



By E-Mail

Ref.No.: MGM/P&E/ 347/20

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 Joda West 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,

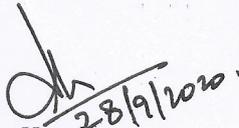
We are hereby submitting the Annual Environmental Statement in "FORM-V" prescribed under the above referenced statute, for the year ending 31st March 2020 in respect of Joda West Iron and Manganese Mine of M/s Tata Steel Ltd., At/Po-Bichhakundi, Dist-Keonjhar, Odisha.

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.


Head
28/9/2020

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:

Joda West 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. : **JODA WEST IRON & 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 : **180,000 Tonnes per annum** (Manganese Ore or 1.80 LTPA (as per Environmental Clearance)
- (iv) Year of Establishment : 1933
- (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 : 24.21 m³/day (Water sprinkling) (**Total-8837.7m³**)

Cooling : Nil

Domestic : 138.7 m³/day (**Total-50628.6m³**)

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 64866.193 MT	Production 93605.0 MT
		Despatch 59359.38 MT	Despatch 68821.54 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 (885.119KL), Explosive (80525Kg), Electricity (1521606 Kw-h from grid & 15183 Kw-h from DG set).

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 ever 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 results 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.)	932 Ltrs	600 Ltrs
Cotton Waste (in Kgs)	Nil	7(approx.)
Duster (in Nos.)	Nil	Nil
Filters (in Nos.)	Nil	83(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)	1279988 MT	1452256 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	1279988 MT	1452256 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 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. We have planted around 11.54 lakh nos. of trees over an area around 225.9 ha till 2019-20. Including areas over safety zone, OB dump and as avenue plantation. The tree density is maintained at the rate of more than 2500 saplings per ha.
5. During FY 2019-20, 11717 nos of forestry saplings have been planted. Apart from this, dump slope stabilisation have been carried out by 1,22,300 nos. of vetiver slips/grass slips.
6. 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 during FY 2019-20, in respect of Joda West Iron & Manganese Mine is summarised in the table as follows:

Table. Environmental Expenditure for 2019-20

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	27.95	32.8

7. 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.
 - Native sapling and vetiver plantation in inactive dumps.
 - STP for domestic effluent in Joda West 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).


Head 20/9/2020
Head (MPP)
A & M, JODA
Tata Steel Ltd.
Mine & Production Planning
Ferro Alloys Mineral Division
M/s Tata Steel Limited

Date: 28/9/2020

ABSTRACT ON ENVIRONMENTAL MONITORING RESULTS

[PERIOD: APRIL 2019 TO MARCH 2020]

MINE-JODA WEST IRON & MANGANESE MINES

M/s TATA Steel Limited

1. Surface Water Quality Monitoring Report**W1: Kundra Nala Entering H Quarry**

Joda West (Kundra Nala Entering H Quarry)			April-19	May'19	June'19	July'19	Aug-19	Sept-19	Oct-19	Nov-19	Dec-19	Jan-20	Feb-20	Mar-20
Parameters	Unit	Standard	1st Report											
Dissolved Oxygen (minimum)	mg/l	4	6.1	4.8	5.8	6.2	5.8	6.2	6.1	6.6	6.2	6.4	6.2	5.1
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	310	7.46	240	228	210	180	220	210	220	210	228	220
pH Value	--	6.0-9.0	7.58	7.22	7.28	7.12	7.48	7.51	7.54	7.51	7.55	7.56	7.12	7.22
Colour (max)	Hazen	300	CL	CL	1	1.8	CL	CL	CL	CL	CL	CL	1.8	CL
Total Dissolved Solids	mg/l	1500	160	172	137	142	160	182	188	182	188	180	142	129
Copper as Cu (max)	mg/l	1.5	<0.05	<0.05	<0.05	<0.05	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.05	<0.05
Iron as Fe (max)	mg/l	0.5	0.48	0.46	0.36	0.31	0.38	0.32	0.42	0.38	0.42	0.38	0.31	0.42
Chloride (max)	mg/l	600	40	48	36	32	46.2	48.8	51.8	50.6	52.6	50.6	32	26
Sulphates (SO ₄) (max)	mg/l	400	6.2	5.9	5.6	4.8	5.2	5.6	5.4	5.2	5.6	5.2	4.8	4.5
Nitrate as NO ₃ (max)	mg/l	50	2.1	2.6	1.82	1.12	3.2	3.1	3.6	3.2	3.6	3.8	1.12	1.9
Fluoride as F (max)	mg/l	1.5	0.019	0.026	0.021	0.02	0.021	0.018	0.018	0.016	0.018	0.016	0.02	0.02
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	<0.001	<0.001	<0.001	<0.001	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.001	<0.001
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	<0.001	<0.001	<0.001	<0.001	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.001	<0.001
Cyanide as CN (max)	mg/l	0.05	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	<0.05	<0.05	<0.05	<0.05	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.05	<0.05
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

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

W2: Kundra Nala Leaving H Quarry:

JODA-WEST (DOWN STREAM) (Kundra Nala Leaving H Quarry)			April-19	May'19	June'19	July19	Aug-19	Sept-19	Oct-19	Nov-19	Dec-19	Jan-20	Feb-20	Mar-20
Parameters	Unit	Standards	1st Report											
Dissolved Oxygen (minimum)	mg/l	4	6.6	6.9	6.1	6	6.1	6.6	6.6	6.8	6.8	6.6	6	5.3
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	420	360	310	220	220	210	260	240	260	240	220	170
pH Value	--	6.0-9.0	7.54	7.52	7.16	7.18	7.54	7.56	7.68	7.56	7.61	7.62	7.18	7.18
Colour (max)	Hazen	300	CL	CL	2	2	CL	CL	CL	CL	CL	CL	2	CL
Total Dissolved Solids	mg/l	1500	171	181	142	138	182.8	160	196	192	196	192	138	134
Copper as Cu (max)	mg/l	1.5	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.02	<0.02	<0.05	<0.05	<0.05
Iron as Fe (max)	mg/l	0.5	0.42	0.44	0.42	0.36	0.42	0.41	0.46	0.48	0.49	0.42	0.36	0.47
Chloride (max)	mg/l	600	46	52	40	36	51.2	54.8	54.6	52.8	54.8	52.8	36	30
Sulphates (SO ₄) (max)	mg/l	400	6.8	6.4	5.6	4.2	6.1	6.6	6.2	5.8	6.4	6.1	4.2	4.8
Nitrate as NO ₃ (max)	mg/l	50	2.44	3.4	1.88	1.18	3.8	4.2	3.9	4.1	4.8	4.2	1.18	2.1
Fluoride as F (max)	mg/l	1.5	0.026	0.034	0.022	0.018	0.028	0.031	0.022	0.018	0.021	0.02	0.018	0.018
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	<0.001	<0.001	<0.001	<0.001	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.001	<0.001
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	<0.001	<0.001	<0.001	<0.001	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.001	<0.001
Cyanide as CN (max)	mg/l	0.05	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	<0.05	<0.05	<0.05	<0.05	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.05	<0.05
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

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

2. DRINKING WATER
DW1: Near Canteen

Sl No.	Test Parameters	Unit	Norms as per IS:10500-2012		Apr-19	May-19	June-19	July-19	Aug-19	Sep-19	Oct-19	Nov-19	Dec-19	Jan-20	Feb-20	Mac-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	<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	<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											
1	Colour (Unit)	Hazen	5	15	CL											
2	Odour	--	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable
3	Taste	--	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable
4	pH value (25°C)		6.5 - 8.5	No Relaxation	7.54	7.62	7.66	7.54	7.52	7.44	7.64	7.71	7.72	7.81	7.88	7.78
5	Turbidity	NTU	1	5	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
6	Total Dissolved Solids	mg/l	500	2000	68.0	76.0	81.0	84.0	84.0	80.0	76	84	92	88	92	88
7	Aluminium (as Al)	mg/l	0.03	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
8	Anionic Detergents (as MBAS)	mg/l	0.2	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
9	Boron (as B)	mg/l	0.5	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
10	Calcium (as Ca)	mg/l	75	200	29.8	31.6	30.8	31.2	30.6	28.6	31.2	32.6	32.6	28.2	30.6	36
11	Chloride (as Cl)	mg/l	250	1000	30.0	38.0	42.0	48.0	45.8	50.2	42.6	44.8	51.2	53.2	56.8	50.8
12	Copper (asCu)	mg/l	0.05	1.5	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<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	0.018	0.021	<0.01	<0.01	<0.01	<0.01
14	Residual Free Chlorine	mg/l	0.2(Min.)	---	ND											
15	Iron (as Fe)	mg/l	0.3	1	0.094	0.19	0.18	0.12	0.18	0.11	0.22	0.24	0.26	0.28	0.22	0.28

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

16	Magnesium (as Mg)	mg/l	30	100	14.6	18.8	19.6	11.8	10.2	11.6	11.6	18.2	18.4	19.2	20.8	19.6
17	Manganese (as Mn)	Hazen	0.1	0.3	<0.05	<0.05	<0.005	<0.005	<0.005	<0.005	<0.005	<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	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
19	Nitrate (as NO ₃)	--	45	No Relaxation	0.62	0.74	0.71	0.68	0.54	0.51	0.61	0.66	0.78	0.79	0.88	0.82
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	<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	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
22	Sulphate (as SO ₄)	mg/l	200	400	2.4	3.6	4.2	4.6	4.2	5.1	4.6	5.2	5.6	5.2	5.6	5.8
23	Alkalinity (as CaCO ₃)	mg/l	200	600	36.0	48.0	42.2	46.0	48.0	56.0	52	56	48.6	42.8	44.6	50.6
24	Total Hardness(as CaCO ₃)	mg/l	300	600	44.0	52.0	54.0	58.2	60.2	66.2	64	70	60.8	51.6	50.8	61.2
25	Cadmium (as Cd)	mg/l	0.003	No Relaxation	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
26	Cyanide (as CN)	mg/l	0.05	No Relaxation	ND											
27	Lead (as Pb)	mg/l	0.01	No Relaxation	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<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	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
29	Arsenic (as As)	mg/l	0.01	0.05	<0.01	<0.01	<0.001	<0.001	<0.001	<0.001	<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	<0.01	<0.01	<0.05	<0.05	<0.05	<0.05
31	Chromium (as Cr ⁺⁶)	mg/l	--	--	<0.01	<0.01	<0.05	<0.05	<0.05	<0.05	<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	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
33	Pesticide	µg/l	5	15	Absent											

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

3. GROUND WATER

GW1: PREMABASTI BW

Sl. No	Parameter	Unit	Standards as per IS: 10500:2012 Amended on 2015 & 2018		Analysis Result		
			Acceptable Limit	Permissible Limit	June-19	Aug-19	Nov-19
1	Colour	Hazen	5	15	CL	CL	CL
2	Odour	--	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable
3	Taste	--	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable
4	Turbidity	NTU	1	5	1.2	1.8	1.8
5	pH Value	--	6.5-8.5	No Relaxation	7.18	7.56	7.52
6	Total Hardness (as CaCO ₃)	mg/l	200	600	110.0	116.0	116
7	Iron (as Fe)	mg/l	1.0	No Relaxation	0.21	0.26	0.24
8	Chloride (as Cl)	mg/l	250	1000	42.6	48.0	48.2
9	Residual, free Chlorine	mg/l	0.2	1	ND	ND	ND
<i>Desirable Characteristics</i>							
10	Dissolved Solids	mg/l	500	2000	148.0	152.0	156
11	Calcium (as Ca)	mg/l	75	200	30.8	34.0	34.8
12	Magnesium (as Mg)	mg/l	30	100	12.6	18.0	14.8
13	Copper (as Cu)	mg/l	0.05	1.5	<0.02		<0.02
14	Manganese (as Mn)	mg/l	0.1	0.3	0.012	0.018	0.016
15	Sulphate (as SO ₄)	mg/l	200	400	5.6	6.2	6.4
16	Nitrate (as NO ₃)	mg/l	45	No Relaxation	2.6	3.1	3.4
17	Fluoride (as F)	mg/l	1.0	1.5	0.038	0.041	0.026
18	Phenolic Compounds (as C ₆ H ₅ OH)	mg/l	0.001	0.002	<0.001	<0.001	<0.001
19	Mercury (as Hg)	mg/l	0.001	No Relaxation	<0.002	<0.002	<0.002
20	Cadmium (as Cd)	mg/l	0.003	No Relaxation	<0.01	<0.01	<0.01
21	Selenium (as Se)	mg/l	0.01	No Relaxation	<0.001	<0.001	<0.001
22	Arsenic (as As)	mg/l	0.01	No Relaxation	<0.004	<0.004	<0.004
23	Cyanide (as CN)	mg/l	0.05	No Relaxation	<0.01	<0.01	<0.01
24	Lead (as Pb)	mg/l	0.01	No Relaxation	<0.01	<0.01	<0.01
25	Zinc (as Zn)	mg/l	5	15	2.8	3.2	2.8
26	Anionic Detergents (as MBAS)	mg/l	--	--	<0.2	<0.2	<0.2
27	Chromium (as Cr ⁺⁶)	mg/l	0.5	No Relaxation	<0.01	<0.01	<0.01
28	Mineral Oil	mg/l	200	600	<0.05	<0.05	<0.05
29	Alkalinity	mg/l	0.03	0.2	3.4	36.0	64.0
30	Aluminium as(Al)	mg/l	0.5	2.4	<1.0	<1.0	<1.0
31	Boron (as B)	mg/l	--	--	<0.1	<0.1	<0.1

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

32	Poly Aromatic Hydrocarbon as PAH	mg/l	<0.0001	--	<0.0001	<0.0001	<0.0001
33	Pesticide	µg/l	Absent		Absent	Absent	Absent

GW2: KAMAR JODA OW

Sl. No	Parameter	Unit	Standards as per IS: 10500:2012 Amended on 2015 & 2018		Analysis Result		
			Acceptable Limit	Permissible Limit	June-19	Aug-19	Nov-19
Essential Characteristics							
1	Colour	Hazen	5	15	CL	CL	CL
2	Odour	--	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable
3	Taste	--	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable
4	Turbidity	NTU	1	5	1.6	<0.2	1.1
5	pH Value	--	6.5-8.5	No Relaxation	7.41	7.16	7.48
6	Total Hardness (as CaCO ₃)	mg/l	200	600	118.0	132.0	124
7	Iron (as Fe)	mg/l	1.0	No Relaxation	0.16	0.26	0.28
8	Chloride (as Cl)	mg/l	250	1000	32.4	30.0	36.0
9	Residual, free Chlorine	mg/l	0.2	1	ND	ND	ND
Desirable Characteristics							
10	Dissolved Solids	mg/l	500	2000	136.0	182.0	144
11	Calcium (as Ca)	mg/l	75	200	26.8	32.0	31.6
12	Magnesium (as Mg)	mg/l	30	100	10.8	11.6	12.6
13	Copper (as Cu)	mg/l	0.05	1.5	<0.02		<0.02
14	Manganese (as Mn)	mg/l	0.1	0.3	0.018	0.014	0.021
15	Sulphate (as SO ₄)	mg/l	200	400	4.2	5.1	4.8
16	Nitrate (as NO ₃)	mg/l	45	No Relaxation	3.2	2.6	3.8
17	Fluoride (as F)	mg/l	1.0	1.5	0.046	0.021	<0.001
18	Phenolic Compounds (as C ₆ H ₅ OH)	mg/l	0.001	0.002	<0.001	<0.001	<0.002
19	Mercury (as Hg)	mg/l	0.001	No Relaxation	<0.002	<0.002	<0.002
20	Cadmium (as Cd)	mg/l	0.003	No Relaxation	<0.01	<0.01	<0.01
21	Selenium (as Se)	mg/l	0.01	No Relaxation	<0.001	<0.001	<0.001
22	Arsenic (as As)	mg/l	0.01	No Relaxation	<0.004	<0.004	<0.004
23	Cyanide (as CN)	mg/l	0.05	No Relaxation	<0.01	<0.01	<0.01
24	Lead (as Pb)	mg/l	0.01	No Relaxation	<0.01	<0.01	<0.01
25	Zinc (as Zn)	mg/l	5	15	2.6	<0.05	2.6
26	Anionic Detergents (as MBAS)	mg/l	--	--	<0.2	<0.2	<0.02
27	Chromium (as Cr ⁺⁶)	mg/l	0.5	No Relaxation	<0.01	<0.01	<0.01
28	Mineral Oil	mg/l	200	600	<0.01	<0.01	<0.01
29	Alkalinity	mg/l	0.03	0.2	68.2	111	110

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

30	Aluminium as(Al)	mg/l	0.5	2.4	<1.0	<1.0	<1.0
31	Boron (as B)	mg/l	--	--	<0.1	<0.1	<1.0
32	Poly Aromatic Hydrocarbon as PAH	mg/l	<0.0001	--	<0.0001	<0.0001	<0.0001
33	Pesticide	µg/l	Absent		Absent	Absent	Absent

4. WASTE WATER

Sampling Location:STPW-1:STP (Inlet) STPW-2: STP (Outlet NEAR VEGETABLE GARDEN)									
Sl. No	Parameter	Unit	Standards (In land Surface water)	Apr-19		May-19		June-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	66	30	64	31	62	40
3	Particulate size of SS		Shall pass 850 micron IS Sieve	< 850	< 850	< 850	< 850	< 850	< 850
4	pH Value	--	5.5-9.0	7.31	7.66	7.42	7.48	7.22	7.46
5	Temperature	°C	Shall not exceed 50C above the receiving water temperature	30	30	30	30	30	30
6	Oil & Grease(max)	mg/l	10	4.8	ND	5.2	ND	4.6	ND
7	Total Residual Chlorine	mg/l	1	ND	ND	ND	ND	ND	ND
8	Ammonical Nitrogen (as N)	mg/l	50	9.2	2.1	8.6	1.8	9.2	1.6
9	Total Kjeldahl Nitrogen(as TKN)	mg/l	100	11.8	2.2	11.6	3.4	21.6	4.4
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	26	5.2	24.0	6.1	28.0	4.4
12	Chemical Oxygen Demand as COD	mg/l	250	148.0	20.0	138.0	22.0	174.0	26.0
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	0.94	<0.05	0.96	<0.05	0.78	<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	0.021	0.42	0.016	0.28	0.082

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

25	Dissolved Phosphates (P)	mg/l	5	0.48	<0.05	0.54	<0.05	0.56	<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	94% survival of fishes	88% survival of fishes	942% survival of fishes	88% survival of fishes	92% survival of fishes	96% survival of fishes
29	Manganese (Mn)	mg/l	2	0.054	<0.005	0.053	<0.005	0.052	<0.005
30	Iron as Fe (max)	mg/l	3	1.94	0.61	1.86	0.68	2.9	1.8
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	5.2	2.6	5.6	2.8	4.6	1.8

**Sampling Location:STPW-1:STP (Inlet)
STPW-2: STP (Outlet NEAR VEGETABLE GARDEN)**

Sl. No	Parameter	Unit	Standards (In land Surface water)	July-19		Aug-19		Sept-19	
				STPW-1	STPW-2	STPW-1	STPW-2	STPW-1	STPW-2
1	Colour & Odour	Hazen	Colorless/Odorless as far as practicable	<5& pungent smell	CL & U/O	<5& pungent smell	CL & U/O	<5& pungent smell	CL & U/O
2	Suspended Solids	mg/l	100	78	40	72	36	82	46
3	Particulate size of SS		Shall pass 850 micron IS Sieve	< 850	< 850	< 850	< 850	< 850	< 850
4	pH Value	--	5.5-9.0	7.32	7.64	7.44	7.52	7.18	7.46
5	Temperature	°C	Shall not exceed 50C above the receiving water temperature	31	31	26	26	26	26
6	Oil & Grease(max)	mg/l	10	3.8	ND	4.0	ND	4.1	ND
7	Total Residual Chlorine	mg/l	1	ND	ND	ND	ND	ND	ND
8	Ammonical Nitrogen (as N)	mg/l	50	8.6	1.9	9.2	2.4	8.8	1.62
9	Total Kjeldahl Nitrogen(as TKN)	mg/l	100	11.8	2.1	11.8	3.8	21.8	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	20	4.8	21.4	5.4	24.8	4.4
12	Chemical Oxygen Demand as COD	mg/l	250	128	20	118	20	152	20
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	0.92	<0.05	0.96	<0.05	0.88	<0.05

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

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	0.41	0.019	0.44	0.014	0.28	0.081
25	Dissolved Phosphates (P)	mg/l	5	0.46	<0.05	0.51	<0.05	0.54	<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	94% survival of fishes	88% survival of fishes	942% survival of fishes	88% survival of fishes	92% survival of fishes	96% survival of fishes
29	Manganese (Mn)	mg/l	2	0.052	<0.005	0.048	<0.005	0.042	<0.005
30	Iron as Fe (max)	mg/l	3	1.9	0.62	1.88	0.66	3.1	1.8
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	5.2	2.4	5.8	3.1	4.1	1.6

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

Sampling Location:STPW-1:STP (Inlet) STPW-2: STP (Outlet NEAR VEGETABLE GARDEN)									
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	72	32	66	30	70	42
3	Particulate size of SS		Shall pass 850 micron IS Sieve	< 850	< 850	< 850	< 850	< 850	< 850
4	pH Value	--	5.5-9.0	7.26	7.54	7.38	7.44	7.12	7.42
5	Temperature	°C	Shall not exceed 50C above the receiving water temperature	26	26	26	26	26	26
6	Oil & Grease(max)	mg/l	10	4.2	ND	4.1	ND	4.2	ND
7	Total Residual Chlorine	mg/l	1	ND	ND	ND	ND	ND	ND
8	Ammonical Nitrogen (as N)	mg/l	50	8.4	1.80	8.8	2.00	8.4	1.46
9	Total Kjeldahl Nitrogen(as TKN)	mg/l	100	11.2	1.94	10.6	3.2	20.6	3.8
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	22	4.6	20.8	5.8	25.2	3.6
12	Chemical Oxygen Demand as COD	mg/l	250	132	22	124	20	164	20
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	0.86	<0.05	0.94	<0.05	0.74	<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	0.32	0.018	0.36	0.012	0.2	0.078
25	Dissolved Phosphates (P)	mg/l	5	0.44	<0.05	0.48	<0.05	0.48	<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	94% survival of fishes	88% survival of fishes	942% survival of fishes	88% survival of fishes	92% survival of fishes	96% survival of fishes
29	Manganese (Mn)	mg/l	2	0.046	<0.005	0.051	<0.005	0.046	<0.005
30	Iron as Fe (max)	mg/l	3	1.82	0.58	1.84	0.64	2.8	1.1

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

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	4.8	2.1	5.1	2.6	3.8	1.2

**Sampling Location:STPW-1:STP (Inlet)
STPW-2: STP (Outlet NEAR VEGETABLE GARDEN)**

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	72	32	66	30	70	42
3	Particulate size of SS		Shall pass 850 micron IS Sieve	< 850	< 850	< 850	< 850	< 850	< 850
4	pH Value	--	5.5-9.0	7.26	7.54	7.38	7.44	7.12	7.42
5	Temperature	°C	Shall not exceed 50C above the receiving water temperature	26	26	26	26	26	26
6	Oil & Grease(max)	mg/l	10	4.2	ND	4.1	ND	4.2	ND
7	Total Residual Chlorine	mg/l	1	ND	ND	ND	ND	ND	ND
8	Ammonical Nitrogen (as N)	mg/l	50	8.4	1.80	8.8	2.00	8.4	1.46
9	Total Kjeldahl Nitrogen(as TKN)	mg/l	100	11.2	1.94	10.6	3.2	20.6	3.8
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	22	4.6	20.8	5.8	25.2	3.6
12	Chemical Oxygen Demand as COD	mg/l	250	132	22	124	20	164	20
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	0.86	<0.05	0.94	<0.05	0.74	<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	0.32	0.018	0.36	0.012	0.2	0.078
25	Dissolved Phosphates (P)	mg/l	5	0.44	<0.05	0.48	<0.05	0.48	<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

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

28	Bio-assay test		90% survival of fish after 96 hours in 100% effluent	94% survival of fishes	88% survival of fishes	942% survival of fishes	88% survival of fishes	92% survival of fishes	96% survival of fishes
29	Manganese (Mn)	mg/l	2	0.046	<0.005	0.051	<0.005	0.046	<0.005
30	Iron as Fe (max)	mg/l	3	1.82	0.58	1.84	0.64	2.8	1.1
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	4.8	2.1	5.1	2.6	3.8	1.2

5. QUARRY WATER ANALYSIS REPORT

A. Joda West (D-Quarry)

Sl.	Parameters	Unit	General Standards for discharge of Environmental Pollutants Part A- Effluents	Apr-19	May-19	June-19	July-19	Aug-19	Sept-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	7.68	7.78	7.62	7.68	7.69	7.61	7.64	7.72	7.58	7.64	7.66	7.52
4	Total Dissolved Solids	mg/l	-	274	186	148	142	142	138	142	144	126	138	132.6	122
5	Copper as Cu	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
6	Fluoride as F	mg/l	2.0	0.031	0.038	0.028	0.044	0.048	0.028	0.026	0.031	0.024	0.036	0.041	0.021
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	0.62	0.64	0.71	0.66	0.69	0.64	0.56	0.61	0.66	0.64	0.66	0.62
9	Manganese as Mn	mg/l	2.0	0.048	0.046	0.081	0.084	0.092	0.076	0.044	0.042	0.078	0.081	0.086	0.071
10	Nitrate as NO3	mg/l	10.0	3.41	3.48	3.4	3.8	4.8	3.4	3.26	3.42	3.2	3.6	4.2	2.8
11	Phenolic Compounds as C6H5OH	mg/l	1.0	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
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	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
18	Arsenic as As	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
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	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
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	72	74	76	70	71	66	62	68	68	66	68	62
24	Temperature	0C	shall not exceed 50C above the receiving water	26	26	26	26	26	26	27	26	22	26	28	28

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

			temperature												
25	Dissolved Oxygen	mg/l	-	6.6	6.4	6.2	6.6	6.5	6.2	6.4	6.8	6.6	6.8	6.9	6.4
26	BOD	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	21.6	24.8	22.6	21.8	18.8	16.6	15.2	16.6	15.2	16.6	17.2	14.8
28	Oil & Grease	mg/l	10	ND											
29	Ammonical Nitrogen as N	mg/l	50	ND											
30	Total Kjeldahl Nitrogen as N	mg/l	100	3.6	3.8	3.2	3.1	3.6	3.2	2.48	3.26	2.2	2.6	2.8	2.6
31	Sulphide as S	mg/l	2.0	ND											
32	Free Ammonia as NH3	mg/l	5.0	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	Yes											
35	Dissolved Phosphates as PO4	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

B.Joda West (H-Quarry)

Sl.	Parameters	Unit	General Standards for discharge of Environmental Pollutants Part A- Effluents	Apr-19	May-19	June-19	July-19	Aug-19	Sept-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	7.88	7.96	7.84	7.82	7.88	7.96	7.96	7.92	7.88	7.78	7.84	7.82
4	Total Dissolved Solids	mg/l	-	132	124	132	140	144	124	121	118	124	132	136	116
5	Copper as Cu	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
6	Fluoride as F	mg/l	2.0	0.041	0.051	0.056	0.054	0.062	0.066	0.038	0.042	0.048	0.051	0.058	0.052
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	0.68	0.74	0.78	0.84	0.86	0.81	0.66	0.68	0.74	0.78	0.82	0.72
9	Manganese as Mn	mg/l	2.0	1.46	1.54	1.88	2.6	3.1	2.6	1.38	1.42	1.8	2.1	2.6	2.1
10	Nitrate as NO3	mg/l	10.0	1.84	1.71	1.81	1.84	2.04	1.8	1.62	1.66	1.74	1.82	1.99	1.6
11	Phenolic Compounds as C6H5OH	mg/l	1.0	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
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	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001

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

18	Arsenic as As	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
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	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
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	60	64	74	68	72	80	54	56.6	72	60	68	78
24	Temperature	0C	shall not exceed 50C above the receiving water temperature	26	26	26	26	26	26	26	26	28	28	26	28
25	Dissolved Oxygen	mg/l	-	6.6	7.1	7.8	8.4	8.8	9.2	5.4	5.8	6.8	7.2	7.8	7.4
26	BOD	mg/l	30	5.8	6.6	5.6	4.8	4.6	4.2	5.2	6.2	<1.8	<1.8	2.6	<1.8
27	COD	mg/l	250	24.6	32.0	34.0	32.0	36.0	34.0	21.2	26	24	28	32	28
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	0.81	0.86	ND	ND	ND	ND	0.81	0.86	ND
30	Total Kjeldahl Nitrogen as N	mg/l	100	0.96	0.88	0.89	0.98	1.8	1.41	0.91	0.84	0.94	1.2	1.6	0.92
31	Sulphide as S	mg/l	2.0	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
32	Free Ammonia as NH3	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	All fishes survive in 100% effluent after 96 hrs	All fishes survive in 100% effluent after 96 hrs	All fishes survive in 100% effluent after 96 hrs	All fishes survive in 100% effluent after 96 hrs	All fishes survive in 92% effluent after 96 hrs	All fishes survive in 100% effluent after 96 hrs	All fishes survive in 100% effluent after 96 hrs	All fishes survive in 100% effluent after 96 hrs	All fishes survive in 100% effluent after 96 hrs	All fishes survive in 100% effluent after 96 hrs	All fishes survive in 92% effluent after 96 hrs	All fishes survive in 100% effluent after 96 hrs
35	Dissolved Phosphates as PO4	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

6. OIL SEPARATION PIT

Sl.	Parameters	Unit	General Standards for discharge of Environmental Pollutants Part A- Effluents	Analysis Report							
				Oct-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
2	Odour	-	Unobjectionable	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	7.15	7.15	7.26	7.26	7.34	7.36	7.28	
4	Total Dissolved Solids	mg/l	-	142	142	148	160	168	166	152	
5	Copper as Cu	mg/l	3.0	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	
6	Fluoride as F	mg/l	2.0	0.031	0.031	0.036	0.036	0.041	0.046	0.041	
7	Total Residual Chlorine	mg/l	1.0	ND	ND	ND	ND	ND	ND	ND	
8	Iron as Fe	mg/l	3.0	0.61	0.61	0.66	0.68	0.71	0.64	0.66	
9	Manganese as Mn	mg/l	2.0	1.21	1.21	1.26	1.36	1.42	1.38	1.28	
10	Nitrate as NO3	mg/l	10.0	3.82	3.82	4.28	4.2	4.6	4.8	4.6	

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

11	Phenolic Compounds as C6H5OH	mg/l	1.0	<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
13	Cadmium as Cd	mg/l	2.0	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
14	Cyanide as CN	mg/l	0.2	ND						
15	Lead as Pb	mg/l	0.1	<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
17	Nickel as Ni	mg/l	3.0	<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
19	Total Chromium as Cr	mg/l	2.0	<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
21	Hexavalent Chromium as Cr ⁺⁶	mg/l	0.1	<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
23	Total Suspended Solids	mg/l	100	38	38	42	44	46	52	48
24	Temperature	0C	shall not exceed 5 ^o C above the receiving water temperature	28	28	26	26	26	28	28
25	Dissolved Oxygen	mg/l	-	5.6	5.6	6.2	6.4	6.6	6.8	6.6
26	BOD at 27 ^o C for 3 days	mg/l	30	<1.8	<1.8	<1.8	<1.8	<1.8	<1.8	<1.8
27	COD	mg/l	250	16.4	16.4	17.8	18.6	21.8	24.2	19.2
28	Oil & Grease	mg/l	10	ND						
29	Ammonical Nitrogen as N	mg/l	50	ND						
30	Total Kjeldahl Nitrogen as N	mg/l	100	2.6	2.6	2.6	3.8	4.2	4.1	4.2
31	Sulphide as S	mg/l	2.0	ND						
32	Free Ammonia as NH ₃	mg/l	5.0	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
34	Bio-assay	mg/l	90% survival in 100% effluent	90% survival in 100% effluent	90% survival in 100% effluent	90% survival in 100% effluent	92% survival in 100% effluent	94% survival in 100% effluent	98% survival in 100% effluent	94% 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

AAQ MONITORING (CORE ZONE)

AAQ1: Time Office

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	67.18	44.23	8.64	14.26	7.28	0.65	23.20	BDL	BDL	BDL	BDL	BDL	BDL
May-19	73.71	42.87	9.08	14.37	7.30	0.72	26.50	BDL	BDL	BDL	BDL	BDL	BDL
Jun-19	59.75	29.85	11.0	16.56	8.74	0.51	26.13	BDL	BDL	BDL	BDL	BDL	BDL
Jul-19	51.70	24.46	9.76	17.72	9.16	0.62	25.06	BDL	BDL	BDL	BDL	BDL	BDL

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

Aug-19	47.53	28.38	7.63	12.99	9.07	0.53	24.93	BDL	BDL	BDL	BDL	BDL	BDL
Sep-19	32.60	18.26	6.70	10.68	7.16	0.26	20.95	BDL	BDL	BDL	BDL	BDL	BDL
Oct-19	50.01	24.19	4.41	11.10	5.41	0.23	22.72	< 0.001	< 0.01	< 0.001	< 0.001	< 0.002	0.014
Nov-19	63.84	38.31	6.70	12.23	7.09	0.34	24.76	< 0.001	< 0.01	< 0.001	< 0.001	< 0.002	0.017
Dec-19	59.63	35.81	12.34	16.58	8.53	0.69	25.99	< 0.001	< 0.01	< 0.001	< 0.001	< 0.002	0.013
Jan-20	61.10	36.65	11.01	16.21	8.83	0.59	26.71	< 0.001	< 0.01	< 0.001	< 0.001	< 0.002	0.013
Feb-20	67.98	40.79	14.00	15.96	8.71	0.56	27.96	< 0.001	< 0.01	< 0.001	< 0.001	< 0.002	0.014
Mar-20	57.54	34.53	9.61	13.96	11.46	0.39	22.60	< 0.001	< 0.01	< 0.001	< 0.001	< 0.002	< 0.001

AAQ2: H-Quarry

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	69.51	39.23	6.39	16.34	6.44	0.56	27.02	BDL	BDL	BDL	BDL	BDL	BDL
May-19	75.93	46.09	6.49	13.03	7.03	0.61	28.24	BDL	BDL	BDL	BDL	BDL	BDL
Jun-19	61.90	35.11	8.38	12.45	7.36	0.61	27.84	BDL	BDL	BDL	BDL	BDL	BDL
Jul-19	46.89	24.83	9.0	10.21	9.10	0.55	26.49	BDL	BDL	BDL	BDL	BDL	BDL
Aug-19	43.04	22.93	8.68	11.70	9.02	0.54	26.37	BDL	BDL	BDL	BDL	BDL	BDL
Sep-19	30.98	17.35	6.90	9.99	7.19	0.23	20.87	BDL	BDL	BDL	BDL	BDL	BDL
Oct-19	58.44	29.47	4.67	12.11	5.88	0.28	23.91	< 0.001	< 0.01	< 0.001	< 0.001	< 0.002	0.01
Nov-19	61.00	36.60	5.39	13.12	7.91	0.32	25.87	< 0.001	< 0.01	< 0.001	< 0.001	< 0.002	0.010
Dec-19	60.24	35.70	9.31	14.64	7.13	0.61	25.69	< 0.001	< 0.01	< 0.001	< 0.001	< 0.002	<0.001
Jan-20	62.49	37.43	9.12	13.70	8.27	0.65	26.49	< 0.001	< 0.01	< 0.001	< 0.001	< 0.002	<0.001
Feb-20	70.65	42.39	9.09	14.64	8.25	0.59	26.60	< 0.001	< 0.01	< 0.001	< 0.001	< 0.002	<0.001
Mar-20	63.69	38.21	10.43	13.34	8.07	0.52	25.40	< 0.001	< 0.01	< 0.001	< 0.001	< 0.002	<0.001

1. FUGITIVE EMISSION

FUGITIVE DUST EMISSION MONITORING REPORT								
	Sampling Location							
L-1	Near Screening Plant (D- Quarry)	NAAQ Standard	Apr-19	May-19	Jun-19	July-19	Aug-19	Sept-19
Parameters	Method of Measurement							
SPM	Gravimetric method	1200($\mu\text{g}/\text{m}^3$)	674.8	418.8	431.4	452.6	455.2	548.8
L-2	Near Stack Yard (D-Quarry)	NAAQ Standard	Apr-19	May-19	Jun-19	July-19	Aug-19	Sept-19
Parameters	Method of Measurement							
SPM	Gravimetric method	1200($\mu\text{g}/\text{m}^3$)	682.8	422.6	438.8	460.8	458.8	562.2
L-3	Near Sorting Yard (H-Quarry)	NAAQ Standard	Apr-19	May-19	Jun-19	July-19	Aug-19	Sept-19
Parameters	Method of Measurement							
SPM	Gravimetric method	1200($\mu\text{g}/\text{m}^3$)	691.2	431.2	442.8	464.2	464.2	571.8

L-1	Near Screening Plant (D- Quarry)	NAAQ Standard	Monitoring Date	Oct-19	Nov-19	Dec-19	Jan-20	Feb-20	Mar-20
Parameters	Method of Measurement		Analysis Result						
SPM	Gravimetric method	1200($\mu\text{g}/\text{m}^3$)		686.2	432.8	426.8	446.8	542.6	608.0
L-2	Near Stack Yard (D-Quarry)	NAAQ Standard	Monitoring Date	Oct-19	Nov-19	Dec-19	Jan-20	Feb-20	Mar-20
Parameters	Method of Measurement		Analysis Result						
SPM	Gravimetric method	1200($\mu\text{g}/\text{m}^3$)		502.6	451.6	442.8	461.2	511.2	518.2

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

L-3	Near Sorting Yard (H-Quarry)	NAAQ Standard	Monitoring Date	Oct-19	Nov-19	Dec-19	Jan-20	Feb-20	Mar-20
Parameters	Method of Measurement	1200($\mu\text{g}/\text{m}^3$)	Analysis Result	446.2	468.8	516.2	526.2	531.6	522.2
SPM	Gravimetric method								

L-3	Near Sorting Yard (D-Quarry)	NAAQ Standard	Monitoring Date	Oct-19	Nov-19	Dec-19	Jan-20	Feb-20	Mar-20
Parameters	Method of Measurement	1200($\mu\text{g}/\text{m}^3$)	Analysis Result			521.6	518.6	524.6	521.2
SPM	Gravimetric method								

1. PERSONAL DUST SAMPLING

Location :		Mines Area		
Sl.No	Date of sampling	Name of the Person	Prsonal Number	Particulate matter as PM ($\mu\text{g}/\text{m}^3$)
1	10.10.2019	Asha Munda	TSP/822505/1019	9.6
2		Muni Munda	TSP/753326/0819	8.4
3		Puna Baipai	TSP/814028/0919	7.2
4		Bodhuran Baipai	TSP/823979/0919	8.1
5		Raghunath Naik	TSP/753638/0819	8.4
6		Kanuram Chatombu	TSP/808507/0919	8.2
7		Radha Naik	TSP/753285/0819	8.8
8		Manju Devi	TSP/753281/0819	9.1
9		Nemabai Sahu	TSP/806073/0919	8.4

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

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 ($\mu\text{g}/\text{m}^3$)
Asha Munda	TSP/822505/1019	9.6	Dhunu Munda	JW-307	9.6	Radha Naik	TSP/753285/0819	8.5
Muni Munda	TSP/753326/0819	8.4	Durga Aram	JW-303	8.2	Manju Devi	TSP/753281/0819	8.2
Puna Baipai	TSP/814028/0919	7.2	Rebati Munda	JW-85	7.8	Nemabai Sahu	TSP/806073/0919	8.4
Bodhuran Baipai	TSP/823979/0919	8.1	Anita Kerketa	JW-57	8.4	Suresh Naik	TSP/801522/0919	8.6
Raghunath Naik	TSP/753638/0819	8.4	Pintu Soren	JW-75	8.6	Kumari Patra	TSP/801276/0919	9.2
Kanuram Chatombu	TSP/808507/0919	8.2	Jatia Champia	JW-78	8.1	Laxmi Munda	TSP/775944/0819	9.4
Radha Naik	TSP/753285/0819	8.8	Babulal Munda	JW-287	8.2	Rajesh Patra	TSP/785783/0819	9.6
Manju Devi	TSP/753281/0819	9.1	Manju Devi	TSP/753281/0819	8.8	Jena Patra	TSP/775945/0819	9.1
Nemabai Sahu	TSP/806073/0919	8.4	Nemabai Sahu	TSP/806073/0919	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 ($\mu\text{g}/\text{m}^3$)
Radha Naik	TSP/753285/0819	8.2	Radha Naik	TSP/753285/0819	8.8	Suresh Naik	TSP/801522/0919	4.8
Manju Devi	TSP/753281/0819	7.8	Manju Devi	TSP/753281/0819	8.4	Kumari Patra	TSP/801276/0919	4.1
Nemabai Sahu	TSP/806073/0919	7.6	Nemabai Sahu	TSP/806073/0919	8.2	Laxmi Munda	TSP/775944/0819	4.4
Suresh Naik	TSP/801522/0919	8.1	Suresh Naik	TSP/801522/0919	7.6	Jema Patra	TSP/775945/0819	4.2
Kumari Patra	TSP/801276/0919	8.4	Kumari Patra	TSP/801276/0919	8.1	Rajesh Patra	TSP/785783/0819	3.8
Laxmi Munda	TSP/775944/0819	8.6	Laxmi Munda	TSP/775944/0819	7.8	Sitara Hessa	TSP/770136/0819	4.1
Rajesh Patra	TSP/785783/0819	7.2	Rajesh Patra	TSP/785783/0819	8.2	Ajay Das	TSP/770126/0819	4.2
Jena Patra	TSP/775945/0819	7.8	Jena Patra	TSP/775945/0819	8.4	Sarjen Kulei	TSP/770178/0819	4.4

DG SET STACK

Sampling Location: 32 KVA DG SET						
Parameters Analyzed	Unit	CPCB Limit	Analysis Results			
			May-19	Sept-19	Dec-19	Mar – 20
Stack Temperature	^o C	--	125	131	144	142
Velocity	m/sec	--	10.39	14.3	15.8	146
Concentration of Particulate Matter as PM	mg/Nm ³	50	36	42.0	51.2	50.8
Oxides of Nitrogen as NO _x	mg/Nm ³	400	52.5	58.0	81.6	82.2
Carbon Monoxide as CO	mg/Nm ³	150	36	44	46.6	42
Non Methyl Hydrocarbons as C	mg/Nm ³	--	8.4	7.9	8.1	7.8

1. AMBIENT NOISE

AAQ							
Sl. No	Date	Name of Location	Unit	Day Time Result	CPCB Standard	Night Time Result	CPCB Standard
1	June -19	Township	dB	66.8	75	52.4	70
2		Hospital		69.2	50	50.2	40
3		Mines Area		71.4	75	49.6	70
4		Railway Siding		62.8	75	48.8	70

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

AAQ

Sl. No	Date	Name of Location	Unit	Day Time Result	CPCB Standard	Night Time Result	CPCB Standard
1	July -19	Township	dB	68.8	75	46.2	70
2		Hospital		38.2	50	31.2	40
3		Mines Area		64.6	75	42.8	70
4		Railway Siding		60.8	75	44.6	70

AAQ

Sl. No	Date	Name of Location	Unit	Day Time Result	CPCB Standard	Night Time Result	CPCB Standard
1	Aug -19	Township	dB	67.5	75	45.3	70
2		Hospital		45.8	50	38.2	40
3		Mines Area		63.5	75	43.1	70
4		Railway Siding		60.5	75	45.9	70

AAQ

Sl. No	Date	Name of Location	Unit	Day Time Result	CPCB Standard	Night Time Result	CPCB Standard
1	Sept -19	Township	dB	62.6	75	42.6	70
2		Hospital		41.8	50	36.2	40
3		Mines Area		60.8	75	40.6	70
4		Railway Siding		61.2	75	41.8	70

Location ID	Location	Day time Equivalent Noise Level in dB (A) Leq						Standard as per CPCB	Night time Equivalent Noise Level in dB(A) leq						Standard as per CPCB
		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	62	66	66.8	62.8		66.6	62.8	75	42	44	48	
N-2	Hospital	41	46.2	48.87	51.2	58.2	56.0	50	36	38.4	37.4	39.6	46.9	48	40
N-3	Mines Area	60.8	56.2	65.2	63.8	65.2	61.8	75	42	48.6	48	48.2	56.8	58	70

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

2. EQUIPMENT NOISE

Sl. No	Date	Name of Location	Unit	Result
1	June-2019	OD-09A-4623(Truck)	dB	81.2
2		D-80A (Loader)		80.6
3		OD-09A-4691(Truck)		82.2
4		SD-13(Drojer)		78.8
5		OD-O9N-9454(Truck)		76.4
6		Volvo-EC300 DL(Sovel-1)		78.2
7		Volvo-EC300BLC(Sovel-2)		61.2
8		OR-14N-5243(Water Tank)		66.6
9		OR-09L-9552(Truck)		64.2
10		OD-09A-4125(Truck)		79.0
11		OD-09A-4128(Truck)		82.0
12		OD-09A-4692(Truck)		80.0

Sl. No	Date	Name of Location	Unit	Result
1	Sept-19	OD-09A-4623(Truck)	dB	76.4
2		D-80A (Loader)		78.2
3		OD-09A-4691(Truck)		80.4
4		SD-13(Drojer)		72.6
5		OD-O9N-9454(Truck)		78.8

Name of Location	Unit	Result	Name of Location	Result	Name of Location	Result	Name of Location	Result	Name of Location	Result	Name of Location	Result
		OCT-19		NOV-19		Dec-19		Jan-20		Feb-20		Mar-20
OD-09A-4693(Truck)	dB	72.2	Loader (OR09N9452)	76.6	OR-09A-5106(Truck)	70.6	OR-09A-5106(Truck)	71.4	OR-09A-5106(Truck)	84.6	OR-09A-5106(Truck)	82
OD-09C-1372(Truck)		56.6	Hyua (OD 09K3113)	64.8	Volvo EC360BLC	71.8	Volvo EC360BLC	72.6	Volvo EC360BLC	86.2	Volvo EC360BLC	81.2
OR-09P-8134(Truck)		61.2	Water Tanker (OR09K6391)	66.6	OD-09G-7805	74.6	OD-09G-7805	73.8	OD-09G-7805	82.8	OD-09G-7805	82.6
OR-09A-5106(Truck)		66.8	OR-09A-5106(Truck)	70.2	OD-09G-7806	75.2	OD-09G-7806	74.2	OD-09G-7806	80.6	OD-09G-7806	80.8

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

Volvo EC360BLC		70.8	Volvo EC360BLC	71.1	OD-09G-7865	75.8	OD-09G-7865	74.8	OD-09G-7865	81.2	OD-09G-7865	80.2
											OR-09P-8134 (Truck)	81.4
											OD-09N-9454 (Truck)	82.4
											Volvo EC460BLC (Sovel-1)	83.2
											OD-09A 5665	83
											OD-09A-4693	82.6

1. DUST FALL ANALYSIS

Month	Total Dust Fall (t/km2/month)	Analysis Result			
		Co (%)	Ni(%)	Hg(%)	As (%)
May-19	0.488	<0.001	<0.001	<0.001	<0.001
Aug-19	0.412	<0.001	<0.001	<0.001	<0.001
Dec-19	0.69	<0.001	<0.001	<0.001	<0.001
Mar-20	0.74	<0.001	<0.001	<0.001	<0.001

2. SOIL ANALYSIS

Location: Mines Area

Sl. No.	Parameters	Analysis Result	
		May'19	Aug'19
1	pH	6.4	6.6
2	Texture	Sandy Loam	Sandy Loam
3	Temperature (OC)	19.5	16.4
4	Organic Matter (%)	1.2	1.4
5	Phosphate	2.8	3.2
6	Potash	<250	<250
7	Electrical Conductivity (mS/m))	2.01	1.91

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

8	Porosity (%)	29.3	30.7
9	Nitrogen (%)	0.013	0.017
10	Cobalt (%)	0.022	0.018
11	Nickel (%)	0.053	0.042
12	Mercury (%)	<0.000002	<0.000002
13	Arsenic (%)	<0.000002	<0.000002

1. GROUND WATER (TRACE METALS) ANALYSIS

Parameters Analyzed	Unit	Testing Method	Analysis Results		
			June-19	Sept-19	November-19
Iron as Fe	mg/l	APHA 3500 Fe B	0.25	0.31	0.26
Copper as Cu	mg/l	APHA 3111 B,C	<0.02	<0.02	<0.02
Manganese as Mn	mg/l	APHA 3500 Mn B	0.024	0.028	0.018
Hexavalent Chromium as Cr ⁶⁺	mg/l	APHA 3500 Cr B	<0.05	<0.05	<0.05
Mercury as Hg	mg/l	APHA 3500 Hg	<0.002	<0.002	<0.002
Cadmium as Cd	mg/l	APHA 3114 B,C	<0.01	<0.01	<0.01
Selenium as Se	mg/l	APHA 3114 B	<0.001	<0.001	<0.001
Arsenic as As	mg/l	APHA 3114 B	<0.004	<0.004	<0.004
Lead as Pb	mg/l	APHA 3111 B,C	<0.01	<0.01	<0.01
Zinc as Zn	mg/l	APHA 3111 B,C	<0.05	<0.05	<0.05

3. GROUND WATER LEVEL

GROUND WATER LEVEL ANALYSIS REPORT			
SL.NO	Monitoring Date	Location	Analysis Result (MT/BGL)
1	May-19	Kamar Joda	10.7
2	May-19	Prembasti	10.6
3	Aug-19	kamar joda	2.8