KLCM/ENV / 821 /2022

Dated: 30.11.2022

To,

The Joint Director(s)
Ministry of Environment, Forest & Climate Change,
Eastern Regional Office,
Bhubaneswar

Sub.: Submission of Six-monthly compliance report to the conditions stipulated in the grant order of Environmental Clearance (EC) pertaining to Kalarangiatta Chromite Mines of M/s. FACOR LTD.

Ref.: MoEF EC Letter No.: J-11015/183/2007-IA II(M) dtd.13.05.2009

Dear Sir,

With reference to the captioned subject & cited reference, we are herewith submitting six monthly compliance reports pertaining to Kalarangiatta Chromite Mines of M/s FACOR Ltd. for the period from April'2022 to September'2022 for your kind perusal.

This is for your Kind information & necessary action.

Thanking You

Yours faithfully,
for Ferro Alloys Corporation LTD

MINES MANAGER
KALARANGIATTA CHROMITE MINES

Encl.: A/a

Name of the Project : **Kalarangiatta Chromite Mines, M/s. FACOR Ltd.**

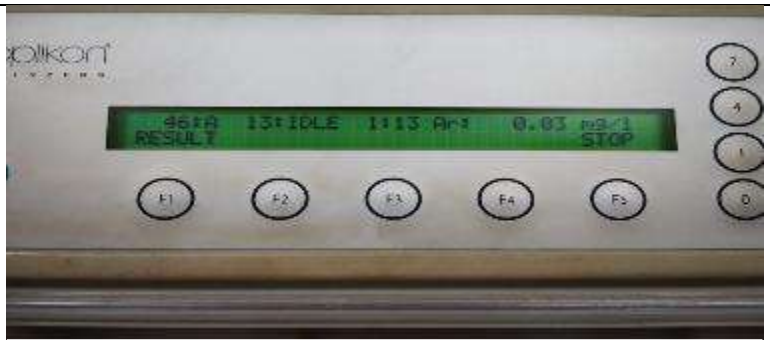
Project Code : **Mining (Non-Coal)**

Clearance Letter No. with date : **J-11015/183/2007-IA-II (M) dated.13-05-2009**

Period of Compliance Report :**Apr' 2022 to Sep' 2022**

Specific Condition

Sl. No.	Condition	Compliance Status
1.	All the conditions stipulated by the State Pollution control Board, Odisha in their consent to establish shall be effectively implemented.	All stipulated conditions are being effectively implemented.
2.	The environmental clearance is granted for opencast mining only. For the underground mining, the project proponent shall obtain separate clearance after getting the mine plan approval from the Indian Bureau of Mines.	Now opencast mining operation is going on. Before starting underground mining the project proponent will obtain separate clearance after getting mining plan approval from the Indian Bureau of Mines.  **Open Pit Mine**
3.	The environmental clearance is subject to approval of the State Land purposes Dept. Govt. of Odisha for diversion of agricultural land for non-agricultural use.	Till date Agricultural land has not been used for non-agricultural use. Diversion of Agricultural land for non-agricultural use will be done after getting approval from the State Land use Dept., Govt. of Odisha.
4.	The Project proponent shall ensure that no natural watercourse and/or water resources are obstructed due to any mining operations. Adequate measures shall be taken for protection of Damsala Nallah and other seasonal channels, if any emanating from the mine lease, during the course of mining operation.	There is no natural water course or water resource obstructed due to the mining operation. Adequate measures have been taken before discharging the mines pumped out water to Damsala Nallah. Water is being treated in ETP with Ferrous sulfate depending upon the concentration of Cr^{+6} to neutralize its effect before discharging out of the mine lease area.

		 **ETP Outlet Cr^{+6} conc. data**
5.	The topsoil 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.	All the generated topsoil has been utilized for land reclamation and plantation purpose & there is no stock presently.
6.	The overburden (OB) generated during the mining operation shall be stacked at earmarked dump site (s) only and it should not be kept active for a long period of time and their phase-wise stabilization shall be carried out. There shall be one external over burden dump having maximum projected height of 30m. Proper terracing of the OB dump maintained to 27º.	The OB generated during the mining operation is being stacked at earmarked dump site. Height of the OB dump is only 30 meters. The OB dump is not kept active for long period. Overall slope of the OB dump is being maintained below 30°. Bottom inactive slope of the dump have been vegetated with native species to prevent erosion & surface run-off. Monitoring and management of rehabilitated areas of the dump have been continuing until the vegetation becomes self-sustaining.  **Plantation on OB Dump Slope**

	The OB dump shall be scientifically vegetated with suitable native species to prevent erosion and surface run off. In critical areas, use of geo textiles shall be undertaken for stabilization of the dump. Monitoring and management of rehabilitated areas shall continue until the vegetation becomes self-sustaining. Compliance status shall be submitted to the Ministry of Environment & Forests and its Regional Office located at Bhubaneswar on six monthly basis	Several precautions have been taken in the dump for its slope stabilization which are given below 1. Dumping is being carried out in peripheral dumping method by using dozers. In this method the materials are compacted by running of vehicles as well as the dozer. 2. The top surface is also maintained to avoid ponding of water which affect the stability of the dump. 3. The overburden is stacked in bench form to ensure stability. 4. The bench height is maintained at 10 – 15mtrs. 5. Various types of plants such as Acacia, Chakunda, Teak, Chhatian etc. have been planted in the inactive portions of the overburden dump. 6. The overburden dump has been stabilized by tree plantation in the dead benches after carrying out suitable terracing of size 2 M × 1 M each. 7. Grass patching has been developed on the dump slopes to ensure prevention of erosion of soil from the dump slopes due to rainwater. 8. Proper drainage system has already been maintained to prevent rain cuts on the dump. 9. Proper garland drain is being maintained all around the dump to collect the surface runoff during rain. 10. Over the bench surface of the overburden dump yard longitudinal and transverse drains have been made to enable the water to flow to the settling pit through proper drainage system. This not only prevents erosion of overburden dump material but also ensure stability of overburden dump by preventing development of hydro static pressure inside the overburden dump and proper channelization of rainwater for plantation purposes. As a result, the generation of rain cut is very negligible. 11. We have already planted 17715 nos. of Saplings to stabilize this overburden dump including safety zone also.  **Plantation on OB Dump**

		12. Garland drain & retaining wall has been constructed all around the dump.  **Retaining Wall & Garland Drain**
7.	Catch drains and siltation ponds of appropriate size shall be constructed for the working pit, soil, OB and mineral dumps to arrest flow of silt and sediment directly into the Damsala Nallah and other water bodies. The water so collected should be utilized for watering the mine area, roads, green belt development etc.	1971 meters of garland drains has been constructed around the working pit, OB & mineral dumps with siltation ponds at different intervals to arrest flow of silt & sediments.  **Garland Drain**

	The drains should be regularly de-silted particularly after the monsoonand maintained properly. Garland drains, settling tanks and check dams of appropriate size, gradient and length shall be constructed both around the mine pit and overburden dump to prevent run off of water and flow of sediments directly into the Damsala Nallah and other water bodies and sump capacity should be designed keeping 50% safety margin over and above peak sudden rainfall (based on 50 years of data) and maximum discharge in the area adjoining the mine site. Sump capacity should also provide adequate retention period to allow proper settling of silt material. Storm water return system should be provided. Storm water should not be allowed to go to the effluent treatment plant during high rainfall/super cyclone period. A separate storm water sump for this purpose should be created.	Whenever required, the silts & sediments are being cleaned. Mines pumped-out water is being used for dust suppression and plantation purposes after proper treatment.  **Settling Pond**
8.	Dimension of retaining wall at the toe of the overburden dump and the OB benches within the mine to check run-off and siltation should be based on the rainfall data.	About 920 meters of retaining wall of width 1.5m and height 1.2m has been constructed at toe of the overburden dump to check run-off and siltation.  **Retaining Wall**

9.	Effluents containing Cr^{+6} shall be treated to meet the prescribed standards before reuse/discharge. Effluent treatment plant should be provided for treatment of mine water discharge and wastewater generated from the workshop and mineral separation plant. Run off from the OB dump and other surface run off should be analyzed for Cr^{+6} and in case its concentration is found higher than the permissible limit the water should be treated before reuse/discharge.	An Effluent Treatment Plant has been in operation for treatment of mines discharge water. The concentration of Cr^{+6} in treated discharged water is <0.005mg/l. The analysis report of mines final discharge water after treatment in ETP for the period from Apr' 2022 to September'2022 is enclosed in **Annexure-1**.  **ETP** Small scale mining operation is being carried out. Also, the machineries & vehicles belong to the Contractor. The repairing of these vehicles is being done at outside workshop only. There is no workshop and mineral separation plant. Surface runoff water samples were collected in a settling pit during rainy season and then pumped to the ETP for treatment before final discharge. Mine discharge water through pumping station is pumped to Flash Mixing Tank with ferrous sulfate ($FeSO_4$) for reduction of Cr^{6+} to Cr^{3+}. The effluent is then distributed to Clariflocculators & the supernatant is passed into the Sand Filters. Now, the filtered water shall be collected in Treated Water Tank and could be disposed of meeting standards stipulated by OSPCB or reused in plantation or haul roads dust suppression.  **Water Sprinkling on Haul Road**
10.	Separate impervious concrete pits for disposal of sludge shall be provided for the safe disposal of sludge generated from the mining operations.	Separate impervious pit has been provided for disposal of sludge generated from treatment of water generated during the mining operation

11.	The project proponent shall ensure that the treated effluents conforming to the prescribed standards shall only be discharged.	The mines pumped out water directly collected in the intake tank of ETP through pipeline and then treated by adding $FeSO_4$ & NaOH dosing. The final treated water is being discharged to outside ML area, conforming to the prescribed standards. For analysis reports refer **Annexure-1.**
12.	Plantation shall be raised in an area of 12.715 ha. Including 7.5m wide green belt in the safety zone around the mining lease, overburden dump, roads etc. by planting the native species in consultation with the local DFO/Agriculture Dept. The density of the trees should be around 2500 plants per hectare.	During the year (till September) 2022-23, 2520 nos. of saplings have been planted in the Safety Zone area around the Mining lease and inactive bottom slope of the dump. And a 7.03 hectares has been planted till September'2023. Native species has been planted in consultation with local Forest Dept. by maintaining the density 2500 plants per Hectare.  **Plantation in Safety Zone**
13.	The void left unfilled in an area of 5.21 hectares shall be converted into the water body. The higher benches of the excavated void/mine pit shall be terraced and plantation done to stabilize the slopes. The slopes of higher benches shall be made gentler for easy accessibility by the local people to use the water body. Peripheral fencing shall be carried out all along the excavated area.	The same will be implemented at the end of mining Operation.

14.	Effective safeguard measures, such as regular water sprinkling shall be carried out in critical areas prone to air pollution and having high levels of SPM & RSPM such as around crushing and screening plant, loading and unloading point and all transfer points. Extensive water sprinkling shall be carried out on haul roads. It should be ensured that the Ambient Air Quality parameters conform to the norms prescribed by the Central Pollution Control Board in this regard.	All the parameters of ambient air quality are well within the prescribed limit. Although, regular water sprinkling is being carried out on haul roads, loading & unloading points to control the dust generation at source. There is no crushing and screening plant. It is enclosed in **Annexure 7**  **Water Sprinkling on Haul Road**
15.	Regular monitoring of water quality upstream and downstream of the Damsala nallah shall be carried out and record of submitted to the Ministry of Environment & Forests, its Regional Office, Bhubaneswar, the Central Ground water Authority, the Regional Director, Central Ground water Board, the State Pollution control Board and the Central Pollution Control Board.	Monitoring of water quality upstream & downstream of the Damsala nallah is being carriedout and record of monitoring data are being Maintained. The test reports is enclosed as **Annexure No.-2**.
16.	The project authority shall implement suitable conservation measures to augment ground water resources in the area in consultation with the Regional Director, Central Ground Water Board.	There are no. of rain water harvesting structures have been made in Mining premises i.e. Check Dam, Garland drain, Settling pond/tank & rooftop rain water harvesting to augment the ground water resources.  **Check Dam**

17.	Regular monitoring of ground water level and quality shall be carried out by establishing a network of existing wells and constructing new piezometers in and around the mining lease during the mining operation. The periodical 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 state ground Water Board/Central Ground Water Authority and the data thus collected may be sent regularly to the MoEF and its Regional Office, Bhubaneswar, the Central Ground Water Authority and the Regional Director, CGWB. If at any stage, it is observed that the ground water table is getting depleted due to the mining activity; necessary corrective measures shall be crried out.	Monitoring of ground water level & quality is being carried out in and around the mining lease by one accredited third party. Further, as per the directive of CGWA, two nos. of piezometer holes are fitted with DWLR with telemetry system to monitor the ground water level through online. **DWLR with Telemetry system**  Monitoring report carried out by third party for water level & quality is enclosed as **Annexure No - 3 & Annexure No – 4.**

18.	The project proponent shall obtain necessary prior permission of the competent authorities for drawl of requisite quantity of water (surface water and ground water) for the project and effectively implement all the conditions stipulated therein.	NOC is obtained vide ref. no. : CGWA/OC//MI/RE/1/2021/6526. It is under renewal. The stipulated conditions are being effectively implemented.
19	Suitable rainwater harvesting measure on long term basis shall be planned and implemented in consultation with the Regional Director, CGWB.	Rainwater is being collected in pits and pond for suitable rainwater harvesting measures. Also roof top rainwater harvesting measure is implemented within the lease area.  **Roof Top Rain-Water Harvesting**
20.	Vehicular emissions shall be kept under control and regularly monitored. Measures shall be taken for maintenance of vehicles used in mining operations and in transportation of mineral. The mineral transportation shall be carried out through the covered trucks only and vehicles carrying the mineral shall not be overloaded.	Vehicular emission of all machinery used in mining operations are being monitored regularly and kept under control by rigorous maintenance of all engines & changing of lubricants as per the recommendation of the manufacturer. The HEMMs, with valid PUC certificate are allowed for operation inside the mines. Transportation of mineral has been done through covered trucks and also avoids overloading. 
21	Blasting operation shall be carried out only during the daytime. Controlled blasting shall be practiced. The Fugitive measures for control of ground vibrations and to arrest fly rocks and boulders should be implemented.	At present, blasting operation has not been carried out. Excavation has been carried out by machines only.
22	Drills shall either be operated with dust extractors or equipped with water injection system.	Drilling has not been done so far. In future, if drilling is required, then wet drilling practice will be adopted.
23	Mineral handling area shall be provided with adequate number of high efficiency dust extraction system. Loading and unloading areas	Water spraying arrangement is being carried out on mineral handling area, loading & unloading areas to suppress dust generation. The test report of fugitive dust emissions is enclosed as **Annexure-5.**

	including all the transfer points should also have efficient dust control arrangements. These should be properly maintained and operated.	
24	Sewage treatment plant shall be installed for the colony, ETP shall also be provided for the workshop and waste water generated during the mining operation.	One 20 KLD STP has been installed to treat the domestic wastewater & to reuse it for gardening purpose.  STP Near Office (20 KLD Capacity) All the mining machineries have been engaged by contractor for mining operation and the maintenance work of their machines have been carried out at outside workshop. Therefore, question of workshop effluent does not arise. An ETP has been established for treatment of mines pumped out water and surface runoff water before discharge to outside leasehold area. Further, installation of STP is under process  **ETP**
25.	Consent to operate shall be obtained from the State Pollution Control Board, Odisha before starting production from the mine.	Consent to Operate has been obtained from SPCB, Odisha before starting production from the mine. Mining operation has been going on with valid consent to operate obtained from SPCB vide their letter No. 4158/IND-I-CON-6318, Dtd.17.03.2022, valid upto dt 31.03.2023
26.	The project authorities should undertake sample survey to generate data on pre-project community health status within a radius of 1 km from proposed mine.	Sample survey for community health status within 1 Km radius from Project area has already been done.

27.	Pre-placement medical examination and periodical medical examination of the workers engaged in the project shall be carried out and records maintained. For the purpose, schedule of health examination of the workers should be drawn and followed accordingly.	Pre-placement medical examination has already been carried out of the workers engaged in the project and the records are being maintained and periodical medical examination is being carried out once in three years & five years depending on the age factor.
28.	Provision shall be made for the housing of construction labor within the site with all necessary infrastructure and facilities such as fuel for cooking, mobile toilets, mobile STP, safe drinking water, medical health care, crèche etc. The housing may be in the form of temporary structures to be removed after the completion of the project.	Housing for construction labour is not required, since the laborers are coming from nearby villages.
29	The critical parameters such as SPM, RSPM, NOx, In the ambient air within the impact zone, peak particle velocity at 300 m distance or within the nearest habitation, whichever is closure shall be monitored periodically (at least once a month). Further, quality of discharged water shall also be monitored (TDS, DO, pH, suspended particulate matter and Cr^{+6}). The monitored data shall be uploaded on the website as well as displayed on a display board at a suitable location in public domain.	Parameters such as PM_{10}, $PM_{2.5}$, NOx &SO_2 in the Ambient Air and Quality of discharge water are being monitored. The monitored data is being uploaded in the Company Website and display on a display board installed at the Mines main gate. Blasting operation has not been carried out. Hence peak particle velocity has not been monitored.
30	The project proponent shall take all precautionary measures during mining operation for conservation and protection of endangered fauna namely elephant etc. spotted in the study area. Action plan for conservation of flora and fauna shall be prepared and implemented in consultation with the State Forest and Wildlife Dept. All the safeguard measures brought out in the Wildlife Conservation Plan so prepared specific to this project site shall be effectively implemented. Necessary allocation of funds for implementation of the conservation plan shall be made and the funds so allocated shall be included in the project cost. A copy of action plan shall be submitted to the MoEF and its Regional Office, Bhubaneswar.	Wildlife management plan has been prepared by accredited consultant "M/s Chandanam". It is approved from the competent Authority vide Ref no.:10180/CWLW-W-FDWC-FD-0032-2022/11-Nov-2022. Approval of wildlife conservation plan is enclosed as **Annexure no 10** After getting the approval, all the stipulated conditions will be implemented strictly. Further, Biodiversity study has been carried out by a domain expert. The company has a proper system of budgeting for implementing environment management activities and CSR activities. All the Environmental protective measures expenses are being maintained in a separate dedicated Cost center/ account & the implemented expenses are being monitored Action taken report is also submitted.

31	A final Mine Closure Plan along with details of Corpus Fund shall be submitted to the MoEF 5 years in advance of final mine closure for approval.	The same will be submitted in due time to MOEF for approval

GENERAL CONDITIONS

Sl. No.	Condition	Compliance Status
1	No change in mining technology and scope of working should be made without prior approval of the MoEF.	The Mining technology & scope of working will not change without approval of Ministry of Environment & Forest.
2	No change in the calendar plan including excavation, quantum of mineral chromite ore and the waste shall be made.	The calendar plans including excavation, quantum of mineral chromite ore and waste overburden have not been changed. The calendar plan including excavation, quantum of mineral chromite ore and overburden generated during the period April 2022 to September, 2022 is given in **Annexure -6**
3	At least four ambient air quality monitoring stations should be established in the core zone as well as in the buffer zone for RSPM, SPM, SO2, & 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 the State Pollution Control Board.	Ambient Air quality monitoring stations has already been established in consultation with SPCB.  Near Office Building  Near ETP  NearElectrical substation  Near Weigh bridge
4	Data on ambient air quality (RSPM, SPM, SO2 & NOx) should be regularly submitted to the MoEF including its Regional. Office located at Bhubaneswar and the state Pollution Control Board / Central Pollution Control Board once in six months.	Data on Ambient Air Quality Monitoring with respect to PM_{10}, $PM_{2.5}$, SO_2, & NOx are being carried out. The monitoring reports for the period from Apr'2022 to Sept 2022 are enclosed as **Annexure-7**

5	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.	Control of fugitive dust emission is being carried out by water spraying on haul roads, loading & unloading points and ore handling yard regularly.  **Water Sprinkling on Haul Road**
6	Measures should be taken for control of noise levels below 85 dB (A) in the work environment. Workers engaged in operations of HEMM etc. should be provided with ear plugs/muffs.	Control measures such as maintenance of all machines including checking of silencers regularly and changing of engine oil as per recommendation of the manufacturer has been carried out regularly. The workers engaged at noise generating areas are provided with earplugs/muffs. The present noise level at work environment is below 85 dB (A). Sound pressure level at work environment is enclosed as **Annexure No.-8**
7	Industrial wastewater (Workshop & Waste water from the mine) should be properly collected, treated so as to conform to the standards prescribed under GSR 422(E) Dtd. 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 effluents.	The Mines wastewater is being collected directly in intake tank of the ETP for treatment of Cr^{+6} and finally discharged to outside ML area. The analysis of this water shows that all parameters are well within the prescribed limit. The analysis report of mines final discharge water after treatment in ETP is given in **Annexure -1**. Almost all mining machineries and transporting vehicles are being engaged on contract basis for transportation of OB and chrome ore. The repairing of these vehicles is being done at outside workshop by the contractor. Therefore, question of workshop effluent does not arise.
8	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 of the workers should be undertaken periodically to observe any contractions due to exposure to dust and take corrective measures, if needed.	In addition to water spraying for dust suppression, workers engaged in dusty areas such as dumper drivers, HEMM Operators, are being provided with nose masks as precautionary measure. Training & information on safety, health hazards are being given to all categories of deserved workers. Occupational health surveillance program of all categories of workers and employees have been conducted periodically.

9	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 separate Environment Management Cell with qualified personnel and well equipped Environment Engineering Laboratory are functioning under the control of a Senior Executive. Besides, we are carrying out all Environmental monitoring & analysis through a MoEF & NABL accredited laboratory M/S **VisionTek Consultancy Services** Pvt. Ltd., Bhubaneswar.
10	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 and its Regional Office located at Bhubaneswar.	Separate funds provision is made to carryout environmental protection measures. Details of expenses for Environmental protection measures during the year 2022-23 (till September) are given in **Annexure No.-9**
11	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.	The date of final approval of the Project is 04.10.2010 by DMS and 23-01-2012 by SPCB.
12	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/information/monitoring reports.	As & when required and during the inspection, full co-operation is being extended by the project authorities.
13	The project proponent shall submit six monthly reports on the status of the implementation of the stipulated environmental safeguards to the MoEF, its Regional Office, Bhubaneswar, CPCB, and SPCB, The project proponent shall upload the status of compliance of the environment clearance conditions on their website and update the same periodically and simultaneously send the same by e-mail to the Regional Office, MoEF, Bhubaneswar.	All the stipulated conditions have been implemented. The Six-monthly report on Status of compliance of the Environmental Clearance conditions have been submitted to the concerned authorities and the same is being uploaded in our website www.facorgroup.in

Ref : Envlab/22/R-8313 ANNEXURE 1 **Date : 10.10.2022**

EFFLUENT WATER DISCHARGE ANALYSIS REPORT- SEPT 2022

1. Name of Client : **M/s FERRO ALLOYS CORPORATION LIMITED , BHADRAK**
2. Name of the Project : **KALARANGIATTA CHROMITE MINES , KALIAPANI, JAJPUR**
3. Sampling Location : **EW1:** ETP Mines Final Discharge Water
4. Method of Sampling **: APHA 1060 B**
5. **Date of Sampling : 21.09.2022**
6. Date of Analysis **: 22.09.2022 TO 28.09.2022**
7. Sample Collected by : VCSPL Representative in presence of Client's Representative

Sl. No.	Parameters	Testing Methods	Unit	Standards (In land Surface water)	Analysis Results
					EW-1
1	Colour	**Visual Comparison Method** APHA 2120 B; 23rd Edition, 2017	Hazen	**Colourless**	10
2	Odour	**Threshold Odour Method** APHA 2150 B; 23rd Edition, 2017	--	**Odourless**	pungent smell
3	pH at 25^0C	**pH Meter** APHA 4500 H^+B; 23rd Edition, 2017	--	**5.5-9.0**	8.38
4	Total Suspended Solids	**Gravimetric Method** APHA 2540 D; 23rd Edition, 2017	mg/l	**100**	54
5	Copper as Cu	**By AAS Method** APHA 3111 B; 23rd Edition, 2017	mg/l	**3**	BDL
6	Fluoride as F	**Distillation followed by Spectophotometric Method** APHA 4500 F^- C,D; 23rd Edition, 2017	mg/l	**2**	0.46
7	Total Residual Chlorine	**Iodometric Method** APHA 23RD Ed,2017 : 4500Cl, B	mg/l	**1**	0.28
8	Iron as Fe	**By AAS Method** APHA 3111 B; 23rd Edition, 2017	mg/l	**3**	0.68
9	Manganese as Mn	**By AAS Method** APHA 3111 B; 23rd Edition, 2017	mg/l	**2**	BDL
10	Nitrate as NO_3	**By UV-Screen Method** APHA 4500 NO_3^- B; 23rd Edition, 2017	mg/l	**10**	8.7
11	Phenolic Compounds as C_6H_5OH	**Distillation Followed by Spectophotometric Method** APHA 5530-B, D; 23rd Edition, 2017	mg/l	**1**	BDL
12	Selenium as Se	**By AAS Method** APHA 3500 Se C; 23rd Edition, 2017	mg/l	**0.05**	BDL
13	Cadmium as Cd	**By AAS Method** APHA 3111 B; 23rd Edition, 2017	mg/l	**2.0**	BDL
14	Cyanide as CN	**Distillation Followed by Spectophotometric Method** APHA 4500 –CN-C,E; 23rd Edition, 2017	mg/l	**0.2**	BDL
15	Lead as Pb	**By AAS Method** APHA 3111 B; 23rd Edition, 2017	mg/l	**0.1**	BDL
16	Mercury as Hg	**By AAS Method** APHA 3112 B; 23rd Edition, 2017	mg/l	**0.01**	BDL
17	Nickel as Ni	**By AAS Method** APHA 3111 B; 23rd Edition, 2017	mg/l	**3**	BDL
18	Arsenic as As	**By AAS Method** APHA 3114 B; 23rd Edition, 2017	mg/l	**0.2**	BDL
19	Total Chromium as Cr	**By AAS Method** APHA 3111 B; 23rd Edition, 2017	mg/l	**2**	0.38
20	Zinc as Zn	**By AAS Method** APHA 3111 B; 23rd Edition, 2017	mg/l	**5**	0.052
21	Hexavalent Chromium as Cr^{+6}	**By AAS Method** APHA 3500 Cr B; 23rd Edition, 2017	mg/l	**0.1**	BDL
22	Vanadium as V	**By AAS Method** APHA 3500 V; 23rd Edition, 2017	mg/l	**0.2**	BDL

23	Temperature	**By Thermometer** APHA 2550 B; 23rd Edition, 2017	°C	**Shall not exceed 5^0C above the receiving water temperature**	35
24	Dissolved Oxygen	**Modified Winkler Method** APHA 4500 O. C; 23rd Edition, 2017	mg/l	--	6.8
25	Biochemical Oxygen Demand as BOD	**Oxygen Depletion Method** IS 3025 (Part 44):2003	mg/l	**30**	6.2
26	Chemical Oxygen Demand as COD	**Open Reflux Method** APHA 5220 B; 23rd Edition, 2017	mg/l	**250**	19
27	Oil & Grease	**Gravimetric Method (Solvent Extraction)** APHA 5520 B; 23rd Edition, 2017	mg/l	**10**	6.8
28	Ammonical Nitrogen as N	**By TKN Method** APHA 4500-NH_3 C; 23rd Edition, 2017	mg/l	**50**	3.7
29	Total Kjeldahl Nitrogen as N	**By TKN Method** APHA 4500-N_{org} C; 23rd Edition, 2017	mg/l	**100**	7.9
30	Sulphide as S	**By Methylene Blue Method** APHA 4500-S D; 23rd Edition, 2017	mg/l	**2**	BDL
31	Free Ammonia as NH_3	**By Calculation**	mg/l	**10**	7.2
32	Particulate Size of Suspended Solids	**Gravimetric Method** APHA 2540 D; 23rd Edition, 2017	µ	**Shall pass 850 micron IS Sieve**	<850
33	Bio-assay Test	**Evaluating Acute Toxicity** IS 6582 (P-2) 2008	%	**90% survival of fish after 96 hours in 100% effluent**	98% Survival of Fish after 96 Hrs in 100% Effluent

CL – Colorless, ND – Not detected.

BDL (Below detection limit) Values :(Cu<0.02 mg/l , Mn<0.025 mg/l, C_6H_5OH<0.05mg/l, Hg<0.004mg/l, Cd<0.01 mg/l ,Se<0.001 mg/l, As<0.004 mg/l,Pb<0.02 mg/l, Zn<0.65 mg/l, Cr^{+6}<0.01 mg/l, Al<0.1 mg/l , B<0.1 mg/l, NO_3<1 mg/l)

Reviewed By

Approved By

Ref : Envlab/22/R-8315 ANNEXURE 2 **Date : 10.10.2022**

SURFACE WATER QUALITY ANALYSIS REPORT- SEPT-2022

1. Name of Client : **M/s FERRO ALLOYS CORPORATION LIMITED , BHADRAK**
2. Name of the Project : **KALARANGIATTA CHROMITE MINES , KALIAPANI, JAJPUR**
3. Sampling Location : **SW1:** Damsala Nallah Upstream Water (100 mtr Up)
   SW2: Damsala Nallah Downstream Water (100 mtr Down)
   (with impact of other mines discharge)
4. Method of Sampling **: APHA 1060 B**
5. **Date of Sampling : 22.09.2022**
6. Date of Analysis **: 23.09.2022 TO 29.09.2022**
7. Sample Collected by : VCSPL Representative in presence of Client's Representative

Sl. No	Parameter	Testing Method	Unit	Standards as per IS-2296:1992 Class –'C'	Analysis Results	
					SW-1	SW-2
1	Colour (max)	**Visual Comparison Method** APHA 23RD Ed,2017 : 2120 B, C	Hazen	**300**	<5	5
2	pH Value	**pH Meter** APHA 23RD Ed,2017 : 4500H^+ B	--	**6.0-9.0**	7.28	7.30
3	Suspended solids	**Gravimetric Method** APHA 23RD Ed,2017 : 2540 D	mg/l	--	76	81
4	Dissolved Oxygen (minimum)	**Modified Winkler Method** APHA 23RD Ed,2017 : 2540 C	mg/l	**4.0**	6.9	6.2
5	Turbidity	**Nephelometric Method** APHA 23RD Ed,2017: 2130 B	NTU	--	8.4	11.0
6	Chloride (max)	**Titrimetric Method** APHA 23RD Ed,2017: 4500Cl^- B	mg/l	**600**	8.1	11.2
7	Total Dissolved Solids	**Gravimetric Method** APHA 23RD Ed,2017: 2540 C	mg/l	**1500**	98	128
8	BOD (3) days at 27^0C (max)	IS 3025(P-44) : 1993 RA 2003	mg/l	**3.0**	BDL	BDL
9	Arsenic as As	**By AAS Method** APHA 23RD Ed,2017: 3114 B	mg/l	**0.2**	BDL	BDL
10	Lead as Pb(max)	**By AAS Method** APHA 23RD Ed,2017 3111 B	mg/l	**0.1**	BDL	BDL
11	Cadmium as Cd (max)	**By AAS Method** APHA 23RD Ed,2017: 3111 B	mg/l	**0.01**	BDL	BDL
12	Hexa Chromium as Cr^{+6}	**Diphenyl Carbazide Method** APHA 23RD Ed,2017: 3500Cr B	mg/l	**0.05**	BDL	BDL
13	Copper as Cu (max)	**By AAS Method** APHA 23RD Ed,2017: 3111 B	mg/l	**1.5**	BDL	BDL
14	Zinc as Zn(max)	**By AAS Method** APHA 23RD Ed,2017: 3111 B	mg/l	**15**	BDL	BDL
15	Selenium as Se (max)	**By AAS Method** APHA 23RD Ed,2017: 3500 Se C	mg/l	**0.05**	BDL	BDL
16	Cyanide as CN (max)	**Distillation followed by Spectophotometric Method** APHA 23RD Ed,2017: 4500 CN^- C,D	mg/l	**0.05**	BDL	BDL
17	Fluoride as F (max)	**Distillation followed by Spectrophotometric Method** APHA 23RD Ed,2017: 4500F^- C	mg/l	**1.5**	0.23	0.28
18	Sulphates (SO_4) (max)	**Turbidimetric Method** APHA 23RD Ed,2017: 4500 $SO4^{2-}$ E	mg/l	**400**	0.96	0.98

19	Phenolic Compounds as C_6H_5OH (max)	**Chloroform Extraction By Colorimetric Method** APHA 23RD Ed,2017: 5530 B,D	mg/l	**0.005**	BDL	BDL
20	Iron as Fe (max)	**By AAS Method** APHA 23RD Ed,2017: 3500Fe, B	mg/l	**0.5**	0.72	0.062
21	Nitrate as NO_3, (max)	**By UV-Screen Method** APHA 23RD Ed,2017: 4500 NO_3^- E	mg/l	**50**	3.1	3.7
22	Anionic Detergents (max)	**Anionic Surfactants as MBAS** APHA 23RD Ed,2017: 5540 C	mg/l	**1.0**	ND	ND
23	Total Coli form	**By Multiple Tube Fermentation Technique** APHA 23RD Ed,2017: 9221 B	MPN/ 100 ml	**5000**	1340	1520

CL – Colorless, ND – Not detected.

BDL (Below detection limit) Values :(Cu<0.02 mg/l , Mn<0.025 mg/l, C_6H_5OH<0.05mg/l, Hg<0.004mg/l, Cd<0.01 mg/l ,Se<0.001 mg/l, As<0.004 mg/l,Pb<0.02 mg/l, Zn<0.65 mg/l, Cr^{+6}<0.01 mg/l, Al<0.1 mg/l , B<0.1 mg/l, NO_3<1 mg/l)

Reviewed By

Approved By

ANNEXURE 3

Ref : Envlab/22/R-8319 **Date : 10.10.2022**

GROUND WATER LEVEL REPORT- SEP 2022

1. Name of Client : **M/s FERRO ALLOYS CORPORATION LIMITED , BHADRAK**
2. Name of the Project : **KALARANGIATTA CHROMITE MINES , KALIAPANI, JAJPUR**
3. Sample Collected by : VCSPL Representative in presence of Client's Representative

SL.No.	Locations	DOS	Unit	Analysis Result
1	Tube Well Water Near TISCO Main Gate	21.09.2022	mt/bgl	8.4
2	Tube Well Inside the Lease Hold Area	21.09.2022	mt/bgl	7.9
3	Open Well Water of Ransol	21.09.2022	mt/bgl	8.6
4	Tube Well Water of Kalarangiatta	21.09.2022	mt/bgl	7.3
5	Tube Well Water of Bhimtanagar	21.09.2022	mt/bgl	7.5
6	Open Well Village Goramian	21.09.2022	mt/bgl	7.7
7	Tube Well Near OMC Labour Colony	21.09.2022	mt/bgl	7.9
8	Open Well at Village Chingudipal	21.09.2022	mt/bgl	8.2
9	Open Well at Village Kusumundia	21.09.2022	mt/bgl	8.6

Reviewed By

Approved By

Ref : Envlab/22/R-8312 ANNEXURE 4 **Date : 10.10.2022**

GROUND WATER QUALITY ANALYSIS REPORT- SEPT 2022

1. Name of Client : **M/s FERRO ALLOYS CORPORATION LIMITED , BHADRAK**
2. Name of the Project : **KALARANGIATTA CHROMITE MINES , KALIAPANI, JAJPUR**
3. Sampling Location : **GW4:** Tube Well at Kalarngiatta Village
   GW5: Tube Well at Bhimta Nagar Village
4. Method of Sampling **: APHA 1060 B**
5. Date of Analysis **: 23.09.2022 to 28.09.2022**
6. Sample Collected by : VCSPL Representative in presence of Client's Representative

Sl. No.	Parameter	Testing Method	Unit	Standard as per IS -10500:2012 Amended on 2015 & 2018		Analysis Result	
						GW4	GW5
				Permissible Limit	Acceptable Limit	DOS: 22.09.2022	DOS: 22.09.2022
Essential Characteristics							
1	Colour	**Visual Comparison Method** APHA 23RD Ed,2017 : 2120 B, C	Hazen	**5**	**15**	<5	<5
2	Odour	**Threshold Odour Test** APHA 23RD Ed,2017 :2150 B	--	**Agreeable**	**Agreeable**	Agreeable	Agreeable
3	Taste	**Flavor Threshold Test** APHA 23RD Ed,2017 : 2160 C	--	**Agreeable**	**Agreeable**	Agreeable	Agreeable
4	Turbidity	**Nephelometric Method** APHA 23RD Ed,2017 :2130 B	NTU	**1**	**5**	1.6	1.9
5	pH Value at 25^0C	**pH Meter** APHA 23RD Ed,2017 : 4500H^+ B	--	**6.5-8.5**	**No Relaxation**	6.57	7.21
6	Total Hardness (as $CaCO_3$)	**EDTA Titrimetric Method** APHA 23RD Ed,2017 : 2340 C	mg/l	**200**	**600**	183	192
7	Iron (as Fe)	**By AAS Method** APHA 23RD Ed,2017 : 3111, B	mg/l	**1.0**	**No Relaxation**	0.52	0.44
8	Chloride (as Cl)	**Argentometric Method** APHA 23RD Ed,2017 : 4500Cl^- B	mg/l	**250**	**1000**	32	29
9	Residual, free Chlorine	**Iodometric Method** APHA 23RD Ed,2017 : 4500Cl, B	mg/l	**0.2**	**1**	0.20	0.24
Desirable Characteristics							
10	Dissolved Solids	**Gravimetric Method** APHA 23RD Ed,2017 : 2540 C	mg/l	**500**	**2000**	332	310
11	Calcium (as Ca)	**EDTA Titrimetric Method** APHA 23RD Ed,2017 : 3500Ca B	mg/l	**75**	**200**	65	52
12	Magnesium (as Mg)	**Calculation Method** APHA 23RD Ed,2017 : 3500Mg B	mg/l	**30**	**100**	28.2	24.3
13	Copper (as Cu)	**By AAS Method** APHA 23RD Ed,2017: 3111 B	mg/l	**0.05**	**1.5**	BDL	BDL
14	Manganese (as Mn)	**Persulfate Method** APHA 23RD Ed,2017: 3500Mn B	mg/l	**0.1**	**0.3**	BDL	BDL
15	Sulphate (as SO_4)	**Turbidimetric Method** APHA 23RD Ed,2017: 4500 $SO4^{2-}$ E	mg/l	**200**	**400**	29.7	26.4
16	Nitrate (as NO_3)	**By UV-Screen Method** APHA 23RD Ed,2017: 4500 NO_3^- E	mg/l	**45**	**No Relaxation**	8.0	7.8
17	Fluoride (as F)	**Distillation followed by Spectrophotometric Method** APHA 23RD Ed,2017: 4500F^- C	mg/l	**1.0**	**1.5**	0.28	0.23
18	Phenolic Compounds (as C_6H_5OH)	**Chloroform Extraction by Colorimric Method** APHA 23RD Ed,2017: 5530 B,D	mg/l	**0.001**	**0.002**	BDL	BDL
19	Mercury (as Hg)	**AAS Method** APHA 23RD Ed,2017: 3112 B	mg/l	**0.001**	**No Relaxation**	BDL	BDL
20	Cadmium (as Cd)	**AAS Method** APHA 23RD Ed,2017: 3111 B	mg/l	**0.003**	**No Relaxation**	BDL	BDL
21	Selenium (as Se)	**By AAS Method** APHA 23RD Ed,2017: 3500 Se C	mg/l	**0.01**	**No Relaxation**	BDL	BDL
22	Arsenic (as As)	**By AAS Method** APHA 23RD Ed,2017: 3114 B	mg/l	**0.01**	**No Relaxation**	BDL	BDL

23	Cyanide (as CN)	**Distillation followed by Spectophotometric Method** APHA 23RD Ed,2017: 4500 CN^- C,D	mg/l	**0.05**	**No Relaxation**	BDL	BDL
24	Lead (as Pb)	**By AAS Method** APHA 23RD Ed,2017 3111 B	mg/l	**0.01**	**No Relaxation**	BDL	BDL
25	Zinc (as Zn)	**By AAS Method** APHA 23RD Ed,2017: 3111 B	mg/l	**5**	**15**	BDL	BDL
26	Hexavalent chromium as Cr^{+6}	APHA 3500 Cr B	mg/l	**0.05**	**No Relaxation**	BDL	BDL
27	Anionic Detergents (as MBAS)	**Anionic Surfactants as MBAS** APHA 23RD Ed,2017: 5540 C	mg/l	**0.2**	--	BDL	BDL
28	Mineral Oil	**Partition-Gravimetric Method** APHA 23RD Ed,2017: 5520 B	mg/l	**0.5**	**No Relaxation**	BDL	BDL
29	Alkalinity	**Titration Method** APHA 23RD Ed,2017:2320 B	mg/l	**200**	**600**	212	172
30	Aluminium as(Al)	**AAS Method** APHA 23RD Ed,2017: 3111 D	mg/l	**0.03**	**0.2**	BDL	BDL
31	Boron (as B)	**Curcumin Method** APHA 23RD Ed,2017: 4500B, B	mg/l	**0.5**	**2.4**	BDL	BDL
32	Total Coliform as TC	**MPN Method** APHA 23RD Ed,2017 : 9221 b	MPN/ 100ml	Shall not be detectable in any 100ml sample	--	ND	ND

CL – Colorless, ND – Not detected.

BDL (Below detection limit) Values :(Cu<0.02 mg/l , Mn<0.025 mg/l, C_6H_5OH<0.05mg/l, Hg<0.004mg/l, Cd<0.01 mg/l ,Se<0.001 mg/l, As<0.004 mg/l,Pb<0.02 mg/l, Zn<0.65 mg/l, Cr^{+6}<0.01 mg/l, Al<0.1 mg/l , B<0.1 mg/l, NO_3<1 mg/l)

Reviewed By

Approved By

Ref : Envlab/22/R-8311 **Date : 10.10.2022**

GROUND WATER QUALITY ANALYSIS REPORT- SEPT 2022

1. Name of Client : **M/s FERRO ALLOYS CORPORATION LIMITED , BHADRAK**
2. Name of the Project : **KALARANGIATTA CHROMITE MINES , KALIAPANI, JAJPUR**
3. Sampling Location : **GW1:** Tube Well Near TISCO Main Gate
   GW2: Tube Well inside the Lease hold Area
   GW3: Open Well at Ransol Village
4. Method of Sampling **: APHA 1060 B**
5. Date of Analysis **: 23.09.2022 TO 28.09.2022**
6. Sample Collected by : VCSPL Representative in presence of Client's Representative

Sl. No.	Parameter	Testing Method	Unit	Standard as per IS -10500:2012 Amended on 2015 & 2018		Analysis Result		
						GW1	GW2	GW3
				Permissible Limit	Permissible Limit	DOS: 23.09.2022	DOS: 23.09.2022	DOS: 23.09.2022
Essential Characteristics								
1	Colour	**Visual Comparison Method** APHA 23RD Ed,2017 : 2120 B, C	Hazen	**5**	**15**	<5	<5	<5
2	Odour	**Threshold Odour Test** APHA 23RD Ed,2017 :2150 B	--	**Agreeable**	**Agreeable**	Agreeable	Agreeable	Agreeable
3	Taste	**Flavor Threshold Test** APHA 23RD Ed,2017 : 2160 C	--	**Agreeable**	**Agreeable**	Agreeable	Agreeable	Agreeable
4	Turbidity	**Nephelometric Method** APHA 23RD Ed,2017 :2130 B	NTU	**1**	**5**	2.2	2.6	2.5
5	pH Value at 25^0C	**pH Meter** APHA 23RD Ed,2017 : 4500H^+ B	--	**6.5-8.5**	**No Relaxation**	6.94	6.72	6.89
6	Total Hardness (as $CaCO_3$)	**EDTA Titrimetric Method** APHA 23RD Ed,2017 : 2340 C	mg/l	**200**	**600**	193	189	185
7	Iron (as Fe)	**By AAS Method** APHA 23RD Ed,2017 : 3111, B	mg/l	**1.0**	**No Relaxation**	0.24	0.26	0.25
8	Chloride (as Cl)	**Argentometric Method** APHA 23RD Ed,2017 : 4500Cl^- B	mg/l	**250**	**1000**	46	38	51
9	Residual, free Chlorine	**Iodometric Method** APHA 23RD Ed,2017 : 4500Cl, B	mg/l	**0.2**	**1**	ND	ND	ND
Desirable Characteristics								
10	Dissolved Solids	**Gravimetric Method** APHA 23RD Ed,2017 : 2540 C	mg/l	**500**	**2000**	311	279	307
11	Calcium (as Ca)	**EDTA Titrimetric Method** APHA 23RD Ed,2017 : 3500Ca B	mg/l	**75**	**200**	53.4	50.6	54.8
12	Magnesium (as Mg)	**Calculation Method** APHA 23RD Ed,2017 : 3500Mg B	mg/l	**30**	**100**	14.5	15.2	30.4
13	Copper (as Cu)	**By AAS Method** APHA 23RD Ed,2017: 3111 B	mg/l	**0.05**	**1.5**	BDL	BDL	BDL
14	Manganese (as Mn)	**Persulfate Method** APHA 23RD Ed,2017: 3500Mn B	mg/l	**0.1**	**0.3**	BDL	BDL	BDL
15	Sulphate (as SO_4)	**Turbidimetric Method** APHA 23RD Ed,2017: 4500 $SO4^{2-}$ E	mg/l	**200**	**400**	27	24	25
16	Nitrate (as NO_3)	**By UV-Screen Method** APHA 23RD Ed,2017: 4500 NO_3^- E	mg/l	**45**	**No Relaxation**	8.4	7.5	8.7
17	Fluoride (as F)	**Distillation followed by Spectrophotometric Method** APHA 23RD Ed,2017: 4500F^- C	mg/l	**1.0**	**1.5**	0.19	0.24	0.28
18	Phenolic Compounds (as C_6H_5OH)	**Chloroform Extraction by Colorimetric Method** APHA 23RD Ed,2017: 5530 B,D	mg/l	**0.001**	**0.002**	BDL	BDL	BDL
19	Mercury (as Hg)	**AAS Method** APHA 23RD Ed,2017: 3112 B	mg/l	**0.001**	**No Relaxation**	BDL	BDL	BDL
20	Cadmium (as Cd)	**AAS Method** APHA 23RD Ed,2017: 3111 B	mg/l	**0.003**	**No Relaxation**	BDL	BDL	BDL

21	Selenium (as Se)	**By AAS Method** APHA 23RD Ed,2017: 3500 Se C	mg/l	**0.01**	**No Relaxation**	BDL	BDL	BDL
22	Arsenic (as As)	**By AAS Method** APHA 23RD Ed,2017: 3114 B	mg/l	**0.01**	**No Relaxation**	BDL	BDL	BDL
23	Cyanide (as CN)	**Distillation followed by Spectophotometric Method** APHA 23RD Ed,2017: 4500 CN^- C,D	mg/l	**0.05**	**No Relaxation**	BDL	BDL	BDL
24	Lead (as Pb)	**By AAS Method** APHA 23RD Ed,2017 3111 B	mg/l	**0.01**	**No Relaxation**	BDL	BDL	BDL
25	Zinc (as Zn)	**By AAS Method** APHA 23RD Ed,2017: 3111 B	mg/l	**5**	**15**	BDL	BDL	BDL
26	Hexavalent chromium as Cr^{+6}	APHA 3500 Cr B	mg/l	**0.05**	**No Relaxation**	BDL	BDL	BDL
27	Anionic Detergents (as MBAS)	**Anionic Surfactants as MBAS** APHA 23RD Ed,2017: 5540 C	mg/l	**0.2**	--	BDL	BDL	BDL
28	Mineral Oil	**Partition-Gravimetric Method** APHA 23RD Ed,2017: 5520 B	mg/l	**0.5**	**No Relaxation**	BDL	BDL	BDL
29	Alkalinity	**Titration Method** APHA 23RD Ed,2017:2320 B	mg/l	**200**	**600**	170	204	211
30	Aluminium as(Al)	**AAS Method** APHA 23RD Ed,2017: 3111 D	mg/l	**0.03**	**0.2**	BDL	BDL	BDL
31	Boron (as B)	**Curcumin Method** APHA 23RD Ed,2017: 4500B, B	mg/l	**0.5**	**2.4**	BDL	BDL	BDL
32	Total Coli form as TC	**MPN Method** APHA 23RD Ed,2017 : 9221 b	MPN/ 100ml	Shall not be detectable in any 100ml sample	--	ND	ND	ND

CL – Colourless, ND – Not detected.

BDL (Below detection limit) Values :(Cu<0.02 mg/l , Mn<0.025 mg/l, C_6H_5OH<0.05mg/l, Hg<0.004mg/l, Cd<0.01 mg/l ,Se<0.001 mg/l, As<0.004 mg/l,Pb<0.02 mg/l, Zn<0.65 mg/l, Cr^{+6}<0.01 mg/l, Al<0.1 mg/l , B<0.1 mg/l, NO_3<1 mg/l)

Reviewed By

Approved By

Ref : Envlab/22/R-8320 **Date : 10.10.2022**

ANNEXURE 5

FUGITIVE EMISSION ANALYSIS REPORT- SEP 2022

1. Name of Client : **M/s FERRO ALLOYS CORPORATION LIMITED , BHADRAK**
2. Name of the Project : **KALARANGIATTA CHROMITE MINES , KALIAPANI, JAJPUR**
3. Sampling Location : **F1-** Near Mines Ore Plot Area
   F2- Near Office
4. Method of Sampling : IS 5182(P-5) 1975 RA 2014
5. Date of Sampling : 22.09.2022
6. Date of Analysis : 23.09.2022 TO 28.09.2022
7. Sample Collected by : VCSPL Representative in presence of Client's Representative

SL. No.	Test Parameters	Test Method	Unit	Analysis Result	
				F1	F2
1	Suspended Particulate Matter as SPM	IS 5182 (P-4)1999 RA 2014 Gravimetric Method	$\mu g/m^3$	239	310

Reviewed By

Approved By

ANNEXURE 6

MINE CALENDAR PLAN

PERIOD FROM APRIL 2022 TO SEPTEMBER 2022

EXCAVATION	PROPOSED	ACTUAL
ROM PRODUCTION (IN MT)	50000	49654
OVERBURDEN(M3)	391000	146342.04

Ref : Envlab/22/R-8252 **Date : 10.10.2022**

ANNEXURE 7

AMBIENT AIR QUALITY (CORE ZONE) MONITORING REPORT- SEPT 2022

9. Name of Client : **M/s FERRO ALLOYS CORPORATION LIMITED , BHADRAK**
10. Name of the Project : **KALARANGIATTA CHROMITE MINES , KALIAPANI, JAJPUR**
11. Monitoring Instruments : RDS (APM 460 BL), FPS (APM 550) Envirotech, CO Monitor, VOC Sampler
12. Sample Collected by : VCSPL Representative in presence of Client's Representative

Monitoring Date	PM_{10} (µg/m^3)	$PM_{2.5}$ (µg/m^3)	SO_2 (µg/m^3)	NO_x (µg/m^3)	CO (mg/m^3)	O_3 (µg/m^3)	NH_3 (µg/m^3)	C_6H_6 (µg/m^3)	Bap (ng/m^3)	Pb (µg/m^3)	Ni (ng/m^3)	As (ng/m^3)
	AAQMS-1: Near Office Building											
03.09.2022	65.2	40.8	8.8	13.9	0.49	BDL	BDL	BDL	BDL	BDL	BDL	BDL
07.09.2022	63.4	37.5	7.2	12.7	0.46	BDL	BDL	BDL	BDL	BDL	BDL	BDL
10.09.2022	64.7	38.4	7.6	13.4	0.45	BDL	BDL	BDL	BDL	BDL	BDL	BDL
14.09.2022	62.9	37.9	7.2	12.6	0.42	BDL	BDL	BDL	BDL	BDL	BDL	BDL
17.09.2022	66.7	40.4	7.9	13.8	0.48	BDL	BDL	BDL	BDL	BDL	BDL	BDL
21.09.2022	64.6	41.4	7.3	13.6	0.47	BDL	BDL	BDL	BDL	BDL	BDL	BDL
24.09.2022	64.9	40.9	7.2	12.8	0.46	BDL	BDL	BDL	BDL	BDL	BDL	BDL
28.09.2022	66.4	42.8	8.7	13.7	0.49	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Monthly Average	**64.9**	**40.0**	**7.7**	**13.3**	**0.47**	BDL	BDL	BDL	BDL	BDL	BDL	BDL
NAAQ Standard	100	60	80	80	4	100	400	5	01	01	20	06
Monitoring Date	PM_{10} (µg/m^3)	$PM_{2.5}$ (µg/m^3)	SO_2 (µg/m^3)	NO_x (µg/m^3)	CO (mg/m^3)	O_3 (µg/m^3)	NH_3 (µg/m^3)	C_6H_6 (µg/m^3)	Bap (ng/m^3)	Pb (µg/m^3)	Ni (ng/m^3)	As (ng/m^3)
	AAQMS-2: Near ETP											
03.09.2022	72.6	43.2	7.9	15.2	0.51	BDL	BDL	BDL	BDL	BDL	BDL	BDL
07.09.2022	69.5	41.8	7.6	14.4	0.48	BDL	BDL	BDL	BDL	BDL	BDL	BDL
10.09.2022	70.6	40.6	7.1	15.0	0.47	BDL	BDL	BDL	BDL	BDL	BDL	BDL
14.09.2022	67.8	37.2	6.9	14.7	0.44	BDL	BDL	BDL	BDL	BDL	BDL	BDL
17.09.2022	71.3	43.1	7.9	15.1	0.50	BDL	BDL	BDL	BDL	BDL	BDL	BDL
21.09.2022	69.4	41.9	7.7	14.9	0.47	BDL	BDL	BDL	BDL	BDL	BDL	BDL
24.09.2022	68.4	41.6	7.8	14.8	0.48	BDL	BDL	BDL	BDL	BDL	BDL	BDL
28.09.2022	71.4	43.5	7.9	15.4	0.50	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Monthly Average	**70.1**	**41.6**	**7.6**	**14.9**	**0.48**	BDL	BDL	BDL	BDL	BDL	BDL	BDL
NAAQ Standard	100	60	80	80	4	100	400	5	01	01	20	06
Testing Method	Gravimetric	Gravimetric	Improved West and Geake method	Modified Jacob & Hochheiser (Na-Arsenite)	NDIR Spectroscopy	Chemical Method	Indo Phenol Blue Method	Absorption & Desorption followed by GC	Solvent Extraction Followed by GC	AAS Method	AAS Method	AAS Method

BDL (Below Detection Limit) PM10 <20 µg/m^3, PM 2.5<10 µg/m^3, SO_2<4 µg/m^3, NO_2<6 µg/m^3, O_3<4 µg/m^3, NH_3<20 µg/m^3, C6H6<4 µg/m^3, Bap <0.5 ng/m^3, As < 1 ng/m^3, Ni < 2.5 ng/m^3, Pb <0.02 µg/m^3

Reviewed By

Approved By

Ref : Envlab/22/R- 8253 **Date : 10.10.2022**

AMBIENT AIR QUALITY (CORE ZONE) MONITORING REPORT- SEPT 2022

9. Name of Client : **M/s FERRO ALLOYS CORPORATION LIMITED , BHADRAK**
10. Name of the Project : **KALARANGIATTA CHROMITE MINES , KALIAPANI, JAJPUR**
11. Monitoring Instruments : RDS (APM 460 BL), FPS (APM 550) Envirotech, CO Monitor, VOC Sampler
12. Sample Collected by : VCSPL Representative in presence of Client's Representative

Monitoring Date	PM_{10} (µg/m^3)	$PM_{2.5}$ (µg/m^3)	SO_2 (µg/m^3)	NO_x (µg/m^3)	CO (mg/m^3)	O_3 (µg/m^3)	NH_3 (µg/m^3)	C_6H_6 (µg/m^3)	Bap (ng/m^3)	Pb (µg/m^3)	Ni (ng/m^3)	As (ng/m^3)
	AAQMS-3: Near Electrical Substation											
03.09.2022	71.3	42.6	8.6	18.3	0.55	BDL	BDL	BDL	BDL	BDL	BDL	BDL
07.09.2022	69.8	40.6	7.8	17.2	0.50	BDL	BDL	BDL	BDL	BDL	BDL	BDL
10.09.2022	70.8	41.8	7.6	17.7	0.53	BDL	BDL	BDL	BDL	BDL	BDL	BDL
14.09.2022	66.3	37.3	6.9	16.9	0.42	BDL	BDL	BDL	BDL	BDL	BDL	BDL
17.09.2022	71.6	43.5	8.7	18.1	0.55	BDL	BDL	BDL	BDL	BDL	BDL	BDL
21.09.2022	68.8	41.6	8.8	18.5	0.51	BDL	BDL	BDL	BDL	BDL	BDL	BDL
24.09.2022	68.6	42.2	7.6	17.3	0.50	BDL	BDL	BDL	BDL	BDL	BDL	BDL
28.09.2022	72.9	44.9	8.8	18.6	0.57	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Monthly Average	**70.0**	**41.8**	**8.1**	**17.8**	**0.52**	BDL	BDL	BDL	BDL	BDL	BDL	BDL
NAAQ Standard	100	60	80	80	4	100	400	5	01	01	20	06
Monitoring Date	PM_{10} (µg/m^3)	$PM_{2.5}$ (µg/m^3)	SO_2 (µg/m^3)	NO_x (µg/m^3)	CO (mg/m^3)	O_3 (µg/m^3)	NH_3 (µg/m^3)	C_6H_6 (µg/m^3)	Bap (ng/m^3)	Pb (µg/m^3)	Ni (ng/m^3)	As (ng/m^3)
	AAQMS-4: Near Weigh Bridge											
03.09.2022	70.8	43.2	9.4	14.6	0.55	BDL	BDL	BDL	BDL	BDL	BDL	BDL
07.09.2022	68.7	41.3	8.7	13.6	0.53	BDL	BDL	BDL	BDL	BDL	BDL	BDL
10.09.2022	67.2	40.7	8.2	14.1	0.51	BDL	BDL	BDL	BDL	BDL	BDL	BDL
14.09.2022	64.2	37.4	7.9	13.7	0.48	BDL	BDL	BDL	BDL	BDL	BDL	BDL
17.09.2022	71.2	44.6	9.1	14.8	0.56	BDL	BDL	BDL	BDL	BDL	BDL	BDL
21.09.2022	68.6	42.5	8.8	13.8	0.52	BDL	BDL	BDL	BDL	BDL	BDL	BDL
24.09.2022	67.9	43.3	8.6	13.6	0.54	BDL	BDL	BDL	BDL	BDL	BDL	BDL
28.09.2022	71.2	44.1	9.1	14.9	0.56	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Monthly Average	**68.7**	**42.1**	**8.7**	**14.1**	**0.53**	BDL	BDL	BDL	BDL	BDL	BDL	BDL
NAAQ Standard	100	60	80	80	4	100	400	5	01	01	20	06
Testing Method	Gravimetric	Gravimetric	Improved West and Geake method	Modified Jacob & Hochheiser (Na-Arsenite)	NDIR Spectroscopy	Chemical Method	Indo Phenol Blue Method	Absorption & Desorption followed by GC	Solvent Extraction Followed by GC	AAS Method	AAS Method	AAS Method

BDL (Below Detection Limit) PM10 <20 µg/m^3, PM 2.5<10 µg/m^3, SO_2<4 µg/m^3, NO_2<6 µg/m^3, O_3<4 µg/m^3, NH_3<20 µg/m^3, C6H6<4 µg/m^3, Bap <0.5 ng/m^3, As < 1 ng/m^3, Ni < 2.5 ng/m^3, Pb <0.02 µg/m^3

Reviewed By *Approved By*

Ref : Envlab/22/R- 8256 **Date :10.10.2022**

AMBIENT AIR QUALITY (BUFFER ZONE) MONITORING REPORT- SEPT 2022

17. Name of Client : **M/s FERRO ALLOYS CORPORATION LIMITED , BHADRAK**
18. Name of the Project : **KALARANGIATTA CHROMITE MINES , KALIAPANI, JAJPUR**
19. Monitoring Instruments : RDS (APM 460 BL), FPS (APM 550) Envirotech, CO Monitor, VOC Sampler
20. Sample Collected by : VCSPL Representative in presence of Client's Representative

Monitoring Date	PM_{10} ($\mu g/m^3$)	$PM_{2.5}$ ($\mu g/m^3$)	SO_2 ($\mu g/m^3$)	NO_x ($\mu g/m^3$)	CO (mg/m^3)	O_3 ($\mu g/m^3$)	NH_3 ($\mu g/m^3$)	C_6H_6 ($\mu g/m^3$)	Bap (ng/m^3)	Pb ($\mu g/m^3$)	Ni (ng/m^3)	As (ng/m^3)
	AAQMS-1: Near Village Bhimtanagar											
19.09.2022	**48.9**	**27.5**	**6.7**	**10.2**	**BDL**	**BDL**	**BDL**	**BDL**	**BDL**	**BDL**	**BDL**	**BDL**
AAQMS-2: Near Village Ransol												
19.09.2022	**45.7**	**26.3**	**7.2**	**13.1**	**BDL**	**BDL**	**BDL**	**BDL**	**BDL**	**BDL**	**BDL**	**BDL**
AAQMS-3: Near Kaliapani Township												
20.09.2022	**44.1**	**25.4**	**6.6**	**12.1**	**BDL**	**BDL**	**BDL**	**BDL**	**BDL**	**BDL**	**BDL**	**BDL**
AAQMS-4: Near Village Godisahi												
20.09.2022	**50.3**	**30.1**	**6.8**	**11.4**	**BDL**	**BDL**	**BDL**	**BDL**	**BDL**	**BDL**	**BDL**	**BDL**
AAQMS-5: Near Village Baragaji												
19.09.2022	**52.9**	**31.2**	**6.5**	**12.4**	**BDL**	**BDL**	**BDL**	**BDL**	**BDL**	**BDL**	**BDL**	**BDL**

Reviewed By

Approved By

Ref : Envlab/22/R- 8257 **Date :10.10.2022**

AMBIENT AIR QUALITY (BUFFER ZONE) MONITORING REPORT- SEPT 2022

21. Name of Client : **M/s FERRO ALLOYS CORPORATION LIMITED , BHADRAK**
22. Name of the Project : **KALARANGIATTA CHROMITE MINES , KALIAPANI, JAJPUR**
23. Monitoring Instruments : RDS (APM 460 BL), FPS (APM 550) Envirotech, CO Monitor, VOC Sampler
24. Sample Collected by : VCSPL Representative in presence of Client's Representative

Monitoring Date	PM_{10} ($\mu g/m^3$)	$PM_{2.5}$ ($\mu g/m^3$)	SO_2 ($\mu g/m^3$)	NO_x ($\mu g/m^3$)	CO (mg/m^3)	O_3 ($\mu g/m^3$)	NH_3 ($\mu g/m^3$)	C_6H_6 ($\mu g/m^3$)	Bap (ng/m^3)	Pb ($\mu g/m^3$)	Ni (ng/m^3)	As (ng/m^3)
	AAQMS-1: Near Village Bhimtanagar											
15.09.2022	**48.5**	**27.2**	**6.8**	**10.5**	**BDL**	**BDL**	**BDL**	**BDL**	**BDL**	**BDL**	**BDL**	**BDL**
AAQMS-2: Near Village Ransol												
15.09.2022	**44.8**	**26.8**	**7.5**	**13.3**	**BDL**	**BDL**	**BDL**	**BDL**	**BDL**	**BDL**	**BDL**	**BDL**
AAQMS-3: Near Kaliapani Township												
16.09.2022	**44.6**	**24.9**	**6.9**	**12.4**	**BDL**	**BDL**	**BDL**	**BDL**	**BDL**	**BDL**	**BDL**	**BDL**
AAQMS-4: Near Village Godisahi												
16.09.2022	**50.1**	**30.3**	**6.5**	**11.5**	**BDL**	**BDL**	**BDL**	**BDL**	**BDL**	**BDL**	**BDL**	**BDL**
AAQMS-5: Near Village Baragaji												
15.09.2022	**53.4**	**31.5**	**6.2**	**12.6**	**BDL**	**BDL**	**BDL**	**BDL**	**BDL**	**BDL**	**BDL**	**BDL**

Reviewed By

Approved By

Ref : Envlab/22/R-8318 ANNEXURE 8 **Date : 10.10.2022**

NOISE QUALITY ANALYSIS REPORT- SEPT 2022

1. Name of Client : **M/s FERRO ALLOYS CORPORATION LIMITED , BHADRAK**
2. Name of the Project : **KALARANGIATTA CHROMITE MINES , KALIAPANI, JAJPUR**
3. **Date of Sampling :22.09.2022**
4. Sample Collected : VCSPL Representative in presence of Client's Representative

Location ID	Location	Ambient	Result in dB (A)	
			Day Time (6.00 am to 10.00pm)	Night Time (10.00pm to 6.00 am)
N1	**Near Kaliapani bus stand**		55.2	53.7
N2	**At Kalarangi Village**		56.7	52.4
N3	**At Godisahi village**		57.1	53.8
N4	**At Chadeiragada village**		56.6	52.5
N5	**Naer to TATA hospital area**		55.1	50.7
N6	**At Tarini market, TATA mines chhak**		59.1	54.5
N7	**Near Ransol Village**		56.8	54.2

AMBIENT NOISE LEVEL STANDARD

Category Area/Zone	Limit in dB (A)	
	Day Time (6.00 am to 10.00pm)	Night Time (10.00pm to 6.00 am)
Industrial Area	75	70
Residential Area	55	45
Commercial Area	65	55
Silence Zone	50	40

Reviewed By

Approved by

ANNEXURE NO 9

Expenses for Environmental Protection Measures FY 2022-23(Till 30.09.2022) Kalarangiatta Chromite Mines		
Sl No	**ITEM**	**Expenses in Rs**
1	**Afforestation FY 2022-23 2520 nos. planted & Distributed 1100 nos.**	
a)	Seedling @70 each	176400.00
b)	Fertilizer/Insectiside/Cowdung @ 25 /plant176400(Only for inside Plantation)	63000.00
c)	Digging of Pits/Planting (Labor cost) @ 35	100800.00
d)	Post plantation care @ 120/ (Watering, Weeding, basin making)	302400.00
e)	Supervising	180000.00
	Sub-total	**822600.00**
2	**Water Management & Treatment**	
a)	ETP Operation & Maintenance	179906
b)	ETP Chemical cost (7966 Kg FeSo4,40 kg Nao, 46 Kg Polly)	130940
c)	Manpower for ETP operation & maintenance cost (Total Mondays 1581nos.)	940695
d)	Power Consumption (Total 32613 KWH)	189411
e)	ETP sludge Disposal	26466
f)	Water Sample Analysis	33728
g)	Water Tax	38058
h)	Water Abstraction charges	1660758
	Impact Assessment Study Ground water	650000
	Sub-total	**3849962**
3	**Dust Suppression & Air, Noise & Soil Monitoring**	
a)	Water sprinkling by water tanker 440 trips	222000
b)	Air Monitoring Charges	622617
c)	Noise level measurement	2217
d)	Soil sample analysis	8448
	Sub-total	**855282**
	G.TOTAL	**5527844**

ANNEXURE 10

OFFICE OF THE PRINCIPAL CHIEF CONSERVATOR OF FORESTS (WILDLIFE) & CHIEF WILDLIFE WARDEN, ODISHA

Government of Odisha, Forest, Environment & Climate Change Department

PRAKRUTI BHAWAN, PLOT NO.1459, SAHEED NAGAR, BHUBANESWAR- 751007
Phone: 0674-2602250, Website: www.wildlife.odisha.gov.in, Email: odishawildlife@gmail.com

No. 10180 / CWLW-FDWC-FD-0032-2022
Bhubaneswar, Dated the 11 November, 2022

To

The Director (Mines)
M/s FACOR Ltd.
Laxmi Bhawan, Kuans, Bhadrak – 756100

Sub: Mining of Chromite ore in Kalarangiatta Chromite Mines of M/s Ferro Alloys Corporation Limited in Jajpur District - Approval of Site Specific Wildlife Conservation Plan

Sir,

It is to intimate that you have to implement mitigation measures as per the Site Specific Wildlife Conservation Plan approved in compliance to Standard ToR No.(xviii) for Mining Project prescribed by SEIAA, Odisha in their letter No.3495/SEIAA dt 18.11.2021.

2. I am directed to convey the approval of PCCF (WL) & CWLW, Odisha for the Site Specific Wildlife Conservation Plan in respect of the above project at financial outlay of ₹150.52 lakh (Rupees one crore fifty lakh fifty-two thousand) only as detailed below -

Sl. No.	Name of the Division	Cost of approved activities
i	In project impact area in Cuttack Division	₹105.922 lakh
ii	In project impact area in Dhenkanal Division	₹35.118 lakh
iii	In project impact area in Keonjhar WL Division	₹9.480 lakh
	Total cost :	**₹150.520 lakh**

3. Activities in the project area will be executed by the project proponent under the guidance of DFO, Cuttack Division. A sum of ₹150.52 lakh only shall be deposited in State CAMPA fund only through e-portal (https://parivesh.nic.in/) for implementation of various activities within the project impact area by the Forest Department through concerned DFOs.

4. The following conditions may be noted for future compliance.
   a. If there would be need for Site Specific Wildlife Conservation Plan after expiry of the present plan period, the User agency will have to submit another such plan at least one year before the expiry of the existing Conservation Plan and deposit the amount upon its approval. In case of delay, it will be dealt as per law for violations of Forest (Conservation) Act, 1980 and Environment (Protection) Act, 1986.
   b. The user agency has to give an undertaking to bear the differential cost in case of enhancement of wage rate during implementation of the plan.

Yours faithfully

Encl: Copy of approved SSWLCP

Conservator of Forests (Wildlife)

P.T.O.

Memo No. 10181 /dt 11/11/2022

Copy forwarded for information and necessary action to the -

1. OSD-cum-Special Secretary to Government of Odisha, F,E &CC Department, Bhubaneswar with reference to that Department Memo.No.10F (Cons)228/2016/13770/F&E dt 27.07.2016.
2. PCCF & HoFF, Odisha with reference to F,E&CC Department Memo.No.13770/F&E dt 27.07.2016.
3. Regional Chief Conservator of Forests, Angul Circle with reference to Memo.No.6766 dt 13.10.2022 of DFO, Cuttack Division
4. Regional Chief Conservator of Forests, Baripada Circle with reference to this office Memo.No.8400 dt 19.09.2022
5. Divisional Forest Officer(s), Cuttack/ Dhenkanal/ Keonjhar WL Division alongwith copy of approved SSWLCP

Conservator of Forests (Wildlife)