COMPLIANCE REPORT PERIOD : APR'14 TO SEPT'14

ENVIRONMENTAL CLEARANCE TO BAMEBARI MANGANESE MINE OF TATA STEEL LIMITED VIDE MoEF's LETTER NO. J-11015/85/2003-1A.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 Bamebari Manganese Mine over an area 1150.55 ha. (RML – 464 ha & ML – 686.550 ha.) was submitted under Rule No.12, MCDR 1988 for the period 2010-11 to 2014-15 and has been approved by IBM vide letter no. MS/OTF-MECH/06-ORI/BHU/2010-11, dated 09.06.2010.

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 the Forest Clearance vide MoEF's letter No 8-72/2004-FC dt 15.01.2007 over an area of 145.329 ha of forest land. 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.	No Topsoil has been generated during Apr'14 to Sept'14 as all the workings were concentrated within the existing pit limit. The top soil generated prior to this period has already been utilized for plantation in the inactive dump slopes.
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 wastes are being dumped as per plan and within an area of 46.823 ha. The inactive portion of OB dumps area being stabilized by plantation of fast growing species. 28145 nos. of sapling of local species (Gambhari, Chakunda, Mahanimba, Kala Sirs, Sisu etc) were planted during 2014-15 and the survival rate will be assessed during May'2015 Apart from this we have distributed 5000 no saplings (fruit and timber) free of cost to our surrounding communities including, school children, villagers, clubs and SHGs under guidance of State Pollution Control Board, Odisha. We have also planted 1,00,000 of Vetiver slips in inactive dump slopes of Bamebari quarry under guidance of IIT, Kharagpur for stabilization of dump slopes during the year 2013-14. The overall slope angles of OB dumps are

		maintained within the natural angle of repose of the waste. The overall slope angles of OB dumps are maintained within the natural angle of repose of the waste. The retaining wall and garland drain with sedimentation pit at corners near toe of OB dump at maximum places has been constructed & in remaining area it is under construction. 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 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. No Provision of Effluent treatment plant , so no chance of inrush of storm water in to the ETP during high rainfall/super cyclone period
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; <u>Dimension of the Retaining Wall</u> : Height – 1 to 1.2 mtr. Width – 1 mtr. <u>Dimension of the Garland Drain</u> : 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 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.	Samples have been analyzed in dust fall & soil during pre monsoon season. It was observed that, a) Presence of Co and Hg was nil. Only Ni & As presence varies from 0.029 to 0.042 & 0.021 to 0.038 % near Bamebari Pit & Joribar Pit respectively in dust fall samples during pre monsoon season. b) Presence of Co and Hg was nil. Only Ni & As presence varies from 0.022 to 0.029 &

		0.014 to 0.022 % near Bamebari Pit & Joribar Pit respectively in soil samples during pre-monsoon season. The detail analysis result is enclosed as **Annexure-I (Dust Fall) & II (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 being 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 transportation 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. The processed manganese ore is being transferred manually; hence there is less fugitive emission during transfer of ore. The fugitive dust monitoring done during the period Apr'14 to Sept'14 is being enclosed as **Annexure-III**.
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.	• Reclamation and plantation programs have been drawn. We have planted 389085 nos. of sapling over an area of 66.27 ha with 80 % survival rate. • Tree density is maintained at the rate of 4695 saplings per ha. • The plantation includes the local species (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.	Ground water use permission has been obtained from CGWA vide letter no. 21-4(297)/CGWA/SER/2010-168, Dt.15.02.2011 for 500 m^3 per day. The ground water is not being used for mining and its allied activities.
11	Mining will not intersect groundwater. Prior permission 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 *I* May), monsoon (August). Post-monsoon (November) and winter (January) seasons	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 are being monitored. It was observed that , the level of ground

	and for quality in May. Data thus collected should be submitted to the MoEF & CGWA quarterly.	water , a) During pre-monsoon was 7.13 mtr (at 540.870 mRL) to 2.58 mtr (at 511.42 mRL). b) During monsoon season was 1.92 mtr (at 546.08 mRL) to 0.30 mtr (at 513.7 mRL). c) During pre monsoon it was 33.65 mtr (at 519.35 mRL) for the Piezometric test point at Bamebari and was 25.30 mtr (at 527.70 mRL) during monsoon. d) The quality of ground water monitored with reference to standard of BIS: 10500 and the qualities are well within the standard. The ground water level and quality monitoring results are enclosed as **Annexure IV & V** 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 pennissible 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. It was observed in ground water samples that, only Fe, Zn and Mn 0.21, 0.34 and 0.029 mg/l during pre-monsoon and 0.18, 0.26 and 0.019 mg/l during monsoon respectively. The analysis results are well within the permissible standards while other parameters are below detection level. The details of analysis result for ground water and surface water with standards are enclosed as **Annexure – VI & VIII respectively.**
14	"Consent to Operate" should be obtained from SPCB before expanding mining activities.	“Consent to operate” order no.117 No.7249/ IND-I-CON-189 dated 12.04.2012 & valid up to 31.03.2016.
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/taslcs 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	We have deposited Rs.45,05,554/- 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. 47,74,446 with DFO, Keonjhar, Orissa towards differential payment for implementation of regional Wildlife Management Plan prepared for Bonai & Keonjhar division. Further, Site Specific wildlife management plan has been prepared and submitted for approval as per the new guidelines.

	the Ministry of Environment & forests, RO, Bhubaneshwar.	
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.	Progressive Mine Closure Plan for the period 2010-11 to 2014-15 has been approved by IBM. 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.
Sl.No	**B : General Conditions**	**Compliance Status**
1	No change in mining technology and scope of working should be made without prior approval of the Ministry of Environment & Forests.	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.
2	No change in the calendar plan including excavation, quantum of manganese ore and waste should be made.	Plan for production of Manganese Ore and excavation of waste has been prepared and is being strictly adhered to; Plan 2014-15 Production: 83,200 MT OB Removal: 5,65,47 CuM Planned (Apr'14 to Sept'14) Production:- 41,600 MT OB Removal:- 2,82,924 CuM Actual (Apr'14 to Sept'14)- Production (Apr'14 to Sept'14) : 32,072 MT OB Removal (Apr'14 to Sept'14) : 2,25,255 CuM
3	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.	Six ambient air quality monitoring stations have been established out of which 2 nos. in core zone (Near Manager's Office close proximity to residential and near old magazine close proximity to mining area) and 4 nos. in buffer zone (at Jagannathpur, Bandhuabeda, Raikera & Balita). Samples are drawn twice in a week in core zone and once in a quarter in buffer zone to ascertain the 24 hour monitoring average for $PM_{10,}$ $PM_{2.5}$, So2 & NOx, CO & Mn. It was observed that, a) PM_{10} varies from 32.88 µg/m^3 (July'14) to 56.89 µg/m^3 (Apr'14) near Mgr. Office (close proximity residential colony) against the standard 100 µg/m^3. b) PM_{10} varies from 40.00 µg/m^3 (Aug'14) to 64.00 µg/m^3 (Apr'14) near old magazine (quarry area) against the standard 100 µg/m^3. c) $PM_{2.5}$ varies from 20.24 µg/m^3 (Aug'14) to 32.16 µg/m^3 (Apr'14) near Mgr. Office

		(close proximity residential colony) against the standard 60 µg/m^3. d) $PM_{2.5}$ varies from 24.04 µg/m^3 (Aug'14) to 35.48 µg/m^3 (Apr'14) near old magazine (quarry area) against the standard 60 µg/m^3. e) SO_2 varies from 4.02 µg/m^3 (May'14) to 4.28 µg/m^3 (Apr'14) is under below detection level near Mgr. Office (close proximity residential colony) against the standard 80 µg/m^3. f) SO_2 varies from 4.09 µg/m^3 (May'14) to 5.98 µg/m^3 (Apr'14) near old magazine (quarry area) against the standard 80 µg/m^3. g) NoX varies from 9.46 µg/m^3 (Aug'14) to 11.43 µg/m^3 (Apr'14) near Mgr. Office (close proximity residential colony) against the standard 80 µg/m^3. h) NoX varies from 10.18 µg/m^3 (Aug'14) to 12.37 µg/m^3 (Apr'14) near old magazine (quarry area) against the standard 80 µg/m^3. i) CO varies from 0.11 mg/m^3 (Aug'14) to 0.17 mg/m^3 (Apr'14) near Mgr. Office (close proximity residential colony) against the standard 2 mg/m^3. j) CO varies from 0.13 mg/m^3 (Aug'14) to 0.24 mg/m^3 (Apr'14) near old magazine (quarry area) against the standard 80 mg/m^3. k) Mn varies from 0.48 µg/m^3 (Aug'14) to 0.67 µg/m^3 (Apr'14) near Mgr. Office (close proximity residential colony) against the standard 0.25 mg/m^3. l) Mn varies from 0.56 µg/m^3 (Aug'14) to 0.77 mg/m^3 (Apr'14) near old magazine (quarry area) against the standard 0.25 mg/m^3. 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 **Annexure – VIII**.
4	Drills should be wet operated or with dust extractors and controlled blasting should be practiced.	Wet drilling concept is already in place. Controlled blasting technique with NONEL is in practice.
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 fugitive dust monitoring done during the period Apr'14 to Oct'14 is being enclosed as **Annexure-III.**

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. Rest of operations are below the noise levels of 80 dBA. The details of noise monitoring for the period Apr'14 to Sept'14 are enclosed as **Annexure-IX.**
7	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.	The oil separation system has been provided at workshop and working effectively. This is being centrally used for maintenance of all the equipments running at Bamebari & Tiringpahar Mn.Mine.
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 SS Environics India Pvt.Ltd at Bhubaneswar. (Recognized as "A" category consultant as by State Pollution Control Board, Orissa). The type of pollution monitoring and analysis equipment used by M/s SS Environics India 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 programmes 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 hematology, 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 2011-12, 219 nos. of employees were examined while during 2012-13, a total no. of 240 employees (both Departmental and Contractual) were examined. During 2013-14 a total no. of 72 employees (Departmental-9 and contractor employees-63) & during 2014-15 a total of 78 no(Departmental-4 and Contractor-74) were examined.

		The employees of Bamebari Manganese Mines and Tiringpahar Manganese Mines are shown together. 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. The utilization of environment management for the period Apr'14 to Sep'14 was Rs. 12,87,701 (Monitoring – Rs 9,24,442/- & Plantation - Rs. 3,63,259/-) against the annual budget of Rs 6,82,000/- (Monitoring - Rs, 5,70,000/- & Plantation - Rs. 1,12,000/-) for Bamebari Manganese Mines.
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 are extending full co-operation to the officers of the Regional Office by furnishing the requisite data / 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, Palasa 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 and Collector's Office/Tehsildar's Office for 30 days.	This is applicable to State Pollution Control Board, Orissa.
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 Bamebari 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.

Sd/-
Agent, Bamebari Mn.Mine &
Head (Manganese Group of Mines), Joda

Annexure – I

S.S.Environics (India) Pvt. Ltd.

(An ISO 9001:2008, 14001:2004 and OHSAS 18001:2007 Certified Company)

Plot No-361/2314 "Sustenance Tower"
At: Patrapada, P.O: Dumuduma, Dist: Khurda, Bhubaneswar-751 019, Odisha
Tele Fax: 0674- 2471574; E-mail: emails@ssenvironics.com

Ref No: SSE/14/R-0641 *Date:* 03.05.2014

DUST FALL ANALYSIS RESULTS FOR TRACE METALS

Name of the Mines	:	**Bamebari Manganese Mines (Tata Steel Ltd)**
Location of Sampling	:	DF1: Near Bamebari Mine Pit
		DF2: Near Joribahar Pit
Period of monitoring	:	April-2014

Sl. No.	Parameters	DF1	DF2
1.	Nickel as (Ni) in %	0.042	0.029
2.	Cobalt as (Co) in %	Nil	Nil
3.	Arsenic as (As) in %	0.038	0.021
4.	Mercury as (Hg) in %	Nil	Nil

For S.S ENVIRONICS (I) PVT. LTD

Annexure –II

S.S.Environics (India) Pvt. Ltd.

(An ISO 9001:2008, 14001:2004 and OHSAS 18001:2007 Certified Company)

Plot No-361/2314 "Sustenance Tower"
At: Patrapada, P.O: Dumuduma, Dist: Khurda, Bhubaneswar-751 019, Odisha
Tele Fax: 0674- 2471574; E-mail: emails@ssenvironics.com

Ref No: SSE/14/R-0656 Date: 03.05.2014

SOIL QUALITY ANALYSIS RESULTS FOR TRACE METALS

Name of the Mines : Bamebari Manganese Mines (Tata Steel Ltd)
Location of Sampling : S1: Near Bamebari Mine pit
S2: Joribahar pit
Date of Sampling : 28.04.2014
Date of Analysis : 30.04.2014

Sl. No.	Parameters	S1	S2
1.	Nickel as (Ni) in %	0.029	0.022
2.	Cobalt as (Co) in %	Nil	Nil
3.	Arsenic as (As) in %	0.022	0.014
4.	Mercury as (Hg) in %	Nil	Nil

For S.S Environics (India) Pvt. Ltd.

Annexure – III(Fugitive Emission Report)

Mine	Location	Place of Monitoring	Standard	07.04.2014 to 12.04.2014	21.04.2014 to 26.04.2014	05.05.2014 to 10.05.2014	11.06.2014 to 16.06.2014	23.06.2014 to 28.06.2014	07.07.2014 to 12.07.2014	21.07.2014 to 26.07.2014	04.08.2014 to 09.08.2014	25.08.2014 to 30.08.2014	08.09.2014 to 13.09.2014	22.09.2014 to 27.09.2014	Average-H1
Bamebari Mn Mines	Bamebari Pit	Mine Haul Road	Total SPM-1200 µg/m3	307	264	285	282	270	183	175	160	205	183	269	235
		20 m away from Shovel operation	Total SPM-1200 µg/m4	243	193	204	198	181	155	180	162	168	222	208	192
		10 m away from Wagon Drill in Operation	Total SPM-1200 µg/m5	166	155	162	158	164	140	144	142	160	135	167	154
		10 m away from ore unloading point at Stack Yard	Total SPM-1200 µg/m6	189	183	211	183	170	142	153	143	164	183	175	172
	Joribar Pit	Mine Haul Road	Total SPM-1200 µg/m7	306	298	224	260	179	168	135	164	144	163	206	204
		20 m away from Shovel operation	Total SPM-1200 µg/m8	260	183	217	215	194	218	185	180	159	161	212	199
		10 m away from Wagon Drill in Operation	Total SPM-1200 µg/m9	179	168	170	158	152	154	149	135	148	142	145	155
		10 m away from ore unloading point at Stack Yard	Total SPM-1200 µg/m10	189	164	174	175	178	152	153	167	165	186	163	170

Annexure-IV

S.S.Environics (India) Pvt. Ltd.

(An ISO 9001:2008, 14001:2004 and OHSAS 18001:2007 Certified Company)

Plot No-361/2314 "Sustenance Tower"
At: Patrapada, P.O: Dumuduma, Dist: Khurda, Bhubaneswar-751 019, Odisha
Tele Fax: 0674- 2471574; E-mail: emails@ssenvironics.com

Ref No: SSE/14/R-0644 *Date:* 03.05.2014

GROUND WATER LEVEL MONITORING REPORT

Name of the Mines : **Bamebari Manganese Mines, Tata Steel Ltd.**

Monitoring Area & Date	Name of the Location	Top mRL	Water Encountered at mRL	Water Level in mtrs
28.04.2014	W-1: Well at Bamebari Petrol pump	548	540.87	7.13
	W-2: Well at Nimira	514	511.42	2.58
28.04.2014	W-3: Peizometric test Point at Bamebari	553	519.35	33.65

For S.S. Environics (India) Pvt. Ltd.

S.S.Environics (India) Pvt. Ltd.

(An ISO 9001:2008, 14001:2004 and OHSAS 18001:2007 Certified Company)

Plot No-361/2314 "Sustenance Tower"

At: Patrapada, P.O: Dumuduma, Dist: Khurda, Bhubaneswar-751 019, Odisha

Tele Fax: 0674- 2471574; E-mail: emails@ssenvironics.com

Ref No: SSE/14/R-1819 *Date:* 03.09.2014

GROUND WATER LEVEL MONITORING REPORT

Name of the Mines : **Bamebari Manganese Mines, Tata Steel Ltd.**

Monitoring Area & Date	Name of the Location	Top mRL	Water Encountered at mRL	Water Level in mtrs
25.08.2014	W-1: Well at Bamebari Petrol pump	548	546.08	1.92
	W-2: Well at Nimira	514	513.70	0.30
25.08.2014	W-3 Peizometric test Point at Bamebari	553	527.70	25.30

For S.S. Environics (India) Pvt. Ltd.

Annexure – V

S.S.Environics (India) Pvt. Ltd.

(An ISO 9001:2008, 14001:2004 and OHSAS 18001:2007 Certified Company)

Plot No-361/2314 "Sustenance Tower"
At: Patrapada, P.O: Dumuduma, Dist: Khurda, Bhubaneswar-751 019, Odisha
Tele Fax: 0674- 2471574; E-mail: emails@ssenvironics.com

Ref No: SSE/13/R-0648 *Date:* 03.05.2014

GROUND WATER QUALITY ANALYSIS REPORT

Name of the Mines : **Bamebari Manganese Mines (Tata Steel Ltd)**
Location of Sampling : GW1: Well near Bamebari Petrol Pump
GW2: Well at Namira
Date of Sampling : 24.04.2014
Date of Analysis : 26.04.2014

Sl. No	Parameter	Standard as per BIS: 10500	Sampling Locations	
			GW1	GW2
Essential Characteristics				
1	Colour	5	CL	CL
2	Odour	U/O	U/O	U/O
3	Taste	Agreeable	AL	AL
4	Turbidity (NTU), max	1	<1	<1
5	pH Value	6.5-8.5	7.2	7.1
6	Total Hardness (as $CaCO_3$), mg/l, max	300	56	51
7	Iron (as Fe), mg/l, max	0.3	0.16	0.14
8	Chloride (as Cl), mg/l, max	250	11.4	10.6
9	Residual, free Chlorine, mg/l, min	0.2	ND	ND
Desirable Characteristics				
10	Dissolved Solids, mg/l, max	500	139	127
11	Calcium (as Ca), mg/l, max	75	9.6	9.2
12	Copper (as Cu), mg/l, max	0.05	BDL	BDL
13	Manganese (as Mn), mg/l, max	0.1	0.018	0.011
14	Sulphate (as SO_4), mg/l, max	200	17.6	13.9
15	Nitrate (as NO_3), mg/l, max	45	0.19	0.14
16	Fluoride (as F), mg/l, max	1.0	BDL	BDL
17	Phenolic Compounds (as C_6H_5OH), mg/l, max	0.001	ND	ND
18	Mercury (as Hg), mg/l, max	0.001	BDL	BDL
19	Cadmium (as Cd), mg/l, max	0.01	BDL	BDL
20	Selenium (as Se), mg/l, max	0.01	BDL	BDL
21	Arsenic (as As), mg/l, max	0.05	BDL	BDL
22	Cyanide (as CN), mg/l, max	0.05	BDL	BDL
23	Lead (as Pb), mg/l, max	0.05	BDL	BDL
24	Zinc (as Zn), mg/l, max	5	0.21	0.18
25	Anionic Detergents (as MBAS), mg/l, max	0.2	Absent	Absent
26	Chromium (as Cr+6), mg/l, max	0.05	BDL	BDL
27	Polynuclear aromatic hydrocarbons (as PAH), g/l, max	-	ND	ND
28	Mineral Oil, mg/l, max	0.01	ND	ND
29	Pesticides, mg/l, max	Absent	Absent	Absent
30	Alkalinity , mg/l, max	200	33	28
31	Aluminium as Al, mg/l, max	0.03	BDL	BDL
32	Boron mg/l , max	1.0	BDL	BDL

CL – Colourless, U/O – Unobjectionable, ND – Not detectable.
BDL Values: Copper- 0.001mg/l,Flouride-0.001 mg/l, Cadmium- 0.001 mg/l, Mercury- 0.0001 mg/l, Lead- 0.001 mg/l, Arsenic- 0.001 mg/l, Zinc- 0.005 mg/l, Cyanide- 0.001 mg/l, Cr+6- 0.001 mg/l, , Selenium- 0.001 mg/l, Al-0.001 mg/l.

For S.S. Environics (India) Pvt. Ltd.

S.S.Environics (India) Pvt. Ltd.

(An ISO 9001:2008, 14001:2004 and OHSAS 18001:2007 Certified Company)

Plot No-361/2314 "Sustenance Tower"

At: Patrapada, P.O: Dumuduma, Dist: Khurda, Bhubaneswar-751 019, Odisha

Tele Fax: 0674- 2471574; E-mail: emails@ssenvironics.com

Ref No: SSE/14/R-1814 *Date:* 03.09.2014

GROUND WATER QUALITY ANALYSIS REPORT

Name of the Mines : **Bamebari Manganese Mines (Tata Steel Ltd)**
Location of Sampling : GW1: Well near Bamebari Petrol Pump
GW2: Well at Namira
Date of Sampling : 24.08.2014
Date of Analysis : 28.08.2014

Sl. No	Parameter	Standard as per BIS: 10500	Sampling Locations	
			GW1	GW2
Essential Characteristics				
1	Colour	5	CL	CL
2	Odour	U/O	U/O	U/O
3	Taste	Agreeable	AL	AL
4	Turbidity (NTU), max	1	<1	<1
5	pH Value	6.5-8.5	7.2	7.2
6	Total Hardness (as $CaCO_3$), mg/l, max	300	58	47
7	Iron (as Fe), mg/l, max	0.3	0.13	0.12
8	Chloride (as Cl), mg/l, max	250	9.7	9.4
9	Residual, free Chlorine, mg/l, min	0.2	ND	ND
Desirable Characteristics				
10	Dissolved Solids, mg/l, max	500	123	134
11	Calcium (as Ca), mg/l, max	75	9.1	8.7
12	Copper (as Cu), mg/l, max	0.05	BDL	BDL
13	Manganese (as Mn), mg/l, max	0.1	0.009	0.010
14	Sulphate (as SO_4), mg/l, max	200	19.4	15.6
15	Nitrate (as NO_3), mg/l, max	45	0.16	0.21
16	Fluoride (as F), mg/l, max	1.0	BDL	BDL
17	Phenolic Compounds (as C_6H_5OH), mg/l, max	0.001	ND	ND
18	Mercury (as Hg), mg/l, max	0.001	BDL	BDL
19	Cadmium (as Cd), mg/l, max	0.01	BDL	BDL
20	Selenium (as Se), mg/l, max	0.01	BDL	BDL
21	Arsenic (as As), mg/l, max	0.05	BDL	BDL
22	Cyanide (as CN), mg/l, max	0.05	BDL	BDL
23	Lead (as Pb), mg/l, max	0.05	BDL	BDL
24	Zinc (as Zn), mg/l, max	5	0.19	0.23
25	Anionic Detergents (as MBAS), mg/l, max	0.2	Absent	Absent
26	Chromium (as Cr+6), mg/l, max	0.05	BDL	BDL
27	Polynuclear aromatic hydrocarbons (as PAH), g/l, max	-	ND	ND
28	Mineral Oil, mg/l, max	0.01	ND	ND
29	Pesticides, mg/l, max	Absent	Absent	Absent
30	Alkalinity , mg/l, max	200	26	29
31	Aluminium as Al, mg/l, max	0.03	BDL	BDL
32	Boron mg/l , max	1.0	BDL	BDL

CL – Colourless, U/O – Unobjectionable, ND – Not detectable.
BDL Values: Copper- 0.001mg/l,Flouride-0.001 mg/l, Cadmium- 0.001 mg/l, Mercury- 0.0001 mg/l, Lead- 0.001 mg/l, Arsenic- 0.001 mg/l, Zinc- 0.005 mg/l, Cyanide- 0.001 mg/l, Cr+6- 0.001 mg/l, , Selenium- 0.001 mg/l, Al-0.001 mg/l.

For S.S. Environics (India) Pvt. Ltd.

Annexure - VI

S.S.Environics (India) Pvt. Ltd.

(An ISO 9001:2008, 14001:2004 and OHSAS 18001:2007 Certified Company)

Plot No-361/2314 "Sustenance Tower"
At: Patrapada, P.O: Dumuduma, Dist: Khurda, Bhubaneswar-751 019, Odisha
Tele Fax: 0674- 2471574; E-mail: emails@ssenvironics.com

Ref No: SSE/14/R-0659 *Date:* 03.05.2014

ANALYSIS OF TRACE METALS IN GROUND WATER AT LOWER ELEVATION

Name of the Mines	:	**Bamebari Manganese Mines (Tata Steel Ltd)**
Location of Sampling	:	Borewell near Bamebari Main gate
Date of Sampling	:	24.04.2014
Date of Analysis	:	26.04.2014

Sl. No	Parameter	Standard as per BIS: 10500	Analysis Results
1	Iron (as Fe), mg/l, max	0.3	0.21
2	Chromium (as Cr+6), mg/l, max	0.05	BDL
3	Copper (as Cu), mg/l, max	0.05	BDL
4	Selenium (as Se), mg/l, max	0.01	BDL
5	Arsenic (as As), mg/l, max	0.05	BDL
6	Cadmium (as Cd), mg/l, max	0.01	BDL
7	Mercury (as Hg), mg/l, max	0.001	BDL
8	Lead (as Pb), mg/l, max	0.05	BDL
9	Zinc (as Zn), mg/l, max	5	0.34
10	Manganese (as Mn), mg/l, max	0.1	0.029

BDL Values: Copper- 0.001mg/l, Cadmium- 0.001 mg/l, Mercury- 0.0001 mg/l, , Arsenic- 0.001 mg/l,Selenium-0.001 mg/l, Cr+6- 0.001 mg/l.

For S.S ENVIRONICS (I) PVT. LTD.

S.S.Environics (India) Pvt. Ltd.

(An ISO 9001:2008, 14001:2004 and OHSAS 18001:2007 Certified Company)

Plot No-361/2314 "Sustenance Tower"
At: Patrapada, P.O: Dumuduma, Dist: Khurda, Bhubaneswar-751 019, Odisha
Tele Fax: 0674- 2471574; E-mail: emails@ssenvironics.com

Ref No: SSE/14/R-1823 *Date:* 03.09.2014

ANALYSIS OF TRACE METALS IN GROUND WATER AT LOWER ELEVATION

Name of the Mines	:	**Bamebari Manganese Mines (Tata Steel Ltd)**
Location of Sampling	:	Borewell near Bamebari Main gate
Date of Sampling	:	25.08.2014
Date of Analysis	:	28.08.2014

Sl. No	Parameter	Standard as per BIS: 10500	Analysis Results
1	Iron (as Fe), mg/l, max	0.3	0.18
2	Chromium (as Cr+6), mg/l, max	0.05	BDL
3	Copper (as Cu), mg/l, max	0.05	BDL
4	Selenium (as Se), mg/l, max	0.01	BDL
5	Arsenic (as As), mg/l, max	0.05	BDL
6	Cadmium (as Cd), mg/l, max	0.01	BDL
7	Mercury (as Hg), mg/l, max	0.001	BDL
8	Lead (as Pb), mg/l, max	0.05	BDL
9	Zinc (as Zn), mg/l, max	5	0.26
10	Manganese (as Mn), mg/l, max	0.1	0.019

BDL Values: Copper- 0.001mg/l, Cadmium- 0.001 mg/l, Mercury- 0.0001 mg/l, , Arsenic- 0.001 mg/l,Selenium-0.001 mg/l, Cr+6- 0.001 mg/l.

For S.S ENVIRONICS (I) PVT. LTD.

Annexure – VII(Surface Water Quality Analysis Report)

BAMEBARI (UPSTREAM) W1				April'14		May'14		June'14		July'14		Aug'14		Sep'14		Avg 6 months
Sl.	Parameters	Unit	Standards as per	1st Report	2nd Report	1st Report	2nd Report	1st Report	2nd Report	1st Report	2nd Report	1st Report	2nd Report	1st Report	2nd Report	W-1
1	Colour & Odour	--	300 & $	CL & U/O	CL & U/O	CL & U/O	CL & U/O	15 & U/O	15 & U/O	14& U/O	14 & U/O	10& U/O	16& U/O	15& U/O	14& U/O	**9.75& U/O**
2	Suspended Solids	Mg/l	$	29	26	17	19	105	97	128	121	137	148	141	131	**91.58**
3	Particular Size of S.S.	µ(micron)	$	<850	<850	<850	<850	<850	<850	<850	<850	<850	<850	<850	<850	**<850**
4	Dissolved Solids	Mg/l	1500	116	109	96	101	156	138	164	122	179	189	185	172	**143.92**
5	PH	--	6.5-8.5	7.2	7.1	7.1	7.1	7.2	7.2	7.1	7.2	7.2	7.2	7.2	7.1	**7.16**
6	Temperature	^{0}C	$	25	25	25	25	25	25	25	25	25	25	25	25	**25.00**
7	Oil & Grease	Mg/l	0.1	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	**ND**
8	Total Residual Chlorine	Mg/l	$	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	**ND**
9	Amm. Nitrogen as N	Mg/l	$	0.36	0.29	0.24	0.21	0.83	0.57	0.47	0.52	0.58	0.68	0.62	0.59	**ND**
10	Total Kjeldal Nitrogen as N	Mg/l	$	0.91	0.88	0.79	0.75	1.48	1.36	1.37	1.21	1.43	1.58	1.55	1.47	**1.23**
11	Free Ammonia as NH_3	Mg/l	$	ND	ND	ND	ND	ND	ND	0.003	0.005	0.005	0.006	0.005	0.006	**ND**
12	Dissolved Oxygen	Mg/l	4	7.2	7.2	7.3	7.2	7.4	7.1	7.3	7.3	7.4	7.3	7.3	7.4	**7.28**
13	BOD(3) days at 27^{0}C	Mg/l	3	1.09	1.04	0.96	1	1.25	1.14	1.17	1.21	1.25	1.33	1.34	1.19	**1.16**
14	COD	Mg/l	$	3.17	3.21	2.79	3.11	3.78	3.29	3.68	3.52	3.59	4.01	3.68	3.54	**3.45**
15	Arsenic as As	Mg/l	0.2	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	**BDL**
16	Mercury as Hg	Mg/l	$	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	**BDL**
17	Lead as Pb	Mg/l	0.1	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	**BDL**
18	Cadmium as Cd	Mg/l	0.01	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	**BDL**
19	Hexa Chromium as Cr^{+6}	Mg/l	0.05	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	**BDL**
20	Total Chromium as Cr	Mg/l	$	0.14	0.096	0.092	0.087	0.13	0.076	0.15	0.093	0.18	0.2	0.22	0.17	**0.136**
21	Copper as Cu	Mg/l	1.5	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	**BDL**
22	Zinc as Zn	Mg/l	15	0.15	0.13	0.11	0.09	0.17	0.18	0.19	0.12	0.25	0.33	0.31	0.25	**0.19**
23	Selenium as Se	Mg/l	0.05	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	**BDL**
24	Nickel as Ni	Mg/l	$	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	**BDL**
25	Cyanide as CN	Mg/l	0.05	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	**BDL**
26	Fluoride as F	Mg/l	1.5	0.048	0.038	0.035	0.029	0.09	0.14	0.087	0.089	0.079	0.088	0.085	0.065	**0.07**
27	Diss. Phosphate as P	Mg/l	$	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	**BDL**
28	Sulphide as S	Mg/l	$	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	**BDL**
29	Phenolic Compounds as C_6H_5OH	Mg/l	$	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	**BDL**
30	Bio-assay Test	--	$	98%	98%	98%	98%	98%	98%	98%	98%	98%	98%	98%	98%	**98%.**
31	Manganese as Mn	Mg/l	$	0.055	0.048	0.039	0.036	0.11	0.092	0.09	0.085	0.074	0.084	0.084	0.084	**0.073**
32	Iron as Fe	Mg/l	50	0.22	0.19	0.18	0.16	0.43	0.35	0.56	0.65	0.68	0.79	0.74	0.67	**0.47**
33	Vanadium as V	Mg/l	$	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	**BDL**
34	Nitrate as NO_3	Mg/l	50	0.18	0.16	0.15	0.13	0.23	0.14	0.19	0.2	0.26	0.32	0.31	0.29	**0.21**

N.B. : $- No Specific Limit , C.L – Colour less, U/O-Unobjectionable , BDL- Below detection limit, Not detectable

BAMEBARI (DOWNSTREAM) W2				April'14		May'14		June'14		July'14		Aug'14		Sep'14		Avg 6 months
Sl.	Parameters	Unit	Standards as per	1st Report	2nd Report	1st Report	2nd Report	1st Report	2nd Report	1st Report	2nd Report	1st Report	2nd Report	1st Report	2nd Report	W-2
1	Colour & Odour	--	300 & $	CL & U/O	CL & U/O	CL & U/O	CL & U/O	17 & U/O	16 & U/O	16 & U/O	16 & U/O	10 & U/O	19 & U/O	17 & U/O	17 & U/O	**10.63& U/O**
2	Suspended Solids	Mg/l	$	32	31	21	24	109	101	134	127	144	152	149	139	**96.92**
3	Particular Size of S.S.	µ(micron)	$	<850	<850	<850	<850	<850	<850	<850	<850	<850	<850	<850	<850	**<850**
4	Dissolved Solids	Mg/l	1500	120	113	101	106	165	143	172	134	182	197	193	181	**150.58**
5	PH	--	6.5-8.5	7.2	7.2	7.1	7.1	7.2	7.1	7.2	7.2	7.2	7.3	7.2	7.2	**7.18**
6	Temperature	^{0}C	$	25	25	25	25	25	25	25	25	25	25	25	25	**25.00**
7	Oil & Grease	Mg/l	0.1	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	**ND**
8	Total Residual Chlorine	Mg/l	$	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	**ND**
9	Amm. Nitrogen as N	Mg/l	$	0.41	0.32	0.27	0.28	0.89	0.61	0.51	0.56	0.64	0.72	0.69	0.63	**ND**
10	Total Kjeldal Nitrogen as N	Mg/l	$	0.96	0.91	0.84	0.82	1.55	1.41	1.43	1.28	1.51	1.64	1.62	1.52	**1.29**
11	Free Ammonia as NH_3	Mg/l	$	ND	ND	ND	ND	ND	ND	0.005	0.005	0.006	0.008	0.005	0.007	**ND**
12	Dissolved Oxygen	Mg/l	4	7.2	7.1	7.2	7.2	7.2	7	7.2	7.3	7.3	7.3	7.3	7.3	**7.22**
13	BOD(3) days at 27^{0}C	Mg/l	3	1.11	1.13	1.02	1.14	1.19	1.18	1.22	1.26	1.33	1.41	1.41	1.24	**1.22**
14	COD	Mg/l	$	3.25	3.29	2.94	3.36	3.9	3.37	3.92	3.6	3.72	4.13	3.93	3.81	**3.60**
15	Arsenic as As	Mg/l	0.2	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	**BDL**
16	Mercury as Hg	Mg/l	$	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	**BDL**
17	Lead as Pb	Mg/l	0.1	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	**BDL**
18	Cadmium as Cd	Mg/l	0.01	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	**BDL**
19	Hexa Chromium as Cr^{+6}	Mg/l	0.05	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	**BDL**
20	Total Chromium as Cr	Mg/l	$	0.18	0.11	0.1	0.095	0.16	0.81	0.16	0.097	0.21	0.26	0.28	0.21	**0.223**
21	Copper as Cu	Mg/l	1.5	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	**BDL**
22	Zinc as Zn	Mg/l	15	0.16	0.15	0.12	0.099	0.19	0.2	0.2	0.17	0.29	0.38	0.35	0.31	**0.22**
23	Selenium as Se	Mg/l	0.05	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	**BDL**
24	Nickel as Ni	Mg/l	$	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	**BDL**
25	Cyanide as CN	Mg/l	0.05	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	**BDL**
26	Fluoride as F	Mg/l	1.5	0.054	0.041	0.041	0.033	0.1	0.16	0.092	0.094	0.086	0.093	0.094	0.073	**0.08**
27	Diss. Phosphate as P	Mg/l	$	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	**BDL**
28	Sulphide as S	Mg/l	$	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	**BDL**
29	Phenolic Compounds as C_6H_5OH	Mg/l	$	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	**BDL**
30	Bio-assay Test	--	$	98%	98%	98%	98%	97%	97%	98%	98%	98%	97%	97%	98%	**97.8%.**
31	Manganese as Mn	Mg/l	$	0.061	0.052	0.046	0.041	0.12	0.096	0.1	0.091	0.081	0.089	0.092	0.089	**0.080**
32	Iron as Fe	Mg/l	50	0.26	0.24	0.21	0.2	0.47	0.39	0.62	0.73	0.73	0.84	0.79	0.71	**0.52**
33	Vanadium as V	Mg/l	$	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	**BDL**
34	Nitrate as NO_3	Mg/l	50	0.21	0.19	0.17	0.15	0.27	0.17	0.22	0.28	0.33	0.39	0.36	0.31	**0.25**

N.B. : $- No Specific Limit , C.L – Colour less, U/O-Unobjectionable , BDL- Below detection limit, Not detectable

Annexure – VIII (Ambient Air Quality)

BAMEBARI Monthly Avgs	Location	PM10 µg/m3	PM2.5 µg/m3	SO2 µg/m3	NOx µg/m3	CO mg/m3	Mn µg/m3	O3 µg/m3	Pb µg/m3	NH3 µg/m3	Benzene µg/m3	Benzo(a) Pyrene ng/m3	Arsenic ng/m3	Nickel ng/m3
April'14	Bamebari Camp	56.89	32.16	4.28	11.43	0.17	0.67	6.58	BDL	BDL	0.72	BDL	BDL	BDL
May'14	Bamebari Camp	50.22	28.32	4.02	11.24	0.13	0.65	5.93	BDL	BDL	0.51	BDL	BDL	BDL
June'14	Bamebari Camp	41.13	24.94	4.14	10.29	0.12	0.62	6.14	BDL	BDL	0.50	BDL	BDL	BDL
JULY'14	Bamebari Camp	32.88	20.81	4.15	10.24	0.12	0.59	5.49	BDL	BDL	0.48	BDL	BDL	BDL
AUG'14	Bamebari Camp	33.75	20.24	4.13	9.46	0.11	0.48	5.45	BDL	BDL	0.53	BDL	BDL	BDL
SEP'14	Bamebari Camp	42.11	24.60	4.17	10.50	0.13	0.63	6.62	BDL	BDL	0.53	BDL	BDL	BDL
6 Months Avgs	Bamebari Camp	**42.83**	**25.18**	**4.15**	**10.53**	**0.13**	**0.61**	**6.03**	**BDL**	**BDL**	**0.55**	**BDL**	**BDL**	**BDL**

BAMEBARI Monthly Avgs	Location	PM10 µg/m3	PM2.5 µg/m3	SO2 µg/m3	NOx µg/m3	CO mg/m3	Mn µg/m3	O3 µg/m3	Pb µg/m3	NH3 µg/m3	Benzene µg/m3	Benzo(a) Pyrene ng/m3	Arsenic ng/m3	Nickel ng/m3
April'14	Bamebari Pit	64.00	35.48	4.98	12.37	0.24	0.77	7.43	BDL	BDL	0.83	BDL	BDL	BDL
May'14	Bamebari Pit	57.00	32.43	4.09	11.19	0.17	0.60	6.48	BDL	BDL	0.52	BDL	BDL	BDL
June'14	Bamebari Pit	49.38	28.69	4.51	11.08	0.16	0.71	6.94	BDL	BDL	0.61	BDL	BDL	BDL
JULY'14	Bamebari Pit	42.88	24.15	4.45	11.15	0.14	0.69	6.35	BDL	BDL	0.59	BDL	BDL	BDL
AUG'14	Bamebari Pit	40.00	24.04	4.13	10.18	0.13	0.56	6.23	BDL	BDL	0.61	BDL	BDL	BDL
SEP'14	Bamebari Pit	48.78	28.18	4.62	11.39	0.17	0.73	7.49	BDL	BDL	0.63	BDL	BDL	BDL
6 Months Avgs	Bamebari Pit	**50.34**	**28.83**	**4.46**	**11.22**	**0.17**	**0.68**	**6.82**	**BDL**	**BDL**	**0.63**	**BDL**	**BDL**	**BDL**

Annexure - IX

TATA STEEL

MANGANESE GR.OF MINES, JODA

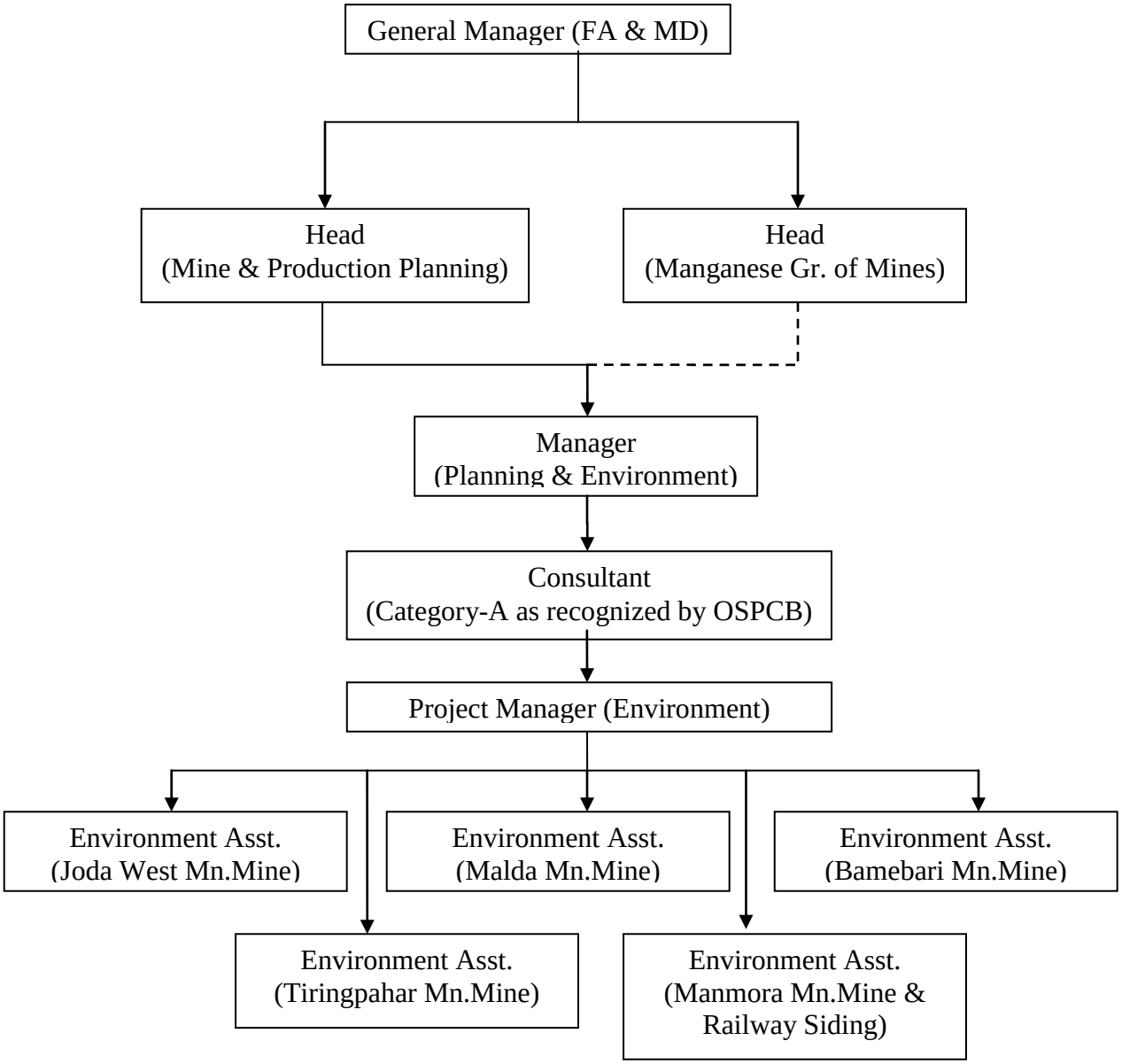
RESULT OF NOISE LEVEL MONITORING AT DIFFERENT LOCATION

Mine	Location	Physical Condition	Period **05.05.2014 to 16.05.2014** Noise Level dB(A)	Period **07.09.2014 to 14.09.2014** Noise Level dB(A)
Bamebari Mn Mines	a) Bamebari Pit	i) 2 mtr.away from Shovel Operation	76	79
		ii) Inside the Shvel Operator Cabin	50	52
		iii) 1 mtr.away from wagon drill operation	81 *	85*
	b) Joribar Pit.	i) 2 mtr.away from Shovel Operation	72	76
		ii) Inside the Shvel Operator Cabin	51	53
		iii) 1 mtr.away from wagon drill operation	82 *	86 *

NB : - Prescribed noise level for 8 hr. exposure is 90 dB(A)
*** Ear Muff / Ear Plug has been provided to all the crew members of operation**

Annexure - X

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
Adequate Titration , Distillation and Filtration unit with sufficient glassware required for laboratory analysis are available with us.		

Annexure – XI
Organizational Structure