O/C

TATA

Regd Post with A/D

Ref.No.: MGM/P&E/1382/18 Date: 27/11/2018

To,

The Additional Director,
Ministry of Environment and Forest & Climate Change
Eastern Region Office,
A/3, Chandrasekharpur,
Bhubaneswar-751023

Sub: Submission of Six-monthly EC compliance report on implementation of safeguards in respect of Tiringpahar Iron and Manganese Mine, M/s TATA Steel Ltd. for the period April to September 2018.

Dear Sir,

We are submitting herewith six-monthly EC compliance report on implementation of safeguards in respect of Tiringpahar Iron and Manganese Mine, M/s TATA Steel Ltd. for the period April to September 2018 as per EIA notification 2006.

We trust that the measures taken towards environmental safeguards comply with the stipulated conditions. We look forward to your guidance which shall certainly help us in our endeavor for improving upon our environmental management practices.

This is for your kind perusal.

Thanking you,

Yours faithfully,

F: TATA STEEL LTD.

Amit
27.11.18

Agent, Tiringpahar Iron and Manganese Mine &
Head, Manganese Gr. of Mines
Ferro Alloys & Minerals Division,
Joda.

Encl: as above.

Copy to : Zonal Office Kolkata, Central Pollution Control Board

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

COMPLIANCE REPORT PERIOD: Apr'18 to Sept'18

ENVIRONMENTAL CLEARANCE TO TIRINGPAHAR IRON AND MANGANESE MINE OF TATA STEEL LIMITED VIDE MoEF's LETTER NO. J-11015/87/2004-IA. II (M) DATED 17.11.2005 COMMENTS SUBMITTED TO THE MINISTRY OF ENVIRONMENT & FORESTS, GOVERNMENT OF INDIA

Present Status of the Project: -

The Scheme of Mining and Progressive Mine Closure Plan for Tiringpahar Iron and Manganese Mine over an area of 643.710 ha. (RML – 169 ha & ML – 474.710 ha) was submitted under Rule No.12, MCDR 1988 for the period 2015-16 to 2019-20 and was approved by IBM vide letter no. MS/OTFM/34-ORI/BHU/2014-15

Sl. No	A: Specific conditions	Compliance status
1	Mining shall not be undertaken in areas of forestland within the lease without the necessary approvals / forestry clearance.	The mine has obtained forest clearance over 52.348 ha vide MoEF's letter No 8-80/2004-FC dt 28.03.2007. Further, in accordance to the MoEF & CC Circular dated F.No.8-78/1996-FC, dated 10.03.2015, the forest area as on 25.10.1980 (i.e. Sabik Settlement) 64.260ha. within the mining lease of 169 ha is now termed as forest land. Hence, fresh forest diversion proposal over an area of 80.826 ha (Sabik forest+ Balance forest) has been applied on 19.06.2016. The mining operation and allied activities are confined within the approved diverted area only.
2	Topsoil should be stacked properly with proper slope at earmarked site(s) with adequate measures and should be used for reclamation and rehabilitation of mined out area.	There was no generation of top soil during the period Apr'18 to Sept'18.
3	OB and other wastes should be stacked at earmarked sites only and should not be kept active for long periods of time. Plantation should be taken up for soil stabilisation along the slopes of the dump and terraced after every 5-6 m of height and overall slope angle shall be maintained not exceeding 28°. Sedimentation pits shall be constructed at the corners of the garland drains. Retention/toe walls shall be provided at the base of the dumps.	OB and other waste are being dumped as per approved Scheme of Mining. The dump is terraced at every 10m and overall slope is maintained well within 28° as per approved Scheme of Mining. The inactive portion of OB dumps area being stabilized by plantation of local species. The inactive portion of OB dumps area being stabilized by plantation of fast growing species.

		Total 18640 Nos of saplings and 12000 vetiver slips have been planted during Apr'18 to Sept'18. Further plantation and maintenance of the same is in progress. The total numbers along with area coverage for plantation shall be provided in the next six-monthly EC compliance report. The local forest species like Gambhari, Chakunda, Mahanimba, Kala Sirs, Sisu, etc) were planted. The retaining wall and garland drain with sedimentation pit at corners near toe of OB dump at maximum places has been constructed. Their dimensions are matching the requirements to arrest effectively the run off.
4	Minerals rejects shall be stacked separately at earmarked site/dump only.	The mineral rejects generated during manual processing of manganese ore (i.e. sorting, dressing and sizing) has been stacked separately at earmarked site.
5	Catch drains and siltation ponds of appropriate size should be constructed to arrest silt and sediment flows from soil, 0B and mineral dumps. The drains should be regularly desilted and maintained properly. Garland drains (size, gradient & length) and sump capacity should be designed keeping 50% safety margin over and above the peak sudden rainfall and maximum discharge in the area adjoining the mine site. Sump capacity should also provide adequate retention period to allow proper settling of silt material. Storm water return system should be provided. Storm water should not be allowed to go to the effluent treatment plant during high rainfall/super cyclone period. A separate storm water sump for this purpose should be created.	Existing catch drains and garland drains are covering the entire dump slope at low lying part. The catch drains and sedimentation pits are periodically de-silted and maintained properly. Size, gradient and length of the drains will be adequate to take care of the peak flow. The retaining wall and garland drain with sedimentation pit at corners near toe of OB dump at maximum places has been constructed. Their dimensions are matching the requirements to arrest effectively the run off.
6	Dimension of retaining wall at the toe of OB dumps and benches within the mine to check run-off and siltation should be based on the rainfall data.	In order to prevent the siltation and check the run-off, retaining wall and garland drain are provided with the dimension as; Dimension of the Retaining Wall : Height – 1 to 1.2 mtr. Width – 1 mtr. Dimension of the Garland Drain : Depth – 1.20 to 1.5 mtr. Width – 1 to 1.2 mtr.
7	Trace Metals such as Ni, Co, As and Hg should be analyzed in dust fall and soil samples for at least one year during	Samples have been analyzed in dust fall & soil for trace metal.

	summer, monsoon and winter seasons. If concentrations of these metals are found below the standards then with prior approval of MOEF this specific monitoring could be discontinued.	The detail analysis result is enclosed as **Annexure-VIII (Dust Fall) & IX (Soil).**
8	Mine Mineral and OB transportation shall be in trucks/dumpers covered with tarpaulins. Vehicular emissions should be kept under control and regularly monitored. Suitable measures should be taken to check fugitive emissions from haulage roads & transfer points, etc.	The trucks are covered with tarpaulin during dispatch of manganese ore from mine to Ferro Alloys Plant and Railway Siding at Joda. OB is being transported by shovel – dumper combination from mine face to dumps located near the quarry itself within 1.5 Km. So, it is not in practice to cover the OB transpiration trucks with tarpaulin. All the trucks meant for transportation of mineral from mine to our captive plant & Railway Siding at Joda is bearing the "Pollution under Control" certificate. The emissions are under control. Provision of water sprinkling by mobile water sprinklers to suppress fugitive emission from haul roads and other potential area like OB dump and stack yard has been made. The processed manganese ore is being transferred manually; hence there is no fugitive emission during transfer of ore.
9	A green belt of adequate width should be raised by planting the native species around ML area. Plantation should also be carried out along roads, OB dump sites etc. in consultation with the local DFO *I* Agriculture Department. The density of the trees should be not less than 2500 plants per ha.	Total 18640 Nos of saplings and 12000 vetiver slips have been planted during Apr'18 to Sept'18. Further plantation and maintenance of the same is in progress. The total numbers along with area coverage for plantation shall be provided in the next six-monthly EC compliance report. Tree density is maintained at the rate of 2500 saplings per ha. The plantation includes the local species like Gambhari, Chakunda, Mahanimba, Kala Sirs, Sisu, etc.
10	Groundwater shall not be used for mine operations. Prior approval of CGWA shall be obtained for using groundwater.	The ground water is not being used for mining and its allied activities.
11	Mining will not intersect groundwater. Prior pennission of the MOEF and CGWA shall be taken to mine below water table.	Mining is not intersecting the ground water as the Ground water being at lower level in comparison to existing maximum quarry depth.

12	Regular monitoring of ground water level and quality should be carried out by establishing a network of existing wells and constructing new piezometers. The monitoring should be done for quantity four times a year in pre-monsoon (April / May), monsoon (August). Post-monsoon (November) and winter (January) seasons and for quality in May. Data thus collected should be submitted to the Ministry of Environment & Forests and the Central Ground Water Authority quarterly.	Ground water table is much below the existing mine workings because of mining operations are confined at hilly topography only. However, ground water level & quality at existing well at nearby villages is being monitored. The ground water level and quality monitoring results are enclosed as **Annexure III & VI** respectively.
13	Trace metals such as Fe, Cr+6, Cu, Se, As, Cd, Hg, Pb, Zn and Mn at specific locations for both surface water downstream and in ground water at lower elevations from mine area, shall be periodically monitored in consultation with the OSPCB and State Ground Water Board. Suitable treatment measures shall be undertaken in case levels are found to be higher than permissible limits.	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. The details of analysis result for surface water and ground water with standards are enclosed as **Annexure –I & VI** respectively.
14	"Consent to Operate" should be obtained from SPCB before expanding mining activities.	"Consent to operate" has been obtained from State Pollution Control Board, Orissa vide Order no.115 issued by letter no. 1482 / IND-I-CON-190 dated 19.01.2016 & it is valid up to 31.03.2021.
15	A Conservation Plan for conservation of endangered fauna including the Indian Elephant found in and around the mine area shall be prepared and implemented in consultation with identified agencies/institutions and with the State Forest Department. The Plan should be dovetailed with that prepared/under implementation/proposed for the endangered fauna found in the Reserve Forest in the buffer zone of the project site. The costs for the specific activities/tasks should be earmarked in the Conservation Plan and shall not be diverted for any other purpose. Year wise status of the implementation of the Plan and the expenditure thereon should be reported to the Ministry of Environment & forests, RO, Bhubaneshwar.	We have deposited Rs.25,20,385/- on 15.12.2005 with DFO, Keonjhar, Orissa being the contribution towards implementation of Wild Life Management Plan prepared for Bonai & Keonjhar division. We have also paid additional amount of Rs. 8,59,615 with DFO, Keonjhar, Orissa towards differential payment for implementation of regional Wildlife Management Plan prepared for Bonai & Keonjhar division. An amount of Rs. 3887000/- has been made on 30.07.2015 towards differential payment for implementation conservation of regional Wildlife management at the rate 43,000/ha. Further, Site Specific wildlife management plan has been approved as per the new guidelines.
16	A Final Mine Closure Plan along with details of Corpus Fund should be submitted to the Ministry of Environment & Forests 5 years in advance of final mine closure for approval.	Scheme of Mining along with progressive mine closure plan for the period from 2014-15 to 2019-20 has been approved by Indian Bureau of Mine (IBM).

<table>
<tr><td></td><td></td><td>The final mine closure plan along with details of Corpus fund will be submitted to the Ministry of Environment & Forests in advance of final mine closure for approval.</td></tr>
<tr><td>Sl.No.</td><td>B : General Conditions</td><td>Compliance Status</td></tr>
<tr><td>1</td><td>No change in mining technology and scope of working should be made without prior approval of the Ministry of Environment & Forests.</td><td>No change in mining technology and scope of working has been made at the mine. If any changes proposed in technology and scope of workings, prior approval shall be sought from Ministry of Environment & Forests.</td></tr>
<tr><td>2</td><td>No change in the calendar plan including excavation, quantum of manganese ore and waste should be made.</td><td>Plan for production of Manganese Ore and excavation of waste has been prepared and is being strictly adhered. The actual figures achieved during Apr’18 to Sept’18 against plan for the year 2018-19 is given below.

<table>
<tr><td>Year 2017-18</td><td>Plan (2017-18)</td><td>Actual</td></tr>
<tr><td>Total Excavation (cum)</td><td>3,56,211</td><td>1,53,926</td></tr>
<tr><td>OB (cum)</td><td>3,16,211</td><td>1,36,331</td></tr>
<tr><td>Production (MT)</td><td>85,000</td><td>43,987</td></tr>
</table>
</td></tr>
<tr><td>3</td><td>Four ambient air quality-monitoring stations should be established in the core zone as well as in the buffer zone for RPM. SPM, SO2, NOx. monitoring. Location of the stations should be decided based on the meteorological data, topographical features, and environmentally and ecologically sensitive targets in consultation with the State Pollution Control Board.

Data on ambient air quality (RPM, SPM, SO2 & NOx.) should be regularly submitted to the Ministry including its Regional office at Bhubaneshwar and the State Pollution Control Board I Central Pollution Control Board once in six months.</td><td>Six ambient air quality monitoring stations have been established out of which 2 nos. in core zone (Near Purnapani Quarry and Near Guruda mining area) & 3 nos. in buffer zone (at Jaribahal, Palasa & Balda).

Samples are drawn twice in a week in core zone and once in a quarter in buffer zone to ascertain the 24hour monitoring average for PM_{10}, $PM_{2.5}$, SO_2 & NOx, CO & Mn.

It was observed that the environmental parameters are within the prescribed limit.

The report of ambient air quality monitoring for every month is submitted to State Pollution Control Board on monthly basis. Abstract of the monthly monitoring data on ambient air quality is enclosed as Annexure – IV & V.</td></tr>
<tr><td>4</td><td>Drills should be wet operated or with dust extractors and controlled blasting should be practiced.</td><td>Wet drilling concept is already in place.
Controlled blasting technique with NONEL is being practiced where ever required.</td></tr>
</table>

5	Fugitive dust emissions from all the sources should be controlled regularly monitored and data recorded properly. Water spraying arrangements on haul roads, wagon loading, dumpers/ trucks, loading & unloading points should be provided and properly maintained.	Effective water sprinkling by mobile water tanker is being done on haul roads. The Ambient Air Quality Report of Tiringpahar Mine is attached in **Annexure IV & V.**
6	Adequate measures should be taken for control of noise levels below 85 dBA in the work environment. Workers engaged in blasting and drilling operations, operations of HEMM, etc should be provided with ear plugs/ muffs.	Ear plugs & Ear muffs are provided to the workers working in drilling operations & DG operations. Noise monitoring done during the period Apr'18 to Sept'18 is attached in **Annexure VII.**
7	In Industrial waste water (workshop and waste water from the mine) should be properly collected, treated so as to conform to the standards prescribed under GSR 422 (E) dated 191b May, 1993 and 31 II December, 1993 or as amended from time to time. Oil and grease trap should be installed before discharge of workshop effluents.	No infrastructural facility has been installed for equipment/ vehicle within the lease hold area. The equipment and vehicles deployed in the mine are maintained at Bamebari Mn. Mines which is under same management control. The oil separation system has been provided at workshop at Bamebari and working effectively.
8	Environmental laboratory should be established with adequate number and type of pollution monitoring and analysis equipment in consultation with the State Pollution Control Board.	It is being done by M/s Visiontek Consultancy Service Pvt. Ltd Recognized as "A" category consultant as by State Pollution Control Board, Orissa). The type of pollution monitoring and analysis equipment used by M/s Visiontek Consultancy Service Pvt. Ltd is enclosed as **Annexure – X.**
9	Personnel working in dusty areas should wear protective respiratory devices and they should also be provided with adequate training and information on safety and health aspects. Occupational health surveillance program of the workers should be undertaken periodically to observe any contractions due to exposure to dust and take corrective measures, if needed.	Suitable dust masks are being provided to employees (departmental & contractual) engaged in dusty operations. It is also ensured that they use the same. Employees are undergoing Periodical Medical Examination which is inclusive of lungs function test and audiometry. All the personnel are trained on safety in work place and continuous awareness program are being conducted for all employees to avert manganese poisoning. 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. All chest radiographs are being classified for detection of pneumoconiosis, diagnosis and

		documentation made in accordance to ILO classifications. During Apr'18 to Sept'18 PME was conducted for 14 contracual employees. There are no findings of pneumoconiosis and manganese poisoning which is classified as occupational disease.
10	A separate environmental management cell with suitable qualified personnel should be set up under the control of a Senior Executive, who will report directly to the Head of the Organization.	The department is in place and the Head of the department is reporting to General Manager of the division. The organizational structure in place is enclosed as **Annexure-XI.**
11	The funds earmarked for environmental protection measures should be kept in separate account and should not be diverted for other purpose. Year wise expenditure should be reported to the Ministry and its Regional Office located at Bhubaneshwar.	Funds allocated for environmental management are spent only for environment related purposes and not diverted to any other purpose. For the year 2017-18, Rs 15,00,000 was allocated for Environment monitoring out of which Rs 5,82,200 was spent and Rs. 4,35,750 was allocated for plantation out of which 8,33,016 was spent. The expenditure incurring towards environmental monitoring and protection measures during 2018-19 shall be submitted in the next six-monthly EC compliance report. Environmental monitoring in core and buffer zone is being done as per the stipulated conditions in CTO and EC, however the cost incurred in environment monitoring was less, due to less price was quoted by third party compare to projected cost for doing environment monitoring job.
12	The Regional Office of this Ministry located at Bhubaneshwar shall monitor compliance of the stipulated conditions. The project authorities should extend full cooperation to the officer (s) of the Regional Office by furnishing the requisite data *I* information *I* monitoring reports.	We shall extend to full co-operation to the officers of the Regional Office by furnishing the requisite date/information/monitoring reports.
13	A copy of clearance letter will be marked to the concerned Panchayat/local NGO, if any, from whom suggestion/ representation has been received while processing the proposal.	Copy of the clearance letter marked to Sarpanch, Gram Panchayat, Jajang on 12.01.2006.
14	The State Pollution Control Board should display a copy of the clearance letter at the Regional Office, District Industry Centre	This is applicable to State Pollution Control Board, Orissa.

	and Collector's Office/Tehsildar's Office for 30 days.	
15	The project authorities should advertise at least in two local newspapers widely circulated around the project, one of which shall be in the vernacular of the locality concerned within seven days of the issue of the clearance letter informing that the project has been accorded environmental clearance and a copy of the clearance letter is available with the State Pollution Control Board and may also be seen at Web Site of the Ministry of Environment & Forests at http://envfor.nic.in and a copy of the same should be forwarded to the Regional Office of this Ministry located at Bhubaneswar.	A detail of Environmental Clearance with regard to Tiringpahar Manganese Mine was published in Oriya News Papers Anupam Bharat & Aam Khabar dated 10.01.2006.
16	The Ministry or any other competent authority may stipulate any further condition for environmental protection.	Noted
17	Failure to comply with any of the conditions mentioned above may result in withdrawal of this clearance.	Noted
18	The above conditions will be enforced, inter alia, under the provisions of the Water (Prevention & Control of Pollution) Act, 1974, the Air (Prevention & Control of Pollution) Act, 1991 along with their amendments and rules.	Noted

Yours faithfully
F: TATA STEEL LTD.

Amit
27.11.18

Agent, Tiringpahar Iron and Mn.Mine &
Head (Manganese Group of Mines), Joda

ANNEXURE-I

Surface Water Quality Report (Apr'18 to Sept'18)

Tiringpahar Iron and Manganese Mine, TATA STEEL LIMITED

Tiringipahar (Kundra Nallah entering Tiringipahar)			April'18	May'18	June'18	July'18	Aug-18	Sept-18
Parameters	Unit	Standard	1st Report	1st Report	1st Report	1st Report	1st Report	1st Report
Dissolved Oxygen (minimum)	mg/l	4	5.1	5.4	5.8	5	4.9	4.8
BOD (3) days at 27^0C (max)	mg/l	3	< 1.8	< 1.8	< 1.8	< 1.8	< 1.8	< 1.8
Total Coli form	MPN/ 100 ml	5000	170	470	240	400	98	70
pH Value	--	6.0-9.0	7.24	7.28	7.28	7.28	7.16	7.2
Colour (max)	Hazen	300	CL	CL	1	CL	1	CL
Total Dissolved Solids	mg/l	1500	120	125	137	130	126	128
Copper as Cu (max)	mg/l	1.5	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Iron as Fe (max)	mg/l	0.5	0.39	0.42	0.36	0.32	0.44	0.48
Chloride (max)	mg/l	600	27	28	36	32	22	26
Sulphates (SO_4) (max)	mg/l	400	4.1	4.4	5.6	4	4.6	4.5
Nitrate as NO_3 (max)	mg/l	50	1.44	1.52	1.82	1.6	1.5	1.4
Fluoride as F (max)	mg/l	1.5	0.013	0.011	0.021	0.011	0.017	0.015
Phenolic Compounds as C_6H_5OH (max)	mg/l	0.005	<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	<0.001	<0.001
Selenium as Se (max)	mg/l	0.05	<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	<0.001	<0.001
Cyanide as CN (max)	mg/l	0.05	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
Zinc as Zn(max)	mg/l	15	<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
Anionic Detergents (max)	mg/l	1.0	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2

Tiringipahar (Kundra Nallah leaving Tiringipahar)			April'18	May'18	June'18	July'18	Aug-18	Sept-18
Parameters	Unit	Standards	1st Report	1st Report	1st Report	1st Report	1st Report	1st Report
Dissolved Oxygen (minimum)	mg/l	4	5.3	5.8	6.1	5.2	5.2	5.3
BOD (3) days at 27^0C (max)	mg/l	3	< 1.8	< 1.8	< 1.8	< 1.8	< 1.8	< 1.8
Total Coli form	MPN/ 100 ml	5000	210	510	310	460	120	98
pH Value	--	6.0-9.0	7.2	7.22	7.16	7.21	7.22	7.24
Colour (max)	Hazen	300	CL	CL	2	CL	1	CL
Total Dissolved Solids	mg/l	1500	128	134	142	136	128	130
Copper as Cu (max)	mg/l	1.5	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Iron as Fe (max)	mg/l	0.5	0.46	0.45	0.42	0.38	0.5	0.52
Chloride (max)	mg/l	600	28	30	40	36	24	29
Sulphates (SO_4) (max)	mg/l	400	4.3	4.6	5.6	4.1	5.1	5.3
Nitrate as NO_3 (max)	mg/l	50	1.48	1.58	1.88	1.68	2.1	2.2
Fluoride as F (max)	mg/l	1.5	0.016	0.015	0.022	0.012	0.02	0.018
Phenolic Compounds as C_6H_5OH (max)	mg/l	0.005	<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	<0.001	<0.001
Selenium as Se (max)	mg/l	0.05	<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	<0.001	<0.001
Cyanide as CN (max)	mg/l	0.05	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
Zinc as Zn(max)	mg/l	15	<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
Anionic Detergents (max)	mg/l	1.0	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2

ANNEXURE-II
Drinking Water Quality Report (Apr'18 to Sept'18)
Sampling Location: Near Office
Tiringpahar Iron and Manganese Mine, TATA STEEL LIMITED

MICROBIOLOGICAL ANALYSIS OF WATER AS PER IS: 10500 - 1991

Sl No.	Test Parameters	Norms as per IS:10500-1991	18-Apr	18-May	18-June	18-July	18-Aug	18-Sept
1	Total Coliform Organism MPN/100ml	10 (MAX)	<2	<2	<2	<2	<2	<2
2	Faecal Coliforms	Absent	Absent	Absent	Absent	Absent	Absent	Absent
3	E. Coli	Absent	Absent	Absent	Absent	Absent	Absent	Absent

CHEMICAL ANALYSIS OF WATER AS PER IS: 10500 – 1991

Sl No.	Test Parameters	Norms as per IS: 10500-1991							
		Desirable Limit	Permissible Limit						
1	Colour (Hazen Unit)	5	25	CL	CL	CL	CL	CL	CL
2	Odour	Unobjectionable	--	U/O	U/O	U/O	U/O	U/O	U/O
3	Taste	Agreeable	--	AL	AL	AL	AL	AL	AL
4	pH value (250C)	6.5 - 8.5	No Relaxation	7.28	7.18	7.2	7.54	7.12	7.5
5	Turbidity in NTU	5	10	<2.0	<2.0	<2.0	<2.0	< 2.0	<2.0
6	Total Dissolved Solids in mg/l	500	2000	67	74	70	60	86	61.5
7	Aluminium (as Al) in mg/l	0.03	0.2	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
8	Anionic Detergents (as MBAS) in mg/l	0.2	1	<0.2	ND	ND	ND	<0.2	ND
9	Boron (as B) in mg/l	1	5	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
10	Calcium (as Ca) in mg/l	75	200	11.6	12.4	11.6	10.8	15.6	9.7
11	Chloride (as Cl) in mg/l	250	1000	12	14.0	15.2	12.8	15	13.4
12	Copper (asCu) in mg/l	0.05	1.5	<0.005	<0.05	<0.05	<0.05	<0.05	<0.05
13	Fluoride (as F) in mg/l	1	1.5	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
14	Residual Free Chlorine in mg/l	0.2(Min.)	---	ND	ND	ND	ND	ND	ND
15	Iron (as Fe) in mg/l	0.3	1	0.12	0.10	0.14	0.061	0.14	0.11

16	Magnesium (as Mg) in mg/l	30	100	2.7	3.2	2.6	2.1	3.6	1.9
17	Manganese (as Mn) in mg/l	0.1	0.3	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
18	Mineral Oil mg/l	0.01	0.03	<0.01	<0.1	<0.1	<0.1	<0.01	<0.1
19	Nitrate (as NO3) in mg/l	45	100	0.64	0.76	0.72	1.18	1.1	0.54
20	Phenolic Compounds (as C6H5OH) in mg/l	0.001	0.002	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
21	Selenium (as Se) in mg/l	0.01	No Relaxation	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
22	Sulphate (as SO4) in mg/l	200	400	<0.001	1.68	1.7	1.24	2.6	0.9
23	Alkalinity (as CaCO3) in mg/l	200	600	36	40.0	38	30.8	50	38
24	Total Hardness(as CaCO3) in mg/l	300	600	40	44.0	42	32.4	54	44
25	Cadmium (as Cd) in mg/l	0.01	No Relaxation	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
26	Cyanide (as CN) in mg/l	0.05	No Relaxation	ND	ND	ND	ND	ND	ND
27	Lead (as Pb) in mg/l	0.05	No Relaxation	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
28	Mercury (as Hg) in mg/l	0.001	No Relaxation	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
29	Arsenic (as As) in mg/l	0.05	No Relaxation	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
30	Zinc (as Zn) in mg/l	5	15	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
31	Chromium (as Cr+6) in mg/l	0.05	No Relaxation	<0.05	<0.01	<0.01	<0.01	<0.05	<0.01
32	Poly Aromatic Hydrocarbon as PAH	--	--	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
33	Pesticide	Absent	0.001	Absent	Absent	Absent	Absent	Absent	Absent

ANNEXURE-III

Ground Water Analysis Report as per IS:10500-1991

Sampling Location: GW1: Palsa Village OW (Apr'18 to Sept'18)

Tiringpahar Iron and Manganese Mine, M/S TATA STEEL LIMITED

Sl. No	Parameter	Unit	Standards as per IS: 10500, 1991	Analysis Results	
				May-18	Aug-18
				GW-1	GW-1
Essential Characteristics					
1	Colour	Hazen	5	CL	CL
2	Odour	--	U/O	U/O	U/O
3	Taste	--	Agreeable	Agreeable	Agreeable
4	Turbidity	NTU	5	<0.2	<0.2
5	pH Value	--	6.5-8.5	7.43	7.22
6	Total Hardness (as $CaCO_3$)	mg/l	300	160.0	130.0
7	Iron (as Fe)	mg/l	0.3	0.28	0.18
8	Chloride (as Cl)	mg/l	250	39.0	28.0
9	Residual, free Chlorine	mg/l	0.2	ND	ND
Desirable Characteristics					
10	Dissolved Solids	mg/l	500	243.0	190.0
11	Calcium (as Ca)	mg/l	75	43.3	35.3
12	Magnesium (as Mg)	mg/l	30	12.6	10.2
13	Copper (as Cu)	mg/l	0.05	<0.05	<0.05
14	Manganese (as Mn)	mg/l	0.1	0.016	0.012
15	Sulphate (as SO_4)	mg/l	200	6.2	4.9
16	Nitrate (as NO_3)	mg/l	45	2.6	2.5
17	Fluoride (as F)	mg/l	1	0.018	0.017
18	Phenolic Compounds (as C_6H_5OH)	mg/l	0.001	<0.001	<0.001

19	Mercury (as Hg)	mg/l	0.001	<0.001	<0.001
20	Cadmium (as Cd)	mg/l	0.01	<0.001	<0.001
21	Selenium (as Se)	mg/l	0.01	<0.001	<0.001
22	Arsenic (as As)	mg/l	0.05	<0.001	<0.001
23	Cyanide (as CN)	mg/l	0.05	ND	ND
24	Lead (as Pb)	mg/l	0.05	<0.001	<0.001
25	Zinc (as Zn)	mg/l	5	<0.05	<0.05
26	Anionic Detergents (as MBAS)	mg/l	0.2	<0.2	<0.2
27	Chromium (as Cr^{+6})	mg/l	0.05	<0.05	<0.05
28	Mineral Oil	mg/l	0.01	<0.01	<0.01
29	Alkalinity	mg/l	200	148.0	118.0
30	Aluminium as(Al)	mg/l	0.03	<0.001	<0.001
31	Boron (as B)	mg/l	1	<0.01	<0.01
32	Poly Aromatic Hydrocarbon as PAH	µg/l	--	<0.001	<0.001
33	Pesticide	mg/l	Absent	Absent	Absent

Sampling Location: GW2: Sandhy Guta BW

Sl. No	Parameter	Unit	Standards as per IS: 10500, 1991	Analysis Results	
				May-18	Aug-18
				GW-2	GW-2
Essential Characteristics					
1	Colour	Hazen	5	CL	CL
2	Odour	--	U/O	U/O	U/O
3	Taste	--	Agreeable	Agreeable	Agreeable
4	Turbidity	NTU	5	<0.2	<0.2
5	pH Value	--	6.5-8.5	7.46	7.40
6	Total Hardness (as $CaCO_3$)	mg/l	300	166.0	140.0

7	Iron (as Fe)	mg/l	0.3	0.26	0.22
8	Chloride (as Cl)	mg/l	250	43.0	34.0
9	Residual, free Chlorine	mg/l	0.2	ND	ND
Desirable Characteristics					
10	Dissolved Solids	mg/l	500	255.0	212.0
11	Calcium (as Ca)	mg/l	75	44.9	38.5
12	Magnesium (as Mg)	mg/l	30	13.1	10.7
13	Copper (as Cu)	mg/l	0.05	<0.05	<0.05
14	Manganese (as Mn)	mg/l	0.1	0.014	0.015
15	Sulphate (as SO_4)	mg/l	200	5.9	4.8
16	Nitrate (as NO_3)	mg/l	45	2.3	2.4
17	Fluoride (as F)	mg/l	1	0.016	0.019
18	Phenolic Compounds (as C_6H_5OH)	mg/l	0.001	<0.001	<0.001
19	Mercury (as Hg)	mg/l	0.001	<0.001	<0.001
20	Cadmium (as Cd)	mg/l	0.01	<0.001	<0.001
21	Selenium (as Se)	mg/l	0.01	<0.001	<0.001
22	Arsenic (as As)	mg/l	0.05	<0.001	<0.001
23	Cyanide (as CN)	mg/l	0.05	ND	ND
24	Lead (as Pb)	mg/l	0.05	<0.001	<0.001
25	Zinc (as Zn)	mg/l	5	<0.05	<0.05
26	Anionic Detergents (as MBAS)	mg/l	0.2	<0.2	<0.2
27	Chromium (as Cr^{+6})	mg/l	0.05	<0.05	<0.05
28	Mineral Oil	mg/l	0.01	<0.01	<0.01
29	Alkalinity	mg/l	200	153.0	128.0
30	Aluminium as(Al)	mg/l	0.03	<0.001	<0.001
31	Boron (as B)	mg/l	1	<0.01	<0.01
32	Poly Aromatic Hydrocarbon as PAH	µg/l	--	<0.001	<0.001
33	Pesticide	mg/l	Absent	Absent	Absent

ANNEXURE-IV

Ambient Air Quality (AAQ) Monitoring Report

CORE ZONE (Apr'18 to Sept'18)

Tiringpahar Iron and Manganese Mine, M/S TATA STEEL LTD.

Purunapani

Monthly Average	PM_{10} ($\mu g/m^3$)	$PM_{2.5}$ ($\mu g/m^3$)	SO_2 ($\mu g/m^3$)	NOx ($\mu g/m^3$)	O_3 ($\mu g/m^3$)	CO mg/m^3)	NH_3 ($\mu g/m^3$)	Pb ($\mu g/m^3$)	Ni (ng/m^3)	As (ng/m^3)	C_6H_6 ($\mu g/m^3$)	BaP (ng/m^3)	Mn $\mu g/m^3$)
Apr-18	51.06	25.43	4.28	10.55	<4.0	0.23	<20.0	<0.001	<0.01	<0.001	<0.001	<0.002	<0.001
May-18	42.76	20.40	<4.0	9.40	<4.0	0.24	<20.0	<0.001	<0.01	<0.001	<0.001	<0.002	<0.001
Jun-18	40.10	18.89	<4.0	9.17	<4.0	0.22	<20.0	<0.001	<0.01	<0.001	<0.001	<0.002	<0.001
Jul-18	39.54	17.70	<4.0	8.80	<4.0	0.21	<20.0	<0.001	<0.01	<0.001	<0.001	<0.002	<0.001
Aug-18	30.38	15.90	4.22	8.84	<4.0	0.17	<20.0	<0.001	<0.01	<0.001	<0.001	<0.002	<0.001
Sep-18	33.59	16.93	4.27	9.40	<4.0	0.28	<20.0	<0.001	<0.01	<0.001	<0.001	<0.002	<0.001

Garuda Pit

Monthly Average	PM_{10} ($\mu g/m^3$)	$PM_{2.5}$ ($\mu g/m^3$)	SO_2 ($\mu g/m^3$)	NOx ($\mu g/m^3$)	O_3 ($\mu g/m^3$)	CO mg/m^3)	NH_3 ($\mu g/m^3$)	Pb ($\mu g/m^3$)	Ni (ng/m^3)	As (ng/m^3)	C_6H_6 ($\mu g/m^3$)	BaP (ng/m^3)	Mn $\mu g/m^3$)
Apr-18	48.14	22.99	4.22	9.88	<4.0	0.27	<20.0	<0.001	<0.01	<0.001	<0.001	<0.002	<0.001
May-18	45.86	22.04	4.20	9.85	<4.0	0.29	<20.0	<0.001	<0.01	<0.001	<0.001	<0.002	<0.001
Jun-18	44.03	20.08	4.20	9.75	<4.0	0.25	<20.0	<0.001	<0.01	<0.001	<0.001	<0.002	<0.001
Jul-18	48.95	19.39	3.65	9.63	<4.0	0.22	<20.0	<0.001	<0.01	<0.001	<0.001	<0.002	<0.001
Aug-18	31.84	15.61	<4.0	9.33	<4.0	0.22	<20.0	<0.001	<0.01	<0.001	<0.001	<0.002	<0.001
Sep-18	48.95	19.39	3.65	9.63	<4.0	0.22	<20.0	<0.001	<0.01	<0.001	<0.001	<0.002	<0.001

ANNEXURE-V

Ambient Air Quality (AAQ) Monitoring Report

BUFFER ZONE (Apr'18 to Sept'18)

Tiringpahar Iron and Manganese Mine, M/S TATA STEEL LTD.

BZ-1 : Joribahal

Monthly Average	PM_{10} ($\mu g/m^3$)	$PM_{2.5}$ ($\mu g/m^3$)	SO_2 ($\mu g/m^3$)	NOx ($\mu g/m^3$)	CO mg/m^3)	O_3 ($\mu g/m^3$)	NH_3 ($\mu g/m^3$	BaP (ng/m^3)	C_6H_6 ($\mu g/m^3$)	As (ng/m^3)	Ni (ng/m^3)	Pb ($\mu g/m^3$)
Aug-18	23.8	11.6	<4.0	<9.0	<0.1	<4.0	<20.0	<0.002	<0.001	<0.001	<0.01	<0.001

BZ-2 : Balada

Monthly Average	PM_{10} ($\mu g/m^3$)	$PM_{2.5}$ ($\mu g/m^3$)	SO_2 ($\mu g/m^3$)	NOx ($\mu g/m^3$)	CO mg/m^3)	O_3 ($\mu g/m^3$)	NH_3 ($\mu g/m^3$	BaP (ng/m^3)	C_6H_6 ($\mu g/m^3$)	As (ng/m^3)	Ni (ng/m^3)	Pb ($\mu g/m^3$)
Aug-18	26.2	11.8	<4.0	<9.0	<0.1	<4.0	<20.0	<0.002	<0.001	<0.001	<0.01	<0.001

BZ-3 : Raikara

Monthly Average	PM_{10} ($\mu g/m^3$)	$PM_{2.5}$ ($\mu g/m^3$)	SO_2 ($\mu g/m^3$)	NOx ($\mu g/m^3$)	CO mg/m^3)	O_3 ($\mu g/m^3$)	NH_3 ($\mu g/m^3$	BaP (ng/m^3)	C_6H_6 ($\mu g/m^3$)	As (ng/m^3)	Ni (ng/m^3)	Pb ($\mu g/m^3$)
27.8	12.4	<4.0	<9.0	<0.1	<4.0	<20.0	<0.002	<0.001	<0.001	<0.01	<0.001	<0.001

ANNEXURE-VI

GROUND WATER LEVEL (Apr'18 to Sept'18)

Tiringpahar Iron and Manganese Mine, M/S TATA STEEL LIMITED

Month	Name of Village	Unit	Result
May-18	Palasa	Mt./bgl	12.1
	Joribahal	Mt./bgl	12.9
Aug-18	Palasa	Mt./bgl	3.8
	Joribahal	Mt./bgl	3.2

ANNEXURE-VII

Ambient Noise Monitoring Report (Apr'18 to Sept'18)

Tiringpahar Iron and Manganese Mine, M/S TATA STEEL LIMITED

AAQ				Day Time
Sl. No	Date	Name of Location	Unit	Result
1	May-18	Mines Area	db	61.8
EQUIPMENT				
Sl. No	Date	Name of Location	Unit	Result
1	May-18	OD-09A-5105(Truck)	db	73
2		OD-09C-5268(Truck)		81.8
3		OD-09A-5107(Truck)		81.2
4		Drojer		82
5		Volvo EC 300DL		78.9
6		OR09M-7869		82
7		OD-09A-5108 (Truck)		78.2

ANNEXURE-VIII

DUST FALL MONITORING (Apr'18 to Sept'18)

Tiringpahar Iron and Manganese Mine, M/S TATA STEEL LIMITED

MONTH	Total Dust Fall (t/km2/month)	Analysis Result			
		Co (%)	Ni(%)	Hg(%)	As (%)
May-18	0.506	<0.001	<0.001	<0.001	<0.001
Aug-18	0.512	<0.001	<0.001	<0.001	<0.001

ANNEXURE-VIII

Soil Quality Test Report (Apr'18 to Sept'18)

Tiringpahar Iron and Manganese Mine, M/S TATA STEEL LIMITED

MONTH	Co (%)	Ni(%)	Hg(%)	As (%)
May-18	0.017	0.047	<0.000002	<0.000002
Aug-18	0.014	0.041	<0.000002	<0.000002

ANNEXURE-X

LIST OF ENVIRONMENTAL MONITORING EQUIPMENT

Tiringpahar Iron and Manganese Mine, M/S TATA STEEL LIMITED

LIST OF ENVIRONMENTAL MONITORING EQUIPMENT		
Ambient Air Quality		
Sl.No.	Name of the Instrument	Parameter
1	Respirable Dust sampler	PM_{10}
2	Fine Particulate Sampler	$PM_{2.5}$
3	Spectrophotometer UV-Visible range	SO_2,NO_x
4	NDIR	CO
5	AAS	Manganese
Other Paraphernalia for analysis of air quality are also available in the laboratory.		
Water Quality		
Sl.No.	Name of the Instrument	Parameter
1	Analytical weighing Balance	Used for weighing the chemicals
2	Micro Balance	Used for weighing CRMs
3	AAS with VGA and Hallow cathode lamps	All Heavy metals (Arsenic, Mercury, Selenium, Cadmium, Chromium, Cobalt, Iron, Lead, Manganese, Zinc, Aluminium, etc..)
4	Spectrophotometer UV-Visible range	Nitrate, Nitrite, Sulphate, Chromium(VI),Fluoride, Cyanide, Phenolic compounds
5	Flame Photometer	Sodium ,Potassium
6	Ion Analyzer	Fluoride
7	BOD Incubator	BOD
8	COD Digester	COD
9	Furnace	Total volatile solids, Fixed solids
10	Hot Air Oven	Total Suspended Solids, Total Dissolved Solids
11	pH meter	pH
12	Conductivity meter	Conductivity
13	Turbidity Meter	Turbidity
14	Bacteriological Incubator	Total coli form and fecal coli form
15	Autoclave	sterilization
16	Microscope	Bacteriological colony count
17	Magnetic stirrer	Stirring purpose
18	Vacuum filtration unit	Rapid filtration
19	Water Bath	Boiling and evaporation purpose
20	Cadmium reduction column	Nitrate
21	Fluoride distillation unit	Fluoride
22	Kjeldal flask	Ammonia and Organic Nitrogen
23	Hot Plate	Digestion
24	Pizometer	Water level monitoring
25	Aquarium	Bio assay test

ANNEXURE-XI

ORGANIZATION STRUCTURE

Bamebari Iron and Manganese Mine, M/S TATA STEEL LIMITED