



ENVIRONMENTAL STATEMENT

2016-17

**UNDER RULE 14 OF ENVIRONMENT (PROTECTION)
RULES, 1986**

In

FORM - V

TIRINGPAHAR MANGANESE MINES

TATA STEEL LIMITED

SEPTEMBER 2017

FORM V
[See Rule 14 of Environment (Protection) Rules, 1986]

ENVIRONMENTAL STATEMENT
FOR THE FINANCIAL YEAR ENDING THE 31ST MARCH 2017

PART - A

- (i) Name and Address of the Owner / occupier of the industry operation or process. : **TIRINGPAHAR MANGANESE MINE**
- Nominated Owner :-
Mr. T.V. Narendran
Managing Director, M/s TATA Steel Ltd.
Jamshedpur, Dist- East Singhbhum
Jharkhand - 831 001
- Agent :-
Mr. Amit Kumar Dubey,
Head(Manganese Group of Mines), Joda,
FA & MD, TATA Steel
P.O.: Bichhakundi, Via : Joda
Dist : Keonjhar, Orissa - 758 034
- (ii) Industry Category : Opencast Mining
- (iii) Production Capacity - Units : 85000 TPA (Manganese Ore)
- (iv) Year of Establishment : 1972
- (v) Date of the last environmental statement submitted : 27th Sept'2016
(Vide Letter No. MGM/P&E/614/2016)

PART - B

Water and Raw Material Consumption

(1) Water Consumption m³/day

Process : 12.74 m³/day (Water sprinkling – Avg. during 2016- 17)

Cooling : Nil

Domestic : 10.24 m³/day (Avg. during 2016-17)

Name of the Products	<u>Process water consumption per unit of product output</u>	
	During the previous Financial year	During the current Financial year
	(1)	(2)
(1) Manganese Ore	Nil	Nil

Remarks : Manganese Ore is produced by semi mechanized Mining method, which does not involve beneficiation and thus precludes the consumption of water.

(2) Raw material consumption

Name of the raw materials	Name of the product	<u>Consumption of raw materials per unit</u>	
		During the previous Financial year	During the current Financial year
Manganese Ore	Manganese Ore	<u>Year – 2015-16</u>	<u>Year – 2016-17</u>
		Production :- 30350.665 MT	Production :- 32835.269 MT
		Dispatch :- 26278.07 MT	Dispatch :- 30908.120 MT

Remarks : Produced Manganese Ore dispatched to Ferro Alloys Plants within India.

PART - C

Pollution discharged to environment / unit of output

(Parameter as specified in the Consents issued)

Pollution	Quantity of pollutants discharged (mass/day)	Concentrations of Pollutants in discharges (mass/volume)	Percentage of variation from prescribed standards with reasons
(a) Water	The process of Manganese Ore production includes blasting, removal of overburden, breaking and sizing of ore to required size and then transportation to the customer does not require consumption of water. Thus, there is no process		

discharge from the mine.

The six month average surface water quality data is enclosed as **Annexure - I**. It shows that the concentrations of the pollutants are well within the permissible standards.

(b) Air

Since this is an open cast Mine, the dust generation is mainly due to the movement of vehicles in the haul roads, drilling activities etc, which is fugitive in nature and cannot be quantified. The fugitive dust is allayed by sprinkling of water by mobile tanker and development of green barrier by plantation around the residential area.

The monthly average ambient air quality data is enclosed as **Annexure - II**. It shows that the concentrations of the pollutants are well within the permissible standards.

PART - D

Hazardous Wastes

[As specified under the Hazardous wastes (Management & Handling) Rules, 1989]

Hazardous Wastes	Total Quantity	
	During the previous Financial year	During the current Financial year
	<u>Year - 2015-16</u>	<u>Year - 2016-17</u>
(i) From Process		
Waste Oil (in Ltrs.)	} Nil*	} Nil*
Used Oil (in Ltrs.)		
Cotton Waste (in Kgs)		
Duster (in Nos.)		
Filters (in Nos.)		
(ii) From pollution control facilities	Nil	Nil

* The mine has no facility for maintenance of equipment deployed at the mine itself. Viewing the close proximity and same management control, the equipment of Tiringpahar Mn.Mine are being maintained at Bamebari Mn.Mine

PART - E

Solid Wastes

	Total Quantity	
	During the previous Financial year <u>Year - 2015-16</u>	During the current Financial year <u>Year - 2016-17</u>
(a) From Process (Overburden rejects)	392152 MT	109813 MT
(b) From pollution control facilities	Nil	Nil
(c)		
(1) Quantity recycled or re-utilized within the unit	Nil	Nil
(2) Sold	Nil	Nil
(3) Disposal	392152 MT	109813 MT

PART - F

Please specify the characterization (in terms of composition and quantum) of hazardous as well as solid wastes and indicate disposal practice adopted for both these categories of wastes.

- **Characterization of Hazardous Waste:** - The composition of hazardous wastes like Waste Oil & used oil are Hydrocarbons, lead and used acids. The composition of the solid wastes (Overburden and rejects) contains lateritic morrum, shale and quartzite.
- **Disposal Practice:-**
 - **SOLID WASTES** -The overburden is systematically and scientifically dumped on a geologically barren area and the same will be reclaimed by plantation after being declared inactive.

The mine has no facility for maintenance of equipment deployed at the mine itself. Viewing the close proximity and same management control, the equipment of Tiringpahar Mn.Mine are being maintained at Bamebari Mn.Mine.

- WASTE OIL -The waste oil generated at various sources is collected in leak proof barrels and then is kept on an impervious floor with oil catch pit. It is also ensured that the caps of the barrels remain intact and horizontal. The storage area is properly fenced and caution board displayed. During transfer of waste oil to barrels, a trough is placed underneath in order to prevent land contamination due to oil spillage. Then at a fixed interval, these barrels are returned to Ferro Manganese Plant Stores for final disposal through auction to the authorized party.
- USED COTTON WASTES - The used cotton wastes generated at various locations are kept in designated barrels and at a fixed interval, these wastes are handed over to the Shift in-charge of the Furnace Section of FAP, Joda for incinerating in the Electric Arc Furnace at a temperature of more than 1100 degree C.
- Provision of impervious pit for collection of oily waste in the workshop premises in addition to the existing practice of collection at specified barrels.

PART - G

Impact of pollution abatement measures taken on conservation of natural resources and on the cost of production.

1. Water spraying on haul Roads and Mine Pits is done regularly to suppress the dust.
2. All the haul roads in the mining area are made up of morrum & compacted. Regular repair is being done by dozer & grader after spreading the layer of sweat morrum over it.
3. Wet drilling has been implemented in all drills. Controlled blasting pattern is being followed.
4. 20820 nos. of saplings of various forestry species were planted covering an area of 3.6 Hectare within the leasehold areas of Tiringpahar Mn.Mine with a during the year 2016-17.
5. The utilization of environment management for the period 2016-17 was Rs. 19,54,720/- including Environmental Monitoring, Plantation activities and construction of toe-wall, check dams and garland drains.
6. In addition, Tata Steel Rural Development Society also undertakes the peripheral development activities with a large magnitude.

PART - H

Additional measures / investment proposal for environmental protection, abatement of pollution, prevention of pollution.

- a) Garland drains and toe wall around the OB dumping shall be provided to check and channelize surface run-off.
- b) Plantation of forestry species shall be planted over the inactive waste dump slopes to arrest the airborne dust.

PART - I

Any other particulars for improving the quality of environment.

1. With compliance to conditions of Environment Clearance obtained from MoEF, the following monitoring is being done at regular interval.
 - Ground Water Level at nearby bore wells
 - Trace metal in dust fall
 - Ground water quality at lower level
 - Trace metals such as Fe, Cr+6, Cu, Se, As, Cd, Hg, Pb, Zn and Mn at specific locations for both surface water (downstream & upstream) and ground water at lower elevation is being periodically monitored by referring to the standards as per BIS : 10500.
2. Top soils generated during excavation are utilized immediately for nursery development and dump slope plantation.
3. Measures taken to control Air Pollution :-
 - Water sprinkling on the haul road,
 - Provision of dust masks to the workmen,
 - Adoption of wet drilling arrangement in the drill machines and
4. Measures taken to control Water Pollution :-
 - Construction of toe wall and garland drain along the dump slope to prevent surface run-off during monsoon.
 - Construction of soak pits for discharge of sanitary sewage at centralized residential colony within Bamebari Mn.Mine.
5. Measures taken to control Noise & Ground Vibration :-
 - Thick plantation has been developed around the mines to provide a canopy cover
 - Implementation of advance blasting technique(NONEL) to reduce the blast induced ground vibration and
 - Workmen are provided with ear-muff while working near heavy earth moving machineries.
6. Measures taken to control Land Degradation :-
 - Afforestation around the non-active dump for stabilization
7. Surveillance of Occupational Health: - Periodical Medical Examination of employees (departmental & contractual) is conducted as per prescribed

norms of Mines Rule, 1955. The initial and periodical examination includes blood haematology, blood pressure, detailed cardiovascular assessment, neurological examination etc. All chest radiographs are being classified for detection of pneumoconiosis, diagnosis and documentation made in accordance to ILO classifications. During the calendar year 2016, 168 employees (Departmental-0, Contractual-168) underwent Initial Medical Examination. There are no findings of pneumoconiosis and manganese poisoning which is classified as occupational disease.

8. The mine is certified with ISO-14001 (Environment Management System) .



Manager,
Tiringpahar Mn.Mine,
M/s.TATA STEEL LTD

Annexure – I : Surface Water Analysis

TIRINGPAHAR UPSTREAM W-1 (Kundra Nallah entering Tiringpahar)		Unit	Standards as per	April'16	May'16	June'16
Sl.	Parameters			1st Report	1st Report	1st Report
1	Colour	Hazen	5	<1.0	<1.0	<1.0
2	Odour	-	Unobjectionable	Unobjectionable	Unobjectionable	Unobjectionable
3	pH at 26°C	-	5.5-9.0	6.9	7.32	7.21
4	Total Dissolved Solids	mg/l	-	60	92	66
5	Copper as Cu	mg/l	3.0	<0.02	<0.02	<0.02
6	Fluoride as F	mg/l	2.0	0.17	0.20	0.20
7	Total Residual Chlorine	mg/l	1.0	<0.1	<0.1	<0.1
8	Iron as Fe	mg/l	3.0	0.64	0.72	1.74
9	Manganese as Mn	mg/l	2.0	<0.02	0.05	0.08
10	Nitrate as NO3	mg/l	10.0	<0.5	<0.5	<0.5
11	Phenolic Compounds as C6H5OH	mg/l	1.0	<0.001	<0.001	<0.001
12	Selenium as Se	mg/l	0.05	<0.005	<0.005	<0.005
13	Cadmium as Cd	mg/l	2.0	<0.001	<0.001	<0.001
14	Cyanide as CN	mg/l	0.2	<0.01	<0.01	<0.01
15	Lead as Pb	mg/l	0.1	<0.005	<0.005	<0.005
16	Mercury as Hg	mg/l	0.01	<0.001	<0.001	<0.001
17	Nickel as Ni	mg/l	3.0	<0.02	<0.02	<0.02
18	Arsenic as As	mg/l	0.2	<0.01	<0.01	<0.01
19	Total Chromium as Cr	mg/l	2.0	<0.01	<0.01	<0.01
20	Zinc as Zn	mg/l	5.0	<0.02	<0.02	<0.02
21	Hexavalent Chromium as Cr ⁺⁶	mg/l	0.1	<0.01	<0.01	<0.01
22	Vanadium as V	mg/l	0.2	<0.2	<0.2	<0.2
23	Total Suspended Solids	mg/l	50 / 100	3.0	5.4	12.7
24	Temperature	°C	-	28	28	28
25	Dissolved Oxygen	mg/l	-	6.2	6.2	6.4
26	BOD	mg/l	30	<2.0	<2.0	<2.0
27	COD	mg/l	250	<4.0	<4.0	<4.0
28	Oil & Grease	mg/l	10	<1.4	<1.4	<1.4
29	Ammonical Nitrogen as N	mg/l	50	<0.1	<0.1	<0.1
30	Total Kjeldahl Nitrogen as N	mg/l	100	<0.3	<0.3	<0.3
31	Sulphide as S	mg/l	2.0	<0.1	<0.1	<0.1
32	Free Ammonia as NH ₃	mg/l	5.0	<0.1	<0.1	<0.1
33	Particulate Size of Suspended Solids	mg/l	Passes through 850 um IS sieve	Passes through 850 um IS sieve	Passes through 850 um IS sieve	Passes through 850 um IS sieve
34	Bio-assay	mg/l	All fishes survive after 96 hrs in 100% effluent	All fishes survive after 96 hrs in 100% effluent	All fishes survive after 96 hrs in 100% effluent	All fishes survive after 96 hrs in 100% effluent
35	Dissolved Phosphates as PO ₄	mg/l	5.0	<0.05	<0.05	<0.05

TRINGPAHAR UPSTREAM W-1 (Kundra Nallah entering Tiringpahar)			July'16		Aug '16		Sept '16	
Parameter	Standards as per IS-	Unit	1st Report	2nd Report	1st Report	2nd Report	1st Report	2nd Report
Dissolved Oxygen (minimum)	4	mg/l	6.5	6.1	6.4	6.2	5.9	5.8
BOD (3) days at 27°C (max)	3	mg/l	<2	<2	<1.8	<1.8	<1.8	<1.8
Total Coli form	5000	MPN/100 ml	210	350	350	220	540	410
pH Value	6.0-9.0		7.1	7.2	7.14	7.02	7.24	7.2
Colour (max)	300	Hazen	30	38	18	24	20	13
Total Dissolved Solids	1500	mg/l	112	115	118	112	120	124
Copper as Cu (max)	1.5	mg/l	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Iron as Fe (max)	0.5	mg/l	0.46	0.44	0.58	0.62	0.6	0.62
Chloride (max)	600	mg/l	18	20	22	18	22	24
Sulphates (SO ₄) (max)	400	mg/l	5.5	5.8	4.8	4.9	4.9	4.7
Nitrate as NO ₃ (max)	50	mg/l	2.2	2.1	1.8	1.9	1.6	1.5
Fluoride as F (max)	1.5	mg/l	0.02	0.018	0.01	0.014	0.015	0.018
Phenolic Compounds as C ₆ H ₅ OH	0.005	mg/l	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Cadmium as Cd (max)	0.01	mg/l	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Selenium as Se (max)	0.05	mg/l	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Arsenic as As	0.2	mg/l	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Cyanide as CN (max)	0.05	mg/l	ND	ND	ND	ND	ND	ND
Lead as Pb(max)	0.1	mg/l	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Zinc as Zn(max)	15	mg/l	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Hexa Chromium as Cr ⁺⁶	0.05	mg/l	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Antionic Detergents (max)	1	mg/l	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Total Suspended Solids		mg/l			90	88	56	64
Turbidity in E. coli		NTU			110	170	130	100
		MPN/100ml			Absent	Absent	Absent	Absent

SURFACE WATER QUALITY ANALYSIS REPORT

Sampling Location: W-1: Kundra Nallah entering Tiringpahar (UPSTREAM)

Sl. No	Parameter	Unit	Standard as DER	Oct'16		Nov'16 1st Report	Dec'16 1st Report	Jan'17 1st Report	Feb'17 1st Report	Mar'17 1st Report
				1 st Report	2 nd Report					
1	Dissolved Oxygen (minimum)	mg/l	4	6.1	5.6	5.1	4.9	4.8	5.4	5.5
2	BOD (3) days at 270C (max)	mg/l	3	< 1.8	< 1.8	< 1.8	< 1.8	< 1.8	< 1.8	< 1.8
3	Total Coli form	MPN/10	5000	450	380	220	98	70	98	70
4	pH Value		6.0-9.0	7.19	7.22	7.18	7.16	7.2	7.24	7.22
5	Colour (max)	Hazen	300	8	5	2	1	CL	CL	CL
6	Total Dissolved Solids	mg/l	1500	122	126	124	126	128	136	130
7	Copper as Cu (max)	mg/l	1.5	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
8	Iron as Fe (max)	mg/l	0.5	0.56	0.58	0.48	0.44	0.48	0.54	0.5
9	Chloride (max)	mg/l	600	18	22	23	22	26	29	28
10	Sulphates (SO4) (max)	mg/l	400	4.6	5.1	4.4	4.6	4.5	4.4	4.5
11	Nitrate as NO3 (max)	mg/l	50	1.7	1.9	1.6	1.5	1.4	1.5	1.7
12	Fluoride as F (max)	mg/l	1.5	0.016	0.024	0.016	0.017	0.015	0.014	0.016
13	Phenolic Compounds as	mg/l	0.005	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
14	Cadmium as Cd (max)	mg/l	0.01	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
15	Selenium as Se (max)	mg/l	0.05	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
16	Arsenic as As	mg/l	0.2	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
17	Cyanide as CN (max)	mg/l	0.05	ND	ND	ND	ND	ND	ND	ND
18	Lead as Pb(max)	mg/l	0.1	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
19	Zinc as Zn(max)	mg/l	15	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
20	Hexa Chromium as Cr +6	mg/l	0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
21	Anionic Detergents	mg/l	1	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2

TIRINGPAHAR DOWNSTREAM W-2 (Kundra Nallah leaving Tiringpahar)		June '16				
Sl.	Parameters	Unit	Standards as per	April '16	May '16	June '16
1	Colour	Hazen	5	1st Report <1.0	1st Report <1.0	2nd Report <1.0
2	Odour	-	Unobjectionable	Unobjectionable	Unobjectionable	Unobjectionable
3	pH at 26°C	-	5.5-9.0	7.25	7.4	7.11
4	Total Dissolved Solids	mg/l	-	69	94	69
5	Copper as Cu	mg/l	3.0	<0.02	<0.02	<0.02
6	Fluoride as F	mg/l	2.0	<0.1	0.47	0.21
7	Total Residual Chlorine	mg/l	1.0	<0.1	<0.1	<0.1
8	Iron as Fe	mg/l	3.0	0.75	0.41	1.94
9	Manganese as Mn	mg/l	2.0	<0.02	0.06	0.09
10	Nitrate as NO3	mg/l	10.0	<0.5	<0.5	<0.5
11	Phenolic Compounds as C6H5OH	mg/l	1.0	<0.001	<0.001	<0.001
12	Selenium as Se	mg/l	0.05	<0.005	<0.005	<0.005
13	Cadmium as Cd	mg/l	2.0	<0.001	<0.001	<0.001
14	Cyanide as CN	mg/l	0.2	<0.01	<0.01	<0.01
15	Lead as Pb	mg/l	0.1	<0.005	<0.005	<0.005
16	Mercury as Hg	mg/l	0.01	<0.001	<0.001	<0.001
17	Nickel as Ni	mg/l	3.0	<0.02	<0.02	<0.02
18	Arsenic as As	mg/l	0.2	<0.01	<0.01	<0.01
19	Total Chromium as Cr	mg/l	2.0	<0.01	<0.01	<0.01
20	Zinc as Zn	mg/l	5.0	<0.02	<0.02	<0.02
21	Hexavalent Chromium as Cr+6	mg/l	0.1	<0.01	<0.01	<0.01
22	Vanadium as V	mg/l	0.2	<0.2	<0.2	<0.2
23	Total Suspended Solids	mg/l	50 / 100	6.9	8.4	13.6
24	Temperature	°C	-	28	28	28
25	Dissolved Oxygen	mg/l	-	5.2	6.4	6.1
26	BOD	mg/l	30	<2.0	<2.0	<2.0
27	COD	mg/l	250	<4.0	<4.0	<4.0
28	Oil & Grease	mg/l	10	<1.4	<1.4	<1.4
29	Ammonical Nitrogen as N	mg/l	50	<0.1	<0.1	<0.1
30	Total Kjeldahl Nitrogen as N	mg/l	100	<0.3	<0.3	<0.3
31	Sulphide as S	mg/l	2.0	<0.1	<0.1	<0.1
32	Free Ammonia as NH3	mg/l	5.0	<0.1	<0.1	<0.1
33	Particulate Size of Suspended Solids	mg/l	Passes through 850 um IS sieve	Passes through 850 um IS sieve	Passes through 850 um IS sieve	Passes through 850 um IS sieve
34	Bio-assay	mg/l	All fishes survive after 96 hrs in 100% effluent	All fishes survive after 96 hrs in 100% effluent	All fishes survive after 96 hrs in 100% effluent	All fishes survive after 96 hrs in 100% effluent
35	Dissolved Phosphates as PO4	mg/l	5.0	<0.05	<0.05	<0.05

TIRINGPAHAR DOWNSTREAM W-2(Kundra Nallah leaving Tiringpahar)										
Parameter	Standards as per IS-2296:1992 Class 'C'	Unit	July'16		Aug '16		Sept '16		Oct '16	
			1st Report	2nd Report	1st Report	2nd Report	1st Report	2nd Report	1st Report	2nd Report
Dissolved Oxygen (minimum)	4	mg/l	6.4	6.2	6.5	6	5.7	6	5.8	6
BOD (3) days at 27°C (max)	3	mg/l	<2	<2	<1.8	<1.8	<1.8	<1.8	<1.8	<1.8
Total Coli form	5000	MPN/100 ml	220	350	280	210	510	450	520	350
pH Value	6.0-9.0		7.2	7.3	7.18	7.1	7.22	7.16	7.24	7.18
Colour (max)	300	Hazen	29	35	22	25	18	12	6	5
Total Dissolved Solids	1500	mg/l	114	116	114	115	118	120	124	128
Copper as Cu (max)	1.5	mg/l	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Iron as Fe (max)	0.5	mg/l	0.42	0.4	0.6	0.65	0.64	0.58	0.54	0.6
Chloride (max)	600	mg/l	16	21	20	19	20	22	20	25
Sulphates (SO ₄) (max)	400	mg/l	5.2	5.3	4.6	5.1	4.7	4.5	4.8	5.2
Nitrate as NO ₃ (max)	50	mg/l	2.3	2.1	1.7	2	1.8	1.4	1.8	2.1
Fluoride as F (max)	1.5	mg/l	0.02	0.017	0.012	0.015	0.015	0.013	0.018	0.02
Phenolic Compounds as C ₆ H ₅ OH	0.005	mg/l	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Cadmium as Cd (max)	0.01	mg/l	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Selenium as Se (max)	0.05	mg/l	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Arsenic as As	0.2	mg/l	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Cyanide as CN (max)	0.05	mg/l	ND	ND	ND	ND	ND	ND	ND	ND
Lead as Pb(max)	0.1	mg/l	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Zinc as Zn(max)	15	mg/l	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Hexa Chromium as Cr ⁺⁶	0.05	mg/l	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Anionic Detergents (max)	1	mg/l	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Total Suspended Solids		mg/l			94	115	48	58	52	44
Turbidity in		NTU			140	190	120	90	42	41
E. coli		MPN/100ml			Absent	Absent	Absent	Absent	Absent	Absent

Sampling Location: SW-2:Kundra Nallah leaving Tiringpahar (Downstream)

Sl. No	Parameter	Unit	Standard as per IS:2296:1992, Class 'C'	Oct'16		Nov'16	Dec'16	Jan'17	Feb'17	Mar'17
				1st Report	2nd Report					
1	Dissolved Oxygen (minimum)	mg/l	4	5.8	6.0	5.3	5.2	5.3	5.8	5.6
2	BOD (3) days at 270C (max)	mg/l	3	< 1.8	< 1.8	< 1.8	< 1.8	< 1.8	< 1.8	< 1.8
3	Total Coli form	MPN/100	5000	520	350	250	120	98	120	98
4	pH Value		6.0-9.0	7.24	7.18	7.12	7.22	7.24	7.26	7.28
5	Colour (max)	Hazen	300	6	5	2	1	CL	CL	CL
6	Total Dissolved Solids	mg/l	1500	124	128	130	128	130	124	131
7	Copper as Cu (max)	mg/l	1.5	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
8	Iron as Fe (max)	mg/l	0.5	0.54	0.60	0.55	0.5	0.52	0.55	0.56
9	Chloride (max)	mg/l	600	20	25	26	24	29	33	31
10	Sulphates (SO4) (max)	mg/l	400	4.8	5.2	4.8	5.1	5.3	4.6	4.4
11	Nitrate as NO3 (max)	mg/l	50	1.8	2.1	1.8	2.1	2.2	1.8	1.7
12	Fluoride as F (max)	mg/l	1.5	0.018	0.02	0.018	0.02	0.018	0.016	0.014
13	Phenolic Compounds	mg/l	0.005	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
14	Cadmium as Cd (max)	mg/l	0.01	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
15	Selenium as Se (max)	mg/l	0.05	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
16	Arsenic as As	mg/l	0.2	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
17	Cyanide as CN (max)	mg/l	0.05	ND	ND	ND	ND	ND	ND	ND
18	Lead as Pb (max)	mg/l	0.1	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
19	Zinc as Zn (max)	mg/l	15	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
20	Hexa Chromium as Cr +6	mg/l	0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
21	Anionic Detergents (max)	mg/l	1	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2

Annexure – II: Ambient Air Quality Monitoring

TMM (Near Purunapani)

Monthly Average	PM ₁₀ (µg/m ³)	PM _{2.5} (µg/m ³)	SO ₂ (µg/m ³)	NO ₂ (µg/m ³)	NH ₃ (µg/m ³)	O ₃ (µg/m ³)	CO (mg/m ³)	Pb (µg/m ³)	Ni (ng/m ³)	Mn (µg/m ³)	As (ng/m ³)	Benzene (µg/m ³)	Benzo(a) pyrene (ng/m ³)
Apr-16	51.60	24.00	4.80	15.00	10.00	19.62	0.12	<0.02	<4	0.11	<1	<2.08	<0.4
May-16	49.00	22.00	4.90	14.70	10.00	19.62	0.12	<0.02	<4	0.10	<1	<2.08	<0.4
Jun-16	43.50	19.90	4.50	15.20	10.00	19.62	0.14	<0.02	<4	0.06	<1	<2.08	<0.4
Jul-16	32.81	15.22	4.00	9.00	<20	<4	0.11	<0.001	<0.01	<0.001	<0.001	<0.001	<0.002
Aug-16	30.26	14.48	4.00	9.00	<20	<4	0.11	<0.001	<0.01	<0.001	<0.001	<0.001	<0.002
Sep-16	31.16	14.60	4.00	9.10	<20	<4	0.10	<0.001	<0.01	<0.001	<0.001	<0.001	<0.002
AVERAGE	39.72	18.37	4.37	12.00	10.00	19.62	0.12	--	--	0.09	--	--	--

TMM (Near Guruda Pit)

Monthly Average	PM ₁₀ (µg/m ³)	PM _{2.5} (µg/m ³)	SO ₂ (µg/m ³)	NO ₂ (µg/m ³)	NH ₃ (µg/m ³)	O ₃ (µg/m ³)	CO (mg/m ³)	Pb (µg/m ³)	Ni (ng/m ³)	Mn (µg/m ³)	As (ng/m ³)	Benzene (µg/m ³)	Benzo(a) pyrene (ng/m ³)
Apr-16	67.4	34.7	5.2	22.4	10.3	20.7	0.22	<0.02	<4	0.16	<1	<2.08	<0.4
May-16	59	31	5.7	22.3	10.4	19.9	0.21	<0.02	<4	0.13	<1	<2.08	<0.4
Jun-16	57.90	29.20	5.20	22.00	10.40	19.90	0.22	<0.02	<4	0.12	<1	<2.08	<0.4
Jul-16	32.67	15.28	4.00	9.00	<20	<4	0.11	<0.001	<0.01	<0.001	<0.001	<0.001	<0.002
Aug-16	30.89	14.96	4.00	9.00	<20	<4	0.11	<0.001	<0.01	<0.001	<0.001	<0.001	<0.002
Sep-16	32.03	15.14	4.00	9.00	<20	<4	0.11	<0.001	<0.01	<0.001	<0.001	<0.001	<0.002
AVERAGE	46.65	23.38	4.68	15.62	10.37	20.17	0.16	--	--	0.14	--	--	--

TMM (Guruda Pit)

Monthly Average	PM ₁₀ (µg/m ³)	PM _{2.5} (µg/m ³)	SO ₂ (µg/m ³)	NO ₂ (µg/m ³)	O ₃ (µg/m ³)	CO (mg/m ³)	NH ₃ (µg/m ³)	Pb (µg/m ³)	Ni (ng/m ³)	As (ng/m ³)	Benzene (µg/m ³)	Benzo(a) pyrene (ng/m ³)	Mn (µg/m ³)
Oct-16	33.0	15.5	4.1	9.2	4.0	0.11	20.0	0.001	0.01	0.001	0.001	0.002	0.001
Nov-16	47.8	23.3	4.4	10.4	5.6	0.17	20.0	0.001	0.01	0.001	0.001	0.002	0.001
Dec-16	50.4	24.9	4.5	10.8	6.1	0.22	20.0	0.001	0.01	0.001	0.001	0.002	0.001
Jan-17	52.0	25.7	4.5	11.0	5.9	0.24	20.0	0.001	0.01	0.001	0.001	0.002	0.001
Feb-17	54.1	27.1	4.6	11.1	5.9	0.27	20.0	0.001	0.01	0.001	0.001	0.002	0.001
Mar-17	43.4	19.9	4.0	9.1	4.1	0.15	20.0	0.001	0.01	0.001	0.001	0.002	0.001
AVERAGE	46.78	22.72	4.36	10.26	5.26	0.19	20.00	0.00	0.01	0.00	0.00	0.00	0.00

TMM (Purunapani)

Monthly Average	PM ₁₀ (µg/m ³)	PM _{2.5} (µg/m ³)	SO ₂ (µg/m ³)	NO ₂ (µg/m ³)	O ₃ (µg/m ³)	CO (mg/m ³)	NH ₃ (µg/m ³)	Pb (µg/m ³)	Ni (ng/m ³)	As (ng/m ³)	Benzene (µg/m ³)	Benzo(a) pyrene (ng/m ³)	Mn (µg/m ³)
Oct-16	31.4	14.2	4.0	9.2	4.0	0.11	20.0	0.001	0.01	0.001	0.001	0.002	0.001
Nov-16	45.6	21.9	4.2	9.9	5.3	0.14	20.0	0.001	0.01	0.001	0.001	0.002	0.001
Dec-16	48.4	23.6	4.3	9.8	4.8	0.15	20.0	0.001	0.01	0.001	0.001	0.002	0.001
Jan-17	49.0	24.3	4.1	9.9	4.8	0.14	20.0	0.001	0.01	0.001	0.001	0.002	0.001
Feb-17	52.6	26.1	4.2	10.4	5.3	0.16	20.0	0.001	0.01	0.001	0.001	0.002	0.001
Mar-17	41.0	18.2	4.0	9.1	4.1	0.12	20.0	0.001	0.01	0.001	0.001	0.002	0.001
AVERAGE	44.66	21.36	4.14	9.71	4.71	0.14	20.00	0.00	0.01	0.00	0.00	0.00	0.00