



Ref: SCM/ENV/02/ 30/18

Date: 29<sup>th</sup> Sept'2018

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

**Subject: Submission of Environmental Statement in FORM-V for the year ending 31<sup>st</sup> March 2018 in respect of Sukinda Chromite Mines of M/s Tata Steel Ltd.**

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

Dear Sir,

We are hereby submitting the **Annual Environmental Statement** in prescribed format "FORM-V" for the year ending 31<sup>st</sup> March 2018 in respect of Sukinda Chromite Mines of M/s Tata Steel Ltd. At/Po- Kalarangiatta, Dist-Jajpur, Odisha

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

Thanking You.

Yours faithfully,  
f: Tata Steel Limited

Manager,  
Sukinda Chromite Mines

Enclosures: 1. Annual Environmental Statement (FORM-V) for the Year 2017-18

Copy to: 1. Regional Officer, OSPCB, Kalinganagar, Pankapal, Jajpur.  
2. MoEF&CC Eastern Regional Office through E-Mail

**TATA STEEL LIMITED**

Sukinda Chromite Mine PO Kalarangiatta Dist Jajpur Odisha 755028  
Phone no 91 6726 268763 Fax 91 6726 268734  
Registered Office Bombay House 24 Homi Mody Street Fort Mumbai 400 001 India  
Tel 91 22 6665 8282 Fax 91 22 66657724  
Corporate Identity Number L27100MH1907PLC000260 Website www.tatasteel.com

**FORM - V**  
(See Rule -14)

**ENVIRONMENT STATEMENT FOR THE FINANCIAL YEAR ENDING THE 31<sup>st</sup> MARCH, 2018**

**SUKINDA CHROMITE MINE, TATA STEEL LTD.**

**PART-A**

i.	Name and address of the owner/Occupier of the industry, operation	:	Mr.T V Narendran (Owner) Address: Sukinda Chromite Mine, Tata Steel Ltd., At/P.O-Kalarangiatta, Dist. - Jajpur, Orissa -755028
ii.	Industry Category	:	Primary (SIC): 1000 (Metal Mining) Secondary (SIC): 1060 (Ferro Alloy Ore)
iii.	Production capacity	:	Chrome Ore (ROM): 2.4 MTPA* Pyroxenite Ore (ROM): 0.5 MTPA Chrome Concentrate: 0.65 MTPA
iv.	Year of establishment	:	1960. (20 <sup>th</sup> December 1960)
v.	Date of the last environmental statement submitted	:	26 <sup>th</sup> September 2017

Note: \*MTPA: Million tonnes per annum

**PART-B**

**{WATER & RAW MATERIAL CONSUMPTION}**

**(1) Water Consumption:**

**A) Water Consumption for FY 2016-17 & FY 2017-18**

S.No	Heads of Consumptions	Water Consumption (m <sup>3</sup> )		Water Consumption (m <sup>3</sup> /day)		
		2016-17	2017-18	2016-17	2017-18	
01	Process	*Spraying in mine pit	3,91,322	3,90,831	1,072.1	1070.8
		Vehicle Washing	3,090	3,222	8.5	8.8
		Beneficiation	4,77,453	2,96,168	1,308.1	811.4
		Desludging	7,132	0	19.5	0
		<b>Total Consumption</b>	<b>8,78,997</b>	<b>6,90,221</b>	<b>2,408.2</b>	<b>1891</b>
02	<b>Cooling (Ac Cooling)</b>	<b>2,198</b>	<b>2,215</b>	<b>6.02</b>	<b>6.07</b>	
03	Domestic	Drinking Purpose	7,25,506	2,69,170	1,987.7	737.5
		Gardening Purpose	2,76,881	2,27,666	758.6	623.7
		<b>Total Consumption</b>	<b>10,02,387</b>	<b>4,96,836</b>	<b>2,746.3</b>	<b>1361.2</b>
04	<b>Total Consumption (1+2+3)</b>	<b>1883582</b>	<b>11,89,272</b>	<b>5160.5</b>	<b>3258.3</b>	

Note: \* Spraying in mine pit is not exactly a process driven parameter however is an essential activity referred as haul road dust suppression essential for carrying out mine operation.

**B. Specific Water Consumption- Water Consumption per unit of product output(Cu.M/Tonne)**

Name of Product	Production (Tonnes)		Water Consumption (Cu.M/Tonne)#	
	FY:16-17	FY:17-18	FY:16-17	FY:17-18
Chrome Ore (ROM)	1640004.007	1550375.084	0.239	0.253
Pyroxenite Ore (ROM)	11053.433	7400	0.239	0.253
Chrome Concentrate	332692.181	287374.227	1.46	1.03

Note: # for computing specific water consumption qty consumed under "spraying in mine pit" & "vehicle washing" is considered for Chrome Ore (ROM) and Pyroxenite Ore (ROM) and for Chrome concentrate the heads under "beneficiation" & "De-sludging" have been considered. (Ref.Table.A)

**(ii) Raw Material Consumption**

Tatasteel is involved in extraction of chrome ore and pyroxenite (Run off Mine) from the mine/quarry. Mining is not a manufacturing process thus there are no such raw materials involved in the process, however there are number of indirect raw materials/consumables used to support the process of mining and beneficiation of ore e.g chrome concentrations. The details of major consumables is reflected in the Table.1 below:

**Table.1: Indirect Raw Materials/ Consumables**

Name of Raw materials/Consumables	Consumption of Raw Material (Indirect)	
	During previous financial Year (2016 – 17)	During current financial Year (2017 – 18)
High Speed Diesel (Ltrs)	6923745	8534250
Lubricants (Ltrs)	50855	28838
Grease (Kg)	14490	16170
Explosives of all types (Explosive, codex/fuse, detonator)	41675Kg, 26450m, 23514Nos	32613Kg, 21120m, 22350Nos
<b>Electric Power</b>		
Consumed (KhW)	18829393	19096950
Generated(KhW)	82200	87840
Gas (Cu.M)	6892	4907
Tyres (Nos.)	64	56
Drill rods (Nos.)	2	2
<b>Acids &amp; Chemicals</b>		
Nitric Acid (Ltrs)	282.5	278
Acetone (Ltrs)	1.5	1.5
Borax (Kg)	46.5	23
Hydrochloric Acid (Ltrs)	550	190

## PART-C

### {POLLUTION DISCHARGED TO ENVIROMENT/ UNIT OF OUTPUT} (Parameters as specified in the consent issued)

#### A. Water Pollution:

- ❖ The majority of water usage is fulfilled by utilizing the accumulated water in the mine pit/quarry and the ground water seepage which is dewatered to continue mining operation and the same volume caters to different purposes viz. as process water for chrome ore beneficiation and dust suppression inside mine & services to the tune of approx.811.4 Cu.M/day & 1070.8 Cu.M/day respectively.
- ❖ Water consumed for industrial cooling (AC Cooling) is completely recycled.
- ❖ Effluents is generated majorly from the beneficiation process wherein approx. 85% of the generated volume is recycled and reused in the process.
- ❖ Slimes de-watering facility is added to the plant, and about 90% of the total slimes generated in the plant are being de-watered here, and at times due to no operation of de-watering facility, about max. 10% of slurry is discharged in to slime pond, from where clarified water is recycled back to the plant.
- ❖ The balance water after adequate treatment is discharged out of lease boundary to the fallow land and regular real-time monitoring is performed to check its conformance with the discharged norms (a prerequisite strictly adhered upon at site). The drainage network of the discharge line is maintained with check dam to arrest the flow and allow siltation of the residual solids collected along the course of discharge. The summary of the treated effluent quality is outlined in the Table.2 below:

**Table.2: Details of Water Quality Monitoring**

Sl. No	Parameter	Unit	Detection Limit	Result (Average)	Max. Permissible Standard ##	Variations from the prescribed standard (%)	Remarks for the deviations if any
1	PH	--	--	7.1-7.24	6.0-9.0	0	In the permissible range
2	Suspended Solids	mg/ltr	--	20.92	100	-79.08	much below the permissible value
3	Oil & Grease	mg/ltr	0.01	BDL	10	0	Not detected in any of the samples
4	BOD (3) days at 27°C.	mg/ltr	1.8	<1.8	30	0	Detected only in few samples and on lower
5	COD	mg/ltr	--	6.04	250	-97.59	much below the permissible value
6	Hexavalent Chromium as Cr <sup>+6</sup>	mg/ltr	0.05	BDL	0.05	0	Not detected in any of the samples
7	Total Chromium as Cr	mg/ltr	0.05	<0.12	2	0	Detected only in few samples



Sl. No	Parameter	Unit	Detection Limit	Result (Average)	Max. Permissible Standard ##	Variations from the prescribed standard (%)	Remarks for the deviations if any
8	Nickel as Ni	mg/ltr	0.001	BDL	3	0	Not detected in any of the samples
9	Iron as Fe	mg/ltr	--	0.30	3	-90.17	much below the permissible value

Note: ## Standards mention is as per the consent to operate and/or general standards for discharge of effluent for inland surface water (Part-A of Schedule-VI to Environmental Protection Rules,1986) whichever is capped at lower side of the max permissible value, BDL: Below Detection Limit

#### B) Air Pollution:

❖ This is an opencast mine and does not have any potential point sources of emissions or processed stacks emanating pollutants to the environments. Hence, specific quantitative estimation of air pollutants discharged in Kg/day cannot be ascertained, however ambient air quality for different locations are monitored as per NAAQS-2009 and the summary of the monitoring results for FY 2017-18 is outlined as below in Table.3 below:

**Table.3: Ambient Air Quality at Sukinda Chromite Mines {average values }**

Monitoring Locations	Parameters (unit)	Results Annual Averages	Prescribed Standards Annual Average (NAAQS-2009)	Prescribed Standards 24hr Average (NAAQS-2009)	Variations from prescribed standards (%) (variation w.r.t annual averages)	Reasons for +ive Variations (deviations from the standard values)
COB Plant	PM10 µg/m3	58.28	60	100	-2.86	
	PM2.5 µg/m3	29.71	40	60	-25.73	
	SO2 µg/m3	4.89	50	80	-90.23	
	NOx µg/m3	13.91	40	80	-65.22	
	#CO mg/m3	3.11	N/A	4	N/A	Annual average standard not prescribed in NAAQS-2009
Stack Yard	PM10 µg/m3	66.03	60	100	10.05	Not a processed emission source and ambient air quality gets affected by local meteorology quite often
	PM2.5 µg/m3	34.59	40	60	-13.52	
	SO2 µg/m3	5.19	50	80	-89.62	
	NOx µg/m3	14.10	40	80	-64.74	
	CO mg/m3	3.28	N/A	4	64.17	Annual average standard not prescribed in NAAQS-2009
Laboratory Top	PM10 µg/m3	53.13	60	100	-11.45	
	PM2.5 µg/m3	26.99	40	60	-32.52	

Monitoring Locations	Parameters (unit)	Results Annual Averages	Prescribed Standards Annual Average (NAAQS-2009)	Prescribed Standards 24hr Average (NAAQS-2009)	Variations from prescribed standards (%) (variation w.r.t annual averages)	Reasons for +ive Variations (deviations from the standard values)
	SO <sub>2</sub> µg/m <sup>3</sup>	4.49	50	80	-91.01	
	NO <sub>x</sub> µg/m <sup>3</sup>	12.94	40	80	-67.64	
	CO mg/m <sup>3</sup>	2.68	N/A	4	N/A	Annual average standard not prescribed in NAAQS-2009
Hospital Top	PM <sub>10</sub> µg/m <sup>3</sup>	46.11	60	100	-23.14	
	PM <sub>2.5</sub> µg/m <sup>3</sup>	23.15	40	60	-42.11	
	SO <sub>2</sub> µg/m <sup>3</sup>	4.18	50	80	-91.65	
	NO <sub>x</sub> µg/m <sup>3</sup>	10.26	40	80	-74.35	
	CO mg/m <sup>3</sup>	0.84	2	4	-57.91	
Mining Complex	PM <sub>10</sub> µg/m <sup>3</sup>	59.15	60	100	-1.42	
	PM <sub>2.5</sub> µg/m <sup>3</sup>	30.42	40	60	-23.95	
	SO <sub>2</sub> µg/m <sup>3</sup>	4.99	50	80	-90.01	
	NO <sub>x</sub> µg/m <sup>3</sup>	13.15	40	80	-67.12	
	CO mg/m <sup>3</sup>	3.70	2	4	84.88	
Near Tailing Pond	PM <sub>10</sub> µg/m <sup>3</sup>	50.32	60	100	-16.13	
	PM <sub>2.5</sub> µg/m <sup>3</sup>	25.60	40	60	-36.01	
	SO <sub>2</sub> µg/m <sup>3</sup>	4.38	50	80	-91.25	
	NO <sub>x</sub> µg/m <sup>3</sup>	11.06	40	80	-72.34	
	CO mg/m <sup>3</sup>	2.14	2	4	6.87	Annual Standard not prescribed in NAAQS-2009

Note: # duration of monitoring is for 8hrs in a sampling event, (-) deviation implies values below the prescribed standards

- ❖ In addition to this there are five numbers of DG Sets of 1000KVA capacity installed and in operation for captive power utility purpose; however, these are not in continual operation on regular basis thus quantitative estimation (mass/day) of the air emissions is not carried out, however the stacks emission is monitored on quarterly basis and summarized result of the same is outlined in the Table-4

*Handwritten signature*

Table 4: Summary of DG Set Stack Emission Results

	PARAMETERS	Average Value	Prescribed **Standards	Variations from the prescribed standards (%)	Reasons for deviations if any
DG-1	Stack Temp °c (Range)	180-201	N/A	N/A	
	Stack Velocity in (m/sec)	17.74	N/A	N/A	
	Particulate Matter, PM (mg/Nm <sup>3</sup> )	47.73	150	-68.2	
	Oxides of Nitrogen as NO <sub>x</sub> (mg/Nm <sup>3</sup> )	48.83	1100	-95.6	
	Carbon Monoxide as (mg/Nm <sup>3</sup> )	84.45	150	-43.7	
	Non-Methyl Hydro Carbon (as C) (mg/Nm <sup>3</sup> )	34.18	150	-77.2	
DG-2	Stack Temp °c (Range)	178-197	N/A	N/A	
	Stack Velocity in (m/sec)	17.49	N/A	N/A	
	Particulate Matter, PM (mg/Nm <sup>3</sup> )	48.15	150	-67.9	
	Oxides of Nitrogen as NO <sub>x</sub> (mg/Nm <sup>3</sup> )	48.40	1100	-95.6	
	Carbon Monoxide as (mg/Nm <sup>3</sup> )	87.35	150	-41.8	
	Non-Methyl Hydro Carbon (as C) (mg/Nm <sup>3</sup> )	44.73	150	-70.2	
DG-3	Stack Temp °c (Range)	183-204	N/A	N/A	
	Stack Velocity in (m/sec)	17.72	N/A	N/A	
	Particulate Matter, PM (mg/Nm <sup>3</sup> )	46.43	150	-69.1	
	Oxides of Nitrogen as NO <sub>x</sub> (mg/Nm <sup>3</sup> )	48.23	1100	-95.6	
	Carbon Monoxide as (mg/Nm <sup>3</sup> )	79.55	150	-47.0	
	Non-Methyl Hydro Carbon (as C) (mg/Nm <sup>3</sup> )	43.08	150	-71.3	
DG-4	Stack Temp °c (Range)	180-190	N/A	N/A	
	Stack Velocity in (m/sec)	17.11	N/A	N/A	
	Particulate Matter, PM (mg/Nm <sup>3</sup> )	44.00	150	-70.7	
	Oxides of Nitrogen as NO <sub>x</sub> (mg/Nm <sup>3</sup> )	49.18	1100	-95.5	
	Carbon Monoxide as (mg/Nm <sup>3</sup> )	81.03	150	-46.0	
	Non-Methyl Hydro Carbon (as C) (mg/Nm <sup>3</sup> )	43.63	150	-70.9	
DG-5	Stack Temp °c (Range)	186-196	N/A	N/A	



	PARAMETERS	Average Value	Prescribed **Standards	Variations from the prescribed standards (%)	Reasons for deviations if any
	Stack Velocity in (m/sec)	17.40	N/A	N/A	
	Particulate Matter, PM (mg/Nm <sup>3</sup> )	43.80	150	-70.8	
	Oxides of Nitrogen as NO <sub>x</sub> (mg/Nm <sup>3</sup> )	50.10	1100	-95.4	
	Carbon Monoxide as (mg/Nm <sup>3</sup> )	80.48	150	-46.4	
	Non-Methyl Hydro Carbon (as C) (mg/Nm <sup>3</sup> )	40.28	150	-73.2	

Note: \*\* Emission Standards For Diesel Engines (Engine Rating More Than 0.8 Mw (800 Kw) For Power Plant, Generator Set Applications And Other Requirements notified vide G.S.R 489 (E).dt. 9th July 2002

#### PART-D

#### {HAZARDOUS WASTES}

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

Hazardous Wastes	Total Quantity	
	During the Previous Financial Year (2016-17)	During the Current Financial Year (2017-18)
Used Oil	41MT	40.14KL
Waste containing Oil	10.08MT	19.90 MT
Waste Battery	178Nos.	156Nos.
ETP Sludge	97.27 MT	244.57MT
From Pollution Control Facility: <ul style="list-style-type: none"> <li>▪ Waste oil from oil &amp; grease separation pit</li> <li>▪ Sludge from oil and grease separation pit</li> </ul>	Included in the above Items	Included in the above Items

#### PART-E

#### {SOLID WASTES}

Sources	TOTAL QUALITY	
	During the Current Year (2016-17)	During the Current Year (2017-18)
A. Generated from process		
A1 From Mining as Overburden	50.30 Lakh Cu.M or (11570498 Tonnes)	65.5 Lakh Cu.M or (15068432 Tonnes)
A2 From COB as Tailings	454632Tonnes	514323.7Tonnes



Sources		TOTAL QUALITY	
		During the Current Year (2016-17)	During the Current Year (2017-18)
A3	Misc. waste from canteen/office/colony	0.75MT	0.65MT
B	Generation from Pollution Control Facility	-Nil-	-Nil-
C	Quantity Recycled/Reused/Sold/disposed off		
C1	Quantity recycled or reused within the unit	-Nil-	-Nil-
C2	Quantity Sold (General office waste)	1.3MT	0.65MT
C3	Quantity disposed-Overburden used in backfilling mine pit	50.3Lakh Cu.M	15068432 Tonnes
C4	Quantity disposed-colony waste/office garbage	Organic waste used at biogas plant and compost pits	Organic waste used at biogas plant and compost pits

### PART-F

**(PLEASE SPECIFY THE CHARACTERISTICS (IN TERMS OF COMPOSITION AND QUANTUM) OF HAZARDOUS AS WELL AS SOLID WASTES AND INDICATE DISPOSAL PRACTICE ADOPTED FOR BOTH THESE CATEGORIES OF WASTES)**

The Table.5 outlines the details pertaining to the management of solid waste and hazardous waste at our site.

**Table.5: Waste Management Aspects:**

Sl. No	Waste Description	Nature of Waste	Composition/ Characteristics	Qty (2017-18)	Management (Methods of Collection & Disposal)
01	Overburden Material	Non-Hazardous (Solid Waste)	Quartzite and talk serpentine, Nickeliferous limonite	1506832MT	-Used in backfilling the mine void.
02	Mine Tailings	Non-Hazardous	Chemical composition: SiO <sub>2</sub> , Fe, MgO, CaO, Al <sub>2</sub> O <sub>3</sub> , Cr <sub>2</sub> O <sub>3</sub> , Mn, TiO <sub>2</sub>	514324MT	- Tailings produced are fed to thickener to increase the settling rate of particles thus producing clarified water - Thickener's discharge is fed to Tailings Dewatering Plant and Tailing pond. - Clarified water from the tailing pond & clear water produced from the dewatering plant is re-circulated back to

Sl. No	Waste Description	Nature of Waste	Composition/ Characteristics	Qty (2017-18)	Management (Methods of Collection & Disposal)
					the COB plant ensuring zero discharge from the plant. - Recently, company has installed one Tailing dewatering unit at the COB Plant to recover the water from the tailings and - Tailings are disposed in the form of dry cake in safe and environment friendly manner.
03	Solid Waste (from Canteen, camp, office)	Non-Hazardous & Solid Waste	Organic & biodegradable waste, garbage, dry leaves, etc.	Approx.:0.15MT	-Collected in buckets (3 cum capacity) disposed on the OB dumps to fasten the vegetation cover and reclamation process.
04	Food Waste (clubs, canteen, camps)	Non-Hazardous waste	Organic in nature	Approx..0.3MT	- Processed in bio-gas plant (two nos) and the gas recovered is used in cooking and the residual waste as manures
05	General Office Waste	Municipal Solid Waste & Other solid waste	Plastics, rubber, scraps, tins, jute bags, bottles, damaged stationaries	Approx..0.2MT	-recycled by a registered scrap recycler based at Cuttack. - construction waste (debris) used in backfilling.
06	Used Oil: Gear oil- SP460, 320, 220 & 90, Hydraulic oil: 68, 10, 46, and 100, Mobil oil: 20W40, 30, 40 Transformer oil, Grease: Senogem EP2, KG 10.	Hazardous Waste (HW-5.1)	PCBs, Lead, Arsenic, Cadmium, Chromium, Nickel, PAHs, etc.	Gen:40.14KL Recycled:53.82KL Bal:29.88KL (As on 31.03.2018)	- Collected and securely stored inside 200Ltr MS Barrels and stored above concrete pavement under shed. - Sold to M/s Raj Lubricants, an OSPCB recognized recycler

Sl. No	Waste Description	Nature of Waste	Composition/ Characteristics	Qty (2017-18)	Management (Methods of Collection & Disposal)
07	ETP Sludge	Hazardous Waste (HW-35.3 & 35.4)	Contains-compounds of Cr, Fe, Ni, Al, Si, etc.	Gen:244.57MT Disposed off:244.57MT Bal:1.0MT (from previous year stock)	-stored over impervious structure preventing spillage - disposed off at CHWTSDF of M/s Orissa Waste Management Ltd.
08	Residual waste containing oil	Hazardous Waste (HW-5.2)	Consists of oil filters, and residues such as soaked sand/soil, jutes, etc.	Gen:19.9MT Disposed off:19.9MT Bal:1.0MT (from previous year stock)	-Stored in HDPE lined placer dumper buckets - Soaked sand stored in vats at oil & grease separation system -Incinerable waste disposed off by M/s West Bengal Waste Management Ltd, Haldia, W.B as per the directive of Member secretary, OSPCB.
09	Battery Waste from automotive-four-wheeler, HEMM, DG Set, UPS, etc.	Discarded batteries (hazardous in nature)	lead acid batteries with diluted acid	Previous Bal: 175Nos Gen: 150 Nos Sale: 156Nos Balance: 169Nos (As on 31.03.2018)	-Recycled through registered recyclers.

### PART-G

#### {IMPACT OF POLLUTION ABATEMENT MEASURES TAKEN ON CONSERVATION OF NATURAL RESOURCES AND ON THE COST OF PRODUCTION}

##### A.) DUST SUPPRESSION:

- ❖ To limit the fugitive emissions, various control measures like water sprinkling on haul road, transfer points, Ore stack yard, etc is being done. Four graders have been deployed for grading all the haul roads to remove the accumulated muck. Ten water sprinklers (two of 28 KL, four of 25 KL, and four 8 KL) have been deployed in the mine area for dust suppression on haul road and at mineral storage yards.
- ❖ The main haul roads and areas in maintenance, stack yard and chrome ore beneficiation plant have been concreted and stationary water sprinkler have also been installed to control dust dust in these permanent haulage roads. Plantation of 5-20 m width has also been raised in between colony and mines to minimize any air borne problems to the inhabitants.
- ❖ Stationary water sprinklers have been installed in roads within COB Plant and Workshop also. Water spraying is done through pressure water jets at feed hopper, transfer points, discharge chute to prevent dust generation. The

process at COB Plant is totally wet and eliminates the chance of any dust generation. The concentrate stacks are now being covered using tarpaulin sheets to prevent finer concrete particle from getting air borne.

- ❖ The details of concrete road including provision of fixed water sprinkler is outlined in the Table.6 below:

Table.6: Dust Suppression/Control Measures at Sukinda Chromite Mines

Particulars	Location	Length(m)	Width(m)
Concrete road	Main Haulage road	1000	13
	COB Plant	100	10
	LOP Plant	200	06
	Workshop	200	06
Fixed water sprinkling system	Main Haulage road	1000	-
	COB Plant	100	-
	LOP Plant	200	-
	Workshop	100	-
	Mining Road	1500	11

- ❖ To reduce dust generation in workshop area, automatic sprinkling system has been installed.
- ❖ To reduce dust generation at dry tailing plant, floor concreting and sise drain construction had been made.
- ❖ Concreting of the parking area of the administrative building has also been made to reduce fugitive dust generation.
- ❖ Tarpaulin covers are being used in stock yard and COBP to reduce dust generation with the expenditure of Rs. 10 Lakh per year.
- ❖ Dust sampling study including dust fall monitoring and mineralogical composition analysis had been carried out during the year.

#### B.) ENVIRONMENTAL MANAGEMENT AT ASSOCIATED MINERAL STORAGE AREAS:

- ❖ To limit the fugitive emissions, various control measures like water sprinkling on haul road, transfer points, Ore stack yard, etc is being done.
- ❖ Four graders have been procured for grading all the haul roads and the stock pile areas to remove the accumulated muck.
- ❖ Nine water sprinklers (two of 28 KL, four of 20 KL, one 12 KL, one 10 KL and one 8 KL) have been deployed in the mine area for dust suppression on haul road and at mineral storage yards.
- ❖ The main haul road and areas in maintenance stack yard and chrome ore beneficiation plant has been concreted. Stationary water sprinkler has also been installed in these permanent haulage roads. Fixed sprinkler, about a length of 1.5 Km, is installed in mining road.
- ❖ Stationary water sprinklers have been installed in roads within COB Plant and Workshop also. Water spraying is done through pressure water jets at feed hopper, transfer points, discharge chute to prevent dust generation.
- ❖ The process at COB Plant is totally wet and eliminates the chance of any dust generation. The concentrate stacks are now being covered using tarpaulin sheets to prevent finer concrete particle being getting air borne.

- ❖ Plantation of 5-20 m width has also been raised in between colony and mines to minimize any air borne problems to the inhabitants. All parameter w.r.t ambient air quality is complying with the prescribed limit.
- ❖ Garland drains around the mines of 15,755m stretch have been maintained regularly at the toe of dumps, periphery of the quarries, stack yard, COB plant and camp area.
- ❖ Prior to monsoon above drains are cleaned and made ready to check runoff from overburden dumps and to prevent surface runoff from entering into the quarry. These drains (avg. width 1.5 m and depth min. 1m) are made ready by constructing new ones, wherever required, and cleaning the existing ones through machines as well as by manual excavation. Settling pits are made ready to arrest the suspended solids.

**C.) ENVIRONMENTAL MANAGEMENT: OB Dump Reclamation:**

- ❖ The maximum height of the overburden dumps from its toe to the top of the dump on sloping ground is being maintained within 110 m.
- ❖ Dump Stability Study was taken up in 2010-11 with IIT, Kharagpur as per advice of the Regional Office of the MoEF, Bhubaneswar, for assessing long term dump stability requirements. As per the Report of May 2011, dumps up to 110m height are stable. The topography of the already stabilised old area is undulated and hilly ranging from 140 mRL to 200 mRL. At present over burden is disposed only in to OB II quarry as backfilling. Benches have been provided and overall slope of the dumps are less than 28°.
- ❖ Each level of dump is provided with garland drain and water from upper level flow to next level via concrete patch path (channel) provided for same purpose at areas were feasible. The concrete patch path ensures less soil erosion and flow of water from designated path. Further, coir matting and vetiver plantation has been done on the dump slopes to prevent wash off during the monsoon. Garland drains with 10 nos. of settling pits for silt collection of 1.5 m-2m width and 1m-1.5m deep have been constructed on the toe of all the OB dumps to collect the surface run-off during rainy season. The collected run-off is treated in newly installed ETP of capacity 4500 m<sup>3</sup>/hr and is then discharged beyond the lease boundary.
- ❖ **Practice like coir mating and Vetiver Plantation:** Vetiver Slip based reclamation strategy has been adopted for making the slopes of the dump (Kakudia dump) stable and ensuring the vegetation to be self-sustaining executed in collaboration with IIT, Kharagpur and more than one lakh vetiver slips has been planted, which has shown encouraging results and good growth and prevented soil erosion of the dump slopes. More than more than 1,10,000 nos. of vetiver slips had been planted along the dump slopes for dump slope stabilization.
- ❖ Hard rocky material was dumped at outer slope of running overburden dump benches to stop erosion of dump slope. Boulder patching had also been done on critical places of the dump to prevent wash out by channelizing the storm water through rocky patches.
- ❖ To prevent soil erosion and to stabilize the dump slope of associated minerals 59,000 no. of saplings were planted over 11 ha (5 ha of area within the Mining lease and 6 ha in the Additional area of 100 ha allotted for overburden dumping). The density of tree more than 2500 trees per ha is being maintained in FY 2017-18.
- ❖ **Miyawaki Method:** We had also planted about 4000 plants in miyawaki method on the dump slope which had shown encouraging growth and survival. Such practices are encouraged and assessed to evolve with a better strategy for reclamation work.

**D.) SOLID WASTE MANAGEMENT:**

The strategy for solid waste management basically focuses at Reduction and Source followed by proper segregation to explore the possibility of re-use /recycle and ultimately disposal in case becomes inevitable.

❖ Organic waste of canteen was put to the bio-gas plant made near canteen for the purpose. Organic waste of Hospital, Guest House & Valley club are also put to the bio-gas plant made near Valley club and other biodegradable waste including plant wastes are put in the overburden dumps to improve the nutrient content and thereby the plant growth.

❖ Each work place has been provided with containers for segregation of solid wastes depending on its characteristics for proper management.

❖ All the houses in the camp have been provided with two separate buckets for storage of degradable and non-degradable waste separately for safe disposal.

**E.) WATER CONSERVATION: TREATMENT & RECYCLING:**

❖ During 2017-18 company has spent Rs.144.49 Lakh (INR) towards mine water treatment to ensure that the water quality meets all the parameters as prescribe by the statutory authorities.

❖ The oil and grease separation system was in effective operation for treating workshop effluent. The system of treatment consists of an ETP of 4500 m<sup>3</sup>/hr having the facilities like, settling pit, flash mixture, clarri-focculator, automatic dosing system, dry sludge collection system, multi sand filters etc as per the Direction of State Pollution Control Board.

❖ Herbal Treatment Plant is in use at our COB Plant for treatment of Hexavalent Chromium in the chrome concentrate. The water from tailing dam is recycled back to COBP for further reuse.

❖ Company has introduced single line intake system at COB Plant to monitor and reduce water consumption.

❖ Rain water harvesting study had been conducted and one roof top harvesting structure had been constructed inside General Office premises which will be also extended to other buildings.

**F.) ENVIRONMETNAL MONITORING:**

❖ An amount of Rs.28.51 Lakh (INR) was spent towards monitoring of various environmental parameters in FY 2017-18. This consists of air quality monitoring at a frequency of twice in a week with 24 hourly sampling and water quality monitoring once in a month for all the parameters as prescribed in NAAQS-2009, Noise monitoring, water quality monitoring, effluent quality monitoring, etc.

❖ Weather monitoring is done through automatic weather monitoring station and compiled report on rain fall, humidity, temperature, wind speed, wind direction etc.

**G.) PREVENTION OF LAND CONTAMINATION:**

❖ The entire area of the HEMM maintenance workshop had been "Epoxy Flooring" for preventing any oil to reach the soil or ground.

❖ Usage of movable oil collection tray with built in pneumatic oil pump during any kind of HEMM maintenance to reduce oil leakage incidents.

- ❖ Targets have been put at various concerned locations to reduce the leakage/ spillage of oil which are monitored in as per the laid down EMS procedure.
- ❖ Installation of one water column near the pit maintenance shop has reduced the lead distance significantly thereby reducing the diesel consumption considerably.
- ❖ Introduction of barrel handler for handling of oil barrels to reduce oil leakage and spillage.
- ❖ Introduction of off line oil cleaner resulting in enhancement of oil life (increased oil replacement interval) and thereby reducing waste oil generation.
- ❖ Modification of the hose kits in CAT dumper that has resulted in oil consumption. Separate dust bins have been provided at COB Plant and workshop for collection of oil soaked waste to prevent contamination of land.

#### H.) AFFORESTATION:

- ❖ The plantation programme is being carried out as per the approved Mining Plan & Progressive Mine Closure Plan as that was envisaged in the EIA report.
- ❖ During the past year ended on March' 18, total 59,000 no. of saplings were planted over 11 ha (5 ha of area within the Mining lease and 6 ha in the Additional area of 100 ha allotted for overburden dumping). The density of tree more than 2500 trees per ha is being maintained. Further to above, company had taken up plantation programme in the nearby villages through TSRDS (Tata Steel Rural Development Society). Further, 6000 nos. of fruit bearing sapling were planted in the interested villagers nearby (Kansa, Chingudipal, Gauramia).
- ❖ Also a 7.5m wide greenbelt in the safety zone around the mining lease, backfilled and reclaimed area is being maintained. Apart from the above, we had distributed more than 15000 numbers of fruit bearing saplings to the nearby villagers for improvement of environment.

#### I.) NOISE REDUCTION:

- ❖ Noise monitoring is being done once in three months both in work zone and in ambient. The data on noise level for the period Apr'17 to March'18 indicate that the values of noise levels are within the prescribed limits of 75dB(A) Day time.
- ❖ Due precautions at source and at the receiver end are being taken adequately. Wherever possible the noise is controlled at the source by replacement of metallic screens by rubber screens & polyurethane panels etc at Chrome Ore Beneficiation and Lumpy Ore Processing plant. DG sets have also been provided with acoustic enclosures to prevent noise propagation.
- ❖ The operator's cabin of all the HEMM's including drills and dozers has been made air conditioned which serves as acoustic barriers. Controlled blasting technique like presplit blasting, use of Nonel and SME (Site Mixed Emulsion) is being followed as per CIMFR, Dhanbad's recommendation minimize noise pollution and fly rock generation. However, the people working in the noisy areas are provided with personal protective appliances to reduce exposure of high noise. Regular test of all the vehicles is being carried out to check whether the vehicles are meeting pollution under control (PUC) norms. The K factor for all the vehicles is <0.33. Noise monitoring for the period Oct'17 to March'18 is
- ❖ To reduce the noise level at source a lot of work has been done at COB plant and in the machines. In all the places proper, operational control procedures have been practiced for the same.

- ❖ In the crusher area polymer liners have been fitted to reduce noise.
- ❖ Constant monitoring and adjustment reduced the noise level by 4 dB in 30% of mining equipment deployed in mines, COBP, & LOP Plant.
- ❖ All the shovels and haul pack cabins have been air conditioned to prevent adverse impact of dust and noise on the operators. To start with two dozer cabins have been made air conditioned.
- ❖ The DG sets working inside the camp have been provided with acoustic enclosures. The noise outside the acoustic enclosure, at the time of running DG sets measures to be within 45 - 65 dB.
- ❖ Employees working in the noisy areas have been provided earmuffs to reduce impact of noise.

**J.) BEAUTIFICATION:**

- ❖ For landscaping and horticultural development in the colony and workplaces an amount of Rs.66.80 Lakh(INR) was spent including watering arrangement to different gardens and plantation sties.

**K.) SANITATION & WATER SUPPLY:**

- ❖ Towards potable water supply for the camp residents Rs.34.40Lakh (INR) was spent during financial year 2017-18 and Rs.50.00 Lakh (INR) on sanitation fonts incurred in maintenance of sewer lines and storm water drains.
- ❖ Towards operation & maintenance of full-fledged STP an amount of Rs.6.80 lakh was spent during 2017-18.

**L.) MALARIA ERADICATION (expenditure of 3.65Lakhs INR):**

- ❖ Integrated mosquito control management programme undertaken to eradicate malaria cases in the colony.
- ❖ TSRDS has done several mobile treatment programs in different villages regarding diseases and their remedial measures with full checkup.
- ❖ Mosquito net have been procured by Tata steel for the villagers and regular medicine distribution and anti-mosquito spray was being spread inside the colony area.

**M.) RESOURCE CONSERVATION:**

- ❖ The establishment of Chrome ore beneficiation plant has been able to utilize low grade ore having no market to produce beneficiated ore of the desired market value. This has been the best example of our dedication towards the conservation of natural resources, which would otherwise have been wasted.
- ❖ Tailing dewatering plant has been established in the Chrome Ore Beneficiation (COB) plant premises. Higher and instant recovery of clear water is now possible using filter press process. With this effort, we had achieved reduction in water consumption in the COB plant and eliminated loss of water from the tailing pond.
- ❖ **Water Conservation:** To measure quantities of water used for various purposes like processing & cooling in COBP, sprinkling on mine haul rods and domestic/ human consumption, water meters are installed at the inlet points of each connections. The water from slime dam is also getting re-



circulated to COB plant for reuse and water recycling sump pump with automation has been put in operation to reduce water wastage. COBP uses about 85% of re-circulated water.

- ❖ **Energy Conservation-1:** In COB plant, translucent sheets have been fixed on the roof for the purpose of reducing wastage of electricity and to reduce water consumption.
- ❖ **Energy Conservation-2:** With the expenditure of Rs. 1.2 Lakhs company has modified the tailing management system which results as reduction of 8000 hours of 75 KW motor per year.
- ❖ **Energy Conservation-3:** Flocculent dosing was changed from pump dosing to gravity dosing, which reduced 8000 running hour of 2 KW motor per year.
- ❖ **Energy Conservation-4:** Installed sun reflectors in Chrome Ore Beneficiation Plant with the expenditure of Rs. 5 Lakhs, which results as 937 KWH energy per light per year
- ❖ **Energy Conservation-5:** With the expenditure of Rs. 1.5 Lakh we installed a single pump to remove slurry during COB plant maintenance, which results reduction of 4 hours of 1850 KW machineries per year and Turbo Ventilators in Chrome Ore Beneficiation Plant with the expenditure of Rs. 2.50 Lakhs, which results as 1753 KWH energy per year per turbo ventilator.
- ❖ **Recovery of Resource from Waste:** Composting of garden waste is done at major locations.
- ❖ **Oil-Spillage Management:** Different measures have been taken to prevent oil leakage and spillage resulting reduction in 35% oil consumption by equipment and one environmental management programme is going on now for further conservation.
- ❖ Diesel pumps used for pumping water from Damsala River to drinking water treatment plant have been replaced with electric pumps resulting prevention of waste oil generation, leakage of lubricant and diesel, reduction of noise and air pollution.
- ❖ Installation of Fuel indicator, Magnetizer and HSD additives reduces fuel consumption in mining machinery and vehicular exhaust monitoring for all diesel and petrol driven vehicles is done once in six months and result utilized in optimizing the HSD and petrol consumption by vehicles.
- ❖ Achieved reduction of oil leakage by 95% and grease by 10% in VS ball mill of COB plant over the years.

#### PART-H

#### **{Additional Measures/ Investment Proposal for Environmental Protection Including Abatement of Pollution, Prevention of Pollution}**

The management of sukinda chromite mines plans to undertake the environmental protection measures aiming at specific areas with defined budgetary provisions earmarked towards the environmental protection measures every year. Funds earmarked for this purpose for the year 2017-18 is outlined in the table below reflecting the comparative status b/w the planned provision and the actual expenditure.

**Table.7:Environmental Budgets (Planned Vs Actual) for FY 2017-18**

Sl.No.	Item	Expenditure (Lakh(s) INR) Year-2017-18	
		Planned	Actual
1	Afforestation	84.19	81.5

*APV*

Sl.No.	Item	Expenditure (Lakh(s) INR) Year-2017-18	
		Planned	Actual
2	Dust suppression	180	185.5
3	Treatment of mine discharge & recycling	140	144.49
4	Environment & weather, exhaust monitoring	28	28.51
5	Horticulture development	66.81	66.80
6	Drinking water supply	35.00	34.50
7	STP Operation & Maintenance	6.85	6.80
8	Sanitation	51.00	50.00
9	Herbal Treatment	5.00	5.00
10	Malaria Eradication	5.00	3.65
11	Garland drain & storm water drain	2.50	2.72
12	Family planning	1.00	00
13	Slime dam management	10.00	10.50
14	Environment awareness (EMS)	10.00	12.80
15	Community development through TSRDS	563.00	567.00
16	Hazardous waste management	21.5	17.05
17	Bio medical waste	4.00	3.50
18	<b>Total</b>	<b>1213.85</b>	<b>1220.32</b>

### PART-I

#### (ANY OTHER PARTICULARS FOR IMPROVING THE QUALITY OF THE ENVIRONMENT)

- ❖ Company is committed for prevention/abatement of pollution and minimize adverse environmental impacts of the business by ensuring continual improvement of environmental performance, and complying to the relevant environmental and other legislation, regulation & other requirements.
- ❖ The mine has already been certified with ISO-14001 (Environment Management System), ISO-9001 (Quality Management System), OHSAS-18001 (Occupational Health and Safety Assessment Series), (SA-8000) Social Accountability system and maintaining the systems satisfactorily. Apart from the above stated certifications our camp has also been certified with ISO-14001 (Environment Management System).
- ❖ Rain water harvesting study had been conducted and one roof top harvesting structure had been constructed inside General Office premises which will be also extended to other buildings.

*AN*

- ❖ The conventional technology also requires huge (~200lit/ton) amount of water for treatment whereas the Organic reductant method requires negligible amount of additional water due to its online nature in continuous production process. Therefore, the developed process technology saves huge quantity of water. Company was awarded DISR National Award for the Herbal Treatment Plant installed at our COB Plant for treatment of Hexavalent Chromium.
- ❖ The Management conducts the awareness development programme on environmental protection for school children and camp residents.
- ❖ Company has started initiative to combat Climate Change. Energy Audit has already been conducted and time bound action plan has been made to reduce energy consumption.
- ❖ **Environment awareness:** To make the camp residents and local people aware on the environment, the mine celebrated World Environment Day on 5th June' 2017.
- ❖ National Pollution Prevention Day" was observed on 2<sup>nd</sup> December'2017 with wide participation from the employees family members and the local community. As a part of our environment awareness initiative, we had organised a program called JAIBA KALA VIVIDHATA – bio diversity expressed through art and paint on 14<sup>th</sup> and 15<sup>th</sup> December'2015 at Sukinda. A painting competition is being organised on the following themes of Mythological Animals, Extinct Animals & Contemporary Animals which was open for all.
- ❖ Similarly, the "Prajatiya Khadyochhab Festival" was also organized to create awareness on different food habits of the indigenous people from the natural sources and preservation of the traditional varieties of pulses like rice in presence of experts from research organizations of national repute to create awareness among the community.
- ❖ An innovative environmental sustainability awareness program was organized in the name of "GREEN SCHOOL" for the local school children in collaboration with TERI, New Delhi. This was a year-long initiative involving school students in exposure visits to nearby eco sensitive site, photography, painting and identification of biodiversity and appreciating the essence of sustainability through taking up sustainable projects on environment.
- ❖ **Celebration of MEMC Week:** Mines Environment and Mineral Conservation week was observed by participation of most of the mines of Bhubaneswar region, under the aegis of Indian Bureau of Mines, Govt. of India. The mine also hosted the environment awareness programme amongst school children, organized by SGAT.
- ❖ Besides the above, from time to time knowledge sharing sessions on environment, biodiversity and climate change are also organized by top industry leaders and domain experts to spread awareness among all stake holders.
- ❖ Drive has also been taken to combat climate change. Carbon foot prints of all the units & employees had been mapped and suitable action plan had been initiated to reduce the CO<sub>2</sub> emission. Energy audit had also been conducted by ERDA and various actions had also been taken up to reduce the energy consumption level. In order to promote awareness among the employees and community, hoarding boards depicting environment related issues had been put at key locations.
- ❖ Biodiversity conservation program was started with the help of IUCN. The objective of this initiative was to adopt a comprehensive Biodiversity Conservation & Management Policy for Sukinda Chromite

Mine to enhance the knowledge on biodiversity conservation among all the stake holders and develop a collaborative activity for its implementation. The Comprehensive Biodiversity Plan had been prepared and is under implementation.

❖ Campaign for safe segregation and disposal of household waste was organized among camp ladies and environmental awareness was developed.

❖ **PERIPHERAL DEVELOPMENT:**The Tata Steel Rural Development Society, an independent body of Tata Steel is engaged in peripheral development activities in the nearby villages around the mine. During 2017-18 a total amount of Rs.567 Lakh(INR) spent on various plantation programmes, civil projects, agricultural extensions, medical facilities, sports, cultural and other developmental activities taken up in these villages. The above expenditure does not include statutory payments, the cost of in-built pollution control facilities in the Chrome ore beneficiation plant, and other equipment like wet drilling etc., the wages, medical facilities and other allowance/ facilities given to the concerned employees.



**Manager**  
**Sukinda Chromite Mine**  
**M/s Tata Steel Limited**