



To,  
The Member Secretary  
SEIAA,  
Qtr. No. 5RF, 2/1, Unit - A/3 Chandrasekharpur  
Bhubaneswar – 751 022  
Odisha

MD/ENV/ 82 /116/18  
Date: 29.05.2018

**Sub: Half-yearly compliance status report of Environmental Clearance conditions for the period October'17 - March'18 in respect of Manmora Manganese Mine.**

**Ref: Environmental Clearance letter no. SEIAA-329 (SEIAA-38/11) dated: 29.06.2011 & Extension of Environmental Clearance vide letter no. SEIAA/1925, dated 31.08.2016**

Dear Sir,

We are herewith submitting the six-monthly compliance report in respect of the stipulated Environmental Clearance conditions of Manmora Manganese Mine for the period from **October'17 - March'18** as per EIA Notification, 2006. We are also sending you the soft copy of the report to your good office on email: [seiaaorissa@gmail.com](mailto:seiaaorissa@gmail.com) for your ready reference.

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

Thanking you,  
Yours faithfully,

f: TATA Steel Limited

Head (Planning), OMQ

Encl: As above

Copy to : The Chairman, Central Pollution Control Board, Southernd Conclave, Block 502, 5<sup>th</sup> & 6<sup>th</sup> Floors, 1582 Rajdanga Main Road, Kolkata - 700107 (W. B.)  
: The Member Secretary, State Pollution Control Board, Paribesh Bhawan, A/118, Nilkanta Nagar, Unit – VIII, Bhubaneswar – 751012 (Odisha)  
: The Regional Officer, State Pollution Control Board, College Road, At/PO- Baniapat, Keonjhar – 758001 (Odisha).  
: The Regional Officer, MoEF &CC, (EZ), Ministry of Environment, Forests & Climate Change, Govt. of India, A/3, Chandrasekharpur, Bhubaneswar-751 013

**TATA STEEL LIMITED**

Mines Division Noamundi 833 217 India

Tel 91 92343-1340 Fax 91 6596 290737

Registered Office Bombay House 24 Homi Mody Street Mumbai 400 001





**Compliance**  
to  
**Environmental Clearance Conditions**  
of

**Manmora Manganese Mine**  
**M/s. Tata Steel Limited**

**For the period: Oct'17 - March'18**

**(Environmental Clearance letter no. SEIAA-329 (SEIAA-38/11) dated: 29.06.2011)**



**COMPLIANCE REPORT PERIOD: Oct'2017 TO March '2018**

**ENVIRONMENTAL CLEARANCE NO. SEIAA-38/11 OF  
MANMORA MANGANESE MINE OF TATA STEEL LIMITED  
VIDE SEIAA's LETTER NO. SEIAA/329 DATED 29.06.2011**

<b>Sl. no</b>	<b>Stipulated Conditions</b>	<b>Compliance status</b>
1	The earthen embankments are planned as per WAPCO design; it needs stone walling on both sides to prevent collapse of the embankment as immediately down of the mine are the townships, railway line and some agricultural land.	<ul style="list-style-type: none"><li>• The outer face as well as the inner face of the embankment has been stone patched to prevent collapse of the embankment. Photograph of Stone Pitched Embankment is attached as <b>Annexure-1</b></li></ul>
2	Since the mine has been fully worked and mineral resources have been fully removed, mine closure plan should be implemented forthwith reclaiming the mine pits and re-vegetation of the mine lease area.	<ul style="list-style-type: none"><li>• The mined out pit of Manmora Manganese mine over 6.46 ha has been reclaimed by filling of slime. The void consists of 0.6 million tonnes of resources in the form of slime. The slime will be allowed to settle down for few years and feasibility studies has under process for its future use. Once the slime is extracted, the entire area will be reclaimed by afforestation. However, progressive reclamation is carried out by plantation in the lease area as per approved Progressive mine closure plan.</li></ul>
3	The existing overburden dumps and the entire quantity of waste generated shall be back filled and liquidated within five years and there shall be no external overburden dump in the mining lease area. The back filled area shall be afforested and back filling has to be done in a manner that it is restored to the normal ground level. A complete mine closure plan with afforestation/ re-vegetation component with year wise details submitted to the SEIAA within six months and strictly implemented.	<ul style="list-style-type: none"><li>• Reclamation as per progressive Mine closure plan approved by IBM is being done.</li><li>• Reclamation is being done through Plantation.</li><li>• In FY 17-18 , 3500 nos. of plantation was done in the area of 1.5 Ha rea at dump and gap filling was done as per approved mine plan.</li></ul>

4	<p>The project proponent shall prepare wild life conservation plan in consultation with DFO and adequate safety and mitigation measures should be incorporated to protect the wild life, flora, fauna to mitigate adverse impact.</p>	<ul style="list-style-type: none"> <li>• Tata Steel has deposited Rs. 2,88,57,000/- (Rupees Two crore eighty-eight Lakhs Fifty - Seven Thousand Only) to forest Department for implementation &amp; management of Regional Wild Life Management Plan.</li> </ul>																								
5	<p>Shelter Belt i.e. Wind Break of 15m width consisting of at least 5 tiers around the lease facing the human habitation, school / agricultural land etc. (if any in the vicinity), in the safety zone / backfilled &amp; reclaimed areas around voids &amp; roads shall be raised. Green belt development and selection of plant species shall be as per CPCB guidelines. Density of the trees has to be around 2500 plants per hectare. Herbs and shrubs shall also form a part of afforestation programme besides tree plantation. Help &amp; guidance of local DFO may be sought in the matter. Details of year-wise afforestation programme including rehabilitation of mined out area shall be submitted to the SEIAA, Odisha within six months.</p>	<ul style="list-style-type: none"> <li>• The afforestation program of last five Years is furnished below-</li> </ul> <table border="1" data-bbox="861 627 1484 862"> <thead> <tr> <th>Survival of plantation (year)</th> <th>1<sup>st</sup> (2013-14)</th> <th>2<sup>nd</sup> (2014-15)</th> <th>3<sup>rd</sup> (2015-16)</th> <th>4<sup>th</sup> (2016-17)</th> <th>5<sup>th</sup> (2017-18)</th> </tr> </thead> <tbody> <tr> <td>Total Plantation</td> <td>15,500</td> <td>10450</td> <td>10250</td> <td>1641</td> <td>3500</td> </tr> <tr> <td>Survival</td> <td>14446</td> <td>7400</td> <td>2670</td> <td>1477</td> <td>2550</td> </tr> <tr> <td>Survival (%)</td> <td>93.5</td> <td>92.5</td> <td>89</td> <td>90</td> <td>85</td> </tr> </tbody> </table> <p>Development of green belt and reclamation is being adhered in accordance with Approved Progressive Mine Closure Plan.</p> <p>Plantation photographs is attached as <b>Annexure-2</b></p>	Survival of plantation (year)	1 <sup>st</sup> (2013-14)	2 <sup>nd</sup> (2014-15)	3 <sup>rd</sup> (2015-16)	4 <sup>th</sup> (2016-17)	5 <sup>th</sup> (2017-18)	Total Plantation	15,500	10450	10250	1641	3500	Survival	14446	7400	2670	1477	2550	Survival (%)	93.5	92.5	89	90	85
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6	<p>The applicant (Project Proponent) will take necessary measures for prevention, control and mitigation of Air Pollution, Noise Pollution and Land Pollution including solid waste management as mentioned by him in Form-1, Final EIA reports and Environment Management Plan (EMP) in compliance with the prescribed statutory norms and standards.</p>	<ul style="list-style-type: none"> <li>• As the entire mineable resource has been depleted, no further mining activities is being undertaken within the lease hold area. However, subgrade mineral dump will be re-handled and low grade material will be recovered in the future as per mine plan . Hence, at present there is no Air Pollution, Noise Pollution and Land pollution could be observed which emanates from Manmora Mn Mine.</li> <li>• Further, to control the air pollution during dry seasons, water sprinkling by mobile water tanker is being done.</li> </ul>																								

7	The applicant will take necessary steps for socio-economic development of the people of the area on need based assessment for providing employment, education, health care, drinking water and sanitation, road and communication facilities etc. after a detailed primary socio-economic survey.	<ul style="list-style-type: none"> <li>The company deploys the Tata Steel Rural Development Society (TSRDS) for socio-economic development of the area on need based assessment by providing employment, education, health care, drinking water and sanitation.</li> </ul>
8	The applicant will comply to the points, concerns and issues raised by the people during public hearing on 01.02.2010 in accordance with the commitments made by him thereon.	<ul style="list-style-type: none"> <li>Most of the commitments made during the Public Hearing, have been complied</li> </ul>
9	The project proponent shall take necessary safeguard measures to ensure that there is no leaching from the tailing pond.	<ul style="list-style-type: none"> <li>The Tailing dam has been designed by M/s. WAPCOS Ltd. a Central Govt. organization having expertise in designing and construction of such dams. Adequate safeguard measures have been taken to prevent any leaching from the tailing dam. No spill or leaching incidents have taken place to date.</li> </ul>
10	The decanted water from the tailing pond shall be re-circulated and there should be zero discharge from the tailing pond.	<ul style="list-style-type: none"> <li>The slime is stored in the zero discharge slime pond. The decanted water from the slime pond is completely recycled back to beneficiation plant within the Joda East Iron Mine ensuring zero outside discharge.</li> </ul>
11	The applicant will take statutory clearance / approval / permissions from the concerned authorities in respect of his project as and when required.	<ul style="list-style-type: none"> <li>All required statutory clearances/ approvals/ permissions from the concerned authorities in respect of the project have been obtained.</li> </ul>
12	For post environment clearance monitoring, the applicant will submit half-yearly compliance report in respect of stipulated terms and conditions of Environment Clearance to the State Environmental Impact Assessment Authority (SEIAA), Orissa on 1 <sup>st</sup> June & 1 <sup>st</sup> December of each calendar year.	<ul style="list-style-type: none"> <li>Last Half yearly compliance report for the year 2016-17 in respect of the stipulated terms and conditions of the EC is being submitted herewith to the Regional Office of the Ministry of Environment and Forests, Bhubaneswar vide letter no:MD/ENV/414/116/17 dated 29.09.2017 and the same has been uploaded in Tata Steel official website <a href="http://www.tatasteel.com">www.tatasteel.com</a>.</li> </ul>

13	The core zone should be monitored intensively with nos. of stations as prescribed by CPCB, Delhi. The detailed methodology adopted for analysis of samples shall be clearly indicated.	<ul style="list-style-type: none"> <li>• Due to small lease area and non-operative mine, one ambient air monitoring station has been identified at the stack yard which will active during manual processing of sub-grade and mineral reject of manganese ore. The detailed methodology for analysis of samples are furnished below- <ul style="list-style-type: none"> <li>a. PM<sub>10</sub> : Avg. Flow rate not less than 1.1 m<sup>3</sup> / min</li> <li>b. PM<sub>2.5</sub> : Avg. Flow rate not less than 1.1 m<sup>3</sup> / min</li> <li>c. SO<sub>2</sub> : Improved West Gaeke &amp; Ultraviolet Fluorescence</li> <li>d. NO<sub>x</sub> : Jacob &amp; Hochhelser modified (Na-Arsenite) and Gas Phase Chemiluminescence</li> <li>e. CO : Non dispersive Infrared Spectroscopy &amp;</li> <li>f. Mn : Colorimetric method</li> </ul> </li> </ul>
14	The proponent shall submit base line data on flora and fauna and CSR activities carried out within three months to the SEIAA.	<ul style="list-style-type: none"> <li>• The base line data on flora &amp; fauna and the list of CSR activities already carried out in the area have been submitted to SEIAA vide our letter No. MD/ENV/519/116/2011, dated: 07/10/2011.</li> </ul>
15	The following shall be implemented viz (a) dump run-off should be diverted into a settling pond (b) adequate rain water harvesting and ground water recharging facilities should be developed in the core zone (c) attempt should be made to achieve zero water balance.	<ul style="list-style-type: none"> <li>• Waste dump had become inactive and therefore the slopes have been stabilized by plantation to prevent soil erosion.</li> <li>• Catch drains and a garland drain has been provided along the entire dump slope which emanates at low lying part to sedimentation pit.</li> <li>• Further, the catch drains and sedimentation pits are periodically de-silted and maintained properly.</li> <li>• Rain water harvesting and ground water recharge facilities have been made at the mine site.</li> </ul>



16	Maintenance of roads through which transportation are undertaken shall be carried out by the project proponent regularly at its own cost.	<ul style="list-style-type: none"> <li>• All the haul roads are made up of morrum &amp; compacted. Regular repair is being done by dozer &amp; grader after spreading the layer of morrum over it. Water sprinkling arrangement is adequate for suppressing the road dust.</li> </ul>
17	Fugitive dust generation shall be controlled. Fugitive dust emission shall be regularly monitored at locations of near human habitation (including schools and other public amenities located nearest to sources of dust generation as applicable) and records shall be submitted to SEIAA, Odisha.	<ul style="list-style-type: none"> <li>• The AAQ (fugitive dust) being monitored at one location (near stack yard) twice in a week.</li> <li>• Data on ambient air quality monitoring for every month is being submitted to State Pollution Control Board. Abstract of the monthly monitoring data on ambient air quality is enclosed as <b>Annexure-3</b>.</li> <li>• There has been no mining activity at Manmora Mn. Mines during the period Oct'17 to March'18 therefore, no fugitive dust emission monitoring has been carried out.</li> </ul>
18	Mineral handling area shall be provided with adequate number of high efficiency dust extraction system. Loading and unloading areas including all the transfer points should also have efficient dust control arrangements. These should be properly maintained and operated.	<ul style="list-style-type: none"> <li>• The mineral handling is only by manual means during dry season only for manual processing (sorting and sizing) and screening of available sub grade and mineral rejects available at pit head. So, water sprinkling over the area is sufficient to allay the dust generation.</li> </ul>
19	Transportation shall be done by covering the trucks by tarpaulin or other suitable mechanism so that no spillage of ore / dust takes place.	<ul style="list-style-type: none"> <li>• The trucks are being covered with tarpaulin during dispatch of manganese ore from mine to Ferro Alloys Plant and Railway Siding located at Joda.</li> </ul>
20	Rain Water Harvesting shall be undertaken to recharge the ground water source.	<ul style="list-style-type: none"> <li>• Rain water harvesting pond has been made at the side of the mining lease under expert consultation of M/s. KRG Foundation, Chennai, to recharge the ground water.</li> </ul>
21	Monitoring of ground and surface water quality shall be regularly conducted and records should be maintained and data shall be submitted regularly to the SEIAA.	<ul style="list-style-type: none"> <li>• The ground water quality at existing well outside the lease hold area and surface water quality is being monitored and the analysis results are enclosed as <b>Annexure-4</b>.</li> </ul>

22	<p>The proponent shall ensure that no silt originating due to mining activity is transported in the surface water course. Measures for prevention and control of soil erosion and management of silt shall be undertaken. Protection of dumps against erosion shall be carried out with geo-textile matting or other suitable material and thick plantation of native trees and shrubs shall be carried out at the dump slopes. Dump shall be protected by retaining wall.</p>	<ul style="list-style-type: none"> <li>• Waste dump had become inactive and therefore the slopes have been stabilized by plantation to prevent soil erosion.</li> <li>• Catch drains and a garland drain has been provided along the entire dump slope which emanates at low lying part to sedimentation pit.</li> <li>• Further, the catch drains and sedimentation pits are periodically de-silted and maintained properly.</li> <li>• The retaining wall of 710 mtr. has been provided at the toe of the waste dump.</li> </ul>
23	<p>Trenches/ garland drains shall be constructed at foot of dumps to arrest silt from being carried to water bodies. Adequate check dams shall be constructed across the seasonal/ perennial nallahs (if any) flowing through the ML area and silts be arrested. De-silting at regular intervals shall be carried out.</p>	<ul style="list-style-type: none"> <li>• Catch drains and garland drains are covering the entire dump slope at toe part. Similarly, a garland drain with settling pit has been provided near the railway track and causeway near railway culverts for directing the flow of surface run-offs after settling.</li> </ul>

24	Provision shall be made for the housing of labourers within the site with all necessary infrastructure and facilities such as fuel for cooking, mobile toilets, mobile STP, safe drinking water, medical health care, crèche etc. The housing may in the form of temporary structures to be removed after the completion of the project.	<ul style="list-style-type: none"> <li>• Housing facilities for the employees has been provided within a centralized camp at Joda East beyond the mining lease hold area.</li> </ul>
25	Occupational health and safety measures for the workers including identification of work related hazards, training on malaria eradication, HIV and healthy effects on exposure to mineral dust etc. shall be carried out. The proponent shall engage a full time qualified doctor who is trained in occupational health. Periodic monitoring of exposure to respirable mineral dust on the workers shall be conducted and record maintained including health record of workers. Awareness programme for workers on impact of mining on their health and precautionary measures like use of personal equipments etc. shall be carried out periodically. Review of impact of various health measures undertaken (at interval of five years or less) shall be conducted followed by follow up action wherever required. Occupational Health Center shall be established near the mine itself.	<ul style="list-style-type: none"> <li>• The production of finished ore will be continued by manual screening and processing of sub-grade mineral and mineral rejects already available at pit head during dry season only.</li> <li>• Due to this temporary nature of job, the laborers from our Joda West Manganese Mine will be deployed at the mine. Hence, Periodical Medical Examination of employees (departmental &amp; contractual) are conducted as per prescribed norms of Mines Rule, 1955 at Joda West Mn. Mine covering the workers identified for Manmora.</li> <li>• 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.</li> <li>• During, Fy 2017-18 (till sept'17) a total no. of 139 employees (Departmental-10 and contractor employees-129) were examined which are included in the compliance report of Joda West. There are no findings of pneumoconiosis and manganese poisoning which is classified as occupational disease.</li> </ul>
26	The Environmental Clearance is subject to Forest Clearance under Forest (Conservation) Act, 1980.	<ul style="list-style-type: none"> <li>• Forest clearance over the entire forest area of 9.373 Ha within the lease has been granted along with FC of Joda East Iron Mine vide letter no. F. No. 8-32/1993-FC (vol-II), dated 24.09.2007.</li> </ul>
27	The mining operation shall be restricted to above ground water table and it should not	<ul style="list-style-type: none"> <li>• Mining is not intersecting the ground water as the ground water being at lower level in</li> </ul>

	intersect the ground water table.	comparison to existing maximum quarry depth. No further mine development will be in place due exhaustion of mineable resource.
28	The top soil shall be temporarily be stored at earmarked site (s) only and it should not be kept unutilized for long (not more than 3 years). The top soil shall be used for land reclamation and plantation.	<ul style="list-style-type: none"> <li>No top soil was generated during Oct'17 to March'18 because there was no mine development work undertaken due to exhaustion of mineable resource.</li> </ul>
29	The fund earmarked for the environment protection measures shall be judiciously utilized. Under no circumstances this funds shall be diverted for other purposes. Year-wise expenditure for this fund should be reported to the SEIAA, Odisha.	<ul style="list-style-type: none"> <li>Funds allocated for environmental management are spent only for environment related purposes and not diverted to any other purpose.</li> <li>The utilization of environment management for the FY 17-18 was Rs 580,328. (Monitoring-Rs.4,59,328/- &amp; Plantation-Rs.1,21,000/-) against the annual budget of Rs. 5,00,000/-</li> <li>Moreover, where replacing the loose boulder retaining wall with cemented retaining wall at strategic points in the cost included in mining operation.</li> </ul>
30	The critical parameters in the ambient air within the impact zone, peak particle velocity at 300m distance or within the nearest habitation, whichever is closer shall be monitored periodically. Further, quality of discharge water shall be monitored {[TDS, DO, pH and Total suspended solids (TSS)}. The monitored data shall be uploaded on the website of the company sa well as displayed on a display board at the project site at a suitable location near main gate of the company in public domain. The Circular No. J-20012/1/2006-IA.II(M), dated 27.05.2009 issued by MoEF which is available on the website of Ministry <a href="http://www.envfor.nic.in">www.envfor.nic.in</a> shall also be referred in this regard for its compliance.	<ul style="list-style-type: none"> <li>The critical parameters in the Ambient Air Quality are being analyzed. The monthly average of analysis is enclosed as Annexure-IV: AAQ monitoring report.</li> <li>There is no blasting operation being carried out within lease hold area as there is no mine developmental work due to exhaustion of mineable resource.</li> <li>There is no generation of mine drainage water as the mine is working at high hill slope area and does not intersects the ground water table.</li> <li>The monitoring data has been displayed on a board near entrance of the mine.</li> </ul>
31	The project proponent shall obtain necessary prior permission of the competent authorities for drawl of requisite quantity of water (surface water and ground water) required for the project.	<ul style="list-style-type: none"> <li>Water required for water sprinkling and drinking water during dry season is being supplied from Joda West Manganese Mine which has got the surface water drawl permission from competent authority.</li> </ul>
32	The above mentioned stipulated conditions shall be complied in time bound manner. Failure to comply with any of the conditions mentioned above may result withdrawal of	<ul style="list-style-type: none"> <li>All the conditions mentioned above are complied.</li> </ul>

	this environmental clearance and attract penal action under the provisions of Environmental Protection (EP) Act, 1986.	
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**Annexure-1**

**Picture showing stone pitching at the embankment of Manmora slime dam**







**Annexure-2**

**Glimpses of plantation done at Manmora Manganese Ore Mines**







**MANMORA MANGANESE IRON MINE  
AVERAGE AIR QUALITY REPORT (CORE ZONE)**

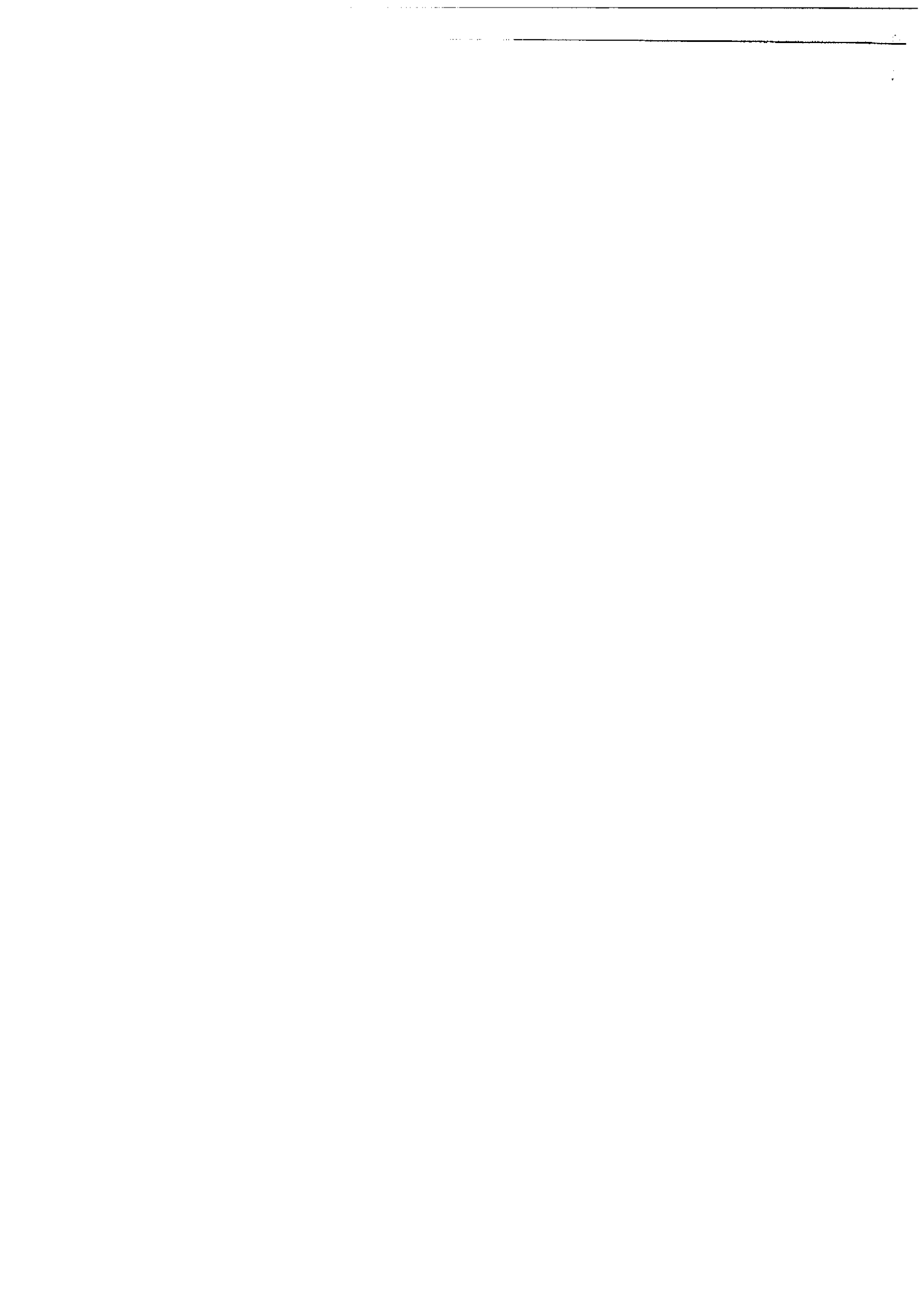
Month	Manmora Silime Dam				Near Rain Water Harvesting				Near New Silime Dam				Near Equipment Maintenance							
	PM <sub>10</sub>	PM <sub>2.5</sub>	SO <sub>2</sub>	NO <sub>x</sub>	CO	PM <sub>10</sub>	PM <sub>2.5</sub>	SO <sub>2</sub>	NO <sub>x</sub>	CO	PM <sub>10</sub>	PM <sub>2.5</sub>	SO <sub>2</sub>	NO <sub>x</sub>	CO	PM <sub>10</sub>	PM <sub>2.5</sub>	SO <sub>2</sub>	NO <sub>x</sub>	CO
Oct 17	46.00	21.83	4.21	10.33	0.24	40.86	18.54	4.08	9.52	0.21	55.74	26.94	4.68	12.16	0.40	60.02	29.74	5.03	13.40	0.41
Nov 17	58.20	28.70	<4.4	11.90	0.34	51.80	25.50	4.20	10.80	0.30	55.70	26.90	4.70	12.20	0.40	60.00	29.70	5.00	13.40	0.41
Dec 17	70.38	35.40	4.91	14.29	0.41	63.76	31.81	4.39	12.83	0.36	78.70	40.08	5.90	16.33	0.51	85.35	46.24	6.45	17.40	0.55
Jan 18	71.98	35.49	5.01	15.06	0.40	64.63	31.99	4.32	13.56	0.35	76.84	38.50	5.63	16.80	0.50	83.44	43.46	6.08	17.70	0.54
Feb 18	70.40	35.56	4.96	15.65	0.43	62.29	31.24	4.36	13.24	0.33	74.30	37.86	5.35	17.13	0.51	82.78	43.73	6.06	18.16	0.54
Mar 18	72.80	36.89	4.89	15.23	0.42	64.98	32.13	4.43	14.05	0.38	81.14	41.59	5.63	17.19	0.51	89.44	49.06	6.06	18.38	0.57

**AVERAGE AIR QUALITY REPORT (BUFFER ZONE)**

Month	Banelkela				Birkela				Khuntpani				Joda Colony (VTC)							
	PM <sub>10</sub>	PM <sub>2.5</sub>	SO <sub>2</sub>	NO <sub>x</sub>	CO	PM <sub>10</sub>	PM <sub>2.5</sub>	SO <sub>2</sub>	NO <sub>x</sub>	CO	PM <sub>10</sub>	PM <sub>2.5</sub>	SO <sub>2</sub>	NO <sub>x</sub>	CO	PM <sub>10</sub>	PM <sub>2.5</sub>	SO <sub>2</sub>	NO <sub>x</sub>	CO
Oct 17	35.50	16.95	4.00	9.00	0.14	33.00	15.25	4.00	9.00	0.13	41.50	19.25	4.00	9.00	0.15	38.50	18.10	4.00	9.00	0.14
Nov 17	38.20	17.60	<4.0	<9.0	0.15	34.90	16.30	<4.0	<9.0	0.13	47.40	23.30	4.0	<9.0	0.19	44.20	21.30	4.00	9.00	0.17
Dec 17	51.80	25.60	<4.0	9.75	0.21	49.90	24.85	<4.0	9.35	0.20	52.30	25.10	4.0	9.80	0.22	48.10	23.30	4.00	9.40	0.18
Jan 18	55.70	27.10	<4.0	10.00	0.26	52.95	25.85	<4.0	9.75	0.25	58.05	27.90	4.0	10.45	0.28	52.30	25.35	4.00	9.75	0.24
Feb 18	52.50	25.40	<4.0	10.60	0.26	52.90	25.50	<4.0	10.5	0.26	56.50	27.30	4.0	10.80	0.29	54.45	26.65	4.00	10.45	0.28
Mar 18	56.75	27.25	<4.0	10.75	0.31	56.90	27.30	<4.0	10.8	0.30	56.45	27.20	4.10	11.05	0.30	56.10	27.30	4.00	11.05	0.30

Unit of measurement for all parameters except CO is  $\mu\text{g}/\text{m}^3$ . Co is in  $\text{mg}/\text{m}^3$

Lab-in-charge





# Annexure-4



Ref: ENVLAB/18/R-83

Date: 04/04/18

**GROUND WATER QUALITY ANALYSIS REPORT FOR THE MONTH OF MAR. 2018**

1. Name of Industry : Joda East Iron Mines (M/s TATA Steel Limited)
2. Sampling location : GW-1, Khampani Village;  
GW-2, Bomsapani Village.
3. Date of sampling : 14.03.2018
4. Date of analysis : 14.03.2018 to 21.03.2018
5. Sample collected by : M.S.H. Representative in presence of TATA Representative

Sl. No	Parameter	Testing Methods	Unit	Standard as per IS (2010/1992)	Analysis Results	
					GW-1	GW-2
<b>Residual Characteristics</b>						
1	Colour	APHA 2120 D	mg/L	5	1	1
2	Turbidity	APHA 2130 D	mg/L	5 NTU	1.0	1.0
3	TSS	APHA 2540 D	mg/L	Agreeable	0.1	0.1
4	Total Hardness	APHA 2120 D	mg/L	500	2	2
5	Ca <sup>++</sup> (as Ca)	APHA 3500 D	mg/L	250	40	40
6	Total Hardness (as CaCO <sub>3</sub> )	APHA 2120 D	mg/L	500	150	150
7	Ca (as Ca)	APHA 3500 D	mg/L	250	175	175
8	Mg (as Mg)	APHA 3500 D	mg/L	100	25	25
9	Residual, Non-Calcium	APHA 3500 D	mg/L	50	10	10
<b>Dissolved Characteristics</b>						
10	Dissolved Solids	APHA 2540 D	mg/L	500	100	100
11	Calcium (as Ca)	APHA 3500 D	mg/L	250	40	40
12	Magnesium (as Mg)	APHA 3500 D	mg/L	100	25	25
13	Calcium (as Ca)	APHA 3500 D	mg/L	250	100	100
14	Magnesium (as Mg)	APHA 3500 D	mg/L	100	25	25
15	Sulphate (as SO <sub>4</sub> )	APHA 4500 D	mg/L	200	0.5	0.5
16	Chloride (as Cl)	APHA 4500 D	mg/L	250	0.5	0.5
17	Fluoride (as F)	APHA 4500 D	mg/L	1.5	0.01	0.01
18	Phosphate (as PO <sub>4</sub> -P)	APHA 4500 D	mg/L	0.001	0.01	0.01
19	Mercury (as Hg)	APHA 3500 D	mg/L	0.001	0.001	0.001
20	Cadmium (as Cd)	APHA 3500 D	mg/L	0.01	0.001	0.001
21	Nickel (as Ni)	APHA 3500 D	mg/L	0.01	0.001	0.001
22	Arsenic (as As)	APHA 3500 D	mg/L	0.05	0.001	0.001
23	Chromate (as Cr)	APHA 4500 D	mg/L	0.05	0.01	0.01
24	Cyanide (as CN)	APHA 3500 D	mg/L	0.05	0.01	0.01
25	Iron (as Fe)	APHA 3500 D	mg/L	1	0.05	0.05
26	Zinc (as Zn)	APHA 3500 D	mg/L	5	0.05	0.05
27	Various Heavy Metals (as mg/L)	APHA 3500 D	mg/L	0.2	0.01	0.01
28	Ammonia (as N)	APHA 4500 D	mg/L	0.05	0.05	0.05
29	Nitrate (as N)	APHA 4500 D	mg/L	45	0.01	0.01
30	Nitrite (as N)	APHA 4500 D	mg/L	100	0.01	0.01
31	Ammonium (as N)	APHA 4500 D	mg/L	0.05	0.01	0.01
32	Phosphate (as P)	APHA 4500 D	mg/L	1	0.01	0.01
33	Total Organic Carbon (as C)	APHA 8000 D	mg/L	—	0.001	0.001
34	Total Chloride	APHA 4500 D	mg/L	—	0.001	0.001
35	Total Solids	APHA 2540 D	mg/L	Not more than 10 MPN/100 ml	0	0

Note: 1. Colorless; 2. Agreeable; 3. Unsatisfactory; 4. Not Detected



For Visiontek Consultancy Services Pvt. Ltd.



# Visiontek Consultancy Services Pvt. Ltd.

(An Enviro Engineering Consulting Cell)



ISO 9001:2008  
ISO 14001:2004  
OHSAS 18001:2007

Ref: VCSPL/171R-3403

Date: 04-01-2015

## GROUND WATER QUALITY ANALYSIS REPORT FOR THE MONTH OF DEC -2017

1. Name of Industry : Joda East Iron Mines (M/s TATA Steel Limited)
2. Sampling location : GW-1: Khuntani Village;  
GW-2: Bounapuni Village.
3. Date of sampling : 16.12.2017
4. Date of analysis : 18.12.2017 to 23.12.2017
5. Sample collected by : VCSPL Representative in presence of TATA Representative

Sl. No	Parameter	Testing Methods	Unit	Standard as per IS -10500:1991	Analysis Results	
					GW-1	GW-2
<b>Essential Characteristics</b>						
1	Colour	APHA 2120 B, C	traces	5	CL	CL
2	Odour	APHA 2125 B	--	1.0	UO	UO
3	Taste	APHA 2125 C	--	Agreeable	AI	AI
4	Turbidity	APHA 2130 B	NTU	5	<2	<2
5	pH Value	APHA 4500-1 B	--	6.5-8.5	7.48	7.52
6	Total Hardness (as CaCO <sub>3</sub> )	APHA 2340 C	mg/l	300	145.0	154.0
7	Iron (as Fe)	APHA 1900-1 B	mg/l	0.3	0.23	0.26
8	Chloride (as Cl <sup>-</sup> )	APHA 4500-1 B	mg/l	250	4.0	4.0
9	Residual free Chlorine	APHA 4500-1 D	mg/l	0.2	ND	ND
<b>Desirable Characteristics</b>						
10	Dissolved Solids	APHA 2340 C	mg/l	500	250.0	261.0
11	Calcium (as Ca)	APHA 3100-A, B	mg/l	75	49.7	50.9
12	Magnesium (as Mg)	APHA 3100-A, B	mg/l	30	11.3	15.6
13	Copper (as Cu)	APHA 3111 B, C	mg/l	0.05	<0.05	<0.05
14	Manganese (as Mn)	APHA 3100-A, B	mg/l	0.1	<0.05	<0.05
15	Sulphate (as SO <sub>4</sub> )	APHA 4500-1 B, D	mg/l	200	8.5	8.6
16	Nitrate (as NO <sub>3</sub> )	APHA 4500-1 E	mg/l	45	2.7	2.7
17	Fluoride (as F)	APHA 4500-1 C	mg/l	1.0	0.021	0.023
18	Phenolic Compounds (as C <sub>12</sub> H <sub>10</sub> O)	APHA 5510 B, D	mg/l	0.001	<0.001	<0.001
19	Mercury (as Hg)	APHA 3101-1 B	mg/l	0.001	<0.001	<0.001
20	Cadmium (as Cd)	APHA 3111 B, C	mg/l	0.01	<0.001	<0.001
21	Selenium (as Se)	APHA 3114 B	mg/l	0.01	<0.001	<0.001
22	Arsenic (as As)	APHA 3114 B	mg/l	0.05	<0.001	<0.001
23	Cyanide (as CN)	APHA 4500-1 C, D	mg/l	0.05	ND	ND
24	Lead (as Pb)	APHA 3111 B, C	mg/l	0.05	<0.01	<0.01
25	Zinc (as Zn)	APHA 3111 B, C	mg/l	5	<0.05	<0.05
26	Aromatic Detergents (as MBAS)	APHA 9000 C	mg/l	0.2	<0.2	<0.2
27	Chromium (as Cr <sup>6+</sup> )	APHA 3500-1 B	mg/l	0.05	<0.05	<0.05
28	Mineral Oil	APHA 9230 B	mg/l	0.01	<0.01	<0.01
29	Alkalinity	APHA 2320 B	mg/l	100	124.0	131.0
30	Aluminium (as Al)	APHA 3500-1 B	mg/l	0.03	<0.001	<0.001
31	Boron (as B)	APHA 4500-1 B	mg/l	1	<0.01	<0.01
32	Poly Aromatic Hydrocarbon (as PAH)	APHA 6400 B	µg/l	--	<0.0004	<0.0004
33	Pesticide	APHA 6600 B, C	mg/l	Absent	Absent	Absent
34	Total Coliform	APHA 9221 B	MPN/100 ml	Not more than 10 MPN/100 ml	<2	<2

Note: CL: Colourless, AI: Agreeable, UO: Undesirable, ND: Not Detected



For Visiontek Consultancy Services Pvt. Ltd.

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