स्टील अथॉरिटी ऑफ इण्डिया लिमिटेड
STEEL AUTHORITY OF INDIA LIMITED
रॉ मेटेरियल्स डिवीजन
RAW MATERIALS DIVISION
बरसुआ लौह खदान
BARSUA IRON MINES
P.O. TENSA - 770042
Phone- 06625-236026 Fax - 236031

Ref. No. BIM/E&L/ENV/5/ 1662

Date: 27/9/2017

To,
The Member Secretary,
State Pollution Control Board,
Paribesh Bhawan, A/118,
Nilakantha Nagar, Unit - VIII,
BHUBANESWAR - 751012

Sub : Environmental Statement for 2016-17 in respect of Barsua,Taldih & Kalta Iron Mine.

Sir,

Enclosed herewith please find Environmental Statement in Form-V for the year ending on 31st March 2017 in respect of Barsua Iron Mine and Kalta Iron Mine, Raw Materials Division, SAIL for your kind perusal.

Thanking You,

Yours Faithfully,

27/9/17

D.G.M(E&L)
Barsua Iron Mine

Encl : As above.

Copy to:
1. The Additional Director(S)
   MoEF, Govt.of India
   Eastern Regional Office,
   A/9, Chandrasekharpur
   Bhubaneswar-751023(Odisha)
2. Regional Officer,
   State Pollution Control Board,
   Sector - 5, Rourkela - 2.
3. Office Copy.

Head Office : 5th & 6th Floor, Industry House, 10 Camac Street, Calcutta - 700017, Telex : 021-2621 Fax : 033-282-5630
Regd. Office : Ispat Bhawan, Lodi Road, New Delhi - 110003, P.B. : 3049, Telex : 031-62689, Fax : 011-694015

सेल SAIL

ENVIRONMENTAL STATEMENT
2016-2017

BARSUA, TALDIH & KALTA IRON MINE
STEEL AUTHORITY OF INDIA LIMITED
RAW MATERIALS DIVISION

FORM – V

Environmental Statement for the financial year ending 31st March 2017

PART – A

(i)	**Name and address of the owner/occupier of the industry operation or process.**	:	Barsua , Taldih & Kalta Iron Mine P.O- Tensa, Dist. : Sundargarh Pin- 770042, Odisha
	Agent	:	Shri AK Pal, General Manager (Mines)
	Nominated Owner	:	Shri Kalyan Maity Director (Raw Materials & Logistics)
(ii)	**Industry category Primary - (STC code) Secondary - (SIC Code)**	:	Open Cast Iron Mine
(iii)	**Production capacity**	:	8.5 million tonnes per annum
(iv)	**Year of establishment**	:	1960
(v)	**Date of the last environmental statement submitted**	:	03.08.2016

PART – B

Water and Raw Material Consumption

(1) **Water consumption** m^3/day

Process	110.23 (including dust suppression)
Cooling	507.69
Domestic	3517.87

Name of Products	*Process water consumption per unit of product output*	
	During the previous financial year (2015-16)	*During the Current financial (2016-17)*
(1) Washed Iron Ore	1.49 m^3/Ton of ROM washed	1.03 m^3/Ton. of ROM Washed

(2) Raw Material Consumption

Name of raw materials	*Name of products*	*Process water consumption per unit of product output*	
		During the previous financial year (2015-16)	*During the Current financial (2016-17)*
-	-	-	-

This is an opencast semi-Mechanized/Mechanized mine producing iron ore. There is no processing of iron ore. Run-of-Mine (ROM) from the mine is produced sized ore products. The ROM production during 2015-16 is 1.26 million tonnes and during 2016-17 is 1.453 million tonnes.

PART - C

Pollution discharged to environment / unit of output

a) Water Environment

Pollutants	*Quality of pollutants generated (mass/volume)*	*Concentrations of pollutants in discharges*	*Percentage of variation from prescribed standards with reason.*
			Standard
1. Process Effluent: NA			
(i) pH	-	7.1-7.9	5.5 – 9.0
(ii) TSS	-	1-21	100 mg/l
(iii) Oil & Grease	-	-	10 mg/l
2. Domestic Effluents :			
(i) pH		6.7-7.7	5.5 – 9.0
(ii) TSS		1-23	100/l
(iii) BOD		-	
(iv) COD		-	
(v) Oil & Grease		-	

b) Air Environment

This is an opencast mine and the air emissions are fugitive in nature mainly containing dust particles. The fugitive emissions are being controlled through various dust prevention and control measures. Hence, the quantity of air pollutants discharged in Kg/day cannot be ascertained. The annual average ambient air quality in and around the mines for the year 2016-17 is given below:

Unit : microgram/m^3

Pollutants	*Quality of pollutants generated (mass/volume)*	*Concentrations of pollutants in discharges*	*Percentage of variation from prescribed standards with reason.* <u>*Standard*</u>
(1) Location – Tensa & Kalta Township			
i) $PM_{2.5}$	-	14-86	60
ii) PM_{10}	-	45-99	100
iii) SO_2	-	2-18	80
iv) NO_2		2-22	80
(2) Location – Excavation and loading site			
i) RSPM	-	31-310	350
ii) SPM	-	166-366	700
iii) SO_2	-	6-18	5000
iv) NO_2		11-21	6000

PART –D

Hazardous Wastes

(As specified under Hazardous Wastes (Management and Handling) Rules, 1989)

Hazardous Waste	Total Quantity During the current financial year
a) From process b) From pollution control Facilities	As mentioned below

	Quantum of hazardous waste generated during 2016-17		Quantity
1	*Filters & filter materials containing oil during maintenance of vehicles*		*687 Nos.*
2	*Oil containing sludge & oil emulsion from oil and grease trap and Oil Contaminated Wastes*		*625 Kgs.*
3	*Used oil*		*14280 Ltrs*
4	*Used Batteries*	*Spent acid from Batteries*	*36 Nos.*
		Lead & Lead Compounds	
5	*Empty oil barrels contaminated with Fresh oil or Used oil*		*126 Nos.*
6	*Discarded Lab. Chemical Containers*		*13 Nos.*

PART – E

Solid Wastes

Wastes	Total Quantity(Tonnes)	
	During the previous Financial Year (2015-16)	During the current Financial Year (2016-17)
(a) From Process (1) Overburden / rejects (2) Ore washing slimes	(1) 2409690 (2) Nil	(1) 2115495 (2) Nil
(b) From Pollution Control facilities	NIL	NIL
(c) (1) Quantity recycled or re- utilized within the unit (2) Sold (3) Disposal	- - 2409690	- - 2115495

PART –F

Please specify the characterisations (in terms of compositions of quantum) of Hazardous as well as Solid Wastes and indicate disposal practice adopted for both these category of wastes.

Hazardous Waste Handling and Disposal :

Mode of Storage

1	Filters & Filter materials containing oil during maintenance of vehicles	*Disposed inside the "Used oil filter disposal pits" maintained & earmarked for this purpose only and the pit is being kept covered.*
2	Oil containing sludge & oil emulsion from oil and grease trap and Oil Contaminated Wastes	*Oil Separation Tank exists and is in good condition.. Further, the oil contaminated wastes etc. are being kept inside impervious pits / containers earmarked for this purpose.*
3	Used Oil	*Kept in Barrels tightly capped in right up position at the earmarked place inside the stores premises.*
4	Used Batteries	*Stored in an earmarked place on impervious floor under shed and lock & key inside the stores premises.*
5	Empty oil barrels contaminated with Fresh oil or Used oil	*Stored in an earmarked place inside the stores premises on impervious ground capped tightly.*
6	Discarded Lab. Chemical Containers	*Stored in an earmarked place under shed and lock & key arrangements.*

Method of disposal

The Used Oil and the Used Batteries are being auctioned to authorized parties from time to time. Similar process of auction is to be taken for the Used Chemical Containers and Empty oil Barrels.

Characteristics of solid waste :

These contain high proportions of gravel/boulder (+2mm size particle), 11% tailing dam and 60-67% at waste dumps. The textural classification of soils of tailing dam is "silty loam" and waste dumps "loamy sands". Clay is totally absent. Soils are "highly deficient" inorganic carbon and P_2O_5 content and "highly excessive" in K_2O content.

Disposal practice adopted for solid wastes :

i) Tailings generated out of washing and jigging operations are allowed to settle in tailing pond and clear water is allowed to go to water stream, which is being monitored regularly.

ii) Over burden waste is being dumped in mined out area and is planned to be dumped in mined out /barren patches in already broken areas.

PART – G

Impact of pollution control measures on conservation of natural resources and consequently on the cost of production.

1. IMPACT ON AIR : Seasonal variations in concentration of air pollution parameters, viz., SPM,RPM, SO_2 and NOx, are given in the reports on monitoring conducted by Environment Management Division, SAIL, Kolkata the nodal agency of SAIL's Plants and Mines.(enclosed as Annexure-I) -- RSPM, $PM_{2.5}$, NOx & SO_2 are within norms.

Respirable Suspended Particulate Matter RSPM(PM_{10}) and $PM_{2.5}$: It is necessary to describe the sampling points in order to discuss the observed values of SPM. Site(A9) which is of Drilling point is recorded a maximum of 410 m^3 & annual average was 227 $\mu g/m^3$. At Site (A7) which is of excavation and loading at mine face, and it recorded a maximum of 366 g/m^3. Annual average was 229 $\mu g/m^3$.

Site (A1) is characterized as residential area at Tensa township, the average RSPM(PM_{10}) and $PM_{2.5}$ here was 62.3 $\mu g/m^3$ and 34.2 $\mu g/m^3$ only. The average concentration of RSPM(PM_{10}) and $PM_{2.5}$ at Tantra village (A2) was 50.3 $\mu g/m^3$ and 23 $\mu g/m^3$.

Sulphur Dioxide : Average concentrations of sulphur dioxide (SO_2) were always within the permissible limit during all the four quarters in ambient air quality in residential, rural and other area as well as in fugitive emission /work zone air quality.

Oxides of Nitrogen : Average concentrations of nitrogen oxide (NOx) were always within the permissible limit during all the four seasons in ambient air quality in residential, rural and other area as well as in fugitive emission /work zone air quality.

2. IMPACT ON NOISE : Noise levels at all places of monitoring where people are engaged in work were found within the norms. The relevant data's are enclosed as Annexure-II. However noise levels at secondary crusher, drilling point, wagon loading area and at haul road are high, persons working these areas are provided with ear plugs/muffs etc.

3. IMPACT ON WATER : Composite results are given in Annexure III-A and III-B, in the form of annual ranges of variation. Conclusions are based on the composite data. Additional analysis reports of effluents through tailing pond are prepared and maintained, a section of that is given in Annexure III-C. Findings on water analysis are presented herein under these four broad classifications, viz., organoleptic, physio-chemical, toxic substances and other chemical parameters and health-related parameters.

Organoleptic Parameters :

Temperature : Ambient water temperature governs the dissolved oxygen concentration in water. Temperature measurements have more significance if there is a possibility of thermal discharge, which does not exist in the part of Barsua Iron Mine.

Colour, Odour and Taste : Colour was absent, except in monsoon in surface water. This is expected during the monsoon season. Other parameters, viz., odour and taste were within acceptable limits. The slight metallic taste in sample was expected due to iron content.

Physico-Chemical Parameters : **pH :** pH of water samples was always within the acceptable range, though on the lower side in respect of drinking water lifted from river. This was probably due to lateritic nature of soils. All alkaline salts in such soils are washed away and only the insoluble part is left out. These are mostly iron salts in case of Barsua Iron Mine. At such pH levels, water is likely to become slightly aggressive and can leave red deposits of ferric hydroxide on exposure to atmosphere. This is corroborated by the high iron values.

Solids : (Total Dissolved Solids (TDS) and Total Suspended Solids (TSS)

These can be classified into three groups, viz., total, dissolved and suspended solids. Dissolved Solids (DS) indicate the mineralization of the strata over which water flows. Higher the mineralization, higher will be the DS. These are also related to the conductivity values. In water quality criteria, DS of treated water has more significance if it is to be used for industrial purposes. In the present case, values have been low as were the conductivity values (Refer to Annexure III-A to III-C). This confirms the earlier contention that soluble matter in the soils/strata over which the water flowed was negligible.

Suspended solids (SS) and their concentration show erodability of the area through which water flows. Flowing waters pick up loose solid particles. They cause turbidity, which can be both suspended, and settle able.

Settle able solids essentially have more density or large size to promote settling under gravity. In case of Stream Water the TSS varied from 02 to 63 mg/l and that of Effluent discharge varies from 01 to 60 mg/l.

Other Chemical Parameters and Toxic Substances : On perusal of the remaining parameters, it is evident that the following parameters deserve special mention while describing water quality in this iron ore mine, viz., iron, manganese (since it is associated with iron), chloride and sulfate (since they are esthetic parameters). Rest of the parameters are associated with either man-made pollution e.g. cyanide, organic phosphorus compounds, radioactivity etc. or natural pollution e.g. fluoride, chromium, selenium etc. In view of the environmental setting of Barsua Iron Mine,Tensa, the former considerations were absent, as shown by the values of organ phosphorus compounds, ammonia, cyanide etc. Fluoride is associated with alkaline water and nitrates with high chlorides. Hence, natural contamination by fluorides etc. is ruled out of consideration in Barsua Iron Mine.

Iron : This element is present in aquatic condition as ferrous and ferric forms, and is estimated as total iron, is insoluble. However, rain water which is acidic due to carbon dioxide, can cause dissolution of the ore to a very limited extent, as shown by the negligible values in all the water samples in Barsua. Average concentration in stream sample varied from 0.018 to 0.47 mg/l. & average concentration in drinking water varied from 0.08 to 2.44 mg/l.

This value includes colloidal as well as soluble iron concentration. It is possible that the fine iron ore particles get dissolved during iron estimation. It is to be kept in mind that colloids cannot be filtered, which is the reason why iron values are higher.

So far as its environmental significance is concerned, such water will appear more turbid than their counterparts in other regions, because of reddish colour. Treatment of water of Barsua Iron Mine, Tensa consists of plain settling, followed by sand filtration and chlorination.

It can thus be concluded that water quality at Barsua Iron Mine, Tensa was satisfactory and free from any organic loads. Refer to Annexure III-A to III-C.

3. **IMPACT ON LAND:** No area has been added to already broken area of Barsua Iron Mine i.e. 287.567 Ha. But, 5.00 Ha of land within mining lease was afforested during 2016-17, which brought the total afforested area to 122.203 Ha. within ML and the grand total figure to about 148.863 Ha.. In Kalta portion 9985 no of saplings gap plantation has been done.

5. IMPACT ON SOIL: Soil testing was done at Barsua in the year 1993 on two separate occasions. August '93 representing wet state and Dec'93 representing the dry state. Besides virgin soil in the lease area and broken soil in the overburden dumps (both active and old), samples were also taken from the tailings as well as of soils in the valley. An analysis is given:

(a) Soil samples from agricultural lands had around 60% clay and slightly acidic pH. Available Phosphorus was in the "medium" range, but both the Organic Carbon Content and the Available Potassium were "highly excessive".

(b) On the other end of the scale, tailings consisted mainly (about 3/4 th parts) of silt, there being no clay at all. Their pH was normal.

(c) pH of other soils was "normal" for all samples collected in dry state, and "acidic" in all samples in wet state.

(d) Textural Classification of all virgin soils (both top soils and sub-soils) was "sandy clay loam". It was "silty loam", "sandy loam" or "loam" for OBD soils, there being (again) no differentiation between top-soils and sub-soils.

(e) Organic_Carbon_Content varied widely from "highly deficient" on one end (six samples), to "deficient" (three samples), "excessive" (two virgin soil samples) and "medium" in an old OBD sample) on the other.

(f) Similarly, Available_Phosphorus varied from "highly deficient" (seven samples), to "deficient" (three samples) and "medium" (three samples).

(g) On the other hand, Available_Potassium was "highly excessive" in every sample, normal for lateritic soils.

These indicate that, like soils in most elevated iron-ore areas, nutrients in even virgin soils at Barsua are generally in state of imbalance :

Acute deficiency of Organic Carbon & available Phosphorus and Acute excess of available Potassium. Also that, their quality generally deteriorates on being broken during mining operations. All the same, this area being a high ratnfall zone with weakly expressed dry season supports quite dense vegetation of forest.

As no toxic substances are involved in the mining of iron ore, the impact on soil quality is not likely to get accentuated because of mining operations in Barsua.

The major pollution prevention / control measures adopted at the mine, which resulted in resource conservation as well as are as follows.

BARSUA IRON MINE,	

Sl.No	ITEM	*COST (in Rs.Lakh.)*
1	COST OF AMBIENT AIR & WATER QUALITY MONITORING	4.20
2	COST OF WATER SPRAYING	5.10
3	Plantation & maintenance	5.60
4	CONSTRUCTION OF Dry boulder wall & Check dam	8.60
5	3RD PARTY AUDIT OF HAZARDOUS WASTE	0.60
6	SALARY OF ENV. ENGINEER AND RELATED STAFF	35.53
7	Stabilisation of 10000 sqm area of Dump-8	12.20
8	Installation of CAAQMS	83.00
9.	Protective Measures towards hazardous waste management	13.60
	TOTAL	**168.43**

KALTA IRON MINE(2016-17)	Cost incurred (Rs.)
Terracing of sub grade dump at challan gate (West) and plantation of broom grass over an area of 6000 sq mtr	2,04,958.80
Construction 250 mtr dry stone retaining wall below sub grade dump at challan gate (West)	3,63,059.55
Plantation of 9,985 no of saplings	3,50,000.00

PART – H

Additional investment proposal for environmental protection including abatement of pollution.

The following additional investment proposals for environmental protection including abatement of pollution are under consideration for the mine:

BIM & TIM Part

1. Water harvesting & artificial re-charges of ground water.
2. Stabilizing the of inactive waste dumps with coir matting.
3. Construction / Repair of check dam, garland drain and toe walls.
4. De-siltation of garland drains and village ponds.
5. Offloading of Environmental Monitoring.
6. Static water sprinkling system at loading area and permanent haul road.

KIM Part

i) Installation of Continuous Ambient Air Monitoring System
ii) Construction of garland drain and silting pond along haul road.
iii) De-silting of pond below old GKP area.
iv) Coir matting over sub grade dumps No-4&5.
v) Retaining wall below sub grade dump No-4,5,7,8 & 9
vi) Construction of check dam and retaining wall in western side of sub grade dump(Challan gate West)
vii) Installation of permanent water sprinkling system in permanent haul road side.
viii) Installation of solar power unit at Administrative Building KIM
ix) Plantation of 10,000 no of saplings outside ML area.

PART – I

Any other particulate in respect of environment protection and abatement of pollution.

AFFORESTATION IN 2016-17

Area (Ha)	Nos. of tree	Total Expenditure
11.24	11,50,000	Rs.10.00 Lakhs

DURING THE FINANCIAL YEAR 2016-17

R.O.M. FED TO CRUSHER:	0 T
DEVELOPMENT:	21,15,495 T
SLIME LOSS:	0 T

1. Creating awareness amongst employees and public regarding protection of environment by observing Environment day, Environment month and Environment week.
2. Display of Boards carrying environmental slogans. LED display board for showing environment parameters & environment care.
3. Celebration of World Environment Day, Environment Week, Environment Month.
4. Celebration for Mass awareness by slogans, working models & Cultural Programmes by employees & school children in Mines Environment & Mineral Conservation week under the aegis of IBM.

Date: 27.09.2017

27/9/17

D.G.M(E&L)
Barsua Iron Mine