स्टील अथॉरिटी ऑफ इण्डिया लिमिटेड
STEEL AUTHORITY OF INDIA LIMITED
राउरकेला इस्पात कारखाना
ROURKELA STEEL PLANT
बरसुआ लौह खादान - टेलडिही लौह खादान
BARSUA IRON MINES - TALDHI IRON MINES
P.O. TENSA - 770042
E-mail : gmofficebim@gmail.com

Ref. No. BIM/E&L/2022-23/026

Date: 26.05.2022

To,
The Director, IA Division,
Ministry of Environment, Forests and Climate Change,
Indira Paryavaran Bhawan, Jor Bagh Road, Aliganj,
New Delhi – 110003

Sub: Six monthly status of compliance of conditions stipulated in Environmental Clearance (grant order of MoEF No. J-11015/351/2006-IA.II(M), dated 29th October 2010) for the period ending 31st March 2022.

Sir,

Please find enclosed herewith the updated six monthly compliance report with respect to the conditions stipulated by MoEF&CC, Govt. of India, New Delhi while granting Environmental Clearance to integrated Barsua-Taldih- Kalta Iron Ore Mines (ML-130) of M/s. Steel Authority of India Limited for production of 8.05 MTPA vide MoEF letter No. J-11015/351/2006-IA.II(M), dated 29th October 2010 for the period ending 31st March 2022. The report also contains the updated status of environmental monitoring of air, water and noise pertaining to the period ending 31st March 2022.

Thanking You,

Yours Faithfully,
For SAIL/Barsua-Taldih-Kalta Iron Mines

(P K Rath)
Chief General Manager, BIM & KIM

Encl : As Above

Copy to:

1. The Dy. Director General of Forest (C), MoEF&CC, Govt. of India, Regional Office (EZ), A/3 Chandrasekharpur, Bhubaneswar-751023 (Odisha)
2. The Regional Director, Central Pollution Control Board, G97V+H5Q, Kasba New Market, Sector E, East Kolkata Twp, Kolkata, West Bengal – 700 107
3. The Member Secretary, Odisha State Pollution Control Board, Paribesh Bhawan, A/118 Nilakantha Nagar, Unit-VIII, Bhubaneswar-751012 (Odisha)

Status of Compliance to Conditions Stipulated in Environmental Clearance of Integrated Barsua –Taldih – Kalta Iron Ore Mining Project of M/s Steel Authority of India Limited located in Village Tantra and within Tohra RF, Tehsil Koira, District Sundargarh, Odisha (EC order no. J-11015/351/2006-IA.II(M), dt. 29.10.2010 and Amendments vide even letter dated 30.03.2016, dated 03.07.2020 with corrigendum dated 13.07.2020, dated 17.03.2021 and dated 25.01.2022)

(Period: October 2021 to March 2022)

A. Specific Conditions

Sl. No	Condition	Compliance Status
(i)	The Project proponent shall obtain consent to Establish and Consent to Operate from the State Pollution Control Board, Orissa and effectively implement all the conditions stipulated therein.	Consent to Establish was obtained from SPCB, Odisha for a capacity of 8.05 MTPA for Integrated Barsua – Taldih- Kalta Mining Project (ML-130) Vide No. 609/IND-II-NOC-5182, dated 13.01.2012. Also, Consent to Establish has been amended on dated 05.11.2016, 25.09.2020 and 24.08.2021. CTO has also been obtained from SPCB, Odisha Vide No. 4882/IND-I-CON-1(A), dated 28.03.2022 for a quantity of 8.05 MTPA with validity up to 31.03.2023. Necessary actions are being taken to effectively implement the conditions stipulated therein.
(ii)	The environmental clearance is subject to grant of approval of the State Land use Department, Government of Orissa for diversion of agricultural land for non agricultural use.	There is 19.059 Ha of agricultural land present out of 2486.383 Ha of total mine lease area of ML -130. However, the same is present in the non-mineralized zone of the lease area and not required to be utilized for mining and allied activities till the life of mines. Hence, diversion of agricultural land for non-agricultural purpose doesn't require.
(iii)	Necessary Forestry Clearance (FC) under the FC Act, 1980 for an area of 2347.641 ha is forest land involved in the project shall be obtained. Environmental Clearance is subject to grant of FC.	Stage-II Forest Clearance for diversion of 2341.931 ha forest land is granted by MoEFCC vide letter no. F. No. 8-90/1996-FC(pt.), dated 06.03.2013. The remaining 5.742 ha forest land is under the occupation of ST & OTFD, for which diversion is not granted as per ST & OTFD (RFR) Act, 2006.
(iv)	Environmental Clearance is subject to final order of the Hon'ble Supreme court of India in the matter of Goa Foundation Vs. Union of India in Petition (Civil) No.460 of 2004, as may be applicable to this project.	Agreed.
(v)	Environmental Clearance is subject to obtaining clearance under the Wildlife (Protection) Act, 1972 from the competent authority, as may be applicable to this project.	No notified National Park / Wildlife Sanctuary / Biosphere Reserve / Tiger Reserve are located within 10 kms from the Mining Lease boundary. Hence it is not applicable to this mining project.

Sl. No	Condition	Compliance Status
vi)	The project proponent shall ensure that no natural watercourse and drainage channels except first order channels Id1, Id2, Id3, Id4, Id5, Id6, Id7 and Id8 passing through the mine lease shall be diverted. The channels shall be so diverted that it finally meets its final natural course.	Due precautions are being taken and ensured that no natural watercourse / drainage channels obstructed due to any mining operation at the mines. So far only Id1, Id2 & Id8 have been diverted and finally meet their final natural course.
(vii)	The top soil shall temporarily be stored at earmarked site(s) only and it should not be kept unutilized for long. The topsoil shall be used for land reclamation and plantation.	Though the generation of top soil is very less, it is being stacked separately and used for rehabilitation of dumps and other areas through plantation. During the period, 229.97 cbm topsoil has been utilized out of total 2383 cbm topsoil stored at earmarked site for plantation purpose. The top soil will be utilized for land reclamation and plantation purpose only.
(viii)	The OB generated shall be stacked at earmarked dump site(s) only and it should not be kept active for a long period of time and its phase-wise stabilization shall be carried out. The project proponent shall carry out slope stability study through an expert organization like CIMFR, Dhanbad for attaining the proposed height of dump of 60m in three lifts and submit report to the ministry and its Regional Office within three months. Proper terracing of the OB dumps shall be carried out so that the overall slope of the dump shall be maintained to 27°. Compliance status shall be submitted to the MoEF and its Regional Office located at Bhubaneswar on six monthly basis.	The over burden (OB) / sub-grade ore generated during the mining operations is being stored at earmarked sites only, as per the approved Modification of Mining Plan. Phase wise stabilization with installation of coir mats and broadcasting of grass seeds are carried out as per approved plan. For effective stabilization, terracing of the OB dumps with overall slope of the dump is being maintained to below 27°. Also, Geo-textile coir matting of 28000 Sq. m has been done in Barsua Block. Plantation has also been carried out over all the old dumps slopes for stabilization and prevention of washout. Some of the photographs showing Geo-textile coir matting at Barsua mines are shown in **Annexure XI.** Regular Compliance Status Report on six monthly basis is submitted to MoEF&CC and its Regional Office.
(ix)	Catch drains and siltation ponds of appropriate size shall be constructed around the mine working, mineral and OB dumps to prevent run off of water and flow of sediments directly into the agricultural fields, the first order channels, the Samaj Nallah, the Kuradihi Nallah, and other water bodies. Garland drains, setting tanks and check dams of appropriate size, gradient and length shall be constructed around the mine pit, dumps to prevent run off of	There are 33 nos. of Check dams / Retaining wall / Toe walls provided in Barsua-Taldih-Kalta mines to prevent direct flow of washout to nearby agricultural fields and water bodies. Also the surface runoff from the Barsua Mines has been channelized through a series of Garland drains into 3E pit to prevent direct flow of runoff to nearby water bodies. During the period, construction of 100 m retaining wall with Garland Drain and settling pit along the waste dump at Taldih-C Block, 540 m retaining wall with Garland Drain and settling pit along the Mine quarry at Taldih Block and 150 m retaining wall along the waste dump at Kalta block has been

Sl. No	Condition	Compliance Status
	water and flow of sediments.	completed. Further, proposal for construction of 485 m retaining wall with Garland Drain and settling pit at Taldih A block and 750 m retaining wall with Garland Drain and settling pit at Barsua block is under process. Some of the photographs showing Garland drain, settling pit, Check dams / Retaining wall / Toe walls in Barsua-Taldih-Kalta Iron Mines are shown in **Annexure XI.**
(x)	Dimension of the retaining wall at the toe of the over burden dumps and the OB benches within the mine to check run-off and siltation shall be based on the rain fall data.	Toe walls, garland drains and siltation ponds at the OB Dumps have been constructed to control the surface runoff from the OB dumps. Based on the rainfall of the region, 1.5m to 2.0m width and 1.5m to 2.0m height toe walls were provided.
(xi)	The water recovery and spill way system shall be so designed that the natural water resources are not affected and that no spill water goes into the nearby Karo River and other water bodies.	The tailing dam top is at 420.5m AMSL. Maximum settled slime level is at 416.5m AMSL and the spill way is at 418.0m AMSL. Also a system for recovery and recycling of clean water from the tailing pond has been provided at Barsùa Iron Mine under Zero Discharge Project. The quality of overflow water is monitored regularly and found within the norm.
(xii)	The project proponent shall carry out conditioning of the ore with water to mitigate fugitive dust emission, without affecting flow of ore in the ore processing and handling areas.	Dry Fog System (DFS) and wet screening arrangements have been provided in the Ore Handling Plant at Barsua Block. Also Mist Cannon & Water injection system has been provided near mobile Crushing & Screening area to mitigate fugitive dust emission. Some of the photographs of Dry Fog System (DFS) and Mist Cannon are shown in **Annexure XI.**
(xiii)	The effluent from the ore beneficiation plant shall be treated to conform to the prescribed standards and the tailings slurry shall be transported through a closed pipeline to the tailing dam.	Effluent generated from the ore beneficiation plant is being treated in Thickeners followed by Tailing Ponds. The clear water to the tune of 60 % is being recycled and the underflow from thickener is discharged into Tailing Dam. The quality of the dam seepage water is being monitored and found to be in compliance with the discharge quality standards. Currently tailing slurry from the beneficiation plant is being transported through proper channel to tailing pond.

Sl. No	Condition	Compliance Status
(xiv)	The project proponent shall take necessary safeguard measures to ensure that there is no leaching from the pond.	The Tailing Pond at Barsua Iron Mine is located on the hard & plain area and is in operation since 1969. As iron ore in the region does not containing any heavy metals and no chemicals are being used in the beneficiation of ore at the mine, leaching of metals from the pond is not expected. The quality of the ground water at downstream of tailing pond is measured regularly.
(xv)	The decanted water from the tailing pond shall be re-circulated and there should be zero discharge from the tailing pond.	System for recovery and recycling of decanted water from the tailing pond has been provided at Barsua Iron Mine under Zero Discharge Project. A photograph showing Zero Discharge Project is shown in **Annexure XI.**
(xvi)	Effective safeguard measures such as regular water sprinkling shall be carried out in critical areas prone to air pollution and having high levels of particulate matter such as crusher zone, loading and unloading point and all transfer points during handling of the ore. Extensive water sprinkling shall be carried out on roads. It should be ensured that the Ambient Air Quality parameters conform to the norms prescribed by the CPCB.	Dry Fog System (DFS) and Mist Cannon have been provided in crushing and screening plant. Also, fixed water sprinklers of about 6 km have been provided in the permanent haul roads. Further, regular water sprinkling is being done with 2 X 28KL highly pressurized mobile water tankers for Barsua Block, 1 X 12 KL & 1 X 10KL mobile water tanker for loading area of Barsua, 2 X 12 KL & 5 X 8 KL mobile water tankers for Kalta Block and 1 X 12 KL & 1 X 20 KL mobile water tankers for Taldih Block which is sufficient to keep the haul road in wet condition. Some photographs of water sprinkling arrangement and mist canon are shown in **Annexure XI.**
(xvii)	Plantation shall be raised in an area of 1658.803 ha including a 7.5m wide green belt in the safety zone around the mining lease, OB dumps, around beneficiation plant, mine benches around tailing ponds, roads etc. by planting the native species in consultation with the local DFO. The density of the trees should be around 2500 plants per Ha. Green belt shall be developed all along the mine lease area in a phased manner and shall be completed within first five years.	Safety Zone plantation over 93.679 ha safety zone area of Barsua-Taldih-Kalta Iron Mines has been completed through State Forest Department. Apart from this, so far 2, 32,865 saplings have been planted covering an area of 112.98 ha since 2010. In the year 2021-22, total 7000 saplings have been planted over an area of 2.50 ha at Barsua block. However, development of green belt in an area of 1658.803 ha will be completed during conceptual period, after reclamation and rehabilitation of mined out pits, OB dumps and mine benches. The detail of plantation is placed at **Annexure I.**

Sl. No	Condition	Compliance Status
(xviii)	The project authority should implement suitable conservation measures to augment ground water resources in the area in consultation with the Regional Director, Central ground water Board.	A technical feasibility study for hydro-geological, rain water harvesting and augmentation of ground water has been conducted through M/s Tirupati Balajee Maharaj Consultant (P) Ltd. As per recommendation, two (02) nos. of Check dams i.e. one in Kuradih nala near pump house and other at Tantra Village near Taldih Block has already been constructed. The following measures have also been adapted for conservation and augmentation of ground water. ➢ The surface run-off generated from the mine is channelized through a series of garland drain to lowest level of pit for ground water recharge. ➢ Series of check dams at different strategic locations are being constructed.
(xix)	Regular monitoring of ground water level and quality shall be carried out in and around the project area by establishing a network of existing wells and installing new piezometers during the operation. The periodic monitoring [(at least four times in a year pre monsoon (April-May), monsoon (August), post-monsoon (November) and winter (January); once in each season)] shall be carried out in consultation with the SGWB/CGWB and the data thus collected may be sent regularly to the MoEF and its regional office at Bhubaneswar and the Regional Director, CGWB.	Regular monitoring of ground water level and quality is being carried out and the monitoring reports are being submitted regularly. 3 nos. of open wells as well as tube wells have been selected all around the mines viz, Barsua Valley, Tensa and Kalta for regular monitoring of water levels & quality. Further, 2 Nos. of piezometers have been installed at Barsua valley and Taldih for ground water monitoring. The monitoring results of ground water level and quality are placed as **Annexure – III and Annexure – IV respectively**.
(xx)	The groundwater and surface water in and around the mine including tailing ponds shall be regularly monitored at strategic locations for heavy metals. The monitoring stations shall be established in consultation with the Regional Director, CGWB and SPCB.	Monitoring for heavy metals in ground water, surface water and tailing pond discharge are being carried out on monthly basis. Water quality for the period from October 2021 to March 2022 is placed in ***Annexure - V.***
(xxi)	Appropriate mitigative measures shall be taken to prevent pollution of the Karo River in consultation with the State Pollution control Board.	Detailed study has been conducted through IIT Kharagpur to assess the impacts of mining on water bodies and suggest measures to minimize the impacts. Some of the recommendations suggested by IIT, Kharagpur like silt traps, check dams, sedimentation ponds, plantation on the slopes have been made at various strategic locations and the same are under continuous implementation at other

Sl. No	Condition	Compliance Status
		sites. Also a system for zero discharge has been provided at Barsua Iron Mines to prevent discharge of tailing pond overflow water to Kuradih nallah.
(xxii)	Regular monitoring of the flow rate of the spring and perennial nallahs flowing in and around the project area shall be carried out and records maintained.	Regular monitoring of the flow rate of the spring and perennial nallahs i.e. Kuradih Nalla at Barsua part and Samaj Nalla at Taldih & Kalta part are being done and records are being maintained. Flow rate of spring and perennial nalla for the period from October 2021 to March 2022 is placed in ***Annexure – IX.***
(xxiii)	The project proponent shall obtain necessary prior permission of the competent authorities for drawl of requisite quantity of water (surface water) required for the project.	Department of Water Resources, Govt. of Odisha has allocated 3.406 cusec of Surface Water from Kuradih Nalla in favour of Barsua Iron Mines vide letter No. 4897/WR, dated 15.02.2021.
(xxiv)	Suitable rainwater harvesting measures on long term basis shall be planned and implemented in consultation with the Regional Director, CGWB.	A Technical Feasibility Study for hydro-geological, rain water harvesting & augmentation of ground water resources has been conducted through M/s Tirupati Balajee Maharaj Consultant (P) Ltd. Two (02) nos. of Check dams has already been constructed, one in Kuradih nala near pump house and other at Tantra Village near Taldih Block as per recommendation.
(xxv)	Vehicular emissions shall be kept under control and regularly monitored. Measures shall be taken for maintenance of vehicles used in mining operation and in transportation of mineral. The vehicles carrying the mineral shall be covered with a tarpaulin and shall not be overloaded.	Pollution Under Control (PUC) certificate is made compulsory for deployment of vehicles in Mines. Scheduled / Preventive maintenance of HEMM and light vehicles are undertaken regularly to keep the vehicular emissions under control. The vehicles used for transportation of ore are covered with tarpaulins and ensured that there is no overloading with the help of weighbridge. The vehicular emission results are placed in **Annexure – VIII.**
(xxvi)	Mineral handling area shall be provided with adequate number of high efficiency dust extraction system. Loading and unloading areas including all the transfer points should also have efficient dust control arrangements.	Mineral handing plant has been provided with the dust control measures like Dry Fog System (DFS), Mist Cannon & Water injection system at hopper and other transfer units. Also water spraying is being done at Loading & unloading areas.
(xxvii)	Occupational health surveillance program of the workers shall be undertaken periodically to observe any contractions due to exposure of dust and take corrective measures, if needed. Health records of the workers shall be maintained.	Occupational health surveillance programs of the workers are being undertaken periodically to observe any contractions due to exposure of dust. Health records of the workers are maintained. Barsua Iron Mines has been certified with ISO 45001:2018. Copy of certificate enclosed as **Annexure XIII.**

Sl. No	Condition	Compliance Status
(xxviii)	Pre-placement medical examination and periodical medical examination of the workers engaged in the project shall be carried out and record maintained. For the purpose, schedule of health examination of the workers should be drawn and followed accordingly.	Pre-placement medical examination and periodical medical examination of the workers engaged in the project are being carried out. During October 2021 to March 2022, IME for 203 nos. of regular/ contractual employees and PME for 690 nos. of regular/ contractual employees have been done and records are being maintained. Schedule of health examination of the workers is also drawn and followed accordingly.
(xxix)	Sewage treatment plant shall be installed for the colony. ETP shall also be provided for the workshop and the wastewater generated during mining operation.	Individual septic tank with soak pits has been provided in the colony. ETP has been provided for treatment of effluents from the ore beneficiation plant consisting of Thickeners followed by Tailing Pond. About 60% of clear water from the Thickener as overflow, recycled back to the system. The underflow from the Thickener is being drained to the Tailing Pond for further settling of solids. State-of-art Oil & grease traps have been provided for treating the effluents from workshop and garages. Some photographs are shown in **Annexure XI.**
(xxx)	The R&R of the project affected people, if any shall be carried out as per the NPRR.	Not Applicable.
(xxxi)	Digital processing of the entire lease area using remote sensing technique should be done regularly once in three years for monitoring land use pattern and report submitted to MOEF and its Regional office located at Bhubaneswar.	Digital processing of the entire lease area using remote sensing technique has been studied through satellite imagery i.e. Linear Imaging Self-Scanner during March, 2021 by IIT ISM, Dhanbad. Copy of the report is enclosed as **Annexure - XII.**
(xxxii)	Provision shall be made for the housing of construction labour within the site with all necessary infrastructure and construction such as fuel for cooking, mobile toilets, mobile STP, safe drinking water, medical health care, creche etc. The housing may be in the form of temporary structures to be removed after the completion of the project.	SAIL has a well-developed township at Tensa, Barsua and Kalta with residential accommodation for its workers with all necessary infrastructure and construction such as LPG gas connection, electricity for cooking, welfare amenities like toilets, drinking water and medical facilities etc. Whenever required, the construction labour are hired from the local villagers and only few are being hired from outside, for which housing facilities along with necessary infrastructure are being provided at the existing colony of the mines.
(xxxiii)	The project proponent shall take all precautionary measures during mining operation for conservation and protection of endangered fauna namely elephant, sloth bear, peacock etc.	All precautions are undertaken for not to disturb the flora and fauna inside the lease area. All necessary facilities are being extended to the local Forest Department for implementation of the wildlife conservation activities regularly.

Sl. No	Condition	Compliance Status
	spotted in the study area. All the safeguard measures brought out in the Wildlife Conservation Plan so prepared specific to this project site shall be effectively implemented.	Also State Government had approved the study report prepared by an expert committee under the chairmanship of RCCF, Rourkela. Accordingly, an amount of Rs.17.82 Crore has been deposited in CAMPA through RTGS on 26.02.2013 as a part of the Site Specific Wildlife Conservation Plan. Also, an amount of Rs.10,69,14,469.00 @ Rs.43,000.00 per Ha. has been deposited in three phases towards implementation of comprehensive wild life management plan prepared for Bonai-Keonjhar forest division. Again, so far an amount of Rs. 539.17 Lakhs has been incurred since 2013-14 in various activities as part of Site Specific Conservation Plan from the fund realized by SAIL.
(xxxiv)	The critical parameters such as RSPM (Particulate matter with size less than 10micron i.e., PM10) SO_2 and NOx in the ambient air within the impact zone, peak particle velocity at 300m distance or written the nearest habitation whichever is closer shall be monitored periodically. Further, quality of discharged water shall also be monitored for TDS, DO, PH and TSS. The monitored data shall be uploaded on the website of the company as well as displayed on a display board at the project site at a suitable location near the main gate of the company in public domain.	Critical parameters i.e. PM10, PM2.5, NOx and SO2 in ambient air and relevant parameters in the effluents are being monitored regularly. The effluent quality for the period from October 2021 to March 2022 is placed in ***Annexure - VI.*** Also 3 Nos. of Continuous Ambient Air Quality Monitoring Stations (CAAQMS) at Barsua-Kalta has been installed and data are being transmitted to SPCB server. The monitored data is being displayed at the main gate of the mines. Copy of EC compliance along with environmental quality data is being uploaded to the company website www.sail.co.in.
(xxxv)	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.	A Final Mine Closure Plan along with details of corpus fund will be submitted to MoEF&CC, New Delhi 5 years in advance of final mine closure for approval.

B. General Conditions

<table>
<tr><th>Sl. No</th><th>Condition</th><th>Compliance Status</th></tr>
<tr><td>(i)</td><td>No change in mining technology and scope of working should be made without prior approval of the MoEF & CC.</td><td>Mining is being done as per the approved Mining Plan/ Scheme of Mining and amended Environmental Clearance.</td></tr>
<tr><td>(ii)</td><td>No change in the calendar plan including excavation, quantum of mineral iron ore and waste should be made.</td><td>There will be no change in the calendar plan including excavation, quantum of mineral iron ore and waste. ROM production at various mining blocks of Barsua-Taldih-Kalta Iron Mines is kept within permitted capacity of EC / approved Mining Plan.
The quantity of Production for the year 2021-22 is as follows:
<table>
<tr><td></td><td>BIM</td><td>TIM</td><td>KIM</td></tr>
<tr><td>ROM</td><td>2,757,211</td><td>1,253,950</td><td>3,168,400</td></tr>
<tr><td>Tailings/ Sub-grade Fines</td><td>465,149.4</td><td>83,577.72</td><td>0.00</td></tr>
</table></td></tr>
<tr><td>(iii)</td><td>Four ambient air quality-monitoring stations should be established in the core zone as well as in the buffer zone for RSPM (Particulate matter with size less than 10 micron i.e., PM_{10}), SO_2 and NOx monitoring. Location of the stations should be decided based on the meteorological data, topographical features and environmentally and ecologically sensitive targets and frequency of monitoring should be undertaken in consultation with SPCB.</td><td>Four nos. of ambient air quality monitoring stations at Barsua-Taldih-Kalta Iron Mines have been established in the core zone as well as in the buffer zone based on the topography and meteorological conditions of the area. Regular ambient air quality monitoring of key parameters ($PM_{2.5}$, PM_{10}, SO2 and NO_X) to mining industries as per the guidelines of MoEF&CC and CPCB is being done. Moreover, 3 Nos. of Continuous Ambient Air Quality Monitoring Stations (CAAQMS) at Barsua & Kalta have also been commissioned and data are being transmitted to SPCB server.</td></tr>
<tr><td>(iv)</td><td>Data on ambient air quality RSPM (Particulate matter with size less than 10 micron i.e., PM_{10}), SO_2 and NOx should be regularly submitted to the Ministry of environment and Forest including its Regional office located at Bhubaneswar and the SPCB / CPCB in six months.</td><td>Ambient air quality monitoring data ($PM_{2.5}$, PM_{10}, SO_2 and NO_2) is being submitted to MoEF&CC, New Delhi and Regional Office, Bhubaneshwar along with the compliance reports. Air Quality report for the period October 2021 to March 2022 is placed as ***Annexure – II***. Air quality data is also being submitted to SPCB and CPCB in every six months.</td></tr>
<tr><td>(v)</td><td>Fugitive dust emissions from all the sources should be controlled regularly. Water spraying arrangement on haul roads, loading and unloading and at transfer points should be provided and properly maintained.</td><td>Dry Fog System (DFS) and Mist Cannon have been provided in crushing and screening plant. Also, fixed water sprinklers of about 6 km have been provided in the permanent haul roads. Further, regular water sprinkling is being done with 2 X 28 KL highly pressurized mobile water tankers for Barsua Block, 1 X 12 KL & 1 X 10 KL mobile</td></tr>
</table>

Sl. No	Condition	Compliance Status
		water tanker for loading area of Barsua, 2 X 12 KL & 5 X 8 KL mobile water tankers for Kalta Block and 1 X 12 KL & 1 X 20 KL mobile water tankers for Taldih Block. All these dust control measures installed at the mines are sufficient to control fugitive dust emission.
(vi)	Measures should be taken for control of noise levels below 85 dBA in the work environment. Workers engaged in operations of HEMM, etc. should be provided with ear plugs / muffs.	Regular maintenances and periodic checks of the HEMM are being carried out to control noise below 85 dB (A) in the work environment. The operators engaged in blasting/ drilling operations and operator of HEMM are provided with PPEs such as ear plug/ ear muffs with helmet. Use of these protective measures is ensured by educating the workers on ill effect of the prolonged excessive exposure to high Noise levels and daily checks by shift mining engineers regarding usage of ear plug/ear muffs. The measured noise level in critical areas is placed in **Annexure – VII**.
(vii)	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 19th May, 1993 and 31st December, 1993 or as amended from time to time. Oil and grease trap should be installed before discharge of workshop effluent.	State-of-art Oil & grease traps have been provided for treating the effluents from workshop and garages in the HEMM maintenance unit. Effluents generated from the beneficiation plants are being treated in Thickeners followed by Tailing Ponds. The clear water to the tune of 60% is being recycled and the underflow from thickener is discharged into Tailing Dam.
(viii)	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.	Dust masks have been provided to personnel working in dusty areas and ensured by daily checks. Training on safety and health aspects is being imparted on regular basis. A full-fledged Occupational Health Centre (OHC) is run by the mines for regular health surveillance. Periodical Medical Examination (PME) of all workmen working in the mines is being done at our OHC once in every five years/three/one year depending on category.
(ix)	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.	A full-fledged Environment & Lease Department has been established at Barsua Iron Mines to look after environmental aspects headed by a Senior Manager, who reports to Mines Manager. He is further assisted by two officers for environmental management at mines.

<table>
<tr><th>Sl. No</th><th>Condition</th><th>Compliance Status</th></tr>
<tr><td>(x)</td><td>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 MoEF&CC and its Regional Office located at Bhubaneswar.</td><td>Funds earmarked for environmental protection measures at the mines are booked separately and not being diverted for other purpose. Year wise expenditure for last 3 years on Environmental protection measures is furnished below.

The details of expenditure are placed as Annexure – X.

<table><tr><td>Year</td><td>Approx. Expenditure</td></tr><tr><td>2019-20</td><td>210.09 Lakhs</td></tr><tr><td>2020-21</td><td>398.58 Lakhs</td></tr><tr><td>2021-22</td><td>422.43 Lakhs</td></tr></table></td></tr>
<tr><td>(xi)</td><td>The project authorities should inform to the Regional Office located at Bhubaneswar regarding date of financial closures and final approval of the project by the concerned authorities and the date of start of land development work.</td><td>The Barsua and Kalta Blocks under the ML-130 are operating since 1960 and 1966 respectively. Development work in Taldih block started since 9th June 2016 and installation of various facilities at Taldih Block are under progress.</td></tr>
<tr><td>(xii)</td><td>The Regional Office of this Ministry located at Bhubaneswar 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 / monitoring reports.</td><td>Full co-operation is extended to the officer(s) of the regional office of MoEF&CC by furnishing the requisition data information, monitoring reports etc.</td></tr>
<tr><td>(xiii)</td><td>The project proponent shall submit six monthly reports on the status of compliance of the stipulated environmental clearance conditions including results of monitored data to the MoEF, its Regional Office Bhubaneswar, and the respective Zonal Office of CPCB. The proponent shall upload the status of compliance of the EC conditions on their website and shall update the same periodically. It shall simultaneously be sent to the regional Office of the MoEF, Bhubaneswar, the respective Zonal Office of CPCB and SPCB.</td><td>Six monthly compliance reports on the status of implementation of environmental safeguards are being submitted to MoEF&CC, New Delhi, Regional Office, MoEF&CC, Bhubaneswar, Central Pollution Control Board and State Pollution Control Board.

Copy of the compliance report including environmental quality data is being uploaded to the SAIL web site i.e. www.sail.co.in.</td></tr>
</table>

Sl. No	Condition	Compliance Status
(xiv)	A copy of the clearance letter shall be sent by the proponent to concerned Panchayat, Zila Parisad / Municipal corporation, Urban local Body and the Local NGO, if any, from whom suggestions, representations, if any, were received while processing the proposal. The clearance letter shall also be put on the website of the company by the proponent.	Copy of clearance letter was notified in public places and community centers. A copy of the environmental clearance letter has already been sent to the Panchayat. The clearance letter has been put on the Company website i.e. www.sail.co.in.
(xv)	The State Pollution Control Board should display a copy of the clearance letter at the regional Office, District Industry Centre and the Collector's Office / Tehsildar's Office for 30 days.	-
(xvi)	The environmental statement for each financial year ending 31st March in Form-V as is maintained to be submitted by the project proponent to the concerned SPCB as prescribed under the EP Rules- 1986, as amended subsequently, shall also be put on the website of the company and shall also be sent to the Regional office of the MoEF, Bhubaneswar by e-mail.	Being complied with.
(xvii)	The project authorities should advertise at least in two local newspapers widely circulated, one of which shall be in the vernacular language of the locality concerned, within 7 days of the issue of the clearance letter is available with the SPCB and also at web site of the MoEF at http://envfor.nic.in and a copy of the same should be forwarded to the Regional Office of the Ministry located at Bhubaneswar.	Already advertised. Also, amended Environmental Clearance vide F.No.J-11015/351/2006-IA.II (M), dated. 25.01.2022 of integrated Barsua-Taldih-Kalta Iron ore Mines for change in lease area from 2486.383 ha to 2564.323 ha has been advertised in two local news papers, i.e. The New Indian Express and Prameya on dated 31.01.2022

P. K. RATH
Chief General Manager
SAIL, RSP, BIM, TIM & KIM

Annexure - I

BARSUA-TALDIH-KALTA IRON MINE

DETAILS OF PLANTATION

YEAR	INSIDE MINING LEASE			OUTSIDE MINING LEASE		
	No. of trees	Area in Ha.	Rate of survival in %	No. of trees	Area in Ha.	Rate of survival in %
2010-11				8450	3.86	85
2011-12	25000	8.00	74	4600	3.02	65
2012-13	25000	10.00	85	1780	0.80	70
2013-14	25480	10.20	95	1620	1.20	90
2014-15				7400	3.30	72
2015-16	11600	16.00	65	8700	5.00	80
2016-17	8000	5.00	85	9985	3.50	80
2017-18	500	0.40	75	17750	8.40	70
2018-19	300	0.20	85	11700	4.90	79
2019-20				45000	21.20	47
2020-21				13000	5.50	81
2021-22				7000	2.50	85
TOTAL	**95880**	**49.800**	**82.21**	**136985**	**63.180**	**67.48**

Apart from above, the following plantation has been done through State Forest Department

1. Safety Zone Plantation of 32073 saplings over an area of 93.679 Ha
2. 1.5 times safety zone plantation of 28104 saplings over an area of 140.519 Ha
3. Compensatory Afforestation of 1237179 saplings over an area of 6122.269 Ha

BARSUA-TALDIH-KALTA IRON MINES

Annexure - II

DETAIL ANALYSIS OF AIR QUALITY MONITORING

Location	OCTOBER 2021					'NOVEMBER 2021					'DECEMBER 2021					'JANUARY 2022					'FEBRUARY 2022					'MARCH 2022				
	RSPM (PM_{10})	$PM_{2.5}$	SO_2	NO_x	CO	RSPM (PM_{10})	$PM_{2.5}$	SO_2	NO_x	CO	RSPM (PM_{10})	$PM_{2.5}$	SO_2	NO_x	CO	RSPM (PM_{10})	$PM_{2.5}$	SO_2	NO_x	CO	RSPM (PM_{10})	$PM_{2.5}$	SO_2	NO_x	CO	RSPM (PM_{10})	$PM_{2.5}$	SO_2	NO_x	CO
Unit	µg/m3	µg/m3	µg/m3	µg/m3	mg/m3	µg/m3	µg/m3	µg/m3	µg/m3	mg/m3	µg/m3	µg/m3	µg/m3	µg/m3	mg/m3	µg/m3	µg/m3	µg/m3	µg/m3	mg/m3	µg/m3	µg/m3	µg/m3	µg/m3	mg/m3	µg/m3	µg/m3	µg/m3	µg/m3	mg/m3
A) Ambient Air Quality in Residential, rural & other areas.																														
Norm as per NAAQS	100	60	80	80	4	100	60	80	80	4	100	60	80	80	4	100	60	80	80	4	100	60	80	80	4	100	60	80	80	4
A 1	62.99	30.97	7.84	13.83	0.47	62.18	29.02	7.73	13.58	0.44	64.83	44.00	8.76	13.00	0.38	55.25	28.92	8.21	14.68	0.42	64.52	33.26	9.09	15.73	0.49	72.30	43.93	9.00	16.39	0.69
A 2	66.38	33.53	8.37	14.75	0.54	65.62	32.91	8.48	14.62	0.53	73.76	41.21	7.62	12.85	0.33	65.51	33.87	9.12	16.37	0.50	54.06	28.47	8.15	14.36	0.41	80.19	49.20	10.05	19.37	0.86
A 3	66.19	36.90	7.45	13.19	0.48	64.21	36.05	7.29	12.57	0.47	59.52	25.76	7.55	16.57	0.70	50.09	29.99	7.47	13.20	0.34	49.71	29.70	7.46	13.30	0.34	63.01	36.83	8.40	15.52	0.46
A 4	76.94	47.55	8.47	15.42	0.65	77.57	47.59	8.40	15.24	0.62	65.18	24.22	9.87	12.98	0.31	66.42	41.72	8.78	15.57	0.56	63.41	40.82	8.74	15.62	0.55	84.14	49.32	10.46	19.17	0.90

* unit in µg/m^3

Note : Ambient Air Quality Monitoring was conducted as per MoEF Notification No. GSR 826(E), dtd.16.11.2009.

B) Results of Fugitive Emission / Work Zone Quality.

	OCTOBER 2021		'NOVEMBER 2021		'DECEMBER 2021		'JANUARY 2022		'FEBRUARY 2022		'MARCH 2022	
Norm as per IBM	1200 µg/m3		1200 µg/m3		1200 µg/m3		1200 µg/m3		1200 µg/m3		1200 µg/m3	
Actual(PM)	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.
F 1	292.5	464.8	293	463.4	542.3	803.1	186.3	432.2	182.13	660.8	496.3	911.6
F 2	546.4	795.3	543	794.2	532.4	770.7	224.5	744.7	238.32	648.2	570.6	911.3
F 3	234.2	527.6	216	547.7	563.3	778.6	204.5	705.2	212.44	715.2	428.3	985.8
F 4	256.4	492.4	286	491.4	556.4	709.6	238.1	648.2	238.23	650.4	543.8	811.8
F 5	327.8	513.4	316	545.4	599.2	765.9	182.2	680.8	175.23	668.5	288.3	632.5
F 6	211.4	686.2	402	676.2	506.8	812.7	152.4	684.1	152.43	683.1	509.4	1083
F 7	447.3	810.1	389	806.3	578.3	832.7	305.3	865.4	305.23	865.4	849.2	1109
F 8	622.5	887.5	392	889.2	501.3	718.3	243.4	732.7	242.43	735.6	511.8	792.9
F 9	682.5	830.2	672	834.1	511.3	788.4	192.5	696.2	312.47	845.4	588.7	735.5
F 10	642.5	896.5	640	876.2	481.3	713.2	202.3	732.4	215.52	752.3	582.7	764.4
F 11	227.7	694.7	362	684.7	589.3	813.3	142.2	421.3	142.44	451.4	464.7	917.1
F 12	715.5	935.3	745	975.3	581.4	843.3	317.7	742.4	323.65	744.5	891.8	1127

* unit in µg/m^3

Note : Fusitive emission standards as per MoEF Notification No. GSR 809(E), dtd.4.10.2010 on iron ore mining and processing. Particulate matter (PM)-1200 µg/m^3 at a distance of 25±2m. In the pre dominant downward direction from the source of generation .

NB :

Locations :

A 1 : Tensa Hospital, Tensa
A 2 : Barsua valley, Township
A 3 : Tantara Village
A 4 : Mine Site Office (KIM)

F1 : Ore Handling plant(BIM)
F2: Excavation & loading (BIM)
F3 : Haul Road(BIM)
F4 : Dump Area(BIM)

F5 : Stock pile & Loading(B V. BIM)
F6 : Haul Road (TIM)
F7 : Mobile Screening Area (TIM)
F8 : Excavation Area(TIM)

F9: Drilling Area (KIM)
F10: Excavation (KIM)
F11: Haul Road Area (KIM)
F12: Mobile Crushing & Screening Area (KIM)

Annexure – III

BARSUA-TALDIH-KALTA IRON MINE

GROUND WATER LEVEL MEASUREMENTS			
Month	Water level below the Ground Surface (in meters)		
	Locations		
	Barsua Valley	Zero Pount, Tensa	Kalta Bast, Kalta
OCTOBER' 2021	0.32	1.59	1.525
NOVEMBER' 2021	0.28	1.66	1.545
DECEMBER' 2021	0.295	1.76	1.565
JANUARY' 2022	0.275	1.56	1.545
FEBRUARY' 2022	0.28	1.66	1.565
MARCH' 2022	0.33	1.76	1.575

BARSUA-TALDIH-KALTA IRON MINE

WATER QUALITY OF GROUND WATER

Sl.No.	Parameters	'OCTOBER 2021			NOVEMBER 2021			'DECEMBER 2021			'JANUARY 2022			'FEBRUARY 2022			'MARCH 2022		
		GW1	GW 2	GW3	GW1	GW2	GW3	GW1	GW2	GW3	GW1	GW2	GW3	GW1	GW2	GW3	GW1	GW2	GW3
1	pH	6.16	6.1	5.48	6.85	7.03	7.23	7	7	7	7	7	7	7	7	7	6.29	6.24	5.64
2	Colour(Hazen unit)	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	7	4.3	<1.0
3	Turbidity (NTU)	1.2	1	4.4	4.2	1.5	1.4	2.8	2	1.9	3.6	3.4	1.2	1.6	2	2.6	7	4.3	<1.0
4	Temperature °C	28.3°C	29.2°C	29.3°C	22°C	22°C	22°C	21°C	21°C	20°C	21°C	21°C	20°C	22°C	22°C	21°C	28.7°C	28.3°C	28.5°C
5	Total Hardness as $CaCO_3$,mg/l	120	140	48	120	130	48	66	116	44	120	44	44	92	128	44	104	130	44
6	Alkalinity as $CaCO_3$,mg/l	140	120	40	120	140	118	78	116	34	120	40	40	104	124	36	120	116	36
7	Chlorides as Cl , mg/l	8	8	4	6	7	6	2	18	10	8	8	8	4	16	8	4	16	12
8	Calcium as Ca, mg/l	29	45	11.2	26	38	14	15.2	32.8	8.8	19.2	32	8	16	36.8	9.6	28.8	48	11.2
9	Magnesium as Mg, mg/l	12	7	5	13	8.5	20	6.8	8.2	5.3	12.6	9.7	5.8	12.636	8.748	4.86	77.7	2916	7.79
10	Residual Free Chlorine, mg/l	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
11	Sulphate as SO_4,mg/l	<1.0	3	<1.0	<1.0	2	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	2	<1.0	<1.0	<1.0	<1.0	<1.0	4
12	Nitrate as NO_3, mg/l	0.86	0.662	0.662	0.226	0.469	0.402	0.362	0.227	0.762	2.2	1.8	1.6	0.86	0.66	0.32	0.07	5.6	11.3
13	Iron as Fe,mg/l	0.066	0.098	0.088	0.206	0.123	0.09	<0.05	<0.05	<0.05	0.202	0.123	0.09	0.168	0.205	0.116	0.6	0.4	0.03
14	Copper as Cu,mg/l	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04
15	Manganese as Mn,mg/l	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03
16	Phenolic Compounds C_6H_5OH, mg/l	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.002	<0.002	<0.002
17	Zinc as Zn, mg/l	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
18	Cadmium as Cd, mg/l	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
19	Arsenic as As, mg/l	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
20	Cyanide as CN, mg/l	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
21	Lead as pb	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
22	Total Chromium as Cr^{+6}, mg/l	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
23	Mineral oil ,mg/l	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0.194	0.223	<0.5	<0.1	<0.1	<0.5
24	Fluoride as F, mg/l	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.01	<0.01	<0.1	<0.1	<0.1	<0.1	104	106	<0.1	128	165	<0.1
25	Selenium as Se, mg/l	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.2	<0.2	<0.01	<0.2	<0.2	<0.01
26	Total Dissolved solids (mg/l)	135	166	90	90	139	77	63	137	65	113	164	78	<1.0	<1.0	79	<1.0	<1.0	80
27	Aluminium as Al mg/l	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.001	<0.001	<0.2	<0.001	<0.001	<0.2
28	Boron as B mg/l	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<0.01	<0.01	<1.0	<0.01	<0.01	<1.0
29	Odour	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable	<0.5	<0.5	Agreeable	<0.5	<0.5	Agreeable
30	Taste	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable
31	Mercury as Hg, mg/l	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	Agreeable	Agreeable	<0.001	Agreeable	Agreeable	<0.001
32	Anionic detergent	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0

NB :

GW 1 : Hand pump at Zero point : (BIM)

GW 2 : Hand pump at Banka Bazar B/Valley

GW 3 : Hand Pump at Kalta Village (KIM)

Annexure-V

BARSUA-TALDIH-KALTA IRON MINE

WATER QUALITY OF STREAM SAMPLES/SURFACE WATER

Sl.No.	Parameters	'OCTOBER 2021						'NOVEMBER 2021						DECEMBER 2021					
		SW 1	SW 2	SW 3	SW 4	SW 5	SW 6	SW 1	SW 2	SW 3	SW 4	SW 5	SW 6	SW 1	SW 2	SW 3	SW 4	SW 5	SW 6
1	pH	6.53	6.46	5.72	5.93	6.2	6.31	7.03	6.96	6.66	6.58	6.62	6.8	7.1	7.2	7.1	6.9	7.1	7.1
2	Temperature	27.7°C	29.5°C	29.2°C	29.7°C	29.7°C	25.8°C	22°C	22°C	22°C	22°C	21°C	21°C	21°C	21°C	22°C	22°C	21°C	21°C
3	Turbidity(NTU)	5.5	6	4.8	4.6	5.2	5.4	3.8	3.6	2.9	3.2	3.5	4	3.9	5.6	4.6	4.2	3.8	3.6
4	Residual Free Chlorine mg/l	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
5	Alkalinity as CaCo3 mg/l	20	24	24	20	36	36	20	24	20	26	32	34	18	20	20	20	30	42
6	Chloride as Cl mg/l	8	8	4	8	4	8	6	8	7	6	6	2	2	4	2	2	6	4
7	Total Hardness as CaCo3 mg/l	20	28	12	24	28	24	22	30	14	26	30	26	24	32	32	40	26	56
8	Calcium as Ca mg/l	8	5	5	5	8	6	8	4	4	4	6	6	9.6	6.4	6.4	3.2	9.6	9.6
9	Magnesium as Mg mg/l	<0.243	4	<0.243	3	3	3	0.486	4.7	<0.243	<0.243	0.486	1.9	0.243	3.9	3.9	7.7	2.9	7.7
10	Sulphate as So4 mg/l	1	3	<1.0	2	1	1	1	3.2	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
11	Nitrate as No3 mg/l	6.4	6.8	5.5	4.9	5.2	5.5	6.2	4.8	5.6	4.6	4.8	4.5	2.4	2.6	2.9	2.7	2.6	2.5
12	Fluoride as F mg/l	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0..1	<0.1	<0.1	<0.1	<0.1	<0.1
13	Total dissolve Solids mg/l	27	28	33	29	39	39	26	27	38	32	38	50	20	22	37	29	38	48
14	Total Suspended Solids mg/l	18	16	25	26	20	18	7	8	4	8	6	4	8	10	11	10	8	10
15	D.O.	4.5	4.2	4	4.3	4.4	24.3	4.5	4.6	4.4	4.5	4.6	4.2	4.4	4.6	4.5	4.5	4.6	4.4
16	COD	5	4	6	5	5	4	7	5	6	8	4	5	5	6	5	4	5	5
17	Oil and Grease mg/l	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.432	0.339
18	Iron as Fe mg/l	0.862	0.552	0.362	0.362	0.489	0.356	0.462	0.562	0.446	0.562	0.552	0.402	0.462	0.362	0.469	0.569	<0.04	<0.04
19	Copper as Cu mg/l	<0.04	<0.04	<0.004	<0.004	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.01	<0.01
20	Zinc as Zn mg/l	<1.0	<1.0	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.2	<0.2
21	Aluminium as Al mg/l	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<1.0	<1.0
22	Boron as B mg/l	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<0.03	<0.03
23	Manganese as Mn mg/l	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.01	<0.01
24	Lead as Pb mg/l	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
25	Cadmium as Cd mg/l	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.01	<0.01	<0.01	<0.01	<0.05	<0.05
26	Arsenic as As mg/l	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
27	Mercury as Hg mg/l	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
28	Nickel as Ni mg/l	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
29	Chromium as Cr +6mg/l	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
30	Phenolic compound mg/l	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
31	Cyanide as CN mg/l	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
32	Sulphide as S mg/l	N.T	N.T	N.T	N.T	N.T	N.T	N.T	N.T	N.T	N.T	N.T	N.T	N.T	N.T	N.T	N.T	N.T	N.T
33	Free Ammonia as N mg/l	N.T	N.T	N.T	N.T	N.T	N.T	N.T	N.T	N.T	N.T	N.T	N.T	N.T	N.T	N.T	N.T	N.T	N.T
34	Kjeldahl Nitrogen as N mg/l	2	4	2	3	2	3	4	3	5	3	4	3	3	6	4	5	6	5
35	Ammonia as N mg/l	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02

NB :

SW 1: Kuradih Nala US : BIM

SW 2: Kuradih Nala DS : BIM

SW 3: Samaj Nallah US : Near Tantra

SW 4: Samaj Nallah DS : Near Phuljhar

SW 5: Samaj Nallah US : KIM

SW 6 : Samaj Nallah DS : KIM

N.T: Not Tested

Annexure-V

BARSUA-TALDIH-KALTA IRON MINE

WATER QUALITY OF STREAM SAMPLES/SURFACE WATER

Sl.No.	Parameters	'JANUARY 2022						'FEBRUARY 2022						'MARCH 2022					
		SW 1	SW 2	SW 3	SW 4	SW 5	SW 6	SW 1	SW 2	SW 3	SW 4	SW 5	SW 6	SW 1	SW 2	SW 3	SW 4	SW 5	SW 6
1	pH	7	7	7.1	7	6.9	7.1	7.5	7.5	7.5	7.6	7.4	7.6	5.58	5.85	5.63	5.73	6.03	6.14
2	Temperature	20°C	20°C	22°C	22°C	22°C	22°C	20°C	20°C	24°C	24°C	23°C	23°C	29.5°C	29°C	27.7°C	27.7°C	26.2°C	27.2°C
3	Turbidity(NTU)	3.6	3.5	3.8	3.3	3.2	3	4.2	3.8	4.2	4.5	4.8	3.3	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
4	Residual Free Chlorine mg/l	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
5	Alkalinity as CaCo3 mg/l	20	24	28	28	40	36	20	20	24	28	36	36	16	20	28	28	36	40
6	Chloride as Cl mg/l	4	4	4	4	4	4	4	4	8	4	8	4	4	4	4	4	8	4
7	Total Hardness as CaCo3 mg/l	16	16	32	20	40	28	12	16	24	24	36	32	12	24	20	24	36	32
8	Calcium as Ca mg/l	3.2	4.8	6.4	4.8	8	8	3.2	4.8	9.6	6.4	6.4	6.4	4.8	6.4	8	6.4	8	6.4
9	Magnesium as Mg mg/l	1.9	0.972	3.9	1.9	4.8	1.9	0.972	0.972	<0.243	1.944	4.86	3.888	0.243	1.944	<0.243	1.944	3.88	3.88
10	Sulphate as So4 mg/l	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
11	Nitrate as No3 mg/l	5.2	4.8	4.6	5	5.3	4.9	2.2	2.6	2.4	2.2	2.5	2.4	4.6	4.8	4.6	5.9	6.2	8.3
12	Fluoride as F mg/l	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
13	Total dissolve Solids mg/l	21	27	49	35	43	44	21	27	35	39	42	42	19	25	51	34	44	44
14	Total Suspended Solids mg/l	5	8	9	6	7	5	6	8	10	15	8	10	19	12	18	20	15	18
15	D.O.	4.2	4	4.4	4.3	42	4.2	4.5	4.4	4.2	4.4	4.5	4.4	4.2	4	4	3.9	4.2	4
16	COD	8	6	7	6	8	8	8	6	5	4	6	6	4	5	5	6	4	5
17	Oil and Grease mg/l	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
18	Iron as Fe mg/l	0.551	0.448	0.506	0.862	0.732	0.698	0.462	0.443	0.502	0.553	0.562	0.583	<0.02	0.04	0.06	0.117	<0.02	<0.02
19	Copper as Cu mg/l	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	0.13	0.123	0.13	0.123	0.137	0.123
20	Zinc as Zn mg/l	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
21	Aluminium as Al mg/l	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
22	Boron as B mg/l	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
23	Manganese as Mn mg/l	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03
24	Lead as Pb mg/l	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
25	Cadmium as Cd mg/l	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
26	Arsenic as As mg/l	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
27	Mercury as Hg mg/l	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
28	Nickel as Ni mg/l	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
29	Chromium as Cr +6mg/l	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
30	Phenolic compound mg/l	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
31	Cyanide as CN mg/l	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
32	Sulphide as S mg/l	N.T	N.T	N.T	N.T	N.T	N.T	N.T	N.T	N.T	N.T	N.T	N.T	N.T	N.T	N.T	N.T	N.T	N.T
33	Free Ammonia as N mg/l	N.T	N.T	N.T	N.T	N.T	N.T	N.T	N.T	N.T	N.T	N.T	N.T	N.T	N.T	N.T	N.T	N.T	N.T
34	Kjeldahl Nitrogen as N mg/l	3	6	5	4	5	4	4	5	4	5	5	6	4	6	5	6	5	6
35	Ammonia as N mg/l	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02

NB :

SW 1: Kuradih Nala US : BIM

SW 2: Kuradih Nala DS : BIM

SW 3: Samaj Nallah US : Near Tantra

SW 4: Samaj Nallah DS : Near Phuljhar

SW 5: Samaj Nallah US : KIM

SW 6 : Samaj Nallah DS : KIM

N.T: Not Tested

BARSUA-TALDIH-KALTA IRON MINES

WATER QUALITY OF EFFLUENT WATER

Sl.No.	Parameters	OCTOBER 2021		NOVEMBER 2021		DECEMBER 2021		JANUARY 2022		FEBRUARY 2022		MARCH 2022	
		EW 1	EW 2	EW 1	EW 2	EW 1	EW 2	EW 1	EW 2	EW 1	EW 2	EW 1	EW 2
1	pH	5.92	6.4	7.1	7.05	7.4	7.5	6.8	6.8	8	8	6.23	6.43
2	Temperature	28.2°C	26.7°C	24°C	24 °C	22°C	22°C	21°C	21°C	23°C	23°C	27.4.°C	28.7.°C
3	Selenium as Se, mg/l	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
4	Total Residual Chloride mg/l	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
5	Alkalinity as CaCo3 mg/l	48	48	60	65	44	44	24	36	32	40	36	80
6	Chloride as Cl mg/l	4	8	4	5	2	2	4	4	8	4	8	4
7	Total Hardness as CaCo3 mg/l	40	40	44	45	40	44	32	36	32	36	40	64
8	Calcium as Ca mg/l	10	8	8	8	8	8	4.8	9.6	6.4	8	9.6	20.8
9	Magnesium as Mg mg/l	4	5	5.8	6	4.9	5.8	4.8	2.9	3.888	3.888	3.88	2.196
10	Sulphide as S mg/l	N.T.	N.T.	NT	NT	N.T.	N.T.	N.T.	N.T.	NT	NT	NT	NT
11	Nitrate as No3 mg/l	8.2	8.6	8.8	9.5	6.8	7	4.5	4.8	2.6	2.8	<0.02	<0.02
12	Fluoride as F mg/l	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
13	Total dissolve Solids mg/l	56	58	48	49	59	54	45	53	43	53	50.09	86.1
14	Suspended Solids mg/l	10	12	12	16	6	7	14	12	8	10	5	6
15	B.O.D (3 days at 27 °C) mg/l	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<0..03	<0..03	<3.0	<3.0
16	C.O.D	4	5	6	8	10	12	10	12	6	8	6	6
17	Oil and Grease mg/l	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
18	Total Chromium as Cr mg/l	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
19	Copper as Cu mg/l	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	0.123	0.13
20	Zinc as Zn mg/l	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
21	Boron as B mg/l	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
22	Odour	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable
23	Colour	15	16	16	18	10	12	15	18	10	12	<1.0	<1.0
24	Lead as Pb mg/l	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
25	Cadmium as Cd mg/l	<0.003	<0.003	<0.003	<0.003	<0.01	<0.01	<0.01	<0.01	<0.001	<0.001	<0.001	<0.001
26	Arsenic as As mg/l	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.01	<0.01
27	Mercury as Hg mg/l	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
28	Nickel as Ni mg/l	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
29	Hexavalent Chromium as Cr^{+6} mg/l	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
30	Phenolic compound As C_6H_5OH mg/l	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.001	<0.001	<0.002	<0.002
31	Cyanide as CN mg/l	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
32	Dissolved Phosphate as P mg/l	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
33	Ammonical Nitrogen as N mg/l	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
34	Total Kjeldahl Nitrogen as N mg/l	2	3	4	5	8	9	10	9	8	8	3	4
35	Free Ammonia as NH_3 mg/l	N.T	N.T	NT	NT	N.T	N.T	N.T	N.T	N.T	N.T	N.T	N.T
36	Iron as Fe mg/l	0.553	0.645	0.882	0.865	0.462	0.456	0.536	0.588	0.508	0.508	0.243	0.254

NB :

EW 1: Tailing Dam (Before) Discharge

EW 2: Tailing Dam (After) Discharge

N.T: Not Tested

सेल SAIL

BARSUA-TALDIH-KALTA IRON MINE

Annexure-VII

DETAIL MONITORING OF NOISE QUALITY

Sl. No.	LOCATION	OCTOBER 2021		NOVEMBER 2021		DECEMBER 2021		JANUARY 2022		FEBRUARY 2022		MARCH 2022	
		Day time Leq. dB (A)	Night time Leq. dB (A)	Day time Leq. dB (A)	Night time Leq. dB (A)	Day time Leq. dB (A)	Night time Leq. dB (A)	Day time Leq. dB (A)	Night time Leq. dB (A)	Day time Leq. dB (A)	Night time Leq. dB (A)	Day time Leq. dB (A)	Night time Leq. dB (A)
1	Tensa Hospital	47	35.2	45.2	34.3	46.8	35.6	49.2	35.8	48.3	34.5	47.1	33.2
2	VTC Tensa	53.3	39.4	50.6	42.4	56.78	39.4	51.3	40.6	50.2	41.8	51.3	43.4
3	Barsua Valley Township	51.9	40.6	46.2	36.3	53.6	42.5	50.7	40.7	52.5	41.6	53.2	42.1
4	Tantra Village (TIM)	52.3	41.7	46.7	39.2	52.76	38.18	51.6	33.9	52.3	31.4	53.2	35.1
5	Guest House Kalta	41.5	36.8	42.2	33.4	51.3	38.6	48.69	38.12	46.2	36.1	45.3	37.12

सेल SAIL

BARSUA-TALDIH-KALTA IRON MINE

Annexure-VII

DETAIL MONITORING OF NOISE QUALITY

Sl. No.	LOCATION	OCTOBER 2021		NOVEMBER 2021		DECEMBER 2021		JANUARY 2022		FEBRUARY 2022		MARCH 2022	
		Day time Leq. dB (A)	Night time Leq. dB (A)	Day time Leq. dB (A)	Night time Leq. dB (A)	Day time Leq. dB (A)	Night time Leq. dB (A)	Day time Leq. dB (A)	Night time Leq. dB (A)	Day time Leq. dB (A)	Night time Leq. dB (A)	Day time Leq. dB (A)	Night time Leq. dB (A)
1	Drilling (BIM)	72.2-73.2	Not in operation	71.7-72.5	Not in operation	71.8-72.5	Not in operation	72.1-72.4	Not in operation	71.5-73.4	Not in operation	72.1-72.3	Not in operation
2	Excavation & Loading (BIM)	70.1-71.6	60.3-62.7	71.3-72.2	61.7-63.3	70.6-73.2	60.3-65.4	71.2-72.5	61.3-63.1	71.3-73.6	62.4-63.2	72.4-73.2	63.2-63.4
3	Haul Road (BIM)	70.2-72.1	63.1-64.5	72.2-73.4	62.1-63.2	69.3-71.3	58.7-63.7	70.1-72.3	62.2-62.8	71.2-73.4	62.3-63.4	71.1-73.1	62.1-63.2
4	Secondary Crusher (BIM)	72.1-73.1	63.7-64.2	71.5-73.3	62.2-63.8	71.3-74.3	63.8-68.2	72.1-72.4	62.2-63.2	72.7-75.3	62.1-63.1	71.3-73.2	62.3-63.2
5	Wagon Loading Area (B/V)	70.5-70.9	61.2-65.2	71.1-72.4	61.8-64.3	67.5-70.5	57.4-63.2	71.3-71.8	61.6-62.9	71.4-73.5	61.2-63.4	72.2-73.3	62.1-62.4
6	Haul Road (TIM)	72.0-74.0	63.3-64.4	72.0-72.4	61.3-63.1	69.5-70.5	58.6-63.7	71.9-72.5	62.1-63.9	71.2-73.4	62.2-63.3	72.3-74.1	63.1-63.3
7	Crushing & Screening (TIM)	72.8-73.3	63.5-64.6	72.0-72.4	62.2-62.6	72.8-74.2	65.6-67.9	72.6-73.2	62.4-64.2	71.3-73.3	62.5-63.8	72.1-73.3	62.1-64.1
8	Excavation Area (TIM)	71.3-73.4	62.1-63.9	72.2-73.2	62.2-63.3	67.6-72.6	61.8-64.9	71.3-72.4	61.2-63.3	71.3-73.1	60.6-62.4	72.1-73.3	62.1-63.2
9	Drilling (KIM)	71.6-73.8	Not in operation	71.2-72.3	Not in operation	69.5-72.8	Not in operation	72.0-73.2	Not in operation	72.2-73.3	Not in operation	72.1-73.2	Not in operation
10	Excavation & Loading (KIM)	72.0-73.2	60.2-63.8	72.2-72.6	62.1-62.5	68.4-72.4	59.4-67.9	71.6-72.9	61.3-63.9	71.2-72.4	61.1-63.4	72.1-73.4	62.2-63.5
11	Haul Road (KIM)	72.5-73.5	61.1-63.4	71.3-73.1	62.1-63.4	67.4-73.7	60.4-65.3	71.8-73.0	61.9-63.6	72.0-73.2	62.2-63.1	72.4-73.4	62.2-63.3
12	Crushing & Screening (KIM)	72.2-73.3	61.5-63.7	72.2-73.4	62.2-63.2	72.2-73.2	63.5-68.4	72.5-73.2	61.2-64.2	72.4-73.5	61.3-63.4	72.2-73.3	62.2-63.3

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Annexure - VIII

BARSUA-TALDIH-KALTA IRON MINES

RESULTS OF VEHICULAR EMMISSION

SL. NO	Vehicle Registration No. / I.D. No.	Model No.	RESULTS Smoke Density (Light Absorption coefficient unit 1/meter) 3rd Qtr. 2021-22	Permissible Emission Limit As per National Register of Motor Vehicles
1	OR 14S 3752	HPD-103	1.23	1.62
2	OD 14E 8392	WS-100	1.24	2.45
3	OD 14M 4886	HPD-101	1.27	1.62
4	OD 14M 4885	HPD-102	1.26	1.62
5	OR 14T 4191	HPD-90	1.27	2.45
6	OR 14W 9579	HPD-98	1.27	2.45
7	OR 14Y 3496	Maintenance Van	1.26	2.45
8	OR 14X 3345	HL 770 7A	1.27	2.45
9	OD 14Y 8824	F-150	1.24	2.45
10	Water Sprinkler	WS-91	1.25	2.45
11	Dumper (50T)	HPD-104	1.24	2.45
12	Dumper (50T)	HPD-105	1.28	2.45
13	Motor Grader BG-825-25135	MG-07	1.31	2.45
14	Tyre Holder (BEML)	BL-14TH	1.34	2.45
15	SHOVEL (BE-1000)	EX-22	1.3	2.45
16	OR 14R 0624	HYVA	1.29	2.45
17	OR 14R 0633	HYVA	1.28	2.45
18	OR 14U 5960	HYVA	1.28	2.45
19	OD 09P 1359	BHARAT BENZ	1.27	1.62
20	CG 22P 1134	BHARAT BENZ	1.27	1.62
21	OD 09P 0558	BHARAT BENZ	1.29	1.62
22	OD 35C 0126	BHARAT BENZ	1.28	1.62
23	OR 14U 5951	HYVA	1.25	2.45
24	OR 14T 9137	HYVA	1.28	2.45
25	OR 14U 5944	HYVA	1.29	2.45
26	OD 09N 8529	TIPPLER (DPV-218)	1.26	1.62
27	OD 33G 4269	TIPPLER (DPV-98)	1.26	2.45
28	OD 14T 6443	TIPPLER (TATA)	1.25	1.62
29	OD 33Y 7619	LOADER (WL-45)	1.27	2.45
30	OD 33L 3899	TIPPLER (DPV-134)	1.25	2.45
31	OD 09N 8549	TIPPLER (DPV-222)	1.26	1.62
32	OD 33G 4279	TIPPLER (DPV-95)	1.27	2.45
33	OD 33P 7229	LOADER (WL-30)	1.28	2.45
34	OD 09N 8579	TIPPLER (DPV-219)	1.26	1.62
35	OD 14R 5025	TIPPLER (TATA)	1.26	1.62
36	OD 33F 5019	TIPPER (DPV-65)	1.27	2.45
37	OD 09N 8489	TIPPLER (DPV-224)	1.26	1.62
38	OD 33H 0459	TIPPLER (DPV-101)	1.27	2.45
39	OD 33G 4289	TIPPLER (DPV-94)	1.26	2.45
40	OD 33H 0419	TIPPLER (DPV-102)	1.28	2.45

Annexure - VIII

BARSUA-TALDIH-KALTA IRON MINES

RESULTS OF VEHICULAR EMMISSION

SL. NO	Vehicle Registration No. / I.D. No.	Model No.	RESULTS Smoke Density (Light Absorption coefficient unit 1/meter) 4th Qtr. 2021-22	Permissible Emission Limit As per National Register of Motor Vehicles
1	OR 14S 3752	HPD-103	1.28	1.62
2	OD 14E 8392	WS-100	1.28	2.45
3	OD 14M 4886	HPD-101	1.28	1.62
4	OD 14M 4885	HPD-102	1.28	1.62
5	OR 14T 4191	HPD-90	1.28	2.45
6	OR 14W 9579	HPD-98	1.28	2.45
7	OR 14Y 3496	Maintenance Van	1.28	2.45
8	OR 14X 3345	HL 770 7A	1.28	2.45
9	OD 14Y 8824	F-150	1.28	2.45
10	OR 14W 9578	HPD-97	1.28	2.45
11	Dumper (50T)	HPD-104	1.25	2.45
12	Dumper (50T)	HPD-105	1.28	2.45
13	Motor Grader BG-825-25135	MG-07	1.3	2.45
14	Tyre Holder (BEML)	BL-14TH	1.32	2.45
15	SHOVEL (BE-1000)	EX-22	1.29	2.45
16	OD 14X 5875	HYVA	1.27	1.62
17	OD 14X 5881	HYVA	1.28	1.62
18	OD 35B 3339	HYVA	1.27	2.45
19	OD 14X 5861	HYVA	1.28	1.62
20	OD 14X 5885	HYVA	1.27	1.62
21	OD 14X 7738	HYVA	1.28	1.62
22	OD 14L 1041	HYVA	1.28	2.45
23	OD 35A 4779	HYVA	1.27	2.45
24	OD 14Y 3609	BOLERO	1.27	1.62
25	OD 14T 4373	CAMPER	1.28	1.62
26	OD 33F 4969	DPV-63	1.25	2.45
27	OD 09N 8529	DPV-218	1.26	1.62
28	OD 33F 5029	DPV-66	1.29	2.45
29	OD 33G 4279	DPV-95	1.28	2.45
30	OD 09N 8489	DPV-224	1.28	1.62
31	OD 33H 0459	DPV-101	1.29	2.45
32	OD 33F 5039	DPV-68	1.28	2.45
33	OD 33L 1109	DPV-115	1.27	2.45
34	OD 33G 4309	DPV-97	1.27	2.45
35	OD 09N 8499	DPV-220	1.27	1.62
36	OD 33L 3929	DPV-132	1.26	2.45
37	OD 14J 7585	DPV-110	1.28	2.45
38	OD 09N 8519	DPV-221	1.28	1.62
39	OD 33AC 4749	Water Sprinkler	1.26	1.62
40	OD 33Q 9649	LOADER 34	1.28	2.45

Annexure-IX

सेल SAIL

BARSUA-TALDIH-KALTA IRON MINE

FLOW RATE OF PERENNIAL NALLAH			
Month	Locations		
	Kuradih Nallah (in m^3/Sec)	Samaj Nallah, Taldih (in m^3/Sec)	Samaj Nallah, Kalta (in m^3/Sec)
OCTOBER' 2021	11.71	1.01	1.82
NOVEMBER' 2021	7.06	0.74	1.06
DECEMBER' 2021	3.56	0.54	1.25
JANUARY' 2022	6.81	1.02	1.32
FEBRUARY' 2022	4.27	0.64	1.06
MARCH' 2022	3.03	0.51	0.53

Annexure- X

BARSUA-TALDIH-KALTA IRON MINE

TOTAL EXPENDITURE INCURRED FOR ENVIRONMENTAL PROTECTION MEASURES DURING THE YEAR 2021-22.

Sl. No.	Environmental Protection Measures	Amount (in Lakhs)
1	House Keeping of CAAQMS & Maintenance of Garden	19.38
2	Maintenance of Plantation	4.81
3	Water Spraying	23.20
4	Environmental Monitoring	13.16
5	Maintenance of CAAQMS	13.94
6	Construction / Repairing of check dams/ toe wall	49.50
7	Hiring of vehicles for monitoring of Protection measures	8.17
8	Cleaning of Check dam	3.67
9	Payment for Protection Watchers	41.80
10	Procurement of a Motor Grader	233.82
11	Operational cost of Motor Grader	10.97
Total		**422.43**

Annexure - XI

PHOTOGRAPHS SHOWING ENVIRONMENTAL PROTECTION MEASURES AT BARSUA-TALDIH-KALTA IRON MINES

Coir mating over the dump at Barsua

Wheel washing facility at Taldih Mines

Retaining wall at Sub-grade dump at Barsua

Dry Boulder wall at Waste Dump, Taldih

Check Dam across the Najkura Nalla at Kalta

Tow wall at the bottom of Dump-8, Barsua

Concrete approach road at Taldih Block

Garland drains to channelized the water towards Area 3E pit

Area 3E pit which act as settling pit during Monsoon

Check dam constructed across the overflow channel of tailing dam to re-cycle the water, Barsua

Dry fog system at Crusher, Barsua

Fixed sprinkler at Crusher, Barsua

Fixed Sprinkler at Loading Plant, Barsua

Road Dust Suppression at Kalta

Operation of Mist Cannon at Kalta Block

Oil & Grease trap at F/M Area, Barsua

Thickener at Barsua

LAND USE AND LAND COVER MAP OF BARSUA-TALDIH-KALTA (ML-130) & ML-139 MINING LEASES AREA OF BARSUA & KALTA IRON MINES, ODISHA

Sponsored by

Steel Authority of India Limited

Raw Materials Division

Consultant-in-Charge

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Indian Institute of Technology (Indian School of Mines), Dhanbad

July 2021

Introduction

Land Use Land Cover Land studies are carried out to reveal how much of a region is covered by forests, wetlands, impervious surfaces, agriculture, and other land and water types. The water types include wetlands or open water. The Land Use information describes how people use the landscape. Such uses include developmental use, conservation related use, or mixed uses.

Land use and land cover map of Barsua Iron Mines, Odisha have been developed from Linear Imaging Self scanning Sensor (LISS) data obtained from Indian Remote Sensing satellite- Resource sat-2, LISS-IV (2021) sensor and Cartosat (2021) sensor. The satellite images so obtained were processed applying supervised classification method have using the Erdas Imagine software. The Land Use Land Cover has been classified into six classes, which are built-up land, open forest, dense forest, agricultural land, wasted land and water body. The areas under each of these classes were estimated on the basis of the pixel grid cell process in Erdas Imagine software following the rules of NRSC/ISRO Land Use and Cover Monitoring. The theme of Barsua Iron Mines, Odisha LULC is given in the following **Table 1**.

Table-1. Descriptions of land use and land cover classes (Source- NRSC/ISRO)

Sl.	Description-1	Description-2	Remark
1.	Built-up Land	Urban	Residential, Mixed built up, Public / Semi Public, Communication, Public utilities /facility, Commercial, Transportation, Reclaimed land, Vegetated Area, Recreational, Industrial, Industrial / Mine dump, Ash/ Cooling pond.
		Rural	Rural.
		Mining	Mine / Quarry, Abandoned Mine Pit, Land fill area.
2.	Agriculture Land	Crop land	Kharif, Rabi, Zaid, Two cropped, More than two cropped.
		Plantation	Plantation-Agricultural, Horticultural, Agro Horticultural.

		Fallow	Current and Long Fallow.
		Current Shifting cultivation	Current Shifting cultivation.
3.	Forest Land	Evergreen/Semi evergreen	Dense / Closed and Open category of Evergreen / Semi evergreen.
		Deciduous	Dense / Closed and Open category of Deciduous and Tree Clad Area.
		Forest Plantation	Forest Plantation.
		Scrub Forest	Scrub Forest, Forest Blank, Current &Abandoned Shifting Cultivation.
		Swamp/ Mangroves	Dense / Closed & Open Mangrove.
4.	Barren/ uncultivable/ Wastelands	Salt Affected Land	Slight, Moderate & Strong Salt Affected Land.
		Gullied/ Ravinous Land	Gullied, Shallow ravine & Deep ravine area.
		Scrub land	Dense / Closed and Open category of scrub land.
		Sandy area	Desertic, Coastal, Riverine sandy area.
		Barren rocky	Barren rocky.
		Rann	Rann.
5.	Wetlands/Water Bodies	Inland Wetland	Inland Natural and Inland Manmade wetland
		Coastal Wetland	Coastal Natural and Coastal Manmade wetland
		River / Stream / canals	Perennial & Dry River/stream and line & unlined canal/drain
		Water bodies	Perennial, Dry, Kharif, Rabi &Zaid extent of lake/pond and reservoir and tanks

Built-up land: It is an area of human habitation developed due to non-agricultural use and that has a cover of buildings, transport and communication, utilities in association with water, vegetation and vacant land. LULC map consists of 3 classes under built-up viz., urban, rural and mining. In this region, ore mining town have emerged Barsua Iron Mines.

Forest: The term forest is used to refer to land with a tree canopy cover of more than 10 percent and area of more than 0.5 ha. Forests are determined by both the presence of trees and the absence of other predominant land uses. The trees should be able to reach a minimum height of 5 m. The two categories i.e. open forest and dense forest is predominant in Barsua Iron Mines.

Wasted land or Wet land: Wasted lands are those areas where the water table is at, near, or above the land surface for a significant part of most years. The hydrologic regime is such that aquatic or hydrophyte vegetation usually is established, although alluvial and tidal flats may be no vegetated. Wastelands frequently are associated and topographic lows, even in mountainous regions.

Water body: This category comprises areas with surface water in the form of ponds, river, lakes, tanks and reservoirs. Rivers/streams are natural course of water flowing on the land surface along a definite channel/slope regularly or intermittently towards a sea in most cases or in to a lake or an inland basin in desert areas or a marsh or another river. Canals are artificial watercourse constructed for irrigation, navigation or to drain out excess water from agricultural lands.

Agricultural land: These are the lands primarily used for farming and for production of food, fiber, and other commercial and horticultural crops. Agricultural Land may be defined broadly as land used primarily for production of food and fiber. These are the areas with standing crop as on the date of Satellite overpass. Cropped areas appear in bright red to red in color with varying shape and size in a contiguous to noncontiguous pattern. They are widely distributed indifferent terrains; prominently appear in the irrigated are as irrespective of the source of irrigation. It includes Kharif, Rabi and Zaid croplands along with areas under double or triple crops.

1. Barsua- Taldih- Kalta area land use and land cover (ML-130):

The Barsua- Taldih- Kalta mining area (2472.561 ha) was classified for land use and land cover by using supervised classification technique. Seven classes are identified over the study area namely dense forest (1493.722 ha), open forest (272.976 ha), water bodies (2.704 ha), agricultural land and plantation (10.350 ha), barren land/waste land (272.976 ha), mining land (303.441 ha) and built-up (50.684 ha) shown in Figure-1.

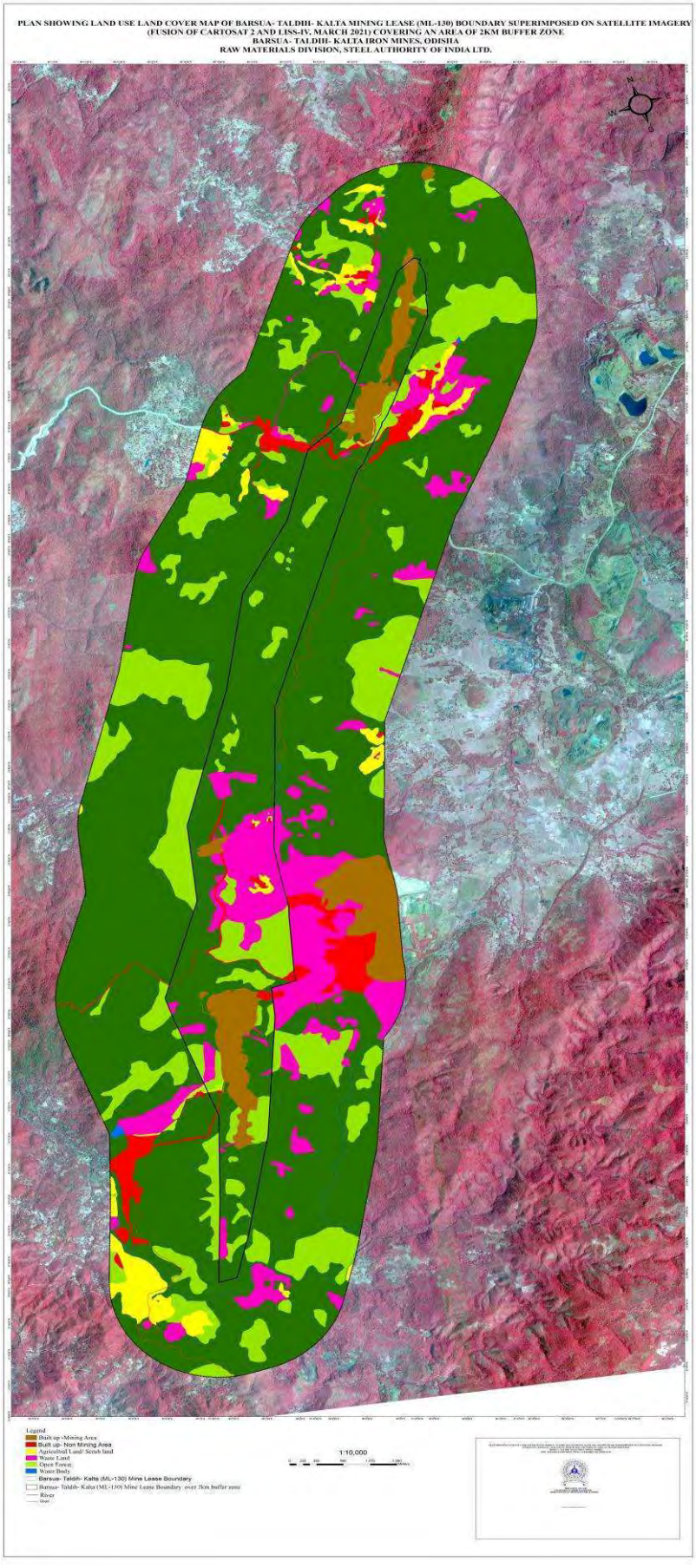

Figure: 1. Land use Land cover map of Barsua-Taldih- Kalta Mine Lease (ML-130)

Accuracy assessment was carried out using 100 points, from field data, existing maps and land cover map of (Bhuvan ISRO). Then location of the 100 points was chosen using random stratified method to represent different land cover classes of the area. The land cover mapping of the images, ancillary data and the result of visual interpretation was integrated with the classification result using GIS in order to improve the classification accuracy of the classified image.

The summary of the land use land cover classifications is shown in the Table 2. The classification distributions are shown in the Figure 2.

Table 2: Land use land cover classifications of ML-130 Lease

LU/LC classes	ML-130 Mining Lease (ha)
Built-up Land	**50.684**
Agriculture Land	**10.350**
Dense forest	**1493.722**
Open Forest	**338.684**
Water body	**2.704**
Waste land	**272.976**
Mining	**303.441**
Total Area (ha)	**2472.561**

Figure 2: Land use distribution of Barsua-Taldih-Kalta (ML-130) Iron Mines