwater. Ajoy River is flowing on the north eastern part of the lease area. The parameter to prime importance for water quality studies were selected under physical, chemical, inorganic, chemical organic, chemical organic, nutrient and heavy metal groups. To assess the water quality of the area water samples from four locations (tube well near GM office/mine office, well water of Churulia village, mine water and rive water) were collected. The analysis was carried out in the filed as well as in the Laboratory and results in presented from Tables below.

Quality of ground water has shown that there is no significant impact of mining on water quality of region. TSS, TDS, Oil & Grease, COD, trace metals and other parameters are found within their respective threshold limits. Mine Water quality also does not show any high value as it remains within the pit, where the contaminants settle before the mine water discharge. As far as river water is concerned, its quality shows its acceptability as is not affected by Tara mine effluents. The level of TSS, TDS and DO in the river water were found within threshold limit.

MINE DISCHARGE WATER QUALITY DATA

Area: Core zone		Season: Pre-monsoon		
Name of the Sampling Station:				
Sl. No.	Parameters	Station Code		MoEF Sch.-VI Standard
		W1 Mine Water (East Pit)	W2 Mine Water (West Pit)	
1.	Colour, Hazen units, Max	<5	<5	5
2.	Odour	Unobjectionable	Unobjectionable	Unobjectionable
3.	Total suspended Solids, mg/l, Max	62	56	100
4.	pH	8.02	7.5	6.5-8.5
5.	Temperature (°C)	26.5	26.6	
6.	Oil & Grease, mg/l, Max	5.7	4.5	10
7.	Total Residual Chlorine, mg/l, Max	0.4	0.3	1.0
8.	Ammonical Nitrogen, (as N) mg/l, Max	1.324	1.421	50
9.	Total Kjeldahi,Nitrogen, (as NH3) mg/l, Max	1.162	1.352	100
10.	Free Ammonia (as NH3) mg/l, Max	0.238	0.387	5.0
11.	BOD (3 days at 27°C), mg/l, Max	1.2	1.0	30
12.	COD, mg/l, Max	38.5	40.2	250
13.	Phenolic compounds (as C6H5OH) mg/l, Max	<0.001	<0.001	1.0
14.	Arsenic (as AS), mg/l, Max	0.002	0.003	0.2
15.	Lead (as Pb), mg/l, Max	0.001	0.001	0.1
16.	Cadmium (as Cd), mg/l, Max	0.001	0.001	2.0
17.	Hexavalent Chromium (as Cr6+), mg/l, Max	0.003	0.004	0.1
18.	Total Chromium (as Cr), mg/l, Max	0.008	0.006	2.0
19.	Copper (as Cu), mg/l, Max	0.008	0.012	3.0
20.	Zinc (as Zn), mg/l, Max	0.015	0.022	5.0
21.	Selenium (as Se), mg/l, Max	0.002	0.004	0.05
22.	Nickel (as Ni), mg/l, Max	0.016	0.015	3.0
23.	Fluorides (as F), mg/l, Max	1.12	1.39	2.0
24.	Dissolved Phosphate (as P), mg/l, Max	0.263	0.257	5.0
25.	Sulphide (as S), mg/l, Max	0.18	0.27	2.0
26.	Manganese (as Mn), mg/l, Max	0.011	0.014	2.0
27.	Iron (as Fe), mg/l, Max	0.95	1.03	3.0
28.	Nitrate (as N), mg/l, Max	5.82	7.85	10

$: Temperature shall not exceed 5°C above the receiving water temp. BDL: Below Detection Limit.

GROUND WATER QUALITY DATA

Area: Core Zone/Buffer Zone		Season: Pre-monsoon		
Name of the Sampling Station:				
Sl. No.	Parameters	Station Code		IS: 10500 (Desirable Limit)
		W3 Tube Well Water G. M. Office	W4 Well Water Churulia Village near N.K.High School	
1.	Colour, Hazen units, Max	<5	<5	5
2.	Odour	Unobjectionable	Unobjectionable	Unobjectionable
3.	Taste	Agreeable	Agreeable	Agreeable
4.	Turbidity, NTU, Max	1.24	1.12	5.0
5.	pH	7.83	7.77	6.5-8.5
6.	Total Hardness (as CaCO3)	132	70	300
7.	Iron (as Fe), mg/l, Max	0.125	0.109	0.3
8.	Chloride (as Cl-), mg/l, Max	16.5	10.0	250
9.	Total Dissolved Solid, mg/l, Max	265	140	500
10.	Calcium (as Ca), mg/l, Max	21.6	16.	9 75
11.	Magnesium (as Mg), mg/l, Max	14.2	6.	8 30
12.	Manganese (as Mn), mg/l, Max	0.019	0.014	0.10
13.	Sulphates (as SO4 -), mg/l, Max	64.1	31.8	150
14.	Nitrate (as NO3), mg/l, Max	2.5	20.0	45
15.	Fluorides (as F), mg/l, Max	0.52	0.17	0.06-1.2
16.	Boron (as B), mg/l, Max	0.019	0.018	0.5
17.	Arsenic (as AS), mg/l, Max	<0.001	<0.001	0.05
18.	Cadmium (as Cd), mg/l, Max	<0.001	<0.001	0.01
19	Lead (as Pb), mg/l, Max	<0.001	<0.001	0.1
20.	Copper (as Cu), mg/l, Max	0.019	0.015	0.05
21.	Hexavalent Chromium (as Cr6+), mg/l, Max	0.009	0.007	0.05
22.	Nickel (as Ni), mg/l, Max	<0.001	<0.001	0.001
23.	Selenium (as Se), mg/l, Max	<0.001	<0.001	0.01
24.	Silver (as Ag), mg/l, Max	0.014	0.009	-
25.	Zinc (as Zn), mg/l, Max	0.028	0.032	5
26.	Alkalinity, mg/l, Max	72	68	200
27.	Mineral Oil, mg/l, Max	<0.001	<0.001	0.001
28.	Coliform Organism (MPN/100 ml)	Absent	Absent	Absent

BDL: Below Detection Limit.

SURFACE WATER QUALITY DATA

Area: Buffer Zone		**Season: Pre-monsoon**	
Name of the Sampling Station:			
Sl. No.	**Parameters**	**Station Code** **W5- Ajay River, D/S of Mine**	**(IS: 2296)# Surface Waters Class "C" Tolerance Limits**
1.	Colour, Hazen units, Max	10	300
2.	Odour	Unobjectionable	Unobjectionable
3.	Dissolved Oxygen, mg/l, Min.	6.8	4
4.	pH	7.29	6.5-8.5
5.	BOD (3 days at 27°C), mg/l Max	1.5	3
6.	Phenolic compounds (as C6H5OH), mg/l, Max	<0.001	0.005
7.	Total Hardness (as CaCO3), mg/l, Max	152	NS
8.	Iron (as Fe), mg/l, Max	0.632	50
9.	Chloride (as Cl-), mg/l, Max	12.5	600
10.	Total Dissolved Solid, mg/l, Max	283	1500
11.	Calcium (as Ca), mg/l, Max	24.5	NS
12.	Magnesium (as Mg), mg/l, Max	22.0	NS
13.	Manganese (as Mn), mg/l, Max	0.019	NS
14.	Sulphates (as SO4), mg/l, Max	93.7	400
15.	Nitrate (as NO3), mg/l, Max	22.2	50
16.	Fluorides (as F), mg/l, Max	0.56	1.5
17.	Arsenic (as AS), mg/l, Max	0.017	0.2
18.	Cadmium (as Cd), mg/l, Max	<0.001	0.01
19.	Lead (as Pb), mg/l, Max	0.004	0.1
20.	Copper (as Cu), mg/l, Max	0.012	1.5
21.	Hexavalent Chromium (as Cr6+), mg/l, Max	0.018	0.05
22.	Selenium (as Se), mg/l, Max	<0.001	0.05
23.	Zinc (as Zn), mg/l, Max	0.026	15
24.	Coliform Organism (MPN/100 ml)	32	5000

#: Class "C" – Drinking water source with conventional treatment followed by disinfection.

BDL: Below Detection Limit.

NS: Not Specified

Quality of water is anticipated to improve as production in future will be same against that in the past (4 MTPA). Accordingly, the scale of equipment washing will also reduce which will be another factor for quality improvement.

4.8. Social Infrastructure available

There is no major social infrastructure available within leasehold boundary.

5. PLANNING BRIEF

5.1. Planning Concept

The mine boundaries of Tara (East) and Tara (West) block OCP have been fixed considering leasehold boundary, surface constraints, geological information and topography of the area. Based on borehole data, floor contour plans and seam folio plans are provided in the geological report prepared by CMPDIL. The floor of seam IV/IV B and IIITop/ III Bot. (wherever it is >1.2m thick) is envisaged as the floor of the quarry.

It is proposed to mine maximum area leaving a barrier of 7.5 m on surface from block boundary which is a statutory requirement. It is also required for the diversion of local village roads / local power lines, nala and telephone lines.

Coal will be sterilized in the following areas:

(a) Batter on both sides as well as high wall side.

(b) From Slope stability considerations, final quarry slope at the end of mining operations will be 45° from horizontal, leaving sufficient berm along the batter.

(c) 15m barrier against surface nallah flowing over the block.

(d) 7.5 barrier from block boundary in the western side only.

(e) 15m barrier against Ajoy River in the eastern end of the block boundary.

5.1.1. Mining Method

Mine Plan for Tara (East) & Tara (West) OCP has been prepared for a rated capacity of 4 Mty of power grade Coal. This output is prima facie considered

technically feasible because of its favourable geo-mining conditions like:

- Thickness of various seams,
- Their disposition & its splits,
- Comparatively long strike length and with deployment of HEMM
- Free from major geological disturbances
- Sufficient mineable coal reserves etc.

The top OB will be mined and transported by Hydraulic shovel in conjunction with Rear Dumper.

Surface miner will be deployed in combination with 35 T Dump truck along with auxiliary HEMM like 4.5 cum front end loader are provided in the project for coal extraction.

5.1.2. Design Criteria

The design criteria adopted in this project is as follows: -

- Number of annual working days --- 330
- Number of daily shifts /day --- 3
- Duration of each shift (hours) --- 8

The opencast mine would be worked on the 3-shifts/day and seven days/week round the year for coal extraction and overburden removal.

Geo-mining condition as given below

- Gradient of 12^0 - 15^0 of the coal seams.
- Multiple coal seams.(9 No. of Coal Horizons)
- Long strike length.
- Presence of medium thick coal seams along with thin seams.

- Variable thickness of OB/partings
- Less no. faults.

5.1.3. Mining Parameters

Mine parameters for the delineated mine boundaries are as follows:

Sl. no.	Parameters	Unit	Value
1	Quarry depth	m	17 - 255
2	Strike length:		
	along the Mine Floor	Km	4.10
	along the Mine Surface	Km	4.50
3	Dip rise length on the Mine Surface		
	Maximum	Km	1.29
	Minimum	Km	0.50

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

5.1.4. Drilling & Blasting pattern

This mine will be operated by Opencast Method of Mining. The method of blasting and requirement of the explosives has, therefore been separately described below. The total coal production planned is 4.00 MTPA.

After shot holes are drilled into the horizontal bench cut by the shovel, the OB benches are blasted using ANFO/SME/SMS with booster explosives and detonators or TLD and DTH combination. In this mine, main waste is overburden in the form of top soil, alluvium and weathered mantle and hard OB.

The drill is deployed on the horizontal bench cut by the shovel. From this level, blast holes are drilled down to the floor of the seam or bench, the length of holes

will be 10% longer than the height of the bench. Easy access to the drill is provided via the waste bench. In the blasting operations, shaking blast practices are proposed using low powder factor. This method will generate a set of cracks in the blasted strata with material movement reduced to minimum. It has been assumed that about 10% of the weathered mantle will not require blasting.

Holes of 160mm dia will be drilled both in top OB and OB partings Short delays will be used while blasting. The controlled blasting techniques will be adopted wherever required to reduce noise, ground vibrations and fly rocks.

The blast site layout, blasthole drilling and blast hole loading practices shall be carried out in such a manner so as to minimize fly rock. All open joints and cracks in rock shall be filled up before loading.

5.2. Population projection

There are mainly four (4) villages in the Core zone of Tara (East) and Tara (West) Coal mine. Demographic details of these villages as per Census 2011 is as below:

Sl. No.	Name of the Village	No of Househols	Total Population	Total Population Male	Total Population Female	Literacy %
1	Churulia	1628	8173	4203	3970	54%
2	Jaynagar	293	1402	741	661	62%
3	Desher Mohan	239	1195	605	590	57%
4	Chichurbil	356	1663	912	751	64%
	Total	**2516**	**12433**	**6461**	**5972**	**56%**

Although, Churulia and Jaynagar villages are within the Mining lease boundary, Desher Mohan and Chichurbil lies adjacent to the lease boundary area, there is no plan for any displacement or R&R consideration of these villages. Proper safety

zone of 100m is considered for planning mining activity as per regulation.

There are two (2) numbers of R&R Colony constructed by prior allottee in the core zone. These R&R colonies will be relocated outside Mine Lease area as per R&R policy of the state of West Bengal. Details of R&R colonies are as below:

Sl No	**Name of R&R Colony**	**No of Households**	**Population**
1	Dulalpur	34	160
2	Pialdanga	69	295
	Total	**103**	**455**

It is obvious to assume that the activities of the mining operations will improve the socio-economic levels in the study area. The anticipated impact of this project on various aspects is described in the following sections:

- **Impact on Human Settlement**

Human settlement is expected to increase after this project gets operational

- **Impact on Population Growth**

This project will have an impact on the population growth, as it will provide good value of employment to the families in the nearby villages. Preference will be given to local unemployed youth for employment during development of mine and in operation of mines which will substantially increase the income status of population of the area and due to migration of people from outside area will be having impact on the area

- **Impact on Literacy and Educational Facilities**

The literacy level of the project area is likely to increase as there will be influx of

many educated people taking up jobs in the mine, which is likely to result in establishment of better educational facilities.

- **Impact on Civic Amenities**

The impact of mining on the civic amenities will be substantial after the commencement of mining activities. The construction of new roads in the project area will enhance the transportation facilities.

- **Impact on Health Care Facilities**

It is imperative to have proper health care facilities near the mining area. Health care center will be developed at proposed residential colonies, which will also extending the medical facilities in the surrounding villages through its rural welfare schemes.

- **Impact on Economic Aspects**

The proposed mining activities will provide employment to persons of different skills and trades. The local population will have preference to get an employment. The employment potential will ameliorate economic conditions of these families directly and provide employment to many other families indirectly who are involved in business and service oriented activities. This in-turn will improve the socio-economic conditions of the area.

5.3. Land use planning (breakup along with green belt etc.)

Tara (East) and Tara (West) Coal block is covers area of 800 Ha. Additional 137.44 Ha of area is required for external dump, infrastructure and residential colony etc. outside coal block area, making total project area of 937.44 Ha.

Out of total 937.44 Ha of project area, only 607.65 Ha of land will be used for

mining and related activities to carry out the operations as stated in Table below.

(Figures in Ha)

Sl. No.	Particulars	Area (Ha)
1	Excavation Area	405.06
2	External Dump	96.21
3	Safety Zone	50.58
4	Nala / Road Diversion	24.57
5	Infrastructure	21.27
6	Green Belt	9.96
	Sub – Total (Mining)	**607.65**
7	Undisturbed Area	329.79
	Total	**937.44**

5.4. Assessment of Infrastructure Demand (Physical and Social)

Most of the infrastructure like Office building, Explosive magazine, Workshop, Diesel dispensing unit, Pump house, Sub-Station, Statutory buildings – VT training building, Restrooms, Canteen, Store, coal depot, Residential colony etc. has already been built by prior allottee and is transferred to WBPDCL by Allotment Order issued by Ministry of Coal. These infrastructure facilities will be augmented and shall be used.

Approach road for mine is already available and shall be repaired and maintained

throught out the mine life.

One local road passes through the mine area, which will be diverted along the boundary of block in order to move the edge of mining pit towards south.

5.5. Amenities/Facilities

Service Buildings

The residential colony consists of type quarters, community and welfare buildings, parks and play ground etc. for the proposed Project. The colony has been envisaged as shown in surface plan.

The Service Buildings include community buildings like dispensary, primary school, officers' and staff rest houses, clubs, shopping centre, community centre etc. apart from offices, workshop & stores, sub-stations, shovel erection yard, magazine & other statutory buildings like canteen, first aid centre, rest shelter, training centres, pit head bath etc.

Following are the broad details of these buildings.

Community Buildings

Community facilities, essential for a sound living of the project personnel and their families like Parks and Playground, Workers' Institute, Staff club, Community Centre, shopping complex etc. have been envisaged in the present report.

Offices

Provision has been made for Project office and mine site office. These buildings have been envisaged as RCC-cum-brick masonry structures.

Workshops And Stores

Provisions have been made for maintenance and repair of HEMM, LMV and other Plant & Machineries. Accordingly, workshop and stores to cater for the needs of their repairs and maintenance have been considered. The area of various shops and facilities are envisaged on the basis of technological & operational requirements.

The buildings are envisaged to be of structural steel construction with RCC foundation, cubicles for shop in-charge, small toilet facility, cage ladder for access to roof etc.

Sub-Station

Sub-station has been considered to cater for the requirements of the Project & township. This will be brick masonry, RCC beam and slab construction with RCC louvers for ventilation and ducts with proper size for electric cables.

Magazine

Required provision for magazine has been made in the report.

Statutory Buildings

There are provisions for canteen, first aid centre, rest shelter, training centre, pit head bath etc. The areas for various statutory buildings have been considered.

Residential Buildings

The manpower requirements for this Opencast Mine have been estimated as 941 upto target achieving year. The proposed project has been envisaged as mechanised mine needing skilled manpower. This manpower is required to be housed near the project site for smooth and continuous operation of the mine. With this background, 50% housing satisfaction has been considered for the project.

Further, the WBPDCL is preparing a comprehensive CSR action plan for the area. This plan involves the activities as listed:

- Improvement in medical and health care system
- Improvement in educational services
- Infrastructure betterment through better roads, lighting and communication system.
- Betterment of drinking water facilities
- Vocational training facilities for local eligible youth of local community to enable them to seek employment in suitable project operations in and around the mine area or elsewhere.
- Improvement in irrigation facilities.

6. PROPOSED INFRASTRUCTURE

6.1. Industrial Area (Processing Area)

No industrial area is present.

6.2. Residential Area (Non-Processing Area)

The residential buildings and allied facilities of the project are already available at a suitable place outside the block boundary within project area.

6.3. Green Belt

About 9.96 Ha of Green belt has been developed within the project area. Reclamation of mined out land has been planned by backfilling and progressive restoration of area will done by plantation.

6.4. Social Infrastructure

Community centre, playground is already available at the mine site, built by prior allottee. Necessary repair and augmentation of facilities will be taken up and maintained.

6.5. Connectivity

The block is ideally located and is well connected by both rail and road. The Andal – Gourangdih section of the Eastern Railway passes through the eastern and north-eastern part of the block in a south-east to north-west direction. The Churulia – Dohomani Road which connects the G.T. Road with Ajoy Ghat passes through the western part of block. Asansol, a major town in the Raniganj Coalfield, is situated at a distance of about 20 km by all weather road to the south-west to Tara (East) and Tara (West) Coal mine.

The nearest airstrip is located at Asansol at a distance of about 20 km from the block India's first Aerotropolis and first privately managed airport, located in Andal (a sub-div of Durgapur, Asansol) developed by Bengal Aerotropolis Projects Limited. West Bengal's second largest airport. Has night landing facilities with a plan to make it an international airport while the nearest international airport is at Kolkata, the state capital, situated at about 232 km. The nearest major ports is Kolkata in the east coast.

It has been planned to bring coal from coal face to surface by dumpers. From mine site Coal will be transported to nearest Railway Siding at Bhanora located at 14 km from mine site. Coal will loaded on to wagons by front loaders after proper weighment. Coal will then transported to EUPs by rail.

6.6. Drinking Water Management (Source & Supply of water)

It is proposed that requirement of potable water requirement is met from ground water resources. An overhead tank with suitable capacity is available at mine site. Water will be distributed to various locations like office buildings, residential colony

and other location by well managed distribution network of pumps and pipes.

6.7. Sewerage System.

Domestic and industrial effluent will be disposed off after suitable treatment in the effluent treatment plants (STP/ ITP) located in colony and industrial area.

6.8. Industrial Waste Management.

a) **Mine discharge:** Mine effluent contains silt and coal particles, which will be treated in two stages at primary sedimentation sump in mine floor and secondary sedimentation sump at mine surface.

   The mine water discharge will be used to meet the requirement of the, afforestation / plantation, dust suppression, fire fighting, other industrial, domestic applications.

b) **Workshop effluent**: The workshop effluent will be treated in a proper effluent treatment plant. Oil and grease will be skimmed using oil trap and stored in leak proof containers and will be sold to authorized vendors.

c) **Domestic effluent:** STP will be provided. Sludge after digestion will be used as manure / compost.

6.9. Solid Waste Management.

The opencast mine is planned up to 255 m depth with overall average stripping ratio of 10.72 cum/tonne.

The total volume of OB for balanced reserve of 17.78 MT has been estimated as 190.56 Mcum.

From start of Mining operation from 1997, 53.83 MT of coal excavated in the process generating 183.25 Mcum of OB, Out of which 149.25 Mcum has been

backfilled in internal dumps and 34 Mcum has been dumped in external surface dumps. The surface area of backfill dump (corresponding to local original level 100-130mRL) is 115.68 ha.

Further, 190.56 Mcum of OB generated during 11 years of mine life will be accommodated in internal dumps by backfilling and no external dumps will be created. After stabilization of internal dumps, top soil will be spread and plantation will be carried out as part of progressive closure activity.

At the end of mine closure, external dumps will be reclaimed and backfilled in the internal dumps as part of final closure activity.

Scheme of overburden dumping and management already discussed in Section 3.9.

6.10. Power Requirement & Supply / source.

Heavy Earth Moving Machines consume significant power in opencast project. Mine dewatering, workshop, offices, colony etc. add to the total power demand of the project. On achieving the targeted coal production and commissioning of Workshop and Main pumps, the power demand is expected to touch the maximum demand.

- Based on Rated capacity of 4.0 MTY ROM Coal form Tara(East) & Tara(West) coal Block tentative requirement of power shall be in the range of 2-3 MVA at 33 kV.
- Provision of DG sets has been made for emergency power supply for important services like pumping, workshop etc.
- Restricted earthing has been envisaged for Electrical System. All electrical system will have protection from lightning and high voltage surge.

Switching station and substation shall be equipped with all safety features firefighting system.

7. REHABILITATION AND RESETTLEMENT (R & R) PLAN

There are two earlier constructed R&R Colony namely Dulalpur and Pialdanga consisting of 103 households having population of around 455 persons needs to be relocated to outside the Mining Lease area. Rehabilitaion and Resettlement will be as per policy of State of West Bengal.

There is no R&R required for other four villages namely Churulia, Jaynagar, Desher Mohan and Chichurbil falling in core zone.

8. PROJECT SCHEDULE & COST ESTIMATES

(i) Likely date of start of construction and likely date of Completion

Initial one year has been kept for Approval and clearance stage. Operation will start from 2019-2020. Yearly production planned until achievement of full capacity has been given in table below;

2019-20	-	0.0 MTPA
2020-21	-	0.5 MTPA
2021-22	-	2.0 MTPA
2022-23	-	2.0 MTPA
2023-24	-	2.0 MTPA
2024-25	-	4.0 MTPA

(ii) Estimated project cost along with analysis in terms of economic viability of the project.

Project cost has been estimated as 33560 Lakhs.

Details of Investment has been presented below (**Rs.in Lakhs**)

i) Land	:	**4000.00**
ii) Building	:	**2839.00**
iii) Plant and Machinery	:	**18108.00**
Sub Total	:	**24947.00**

iv) Other fixed assets : **8613.00**

Total : 33560.00

On the basis of capital investment envisaged for the project, this project is economically viable

9. ANALYSIS OF PROPOSAL (FINAL RECOMMENDATIONS)

Financial and social benefits.

It is obvious to assume that the activities of the mining operations will improve the socio-economic levels in the study area. The anticipated impact of this project on various aspects is given below:

- **Impact on Human Settlement**

Human settlement is expected to increase after this project gets operational.

- **Impact on Population Growth**

This project will have an impact on the population growth, as it will provide good value of employment to the families in the nearby villages. Preference will be given to local unemployed youth for employment during development of mine and in operation of mines which will substantially increase the income status of population of the area and due to migration of people from outside area will be having impact on the area

- **Impact on Literacy and Educational Facilities**

The literacy level of the project area is likely to increase as there will be influx of many educated people taking up jobs in the mine, which is likely to result in establishment of better educational facilities.

- **Impact on Civic Amenities**

The impact of mining on the civic amenities will be substantial after the commencement of mining activities. The construction of new roads in the project area will enhance the transportation facilities.

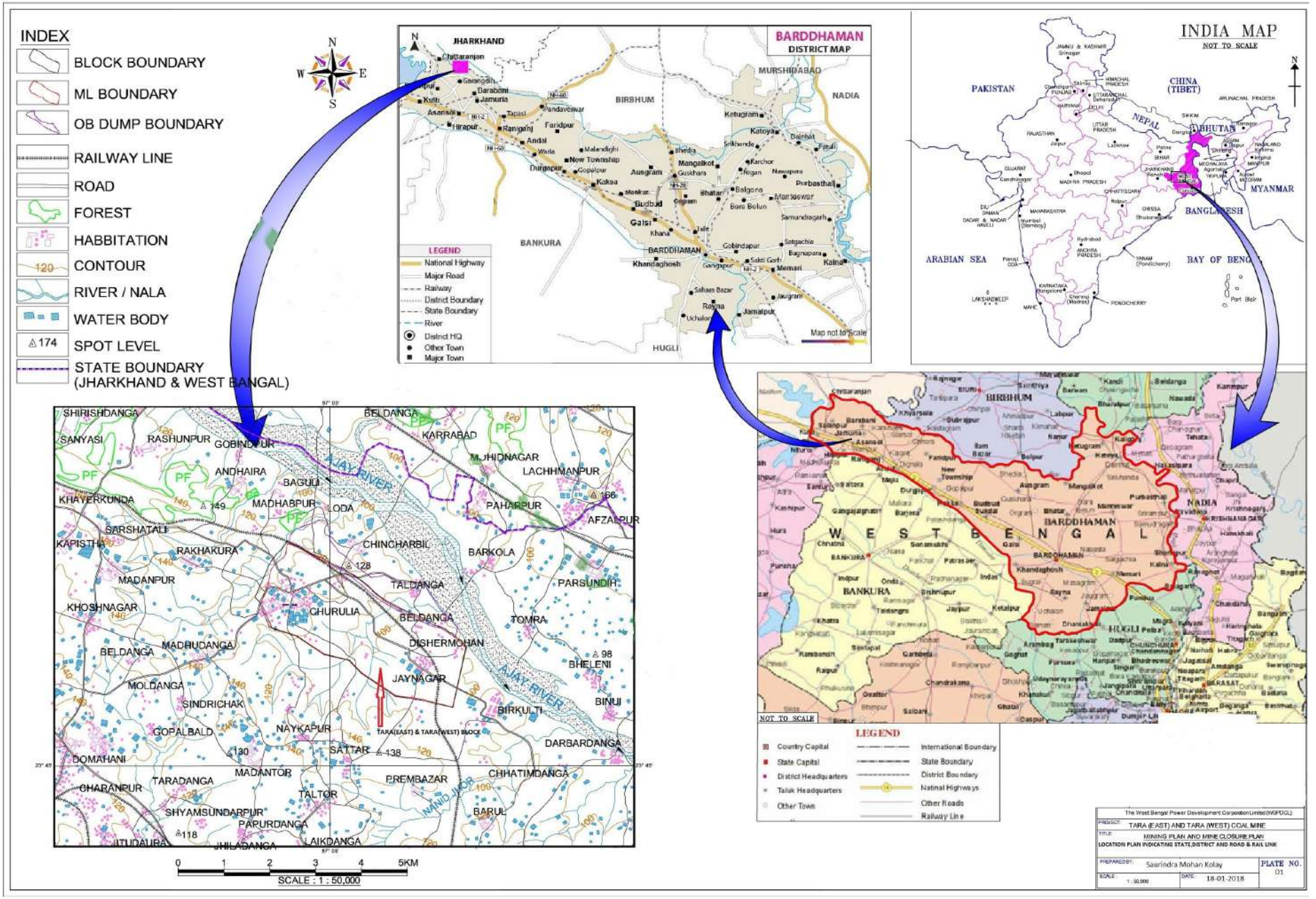
- **Impact on Health Care Facilities**

It is imperative to have proper health care facilities near the mining area. Health care center will be developed at proposed residential colonies, which will also extending the medical facilities in the surrounding villages through its rural welfare schemes.

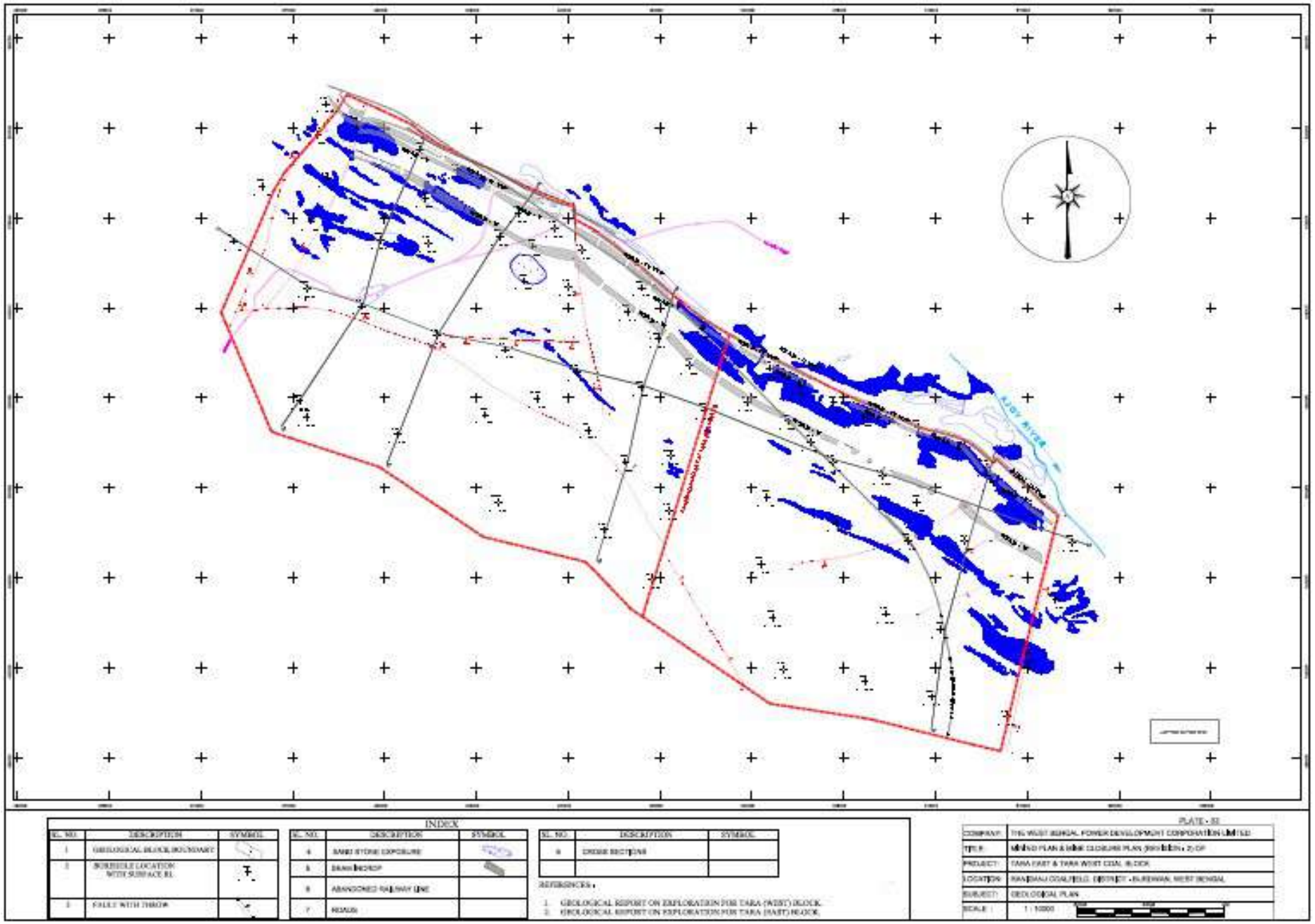
- **Impact on Economic Aspects**

The proposed mining activities will provide employment to persons of different skills and trades. The local population will have preference to get an employment. The employment potential will ameliorate economic conditions of these families directly and provide employment to many other families indirectly who are involved in business and service oriented activities. This in-turn will improve the socio-economic conditions of the area.

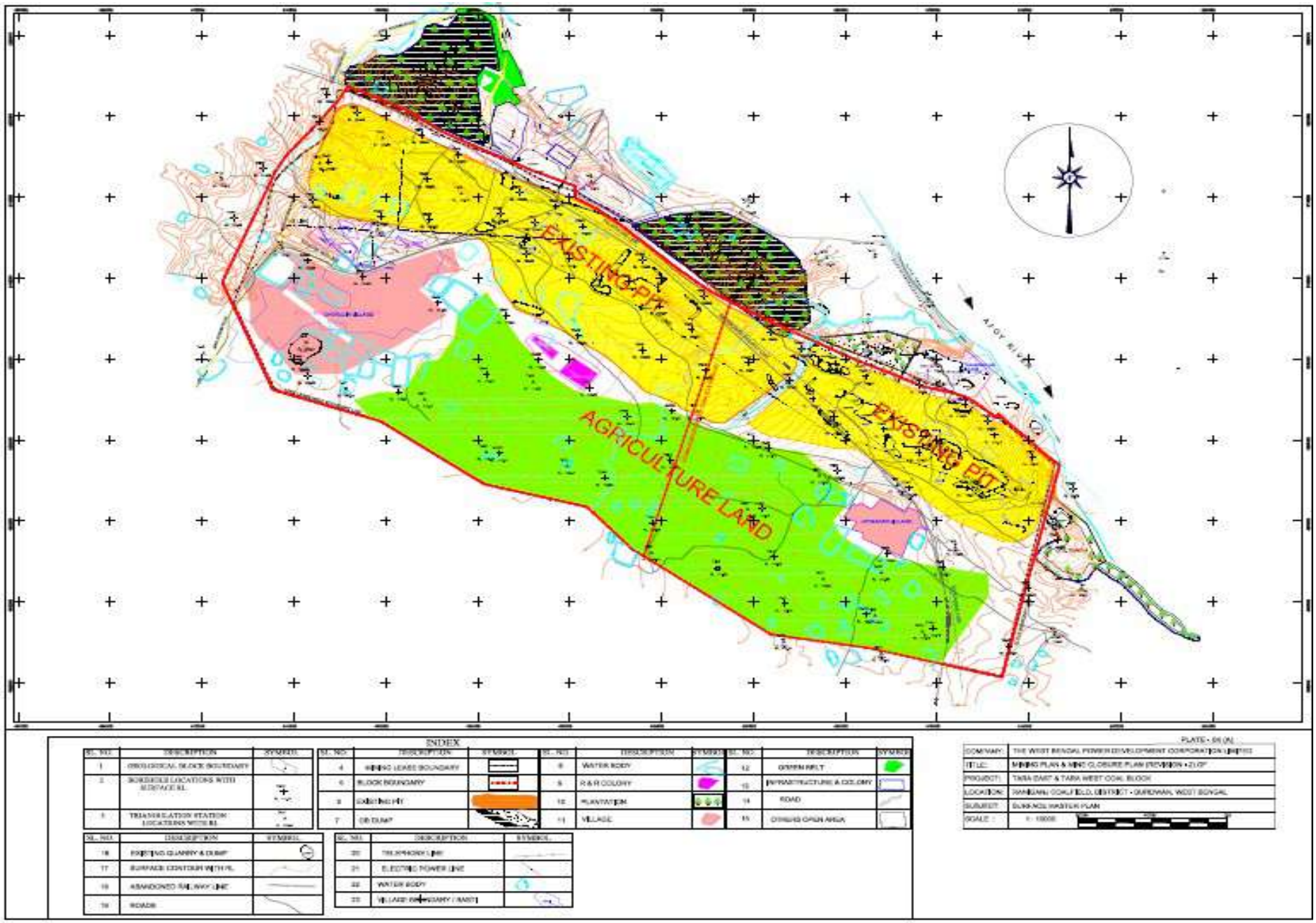
Annexure I: Location Plan



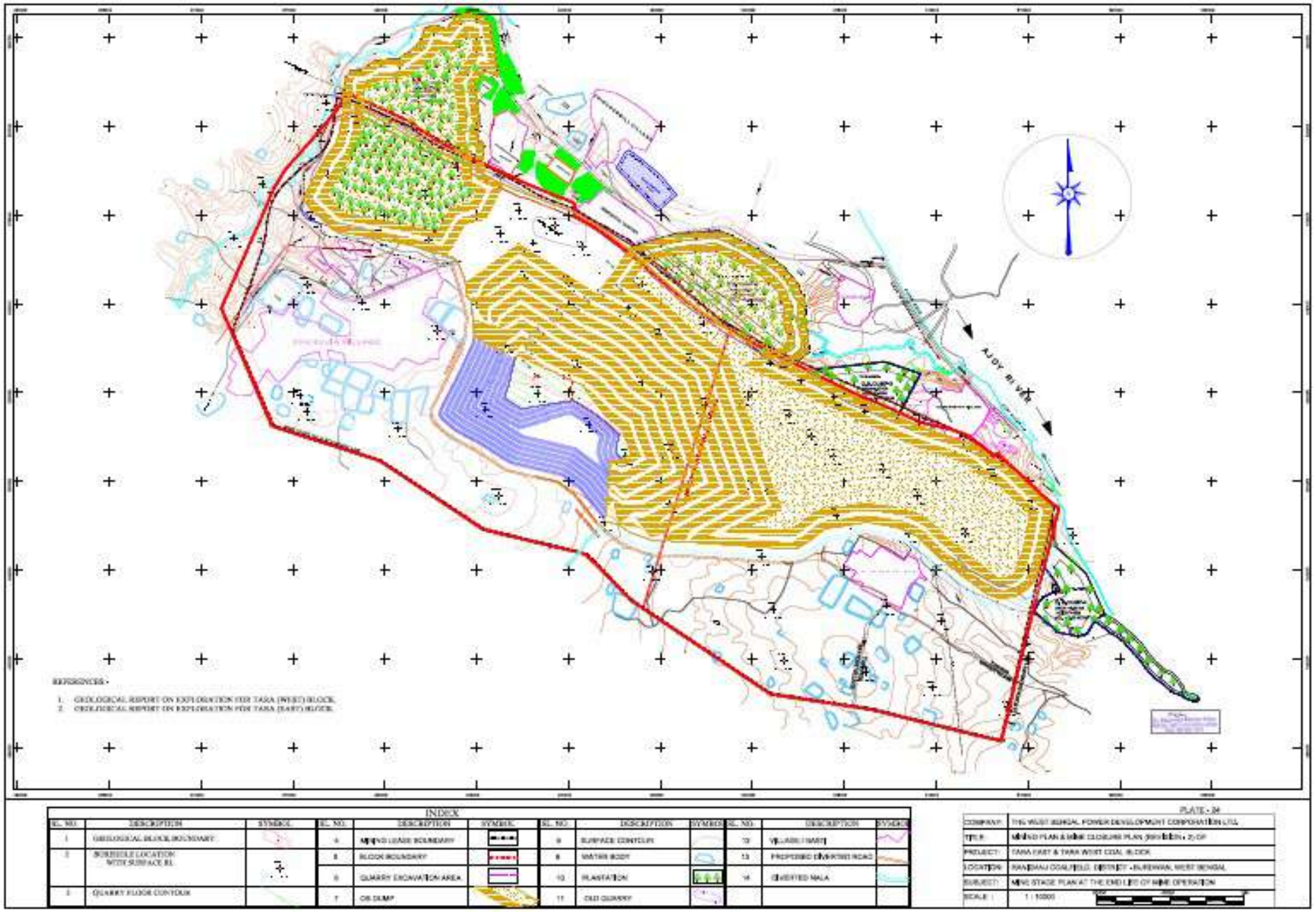
Annexure II: Geological Plan



Annexure III: Surface Plan



Annexure IV: Mine Stage plan at the end of Mine Life



Annexure V: Reclamation Plan