



By E-Mail

Ref.No.: MGM/P&E/395/20

Date: 28/09/2020

To
The Member Secretary,
Odisha State Pollution Control Board,
Paribesh Bhawan,
A/118, Nilakantha Nagar,
Bhubaneswar, 751012

Subject: Submission of Annual Environmental Statement in FORM-V for the year ending 31st March 2020 in respect of Bamebari Iron and Manganese Mine of M/s Tata Steel Ltd.

Reference: Rule-14 under Environmental (Protection) Amendment Rule, 1993 (G.S.R.386,22.04.1993)

Dear Sir,


We are hereby submitting the Annual Environmental Statement in "FORM-V" prescribed under the above referenced statute, for the year ending 31st March 2020 in respect of Bamebari Iron and Manganese Mine of M/s Tata Steel Ltd., At/Po-Bichhakundi, Dist-Keonjhar, Odisha.

This is for your kind information and perusal please. Receipt of the same may please be acknowledged.

Thanking you,

Yours faithfully,

F: TATA STEEL LTD.


28/9/2020
Head

Mine & Production Planning
Ferro Alloys Mineral Division

Enclosure: Annual Environmental Statement (FORM-V) for the Financial Year ending 31st March 2020

Copy To:

- 1) Zonal Office Kolkata, Central Pollution Control Board, South end Conclave, Block 502, 5th and 6th Floors, 1582 Rajdanga Main Road, Kolkata, West Bengal 700107.
- 2) The Regional Officer, State Pollution Control Board, Baniapat, DD College Road, Keonjhar, Odisha-758001.
- 3) MoEF&CC Eastern Regional Office, A/3, Chandrasekharpur, Bhubaneswar-751023

TATA STEEL LTD.

Ferro Alloys & Minerals Division, Manganese Group of Mines, At/P.O.: Bichhakundi, Via: Joda,
Dist: Keonjhar Odisha – 758 034 Tel.: 9238101370, e-mail : mnminesadmin@tatasteel.com
Regd. Office : Bombay House, 24 Homi Modi Street, Mumbai – 400 001 Tel 912266658282, Fax 912266657724
Corporate Identity Number L27100MH1907PLC000260 website : www.tatasteel.com



ENVIRONMENTAL STATEMENT

FORM – V [2019-20]

**[Rule-14 under Environmental (Protection) Amendment Rule, 1993]
(G.S.R.386,22.04.1993)**

Submitted By:

Bamebari Iron & Manganese Mine

M/s. Tata Steel Limited

At/Po: Bichhakundi, Via-Joda

District- Keonjhar, Odisha -758 034

FORM V

[See Rule 14 of Environment (Protection) Amendment Rules, 1993]

ENVIRONMENTAL STATEMENT

for the financial year ending the 31st March 2020

PART - A

(i) Name and Address of the Owner / occupier of the industry operation or process. : **BAMEBARI IRON & MANGANESE MINE**
Mr. T.V. Narendran
Managing Director, M/s TATA Steel Ltd.

Nominated Owner:

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 : **83,200 Tonnes per annum** (Manganese Ore or 0.832 LTPA (as per Environmental Clearance)

(iv) Year of Establishment : 1938

(v) Date of the last environmental statement submitted : 26th Sept'2019

PART - B

Water and Raw Material Consumption: Mining is not a manufacturing process thus water is not a raw material essential for production; however, water is used for haul road dust suppression and other support services which are not directly linked with the quantum of production.

(1) Water Consumption m³/day (Av. figures for 2019-20)

Process : 23.85 m³/day (Water sprinkling) (**Total-8707.22m³**)

Cooling : Nil

Domestic : 136.0 m³/day (**Total-49881.11m³**)

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. Unlike manufacturing*

processes, production from mining doesn't involve water as raw material for any of the operational activities.

(2) Raw material consumption: Unlike manufacturing processes, mining doesn't involve any such raw materials; However, uses various other resources for ancillary services essential to ensure mining such as Diesel, Electricity and Explosives, etc.

The table below reflects the production and dispatch figures for the last two financial year

Name of the raw materials	Name of the product	Consumption of raw materials per unit	
		During the previous Financial year (Year 2018-19)	During the current Financial year (Year 2019-20)
-Nil-	Manganese Ore	Production 79619 MT	Production 92223.000 MT
		Despatch 67770.66 MT	Despatch 83110.96 MT

Remarks: The ore produced from Mine head is used as raw material to produce ferro manganese. Other essential resources used during the reporting period (2019-20) is as follows: Diesel (336.622KL), Explosive (93000Kg), Electricity (356821Kw-h from grid & 75927Kw-h from DG set). Production figure represents ROM, which is inclusive of product under use and subgrade ore.

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	-Nil-	-Nil-	Not Applicable

There are no direct/indirect source for discharge of effluents/pollutants to the environment. Ground water strata is much below the present pit depth and since mine is operated without intervening with the ground water thus potential source of water getting polluted/contaminated is eliminated. Environmental quality parameters are monitored from time to time to assess the water quality of the nearby streams/nallahs and monsoon runoff from the mining areas. The environmental quality parameters are monitored and reports are submitted to SPCB as well as MoEF&CC along with six monthly compliance reports.

(b) Air -Nil- -Nil- Not Applicable

There is no such point source of emission from the mine. Major source of air pollutants is fugitive dust generated mainly due to the movement of vehicles in the haul roads, drilling/blasting activities etc, which is fugitive in nature and thus has not been quantified (mass/day). More over the dust generated during mining operation is mainly driven by local meteorology and thus attributing the ambient air quality and fugitive dust emission to specific mine/activity will not be rational.

The environmental quality parameters are monitored and reports are submitted to SPCB as well as MoEF&CC along with six monthly compliance reports.

Abstract of Environmental Monitoring Result for FY 2019-20 is enclosed as **Annexure-I**.

PART - D
(Hazardous Wastes)

[As specified under the Hazardous and Other Waste (Management and Transboundary Movement) Rules, 2016]

Hazardous Wastes	Total Quantity	
	During the previous Financial year	During the current Financial year
	<u>Year (2018-19)</u>	<u>Year (2019-20)</u>
(i) From Process		
Waste containing Oil	Nil	Nil
Used Oil (in Ltrs.)	42 Ltrs	200 Ltrs
Cotton Waste (in Kgs)	Nil	5(approx.)
Duster (in Nos.)	Nil	Nil
Filters (in Nos.)	Nil	45(approx.)
(ii) From pollution control facilities	Nil	Nil

Remark: The quantity indicated reflects that of the quantity generated from the departmental HEMM fleets and is exclusive of the major chunk of generation, managed by the outsourced agencies deployed for mining.

PART - E
(Solid Wastes)

	Total Quantity	
	During the previous Financial year	During the current Financial year
	<u>Year (2018-19)</u>	<u>Year (2019-20)</u>
(a) From Process (Overburden material)	233308MT	221195MT
(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	233308 MT	221195MT

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 significant source of hazardous waste is Used oil (HW-5.1) is mainly Hydrocarbons and consist of lubricants, coolants, transformer oil and hydraulic oil. Lead Acetate batteries are also used in HEMM fleet which are mainly of automotive fuel cells.
- Overburden being the only form of significant solid **waste** contains lateritic morrum, shale and quartzite, etc.
- **Disposal Practice:** -
 - SOLID WASTES -OB dumps are maintained as per the approved scheme of mine plan where proper terraces and peripheral drains are constructed supported with gabion wall/retention wall to arrest the silt/sediments during monsoon season. Once the slope of the dumps is stabilised then the dumps are reclaimed by plantation of native varieties of forestry saplings.
 - USED OIL -The used 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. The used oil collected from sites are centrally auctioned to an SPCB authorised/registered recycler for recycling. At present, used oil generated from the departmental HEMM fleet (TSL's fleet of HEMM) are managed by the company through auctioning; however major chunk of generation is due to the contractual operations, managed by outsourced agencies as per applicable norms.
 - 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 sweet morrum over it.
3. Wet drilling is practices along with controlled blasting followed for minimal dust generation and prevent fly rocks.
4. Total plantation for FY 2019-20 for the dump and other available fonts was 10150Nos. of local forestry species such as Gambhari, Neem, Mahaneem, Sisam, Karanj, Sal, etc.
5. The mine management proactively undertakes various environmental activities for the conservation/protection of environment. The cost incurred towards environmental measures are earmarked in a separate fund center. An abstract on the approximate cost spent towards environmental measures in respect of Bamebari Iron & Manganese Mine is as follows:

S.No.	Environmental Conservation/Protection Measures	Expenditure (Lacs-INR)	
		Proposed	Actual
1	Afforestation on Dump slopes	1.825	3.0

2	Construction of retaining wall	0.093	1.20
3	Construction of Garland drain, settling pits with check dam	0.0312	0.40
4	Env. Awareness	03.0	4.0
5	Environmental monitoring	15.0	15.5
	Total	19.9492	24.1

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.
- c) Vetiver Plantation has been done in inactive dump slope.
- d) Green belt has been developed along colony and mining.
- e) Soil Conditioning and treatment practices followed for land reclamation
- f) In-House nursery for development of native varieties of forestry saplings.

PART - I

(Any other 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
 - Meteorological monitoring
 - 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
 - Black topped road in the residential colony.
 - Green belt along mining and colony
 - Native sapling and vetiver plantation in inactive dumps.
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.
 - Provision of oil separation pit for effluents coming out of work shop.

- STP for domestic effluent in Bamebari colony.
5. Measures taken to control Noise & Ground Vibration: -
- Thick plantation has been developed around the mines and office building 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 and
 - Reclamation and rehabilitation of mined out area as per approved Scheme of Mining.
7. Surveillance of Occupational Health: - Periodical Medical Examination of employees (departmental & contractual) are 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.
8. The mine is certified with ISO-14001:2015 (Environment Management System).


28/9/2020
Head (MPP)
FA & M, JODA
Tata Steel Ltd.
Head
Mine & Production Planning
Ferro Alloys Mineral Division
M/s Tata Steel Limited
(For Bamebari Iron & Manganese Mine)

Date: 28/9/2020

ABSTRACT ON ENVIRONMENTAL MONITORING RESULTS

[PERIOD: APRIL 2019 TO MARCH 2020]

**MINE-BAMEBARI IRON & MANGANESE MINES
M/s TATA Steel Limited**

Annexure-I to Environmental Statement (Form-V) for Bamebari Iron & Manganese Mine for FY 2019-20

1. SURFACE WATER QUALITY ANALYSIS REPORT**SW1: Confluence Point at Kassia Nallah**

Parameters	Unit	Standard	Monitoring Period (Apr'19 to March'20)											
			Apr-19	May-19	Jun-19	Jul-19	Aug-19	Sep-19	Oct-19	Nov-19	Dec-19	Jan-20	Feb-20	Mar-20
Dissolved Oxygen (minimum)	mg/l	4	5.9	5.6	5.5	5.4	5.3	5.1	5.6	5.2	5.6	6.6	6.2	6.2
BOD (3) days at 27°C (max)	mg/l	3	< 1.8	< 1.8	< 1.8	< 1.8	< 1.8	< 1.8	< 1.8	< 1.8	< 1.8	< 1.8	< 1.8	< 1.8
Total Coli form	MPN/100 ml	5000	260	220	173	180	120	110	110	100	110	180	210	110
pH Value	--	6.0-9.0	7.52	7.46	7.57	7.56	7.51	7.46	7.56	7.64	7.48	7.66	7.68	7.6
Colour (max)	Hazen	300	CL	CL	CL	CL	CL	CL	CL	CL	CL	CL	CL	CL
Total Dissolved Solids	mg/l	1500	156	158	157	151	154	148	162	168	160	188	192	180
Copper as Cu (max)	mg/l	1.5	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Iron as Fe (max)	mg/l	0.5	0.58	0.61	0.48	0.39	0.32	0.21	0.36	0.38	0.44	0.41	0.44	0.32
Chloride (max)	mg/l	600	38	33	58	61	61	60	66.8	71.4	71.2	78	80	70
Sulphates (SO ₄) (max)	mg/l	400	4.6	5.1	3.03	3.8	3.2	3.0	3.9	4.2	5.8	5.2	5.6	4.2
Nitrate as NO ₃ (max)	mg/l	50	2.1	2.04	2.53	2.6	2.2	2.1	2.6	3.2	3.2	3.2	3.8	3.2
Fluoride as F (max)	mg/l	1.5	0.028	0.017	0.02	0.021	0.021	0.018	0.019	0.018	0.051	0.026	0.022	0.026
Phenolic Compounds as C ₆ H ₅ OH (max)	mg/l	0.005	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Cadmium as Cd (max)	mg/l	0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Selenium as Se (max)	mg/l	0.05	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Arsenic as As	mg/l	0.2	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004
Cyanide as CN (max)	mg/l	0.05	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Lead as Pb(max)	mg/l	0.1	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Zinc as Zn(max)	mg/l	15	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Hexa Chromium as Cr ⁺⁶	mg/l	0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Anionic Detergents (max)	mg/l	1	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2

SW2: Intake Point at Tindharia

Parameters	Unit	Standards	Monitoring Period (Apr'19 to March'20)											
			Apr-19	May-19	Jun-19	Jul-19	Aug-19	Sep-19	Oct-19	Nov-19	Dec-19	Jan-20	Feb-20	Mar-20
Dissolved Oxygen (minimum)	mg/l	4	6.2	6.03	6.03	6.1	6.2	5.6	6.6	6.1	6.5	6.8	6.4	6.4
BOD (3) days at 27°C (max)	mg/l	3	< 1.8	< 1.8	< 1.8	< 1.8	< 1.8	< 1.8	< 1.8	< 1.8	< 1.8	< 1.8	< 1.8	< 1.8
Total Coli form	MPN/100 ml	5000	320	217	216	110	150	120	170	120	220	210	240	180
pH Value	--	6.0-9.0	7.61	7.65	7.65	7.61	7.56	7.22	7.64	7.72	7.71	7.74	7.82	7.69
Colour (max)	Hazen	300	CL	CL	CL	CL	CL	CL	CL	CL	CL	CL	CL	CL
Total Dissolved Solids	mg/l	1500	168	174	174	162	160	132	174	174	194	192	210	192

Annexure-I to Environmental Statement (Form-V) for Bamebari Iron & Manganese Mine for FY 2019-20

Parameters	Unit	Standards	Monitoring Period (Apr'19 to March'20)											
			Apr-19	May-19	Jun-19	Jul-19	Aug-19	Sep-19	Oct-19	Nov-19	Dec-19	Jan-20	Feb-20	Mar-20
Copper as Cu (max)	mg/l	1.5	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Iron as Fe (max)	mg/l	0.5	0.62	0.42	0.42	0.36	0.34	0.56	0.38	0.44	0.42	0.44	0.46	0.38
Chloride (max)	mg/l	600	42	51	51	66	63	31	64.6	74.8	76	82	84	74
Sulphates (SO ₄) (max)	mg/l	400	5.8	3.33	3.33	4.2	3.6	5.1	3.2	4.6	4.8	5.6	6.2	5.1
Nitrate as NO ₃ (max)	mg/l	50	3.2	2.60	2.60	3.2	2.8	2.2	2.1	3.6	3.6	3.8	4.2	3.8
Fluoride as F (max)	mg/l	1.5	0.051	0.03	0.03	0.036	0.029	0.018	0.012	0.021	0.019	0.021	0.026	0.022
Phenolic Compounds as C ₆ H ₅ OH (max)	mg/l	0.005	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Cadmium as Cd (max)	mg/l	0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Selenium as Se (max)	mg/l	0.05	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Arsenic as As	mg/l	0.2	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004
Cyanide as CN (max)	mg/l	0.05	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Lead as Pb(max)	mg/l	0.1	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Zinc as Zn(max)	mg/l	15	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Hexa Chromium as Cr ⁺⁺⁶	mg/l	0.05	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Anionic Detergents (max)	mg/l	1.0	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2

2. DRINKING WATER

DW1: Near Canteen

MICROBIOLOGICAL ANALYSIS OF WATER AS PER IS: 10500 - 2012										
Sl No.	Test Parameters	Unit	Norms as per IS:10500-2012	Apr-19	May-19	June-19	July-20	Aug-20	Sep-20	
1	Total Coli form Organism MPN/100ml	MPN/100 ml	Shall not be detectable in any 100ml sample	<1.1	<1.1	<1.1	<1.1	<1.1	<1.1	<1.1
2	Fecal Coli forms	MPN/100 ml	---	<1.1	<1.1	<1.1	<1.1	<1.1	<1.1	<1.1
3	E. Coli	MPN/100 ml	Shall not be detectable in any 100ml sample	Absent	Absent	Absent	Absent	Absent	Absent	Absent
CHEMICAL ANALYSIS OF WATER AS PER IS: 10500 - 2012										
Sl No.	Test Parameters	Unit	Norms as per IS: 10500-2012 (Amended on 2015 & 2018)							
			Desirable Limit	Permissible Limit	Apr-19	May-19	June-19	July-20	Aug-20	Sep-20
1	Colour (Unit)	Hazen	5	25	CL	CL	CL	CL	CL	CL
2	Odour	--	Unobjectionable	--	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable
3	Taste	--	Agreeable	--	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable
4	pH value (25°C)		6.5 - 8.5	No Relaxation	7.34	7.46	7.52	7.44	7.41	7.60
5	Turbidity	NTU	5	10	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0

Annexure-I to Environmental Statement (Form-V) for Bamebari Iron & Manganese Mine for FY 2019-20

6	Total Dissolved Solids	mg/l	500	2000	80	88	94	112	108	96
7	Aluminium (as Al)	mg/l	0.03	0.2	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
8	Anionic Detergents (as MBAS)	mg/l	0.2	1	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
9	Boron (as B)	mg/l	1	5	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
10	Calcium (as Ca)	mg/l	75	200	19.2	36	43	48	46	50.6
11	Chloride (as Cl)	mg/l	250	1000	21	30	36	46	40	48
12	Copper (asCu)	mg/l	0.05	1.5	<0.02	<0.02	<0.05	<0.05	<0.05	<0.05
13	Fluoride (as F)	mg/l	1	1.5	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
14	Residual Free Chlorine	mg/l	0.2(Min.)	---	ND	ND	ND	ND	ND	ND
15	Iron (as Fe)	mg/l	0.3	1	0.24	0.26	0.28	0.22	0.16	0.12
16	Magnesium (as Mg)	mg/l	30	100	10	18.8	21.2	18.8	16.8	17.2
17	Manganese (as Mn)	Hazen	0.1	0.3	<0.05	<0.05	<0.005	<0.005	<0.005	<0.005
18	Mineral Oil	--	0.01	0.03	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
19	Nitrate (as NO ₃)	--	45	100	1.36	1.42	2.4	2.6	3.2	2.8
20	Phenolic Compounds (as C ₆ H ₅ OH)		0.001	0.002	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
21	Selenium (as Se)	NTU	0.01	No Relaxation	<0.001	<0.001	<0.001	<0.001	<0.001	5.2
22	Sulphate (as SO ₄)	mg/l	200	400	3.8	4.1	4.8	5.4	5.2	5.6
23	Alkalinity (as CaCO ₃)	mg/l	200	600	42	56	61	60	60	61
24	Total Hardness(as CaCO ₃)	mg/l	300	600	56	64	71	72	72	58
25	Cadmium (as Cd)	mg/l	0.01	No Relaxation	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
26	Cyanide (as CN)	mg/l	0.05	No Relaxation	ND	ND	ND	ND	ND	ND
27	Lead (as Pb)	mg/l	0.05	No Relaxation	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
28	Mercury (as Hg)	mg/l	0.001	No Relaxation	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
29	Arsenic (as As)	mg/l	0.05	No Relaxation	<0.01	<0.01	<0.001	<0.001	<0.001	<0.001
30	Zinc (as Zn)	mg/l	5	15	<0.01	<0.01	<0.05	<0.05	<0.05	<0.05
31	Chromium (as Cr ⁺⁶)	mg/l	0.05	No Relaxation	<0.01	<0.01	<0.05	<0.05	<0.05	<0.05
32	Poly Aromatic Hydrocarbon as PAH	mg/l	<0.0001	--	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
33	Pesticide	µg/l	Absent	0.001	Absent	Absent	Absent	Absent	Absent	Absent

Annexure-I to Environmental Statement (Form-V) for Bamebari Iron & Manganese Mine for FY 2019-20

MICROBIOLOGICAL ANALYSIS OF WATER AS PER IS: 10500 - 2012										
Sl No.	Test Parameters	Unit	Norms as per IS:10500-2012	Oct-19	Nov-19	Dec-19	Jan-20	Feb-20	Mar-20	
1	Total Coli form Organism MPN/100ml	MPN/100 ml	Shall not be detectable in any 100ml sample	<1.1	<1.1	<1.1	<1.1	<1.1	<1.1	
2	Fecal Coli forms	MPN/100 ml	---	<1.1	<1.1	<1.1	<1.1	<1.1	<1.1	
3	E. Coli	MPN/100 ml	Shall not be detectable in any 100ml sample	Absent	Absent	Absent	Absent	Absent	Absent	
CHEMICAL ANALYSIS OF WATER AS PER IS: 10500 - 2012										
Sl No.	Test Parameters	Unit	Norms as per IS: 10500-2012 (Amended on 2015 & 2018)							
			Desirable Limit	Permissible Limit	Oct-19	Nov-19	Dec-19	Jan-20	Feb-20	Mar-20
1	Colour (Unit)	Hazen	5	25	CL	CL	CL	CL	CL	CL
2	Odour	--	Unobjectionable	--	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable
3	Taste	--	Agreeable	--	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable
4	pH value (25°C)		6.5 - 8.5	No Relaxation	7.48	7.52	7.61	7.66	7.68	7.56
5	Turbidity	NTU	5	10	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
6	Total Dissolved Solids	mg/l	500	2000	112.2	118.6	112	118	128	108
7	Aluminium (as Al)	mg/l	0.03	0.2	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
8	Anionic Detergents (as MBAS)	mg/l	0.2	1	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
9	Boron (as B)	mg/l	1	5	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
10	Calcium (as Ca)	mg/l	75	200	52	56	51.2	50.8	52.6	50.6
11	Chloride (as Cl)	mg/l	250	1000	46	52	48.2	51.2	56.8	46
12	Copper (asCu)	mg/l	0.05	1.5	<0.02	<0.02	<0.05	<0.05	<0.05	<0.05
13	Fluoride (as F)	mg/l	1	1.5	0.016	0.018	<0.01	<0.01	<0.01	<0.01
14	Residual Free Chlorine	mg/l	0.2(Min.)	---	ND	ND	ND	ND	ND	ND
15	Iron (as Fe)	mg/l	0.3	1	0.18	0.22	0.29	0.26	0.34	0.26
16	Magnesium (as Mg)	mg/l	30	100	18.6	21.4	24.6	28.8	30.6	22.8
17	Manganese (as Mn)	Hazen	0.1	0.3	<0.05	<0.05	<0.005	<0.005	<0.005	<0.005
18	Mineral Oil	--	0.01	0.03	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
19	Nitrate (as NO ₃)	--	45	100	1.36	1.42	2.4	2.6	3.2	2.8
20	Phenolic Compounds (as C ₆ H ₅ OH)		0.001	0.002	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001

Annexure-I to Environmental Statement (Form-V) for Bamebari Iron & Manganese Mine for FY 2019-20

21	Selenium (as Se)	NTU	0.01	No Relaxation	5.6	6.1	<0.001	<0.001	<0.001	5.2
22	Sulphate (as SO ₄)	mg/l	200	400	5.4	6.6	5.6	5.8	6.2	5.4
23	Alkalinity (as CaCO ₃)	mg/l	200	600	62	70	64.8	66.2	70.8	60.8
24	Total Hardness(as CaCO ₃)	mg/l	300	600	78	80	78	72	80	72
25	Cadmium (as Cd)	mg/l	0.01	No Relaxation	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
26	Cyanide (as CN)	mg/l	0.05	No Relaxation	ND	ND	ND	ND	ND	ND
27	Lead (as Pb)	mg/l	0.05	No Relaxation	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
28	Mercury (as Hg)	mg/l	0.001	No Relaxation	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
29	Arsenic (as As)	mg/l	0.05	No Relaxation	<0.01	<0.01	<0.001	<0.001	<0.001	<0.001
30	Zinc (as Zn)	mg/l	5	15	<0.01	<0.01	<0.05	<0.05	<0.05	<0.05
31	Chromium (as Cr ⁺⁶)	mg/l	0.05	No Relaxation	<0.01	<0.01	<0.05	<0.05	<0.05	<0.05
32	Poly Aromatic Hydrocarbon as PAH	mg/l	<0.0001	--	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
33	Pesticide	µg/l	Absent	0.001	Absent	Absent	Absent	Absent	Absent	Absent

3. GROUND WATER

GW1: Joribahal Pump House

Sl. No	Parameter	Unit	Standards as per IS: 10500:2012 Amended on 2015 & 2018		Analysis Result	
			Acceptable Limit	Permissible Limit	June-19	Nov-19
1	Colour	Hazen	5	15	CL	CL
2	Odour	--	Agreeable	Agreeable	Agreeable	Agreeable
3	Taste	--	Agreeable	Agreeable	Agreeable	Agreeable
4	Turbidity	NTU	1	5	1.6	1.3
5	pH Value	--	6.5-8.5	No Relaxation	7.44	7.51
6	Total Hardness (as CaCO ₃)	mg/l	200	600	112.0	110.0
7	Iron (as Fe)	mg/l	1.0	No Relaxation	0.28	0.22
8	Chloride (as Cl)	mg/l	250	1000	40.8	43.2
9	Residual, free Chlorine	mg/l	0.2	1	ND	ND
<i>Desirable Characteristics</i>						
10	Dissolved Solids	mg/l	500	2000	188.0	196.0

Annexure-I to Environmental Statement (Form-V) for Bamebari Iron & Manganese Mine for FY 2019-20

Sl. No	Parameter	Unit	Standards as per IS: 10500:2012 Amended on 2015 & 2018		Analysis Result	
			Acceptable Limit	Permissible Limit	June-19	Nov-19
11	Calcium (as Ca)	mg/l	75	200	41.2	44.8
12	Magnesium (as Mg)	mg/l	30	100	19.2	22.8
13	Copper (as Cu)	mg/l	0.05	1.5	<0.05	<0.02
14	Manganese (as Mn)	mg/l	0.1	0.3	0.018	0.021
15	Sulphate (as SO ₄)	mg/l	200	400	5.2	5.5
16	Nitrate (as NO ₃)	mg/l	45	No Relaxation	3.2	3.8
17	Fluoride (as F)	mg/l	1.0	1.5	0.021	0.018
18	Phenolic Compounds (as C ₆ H ₅ OH)	mg/l	0.001	0.002	<0.001	<0.001
19	Mercury (as Hg)	mg/l	0.001	No Relaxation	<0.002	<0.002
20	Cadmium (as Cd)	mg/l	0.003	No Relaxation	<0.01	<0.01
21	Selenium (as Se)	mg/l	0.01	No Relaxation	<0.01	<0.001
22	Arsenic (as As)	mg/l	0.01	No Relaxation	<0.01	<0.004
23	Cyanide (as CN)	mg/l	0.05	No Relaxation	<0.01	<0.01
24	Lead (as Pb)	mg/l	0.01	No Relaxation	<0.01	<0.01
25	Zinc (as Zn)	mg/l	5	15	3.2	3.4
26	Anionic Detergents (as MBAS)	mg/l	--	--	<0.2	<0.2
27	Chromium (as Cr ⁺⁶)	mg/l	0.5	No Relaxation	<0.01	<0.01
28	Mineral Oil	mg/l	200	600	<0.01	<0.01
29	Alkalinity	mg/l	0.03	0.2	84.0	78.0
30	Aluminium as(Al)	mg/l	0.5	2.4	<1.0	<1.0
31	Boron (as B)	mg/l	--	--	<0.1	<0.1
32	Poly Aromatic Hydrocarbon as PAH	mg/l	<0.0001	--	<0.0001	<0.0001
33	Pesticide	µg/l	Absent		Absent	Absent

GW2: Nimera Village OW

Sl. No	Parameter	Unit	Standards as per IS: 10500:2012 Amended on 2015 & 2018		Analysis Result	
			Acceptable Limit	Permissible Limit	June-19	Nov-19
Essential Characteristics						
1	Colour	Hazen	5	15	CL	CL
2	Odour	--	Agreeable	Agreeable	Agreeable	Agreeable
3	Taste	--	Agreeable	Agreeable	Agreeable	Agreeable
4	Turbidity	NTU	1	5	1.2	1.5
5	pH Value	--	6.5-8.5	No Relaxation	7.38	7.46
6	Total Hardness (as CaCO ₃)	mg/l	200	600	124.0	128.0
7	Iron (as Fe)	mg/l	1.0	No Relaxation	0.29	0.25
8	Chloride (as Cl)	mg/l	250	1000	51.2	54.0
9	Residual, free Chlorine	mg/l	0.2	1	ND	ND

Annexure-I to Environmental Statement (Form-V) for Bamebari Iron & Manganese Mine for FY 2019-20

<i>Desirable Characteristics</i>						
10	Dissolved Solids	mg/l	500	2000	216.0	224.0
11	Calcium (as Ca)	mg/l	75	200	51.6	52.2
12	Magnesium (as Mg)	mg/l	30	100	24.6	24.2
13	Copper (as Cu)	mg/l	0.05	1.5	<0.05	<0.02
14	Manganese (as Mn)	mg/l	0.1	0.3	0.021	0.016
15	Sulphate (as SO ₄)	mg/l	200	400	6.1	6.2
16	Nitrate (as NO ₃)	mg/l	45	No Relaxation	2.6	3.1
17	Fluoride (as F)	mg/l	1.0	1.5	0.034	0.028
18	Phenolic Compounds (as C ₆ H ₅ OH)	mg/l	0.001	0.002	<0.001	<0.001
19	Mercury (as Hg)	mg/l	0.001	No Relaxation	<0.002	<0.002
20	Cadmium (as Cd)	mg/l	0.003	No Relaxation	<0.01	<0.01
21	Selenium (as Se)	mg/l	0.01	No Relaxation	<0.001	<0.001
22	Arsenic (as As)	mg/l	0.01	No Relaxation	<0.004	<0.004
23	Cyanide (as CN)	mg/l	0.05	No Relaxation	<0.01	<0.01
24	Lead (as Pb)	mg/l	0.01	No Relaxation	<0.01	<0.01
25	Zinc (as Zn)	mg/l	5	15	3.4	3.6
26	Anionic Detergents (as MBAS)	mg/l	--	--	<0.2	<0.2
27	Chromium (as Cr ⁺⁶)	mg/l	0.5	No Relaxation	<0.01	<0.01
28	Mineral Oil	mg/l	200	600	<0.01	<0.01
29	Alkalinity	mg/l	0.03	0.2	86	90.0
30	Aluminium as(Al)	mg/l	0.5	2.4	<1.0	<1.0
31	Boron (as B)	mg/l	--	--	<0.1	<0.1
32	Poly Aromatic Hydrocarbon as PAH	mg/l	<0.0001	--	<0.0001	<0.0001
33	Pesticide	µg/l	Absent		Absent	Absent

4.WASTE WATER

Sampling Location:STPW-1:STP (Inlet) STPW-2: STP (Outlet)									
Sl. No	Parameter	Unit	Standards (In land Surface water)	Apr-19		May-19		Jun-19	
				STPW-1	STPW-2	STPW-1	STPW-2	STPW-1	STPW-2
1	Colour & Odour	Hazen	Colorless/Odorless as far as practicable	02 & pungent smell	CL & U/O	<5 & pungent smell	CL & U/O	02 & pungent smell	CL & U/O
2	Suspended Solids	mg/l	100	90	32	92	41	86	38
3	Particulate size of SS		Shall pass 850 micron IS Sieve	< 850	< 850	< 850	< 850	< 850	< 850
4	pH Value	--	5.5-9.0	6.56	7.41	6.65	7.26	6.81	7.12
5	Temperature	°C	Shall not exceed 5°C above the receiving water temperature	34	34	28	28	25	25
6	Oil & Grease(max)	mg/l	10	3.4	ND	2.9	ND	3.4	ND
7	Total Residual Chlorine	mg/l	1	ND	ND	ND	ND	ND	ND
8	Ammonical Nitrogen (as N)	mg/l	50	6.2	0.64	7.1	0.74	7.1	0.94

Annexure-I to Environmental Statement (Form-V) for Bamebari Iron & Manganese Mine for FY 2019-20

Sampling Location:STPW-1:STP (Inlet) STPW-2: STP (Outlet)									
Sl. No	Parameter	Unit	Standards (In land Surface water)	Apr-19		May-19		Jun-19	
				9	Total Kjeldahl Nitrogen(as TKN)	mg/l	100	12.8	2.6	13.2	3.4	12.9	4.2
10	Free ammonia (as NH ₃)	mg/l	5	ND	ND	ND	ND	ND	ND
11	BOD(3 days at 27°C (max)	mg/l	30	36	5.2	32.8	6.1	31.2	6.26
12	Chemical Oxygen Demand as COD	mg/l	250	210	30	188	36	182	40
13	Arsenic as As	mg/l	0.2	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
14	Mercury (Hg)	mg/l	0.01	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
15	Lead as Pb(max)	mg/l	0.1	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
16	Cadmium as Cd (max)	mg/l	2	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
17	Hexavalent Chromium as Cr ⁺⁶	mg/l	0.1	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
18	Total Chromium (Cr)	mg/l	2	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
19	Copper as Cu (max)	mg/l	3	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
20	Zinc as Zn(max)	mg/l	5	0.64	<0.05	0.66	<0.05	0.62	<0.05
21	Selenium (Se) (max)	mg/l	0.05	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
22	Nickel (Ni)	mg/l	3	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
23	Cyanide as CN (max)	mg/l	0.2	ND	ND	ND	ND	ND	ND
24	Fluoride as F (max)	mg/l	2	0.21	0.018	0.26	0.024	0.31	0.029
25	Dissolved Phosphates (P)	mg/l	5	0.32	<0.05	0.44	<0.05	0.28	<0.05
26	Sulphide (S)	mg/l	2	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
27	Phenolic Compounds as C6H5OH (max)	mg/l	1	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
28	Bio-assay test		90% survival of fish after 96 hours in 100% effluent	98% survival of fishes	92% survival of fishes	92% survival of fishes	90% survival of fishes	94% survival of fishes	98% survival of fishes
29	Manganese (Mn)	mg/l	2	0.039	<0.005	0.042	<0.005	0.051	<0.005
30	Iron as Fe (max)	mg/l	3	1.54	0.34	1.58	0.48	1.62	0.56
31	Vanadium (V)	mg/l	0.2	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
32	Nitrate Nitrogen	mg/l	10	4.1	0.54	4.6	0.68	4.8	0.72

Sampling Location:STPW-1:STP (Inlet) STPW-2: STP (Outlet)									
Sl. No	Parameter	Unit	Standards (In land Surface water)	July-19		Aug-19		Sep-19	
				STPW-1	STPW-2	STPW-1	STPW-2	STPW-1	STPW-2
1	Colour & Odour	Hazen	Colorless/Odorless as far as practicable	04 & pungent smell	CL & U/O	05 & pungent smell	CL & U/O	04 & pungent smell	<5 & U/O
2	Suspended Solids	mg/l	100	189	14	71	26	78	30
3	Particulate size of SS		Shall pass 850 micron IS Sieve	< 850	< 850	< 850	< 850	< 850	< 850
4	pH Value	--	5.5-9.0	6.54	7.21	6.78	7.21	6.82	7.24

Annexure-I to Environmental Statement (Form-V) for Bamebari Iron & Manganese Mine for FY 2019-20

Sampling Location:STPW-1:STP (Inlet) STPW-2: STP (Outlet)									
Sl. No	Parameter	Unit	Standards (In land Surface water)	July-19		Aug-19		Sep-19	
5	Temperature	°C	Shall not exceed 5°C above the receiving water temperature	25	25	27	27	26	26
6	Oil & Grease(max)	mg/l	10	ND	ND	3.4	ND	3.1	ND
7	Total Residual Chlorine	mg/l	1	ND	ND	ND	ND	ND	ND
8	Ammonical Nitrogen (as N)	mg/l	50	4.1	ND	7.3	1.3	6.8	1.6
9	Total Kjeldahl Nitrogen(as TKN)	mg/l	100	11.6	1.18	8.1	3.7	8.8	3.2
10	Free ammonia (as NH ₃)	mg/l	5	ND	ND	ND	ND	ND	ND
11	BOD(3 days at 27°C (max)	mg/l	30	30.6	5.8	23.9	5.6	21.6	6.4
12	Chemical Oxygen Demand as COD	mg/l	250	142	18	143	32	138	30.6
13	Arsenic as As	mg/l	0.2	<0.004	<0.004	<0.004	<0.004	<0.001	<0.001
14	Mercury (Hg)	mg/l	0.01	<0.002	<0.002	<0.002	<0.002	<0.001	<0.001
15	Lead as Pb(max)	mg/l	0.1	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
16	Cadmium as Cd (max)	mg/l	2	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
17	Hexavalent Chromium as Cr ⁺⁶	mg/l	0.1	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
18	Total Chromium (Cr)	mg/l	2	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
19	Copper as Cu (max)	mg/l	3	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
20	Zinc as Zn(max)	mg/l	5	0.28	<0.05	0.53	<0.05	0.031	<0.05
21	Selenium (Se) (max)	mg/l	0.05	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
22	Nickel (Ni)	mg/l	3	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
23	Cyanide as CN (max)	mg/l	0.2	ND	ND	ND	ND	ND	ND
24	Fluoride as F (max)	mg/l	2	0.11	0.01	0.34	0.023	0.32	0.011
25	Dissolved Phosphates (P)	mg/l	5	0.28	<0.05	0.37	<0.05	0.41	<0.05
26	Sulphide (S)	mg/l	2	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
27	Phenolic Compounds as C ₆ H ₅ OH (max)	mg/l	1	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
28	Bio-assay test		90% survival of fish after 96 hours in 100% effluent	92% survival of fishes	96% survival of fishes	94% survival of fishes	98% survival of fishes	96% survival of fishes	98% survival of fishes
29	Manganese (Mn)	mg/l	2	0.026	<0.005	0.052	<0.005	0.048	<0.005
30	Iron as Fe (max)	mg/l	3	1.21	0.28	1.72	0.61	1.5	0.74
31	Vanadium (V)	mg/l	0.2	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
32	Nitrate Nitrogen	mg/l	10	2.12	0.52	5.3	0.79	5.1	0.84

Annexure-I to Environmental Statement (Form-V) for Bamebari Iron & Manganese Mine for FY 2019-20

Sampling Location:STPW-1:STP (Inlet) STPW-2: STP (Outlet)									
Sl. No	Parameter	Unit	Standards (In land Surface water)	Oct-19		Nov-19		Dec-19	
				STPW-1	STPW-2	STPW-1	STPW-2	STPW-1	STPW-2
1	Colour & Odour	Hazen	Colorless/Odorless as far as practicable	02 & pungent smell	CL & U/O	<5 & pungent smell	CL & U/O	02 & pungent smell	CL & U/O
2	Suspended Solids	mg/l	100	76	30	70	26	96	52
3	Particulate size of SS		Shall pass 850 micron IS Sieve	< 850	< 850	< 850	< 850	< 850	< 850
4	pH Value	--	5.5-9.0	6.86	7.26	6.94	7.18	6.87	7.19
5	Temperature	°C	Shall not exceed 5°C above the receiving water temperature	26	26	26	26	22	22
6	Oil & Grease(max)	mg/l	10	4.6	ND	4.2	ND	3.6	ND
7	Total Residual Chlorine	mg/l	1	ND	ND	ND	ND	ND	ND
8	Ammonical Nitrogen (as N)	mg/l	50	8.1	1.8	7.2	1.6	8.4	1.4
9	Total Kjeldahl Nitrogen(as TKN)	mg/l	100	10.2	4.2	11.4	4.6	13.6	5.6
10	Free ammonia (as NH ₃)	mg/l	5	ND	ND	ND	ND	ND	ND
11	BOD(3 days at 27°C (max))	mg/l	30	21.2	6.2	20.8	7.1	32.4	6.4
12	Chemical Oxygen Demand as COD	mg/l	250	136	34	142.2	36	196	48
13	Arsenic as As	mg/l	0.2	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
14	Mercury (Hg)	mg/l	0.01	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
15	Lead as Pb(max)	mg/l	0.1	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
16	Cadmium as Cd (max)	mg/l	2	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
17	Hexavalent Chromium as Cr ⁺⁶	mg/l	0.1	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
18	Total Chromium (Cr)	mg/l	2	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
19	Copper as Cu (max)	mg/l	3	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
20	Zinc as Zn(max)	mg/l	5	0.64	<0.05	0.66	<0.05	0.62	<0.05
21	Selenium (Se) (max)	mg/l	0.05	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
22	Nickel (Ni)	mg/l	3	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
23	Cyanide as CN (max)	mg/l	0.2	ND	ND	ND	ND	ND	ND
24	Fluoride as F (max)	mg/l	2	0.38	0.026	0.42	0.028	0.36	0.034
25	Dissolved Phosphates (P)	mg/l	5	0.44	<0.05	0.48	<0.05	0.52	<0.05
26	Sulphide (S)	mg/l	2	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
27	Phenolic Compounds as C6H5OH (max)	mg/l	1	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
28	Bio-assay test		90% survival of fish after 96 hours in 100% effluent	98% survival of fishes	92% survival of fishes	92% survival of fishes	90% survival of fishes	94% survival of fishes	98% survival of fishes
29	Manganese (Mn)	mg/l	2	0.062	<0.005	0.066	<0.005	0.054	<0.005
30	Iron as Fe (max)	mg/l	3	1.86	0.71	1.92	0.77	1.74	0.66
31	Vanadium (V)	mg/l	0.2	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
32	Nitrate Nitrogen	mg/l	10	6.2	0.86	6.6	0.91	5.4	1.11

Annexure-I to Environmental Statement (Form-V) for Bamebari Iron & Manganese Mine for FY 2019-20

Sampling Location:STPW-1:STP (Inlet) STPW-2: STP (Outlet)									
Sl. No	Parameter	Unit	Standards (In land Surface water)	Jan -20		Feb-20		Mar-20	
				STPW-1	STPW-2	STPW-1	STPW-2	STPW-1	STPW-2
1	Colour & Odour	Hazen	Colorless/Odorless as far as practicable	02 & pungent smell	CL & U/O	<5 & pungent smell	CL & U/O	02 & pungent smell	CL & U/O
2	Suspended Solids	mg/l	100	76	30	70	26	96	52
3	Particulate size of SS		Shall pass 850 micron IS Sieve	< 850	< 850	< 850	< 850	< 850	< 850
4	pH Value	--	5.5-9.0	6.86	7.26	6.94	7.18	6.87	7.19
5	Temperature	°C	Shall not exceed 5°C above the receiving water temperature	26	26	26	26	22	22
6	Oil & Grease(max)	mg/l	10	4.6	ND	4.2	ND	3.6	ND
7	Total Residual Chlorine	mg/l	1	ND	ND	ND	ND	ND	ND
8	Ammonical Nitrogen (as N)	mg/l	50	8.1	1.8	7.2	1.6	8.4	1.4
9	Total Kjeldahl Nitrogen(as TKN)	mg/l	100	10.2	4.2	11.4	4.6	13.6	5.6
10	Free ammonia (as NH ₃)	mg/l	5	ND	ND	ND	ND	ND	ND
11	BOD(3 days at 27°C (max)	mg/l	30	21.2	6.2	20.8	7.1	32.4	6.4
12	Chemical Oxygen Demand as COD	mg/l	250	136	34	142.2	36	196	48
13	Arsenic as As	mg/l	0.2	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
14	Mercury (Hg)	mg/l	0.01	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
15	Lead as Pb(max)	mg/l	0.1	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
16	Cadmium as Cd (max)	mg/l	2	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
17	Hexavalent Chromium as Cr ⁺⁶	mg/l	0.1	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
18	Total Chromium (Cr)	mg/l	2	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
19	Copper as Cu (max)	mg/l	3	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
20	Zinc as Zn(max)	mg/l	5	0.64	<0.05	0.66	<0.05	0.62	<0.05
21	Selenium (Se) (max)	mg/l	0.05	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
22	Nickel (Ni)	mg/l	3	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
23	Cyanide as CN (max)	mg/l	0.2	ND	ND	ND	ND	ND	ND
24	Fluoride as F (max)	mg/l	2	0.38	0.026	0.42	0.028	0.36	0.034
25	Dissolved Phosphates (P)	mg/l	5	0.44	<0.05	0.48	<0.05	0.52	<0.05
26	Sulphide (S)	mg/l	2	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
27	Phenolic Compounds as C ₆ H ₅ OH (max)	mg/l	1	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
28	Bio-assay test		90% survival of fish after 96 hours in 100% effluent	98% survival of fishes	92% survival of fishes	92% survival of fishes	90% survival of fishes	94% survival of fishes	98% survival of fishes

Annexure-I to Environmental Statement (Form-V) for Bamebari Iron & Manganese Mine for FY 2019-20

Sampling Location:STPW-1:STP (Inlet) STPW-2: STP (Outlet)									
Sl. No	Parameter	Unit	Standards (In land Surface water)	Jan -20		Feb-20		Mar-20	
29	Manganese (Mn)	mg/l	2	0.062	<0.005	0.066	<0.005	0.054	<0.005
30	Iron as Fe (max)	mg/l	3	1.86	0.71	1.92	0.77	1.74	0.66
31	Vanadium (V)	mg/l	0.2	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
32	Nitrate Nitrogen	mg/l	10	6.2	0.86	6.6	0.91	5.4	1.11

5. OIL SEPARATION PIT

W1: Workshop Water

Sl.	Parameters	Unit	General Standards for discharge of Environmental Pollutants Part A- Effluents	Analysis Report											
				Apr-19	May-19	Jun-19	Jul-19	Aug-19	Sep-19	Oct-19	Nov-19	Dec-19	Jan-20	Feb-20	Mar-20
1	Colour	Hazen	5	CL	CL	CL	CL	CL	CL	CL	CL	CL	CL	CL	CL
2	Odour	-	Unobjectionable	U/O	U/O	U/O	U/O	U/O	U/O	U/O	U/O	U/O	U/O	U/O	U/O
3	pH at 25 degree C	-	5.5-9.0	7.44	7.48	7.46	7.48	7.42	7.48	7.44	7.48	7.46	7.41	7.46	7.52
4	Total Dissolved Solids	mg/l	-	148	156	156	148	152	166	148	156	156	148	158	142
5	Copper as Cu	mg/l	3.0	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
6	Fluoride as F	mg/l	2.0	0.031	0.042	0.038	0.026	0.028	0.031	0.031	0.042	0.038	0.031	0.034	0.03
7	Total Residual Chlorine	mg/l	1.0	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
8	Iron as Fe	mg/l	3.0	0.64	0.68	0.68	0.66	0.58	0.66	0.64	0.68	0.68	0.62	0.58	0.56
9	Manganese as Mn	mg/l	2.0	1.26	1.32	1.41	1.26	1.18	1.12	1.26	1.32	1.41	1.32	1.38	1.32
10	Nitrate as NO3	mg/l	10.0	3.78	4.2	4.42	1.4	3.64	4.1	3.78	4.2	4.42	4.36	4.28	4.18
11	Phenolic Compounds as C6H5OH	mg/l	1.0	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
12	Selenium as Se	mg/l	0.05	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
13	Cadmium as Cd	mg/l	2.0	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
14	Cyanide as CN	mg/l	0.2	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
15	Lead as Pb	mg/l	0.1	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
16	Mercury as Hg	mg/l	0.01	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
17	Nickel as Ni	mg/l	3.0	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
18	Arsenic as As	mg/l	0.2	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004
19	Total Chromium as Cr	mg/l	2.0	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
20	Zinc as Zn	mg/l	5.0	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
21	Hexavalent Chromium as Cr ⁺⁶	mg/l	0.1	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
22	Vanadium as V	mg/l	0.2	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
23	Total Suspended Solids	mg/l	100	48	52	56	52.8	44.2	48	48	52	56	52	58	52
24	Temperature	0C	shall not exceed 5°C above the receiving water temperature	26	26	26	28	28	26	26	26	26	25	32	28
25	Dissolved Oxygen	mg/l	-	5.6	6.2	6.4	6.6	6.8	6.6	5.6	6.2	6.4	6.6	6.8	6.6
26	BOD at 27°C for 3 days	mg/l	30	<1.8	<1.8	<1.8	<1.8	<1.8	<1.8	<1.8	<1.8	<1.8	<1.8	<1.8	<1.8
27	COD	mg/l	250	26	32	32	30	32	34	26	32	32	30	32	34
28	Oil & Grease	mg/l	10	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
29	Ammonical Nitrogen as N	mg/l	50	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND

Annexure-I to Environmental Statement (Form-V) for Bamebari Iron & Manganese Mine for FY 2019-20

Sl.	Parameters	Unit	General Standards for discharge of Environmental Pollutants Part A- Effluents	Analysis Report											
				Apr-19	May-19	Jun-19	Jul-19	Aug-19	Sep-19	Oct-19	Nov-19	Dec-19	Jan-20	Feb-20	Mar-20
30	Total Kjedadl Nitrogen as N	mg/l	100	1.8	2.4	2.4	2.6	3.2	2.6	1.8	2.4	2.4	2.6	3.2	2.6
31	Sulphide as S	mg/l	2.0	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
32	Free Ammonia as NH ₃	mg/l	5.0	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
33	Particulate Size of Suspended Solids	mg/l	850 µm IS Sieve	Passes through 850 mm IS Sieve	Passes through 850 mm IS Sieve	Passes through 850 mm IS Sieve	Passes through 850 mm IS Sieve	Passes through 850 mm IS Sieve	Passes through 850 mm IS Sieve	Passes through 850 mm IS Sieve	Passes through 850 mm IS Sieve	Passes through 850 mm IS Sieve	Passes through 850 mm IS Sieve	Passes through 850 mm IS Sieve	Passes through 850 mm IS Sieve
34	Bio-assay	mg/l	90% survival in 100% effluent	90% survival in 100% effluent	90% survival in 100% effluent	94% survival in 100% effluent	96% survival in 100% effluent	98% survival in 100% effluent	92% survival in 100% effluent	90% survival in 100% effluent	90% survival in 100% effluent	94% survival in 100% effluent	96% survival in 100% effluent	98% survival in 100% effluent	92% survival in 100% effluent
35	Dissolved Phosphates as PO ₄	mg/l	5.0	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05

1.AAQ MONITORING (CORE ZONE)

AAQ1: Bamebari Camp

Monthly Average	PM ₁₀ (µg/m ³)	PM _{2.5} (µg/m ³)	SO ₂ (µg/m ³)	NO _x (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)	C ₆ H ₆ (µg/m ³)	BaP (ng/m ³)	Mn (µg/m ³)
Apr-19	49.89	28.11	6.98	13.24	6.83	0.47	22.93	< 0.001	< 0.01	< 0.001	< 0.001	< 0.002	< 0.001
May-19	53.02	28.03	7.43	14.39	7.24	0.59	27.90	< 0.001	< 0.01	< 0.001	< 0.001	< 0.002	< 0.001
Jun-19	54.47	31.41	8.40	16.96	8.13	0.57	30.62	< 0.001	< 0.01	< 0.001	< 0.001	< 0.002	< 0.001
Jul-19	54.37	24.56	8.10	16.92	8.32	0.42	27.64	< 0.001	< 0.01	< 0.001	< 0.001	< 0.002	< 0.001
Aug-19	44.07	23.11	7.98	12.84	8.14	0.39	25.08	< 0.001	< 0.01	< 0.001	< 0.001	< 0.002	< 0.001
Sep-19	28.31	15.86	4.86	11.68	6.16	0.25	21.00	< 0.001	< 0.01	< 0.001	< 0.001	< 0.002	< 0.001
Oct-19	47.39	22.91	4.39	10.02	5.36	0.22	26.99	< 0.001	< 0.01	< 0.001	< 0.001	< 0.002	< 0.001
Nov-19	49.78	29.87	5.73	10.24	6.58	0.28	24.11	< 0.001	< 0.01	< 0.001	< 0.001	< 0.002	< 0.001
Dec-19	58.51	35.11	7.10	15.99	8.24	0.44	25.91	< 0.001	< 0.01	< 0.001	< 0.001	< 0.002	< 0.001
Jan-20	61.69	37.01	7.12	15.79	8.24	0.53	27.71	< 0.001	< 0.01	< 0.001	< 0.001	< 0.002	< 0.001
Feb-20	62.38	37.43	8.18	16.73	8.33	0.56	32.05	< 0.001	< 0.01	< 0.001	< 0.001	< 0.002	< 0.001
Mar-20	57.70	34.62	9.86	14.29	7.73	0.37	24.86	< 0.001	< 0.01	< 0.001	< 0.001	< 0.002	< 0.001

Annexure-I to Environmental Statement (Form-V) for Bamebari Iron & Manganese Mine for FY 2019-20

AAQ2: Mines Pit

Monthly Average	PM ₁₀ (µg/m ³)	PM _{2.5} (µg/m ³)	SO ₂ (µg/m ³)	NO _x (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)	C ₆ H ₆ (µg/m ³)	BaP (ng/m ³)	Mn µg/m ³
Apr-19	67.60	35.75	10.91	14.45	6.68	0.65	22.83	< 0.001	< 0.01	< 0.001	< 0.001	< 0.002	< 0.001
May-19	77.09	35.26	11.72	16.52	7.02	0.64	24.48	< 0.001	< 0.01	< 0.001	< 0.001	< 0.002	< 0.001
Jun-19	82.09	33.28	12.13	16.16	7.66	0.76	24.20	< 0.001	< 0.01	< 0.001	< 0.001	< 0.002	< 0.001
Jul-19	51.71	24.31	13.77	17.96	8.62	0.76	28.78	< 0.001	< 0.01	< 0.001	< 0.001	< 0.002	< 0.001
Aug-19	49.86	27.81	8.13	13.12	8.58	0.59	26.04	< 0.001	< 0.01	< 0.001	< 0.001	< 0.002	< 0.001
Sep-19	31.88	17.85	6.30	11.41	6.31	0.49	21.73	< 0.001	< 0.01	< 0.001	< 0.001	< 0.002	< 0.001
Oct-19	51.1	25.0	4.40	11.2	8.5	0.3	24.5	< 0.001	< 0.01	< 0.001	< 0.001	< 0.002	< 0.001
Nov-19	51.5	30.9	5.10	10.5	9.0	0.3	24.2	< 0.001	< 0.01	< 0.001	< 0.001	< 0.002	< 0.001
Dec-19	64.96	38.97	15.16	20.82	7.70	0.71	24.53	< 0.001	< 0.01	< 0.001	< 0.001	< 0.002	< 0.001
Jan-20	67.16	40.29	15.98	22.43	8.70	0.69	25.14	< 0.001	< 0.01	< 0.001	< 0.001	< 0.002	< 0.001
Feb-20	67.25	40.35	17.31	22.83	9.49	0.77	26.24	< 0.001	< 0.01	< 0.001	< 0.001	< 0.002	< 0.001
Mar-20	62.89	37.73	14.60	19.49	8.34	0.74	25.80	< 0.001	< 0.01	< 0.001	< 0.001	< 0.002	< 0.001

AAQ3: Weigh Bridge

Monthly Average	PM ₁₀ (µg/m ³)	PM _{2.5} (µg/m ³)	SO ₂ (µg/m ³)	NO _x (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)	C ₆ H ₆ (µg/m ³)	BaP (ng/m ³)	Mn µg/m ³
Apr-19	67.46	41.94	6.68	15.35	5.00	0.58	23.94	< 0.001	< 0.01	< 0.001	< 0.001	< 0.002	< 0.001
May-19	78.27	42.93	7.44	18.01	5.31	0.64	27.12	< 0.001	< 0.01	< 0.001	< 0.001	< 0.002	< 0.001
Jun-19	70.57	35.41	6.94	17.08	6.54	0.68	24.08	< 0.001	< 0.01	< 0.001	< 0.001	< 0.002	< 0.001
Jul-19	46.00	20.09	8.70	20.36	8.19	0.83	26.90	< 0.001	< 0.01	< 0.001	< 0.001	< 0.002	< 0.001
Aug-19	46.59	26.14	8.50	11.84	8.03	0.64	27.07	< 0.001	< 0.01	< 0.001	< 0.001	< 0.002	< 0.001
Sep-19	34.80	19.50	4.60	9.20	8.40	0.41	21.20	< 0.001	< 0.01	< 0.001	< 0.001	< 0.002	< 0.001
Oct-19	55.97	28.08	7.43	12.32	6.43	0.30	23.88	< 0.001	< 0.01	< 0.001	< 0.001	< 0.002	< 0.001
Nov-19	51.80	31.08	7.53	11.90	6.16	0.32	23.27	< 0.001	< 0.01	< 0.001	< 0.001	< 0.002	< 0.001
Dec-19	63.58	38.15	8.01	18.09	7.22	0.62	27.06	< 0.001	< 0.01	< 0.001	< 0.001	< 0.002	< 0.001
Jan-20	71.47	42.88	8.73	18.46	7.62	0.66	27.32	< 0.001	< 0.01	< 0.001	< 0.001	< 0.002	< 0.001
Feb-20	64.53	38.72	8.75	17.30	7.96	0.70	23.84	< 0.001	< 0.01	< 0.001	< 0.001	< 0.002	< 0.001
Mar-20	64.26	38.55	9.80	37.48	7.66	0.60	25.73	< 0.001	< 0.01	< 0.001	< 0.001	< 0.002	< 0.001

Annexure-I to Environmental Statement (Form-V) for Bamebari Iron & Manganese Mine for FY 2019-20

AAQ MONITORING (BUFFER ZONE)

AMBIENT AIR QUALITY MONITORING REPORT (BUFFER ZONE)								
	Sampling Location	NAAQ Standard	Apr-19	May-19	Jun-19	Jul-19	Aug-19	Sep-19
BZ-1	Jaganathpur		Analysis Result					
Parameters	Method of Measurement							
PM ₁₀	Gravimetric method	100(µg/m ³)	48.2	54.8	58.8	51.8	45.8	30.6
PM _{2.5}	Gravimetric method	60 (µg/m ³)	26.99	30.68	36.2	30.2	22.60	17.14
SO ₂	Improved West Gaeke method.	80 (µg/m ³)	5.3	6.1	7.4	8.2	8.1	4.8
NO _x	Jacob & Hochhelser modified (Na-Arsenite) method	80(µg/m ³)	12.2	12.4	10.2	11.6	10.8	12.2
CO	NDIR Spectroscopy method	4(mg/m ³)	0.56	0.54	0.61	0.66	6.4	0.44
O ₃	Chemical Method	100 (µg/m ³)	<4.0	<4.0	<4.0	<4.0	<4.0	<4.0
NH ₃	Indo Phenol Blue Method	400 (µg/m ³)	<20.0	<20.0	<20.0	<20	25.8	<20
As	AAS Method	6ng/m ³	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Ni	AAS Method	20µg/m ³	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Pb	AAS Method	1µg/m ³	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
C ₆ H ₆	Gas Chromatography	5µg/m ³	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Bap	Gas Chromatography	1ng/m ³	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
HC	GC Method		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
BZ-2	Bandhubaria	NAAQ Standard	Apr-19	May-19	Jun-19	Jul-19	Aug-19	Sep-19
Parameters	Method of Measurement							
PM ₁₀	Gravimetric method	100(µg/m ³)	53.6	52.6	51.2	52.6	45.8	38.2
PM _{2.5}	Gravimetric method	60 (µg/m ³)	28.43	31.36	30.6	30.8	29.4	14.9
SO ₂	Improved West Gaeke method.	80 (µg/m ³)	8.6	8.1	7.2	8.6	8.1	5.2
NO _x	Jacob & Hochhelser modified (Na-Arsenite) method	80(µg/m ³)	11.4	13.4	11.4	10.8	13.6	10.6
CO	NDIR Spectroscopy method	4(mg/m ³)	0.64	0.63	0.66	0.72	0.64	0.48
O ₃	Chemical Method	100 (µg/m ³)	<4.0	<4.0	<4.0	<4.0	<4.0	<4.0
NH ₃	Indo Phenol Blue Method	400 (µg/m ³)	<20.0	<20.0	<20.0	<20	26.6	<20
As	AAS Method	6ng/m ³	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Ni	AAS Method	20µg/m ³	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Pb	AAS Method	1µg/m ³	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
C ₆ H ₆	Gas Chromatography	5µg/m ³	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Bap	Gas Chromatography	1ng/m ³	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
HC	GC Method		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001

Annexure-I to Environmental Statement (Form-V) for Bamebari Iron & Manganese Mine for FY 2019-20

AMBIENT AIR QUALITY MONITORING REPORT (BUFFER ZONE)

Parameters	Sampling Location	NAAQ Standard	Apr-19	May-19	Jun-19	Jul-19	Aug-19	Sep-19
	Method of Measurement		Analysis Result					
BZ-1	Jaganathpur							
PM₁₀	Gravimetric method	100(µg/m³)	48.2	54.8	58.8	51.8	45.8	30.6
PM_{2.5}	Gravimetric method	60 (µg/m³)	26.99	30.68	36.2	30.2	22.60	17.14
SO₂	Improved West Gaeke method.	80 (µg/m³)	5.3	6.1	7.4	8.2	8.1	4.8
NO_x	Jacob & Hochhelser modified (Na-Arsenite) method	80(µg/m³)	12.2	12.4	10.2	11.6	10.8	12.2
CO	NDIR Spectroscopy method	4(mg/m³)	0.56	0.54	0.61	0.66	6.4	0.44
O₃	Chemical Method	100 (µg/m³)	<4.0	<4.0	<4.0	<4.0	<4.0	<4.0
NH₃	Indo Phenol Blue Method	400 (µg/m³)	<20.0	<20.0	<20.0	<20	25.8	<20
As	AAS Method	6ng/m³	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Ni	AAS Method	20µg/m³	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Pb	AAS Method	1µg/m³	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
C₆H₆	Gas Chromatography	5µg/m³	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Bap	Gas Chromatography	1ng/m³	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
HC	GC Method		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
BZ-2	Bandhubaria		Apr-19	May-19	Jun-19	Jul-19	Aug-19	Sep-19
Parameters	Method of Measurement	NAAQ Standard						
PM₁₀	Gravimetric method	100(µg/m³)	53.6	52.6	51.2	52.6	45.8	38.2
PM_{2.5}	Gravimetric method	60 (µg/m³)	28.43	31.36	30.6	30.8	29.4	14.9
SO₂	Improved West Gaeke method.	80 (µg/m³)	8.6	8.1	7.2	8.6	8.1	5.2
NO_x	Jacob & Hochhelser modified (Na-Arsenite) method	80(µg/m³)	11.4	13.4	11.4	10.8	13.6	10.6
CO	NDIR Spectroscopy method	4(mg/m³)	0.64	0.63	0.66	0.72	0.64	0.48
O₃	Chemical Method	100 (µg/m³)	<4.0	<4.0	<4.0	<4.0	<4.0	<4.0
NH₃	Indo Phenol Blue Method	400 (µg/m³)	<20.0	<20.0	<20.0	<20	26.6	<20
As	AAS Method	6ng/m³	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Ni	AAS Method	20µg/m³	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Pb	AAS Method	1µg/m³	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
C₆H₆	Gas Chromatography	5µg/m³	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Bap	Gas Chromatography	1ng/m³	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
HC	GC Method		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001

Annexure-I to Environmental Statement (Form-V) for Bamebari Iron & Manganese Mine for FY 2019-20

AMBIENT AIR QUALITY MONITORING REPORT (BUFFER ZONE)

Parameters	Sampling Location	NAAQ Standard	Apr-19	May-19	Jun-19	Jul-19	Aug-19	Sep-19
	Method of Measurement		Analysis Result					
BZ-1	Jaganathpur							
PM₁₀	Gravimetric method	100(µg/m³)	48.2	54.8	58.8	51.8	45.8	30.6
PM_{2.5}	Gravimetric method	60 (µg/m³)	26.99	30.68	36.2	30.2	22.60	17.14
SO₂	Improved West Gaeke method.	80 (µg/m³)	5.3	6.1	7.4	8.2	8.1	4.8
NO_x	Jacob & Hochhelser modified (Na-Arsenite) method	80(µg/m³)	12.2	12.4	10.2	11.6	10.8	12.2
CO	NDIR Spectroscopy method	4(mg/m³)	0.56	0.54	0.61	0.66	6.4	0.44
O₃	Chemical Method	100 (µg/m³)	<4.0	<4.0	<4.0	<4.0	<4.0	<4.0
NH₃	Indo Phenol Blue Method	400 (µg/m³)	<20.0	<20.0	<20.0	<20	25.8	<20
As	AAS Method	6ng/m³	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Ni	AAS Method	20µg/m³	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Pb	AAS Method	1µg/m³	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
C₆H₆	Gas Chromatography	5µg/m³	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Bap	Gas Chromatography	1ng/m³	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
HC	GC Method		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
BZ-2	Bandhubaria		Apr-19	May-19	Jun-19	Jul-19	Aug-19	Sep-19
Parameters	Method of Measurement	NAAQ Standard						
PM₁₀	Gravimetric method	100(µg/m³)	53.6	52.6	51.2	52.6	45.8	38.2
PM_{2.5}	Gravimetric method	60 (µg/m³)	28.43	31.36	30.6	30.8	29.4	14.9
SO₂	Improved West Gaeke method.	80 (µg/m³)	8.6	8.1	7.2	8.6	8.1	5.2
NO_x	Jacob & Hochhelser modified (Na-Arsenite) method	80(µg/m³)	11.4	13.4	11.4	10.8	13.6	10.6
CO	NDIR Spectroscopy method	4(mg/m³)	0.64	0.63	0.66	0.72	0.64	0.48
O₃	Chemical Method	100 (µg/m³)	<4.0	<4.0	<4.0	<4.0	<4.0	<4.0
NH₃	Indo Phenol Blue Method	400 (µg/m³)	<20.0	<20.0	<20.0	<20	26.6	<20
As	AAS Method	6ng/m³	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Ni	AAS Method	20µg/m³	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Pb	AAS Method	1µg/m³	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
C₆H₆	Gas Chromatography	5µg/m³	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Bap	Gas Chromatography	1ng/m³	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
HC	GC Method		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001

BZ-3	Raikara	NAAQ Standard	Apr-19	May-19	Jun-19	Jul-19	Aug-19	Sep-19
-------------	----------------	----------------------	---------------	---------------	---------------	---------------	---------------	---------------

Annexure-I to Environmental Statement (Form-V) for Bamebari Iron & Manganese Mine for FY 2019-20

AMBIENT AIR QUALITY MONITORING REPORT (BUFFER ZONE)

Parameters	Sampling Location	NAAQ Standard	Apr-19	May-19	Jun-19	Jul-19	Aug-19	Sep-19
	Method of Measurement		Analysis Result					
BZ-1	Jaganathpur							
PM₁₀	Gravimetric method	100(µg/m³)	48.2	54.8	58.8	51.8	45.8	30.6
PM_{2.5}	Gravimetric method	60 (µg/m³)	26.99	30.68	36.2	30.2	22.60	17.14
SO₂	Improved West Gaeke method.	80 (µg/m³)	5.3	6.1	7.4	8.2	8.1	4.8
NO_x	Jacob & Hochhelser modified (Na-Arsenite) method	80(µg/m³)	12.2	12.4	10.2	11.6	10.8	12.2
CO	NDIR Spectroscopy method	4(mg/m³)	0.56	0.54	0.61	0.66	6.4	0.44
O₃	Chemical Method	100 (µg/m³)	<4.0	<4.0	<4.0	<4.0	<4.0	<4.0
NH₃	Indo Phenol Blue Method	400 (µg/m³)	<20.0	<20.0	<20.0	<20	25.8	<20
As	AAS Method	6ng/m³	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Ni	AAS Method	20µg/m³	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Pb	AAS Method	1µg/m³	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
C₆H₆	Gas Chromatography	5µg/m³	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Bap	Gas Chromatography	1ng/m³	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
HC	GC Method		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
BZ-2	Bandhubaria		Apr-19	May-19	Jun-19	Jul-19	Aug-19	Sep-19
Parameters	Method of Measurement	NAAQ Standard						
PM₁₀	Gravimetric method	100(µg/m³)	53.6	52.6	51.2	52.6	45.8	38.2
PM_{2.5}	Gravimetric method	60 (µg/m³)	28.43	31.36	30.6	30.8	29.4	14.9
SO₂	Improved West Gaeke method.	80 (µg/m³)	8.6	8.1	7.2	8.6	8.1	5.2
NO_x	Jacob & Hochhelser modified (Na-Arsenite) method	80(µg/m³)	11.4	13.4	11.4	10.8	13.6	10.6
CO	NDIR Spectroscopy method	4(mg/m³)	0.64	0.63	0.66	0.72	0.64	0.48
O₃	Chemical Method	100 (µg/m³)	<4.0	<4.0	<4.0	<4.0	<4.0	<4.0
NH₃	Indo Phenol Blue Method	400 (µg/m³)	<20.0	<20.0	<20.0	<20	26.6	<20
As	AAS Method	6ng/m³	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Ni	AAS Method	20µg/m³	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Pb	AAS Method	1µg/m³	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
C₆H₆	Gas Chromatography	5µg/m³	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Bap	Gas Chromatography	1ng/m³	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
HC	GC Method		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Parameters	Method of Measurement							
PM₁₀	Gravimetric method	100(µg/m³)	54.2	58.45	60.2	51.56	50.2	26.6
PM_{2.5}	Gravimetric method	60 (µg/m³)	29.45	32.78	38.8	30.8	29.4	14.9

Annexure-I to Environmental Statement (Form-V) for Bamebari Iron & Manganese Mine for FY 2019-20

AMBIENT AIR QUALITY MONITORING REPORT (BUFFER ZONE)

Parameters	Sampling Location	NAAQ Standard	Apr-19	May-19	Jun-19	Jul-19	Aug-19	Sep-19
	Method of Measurement		Analysis Result					
BZ-1	Jaganathpur							
PM₁₀	Gravimetric method	100(µg/m³)	48.2	54.8	58.8	51.8	45.8	30.6
PM_{2.5}	Gravimetric method	60 (µg/m³)	26.99	30.68	36.2	30.2	22.60	17.14
SO₂	Improved West Gaeke method.	80 (µg/m³)	5.3	6.1	7.4	8.2	8.1	4.8
NO_x	Jacob & Hochhelser modified (Na-Arsenite) method	80(µg/m³)	12.2	12.4	10.2	11.6	10.8	12.2
CO	NDIR Spectroscopy method	4(mg/m³)	0.56	0.54	0.61	0.66	6.4	0.44
O₃	Chemical Method	100 (µg/m³)	<4.0	<4.0	<4.0	<4.0	<4.0	<4.0
NH₃	Indo Phenol Blue Method	400 (µg/m³)	<20.0	<20.0	<20.0	<20	25.8	<20
As	AAS Method	6ng/m³	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Ni	AAS Method	20µg/m³	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Pb	AAS Method	1µg/m³	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
C₆H₆	Gas Chromatography	5µg/m³	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Bap	Gas Chromatography	1ng/m³	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
HC	GC Method		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
BZ-2	Bandhubaria		Apr-19	May-19	Jun-19	Jul-19	Aug-19	Sep-19
Parameters	Method of Measurement	NAAQ Standard						
PM₁₀	Gravimetric method	100(µg/m³)	53.6	52.6	51.2	52.6	45.8	38.2
PM_{2.5}	Gravimetric method	60 (µg/m³)	28.43	31.36	30.6	30.8	29.4	14.9
SO₂	Improved West Gaeke method.	80 (µg/m³)	8.6	8.1	7.2	8.6	8.1	5.2
NO_x	Jacob & Hochhelser modified (Na-Arsenite) method	80(µg/m³)	11.4	13.4	11.4	10.8	13.6	10.6
CO	NDIR Spectroscopy method	4(mg/m³)	0.64	0.63	0.66	0.72	0.64	0.48
O₃	Chemical Method	100 (µg/m³)	<4.0	<4.0	<4.0	<4.0	<4.0	<4.0
NH₃	Indo Phenol Blue Method	400 (µg/m³)	<20.0	<20.0	<20.0	<20	26.6	<20
As	AAS Method	6ng/m³	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Ni	AAS Method	20µg/m³	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Pb	AAS Method	1µg/m³	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
C₆H₆	Gas Chromatography	5µg/m³	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Bap	Gas Chromatography	1ng/m³	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
HC	GC Method		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
SO₂	Improved West Gaeke method.	80 (µg/m³)	7.8	8.3	8.4	9.2	8.6	4.8
NO_x	Jacob & Hochhelser modified (Na-Arsenite) method	80(µg/m³)	12.2	11.3	11.2	10.6	13.8	9.8

Annexure-I to Environmental Statement (Form-V) for Bamebari Iron & Manganese Mine for FY 2019-20

AMBIENT AIR QUALITY MONITORING REPORT (BUFFER ZONE)

Parameters	Sampling Location	NAAQ Standard	Apr-19	May-19	Jun-19	Jul-19	Aug-19	Sep-19
	Method of Measurement		Analysis Result					
BZ-1	Jaganathpur							
PM₁₀	Gravimetric method	100(µg/m³)	48.2	54.8	58.8	51.8	45.8	30.6
PM_{2.5}	Gravimetric method	60 (µg/m³)	26.99	30.68	36.2	30.2	22.60	17.14
SO₂	Improved West Gaeke method.	80 (µg/m³)	5.3	6.1	7.4	8.2	8.1	4.8
NO_x	Jacob & Hochhelser modified (Na-Arsenite) method	80(µg/m³)	12.2	12.4	10.2	11.6	10.8	12.2
CO	NDIR Spectroscopy method	4(mg/m³)	0.56	0.54	0.61	0.66	6.4	0.44
O₃	Chemical Method	100 (µg/m³)	<4.0	<4.0	<4.0	<4.0	<4.0	<4.0
NH₃	Indo Phenol Blue Method	400 (µg/m³)	<20.0	<20.0	<20.0	<20	25.8	<20
As	AAS Method	6ng/m³	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Ni	AAS Method	20µg/m³	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Pb	AAS Method	1µg/m³	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
C₆H₆	Gas Chromatography	5µg/m³	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Bap	Gas Chromatography	1ng/m³	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
HC	GC Method		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
BZ-2	Bandhubaria		Apr-19	May-19	Jun-19	Jul-19	Aug-19	Sep-19
Parameters	Method of Measurement	NAAQ Standard						
PM₁₀	Gravimetric method	100(µg/m³)	53.6	52.6	51.2	52.6	45.8	38.2
PM_{2.5}	Gravimetric method	60 (µg/m³)	28.43	31.36	30.6	30.8	29.4	14.9
SO₂	Improved West Gaeke method.	80 (µg/m³)	8.6	8.1	7.2	8.6	8.1	5.2
NO_x	Jacob & Hochhelser modified (Na-Arsenite) method	80(µg/m³)	11.4	13.4	11.4	10.8	13.6	10.6
CO	NDIR Spectroscopy method	4(mg/m³)	0.64	0.63	0.66	0.72	0.64	0.48
O₃	Chemical Method	100 (µg/m³)	<4.0	<4.0	<4.0	<4.0	<4.0	<4.0
NH₃	Indo Phenol Blue Method	400 (µg/m³)	<20.0	<20.0	<20.0	<20	26.6	<20
As	AAS Method	6ng/m³	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Ni	AAS Method	20µg/m³	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Pb	AAS Method	1µg/m³	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
C₆H₆	Gas Chromatography	5µg/m³	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Bap	Gas Chromatography	1ng/m³	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
HC	GC Method		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
CO	NDIR Spectroscopy method	4(mg/m³)	0.62	0.57	0.71	0.74	0.59	0.49
O₃	Chemical Method	100 (µg/m³)	<4.0	<4.0	<4.0	<4.0	<4.0	<4.0
NH₃	Indo Phenol Blue Method	400 (µg/m³)	<20.0	<20.0	<20.0	<20	27.2	<20

Annexure-I to Environmental Statement (Form-V) for Bamebari Iron & Manganese Mine for FY 2019-20

AMBIENT AIR QUALITY MONITORING REPORT (BUFFER ZONE)

Parameters	Sampling Location	NAAQ Standard	Apr-19	May-19	Jun-19	Jul-19	Aug-19	Sep-19
	Method of Measurement		Analysis Result					
BZ-1	Jaganathpur							
PM₁₀	Gravimetric method	100(µg/m³)	48.2	54.8	58.8	51.8	45.8	30.6
PM_{2.5}	Gravimetric method	60 (µg/m³)	26.99	30.68	36.2	30.2	22.60	17.14
SO₂	Improved West Gaeke method.	80 (µg/m³)	5.3	6.1	7.4	8.2	8.1	4.8
NO_x	Jacob & Hochhelser modified (Na-Arsenite) method	80(µg/m³)	12.2	12.4	10.2	11.6	10.8	12.2
CO	NDIR Spectroscopy method	4(mg/m³)	0.56	0.54	0.61	0.66	6.4	0.44
O₃	Chemical Method	100 (µg/m³)	<4.0	<4.0	<4.0	<4.0	<4.0	<4.0
NH₃	Indo Phenol Blue Method	400 (µg/m³)	<20.0	<20.0	<20.0	<20	25.8	<20
As	AAS Method	6ng/m³	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Ni	AAS Method	20µg/m³	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Pb	AAS Method	1µg/m³	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
C₆H₆	Gas Chromatography	5µg/m³	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Bap	Gas Chromatography	1ng/m³	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
HC	GC Method		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
BZ-2	Bandhubaria		Apr-19	May-19	Jun-19	Jul-19	Aug-19	Sep-19
Parameters	Method of Measurement	NAAQ Standard						
PM₁₀	Gravimetric method	100(µg/m³)	53.6	52.6	51.2	52.6	45.8	38.2
PM_{2.5}	Gravimetric method	60 (µg/m³)	28.43	31.36	30.6	30.8	29.4	14.9
SO₂	Improved West Gaeke method.	80 (µg/m³)	8.6	8.1	7.2	8.6	8.1	5.2
NO_x	Jacob & Hochhelser modified (Na-Arsenite) method	80(µg/m³)	11.4	13.4	11.4	10.8	13.6	10.6
CO	NDIR Spectroscopy method	4(mg/m³)	0.64	0.63	0.66	0.72	0.64	0.48
O₃	Chemical Method	100 (µg/m³)	<4.0	<4.0	<4.0	<4.0	<4.0	<4.0
NH₃	Indo Phenol Blue Method	400 (µg/m³)	<20.0	<20.0	<20.0	<20	26.6	<20
As	AAS Method	6ng/m³	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Ni	AAS Method	20µg/m³	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Pb	AAS Method	1µg/m³	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
C₆H₆	Gas Chromatography	5µg/m³	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Bap	Gas Chromatography	1ng/m³	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
HC	GC Method		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
As	AAS Method	6ng/m³	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Ni	AAS Method	20µg/m³	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Pb	AAS Method	1µg/m³	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001

Annexure-I to Environmental Statement (Form-V) for Bamebari Iron & Manganese Mine for FY 2019-20

AMBIENT AIR QUALITY MONITORING REPORT (BUFFER ZONE)

Parameters	Sampling Location	NAAQ Standard	Apr-19	May-19	Jun-19	Jul-19	Aug-19	Sep-19
			Analysis Result					
BZ-1	Jaganathpur							
PM₁₀	Gravimetric method	100(µg/m³)	48.2	54.8	58.8	51.8	45.8	30.6
PM_{2.5}	Gravimetric method	60 (µg/m³)	26.99	30.68	36.2	30.2	22.60	17.14
SO₂	Improved West Gaeke method.	80 (µg/m³)	5.3	6.1	7.4	8.2	8.1	4.8
NO_x	Jacob & Hochhelser modified (Na-Arsenite) method	80(µg/m³)	12.2	12.4	10.2	11.6	10.8	12.2
CO	NDIR Spectroscopy method	4(mg/m³)	0.56	0.54	0.61	0.66	6.4	0.44
O₃	Chemical Method	100 (µg/m³)	<4.0	<4.0	<4.0	<4.0	<4.0	<4.0
NH₃	Indo Phenol Blue Method	400 (µg/m³)	<20.0	<20.0	<20.0	<20	25.8	<20
As	AAS Method	6ng/m³	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Ni	AAS Method	20µg/m³	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Pb	AAS Method	1µg/m³	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
C₆H₆	Gas Chromatography	5µg/m³	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Bap	Gas Chromatography	1ng/m³	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
HC	GC Method		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
BZ-2	Bandhubaria		Apr-19	May-19	Jun-19	Jul-19	Aug-19	Sep-19
Parameters	Method of Measurement	NAAQ Standard						
PM₁₀	Gravimetric method	100(µg/m³)	53.6	52.6	51.2	52.6	45.8	38.2
PM_{2.5}	Gravimetric method	60 (µg/m³)	28.43	31.36	30.6	30.8	29.4	14.9
SO₂	Improved West Gaeke method.	80 (µg/m³)	8.6	8.1	7.2	8.6	8.1	5.2
NO_x	Jacob & Hochhelser modified (Na-Arsenite) method	80(µg/m³)	11.4	13.4	11.4	10.8	13.6	10.6
CO	NDIR Spectroscopy method	4(mg/m³)	0.64	0.63	0.66	0.72	0.64	0.48
O₃	Chemical Method	100 (µg/m³)	<4.0	<4.0	<4.0	<4.0	<4.0	<4.0
NH₃	Indo Phenol Blue Method	400 (µg/m³)	<20.0	<20.0	<20.0	<20	26.6	<20
As	AAS Method	6ng/m³	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Ni	AAS Method	20µg/m³	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Pb	AAS Method	1µg/m³	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
C₆H₆	Gas Chromatography	5µg/m³	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Bap	Gas Chromatography	1ng/m³	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
HC	GC Method		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
C₆H₆	Gas Chromatography	5µg/m³	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Bap	Gas Chromatography	1ng/m³	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
HC	GC Method		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001

Annexure-I to Environmental Statement (Form-V) for Bamebari Iron & Manganese Mine for FY 2019-20

AMBIENT AIR QUALITY MONITORING REPORT (BUFFER ZONE)								
	Sampling Location	NAAQ Standard-2009	OCT-19	NOV-19	DEC-19	JAN-20	FEB-20	MAR-20.
BZ-1	Jaganathpur		Analysis Result					
Parameters	Method of Measurement							
PM ₁₀	Gravimetric method	100(µg/m ³)	48.2	54.8	52.8	56.6	60.2	56
PM _{2.5}	Gravimetric method	60 (µg/m ³)	26.992	30.688	31.68	33.96	36.12	33.6
SO ₂	Improved West Gaeke method.	80 (µg/m ³)	5.6	6.2	7.6	8.6	6.8	7.9
NO _x	Jacob & Hochhelser modified (Na-Arsenite) method	80(µg/m ³)	11.1	12.1	11.2	11.2	10.6	12.2
CO	NDIR Spectroscopy method	4(mg/m ³)	0.54	0.58	0.66	0.71	6.4	0.68
O ₃	Chemical Method	100 (µg/m ³)	<4.0	<4.0	<4.0	<4.0	<4.0	<4.0
NH ₃	Indo Phenol Blue Method	400 (µg/m ³)	<20.0	<20.0	<20.0	<20	25.8	<20
As	AAS Method	6ng/m ³	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Ni	AAS Method	20µg/m ³	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Pb	AAS Method	1µg/m ³	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
C ₆ H ₆	Gas Chromatography	5µg/m ³	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Bap	Gas Chromatography	1ng/m ³	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
HC	GC Method		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
BZ-2	Bandhubaria	NAAQ Standard	OCT-19	NOV-19	DEC-19	JAN-20	FEB-20	MAR-20.
Parameters	Method of Measurement							
PM ₁₀	Gravimetric method	100(µg/m ³)	50.6	56.6	54.8	60.6	70.2	58
PM _{2.5}	Gravimetric method	60 (µg/m ³)	28.336	31.696	32.88	36.36	42.12	34.8
SO ₂	Improved West Gaeke method.	80 (µg/m ³)	8.4	9.1	8.1	8.6	10.2	8.4
NO _x	Jacob & Hochhelser modified (Na-Arsenite) method	80(µg/m ³)	11.6	12.4	11.4	13.2	13.8	12.4
CO	NDIR Spectroscopy method	4(mg/m ³)	0.62	0.66	0.79	0.68	6.6	0.68
O ₃	Chemical Method	100 (µg/m ³)	<4.0	<4.0	<4.0	<4.0	<4.0	<4.0
NH ₃	Indo Phenol Blue Method	400 (µg/m ³)	<20.0	<20.0	<20.0	<20	26.6	<20
As	AAS Method	6ng/m ³	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Ni	AAS Method	20µg/m ³	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Pb	AAS Method	1µg/m ³	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
C ₆ H ₆	Gas Chromatography	5µg/m ³	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Bap	Gas Chromatography	1ng/m ³	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
HC	GC Method		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001

Annexure-I to Environmental Statement (Form-V) for Bamebari Iron & Manganese Mine for FY 2019-20

BZ-3	Raikara	NAAQ Standard	OCT-19	NOV-19	DEC-19	JAN-20	FEB-20	MAR-20.
Parameters	Method of Measurement							
PM ₁₀	Gravimetric method	100(µg/m ³)	52.2	5808	58.4	60.6	73.2	60.2
PM _{2.5}	Gravimetric method	60 (µg/m ³)	29.232	3252.48	35.04	36.36	43.92	36.12
SO ₂	Improved West Gaeke method.	80 (µg/m ³)	8.8	8.4	9.6	9.8	8.2	9.8
NO _x	Jacob & Hochhelser modified (Na-Arsenite) method	80(µg/m ³)	11.2	11.6	11.4	12.6	13.8	11.8
CO	NDIR Spectroscopy method	4(mg/m ³)	0.64	0.66	0.79	0.84	7.4	0.82
O ₃	Chemical Method	100 (µg/m ³)	<4.0	<4.0	<4.0	<4.0	<4.0	<4.0
NH ₃	Indo Phenol Blue Method	400 (µg/m ³)	<20.0	<20.0	<20.0	<20	27.2	<20
As	AAS Method	6ng/m ³	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Ni	AAS Method	20µg/m ³	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Pb	AAS Method	1µg/m ³	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
C ₆ H ₆	Gas Chromatography	5µg/m ³	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Bap	Gas Chromatography	1ng/m ³	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
HC	GC Method		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001

1. FUGITIVE EMISSION

L-1	Near Sorting Yard (Joribar Block)	NAAQ Standard	Monitoring Date	Apr-19	May-19	Jun-19	Jul-19	Aug-19	Sep-19	Oct-19	Nov-19	Dec-19	Jan-20	Feb-20	Mar-20
Parameters	Method of Measurement	1200(µg/m ³)	Analysis Result	-	-	-	-	632.2	412.6	686.6	348.8	714.6	708.6	711.6	706.2
SPM	Gravimetric method														
L-2	Near Stack Yard (Joribar Block)	NAAQ Standard	Monitoring Date	Apr-19	May-19	Jun-19	Jul-19	Aug-19	Sep-19	Oct-19	Nov-19	Dec-19	Jan-20	Feb-20	Mar-20
Parameters	Method of Measurement	1200(µg/m ³)	Analysis Result	-	-	-	-	482.6	438.2	502.6	392.6	521.2	536.2	544.8	552.2
SPM	Gravimetric method														
L-3	Near Haul Road (Joribar Block)	NAAQ Standard	Monitoring Date	Apr-19	May-19	Jun-19	Jul-19	Aug-19	Sep-19	Oct-19	Nov-19	Dec-19	Jan-20	Feb-20	Mar-20
Parameters	Method of Measurement	1200(µg/m ³)	Analysis Result	-	-	-	-	411.2	388.6	446.2	446.8	502.8	518.8	526.6	518.8

Annexure-I to Environmental Statement (Form-V) for Bamebari Iron & Manganese Mine for FY 2019-20

L-1	Near Sorting Yard (Joribar Block)	NAAQ Standard	Monitoring Date	Apr-19	May-19	Jun-19	Jul-19	Aug-19	Sep-19	Oct-19	Nov-19	Dec-19	Jan-20	Feb-20	Mar-20
SPM	Gravimetric method														

Ambient Noise

Locat ion ID	Location	Day time Equivalent						Standard as per CPCB	Night time Equivalent						Standard as per CPCB
		Noise Level in dB (A) Leq							Noise Level in dB(A) leq						
		Apr-19	May-19	Jun-19	Jul-20	Aug-20	Sep-20		Apr-19	May-19	Jun-19	Jul-20	Aug-20	Sep-20	
N-1	Town ship	-	-	68	68.4	66.4	62.8	75	-	-	50.8	48.0	48.1	49.2	70
N-2	Hospital	-	-	48	48.0	44.9	46	50	-	-	38.8	34.2	36.8	39.0	40
N-3	Mines Area	-	-	66	66.2	65.4	61.9	75	-	-	50.4	50.6	48.6	42.6	70

DG SET EMISSION

Sampling Location: 100 KVA DG SET				June-19	Sept-19	Dec-19	Mar-20
SL.No	Parameters Analyzed	Unit	CPCB LIMIT	Result			
1	Stack Temperature	°C	....	120	118	124	128
2	Velocity	m/Sec	....	9.1	10.6	9.6	10.2
3	Concentration Of Particulate Matter As PM	mg/Nm ³	50	30	31.2	38	44
4	Oxides of Nitrogen as Nox	mg/Nm ³	400	52	54.6	62.8	66
5	Carbon Monoxide as CO	mg/Nm ³	150	30	32.6	38.8	40.8
6	Non Methyl Hydrocarbon as C	mg/Nm ³	....	6.5	7.2	7.2	7.6

Annexure-I to Environmental Statement (Form-V) for Bamebari Iron & Manganese Mine for FY 2019-20

1. PERSONAL DUST SAMPLING

Name of the Person	Personal Number	Oct-2019	Name of the Person	Personal Number	NOV-2019	Name of the Person	Personal Number	DEC-2019
		PM ($\mu\text{g}/\text{m}^3$)			PM ($\mu\text{g}/\text{m}^3$)			PM ($\mu\text{g}/\text{m}^3$)
Draupadi Lahur	TSP/806096/0919	6.6	Simon Baebandi	TSP/806076/0919	6.6	Lalatendu Lohar	TSP/798688/0919	8.1
Nirakar Patra	TSP/753639/0819	7.1	Balma Munda	TSP/753631/0819	6.8	Santana Munda	TSP/753276/0819	8.4
Anita Patra	BMM-304	7.4	Rajen Munda	BMM-122	8.1	Bigneswari Malakut	BMM-236	8.2
lalatendu Lohar	TSP/798688/0919	7.2	Bhumi Naik	BMM-184	7.8	Johan Hembram	MW0719167159	8.4
Santana Munda	TSP/753276/0819	7.8	Sapani Purti	BMM-414	8.6	Saraswati Tanti	MW0719166977	8.2
Bigneswari Malakut	BMM-236	7.5	Amita Patra	BMM-304	8.1	Shradhanjali Maharana	MW0719167124	8.1
Sibani Soren	TSP/811305/0919	7.4	Bigneswari Malakut	BMM-236	7.8	Bhaina Hembram	MW0719166713	8.2
Simon Bulbandi	TSP/806076/0919	6.9	Simon Bulbandi	TSP/806076/0919	7.4	Parinda Munda	MW0719167743	8.4
Balma Munda	TSP/753631/0819	6.6	Balma Munda	TSP/753631/0819	7.2			
Kamal Patra	TSP/806098/0919	7.4	Kamal Patra	TSP/806098/0919	8.1			

Name of the Person	Personal Number	Jan-20	Name of the Person	Personal Number	Feb-20	Name of the Person	Personal Number	Mar-20
		PM ($\mu\text{g}/\text{m}^3$)			PM ($\mu\text{g}/\text{m}^3$)			PM ($\mu\text{g}/\text{m}^3$)
lalatendu Lohar	TSP/798688/0919	7.8	lalatendu Lohar	TSP/798688/0919	8.4	lalatendu Lohar	TSP/798688/0919	4.1
Santana Munda	TSP/753276/0819	7.6	Santana Munda	TSP/753276/0819	8.6	Santana Munda	TSP/753276/0819	4
Bigneswari Malakut	BMM-236	8.1	Bigneswari Malakut	BMM-236	8.6	Bigneswari Malakut	BMM-236	3.9
Johan Hembram	MW0719167159	8.2	Johan Hembram	MW0719167159	8.4	Johan Hembram	MW0719167159	3.6
Saraswati Tanti	MW0719166977	8.4	Saraswati Tanti	MW0719166977	8.2	Saraswati Tanti	MW0719166977	3.2
Shradhanjali Maharana	MW0719167124	8.2	Shradhanjali Maharana	MW0719167124	8.4	Shradhanjali Maharana	MW0719167124	4.2
Bhaina Hembram	MW0719166713	7.8	Bhaina Hembram	MW0719166713	8.6	Bhaina Hembram	MW0719166713	4.4
Parinda Munda	MW0719167743	7.6	Parinda Munda	MW0719167743	7.9	Parinda Munda	MW0719167743	3.8

AMBIENT NOISE (Oct'19 to March'20)

Locat ion ID	Location	Day time Equivalent						Standard as per CPCB	Night time Equivalent						Standard as per CPCB
		Noise Level in dB (A) Leq							Noise Level in dB(A) leq						
		Oct- 19	Nov- 19	Dec- 19	Jan- 20	Feb-20	Mar- 20		Oct-19	Nov- 19	Dec- 19	Jan-20	Feb- 20	Mar-20	
N-1	Town ship	64	70.2	68	67.6	69.6	64.8	75	44	48	48	49.2	50.6	51.8	70
N-2	Hospital	48	52.6	44.2	48.6	52.8	56	50	30	32.8	36.8	39.2	41.2	44.6	40
N-3	Mines Area	64	66.2	71.4	70.8	71.2	68.8	75	44	42.8	50.6	51.6	42.8	40.8	70

EQUIPMENT NOISE:

Name of Location	Unit	Result	Name of Location	Result	Name of Location	Result
		OCT-19		NOV-19		DEC-19
OR-09K-7335(Volvo Truck)	dB	71.2	MW-Hyua (OR09N9453)	78.8	OD-09K-3107	88.2
HI Tach 200LC(Sovel-1)		78.8	MW-Hyua (OR09N9468)	76.4	OD-09K-3109	83.8
DOOSAN 340LC(Sovel-2)		72.8	Hyua (OD09K 3114)	70.6	OD-09K-3930	80.6
OD-09A-6541(Truck Tata)		73.6	MW-Hyua (OR09N9470)	71.8	OD-09K-3931	81.8
OD-09A-6540(Truck Tata)		74.8	Loader Screen Plant (OD09K1796)	75.6	OD-09K-3932	82.6

1. DUST FALL ANALYSIS

Date of Sampling	Total Dust Fall (t/km ² /month)	Analysis Result			
		Co (%)	Ni(%)	Hg(%)	As (%)
June - 19	0.56	<0.001	<0.001	<0.001	<0.001
September-19	0.36	<0.001	<0.001	<0.001	<0.001
01.12.2019 TO 31.12.2019	0.66	<0.001	<0.001	<0.001	<0.001
01.03.2020 TO 31.03.2020	0.64	<0.001	<0.001	<0.001	<0.001

2. SOIL QUALITY ANALYSIS

Month	Co (%)	Ni(%)	Hg(%)	As (%)
Jun-19	0.0031	0.052	<0.000002	<0.000002
Sep-19	0.0038	0.046	<0.000002	<0.000002
Dec-19	0.036	0.062	<0.000002	<0.000002
Mar-20	0.041	0.058	<0.000002	<0.000002

1. GROUND WATER QUALITY (TRACE METALS)**Panchayat Office Borewell**

Parameters	Iron as Fe	Copper as Cu	Manganese as Mn	Hexavalent Chromium as Cr ⁶⁺	Mercury as Hg	Cadmium as Cd	Selenium as Se	Arsenic as As	Lead as Pb	Zinc as Zn
November-19	0.18	<0.02	<0.05	<0.05	<0.002	<0.01	<0.001	<0.004	<0.01	<0.05

1. GROUND WATER (LEVEL) ANALYSIS**A. GWL1 : Joribahal Pump House****B. GWL2 : Nimera Village**

Parameters	Unit	Analysis Result
June-19	GWL1	6.1
	GWL2	6.6
November-19	GWL1	7.1
	GWL2	2.6