A REPORT ON

Ambient Air Quality, Water/ Waste Water Quality

&

Ambient Noise Level

At

NORTH EASTERN COALFIELDS

COAL INDIA LTD.

MARGHERITA

SUMMER SEASON

(April 2012 - June 2012)

Submitted To:

North-Eastern Coalfields
Coal India Limited
Margherita
Assam

Submitted By:

ENVIROCON
Digboi Stores Building
New Market
Digboi, Assam

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BACKGROUND

Coal is the primary source of energy and is the most abundant fossil fuel resource in our country. The Nation's endeavour has been only partly successful in locating and exploiting coal in the North Eastern region and much is yet to be done. Assam, one of the major states of this region, possesses a moderate reserve of coal. **The North Eastern Coal Fields**, a division of the Public Sector giant **COAL INDIA LTD.** having it's headquarter at Guwahati is looking after the coal mining activities in the North Eastern Region. The North Eastern Coal Fields office at Margherita in the upper Assam district of Tinsukia, specifically looks after the coal mining activities in the state of Assam.

Coalmines of Assam, known to have the worst natural conditions of all the coalmines of India, have had a long and varied history of operation. Although coal was discovered in the northeastern region more than 250 years ago, systematic mining of coal was started only in 1888 by the erstwhile AR & T Co. (Assam Railways and Trading Company). Mining was first -started at Makum coalfields near Margherita. In the following years many new collieries were started in the nearby areas. Production, which was around 2 lakh tonnes at the beginning of this century, increased to 12.10 lakh tonnes during 1993-94.

Coal like any other mineral, lies in the earth's body and extraction of coal by mining, is carried out in either of the two ways – Opencast mining or Under-ground mining. Among the collieries of the North Eastern Coalfields under Margherita, "Tikak" and "Tirap" mines use opencast mining method and in the rest underground mining system is used. Recently, two more OCPs namely "Ledo" & "Tikak Extension" have been developed to augment the production capacity.

Coal shares over 61.6% of total commercial primary energy sources in India (as estimated in 1991- 92) and hence coal is essential for development and progress of a nation. Development, Environment and Mining all have become complimentary to each other and none of them can be separated or ignored in the interest of the development of a particular country. Environmental problems, related to coal mining activities, start from extraction, continues during beneficiation, during transportation of the minerals to the users and during ultimate use. Process of coal mining, thus, is not the only one, which creates environmental problems. During the use of coal and other fossil fuels also, emissions of gases take place resulting in greenhouse effect and other related environmental problems. Coal mining operation though, particularly opencast mining always causes certain environmental degradation. The Environmental damages associated with coal mining are as follows:

a. <u>By Open Cast mining method</u>:

- ◊ Damages to the landscape and topography.
- ◊ Dumping of mine waste/ overburden in an unplanned manner.
- ◊ Loss of topsoil and greenery due to disruption of topography.
- ◊ Effect of rainfall in eroding and transporting topsoil/ OB material with consequent siltation in downstream of watercourses and water bodies.
- ◊ Potential health hazard due to storage of water in abandoned quarries.

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b. By Underground mining method:

◊ Loss of productive land and property due to subsidence and surface/ underground mine fires.
◊ Lowering of ground water bodies.
◊ Adverse effect on surface water through release of polluted effluents etc.
◊ Noise, vibration and occupational health problems etc.

Besides, release of solid and gaseous pollutants to the atmosphere disturbs the air to be breathed. All the above adverse effects of mining may cause environmental degradation and ecological imbalance through disturbances to atmosphere, hydrosphere, lithosphere and biosphere.

To protect and safeguard the environment against the resultant effects due to multiple activities, various stringent laws, rules and regulations at National and International levels have been framed and are being enforced by Environment Ministries, Pollution Control Boards and other similar organizations.

In order to curb the adverse effects of the abovementioned problems, the management of North Eastern Coalfields, has taken various measures for Pollution control and given a new thrust in the direction of environmental restoration to confine better mining scenario vis-à-vis environment. Suitable studies were initiated to generate data on existing status of the environment; a number of measures have been adopted to prevent degradation due to deforestation, soil erosion, water and air pollution etc., and at the same time provide concrete and exemplary works of land restoration to establish the credibility of the company's intention of environmental management.

As part of the Environmental Management program of NEC- Margherita and to keep an eye on the state of the environment at the collieries and their adjacent residential areas, periodic test for Ambient Air Quality is carried out at the collieries of *Tikak, Tirap, Tipong, Baragolai* and *Ledo* together with the *Central Hospital* in Margherita. Tests for Water quality is also being carried out for Effluent (raw and treated) and Drinking water available from different sources in and around the collieries. Noise level measurement is also conducted at some selected locations.

ENVIROCON, a Digboi based Environmental Consultancy firm, which is engaged in Environmental Data Generation, Pollution Monitoring, Environmental Study and other allied works, was assigned with this important job of regular Ambient Air Testing, Water analysis and Noise level measurement at selected locations of the different collieries of Coal India Ltd., NEC- Margherita.

SCOPE OF THE STUDY

The present study included the open cast mines i.e. *Tikak, Tirap* and *Ledo* and the underground mine of *Tipong* together with the *Margherita Central Hospital* and residential and commercial areas surrounding the mine areas, for Ambient Air Quality testing; all the mines and adjoining areas for Water/ Waste Water analysis, and some selected locations for noise level measurement.

OBJECTIVE OF THE STUDY

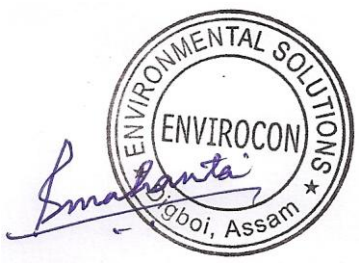
The major objectives of the study were,

- ◊ *To assess the ambient air quality at the selected mines (both open- cast & underground) and adjacent residential areas and also at the Central Hospital in Margherita.*

- ◊ *To assess the quality of effluent (raw and treated) and drinking water collected from different sources in and around the mine areas.*

- ◊ *To determine the noise levels at some selected locations near the mines and the residential areas.*

This report is prepared on the basis of available literature and on the data obtained by onsite monitoring through the Summer Season (April 2012 to June 2012) for the relevant environmental components and parameters.



METHODOLOGY

Ambient Air Quality testing was conducted for the following parameters-

- ◊ Respirable Particulate Matter (**RPM**)
- ◊ Suspended Particulate Matter (**SPM**)
- ◊ Sulfur Dioxide (**SO_2**)
- ◊ Nitrogen Dioxide (**NO_2**).

For collecting samples for the determination of RPM, SPM, SO_2 and NO_2, *'ENVIROTECH High Volume Respirable Dust Sampler, APM 460'* together with gaseous attachment *APM 411* was used. The instrument is capable of drawing air at a flow rate of 1 to 1.3 m^3/ min, with very little pressure drop. The APM 460 sampler uses an improved cyclone to separate the coarser particles (larger than 10 microns) from the air stream before filtering it on the 0.5 micron pore-size filter allowing a measurement of both TSPM (Total Suspended Particulate Matter) and the Respirable fraction of Suspended Particulate Matter. Glass micro-fibre filter papers (GFA sheets, Whatman or equivalent) were used for the collection of RPM. To determine the SO_2 component in ambient air, sample was collected by drawing air at a flow rate of 0.5 liters per minute (LPM) through an absorbing solution of *Sodium tetrachloromercurate*. For the NO_2 component, sample was collected by drawing air at a similar flow rate through another absorbing solution (*a mixture of Sodium hydroxide and Sodium arsenite*). While the measurements of RPM and SPM were done gravimetrically, measurements of both SO_2 and NO_2 were carried out colorimetrically. Samples for all the parameters were collected after every eight hours during the twenty-four hours of total sampling period at each of the sampling points. All the analysis was done as per standard methodology of **IS-5182.**

For analysis of water, the water samples collected from different sources were analysed as per relevant norms and standards.

For measurement of noise, an appropriate sound level meter was used to measure the sound pressure levels. In environmental noise measurement, the assessment of loudness is very important for its effects on people. This was achieved by the use of A-weighting filters in the noise measuring instrument which gives a direct reading of the approximate loudness. Moreover, A-weighted equivalent sound pressure levels (L_{eq}) were also computed from the hourly values of A-weighted sound levels. Noise measurement was carried out at some carefully selected locations covering industrial, commercial and residential areas to assess the baseline noise levels.

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ENVIRONMENTAL TEST RESULTS

AMBIENT AIR QUALITY

a) RPM Levels:

Date	Location	6 am - 2 pm (μg/m³)	2 pm - 10 pm (μg/m³)	10 pm - 6 am (μg/m³)	Daily Average (μg/m³)
07.06.2012	Tipong Colliery Coal Dump Area	48	44	37	43
07.06.2012	Tipong Colliery Residential Area	42	35	26	34
09.06.2012	Tirap Colliery Mine Area (1)	89	82	70	80
09.06.2012	Tirap Colliery mine Area (2)	53	62	39	51
11.06.2012	Tirap Colliery Residential Area	24	24	14	22
12.06.2012	Ledo OCP Area	49	43	36	43
12.06.2012	Ledo Colliery Coal Dump Area	55	48	41	48
13.06.2012	Ledo Bazaar Area	29	24	17	23
14.06.2012	Tikak Colliery Mine Area	53	43	24	40
14.06.2012	Tikak Colliery Coal Dump Area	52	47	31	43
15.06.2012	Tikak Colliery Residential Area	26	19	10	18
18.06.2012	Baragolai Residential Area	21	12	18	17
19.06.2012	Central Hospital, Margherita	25	19	11	18

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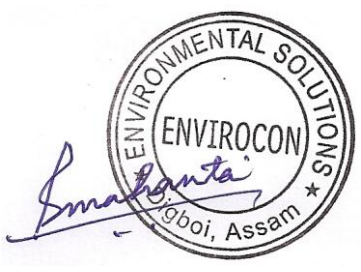
b) SPM Levels:

Date	Location	6 am - 2 pm (μg/m³)	2 pm - 10 pm (μg/m³)	10 pm - 6 am (μg/m³)	Daily Average (μg/m³)
07.06.2012	Tipong Colliery Coal dump Area	203	220	181	201
07.06.2012	Tipong Colliery Residential Area	143	162	119	141
09.06.2012	Tirap Colliery Mine Area (1)	343	328	294	322
09.06.2012	Tirap Colliery mine Area (2)	327	293	257	292
11.06.2012	Tirap Colliery Residential Area	183	155	121	159
12.06.2012	Ledo OCP Area	312	274	267	284
12.06.2012	Ledo Colliery Coal Dump Area	292	286	239	276
13.06.2012	Ledo Bazaar Area	205	168	129	171
14.06.2012	Tikak Colliery Mine Area	231	224	205	220
14.06.2012	Tikak Colliery Coal Dump Area	249	242	218	238
15.06.2012	Tikak Colliery Residential Area	127	108	98	111
18.06.2012	Baragolai Residential Area	108	94	83	94
19.06.2012	Central Hospital, Margherita	117	102	91	101

c) SO_2 Levels:

Date	Location	6 am - 2 pm (μg/m³)	2 pm - 10 pm (μg/m³)	10 pm - 6 am (μg/m³)	Daily Average (μg/m³)
07.06.2012	Tipong Colliery Coal Dump Area	17	20	11	16
07.06.2012	Tipong Colliery Residential Area	10	09	09	9
09.06.2012	Tirap Colliery Mine Area (1)	41	36	20	32
09.06.2012	Tirap Colliery Mine Area (2)	30	22	17	23
11.06.2012	Tirap Colliery Residential Area	ND	ND	ND	--
12.06.2012	Ledo OCP Area	23	19	14	19
12.06.2012	Ledo Colliery Coal Dump Area	26	29	18	24
13.06.2012	Ledo Bazaar Area	ND	ND	ND	--
14.06.2012	Tikak Colliery Mine Area	ND	ND	ND	--
14.06.2012	Tikak Colliery Coal Dump Area	22	19	12	18
15.06.2012	Tikak Colliery Residential Area	ND	ND	ND	--
18.06.2012	Baragolai Residential Area	ND	ND	ND	--
19.06.2012	Central Hospital, Margherita	ND	ND	ND	--

ND: Not Detected



d) NO_2 Levels:

Date	Location	6 am - 2 pm (μg/m³)	2 pm - 10 pm (μg/m³)	10 pm - 6 am (μg/m³)	Daily Average (μg/m³)
07.06.2012	Tipong Colliery Coal Dump Area	33	29	17	26
07.06.2012	Tipong Colliery Residential Area	18	17	10	15
09.06.2012	Tirap Colliery Mine Area (1)	66	57	43	55
09.06.2012	Tirap Colliery Mine Area (2)	58	49	36	48
11.06.2012	Tirap Colliery Residential Area	19	12	08	13
12.06.2012	Ledo OCP Area	60	46	28	45
12.06.2012	Ledo Colliery Coal Dump Area	49	38	25	37
13.06.2012	Ledo Bazaar Area	23	16	11	17
14.06.2012	Tikak Colliery Mine Area	36	30	17	28
14.06.2012	Tikak Colliery Coal Dump Area	44	37	27	36
15.06.2012	Tikak Colliery Residential Area	14	11	08	11
18.06.2012	Baragolai Residential Area	16	17	11	15
19.06.2012	Central Hospital, Margherita	23	18	12	18

REMARKS

Sampling for onsite Ambient Air Quality test was carried out from 07/06/2012 to 19/06/2012 at the abovementioned 13 nos. locations of NEC for the parameters of RPM, SPM, SO_2 & NO_2. From the test results it can be seen that the daily average levels of all the four parameters are within the prescribed limits of ambient air quality standards for existing mines.

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WATER/ WASTE WATER ANALYSIS

(For the Period 'April 2012 --- June 2012', for the Summer Season)

a) Effluent/Waste Water Analysis Results

[18 (Eighteen) nos. of Effluent/ Waste Water Samples were collected in the period between 04/06/201 and 21/06/2012, and analyzed for the following parameters].

Parameters & Units	**E 01**	**E 02**	**E 03**	**E 04**	**E 05**	**E 06**
pH	7.9	6.4	6.6	6.7	3.1	6.5
COD (mg/L)	107	124	83	65	278	72
Suspended Solids. (mg/L)	138	75	122	63	179	81
Oil & Grease. (mg/L)	4.3	2.0	2.3	ND	2.7	1.0
Nitrate Nitrogen (mg/L)	7.9	2.8	4.9	1.0	2.1	0.9

ND: Not Detected

E 01: Colony Effluent- *MARGHERITA*

E 02: Central Hospital effluent- *MARGHERITA*

E 03: Near temple by the side of NH - *BARAGOLAI*

E 04: Downstream of Namdang river- *BARAGOLAI*

E 05: Raw mine water- *TIKAK*

E 06: Treated water- *TIKAK*

Effluent Water Analysis Results (contd-1):

Parameters & Units	**E 07**	**E 08**	**E 09**	**E 10**	**E 11**	**E 12**
pH	5.6	2.9	6.6	6.7	6.5	2.6
COD (mg/L)	118	209	91	104	146	283
Suspended Solids. (mg/L)	181	137	69	163	194	185
Oil & Grease. (mg/L)	4.3	2.4	1.4	2.9	3.0	3.2
Nitrate Nitrogen (mg/L)	4.8	3.1	2.4	4.3	4.5	3.5

E 07: Nallah water surrounding coal dump outlet of Samukjan Nallah – *TIKAK*

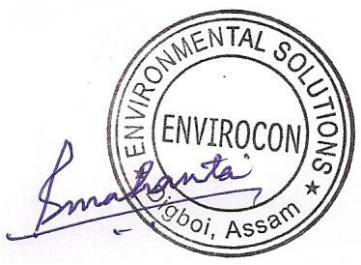
E 08: Raw mine water- *LEDO OCP*

E 09: Treated water – *LEDO OCP*

E 10: Upstream of Ledo Pani Nallah - *LEDO*

E 11: Downstream of Ledo Pani Nallah – *LEDO*

E 12: Raw mine water- *TIRAP*



Effluent Water Analysis Results (contd-2):

Parameters & Units	**E 13**	**E 14**	**E 15**	**E 16**	**E 17**	**E 18**
pH	6.8	6.3	2.6	6.3	6.8	6.6
COD (mg/L)	89	126	237	131	52	68
Suspended Solids. (mg/L)	70	109	169	88	76	83
Oil & Grease. (mg/L)	1.1	1.0	2.8	1.2	ND	ND
Nitrate Nitrogen (mg/L)	2.5	1.8	5.2	3.4	1.1	1.6

ND: Not Detected

E 13: Treated water - *TIRAP*

E 14: Ledo pani nallah water after meeting the diverted water from Tirap OCP (confluence) - *TIRAP*

E 15: Raw mine water – *TIPONG*

E 16: Treated water- *TIPONG*

E 17: Upstream of Tipong river - *TIPONG*

E 18: Downstream of Tipong river - *TIPONG*

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b) Drinking Water Analysis Results

[6 (Six) nos. of Drinking Water Samples were collected in the period between 04/06/2012 -- 21/06/2012, and analyzed for the following parameters]

Parameter and Unit	**DW 1**	**DW 2**	**DW 3**	**DW 4**	**DW 5**	**DW 6**
Appearance	C	C	C	C	C	C
Colour	CL	CL	CL	CL	CL	CL
Odour	OL	OL	OL	OL	OL	OL
pH	6.7	6.8	6.9	6.7	6.6	6.8
Turbidity (NTU)	0.85	0.93	1.07	0.86	1.04	0.94
Total Solids (mg/L)	142	155	172	141	166	158
Total Hardness as $CaCO_3$ (mg/L)	65	76	99	79	85	94
Carbonate Hardness as $CaCO_3$ (mg/L)	61	70	84	65	81	82
M-Alkalinity as $CaCO_3$ (mg/L)	44	59	72	53	65	51
P-Alkalinity as $CaCO_3$ (mg/L)	ND	ND	ND	ND	ND	ND
Total Chloride as Cl (mg/L)	7.52	6.47	9.00	11.45	9.44	12.76
Residual Chloride as Cl (mg/L)	ND	ND	ND	ND	ND	ND
Ammonical Nitrogen as NH_3 (mg/L)	0.08	0.12	0.10	0.09	0.21	0.18
Fluoride as F (mg/L)	ND	ND	ND	ND	ND	ND
Nitrate as NO_3 (mg/L)	0.31	0.17	0.52	0.26	0.42	0.35
Total Iron as Fe (mg/L)	0.14	0.09	0.15	0.11	0.13	0.08
Calcium as Ca (mg/L)	27	36	53	39	41	30
Copper as Cu (mg/L)	ND	ND	ND	ND	ND	ND
Arsenic as As (mg/L)	ND	ND	ND	ND	ND	ND
Lead as Pb (mg/L)	ND	ND	ND	ND	ND	ND
Phenolics as C_6,H_5OH (mg/L)	ND	ND	ND	ND	ND	ND
Faecal Coliform (as MPN/100 ml)	Nil	Nil	Nil	Nil	Nil	Nil

C – Clear **CL** - Colourless **OL** - Odourless

ND: Not Detected

DW 1: Drinking Water – *BARAGOLAI COLLIERY*

DW 2: Drinking Water – *TIKAK COLLIERY*

DW 3: Drinking Water – *TIRAP COLLIERY*

DW 4: Drinking Water of RODEGAON – *TIRAP COLLIERY*

DW 5: Drinking Water of SIPEGAON – *TIRAP COLLIERY*

DW 6: Drinking Water – *TIPONG COLLIERY*

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REMARKS

A total of Eighteen numbers of Waste water/ Effluent samples (raw and treated) collected from different locations, were analyzed as per IS- 2490. The raw mine water samples are mostly acidic in nature and require chemical treatment to bring the pH values to acceptable limits. The overall quality of the effluent samples is satisfactory.

All the Six Drinking Water samples conformed to the standards as per IS- 10500. Overall, the drinking water samples are soft in nature and parameter levels well within the prescribed limits.

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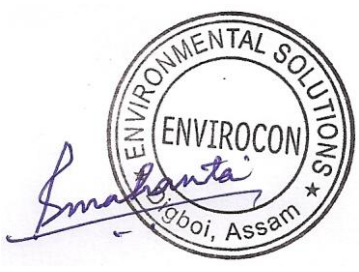

NOISE LEVEL MEASUREMENT

[Conducted between 07/06/2012 and 19/06/2012]

SL. NO.	LOCATION	dB (A) as L_{eq}	
		Day time	Night time
1	Central Hospital- Margherita	61	34
2	Tikak Weighbridge Area	59	33
3	Tikak Mine Area	55	32
4	Ledo OCP Mine Area	63	33
5	Tirap Mine Area	67	34
6	Tirap Residential Area	57	32
7	Tipong Coal Dump Area	62	32

REMARKS

As can be seen from the measurement results, the ambient noise level at the study area is very satisfactory and well within the stipulated limits.

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AMBIENT NOISE LEVEL STANDARDS

[Rule 3(1) and 4(1) of Noise Pollution (Regulation & Control) Rules, 2000]

Area Code	Category of Area/ Zone	Limit in dB (A) in L_{eq}
A	Industrial Area	75
B	Commercial Area	65
C	Residential Area	55
D	Silence Zone	50

NB:

Silence Zone is an area comprising an area not less than 100 m around Hospitals, Educational Institutions, Courts, Religious Places or any other area which is declared as such by the competent authority.

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CONCLUSION

The onsite sampling was conducted for the Summer Season during the period of 'April 2012 to June 2012'. From the air quality results, it is seen that, the levels of all the four pollutants i.e. RPM, SPM, SO_2 & NO_2 present in ambient air are within the prescribed limits at all the sampling stations, which includes both active mine areas and nearby residential areas. Movement of heavy trucks and dumpers while transporting coal and OB leads to the production of dust along the haul roads. For the purpose of suppressing this airborne dust, the Coal India Ltd. authority carries out frequent watering with the help of water tankers. High humidity and rainfall of the area, particularly during the summer and monsoon seasons also make this job easier.

The quality of Waste Water/ Effluents (raw and treated) is satisfactory. The quality of drinking water samples also conformed to the relevant standards.

The Ambient Noise scenario is satisfactory and Noise Levels well under the prescribed limits at all the monitoring stations.

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AIR QUALITY STANDARDS FOR EXISTING COAL MINES

The Respirable Particulate Matter (RPM), Suspended Particulate Matter (SPM), Sulfur dioxide (SO_2) and Oxides of Nitrogen (NO_x) concentrations at downward direction, considering predominant wind direction at 500 mts. from the dust generating source shall not exceed the following standards-

Dust Generating Sources : Loading or unloading, Haul road, coal transportation road, Coal handling plant (CHP), Railway sliding, Blasting, Drilling, Overburden dumps, or any other dust generating external sources like coke ovens (hard as well as soft), briquette industry, nearby road etc.

Pollutant	Time Weighted Average	Concentration in Ambient Air	Method of Measurement
Respirable Particulate Matter (RPM)	Annual Average* 24 hrs.**	215 µg/ m^3 300 µg/ m^3	Respirable Particulate Matter sampling and analysis.
Suspended Particulate Matter (SPM)	Annual Average* 24 hrs.**	430 µg/ m^3 600 µg/ m^3	High volume sampling. (Average flow rate not less than 1.1 m^3/ minute)
Sulfur Dioxide (SO_2)	Annual average* 24 hrs.**	80 µg/ m^3 120 µg/ m^3	1. Improved West & Gaeke Method. 2. Ultraviolet Fluorescence
Nitrogen Dioxide (NO_2)	Annual Average* 24 hrs.**	80 µg/ m^3 120 µg/ m^3	1. Jacob & Hochheiser Modified (Na- Aresnic) Method. 2. Gas phase chemiluminescence

Note

*Annual arithmetic mean for the measurements taken in a year following the guidelines of frequency of sampling as laid down by CPCB.

**24 hourly/ 8 hourly values should be met 98% of the time in a year. However 2% of the time it may exceed, but not on two consecutive days.

- The Ambient air quality standard shall apply to the nearest residential/ commercial places (existing/ likely) on the leeward direction of the mining and allied activities.
- Unauthorized construction will not be taken as reference of nearest residential/ commercial place for monitoring.

INDIAN STANDARDS
FOR INDUSTRIAL AND SEWEGE EFFLUENT DISCHARGE
IS: 2490

Parameters	Into Public Sewers	On Land for Irrigation	Into Inland Surface Water	Sewage Farming
01. Colour	--	--	--	--
02. pH Value	5.5- 9	5.5- 9	5.5- 9	5.5- 9
03. Suspended Solids, (mg/l)	600	200	100	30
04. Dissolved Solids, (mg/l)	2100	2100	2100	--
05. Oil & Grease, (mg/l)	20	10	10	--
06. Total Residual Chlorine, (mg/l)	--	--	1	--
07. Ammonical Nitrogen, (mg/l)	50	--	50	--
08. Total Kjeldhal Nitrogen, (mg/l)	--	--	100	--
09. Free Ammonia [as NH_3], (mg/l)	--	--	5	--
10. Biochemical Oxygen Demand, (mg/l)	350	100	30	20
11. Chemical Oxygen Demand, (mg/l)	--	--	250	--
12. Arsenic [as As], (mg/l)	0.2	0.2	0.2	--
13. Mercury [as Hg], (mg/l)	0.01	--	0.01	--
14. Lead [as Pb], (mg/l)	1	--	0.1	--
15. Cadmium [as Cd], (mg/l)	1	--	2	--
16. Hexavalent Chromium [as Cr^{6+}], (mg/l)	2	--	0.1	--
17. Total Chromium [as Cr], (mg/l)	2	--	2	--
18. Copper [as Cu], (mg/l)	3	--	3	--
19. Zinc [as Zn], (mg/l)	15	--	5	--
20. Selenium [as Se], (mg/l)	0.05	--	0.05	--
21. Nickel [as Ni], (mg/l)	3	--	3	--
22. Boron [as B], (mg/l)	2	2	2	--
23. Percent Sodium	--	60	--	--
24. Residual Sodium Carbonate, (mg/l)	--	50	--	--
25. Cyanide [as Cn], (mg/l)	0.2	0.2	0.2	--
26. Chloride [as Cl], (mg/l)	1000	600	1000	--
27. Fluoride [as F], (mg/l)	15	--	2	--
28. Dissolved Phosphate [as P], (mg/l)	--	--	5	--
29. Sulphate [as SO_4], (mg/l)	1000	1000	1000	--
30. Sulphide [as S], (mg/l)	--	--	2	--
31. Pesticides	Absent	Absent	Absent	Absent
32. Phenolic Compounds [as C_6H_5OH], (mg/l)	6	--	1	--

DRINKING WATER STANDARDS

[IS: 10500]

Sl. No.	Parameters	Desirable Limit
01	Odour	Unobjectionable
02	Taste	Agreeable
03	Turbidity, NTU	5
04	pH value	6.5 – 8.5
05	Total hardness (as $CaCO_3$), mg/l	300
06	Alkalinity (as $CaCO_3$), mg/l	200
07	Iron (as Fe), mg/l	0.30
08	Chlorides (as Cl), mg/l	250
09	Dissolved solids, mg/l	500
10	Calcium (as Ca), mg/l	75
11	Copper (as Cu), mg/l	0.05
12	Sulfate (as SO_4), mg/l	200
13	Nitrate (as NO_3), mg/l	45
14	Fluoride (as F), mg/l	1
15	Residual free chlorine, mg/l	0.20
16	Arsenic (as As), mg/l	0.05
17	Lead (as Pb), mg/l	0.05
18	Boron (as B), mg/l	1.00
19	Phenolics (as C_6,H_5OH), mg/l	0.001
20	Faecal coliform (as MPN/100ml)	NIL

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