QUERIES RAISED DURING THE 39TH EAC MEETING HELD ON 13.01.2023

Query:

PP shall justify the technical reason for not achieving the rated capacity from its approved sanctioned (EC) capacity and how Sonepur-Bazari mine will be adjusted once other mines proposed to retain at their sanctioned production capacity. Hence, PP needs to justify the name of mines whose sanctioned production capacity to be lowered in lieu of enhanced production.

a. PP shall justify the technical reason for not achieving the rated capacity from its approved sanctioned (EC) capacity.

Reply:

EC for all the mines in the cluster has been obtained for their individual peak capacities. However, it is to be noted that each mine has its own production curve and all the mines will not produce at peak capacity simultaneously. As such, in the present cluster configuration, the cluster will not achieve the assigned capacity of 31.83 MTY, which is only an arithmetic sum of the peak capacities of the constituent mines. The envisaged 10-year production from FY 2023-24 onwards is as below:

#	Name of the Mine / Project	Lease / Project Area (Ha)	EC Capacity (MTY)	Balance Life as on 01.04.2023 (years)	Production during FY 2022-23	Targeted Production Schedule (MT)									
						23-24	24-25	25-26	26-27	27-28	28-29	29-30	30-31	31-32	32-33
1	Pandaveswar-Dalurband UG & OC	1385.00	2.25	>25	0.24	0.10	0.10	0.25	0.51	0.51	0.51	**1.05**	**1.05**	**1.05**	**1.05**
						0.90	0.90	0.70	0.64	1.00	1.00	**1.20**	**1.20**	**1.20**	**1.20**
2	Manderboni – South Samla UG	1025.00	0.28	>25	0.05	0.08	0.08	0.15	0.18	0.20	**0.28**	**0.28**	**0.28**	**0.28**	**0.28**
3	Madhaipur UG & OC	622.00	0.65	>25	0.07	0.05	0.05	0.05	**0.65**	**0.65**	**0.65**	0.05	0.05	0.05	0.05
						0.20	-	-	**-**	**-**	**-**	-	-	-	-
4	Nutandanga UG	543.00	Production suspended	-	0.00	-	-	-	-	-	-	-	-	-	-
5	Kendra UG	459.00	Production	-	0.00	-	-	-	-	-	-	-	-	-	-

#	Name of the Mine / Project	Lease / Project Area (Ha)	EC Capacity (MTY)	Balance Life as on 01.04.2023 (years)	Production during FY 2022-23	Targeted Production Schedule (MT)									
						23-24	24-25	25-26	26-27	27-28	28-29	29-30	30-31	31-32	32-33
			suspended												
6	Samla UG & OC	676.00	0.60	3	0.00	-	-	-	-	-	-	-	-	-	-
						-	-	-	0.10	**0.60**	0.23	-	-	-	-
7	Sonepur Bazari OC	2405.00	12.00 (existing) 14.00 (proposed)	10	**12.00**	**14.00**	**14.00**	**14.00**	**12.00**	**12.00**	**12.00**	**12.00**	**12.00**	10.00	8.00
8	Nakrakonda – Kumardih B UG & OC	642.00	4.12	>25	1.77	1.05	1.05	**1.12**	**1.12**	**1.12**	**1.12**	**1.12**	**1.12**	**1.12**	**1.12**
						1.00	1.20	1.50	1.80	2.00	2.30	2.75	**3.00**	**3.00**	**3.00**
9	Kumardihi A UG	457.00	0.20	>25	0.09	**0.20**	**0.20**	**0.20**	**0.20**	**0.20**	**0.20**	**0.20**	**0.20**	**0.20**	**0.20**
10	Jhanjra UG	1520.00	5.00	>25	2.92	4.00	4.00	4.00	**5.00**	**5.00**	**5.00**	**5.00**	**5.00**	**5.00**	**5.00**
11	Tilaboni UG	827.47	2.14	>25	0.13	1.00	1.00	1.20	1.60	1.90	**2.14**	**2.14**	**2.14**	**2.14**	**2.14**
12	Shyamsundarpur UG	533.00	1.59	>25	0.66	1.27	1.30	**1.59**	**1.59**	**1.59**	1.41	1.41	1.32	1.32	1.32
13	Bankola UG	830.00	0.30	>25	0.19	0.25	0.25	**0.30**	**0.30**	**0.30**	**0.30**	**0.30**	**0.30**	**0.30**	**0.30**
14	Khottadih UG & OC	770.00	2.70	>25	1.07	0.90	0.90	0.90	**0.90**	**0.90**	0.90	0.90	0.90	0.90	0.90
						0.70	0.90	1.10	**1.80**	**1.80**	1.10	-	-	-	-
		12694.47	**31.83**		**19.19**	**25.70**	**25.93**	**27.06**	**28.39**	**29.77**	**29.14**	**28.40**	**28.56**	**26.56**	**24.56**

Thus, total output from the cluster will not achieve the rated capacity of 31.83 MT in the next 10 years. A breakup of UG and OC productions from the cluster is also tabulated as under:

Capacity	As per EC amended on 30.05.2020 (MTY)	Proposed Production of the cluster (MT)										Remarks
		2023-24	2024-25	2025-26	2026-27	2027-28	2028-29	2029-30	2030-31	2031-32	2032-33	
UG	13.98	8.90	8.93	9.76	12.05	12.37	12.51	12.45	12.36	12.36	12.36	Never exceed 13.98 MTY
OC	17.85	16.80	17.00	17.30	16.34	17.40	16.63	15.95	16.20	14.20	12.20	Never exceed 17.85 MTY
Total	**31.83**	**25.70**	**25.93**	**27.06**	**28.39**	**29.77**	**29.14**	**28.40**	**28.56**	**26.56**	**24.56**	Never exceed 31.83 MTY

From the above tables it can be seen that each mine will achieve its peak capacity in different years and OC production will never go beyond 17.85 MTY and production from UG will never go beyond 13.98 MTY. Reasons for achieving peak capacities in different years for each mine are given below:

Sl. No.	Name of Mine	Technical reason for not achieving the rated capacity
1	Pandaveswar-Dalurband UG & OC	Mine will achieve its peak capacity during FY 2029-30. The OC mine will achieve its full potential only after completion of land acquisition and R&R activities. The UG mine will achieve its full potential of 1.76 MTY after completion of OC mining in FY 2035-36.
2	Manderboni-South Samla UG	Mine will achieve its peak capacity during FY 2028-29. The UG mine will achieve its full potential after introduction of additional SDLs/LHDs and starting of depillaring of developed pillars in conjunction with hydraulic sand stowing in R-V seam which has already been developed. For this purpose, the stowing infrastructure is being developed for R-V seam to meet the additional capacity.
3	Madhaipur UG & OC	The remaining life of the OC patch is only two years after which the mine will produce from UG workings only. Mine will achieve its peak capacity of 0.65 MTY from UG workings after introduction of mass production technology (Standard Height Continuous Miner (SHCM)) from 2026-27 in the present workings of R-III/II seam.
4	Samla UG & OC	Presently, there is no production from either UG or OC. Land acquisition for starting an OC patch is in process and the OC patch is likely to start production from 2026-27 onwards for 3 years only. The UG workings are presently waterlogged as production has been suspended owing to geo-mining difficulties & huge losses and there is no immediate programme of reopening the workings.
5	Nakrakonda-Kumardih B UG & OC	Mine will achieve its peak capacity in FY 2030-31. Both UG & OC operations will achieve full potential from 9th year onwards. The OC mine will achieve its full potential only after completion of land acquisition and R&R activities in phased manner. It is proposed to introduce 2 nos. of SHCM to augment production from UG.
6	Jhanjra UG	Mine will achieve its peak capacity in FY 2026-27 after the construction of Jhanjra Railway Siding with Silo Loading System. The construction is in full swing and likely to be completed in FY 2025-26.
7	Tilaboni UG	Mine will achieve its peak capacity in FY 2028-29. It is proposed to heighten two districts in R-VIIIB1 & RVIIIB1 (BOT) and R-VII seams along with introduction of 4 nos. of SHCM / Low Height Continuous Miner (LHCM) in phased manner to augment production from UG.
8	Shyamsundarpur UG	Mine will achieve its peak capacity in FY 2025-26. It is proposed to heighten one district in R-VII seam along with introduction of 2 nos. each of SHCM & LHCM in phased manner to augment production from UG.
9	Bankola UG	Mine will achieve its peak capacity in FY 2025-26. The UG mine will achieve its full potential after introduction of additional 3 more SDLs in phased manner in the UG mine to augment coal production from it. The SDLs shall be introduced after opening up one more production district in the mine for which various statutory and non-statutory formalities will be fulfilled.
10	Khottadih UG & OC	Mine will achieve its peak capacity during FY 2026-27. It is proposed to augment production from UG by introducing Mass Production Technology (SHCM). The R&R activity of Khottadih OCP has been completed in March 2023.

b. How Sonepur-Bazari mine will be adjusted once other mines proposed to retain at their sanctioned production capacity. Hence, PP needs to justify the name of mines whose sanctioned production capacity to be lowered in lieu of enhanced production.

Reply:

The additional 2.00 MTY from Sonepur-Bazari OCP during next 3 years is to compensate for un-utilized OC capacity from the following 2 mines / projects:

#	Name of the Mine / Project	Type	EC Capacity		Targeted Production Schedule for coming 3 years (MT)		
					2023 – 24	2024 – 25	2025 – 26
1	Pandaveswar-Dalurband UG & OC	UG	1.76	2.25	0.10	0.10	0.25
		OC	1.20		0.90	0.90	0.70
2	Nakrakonda – Kumardih B UG & OC	UG	1.12	4.12	1.05	1.05	1.12
		OC	3.00		1.00	1.20	1.50
	Total	**UG**	**2.88**	**6.37**	**1.15**	**1.15**	**1.37**
		OC	**4.20**		**1.90**	**2.10**	**2.20**
	Unutilized OC Capacity				**2.30**	**2.10**	**2.00**

It can be seen that there is spare OC capacity of ≥ 2.0 MTY in the next three years, which is proposed to be compensated by obtaining higher output from Sonepur-Bazari OCP. As such, no adjustment against sanctioned capacity of any other mine of the cluster is required. This arrangement will be for a period of next three years during which Sonepur-Bazari OCP is expected to produce @ 14.0 MTY, where after, the mine will revert to present EC capacity of 12.0 MTY due to non-availability of space. Further, this additional production would be achieved by use of blasting free technology of surface miners which is an eco-friendly technology.

Query:

PP shall submit Certified Compliance report from Ministry's IRO of previous EC conditions.

Reply:

IRO, Kolkata had visited Cluster No. 12 on 09.02.2023 and 10.02.2023. CCR has been issued on 21.03.2023 (**Attached as Annexure-I**). Project Proponent submitted the Action taken report (ATR) on the observations made in CCR on 13.04.2023 **(Annexure-II)**. IRO, Kolkata on 02.05.2023 (**Attached as Annexure-III**), has provided the satisfactory report on the acceptance of ATR on observations of CCR.

Query:

PP shall collect one-month baseline data, impact assessment and submit it with the current photographs authorized by the head of the department.

Reply:

- One-month baseline data w.r.t. air quality, water quality and noise level (Dec'21) has been generated by Environment Laboratory, CMPDI, RI-I, Asansol which is having NABL Accreditation.

- Air Quality Impact Assessment considering peak production capacity of the Cluster 31.83 MTY has been carried out using the latest version of AERMOD **(Attached as Annexure – IV)**. The values obtained are within the prescribed limit.

A. One Month Baseline Data for <u>Ambient Air Quality</u> for the month of December, 2021:

Climate & Meteorology

<u>Rainfall</u>

The area receives rainfall by South-West monsoon. Rainy season sets in the middle of June and lasts till September. The normal average rainfall is 1400 mm.

<u>Climate</u>

The climate is tropical with hot dry summer, a good rainy season and cool winter. Thunder storms accompanied with severe squalls occur in pre-monsoon months. Dust storms also occur occasionally in April and May. Morning fog occurs in the winter months.

The area is characterized by humid to sub-humid climate. During summer the hot spell prevails from March to middle of June. Rainy season starts from middle of June to end to September. Winter starts from the middle of November and continues till the end of February. The area experiences great heat from April to June, when the maximum temperature crosses 45 ^{0}C. December is the coldest month when the minimum temperatures fall down to as low as 1 ^{0}C.

<u>Micro – Meteorological Data</u>

Micro – meteorological data was generated at station set up for the purpose within the Project Office, Sonepur-Bazari OCP during the post-monsoon season concurrently

with baseline data generation for air for the period from 1st Dec'21 to 31st Dec'21 and the abstract is provided below –

Date	Wind Velocity (m/sec)			Predominant Wind Direction (From)	Temperature (°C)			Relative Humidity (%) Average			REL Barometer (mbar)	Rainfall (mm)	Cloud Cover (Tenths)
	Min	Max	Avg.		Min	Max	Avg.	Min	Max	Avg.			
01/02.12.21	0.00	9.25	1.07	NW	16.10	27.30	21.10	35.00	71.20	57.06	1001	0.00	3
02/03.12.21	0.00	3.08	0.16	NE	16.90	28.10	22.05	37.00	73.50	57.16	1001	0.00	2
03/04.12.21	0.00	0.75	0.03	N	17.60	27.40	22.36	40.00	74.10	59.07	1001	0.00	2
04/05.12.21	0.00	0.80	0.05	NW	19.50	22.70	21.12	64.30	77.10	71.31	1001	0.00	2
05/06.12.21	0.00	9.25	0.58	NW	19.20	23.50	21.38	58.10	79.40	70.07	1001	0.00	2
06/07.12.21	0.00	9.25	1.19	NE	19.20	24.70	21.68	63.20	83.30	74.40	1001	2.29	8
07/08.12.21	0.00	0.75	0.03	NE	19.40	27.50	23.36	47.40	82.60	66.70	1001	0.34	2
09/10.12.21	0.00	4.61	0.93	N	18.90	28.20	23.74	40.40	78.90	57.83	1001	0.00	0
10/11.12.21	0.00	0.75	0.06	ENE	18.40	28.10	24.01	34.70	75.30	50.83	1001	0.00	1
11/12.12.21	0.00	0.75	0.03	NW	19.00	27.30	22.85	38.70	76.90	57.70	1001	0.00	2
12/13.12.21	0.00	7.69	1.22	NW	17.80	24.90	20.76	42.80	71.70	60.53	1001	0.00	2
13/14.12.21	0.00	3.08	0.32	SE	16.50	24.60	20.06	40.30	69.50	55.44	1001	0.00	0
14/15.12.21	0.00	0.75	0.06	NE	15.60	24.30	20.56	36.90	75.30	53.82	1001	0.00	0
15/16.12.21	0.00	5.39	0.22	NE	14.80	24.40	18.62	32.40	67.90	54.40	1001	0.00	0
16/17.12.21	0.00	4.61	0.58	N	13.70	23.50	18.10	34.70	74.30	55.53	1001	0.00	1
17/18.12.21	0.00	6.94	0.80	SE	13.30	24.90	18.49	25.30	73.50	52.39	1001	0.00	1
18/19.12.21	0.00	5.39	0.77	ESE	15.10	25.00	19.13	36.90	75.80	56.84	1001	0.00	2
19/20.12.21	0.00	6.94	0.64	NW	11.50	21.50	16.96	23.00	60.80	43.74	1001	0.00	0
20/21.12.21	0.00	3.83	0.51	NW	9.60	20.00	14.11	28.00	68.40	48.72	1001	0.00	2
21/22.12.21	0.00	5.39	1.25	N	9.90	22.60	16.04	38.90	68.20	54.80	1001	0.00	0
22/23.12.21	0.00	5.39	0.61	NE	12.90	20.30	15.43	46.40	74.80	62.53	1001	0.00	1
23/24.12.21	0.00	6.94	0.93	NE	12.70	23.00	17.65	34.40	68.80	51.13	1001	0.00	1
24/25.12.21	0.00	4.61	0.48	SE	13.30	22.50	18.31	43.30	74.10	58.77	1001	0.00	2
25/26.12.21	0.00	2.31	0.22	NW	13.50	22.90	18.30	43.50	78.60	62.21	1001	0.00	0
26/27.12.21	0.00	1.98	0.12	NW	15.20	23.20	53.10	77.00	66.35	59.3	1001	0.00	0
27/28.12.21	0.00	6.17	0.26	N	17.30	23.70	19.70	52.40	76.40	65.37	1001	0.00	0
28/29.12.21	0.00	3.08	0.16	SE	15.70	23.70	18.99	53.00	79.10	68.54	1001	0.00	0
29/30.12.21	0.00	10.03	1.15	NE	16.40	21.70	18.78	56.30	98.10	83.18	1001	17.73	10
30/31.12.21	0.00	5.10	1.39	NE	16.40	23.80	19.45	48.10	85.60	72.61	1001	3.25	2
Month	**0.00**	**10.03**	**0.55**	**NW & NE**	**9.60**	**28.20**	**20.90**	**23.00**	**98.10**	**60.07**	**1001**	**23.61**	**2**

Observations

It can be observed that the pre – dominant wind direction during the month of Dec'21 was from North – West and North – East which generally conforms to the long – term trend. Highest wind velocity was recorded as 36.10 kmph (10.03 m/s). Maximum and minimum temperatures recorded were 28.20 ^{0}C & 9.60 ^{0}C respectively. Maximum and minimum humidity recorded were 98.10 % & 23.00 % respectively and atmospheric pressure was around 1001 mbar. Total number of rainy days were 4 with a total precipitation of 23.61 mm.

Methodology of Sampling & Analysis

To assess the ambient air quality status, monitoring stations were identified based on meteorology in the upwind and downwind direction as well as to represent the cross-sectional scenario of the project site. Based on the production activities, the parameters chosen for assessment of air quality are Particulate Matter <10 (PM_{10}),

Particulate Matter <2.5 ($PM_{2.5}$), Sulphur dioxide (SO_2), Oxides of Nitrogen (NO_X) and Heavy Metals (Lead (Pb), Arsenic (As), Chromium (Cr), Cadmium (Cd), Mercury (Hg) and Nickel (Ni)).

Calibrated APM 460 Respirable Dust sampler (with an average flow of 0.80 to 1.50 m^3/min) were used for monitoring of PM_{10} and a tapping provided in the hopper of the same sampler was utilised for sampling of SO_2 and NO_X with proper flow controller (1 L/min). Calibrated GTI 131 Fine Particle Sampler (with an average flow of 16.70 lpm $\pm$ 4%) was used for monitoring of $PM_{2.5}$. Collected samples were analysed on the day of sample collection with the following procedure.

PM_{10} (IS 5182 (Part 23): 2006, Reaffirmed: 2022)

Calibrated Respirable Dust Sampler with 20.3 cm× 25.4 cm glass fibre filter paper was used for the determination of PM. PM_{10} is a measure of particulate matter having size <10 microns. Ambient air laden with suspended particulates enters the Respirable Dust Sampler (RDS) through the inlet pipe of sampler by means of high flow rate blower (0.80 to 1.50 m^3/min). As the air passes through the cyclone, coarse, non – respirable dust (size > 10 microns) is separated from the air stream by centrifugal forces acting on the solid particles. These separated particles fall through the cyclone's conical hopper and collect in the sampling bottle placed at bottom. The fine dust forming the respirable fraction (size <10 microns) of the Total Suspended Particulates passes through the cyclone and is carried by the air stream to the Glass Micro-fibre Filter Paper. The Respirable Particulate Matter (RPM) is retained by the filter and the carrier air exhausted from the system through the blower. The mass concentration (µg/m^3) of Respirable Particulate Matter in the ambient air is computed by measuring the mass of collected particulates and the volume of air sampled. These machines were installed 3 m above ground level and free from obstructions, 500 m away from dust generating sources.

$PM_{2.5}$ (IS 5182 (Part 24): 2019)

Calibrated GTI 131 Fine Particle Sampler with Teflon membrane 46.2 $\pm$ 0.25 mm effective diameter with a polypropylene or polymethylpentene or equivalent inert material with 0.38 $\pm$ 0.04 mm thick (measurement with micrometer) filter media was used for the determination of Fine Particles ($PM_{2.5}$). $PM_{2.5}$ is a measure of particulate matter having size <2.5 microns. GTI 131 Fine Particle Sampler is based on impactor designs standardized by USEPA for ambient air quality monitoring.

SO_2 (IS 5182 (Part 2): 2001, Reaffirmed: 2017)

For each set of determinations prepare a reagent blank by adding 10 ml of unexposed TCM solution to a 25-ml volumetric flask. Prepare a control solution by measuring 2 ml of working sulphite-TCM solution into a 25-ml volumetric flask by pipette. To each flask containing sample or control solution or reagent blank, add 1 ml of 0.6 percent sulphamic acid and allow to react for 10 min to destroy the nitrite resulting from oxides of nitrogen. Add 2 ml of 0.2 percent formaldehyde solution and 5 ml of pararosaniline solution. Start a laboratory timer that has been set for30 min. Bring all flasks to volume with freshly boiled and cooled distilled water and mix thoroughly. Within30 to 60 min, determine the absorbance of the sample, reagent blank, and the control solution at 560 nm using cells with a 1 cm path length. Measure SO_2 from calibration curve.

NO_2 (IS 5182 (Part 6): 2006, Reaffirmed: 2017)

Pipette 10 ml of the collected sample into 50 ml volumetric flask. Add 1 ml hydrogen peroxide solution, 10ml sulphanilamide solution, and 1.4 ml of NEDA solution using pipette, with thorough mixing after the addition of each reagent and make up to 50 ml with distilled water.

Prepare a blank in the same manner using 10 ml of unexposed absorbing reagent. After a 10 min color development interval, measure and record the absorbance at 540 nm against the prepared reagent blank. Measure NO_X from calibration curve.

Heavy metals (Pb, As, Cd, Cr, Hg & Ni)

The AAS technique makes use of absorption spectrophotometry to assess the concentration of metals in the sample. The method is based on active sampling using PM_{10} high volume sampler and then sample analysis is done by Atomic Absorption Spectrophotometer.

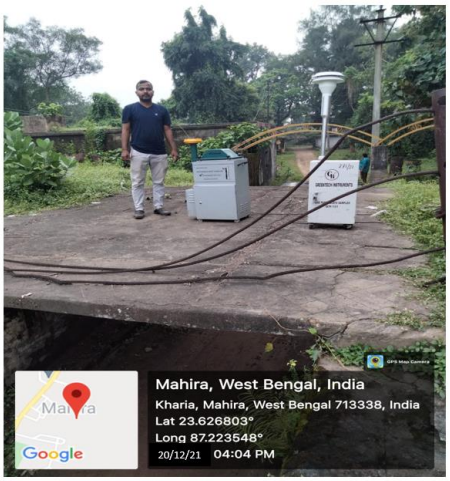
Summary of Methodology of analysis

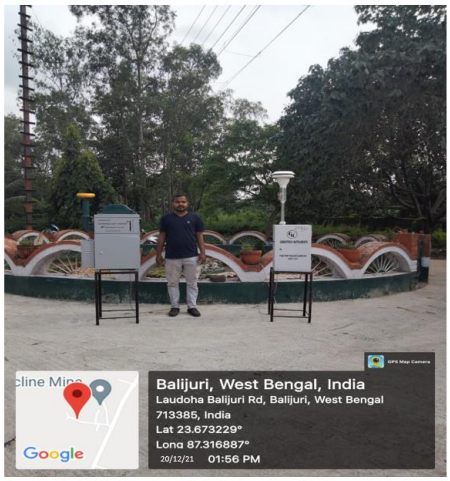
S. No.	Parameters	Methodology
1	PM_{10}	IS 5182 (Part 23): 2006, Reaffirmed: 2022
2	$PM_{2.5}$	IS 5182 (Part 24): 2019
3	SO_2	IS 5182 (Part 2): 2001, Reaffirmed: 2017
4	NO_X	IS 5182 (Part 6): 2006, Reaffirmed: 2017
5	Heavy Metals	AAS method after sampling on EPM Filter paper

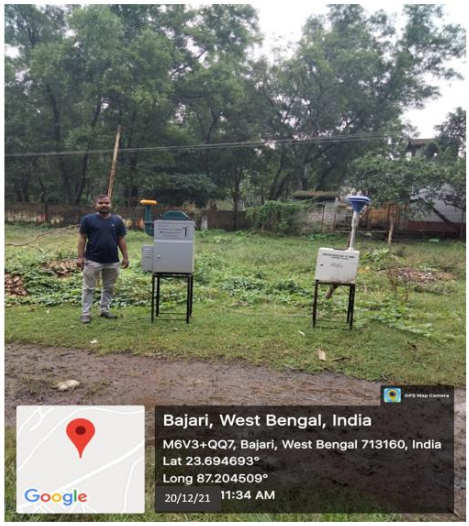
Following stations were earmarked for baseline data generation:

Location & Description of Baseline AAQ Stations

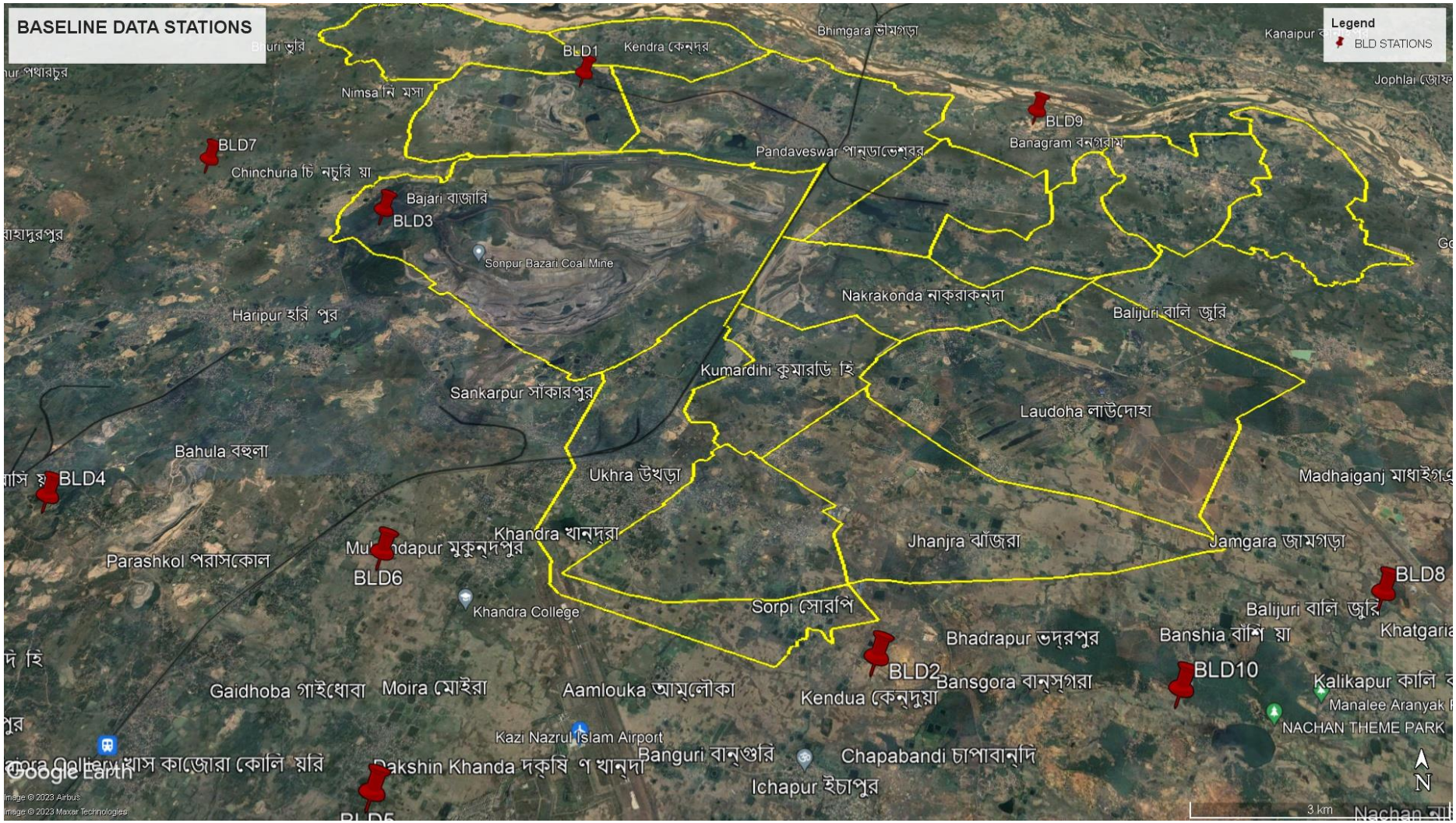
Stn. No.	Name of sampling station	Location of sampling station, aerial distance and its description
Core Zone		
BLD_1	Agent Office, Khottadih Colliery	This location was selected to assess the immediate effects in the active mining area and the present data will help to know the increase in pollution levels due to mining operation. The station is located within the project boundary.
BLD_3	CISF Camp, Sonepur Bazari OCP	This location was selected to assess the immediate effects in the active mining area and the present data will help to know the increase in pollution levels due to mining operation. The station is located within the project boundary.
Buffer Zone		
BLD_2	Agent's Bunglow, Shyamsundarpur UG	0.80 km from the project boundary towards SSE in downwind direction. Setup to assess the effect of pollutants in the downwind direction.
BLD_{10}	Tilaboni Filter Plant	1.50 km from the project boundary towards SE in downwind direction. Setup to assess the effect of pollutants in the downwind direction.
BLD_4	Manager's Office, Jambad UG	7.20 km from the project boundary towards WSW in downwind direction. Setup to assess the effect of pollutants in the downwind direction.
BLD_5	Manager's Office, Moira UG	3.50 km from the project boundary towards SSW in downwind direction. Setup to assess the effect of pollutants along buffer zone. Setup to assess the effect of pollutants in the downwind direction.
BLD_6	Khandra Workshop	2.00 km from the project boundary towards SSW in downwind direction. Setup to assess the effect of pollutants along buffer zone. Setup to assess the effect of pollutants in the downwind direction.
BLD_7	Chinchuria Village	2.50 km from the project boundary towards WNW in crosswind direction. Setup to assess the effect of pollutants in the crosswind direction.
BLD_8	Balijuri Community Hall	3.60 km from the project boundary towards ESE in crosswind direction. Setup to assess the effect of pollutants in the crosswind direction.
BLD_9	Konda Hospital	1.00 km from the project boundary towards NE in upwind direction. Setup as control station.







PHOTOS OF BASELINE DATA GENERATION STATION W.R.T. AMBIENT AIR QUALITY ON 20.12.2021



LOCATION OF BLD STATIONS W.R.T. AMBIENT AIR QUALITY, CLUSTER NO. 12

Baseline Data for AAQ

The station – wise observed data on concentrations of pollutants in ambient air during Dec'21 are tabulated below –

1. Agent Office, Khottadih Colliery (A1); Core Zone

Week	Date	PM_{10} µg/m^3	$PM_{2.5}$ µg/m^3	SO_2 µg/m^3	NOx µg/m^3	Pb µg/m^3	As ng/m^3	Cd µg/m^3	Cr µg/m^3	Hg µg/m^3	Ni ng/m^3
I	06.12.2021	101.90	38.70	BDL	19.30	BDL	BDL	BDL	BDL	BDL	BDL
	07.12.2021	146.00	54.20	BDL	17.50	BDL	BDL	BDL	BDL	BDL	BDL
II	13.12.2021	196.90	77.40	BDL	13.60	BDL	BDL	BDL	BDL	BDL	BDL
	14.12.2021	244.40	39.60	BDL	15.70	BDL	BDL	BDL	BDL	BDL	BDL
III	20.12.2021	233.80	21.00	BDL	16.80	BDL	BDL	BDL	BDL	BDL	BDL
	21.12.2021	227.30	62.00	BDL	17.30	BDL	BDL	BDL	BDL	BDL	BDL
IV	27.12.2021	236.70	57.30	BDL	12.60	BDL	BDL	BDL	BDL	BDL	BDL
	28.12.2021	239.70	63.80	BDL	15.60	BDL	BDL	BDL	BDL	BDL	BDL
Limit as per GSR 742 (E) dated 25.09.2000		**300.00**	**ND**	**120.00**	**120.00**	**ND**	**ND**	**ND**	**ND**	**ND**	**ND**
Limit as per NAAQS, 2009		**-**	**60.00**	**-**	**-**	**1.00**	**6.00**	**ND**	**ND**	**ND**	**20.00**

ND – Not Defined,
BDL for Pb – 0.05 µg/m^3,
BDL for Cr – 0.01 µg/m^3,
BDL for Ni – 0.10 ng/m^3
BDL for As – 1.00 ng/m^3,
BDL for Cd – 0.001 µg/m^3,
BDL for Hg – 0.001 µg/m^3,
BDL for SO_2 – 10.00 µg/m^3

2. Agent Bunglow, Shyamsundarpur Colliery (A2); Core Zone

Week	Date	PM_{10} µg/m^3	$PM_{2.5}$ µg/m^3	SO_2 µg/m^3	NOx µg/m^3	Pb µg/m^3	As ng/m^3	Cd µg/m^3	Cr µg/m^3	Hg µg/m^3	Ni ng/m^3
I	06.12.2021	56.30	30.10	BDL	15.60	BDL	BDL	BDL	BDL	BDL	BDL
	07.12.2021	89.60	50.50	BDL	17.60	BDL	BDL	BDL	BDL	BDL	BDL
II	13.12.2021	76.70	37.30	BDL	13.70	BDL	BDL	BDL	BDL	BDL	BDL
	14.12.2021	94.30	54.40	BDL	17.60	BDL	BDL	BDL	BDL	BDL	BDL
III	20.12.2021	70.80	26.50	BDL	19.30	BDL	BDL	BDL	BDL	BDL	BDL
	21.12.2021	63.50	14.60	BDL	17.60	BDL	BDL	BDL	BDL	BDL	BDL
IV	27.12.2021	79.50	47.80	BDL	14.30	BDL	BDL	BDL	BDL	BDL	BDL
	28.12.2021	89.70	24.40	BDL	12.80	BDL	BDL	BDL	BDL	BDL	BDL
Limit as per GSR 742 (E) dated 25.09.2000		**300.00**	**ND**	**120.00**	**120.00**	**ND**	**ND**	**ND**	**ND**	**ND**	**ND**
Limit as per NAAQS, 2009		**-**	**60.00**	**-**	**-**	**1.00**	**6.00**	**ND**	**ND**	**ND**	**20.00**

ND – Not Defined,
BDL for Pb – 0.05 µg/m^3,
BDL for Cr – 0.01 µg/m^3,
BDL for Ni – 0.10 ng/m^3
BDL for As – 1.00 ng/m^3,
BDL for Cd – 0.001 µg/m^3,
BDL for Hg – 0.001 µg/m^3,
BDL for SO_2 – 10.00 µg/m^3

3. CISF Camp. Sonepur-Bazari OCP (A3); Core Zone

Week	Date	PM_{10} µg/m^3	$PM_{2.5}$ µg/m^3	SO_2 µg/m^3	NOx µg/m^3	Pb µg/m^3	As ng/m^3	Cd µg/m^3	Cr µg/m^3	Hg µg/m^3	Ni ng/m^3
I	06.12.2021	74.70	44.10	BDL	13.50	BDL	BDL	BDL	BDL	BDL	BDL
	07.12.2021	138.50	81.10	BDL	12.80	BDL	BDL	BDL	BDL	BDL	BDL
II	13.12.2021	153.60	63.90	BDL	15.80	BDL	BDL	BDL	BDL	BDL	BDL
	14.12.2021	195.80	53.70	BDL	19.80	BDL	BDL	BDL	BDL	BDL	BDL
III	20.12.2021	166.30	57.80	BDL	17.20	BDL	BDL	BDL	BDL	BDL	BDL
	21.12.2021	163.70	67.30	BDL	15.40	BDL	BDL	BDL	BDL	BDL	BDL
IV	27.12.2021	202.80	67.70	BDL	18.20	BDL	BDL	BDL	BDL	BDL	BDL
	28.12.2021	192.80	88.30	BDL	12.80	BDL	BDL	BDL	BDL	BDL	BDL
Limit as per GSR 742 (E) dated 25.09.2000		**300.00**	**ND**	**120.00**	**120.00**	**ND**	**ND**	**ND**	**ND**	**ND**	**ND**
Limit as per NAAQS, 2009		**-**	**60.00**	**-**	**-**	**1.00**	**6.00**	**ND**	**ND**	**ND**	**20.00**

ND – Not Defined,
BDL for As – 1.00 ng/m^3,
BDL for Pb – 0.05 µg/m^3,
BDL for Cd – 0.001 µg/m^3,
BDL for Cr – 0.01 µg/m^3,
BDL for Hg – 0.001 µg/m^3,
BDL for Ni – 0.10 ng/m^3
BDL for SO_2 – 10.00 µg/m^3

4. Manager's Office, Jambad UG (A4); Buffer Zone

Week	Date	PM_{10} µg/m^3	$PM_{2.5}$ µg/m^3	SO_2 µg/m^3	NOx µg/m^3	Pb µg/m^3	As ng/m^3	Cd µg/m^3	Cr µg/m^3	Hg µg/m^3	Ni ng/m^3
I	06.12.2021	92.70	13.80	BDL	14.60	BDL	BDL	BDL	BDL	BDL	BDL
	07.12.2021	160.70	25.80	BDL	14.60	BDL	BDL	BDL	BDL	BDL	BDL
II	13.12.2021	243.00	33.50	BDL	17.60	BDL	BDL	BDL	BDL	BDL	BDL
	14.12.2021	236.00	36.70	BDL	14.60	BDL	BDL	BDL	BDL	BDL	BDL
III	20.12.2021	230.30	19.30	BDL	15.30	BDL	BDL	BDL	BDL	BDL	BDL
	21.12.2021	253.90	29.90	BDL	16.20	BDL	BDL	BDL	BDL	BDL	BDL
IV	27.12.2021	226.50	28.60	BDL	13.40	BDL	BDL	BDL	BDL	BDL	BDL
	28.12.2021	198.20	24.90	BDL	17.60	BDL	BDL	BDL	BDL	BDL	BDL
Limit as per GSR 742 (E) dated 25.09.2000		**300.00**	**ND**	**120.00**	**120.00**	**ND**	**ND**	**ND**	**ND**	**ND**	**ND**
Limit as per NAAQS, 2009		**-**	**60.00**	**-**	**-**	**1.00**	**6.00**	**ND**	**ND**	**ND**	**20.00**

ND – Not Defined,
BDL for As – 1.00 ng/m^3,
BDL for Pb – 0.05 µg/m^3,
BDL for Cd – 0.001 µg/m^3,
BDL for Cr – 0.01 µg/m^3,
BDL for Hg – 0.001 µg/m^3,
BDL for Ni – 0.10 ng/m^3
BDL for SO_2 – 10.00 µg/m^3

5. Manager's Office, Moira UG (A5); Buffer Zone

Week	Date	PM_{10} µg/m^3	$PM_{2.5}$ µg/m^3	SO_2 µg/m^3	NOx µg/m^3	Pb µg/m^3	As ng/m^3	Cd µg/m^3	Cr µg/m^3	Hg µg/m^3	Ni ng/m^3
I	06.12.2021	159.70	87.10	BDL	18.70	BDL	BDL	BDL	BDL	BDL	BDL
	07.12.2021	184.30	68.20	BDL	18.30	BDL	BDL	BDL	BDL	BDL	BDL
II	13.12.2021	241.90	16.70	BDL	12.80	BDL	BDL	BDL	BDL	BDL	BDL
	14.12.2021	247.20	72.70	BDL	17.30	BDL	BDL	BDL	BDL	BDL	BDL
III	20.12.2021	229.70	75.40	BDL	14.90	BDL	BDL	BDL	BDL	BDL	BDL
	21.12.2021	272.10	22.20	BDL	13.80	BDL	BDL	BDL	BDL	BDL	BDL
IV	27.12.2021	193.50	57.80	BDL	17.60	BDL	BDL	BDL	BDL	BDL	BDL
	28.12.2021	159.50	54.20	BDL	14.60	BDL	BDL	BDL	BDL	BDL	BDL
Limit as per GSR 742 (E) dated 25.09.2000		**300.00**	**ND**	**120.00**	**120.00**	**ND**	**ND**	**ND**	**ND**	**ND**	**ND**
Limit as per NAAQS, 2009		**-**	**60.00**	**-**	**-**	**1.00**	**6.00**	**ND**	**ND**	**ND**	**20.00**

ND – Not Defined,
BDL for As – 1.00 ng/m^3,
BDL for Pb – 0.05 µg/m^3,
BDL for Cd – 0.001 µg/m^3,
BDL for Cr – 0.01 µg/m^3,
BDL for Hg – 0.001 µg/m^3,
BDL for Ni – 0.10 ng/m^3
BDL for SO_2 – 10.00 µg/m^3

6. Khandra Workshop (A6); Buffer Zone

Week	Date	PM_{10} µg/m^3	$PM_{2.5}$ µg/m^3	SO_2 µg/m^3	NOx µg/m^3	Pb µg/m^3	As ng/m^3	Cd µg/m^3	Cr µg/m^3	Hg µg/m^3	Ni ng/m^3
I	06.12.2021	122.50	74.70	BDL	16.40	BDL	BDL	BDL	BDL	BDL	BDL
	07.12.2021	174.30	64.60	BDL	18.10	BDL	BDL	BDL	BDL	BDL	BDL
II	13.12.2021	194.50	36.20	BDL	16.20	BDL	BDL	BDL	BDL	BDL	BDL
	14.12.2021	254.80	28.50	BDL	17.80	BDL	BDL	BDL	BDL	BDL	BDL
III	20.12.2021	251.30	85.90	BDL	12.80	BDL	BDL	BDL	BDL	BDL	BDL
	21.12.2021	214.90	67.90	BDL	18.30	BDL	BDL	BDL	BDL	BDL	BDL
IV	27.12.2021	228.70	77.40	BDL	19.40	BDL	BDL	BDL	BDL	BDL	BDL
	28.12.2021	211.80	42.50	BDL	14.60	BDL	BDL	BDL	BDL	BDL	BDL
Limit as per GSR 742 (E) dated 25.09.2000		**300.00**	**ND**	**120.00**	**120.00**	**ND**	**ND**	**ND**	**ND**	**ND**	**ND**
Limit as per NAAQS, 2009		**-**	**60.00**	**-**	**-**	**1.00**	**6.00**	**ND**	**ND**	**ND**	**20.00**

ND – Not Defined,
BDL for As – 1.00 ng/m^3,
BDL for Pb – 0.05 µg/m^3,
BDL for Cd – 0.001 µg/m^3,
BDL for Cr – 0.01 µg/m^3,
BDL for Hg – 0.001 µg/m^3,
BDL for Ni – 0.10 ng/m^3
BDL for SO_2 – 10.00 µg/m^3

7. Chinchuria Village (A7); Buffer Zone

Week	Date	PM_{10} µg/m^3	$PM_{2.5}$ µg/m^3	SO_2 µg/m^3	NOx µg/m^3	Pb µg/m^3	As ng/m^3	Cd µg/m^3	Cr µg/m^3	Hg µg/m^3	Ni ng/m^3
I	06.12.2021	65.40	14.90	BDL	17.20	BDL	BDL	BDL	BDL	BDL	BDL
	07.12.2021	88.50	21.50	BDL	18.20	BDL	BDL	BDL	BDL	BDL	BDL
II	13.12.2021	81.40	23.70	BDL	18.70	BDL	BDL	BDL	BDL	BDL	BDL
	14.12.2021	52.50	31.10	BDL	16.40	BDL	BDL	BDL	BDL	BDL	BDL
III	20.12.2021	78.30	10.60	BDL	18.70	BDL	BDL	BDL	BDL	BDL	BDL
	21.12.2021	69.20	35.80	BDL	12.50	BDL	BDL	BDL	BDL	BDL	BDL
IV	27.12.2021	72.00	49.40	BDL	16.50	BDL	BDL	BDL	BDL	BDL	BDL
	28.12.2021	92.70	39.20	BDL	18.60	BDL	BDL	BDL	BDL	BDL	BDL
Limit as per NAAQS, 2009		**100.00**	**60.00**	**80.00**	**80.00**	**1.00**	**6.00**	**ND**	**ND**	**ND**	**20.00**

ND – Not Defined,
BDL for Pb – 0.05 µg/m^3,
BDL for Cr – 0.01 µg/m^3,
BDL for Ni – 0.10 ng/m^3
BDL for As – 1.00 ng/m^3,
BDL for Cd – 0.001 µg/m^3,
BDL for Hg – 0.001 µg/m^3,
BDL for SO_2 – 10.00 µg/m^3

8. Balijuri Community Hall (A8); Buffer Zone

Week	Date	PM_{10} µg/m^3	$PM_{2.5}$ µg/m^3	SO_2 µg/m^3	NOx µg/m^3	Pb µg/m^3	As ng/m^3	Cd µg/m^3	Cr µg/m^3	Hg µg/m^3	Ni ng/m^3
I	06.12.2021	74.90	37.40	BDL	18.30	BDL	BDL	BDL	BDL	BDL	BDL
	07.12.2021	83.60	46.80	BDL	13.40	BDL	BDL	BDL	BDL	BDL	BDL
II	13.12.2021	94.60	43.90	BDL	14.90	BDL	BDL	BDL	BDL	BDL	BDL
	14.12.2021	87.90	42.40	BDL	15.30	BDL	BDL	BDL	BDL	BDL	BDL
III	20.12.2021	76.70	31.90	BDL	15.40	BDL	BDL	BDL	BDL	BDL	BDL
	21.12.2021	87.10	53.00	BDL	15.40	BDL	BDL	BDL	BDL	BDL	BDL
IV	27.12.2021	84.70	43.00	BDL	13.50	BDL	BDL	BDL	BDL	BDL	BDL
	28.12.2021	57.60	35.50	BDL	17.60	BDL	BDL	BDL	BDL	BDL	BDL
Limit as per NAAQS, 2009		**100.00**	**60.00**	**80.00**	**80.00**	**1.00**	**6.00**	**ND**	**ND**	**ND**	**20.00**

ND – Not Defined,
BDL for Pb – 0.05 µg/m^3,
BDL for Cr – 0.01 µg/m^3,
BDL for Ni – 0.10 ng/m^3
BDL for As – 1.00 ng/m^3,
BDL for Cd – 0.001 µg/m^3,
BDL for Hg – 0.001 µg/m^3,
BDL for SO_2 – 10.00 µg/m^3

9. Konda Hospital (A9); Buffer Zone

Week	Date	PM_{10} µg/m^3	$PM_{2.5}$ µg/m^3	SO_2 µg/m^3	NOx µg/m^3	Pb µg/m^3	As ng/m^3	Cd µg/m^3	Cr µg/m^3	Hg µg/m^3	Ni ng/m^3
I	06.12.2021	57.80	31.80	BDL	19.40	BDL	BDL	BDL	BDL	BDL	BDL
	07.12.2021	57.90	31.80	BDL	19.40	BDL	BDL	BDL	BDL	BDL	BDL
II	13.12.2021	67.20	32.50	BDL	15.70	BDL	BDL	BDL	BDL	BDL	BDL
	14.12.2021	53.10	22.50	BDL	15.70	BDL	BDL	BDL	BDL	BDL	BDL
III	20.12.2021	64.20	24.00	BDL	17.60	BDL	BDL	BDL	BDL	BDL	BDL
	21.12.2021	66.70	34.00	BDL	17.60	BDL	BDL	BDL	BDL	BDL	BDL
IV	27.12.2021	78.70	45.50	BDL	17.80	BDL	BDL	BDL	BDL	BDL	BDL
	28.12.2021	68.60	35.50	BDL	17.80	BDL	BDL	BDL	BDL	BDL	BDL
Limit as per NAAQS, 2009		**100.00**	**60.00**	**80.00**	**80.00**	**1.00**	**6.00**	**ND**	**ND**	**ND**	**20.00**

ND – Not Defined,
BDL for Pb – 0.05 µg/m^3,
BDL for Cr – 0.01 µg/m^3,
BDL for Ni – 0.10 ng/m^3
BDL for As – 1.00 ng/m^3,
BDL for Cd – 0.001 µg/m^3,
BDL for Hg – 0.001 µg/m^3,
BDL for SO_2 – 10.00 µg/m^3

10. Tilaboni Filter Plant (A10); Buffer Zone

Week	Date	PM_{10} µg/m^3	$PM_{2.5}$ µg/m^3	SO_2 µg/m^3	NOx µg/m^3	Pb µg/m^3	As ng/m^3	Cd µg/m^3	Cr µg/m^3	Hg µg/m^3	Ni ng/m^3
I	06.12.2021	97.70	44.10	BDL	13.60	BDL	BDL	BDL	BDL	BDL	BDL
	07.12.2021	69.00	32.60	BDL	15.60	BDL	BDL	BDL	BDL	BDL	BDL
II	13.12.2021	87.60	31.50	BDL	18.20	BDL	BDL	BDL	BDL	BDL	BDL
	14.12.2021	55.20	40.90	BDL	15.80	BDL	BDL	BDL	BDL	BDL	BDL
III	20.12.2021	77.10	35.60	BDL	12.60	BDL	BDL	BDL	BDL	BDL	BDL
	21.12.2021	90.20	37.60	BDL	19.70	BDL	BDL	BDL	BDL	BDL	BDL
IV	27.12.2021	85.70	44.80	BDL	19.50	BDL	BDL	BDL	BDL	BDL	BDL
	28.12.2021	76.00	24.80	BDL	15.90	BDL	BDL	BDL	BDL	BDL	BDL
Limit as per NAAQS, 2009		**100.00**	**60.00**	**80.00**	**80.00**	**1.00**	**6.00**	**ND**	**ND**	**ND**	**20.00**

ND – Not Defined,
BDL for Pb – 0.05 µg/m^3,
BDL for Cr – 0.01 µg/m^3,
BDL for Ni – 0.10 ng/m^3
BDL for As – 1.00 ng/m^3,
BDL for Cd – 0.001 µg/m^3,
BDL for Hg – 0.001 µg/m^3,
BDL for SO_2 – 10.00 µg/m^3

Observations

From the above tables it can be seen that the concentration levels of PM_{10} at industrial and residential locations vary from 74.10 µg/m^3 to 272.10 µg/m^3 and 52.50 µg/m^3 to 97.70 µg/m^3 respectively. The values are within the limits as per GSR 742 (E) 25.09.2000 and as per NAAQS, 2009. Similarly, the concentration levels of $PM_{2.5}$ at industrial and residential locations vary from 13.80 µg/m^3 to 88.30 µg/m^3 and 10.60 µg/m^3 to 49.40 µg/m^3 respectively. No limits are defined for $PM_{2.5}$ under GSR 742 (E) 25.09.2000 which is applicable for industrial stations while the values are within the limits at residential locations as per NAAQS, 2009. The concentration values of SO_2 remained below 10.00 µg/m^3 while that of NO_X varied from 12.50 µg/m^3 to 19.80 µg/m^3. The values of NO_X remained within limits as per NAAQS, 2009 and GSR 742 (E) 25.09.2000.

Heavy metals in ambient air remained BDL.

B. Noise Level Measurement:

Station Code	Station Name (Category)	Date of sampling	Sampling duration (hrs.)	Day – time Noise Level dB(A) Leq	Night – time Noise Level dB(A) Leq	Day – Night Noise Level dB(A) Leq
1st Fortnight						
BLDGN-01	Khottadih Colliery (I)	14-Dec-21	15.01 to 13.40	71.93	41.79	70.17
BLDGN-02	Agent's Banglow, Sarpi UG (I)	14-Dec-21	16.30 to 15.59	73.42	43.67	71.66
BLDGN-03	CISF Camp, Sonpur Bazari OCP (I)	6-Dec-21	12.15 to 23.34	67.30	64.38	66.53
BLDGN-04	Manager's Office, Jambad UG (I)	6-Dec-21	13.06 to 13.06	68.76	44.11	67.01
BLDGN-05	Manager's Office, Moria UG (I)	7-Dec-21	14.44 to 13.52	56.22	55.02	55.86
BLDGN-06	Khandra Workshop (I)	7-Dec-21	10.32 to 10.32	62.85	52.61	61.29
BLDGN-07	Chichuria Village (R)	13-Dec-21	17.39 to 16.11	51.51	38.71	59.76
BLDGN-08	Baliguri Community Hall (R)	13-Dec-21	16.40 to 16.17	55.40	38.86	63.64
BLDGN-09	Konda Village (R)	8-Dec-21	16.41 to 16.35	54.39	34.22	62.63
BLDGN-10	Tilaboni Filter plant (I)	8-Dec-21	17.39 to 16.35	72.00	57.58	70.32
2nd Fortnight						
BLDGN-01	Khottadih Colliery (I)	22-Dec-21	14.44 to 13.52	56.22	45.02	54.62

Station Code	Station Name (Category)	Date of sampling	Sampling duration (hrs.)	Day – time Noise Level dB(A) Leq	Night – time Noise Level dB(A) Leq	Day – Night Noise Level dB(A) Leq
BLDGN-02	Agent's Banglow, Sarpi UG (I)	22-Dec-21	12.15 to 17.15	68.60	51.36	66.88
BLDGN-03	CISF Camp, Sonpur Bazari OCP (I)	20-Dec-21	13.00 to 08.39	63.06	52.53	61.49
BLDGN-04	Manager's Office, Jambad UG (I)	20-Dec-21	15.38 to 15.38	68.24	45.75	66.49
BLDGN-05	Manager's Office, Moria UG (I)	16-Dec-21	15.23 to 14.36	70.12	65.59	69.06
BLDGN-06	Khandra Workshop (I)	16-Dec-21	15.01 to 13.40	69.93	61.79	68.49
BLDGN-07	Chichuria Village (R)	21-Dec-21	12.15 to 23.34	57.30	34.38	65.54
BLDGN-08	Baliguri Community Hall (R)	21-Dec-21	13.00 to 08.39	53.06	32.53	61.30
BLDGN-09	Konda Village (R)	17-Dec-21	14.12 to 14.12	41.00	36.60	59.25
BLDGN-10	Tilaboni Filter plant (I)	17-Dec-21	16.20 to 14.18	73.98	75.30	74.47

Noise Pollution (Regulation and Control) Rules published in Gazette of India, vide S. O. 123 (E) dated 14.02.2000 under Environment Protection Act, 1986.

Station Category	Limits for noise (Leq dB (A))	
	Day Time: 6.00 AM to 10.00 PM	Night Time: 10.00 PM to 6.00 AM.
Industrial	75.0	70.0
Commercial	65.0	55.0
Residential	55.0	45.0
Silence Zone	50.0	40.0

Observations

From the above tables it can be seen that the values of noise level during day time and night time at industrial stations varies from 56.22 dB(A) to 73.42 dB(A) and 34.38 dB(A) to 65.59 dB(A) respectively while the values of noise level during day time and night time at residential stations varies from 41.00 dB(A) to 55.40 dB(A) and 32.53 dB(A) to 38.71 dB(A) respectively. The values are within the limits as per Noise Pollution (Regulation and Control) Rules, 2000.

C. Water Quality (Surface/Mine/Ground water):

Samples were collected from the following stations falling within the core and buffer zone of Cluster No. 12 and analyzed in the laboratory:

Sl. No.	Name of Surface Water Station	Frequency
1	Ajoy River upstream (near Shyamla Village)	once in a month
2	Ajoy River downstream (near Madhaipur OCP)	once in a month
3	Tumni Nallah upstream (near Tapanpur Village)	once in a month
4	Tumni Nallah downstream (near Kamardanga Village)	once in a month
5	Pond in Kendra Village (Kendra Colliery)	once in a month
6	Pond in Gogla Village (Nutandanga Colliery)	once in a month
7	Pond in Ukhra Village (Bankola Colliery)	once in a month
8	Pond in Haripur Village (SB OCP)	once in a month
Name of Effluent Water Station		
1	Mine Discharge Water Pandaveswar-Dalurband Colliery	once in a month
2	Mine Discharge Water Manderboni-South Samla Colliery	once in a month
3	Mine Discharge Water Madhaipur Colliery	once in a month
4	Mine Discharge Water Sonepur Bazari Colliery	once in a month
5	Mine Discharge Water Nakrakonda-Kumardihi B Colliery	once in a month
6	Mine Discharge Water Kumardihi A Colliery	once in a month
7	Mine Discharge Water Jhanjra Colliery	once in a month
8	Mine Discharge Water Khottadih Colliery	once in a month
9	Mine Discharge Water SSpur Colliery	once in a month
10	Mine Discharge Water Bankola Colliery	once in a month
Name of Drinking Water Station		
1	Dugwell at NHS Qtrs Khottadih beside primary school	once in a month
2	Dugwell at Konda Regional Hospital	once in a month
3	Dugwell at NHS Qtrs of Danya village	once in a month
4	Dugwell at Kumardih "A" colliery	once in a month
5	Dugwell at Dobrana Village	once in a month
6	Dugwell at Sarpi Village	once in a month
7	Dugwell at Madhaiganj Village	once in a month
8	Dugwell at Maheshpur Village	once in a month

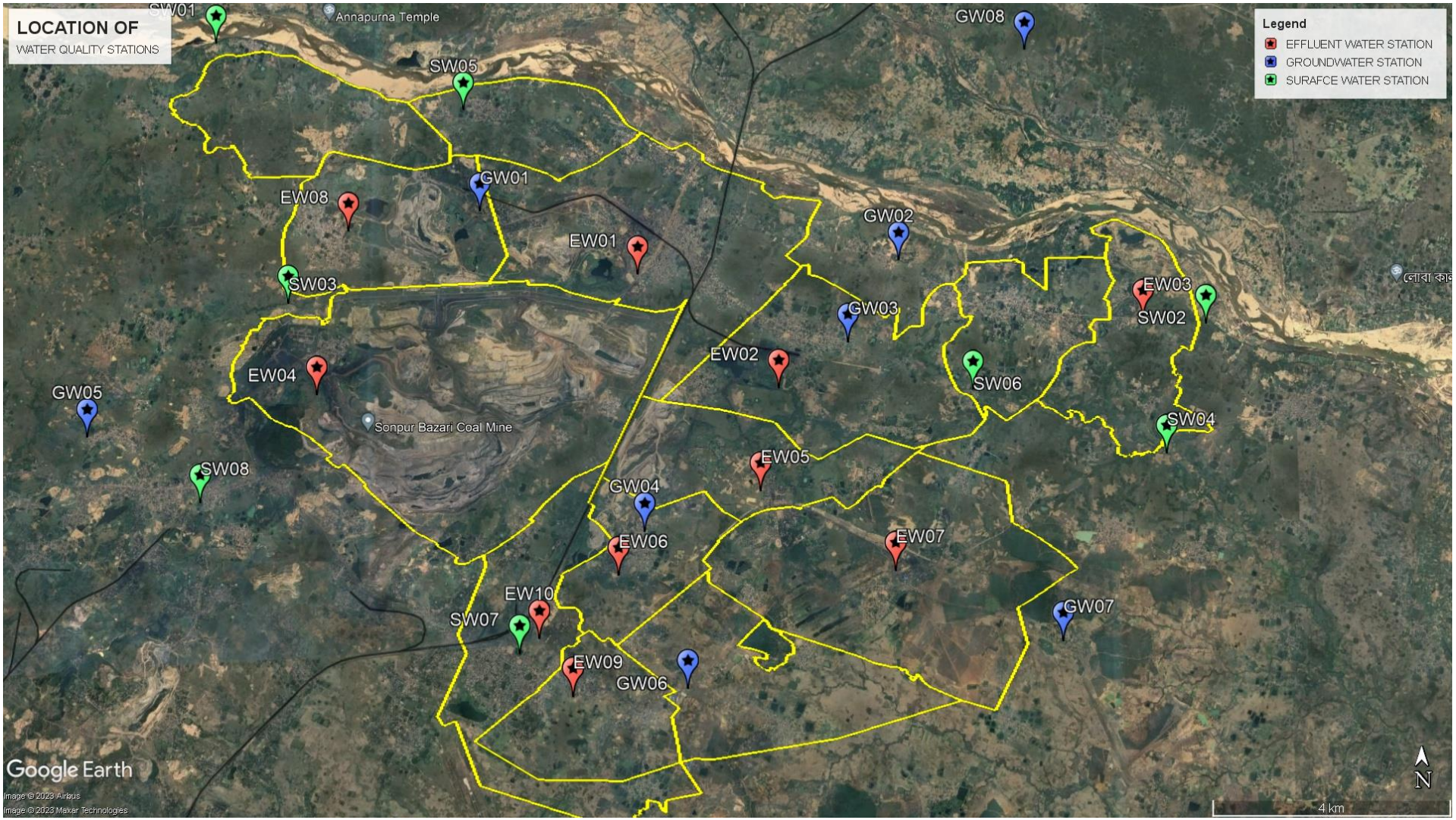
The monitoring of water quality has been conducted by collecting water samples from ground water, surface water and mine water discharge for Cluster No. 12. The various purposes of the water environment monitoring are as follows:

- ✓ To assess the water quality characteristics for critical parameters,
- ✓ To evaluate the impacts on agricultural productivity, habitat conditions, creational resources and aesthetics in the vicinity ; and
- ✓ To facilitate predication of impact on water quality by project activities.

METHODOLOGY

Grab sampling or representative sampling (surface water) method was adopted for collection of ground water sample from hand-pump, waste water and surface water samples from different sources of water bodies as per CMPDI/ASN/LPM27: Procedure for Sampling and Analysis of Water (Effluent/Drinking/Ground/Surface).

PHOTOS OF BASELINE DATA GENERATION STATION W.R.T. WATER QUALITY ON 19-20.10.2021



LOCATION OF BLD STATIONS W.R.T. WATER QUALITY, CLUSTER NO. 12

✓ Surface Water Quality

Sampling Station Name	Ajoy River upstream (near Shyamla Village)	Ajoy River downstream (near Madhaipur OCP)	Tumni Nallah upstream (near Tapanpur Village)	Tumni Nallah downstream (near Kamardanga Village)	Pond in Kendra Village (Kendra Colliery)	Pond in Gogla Village (Nutandanga Colliery)	Pond in Ukhra Village (Bankola Colliery)	Pond in Haripur Village (SB OCP)	Surface Water Quality Standards (as per IS 2296: 1982, Class C)
Sampling Date	19-Oct-21	19-Oct-21	19-Oct-21	19-Oct-21	20-Oct-21	20-Oct-21	20-Oct-21	20-Oct-21	
pH value	7.82	7.64	7.38	7.32	6.97	7.42	8.57	7.76	6.5-8.5
Colour, Hazen units	3	2	4	3	5	2	6	4	300
Odour	Un-objectionable	Un-objectionable	Un-objectionable	Un-objectionable	Un-objectionable	Un-objectionable	Un-objectionable	Un-objectionable	--
Electrical Conductivity (µS/cm)	168	614	573	532	148	438	171	234	--
Dissolved Oxygen, mg/l	4.22	5.74	5.38	5.38	6.94	6.28	7.12	5.48	4
Total hardness (as $CaCO_3$), mg/l	89.34	367.25	479.35	396.58	91.47	371.25	79.48	162.58	--
Chlorides, mg/l	21	23	18	17	47	52	48	36	600
Total Dissolved Solids, mg/l	203	738	687	654	218	548	316	218	1500
Free Ammonia (as N), mg/l	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	--
Fluorides (as F), mg/l	BDL	0.22	BDL	BDL	0.34	BDL	BDL	BDL	1.5
Sulphates (as SO_4), mg/l	28.74	43.67	63.24	22.71	36.48	43.24	31.22	31.71	400
Nitrates (as NO_3), mg/l	6.96	12.72	7.34	2.36	12.84	7.24	2.86	12.72	50
BOD, mg/l	5.16	5.32	5.28	5.48	5.36	5.22	5.18	5.62	3
Arsenic (as As), mg/l	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	0.20
Boron, mg/l	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	--

Sampling Station Name	Ajoy River upstream (near Shyamla Village)	Ajoy River downstream (near Madhaipur OCP)	Tumni Nallah upstream (near Tapanpur Village)	Tumni Nallah downstream (near Kamardanga Village)	Pond in Kendra Village (Kendra Colliery)	Pond in Gogla Village (Nutandanga Colliery)	Pond in Ukhra Village (Bankola Colliery)	Pond in Haripur Village (SB OCP)	Surface Water Quality Standards (as per IS 2296: 1982, Class C)
Sampling Date	19-Oct-21	19-Oct-21	19-Oct-21	19-Oct-21	20-Oct-21	20-Oct-21	20-Oct-21	20-Oct-21	
Iron (as Fe), mg/l	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	0.50
Lead (as Pb), mg/l	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	0.10
Copper (as Cu), mg/l	0.05	BDL	0.04	0.03	0.04	BDL	0.04	0.04	1.50
Manganese (as Mn), mg/l	0.04	0.05	0.04	0.05	0.06	BDL	0.04	0.06	--
Cadmium (as Cd), mg/l	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	0.01
Chromium (as Cr^{6+}), mg/l	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	0.05
Total coliform, MPN/100 ml	NIL	NIL	NIL	NIL	NIL	NIL	NIL	NIL	5000
Phenolic compounds (as C_2H_5OH), mg/l	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	0.005

BDL for Free Ammonia: 0.02 mg/l
BDL for Fluorides: 0.01 mg/l
BDL for Arsenic: 0.02 mg/l
BDL for Boron: 0.10 mg/l
BDL for Iron: 0.01 mg/l
BDL for Lead: 0.05 mg/l
BDL for Copper: 0.03 mg/l
BDL for Manganese: 0.04 mg/l
BDL for Cadmium: 0.002 mg/l
BDL for Chromium: 0.01 mg/l
BDL for Phenolics Compound: 0.001 mg/l

✓ Ground Water Quality

Sampling Station Name	Dugwell at NHS Qtrs Khottadih beside primary school	Dugwell at Konda Regional Hospital	Dugwell at NHS Qtrs of Danya village	Dugwell at Kumardih "A" colliery	Dugwell at Dobrana Village	Dugwell at Sarpi Village	Dugwell at Madhaiganj Village	Dugwell at Maheshpur Village	Drinking Water Standards as per IS 10500: 2012	
Sampling Date	20-Oct-21	19-Oct-21	20-Oct-21	20-Oct-21	19-Oct-21	19-Oct-21	21-Oct-21	21-Oct-21	**Acceptable Limits**	**Permissible Limits**
Colour, Hazen units	3	5	2	4	6	3	5	3	5	15
Odour	Unobjectionable	Unobjectionable	Unobjectionable	Unobjectionable	Unobjectionable	Unobjectionable	Unobjectionable	Unobjectionable	Agreeable	
Taste	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable	
Turbidity, NTU	BDL	BDL	0.6	0.72	0.13	BDL	0.68	BDL	1	5
pH value	7.28	6.74	6.82	6.91	7.42	6.94	6.89	6.34	6.5-8.5	No relaxation
Total Hardness (as $CaCO_3$), mg/l	172.48	68.34	136.42	316.51	218.46	236.45	71.24	178.34	200	600
Iron (as Fe), mg/l	0.05	BDL	BDL	BDL	BDL	BDL	BDL	BDL	0.3	No relaxation
Chloride (as Cl), mg/l	18	22	8	73	28	76	11	62	250	1000
Free Residual Chlorine, mg/l	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	0.2	1
Total Dissolved Solids, mg/l	234	276	316	478	364	418	276	381	500	1000
Calcium (as Ca), mg/l	32.16	14.28	38.57	69.54	56.48	68.74	18.34	46.52	75	200
Copper (as Cu), mg/l	BDL	BDL	BDL	BDL	0.04	0.05	0.04	0.03	0.05	1.5
Manganese (as Mn), mg/l	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	0.1	0.3
Sulphate (as SO_4), mg/l	16.28	12.46	7.32	44.28	36.42	28.68	14.34	4.26	200	400
Nitrate (as NO_3), mg/l	6.48	14.36	8.32	12.76	21.32	7.22	8.36	15.24	45	No relaxation
Fluoride (as F), mg/l	0.18	0.24	0.22	0.16	0.16	0.14	0.16	0.18	1.0	1.5

Sampling Station Name	Dugwell at NHS Qtrs Khottadih beside primary school	Dugwell at Konda Regional Hospital	Dugwell at NHS Qtrs of Danya village	Dugwell at Kumardih "A" colliery	Dugwell at Dobrana Village	Dugwell at Sarpi Village	Dugwell at Madhaiganj Village	Dugwell at Maheshpur Village	Drinking Water Standards as per IS 10500: 2012	
Sampling Date	20-Oct-21	19-Oct-21	20-Oct-21	20-Oct-21	19-Oct-21	19-Oct-21	21-Oct-21	21-Oct-21	**Acceptable Limits**	**Permissible Limits**
Selenium (as Se), mg/l	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	0.01	No relaxation
Total Arsenic (as As), mg/l	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	0.01	0.05
Lead (as Pb), mg/l	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	0.01	No relaxation
Zinc (as Zn), mg/l	0.03	0.04	0.04	BDL	0.05	0.04	0.03	BDL	5	15
Total Chromium (as Cr), mg/l	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	0.05	No relaxation
Boron (as B), mg/l	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	0.5	1.0
Total Coliform (MPN)	NIL	NIL	NIL	NIL	NIL	NIL	NIL	NIL	Shall not be detectable in any 100 ml sample	
Phenolic Compounds (as C_6H_5OH), mg/l	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	0.001	0.002
Total Alkalinity, mg/l	82	44	112	318	196	278	62	84	200	600
Cadmium (as Cd), mg/l	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	0.003	No relaxation

BDL for Free Res. Chlorine: 0.03 mg/l
BDL for Boron: 0.10 mg/l
BDL for Copper: 0.03 mg/l
BDL for Chromium: 0.01 mg/l

BDL for Fluorides: 0.01 mg/l
BDL for Iron: 0.04 mg/l
BDL for Manganese: 0.04 mg/l
BDL for Phenolics Compound: 0.001 mg/l

BDL for Arsenic: 0.02 mg/l
BDL for Lead: 0.05 mg/l
BDL for Cadmium: 0.002 mg/l
BDL for Selenium: 0.002 mg/l

✓ Mine Effluent Water

Sampling Station Name	Mine Discharge Water Pandaveswar-Dalurband Colliery	Mine Discharge Water Manderboni-South Samla Colliery	Mine Discharge Water Madhaipur Colliery	Mine Discharge Water Sonepur Bazari Colliery	Mine Discharge Water Nakrakonda-Kumardihi B Colliery	Mine Discharge Water Kumardihi A Colliery	Mine Discharge Water Jhanjra Colliery	Mine Discharge Water Khottadih Colliery	Mine Discharge Water SSpur Colliery	Mine Discharge Water Bankola Colliery	General Standards for Discharge of Environmental Pollutants Part-A : Effluents (Inland Surface Water)
Sampling Date	21-Oct-21	21-Oct-21	21-Oct-21	21-Oct-21	20-Oct-21	20-Oct-21	20-Oct-21	19-Oct-21	19-Oct-21	19-Oct-21	
Colour, Hazen units	4	3	5	3	7	6	5	3	2	4	Un-objectionable
Odour	Un-Objectionable	Un-Objectionable	Un-Objectionable	Un-Objectionable	Un-Objectionable	Un-Objectionable	Un-Objectionable	Un-Objectionable	Un-Objectionable	Un-Objectionable	Un-objectionable
TSS, mg/l	BDL	BDL	BDL	BDL	12.08	BDL	16.48	BDL	BDL	BDL	100
pH value	7.04	7.12	7.24	7.16	7.22	7.06	8.12	7.29	7.34	6.84	5.5-9.0
Temperature (^{0}C)	28.6	28.4	28.6	28.3	28.4	28.7	28.7	238.4	28.9	28.7	shall not exceed 5 ^{0}C above the receiving water temperature
Oil & Grease, mg/l	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	10
Total Residual Chlorine, mg/l	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	1.0
Ammonical Nitrogen (as N), mg/l	0.62	0.43	0.56	0.68	0.72	0.58	0.64	0.66	0.59	0.68	50
Total Kjeldahl Nitrogen (as NH_3), mg/l	1.72	1.84	1.76	1.78	1.64	1.72	1.58	1.62	1.76	1.84	100
Free Ammonia (as NH_3), mg/l	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	5.0
BOD, mg/l	5.6	4.8	4.2	4.8	5.7	3.8	4.6	5.4	6.2	4.8	30
COD, mg/l	16	12	24	16	28	12	8	16	24	28	250
Arsenic (as As), mg/l	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	0.2
Lead (as Pb), mg/l	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	0.1
Hexavalent	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	0.1

Sampling Station Name	Mine Discharge Water Pandaveswar-Dalurband Colliery	Mine Discharge Water Manderboni-South Samla Colliery	Mine Discharge Water Madhaipur Colliery	Mine Discharge Water Sonepur Bazari Colliery	Mine Discharge Water Nakrakonda-Kumardihi B Colliery	Mine Discharge Water Kumardihi A Colliery	Mine Discharge Water Jhanjra Colliery	Mine Discharge Water Khottadih Colliery	Mine Discharge Water SSpur Colliery	Mine Discharge Water Bankola Colliery	General Standards for Discharge of Environmental Pollutants Part-A : Effluents (Inland Surface Water)
Sampling Date	21-Oct-21	21-Oct-21	21-Oct-21	21-Oct-21	20-Oct-21	20-Oct-21	20-Oct-21	19-Oct-21	19-Oct-21	19-Oct-21	
Chromium (as Cr^{6+}), mg/l											
Total Chromium (as Cr), mg/l	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	2.0
Copper (as Cu), mg/l	0.04	BDL	BDL	0.05	BDL	BDL	0.04	0.05	BDL	BDL	3.0
Zinc (as Zn), mg/l	0.06	0.03	0.04	0.05	0.04	0.05	0.03	0.04	0.05	0.03	5.0
Selenium (as Se), mg/l	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	0.05
Nickel (as Ni), mg/l	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	3.0
Fluoride (as F), mg/l	0.34	0.22	0.28	0.36	0.24	0.22	0.18	0.16	0.28	0.32	2.0
Dissolved Phosphates (as P), mg/l	1.84	1.46	1.68	1.72	1.44	1.64	1.28	1.52	1.26	1.76	5.0
Sulphide (as S), mg/l	0.011	0.010	0.008	0.011	0.009	0.012	0.010	0.014	0.008	0.009	2.0
Phenolic compounds (as C_6H_5OH), mg/l	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	1.0
Manganese (as Mn), mg/l	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	2.0
Iron (as Fe), mg/l	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	3.0
Nitrate Nitrogen, mg/l	3.8	4.7	4.2	3.4	4.2	3.6	4.8	3.9	4.1	3.2	10
Cadmium (as Cd), mg/l	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	2.0

Sampling Station Name	Mine Discharge Water Pandaveswar-Dalurband Colliery	Mine Discharge Water Manderboni-South Samla Colliery	Mine Discharge Water Madhaipur Colliery	Mine Discharge Water Sonepur Bazari Colliery	Mine Discharge Water Nakrakonda-Kumardihi B Colliery	Mine Discharge Water Kumardihi A Colliery	Mine Discharge Water Jhanjra Colliery	Mine Discharge Water Khottadih Colliery	Mine Discharge Water SSpur Colliery	Mine Discharge Water Bankola Colliery	General Standards for Discharge of Environmental Pollutants Part-A : Effluents (Inland Surface Water)
Sampling Date	21-Oct-21	21-Oct-21	21-Oct-21	21-Oct-21	20-Oct-21	20-Oct-21	20-Oct-21	19-Oct-21	19-Oct-21	19-Oct-21	
Total Dissolved Solids, mg/l	428	396	434	493	476	432	668	618	719	472	--

BDL for Total Res. Chlorine: 0.03 mg/l
BDL for Boron: 0.10 mg/l
BDL for Copper: 0.03 mg/l
BDL for Chromium: 0.01 mg/l
BDL for Oil & Grease: 2.0 mg/l
BDL for Fluorides: 0.01 mg/l
BDL for Iron: 0.10 mg/l
BDL for Manganese: 0.04 mg/l
BDL for Phenolics Compound: 0.001 mg/l
BDL for Free Ammonia: 0.02 mg/l
BDL for Arsenic: 0.02 mg/l
BDL for Lead: 0.05 mg/l
BDL for Cadmium: 0.002 mg/l
BDL for Selenium: 0.002 mg/l

Observations: From the above tables it can be seen that different parameters of surface/drinking/effluent water are within the limits as per the relevant standards barring BOD in surface water which is higher than the prescribed limits as per IS 2296:1982 (Class C). Proper mitigation measures as proposed in EIA & EMP report is being adopted to keep the water quality parameters within the limits.

ANNEXURE-I

भारत सरकार/Government of India
पर्यावरण, वन एवं जलवायु परिवर्तन मंत्रालय
Ministry of Environment, Forest & Climate Change
एकीकृत क्षेत्रीय कार्यालय, कोलकाता/ **Integrated Regional Office, Kolkat**
IB-198, Sector – III, Salt Lake City, Kolkata-700106
Phone: 033-2335-0902, E-mail: iro.kolkata-mefcc@gov.in

संख्या. 102-505/17/EPE/105 दिनांक: 21.03.2023

सेवामे,

The General Manager (E&F),
M/s. Eastern Coalfields Limited,
Borachak House, Asansol,
District- Burdwan,
West Bengal, Pin- 313359.
e-mail: envecl@yahoo.com

विषय: Cluster 12 comprising of 19 mixed mines of a combined production capacity of 27.16 MTPA (Normative) with a (Peak) production of 31.83 MTPA in a combined ML area of 13759.55 ha (14047 ha – 287.45 ha= 13759.55 ha); Latitude 23°37'30" N & 23°45' N and Longitude 87°11"35' E & 87°24'05" E of M/s. Eastern Coalfields Limited, Located in Raniganj Coalfields, Tehsil Haripur Block, dist. Burdwan, West Bengal-reg.

संदर्भ: Ministry's EC No. i) J-11015/76/2011-IA-II (M) dated 09.02.2015,
ii) J-11015/76/2011-IA-II (M) dated 03.03.2016,
iii) J-11015/76/2011-IA-II (M) dated 31.07.2020.

महोदय,

I am to state that the above project was monitored by Shri Sujoy dutta, Technical Officer and Shri Kaushik Mallick, Research Officer on 09.02.2023 & 10.02.2023 to review the status of implementation of environmental safeguard stipulated in the environmental clearance letter as referred above. The discussion was held with concerned officer on implementation of stipulated environmental condition. It was observed that the effective measures are required to be taken for following issues to ensure satisfactory compliance status:

J-11015/76/2011-IA-II (M) dated 09.02.2015:

i. *PAs need to take the plantation programme seriously by providing three tier green belt around all the railway sidings and along the road sides to prevent dust and noise pollution.* **(Specific Conditions viii)**

ii. *PAs need to submit the present status regarding acceptance/ approval of the Wildlife Conservation Plan by the State Government.* **(Specific Conditions xiv)**

iii. *PAs need to provide appropriate catch drains and siltation ponds in the Open cast mines of Pandaveswar area to arrest silt and sediment flows from soil, OB and mineral dumps. Garland drains (size, gradient and length) and sump capacity shall be designed keeping 50% safety margin over and above the peak sudden rainfall and maximum discharge in the area adjoining the mine site. Sump capacity shall also provide adequate retention period to allow proper settling of silt material.* **(Specific Conditions xli)**

iv. *PAs need to provide appropriate catch drains and siltation ponds in the Open cast mines of Pandaveswar area to arrest silt and sediment flows from soil, OB and mineral dumps.* **(Specific Conditions xlii)**

v. *PAs need to provide appropriate retaining wall at the toe of the dumps and OB benches within the all Open Cast mines to check run-off.* **(Specific Conditions xliii)**

vi. *PAs need to submit details of major approach roads where 3-tier green belt comprising of a mix native species was developed.* **(Specific Conditions xlvii)**

vii. *PAs need to expedite the implantation of progressive afforestation plan to achieve the target (6215.5 ha) at the end of mining.* **(Specific Conditions xlix)**

viii. *PAs need to provide STP to all the residential colony immediately as well as need to install ETP to all the workshops immediately and maintain the ETP properly in Sonepur-Bazari workshop.* **(Specific Conditions lvi)**

ix. *PAs have not submitted the copy of the detailed Final Mine Closure Plan along with details of Corpus Fund. Hence, PAs need to submit the detailed Final Mine Closure Plan along with details of Corpus Fund to the Ministry of Environment, Forest & Climate Change.* **(Specific Conditions lix)**

x. *PAs need to submit information regarding Workshop waste water treatment and discharge of workshop effluents.* **(General Conditions vi)**

xi. *PAs need to submit the year wise detailed expenditure statement for environmental protection measures for Pandaveshwar, Sonepur-Bazari and Jhanjra area also.* **(General Conditions xii)**

xii. *The monitoring data of the environmental quality parameters and critical pollutant and critical sectoral parameters shall not been displayed at the entrance of the project premises and mine office. PAs need to display the same immediately.* **(General Conditions xvi)**

J-11015/76/2011-IA-II-(M) dated 03.03.2016

i. *PAs need to take action to develop green belt/ vertical greenery system along the railway siding to control dust and other fugitive emissions.* **(Amendment condition v)**

ii. *PAs need to provide the details of the thick green belt at the final boundary along with kml file of the mine area to verify with the satellite image.* **(Amendment condition viii)**

iii. *PAs need to conduct a third-party assessment of EC compliance immediately through Government Institutes or any other expert agency and report may be submitted to this office.* **(Amendment condition xii)**

iv. *It was observed during inspection that some OB dumps in the Pandaveswar area and Sonepur-Bazari has been found to be kept in barren/ open condition. PAs need to cover all the OB dump by temporary grass to avoid air born of particles.* **(Amendment condition xiii)**

v. *PAs need to submit details of plantation along the villages and transportation route separately. Further, a certificate in this regard from concerned District Forest Officer needs to submit to Regional Office.* **(Amendment condition xiv)**

vi. *PAs need to submit details regarding the blasting permission from DGMS for conducting mining operation near villages for other mining areas except Pandaveshwar Area.* **(Amendment condition xv)**

The action taken report on the above non-compliances should be submitted to the Regional Office within 30 days of issue of this letter.

भवदीया,

(Dr. Soma Das/ डॉ0 सोमा दास)
Inspector General of Forests (C)/ वन महानिरीक्षक

Copy to: Mr. Lalit Bokolia, Scientist-F, Mining, Ministry of Environment, Forest and Climate Change, Indira Paryavaran Bhawan, Jorbagh Road, Aliganj, New Delhi– 110 003. (E-mail: lk.bokolia@nic.in)

ANNEXURE-II

ACTION TAKEN REPORT ON PARTIAL NON COMPLIANCES OBSERVED IN THE CERTIFIED COMPLIANCE REPORT OF CLUSTER NO. 12

In respect of letter number 102-505/17/EPE/05 dated 21.03.2023 regarding Certified Compliance Report (CCR) of Cluster no. 12. The following ATR has been prepared and action plan will be implemented for compliance of the observations in the CCR.

J-11015/76/2011-IA-II(M) dated 09.02.2015:

1. PAs needs to take the plantation programme seriously by providing 3-tier green belt around all the railway siding and along the road sides to prevent dust and noise pollution.

Reply: Jhanjra Area: Parks have already been developed around POCP-1 railway siding under Jhanjra Area. New Railway Siding and CHP is under construction at Jhanjra Area. Three tier green belts will be developed around new railway siding after construction. Already multiple plantations are created around new proposed railway siding.

Coal Transportation Route Jhanjra Area

POCP 1 Railway Siding and plantation around under Jhanjra Area

Dy. Mgr. (Env.), PA

POCP Siding under Jhanjra Area

Pandaveswar Area: 3 tier plantations have been done over 2.5 Ha land along NH 60 and in between NH60 and Bilpahari Rehabilitated Village.

Bilphari Rehabilitation Site under Pandaveswar Area

Sonepur Bazari Area: Multi-Tier Plantation at Sonepur Bazari Project of 9 Ha in FY 2017-18 and 8 Ha in the FY 2020-21 has been done along NH 60 road. 1000 native plants along with tree a barrier is planted at railway sidings (Photographs and Plan Attached). Moreover, development of 1Ha of Miyawaki Plantation is scheduled for plantation in the FY 2023-24.

9 Ha Road Side Plantation around NH 60 under Sonepur Bazari Area

Bankola Area: Both sides of connecting roadway are well vegetated naturally. Further, roadside plantation along 5.5 km roadways has been done along coal transportation road and siding. A boundary wall is also constructed around Bankola Siding-I & Siding-II to prevent dust and noise pollution.

5 Ha Roadside Plantation – Nakrakonda-Kumardihi B UG&OC

Further, future program for development of 3 tier Green Belt along the roadside and all along the Railway Siding is also tabulated below. As availability of land for 3 tier plantation is limited around the periphery of Railway Sidings future proposals also include development of vertical Green barriers along the periphery. (Copy of patent certificate of CMPDIL for development of Vertical Green Barrier System is attached as **Annexure-I**).

Proposed 3 tier plantation /Green Barrier along the periphery of Railway Siding and Roadside:

S No.	Activity description	Location for plantation	Creation year
1	Construction of Vertical Green Barrier.	Bankola-I Railway Siding	2023-24
2	Construction of Vertical Green Barrier.	Bankola-II Railway Siding	2023-24
3	Development of Plantation over 5.00 Km length of road	Avenue plantation at Jhanjra UG	2023-24
4	Construction of Vertical Green Barrier	Sonepur Bazari New Railway Siding.	2023-24
5	Development of Plantation over 15.00 Ha land	Sonepur Bazari Internal OB dump.	2023-24
6	Grassing proposal over 5.00 Ha land	Sonepur Bazari Internal OB dump.	2023-24
7	Development of Plantation over 2.50 Ha of dump.	Internal OB dump of Khottadih OCP	2023-24
8	Development of Plantation over plain land	Plain land of Bilpahari rehab site.	2023-24
9	Development of Plantation over 2.30 Km of avenue road	Avenue road at Manderboni-S Samla UG	2023-24
10	Construction of Vertical Green Barrier	Dalurband Railway Siding Pandaveswar Area.	2023-24
11	Development over 1Ha of Miyawaki Plantation	Sonepur Bazari Area	2023-24
12	Construction of Vertical Green Barrier	Select Samla Railway Siding Pandaveswar Area.	2024-25
13	Development of plantation over 15 Ha	Subsided land in Jhanjra Area.	2024-25

As there is scarcity of land along the roadside for plantation. Possibility for roadside plantation beyond ECL land is also being explored. District administration and other local authorities (ADDS, PWD, Municipal Corporation and DFOs) have been requested to provide land for plantation **(**Copy of the letter is attached as **annexure-I)**

2. **PAs need to submit the present status regarding acceptance/approval of the Wildlife Conservation Plan by the State Government. (Specific Condition xiv).**

Reply: Wild Life Management Plan has been prepared by WINGS, Durgapur. Draft report of has been submitted to DFO, Durgapur. The Presentation of the report was briefed to the Chief of Wildlife warden where he suggested conduct additional study. Work order for additional study has been awarded on 23.03.2023 **(Copy attached as Annexure-II).** Final report of Wildlife Conservation Plan will be submitted by Sept. 2023.

3. **PAs needs to provide appropriate catch drains and siltation ponds in the Open Cast mines of Pandaveswar Area to arrest silt and sediment flows from soil, OB and mineral dumps. Garland drains (size, gradient and length) and sump capacity shall be designed keeping 50% safety margin over and above the peak sudden rainfall and maximum discharge in the area adjoining the mine site. Sump capacity shall also provide adequate retention period to allow proper settling of silt material. (Specific Condition xli)**

Reply: Pandaveswar Area: Garland drains (Kuccha) are provided along the toe of the OB dump to arrest sediment flow from soil, OB and mineral dumps. A time bound action plan has been prepared for construction of appropriate size of Catch drains. The future plan is tabulated below:

Dy. Mgr. (Env.), PA

S No	OB dump location for construction of Catch Drain	Dimension of Catch Drain	Settling tank nos.	Year of construction
1	Khottadih OC OB dump	127m x 0.5 m x 0.5 m	1	2023-24 (Sep 23)
2	Dalurband OC OB dump	70m x 0.5 m x 0.5 m		
3	Madhaipur OC OB dump	50m x 0.5 m x 0.5 m	1	2024-25 (Nov 23)

4. **PAs need to provide appropriate catch drains and siltation ponds in the Open Cast mines of Pandaveswar area to arrest silt and sediment flows from soil, OB and mineral dumps**. **(Specific Condition xlii)**

Reply: Time bound action plan has been prepared for construction of appropriate size of Catch drains and settling pond. The plan is tabulated below:

Future plan for construction of Drain and settling tank in Pandaveswar Area is tabulated below:

S No	OB dump location for construction of Catch Drain	Dimension of Catch Drain	Settling tank nos.	Year of construction
1	Khottadih OC OB dump	127m x 0.5 m x 0.5 m	1	2023-24 (Sep 23)
2	Dalurband OC OB dump	70m x 0.5 m x 0.5 m		
3	Madhaipur OC OB dump	50 m x 0.5 m x 0.5 m	1	2024-25 (Nov 23)

5. **PAs need to provide appropriate retaining wall at the toe of the dumps and OB benches within all the Open Cast mines to check runoff. (Specific Condition xliii)**

Reply: Sonepur Bazari Area: Toe Wall is constructed for the dump which are stabilized at the toe of the dumps. For the temporary internal dumps, where dump filling is in process garland drain is provided to check runoff.

Toe Wall Constructed at OB Dump

Backfilling of OB is under process in some of the Open Cast Mine of Cluster no. 12, where garland drain is provided at the base of the dump.

Future plan for Construction of Retaining wall/ Toewall at OB dumps of Cluster no. 12 is provided below:

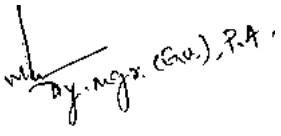
S No	OB dump location for construction of Toe wall	Dimension of Toe Wall	Year of construction
1	Khottadih OB dump	1m (high) x 0.5 m (thick)x 125 m	2023-24
2	Dalurband OB dump	1m (high) x 0.5 m (thick)x 90 m	2023-24
3	Madhaipur OB dump	1m (high) x 0.5 m (thick)x 50 m	2023-24
4	Nakrakonda- Kumardihi OC OB dump 1	1m (high) x 0.5 m (thick)x 200 m	2024-25
5	Nakrakonda- Kumardihi OC OB dump 2	1m (high) x 0.5 m (thick)x 125 m	2024-25

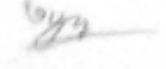
6**. PAs needs to submit details of major approach roads where 3 tier green belt comprising of a mix native species was developed**. **(Specific condition xlvii)**

Reply: Details of Existing 3 tier plantation along roadside:

S No.	Name of the Site planted	Year of Plantation	Area Planted	No. of Saplings Planted	Latitude	Longitude
11	Orchard plantation in Shankarpur Chora from Millenium incline (shankarpur UG) to Bankola Railway Siding- I	2013-14	3.00 Ha	7500	23.66111111	87.23722222
12	Roadside plantation from Nakrakonda-Kumardih B UG & OC to Bankola Railway Siding	2015-16	5.00 Ha	12500	23.67583333	87.26861111
13	Miscellaneous Plantation in Sankala Khani (Bankola UG) to Bankola Railway Siding-I	2016-17	12.00 Ha	30000	23.6733673	87.2532362
14	Roadside plantation from Shyamsundar UG to Bankola Railway Siding-II	2016-17	5.5 Km	13750	23.6733673	87.2532362
9	Plantation in between NH60 and Railway Siding in Sonepur Bazari Area.	2017-18	9.00 Ha	22500	23.707792	87.235803
1	Plantation on the Roadside of roads to Ukhra in Jhanjra Area	2019-20	10.00 Ha	25000	23.66694444	87.28861111
6	Plantation over 2.50 Ha land of ECL between NH60 in Pandaveswar Area.	2019-20	2.50 Ha	6250	23.72477559	87.22833042
7	Plantation over 1.1 Km of length at Bilpahari Rehab Site in Pandaveswar Area	2019-20	1.10 Km	2750	23.70914455	87.23672069
2	Plantation on the Roadside of roads to Ukhra in Jhanjra Area	2020-21	10.00 Ha	25000	23.66388889	87.28833333
8	Transportation road of Khottadih OCP from workshop to Khottadih UGP in Pandaveswar Area.	2020-21	1.00 Km	2500	23.72044135	87.23982604
15	Miscellaneous Plantation at sarpi, shyamsundarpur village at Shyamsundarpur UG	2020-21	10 Ha	25000	23.64000000	87.25222222







10	Plantation between NH60 and Tumni Nala in Sonepur Bazari OCP.	2020-21	8.00 Ha	20000	23.708054	87.227001
3	Plantation on the road side of road to Ukhra. Near to DAV Public School and Jhanjra Colonies	2021-22	10.00 Ha	25000	23.67666667	87.31833333
16	Miscellaneous Plantation sarpi, shyamsundarpur and Chakbanbahal village at Shyamsundarpur UG	2021-22	10 Ha	25000	23.64277778	87.25361111
4	Plantation on the road side of road to Laudoha. Near to Tilaboni Village.	2022-23	5.00 Ha	5000	23.65666667	87.29583333
5	Both the sides of the coal Transportation route from zero point to MIC. Plantation is created along Railway siding and CHP under Construction in Jhanjra Area	2022-23	2.50 Ha	6250	23.67277778	87.29888889
17	Miscellaneous Plantation at Khandra and siduli villages	2022-23	4.00 Ha	10000	23.64416667	87.22194444

Coal Transportation route Jhanjra Area (Avenue Plantation over zero point to MIC)

Plantation created during the FY 2020-21 Jhanjra Area near DAV Public School and beside Ukhra Jhanjra Route.

Plantation created during the FY 2020-21 Jhanjra Area near DAV Public School and beside Ukhra Jhanjra Route.

Photograph of plantation done along the approach road of Pandaveswar UG

Road Side Plantation along with tree guard at Sonepur Bazari Area

Roadside Plantation at Bankola Area

Densely Vegetated Roadside Plantation at Bankola Area

7**. PAs needs to expedite the implantation of progressive afforestation plan to achieve the target (6215.5 Ha) at the end of mining (Specific Conditions xlvii)**

Reply: The EC for the Cluster no. 12 was granted vide letter no. J-11015/76/2011-IA.II(M) dated 09.02.2015. Total Plantation developed over Cluster no. 12 from grant of EC till date is 746.70 Ha which includes 278.50 Ha over Subsided land, 98.00 Ha over external dump, 221.00 Ha over reclaimed Quarry Area and 149.20 Ha over other land. i.e 12.01 % of the total 6215.5 Ha at the end of mining.

Sl. No.	Type of Land	Post Mining Landuse target (after 30 years)	Plantation done till date	%age achieved
1	Subsided Land	3098.80	278.50	8.98%
2	Reclaimed external OB Dump	404.74	98	24.2%
3	Reclaimed internal OB Dump	1856.54	221	11.9%

4	Greenbelt & Plantation	855.38	149.2	17.4%
Total		**6215.50**	**746.7**	**12.01%**

The future 5 year phase wise plan for progressive afforestation of remaining 2809.84 ha out of 6215.50 Ha is tabulated below:

Year	**Subsided Area**	**Old External Dump**	**Reclaimed Quarry Area**	**Others**	**Total**
	Area (Ha)	**Area (Ha)**	**Area (Ha)**	**Area (Ha)**	**Area (Ha)**
Existing as on 30.03.2023	628.50	199.72	311.00	458.39	1597.61
Afforestation Plan for remaining mine life of 25 years					
0-5 years (2023-2028)	430.40	42.00	533.59	36.99	1042.98
6-10 years (2028-2033)	450.00	41.02	450.00	50.00	991.02
11-15 years (2033-2038)	490.00	41.00	330.00	80.00	941.00
16-20 years (2038-2043)	530.00	41.00	150.00	100.00	821.00
21-15years (2043- 2048)	570.00	40.00	81.95	130.00	821.95
Total	**3098.90**	**404.74**	**1856.54**	**855.38**	**6215.56**

8. **PAs need to provide STP to the entire residential colony immediately as well as need to install ETP to all the workshops immediately and maintain the ETP properly in Sonepur Bazari Workshop. (Specific Condition lvi)**

Reply: Sonepur Bazari Area: A Sewage Treatment Plant with capacity 600 cum/d is present at R.N. Colony of and an Effluent Treatment Plant with capacity 7200 cum/d is present at workshop for treating workshop and CHP waste water effluent.

ETP at Workshop under Sonepur Bazari Area

STP at residential colony at Sonepur Bazari Area

Bankola Area: As the quantity of effluent generated from mining activities (viz. workshops) are very less. The construction of ETP in the workshop is not feasible. However, oil & grease traps are installed in all workshops.

Oil and Grease Trap at Bankola Workshop

Pandaveswar Area: Oil and Grease Trap is available at workshop for treatment of waste water. As the existing colonies are old and scatter septic tank facility is provided in individual houses at each colony for treatment of sewage water.

Oil and Grease Trap at Pandaveswar Workshop

Jhanjra Area: A proposal is under process for the installation of STP at Sector 1 and Sector 2 colonies of Jhanjra Area. Plinth area based estimate has been prepared for consultancy services for the design of STP and sewerage network for both the colonies under Jhanjra Area. The said estimate and proposal is under evaluation and process.

Currently Work shop is under construction at Jhanjra Area and is almost complete. The workshop will have a provision of ETP and the proposal is under process. A budget of 25 lakh rupees is allocated for the FY 2023-24 for construction of ETP.

Future plan for construction of Oil and Grease trap/ ETP is provided below:

S No.	Area Responsible	Location for Construction of ETP/ Oil and Grease trap along with Settling tank	Year of Construction
1	Pandaveswar	Khottadih OCP Workshop	2023-24
2	Jhanjra	Work Shop under construction	2023-24
3	Pandaveswar	Samla OC workshop	2024-25

9. **PAs have not submitted the copy of the detailed Final Mine Closure Plan along with details of Corpus funds. Hence, PAs need to submit the details Final Mine Closure Plan along with details of corpus Funds to the Ministry of Environment, Forest & Climate Change. (Specific Condition lix).**

Reply: Details of Corpus Fund deposited for Cluster no. 12 is tabulated below:

S No	Area under Cluster no. 12	Corpus Fund deposited (in Rs.)
1	Jhanjra Area	5,47,04,959.00
2	Sonepur Bazari Area	92,73,2092.00
3	Pandaveswar Area	49,37,58,314.00
4	Bankola Area	8,43,38,679.00
	Total	**72,55,34,044.00**

Mine Closure Plan for mines under Cluster no. 12 is **attached as Annexure-III.**

10. **PAs needs to submit information regarding Workshop waste water treatment and discharge of workshop effluents. (Specific condition vi).**

Reply: Jhanjra Area: Currently Work shop is under construction at Jhanjra Area and is almost complete. The workshop will have a provision of ETP and the proposal is under process.

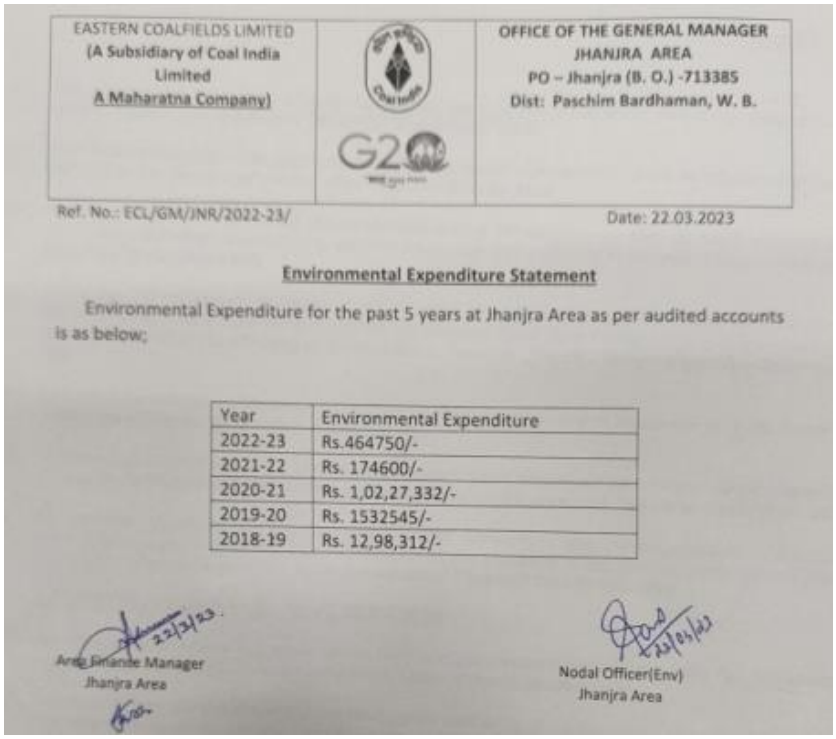
Pandaveswar Area: Discharged water from workshop at Pandaveswar Area is treated in oil and grease trap. Treated water is again reused for HEMM washing and dust suppression at water tanks.

Sonepur Bazari Area: Zero Discharge Policy is adapted at Sonepur Bazari Area. Whole Workshop treated Water from ETP is being recycled and reused for HEMM washing and dust suppression mechanism.

Bankola Area: Discharged water from the workshop is treated in OGT which is then reused for HEMM washing and dust suppression.

11. **PAs need to submit the year-wise detailed expenditure statement for environmental protection measures for Pandaveswar, Sonepur Bazari and Jhanjra Area also (General Condition xii)**

Reply: Jhanjra Area: Environment Expenditure Statement for the past 5 years and CSR expenditure for past 4 years is attached below:



EASTERN COALFIELDS LIMITED
(A Subsidiary of Coal India Limited
A Maharatna Company)

OFFICE OF THE GENERAL MANAGER
JHANJRA AREA
PO – Jhanjra (B. O.) -713385
Dist: Paschim Bardhaman, W. B.

Ref. No.: ECL/GM/JNR/2022-23/ Date: 22.03.2023

Environmental Expenditure Statement

Environmental Expenditure for the past 5 years at Jhanjra Area as per audited accounts is as below;

Year	Environmental Expenditure
2022-23	Rs.464750/-
2021-22	Rs. 174600/-
2020-21	Rs. 1,02,27,332/-
2019-20	Rs. 1532545/-
2018-19	Rs. 12,98,312/-

Area Finance Manager
Jhanjra Area

Nodal Officer(Env)
Jhanjra Area

Dy. Mgr. (Gen.), PA

Jhanjra Area CSR Expenditure 2019-20				
Sl No.	**Sector**	**CSR Projects identified**	**Expenditure (in Rs. Lakhs)**	**Remarks**
1	Skill Development	Training of Kantha Stitch work to rural BPL women in nearby villages	2.92	Durgapur Sundaram Creative Welfare Society
2	Healthcare	Mobile Medical Van Health Camps (80 camps).	-	Project implemented through HQ, Around 4666 people benefitted.
3	Healthcare	Blood Donation Camp at Sirsha Village (1 camp)	-	Activity undertaken by IQ City Narayana Hospital, Durgapur.
4	Healthcare	Cardiac Check-up camp at Jhanjra Area Hospital (1 camp)	-	Activity undertaken by DESUN Hospital Kolkata
5	Environment & Sustainability	Installation of Solar Street Lights 120 nos in 10 villages of Laudoha Panchayat	15.08	Direct
		TOTAL	**18**	
Jhanjra Area CSR Expenditure 2020-21				
1	Healthcare	Mobile Medical Van Health Camps (77 camps)	-	Project implemented through HQ, Around 3429 people benefitted.
2	Healthcare	Food Packets distribution & running of Community Canteen	1	Around 300 food packets distributed. Community canteen run for 45 days.
3	Healthcare	Purchase of Sanitzing Items as a precautionary measure to stop Covid 19 (Sodium Hypochloride and Handwash)	3	Nearby villages
		TOTAL	**4**	
Jhanjra Area CSR Expenditure 2021-22				
1	Healthcare	Mobile Medical Van Health Camps (36 camps)	-	Project implemented through HQ, Around 1923 people benefitted.
2	Rural Development	Construction of PCC Road 500 mtr at Tilaboni Village	8.05	Direct
		TOTAL	**8.05**	
Jhanjra Area CSR Expenditure 2022-23 (till 20th Jan 2023)				
1	National Integration	Har Ghar Tiranga	2.12	Distribution of flags to all employees and installation of flags at roof of all quarter blocks and service buildings
		TOTAL	**2.12**	

Dy. Mgr. (Gen.), P.A.

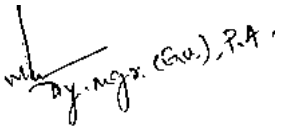
Pandaveswar Area: Details of year-wise expenditure statement for environment protection measure in Pandaveswar Area is as follows:

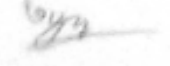
SL No.	Year	Name of Work	Expenditure (in Rs.)
1.	2017-18	Plantation of 40000 nos. saplings in 16 Ha Reclaimed Land at Khottadih OCP	2827200.00
2.	2018-19	Plantation of total 37500 nos. of saplings in 10 Ha and 5 Ha land of Pandaveswar UG and Dalurband OC Phase-III respectively.	2704500.00
3.	2019-20	Creation and maintenance of Plantation	3516105.00
4.		Installation and commissioning of fixed water sprinkler system at SS Railway Siding under Khottadih OCP, Pandaveswar Area	1900000.00
5.	2020-21	Plantation over 32.5 Ha land and maintenance of plantation	8246250.00
6.		Construction of Rainwater Harvesting Structure at Khottadih Hostel, Panthnagar Hospital and at DAV School, Pandaveswar	500000.00
7.		Construction of Oil and Grease trap at Khottadih UG	109000.00
8.	2021-22	Plantation over 10 Ha Internal OB Dump Land under Khottadih OCP, Pandaveswar Area	2187000.00
9.		Plantation over 5 Ha Internal OB Dump Land under Dalurband OC Phase-III, Pandaveswar Area	1093500.00
	Total		**23083555.00**

Sonepur Bazari Area: Details of year wise expenditure of Sonepur Bazari Area is attached:

Sl. No.	Expenditure Under		Total Expenditure of Last 3 Years (Rs. in Crores)			
		2017-18	2018-19	2019-20	2020-21	2021-22
02	Anti Pollution Control Measures (ETP, STP, Water Sprinkler, Rain Water Harvesting, Toe Wall)	0	3.39	5.846	2.229	3.52
03	Community Development in adjoining villages	0.65	0.29	1.19	0.76	0.175
04	Environment Statutory Payments	0	1.08	0	0	0
05	Biological Reclamation Works	1.18	0.64	0.87	0.88	0.838
Total		**1.83**	**5.4**	**7.906**	**3.869**	**4.533**







12. The monitoring data of the environment quality parameters and critical pollutants and critical sectoral parameters shall not been displayed at the entrance of the project premises and mine office. PAs need to display the same immediately. (Specific Condition xvi)

Reply: Jhanjra Area: Environment Monitoring data has been displayed at the project premises. Photo attached below.

Display of Environment Monitoring data at Jhanjra UG

Pandaveswar Area: Environment Information Display Board is installed at major locations of the project.

Display of Environment parameters at Khottadih OCP

Dy. Mgr. (Env.), PA

Display of Environment parameters at Madhaipur UG

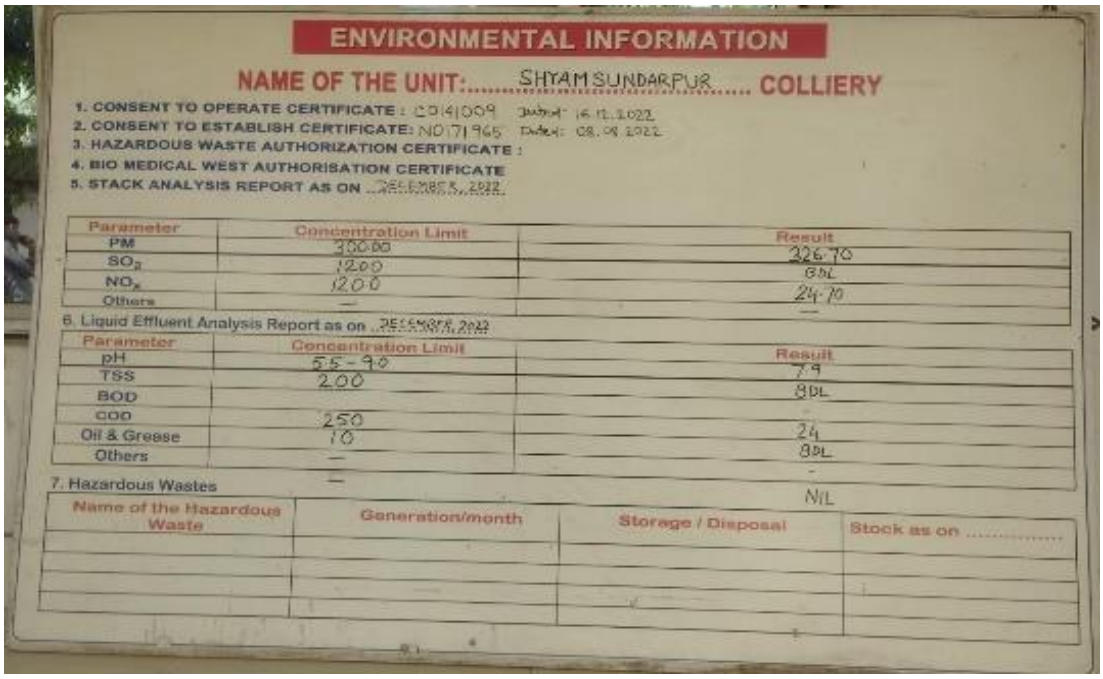
Display of Environment parameters at Manderboni UG

Display of Environment parameters at Khottadih OCP

Dy. Mgr. (Env.), P.A.

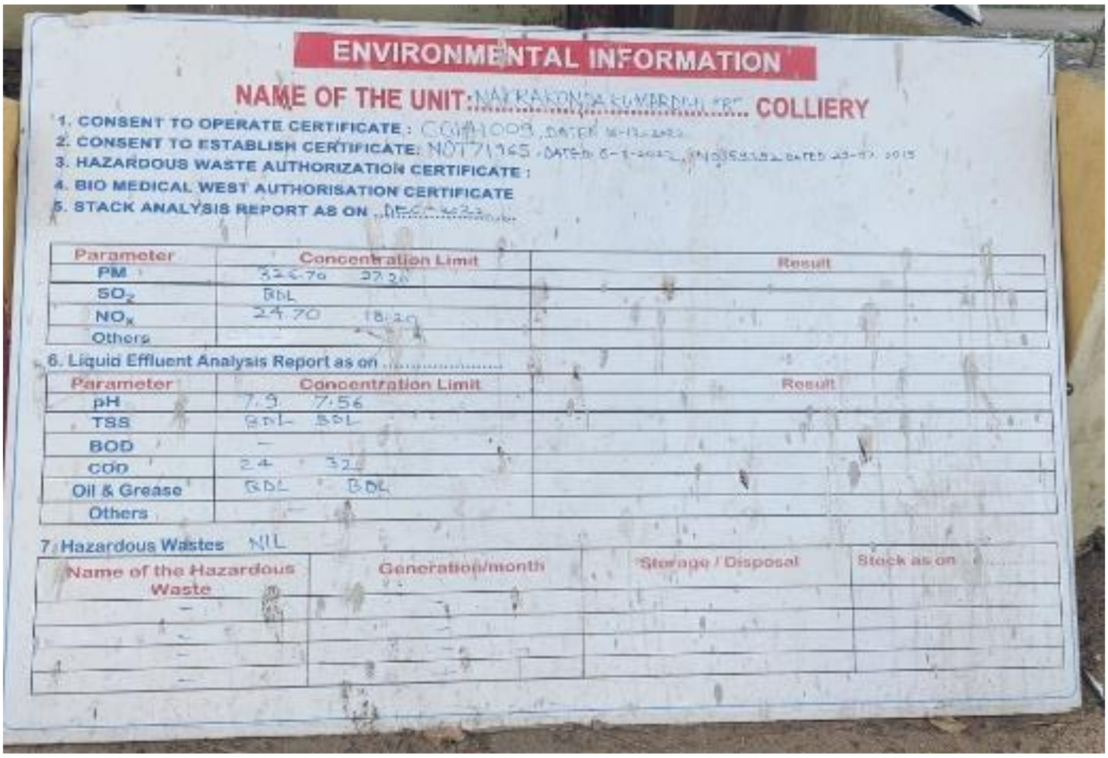
Sonepur Bazari Area: Environment Information Display Board is installed at major locations of the project.

Bankola Area: Environment Information Display Board is installed at major locations of all the projects Photographs of which is attached.



Display of Environment parameters at Shyamsundarpur UG

Dy. Mgr. (Env.), PA



Display of Environment parameters at Nakrakonda Kumardihi B UG & OC

<u>As per J-11015/76/2011-IA-II-(M) dated 31.07.2020</u>

1. **PAs need to take action to develop green belt/vertical greenery system along the railway siding to control dust and other fugitive emissions. (Amendment condition v)**

Reply: Jhanjra Area: A park has already been developed around POCP-1 railway siding under Jhanjra Area. New CHP is under construction under Jhanjra Area along with railway siding. Three tier green belts will be created around new railway siding after construction. Multiple plantations has also been created around new proposed railway siding.

Sonepur Bazari Area: Around 1000 nos of plants have been planted in and around railway siding. 8 Ha of Plantation at OB adjacent to Railway Siding have been done in the FY 2021-22. Vertical Wind barrier of 950m along the periphery of railway siding has been constructed to control dust and other fugitive emission.

Photograph of plantation done in and around the Railway Siding of Sonepur Bazari

Vertical Wind Barrier along Railway Siding at Sonepur Bazari Area

Dy. Mgr. (Civ.), P.A.

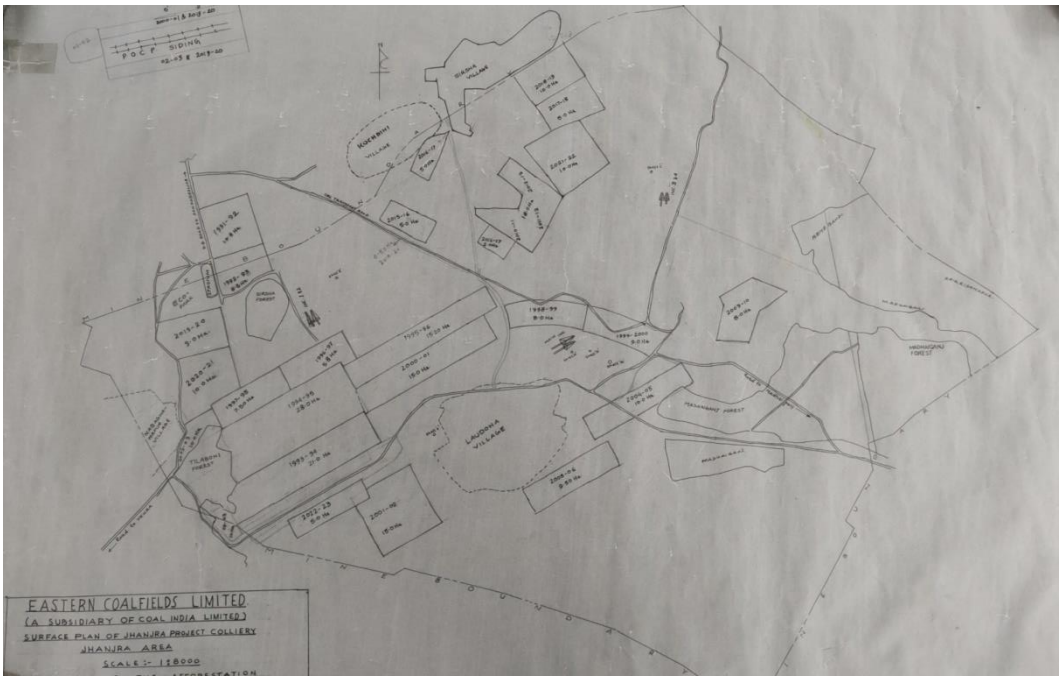
Vertical Wind Barrier along Railway Siding at Sonepur Bazari Area

Time bound action plan for development of 3 tier green belt and vertical greenery system at Cluster no. 12 is tabulated below**:**

S No.	**Activity description**	**Location for plantation**	**Creation year**
1	Construction of Vertical Green Barrier.	Bankola-I Railway Siding	2023-24
2	Construction of Vertical Green Barrier.	Bankola-II Railway Siding	2023-24
3	Development of Plantation over 5.00 Km length of road	Avenue plantation at Jhanjra UG	2023-24
4	Construction of Vertical Green Barrier	Sonepur Bazari New Railway Siding.	2023-24
5	Development of Plantation over 15.00 Ha land	Sonepur Bazari Internal OB dump.	2023-24
6	Grassing proposal over 5.00 Ha land	Sonepur Bazari Internal OB dump.	2023-24
7	Development of Plantation over 2.50 Ha of dump.	Internal OB dump of Khottadih OCP	2023-24
8	Development of Plantation over plain land	Plain land of Bilpahari rehab site.	2023-24
9	Development of Plantation over 2.30 Km of avenue road	Avenue road at Manderboni-S Samla UG	2023-24
10	Construction of Vertical Green Barrier	Dalurband Railway Siding Pandaveswar Area.	2023-24
11	Development over 1Ha of Miyawaki Plantation	Sonepur Bazari Area	2023-24
12	Construction of Vertical Green Barrier	Select Samla Railway Siding Pandaveswar Area.	2024-25
13	Development of plantation over 15 Ha	Subsided land in Jhanra Area.	2024-25

2. **PAs need to provide the details of the thick green belt at the final boundary along with kml file of the mine area to verify with the satellite image**. **(Amendment condition vii)**

Reply: Jhanjra Area:



Plantation plan for Jhanjra area is attached.

Kml file of plantation developed in the Cluster along with the satellite imagery of the Cluster no. 12 is attached as **Annexure-IV.**

3. **PAs need to conduct a third –party assessment of EC compliance immediately through Government Institutes or any other expert agency and report may be submitted to this office. (Amendment Condition xii)**

Reply: Sonepur Bazari Area: Third Party Assessment Study of Sonepur Bazari Area has been conducted by ICFRE. Report to be annexed as **Annexure-V.**

EC Compliance assessment through third party will be done by 2023-24 in respect of mines under Pandaveswar Area, Jhanjra Area and Bankola Area and the report will be submitted to Regional office.

4**. It was observed during inspection that some OB dump in the Pandaveswar Area and Sonepur Bazari Area has been found to be kept in barren/ open condition. PAs needs to cover the entire OB dump by temporary grass to avoid air born of particles. (Amendment condition xiii)**

Reply: OB dump is naturally vegetated which is native to West Bengal. However**,** action plan for grassing the open OB dump under Cluster no. 12 is tabulated below:

Dy. Mgr. (Env.), PA

S No.	Location of OB dump to be grassing	Area (in Ha) to be grassed	Year of implementation
1	OB dump of Dalurband OCP	5.00	2023-24 (Oct 23)
2	OB dump of Khottadih OCP	5.00	2023-24 (Oct 23)
3	Stablized OB dump of Sonepur Bazari OCP	5.00	2023-24 (Oct 23)

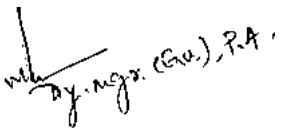
5. **PAs needs to submit details of plantation along the villages and transportation route separately. Further, a certificate in this regard from concerned District Forest Officer needs to submit to Regional Office (Amendment Condition no. xiv)**

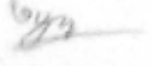
Reply: Details of plantation along villages and transportation route of all the mines have been sent DFO, Durgapur Division for grant of certificate. The same will submitted to Regional Office within July. 2023. (Copy of letter for Certification attached as **Annexure-VI)**

6. **PAs needs to submit details regarding the blasting permission from DGMS for conducting mining operation near villages for other mining areas except Pandaveswar Area (Amendment Condition xv).**

Reply: Blasting permission of all the mines of cluster 12 is annexed as **Annexure-VII.**







ANNEXURE-III

भारत सरकार/Government of India
पर्यावरण, वन एवं जलवायु परिवर्तन मंत्रालय
Ministry of Environment, Forest & Climate Change
एकीकृत क्षेत्रीय कार्यालय, कोलकाता/ Integrated Regional Office, Kolkata
IB-198, Sector – III, Salt Lake City, Kolkata-700106
Phone: 033-2335-0902, E-mail: iro.kolkata-mefcc@gov.in

File No. 102-505/17/EPE/163

Date: 02.05.2023

To,

Mr. Lalit Bokolia,
Scientist-F, Mining,
Ministry of Environment, Forest & Climate Change,
Indira Paryavaran Bhawan,
Jorbagh Road, Aliganj,
New Delhi– 110 003.
(E-mail: lk.bokolia@nic.in)

Sub: Cluster 12 comprising of 19 mixed mines of a combined production capacity of 27.16 MTPA (Normative) with a (Peak) production of 31.83 MTPA in a combined ML area of 13759.55 ha (14047 ha – 287.45 ha= 13759.55 ha); Latitude 23°, 37', 30"N& 23°, 45' N and Longitude 87°,11",35' E & 87°, 24', 05" E of M/s. Eastern Coalfields Limited, Located in Raniganj Coalfields, in Tehsil Haripur Block, dist. Burdwan, West Bengal -reg.

Ref: Ministry's EC letter no. i) J-11015/76/2011-IA-II (M) dated 09.02.2015,
ii) J-11015/76/2011-IA-II (M) dated 03.03.2016,
iii) J-11015/76/2011-IA-II (M) dated 31.07.2020.

This office letter no. 102-505/17/EPE/105 dated 21.03.2023.

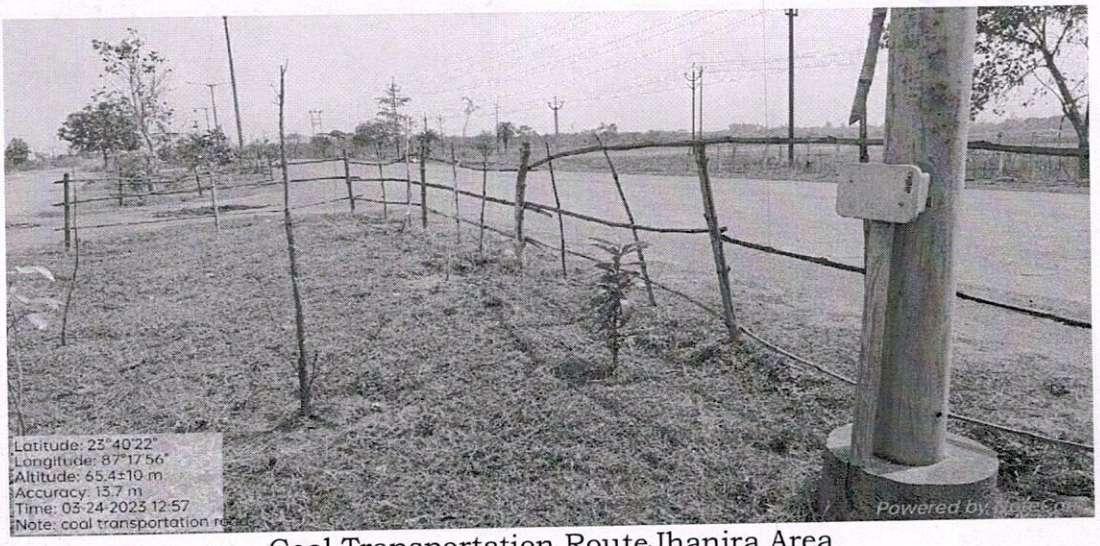
ATR letter no. ECL/ENV/EC/23/131 dated 13.04.2023.

Sir,

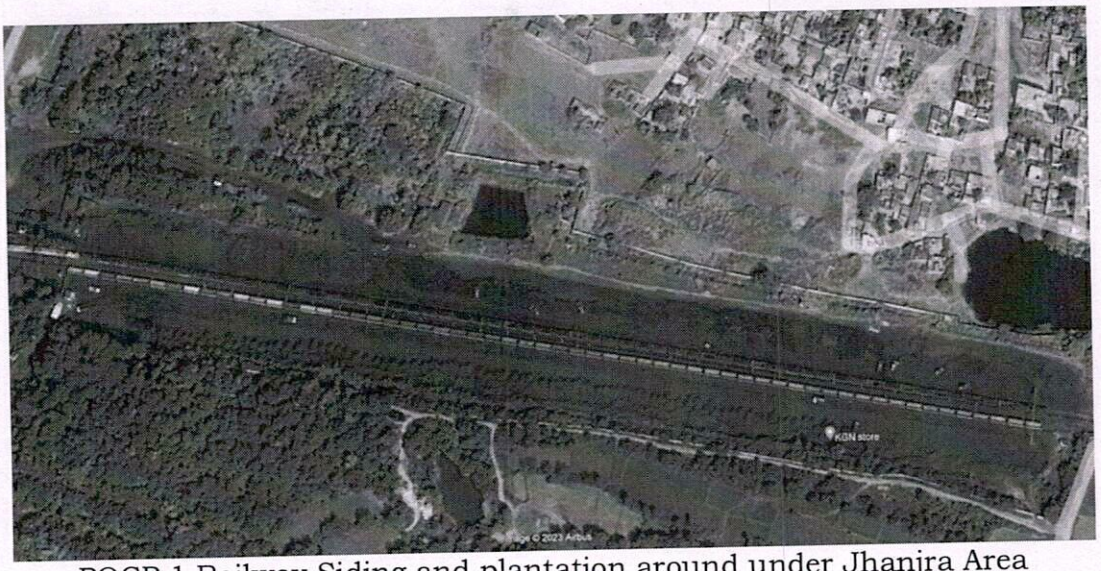
I am to draw your kind attention to the subject and reference letter cited above and to state that the above project was monitored on 09.02.2023 & 10.02.2023by Shri Sujoy Dutta, Technical Officer and Dr. Kaushik Mallick, Research Officer. During monitoring non-compliances were observed. Subsequently, vide this office letter No.102-505/17/EPE/105 dated 21.03.2023,the PAs was asked to comply the non-compliances. Action Taken Report was submitted by PAs vide letter no. ECL/ENV/EC/23/131 dated 13.04.2023 and based on that review of Action Taken Report is furnished below:

J-11015/76/2011-IA-II (M) dated 09.02.2015	
1.	**Observation made during monitoring on 09.02.2023 & 10.02.2023:** PAs need to take the plantation programme seriously by providing three tier green-belt around all the railway sidings and along the road sides to prevent dust and noise pollution. (Specific Conditions viii) **Action taken report submitted by the project proponent:** **Jhanjra Area:**A park has already been developed around POCP-1 railway siding under Jhanjra Area. New CHP is under construction under Jhanjra Area along with railway siding. Three tier green belts will be created around new railway siding after construction. Already multiple plantations are created around new proposed railway siding. **Pandaveswar Area:** 3 tier plantations have been done over 2.5 Ha land along NH 60 and in between NH60 and Bilpahari Rehabilitated Village. **SonepurBazari Area:** Multi-Tier Plantation at Sonepur-Bazari Project of 9 Ha in

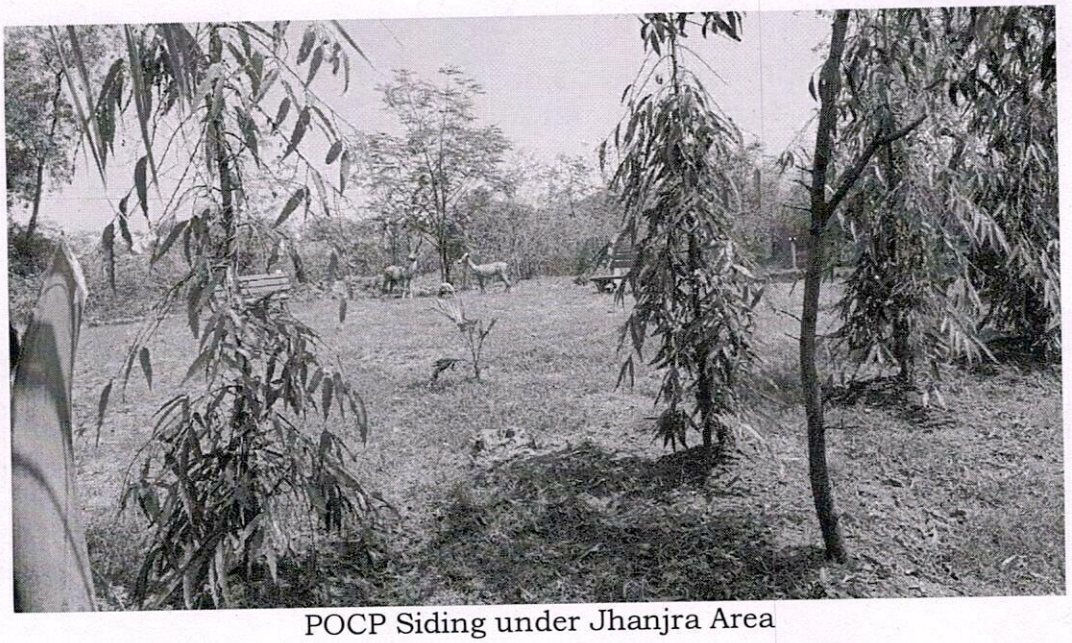
FY 2017-18 and 8 Ha in the FY 2020-21 has been done along NH 60 road as shown in Plan. 1000 native plants along with tree a barrier is planted at railway sidings (Photographs and Plan Attached). Moreover, development of 1Ha of Miyawaki Plantation is scheduled for plantation in the FY 2023-24.



Coal Transportation RouteJhanjra Area



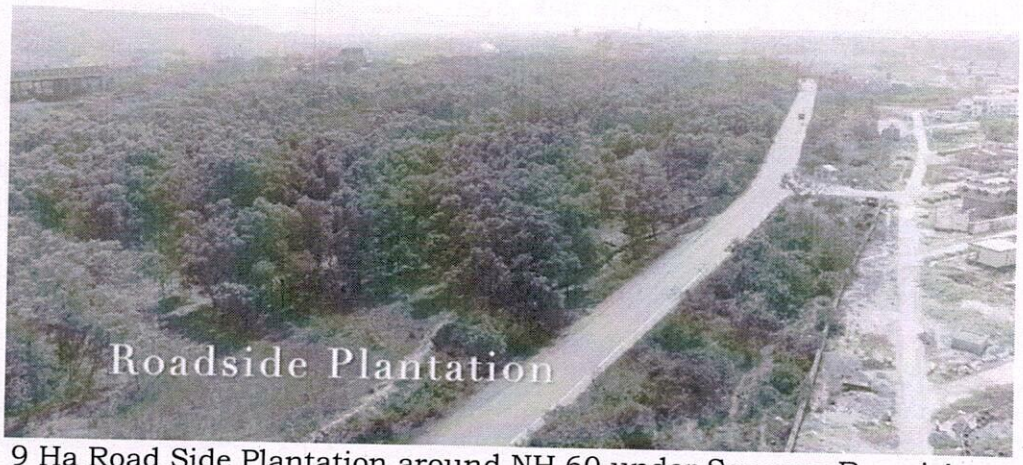
POCP 1 Railway Siding and plantation around under Jhanjra Area



POCP Siding under Jhanjra Area

Bankola Area: Both sides of connecting roadway are well vegetated naturally. Further, roadside plantation along 5.5 km roadways has been done along coal transportation road and siding. A boundary wall is also constructed around Bankola Siding-I & Siding-II to prevent dust and noise pollution.

Bilphari Rehabilitation Site under Pandaveswar Area



9 Ha Road Side Plantation around NH 60 under Sonepur-Bazari Area

5Ha Roadside Plantation – Nakrakonda-Kumardihi B UG & OC

Further, future program for development of 3 tier Green Belt along the roadside and all along the Railway Siding is also tabulated below. As availability of land for 3 tier plantation is limited around the periphery of Railway Sidings future proposals also include development of vertical Green barriers along the periphery. (Copy of patent certificate of CMPDIL for Vertical Green Barrier System attached as **Annexure-I**)

Proposed 3 tier plantation/ Green Barrier along the periphery of Railway Siding and Roadside:

S No.	Activity description	Location for plantation	Creation year
1	Construction of Vertical Green Barrier.	Bankola-I Railway Siding	2023-24
2	Construction of Vertical Green Barrier.	Bankola-II Railway Siding	2023-24
3	Development of Plantation over 5.00 Km length of road	Avenue plantation at Jhanjra UG	2023-24
4	Construction of Vertical Green Barrier	Sonepur-Bazari New Railway Siding.	2023-24
5	Development of Plantation over 15.00 Ha land	Sonepur-Bazari Internal OB dump.	2023-24
6	Grassing proposal over 5.00 Ha land	Sonepur-Bazari Internal OB dump.	2023-24
7	Development of Plantation over 2.50 Ha of dump.	Internal OB dump of Khottadih OCP	2023-24
8	Development of Plantation over plain land	Plain land of Bilpahari rehab site.	2023-24
9	Development of Plantation over 2.30 Km of avenue road	Avenue road at Manderboni-S Samla UG	2023-24
10	Construction of Vertical Green Barrier	Dalurband Railway Siding Pandaveswar Area.	2023-24
11	Development over 1Ha of Miyawaki Plantation	SonepurBazari Area	2023-24
12	Construction of Vertical Green Barrier	Select Samla Railway Siding Pandaveswar Area.	2024-25
13	Development of plantation over 15 Ha	Subsided land in Jhanjra Area.	2024-25

As there is scarcity of land along the roadside for plantation. Possibility for roadside plantation beyond ECL land is also being explored. District administration and other local authorities (ADDS, PWD, Municipal Corporation and DFOs) have been requested to provide land for plantation **(**Copy of the letter is attached as **annexure-I)**

Review of Acton Taken Report: Assured to comply. PAs have provided details of the present status of green belt development along the periphery of the Railway siding and roadside with photographs. PAs have informed that due to availability of land for 3 tier plantation is limited around the periphery of Railway Sidings, their future proposals also include development of vertical Green barriers along the periphery. PAs have also submitted a 3-tier plantation/ green barrier development programme along the periphery of the Railway siding and roadside up to the financial year 2024-25.

2. **Observation made during monitoring on 09.02.2023 & 10.02.2023:** PAs need to submit the present status regarding acceptance/ approval of the Wildlife Conservation Plan by the State Government. (Specific Conditions xiv)

Action taken report submitted by the project proponent:
Wild Life Management Plan has been prepared by WINGS, Durgapur. Draft report of has been submitted to DFO, Durgapur. The Presentation of the report was briefed to the Chief of Wildlife warden where he suggested conduct additional study. Work order for additional study has been awarded on 23.03.2023 (Copy attached as Annexure-II). Final report of Wildlife Conservation Plan will be submitted by Sept. 2023.

Review of Acton Taken Report: Assured to comply. PAs have assured that they will resubmit the Final report of Wildlife Conservation Plan after conducting additional study as suggested by the Chief of Wildlife warden by September, 2023.

3. **Observation made during monitoring on 09.02.2023 & 10.02.2023:** PAs need to provide appropriate catch drains and siltation ponds in the Open cast mines of Pandaveswar area to arrest silt and sediment flows from soil, OB and mineral dumps. Garland drains (size, gradient and length) and sump capacity shall be designed keeping 50% safety margin over and above the peak sudden rainfall and maximum discharge in the area adjoining the mine site. Sump capacity shall also provide adequate retention period to allow proper settling of silt material. (Specific Conditions xli)

Action taken report submitted by the project proponent:

Pandaveswar Area: Garland drains are provided along the toe of the OB dump to arrest sediment flow from soil, OB and mineral dumps. However, time bound action plan has been prepared for construction of appropriate size of Catch drains. The future plan is tabulated below:

S No	OB dump location for construction of Catch Drain	Dimension of Catch Drain	Settling tank nos.	Year of construction
1	Khottadih OC OB dump	1m x 0.5 m x 0.5 m	1	2023-24 (Sep 23)
2	Dalurband OC OB dump	1m x 0.5 m x 0.5 m		
3	Madhaipur OC OB dump	1m x 0.5 m x 0.5 m	1	2024-25 (Nov 23)

Review of Acton Taken Report: Assured to comply. PAs have assured that they will develop the appropriate catch drains and settling tanks by September 2023 under Khottadih OC & Dalurband OC OB Dump & by November 2023 under Maddhaipur OC OB Dump.

4. **Observation made during monitoring on 09.02.2023 & 10.02.2023:** PAs need to provide appropriate catch drains and siltation ponds in the Open cast mines of Pandaveswar area to arrest silt and sediment flows from soil, OB and mineral dumps. (Specific Conditions xlii)

Action taken report submitted by the project proponent:
Time bound action plan has been prepared for construction of appropriate size of Catch drains and settling pond. The plan is tabulated below:

Future plan for construction of Drain and settling tank in Pandaveswar Area is tabulated below:

S No	OB dump location for construction of Catch Drain	Dimension of Catch Drain	Settling tank nos.	Year of construction
1	Khottadih OC OB dump	1m x 0.5 m x 0.5 m	1	2023-24 (Sep 23)
2	Dalurband OC OB dump	1m x 0.5 m x 0.5 m		

3	Madhaipur OC OB dump	1m x 0.5 m x 0.5 m	1	2024-25 (Nov 23)

Review of Acton Taken Report: Assured to comply.

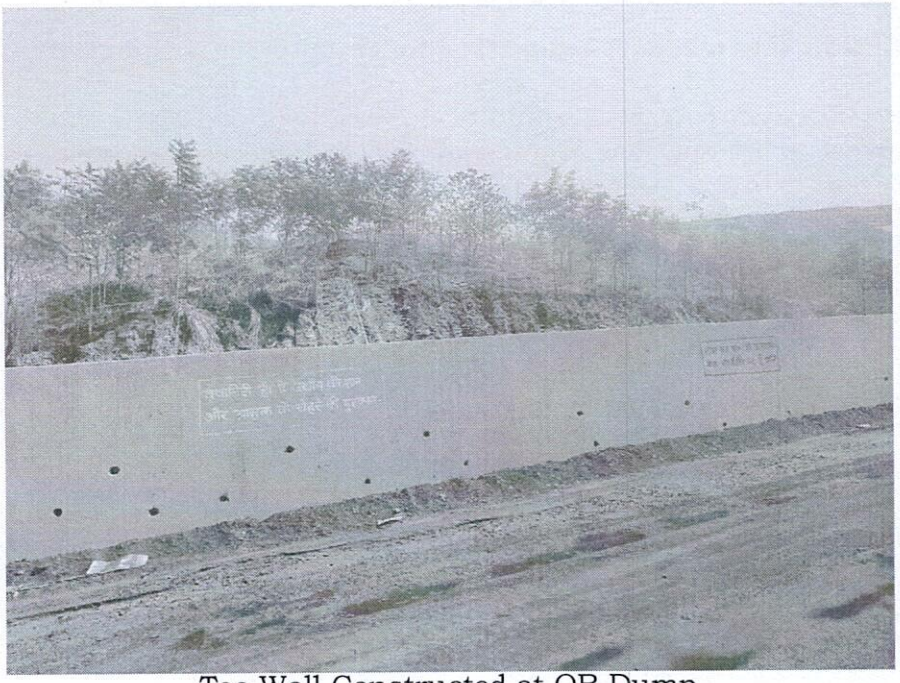
5. **Observation made during monitoring on 09.02.2023 & 10.02.2023:** PAs need to provide appropriate retaining wall at the toe of the dumps and OB benches within the all Open Cast mines to check run-off. (Specific Conditions xliii)

Action taken report submitted by the project proponent:

Sonepur-Bazari Area: Toe Wall is constructed for the dump which is stabilized at the toe of the dumps (WO Attached). For the temporary internal dumps, where dump filling is in process garland drain is provided to check runoff.

Backfilling of OB is under process in some of the Open Cast Mine of Cluster no. 12, garland drain is provided at the base of the dump. Once backfilling will be completed toe wall will be constructed.

Future plan for Construction of Retaining wall/ Toewall at OB dumps of Cluster no. 12 is provided below:



Toe Wall Constructed at OB Dump

S No	OB dump location for construction of Toe wall	Dimension of Toe Wall	Year of construction
1	Khottadih OB dump	1m (high) x 0.5 m (thick)	2023-24
2	Dalurband OB dump	1m (high) x 0.5 m (thick)	2023-24
3	Madhaipur OB dump	1m (high) x 0.5 m (thick)	2024-25
4	Nakrakonda- Kumardihi OC OB dump	1m (high) x 0.5 m (thick)	2024-25

Review of Acton Taken Report: Assured to comply. PAs have assured that they will develop further appropriate Toe wall/ retaining walls within the financial year 2323-24 & 2024-25 and submitted time-bounded future action plan for the same.

6. **Observation made during monitoring on 09.02.2023 & 10.02.2023:** PAs need

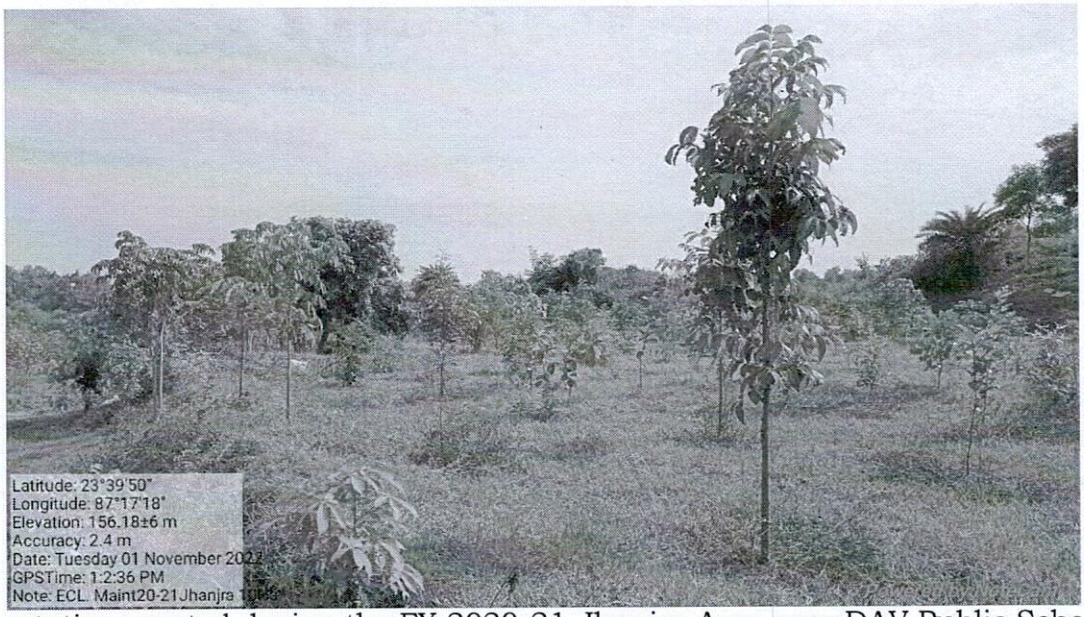
to submit details of major approach roads where 3-tier green belt comprising of a mix native species was developed. (Specific Conditions xlvii)

Action taken report submitted by the project proponent: Details of Existing 3 tier plantation along roadside:

S No.	Name of the Site planted	Year of Plantation	Area Planted	No. of Saplings Planted
1	Plantation on the Roadside of roads to Ukhra in Jhanjra Area	2019-20	10.00 Ha	25000
2	Plantation on the Roadside of roads to Ukhra in Jhanjra Area	2020-21	10.00 Ha	25000
3	Plantation on the road side of road to Ukhra. Near to DAV Public School and Jhanjra Colonies	2021-22	10.00 Ha	25000
4	Plantation on the road side of road to Laudoha. Near to Tilaboni Village.	2022-23	5.00 Ha	5000
5	Both the sides of the coal Transportation route from zero point to MIC. Plantation is created along Railway siding and CHP under Construction in Jhanjra Area	2022-23	2.50 Ha	6250
6	Plantation over 2.50 Ha land of ECL between NH60 in Pandaveswar Area.	2019-20	2.50 Ha	6250
7	Plantation over 1.1 Km of length at Bilpahari Rehab Site in Pandaveswar Area	2019-20	1.10 Km	2750
8	Transportation road of Khottadih OCP from workshop to Khottadih UGP in Pandaveswar Area.	2020-21	1.00 Km	2500
9	Plantation in between NH60 and Railway Siding in Sonepur-Bazari Area.	2017-18	9.00 Ha	22500
10	Plantation between NH60 and TumniNala in Sonepur-Bazari OCP	2020-21	8.00 Ha	20000
11	Orchard plantation in Shankarpur Chora from Millenium incline (shankarpur UG) to Bankola Railway Siding- I	2013-14	3.00 Ha	7500
12	Roadside plantation from Nakrakonda-Kumardih B UG & OC to Bankola Railway Siding	2015-16	5.00 Ha	12500
13	Miscellaneous Plantation in SankalaKhani (BankolaUG) to Bankola Railway Siding-I	2016-17	12.00 Ha	30000
14	Roadside plantation from Shyamsundar UG to Bankola Railway Siding-II	2016-17	5.5 Km	13750
15	Miscellaneous Plantation at sarpi, shyamsundarpur village at Shyamsundarpur UG	2020-21	10 Ha	25000
16	Miscellaneous Plantation sarpi, shyamsundarpur and Chakbanbahal village at Shyamsundarpur UG	2021-22	10 Ha	25000
17	Miscellaneous Plantation at Khandra and siduli villages	2022-23	4.00 Ha	10000

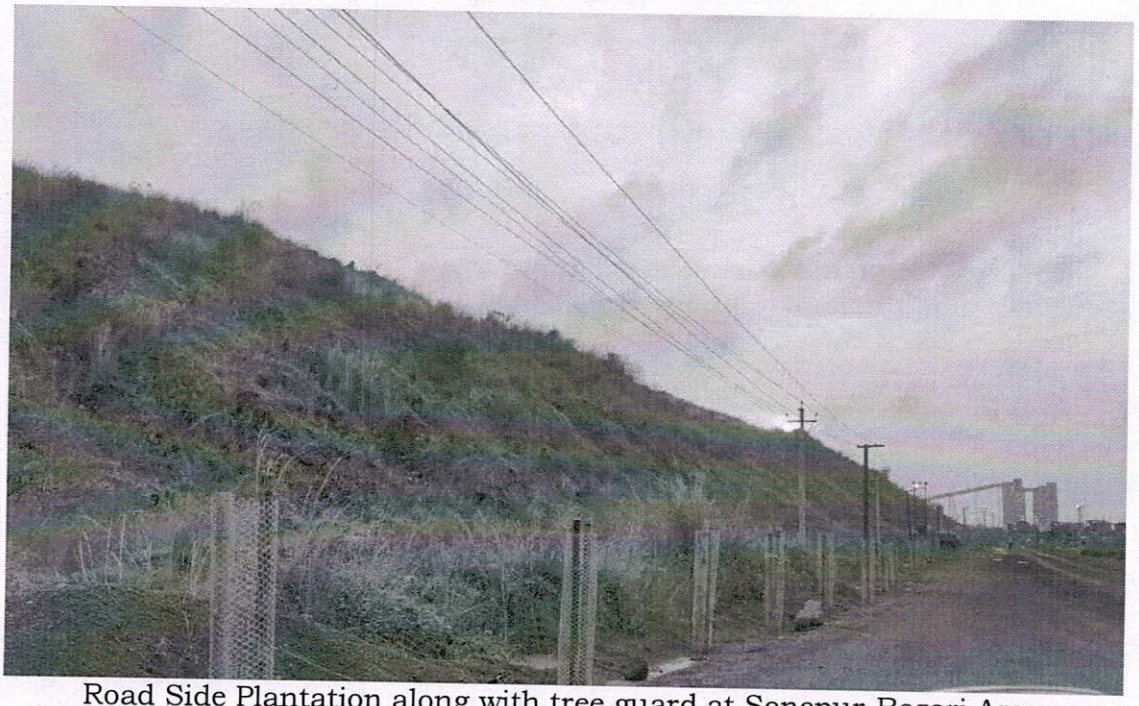
Coal Transportation route Jhanjra Area (Avenue Plantation over zero point to MIC)

Plantation created during the FY 2020-21 Jhanjra Area near DAV Public School and beside Ukhra-Jhanjra Route

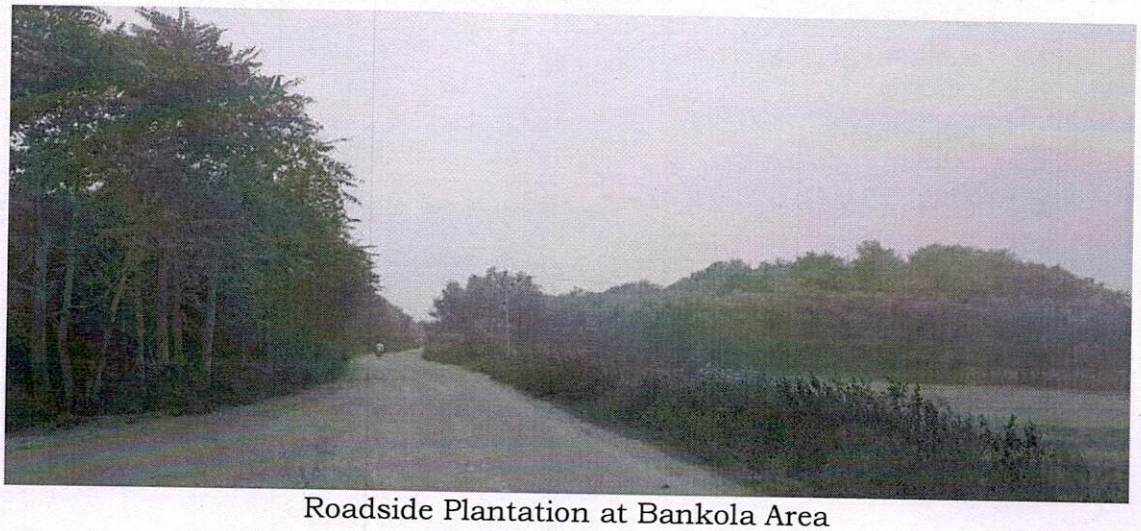


Plantation created during the FY 2020-21 Jhanjra Area near DAV Public School and beside Ukhra-Jhanjra Route

Photograph of plantation done along the approach road of Pandaveswar UG



Road Side Plantation along with tree guard at Sonepur-Bazari Area



Roadside Plantation at Bankola Area

Densely Vegetated Roadside Plantation at Bankola Area

Review of Acton Taken Report: Complied. PAs have submitted details of major approach roads where 3-tier green belt comprising of a mix native species was developed along with photographs.

7. **Observation made during monitoring on 09.02.2023 & 10.02.2023:** PAs need to expedite the implantation of progressive afforestation plan to achieve the target (6215.5 ha) at the end of mining. (Specific Conditions xlix)

Action taken report submitted by the project proponent: The EC for the Cluster no. 12 was granted vide letter no. J-11015/76/2011-IA-II-(M) dated 09.02.2015. Total Plantation developed over Cluster no. 12 from grant of EC till date is 746.70 Ha which includes 278.50 Ha over Subsided land, 98.00 Ha over external dump, 221.00 Ha over reclaimed Quarry Area and 149.20 Ha over other land. i.e. 12.01 % of the total 6215.5 Ha at the end of mining.

Sl. No.	Type of Land	Post Mining Landuse target (after 30 years)	Plantation done till date	%age achieved
1	Subsided Land	3098.80	278.50	8.98%
2	Reclaimed external OB Dump	404.74	98	24.2%
3	Reclaimed internal OB Dump	1856.54	221	11.9%
4	Greenbelt & Plantation	855.38	149.2	17.4%
Total		6215.50	746.7	12.01%

The future 5 year phase wise plan for progressive afforestation of remaining 2809.84 ha out of 6215.50 Ha is tabulated below:

Year	**Subsided Area**	**Old External Dump**	**Reclaimed Quarry Area**	**Others**	**Total**
	Area (Ha)	**Area (Ha)**	**Area (Ha)**	**Area (Ha)**	**Area (Ha)**
Existing as on 30.03.2023	628.50	199.72	311.00	458.39	1597.61

Afforestation Plan for remaining mine life of 25 years					
0-5 years (2023-2028)	430.40	42.00	533.59	36.99	1042.98
6-10 years (2028-2033)	450.00	41.02	450.00	50.00	991.02
11-15 years (2033-2038)	490.00	41.00	330.00	80.00	941.00
16-20 years (2038-2043)	530.00	41.00	150.00	100.00	821.00
21-15years (2043-2048)	570.00	40.00	81.95	130.00	821.95
Total	**3098.90**	**404.74**	**1856.54**	**855.38**	**6215.56**

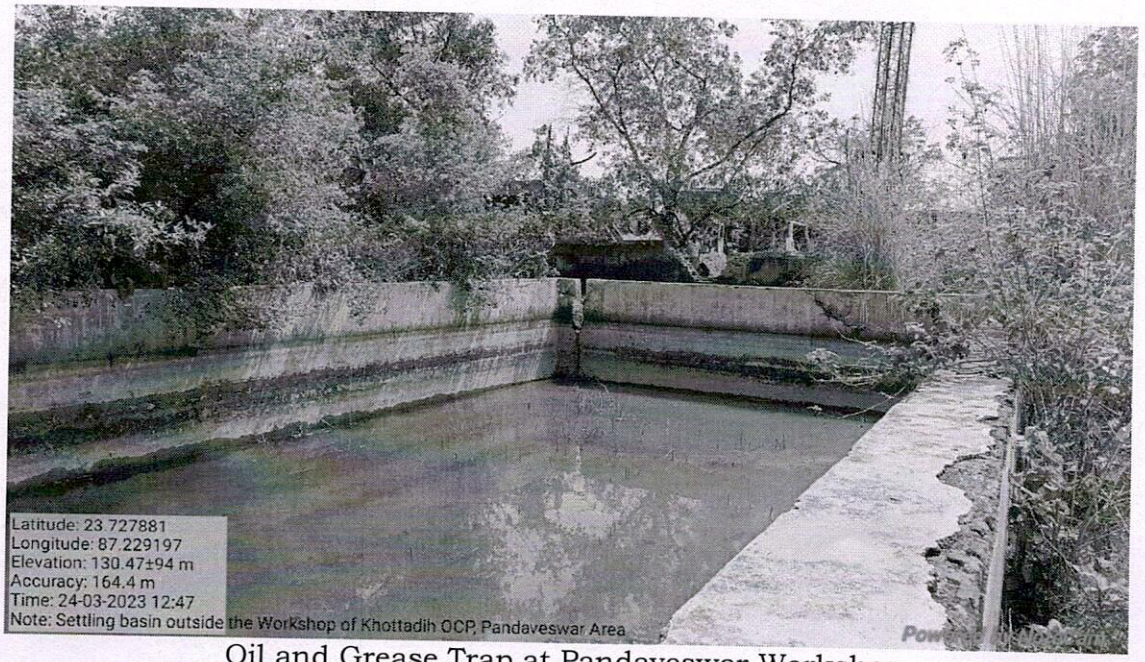
Review of Acton Taken Report: Assured to comply. PAs have informed that total 1597.61 ha area of green belt has been developed by PAs till date. PAs have submitted 5 year phase wise progressive afforestation plan for next 25 years for remaining 4617.95 ha plantation.

8. **Observation made during monitoring on 09.02.2023 & 10.02.2023:** PAs need to provide STP to all the residential colony immediately as well as need to install ETP to all the workshops immediately and maintain the ETP properly in Sonepur-Bazari workshop. (Specific Conditions lvi)

Action taken report submitted by the project proponent:

Jhanjra Area: A proposal is under process for the installation of STP at Sector 1 and Sector 2 colonies of Jhanjra Area. Plinth area based estimate has been prepared for consultancy services for the design of STP and sewerage network for both the colonies under Jhanjra Area. The said estimate and proposal is under evaluation and process.

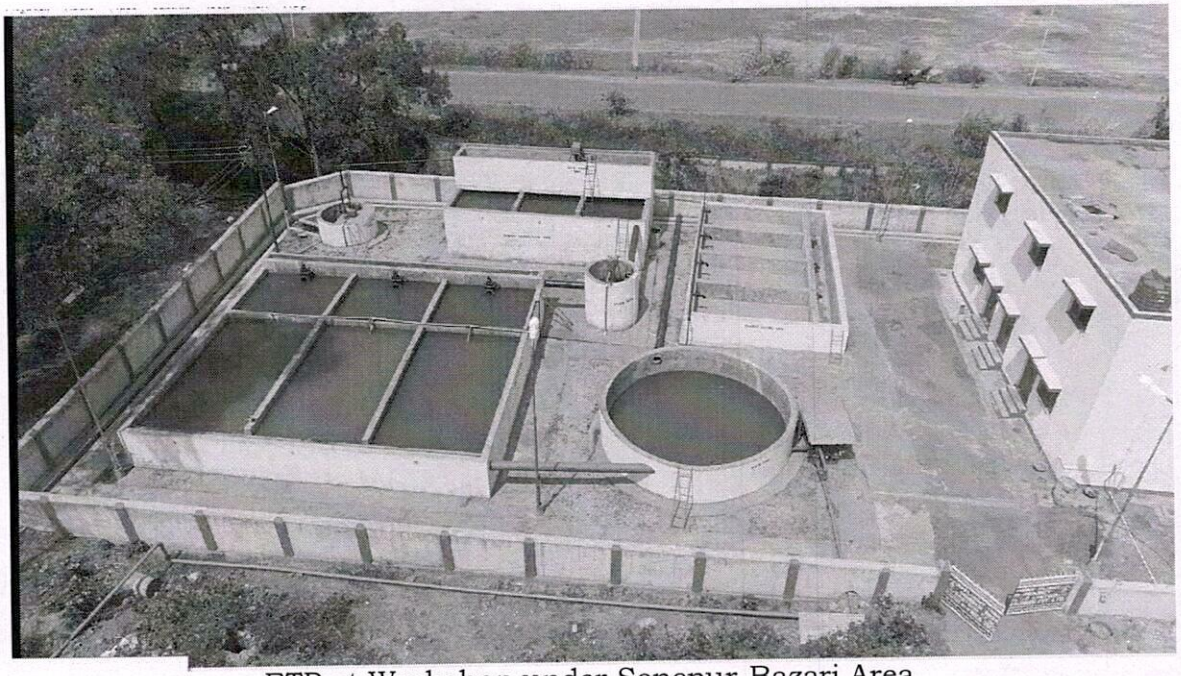
Currently, Work shop is under construction at Jhanjra Area and is almost complete. The workshop will have a provision of ETP and the proposal is under process. A budget of 25 lakh rupees is allocated for the FY 2023-24 for construction of ETP.



Oil and Grease Trap at Pandaveswar Workshop

Pandaveswar Area: Oil and Grease Trap is available at workshop for treatment of waste water. As the existing colonies are old and scatter septic tank facility is

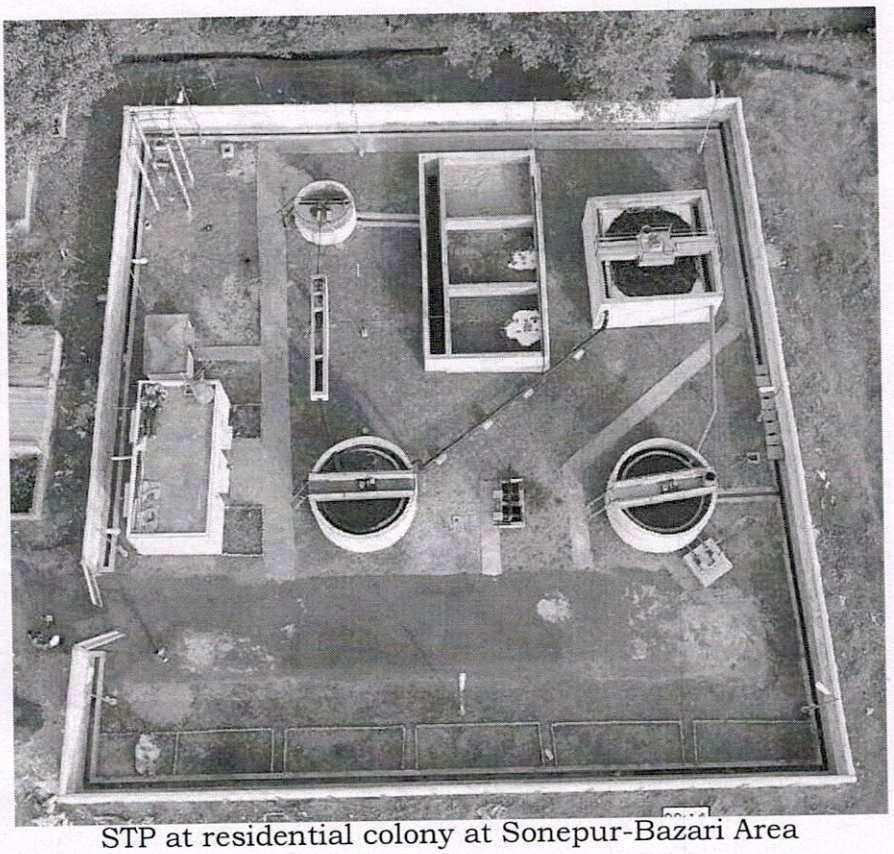
provided in individual houses at each colony for treatment of sewage water.



ETP at Workshop under Sonepur-Bazari Area

Sonepur-Bazari Area: A Sewage Treatment Plant with capacity 600 cum/d is present at R.N. Colony of and an Effluent Treatment Plant with capacity 7200 cum/d is present at workshop for treating workshopand CHP waste water effluent.

Bankola Area: As the quantity of effluent generated from mining activities (viz. workshops) are very less. The construction of ETP in the workshop is not feasible. However, oil & grease traps are installed in all workshops.



STP at residential colony at Sonepur-Bazari Area

Oil and Grease Trap at Bankola Workshop

Future plan for construction of Oil and Grease trap/ ETP is provided below:

S No.	Area Responsible	Location for Construction of ETP/ Oil and Grease trap along with Settling tank	Year of Construction
1	Pandaveswar	Khottadih OCP Workshop	2023-24
2	Jhanjra	Work Shop under construction	2023-24
3	Pandaveswar	Samla OC workshop	2024-25

Review of Acton Taken Report: Assured to comply. PAs have informed that Oil and Grease trap has been provided at Pandaveswar workshop and Bankhola workshop, STP has been provided in Sonepur-Bazari area and submitted the photographs of the same. PAs have assured that they will provide ETP/ Oil and Grease trap along with Settling tank in the Pandaveswar and Jhanjra area before the end of the year 2025 and submitted time-bounded future action plan for the same.

9. **Observation made during monitoring on 09.02.2023 & 10.02.2023:** PAs have not submitted the copy of the detailed Final Mine Closure Plan along with details of Corpus Fund. Hence, PAs need to submit the detailed Final Mine Closure Plan along with details of Corpus Fund to the Ministry of Environment, Forest & Climate Change. (Specific Conditions lix)

Action taken report submitted by the project proponent: Details of Corpus Fund deposited for Cluster no. 12 is tabulated below:

S No	Area under Cluster no. 12	Corpus Fund deposited (in Rs.)
1	Jhanjra Area	5,47,04,959.00
2	SonepurBazari Area	92,73,2092.00
3	Pandaveswar Area	49,37,58,314.00
4	Bankola Area	8,43,38,679.00
	Total	**72,55,34,044.00**

Mine Closure Plan for mines under Cluster no. 12 is **attached as Annexure-III.**

Review of Acton Taken Report: Being complied.

10.	**Observation made during monitoring on 09.02.2023 & 10.02.2023:** PAs need to submit information regarding Workshop waste water treatment and discharge of workshop effluents. (General Conditions vi) **Action taken report submitted by the project proponent:** **Jhanjra Area:** Currently Work shop is under construction at Jhanjra Area and is almost complete. The workshop will have a provision of ETP and the proposal is under process. **Pandaveswar Area:** Discharged water from workshop at Pandaveswar Area is treated in oil and grease trap. Treated water is again reused for HEMM washing and dust suppression at water tanks. **Sonepur-Bazari Area**: Zero Discharge Policy is adapted at Sonepur-Bazari Area. Whole Workshop treated Water from ETP is being recycled and reused for HEMM washing and dust suppression mechanism. **Bankola Area**: Discharged water from the workshop is treated in OGT which is then reused for HEMM washing and dust suppression. **Review of Acton Taken Report: Being complied.** PAs have submitted information regarding Workshop waste water treatment and discharge of workshop effluents.
11.	**Observation made during monitoring on 09.02.2023 & 10.02.2023:** PAs need to submit the year wise detailed expenditure statement for environmental protection measures for Pandaveshwar, Sonepur-Bazari and Jhanjra area also. (General Conditions xii) **Action taken report submitted by the project proponent:** **Jhanjra Area:** Environment Expenditure Statement for the past 5 years and CSR expenditure for past 4 years is attached below:

EASTERN COALFIELDS LIMITED
(A Subsidiary of Coal India Limited
A Maharatna Company)

OFFICE OF THE GENERAL MANAGER
JHANJRA AREA
PO – Jhanjra (B. O.) -713385
Dist: Paschim Bardhaman, W. B.

Ref. No.: ECL/GM/JNR/2022-23/ Date: 22.03.2023

Environmental Expenditure Statement

Environmental Expenditure for the past 5 years at Jhanjra Area as per audited accounts is as below;

Year	Environmental Expenditure
2022-23	Rs.464750/-
2021-22	Rs. 174600/-
2020-21	Rs. 1,02,27,332/-
2019-20	Rs. 1532545/-
2018-19	Rs. 12,98,312/-

Area Finance Manager
Jhanjra Area

Nodal Officer(Env)
Jhanjra Area

Jhanjra Area CSR Expenditure 2019-20				
Sl No.	**Sector**	**CSR Projects identified**	**Expenditure (Lakhs)**	**Remarks**
1	Skill Development	Training of Kantha Stitch work to rural BPL women in nearby villages	2.92	Durgapur Sundaram Creative Welfare Society
2	Healthcare	Mobile Medical Van Health Camps	80 camps	Project implemented through HQ, Around 4666 people benefitted
3	Healthcare	Blood Donation Camp at Sirsha Village	1 camp	IQ City Narayana Hospital, Durgapur
4	Healthcare	Cardiac Check-up camp at Jhanjra Area Hospital	1 camp	DESUN Hospital Kolkata
5	Environment & Sustainability	Installation of Solar Street Lights 120 no's in 10 villages of Laudoha Panchayat	15.08	Direct
TOTAL			**18**	
Jhanjra Area CSR Expenditure 2020-21				
1	Healthcare	Mobile Medical Van Health Camps	77 camps	Project implemented through HQ, Around 3429 people benefitted
2	Healthcare	Food Packets distribution & running of Community Canteen	1	Around 300 food packets distributed. Community canteen run for 45 days.
3	Healthcare	Purchase of Sanitzing Items as a precautionary measure to stop Covid 19 (Sodium Hypochloride and Handwash)	3	Nearby villages
		TOTAL	**4**	
Jhanjra Area CSR Expenditure 2021-22				
1	Healthcare	Mobile Medical Van Health Camps	36 camps	Project implemented through HQ, Around 1923 people benefitted
2	Rural Development	Construction of PCC Road 500 mtr at Tilaboni Village	8.05	Direct
		TOTAL	**8.05**	
Jhanjra Area CSR Expenditure 2022-23 (till 20th Jan 2023)				
1	National Integration	Har Ghar Tiranga	2.12	Distribution of flags to all employees and installation of flags at roof of all quarter blocks and service buildings
		TOTAL	**2.12**	

Pandaveswar Area: Details of year-wise expenditure statement for environment protection measure in Pandaveswar Area is as follows:

SL No.	Year	Name of Work	Expenditure (in Rs.)
1.	2017-18	Plantation of 40000 nos. saplings in 16 Ha Reclaimed Land at Khottadih OCP	2827200.00
2.	2018-19	Plantation of total 37500 nos. of saplings in 10 Ha and 5 Ha land of Pandaveswar UG and Dalurband OC Phase-III respectively.	2704500.00
3.	2019-20	Creation and maintenance of Plantation	3516105.00
4.		Installation and commissioning of fixed water sprinkler system at SS Railway Siding under Khottadih OCP, Pandaveswar Area	1900000.00
5.	2020-21	Plantation over 32.5 Ha land and maintenance of plantation	8246250.00
6.		Construction of Rainwater Harvesting Structure at Khottadih Hostel, Panthnagar Hospital and at DAV School, Pandaveswar	500000.00
7.		Construction of Oil and Grease trap at Khottadih UG	109000.00
8.	2021-22	Plantation over 10 Ha Internal OB Dump Land under Khottadih OCP, Pandaveswar Area	2187000.00
9.		Plantation over 5 Ha Internal OB Dump Land under Dalurband OC Phase-III, Pandaveswar Area	1093500.00
	Total		**23083555.00**

Sonepur-Bazari Area: Details of year wise expenditure of Sonepur-Bazari Area is attached:

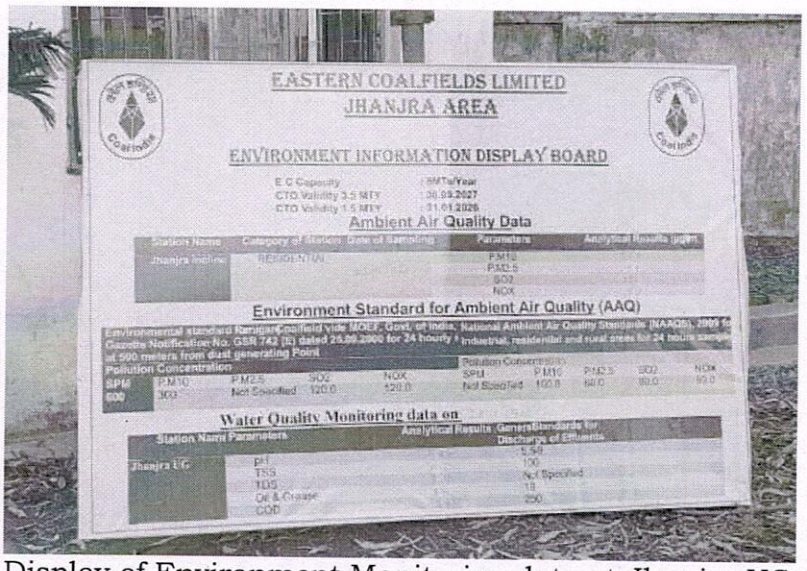
Sl. No.	Expenditure Under		Total Expenditure of Last 3 Years (Rs. in Crores)			
		2017-18	2018-19	2019-20	2020-21	2021-22
02	Anti Pollution Control Measures (ETP, STP, Water Sprinkler, Rain Water Harvesting, Toe Wall)	0	3.39	5.846	2.229	3.52
03	Community Development in adjoining villages	0.65	0.29	1.19	0.76	0.175
04	Environment Statutory Payments	0	1.08	0	0	0
05	Biological Reclamation Works	1.18	0.64	0.87	0.88	0.838
Total		**1.83**	**5.4**	**7.906**	**3.869**	**4.533**

Review of Acton Taken Report: Being complied. PAs have submitted the year wise detailed expenditure statement for environmental protection measures for Pandaveshwar, Sonepur-Bazari and Jhanjra area.

12. **Observation made during monitoring on 09.02.2023 & 10.02.2023:** The monitoring data of the environmental quality parameters and critical pollutant and critical sectoral parameters shall not been displayed at the entrance of the project premises and mine office. PAs need to display the same immediately. (General Conditions xvi)

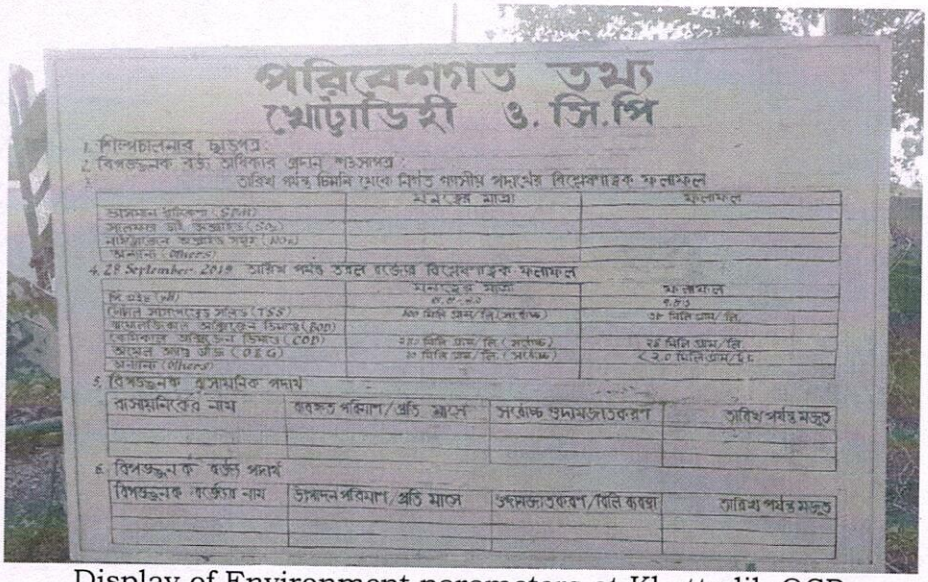
Action taken report submitted by the project proponent:

Jhanjra Area: Environment Monitoring data has been displayed at the project premises. Photo attached below.

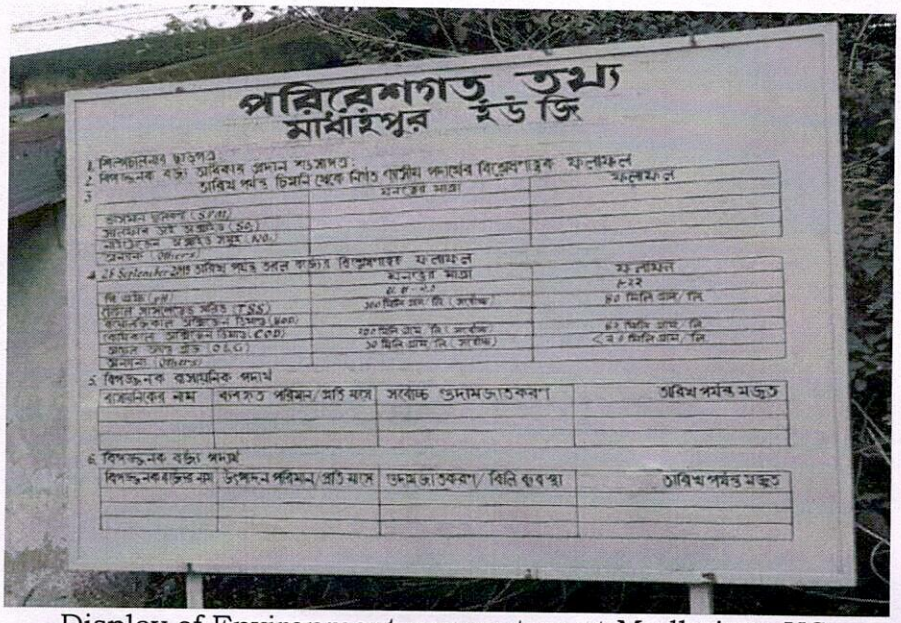


Display of Environment Monitoring data at Jhanjra UG

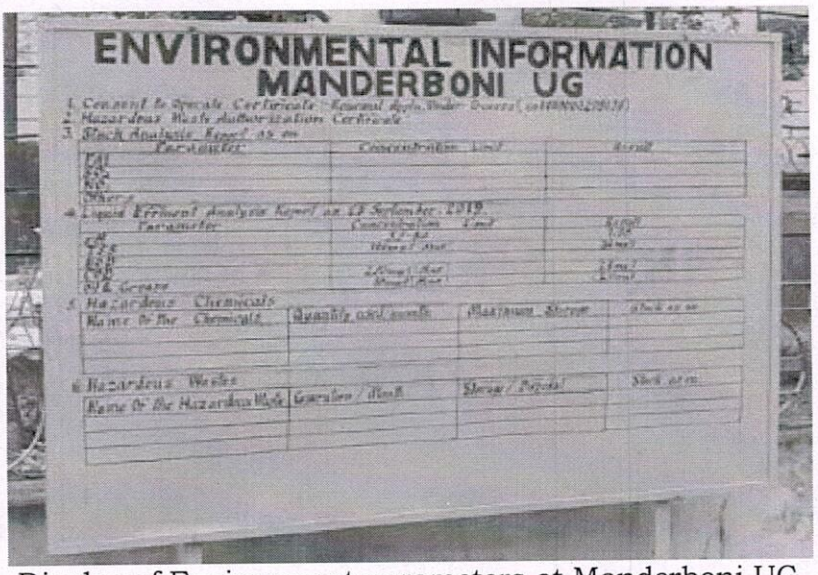
Pandaveswar Area: Environment Information Display Board is installed at major locations of the project.



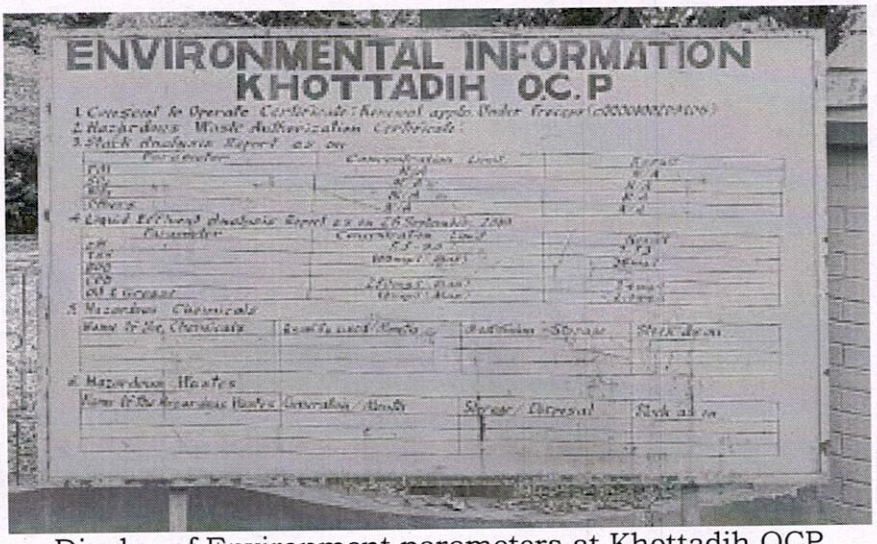
Display of Environment parameters at Khottadih OCP



Display of Environment parameters at Madhaipur UG

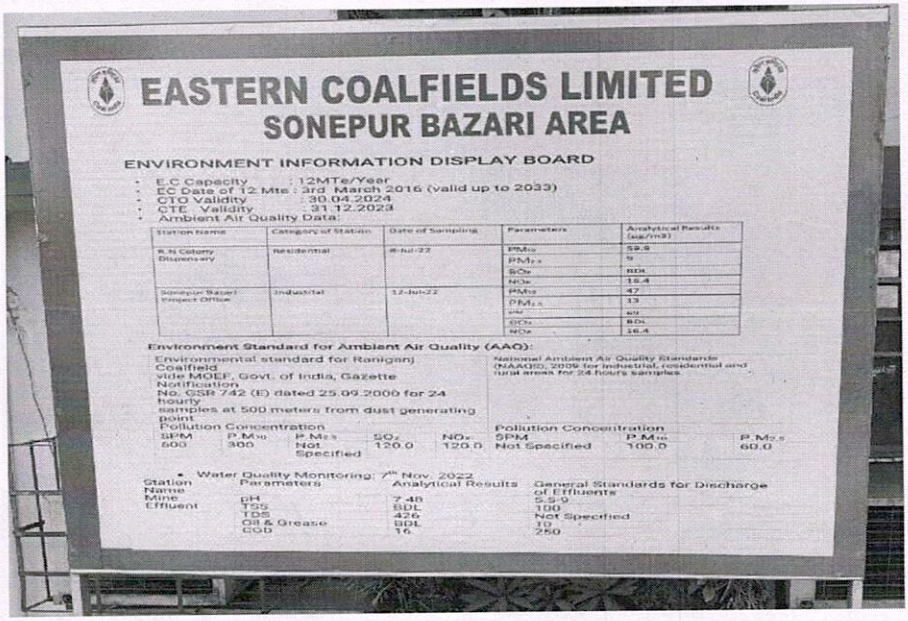


Display of Environment parameters at Manderboni UG



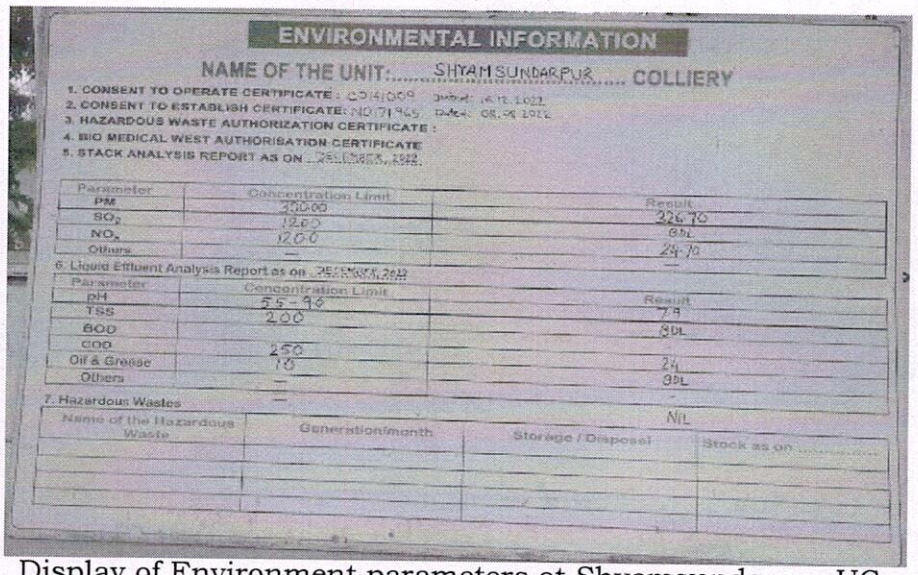
Display of Environment parameters at Khottadih OCP

Sonepur-Bazari Area: Environment Information Display Board is installed at major locations of the project.



Bankola Area: Environment Information Display Board is installed at major

locations of all the projects Photographs of which is attached.



ENVIRONMENTAL INFORMATION

NAME OF THE UNIT: SHYAM SUNDARPUR COLLIERY

1. CONSENT TO OPERATE CERTIFICATE : CO/4/009
2. CONSENT TO ESTABLISH CERTIFICATE: NO/7965
3. HAZARDOUS WASTE AUTHORIZATION CERTIFICATE :
4. BIO MEDICAL WEST AUTHORISATION CERTIFICATE
5. STACK ANALYSIS REPORT AS ON

Parameter	Concentration Limit	Result
PM	250.00	226.70
SO_2	120.0	BDL
NO_x	120.0	24.70
Others	—	—

6. Liquid Effluent Analysis Report as on

Parameter	Concentration Limit	Result
pH	5.5 - 9.0	7.9
TSS	200	BDL
BOD	—	—
COD	250	24
Oil & Grease	10	BDL
Others	—	—

7. Hazardous Wastes — NIL

Name of the Hazardous Waste	Generation/month	Storage / Disposal	Stock as on

Display of Environment parameters at Shyamsundarpur UG

Review of Acton Taken Report: Being complied. PAs have submitted the photographic evidence regarding the display of the monitoring data of the environmental quality parameters, critical pollutant and critical sectoral parameters at the entrance of the project premises and mine office

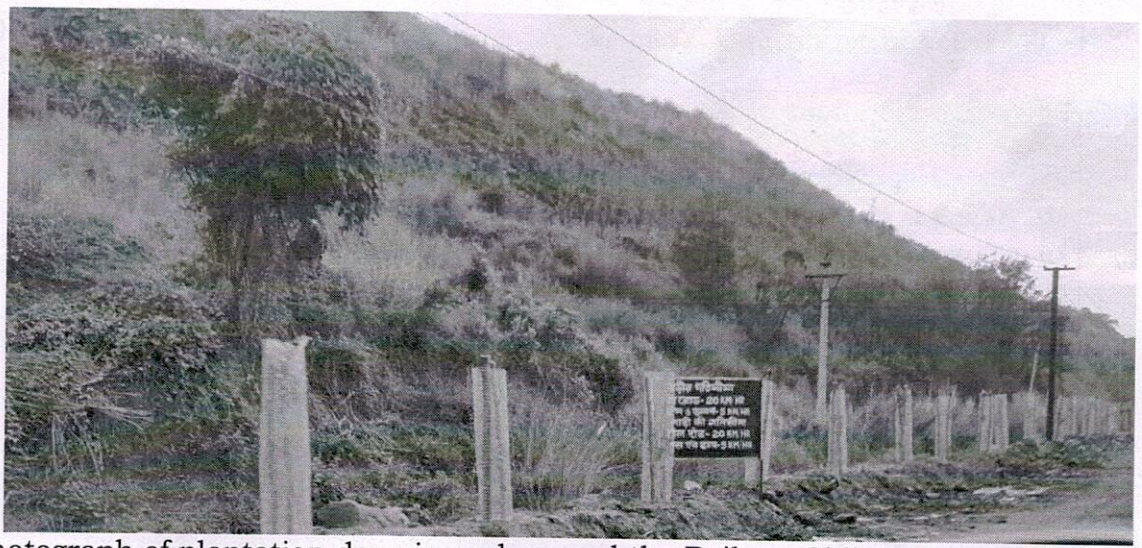
J-11015/76/2011-IA-II (M) dated 03.03.2016

1. **Observation made during monitoring on 09.02.2023 & 10.02.2023:** PAs need to take action to develop green belt/ vertical greenery system along the railway siding to control dust and other fugitive emissions. (Amendment condition v)

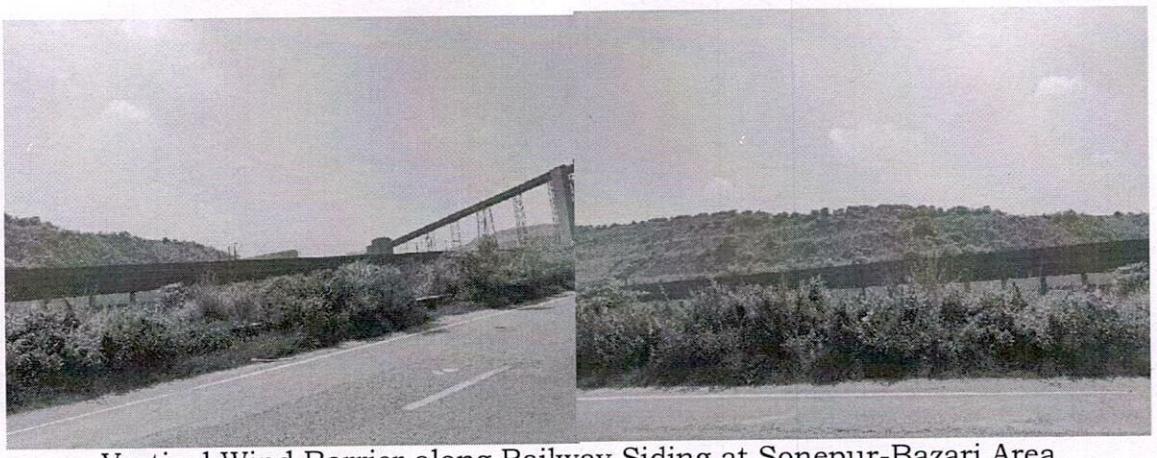
Action taken report submitted by the project proponent:

Jhanjra Area: A park has already been developed around POCP-1 railway siding under Jhanjra Area. New CHP is under construction under Jhanjra Area along with railway siding. Three tier green belts will be created around new railway siding after construction. Multiple plantations has also been created around new proposed railway siding.

Sonepur-Bazari Area: Around 1000 no's of plants have been planted in and around railway siding. 8 Ha of Plantation at OB adjacent to Railway Siding have been done in the FY 2021-22. Vertical Wind barrier of 950m along the periphery of railway siding has been constructed to control dust and other fugitive emission.



Photograph of plantation done in and around the Railway Siding of Sonepur-Bazari



Vertical Wind Barrier along Railway Siding at Sonepur-Bazari Area

Time bound action plan for development of 3 tier green belt and vertical greenery system at Cluster no. 12 is tabulated below:

S No.	Activity description	Location for plantation	Creation year
1	Construction of Vertical Green Barrier.	Bankola-I Railway Siding	2023-24
2	Construction of Vertical Green Barrier.	Bankola-II Railway Siding	2023-24
3	Development of Plantation over 5.00 Km length of road	Avenue plantation at Jhanjra UG	2023-24
4	Construction of Vertical Green Barrier	Sonepur-Bazari New Railway Siding.	2023-24
5	Development of Plantation over 15.00 Ha land	Sonepur-Bazari Internal OB dump.	2023-24
6	Grassing proposal over 5.00 Ha land	Sonepur-Bazari Internal OB dump.	2023-24
7	Development of Plantation over 2.50 Ha of dump.	Internal OB dump of Khottadih OCP	2023-24
8	Development of Plantation over plain land	Plain land of Bilpahari rehab site.	2023-24
9	Development of Plantation over 2.30 Km of avenue road	Avenue road at Manderboni-S Samla UG	2023-24
10	Construction of Vertical Green Barrier	Dalurband Railway Siding Pandaveswar Area.	2023-24
11	Development over 1Ha of Miyawaki Plantation	Sonepur-Bazari Area	2023-24
12	Construction of Vertical Green Barrier	Select Samla Railway Siding Pandaveswar Area.	2024-25
13	Development of plantation over 15 Ha	Subsided land in Jhanra Area.	2024-25

Review of Acton Taken Report: Assured to comply. PAs have informed that plantation has been developed in and around the Railway Siding of Sonepur-Bazari. PAs have assured that they will take up the plantation programme and develop 3 tier green belt and vertical greenery system at different railway sidings, OB dump and subsided land of Cluster 12 and complete before the end of the year 2025 and submitted time-bounded future action plan for the same.

2. **Observation made during monitoring on 09.02.2023 & 10.02.2023:** PAs need to provide the details of the thick green belt at the final boundary along with kml file of the mine area to verify with the satellite image. (Amendment condition viii)

	Action taken report submitted by the project proponent: **Jhanjra Area**: Plantation plan for Jhanjra area is attached. Kml file of plantation developed in the Cluster along with the satellite imagery of the Cluster no. 12 is attached as **Annexure-IV.** **Review of Acton Taken Report: Partially complied.** PAs have not submitted any details of the thick green belt plantation of adequate width at the final boundary of the OCP along with kml file. ***PAs need to provide the details of the thick green belt at the final boundary along with kml file of the OCPs.***
3.	**Observation made during monitoring on 09.02.2023 & 10.02.2023:** PAs need to conduct a third-party assessment of EC compliance immediately through Government Institutes or any other expert agency and report may be submitted to this office. (Amendment condition xii) **Action taken report submitted by the project proponent:** EC Compliance assessment through third party will be done by 2023-24in respect of mines under Pandaveswar Area, Jhanjra Area and Bankola Area and the report will be submitted to Regional office. **Sonepur-Bazari Area:** Third Party Assessment Study of Sonepur-Bazari Area has been conducted by ICFRE. Report to be annexed as **Annexure-V.** **Review of Acton Taken Report: Partially complied.** PAs have informed that 3rd Party Assessment Study of Sonepur-Bazari Area has been conducted by ICFRE in the year 2018 and submitted the copy to IRO, Kolkata. PAs have also assured that they will provide EC Compliance assessment through third party by the end of the year 2023 in respect of mines under Pandaveswar Area, Jhanjra Area and Bankola Area. Since third-party assessment of EC compliance need to be undertaken once in three years through reputed Government Institutes. ***PAs need to conduct third-party assessment again for Sonepur-Bazari Area immediately. PAs also need to submit compliance report/ action taken report regarding the recommendation/ comments of the ICFRE mentioned in the Third Party Assessment Study for Sonepur-Bazari Area.***
4.	**Observation made during monitoring on 09.02.2023 & 10.02.2023:** It was observed during inspection that some OB dumps in the Pandaveswar area and Sonepur-Bazari has been found to be kept in barren/ open condition. PAs need to cover all the OB dump by temporary grass to avoid air born of particles. (Amendment condition xiii) **Action taken report submitted by the project proponent:** OB dump is naturally vegetated which is native to West Bengal. However, action plan for grassing the open OB dump under Cluster no. 12 is tabulated below:

S No.	Location of OB dump to be grassing	Area (in Ha) to be grassed	Year of implementation
1	OB dump of Dalurband OCP	5.00	2023-24 (Oct 23)
2	OB dump of Khottadih OCP	5.00	2023-24 (Oct 23)
3	Stablized OB dump of SonepurBazari OCP	5.00	2023-24 (Oct 23)

	Review of Acton Taken Report: Assured to comply. PAs have submitted the future time-bound action plan for grassing the open OB dump under Cluster no. 12 and assured to complete the grassing over OB dump before the end of the year 2024.
5.	**Observation made during monitoring on 09.02.2023 & 10.02.2023:** PAs need

	to submit details of plantation along the villages and transportation route separately. Further, a certificate in this regard from concerned District Forest Officer needs to submit to Regional Office. (Amendment condition xiv) **Action taken report submitted by the project proponent:** Details of plantation along villages and transportation route of all the mines have been sent DFO, Durgapur Division for grant of certificate. The same will submitted to Regional Office within July. 2023. (Copy of letter for Certification attached as **Annexure-VI)** **Review of Acton Taken Report: Partially complied.** PAs have applied for certificate regarding plantation developed under Cluster No.12 from concerned DFO & CEO, WBFDCL on 7.04.2023, which is awaited. ***PAs need to submit the certificate regarding plantation developed under Cluster No.12 from concerned District Forest Officer needs to submit to Regional Office.***
6.	**Observation made during monitoring on 09.02.2023 & 10.02.2023:** PAs need to submit details regarding the blasting permission from DGMS for conducting mining operation near villages for other mining areas except Pandaveshwar Area. (Amendment condition xv) **Action taken report submitted by the project proponent:** Blasting permission of all the mines of cluster 12 is annexed as **Annexure-VII.** **Review of Acton Taken Report: Being complied.**

Conclusion: The PAs have complied or are in the process of complying the conditions stipulated by the Ministry. In this context, information /action plan need to be submitted by PAs on the following point:

J-11015/76/2011-IA-II (M) dated 03.03.2016:

1. ***PAs need to provide the details of the thick green belt at the final boundary along with kml file of the OCPs.*** (Amendment condition viii)

2. ***PAs need to conduct third-party assessment again for Sonepur-Bazari Area immediately. PAs also need to submit compliance report/ action taken report regarding the recommendation/ comments of the ICFRE mentioned in the Third Party Assessment Study for Sonepur-Bazari Area.*** (Amendment condition xii)

3. ***PAs need to submit the certificate regarding plantation developed under Cluster No. 12 from concerned District Forest Officer needs to submit to Regional Office.*** (Amendment condition xiv)

This is for the kind information and necessary action.

भवदीया,

(Dr. Soma Das/ डॉ0 सोमादास)
Inspector General of Forests (C)/ वनमहानिरीक्षक

Copy to: The General Manager (E&F),M/s. Eastern Coalfields Limited, Borachak House, Asansol, District- Burdwan,West Bengal, Pin- 313359. e-mail: envecl@yahoo.com

ANNEXURE-IV

AIR QUALITY IMPACT PREDICTION

(at peak production capacity of 31.83 MTY)

using

AERMOD

for

CLUSTER NO. – 12

(GROUP OF MINES)

EASTERN COALFIELDS LIMITED

(ANNEXURE – III)

Impact Assessment & Pollution Control Measures for Air

Air pollution in coal mines is mainly due to the fugitive emission of particulate matter and gases including methane (CH_4), sulfur dioxide (SO_2) and oxides of nitrogen (NO_X). The use of explosives releases carbon monoxide (CO), which poses a health risk for mine workers. Dust and coal particles stirred up during the mining process, as well as the soot released during coal transport, can cause severe and potentially deadly respiratory problems. The mining operations like drilling, blasting, movement of the heavy earth moving machinery on haul roads, collection and handling of coal, screening, sizing and segregation units are the major sources of emissions and air pollution. Mine fire is also a major source of air pollution in some of the coal fields.

High levels of suspended particulate matter increase respiratory diseases such as chronic bronchitis and asthma cases while gaseous emissions contribute towards global warming besides causing health hazards to the exposed population.

Sources & Pollutants

Coal dust is generally course and a significant portion of dust generated due to mining activities settles down within a short distance. Only very fine dust generated from grinding of fallen coal, clay and OB on haul roads under the wheels of heavy vehicles as well as at crushers in coal handling plants can become airborne and be carried longer distances by wind. Vehicular exhaust from dumpers ferrying coal and OB is another reason for air pollution. These exhausts contain CO, SO_X, NO_X and small quantities of un-burnt fuel apart from some heavy metals like lead, nickel and arsenic. Air pollution due to coal transportation can be controlled to a great extent by regular sprinkling on roads by mobile water sprinklers. Wetting of coal before transportation and transportation of coal by covered trucks will help prevent spillage, thereby, reducing the quantum of dust. Dumpers employed for coal transportation require good maintenance.

Several such provisions have been made in this report to contain the air pollution within the stipulated standards besides making the mining operation eco-friendly in this project.

For assessment of impact, the project life may be considered in the following time frames:

- Pre-operation phase
- Operation phase
- Post-operational phase

The activities associated with these time frames have varying impact on the ambient air quality as outlined below –

Pre-operational phase: During this phase activities for creation of additional infrastructure are taken up. Such activities have impact on ambient air quality and are detailed below:

(i)	Movement of vehicles	:	Dust and noxious fumes
(ii)	Construction of residential and service buildings	:	Dust and noxious fumes
(iii)	Construction of infrastructure like CHP, coal storage bunkers, workshop, store, sub-station, railway siding etc.	:	Dust and noxious fumes

The impacts (both direct and indirect) are short-term ones. Cluster No. 12 consists of existing mines with necessary infrastructure already in place.

Operational phase: During this phase activities for mining of coal, its handling and transport are taken up. Such activities have impact on ambient air quality and are detailed below:

(i)	Drilling in OB and coal benches	:	Dust
(ii)	Blasting of coal and overburden	:	Dust and noxious gases
(iii)	Handling of coal at CHP, railway siding etc.	:	Dust and noxious gases
(iv)	Overburden handling	:	Dust and noxious gases
(v)	Dump formation (internal /external)	:	Dust and exhaust fumes from dumpers and dust from wind erosion till the development of green cover
(vi)	Movement of vehicles for transport of coal and OB	:	Dust and noxious fumes

The impacts (both direct and indirect) are long-term ones.

Post-operational phase: During this stage of the project, the activities related to the closure of mine are to be carried out. Preparation of final mine closure plan shall be

carried out five years before the closure of the mine. Some of the activities for the closure are:

- Physical and biological reclamation of backfilled area
- Salvaging and shifting operation of HEMMs and other equipment
- Clearing of coal and other materials, restoration of original land-use of infrastructure area & colony area to the extent possible and decommissioning of redundant infrastructure if not useful for other projects
- Management of hydrology and hydrogeology
- Redeployment of workforce, etc.
- Arrangement & implementation of post-operation monitoring mainly keeping watch, vigil, etc.

The activities having impact on the ambient air quality are enumerated below:

(i)	Movement of HEMMs for physical reclamation of backfilled area	:	Dust and obnoxious fumes
(ii)	Movement of vehicles for shifting and salvaging operation of HEMMs and other equipment	:	Dust and obnoxious fumes
(iii)	Movement of vehicles for clearing of coal and other materials	:	Dust and obnoxious gases

The above adverse impacts are of short-term nature.

The mining and its related activities create ambient air pollution. The impact of mining on ambient air quality has been predicted by the latest version of AERMOD View 11.2.0 Version 22112, of USEPA which is discussed below:

Air Quality Modeling

The impact assessment (both short-term and long-term) has been carried out dealing with the help of modeling software with emphasis on the following points:

(i) Inventory of air pollution emission sources

(ii) Impact assessment (short-term and long-term besides direct/indirect and residual)

Air Quality Model

The effects of air pollutants upon receptors are influenced by concentration of pollutants and their dispersion in the atmosphere. Air quality modeling is an important tool for prediction, planning and evaluation of air pollution control activities besides identifying

the requirements for emission control to meet the regulatory standards. The efficient management of air quality requires the use of modeling techniques to analyze the patterns of pollutant concentrations from many individual sources of air pollutants operating simultaneously.

Models for regional concentration patterns are based on "emission inventory" data for the region, and on standard meteorological observations assumed to be representative of the entire region.

Various attempts have been made to establish empirical relations to predict the dust emission characteristics for mining operations. These relations may give only a rough estimate of the total dust emission and provide no information about the contour of the dust plume. The generation rate of the contaminant for most mining operations cannot be precisely determined by empirical relations because there is a high degree of variance in the way such operations are conducted in different mines. Nevertheless, the empirical relations provide the first-hand information to the health workers, administrators, planners, and engineers for the development of dust control strategies.

The assessment methodology for the air dispersion modelling exercise follows the guidance specified in the USEPA user guide for AERMOD. The model of selection is the commercially available AERMOD View dispersion model, developed by Lakes Environmental. This model is used extensively to assess pollution concentration and deposition from a wide variety of sources. AERMOD View is a true, native Microsoft Windows application and runs in Windows applications. The AMS/EPA Regulatory Model (AERMOD) was specially designed to support the EPA’s regulatory modelling programs. AERMOD is a regulatory steady-state plume modelling system with three separate components:

AERMOD (AERMIC Dispersion Model), AERMAP (AERMOD Terrain Pre-processor), and AERMET (AERMOD Meteorological Pre-processor). The AERMOD model includes a wide range of options for modelling air quality impacts of pollution sources, making it a popular choice among the modelling community for a variety of applications. Some of the modelling capabilities of AERMOD include the following:

- ✓ The model may be used to analyze primary pollutants and continuous releases of toxic and hazardous waste pollutants.
- ✓ Source emission rates can be treated as constant or may be varied by month, season, hour-of-day, or other optional periods of variation. These variable emission rate factors may be specified for a single source or for a group of sources. For this project all emission rates were treated as constant.
- ✓ The model can account for the effects of aerodynamic downwash due to buildings that are nearby point source emissions.
- ✓ Receptor locations can be specified as gridded and/or discrete receptors in a Cartesian or polar coordinate system.
- ✓ For applications involving elevated terrain, the U.S. EPA AERMAP terrain preprocessing program is incorporated into the model to generate hill height scales as well as terrain elevations for all receptor locations.
- ✓ The model contains algorithms for modeling the effects of settling and removal (through dry and wet deposition) of large particulates and for modeling the effects of precipitation scavenging for gases or particulates.

AERMOD requires two types of meteorological data files, a file containing surface scalar parameters and a file containing vertical profiles. These two files are provided by the U.S. EPA AERMET meteorological preprocessor programme.

Assessment of contribution to air pollution by AERMOD

The assessment of incremental contribution to air pollution (concentration level of PM_{10} and $PM_{2.5}$) at baseline and REM receptor points in the core and buffer zone from the mining activities due to adjustment in production capacity of mines within the cluster has been carried out by using the latest version of AERMOD View 11.2.0 Version 22112 Air Quality Model of USEPA. The details of production are given below:

Sl. No.	Name of Mine	EC Capacity (MTY)	Production Level (2021-22) (MT)	Production Level (2027-28) (MT)	Difference in Production (MT)
1	Pandaveswar- Dalurband UG & OC	2.25	0.27	1.51	1.24
2	Manderboni-South Samla UG	0.28	0.06	0.20	0.14
3	Madhaipur UG & OC	0.65	0.16	0.65	0.49
4	Nutandanga UG	Production suspended	-	-	0.00
5	Kendra UG	Production suspended	-	-	0.00

Sl. No.	Name of Mine	EC Capacity (MTY)	Production Level (2021-22) (MT)	Production Level (2027-28) (MT)	Difference in Production (MT)
6	Samla UG & OC	0.60	-	0.60	0.60
7	Sonepur Bazari OCP	12.00 (existing) 14.00 (proposed)	9.62	12.00	2.38
8	Nakrakonda – Kumardih B UG & OC	4.12	0.65	3.12	2.65
9	Kumardihi A UG	0.20	0.08	0.20	0.12
10	Jhanjra UG	5.00	3.63	5.00	1.37
11	Tilaboni UG	2.14	0.13	1.90	1.77
12	Shyamsundarpur UG	1.59	0.65	1.59	0.94
13	Bankola UG	0.30	0.17	0.30	0.13
14	Kottadih UG & OC	2.70	1.02	2.70	1.68
Total		**31.83**	**16.44**	**29.77**	**13.51**

The production level during FY 2027-28 i.e., 29.77 MT. However, modeling was carried out on peak capacity of the cluster i.e., 31.83 MTY which has been considered the worst-case scenario.

Identification of sources of PM_{10}, $PM_{2.5}$ and Gaseous pollutants

The main sources of air pollution with regard to mining activities for the purpose of estimation of contribution to PM_{10} and $PM_{2.5}$ concentrations were identified as-

1. Mining activities inside the OCP viz. Drilling and Blasting in OB and coal benches, loading and unloading of coal and OB, transport of coal and OB on haul roads and dumping, both externally & internally, dozing of OB and wind erosion at active OB dumps.
2. Coal handling activities at CHP / coal stockyard including primary and secondary crushing.
3. Transport of coal from CHP to Railway Siding through tarpaulin covered trucks.
4. Coal handling activities at Railway Sidings.

Apart from the above sources, there are few other sources like local industries, vehicular movement etc. which also contribute in concentration levels of PM_{10}, $PM_{2.5}$, SO_2 and NO_X. These sources are not under the control of ECL.

Receptors

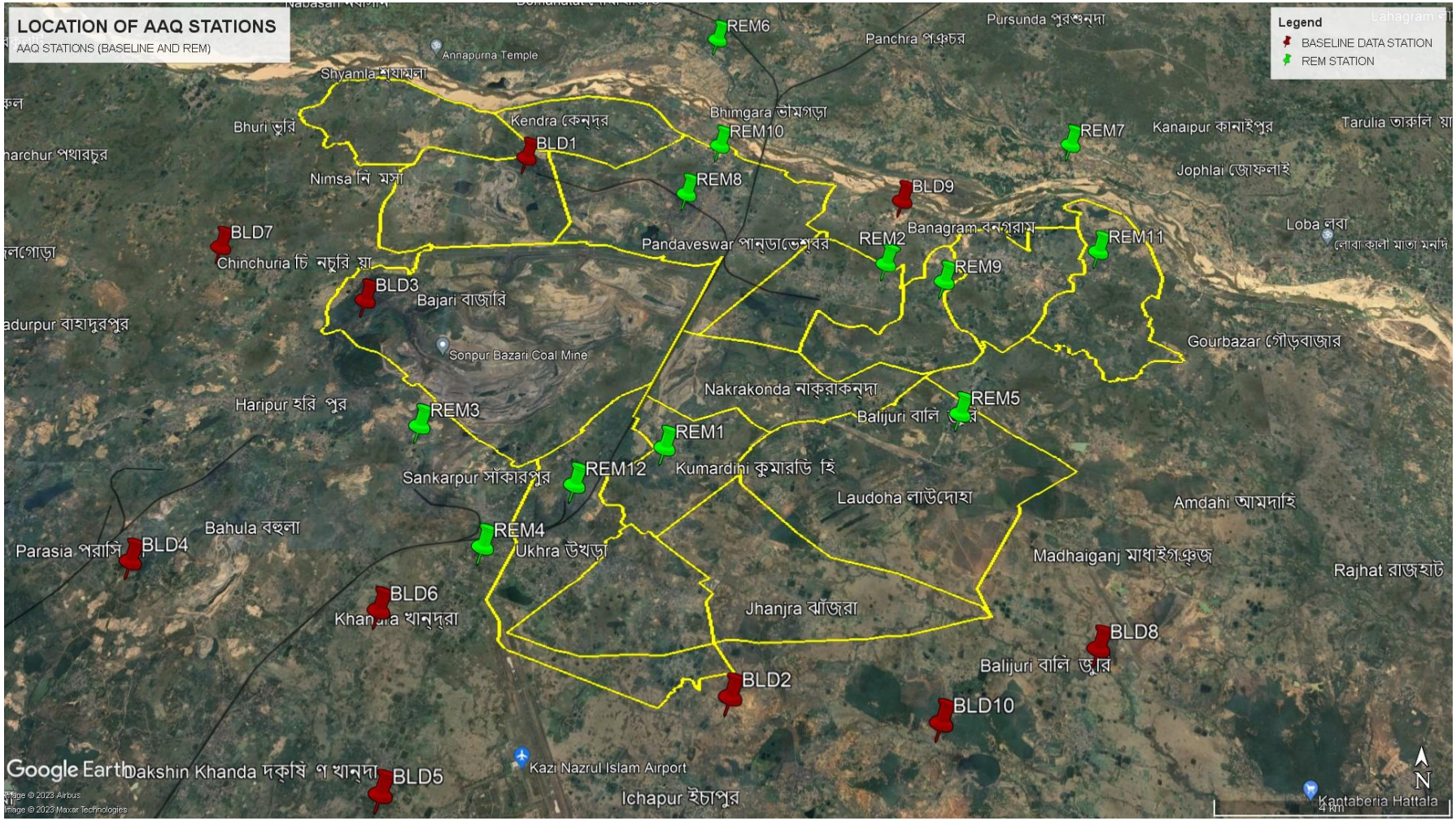
10 nos. of baseline stations (AAQ) falling within core and buffer zone along with 12 nos. of Routine Environment Monitoring stations (REM) of Cluster No. 12 falling in the core

and buffer zone of the project where regular monitoring is being carried out as part of compliance of EC condition have been taken as receptors.

Location & Description of Baseline and REM AAQ Stations

Stn. No.	Name of sampling station	Location of sampling station, aerial distance and its description
Core Zone		
BLD_1	Agent Office, Khottadih Colliery	This location was selected to assess the immediate effects in the active mining area and the present data will help to know the increase in pollution levels due to mining operation. The station is located within the project boundary.
BLD_3	CISF Camp, Sonepur Bazari OCP	This location was selected to assess the immediate effects in the active mining area and the present data will help to know the increase in pollution levels due to mining operation. The station is located within the project boundary.
Buffer Zone		
BLD_2	Agent's Bunglow, Shyamsundarpur UG	0.80 km from the project boundary towards SSE in downwind direction. Setup to assess the effect of pollutants in the downwind direction.
BLD_{10}	Tilaboni Filter Plant	1.50 km from the project boundary towards SE in downwind direction. Setup to assess the effect of pollutants in the downwind direction.
BLD_4	Manager's Office, Jambad UG	7.20 km from the project boundary towards WSW in downwind direction. Setup to assess the effect of pollutants in the downwind direction.
BLD_5	Manager's Office, Moira UG	3.50 km from the project boundary towards SSW in downwind direction. Setup to assess the effect of pollutants along buffer zone. Setup to assess the effect of pollutants in the downwind direction.
BLD_6	Khandra Workshop	2.00 km from the project boundary towards SSW in downwind direction. Setup to assess the effect of pollutants along buffer zone. Setup to assess the effect of pollutants in the downwind direction.
BLD_7	Chinchuria Village	2.50 km from the project boundary towards WNW in crosswind direction. Setup to assess the effect of pollutants in the crosswind direction.
BLD_8	Balijuri Community Hall	3.60 km from the project boundary towards ESE in crosswind direction. Setup to assess the effect of pollutants in the crosswind direction.
BLD_9	Konda Hospital	1.00 km from the project boundary towards NE in upwind direction. Setup as control station.
Routine Environment Monitoring Stations – Core & Buffer Zone		
REM_1	Kumardihi A Colliery Store Office	Industrial Location in Core Zone
REM_2	Danya Village	Residential Location in Core Zone
REM_3	GM Office, Kenda Area	Industrial Location in Buffer Zone
REM_4	Khandra Biseswar Pit	Industrial Location in Buffer Zone
REM_5	Office of Jhanjra Incline	Industrial Location in Core Zone
REM_6	Durga Mandir, Charai Village	Residential Location in Buffer Zone
REM_7	Chapla Village	Residential Location in Buffer Zone
REM_8	Dalurband Colliery Office	Industrial Location in Core Zone
REM_9	Manderboni Colliery Office near Railway Siding	Industrial Location in Core Zone
REM_{10}	Pandaveswar Pit Office near Railway Siding	Industrial Location in Core Zone
REM_{11}	Madhaipur Colliery Office near Railway Siding	Industrial Location in Core Zone
REM_{12}	Bankola Workshop near Railway Siding	Industrial Location in Core Zone

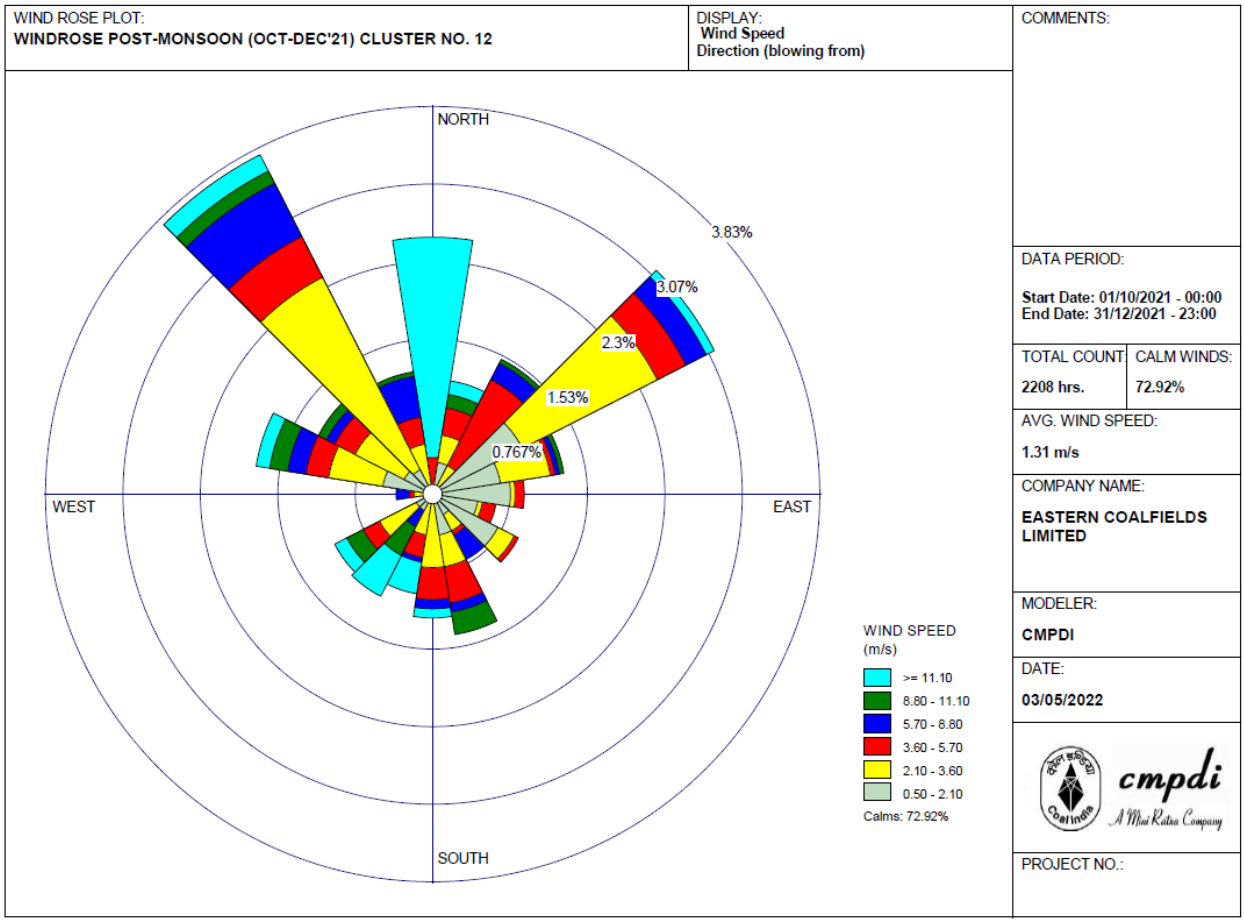
Thus, for proposed modelling, 22 numbers of discrete Cartesian Receptors and 25 Uniform Cartesian Receptors have been taken considering the area of extent 15 km including buffer zone.



LOCATION OF AMBIENT AIR QUALITY STATIONS, CLUSTER NO. 12

4.2.2.5 Meteorological Input

Micrometeorological and microclimatic parameters were recorded by Environment Laboratory, CMPDI, RI-I, Asansol for the winter period (Oct'21 – Dec'21) as detailed in Chapter No. III. Hourly reading of wind velocity, wind direction, temperature, relative humidity, cloud cover, station pressure and rainfall data were recorded. The model was run for 3 months data for each day. Considering worst case scenario out of the 90 days data, highest output at each receptor was considered as incremental value.



Terrain Features

The classification of the land use in the vicinity of the proposed project is needed because dispersion rates differ between urban and rural areas. In general, urban areas cause greater rates of dispersion because of increased turbulent and buoyancy-induced mixing. This is due to the combination of greater surface roughness caused by more buildings and structures and greater amounts of heat released from concrete and

similar surfaces. The USEPA guidance provides two procedures to determine whether the character of an area is predominantly urban or rural. One procedure is based on land-use type, and the other is based on population density. Both procedures require an evaluation of characteristics within a 3-km radius from the subject source, but the land-use methodology is considered more accurate. Hence, this method was applied and it was determined that the urban dispersion coefficient be selected for this modeling project.

Additionally, the topography in the region of the proposed project is defined as either simple terrain (terrain lying below the stack top elevation) or complex terrain (terrain above the top of the stack). Measurements of the terrain in the area surrounding the proposed project were made using terrain data obtained from SRTM3 (Global ~ 30m) – Version 3 derived from the webGIS.

Terrain features has also been considered for an area of 10 km buffer zone. From terrain map, it can be observed that in 10 km buffer zone terrain contour varies from 25.0 m to 153.0 m.

Emission Standards

a) A S&T study titled 'Development of Emission Factors for various Mining Machineries & Operations in Open Cast Mines (EE-27)' carried out by CMPDI (HQ), Ranchi from 2002 to 2008' has been considered for emission factors. During this study, emission factors for Suspended Particulate Matter (PM $\leq$ 100 µm) were developed for drilling, loading of coal and OB by Shovel, unloading of OB, transportation on haul roads and coal sizing. The emission factor along with control factor data for PM_{10} and $PM_{2.5}$ have been estimated on the basis of particle size distribution study. SPM Emission Factors & control factors for various Mining Operations is given below:

Sl. No.	Activity	Uncontrolled Emission Factor				Control Factor (as given in EET)	Reference of E.F.
		Unit	$PM_{2.5}$	PM_{10}	TSP		
1	Top Soil removal by Scrapper	Kg/t	0.00058	0.0052	0.029	50% control when soil is naturally or artificially wet	AP42, USEPA (1998)
2	Drilling in coal bench	Kg/hole	0.04	0.22	0.83	90% for fabric filter. 70% for water sprays.	*Coal S&T Project
3	Drilling in OB bench	Kg/hole	0.11	0.56	2.18	90% for fabric filter. 70% for water sprays.	

Sl. No.	Activity	Uncontrolled Emission Factor				Control Factor (as given in EET)	Reference of E.F.
		Unit	$PM_{2.5}$	PM_{10}	TSP		
4	OB loading	Kg/t	$1.5X10^{-05}$	$1.4X10^{-04}$	$7.7X10^{-04}$	None	
5	OB unloading	Kg/t	$6.0X10^{-05}$	$5.0X10^{-04}$	$3.0X10^{-03}$	None	
6	Coal loading	Kg/t	$2.1X10^{-04}$	$1.5X10^{-03}$	$7.1X10^{-03}$	None	
7	Coal unloading	Kg/t	$1.4X10^{-04}$	$1.23X10^{-03}$	$7.1X10^{-03}$	None	
8	Coal/OB transportation on unpaved haul road	Kg/VKT	0.076 Vehicle km Travelled (VKT) = (No. of trips)x(distance travelled)	0.53	2.56	None as the emission factor was developed under the condition of watering of haul road	
9	Coal Sizing						
a	Primary Crusher	Kg/t	0.008	0.056	0.28	Control factor = 99% for enclosure with dust extraction system	*Coal S&T Project
b	Secondary Crusher	Kg/t	0.02	0.13	0.64		
10	Blasting OB/Coal	Kg/blast	0.03 x E.F. for TSP*	0.18 x E.F. for TSP*	$344(A)^{0.8}/(M)^{1.9}(D)^{1.8}$	None	AP42, USEPA (1998)
11	Dozing OB**	Kg/hr	0.11 x E.F. for TSP	0.29 x E.F. for TSP	$2.6(S)^{1.2}/(M)^{1.3}$	None	
12	Dozing Coal#	Kg/hr	0.11 x E.F. for TSP	0.29 x E.F. for TSP	$35.6(S)^{1.2}/(M)^{1.4}$	None	
13	Wind erosion from OB dumps, coal mine pits and coal stockyard	Kg/ha/hr	0.008 (exclude contribution of the calm period)	0.09 (exclude contribution of the calm period)	0.4	50% for water sprays	
14	Pit Retention		0%	5% for PM_{10}		Emission Estimation technique for Mining, version 2.3, EPA Australia	

*The average values for Silt(S) and Moisture(M) content in coal and OB were observed as S=12%, M=7%, For OB, S=5% & M=4% respectively during a coal S&T Study for "Development of emission factors for various mining machineries & operations in an opencast coal mines" (EE-27).

**For Dozing OB, TSP = 2.96 kg/hr for S=5%, M=4%,

#For Dozing Coal, TSP = 46.06 kg/hr for S=12 %, M =7%,

A = The area blasted (m^2)

M = Moisture Content

D = The depth of blast hole (m)

b) Emission and Control Factors based on AP-42 issued by USEPA for paved roads:

The AP-42 emission factor equation used to estimate paved road dust emissions is provided below, followed by a description of the inputs to the equation:

$$E = [k(sL)^{0.91} \times (W)^{1.02}] \times (1 - P/4N)$$

Where:

E = the particulate emission factor in units of grams of particulate matter per VKT

k = the U.S. EPA AP-42 particle size multiplier (PM_{10} = 0.62 g/VKT),

sL = the roadway-specific silt loading in grams/square meter (g/m^2),

W = the average weight of vehicles traveling the road,

P = number of "wet" days, when at least 0.01 inch of precipitation during the annual averaging period, and

N = the number of days in the annual averaging period (default = 365)

Emission Factors for PM_{10} and $PM_{2.5}$ under different scenarios (loaded and empty) have been calculated using the above formula:

a) E.F. (PM_{10}) for loaded tipper truck: 10.13 g/VKT;
b) E.F. (PM_{10}) for empty tipper truck: 6.24 g/VKT;
c) E.F. ($PM_{2.5}$) for loaded tipper truck: 1.52 g/VKT &
d) E.F. ($PM_{2.5}$) for loaded tipper truck: 0.94 g/VKT

c) Emission Factor for NO_X and SO_2 based on USEPA, 1998 and Study by ARAI, Pune:

Equipment Type	Emission Factor (kg/1000 litre of fuel)		
	NO_X	SO_2	Emission Factor Rating
Track type tractor	34.16	1.70	C
Wheeled tractor	52.35	1.70	C
Wheeled dozer	34.29	1.70	C
Scraper	30.99	1.70	C
Grader	30.41	1.70	C
Off-highway truck	34.29	1.70	C
Wheeled loader	38.50	1.70	C
Track type loader	30.73	1.70	C

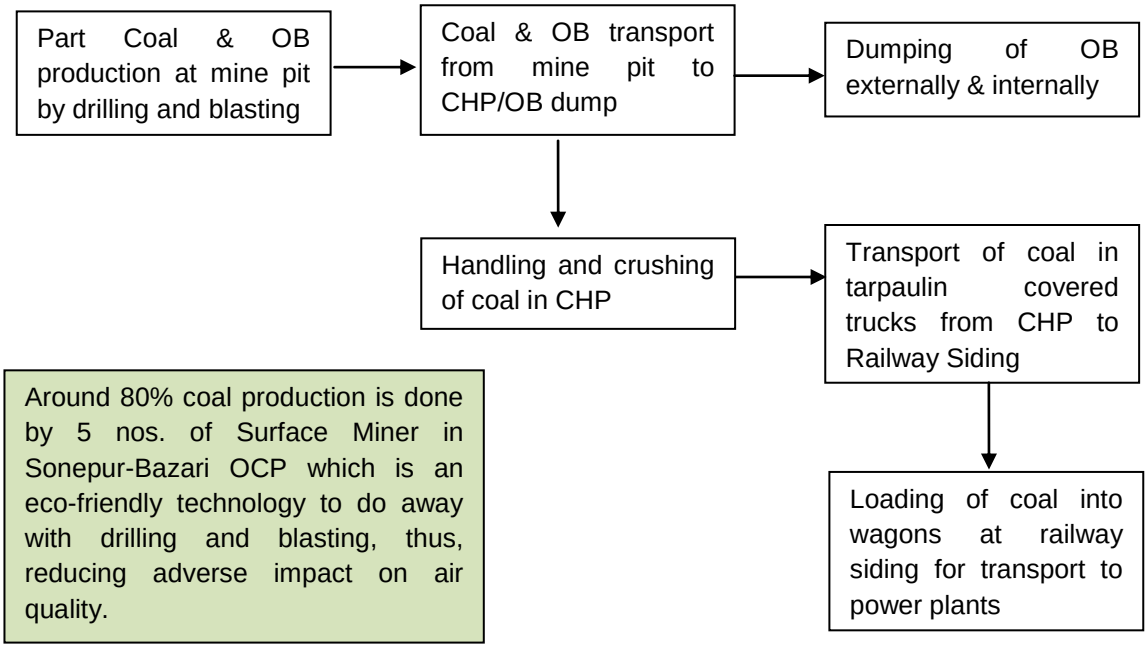
(Source: USEPA, 1998)

Equipment Type	Emission Factor (g/VKT)
	NO_X
HCV Diesel Truck, > 6000 cc	9.30

(Source: "Emission Factor development for Indian Vehicles" carried out by ARAI, Pune (an autonomous body affiliated to the Ministry of Heavy Industries, Government of India) and sponsored by MoEF&CC, New Delhi and CPCB)

Estimation of dust (PM_{10} and $PM_{2.5}$) generation

The following activities have been considered in estimating the emissions:



1. Formulas for calculating the additional dust (PM_{10}) for OC Mines (with control):

Source Identification	Activities	Calculation Formula based on Emission Factors of CMPDI / USEPA
OCP	Top Soil Removal	Quality of top soil removed per day in tonne x E.F. x control factor
	OB Removal	
	Drilling	No. of holes per day x E.F. x control factor
	Blasting	0.18 x E.F. for TSP
	Dumper OB loading by Shovel	Quantity of OB generated per day x E.F.
	OB Transportation	VKT per day x E.F.
	Coal Extraction	
	Drilling	No. of holes per day x E.F. x control factor
	Blasting	0.18 x E.F. for TSP
	Loading of coal for transportation to depot	Quantity of coal produced per day x E.F.
	Transportation of coal to depot	VKT per day x E.F.
	Unloading of coal at depot	Quantity of coal produced per day x E.F.
	Crushing of coal at depot	Quantity of coal produced per day x E.F.
	Loading of coal for transportation to Rly siding	Quantity of coal produced per day x E.F.
	Dozing of coal	0.29*E.F. for TSP
	Wind Erosion in active dumps	Area amenable to wind erosion x E.F x control factor x time in hours (excluding contribution of calm period)
Incremental Emission Rate for OCP ($g/m^2/sec$) = Dust produced (in gm)/Area of the Source (in m^2) * Time (sec)		

Source Identification	Activities	Calculation Formula based on Emission Factors of CMPDI / USEPA
External OB Dump	Unloading of OB at Dump	Quantity of OB generated per day x E.F.
	Wind Erosion in active dumps	Area amenable to wind erosion x E.F x control factor x time in hours (excluding contribution of calm period)
	Dozing of OB	0.29*E.F. for TSP
Incremental Emission factor for External Dump (g/m^2/sec) = Dust produced (in gm)/Area of external dump (in m^2)* Time (sec)		
OB Transport by Haul Road to Dump	OB transportation by road from mine pit to external Dump site	VKT per day x E.F.
Incremental Emission Rate for Haul Road transportation (g/sec) = Dust produced (in gm)/ Time (sec)		
Coal Transport Road (Paved)	Coal transportation by road from CHP/depot to Railway Siding	VKT per day x E.F. (for loaded truck) + VKT per day x E.F. (for empty truck)
Incremental Emission Rate for Road transportation (g/sec) = Dust produced (in gm)/ Time (sec)		
Railway Siding	Truck unloading of Coal at railway siding	Quantity of coal produced per day x E.F.
	Wagon loading of coal at railway siding	Quantity of coal produced per day x E.F.
	Wind erosion	Area amenable to wind erosion x E.F x control factor x time in hours (excluding contribution of calm period)
Incremental Emission Rate for Railway Siding (g/m^2/sec) = Dust produced (in gm)/Area of the railway siding (in m^2) * Time (sec)		

2. Formulas for calculating the additional dust (PM_{10}) for UG Mines (with control):

Source Identification	Activities	Calculation Formula based on Emission Factors of CMPDI / USEPA
Mine Pit	Unloading of Coal	Quantity of coal generated per day x E.F.
	Loading of Coal	Quantity of coal generated per day x E.F.
Incremental Emission factor for Mine Pit (g/m^2/sec) = Dust produced (in gm)/Area of Pit (in m^2) * Time (sec)		
Coal Transport Road (Paved)	Coal transportation by road from CHP/depot to Railway Siding	VKT per day x E.F. (for loaded truck) + VKT per day x E.F. (for empty truck)
Incremental Emission Rate for Road transportation (g/sec) = Dust produced (in gm)/ Time (sec)		
Railway Siding	Truck unloading of Coal at railway siding	Quantity of coal produced per day x E.F.
	Wagon loading of coal at railway siding	Quantity of coal produced per day x E.F.
	Wind erosion	Area amenable to wind erosion x E.F x control factor x time in hours (excluding contribution of calm period)
Incremental Emission Rate for Railway Siding (g/m^2/sec) = Dust produced (in gm)/Area of the railway siding (in m^2) * Time (sec)		

3. Formulas for calculating the additional dust ($PM_{2.5}$) for OC Mines (with control):

Source Identification	Activities	Calculation Formula based on Emission Factors of CMPDI / USEPA
OCP	Top Soil Removal	Quality of top soil removed per day in tonne x E.F. x control factor
	OB Removal	
	Drilling	No. of holes per day x E.F. x control factor

Source Identification	Activities	Calculation Formula based on Emission Factors of CMPDI / USEPA
	Blasting	0.03 x E.F. for TSP
	Dumper OB loading by Shovel	Quantity of OB generated per day x E.F.
	OB Transportation	VKT per day x E.F.
	Coal Extraction	
	Drilling	No. of holes per day x E.F. x control factor
	Blasting	0.03 x E.F. for TSP
	Loading of coal for transportation to depot	Quantity of coal produced per day x E.F.
	Transportation of coal to depot	VKT per day x E.F.
	Unloading of coal at depot	Quantity of coal produced per day x E.F.
	Crushing of coal at depot	Quantity of coal produced per day x E.F.
	Loading of coal for transportation to Rly siding	Quantity of coal produced per day x E.F.
	Dozing of coal	0.11*E.F. for TSP
	Wind Erosion in active dumps	Area amenable to wind erosion x E.F x control factor x time in hours (excluding contribution of calm period)
Incremental Emission Rate for OCP = Dust produced (in gm)/Area of the Source (in m^2)* Time (sec)		
External OB Dump	Unloading of OB at Dump	Quantity of OB generated per day x E.F.
	Wind Erosion in active dumps	Area amenable to wind erosion x E.F x control factor x time in hours (excluding contribution of calm period)
	Dozing of OB	0.11*E.F. for TSP
Incremental Emission factor for External Dump (g/m^2/sec) = Dust produced (in gm)/Area of the Source (in m^2)* Time (sec)		
OB Transport by Haul Road to Dump	OB transportation by road from mine pit to external Dump site	VKT per day x E.F.
Incremental Emission Rate for Haul Road transportation (g/sec) = Dust produced (in gm)/ Time (sec)		
Coal Transport Road (Paved)	Coal transportation by road from CHP/depot to Railway Siding	VKT per day x E.F. (for loaded truck) + VKT per day x E.F. (for empty truck)
Incremental Emission Rate for Road transportation (g/sec) = Dust produced (in gm)/ Time (sec)		
Railway Siding	Truck unloading of Coal at railway siding	Quantity of coal produced per day x E.F.
	Wagon loading of coal at railway siding	Quantity of coal produced per day x E.F.
	Wind erosion	Area amenable to wind erosion x E.F x control factor x time in hours (excluding contribution of calm period)
Incremental Emission Rate for Railway Siding (g/m^2/sec) = Dust produced (in gm)/Area of the railway siding (in m^2) *Time (sec)		

4. Formulas for calculating the additional dust ($PM_{2.5}$) for UG Mines (with control):

Source Identification	Activities	Calculation Formula based on Emission Factors of CMPDI / USEPA
Mine Pit	Unloading of Coal at pit	Quantity of Coal generated per day x E.F.
	Loading of Coal at pit	Quantity of Coal generated per day x E.F.
Incremental Emission factor for Mine Pit (g/m^2/sec) = Dust produced (in gm)/Area of the Pit (in m^2) * Time (sec)		

Source Identification	Activities	Calculation Formula based on Emission Factors of CMPDI / USEPA
OB Transport by Haul Road to Dump	OB transportation by road from mine pit to external Dump site	VKT per day x E.F.
Incremental Emission Rate for Haul Road transportation (g/sec) = Dust produced (in gm)/ Time (sec)		
Coal Transport Road (Paved)	Coal transportation by road from CHP/depot to Railway Siding	VKT per day x E.F. (for loaded truck) + VKT per day x E.F. (for empty truck)
Incremental Emission Rate for Road transportation (g/sec) = Dust produced (in gm)/ Time (sec)		
Railway Siding	Truck unloading of Coal at railway siding	Quantity of coal produced per day x E.F.
	Wagon loading of coal at railway siding	Quantity of coal produced per day x E.F.
	Wind erosion	Area amenable to wind erosion x E.F x control factor x time in hours (excluding contribution of calm period)
Incremental Emission Rate for Railway Siding (g/m^2/sec) = Dust produced (in gm)/Area of the railway siding (in m^2)*Time (sec)		

Output of the Model for PM_{10}

```
* AERMOD (22112): D:\Office Work\EAC Reply
01.02.2023\CLUSTER12PM10\CLUSTER12PM10.isc      02/11/23
* AERMET (16216):
10:24:57
* MODELING OPTIONS USED:   NonDFAULT CONC DEPOS FLAT and ELEV DRYDPLT
WETDPLT  URBAN  ADJ_U*
*         PLOT FILE OF HIGH   1ST HIGH 24-HR VALUES FOR SOURCE GROUP:
ALL
*         FOR A TOTAL OF    47 RECEPTORS.
*         FORMAT:
(4(1X,F13.5),3(1X,F8.2),3X,A5,2X,A8,2X,A5,5X,A8,2X,I8)
*        X             Y      AVERAGE CONC    TOTAL DEPO    ZELEV
ZHILL    ZFLAG    AVE     GRP       RANK     NET ID   DATE(CONC)
* ____________  ____________  ____________  ____________   _______
_______  _______ _______ ________  ________  ________ ________
  507820.90000 2599299.97000       0.88865       0.00028    99.10
99.10     0.00   24-HR  ALL         1ST     UCART1    21102124
  517904.76000 2599299.97000       0.79944       0.00112    86.50
86.50     0.00   24-HR  ALL         1ST     UCART1    21110924
  527988.62000 2599299.97000       0.67441       0.00378    71.40
71.40     0.00   24-HR  ALL         1ST     UCART1    21100924
  538072.48000 2599299.97000       1.40064       0.00131    76.00
76.00     0.00   24-HR  ALL         1ST     UCART1    21100624
  548156.34000 2599299.97000       1.65671       0.00181    66.00
66.00     0.00   24-HR  ALL         1ST     UCART1    21100624
  507820.90000 2609378.90000       5.03916       0.00156    74.00
74.00     0.00   24-HR  ALL         1ST     UCART1    21101124
  517904.76000 2609378.90000       1.33999       0.00198    78.70
78.70     0.00   24-HR  ALL         1ST     UCART1    21122024
  527988.62000 2609378.90000       2.20037       0.00718   101.40
101.40     0.00   24-HR  ALL         1ST     UCART1    21100824
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  538072.48000 2609378.90000      3.92291      0.00518    76.30
76.30     0.00   24-HR  ALL        1ST     UCART1    21100624
  548156.34000 2609378.90000      1.17434      0.00210    55.80
55.80     0.00   24-HR  ALL        1ST     UCART1    21101424
  507820.90000 2619457.83000      3.08468      0.00085   126.50
126.50    0.00   24-HR  ALL        1ST     UCART1    21110424
  517904.76000 2619457.83000     12.01771      0.00691   120.40
120.40    0.00   24-HR  ALL        1ST     UCART1    21101124
  527988.62000 2619457.83000     12.88698      0.02252    78.50
78.50     0.00   24-HR  ALL        1ST     UCART1    21100824
  538072.48000 2619457.83000      2.02074      0.00409    76.00
76.00     0.00   24-HR  ALL        1ST     UCART1    21100824
  548156.34000 2619457.83000      0.45213      0.00059    62.50
62.50     0.00   24-HR  ALL        1ST     UCART1    21101024
  507820.90000 2629536.76000      1.11127      0.00053   117.80
117.80    0.00   24-HR  ALL        1ST     UCART1    21120224
  517904.76000 2629536.76000      1.03796      0.00199    93.00
93.00     0.00   24-HR  ALL        1ST     UCART1    21111024
  527988.62000 2629536.76000      0.33617      0.00277    80.50
80.50     0.00   24-HR  ALL        1ST     UCART1    21101724
  538072.48000 2629536.76000      0.09793      0.00041    77.40
77.40     0.00   24-HR  ALL        1ST     UCART1    21102424
  548156.34000 2629536.76000      0.02234      0.00003    69.20
69.20     0.00   24-HR  ALL        1ST     UCART1    21112524
  507820.90000 2639615.69000      0.52094      0.00080   142.80
142.80    0.00   24-HR  ALL        1ST     UCART1    21111024
  517904.76000 2639615.69000      0.50764      0.00082   113.70
113.70    0.00   24-HR  ALL        1ST     UCART1    21112924
  527988.62000 2639615.69000      0.15098      0.00096   101.00
101.00    0.00   24-HR  ALL        1ST     UCART1    21101724
  538072.48000 2639615.69000      0.01822      0.00010    96.20
96.20     0.00   24-HR  ALL        1ST     UCART1    21112524
  548156.34000 2639615.69000      0.11990      0.00030    67.90
67.90     0.00   24-HR  ALL        1ST     UCART1    21102424
  526813.40000 2617348.37000     15.22121      0.02591    98.00
98.00     0.00   24-HR  ALL        1ST               21100624
  531137.62000 2621309.15000      2.29679      0.00809    82.04
82.04     0.00   24-HR  ALL        1ST               21100824
  522168.93000 2617748.12000     13.41719      0.02673   109.01
112.00    0.00   24-HR  ALL        1ST               21101124
  523562.67000 2615404.76000      7.31763      0.01334   115.93
115.93    0.00   24-HR  ALL        1ST               21101124
  532411.29000 2618083.37000      4.74779      0.01213    83.58
83.58     0.00   24-HR  ALL        1ST               21100824
  527704.58000 2626828.07000      0.70616      0.00556    83.06
83.06     0.00   24-HR  ALL        1ST               21100124
  535122.88000 2624180.78000      0.50145      0.00140    75.26
75.26     0.00   24-HR  ALL        1ST               21121924
  527109.09000 2622901.89000     12.69862      0.03368    98.70
98.70     0.00   24-HR  ALL        1ST               21110924
  532282.34000 2620920.27000      2.83016      0.00638    79.48
79.48     0.00   24-HR  ALL        1ST               21101124
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  527783.56000 2624091.36000       2.50243       0.02030    91.27
91.27     0.00   24-HR  ALL         1ST              21100624
  535424.39000 2621626.66000       4.12472       0.00576    81.82
81.82     0.00   24-HR  ALL         1ST              21101324
  525161.24000 2616600.29000       9.23909       0.02030   102.60
102.60     0.00   24-HR  ALL         1ST              21101224
  523766.00000 2623746.00000      11.77296       0.00950   105.31
105.31     0.00   24-HR  ALL         1ST              21112524
  528079.00000 2612756.00000       4.78309       0.00955   103.63
103.63     0.00   24-HR  ALL         1ST              21100824
  520819.00000 2620400.00000      25.47297       0.01826   112.51
112.51     0.00   24-HR  ALL         1ST              21110424
  517207.00000 2615092.00000      13.06400       0.00556    97.00
97.00     0.00   24-HR  ALL         1ST              21101124
  522203.00000 2611104.00000       2.39768       0.00958    92.61
95.00     0.00   24-HR  ALL         1ST              21110924
  521806.00000 2614226.00000       4.64142       0.01347    94.60
94.60     0.00   24-HR  ALL         1ST              21101124
  514995.00000 2621416.00000       4.60087       0.00198   126.50
126.50     0.00   24-HR  ALL         1ST              21112524
  534150.00000 2613208.00000       5.12035       0.01056    82.07
82.07     0.00   24-HR  ALL         1ST              21100624
  531532.00000 2622780.00000       1.24511       0.00193    81.73
81.73     0.00   24-HR  ALL         1ST              21101324
  530729.85000 2610943.92000       2.13949       0.00678   103.00
103.00     0.00   24-HR  ALL         1ST              21100824
** CONCUNIT ug/m^3
** DEPUNIT g/m^2
```

Output of the Model for $PM_{2.5}$

```
* AERMOD (22112 ): D:\Office Work\EAC Reply
01.02.2023\CLUSTER12PM10\CLUSTER12PM10.isc      02/11/23
* AERMET ( 16216):
10:56:44
* MODELING OPTIONS USED:   NonDFAULT  CONC  DEPOS  FLAT and  ELEV
DRYDPLT  WETDPLT  URBAN  ADJ_U*
*         PLOT FILE OF  HIGH   1ST HIGH 24-HR VALUES FOR SOURCE GROUP:
ALL
*         FOR A TOTAL OF    47 RECEPTORS.
*         FORMAT:
(4(1X,F13.5),3(1X,F8.2),3X,A5,2X,A8,2X,A5,5X,A8,2X,I8)
*        X             Y      AVERAGE CONC    TOTAL DEPO    ZELEV
ZHILL    ZFLAG    AVE     GRP       RANK     NET ID   DATE(CONC)
* ____________  ____________  ____________  ____________   ______
______  ______  ______  ________  ________  ________  ________
  507820.90000 2599299.97000       0.12744       0.00004    99.10
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  517904.76000 2599299.97000       0.11922       0.00016    86.50
86.50     0.00   24-HR  ALL         1ST     UCART1    21110924
  527988.62000 2599299.97000       0.08666       0.00045    71.40
71.40     0.00   24-HR  ALL         1ST     UCART1    21100924
```

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  538072.48000 2599299.97000       0.16997       0.00013    76.00
76.00     0.00   24-HR  ALL          1ST     UCART1    21100624
  548156.34000 2599299.97000       0.22081       0.00022    66.00
66.00     0.00   24-HR  ALL          1ST     UCART1    21100624
  507820.90000 2609378.90000       0.62868       0.00019    74.00
74.00     0.00   24-HR  ALL          1ST     UCART1    21101124
  517904.76000 2609378.90000       0.19701       0.00012    78.70
78.70     0.00   24-HR  ALL          1ST     UCART1    21122024
  527988.62000 2609378.90000       0.28588       0.00087   101.40
101.40     0.00   24-HR  ALL          1ST     UCART1    21100824
  538072.48000 2609378.90000       0.52350       0.00062    76.30
76.30     0.00   24-HR  ALL          1ST     UCART1    21100624
  548156.34000 2609378.90000       0.15914       0.00025    55.80
55.80     0.00   24-HR  ALL          1ST     UCART1    21101424
  507820.90000 2619457.83000       0.36305       0.00010   126.50
126.50     0.00   24-HR  ALL          1ST     UCART1    21110424
  517904.76000 2619457.83000       1.24925       0.00066   120.40
120.40     0.00   24-HR  ALL          1ST     UCART1    21101124
  527988.62000 2619457.83000       1.81116       0.00309    78.50
78.50     0.00   24-HR  ALL          1ST     UCART1    21100824
  538072.48000 2619457.83000       0.21394       0.00035    76.00
76.00     0.00   24-HR  ALL          1ST     UCART1    21100824
  548156.34000 2619457.83000       0.05903       0.00006    62.50
62.50     0.00   24-HR  ALL          1ST     UCART1    21101024
  507820.90000 2629536.76000       0.15411       0.00005   117.80
117.80     0.00   24-HR  ALL          1ST     UCART1    21120224
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93.00     0.00   24-HR  ALL          1ST     UCART1    21111024
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80.50     0.00   24-HR  ALL          1ST     UCART1    21101724
  538072.48000 2629536.76000       0.01278       0.00005    77.40
77.40     0.00   24-HR  ALL          1ST     UCART1    21102424
  548156.34000 2629536.76000       0.00023       0.00000    69.20
69.20     0.00   24-HR  ALL          1ST     UCART1    21102424
  507820.90000 2639615.69000       0.06898       0.00011   142.80
142.80     0.00   24-HR  ALL          1ST     UCART1    21111024
  517904.76000 2639615.69000       0.07444       0.00010   113.70
113.70     0.00   24-HR  ALL          1ST     UCART1    21112924
  527988.62000 2639615.69000       0.01665       0.00010   101.00
101.00     0.00   24-HR  ALL          1ST     UCART1    21101724
  538072.48000 2639615.69000       0.00017       0.00000    96.20
96.20     0.00   24-HR  ALL          1ST     UCART1    21101924
  548156.34000 2639615.69000       0.01643       0.00004    67.90
67.90     0.00   24-HR  ALL          1ST     UCART1    21102424
  526813.40000 2617348.37000       2.15629       0.00343    98.00
98.00     0.00   24-HR  ALL          1ST               21100624
  531137.62000 2621309.15000       0.30111       0.00095    82.04
82.04     0.00   24-HR  ALL          1ST               21100824
  522168.93000 2617748.12000       1.98970       0.00200   109.01
112.00     0.00   24-HR  ALL          1ST               21101124
  523562.67000 2615404.76000       0.87420       0.00193   115.93
115.93     0.00   24-HR  ALL          1ST               21101124
```

```
  532411.29000 2618083.37000       0.53532       0.00134    83.58
83.58     0.00   24-HR  ALL         1ST                 21100824
  527704.58000 2626828.07000       0.07103       0.00064    83.06
83.06     0.00   24-HR  ALL         1ST                 21101724
  535122.88000 2624180.78000       0.07092       0.00012    75.26
75.26     0.00   24-HR  ALL         1ST                 21112924
  527109.09000 2622901.89000       0.27212       0.00071    98.70
98.70     0.00   24-HR  ALL         1ST                 21101124
  532282.34000 2620920.27000       0.29253       0.00075    79.48
79.48     0.00   24-HR  ALL         1ST                 21101124
  527783.56000 2624091.36000       0.14807       0.00165    91.27
91.27     0.00   24-HR  ALL         1ST                 21100124
  535424.39000 2621626.66000       0.27487       0.00119    81.82
81.82     0.00   24-HR  ALL         1ST                 21101224
  525161.24000 2616600.29000       1.07599       0.00279   102.60
102.60     0.00   24-HR  ALL         1ST                 21101224
  523766.00000 2623746.00000       1.71215       0.00093   105.31
105.31     0.00   24-HR  ALL         1ST                 21112524
  528079.00000 2612756.00000       0.55748       0.00122   103.63
103.63     0.00   24-HR  ALL         1ST                 21100824
  520819.00000 2620400.00000       2.17570       0.00128   112.51
112.51     0.00   24-HR  ALL         1ST                 21101124
  517207.00000 2615092.00000       1.83593       0.00078    97.00
97.00     0.00   24-HR  ALL         1ST                 21101124
  522203.00000 2611104.00000       0.35685       0.00095    92.61
95.00     0.00   24-HR  ALL         1ST                 21110924
  521806.00000 2614226.00000       0.56076       0.00073    94.60
94.60     0.00   24-HR  ALL         1ST                 21101124
  514995.00000 2621416.00000       0.45114       0.00019   126.50
126.50     0.00   24-HR  ALL         1ST                 21112524
  534150.00000 2613208.00000       0.92658       0.00120    82.07
82.07     0.00   24-HR  ALL         1ST                 21100624
  531532.00000 2622780.00000       0.16499       0.00013    81.73
81.73     0.00   24-HR  ALL         1ST                 21101324
  531712.00000 2612347.00000       0.69412       0.00137    94.50
94.50     0.00   24-HR  ALL         1ST                 21100624
** CONCUNIT ug/m^3
** DEPUNIT g/m^2
```

Contribution of PM_{10} and $PM_{2.5}$ from different activities

a. Incremental concentration levels of PM_{10} have been predicted at 10 nos. of baseline stations where baseline data were generated during the month of Dec'21 and 12 nos. of Routine Environment Monitoring Station. The results of the predicted concentration levels (with control) are given below:

(Figures in $\mu g/m^3$)

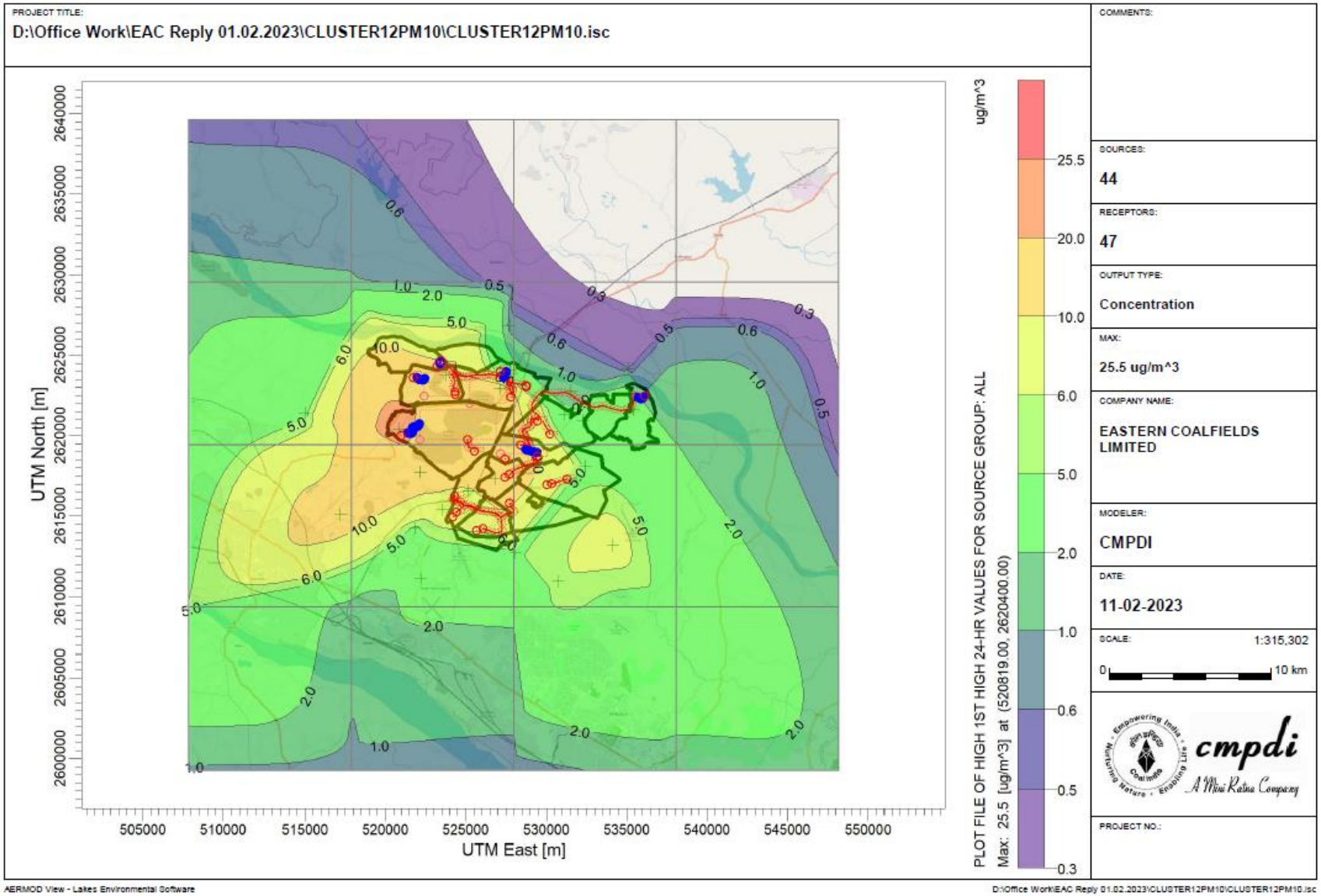
Sl. No.	Name of the Receptor	Location	Type	Arial Distance & Direction wrt Project Boundary	Baseline Concentration of PM_{10} (98^{th} percentile)	Incremental PM_{10} Concentration	Resultant PM_{10} Concentration	Standards (GSR 742 (E) dated 25.09.2000)
Core Zone								
1	Agent Office, Khottadih Colliery	Core Zone	Industrial	Within Project Boundary	244.40	11.77	253.76	300
2	CISF Camp, Sonepur Bazari OCP			Within Project Boundary	202.80	25.47	228.26	
Buffer Zone								
3	Manager's Office, Jambad UG	Buffer Zone	Industrial	7.20 km in WSW direction (Downwind)	253.90	13.06	266.96	300
4	Manager's Office, Moira UG			3.50 km in SSW direction (Downwind)	272.10	2.39	274.49	
5	Khandra Workshop			2.00 km in SSW direction (Downwind)	254.80	4.64	259.44	
6	Kumardihi A Colliery Store Office			Within Project Boundary	254.30	15.22	269.52	
7	GM Office, Kenda Area			0.80 km in SSW direction (Downwind)	256.20	13.41	269.61	
8	Khandra Bisheshwari Pit			0.50 km in SSW direction (Downwind)	259.90	7.31	267.21	
9	Office of Jhanjra Incline			Within Project Boundary	176.00	4.74	180.74	
10	Dalurband Colliery Office			Within Project Boundary	240.00	12.69	252.69	
11	Manderboni Colliery Office near Railway			Within Project Boundary	235.20	2.83	238.03	

Sl. No.	Name of the Receptor	Location	Type	Arial Distance & Direction wrt Project Boundary	Baseline Concentration of PM_{10} (98^{th} percentile)	Incremental PM_{10} Concentration	Resultant PM_{10} Concentration	Standards (GSR 742 (E) dated 25.09.2000)
	Siding							
12	Pandaveswar Pit Office near Railway Siding			Within Project Boundary	250.30	2.50	252.80	
13	Madhaipur Colliery Office near Railway Siding			Within Project Boundary	196.40	4.12	200.52	
14	Bankola Workshop near Railway Siding			Within Project Boundary	213.80	9.23	223.03	
15	Chinchuria Village		Residential	2.50 km in WNW direction (Crosswind)	92.70	4.60	97.30	100
16	Balijuri Community Hall			3.60 km in ESE direction (Crosswind)	94.60	5.12	99.72	
17	Konda Hospital			1.00 km in NE direction (Upwind)	78.70	1.24	79.94	
18	Danya Village			Within Project Boundary	76.90	2.29	79.19	
19	Chapla Village			1.70 km in ENE direction (Upwind)	88.70	0.50	89.20	
20	Durga Mandir, Churor Village			2.10 km in NNE direction (Upwind)	91.40	0.70	92.10	
21	Agent's Bunglow, Shyamsundarpur UG			0.80 km in SSE direction (Downwind)	94.30	4.78	99.08	
22	Tilaboni Filter Plant			1.50 km in SE direction (Downwind)	97.70	2.13	99.83	

Observations

From the above table it can be seen that the resultant concentration values of PM_{10} at different stations are within the limit as per NAAQS, 2009 and GSR 742 (E) dated 25.09.2000.

Existing and proposed additional mitigation measures will be adopted to keep the concentration level within the limit.



INCREMENTAL ISOPLETH FOR PM_{10} CONCENTRATION

b. Incremental concentration levels of $PM_{2.5}$ have been predicted at 10 nos. of baseline stations where baseline data were generated during the month of Dec'21 and 12 nos. of Routine Environment Monitoring Station. The results of the predicted concentration levels (with control) are given below:

(Figures in µg/m^3)

Sl. No.	Name of the Receptor	Location	Type	Arial Distance & Direction wrt Project Boundary	Baseline Concentration of $PM_{2.5}$ (98^{th} percentile)	Incremental $PM_{2.5}$ Concentration	Resultant $PM_{2.5}$ Concentration	Standards (GSR 742 (E) dated 25.09.2000)*
Core Zone								
1	Agent Office, Khottadih Colliery	Core Zone	Industrial	Within Project Boundary	77.40	1.71	79.11	No limit defined in GSR 742 (E) dated 25.09.2000.
2	CISF Camp, Sonepur Bazari OCP			Within Project Boundary	88.30	2.17	90.47	
Buffer Zone								
3	Manager's Office, Jambad UG	Buffer Zone	Industrial	7.20 km in WSW direction (Downwind)	36.70	1.83	38.53	
4	Manager's Office, Moira UG			3.50 km in SSW direction (Downwind)	75.40	0.35	75.75	
5	Khandra Workshop			2.00 km in SSW direction (Downwind)	85.90	0.56	86.46	
6	Kumardihi A Colliery Store Office			Within Project Boundary	78.50	2.16	80.66	
7	GM Office, Kenda Area			0.80 km in SSW direction (Downwind)	73.60	1.99	75.59	
8	Khandra Bisheshwari Pit			0.50 km in SSW direction (Downwind)	59.80	0.87	60.67	
9	Office of Jhanjra Incline			Within Project Boundary	52.60	0.53	53.13	
10	Dalurband Colliery Office			Within Project Boundary	65.40	0.27	65.67	
11	Manderboni Colliery Office near Railway Siding			Within Project Boundary	53.40	0.29	53.69	
12	Pandaveswar Pit Office near Railway Siding			Within Project Boundary	67.00	0.14	67.14	

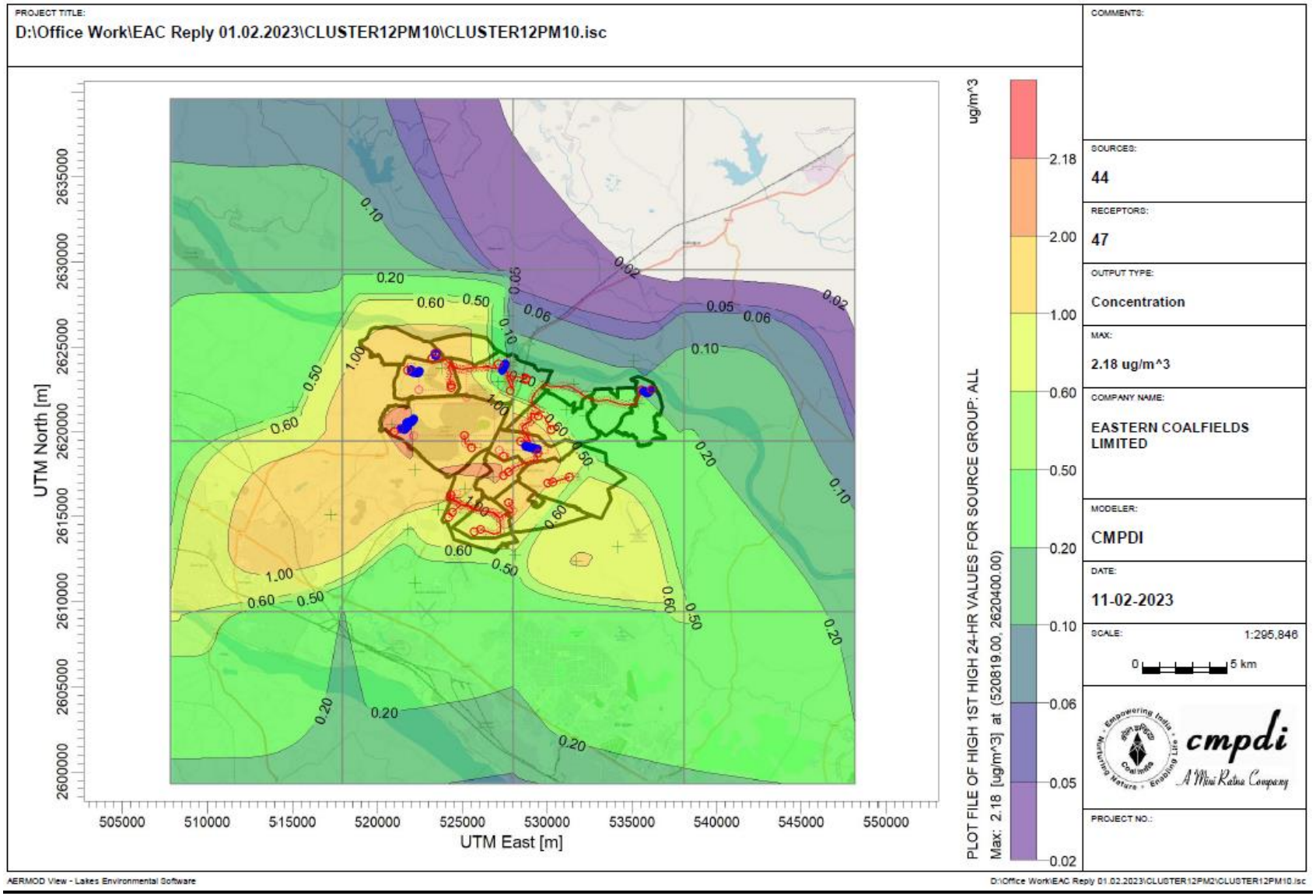
Sl. No.	Name of the Receptor	Location	Type	Arial Distance & Direction wrt Project Boundary	Baseline Concentration of $PM_{2.5}$ (98^{th} percentile)	Incremental $PM_{2.5}$ Concentration	Resultant $PM_{2.5}$ Concentration	Standards (GSR 742 (E) dated 25.09.2000)*
13	Madhaipur Colliery Office near Railway Siding			Within Project Boundary	57.00	0.27	57.27	
14	Bankola Workshop near Railway Siding			Within Project Boundary	68.90	1.07	69.97	
15	Chinchuria Village		Residential	2.50 km in WNW direction (Crosswind)	49.40	0.45	49.85	60
16	Balijuri Community Hall			3.60 km in ESE direction (Crosswind)	53.00	0.92	53.92	
17	Konda Hospital			1.00 km in NE direction (Upwind)	22.50	0.16	22.66	
18	Danya Village			Within Project Boundary	50.20	0.30	50.50	
19	Chapla Village			1.70 km in ENE direction (Upwind)	34.60	0.07	34.67	
20	Durga Mandir, Churor Village			2.10 km in NNE direction (Upwind)	32.80	0.07	32.87	
21	Agent's Bunglow, Shyamsundarpur UG			0.80 km in SSE direction (Downwind)	24.40	0.55	24.95	
22	Tilaboni Filter Plant			1.50 km in SE direction (Downwind)	44.10	0.69	44.79	

*As per OM no. 22-34/2018-IA.III dated 09.08.2018 of MoEF&CC, GSR 742 (E) dated 25.09.2000 is applicable for UG & OC coal mining projects

Observations

From the above table it can be seen that the resultant concentration values of $PM_{2.5}$ at different stations are within the limit as per NAAQS, 2009. No limit defined in GSR 742 (E) dated 25.09.2000 for $PM_{2.5}$ concentration level.

Existing and proposed additional mitigation measures will be adopted to keep the concentration level within the limit.



INCREMENTAL ISOPLETH FOR $PM_{2.5}$ CONCENTRATION

Air Pollution Control Measures

Appropriate mitigation measures are being taken to contain the concentration levels within prescribed limit. These measures (both preventive and suppressive) are enumerated below:

Source Category	Present Mitigation Measures	Additional Mitigation Measures
Drilling Operation	All the drills are equipped with well-designed dust extractor arrangement. Wet drilling is being carried out.	More thrust will be put on their proper maintenance and handling. Use of fabric filters during drilling will be promoted to further reduce the pollution load.
Blasting Operation	Appropriate design of the geometry of blast holes. Use of proper amount of explosive taking into consideration the geo-mechanical conditions of the site. Delayed blasting with shock tube initiation. Controlled blasting is usually done in daytime (12.00 noon to 2.00 PM) during the shift change over period. The operation is in conformity to the extant laws with closer control of blasting parameters including results of blasting like desired fragmentation, permitted vibration, etc. Regular field studies are being conducted. Coal is produced using surface miner in Sonepur-Bazari OCP which is an eco-friendly operation without drilling and blasting.	Same practice will be followed in future.
Loading and Transport	Surfacing of all service roads/permanent roads by asphalt. The length of haul road has been reduced to the minimum possible. The unmetalled roads are kept free of ruts, potholes, etc. Industrial road sweepers for periodic cleaning of loose materials lying on the roads. Regular maintenance of HEMM engines to limit emission of harmful exhaust fumes. Provision of gas filter for exhaust fumes from HEMM. Frequent and at regular intervals, water is being sprayed on haul roads, service roads by using mobile sprinklers. Water mixed with suitable binders available for the purpose is sprayed at the rate of 2 litres / sqm of road, twice a day. Physical removal of dust from the roads. Greenbelts around quarry, industrial sites, service building area besides avenue plantation along roads. Fixed type of water sprinklers has been installed to suppress dust.	Same practice will be followed in future. Frequency of sprinkling will be increased. 2 nos. of truck mounted (10-12 KL) mobile fog canons at an estimated cost of ₹ 80.00 Lakh will be introduced. 3 nos. of wall mounted mist sprayers at an estimated cost of ₹ 30.00 Lakh will be procured and installed at railway sidings.
Fires at coal faces	Exposure of coal benches for long time is avoided. Provision of adequate firefighting arrangements including storage of sufficient quantity of water at all critical points. Careful removal of all loose coal from the abandoned coal faces. Regular supervision.	Same practice will be followed in future.

Source Category	Present Mitigation Measures	Additional Mitigation Measures
Fires at coal stockyards	Limiting the amount of stock by giving close attention to marketing besides following the "first-in and first-out" sequence. Attention to the following while stacking of coal: Proper dimensions of stack (height to be limited to not more than 8 m). Dozing/compaction to make the stock semi-consolidated. Regular and strict supervision of stacks. Provision of firefighting arrangement with supply of adequate quantity of water at sufficient pressure	Same practice will be followed in future.
Fires at workshops and stores	Proper ventilation system in dumper and dozer repair shop and stores.	Same practice will be followed in future.