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ESL STEEL LIMITED
(Formerly known as Electrosteel Steels Limited)

Date:27.05.2025

ESL-IOO/HSE/MoEF/25-26/01

To,
The Deputy Director General of Forests (C),
Ministry of Environment, Forest, and Climate Change,
Regional Office (Eastern Zone),
A/3, Chandrasekhar, Bhubaneswar – 751023

Sub: **Submission of Six-monthly EC compliance report for the Nadidihi Iron Ore Mines of M/s ESL Steel Limited for the period of 1st October 2024 to 31st March 2025 .**
Ref: - 1. Vesting Order, no 8469/ SM dated 22.10.2021., Bhubaneswar. issued by Govt of Odisha, Steel and Mines Department.

Sir

We hereby submitting the half yearly Environmental clearance compliance report of reference letter from MoEF and CC, New Delhi – J-11015/135/2012-IA-II (M) Dated 18.06.2019 Nadidihi Iron Ore Mine of M/S ESL Steel limited

Thanking you

Yours faithfully
For ESL Steel Limited

Mr Ulhas R Naik
Mine Manager
Nadidihi Iron Ore Mine

Copy to:
1. Zonal Office Kolkata, Central Pollution Control Board, South end Conclave, Block 502, 5th and 6th Floors, 1582 Razidanga Main Road, Kolkata, West Bengal 700107.
2. The Member Secretary, State Pollution Control Board, A/118, Nilakantha Nagar, Bhubaneswar, Odisha-751012.
3. The Regional Officer, State Pollution Control Board, Near Panposh Hockey Chawk,Rourkela, Sundargarh, Odisha-769004

ENVIRONMENT CLEARANCE COMPLIANCE STATUS –Nadidihi Iron Ore Mines.

Six Monthly Compliance report of Environmental Clearance for Nadidihi Iron Ore Mines , ESL Steel Ltd. for the period from- 1st October 2024 to 31st March'2025.

Reference letter from MoEF andCC, New Delhi- J-11015/135/2012-IA.II (M) dated: 18.06.2019.
Capacity- 9.0 MTPA of iron Ore Production.

Status- Operating Mine of 3.5 MTPA iron ore production.

A. Specific Conditions

Sr. No.	Specific Conditions	Status
1.	The enhance production shall be on pro-rata basis for the effective period of valid environment clearance herein. The PP shall ensure its compliance by getting concurrence in mining plan approved by concerned authority in this regard.	The mining activity is carried out as per IBM approved mining plan.
2.	The EC for expansion proposal (iron ore production from 5.3 million TPA (4.3 MTPA ROM Iron ore + 1.0 MTPA of low grade iron ore from old dump within lease area) to 9.0 million TPA (8.0 MTPA ROM + 1.0 MTPA of low grade iron ore from old dump within lease area)) shall be operational after submission of an undertaking through affidavit to MoEF and CC within 15 days of receipt of this letter, for compliance of all conditions prescribed herein.	The production is 2.52 Million tonne per annum as per approved mining plan .
3.	Project Proponent and Department of Steel and Mines, Govt. of Odisha shall ensure the implementation of recommendations of carrying capacity study report conducted by CSIR-NEERI w.r.t. mining proposal of Iron ore and/or manganese in the State of Odisha.	The applicable recommendations of NEERI are included in the specific condition of EC and responses are provided on the same
4.	Department of Steel and Mines, Govt. of Odisha should prepare 5 years regional plan for annual iron ore requirement from the state, which in turn shall be met from different mines/zones (e.g. Joda, Koira) in the state. Accordingly, sustainable annual production (SAP) for each zone/mine may be followed adopting necessary environmental protection measures.	5 years Regional Plan for annual Iron Ore Requirement is prepared by the Department of Steel andMines, Govt, of Odisha.
5.	Project Proponent shall construct the cement	The mine exit to main

	concrete road from mine entrance and exit to the main road with proper drainage system and green belt development along the roads and construction of road with minimum 300 inside the mine. This should be done within 1 year for existing mines and new mines should have it since the beginning. The Department of Steel and Mines, Govt. of Odisha should ensure the compliance and should not issue the Mining permits, if mine lease holder has not constructed proper cement concrete road as suggested. The EC for the expansion project shall be operated only after the compliance of the specific condition.	road is provided with Cement Concrete road and green belt is provided.
6.	The Committee observed that as per the recommendations of the NEERI report, the PP needs to do regular vacuum cleaning of all minerals carrying roads aiming at "zero dust re-suspension within 3 months". The EC for the expansion project shall be operated only after the compliance of the specific conditions.	The mineral carrying roads are washed with deployment of tankers for sprinkling and ensure dust suppresion
7.	Project Proponent shall monitor the environmental quality parameters as per EC and CTE/CTO conditions, and implementation of suggested measures for control of road dust and air pollution. Odisha State Pollution Control Board must ensure the compliance of CTE/CTO. Regional office of the MoEFandCC, Bhubaneswar shall monitor the compliance of the EC conditions. Regional Office of the Indian Bureau of Mines (IBM) shall monitor the compliance of mining plan and progressive mine closure plan. Any violation by mine lease holder may invite actions per the provisions of applicable Acts.	Environmental quality parameters are monitored on monthly basis based on EC / CTO conditions, reports are attached in Annexure 1. Various dust suppression measures as specified by PCB are adopted on the mines .
8.	Project Proponent shall ensure the compliance of Suggested Ore Transport Mode (SOTM) with association of the State Govt. of Odisha. All existing mines should ensure adoption of SOTM within next 5 years. New mines or mines seeking expansion should incorporate provision of SOTM in the beginning itself and should have system in place within next 5 years.	The transportation is carried out basis the available infrastructure in the area. Most of the transportation happened through Road Transport. Out of entire capacity of despatch 15 % is rail transport and rest is road transport (however rake

		availability remains a challenge)
9.	The State Govt. of Odisha shall ensure dust free roads in mining areas wherever the road transportation of mineral is involved. The road shoulders shall be paved with fence besides compliance with IRC guidelines. All the roads should have proper drainage system and apart from paving of entire carriage width, the remaining right of way should have native plantation (dust capturing species). Further, regular maintenance should also be ensured by the Govt. of Odisha. Progress on development of dust free roads, implementation of SOTM, increased use of existing rail network, development of additional railway network/conveyor belt/pipelines, etc. shall be submitted periodically to Regional office of the MoEFandCC.	Full cooperation will be provided from the PP side.
10.	Project Proponent shall develop the parking plazas for trucks with proper basic amenities/facilities inside the mine. This should be done within one year for existing mines and new mines should have since beginning.	We have dedicated parking place for mining trucks within the mines. For outbound trucks parking is available at Government Land outside the lease area. There is drinking water and eateries facility available at these places, it is under consideration to upgrade the facilities outside the lease which will also encourage the self-employment of stakeholders. There is no space within the mine lease for parking plaza as these are very old lease and the area is broken up
11.	Department of Steel and Mines shall ensure the construction of NH 215 as minimum 4 lane road with proper drainage system and plantation and subsequent regular maintenance of the road as per IRC guidelines. Construction of other mineral carrying roads with proper width and drainage system along with roadside plantation to be carried out. This shall be completed within 2 years.	Government of Odisha has constructed NH 215 as 4 lane road

12.	Regular vacuum cleaning of all mineral carrying roads aiming at "Zero Dust Re-suspension" shall be adopted by PWD/NHAI/Mine Lease Holders within a time period of 3 months for existing roads.	Dust suppression is done by the water sprinkling through mobile tankers hence there is zero dust.
13.	In case the total requirement of iron ore exceeds the suggested limit for that year, permission for annual production by an individual mine may be decided depending on approved EC capacity (for total actual dispatch) and actual production rate of individual mine during last year or any other criteria set by the State Govt., i.e. Dept. of Steel and Mines Dept. in consultation with IBM. RO should prepare in advance mine-wise annual production scenario so that demand for iron ore can be anticipated, and actual production/dispatch does not exceed the suggested annual production.	Mining is carried out as per approved mining plan.
14.	R and D studies towards utilization of low-grade iron should be conducted through research/academic institutes like IMMT Bhubaneswar, NMI Jamshedpur and concerned metallurgical departments in IITs, NITs, etc. targeting full utilization of low-grade iron (Fe content upto 45% by 2020 and upto 40% by 2025). LCA of whole process including environmental considerations should be done for techno-economic and environmental viability. RandD studies on utilization of mine wastewater having high concentration of Fe content for different commercial applications in industries such as cosmetics, pharmaceutical, paint industry should also be explored. Responsibility: IBM, Dept of Steel and Mines, Individual Mine Lease Holders	RandD studies towards utilization of low-grade iron ore was conducted through the IMMT, Bhubaneswar for iron ore having Fe content upto 45 %. Since Iron ore having Fe content between 40-45 % is considered as waste and it is auctioned mines so lessee don't have permission to handle / workings of old waste dump as per given EC so we will explore the same in future as per conditions and market feasibility. There is no waste water generated the mine pit water is reused for dust suppression, green belt etc
15.	Develop proper rail network in the Joda-Koira region for mining activities. Rail transport shall not only be pollution free mode but also will be much economical option for iron ore transport. The rail	The responsibility of developing the required infrastructure is with various government

	network and/or conveyor belt system upto public railway siding needs to be created. The total length of the conveyor belt system/rail network to be developed from mines to nearest railway sidings by 11 mines in Joda region is estimated to be about 64 km. In Koira region, total length of rail network/conveyor system for 8 mines (under SOTM 1and2) is estimated to be around 95 km. Develop a rail network connecting Banspani (Joda region) and Roxy railway sidings in Koira Region. Responsibility: Dept. of Steel and Mines, Govt. of Odisha and Concerned mines along with Indian Railways. Time period: Max 7 years (by 2025) The Dept. of Steel and Mines, Govt. of Odisha should follow up with the concerned departments and railways so that proposed proper rail network is in place by 2025.	agencies.
16.	State Govt. of Odisha shall make all efforts to ensure exhausting all the iron and manganese ore resources in the existing working mines and from disturbed mining leases/zones in Joda and Koira region. The criteria suggested shall be applicable while suggesting appropriate lease area and sustainable mining rate. Responsibility: Dept. of Steel and Mines, Govt. of Odisha	The responsibility of exhausting all the iron ore is with the Government of Odisha as per approved mining plan and MDPA the production is carried out
17.	**Mining operations/Process related:** Project proponent shall implement the following mitigation measures: 1. Appropriate mining process and machinery (viz. right capacity, fuel efficient) should be selected to carry out various mining operations that generate minimal dust/air pollution, noise, wastewater and solid waste e.g. drills should either be operated with dust extractors or equipped with water injection system. 2. After commencement of mining operation, a study should be conducted to assess and quantify emission load generation (in terms of air pollution, noise, wastewater and solid waste) from each of the mining activity	1. Appropriate Mining process according to IBM approved mining plan is carried out, excavators are selected based on hauling road fleets and also drills are operated with wet drilling system 2. The machinery equipment are maintained properly, and the fuel consumption is

	(including transportation) on annual basis. Efforts should be made to further eliminate/minimize generation of air pollution/dust, noise, wastewater, solid waste generation in successive years through use of better technology. This shall be ensured by respective mine lease holders. 3. Various machineries/equipment selected (viz. dumpers, excavators, crushers, screen plants etc.) and transport means should have optimum fuel/power consumption, and their fuel/power consumption should be recorded on monthly basis. Inspection and maintenance of all the machineries/equipment/transport vehicles should be followed as per manufacturer's instructions/recommended time schedule and record should be maintained by the respective mine lease holders. 4. Digital processing of the entire lease area using remote sensing technique should be carried out regularly once in 3 years for monitoring land use pattern and mining activity taken place. The extent of pit area excavated should also be demarcated based on remote sensing analysis. This should be done by ORSAC (Odisha Space Applications Centre, Bhubaneswar) or an agency of national repute or if done by a private agency, the report shall be vetted/authenticated by ORSAC, Bhubaneswar. Expenses towards the same shall be borne by the respective mine lease holders.	recorded on monthly basis the diesel quantity is monitored. 3. Various machineries/equipment selected (viz. dumpers, excavators, crushers, screen plants etc.) are inspected and maintained as per instructions 4. Digital processing of the entire lease area using remote sensing technique DGPS Drone survey is carried out every year by ORSAC empanelled / accredited agency M/s Geoid Resources Pvt. Ltd. This Drone survey data with land use pattern (demarcating the pit excavated area) is submitted to Indian Bureau of Mines (IBM) , Bhubaneswar on annual basis as per Rule-34A of MCDR-2021
18.	**Air Environment Related:** Project Proponent shall implement the following mitigation measures: 1. Fugitive dust emissions from all the sources should be controlled regularly on daily basis. Water spraying arrangement on haul roads, loading, and unloading and at other transfer points should be provided and properly maintained. Water fogging system	1. Dust suppression is done by water sprinklers on haul road, loading and unloading area regularly on daily basis also water

	to be used to minimize water consumption. Ensure that the ambient water quality parameters conform to the norms prescribed by the CPCB in this regard.	fogging system is installed
	2. The core zone of mining activity should be monitored on daily basis. Minimum 4 ambient air quality monitoring stations should be established in the core zone for SPM, PM10, PM2.5, SO2, NOx, and CO monitoring. Location of air quality monitoring stations should be decided based on the meteorological date, topographical features and environmentally and ecologically sensitive targets and frequency of monitoring should be undertaken in consultation with the State Pollution Control Board (based on Emission Load Assessment Study). The number of monitoring locations may be more for larger capacity mines and working in larger area. Out of 4 stations, one should be online monitoring station in the mines having more than 3 MTPA EC capacity.	2. The core zone, Near Mine office and Mines gate is monitored, all the 12 parameters including PM, 10, PM 25, SOx, NOx and CO monitoring is done and one CAAQMs is installed in core zone with additional to ambient air monitoring system
	3. Monitoring in buffer zone should be carried out by SPCB or through NABET accredited agency. Air quality parameters (SPM, PM10, PM2.5, SO2, NOx and CO) shall be regularly monitored at locations of nearest human habitation including schools and other public amenities located nearest to source of the dust generation as applicable.	3. The buffer zone is monitored through NABL accredited agency in 4 location Village Kenduhidi, Badipada, Jhrapani, Kasira, reports attached in Annexure 1
	4. Emissions from vehicles as well as heavy machinery should be kept under control and regularly monitored. Measures should be taken for regular maintenance of vehicles used in mining operations and in transportation of mineral.	4. Emission from vehicle and HEMM are maintained Pollution under control certificate are available and monitored
	5. The vehicles shall be covered with a tarpaulin and should not be overloaded. Possibility of closed container trucks should be explored for direct to destination movement of iron ore. Air quality monitoring at one location should also be carried out along the transport route within the	5. The vehicles are covered with tarpaulin and it is not

	mine (periodically near truck entry and exit gate) Responsibility: Individual mine lease holders and SPCB	overloaded, one ambient air monitoring is done at exit gate
19.	**Noise and Vibration related:** Project Proponent shall implement the following mitigation measures: 1. Blasting operation should be carried out only during daytime. Controlled blasting such as Nonel, should be practiced. The mitigation measures for control of ground vibrations and to arrest fly rocks and boulders should be implemented. 2. Appropriate 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. 3. Noise levels should be monitored regularly (on weekly basis) near the major sources of noise generation within the core zone. Date, time and distance of measurement also be indicated with the noise levels in the report. The data should be used to map the noise generation from different activities and efforts should be made to maintain the noise levels with the acceptable levels of CPCB (CPCB, 2000) 4. Vibration at various sensitive locations should be monitored at least once in a month and mapped for any significant changes due to successive mining operations. Responsibility: Individual mine lease holders	1. Blasting operations conducted only in day time. Controlled blasting technique is adopted to mitigate ground vibrations and arrest fly rocks. 2. Workers are provided with ear plugs in their PPE kit to control, noise that can affect human environment 3. Noise zone is monitored regular basis in Core and Buffer Zone also in work zone areas 4. No blasting was done during the reporting period
20.	**Water/wastewater related:** Project Proponent shall implement the following mitigation measures: 1. Mining operations should be restricted to above ground water table, and it should not intersect groundwater table. If enough resources are estimated below the ground water table, the same may be explored after conducting detailed geological studies by GSI and hydrogeological studies by CGWB or NIH or Institute of National repute and	1. A detailed comprehensive Hydrogeological report was prepared by CGWA accredited consultant and attached in the annexure 2

	ensuring that no damage to the land stability/water aquifer system shall happen. The details/outcome of such study may be reflected/incorporated in the EIA/EMP report of the mine appropriately.	
	2. Natural watercourse and /or water resources should not be obstructed due to any mining operations. Regular monitoring of the flow rate of the springs and perennial nallas should be carried out and records should be maintained. Regular monitoring of water quality of nallas and river passing through the mine lease area (upstream and downstream locations) should be carried out on monthly basis.	2. Natural water course exist with in the lease and water resources is not obstructed due to mining operations. Regular monitoring of upstream and downstream is done at karo river stream
	3. Regular monitoring of ground water level and its quality should be carried out within the mine lease area by establishing a network of existing wells and constructing new piezometers during the mining operation. The monitoring should be carried out on monthly basis.	3. Regular monitoring of ground water level is being carried out by piezometers – digital level recorder (piezometer), monitoring is done
	4. To optimize water requirement, suitable conservation measures to augment ground water resources in the area should be undertaken in consultation with Central Ground Water Board (CGWB)	4. A suitable ground water conservation are followed like harvesting rain water mine pits and part of its getting recharged
	5. Suitable rainwater harvesting measures on long term basis should be planned and implemented in consultation with CGWB, to recharge the ground water source. CGWB can prepare a comprehensive plan for the whole region.	5. Suitable all rainwater diverted in to mine pits, harvesting measures on long term basis will be planned and implemented in consultation with CGWB, to recharge the ground water source. CGWB can prepare a comprehensive plan for the whole region.
	6. Appropriate mitigation measures (viz. ETP, STP, garland drains, retaining walls, collection of runoff etc.) should be taken to prevent pollution of nearby river/other water bodies. Water quality monitoring study should be conducted by State Pollution Control Board to ensure quality of surface and ground water sources on regular basis. The study can be conducted through NABL/NABET approved water testing	6. Retaining wall of length 110 m and garland drain to

	laboratory. The report should be vetted by SPCB. 7. Industrial wastewater (workshop and wastewater from the mine) should be properly collected, treated in ETP to conform to the discharge standards applicable. 8. Oil and grease trap should be installed before discharge of workshop effluents. STP should be installed for the employees/colony, wherever applicable. 9. Mine lease holder should ensure that no silt originating due to mining activity is transported in the surface water course or any other water body. Appropriate measures for prevention and control of soil erosion and management of silt should be undertaken. Quantity of silt/soil generated should be measured on regular basis for its better utilization. 10. Erosion from dumps site should be protected by providing geo-textile matting or other suitable material, and thick plantation of native trees and shrubs should be carried out at the dump slopes. Dumps should be protected by retaining walls. 11. Trenches/garland drains should be constructed at the foot of dumps to arrest silt from being carried to water bodies. Adequate number of check dams should be constructed across seasonal/perennial nallahs (if any) flowing through the mine lease areas and silt be arrested. De-silting at regular intervals should be carried out and quantity should be recorded for its better utilization, after proper soil quality analysis. 12. The water so collected in the reservoir within the mine should be utilized for the sprinkling on haul roads, green belt development. 13. There should be zero wastewater discharge from the mine. Based on actual water withdrawal and consumption/utilization in	prevent run off and also monitoring is done on regular basis 7. As there is no workshop there is no waste water generated 8. Oil and grease will be required for ETP alone as there is no effluent and ETP is not required 9. Ensured that no silt originating due to mining activity is transported in the surface water course or any other water body as the silt is also a material it is been processed 10. Waste dump is protected by providing plantation. Retaining wall and garland drain is constructed along the toe of dump. As there is no dump finalized so geo-textile is not planned. Once dumps are finalized, same will be done 11. Trenches/garland drains constructed at the foot of dumps to arrest silt from being carried to water bodies. 12. Mine accumulated water is used for water sprinkling purpose, plantation activity etc 13. There is zero waste water discharge as the water discharged from mine pits is passed

	different activities, water balance diagram should be prepared on monthly basis and efforts should be made to optimize consumption of water per ton of ore production in successive years. Responsibility: Individual mine lease holders, SPCB and CGWB	through series of settling ponds and then discharged .
21.	**Land/soil/overburden related:** Project Proponent shall implement the following mitigation measures: 1. The topsoil should be temporarily stored at earmarked site(s) only and it should not be kept unutilized for long (not more than 3 years or as per provisions mentioned in the mine plan/scheme). The topsoil should be used for land reclamation and plantation appropriately. 2. Fodder plots should be developed in the non-mineralised area in lieu of use of grazing land, if any. 3. Overburden/low grade ore should be stacked at earmarked dump site(s) only and should not be kept active for long period. The dump height should be decided on case-to-case basis, depending on the size of the mine and quantity of waste material generated. However, slope stability study should be conducted for larger heights, as per IBM approved mine plan and DGMS guidelines. The OB dump should be scientifically vegetated with suitable native species to prevent erosion and surface run-off. In critical areas, use of geo-textiles should be taken for stabilization of dump. Monitoring and management of rehabilitated areas should continue until the vegetation becomes self-sustaining. Proper records should be maintained regarding species, their growth, area coverage etc. 4. Catch drains and siltation ponds of appropriate size should be constructed to arrest silt and sediment flows from mine operation, soil, OB and mineral dumps. The water so collected can be utilized for	1. Top soil not available in mine as all the area are already mined by previous lease 2. There is no non mineralized area in the mine lease 3. Overburden is dumped on the active dumps as per approved mining plan and regular survey of dump is carried to keep a check on any movement of material. The Ob dumps will be scientifically vegetated by using geo-textiles once the dump is finalized 4. Garland drains and settling ponds are constructed to arrest silt and sediment, Drains are constructed

	watering the mine area, roads, green belt development etc. The drains should be regularly de-silted, particularly after monsoon and should be maintained properly. Appropriate documents should be maintained. Garland drains of appropriate size, gradient and length should be constructed for mine pit, soil. OB and mineral dumps and sump capacity should be designed with appropriate safety margin based on long term rainfall data. Sump capacity should be provided for adequate retention period to allow proper settling of silt material. Sedimentation pits should be constructed at the corners of the garland drains and de-silted at regular intervals. 5. Backfilling should be done as per approved mining plan/scheme. There should be no OB dumps outside the mine lease area. The backfilled area should be afforested, aiming to restore the normal ground level. Monitoring and management of rehabilitated areas should continue till the vegetation is established and becomes self-generating. 6. Hazardous waste such as waste oil, lubricants, resin, and coal tar etc. should be disposed of as per provisions of Hazardous Waste Management Rules, 2016, as amended from time to time. Responsibility: Individual mine lease holders	for mine pit, dumps etc and before monsoon 5. Backfilling will be done as per approved mining plan/scheme. There is no OB dumps outside the mine lease area. The backfilled area will be afforested, aiming to restore the normal ground level as there is no backfilling area during the reporting period 6. Hazardous waste such as. Used oil generated is disposed of as per provisions of Hazardous Waste Management Rules, 2016,
22.	**Ecology/Biodiversity (Flora-Fauna) Related:** Project Proponent shall implement the following mitigation measures: 1. All precautionary measures should be taken during mining operation for conservation and protection of endangered fauna namely elephant, sloth bear etc. spotted in the study area. Action plan for conservation of flora and fauna should be prepared and implemented in consultation with the State Forest and Wildlife Department within the	1. Projects are taken as per Biodiversity Management plan. However, a site specific conservation plan was submitted by previous lessee

	mine lease area, whereas outside the mine lease area, the same should be maintained by State Forest Department. 2. Afforestation is to be done by using local and mixed species saplings within and outside the mining lease area. The reclamation and afforestation are to be done in such a manner like exploring the growth of fruit bearing trees which will attract the fauna and thus maintaining the biodiversity of the area. As afforestation done so far is very less, forest department needs to identify adequate land and do afforestation by involving local people in a time bound manner. 3. Green Belt development carried out by mines should be monitored regularly in every season and parameters like area under vegetation/plantation, type of plantation, type of tree species/grass species/scrubs etc., distance between the plants and survival rate should be recorded. 4. Green Belt is an important sink of air pollutants including noise, development of green cover in mining area will not only help reducing air and noise pollution but also will help improve the ecological conditions and prevent soil erosion to a greater extent. Further, selection of tree species for green belt should constitute dust removal/dust capturing plants since plants can act as efficient biological filters removing significant amounts of particulate pollution. Thus, the identified native trees in the mine area maybe encouraged for plantation. Tree species have small leaf area, dense hair on leaf surface (rough surface), deep channels on leaves should be included for plantation. 5. Vetiver plantation on inactive dumps may be encouraged as the grass species has high strength of anchoring besides medicinal value. 6. Details of compensatory afforestation done should be recorded and documented by respective forest divisions, and State Forest Department should present mine-wise annual status, along with mine-wise annual status, along with expenditure details. Responsibility: Individual mine lease holders and	2. Plantation is done within the lease to promote biodiversity according to mining plan yearly plantation is carried out, local species like Jamun and medicinal values species like Neem etc are planted 3. Green belt area is developed and monitored regularly based on survival rate and it is recorded 4. Green belt is done inactive dumps and also planned further when the dumps gets finalized and also plantation is done at safety zones that act as barrier for noise, light and reduce emission 5. As dumps are not finalized dumps are in working stage once finalized it will be complied 6. Full co-operation is given to Forest division

	State Forest and Wildlife Department.	
23.	**Socio-economic related:** Project Proponent shall implement the following mitigation measures: i) Public interaction should be done on regular basis and social welfare activities should be done to meet the requirements of the local communities. Further, basic amenities and infrastructure facilities like education, medical, roads, safe drinking water, sanitation, employment, skill development, training institute, etc should be developed to alleviate the quality of life of the people of the region. ii) Land outees and land losers/affected people, if any, should be compensated and rehabilitated as per the national/state policy on Resettlement and Rehabilitation. iii) The socio-economic development in the region should be focused and aligned with the guidelines/initiatives of Govt. Of India/NITI Aayog around prosperity, equality, justice, cleanliness, transparency, employment, respect to women, hope, etc. This can be achieved by providing adequate and quality facilities for education, medical and developing skills in the people of the region. District administration in association with mine lease holders should plan for "Samagra Vikas" of these blocks as well as other blocks of the district. While planning for different schemes in the region, the activities should be prioritized as per Pradhan Mantri Khanij Kshetra Kalyan Yojna (PMKKKY) notified by Ministry of Mines, Govt. Of India, vide letter no. 16/7/2017-M.VI (Part), dated September 16, 2015. Responsibility: District Administration and Individual Mine Lease Holders	1. Being complied. For holistic community development, various community development initiatives such us health care support, children wellbeing and education, Water and Sanitation, Skilling and Livelihood initiatives, community asset creation etc has been carried out,from since operation of the mines. Need based assessment survey has been completed and action plan is under implementation for community upliftment. 2. Not applicable as there is no affected people of land losers so compensation was not required 3. Complied as per the statutory guidelines.
24.	**Road Transport Related:** Project Proponent shall implement the following mitigation measures: i) All the mine lease holders should follow the suggested ore transport mode (SOTM), based on its EC capacity within next 5 years. ii) The mine lease holders should ensure construction of cement road of appropriate width	1. There is no rail capacity hence we have to depend on Road Transport for most volumes. Out of entire

	from and to the entry and exit gate of the mine. Further, maintenance of all the roads should be carried out as per requirement to ensure dust free road transport. iii) Transportation of ore should be done by covering the trucks with tarpaulin or other suitable mechanism so that no spillage of ore/dust takes place. Further, air quality in terms of dust, PM10 should be monitored near the roads towards entry and exit gate on regular basis and be maintained within acceptable limits. Responsibility: Individual Mine Lease Holders and Dept. of Steel and Mines	capacity of dispatch 15 % is rail transport (Conditon applied: Rail transport is available) and rest is road transport. As there is no rail network constructed for the full capacity, once the rail network is in place, it will be complied. 2. Construction of Cement road is done at the exit gate of the mine maintenance of the road is done by sprinkling water for dust suppression 3. Transportation of ore is done by truck covered by tarpaulin and Ambient Air monitoring is done ta exit gate
25.	**Occupational Health Related:** Project Proponent shall implement the following mitigation measures: i) 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 periodically. ii) Occupational health surveillance program for all the employees/workers (including casual workers) should be undertaken periodically (on annual basis) to observe any changes due to exposure to dust, and corrective measures should be taken immediately, if needed. iii) Occupational health and safety measures related awareness programs including identification of work-related health hazard, training on malaria eradication, HIV and health effects on exposure to mineral dust, etc should be carried out for all the	1. Personnel working in the mine are provided protective respiratory devices and are made educated on safety and health aspects periodically by in house training. 2. OHS programme of the workers are undertaken periodically by team of professional doctors engaged. 3. Periodical health monitoring is done by doctor through conducting health camps every month.

	workers on regular basis. A full-time qualified doctor should be engaged for the purpose. Periodic monitoring (on 6 monthly basis) for exposure to respirable minerals dust on the workers should be conducted and record should be maintained, including health record of all the workers. Review of impact of various health measures undertaken (at an interval of 3 years or less) should be conducted followed by follow-up of actions, wherever required. Occupational health centre should be established near mine site itself. Responsibility: Individual mine lease holders and District Administration (District Medical Officer)	Dispensary was set up with qualified doctor and paramedical staff The summary report for occupational Health check is atachd in Annexure 3

Sr. No.	Standard Conditions	Status
I.	**Statutory Compliance**	
1)	This Environment Clearance (EC) is subject to orders/judgement of Hon'ble Supreme Court of India, Hon'ble High Court, Hon'ble NGT and any other Court of Law, Common Cause Conditions as may be applicable.	Implemented by Govt of Odisha
2)	This EC is valid upto 31.03.2071 as the lease validity is valid upto 31st March 2071 as per the Ammended MMDR Act, 2015	Noted it will be complied
3)	The Project Proponent complies with all the statutory requirements and judgement of Hon'ble Supreme Court dated August 2nd, 2017, in Writ Petition (Civil) no. 114 of 2014 in matter of Common Cause versus Union of India and Ors. before commencing the mining operations.	Complied and all the statutory documents are renewed on timely basis
4)	The State Government concerned shall ensure that mining operation shall not be commenced till the entire compensation levied, if any, for illegal mining paid by the Project Proponent through their respective Department of Mining and Geology in strict compliance of Judgement of Hon'ble Supreme Court dated 2nd August 2017 in Writ Petition (Civil) no. 114 of 2014 in matter of Common Cause versus Union of India and Ors.	The mining operation does not have any compensation and hence mining operation is started
5)	This Environmental Clearance shall become operational only after receiving formal NBWL Clearance from MoEFandCC after the	NBWL is not applicable for the mine

	recommendations of the Standing Committee of National Board for Wildlife, if applicable to the Project.	
6)	This Environmental Clearance shall become operational only after receiving formal Forest Clearance (FC) under the provision of Forest Conservation Act, 1980, if applicable to the project.	Complied by the previous lessee FC is obtained with reference to file no F.No.8-97/2008-FC
7)	Project Proponent (PP) shall obtain Consent to Operate after Grant of EC and effectively implement all the conditions stipulated therein. The mining activity shall not commence prior to obtaining Consent to Establish/Consent to Operate from the concerned State Pollution Control Board/ Committee.	Consent to operate is obtained by PP with reference no 6503/IND - CON-2266 Dated 28.03.2025
8)	The PP shall adhere to the provision of the Mines Act, 1952, Mines and Mineral (Development and Regulation), Act, 2015 and rules and regulations made there under. PP shall adhere to various circulars issued by Directorate General Mines Safety (DGMS) and Indian Bureau of Mines from time to time.	Mines Act and MMDR act is adhered and various circulars issued by Directorate General Mines Safety (DGMS) and Indian Bureau of Mines from time to time.
9)	The Project Proponent shall obtain consents from all the concerned landowners, before start of mining operations, as per the provisions of MMDR Act, 1957 and rules made there under in respect of lands which are not owned by it.	The mine was got from auction hence there is no concerned landowner vesting order is there
10)	The Project Proponent shall follow the mitigation measures provided in MoEFCC's Office Memorandum No. Z-11013/57/2014-IA.II (M), dated 29th October, 2014, titled "Impact of Mining activities on Habitations- Issues related to the Mining Projects wherein Habitations and villages are the part of mine lease areas in Habitations and villages are surrounded by the mine lease area."	According to the memorandum best mining practices are adopted as per approved mining plan, no water bodies are disturbed, illuminance and noise level are within the limit during night hours, as there is no permanent haul road it is not feasible for fixed water sprinklers instead mobile water tankers are used, transportation is carried on bypass roads
11)	The Project Proponent shall obtain necessary prior permission of the competent authorities for drawl of requisite quantity of surface water and from CGWA for withdrawal of ground water for the project.	Permission from CGWA in under process, applied for renewal

12)	A copy of EC letter will be marked to concerned Panchayat/local NGO etc. if any, from whom suggestion/representation has been received while processing the proposal.	Complied by the previous lease
13)	State Pollution Control Board/Committee shall be responsible for display of this EC letter at its Regional office, District Industries Centre and Collector's office /Tehsildar's Office for 30 days	Complied by the state govt
14)	The Project Authorities should widely advertise about the grant of this EC letter by printing the same in at least two local newspapers, one of which shall be in vernacular language of the concerned area. The advertisement shall be done within 7 days of the issue of the clearance letter mentioning that the instant project has been accorded EC and copy of the EC letter is available with the State Pollution Control Board/Committee and website of the Ministry of Environment, Forest and Climate Change (www.parivesh.nic.in). A copy of the advertisement may be forwarded to the concerned MoEFCC Regional Office for compliance and record.	Complied by previous lease
15)	PP shall inform the MoEFandCC for any change in ownership of the mining lease. In case there is any change in ownership or mining lease is transferred than mining operation shall only be carried out after transfer of EC as per provisions of the para 11 of EIA notification, 2006 as amended from time to time.	As we are operating with the vesting order Change of ownership is in progress
II.	**Air quality monitoring and preservation**	
16)	The Project Proponent shall install a minimum of 3 online Ambient Air Quality Monitoring Stations with 1 in upwind and 2 in downwind direction based on long term climatological data about wind direction such that an angle of 120 degrees is made between the monitoring locations to monitor critical parameters, relevant for mining operations, of air pollution viz. PM10, PM2.5, NO2, CO and SO2 etc. as per the methodology mentioned in NAAQS Notification No. B-29016/20/90/PCI/I dated 18.11.2009 covering the aspects of transportation and use of heavy machinery in the	Since presently the mine is producing less than 3 MPTA iron ore per annum, we are carry out ambient air monitoring through manual sampling mode. As per renewed CTO recommendation one CAAQMS was mentioned and the same is installed in our mine and the data are displayed at mine entrance

	impact zone. The ambient air quality shall also be monitored at prominent places like office building, canteen etc. as per the site condition to ascertain the exposure characteristics at specific places. The above data shall be digitally displayed within 03 months in front of the main gate of the mine site.	
17)	Effective safeguard measures for prevention of dust generation and subsequent suppression (like regular water sprinkling, metalled road construction etc.) shall be carried out in areas prone to air pollution wherein high levels of PM10 and PM2.5 are evident such as haul road, loading and unloading point and transfer points. The fugitive dust emissions from all sources shall be regularly controlled by installation of required equipment/machineries and preventive maintenance. Use of suitable water-soluble chemical dust suppressing agents may be explored for better effectiveness of dust control system. It shall be ensured air pollution level conform to the standards prescribed by the MoEFF/Central Pollution Control Board.	For prevention of dust generation and subsequent suppression water sprinkling is be carried out in areas prone to air pollution where in high level of pm10 and pm 2.5 are evident and dry mist canon system in installed dry fog system is also installed to reduce water consumption with dust suppression
III.	**Water quality monitoring and preservation**	
18)	In case, immediate mining scheme envisages intersection of ground water table, then Environmental Clearance shall become operational only after receiving formal clearance from CGWA. In case, mining operation involves intersection of ground water table at a later stage, then PP shall ensure that prior approval from CGWA and MoEFCC is in place before such mining operations. The permission for intersection of ground water table shall essentially be based on detailed hydrogeological study of the area.	A detailed comprehensive hydrogeological report was prepared by CGWA accredited consultant and attached in Annexure 2
19)	Regular monitoring of the flow rate of the springs and perennial nallahs flowing in and around the mine lease shall be carried out and records maintained. The natural waterbodies and or streams which are flowing in and around the village, should not be disturbed. The Water Table should be nurtured so as not to go down below the pre-mining period. In case of any water scarcity in the area, the PP has to provide water to the	The natural water bodies or streams are not disturbed. The ground water table is monitored by Digital water level recorder (piezometer) also the ground water level is manually monitored Till now there is no water scarcity recorded in the area

	villagers for their use. A provision for regular monitoring of water table in open dug wall located in village should be incorporated to ascertain the impact of mining over ground water table. The Report on changes in Ground Water level and quality shall be submitted on 6-monthly basis to the Regional Office of the Ministry, CGWA and State Groundwater Department/State Pollution Control Board.	
20)	The Project Proponent shall regularly monitor and maintain records wrt ground water level and quality in and around the mine lease by establishing a network of existing wells as well as new piezometer installations during the mining operations in consultation with Central Ground Water Authority/ State Ground Water Department. The Report on changes in Ground water level and quality shall be submitted on 6-monthy basis to the Regional Office of the Ministry, CGWA and State Groundwater Department/ State Pollution Control Board.	Complied as per CGWA conditions. The ground water level is recorded by Digital water level recorder (piezometers) system inside the mine premises and the ground water quality is monitored by NABL accredited laboratory
21)	The PP shall undertake regular monitoring of natural water course/water resources/springs and perennial nallahs existing/flowing in and around the mine lease and maintain its records. The project proponent shall undertake regular monitoring of water quality upstream and downstream of water bodies passing within and nearby/adjacent to the mine lease and maintain its records. Sufficient number of gullies shall be provided at appropriate places within the lease for management of water. PP shall carry out regular monitoring wrt pH and include their water quality vis-à-vis suitability for usage as per CPCB criteria and flow rate. It shall be ensured that no obstruction and/or alteration be made to water bodies during mining operations without justification and prior approval of MoEFCC. The monitoring of water courses/bodies existing in lease area shall be carried out four times in a year viz. pre monsoon (April-May), monsoon (August), post-monsoon (November) and winter (January) and the record of monitored data may be sent	The Karo river water at upstream and downstream is monitored on monthly basis and reports are attached as per Annexure 1 as Karo river is adjacent to the mine and ground water is also monitored monthly once as per CPCB guidelines and the report are attached in Annexure 1

	regularly to Ministry of Environment, Forest and Climate Change and its Regional Office, Central Ground Water Authority and Regional Director, Central Ground Water Board, State Pollution Control Board and Central Pollution Control Board. Clearly showing the trend analysis on 6-monthly basis.	
22)	Quality of polluted water generated from mining operations which include Chemical Oxygen Demand (COD) in mines run-off; acid mine drainage and metal contamination in runoff shall be monitored along with Total Suspended Solids (TSS). The monitored data shall be uploaded on the website of the company as well as displayed at the project site in public domain, on a display board, at a suitable location near the main gate of the Company. The circular no. J-20012/1/2000-IA.II (M) dated 27.05.2009 issued by Ministry of Environment, Forest and Climate Change may also be referred in this regard.	There is no polluted water , only the discharge water quality is maintained and quality monitored regularly, TSS, TDS, pH, COD, BOD and other parameters are monitored
23)	Project Proponent shall plan, develop and implement rainwater harvesting measures on long term basis to augment groundwater resources in the area in consultation with Central Ground Water Board/State Groundwater Department. A report on amount of water recharged needs to be submitted to Regional Office MoEFCC annually.	Existing pits are used as a Rainwater harvesting measures to recharge the ground water.
24)	Industrial wastewater (workshop and wastewater from the mine) should be properly collected and treated so as to conform to the notified standards prescribed from time to time. The standards shall be prescribed through CTO and issued by SPCB. The workshop effluent shall be treated after its initial passage through oil and grease trap.	Industrial workshop is not inside the mine lease as hence there is no waste water generated
25)	The water balance/water auditing shall be carried out and measured for reducing the consumption of water shall be taken up and reported to the Regional Office of the MoEFFandCC and State Pollution Control Board/Committee.	Action plan and taken for reduce water consumption, monthly MIS is tracked for water consumption
IV.	**Noise and vibration monitoring and prevention**	
26)	The peak particle velocity at 500m distance or within the nearest habitation, whichever is closer shall be monitored periodically as per applicable	PPV at a 500m distance or within the nearest habitation is maintained as per DGMS Guideline.

	DGMS guidelines	
27)	The illumination and sound at night at project sites disturb the villages in respect to both human and animal population. Consequent sleeping disorders and stress may affect the health in the villages located close to mining operations. Habitations have a right for darkness and minimal noise levels at night. PPs must ensure that the biological clock of the villages is not disturbed; by orienting the floodlights/masks away from the villagers and keeping the noise levels well within the prescribed limits for day/night hours.	Complied as per DGMS standard and noise monitoring is done monthly once the value is under the limit prescribed by SPCB/ All the lights which are installed in the mine are focused towards working mine pit hence it does not reach to the village side also the safety zone area acts as a barrier for noise and lights
28)	The PP shall take measures for control of noise levels below 85 dbA in the work environment. The workers engaged in operations of HEMM, etc should be provided with ear plugs/muffs. All personnel including laborers working in dusty areas shall be provided with protective respiratory devices along with adequate training, awareness and information on safety and health aspects. The PP shall be held responsible in case it has been found that workers/personnels/labourers are working without personal protective equipment.	Necessary precautions is in place to prevent the noise pollution, workers are provided with ear plugs in PPE kit and also saplings are planted in safety zone area as a barrier
V.	**Mining Plan**	
29)	PP shall adhere to the working parameters of mining plan which was submitted at the time of EC appraisal wherein year-wise plan was mentioned for total excavation i.e. quantum of mineral, waste, overburden, interburden and topsoil, etc. No change in basic mining proposal like mining technology, total excavation, mineral and waste production, lease area and scope of working, viz. method of mining, overburden and dump management, OB and dump mining, mineral transportation mode, ultimate depth of mining etc.) shall not be carried out without prior approval of Ministry of Environment, Forest and Climate Change, which entail adverse environmental impacts, even if it is a part of approved mining plan modified after grant of EC or granted by State Govt. in the form to Short Term Permit (STP), Query license or any other name.	Complied as per Approved Mining Plan issued by the IBM, Bhubaneswar. No change has been made in mining proposal like mining technology, excavation, waste production
30)	The PP shall get the Final Mine Closure Plan along	Will be complied during mine

	with Financial Assurance approved from Indian Bureau of Mines/ Department of Mining and Geology as required under the provision of the MMDR Act, 1957 and Rules/Guidelines made there under. A copy of approved mine closure plan shall be submitted within 2 months of the approval of the same from the competent authority to the Regional Office of the Ministry of Environment, Forest and Climate Change for record and verification.	closure as per Approved Mining Plan issued by the IBM, Bhubaneswar under the provision of MMDR ACT 1957
31)	The land use of the mine lease area at various stages of mining scheme as well as the end of life shall be governed as per the approved Mining Plan. The excavation vis-à-vis backfilling in the mine lease area and corresponding afforestation to be raised in the reclaimed area shall be governed as per approved mining plan. PP shall ensure the monitoring and management of rehabilitated areas until the vegetation becomes self-sustaining. The compliance status shall be submitted half-yearly to the MoEFCC and its concerned Regional Office.	The land use of the mine lease area at various stages of mining scheme as well as the end of life is governed as per the approved Mining Plan. The excavation vis-à-vis backfilling in the mine lease area and corresponding afforestation is raised in the reclaimed area is governed as per approved mining plan. The land use status is attached in Annexure 4
32)	The O.B. generated during the mining operations shall be stacked at earmarked OB dump site(s) only and it should not be kept active for a long period of time. The physical parameters of the OB dumps like height, width and angle of slope shall be governed as per the approved Mining Plan as per the guidelines/circulars issued by DGMS wrt safety in mining operations shall be strictly adhered to maintain the stability of topsoil/OB dumps. The topsoil shall be used for land reclamation and plantation.	The O.B. generated during the mining operations is stacked at OB dump. The physical parameters of the OB dumps like height, width and angle of slope is governed as per the approved Mining Plan as per the guidelines/circulars issued by DGMS wrt safety in mining operations is adhered to maintain the stability of OB dumps.
33)	The reject/waste generated during the mining operations shall be stacked at earmarked waste dump site(s) only. The physical parameters of the waste dumps like height, width and angle of slope shall be governed as per the approved Mining Plan as per the guidelines/circulars issued DGMS w.r.t. safety in mining operations shall be strictly adhered to maintain the stability of waste dumps.	The waste / reject generated is stacked at waste dump and physical parameter like height, width and angle of slope is maintained as per DGMS
34)	The reclamation of waste dump sites shall be done in scientific manner as per the Approved Mining Plan cum Progressive Mine Closure Plan	As the dumps are not finalized they are active dumps hence it is on process

35)	The slope of dumps shall be vegetated in scientific manner with suitable native species to maintain the slope stability, prevent erosion and surface run off. The selection of local species regulates local climatic parameters and help in adaptation of plant species to the microclimate. The gullies formed on slopes should be adequately taken care of as it impacts the overall stability of dumps. The dump mass should be consolidated with the help of dozers/compactors thereby ensuring proper filling/levelling of dump mass. In critical areas, use of geo textiles/geo membranes/ clay liners/ bentonite etc. shall be undertaken for stabilization of the dump.	As the dumps are not finalized they are active dumps once it is not finalized it will be vegetated in scientific manner of local species, once the dumps are not finalized laying of geo-textile will be done
36)	The PP shall carry out slope stability study in case the dump height is more than 30 m. The slope stability report shall be submitted to concerned regional office of MoEFandCC.	Slope stability test/study is done by CSIR-CIMFR and slope stability test/study for pit and dump is done by CSIR-CIMFR and reports are attached in Annexure 5
37)	Catch drains, settling tanks and siltation ponds of appropriate size shall be constructed around the mine working, mine yards and topsoil/OB/waste dumps to prevent runoff of water and flow of sediments directly into the water bodies (nallah/river/pond etc.). The collected water should be utilized for watering the mine area, roads, green belt development, plantation etc. The drains/sedimentation sumps etc. shall be de-silted regularly, particularly after monsoon season, and maintained properly.	Settling ponds and check dams are constructed along with retaining wall at toe of dump and garland drain at benches to prevent run off water and collected in pits to be reused
38)	Check dams of appropriate size, gradient and length shall be constructed around mine pit and OB dumps to prevent storm run-off and sediment flow into adjoining water bodies. A safety margin of 50% shall be kept for designing of sump structures over and above peak rainfall (based on 50 years data) and maximum discharge in the mine and its adjoining area which shall also help in providing adequate retention time thereby allowing proper settling of sediments/silt material. The sedimentation pits/sumps shall be constructed at the corners of the garland drains.	Check dams are in place and every pre-monsoon the check dam, settling ponds are desilted and maintained regularly
39)	The topsoil, if any, shall temporarily be stored at earmarked site(s) within the mine lease only and	As there is no top soil because it is a brownfield mine as the top soil is

	should not be kept unutilized for long. The physical parameters of the topsoil dumps like height, width and angle of slope shall be governed as per the approved Mining Plan and as per the guidelines framed by DGMS wrt safety in mining operations shall be strictly adhered to maintain the stability of dumps. The topsoil shall be used for land reclamation and plantation purpose.	handled by previous lease
VII.	**Transportation**	
40)	No transportation of the minerals shall be allowed in case of roads passing through villages/habitations. In such cases, PP shall construct a 'bypass' road for the purpose of transportation of the minerals leaving an adequate gap (say at least 200 m) so that the adverse impact of sound and dust along with chances of accidents could be mitigated. All costs resulting from widening and strengthening of existing public road network shall be borne by the PP in consultation with Nodal State Govt. Department. Transportation of minerals through road movement in case of existing village/rural roads shall be allowed in consultation with nodal State Govt. Department only after required strengthening such that the carrying capacity of roads increased to handle the traffic load. The pollution due to transportation load on the environment will be effectively controlled and water sprinkling will also be done regularly. Vehicular emissions shall be kept under control and regularly monitored. Project should obtain Pollution Under Control (PUC) certificate for all the vehicles from authorized pollution testing centers.	Transportation of mineral is done on bypass roads there is no roads passing though village / habitations. Vehicular emissions is kept under control and regularly monitored of Pollution Under Control (PUC) certificate and also water sprinkling is done in mine and exit gate for dust supppresiion
41)	The main haulage road within the mine lease should be provided with a permanent water sprinkling arrangement for dust suppression. Other roads within the mine lease should be wetted regularly with tanker-mounted water sprinkling system. The other areas of dust generation like crushing zone, material transfer points, material yards, etc. should invariably be provided with dust suppression arrangements. The air pollution	As there is no permanent or main haul road in the mine it is not feasible for fixed haul sprinklers, water is sprinkled via mobile tankers and areas like crushing plants are provided with sprinkling system

	control equipments like bag filters, vacuum suction hoods, dry fogging system etc. shall be installed at crushers, belt conveyors and other areas prone to air pollution. The belt conveyor should be fully covered to avoid generation of dust while transportation. PP shall take necessary measures to avoid generation of fugitive dust emissions.	
VIII.	**Green Belt**	
42)	The Project Proponent shall develop Green Belt in 7.5m wide safety zone all along. The mine lease boundary as per the guidelines of CPCB to arrest pollution emanating from mining operations within the lease. The whole green belt shall be developed within first 5 years starting from windward side of the active mining area. The development of green belt shall be governed as per the EC granted by the Ministry irrespective of the stimulation made in approved mine plan.	The Project Proponent has already developed Green Belt in 7.5m wide safety zone all along the lease.
43)	The PP shall carryout plantation/afforestation in backfilled and reclaimed area of mining lease, around water body, along the roadsides, in community areas etc. by planting the native species in consultation with the State Forest Department/Agriculture Department/ Rural Development department/ Tribal welfare department/ Gram Panchayat such that only those species be selected which are of use to the local people. The CPCB guidelines in this regard shall also be adhered. The density of the trees should be around 2500 saplings per Ha. Adequate budgetary provision shall be made for protection and care of trees.	Plantation and afforestation proposal conducted as per Approved Mining Plan and CTO conditions in mining lease area, along the roadside of community and density is also maintained
44)	The PP shall make necessary alternative arrangements for livestock feed by developing grazing land with a view to compensate those areas which are coming within the mine lease. The development of such grazing land shall be done in consultation with the State Govt. In this regard, the PP should essentially implement the directions of the Hon'ble Supreme Court with regard to acquisition of grazing land. The sparse trees on such grazing ground, which provide mid-day	There was no gazing land that was in the mine lease if any is instructed from State Government co-operation will be provided

	shelter from the scorching sun, should be scrupulously guarded/protected against felling and plantation of such trees should be promoted.	
45)	The PP shall undertake all precautionary measures for conservation and protection of endangered flora and fauna and Schedule-I species during mining operation. A wildlife conservation plan shall be prepared for the same clearly delineating action to be taken for conservation of flora and fauna. The Plan shall be approved by Chief Wild Life warden of the State Govt.	Will always take necessary precautions to preserve the endangered flora and fauna and schedule-I species during mining operations.
46)	And implemented in consultation with the State Forest and Wildlife Department. A copy of wildlife conservation plan and its implementation status (annual) shall be submitted to the Regional Office of the Ministry.	Submitted by the earlier lessee.
IX.	**Public Hearing and Human Health Issues**	
47)	The PP shall appoint an Occupational Health Specialist for Regular as well as Periodical medical examination of the workers engaged in the mining activities, as per the DGMS guidelines. The records shall be maintained properly. PP shall also carry out Occupational Health check-ups in respect of workers who have ailments like BP, diabetes, habitual smoking, etc. The check-ups shall be undertaken once in six months and necessary remedial/preventive measures be taken. A status report on the same day be sent to MoEFCC Regional Office and DGMS on half-early basis.	Appointed a doctor for Regular as well as Periodical medical examination of the workers engaged in the mining activities, as per the DGMS guidelines. The records is maintained properly. Occupational Health check-ups in respect of workers is carried out by Health camps. The report are attached
48)	The PP must demonstrate commitment to work towards 'Zero Harm' from their mining activities and carry out HIRA for identification of workplace hazards and assess their potential risks to health and determine appropriate control measures to protect the health and wellbeing of workers and nearby community. The Proponent shall maintain accurate and systematic records of the HRA. The HRA for neighbourhood has to focus on public health problems like Malaria, Tuberculosis, HIV, Anaemia, Diarrhoea in children under 5 years, respiratory infections due to bio mass cooking.	PP works towards zero harm by identification of various hazards of each and every activity by HIRA and their severity is analysed and action plan was made. HIRA for Occupational health which focuses on infections and activity that affect health. Awareness is created to nearby community on

	The Proponent shall also create awareness and educate the nearby community and workers for Sanitation, Personal Hygiene, Hand washing, not to defecate in open, Women health and hygiene (providing sanitary napkins), hazard of tobacco and alcohol use. The Proponent shall carryout baseline HRA for all the category of workers and thereafter every 5 years.	sanitation, Personal hygiene .
49)	The Proponent shall carry out Occupational Health surveillance which be a part of HRA and include Biological monitoring where practical and feasible, and then the tests and investigations relevant to the exposure (e.g. for dust a X-Ray chest; for nose audiometric; for lead exposure blood lead; for welders full Ophthalmologic Assessment; for Manganese Miners a complete Neurological Assessment by a Certified Neurologist, and Manganese (Mn) Estimation in Blood; For Inorganic Chromium- Fortnightly skin infection of hands and forearms by a responsible person. Except routine tests, all tests would be carried out in a lab accredited by NABH. Records of Health Surveillance must be kept for 30 years, including results of physical examination and tests. The record of exposure due to materials like Asbetos, Hard Rock Mining, Silica, Gold, Kaolin, Aluminium, Iron, Manganese, Chromium, Lead, Uranium needs to be handed over to the Mining department of the State in case the life of the mine is less than 30 years. It would be obligatory for the State Mines Departments to decide for the safe and secure storage of the records including X-Ray. Only conventional X-Ray will be accepted for record purposes and not the digital one.) X-Ray must meet ILO criteria (17x14 inches and of good quality).	Occupational health surveillance is done by heath camps . 1.Regular health monitoring, including tests specific exposures (e.g., chest X-rays for dust exposure, audiometry for noise is covered in Medical examination records . 2. Reports are as per NABH-accredited labs, and X-rays meeting ILO standards for size (17x14 inches) and quality. 3. Health Records (health camps, ME records are available in OHC)
X.	**<u>Corporate Environment Responsibility (CER)</u>**	
54)	The activities and budget earmarked for CER as per Ministry's O.M No. 22-65/2017-IA. II (M) dated 01.05.2018 or as proposed by EAC should be kept in a separate bank account. The activities proposed for CER shall be implemented in a time bound manner and annual report of	Complied by the previous lessee

	implementation of the same along with documentary proof viz. photographs, purchase documents, latitude and longitude of infrastructure developed and road constructed needs to be submitted to Regional Office MoEFandCC annually along with audited statement.	
55)	PP shall keep the funds earmarked for environmental protection measures in a separate account and refrain from diverting the same for other purposes. The year wise expenditure of such funds should be reported to the MoEFCC and its concerned Regional Office.	Annual Budget kept for environmental protection measures and also tracking system in place to track the amount spent. Details of amount spent is attached in annexure 6
XI.	**Miscellaneous**	
56)	The Project Proponent shall prepare digital map (land use and land cover) of the entire lease area once in 5 years purpose of monitoring land use pattern and submit a report to concerned regional office of the MOEFandCC.	LULC map is prepared by ORSAC on profile of Dec-2021 and same will be submitted to concerned authorities, attached in Annexure 4
57)	The Project Authorities should inform to the Regional Office regarding date of financial closures and final approval of the project by the concerned authorities and the date of start of land development work.	Will be complied when it will require.
58)	The PP shall submit 6 monthly compliance reports on the status of the implementation of the stipulated environmental safeguards to the MoEFandCC and its concerned regional office, CPCB and SPCB.	Complied previous report was submitted on 30.11.2024
59)	A separate 'Environmental Management Cell' with suitable qualified manpower should be set-up under the control of a Senior Executive. The Senior Executive shall report directly to Head of the Organization. Adequate number of qualified Environmental Scientists and Mining Engineers shall be appointed and submit a report to RO, MoEFCC.	Environmental management cell is already constructed by the site.
60)	The concerned Regional office of the MoEFCC shall randomly monitor compliance of the stipulated conditions. The Project authorities should extend full cooperation to the MoEFCC officer(s) by furnishing the requisite data/information/monitoring reports.	Noted full co-operation will be given to the authorities
61)	The Ministry or any other competent authority may	Noted

	alter / modify the above conditions or stipulate any further condition in the interest of environment protection	
62)	Concealing factual data or submission of false/fabricated data and failure to comply with any of the condition mentioned above may result in withdrawal of this clearance and attract action under the provision of Environmental (Protection) Act 1986	Noted
63)	The above conditions will be enforced inter-alia under the provisions of the Water (Prevention & Control of Pollution) Act 1974, the Air (Prevention & Control of Pollution) Act 1981, Environment (Protection) Act 1986 and the Public Liability insurance act 199, along with their amendments and rules made there under and also any other order passed by the Honorable Supreme Court of India / high Court of Odisha and any other Court of law relating to the subject matter	Noted
64)	Any appeal against the environmental clearance shall lie with the National Green tribunal if preferred within a period of 30 days as prescribed under the section 16 of the National Green Tribunal Act 2010	Noted there was no appeal

EPA LABS PRIVATE LIMITED

(Erstwhile know as Environment Pollution Analysis Lab)

ISO 9001: 2015, ISO 14001:2015, ISO 45001:2018 Certified & NABL ACCREDITED LAB

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TC - 11007

TEST CERTIFICATE

Sample No:	**EPAL/AA/24/11/02001-009**	**Report No.:**	**EPAL/24/11/02001-009**
Name & Address of the Project:	**M/s Nadidih Iron Ore Mines, Under ESL Steel Limited, (BICO) At Nadidih, PO - Koira Distt. Sundargarh, Odisha India.**	**Format No.:**	**FRM 062**
		Reporting Date:	**06/11/2024**
		Ref. No:	**NIL**
		Monitoring Period:	**1 October 2024 to 31 October 2024**
		Equipment Used:	**RDS & FPS with all accessories**
Sample Collected By:	**EPAL Representative**	**Protocol Used:**	**IS-5182 & CPCB Guidelines**
Sample Description:	**Ambient Air Quality Monitoring**	**Parameter Required:**	**As per EC Letter**
Location:	**Near Mine Office (A1)**	**Customer Name:**	**Nadidih Iron Ore Mines**
Latitude:	**21° 58'09" N**	**Sample Condition**	**Good/Clear**
Longitude:	**85° 15'33" E**		

RESULTS

Date	PM_{10} ($\mu g/m^3$)	$PM_{2.5}$ ($\mu g/m^3$)	SO_2 ($\mu g/m^3$)	NO_2 ($\mu g/m^3$)	CO (mg/m3)
01.10.2024	65.2	35.6	10.2	15.3	0.35
04.10.2024	76.2	48.5	15.6	26.3	0.45
08.10.2024	66.2	38.4	15.2	27.6	0.41
11.10.2024	61.2	40.6	13.2	22.5	0.56
15.10.2024	68.2	41.5	11.1	21.5	0.42
18.10.2024	66.3	42.3	16.2	18.3	0.31
22.10.2024	72.3	52.3	14.2	22.3	0.42
25.10.2024	74.3	47.5	11.3	18.7	0.41
29.10.2024	64.8	38.7	16.2	34.2	0.34

	Parameter	PM_{10} ($\mu g/m^3$)	$PM_{2.5}$ ($\mu g/m^3$)	SO_2 ($\mu g/m^3$)	NO_2 ($\mu g/m^3$)	CO (mg/m^3)
Limit as per NAAQS*	--	**100**	**60**	**80**	**80**	**4**
	Method of Analysis	**IS 5182 (Part – 23)**	**IS 5182 (Part – 24)**	**IS 5182 (Part – 2)**	**IS 5182 (Part – 6)**	**IS 5182 (Part – 10)**

*National Ambient Air Quality Standards.

End of Test Report

EPA LABS PRIVATE LIMITED BHIWADI

(Checked By)
Ankita Singh

EPA LABS PRIVATE LIMITED Authorised Signatory

(Approved By)
Brijesh Kumar

Note 1. Sample will be retained for 15 days for chemical testing and 7 days for Bacteriological testing from the date of issue of test report, unless specified by the customer. The results given for noise/lux are related to the observed values at the time of monitoring. The customer asked- for the above test only. 2. The parameters marked as * are not accredited by NABL. 3. The results given above are related to the tested sample and mentioned parameters. Endorsement of product is neither inferred not implied. 4 Total liability of our works limited of the invoice amount. 5. This report can not be used as evidence in a court of Law without the written approval of the lab. 6. Certificate shall be not reproduced, except in full, without prior written approval of the laboratory.

EPA LABS PRIVATE LIMITED

(Erstwhile know as Environment Pollution Analysis Lab)

ISO 9001: 2015, ISO 14001:2015, ISO 45001:2018 Certified & NABL ACCREDITED LAB

Lab.: 2nd Floor, Hans Complex, Near Police Chowki, Bhiwadi-301019 (Raj.)

Contact Info : +91-9759427231, Email : environmentpollutionlab@gmail.com

TC - 11007

TEST CERTIFICATE

Sample No:	**EPAL/AA/24/11/02010-018**	**Report No.:**	**EPAL/24/11/02010-018**
Name & Address of the Project:	**M/s Nadidih Iron Ore Mines, Under ESL Steel Limited, (BICO) At Nadidih, PO - Koira Distt. Sundargarh, Odisha India.**	**Format No.:**	**FRM 062**
		Reporting Date:	**07.11.2024**
		Ref. No:	**NIL**
		Monitoring Period:	**1 October. 2024 to 31 October 2024**
		Equipment Used:	**RDS & FPS with all accessories**
Sample Collected By:	**EPAL Representative**	**Protocol Used:**	**IS-5182 & CPCB Guidelines**
Sample Description:	**Ambient Air Quality Monitoring**	**Parameter Required:**	**As per EC Letter**
Location:	**Near Mines Gate (A2)**	**Customer Name:**	**Nadidih Iron Ore Mines**
Latitude:	**21° 58'23" N**	**Sample Condition**	**Good/Clear**
Longitude:	**85° 15'44" E**		

RESULTS

Date	PM_{10} ($\mu g/m^3$)	$PM_{2.5}$ ($\mu g/m^3$)	SO_2 ($\mu g/m^3$)	NO_2 ($\mu g/m^3$)	CO (mg/m3)
01.10.2024	60.2	38.5	11.3	26.3	0.41
04.10.2024	71.3	42.3	10.2	25.6	0.36
08.10.2024	60.8	41.2	11.2	26.4	0.34
11.10.2024	61.4	40.2	16.5	25.1	0.35
15.10.2024	70.2	42.3	10.2	26.5	0.33
18.10.2024	66.2	31.6	12.5	26.3	0.54
22.10.2024	57.3	52.1	15.3	25.4	0.34
25.10.2024	62.3	39.3	13.2	24.1	0.43
29.10.2024	55.3	29.3	16.1	24.5	0.39

	Parameter	PM_{10} ($\mu g/m^3$)	$PM_{2.5}$ ($\mu g/m^3$)	SO_2 ($\mu g/m^3$)	NO_2 ($\mu g/m^3$)	CO (mg/m^3)
Limit as per NAAQS*	--	**100**	**60**	**80**	**80**	**4**
	Method of Analysis	**IS 5182 (Part – 23)**	**IS 5182 (Part – 24)**	**IS 5182 (Part – 2)**	**IS 5182 (Part – 6)**	**IS 5182 (Part – 10)**

*National Ambient Air Quality Standards.

End of Test Report

EPA LABS PRIVATE LIMITED BHIWADI

(Checked By)
Ankita Singh

EPA LABS PRIVATE LIMITED Authorised Signatory

(Approved By)
Brijesh Kumar

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Contact Info : +91-9759427231, Email : environmentpollutionlab@gmail.com

TC - 11007

TEST CERTIFICATE

Sample No:	**EPAL/AA/24/11/02019-027**	**Report No.:**	**EPAL/24/11/02019-027**
Name & Address of the Project:	**M/s Nadidih Iron Ore Mines, Under ESL Steel Limited, (BICO) At Nadidih, PO - Koira Distt. Sundargarh, Odisha India.**	**Format No.:**	**FRM 062**
		Reporting Date:	**07/11/2024**
		Ref. No:	**NIL**
		Monitoring Period:	**1 October. 2024 to 31 October 2024**
		Equipment Used:	**RDS & FPS with all accessories**
Sample Collected By:	**EPAL Representative**	**Protocol Used:**	**IS-5182 & CPCB Guidelines**
Sample Description:	**Ambient Air Quality Monitoring**	**Parameter Required:**	**As per EC Letter**
Location:	**Village - Kenduhidi (A3)**	**Customer Name:**	**Nadidih Iron Ore Mines**
Latitude:	**21° 59'45" N**	**Sample Condition**	**Good/Clear**
Longitude:	**85° 16'14" E**		

RESULTS

Date	PM_{10} ($\mu g/m^3$)	$PM_{2.5}$ ($\mu g/m^3$)	SO_2 ($\mu g/m^3$)	NO_2 ($\mu g/m^3$)	CO (mg/m3)
01.10.2024	54.3	35.6	13.2	22.3	0.34
04.10.2024	61.2	40.2	13.2	23.5	0.38
08.10.2024	66.5	40.3	09.5	23.8	0.51
11.10.2024	71.2	44.5	16.4	31.3	0.37
15.10.2024	62.3	45.2	13.2	29.5	0.41
18.10.2024	54.5	32.5	11.2	24.8	0.38
22.10.2024	68.3	41.2	16.4	25.3	0.41
25.10.2024	61.2	39.8	10.0	14.2	0.55
29.10.2024	66.4	44.3	11.4	14.5	0.42

	Parameter	PM_{10} ($\mu g/m^3$)	$PM_{2.5}$ ($\mu g/m^3$)	SO_2 ($\mu g/m^3$)	NO_2 ($\mu g/m^3$)	CO (mg/m^3)
Limit as per NAAQS*	--	**100**	**60**	**80**	**80**	**4**
	Method of Analysis	**IS 5182 (Part – 23)**	**IS 5182 (Part – 24)**	**IS 5182 (Part – 2)**	**IS 5182 (Part – 6)**	**IS 5182 (Part – 10)**

*National Ambient Air Quality Standards.

End of Test Report

EPA LABS PRIVATE LIMITED

(Checked By)
Ankita Singh

EPA LABS PRIVATE LIMITED

(Approved By)
Brijesh Kumar

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Contact Info : +91-9759427231, Email : environmentpollutionlab@gmail.com

TC - 11007

TEST CERTIFICATE

Sample No:	**EPAL/AA/24/11/02028-036**	**Report No.:**	**EPAL/24/11/02028-036**
Name & Address of the Project:	**M/s Nadidih Iron Ore Mines, Under ESL Steel Limited, (BICO) At Nadidih, PO - Koira Distt. Sundargarh, Odisha India.**	**Format No.:**	**FRM 062**
		Reporting Date:	**07.11.2024**
		Ref. No:	**NIL**
		Monitoring Period:	**1 October. 2024 to 31 October 2024**
		Equipment Used:	**RDS & FPS with all accessories**
Sample Collected By:	**EPAL Representative**	**Protocol Used:**	**IS-5182 & CPCB Guidelines**
Sample Description:	**Ambient Air Quality Monitoring**	**Parameter Required:**	**As per EC Letter**
Location:	**Village Badipada (A4)**	**Customer Name:**	**Nadidih Iron Ore Mines**
Latitude:	**21° 58'04" N**	**Sample Condition**	**Good/Clear**
Longitude:	**85° 18'33" E**		

RESULTS

Date	PM_{10} ($\mu g/m^3$)	$PM_{2.5}$ ($\mu g/m^3$)	SO_2 ($\mu g/m^3$)	NO_2 ($\mu g/m^3$)	CO (mg/m3)
02.10.2024	64.2	39.6	10.2	26.3	0.41
05.10.2024	55.6	31.2	14.1	24.3	0.48
09.10.2024	61.2	44.2	10.3	24.5	0.41
12.10.2024	68.5	39.3	9.5	21.3	0.51
16.10.2024	61.2	38.3	14.2	24.3	0.35
19.10.2024	61.1	38.4	13.4	27.3	0.41
23.10.2024	65.1	32.4	13.2	23.4	0.35
26.10.2024	54.1	37.4	14.2	22.1	0.33
31.10.2024	62.3	41.2	12.4	21.1	0.44

	Parameter	PM_{10} ($\mu g/m^3$)	$PM_{2.5}$ ($\mu g/m^3$)	SO_2 ($\mu g/m^3$)	NO_2 ($\mu g/m^3$)	CO (mg/m^3)
Limit as per NAAQS*	--	100	60	80	80	4
	Method of Analysis	IS 5182 (Part – 23)	IS 5182 (Part – 24)	IS 5182 (Part – 2)	IS 5182 (Part – 6)	IS 5182 (Part – 10)

*National Ambient Air Quality Standards.

End of Test Report

EPA LABS PRIVATE LIMITED BHIWADI

(Checked By)
Ankita Singh

EPA LABS PRIVATE LIMITED Authorised Signatory

(Approved By)
Brijesh Kumar

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TC - 11007

TEST CERTIFICATE

Sample No:	**EPAL/AA/24/11/02037-045**	**Report No.:**	**EPAL/24/11/02037-045**
Name & Address of the Project:	**M/s Nadidih Iron Ore Mines, Under ESL Steel Limited, (BICO) At Nadidih, PO – Koira Distt. Sundargarh, Odisha India.**	**Format No.:**	**FRM 062**
		Reporting Date:	**07.11.2024**
		Ref. No:	**NIL**
		Monitoring Period:	**1 October. 2024 to 31 October 2024**
		Equipment Used:	**RDS & FPS with all accessories**
Sample Collected By:	**EPAL Representative**	**Protocol Used:**	**IS-5182 & CPCB Guidelines**
Sample Description:	**Ambient Air Quality Monitoring**	**Parameter Required:**	**As per EC Letter**
Location:	**Village Jhirapani (A5)**	**Customer Name:**	**Nadidih Iron Ore Mines**
Latitude:	**21° 59'58" N**	**Sample Condition**	**Good/Clear**
Longitude:	**85° 13'10" E**		

RESULTS

Date	PM_{10} ($\mu g/m^3$)	$PM_{2.5}$ ($\mu g/m^3$)	SO_2 ($\mu g/m^3$)	NO_2 ($\mu g/m^3$)	CO (mg/m3)
02.10.2024	54.3	36.5	10.3	24.3	0.41
05.10.2024	51.2	35.6	11.2	26.3	0.44
09.10.2024	61.3	33.5	11.4	22.4	0.38
12.10.2024	62.2	42.1	10.3	23.1	0.41
16.10.2024	51.3	36.8	16.2	29.2	0.66
19.10.2024	66.7	41.5	13.5	27.4	0.41
23.10.2024	51.4	35.7	14.2	24.3	0.37
26.10.2024	61.2	41.4	9.8	18.5	0.37
31.10.2024	62.3	40.6	11.7	23.3	0.47

	Parameter	PM_{10} ($\mu g/m^3$)	$PM_{2.5}$ ($\mu g/m^3$)	SO_2 ($\mu g/m^3$)	NO_2 ($\mu g/m^3$)	CO (mg/m^3)
Limit as per NAAQS*	--	**100**	**60**	**80**	**80**	**4**
	Method of Analysis	**IS 5182 (Part – 23)**	**IS 5182 (Part – 24)**	**IS 5182 (Part – 2)**	**IS 5182 (Part – 6)**	**IS 5182 (Part – 10)**

*National Ambient Air Quality Standards.

End of Test Report

EPA LABS PRIVATE LIMITED BHIWADI

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Ankita Singh

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(Approved By)
Brijesh Kumar

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TC - 11007

TEST CERTIFICATE

Sample No:	**EPAL/AA/24/11/02046-054**	**Report No.:**	**EPAL/24/11/02046-054**
Name & Address of the Project:	**M/s Nadidih Iron Ore Mines, Under ESL Steel Limited, (BICO) At Nadidih, PO - Koira Distt. Sundargarh, Odisha India.**	**Format No.:**	**FRM 062**
		Reporting Date:	**07.11.2024**
		Ref. No:	**NIL**
		Monitoring Period:	**1 October. 2024 to 31 October 2024**
		Equipment Used:	**RDS & FPS with all accessories**
Sample Collected By:	**EPAL Representative**	**Protocol Used:**	**IS-5182 & CPCB Guidelines**
Sample Description:	**Ambient Air Quality Monitoring**	**Parameter Required:**	**As per EC Letter**
Location:	**Village Kashira (A6)**	**Customer Name:**	**Nadidih Iron Ore Mines**
Latitude:	**21° 55'10" N**	**Sample Condition**	**Good/Clear**
Longitude:	**85° 15'20" E**		

RESULTS

Date	PM_{10} ($\mu g/m^3$)	$PM_{2.5}$ ($\mu g/m^3$)	SO_2 ($\mu g/m^3$)	NO_2 ($\mu g/m^3$)	CO (mg/m3)
02.10.2024	72.6	38.2	11.8	24.3	0.45
05.10.2024	51.2	34.8	9.8	24.5	0.43
09.10.2024	62.3	31.4	10.2	16.5	0.37
12.10.2024	64.5	39.3	13.4	28.5	0.34
16.10.2024	67.4	35.6	15.2	16.2	0.34
19.10.2024	64.5	40.3	11.4	27.4	0.38
23.10.2024	68.2	45.1	14.1	32.4	0.35
26.10.2024	54.6	38.7	11.0	25.6	0.40
31.10.2024	68.7	41.3	10.4	31.4	0.53

	Parameter	PM_{10} ($\mu g/m^3$)	$PM_{2.5}$ ($\mu g/m^3$)	SO_2 ($\mu g/m^3$)	NO_2 ($\mu g/m^3$)	CO (mg/m^3)
Limit as per NAAQS*	--	**100**	**60**	**80**	**80**	**4**
	Method of Analysis	**IS 5182 (Part – 23)**	**IS 5182 (Part – 24)**	**IS 5182 (Part – 2)**	**IS 5182 (Part – 6)**	**IS 5182 (Part – 10)**

*National Ambient Air Quality Standards.

****End of Test Report****

EPA LABS PRIVATE LIMITED BHIWADI

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(Approved By)
Brijesh Kumar

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Contact Info : +91-9759427231, Email : environmentpollutionlab@gmail.com

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TEST CERTIFICATE

Sample No:	**EPAL/AA/24/11/02001**	**Report No.:**	**EPAL/24/11/02001**
Name & Address of the Project:	**M/s Nadidih Iron Ore Mines, Under ESL Steel Limited, (BICO) At Nadidih, PO - Koira Distt. Sundargarh, Odisha India.**	**Format No.:**	**FRM 062**
		Reporting Date:	**07.11.2024**
		Ref. No:	**NIL**
		Monitoring Period:	**October 2024**
		Equipment Used:	**RDS & FPS with all accessories**
Sample Collected By:	**EPAL Representative**	**Protocol Used:**	**IS-5182 & CPCB Guidelines**
Sample Description:	**Ambient Air Quality Monitoring**	**Parameter Required:**	**As per EC Letter**
Location:	**Near Mine Office (A1)**	**Customer Name:**	**Nadidih Iron Ore Mines**
Latitude:	**21° 58'09" N**	**Sample Condition**	**Good/Clear**
		Longitude:	**85° 15'33" E**

RESULTS

Date of Sample	Ozone ($\mu g/m^3$)	Ammonia ($\mu g/m^3$)	Lead ($\mu g/m^3$)	Nickel (ng/m^3)	Arsenic (ng/m3)	Benzene ($\mu g/m^3$)	Benzo(a)pyrine (ng/m3)
01.10.2024	16.4	32.1	<0.05	<0.05	<0.50	<5.0	<1.0

	Parameter	Ozone ($\mu g/m^3$)	Ammonia ($\mu g/m^3$)	Lead ($\mu g/m^3$)	Nickel (ng/m^3)	Arsenic (ng/m3)	Benzene ($\mu g/m^3$)	Benzo(a)pyrine (ng/m3)
Limit as per NAAQS*	--	180	400	1	20	6	5	1
	Method of Analysis	IS 5182 (Part – 9)	IS 5182 (Part – 25)	IS 5182 (Part – 22)	IS 5182 (Part – 26)	EPAL/QAD/STP/005, SP-7	IS 5182 (Part – 11)	IS 5182 (Part – 12)

*National Ambient Air Quality Standards.

End of Test Report

EPA LABS PRIVATE LIMITED BHIWADI

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(Approved By)
Brijesh Kumar

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TC - 11007

TEST CERTIFICATE

Sample No:	**EPAL/AA/24/11/02010**	**Report No.:**	**EPAL/24/11/02010**
Name & Address of the Project:	**M/s Nadidih Iron Ore Mines, Under ESL Steel Limited, (BICO) At Nadidih, PO - Koira Distt. Sundargarh, Odisha India.**	**Format No.:**	**FRM 062**
		Reporting Date:	**03/09/2024**
		Ref. No:	**NIL**
		Monitoring Period:	**October 2024**
		Equipment Used:	**RDS & FPS with all accessories**
Sample Collected By:	**EPAL Representative**	**Protocol Used:**	**IS-5182 & CPCB Guidelines**
Sample Description:	**Ambient Air Quality Monitoring**	**Parameter Required:**	**As per EC Letter**
Location:	**Near Mines Gate (A2)**	**Customer Name:**	**Nadidih Iron Ore Mines**
Latitude:	**21° 59'52" N**	**Sample Condition**	**Good/Clear**
		Longitude:	**85° 13'09" E**

RESULTS

Date of Sample	Ozone ($\mu g/m^3$)	Ammonia ($\mu g/m^3$)	Lead ($\mu g/m^3$)	Nickel (ng/m^3)	Arsenic (ng/m3)	Benzene ($\mu g/m^3$)	Benzo(a)pyrine (ng/m3)
01.10.2024	20.3	24.8	<0.05	<0.05	<0.50	<5.0	<1.0

	Parameter	Ozone ($\mu g/m^3$)	Ammonia ($\mu g/m^3$)	Lead ($\mu g/m^3$)	Nickel (ng/m^3)	Arsenic (ng/m3)	Benzene ($\mu g/m^3$)	Benzo(a)pyrine (ng/m3)
Limit as per NAAQS*	--	**180**	**400**	**1**	**20**	**6**	**5**	**1**
	Method of Analysis	**IS 5182 (Part – 9)**	**IS 5182 (Part – 25)**	**IS 5182 (Part – 22)**	**IS 5182 (Part – 26)**	**EPAL/QAD/STP/005, SP-7**	**IS 5182 (Part – 11)**	**IS 5182 (Part – 12)**

*National Ambient Air Quality Standards.

End of Test Report

EPA LABS PRIVATE LIMITED BHIWADI

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Lab.: 2nd Floor, Hans Complex, Near Police Chowki, Bhiwadi-301019 (Raj.)

Contact Info : +91-9759427231, Email : environmentpollutionlab@gmail.com

TC - 11007

TEST CERTIFICATE

Sample No:	**EPAL/AA/24/11/02019**	**Report No.:**	**EPAL/24/11/02019**
Name & Address of the Project:	**M/s Nadidih Iron Ore Mines, Under ESL Steel Limited, (BICO) At Nadidih, PO - Koira Distt. Sundargarh, Odisha India.**	**Format No.:**	**FRM 062**
		Reporting Date:	**07.11.2024**
		Ref. No:	**NIL**
		Monitoring Period:	**October 2024**
		Equipment Used:	**RDS & FPS with all accessories**
Sample Collected By:	**EPAL Representative**	**Protocol Used:**	**IS-5182 & CPCB Guidelines**
Sample Description:	**Ambient Air Quality Monitoring**	**Parameter Required:**	**As per EC Letter**
Location:	**Village Kenduhidi (A3)**	**Customer Name:**	**Nadidih Iron Ore Mines**
Latitude:	**21° 59'45" N**	**Sample Condition**	**Good/Clear**
		Longitude:	**85° 16'14" E**

RESULTS

Date of Sample	Ozone ($\mu g/m^3$)	Ammonia ($\mu g/m^3$)	Lead ($\mu g/m^3$)	Nickel (ng/m^3)	Arsenic (ng/m3)	Benzene ($\mu g/m^3$)	Benzo(a)pyrine (ng/m3)
01.10.2024	18.3	26.8	<0.05	<0.05	<0.50	<5.0	<1.0

	Parameter	Ozone ($\mu g/m^3$)	Ammonia ($\mu g/m^3$)	Lead ($\mu g/m^3$)	Nickel (ng/m^3)	Arsenic (ng/m3)	Benzene ($\mu g/m^3$)	Benzo(a)pyrine (ng/m3)
Limit as per NAAQS*	--	180	400	1	20	6	5	1
	Method of Analysis	IS 5182 (Part – 9)	IS 5182 (Part – 25)	IS 5182 (Part – 22)	IS 5182 (Part – 26)	EPAL/QAD/STP/005, SP-7	IS 5182 (Part – 11)	IS 5182 (Part – 12)

*National Ambient Air Quality Standards.

End of Test Report

(Checked By)
Ankita Singh

(Approved By)
Brijesh Kumar
Authorised Signatory

Note 1. Sample will be retained for 15 days for chemical testing and 7 days for Bacteriological testing from the date of issue of test report, unless specified by the customer. The results given for noise/lux are related to the observed values at the time of monitoring. The customer asked- for the above test only. 2. The parameters marked as * are not accredited by NABL. 3. The results given above are related to the tested sample and mentioned parameters. Endorsement of product is neither inferred not implied. 4 Total liability of our works limited of the invoice amount. 5. This report can not be used as evidence in a court of Law without the written approval of the lab. 6. Certificate shall be not reproduced, except in full, without prior written approval of the laboratory.

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TEST CERTIFICATE

Sample No:	**EPAL/AA/24/11/02028**	**Report No.:**	**EPAL/24/11/02028**
Name & Address of the Project:	**M/s Nadidih Iron Ore Mines, Under ESL Steel Limited, (BICO) At Nadidih, PO - Koira Distt. Sundargarh, Odisha India.**	**Format No.:**	**FRM 062**
		Reporting Date:	**07.11.2024**
		Ref. No:	**NIL**
		Monitoring Period:	**October 2024**
		Equipment Used:	**RDS & FPS with all accessories**
Sample Collected By:	**EPAL Representative**	**Protocol Used:**	**IS-5182 & CPCB Guidelines**
Sample Description:	**Ambient Air Quality Monitoring**	**Parameter Required:**	**As per EC Letter**
Location:	**Village Badipada (A4)**	**Customer Name:**	**Nadidih Iron Ore Mines**
Latitude:	**21° 58'04" N**	**Sample Condition**	**Good/Clear**
		Longitude:	**85° 15'33" E**

RESULTS

Date of Sample	Ozone ($\mu g/m^3$)	Ammonia ($\mu g/m^3$)	Lead ($\mu g/m^3$)	Nickel (ng/m^3)	Arsenic (ng/m3)	Benzene ($\mu g/m^3$)	Benzo(a)pyrine (ng/m3)
02.10.2024	21.2	23.4	<0.05	<0.05	<0.50	<5.0	<1.0

	Parameter	Ozone ($\mu g/m^3$)	Ammonia ($\mu g/m^3$)	Lead ($\mu g/m^3$)	Nickel (ng/m^3)	Arsenic (ng/m3)	Benzene ($\mu g/m^3$)	Benzo(a)pyrine (ng/m3)
Limit as per NAAQS*	--	**180**	**400**	**1**	**20**	**6**	**5**	**1**
	Method of Analysis	**IS 5182 (Part – 9)**	**IS 5182 (Part – 25)**	**IS 5182 (Part – 22)**	**IS 5182 (Part – 26)**	**EPAL/QAD/STP/005, SP-7**	**IS 5182 (Part – 11)**	**IS 5182 (Part – 12)**

*National Ambient Air Quality Standards.

End of Test Report

EPA LABS PRIVATE LIMITED BHIWADI

(Checked By)
Ankita Singh

EPA LABS PRIVATE LIMITED Authorised Signatory

(Approved By)
Brijesh Kumar

Note 1. Sample will be retained for 15 days for chemical testing and 7 days for Bacteriological testing from the date of issue of test report, unless specified by the customer. The results given for noise/lux are related to the observed values at the time of monitoring. The customer asked- for the above test only. 2. The parameters marked as * are not accredited by NABL. 3. The results given above are related to the tested sample and mentioned parameters. Endorsement of product is neither inferred not implied. 4 Total liability of our works limited of the invoice amount. 5. This report can not be used as evidence in a court of Law without the written approval of the lab. 6. Certificate shall be not reproduced, except in full, without prior written approval of the laboratory.

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Sample No:	**EPAL/AA/24/11/02037**	**Report No.:**	**EPAL/24/11/02037**
Name & Address of the Project:	**M/s Nadidih Iron Ore Mines, Under ESL Steel Limited, (BICO) At Nadidih, PO - Koira Distt. Sundargarh, Odisha India.**	**Format No.:**	**FRM 062**
		Reporting Date:	**07.11.2024**
		Ref. No:	**NIL**
		Monitoring Period:	**October 2024**
		Equipment Used:	**RDS & FPS with all accessories**
Sample Collected By:	**EPAL Representative**	**Protocol Used:**	**IS-5182 & CPCB Guidelines**
Sample Description:	**Ambient Air Quality Monitoring**	**Parameter Required:**	**As per EC Letter**
Location:	**Village Jhirapani (A5)**	**Customer Name:**	**Nadidih Iron Ore Mines**
Latitude:	**21° 59'58" N**	**Sample Condition**	**Good/Clear**
		Longitude:	**85° 13'10" E**

RESULTS

Date of Sample	Ozone ($\mu g/m^3$)	Ammonia ($\mu g/m^3$)	Lead ($\mu g/m^3$)	Nickel (ng/m^3)	Arsenic (ng/m3)	Benzene ($\mu g/m^3$)	Benzo(a)pyrine (ng/m3)
02.10.2024	19.5	24.3	<0.05	<0.05	<0.50	<5.0	<1.0

	Parameter	Ozone ($\mu g/m^3$)	Ammonia ($\mu g/m^3$)	Lead ($\mu g/m^3$)	Nickel (ng/m^3)	Arsenic (ng/m3)	Benzene ($\mu g/m^3$)	Benzo(a)pyrine (ng/m3)
Limit as per NAAQS*	--	180	400	1	20	6	5	1
	Method of Analysis	IS 5182 (Part – 9)	IS 5182 (Part – 25)	IS 5182 (Part – 22)	IS 5182 (Part – 26)	EPAL/QAD/STP/005, SP-7	IS 5182 (Part – 11)	IS 5182 (Part – 12)

*National Ambient Air Quality Standards.

End of Test Report

(Checked By)
Ankita Singh

(Approved By)
Brijesh Kumar

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TEST CERTIFICATE

Sample No:	**EPAL/AA/24/11/02046**	**Report No.:**	**EPAL/24/11/02046**
Name & Address of the Project:	**M/S. Nadidih Iron Ore Mines, Under ESL Steel Limited, (BICO) At Nadidih, PO - Koira Distt. Sundargarh, Odisha India.**	**Format No.:**	**FRM 062**
		Reporting Date:	**07.11.2024**
		Ref. No:	**NIL**
		Monitoring Period:	**October 2024**
		Equipment Used:	**RDS & FPS with all accessories**
Sample Collected By:	**EPAL Representative**	**Protocol Used:**	**IS-5182 & CPCB Guidelines**
Sample Description:	**Ambient Air Quality Monitoring**	**Parameter Required:**	**As per EC Letter**
Location:	**Village Kashira (A6)**	**Customer Name:**	**Nadidih Iron Ore Mines**
Latitude:	**21° 58'10" N**	**Sample Condition**	**Good/Clear**
		Longitude:	**85° 15'20" E**

RESULTS

Date of Sample	Ozone ($\mu g/m^3$)	Ammonia ($\mu g/m^3$)	Lead ($\mu g/m^3$)	Nickel (ng/m^3)	Arsenic (ng/m3)	Benzene ($\mu g/m^3$)	Benzo(a)pyrine (ng/m3)
02.10.2024	21.4	15.3	<0.05	<0.05	<0.50	<5.0	<1.0

	Parameter	Ozone ($\mu g/m^3$)	Ammonia ($\mu g/m^3$)	Lead ($\mu g/m^3$)	Nickel (ng/m^3)	Arsenic (ng/m3)	Benzene ($\mu g/m^3$)	Benzo(a)pyrine (ng/m3)
Limit as per NAAQS*	--	180	400	1	20	6	5	1
	Method of Analysis	IS 5182 (Part – 9)	IS 5182 (Part – 25)	IS 5182 (Part – 22)	IS 5182 (Part – 26)	EPAL/QAD/STP/005, SP-7	IS 5182 (Part – 11)	IS 5182 (Part – 12)

*National Ambient Air Quality Standards.

End of Test Report

EPA LABS PRIVATE LIMITED

(Checked By)
Ankita Singh

EPA LABS PRIVATE LIMITED
Authorised Signatory

(Approved By)
Brijesh Kumar

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TEST CERTIFICATE

Sample No:	**EPAL/AA/24/11/02055-060**	**Report No.:**	**EPAL/24/11/02055-060**
Name & Address of the Project:	**M/s Nadidih Iron Ore Mines, Under ESL Steel Limited, (BICO) At Nadidih, PO - Koira Distt. Sundargarh, Odisha India.**	**Format No.:**	**FRM 062**
		Reporting Date:	**07.11.2024**
		Ref. No:	**NIL**
		Monitoring Period:	**October 2024**
		Equipment Used:	**RDS with all accessories**
Sample Collected By:	**EPAL Representative**	**Protocol Used:**	**IS-5182**
Sample Description:	**Ambient Air Quality Monitoring**	**Parameter Required:**	**As per EC Letter**
Sample Type :	**Free Silica Composition**		

RESULTS

Chemical Composition of PM 10 with Free Silica

Location	Date	PM10 ($\mu g/m^3$)	Free Silica %	Ca ($\mu g/m^3$)	Mg ($\mu g/m^3$)	Ni (ng/m^3)	Pb ($\mu g/m^3$)
Near Mine Office	01.10.2024	65.2	1.8	1.05	0.26	<0.5	<0.05
Near Mines Gate	01.10.2024	60.2	1.7	0.09	0.23	<0.5	<0.05
Village Kenduhidi	01.10.2024	54.3	1.0	1.05	0.17	<0.5	<0.05
Village Bandipada	02.10.2024	64.2	1.0	1.14	0.21	<0.5	<0.05
Village Jhirapani	02.10.2024	54.3	1.1	1.12	0.25	<0.5	<0.05
Village Kashira	02.10.2024	72.6	1.4	1.03	0.24	<0.5	<0.05

**** End of Report****

EPA LABS PRIVATE LIMITED BHIWADI

(Checked By)
Ankita Singh

EPA LABS PRIVATE LIMITED Authorised Signatory

(Approved By)
Brijesh Kumar

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TEST CERTIFICATE

Sample No:	**EPAL/AA/24/11/02061-066**	**Report No.:**	**EPAL/24/11/02061-066**
Name & Address of the Project:	**M/s Nadidih Iron Ore Mines, Under ESL Steel Limited, (BICO) At Nadidih, PO - Koira Distt. Sundargarh, Odisha India.**	**Format No.:**	**FRM 062**
		Reporting Date:	**07.11.2024**
		Ref. No:	**NIL**
		Monitoring Period:	**October 2024**
		Equipment Used:	**RDS**
		Protocol Used:	**IS-5182 & CPCB Guidelines**
Sample Collected By:	**EPAL Representative**	**Test Method**	**EPAL/QED/STP/006, SP-3, Issue Date 01.04.2022, Issue No.-1**
Sample Description:	**Ambient Air Monitoring**	**Parameter Required:**	**As per EC Letter**
Sample Name:	**Fugitive Dust Sample**	**Customer Name:**	**Nadidih Iron & Mn Mines**
		Sample Condition	**Good/Clear**

RESULTS

Sr. No.	Location	Date	Latitude:	Longitude:	SPM ($\mu g/m^3$)
1	Mine Benches Area	03.07.2024	21° 57'40" N	85° 15'10" E	827
2	Haul Road	07.10.2024	21° 57'48" N	85° 15'16" E	998
3	Crushing Plant	10.10.2024	21° 57'35" N	85° 15'13" E	912
4	Screening Plant	14.10.2024	21° 57'12" N	85° 15'21" E	994
5	Ore Loading Area	17.10.2024	21° 57'26" N	85° 15'23" E	861
6	Waste Dump Area	21.10.2024	21° 57'33" N	85° 15'07" E	852

Limit as per Consent*	Parameter	Suspended Particulate Matter (SPM 1200 $\mu g/m^3$)

*State Pollution Control Board, Odisha.

End of Test Report

EPA LABS PRIVATE LIMITED BHIWADI

(Checked By)
Ankita Singh

EPA LABS PRIVATE LIMITED Authorised Signatory

(Approved By)
Brijesh Kumar

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TEST CERTIFICATE

Sample No:	**EPAL/W/24/11/02067**	**Report No.:**	**EPAL/24/11/02067**
Name & Address of the Project:	**M/s Nadidih Iron Ore Mines, Under ESL Steel Limited, (BICO) At Nadidih, PO - Koira Distt. Sundargarh, Odisha India.**	**Format No.:**	**FRM-062**
		Reporting Date:	**07.11.2024**
		Measurement Date:	**26.10.2024**

Sample Description : **Ground Water Level Monitoring**

TEST RESULTS

S. No.	Location	Test Method	Depth (in Meter) Below Ground Level
1.	**Near Mine Site**	By Water Level Indicator (Model-Thermo Env. Inst.)	4.5

End of Report

EPA LABS PRIVATE LIMITED

Checked By)
Ankita Singh

EPA LABS PRIVATE LIMITED

(Approved By)
Brijesh Kumar

Note 1. Sample will be retained for 15 days for chemical testing and 7 days for Bacteriological testing from the date of issue of test report, unless specified by the customer. The results given for noise/lux are related to the observed values at the time of monitoring. The customer asked- for the above test only. 2. The parameters marked as * are not accredited by NABL. 3. The results given above are related to the tested sample and mentioned parameters. Endorsement of product is neither inferred not implied. 4 Total liability of our works limited of the invoice amount. 5. This report can not be used as evidence in a court of Law without the written approval of the lab. 6. Certificate shall be not reproduced, except in full, without prior written approval of the laboratory.

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TEST CERTIFICATE

Sample No:	**EPAL/W/24/11/02068**	**Report No.:**	**EPAL/24/11/02068**
Name & Address of the Project:	**M/s Nadidih Iron Ore Mines, Under ESL Steel Limited, (BICO) At Nadidih, PO - Koira Distt. Sundargarh, Odisha India.**	**Format No.:**	**FRM-062**
		Reporting Date:	**07.11.2024**
		Sampling Date:	**26.10.2024**

Sample Description : **Ground Water Level Monitoring**

TEST RESULTS

S. No.	Location	Test Method	Depth (in Meter) Below Ground Level
1.	**Village Kenduhidi**	By Water Level Indicator (Model-Thermo Env.Inst.)	4.9

End of Report

Checked By)
Ankita Singh

(Approved By)
Brijesh Kumar

Note 1. Sample will be retained for 15 days for chemical testing and 7 days for Bacteriological testing from the date of issue of test report, unless specified by the customer. The results given for noise/lux are related to the observed values at the time of monitoring. The customer asked- for the above test only. 2. The parameters marked as * are not accredited by NABL. 3. The results given above are related to the tested sample and mentioned parameters. Endorsement of product is neither inferred not implied. 4 Total liability of our works limited of the invoice amount. 5. This report can not be used as evidence in a court of Law without the written approval of the lab. 6. Certificate shall be not reproduced, except in full, without prior written approval of the laboratory.

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TEST CERTIFICATE

Sample Number:	**EPAL/W/24/11/02069**	**Report No.:**	**EPAL/24/11/02069**
Name & Address of the Project:	**M/s Nadidih Iron Ore Mines, Under ESL Steel Limited, (BICO) At Nadidih, PO - Koira Distt. Sundargarh, Odisha India.**	**Format No.:**	**FRM-062**
		Reporting Date:	**07.11.2024**
		Sampling Date:	**26.10.2024**

Sample Description : **Ground Water Level Monitoring**

TEST RESULTS

S. No.	Location	Test Method	Depth (in Meter) Below Ground Level
1.	**Village Badipada**	By Water Level Indicator (Model-Thermo Env.Inst.)	4.1

End of Report

EPA LABS PRIVATE LIMITED

(Checked By)
Ankita Singh

EPA LABS PRIVATE LIMITED
Authorised Signatory

(Approved By)
Brijesh Kumar

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Contact Info : +91-9759427231, Email : environmentpollutionlab@gmail.com

TEST CERTIFICATE

Sample Number:	**EPAL/W/24/11/02070**	**Report No.:**	**EPAL/24/11/02070**
Name & Address of the Project:	**M/s Nadidih Iron Ore Mines, Under ESL Steel Limited, (BICO) At Nadidih, PO - Koira Distt. Sundargarh, Odisha India.**	**Format No.:**	**FRM-062**
		Reporting Date:	**07.11.2024**
		Sampling Date:	**26.10.2024**

Sample Description : **Ground Water Level Monitoring**

TEST RESULTS

S. No.	Location	Test Method	Depth (in Meter) Below Ground Level
1.	**Village Jhirapani**	By Water Level Indicator (Model-Thermo Env.Inst.)	18.5

End of Report

(Checked By)
Ankita Singh

(Approved By)
Brijesh Kumar

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Lab.: 2nd Floor, Hans Complex, Near Police Chowki, Bhiwadi-301019 (Raj.)

Contact Info : +91-9759427231, Email : environmentpollutionlab@gmail.com

TC - 11007

TEST CERTIFICATE

Sample No:	**EPAL/N/24/11/02071-078**	**Report No.:**	**EPAL/24/11/02071-078**
Name & Address of the Project:	**M/s Nadidih Iron Ore Mines, Under ESL Steel Limited, (BICO) At Nadidih, PO - Koira Distt. Sundargarh, Odisha India.**	**Format No.:**	**FRM-062**
		Reporting Date:	**07.11.2024**
		Ref. No:	**NIL**
		Monitoring Period:	**October 2024**
		Equipment Used:	**Sound Level Meter**
Sample Collected By:	**EPAL Representative**	**Protocol Used:**	**IS-9989**
Sample Description:	**Ambient Noise Monitoring**	**Parameter Required:**	**As per Govt. Standard**
Sample Type :	**Noise Level Monitoring**	**Customer Name:**	**Nadidih Iron Ore Mines**
		Sample Condition:	**Good Clear**

RESULTS

Sr. No.	Location	Date of Monitoring	Latitude	Longitude	Day Time {dB(A)}	Night Time {dB(A)}
1	Near Mine office	01.10.2024	21°58'09" N	85°15'33" E	56.3	43.2
2	Near Mines Gate	04.10.2024	21°58'25" N	85°15'44" E	61.4	46.3
Standard Limit Industrial Area as per CPCB					**75**	**70**
3	Village Kenduhidi	08.11.2024	21°59'45" N	85°16'14" E	53.2	41.2
4	Village Badipada	11.11.2024	21°58'04" N	85°18'33" E	49.8	40.3
5	Village Jhirapani	15.11.2024	21°59'58" N	85°13'10" E	51.6	41.2
6	Village Kashira	18.11.2024	21°55'10" N	85°15'20" E	51.2	50.6
7	Upwind Direction	22.11.2024	21°58'14" N	85°15'22" E	52.8	41.7
8	Downwind Direction	25.11.2024	21°57'19" N	85°13'34" E	54.3	42.1
Standard Limit Residential Area as per CPCB					**55**	**45**

CPCB- Central Pollution Control Board

**** End of Report****

EPA LABS PRIVATE LIMITED BHIWADI

(Checked By)
Ankita Singh

EPA LABS PRIVATE LIMITED Authorised Signatory

(Approved By)
Brijesh Kumar

Note 1. Sample will be retained for 15 days for chemical testing and 7 days for Bacteriological testing from the date of issue of test report, unless specified by the customer. The results given for noise/lux are related to the observed values at the time of monitoring. The customer asked- for the above test only. 2. The parameters marked as * are not accredited by NABL. 3. The results given above are related to the tested sample and mentioned parameters. Endorsement of product is neither inferred not implied. 4 Total liability of our works limited of the invoice amount. 5. This report can not be used as evidence in a court of Law without the written approval of the lab. 6. Certificate shall be not reproduced, except in full, without prior written approval of the laboratory.

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ISO 9001: 2015, ISO 14001:2015, ISO 45001:2018 Certified & NABL ACCREDITED LAB

Lab.: 2nd Floor, Hans Complex, Near Police Chowki, Bhiwadi-301019 (Raj.)

Contact Info : +91-9759427231, Email : environmentpollutionlab@gmail.com

TC - 11007

TEST CERTIFICATE

Sample No:	**EPAL/W/24/11/02079**	**Report No.:**	**EPAL/24/11/02079**
Name & Address of the Project:	**M/s Nadidih Iron Ore Mines, Under ESL Steel Limited, (BICO) At Nadidih, PO - Koira Distt. Sundargarh, Odisha India.**	**Format No.:**	**FRM-062**
		Party Reference No.:	**NIL**
		Reporting Date:	**07/11/2024**
		Ground Water Level :	**4.5 Mtr.**
Sample Description:	**Ground Water Sample**	**Period of Analysis:**	**02.11.2024 to 07.11.2024**
Sample Location:	**Near Mine Site**	**Receipt Date:**	**02.11.2024**
Sample Collected by:	**DMSPL Representative**	**Sampling Date:**	**30.10.2024**
Sampling and Analysis Protocol:	**IS 3025 & APHA 24th Edition 2017**	**Sampling Quantity:**	**3.0 Ltr + 250ml**
Preservation:	**Ice Box**	**Sampling Type:**	**Grab**

RESULTS

S. No.	Parameter	Test-Method	Result	Unit	Limits of IS:10500 -2012	
					Requirement (Acceptable) Limit	Permissible limit in the Absence of Alternate Source
1.	pH (at 25 ^{0}C)	IS:3025 Part-11	7.52	--	6.5 to 8.5	No Relaxation
2.	Colour	IS:3025 Part-4	*BLQ (**LOQ 1.0 Hazen)	Hazen	5	15
3.	Turbidity	IS:3025 Part-10	*BLQ (**LOQ 1.0 NTU)	NTU	1	5
4.	Odour	IS:3025 Part-5	Agreeable	--	Agreeable	Agreeable
5.	Total Hardness as $CaCO_3$	IS:3025 Part-21	172.8	mg/l	200	600
6.	Calcium as Ca	IS:3025 Part-40	52.6	mg/l	75	200
7.	Alkalinity as $CaCO_3$	IS:3025 Part-23	122.4	mg/l	200	600
8.	Chloride as Cl	IS:3025 Part-32	81.2	mg/l	250	1000
9.	Cyanide as CN	IS:3025 Part-29	*BLQ(**LOQ 0.02 mg/l)	mg/l	0.05	No Relaxation
10.	Magnesium as Mg	APHA 24th, 3500 Mg B,	10.03	mg/l	30	100
11.	Total Dissolved Solids	IS:3025 Part-16	342	mg/l	500	2000
12.	Sulphate as SO_4	APHA 24th, 4500 SO_4,	75.8	mg/l	200	400
13.	Fluoride as F	APHA 24th 4500-F^-	0.44	mg/l	1.0	1.5
14.	Nitrate as NO_3	IS 3025 (P-34)	22.2	mg/l	45	No Relaxation
15.	Iron as Fe	APHA 24th 3111B	0.28	mg/l	1.0	No relaxation
16.	Aluminium as Al	APHA 24th 3111B	*BLQ(**LOQ 0.005 mg/l)	mg/l	0.03	0.2
17.	Boron	APHA 24th 4500 BC	*BLQ(**LOQ 0.01 mg/l)	mg/l	0.5	2.4
18.	Chromium as Cr	APHA 24th 3111B	*BLQ(**LOQ 0.002 mg/l)	mg/l	0.05	No Relaxation

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(Checked by)
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TC - 11007

TEST CERTIFICATE

Sample No.: EPAL/W/24/11/02079			Report No.: EPAL/24/11/02079			
S. No.	Parameter	Test-Method	Result	Unit	Limits of IS:10500 -2012	
					Requirement (Acceptable) Limit	Permissible limit in the Absence of Alternate Source
19.	Phenolic Compounds	IS:3025 Prat-43	*BLQ(**LOQ 0.0005 mg/l)	mg/l	0.001	0.002
20.	Oil & Grease	IS:3025 Part-39	*BLQ(**LOQ 0.1 mg/l)	mg/l	1.0	No Relaxation
21.	Anionic Detergents as MBAS	IS: 13428, Annex K of	*BLQ(**LOQ 0.05 mg/l)	mg/l	0.2	1.0
22.	Residual free Chlorine	IS 3025 P-26	*BDL(**DL 0.15mg/l)	mg/l	--	--
23.	Sodium as Na	APHA 24th 3111B	21.4	mg/l	--	--
24.	Potassium as K	APHA 24th 3111B	7.4	mg/l	--	--
25.	Zinc as Zn	APHA 24th 3111B	0.33	mg/l	5	15
26.	Copper as Cu	APHA 24th 3111B)	0.12	mg/l	0.05	1.5
27.	Manganese as Mn	APHA 24th 3111B	*BLQ(**LOQ 0.01 mg/l)	mg/l	0.1	0.3
28.	Cadmium as Cd	APHA 24th 3111B	*BLQ(**LOQ 0.002 mg/l)	mg/l	0.003	No Relaxation
29.	Lead as Pb	APHA 24th 3111B	*BLQ(**LOQ 0.002 mg/l)	mg/l	0.01	No Relaxation
30.	Selenium as Se	APHA 24th 3111B	*BLQ(**LOQ 0.001 mg/l)	mg/l	0.01	No Relaxation
31.	Arsenic as As	APHA 24th 3111B	*BLQ(**LOQ 0.005 mg/l)	mg/l	0.01	No Relaxation
32.	Mercury as Hg	APHA 24th 3111B	*BLQ (**LOQ 0.0005 mg/l)	mg/l	0.001	No Relaxation
33.	Total Coliform	IS 1622	<2	MPN/100ml	Shall not be detectable in any 100 ml sample	
34.	E. Coli	IS 1622	Absent	MPN/100ml	Shall not be detectable in any 100 ml sample	

Note: - *BLQ-Below Limit of Quantification, **LOQ- Limit of Quantification

EPA LABS PRIVATE LIMITED BHIWADI

(Checked by)
Ankita Singh

EPA LABS PRIVATE LIMITED Authorised Signatory

(Approved By)
Brijesh Kumar

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TC - 11007

TEST CERTIFICATE

Sample No:	**EPAL/W/24/11/02080**	**Report No.:**	**EPAL/24/11/02080**
Name & Address of the Project:	**M/s Nadidih Iron Ore Mines, Under ESL Steel Limited, (BICO) At Nadidih, PO - Koira Distt. Sundargarh, Odisha India.**	**Format No.:**	**FRM -062**
		Party Reference No.:	**NIL**
		Reporting Date:	**07.11.2024**
		Ground Water Level :	**4.9 Mtr.**
Sample Description:	**Ground Water Sample**	**Period of Analysis:**	**02.11.2024 to 07.11.2024**
Sample Location:	**Village Kenduhidi**	**Receipt Date:**	**02.11.2024**
Sample Collected by:	**EPAL Representative**	**Sampling Date:**	**30.10.2024**
Sampling and Analysis Protocol:	**IS 3025 & APHA 24th Edition 2017**	**Sampling Quantity:**	**3.0 Ltr + 250ml**
Preservation:	**Ice Box**	**Sampling Type:**	**Grab**

RESULTS

S. No.	Parameter	Test-Method	Result	Unit	Limits of IS:10500 -2012	
					Requirement (Acceptable) Limit	Permissible limit in the Absence of Alternate Source
1.	pH (at 25 ^{0}C)	IS:3025 Part-11	7.75	--	6.5 to 8.5	No Relaxation
2.	Colour	IS:3025 Part-4	*BLQ (**LOQ 1.0 Hazen)	Hazen	5	15
3.	Turbidity	IS:3025 Part-10	*BLQ (**LOQ 1.0 NTU)	NTU	1	5
4.	Odour	IS:3025 Part-5	Agreeable	--	Agreeable	Agreeable
5.	Total Hardness as $CaCO_3$	IS:3025 Part-21	275.3	mg/l	200	600
6.	Calcium as Ca	IS:3025 Part-40	64.7	mg/l	75	200
7.	Alkalinity as $CaCO_3$	IS:3025 Part-23	156.5	mg/l	200	600
8.	Chloride as Cl	IS:3025 Part-32	80.6	mg/l	250	1000
9.	Cyanide as CN	IS:3025 Part-29	*BLQ(**LOQ 0.02 mg/l)	mg/l	0.05	No Relaxation
10.	Magnesium as Mg	APHA 24th, 3500 Mg B,	27.6	mg/l	30	100
11.	Total Dissolved Solids	IS:3025 Part-16	388.5	mg/l	500	2000
12.	Sulphate as SO_4	APHA 24th, 4500 SO_4,	51.7	mg/l	200	400
13.	Fluoride as F	APHA 24th 4500-F^-	0.15	mg/l	1.0	1.5
14.	Nitrate as NO_3	IS 3025 (P-34)	7.3	mg/l	45	No Relaxation
15.	Iron as Fe	APHA 24th 3111B	0.23	mg/l	1.0	No relaxation
16.	Aluminium as Al	APHA 24th 3111B	*BLQ(**LOQ 0.005 mg/l)	mg/l	0.03	0.2
17.	Boron	APHA 24th 4500 BC	*BLQ(**LOQ 0.01 mg/l)	mg/l	0.5	2.4
18.	Chromium as Cr	APHA 24th 3111B	*BLQ(**LOQ 0.002 mg/l)	mg/l	0.05	No Relaxation

EPA LABS PRIVATE LIMITED BHIWADI

(Checked by)
Ankita Singh

EPA LABS PRIVATE LIMITED

(Approved By)
Brijesh Kumar

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TC - 11007

TEST CERTIFICATE

Sample No.: EPAL/W/24/11/02080					Report No.: EPAL/24/11/02080	
S. No.	Parameter	Test-Method	Result	Unit	Limits of IS:10500 -2012	
					Requirement (Acceptable) Limit	Permissible limit in the Absence of Alternate Source
19.	Phenolic Compounds	IS:3025 Prat-43	*BLQ(**LOQ 0.0005 mg/l)	mg/l	0.001	0.002
20.	Oil & Grease	IS:3025 Part-39	*BLQ(**LOQ 0.1 mg/l)	mg/l	1.0	No Relaxation
21.	Anionic Detergents as MBAS	IS: 13428, Annex K	*BLQ(**LOQ 0.05 mg/l)	mg/l	0.2	1.0
22.	Residual free Chlorine	IS 3025 P-26	*BDL(**DL 0.15mg/l)	mg/l	--	--
23.	Sodium as Na	APHA 24th 3111B	20.5	mg/l	--	--
24.	Potassium as K	APHA 24th 3111B	5.6	mg/l	--	--
25.	Zinc as Zn	APHA 24th 3111B	1.31	mg/l	5	15
26.	Copper as Cu	APHA 24th 3111B)	0.15	mg/l	0.05	1.5
27.	Manganese as Mn	APHA 24th 3111B	*BLQ(**LOQ 0.01 mg/l)	mg/l	0.1	0.3
28.	Cadmium as Cd	APHA 24th 3111B	*BLQ(**LOQ 0.002 mg/l)	mg/l	0.003	No Relaxation
29.	Lead as Pb	APHA 24th 3111B	*BLQ(**LOQ 0.002 mg/l)	mg/l	0.01	No Relaxation
30.	Selenium as Se	APHA 24th 3111B	*BLQ(**LOQ 0.001 mg/l)	mg/l	0.01	No Relaxation
31.	Arsenic as As	APHA 24th 3111B	*BLQ(**LOQ 0.005 mg/l)	mg/l	0.01	No Relaxation
32.	Mercury as Hg	APHA 24th 3111B	*BLQ (**LOQ 0.0005 mg/l)	mg/l	0.001	No Relaxation
33.	Total Coliform	IS 1622	<2	MPN/100ml	Shall not be detectable in any 100 ml sample	
34.	E. Coli	IS 1622	Absent	MPN/100ml	Shall not be detectable in any 100 ml sample	

Note: - *BLQ-Below Limit of Quantification, **LOQ- Limit of Quantification

EPA LABS PRIVATE LIMITED BHIWADI

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TC - 11007

TEST CERTIFICATE

Sample No:	**EPAL/W/24/11/02081**	**Report No.:**	**EPAL/24/11/02081**
Name & Address of the Projec	**M/s Nadidih Iron Ore Mines, Under ESL Steel Limited, (BICO) At Nadidih, PO - Koira Distt. Sundargarh, Odisha India.**	**Format No.:**	**FRM -062**
		Party Reference No.:	**NIL**
		Reporting Date:	**07.11.2024**
		Ground Water Level :	**4.1 Mtr.**
Sample Description:	**Ground Water Sample**	**Period of Analysis:**	**02.11.2024 to 07.11.2024**
Sample Location:	**Village Badipada**	**Receipt Date:**	**02.11.2024**
Sample Collected by:	**EPAL Representative**	**Sampling Date:**	**30.10.2024**
Sampling and Analysis Protocol:	**IS 3025 & APHA 24th Edition 2017**	**Sampling Quantity:**	**4.1 Ltr + 250ml**
Preservation:	**Ice Box**	**Sampling Type:**	**Grab**

RESULTS

S. No.	Parameter	Test-Method	Result	Unit	Limits of IS:10500 -2012	
					Requirement (Acceptable) Limit	Permissible limit in the Absence of Alternate Source
1.	pH (at 25 ^{0}C)	IS:3025 Part-11	7.63	--	6.5 to 8.5	No Relaxation
2.	Colour	IS:3025 Part-4	*BLQ (**LOQ 1.0 Hazen)	Hazen	5	15
3.	Turbidity	IS:3025 Part-10	*BLQ (**LOQ 1.0 NTU)	NTU	1	5
4.	Odour	IS:3025 Part-5	Agreeable	--	Agreeable	Agreeable
5.	Total Hardness as $CaCO_3$	IS:3025 Part-21	154.6	mg/l	200	600
6.	Calcium as Ca	IS:3025 Part-40	45.4	mg/l	75	200
7.	Alkalinity as $CaCO_3$	IS:3025 Part-23	103.2	mg/l	200	600
8.	Chloride as Cl	IS:3025 Part-32	72.4	mg/l	250	1000
9.	Cyanide as CN	IS:3025 Part-29	*BLQ(**LOQ 0.02 mg/l)	mg/l	0.05	No Relaxation
10.	Magnesium as Mg	APHA 24th, 3500 Mg B,	9.98	mg/l	30	100
11.	Total Dissolved Solids	IS:3025 Part-16	358	mg/l	500	2000
12.	Sulphate as SO_4	APHA 24th, 4500 SO_4,	78.6	mg/l	200	400
13.	Fluoride as F	APHA 24th 4500-F^-	0.38	mg/l	1.0	1.5
14.	Nitrate as NO_3	IS 3025 (P-34)	22.4	mg/l	45	No Relaxation
15.	Iron as Fe	APHA 24th 3111B	0.32	mg/l	1.0	No relaxation
16.	Aluminium as Al	APHA 24th 3111B	*BLQ(**LOQ 0.005 mg/l)	mg/l	0.03	0.2
17.	Boron	APHA 24th 4500 BC	*BLQ(**LOQ 0.01 mg/l)	mg/l	0.5	2.4
18.	Chromium as Cr	APHA 24th 3111B	*BLQ(**LOQ 0.002 mg/l)	mg/l	0.05	No Relaxation

EPA LABS PRIVATE LIMITED BHIWADI

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TC - 11007

TEST CERTIFICATE

Sample No.: EPAL/W/24/11/02081					Report No.: EPAL/24/11/02081	
S. No.	Parameter	Test-Method	Result	Unit	Limits of IS:10500 -2012	
					Requirement (Acceptable) Limit	Permissible limit in the Absence of Alternate Source
19.	Phenolic Compounds	IS:3025 Prat-43	*BLQ(**LOQ 0.0005 mg/l)	mg/l	0.001	0.002
20.	Oil & Grease	IS:3025 Part-39	*BLQ(**LOQ 0.1 mg/l)	mg/l	1.0	No Relaxation
21.	Anionic Detergents as MBAS	IS: 13428, Annex K	*BLQ(**LOQ 0.05 mg/l)	mg/l	0.2	1.0
22.	Residual free Chlorine	IS 3025 P-26	*BDL(**DL 0.15mg/l)	mg/l	--	--
23.	Sodium as Na	APHA 24th 3111B	18.8	mg/l	--	--
24.	Potassium as K	APHA 24th 3111B	8.2	mg/l	--	--
25.	Zinc as Zn	APHA 24th 3111B	0.75	mg/l	5	15
26.	Copper as Cu	APHA 24th 3111B)	0.24	mg/l	0.05	1.5
27.	Manganese as Mn	APHA 24th 3111B	*BLQ(**LOQ 0.01 mg/l)	mg/l	0.1	0.3
28.	Cadmium as Cd	APHA 24th 3111B	*BLQ(**LOQ 0.002 mg/l)	mg/l	0.003	No Relaxation
29.	Lead as Pb	APHA 24th 3111B	*BLQ(**LOQ 0.002 mg/l)	mg/l	0.01	No Relaxation
30.	Selenium as Se	APHA 24th 3111B	*BLQ(**LOQ 0.001 mg/l)	mg/l	0.01	No Relaxation
31.	Arsenic as As	APHA 24th 3111B	*BLQ(**LOQ 0.005 mg/l)	mg/l	0.01	No Relaxation
32.	Mercury as Hg	APHA 24th 3111B	*BLQ (**LOQ 0.0005 mg/l)	mg/l	0.001	No Relaxation
33.	Total Coliform	IS 1622	<2	MPN/100ml	Shall not be detectable in any 100 ml sample	
34.	E. Coli	IS 1622	Absent	MPN/100ml	Shall not be detectable in any 100 ml sample	

Note: -*BLQ-Below Limit of Quantification, **LOQ- Limit of Quantification

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TC - 11007

TEST CERTIFICATE

Sample No:	**EPAL/W/24/11/02082**	**Report No.:**	**EPAL/24/11/02082**
Name & Address of the Project:	**M/s Nadidih Iron Ore Mines, Under ESL Steel Limited, (BICO) At Nadidih, PO - Koira Distt. Sundargarh, Odisha India.**	**Format No.:**	**FRM -062**
		Party Reference No.:	**NIL**
		Reporting Date:	**07.11.2024**
		Ground Water Level :	**18.5 Mtr.**
Sample Description:	**Ground Water Sample**	**Period of Analysis:**	**02.11.2024 to 07.11.2024**
Sample Location:	**Village Jhirapani**	**Receipt Date:**	**02.11.2024**
Sample Collected by:	**DMSPL Representative**	**Sampling Date:**	**30.10.2024**
Sampling and Analysis Protocol:	**IS 3025 & APHA 24th Edition 2017**	**Sampling Quantity:**	**3.0 Ltr + 250ml**
Preservation:	**Ice Box**	**Sampling Type:**	**Grab**

RESULTS

S. No.	Parameter	Test-Method	Result	Unit	Limits of IS:10500 -2012	
					Requirement (Acceptable) Limit	Permissible limit in the Absence of Alternate Source
1.	pH (at 25 ^{0}C)	IS:3025 Part-11	7.68	--	6.5 to 8.5	No Relaxation
2.	Colour	IS:3025 Part-4	*BLQ (**LOQ 1.0 Hazen)	Hazen	5	15
3.	Turbidity	IS:3025 Part-10	*BLQ (**LOQ 1.0 NTU)	NTU	1	5
4.	Odour	IS:3025 Part-5	Agreeable	--	Agreeable	Agreeable
5.	Total Hardness as $CaCO_3$	IS:3025 Part-21	168.5	mg/l	200	600
6.	Calcium as Ca	IS:3025 Part-40	45.4	mg/l	75	200
7.	Alkalinity as $CaCO_3$	IS:3025 Part-23	147.4	mg/l	200	600
8.	Chloride as Cl	IS:3025 Part-32	78.3	mg/l	250	1000
9.	Cyanide as CN	IS:3025 Part-29	*BLQ(LOQ 0.02 mg/l)	mg/l	0.05	No Relaxation
10.	Magnesium as Mg	APHA 24th, 3500 Mg B,	13.36	mg/l	30	100
11.	Total Dissolved Solids	IS:3025 Part-16	365	mg/l	500	2000
12.	Sulphate as SO_4	APHA 24th, 4500 SO_4,	47.2	mg/l	200	400
13.	Fluoride as F	APHA 24th 4500-F^-	1.35	mg/l	1.0	1.5
14.	Nitrate as NO_3	IS 3025 (P-34)	22.1	mg/l	45	No Relaxation
15.	Iron as Fe	APHA 24th 3111B	0.22	mg/l	1.0	No relaxation
16.	Aluminium as Al	APHA 24th 3111B	*BLQ(**LOQ 0.005 mg/l)	mg/l	0.03	0.2
17.	Boron	APHA 24th 4500 BC	*BLQ(**LOQ 0.01 mg/l)	mg/l	0.5	2.4
18.	Chromium as Cr	APHA 24th 3111B	*BLQ(**LOQ 0.002 mg/l)	mg/l	0.05	No Relaxation

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Brijesh Kumar

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ISO 9001: 2015, ISO 14001:2015, ISO 45001:2018 Certified & NABL ACCREDITED LAB

Lab.: 2nd Floor, Hans Complex, Near Police Chowki, Bhiwadi-301019 (Raj.)

Contact Info : +91-9759427231, Email : environmentpollutionlab@gmail.com

TC - 11007

TEST CERTIFICATE

Sample No.: EPAL/W/24/11/02082					Report No.: EPAL/24/11/02082	
S. No.	Parameter	Test-Method	Result	Unit	Limits of IS:10500 -2012	
					Requirement (Acceptable) Limit	Permissible limit in the Absence of Alternate Source
19.	Phenolic Compounds	IS:3025 Prat-43	*BLQ(**LOQ 0.0005 mg/l)	mg/l	0.001	0.002
20.	Oil & Grease	IS:3025 Part-39	*BLQ(**LOQ 0.1 mg/l)	mg/l	1.0	No Relaxation
21.	Anionic Detergents as MBAS	IS: 13428, Annex K	*BLQ(**LOQ 0.05 mg/l)	mg/l	0.2	1.0
22.	Residual free Chlorine	IS 3025 P-26	*BDL(**DL 0.15mg/l)	mg/l	--	--
23.	Sodium as Na	APHA 24th 3111B	20.3	mg/l	--	--
24.	Potassium as K	APHA 24th 3111B	4.22	mg/l	--	--
25.	Zinc as Zn	APHA 24th 3111B	2.5	mg/l	5	15
26.	Copper as Cu	APHA 24th 3111B)	0.23	mg/l	0.05	1.5
27.	Manganese as Mn	APHA 24th 3111B	*BLQ(**LOQ 0.01 mg/l)	mg/l	0.1	0.3
28.	Cadmium as Cd	APHA 24th 3111B	*BLQ(**LOQ 0.002 mg/l)	mg/l	0.003	No Relaxation
29.	Lead as Pb	APHA 24th 3111B	*BLQ(**LOQ 0.002 mg/l)	mg/l	0.01	No Relaxation
30.	Selenium as Se	APHA 24th 3111B	*BLQ(**LOQ 0.001 mg/l)	mg/l	0.01	No Relaxation
31.	Arsenic as As	APHA 24th 3111B	*BLQ(**LOQ 0.005 mg/l)	mg/l	0.01	No Relaxation
32.	Mercury as Hg	APHA 24th 3111B	*BLQ (**LOQ 0.0005 mg/l)	mg/l	0.001	No Relaxation
33.	Total Coliform	IS 1622	<2	MPN/100ml	Shall not be detectable in any 100 ml sample	
34.	E. Coli	IS 1622	Absent	MPN/100ml	Shall not be detectable in any 100 ml sample	

Note: - *BLQ-Below Limit of Quantification, **LOQ- Limit of Quantification

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TC - 11007

TEST CERTIFICATE

Sample Number:	**EPAL/SO/24/11/02083**	**Report No.:**	**EPAL/24/11/02083**
Name & Address of Party:	**M/s Nadidih Iron Ore Mines, Under ESL Steel Limited, (BICO) At Nadidih, PO - Koira Distt. Sundargarh, Odisha India.**	**Format No.:**	**FRM-062**
		Party Reference No.:	**NIL**
		Reporting Date:	**07.11.2024**
		Receipt Date:	**02.11.2024**
Sample Description:	**SOIL**	**Sampling Date:**	**30.10.2024**
Sampling Location:	**Inside Mine Area**	**Type of Sampling:**	**Composite**
Sample Collected by	**EPAL Lab Representative**	**Sampling Quantity:**	**2.0 Kg**
Sampling & Analysis Protocol:	**IS 2720 & USDA**	**Depth of Sampling:**	**30 cm**
		Packing Status:	**Temp. Sealed**

Test Results

S. No.	Parameter	Protocol	Result	Unit
1.	pH (at 25 ^{0}C)	IS : 2720 (P-26,1987)	8.07	--
2.	Conductivity	IS:14767-2000	0.32	mS/cm
3.	Soil Texture	EPAL/QAD/STP/004,SP-19	Silty Loam	--
4.	Water holding capacity	EPAL/QAD/STP/004,SP-5	21.12	%
5.	Bulk density	IS:2720 Part-	1.15	gm/cc
6.	Chloride as Cl	EPAL/QAD/STP/004,SP-9	21.47	mg/100gm
7.	Calcium as Ca	USEPA3050B	31.5	mg/100gm
8.	Sodium as Na	EPAL/QAD/STP/004,SP-10	31.16	mg/100gm
9.	Potassium as K	EPAL/QAD/STP/004,SP-	62.8	kg/hec.
10.	Organic Matter	IS:2720 Part-22	0.32	%
11.	Magnesium as Mg	EPAL/QAD/STP/004,SP-7	11.8	mg/100gm
12.	Available Nitrogen as N	IS:14684	172.3	kg./hec.
13.	Available Phosphorus	EPAL/QAD/STP/004,SP-11	31.8	kg./hec.
14.	Zinc as Zn	EPAL/QAD/STP/004,SP-17	4.35	mg/100gm
15.	Manganese as Mn	USEPA 3050 B	2.14	mg/100gm
16.	Hexavalent chromium (as Cr+6)	USEPA 3050 B	1.24	mg/100gm
17.	Copper as Cu	EPAL/QAD/STP/004,SP-17	3.12	mg/100gm

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Contact Info : +91-9759427231, Email : environmentpollutionlab@gmail.com

TEST CERTIFICATE

Sample Number:	**EPAL/SO/24/11/02083**	**Report No.:**	**EPAL/24/11/02083a**
Name & Address of Party:	**M/s Nadidih Iron Ore Mines, Under ESL Steel Limited, (BICO) At Nadidih, PO - Koira Distt. Sundargarh, Odisha India.**	**Format No.:**	**FRM-062**
		Party Reference No.:	**NIL**
		Reporting Date:	**07.11.2024**
		Receipt Date:	**02.11.2024**
Sample Description:	**SOIL**	**Sampling Date:**	**30.10.2024**
Sampling Location:	**Inside Mine Area**	**Type of Sampling:**	**Composite**
Sample Collected by	**EPAL Lab Representative**	**Sampling Quantity:**	**2.0 Kg**
Sampling & Analysis Protocol:	**IS 2720 & USDA**	**Depth of Sampling:**	**30 cm**
		Packing Status:	**Temp. Sealed**

Test Results

S. No.	Parameter	Protocol	Result	Unit
1.	Cadmium as Cd	USEPA3050B	1.41	mg/100gm
2.	Lead as Pb	APHA-3030D, APHA-3111B	0.23	mg/100gm
3.	Colour	USDA Method, 1968	Yellowish	--

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TC - 11007

TEST CERTIFICATE

Sample Number:	**EPAL/S/24/11/02084**	**Report No.:**	**EPAL/24/11/02084**
Name & Address of the Project:	**M/s Nadidih Iron Ore Mines, Under ESL Steel Limited, (BICO) At Nadidih, PO - Koira Distt. Sundargarh, Odisha India.**	**Format No.:**	**FRM -062**
		Part Reference No.:	**NIL**
		Reporting Date:	**07.11.2024**
		Period of Analysis:	**02.11.2024 to 06.11.2024**
Sample Collected By:	**EPAL Representative**	**Receipt Date:**	**02.11.2024**
Sample Description:	**Stack Emission Monitoring**		
Sample Type :	**DG Stack Emission**		

Test Report

Sample Description	:	**Stack Emission Monitoring**
General Information		
Sample Location	:	Mine Site (DG Set Area)
Date of Sampling	:	29.10.2024
Sampling Duration (Minutes)	:	45 Min
Stack Attached to	:	DG Set
Make of Stack	:	MS
Diamètre of Stack (m)	:	0.30 Meter
Instruments calibration status	:	Caliberated
Meteorological Condition	:	Clear sky
Ambient Temperature-Ta (^{0}C)	:	28
Temperature of Stack Gases-Ts (^{0}C)	:	183
Velocity of Stack Gases (m/s)	:	10.3
Flow rate of PM (LPM)	:	18
Flow rate of Gas (LPM)	:	2.00
Sampling Condition	:	Isokinetic
Protocol used		IS 11255

RESULTS

Sr. No.	Test Parameters	Results	Test Method	Limit as per CPCB
1	Particulate Matter (as PM)	31.4	IS11255 (P-1)	75
2	Oxide of Nitrogen (as NOx)	205.6	IS 11255(P-7)	710
3	NMHC	21.3	IS: 11255 Part-15	100
4	Sulpher Dioxide (as SO2)	11.4	IS11255 (P-2)	--
5	Carbon Monooxide (CO)	54.8	IS 13270	150

Note- Laboratory Standard Testing Procedure

**** End of Report****

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TC - 11007

TEST CERTIFICATE

Sample Number:	**EPAL/W/24/11/02085**	**Report No.:**	**EPAL/24/11/02085**
Name of the Project:	**M/s Nadidih Iron Ore Mines, Under ESL Steel Limited, (BICO) At Nadidih, PO - Koira Distt. Sundargarh, Odisha India.**	**Format No.:**	**FRM-062**
		Party Reference No.:	**NIL**
		Reporting Date:	**07.11.2024**
Sample Description:	**Surface Water Sample**	**Period of Analysis:**	**02.11.2024 to 07.11.2024**
Sampling Location:	**River Sample (Near Mines Upstream)**	**Receipt Date:**	**02.11.2024**
Sample Collected by:	**EPAL Lab Representative**	**Sampling Date:**	**30.10.2024**
Preservation:	**Ice Box**	**Sampling Quantity:**	**2.0 Ltr + 250ml.**
Sampling and Analysis Protocol:	**APHA & IS, 23rd Edition 2017**	**Sampling Type:**	**Composite**

TEST RESULTS

S. No.	Parameter	Test-Method	Result	Unit
1.	pH (at 25 0C)	IS:3025 Part-11	7.43	--
2.	Colour	IS:3025 Part-4	15	Hazen
3.	Turbidity	IS:3025 Part-10	11	NTU
4.	Odour	IS:3025 Part-5	Agreeable	--
5.	Total Hardness as CaCO3	IS:3025 Part-21	102.3	mg/l
6.	Calcium as Ca	IS:3025 Part-40	27.4	mg/l
7.	Total Alkalinity as CaCO3	S:3025 Part-23	65.1	mg/l
8.	Chloride as Cl	IS:3025 Part-32	38.7	mg/l
9.	Total Residual Chlorine	IS:3025Part-26	*BDL(**DL 0.15mg/l)	mg/l
10.	Cyanide as CN	APHA 24th Ed. 3111 B	*BDL(**DL 0.02 mg/l)	mg/l
11.	Magnesium as Mg	APHA 24th Ed. 3500 B	8.14	mg/l
12.	Total Dissolved Solids (TDS)	IS:3025 Part-16	254	mg/l
13.	Total Suspended solids	IS:3025 Part-17	22	mg/l
14.	Dissolved Oxygen	IS:3025 Part-38	6.1	mg/l
15.	Sulphide	IS:3025 Part-29	1.1	mg/l
16.	Fluoride as F	APHA 24th Ed. 4500 F	0.12	mg/l
17.	BOD (3 Days at 270C)	IS:3025 Part-44	9.8	mg/l
18.	COD	APHA 24th Ed. 5220 B	31.6	mg/l

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TEST CERTIFICATE

Sample No.: EPAL/W/24/11/02085			Report No.: EPAL/24/11/02085	
S. No.	**Parameter**	**Test-Method**	**Result**	**Unit**
19.	Conductivity (at 25 ^{0}C)	IS: 3025 Part-14	0.42	mS/cm
20.	Nitrate as NO_3	IS:3025 Part-34	7.8	mg/l
21.	Sodium as Na	APHA 24th 3111B	16.9	mg/l
22.	Potassium as K	APHA 24th 3111B	7.1	mg/l
23.	Iron as Fe	APHA 24th 3111B	0.38	mg/l
24.	Aluminium as Al	APHA 24th 4500 BC	*BDL(**DL 0.002 mg/l)	mg/l
25.	Boron	APHA 24th 3111B	*BDL(**DL 0.002 mg/l)	mg/l
26.	Hexavalent Chromium as Cr	IS 3025 (P-65):2014(RA:2019)	*BDL(**DL 0.002 mg/l)	mg/l
27.	Phenolic Compounds	IS:3025 Prat-43	*BDL(**DL 0.0004mg/l)	mg/l
28.	Oil & Grease	IS:3025 Part-39	*BDL(**DL 0.1 mg/l)	mg/l
29.	Anionic Detergents as MBAS	IS: 13428, Annex K of	*BDL(**DL 0.05 mg/l)	mg/l
30.	Zinc as Zn	APHA 24th 3111B	*BDL(**DL 0.05 mg/l)	mg/l
31.	Copper as Cu	APHA 24th 3111B	*BDL(**DL 0.1 mg/l)	mg/l
32.	Manganese as Mn	APHA 24th 3111B	*BDL(**DL 0.01 mg/l)	mg/l
33.	Cadmium as Cd	APHA 24th 3111B	*BDL(**DL 0.002 mg/l)	mg/l
34.	Temperature	IS:3025 Part-9	24.6	mg/l
35.	Selenium as Se	APHA 24th Ed. 3111 B	*BDL(**DL 2.0 mg/l)	mg/l
36.	Free Ammonia	IS 3025 (P-34):1988	*BDL(**DL 0.20 mg/l)	mg/l
37.	Total kjeldhal Nitrogen	IS:3025 Part-34	*BDL(**DL 0.20 mg/l)	mg/l
38.	Nickel	APHA 24th Ed. 3111 B	*BDL(**DL 0.02 mg/l)	mg/l
39.	Arsenic as As	APHA 24th Ed. 3111 B	*BDL(**DL 0.02 mg/l)	mg/l
40.	Ammonical Nitrogen	IS 3025 (P-34):1988	*BDL(**DL 0.20 mg/l)	mg/l
41.	Total Coliform	IS : 1622	218	MPN/100ml
42.	Fecal Coliform	IS : 1622	172	MPN/100ml

*BDL-Below Detection Limit, **DL- Detection Limit

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TC - 11007

TEST CERTIFICATE

Sample Number:	**EPAL/W/24/11/02086**	**Report No.:**	**EPAL/24/11/02086**
Name of the Project:	**M/s Nadidih Iron Ore Mines, Under ESL Steel Limited, (BICO) At Nadidih, PO - Koira Distt. Sundargarh, Odisha India.**	**Format No.:**	**FRM-062**
		Party Reference No.:	**NIL**
		Reporting Date:	**03/10/2024**
Sample Description:	**Surface Water Sample**	**Period of Analysis:**	**24/09/2024– 30/09/2024**
Sampling Location:	**River Sample (Near Mines Downstream)**	**Receipt Date:**	**23/09/2024**
Sample Collected by:	**DMSPL Lab Representative**	**Sampling Date:**	**20/09/2024**
Preservation:	**Ice Box**	**Sampling Quantity:**	**2.0 Ltr + 250ml.**
Sampling and Analysis Protocol:	**APHA & IS, 23rd Edition 2017**	**Sampling Type:**	**Composite**

TEST RESULTS

S. No.	Parameter	Test-Method	Result	Unit
1.	pH (at 25 0C)	IS:3025 Part-11	7.41	--
2.	Colour	IS:3025 Part-4	18	Hazen
3.	Turbidity	IS:3025 Part-10	12	NTU
4.	Odour	IS:3025 Part-5	Agreeable	--
5.	Total Hardness as CaCO3	IS:3025 Part-21	102.8	mg/l
6.	Calcium as Ca	IS:3025 Part-40	27.8	mg/l
7.	Total Alkalinity as CaCO3	S:3025 Part-23	65.9	mg/l
8.	Chloride as Cl	IS:3025 Part-32	39.2	mg/l
9.	Total Residual Chlorine	IS:3025Part-26	*BDL(**DL 0.15mg/l)	mg/l
10.	Cyanide as CN	APHA 24th Ed. 3111 B	*BDL(**DL 0.02 mg/l)	mg/l
11.	Magnesium as Mg	APHA 24th Ed. 3500 B	8.18	mg/l
12.	Total Dissolved Solids (TDS)	IS:3025 Part-16	260	mg/l
13.	Total Suspended solids	IS:3025 Part-17	23	mg/l
14.	Dissolved Oxygen	IS:3025 Part-38	6.2	mg/l
15.	Sulphide	IS:3025 Part-29	1.2	mg/l
16.	Fluoride as F	APHA 24th Ed. 4500 F	0.14	mg/l
17.	BOD (3 Days at 270C)	IS:3025 Part-44	9.5	mg/l
18.	COD	APHA 24th Ed. 5220 B	31.8	mg/l

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(Erstwhile know as Environment Pollution Analysis Lab)

ISO 9001: 2015, ISO 14001:2015, ISO 45001:2018 Certified & NABL ACCREDITED LAB

Lab.: 2nd Floor, Hans Complex, Near Police Chowki, Bhiwadi-301019 (Raj.)

Contact Info : +91-9759427231, Email : environmentpollutionlab@gmail.com

TC - 11007

TEST CERTIFICATE

Sample No.: EPAL/W/24/11/02086			Report No.: EPAL/24/11/02086	
S. No.	**Parameter**	**Test-Method**	**Result**	**Unit**
19.	Conductivity (at 25 ^{0}C)	IS: 3025 Part-14	0.42	mS/cm
20.	Nitrate as NO_3	IS:3025 Part-34	7.7	mg/l
21.	Sodium as Na	APHA 24th 3111B	17.2	mg/l
22.	Potassium as K	APHA 24th 3111B	7.4	mg/l
23.	Iron as Fe	APHA 24th 3111B	0.37	mg/l
24.	Aluminium as Al	APHA 24th 4500 BC	*BDL(**DL 0.002 mg/l)	mg/l
25.	Boron	APHA 24th 3111B	*BDL(**DL 0.002 mg/l)	mg/l
26.	Hexavalent Chromium as Cr	IS 3025 (P-65):2014(RA:2019)	*BDL(**DL 0.002 mg/l)	mg/l
27.	Phenolic Compounds	IS:3025 Prat-43	*BDL(**DL 0.0004mg/l)	mg/l
28.	Oil & Grease	IS:3025 Part-39	*BDL(**DL 0.1 mg/l)	mg/l
29.	Anionic Detergents as MBAS	IS: 13428, Annex K of	*BDL(**DL 0.05 mg/l)	mg/l
30.	Zinc as Zn	APHA 24th 3111B	*BDL(**DL 0.05 mg/l)	mg/l
31.	Copper as Cu	APHA 24th 3111B	*BDL(**DL 0.1 mg/l)	mg/l
32.	Manganese as Mn	APHA 24th 3111B	*BDL(**DL 0.01 mg/l)	mg/l
33.	Cadmium as Cd	APHA 24th 3111B	*BDL(**DL 0.002 mg/l)	mg/l
34.	Temperature	IS:3025 Part-9	24.8	mg/l
35.	Selenium as Se	APHA 24th Ed. 3111 B	*BDL(**DL 2.0 mg/l)	mg/l
36.	Free Ammonia	IS 3025 (P-34):1988	*BDL(**DL 0.20 mg/l)	mg/l
37.	Total kjeldhal Nitrogen	IS:3025 Part-34	*BDL(**DL 0.20 mg/l)	mg/l
38.	Nickel	APHA 24th Ed. 3111 B	*BDL(**DL 0.02 mg/l)	mg/l
39.	Arsenic as As	APHA 24th Ed. 3111 B	*BDL(**DL 0.02 mg/l)	mg/l
40.	Ammonical Nitrogen	IS 3025 (P-34):1988	*BDL(**DL 0.20 mg/l)	mg/l
41.	Total Coliform	IS : 1622	232	MPN/100ml
42.	Fecal Coliform	IS : 1622	181	MPN/100ml

*BDL-Below Detection Limit, **DL- Detection Limit

EPA LABS PRIVATE LIMITED BHIWADI

(Checked By)
Ankita Singh

EPA LABS PRIVATE LIMITED Authorised Signatory

(Approved By)
Brijesh Kumar

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ENVIRONMENT MONITORING REPORT

FOR THE MONTH OF

NOVEMBER -2024

NARAYANI

Client- M/s. Nadidih Iron Ore Mines (BICO),

M/s ESL Steel Limited,

Address- Koira, Sundargarh, Odisha.

GREEN FORCE

Monitored By - Green Force Associates Pvt. Ltd.

Address- Plot No-1666, Phase-II, Delta Colony,

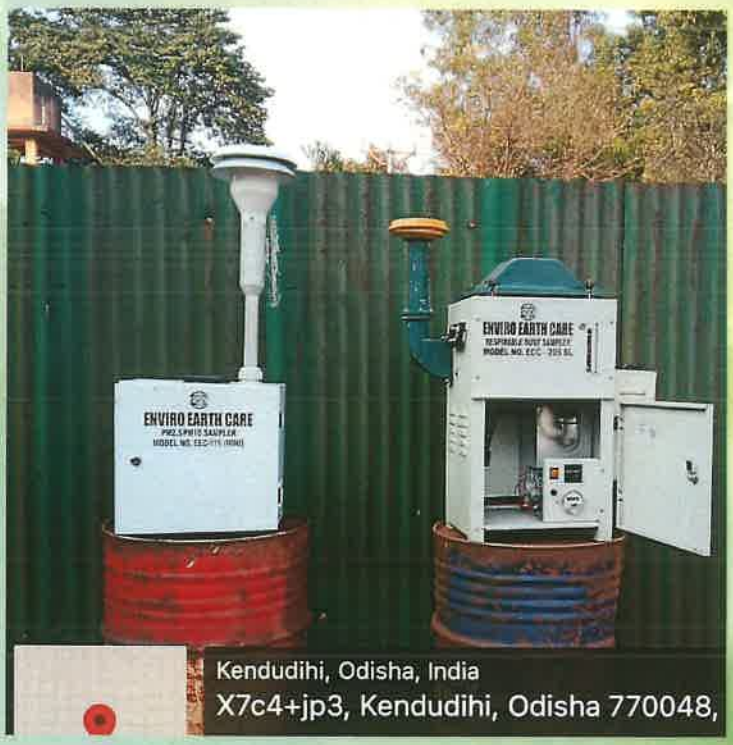
Nilakantheswar Marg, Baramunda,

Bhubaneswar-751003

NABL Certificate No:- TC-12258

PHOTOGRAPHS
OF
ENVIRONMENT MONITORING





GREEN FORCE ASSOCIATES PRIVATE LIMITED

Plot No.-1666, Phase-II, Delta Colony, Nilakantheswar Marg,
Baramunda, Bhubaneswar, Dist - Khurdha

Mail Id: greenforceassociates@gmail.com

TC-12258

Report No- GFAPL/24-25/ESLBI/001 **Issued Date-05.12.2024**

TEST REPORT

Client Name &Address	**M/s. Nadidih Iron Ore Mines (BICO),** ***M/s ESL Steel Limited,*** *At/PO:- Koira, Sundargarh, Odisha.*		
Nature of Sampling	**Ambient Air Quality Monitoring (AAQ)**		
Sampling By	**GFAPL's Representative**		
Environmental Condition	Good	**Sampling Method**	As per IS: 5182
Location of performance of Laboratory activities	Laboratory Permanent Facility	**Deviation from the method (if any)**	NO
Discipline	Chemical	**Group**	Atmospheric Pollution
Sampling Location & Coordinates	**AAQ1- Near Mine Office** **Lat:**21°58'9.21"N **& Long:**85°15'33.67"E;		
Instrument Used	**Respirable Dust Sampler, Fine ParticuLate Dust Sampler**		

Date of Sampling	PM_{10} ($\mu g/m^3$)	$PM_{2.5}$ ($\mu g/m^3$)	SO_2 ($\mu g/m^3$)	NO_2 ($\mu g/m^3$)
04.11.2024	55.2	27.2	7.4	12.4
07.11.2024	57.3	28.5	7.8	12.8
11.11.2024	59.1	29.3	8.2	13.6
14.11.2024	61.9	30.6	8.6	14.2
18.11.2024	64.2	31.8	8.9	14.6
21.11.2024	61.5	30.6	8.4	14.2
25.11.2024	63.4	31.5	8.8	14.8
28.11.2024	65.1	32.4	9.4	15.4
Max	**65.10**	**32.40**	**9.40**	**15.40**
Min	**55.20**	**27.20**	**7.40**	**12.40**
Average	**60.96**	**30.24**	**8.44**	**14.00**
NAAQ* Standard	**100**	**60**	**80**	**80**
Methods of Analysis	**IS:5182 (Part-23)**	**IS:5182 (Part-24)**	**IS:5182 (Part-2)**	**IS:5182 (Part-6)**

Reviewed By
CHIEF ANALYST
GREENFORCE ASSOCIATES PRIVATE LIMITED
BHUBANESWAR, ODISHA
Chief Analyst
Miss. Arti Sahoo

Authorized Signatory
TECHNICAL MANAGER
GREENFORCE ASSOCIATES PRIVATE LIMITED
BHUBANESWAR, ODISHA
Technical Manager
Mr. S.K. Parhi

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END OF REPORT

Plot No- 1363-3892, Baibhab Realcon, Fulnakhara,
Cuttack, Odisha, India 754001

GREEN FORCE ASSOCIATES PRIVATE LIMITED

Plot No.-1666, Phase-II, Delta Colony, Nilakantheswar Marg,
Baramunda, Bhubaneswar, Dist - Khurdha

Mail Id: greenforceassociates@gmail.com

TC-12258

Report No- GFAPL/24-25/ESLBI/002 **Issued Date-05.12.2024**

TEST REPORT

Client Name &Address	**M/s. Nadidih Iron Ore Mines (BICO),** ***M/s ESL Steel Limited,*** *At/PO:- Koira, Sundargarh, Odisha.*		
Nature of Sampling	**Ambient Air Quality Monitoring (AAQ)**		
Sampling By	**GFAPL's Representative**		
Environmental Condition	Good	**Sampling Method**	As per IS: 5182
Location of performance of Laboratory activities	Laboratory Permanent Facility	**Deviation from the method (if any)**	NO
Discipline	Chemical	**Group**	Atmospheric Pollution
Sampling Location & Coordinates	**AAQ2- Near Mine InGate** **Lat:** 21°58'23.32"N **& Long**: 85°15'44.18"E		
Instrument Used	**Respirable Dust Sampler, Fine ParticuLate Dust Sampler**		

Date of Sampling	PM_{10} ($\mu g/m^3$)	$PM_{2.5}$ ($\mu g/m^3$)	SO_2 ($\mu g/m^3$)	NO_2 ($\mu g/m^3$)
04.11.2024	59.1	29.5	8.2	13.4
07.11.2024	61.5	30.3	8.6	13.8
11.11.2024	64.7	32.4	9.2	14.6
14.11.2024	67.4	34.3	9.6	15.2
18.11.2024	69.1	34.6	10.2	15.8
21.11.2024	67.7	34.4	9.8	15.4
25.11.2024	69.5	35.1	10.4	15.8
28.11.2024	71.1	35.8	10.8	16.6
Max	**71.10**	**35.80**	**10.80**	**16.60**
Min	**59.10**	**29.50**	**8.20**	**13.40**
Average	**66.26**	**33.30**	**9.60**	**15.08**
NAAQ* Standard	**100**	**60**	**80**	**80**
Methods of Analysis	**IS:5182 (Part-23)**	**IS:5182 (Part-24)**	**IS:5182 (Part-2)**	**IS:5182 (Part-6)**

Reviewed By

CHIEF ANALYST
GREENFORCE ASSOCIATES PRIVATE LIMITED
BHUBANESWAR, ODISHA

Chief Analyst
Miss. Arti Sahoo

Authorized Signatory

TECHNICAL MANAGER
GREENFORCE ASSOCIATES PRIVATE LIMITED
BHUBANESWAR, ODISHA

Technical Manager
Mr. S.K. Parhi

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END OF REPORT

Plot No- 1363-3892, Baibhab Realcon, Fulnakhara,
Cuttack, Odisha, India 754001

GREEN FORCE ASSOCIATES PRIVATE LIMITED

Plot No.-1666, Phase-II, Delta Colony, Nilakantheswar Marg,
Baramunda, Bhubaneswar, Dist - Khurdha

Mail Id: greenforceassociates@gmail.com

TC-12258

Report No- GFAPL/24-25/ESLBI/003 **Issued Date-05.12.2024**

TEST REPORT

Client Name &Address	**M/s. Nadidih Iron Ore Mines (BICO),** *M/s ESL Steel Limited,* *At/PO:- Koira, Sundargarh, Odisha.*		
Nature of Sampling	**Ambient Air Quality Monitoring (AAQ)**		
Sampling By	**GFAPL's Representative**		
Environmental Condition	Good	**Sampling Method**	As per IS: 5182
Location of performance of Laboratory activities	Laboratory Permanent Facility	**Deviation from the method (if any)**	NO
Discipline	Chemical	**Group**	Atmospheric Pollution
Sampling Location & Coordinates	**AAQ3- Village Kenduhidi;** **Lat**21°59'45.70"N **& Long:** 85°16'14.44"E;		
Instrument Used	**Respirable Dust Sampler, Fine Particulate Dust Sampler**		

Date of Sampling	PM_{10} ($\mu g/m^3$)	$PM_{2.5}$ ($\mu g/m^3$)	SO_2 ($\mu g/m^3$)	NO_2 ($\mu g/m^3$)
04.11.2024	42.2	19.2	<4.0	<9.0
07.11.2024	44.1	21.8	<4.0	<9.0
11.11.2024	45.6	22.2	<4.0	<9.0
14.11.2024	46.8	22.7	<4.0	<9.0
18.11.2024	47.1	23.4	<4.0	<9.0
21.11.2024	48.2	23.8	<4.0	<9.0
25.11.2024	47.6	23.4	<4.0	<9.0
28.11.2024	48.8	23.7	<4.0	<9.0
Max	**48.80**	**23.80**	**<4.0**	**<9.0**
Min	**42.20**	**19.20**	**<4.0**	**<9.0**
Average	**46.30**	**22.53**	**<4.0**	**<9.0**
NAAQ* Standard	**100**	**60**	**80**	**80**
Methods of Analysis	**IS:5182 (Part-23)**	**IS:5182 (Part-24)**	**IS:5182 (Part-2)**	**IS:5182 (Part-6)**

Reviewed By

CHIEF ANALYST
GREENFORCE ASSOCIATES PRIVATE LIMITED
BHUBANESWAR, ODISHA

Chief Analyst
Miss. Arti Sahoo

Authorized Signatory

TECHNICAL MANAGER
GREENFORCE ASSOCIATES PRIVATE LIMITED
BHUBANESWAR, ODISHA

Technical Manager
Mr. S.K. Parhi

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END OF REPORT

Plot No- 1363-3892, Baibhab Realcon, Fulnakhara,
Cuttack, Odisha, India 754001

GREEN FORCE ASSOCIATES PRIVATE LIMITED

Plot No.-1666, Phase-II, Delta Colony, Nilakantheswar Marg,
Baramunda, Bhubaneswar, Dist - Khurdha

Mail Id: greenforceassociates@gmail.com

TC-12258

Report No- GFAPL/24-25/ESLBI/004 **Issued Date-05.12.2024**

TEST REPORT

Client Name &Address	**M/s. Nadidih Iron Ore Mines (BICO),** *M/s ESL Steel Limited,* *At/PO:- Koira, Sundargarh, Odisha.*		
Nature of Sampling	**Ambient Air Quality Monitoring (AAQ)**		
Sampling By	**GFAPL's Representative**		
Environmental Condition	Good	**Sampling Method**	As per IS: 5182
Location of performance of Laboratory activities	Laboratory Permanent Facility	**Deviation from the method (if any)**	NO
Discipline	Chemical	**Group**	Atmospheric Pollution
Sampling Location & Coordinates	**AAQ4- Village Badipada** **Lat:**21°58'4.60"N **& Long:**85°18'33.80"E;		
Instrument Used	**Respirable Dust Sampler, Fine ParticuLate Dust Sampler**		

Date of Sampling	PM_{10} ($\mu g/m^3$)	$PM_{2.5}$ ($\mu g/m^3$)	SO_2 ($\mu g/m^3$)	NO_2 ($\mu g/m^3$)
04.11.2024	42.8	18.6	<4.0	<9.0
07.11.2024	44.2	20.8	<4.0	<9.0
11.11.2024	43.9	21.1	<4.0	<9.0
14.11.2024	45.8	21.8	<4.0	<9.0
18.11.2024	47.2	22.8	<4.0	<9.0
21.11.2024	49.5	23.5	<4.0	<9.0
25.11.2024	48.6	23.6	<4.0	<9.0
28.11.2024	49.8	23.9	<4.0	<9.0
Max	**49.80**	**23.90**	**<4.0**	**<9.0**
Min	**42.80**	**18.60**	**<4.0**	**<9.0**
Average	**46.48**	**22.01**	**<4.0**	**<9.0**
NAAQ* Standard	**100**	**60**	**80**	**80**
Methods of Analysis	**IS:5182 (Part-23)**	**IS:5182 (Part-24)**	**IS:5182 (Part-2)**	**IS:5182 (Part-6)**

Reviewed By

CHIEF ANALYST
GREENFORCE ASSOCIATES PRIVATE LIMITED
BHUBANESWAR, ODISHA

Chief Analyst
Miss. Arti Sahoo

Authorized Signatory

TECHNICAL MANAGER
GREENFORCE ASSOCIATES PRIVATE LIMITED
BHUBANESWAR, ODISHA

Technical Manager
Mr. S.K. Parhi

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END OF REPORT

Plot No- 1363-3892, Baibhab Realcon, Fulnakhara,
Cuttack, Odisha, India 754001

GREEN FORCE ASSOCIATES PRIVATE LIMITED

Plot No.-1666, Phase-II, Delta Colony, Nilakantheswar Marg,
Baramunda, Bhubaneswar, Dist - Khurdha

Mail Id: greenforceassociates@gmail.com

(An ISO 14001, 9001, 45001 certified Consulting Organization & NABL Accredited Laboratory)

Report No- GFAPL/24-25/ESLBI/005 **Issued Date-05.12.2024**

TEST REPORT

Client Name &Address	**M/s. Nadidih Iron Ore Mines (BICO),** ***M/s ESL Steel Limited,*** *At/PO:- Koira, Sundargarh, Odisha.*		
Nature of Sampling	**Ambient Air Quality Monitoring (AAQ)**		
Sampling By	**GFAPL's Representative**		
Environmental Condition	Good	**Sampling Method**	As per IS: 5182
Location of performance of Laboratory activities	Laboratory Permanent Facility	**Deviation from the method (if any)**	NO
Discipline	Chemical	**Group**	Atmospheric Pollution
Sampling Location & Coordinates	**AAQ1- Near Mine Office; Lat:**21°58'9.21"N **& Long**: 85°15'33.67"E; **AAQ2- Near Mine In Gate; Lat:**21°58'23.32"N **& Long**: 85°15'44.18"E **AAQ3- Village Kenduhidi; Lat**21°59'45.70"N **& Long:** 85°16'14.44"E; **AAQ4- Village Badipada; Lat:**21°58'4.60"N **& Long**: 85°18'33.80"E;		
Instrument Used	CO Analyser		

Date of Sampling	**CO (mg/m3)**			
	AAQ1	**AAQ2**	**AAQ3**	**AAQ4**
04.11.2024	0.31	0.35	0.15	0.16
07.11.2024	0.32	0.36	0.16	0.16
11.11.2024	0.34	0.38	0.17	0.15
14.11.2024	0.36	0.4	0.17	0.16
18.11.2024	0.37	0.41	0.18	0.17
21.11.2024	0.36	0.4	0.2	0.19
25.11.2024	0.38	0.42	0.2	0.18
28.11.2024	0.39	0.43	0.19	0.2
Max	**0.39**	**0.43**	**0.20**	**0.20**
Min	**0.31**	**0.35**	**0.15**	**0.15**
Average	**0.35**	**0.39**	**0.18**	**0.17**
NAAQ* Standard	**4 mg/m3 (for 1hr)**			
Methods of Analysis	**IS: 5182 (Part- 10)**			

Reviewed By

CHIEF ANALYST
GREENFORCE ASSOCIATES PRIVATE LIMITED
BHUBANESWAR, ODISHA

Chief Analyst
Miss. Arti Sahoo

Authorized Signatory

TECHNICAL MANAGER
GREENFORCE ASSOCIATES PRIVATE LIMITED
BHUBANESWAR, ODISHA

Technical Manager
Mr. S.K. Parhi

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END OF REPORT

Plot No- 1363-3892, Baibhab Realcon, Fulnakhara,
Cuttack, Odisha, India 754001

GREEN FORCE ASSOCIATES PRIVATE LIMITED

Plot No.-1666, Phase-II, Delta Colony, Nilakantheswar Marg,
Baramunda, Bhubaneswar, Dist - Khurdha

Mail Id: greenforceassociates@gmail.com

Report No- GFAPL/24-25/ESLBI/006 | Issued Date-05.12.2024

TEST REPORT

Client Name &Address	**M/s. Nadidih Iron Ore Mines (BICO),** ***Sukinda Mines (Chromite),*** *At/PO:- Koira, Sundargarh, Odisha.*		
Nature of Sampling	**Ambient Air Quality Monitoring (AAQ)**		
Sampling By	**GFAPL's Representative**		
Environmental Condition	Good	**Sampling Method**	As per IS: 5182
Location of performance of Laboratory activities	Laboratory Permanent Facility	**Deviation from the method (if any)**	NO
Discipline	Chemical	**Group**	Atmospheric Pollution
Sampling Location & Coordinates	**AAQ5- Village Jhirapani;** **Lat:** 21°59'52.38"N, & **Long:** :85°13'9.76"E		
Instrument Used	**Respirable Dust Sampler, Fine ParticuLate Dust Sampler**		

Date of Sampling	PM_{10} ($\mu g/m^3$)	$PM_{2.5}$ ($\mu g/m^3$)	SO_2 ($\mu g/m^3$)	NO_2 ($\mu g/m^3$)
05.11.2024	43.1	20.3	<4.0	<9.0
08.11.2024	44.6	21.8	<4.0	<9.0
12.11.2024	46.2	22.6	<4.0	<9.0
15.11.2024	45.8	22.2	<4.0	<9.0
19.11.2024	47.1	23.1	<4.0	<9.0
22.11.2024	48.5	23.6	<4.0	<9.0
26.11.2024	46.9	22.6	<4.0	<9.0
29.11.2024	48.2	23.8	<4.0	<9.0
Max	**48.50**	**23.80**	**<4.0**	**<9.0**
Min	**43.10**	**20.30**	**<4.0**	**<9.0**
Average	**46.30**	**22.50**	**<4.0**	**<9.0**
NAAQ* Standard	**100**	**60**	**80**	**80**
Methods of Analysis	**IS:5182 (Part-23)**	**IS:5182 (Part-24)**	**IS:5182 (Part-2)**	**IS:5182 (Part-6)**

Reviewed By

CHIEF ANALYST
GREENFORCE ASSOCIATES PRIVATE LIMITED
BHUBANESWAR, ODISHA

Chief Analyst
Miss. Arti Sahoo

Authorized Signatory

TECHNICAL MANAGER
GREENFORCE ASSOCIATES PRIVATE LIMITED
BHUBANESWAR, ODISHA

Technical Manager
Mr. S.K. Parhi

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END OF REPORT

Plot No- 1363-3892, Baibhab Realcon, Fulnakhara,
Cuttack, Odisha, India 754001

GREEN FORCE ASSOCIATES PRIVATE LIMITED

Plot No.-1666, Phase-II, Delta Colony, Nilakantheswar Marg,
Baramunda, Bhubaneswar, Dist - Khurdha
Mail Id: greenforceassociates@gmail.com

TC-12258

Report No- GFAPL/24-25/ESLBI/007 **Issued Date-05.12.2024**

TEST REPORT

Client Name &Address	**M/s. Nadidih Iron Ore Mines (BICO),** ***M/s ESL Steel Limited,*** *At/PO:- Koira, Sundargarh, Odisha.*		
Nature of Sampling	**Ambient Air Quality Monitoring (AAQ)**		
Sampling By	**GFAPL's Representative**		
Environmental Condition	Good	**Sampling Method**	As per IS: 5182
Location of performance of Laboratory activities	Laboratory Permanent Facility	**Deviation from the method (if any)**	NO
Discipline	Chemical	**Group**	Atmospheric Pollution
Sampling Location & Coordinates	**AAQ6- Village Kashira;** **Lat:**21°55'9.95"N, & **Long:** :85°15'18.13"E		
Instrument Used	**Respirable Dust Sampler, Fine Particulate Dust Sampler**		

Date of Sampling	PM_{10} ($\mu g/m^3$)	$PM_{2.5}$ ($\mu g/m^3$)	SO_2 ($\mu g/m^3$)	NO_2 ($\mu g/m^3$)
05.11.2024	43.5	19.4	<4.0	<9.0
08.11.2024	44.8	21.2	<4.0	<9.0
12.11.2024	46.2	22.6	<4.0	<9.0
15.11.2024	45.7	22.4	<4.0	<9.0
19.11.2024	48.6	23.8	<4.0	<9.0
22.11.2024	49.2	24.1	<4.0	<9.0
26.11.2024	48.4	23.9	<4.0	<9.0
29.11.2024	49.4	24.4	4.5	9.6
Max	**49.40**	**24.40**	**4.50**	**9.60**
Min	**43.50**	**19.40**	**<4.0**	**<9.0**
Average	**46.98**	**22.73**	**4.50**	**9.60**
NAAQ* Standard	**100**	**60**	**80**	**80**
Methods of Analysis	**IS:5182 (Part-23)**	**IS:5182 (Part-24)**	**IS:5182 (Part-2)**	**IS:5182 (Part-6)**

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Plot No- 1363-3892, Baibhab Realcon, Fulnakhara,
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GREEN FORCE ASSOCIATES PRIVATE LIMITED

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(An ISO 14001, 9001, 45001 certified Consulting Organization & NABL Accredited Laboratory)

Report No- GFAPL/24-25/ESLBI/008 **Issued Date-05.12.2024**

TEST REPORT

Client Name &Address	**M/s. Nadidih Iron Ore Mines (BICO),** ***M/s ESL Steel Limited,*** *At/PO:- Koira, Sundargarh, Odisha.*		
Nature of Sampling	**Ambient Air Quality Monitoring (AAQ)**		
Sampling By	**GFAPL's Representative**		
Environmental Condition	Good	**Sampling Method**	As per IS: 5182
Location of performance of Laboratory activities	Laboratory Permanent Facility	**Deviation from the method (if any)**	NO
Discipline	Chemical	**Group**	Atmospheric Pollution
Sampling Location & Coordinates	**AAQ5- Village Jhirapani; Lat:**21°59'52.38"N, & **Long:** 85°13'9.76"E **AAQ6- Village Kashira; Lat:**21°55'9.95"N, & **Long:** 85°15'18.13"E		
Instrument Used	**CO Analyser**		

Date of Sampling	CO (mg/m3)	
	AAQ5	AAQ6
05.11.2024	0.17	0.17
08.11.2024	0.17	0.18
12.11.2024	0.18	0.18
15.11.2024	0.18	0.16
19.11.2024	0.17	0.18
22.11.2024	0.19	0.2
26.11.2024	0.18	0.19
29.11.2024	0.2	0.21
Max	**0.20**	**0.21**
Min	**0.17**	**0.16**
Average	**0.18**	**0.18**
NAAQ* Standard	**4 mg/m3 (for 1hr)**	
Methods of Analysis	**IS: 5182 (Part- 10)**	

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TC-12258

Report No- GFAPL/24-25/ESLBI009 **Issued Date-05.12.2024**

TEST REPORT

Client Name &Address	**M/s. Nadidih Iron Ore Mines (BICO),** **M/s ESL Steel Limited,** *At/PO:- Koira, Sundargarh, Odisha.*		
Nature of Sampling	**Fugitive Dust Emission (F)**		
Sampling By	**GFAPL's Representative**		
Environmental Condition	Good	**Sampling Method**	As per IS: 5182
Location of performance of Laboratory activities	Laboratory Permanent Facility	**Deviation from the method (if any)**	NO
Discipline	Chemical	**Group**	Atmospheric Pollution
Sampling Location & Coordinates	**F1: Mine Face Area; Lat:** 21° 58' 17.73"N **& Long**: 85° 15' 33.03"E **F2: Haul Road; Lat:** 21° 51' 54.95"N **& Long**:85° 15' 50.13"E **F3: Near Crushing Plant; Lat:** 21° 58' 21.94"N **& Long**: 85° 15' 35.01"E **F4: Near Screening Plant; Lat:** 21° 58' 12.05"N **& Long:** 85° 15' 35.19"E **F5: Ore Storage Area; Lat:** 21° 58' 05.02"N **& Long:** 85° 15' 34.55"E **F6: West Dump; Lat:** 21° 58' 10.99"N **& Long:** 85° 15' 37.47"		
Instrument Used	**Respirable Dust Sampler (RDS)**		

Sl. No.	Date of Sampling	Result (µg/m³)					
		F1	F2	F3	F4	F5	F6
1	04.11.2024	482.4	476.2	482.5	465.2	412.6	399.4
2	08.11.2024	502.4	498.4	502.5	492.5	445.4	434.3
3	11.11.2024	418.1	412.5	434.1	451.3	402.2	392.2
4	15.11.2024	465.7	437.2	478.2	472.2	424.8	425.9
5	18.11.2024	447.4	412.6	439.3	447.2	419.4	426.2
6	22.11.2024	418.3	392.5	428.1	411.4	395.2	372.5
7	25.11.2024	448.2	447.4	452.5	435.6	406.2	402.3
8	29.11.2024	472.4	471.4	482.4	468.2	471.9	448.2
Max		**502.40**	**498.40**	**502.50**	**492.50**	**471.90**	**448.20**
Min		**418.10**	**392.50**	**428.10**	**411.40**	**395.20**	**372.50**
Average		**456.86**	**443.53**	**462.45**	**455.45**	**422.21**	**412.63**
Fugitive Standard		**1200 µg/m³**					
Methods of Analysis		**IS:5182 (Part-4)**					

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TC-12258

Report No- GFAPL/24-25/ESLBI/010 **Issued Date-05.12.2024**

TEST REPORT

Client Name &Address	**M/s. Nadidih Iron Ore Mines (BICO),** **M/s ESL Steel Limited,** *At/PO:- Koira, Sundargarh, Odisha.*		
Nature of Sampling	**Workzone Noise Monitoring**		
Sampling By	**GFAPL's Representative**		
Location of performance of Laboratory activities	Site Facility	**Deviation from the method (if any)**	NO
Discipline	Chemical	**Group**	Atmospheric Pollution
Environmental Condition	Good	**Time Integration**	1 second
Time Weighing	Fast	**Frequency Weighing**	A- Weighing
Sampling Duration	24 hrs	**Area categorization**	Industrial Area
Date of Sampling	**21.11.2024**	**Date of Completion**	**22.11.2024**
Instrument Used	**Noise Meter**	**Sampling Method**	As per IS: 9989

S. No.	Locations	Day Time	Night Time
		Results in dB(A)	
1	**Near Mine Office; Lat:**21°58'9.21"N **& Long:**85°15'33.67"E	**59.8**	**41.2**
2	**Near Mine In Gate; Lat:**21°58'23.32"N **& Long:**85°15'44.18"E	**64.5**	**50.2**
3	**Near Screening Plant-1; Lat:**21°58'09.21"N **& Long:**85°15'33.66"E	**68.8**	**63.4**
4	**Near Crusher; Lat:**21°58'22.32"N **& Long:**85°15'34.13"E	**69.2**	**63.4**
5	**Near W.Bridge-1; Lat:** 21°57'53.99"N **& Long:**85°15'49.64"E	**67.1**	**56.4**
6	**Near W.Bridge -2; Lat:**21°57'54.26"N **& Long:**85°15'53.53"E	**66.8**	**58.2**

Noise permissible limits as per CPCB Norms in dB(A) Leq

Category of Area	Day Time	Night Time
Industrial Area	**75**	**70**
Commercial Area	65	55
Residential Area	55	45
Sensitive Area/ Silence Zone	50	40

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Report No- GFAPL/24-25/ESLBI/011 **Issued Date-05.12.2024**

TEST REPORT

Client Name &Address	**M/s. Nadidih Iron Ore Mines (BICO),** **M/s ESL Steel Limited,** *At/PO:- Koira, Sundargarh, Odisha.*		
Nature of Sampling	**Ambient Noise Monitoring**		
Sampling By	**GFAPL's Representative**		
Location of performance of Laboratory activities	Site Facility	**Deviation from the method (if any)**	NO
Discipline	Chemical	**Group**	Atmospheric Pollution
Environmental Condition	Good	**Time Integration**	1 second
Time Weighing	Fast	**Frequency Weighing**	A- Weighing
Sampling Duration	24 hrs	**Area categorization**	Residential Area
Date of Sampling	**20.11.2024**	**Date of Completion**	**21.11.2024**
Instrument Used	**Noise Meter**	**Sampling Method**	As per IS: 9989

S. No.	Locations	Day Time	Night Time
		Results in dB(A)	
1	**Village Kenduhidi;** **Lat:**21°59'45.70"N **& Long:**85°16'14.44"E	**47.8**	**37.1**
2	**Village Badipada;** **Lat:**21°58'4.60"N **& Long:**85°18'33.80"E	**48.1**	**36.8**
3	**Village Jhirapani;** **Lat:**21°59'52.38"N **& Long:**85°13'9.76"E	**48.9**	**36.5**
4	**Village Kashira;** **Lat:**21°55'9.95"N **& Long:**85°15'18.13"E	**48.3**	**37.4**

Noise permissible limits as per CPCB Norms in dB(A) Leq

Category of Area	Day Time	Night Time
Industrial Area	75	70
Commercial Area	65	55
Residential Area	**55**	**45**
Sensitive Area/ Silence Zone	50	40

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TC-12258

Report No- GFAPL/24-25/ESLBI/012 **Issued Date-05.12.2024**

TEST REPORT

Client Name &Address	**M/s. Nadidih Iron Ore Mines (BICO),** **M/s ESL Steel Limited,** *At/PO:- Koira, Sundargarh, Odisha.*		
Nature of Sampling	**Stack Monitoring (ST)**		
Sampling By	**GFAPL's Representative**		
Environmental Condition	Good	**Sampling Method**	As per IS-11255
Location of performance of Laboratory activities	**Laboratory Permanent Facility**	**Deviation from the method (if any)**	NO
Discipline	**Chemical**	**Group**	Environment & Pollution
Date of Sampling	**21.11.2024**	**Date of Receiving**	**22.11.2024**
Date of Analysis	**22.11.2024**	**Date of Complete**	**26.11.2024**
Sampling Location & Coordinates	**ST- DG SET;** **Lat:** 21°58'23.31"N & **Long:** 85°15'37.17"E		
Instrument Used	**Stack monitoring Kit; Vacuum Pump; Pyrometer**		

Sl. No	Items	Testing Method	Unit	As per CPCB Standard	Result
01	**Temperature**	IS-11255 (PART-3) 1985	K	---	**453**
02	**Velocity**	IS-11255 (PART-3) 1985	m/sec	---	**18.12**
03	**Particulate Matter as PM**	IS-11255(PART-1) 1985 Gravimetric Method	mg/Nm3	**100**	**88.4**
04	**Sulphur dioxide as SO2**	IS-11255(PART-2) 1985	mg/Nm3	**600**	**70.6**
05	**Carbon Monoxide as CO**	IS-13270:1992	%	**1%**	**<0.2**
06	**Carbon Dioxide as CO2**	IS-13270:1992	%	---	**1.7**
07	**Oxygen as O2**	IS-13270:1992	%	---	**16.9**

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TEST REPORT

Client Name &Address	**M/s. Nadidih Iron Ore Mines (BICO),** **M/s ESL Steel Limited,** *At/PO:- Koira, Sundargarh, Odisha.*		
Nature of Sampling	**Stack Monitoring (ST)**		
Sampling By	**GFAPL's Representative**		
Location of performance of Laboratory activities	**Laboratory Permanent Facility**	**Deviation from the method (if any)**	NO
Discipline	**Chemical**	**Group**	Atmospheric Pollution
Date of Sampling	**21.11.2024**	**Date of Receiving**	**22.11.2024**
Date of Analysis	**22.11.2024**	**Date of Complete**	**26.11.2024**
Sampling Location & Coordinates	**ST- DG SET;** **Lat:** 21°58'23.31"N & **Long:** 85°15'37.17"E		
Instrument Used	**Stack monitoring Kit; Vacuum Pump; Pyrometer**		

Sl. No	Items	Testing Method	Unit	As per CPCB Standard	Result
01	Nitrogen Oxide as NOx	IS-11255(PART-7) 1985	mg/Nm3	300	58.6

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TC-12258

Report No- GFAPL/24-25/IMFAMMC/013 **Issued Date-05.12.2024**

TEST REPORT

Client Name &Address	**M/s. Nadidih Iron Ore Mines (BICO),** **M/s ESL Steel Limited,** *At/PO:- Koira, Sundargarh, Odisha.*		
Nature of Sampling	**Ground Water (GW)**		
Sampling By	**GFAPL's Representative**		
Environmental Condition	Good	**Sampling Method**	As per APHA 24th ED 1060 B: 2023
Location of performance of Laboratory activities	Laboratory Permanent Facility	**Deviation from the method (if any)**	NO
Discipline	Chemical	**Group**	Water
Date of Sampling	**21.11.2024**	**Date of Receiving**	**22.11.2024**
Date of Analysis	**22.11.2024**	**Date of Complete**	**26.11.2024**
Sampling Location & Coordinates	**GW1: Within Mine Lease; Lat:** 21°58'19.62"N & **Long:** 85°15'24.14"E **GW2: Village Rengalberha; Lat:** 21°57'10.45"N & **Long:** 85°14'55.35"E		

Sl. No.	Parameter	Testing Methods	Unit	Standard as per IS: 10500, 2012		GW1	GW2
				AL	PL		
1	**Colour**	IS 3025: (Part 4)- 2021	**Hazen**	5	15	**<5.0**	**<5.0**
2	**Turbidity**	APHA 24th ED: 2130-B -2023	**NTU**	1	5	**<1**	**<1**
3	**pH Value @25°C**	APHA 24th ED 4500- H+B:2023	**--**	6.5-8.5	NR	**7.04**	**7.02**
4	**Total Dissolved Solids (TDS)**	APHA 24th ED: 2540-C: 2023	**mg/l**	500	2000	**186**	**146**
5	**Chloride (as Cl)**	APHA 24th Ed 4500- Cl-B:2023	**mg/l**	250	1000	**15**	**13**
6	**Total Hardness**	APHA 24th ED 2340-C: 2023	**mg/l**	200	600	**118**	**98**
7	**Calcium**	APHA 24th Ed 3500- Ca-B:2023	**mg/l**	75	200	**30.9**	**25.7**
8	**Magnesium**	APHA 24th ED 3500-Mg-B: 2023	**mg/l**	30	100	**10**	**8.3**
9	**Total Alkalinity**	APHA 24th ED 2320-B: 2023	**mg/l**	200	600	**112**	**92**
10	**Residual Free Chlorine**	APHA 24th ED 4500 CL-B:2023	**mg/l**	0.2	1.0	**<0.2**	**<0.2**
11	**Cyanide**	APHA 24th ED 4500 CN-F:2023	**mg/l**	0.05	NR	**<0.02**	**<0.02**
12	**Hexavalent Chromium**	APHA 24th ED 3500-Cr-B: 2023	**mg/l**	0.05	NR	**<0.05**	**<0.05**
13	**Total Chromium**	APHA 24th ED 3500-Cr-B: 2023	**mg/l**	0.05	NR	**0.23**	**<0.05**
14	**Iron**	APHA 24th ED 3500-Fe-B: 2023	**mg/l**	0.3	NR	**3.2**	**0.2**

Plot No- 1363-3892, Baibhab Realcon, Fulnakhara,
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Sl. No.	Parameter	Testing Methods	Unit	Standard as per IS: 10500, 2012		GW1	GW2
				AL	PL		
15	Sulfate	APHA 24th ED 4500-SO4 E: 2023	mg/l	200	400	<0.05	<0.05
16	Fluoride	APHA 24th ED 4500-F-C: 2023	mg/l	1.0	1.5	<0.01	<0.01
18	Boron	APHA 24th ED 4500 B-B:2023	mg/l	0.5	1.0	<0.05	<0.05
18	Manganese	IS 3025 PART-59 :2006 RA 2012	mg/l	0.1	0.3	9.4	8.2
19	Sodium as Na	APHA 24th ED 3500- Na-B	mg/l	--	--	0.8	0.7
20	Potassium as K	APHA 24th ED 3500- K-B	mg/l	--	--	<0.05	<0.05

REMARKS: NR- Not Relaxable; AL-Acceptable Limit; PL- Permissible Limit; al- agreeable;

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Report No- GFAPL/24-25/IMFAMMC/013 **Issued Date-05.12.2024**

TEST REPORT

Client Name &Address	**M/s. Nadidih Iron Ore Mines (BICO),** **M/s ESL Steel Limited,** *At/PO:- Koira, Sundargarh, Odisha.*		
Nature of Sampling	**Ground Water (GW)**		
Sampling By	**GFAPL's Representative**		
Environmental Condition	Good	**Sampling Method**	As per APHA 24th ED 1060 B: 2023
Location of performance of Laboratory activities	Laboratory Permanent Facility	**Deviation from the method (if any)**	NO
Discipline	Chemical	**Group**	Water
Date of Sampling	**21.11.2024**	**Date of Receiving**	**22.11.2024**
Date of Analysis	**22.11.2024**	**Date of Complete**	**26.11.2024**
Sampling Location & Coordinates	**GW1: Within Mine Lease; Lat:** 21°58'19.62"N & **Long:** 85°15'24.14"E **GW2: Village Rengalberha; Lat:** 21°57'10.45"N & **Long:** 85°14'55.35"E		

Sl. No.	Parameter	Testing Methods	Unit	Standard as per IS: 10500, 2012		GW1	GW2
				AL	PL		
1	**Odour**	APHA 24th ED: 2150-B -2023	---	Agreeable	Agreeable	**U/O**	**U/O**
2	**Taste**	APHA 24th ED: 2160-B -2023	---	Agreeable	Agreeable	**al**	**al**
3	**Nitrate**	APHA 24th ED 4500-NO3-E : 2023	**mg/l**	45	NR	**1.44**	**1.18**
4	**Cadmium (as Cd)**	IS: 3025(Part 41)	**mg/l**	0.003	NR	**<0.001**	**<0.001**
5	**Copper (as Cu)**	IS: 3025(Part 42)	**mg/l**	0.05	1.5	**<0.03**	**<0.03**
6	**Zinc (as Zn)**	APHA 24th ED 3500 Zn: 2023	**mg/l**	5	15	**<0.03**	**<0.03**
7	**Lead (as Pb)**	APHA 24th ED 3500 Pb: 2023	**mg/l**	0.01	NR	**<0.01**	**<0.01**
8	**Selenium (as Se)**	APHA 24th ED 3500 B: 2023	**mg/l**	0.001	NR	**<0.001**	**<0.001**
9	**Mercury (as Hg)**	APHA 24th ED3500Hg: 2023	**mg/l**	0.001	NR	**<0.001**	**<0.001**
10	**Arsenic (as As)**	IS: 3025 (Part 37)	**mg/l**	0.01	0.05	**<0.001**	**<0.001**
11	**Aluminum (as Al)**	APHA 24th ED 3500Al : 2023	**mg/l**	0.03	0.2	**<0.01**	**<0.01**
12	**Mineral Oil**	APHA 24th ED 5220 B: 2023	**mg/l**	0.5	NR	**ND**	**ND**
13	**Anionic Detergents (as MBAS)**	APHA 24th ED 5540 C : 2023	**mg/l**	0.2	1.0	**ND**	**ND**

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Sl. No.	Parameter	Testing Methods	Unit	Standard as per IS: 10500, 2012		GW1	GW2
				AL	AL		
14	Phenolic Compound (as C6H5OH)	APHA 24th ED 5530 B,D: 2023	mg/l	0.001	0.002	<0.001	<0.001
15	Total Coliforms	APHA 24th ED 9222-H: 2023	MPN/ 100ml	-	-	<1.8	<1.8

REMARKS: NR- Not Relaxable; AL-Acceptable Limit; PL- Permissible Limit; al- agreeable;

Reviewed By

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BHUBANESWAR, ODISHA

Chief Analyst
Miss. Arti Sahoo

Authorized Signatory

TECHNICAL MANAGER
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BHUBANESWAR, ODISHA

Technical Manager
Mr. S.K. Parhi

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TC-12258

Report No- GFAPL/24-25/IMFAMMC/014 **Issued Date-05.12.2024**

TEST REPORT

Client Name &Address	**M/s. Nadidih Iron Ore Mines (BICO),** **M/s ESL Steel Limited,** *At/PO:- Koira, Sundargarh, Odisha.*		
Nature of Sampling	**Ground Water (GW)**		
Sampling By	**GFAPL's Representative**		
Environmental Condition	Good	**Sampling Method**	As per APHA 24th ED 1060 B: 2023
Location of performance of Laboratory activities	Laboratory Permanent Facility	**Deviation from the method (if any)**	NO
Discipline	Chemical	**Group**	Water
Date of Sampling	**21.11.2024**	**Date of Receiving**	**22.11.2024**
Date of Analysis	**22.11.2024**	**Date of Complete**	**26.11.2024**
Sampling Location & Coordinates	**GW3: Village Kendudihi; Lat:** 21°59'40.63"N & **Long:** 85°16'07.74"E **GW4: Village Kalta; Lat:** 21°57'54.83"N & **Long:** 85°12'49.46"E		

Sl. No.	Parameter	Testing Methods	Unit	Standard as per IS: 10500, 2012		GW3	GW4
				AL	PL		
1	**Colour**	IS 3025: (Part 4)- 2021	**Hazen**	5	15	**<5.0**	**<5.0**
2	**Turbidity**	APHA 24th ED: 2130-B -2023	**NTU**	1	5	**<1**	**<1**
3	**pH Value @25°C**	APHA 24th ED 4500- H+B:2023	**--**	6.5-8.5	NR	**7.14**	**7.18**
4	**Total Dissolved Solids(TDS)**	APHA 24th ED: 2540-C: 2023	**mg/l**	500	2000	**142**	**157**
5	**Chloride (as Cl)**	APHA 24th Ed 4500- Cl-B:2023	**mg/l**	250	1000	**13**	**14**
6	**Total Hardness**	APHA 24th ED 2340-C: 2023	**mg/l**	200	600	**96**	**102**
7	**Calcium**	APHA 24th Ed 3500- Ca-B:2023	**mg/l**	75	200	**25.3**	**26.1**
8	**Magnesium**	APHA 24th ED 3500-Mg-B: 2023	**mg/l**	30	100	**8**	**9**
9	**Total Alkalinity**	APHA 24th ED 2320-B: 2023	**mg/l**	200	600	**90**	**96**
10	**Residual Free Chlorine**	APHA 24th ED 4500 CL-B:2023	**mg/l**	0.2	1.0	**<0.2**	**<0.2**
11	**Cyanide**	APHA 24th ED 4500 CN-F:2023	**mg/l**	0.05	NR	**<0.02**	**<0.02**
12	**Hexavalent Chromium**	APHA 24th ED 3500-Cr-B: 2023	**mg/l**	0.05	NR	**<0.05**	**<0.05**
13	**Total Chromium**	APHA 24th ED 3500-Cr-B: 2023	**mg/l**	0.05	NR	**<0.05**	**<0.05**
14	**Iron**	APHA 24th ED 3500-Fe-B: 2023	**mg/l**	0.3	NR	**0.23**	**0.22**

Plot No- 1363-3892, Baibhab Realcon, Fulnakhara,
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Sl. No.	Parameter	Testing Methods	Unit	Standard as per IS: 10500, 2012		GW3	GW4
				AL	PL		
15	Sulfate	APHA 24th ED 4500-SO4 E: 2023	mg/l	200	400	<0.05	<0.05
16	Fluoride	APHA 24th ED 4500-F-C: 2023	mg/l	1.0	1.5	<0.01	<0.01
17	Boron	APHA 24th ED 4500 B-B:2023	mg/l	0.5	1.0	<0.05	<0.05
18	Manganese	IS 3025 PART-59 :2006 RA 2012	mg/l	0.1	0.3	8.2	8.7
19	Sodium as Na	APHA 24th ED 3500- Na-B	mg/l	--	--	0.6	0.7
20	Potassium as K	APHA 24th ED 3500- K-B	mg/l	--	--	<0.05	<0.05

REMARKS: NR- Not Relaxable; AL-Acceptable Limit; PL- Permissible Limit

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GREEN FORCE ASSOCIATES PRIVATE LIMITED

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Report No- GFAPL/24-25/IMFAMMC/014 **Issued Date-05.12.2024**

TEST REPORT

Client Name &Address	**M/s. Nadidih Iron Ore Mines (BICO),** **M/s ESL Steel Limited,** *At/PO:- Koira, Sundargarh, Odisha.*		
Nature of Sampling	**Ground Water (GW)**		
Sampling By	GFAPL's Representative		
Environmental Condition	Good	**Sampling Method**	As per APHA 24th ED 1060 B: 2023
Location of performance of Laboratory activities	Laboratory Permanent Facility	**Deviation from the method (if any)**	NO
Discipline	Chemical	**Group**	Water
Date of Sampling	**21.11.2024**	**Date of Receiving**	**22.11.2024**
Date of Analysis	**22.11.2024**	**Date of Complete**	**26.11.2024**
Sampling Location & Coordinates	**GW3: Village Kendudihi; Lat:** 21°59'40.63"N, **Long:** 85°16'07.74"E **GW4: Village Kalta; Lat:** 21°57'54.83"N, **Long:** 85°12'49.46"E		

Sl. No.	Parameter	Testing Methods	Unit	Standard as per IS: 10500, 2012		GW3	GW4
				AL	PL		
1	**Odour**	APHA 24th ED: 2150-B -2023	---	Agreeable	Agreeable	**U/O**	**U/O**
2	**Taste**	APHA 24th ED: 2160-B -2023	---	Agreeable	Agreeable	**al**	**al**
3	**Nitrate**	APHA 24th ED 4500-NO3-E : 2023	**mg/l**	45	NR	**0.98**	**1.1**
4	**Cadmium (as Cd)**	IS: 3025(Part 41)	**mg/l**	0.003	NR	**<0.001**	**<0.001**
5	**Copper (as Cu)**	IS: 3025(Part 42)	**mg/l**	0.05	1.5	**<0.03**	**<0.03**
6	**Zinc (as Zn)**	APHA 24th ED 3500 Zn: 2023	**mg/l**	5	15	**<0.03**	**<0.03**
7	**Lead (as Pb)**	APHA 24th ED 3500 Pb: 2023	**mg/l**	0.01	NR	**<0.01**	**<0.01**
8	**Selenium (as Se)**	APHA 24th ED 3500 B: 2023	**mg/l**	0.001	NR	**<0.001**	**<0.001**
9	**Mercury (as Hg)**	APHA 24th ED3500Hg: 2023	**mg/l**	0.001	NR	**<0.001**	**<0.001**
10	**Arsenic (as As)**	IS: 3025 (Part 37)	**mg/l**	0.01	0.05	**<0.001**	**<0.001**
11	**Aluminum (as Al)**	APHA 24th ED 3500Al : 2023	**mg/l**	0.03	0.2	**<0.01**	**<0.01**
12	**Mineral Oil**	APHA 24th ED 5220 B: 2023	**mg/l**	0.5	NR	**ND**	**ND**
13	**Anionic Detergents (as MBAS)**	APHA 24th ED 5540 C : 2023	**mg/l**	0.2	1.0	**ND**	**ND**

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Sl. No.	Parameter	Testing Methods	Unit	Standard as per IS: 10500, 2012		GW3	GW4
				AL	AL		
14	Phenolic Compound (as C6H5OH)	APHA 24th ED 5530 B,D: 2023	mg/l	0.001	0.002	<0.001	<0.001
15	Total Coliforms	APHA 24th ED 9222-H: 2023	MPN/ 100ml	-	-	<1.8	<1.8

REMARKS: NR- Not Relaxable; AL-Acceptable Limit; PL- Permissible Limit; al- agreeable;

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Report No- GFAPL/24-25/ESLBI/014 | Issued Date-05.12.2024

TEST REPORT

Client Name &Address	*M/s. Nadidih Iron Ore Mines (BICO),* **M/s ESL Steel Limited,** At/PO:- Koira, Sundargarh, Odisha.		
Nature of Sampling	**Surface Water (SW)**		
Sampling By	**GFAPL's Representative**		
Environmental Condition	Good	**Sampling Method**	As per APHA 24th ED 1060 B: 2023
Location of performance of Laboratory activities	Laboratory Permanent Facility	**Deviation from the method (if any)**	NO
Discipline	Chemical	**Group**	Water
Date of Sampling	**21.11.2024**	**Date of Receiving**	**22.11.2024**
Date of Analysis	**22.11.2024**	**Date of Complete**	**26.11.2024**
Sampling Location & Coordinates	**SW1: Karo River Upstreem(US); Lat:** 21°58'30.34"N & **Long:** 85°15'28.12"E **SW2: Karo River Downstreem(DS); Lat:** 21°59'35.14"N & **Long:** 85°16' 21.42"E		

Sl. No.	Parameter	Testing Methods	Unit	Standard as per IS-2296 Class-C	SW1	SW2
1.	**Colour**	IS 3025: (Part 4)- 2021	**Hazen**	300	**60**	**80**
2.	**Total Suspended Solid**	APHA 24th ED 2540-D: 2023	**mg/l**	--	**58**	**72**
3.	**pH @25^{0}C**	APHA 24th ED 4500- H+B:2023	**---**	8.5	**7.12**	**7.18**
4.	**Conductivity**	APHA 24th ED 2510-B: 2023	**µS/cm**	--	**173.5**	**185.2**
5.	**Total Dissolved Solid**	APHA 24th ED 2540-C: 2023	**mg/l**	1500	**106**	**114**
6.	**Chloride (as Cl)**	APHA 24th ED 4500- Cl-B:2023	**mg/l**	600	**13**	**14**
7.	**Cyanide (as CN)**	APHA 24th ED 4500-CN-F	**mg/l**	0.05	**<0.02**	**<0.02**
8.	**Hexavalent Chromium(asCr+6)**	APHA 24th ED 3500-Cr-B: 2023	**mg/l**	0.05	**<0.05**	**<0.05**
9.	**Iron (as Fe)**	APHA 24th ED 3500-Fe-B: 2023	**mg/l**	50	**0.32**	**0.34**
10.	**Sulfate (as SO4)**	APHA 24th ED 4500-SO4 D: 2023	**mg/l**	400	**4.1**	**4.6**
11.	**Fluoride (as F)**	APHA 24th ED 4500-F-C: 2023	**mg/l**	1.5	**<0.05**	**0.07**
12.	**Oil & Grease**	IS 3025 PART 39-1991 RA-2003	**mg/l**	0.1	**<2.0**	**<2.0**
13.	**Dissolved oxygen**	APHA 24th ED 4500 O-C:2023	**mg/l**	4	**6.5**	**6.3**
14.	**BOD (3)days at 27^{0}C**	IS 3025 (PART 44): 1993 REA-2009	**mg/l**	3.0	**<2.0**	**<2.0**
15.	**Chemical Oxygen Demand as COD**	APHA 24th ED 5220 C:2023	**mg/l**	--	**8**	**10**
16.	**Manganese**	IS 3025 PART-59 :2006 RA 2012	**mg/l**	--	**<0.05**	**<0.05**

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Report No- GFAPL/24-25/ESLBI/014 **Issued Date-05.12.2024**

TEST REPORT

Client Name &Address	***M/s. Nadidih Iron Ore Mines (BICO),*** **M/s ESL Steel Limited,** At/PO:- Koira, Sundargarh, Odisha.		
Nature of Sampling	**Surface Water (SW)**		
Sampling By	**GFAPL's Representative**		
Environmental Condition	Good	**Sampling Method**	As per APHA 24th ED 1060 B: 2023
Location of performance of Laboratory activities	Laboratory Permanent Facility	**Deviation from the method (if any)**	NO
Discipline	Chemical	**Group**	Water
Date of Sampling	**21.11.2024**	**Date of Receiving**	**22.11.2024**
Date of Analysis	**22.11.2024**	**Date of Complete**	**26.11.2024**
Sampling Location & Coordinates	**SW1: Karo River Upstreem(US); Lat:** 21°58'30.34"N & **Long:** 85°15'28.12"E **SW2: Karo River Downstreem(DS); Lat:** 21°59'35.14"N & **Long:** 85°16' 21.42"E		

Sl. No.	Parameter	Testing Methods	Unit	Standard as per IS-2296 Class-C	SW1	SW2
1.	**Nitrate (as NO3)**	APHA 24th ED 4500-NO3-E: 2023	**mg/l**	50	**1.28**	**1.64**
2.	**Phenolic Compounds as C6H5OH**	APHA 24th ED 5530 B,D:2023	**mg/l**	--	**<0.001**	**<0.001**
3.	**Copper (as Cu)**	IS: 3025(Part 42)	**mg/l**	0.05	**<0.03**	**<0.03**
4.	**Lead (as Pb)**	APHA 24th ED 3500 Pb: 2023	**mg/l**	0.01	**<0.01**	**<0.01**
5.	**Zinc (as Zn)**	APHA 24th ED 3500 Zn: 2023	**mg/l**	5	**<0.03**	**<0.03**
6.	**Arsenic as As**	IS: 3025 (Part 37)	**mg/l**	--	**<0.001**	**<0.001**
7.	**Selenium (as Se)**	APHA 24th ED 3500 B: 2023	**mg/l**	0.005	**<0.001**	**<0.001**
8.	**Cadmium (as Cd)**	IS: 3025(Part 41)	**mg/l**	0.003	**<0.001**	**<0.001**
9.	**Total Coliform**	APHA 24th ED 9222-H: 2023	**MPN/ 100ml**	---	**900**	**900**

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Report No- GFAPL/24-25/ESLBI/016 **Issued Date-05.12.2024**

TEST REPORT

Client Name &Address	***M/s. Nadidih Iron Ore Mines (BICO),*** **M/s ESL Steel Limited,** At/PO:- Koira, Sundargarh, Odisha.		
Nature of Sampling	**Soil**		
Sampling By	**GFAPL's Representative**		
Environmental Condition	Good	**Sampling Method**	As per TNAU Agritech Portal
Location of performance of Laboratory activities	Laboratory Permanent Facility	**Deviation from themethod (if any)**	NO
Discipline	Chemical	**Group**	Soil and Rock
Date of Sampling	**21.11.2024**	**Date of Receiving**	**22.11.2024**
Date of Analysis	**22.11.2024**	**Date of Complete**	**26.11.2024**
Sampling Location & Coordinates	**S1: Lease Area; Lat:** 21°58'11.97"N & Long: 85°15'32.81"E **S2: Village Rengalberha; Lat:** 21°57'09.84"N & Long: 85°14'55.34"E		

Sl. No.	Parameters	Standard	Unit	S1	S2
1	**pH**	IS: 2720(Part-26)-1987	%	**6.11**	**6.28**
2	**Organic Carbon Content**	IS: 2720(Part-22)-1972	%	**1.08**	**1.42**
3	**Water Content (Moisture)**	IS: 2720(Part-2)-1973	%	**7.8**	**7.8**
4	**Specific gravity**	IS: 2720(Part-3/Sec1)-1980	Gs	**2.69**	**2.67**
5	**Sulfate**	IS: 2720(Part-27)-1977	mg/Kg	**90**	**124**

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(An ISO 14001, 9001, 45001 certified Consulting Organization & NABL Accredited Laboratory)

Report No- GFAPL/24-25/ESLBI/016 **Issued Date-05.12.2024**

TEST REPORT

Client Name &Address	***M/s. Nadidih Iron Ore Mines (BICO),*** **M/s ESL Steel Limited,** At/PO:- Koira, Sundargarh, Odisha.		
Nature of Sampling	**Soil**		
Sampling By	**GFAPL's Representative**		
Environmental Condition	Good	**Sampling Method**	As per TNAU Agritech Portal
Location of performance of Laboratory activities	Laboratory Permanent Facility	**Deviation from themethod (if any)**	NO
Discipline	Chemical	**Group**	Soil and Rock
Date of Sampling	**21.11.2024**	**Date of Receiving**	**22.11.2024**
Date of Analysis	**22.11.2024**	**Date of Complete**	**26.11.2024**
Sampling Location & Coordinates	**S1: Lease Area; Lat:** 21°58'11.97"N & Long: 85°15'32.81"E **S2: Village Rengalberha; Lat:** 21°57'09.84"N & Long: 85°14'55.34"E		

Sl. No.	Parameters	Standard	Unit	S1	S2
1.	**Colour**	GFAPL/SOP/Soil & Rock/01-23	--	**Brown**	**Brown**
2.	**Electrical conductivity (as EC)**	IS:14767: 2000	**micro s/cm**	**195.1**	**180.5**
3.	**Soil Texture**	GFAPL/SOP/Soil & Rock/02-23	---	**Sandy loamy**	**Sandy Clay loamy**
4.	**Bulk Density**	GFAPL/SOP/Soil & Rock/03-23	**gm/cc**	**1.34**	**1.28**
5.	**Calcium (as Ca)**	IS: 2720(Part-23)	**mg/kg**	**432**	**348**
6.	**Magnesium (as Mg)**	GFAPL/SOP/Soil & Rock/04-23	**mg/kg**	**214**	**164**
7.	**Nitrogen (as N)**	IS:14684: 1999	**kg/hec**	**90**	**142**
8.	**Phosphorus (as p)**	GFAPL/SOP/Soil & Rock/05-23	**kg/hec**	**30**	**32**
9.	**Potassium (as K)**	GFAPL/SOP/Soil & Rock/06-23	**mg/kg**	**164**	**142**
10.	**Chloride(as Cl)**	GFAPL/SOP/Soil & Rock/07-23	**mg/kg**	**130**	**119**
11.	**Manganese (as Mn)**	GFAPL/SOP/Soil & Rock/08-23	**mg/kg**	**9.2**	**2.6**
12.	**Iron (as Fe)**	GFAPL/SOP/Soil & Rock/09-23	**%**	**2.58**	**1.78**

Reviewed By
CHIEF ANALYST
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BHUBANESWAR, ODISHA
Chief Analyst
Miss. Arti Sahoo

Authorized Signatory
TECHNICAL MANAGER
GREENFORCE ASSOCIATES PRIVATE LIMITED
BHUBANESWAR, ODISHA
Technical Manager
Mr. S.K. Parhi

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END OF REPORT

Plot No- 1363-3892, Baibhab Realcon, Fulnakhara,
Cuttack, Odisha, India 754001

GREEN FORCE ASSOCIATES PRIVATE LIMITED

Plot No.-1666, Phase-II, Delta Colony, Nilakantheswar Marg,
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Mail Id: greenforceassociates@gmail.com

Report No- GFAPL/24-25/ESLBI/017 **Issued Date-05.12.2024**

TEST REPORT

Client Name &Address	***M/s. Nadidih Iron Ore Mines (BICO),*** **M/s ESL Steel Limited,** At/PO:- Koira, Sundargarh, Odisha.		
Nature of Sampling	**Soil**		
Sampling By	**GFAPL's Representative**		
Environmental Condition	Good	**Sampling Method**	As per TNAU Agritech Portal
Location of performance of Laboratory activities	Laboratory Permanent Facility	**Deviation from the method (if any)**	NO
Discipline	Chemical	**Group**	Soil and Rock
Date of Sampling	**21.11.2024**	**Date of Receiving**	**22.11.2024**
Date of Analysis	**22.11.2024**	**Date of Complete**	**26.11.2024**
Sampling Location & Coordinates	**S3: Village Kendudihi; Lat:** 21°59'40.58"N & Long: 85°16'09.91"E **S4: Village Kalta; Lat:** 21°57'54.22"N & Long: 85°12'48.59"E		

Sl. No.	Parameters	Standard	Unit	S3	S4
1	**pH**	IS: 2720(Part-26)-1987	%	**6.21**	**6.31**
2	**Organic Carbon Content**	IS: 2720(Part-22)-1972	%	**1.56**	**1.58**
3	**Water Content (Moisture)**	IS: 2720(Part-2)-1973	%	**8.1**	**8.2**
4	**Specific gravity**	IS: 2720(Part-3/Sec1)-1980	Gs	**2.66**	**2.66**
5	**Sulfate**	IS: 2720(Part-27)-1977	mg/Kg	**128**	**132**

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Report No- GFAPL/24-25/ESLBI/017 **Issued Date-05.12.2024**

TEST REPORT

Client Name &Address	***M/s. Nadidih Iron Ore Mines (BICO),*** **M/s ESL Steel Limited,** At/PO:- Koira, Sundargarh, Odisha.		
Nature of Sampling	**Soil**		
Sampling By	**GFAPL's Representative**		
Environmental Condition	Good	**Sampling Method**	As per TNAU Agritech Portal
Location of performance of Laboratory activities	Laboratory Permanent Facility	**Deviation from the method (if any)**	NO
Discipline	Chemical	**Group**	Soil and Rock
Date of Sampling	**21.11.2024**	**Date of Receiving**	**22.11.2024**
Date of Analysis	**22.11.2024**	**Date of Complete**	**26.11.2024**
Sampling Location & Coordinates	**S3: Village Kendudihi; Lat:** 21°59'40.58"N & Long: 85°16'09.91"E **S4: Village Kalta; Lat:** 21°57'54.22"N & Long: 85°12'48.59"E		

Sl. No.	Parameters	Standard	Unit	S3	S4
1.	**Colour**	GFAPL/SOP/Soil & Rock/01-23	--	**Brown**	**Brown**
2.	**Electrical conductivity (as EC)**	IS:14767: 2000	**micro s/cm**	**178.2**	**180.9**
3.	**Soil Texture**	GFAPL/SOP/Soil & Rock/02-23	---	**Sandy Clay loamy**	**Sandy Clay loamy**
4.	**Bulk Density**	GFAPL/SOP/Soil & Rock/03-23	**gm/cc**	**1.27**	**1.27**
5.	**Calcium (as Ca)**	IS: 2720(Part-23)	**mg/kg**	**328**	**340**
6.	**Magnesium (as Mg)**	GFAPL/SOP/Soil & Rock/04-23	**mg/kg**	**158**	**164**
7.	**Nitrogen (as N)**	IS:14684: 1999	**kg/hec**	**128**	**136**
8.	**Phosphorus (as p)**	GFAPL/SOP/Soil & Rock/05-23	**kg/hec**	**34**	**36**
9.	**Potassium (as K)**	GFAPL/SOP/Soil & Rock/06-23	**mg/kg**	**136**	**140**
10.	**Chloride(as Cl)**	GFAPL/SOP/Soil & Rock/07-23	**mg/kg**	**120**	**124**
11.	**Manganese (as Mn)**	GFAPL/SOP/Soil & Rock/08-23	**mg/kg**	**2.9**	**3.1**
12.	**Iron (as Fe)**	GFAPL/SOP/Soil & Rock/09-23	**%**	**1.92**	**1.88**

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TC-12258

Report No- GFAPL/24-25/ESLBI/018 **Issued Date-05.12.2024**

TEST REPORT

Client Name &Address	**M/s. Nadidih Iron Ore & Mn Mines (BICO)** *M/s ESL Steel Limited,* *At/PO:- Koira, Sundargarh, Odisha.*		
Nature of Sampling	**Ambient Air Quality Monitoring (AAQ)**		
Sampling By	**GFAPL's Representative**		
Environmental Condition	Good	**Sampling Method**	As per IS: 5182
Location of performance of Laboratory activities	Laboratory Permanent Facility	**Deviation from the method (if any)**	NO
Discipline	Chemical	**Group**	Atmospheric Pollution
Instrument Used	**Respirable Dust Sampler, Fine Particulate Dust Sampler**		

Location Code	Sampling Location	Date of Sampling	O3 (µg/m³)	NH3 (µg/m³)
AAQ-1	Near Mine Office;	21.11.2024	<8.0	<20.0
AAQ-2	Near Mine In Gate;	21.11.2024	<8.0	<20.0
AAQ-3	Village Kenduhidi;	21.11.2024	<8.0	<20.0
AAQ-4	Village Badipada;	21.11.2024	<8.0	<20.0
AAQ-5	Village Jhirapani;	22.11.2024	<8.0	<20.0
AAQ-6	Village Kashira;	22.11.2024	<8.0	<20.0
	NAAQ* Standard		100	400
	Methods of Analysis		IS:5182 (Part-9)	IS:5182 (Part-25)

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TEST REPORT

Client Name &Address	**M/s. Nadidih Iron Ore & Mn Mines (BICO)** ***M/s ESL Steel Limited,*** *At/PO:- Koira, Sundargarh, Odisha.*		
Nature of Sampling	**Ambient Air Quality Monitoring (AAQ)**		
Sampling By	**GFAPL's Representative**		
Environmental Condition	Good	**Sampling Method**	As per IS: 5182
Location of performance of Laboratory activities	Laboratory Permanent Facility	**Deviation from the method (if any)**	NO
Discipline	Chemical	**Group**	Atmospheric Pollution
Instrument Used	**Respirable Dust Sampler, Fine Particulate Dust Sampler**		

Location Code	Sampling Location	Date of Sampling	Pb (µg/m³)	Ni (ng/m³)	As (ng/m³)	C6H6 (µg/m³)	BaP (ng/m³)
AAQ-1	Near Mine Office;	22.11.2024	<0.06	<0.6	<0.44	<5	<1
AAQ-2	Near Mine In Gate;	22.11.2024	<0.06	<0.6	<0.44	<5	<1
AAQ-3	Village Kenduhidi;	22.11.2024	<0.06	<0.6	<0.44	<5	<1
AAQ-4	Village Badipada;	22.11.2024	<0.06	<0.6	<0.44	<5	<1
AAQ-5	Village Jhirapani;	22.11.2024	<0.06	<0.6	<0.44	<5	<1
AAQ-6	Village Kashira;	22.11.2024	<0.06	<0.6	<0.44	<5	<1
NAAQ* Standard			1	20	6	5	1
Methods of Analysis			IS:5182 (Part-22)	IS:5182 (Part-26)	As per CPCB method followed by AAS	IS:5182 (Part-11)	IS:5182 (Part-12)

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Report No- GFAPL/24-25/ESLBI/018 **Issued Date-05.12.2024**

TEST REPORT

Client Name &Address	**M/s. Nadidih Iron Ore & Mn Mines (BICO)** ***M/s ESL Steel Limited,*** *At/PO:- Koira, Sundargarh, Odisha.*		
Nature of Sampling	**Ambient Air Quality Monitoring (AAQ)**		
Sampling By	**GFAPL's Representative**		
Environmental Condition	Good	**Sampling Method**	As per IS: 5182
Location of performance of Laboratory activities	Laboratory Permanent Facility	**Deviation from the method (if any)**	NO
Discipline	Chemical	**Group**	Atmospheric Pollution
Instrument Used	**Respirable Dust Sampler, Fine Particulate Dust Sampler**		

Location Code	Sampling Location	Date of Sampling	Free Silica ($\mu g/m^3$)
AAQ-1	**Near Mine Office;**	**22.11.2024**	**<2.0**
AAQ-2	**Near Mine In Gate;**	**22.11.2024**	**<2.0**
AAQ-3	**Village Kenduhidi;**	**22.11.2024**	**<2.0**
AAQ-4	**Village Badipada;**	**22.11.2024**	**<2.0**
AAQ-5	**Village Jhirapani;**	**22.11.2024**	**<2.0**
AAQ-6	**Village Kashira;**	**22.11.2024**	**<2.0**
	Methods of Analysis		**NIOSH Method 7500 by X-Ray Diffraction**

Reviewed By

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Report No- GFAPL/24-25/ESLFG/018 **Issued Date-05.12.2024**

TEST REPORT

Client Name &Address	**M/s. Nadidih Iron Ore & Mn Mines (FEEGRADE),** ***M/s ESL Steel Limited,*** *At/PO:- Koira, Sundargarh, Odisha.*		
Nature of Sampling	**Ambient Air Quality Monitoring (AAQ)**		
Sampling By	**GFAPL's Representative**		
Environmental Condition	Good	**Sampling Method**	As per IS: 5182
Location of performance of Laboratory activities	Laboratory Permanent Facility	**Deviation from the method (if any)**	NO
Discipline	Chemical	**Group**	Atmospheric Pollution
Instrument Used	**Respirable Dust Sampler, Fine Particulate Dust Sampler**		

Location Code	Sampling Location	Date of Sampling	O3 (µg/m³)	NH3 (µg/m³)
AAQ-1	**Near Vedanta Office;**	**20.11.2024**	<8.0	<20.0
AAQ-2	**Near Mine InGate;**	**20.11.2024**	<8.0	<20.0
AAQ-3	**Near Rengalberha;**	**20.11.2024**	<8.0	<20.0
AAQ-4	**Near Kalta;**	**20.11.2024**	<8.0	<20.0
AAQ-5	**Village Jhirapani;**	**22.11.2024**	<8.0	<20.0
AAQ-6	**Village Kashira;**	**22.11.2024**	<8.0	<20.0
	NAAQ* Standard		**100**	**400**
	Methods of Analysis		**IS:5182 (Part-9)**	**IS:5182 (Part-25)**

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TEST REPORT

Client Name &Address	**M/s. Nadidih Iron Ore & Mn Mines (FEEGRADE),** ***M/s ESL Steel Limited,*** *At/PO:- Koira, Sundargarh, Odisha.*		
Nature of Sampling	**Ambient Air Quality Monitoring (AAQ)**		
Sampling By	**GFAPL's Representative**		
Environmental Condition	Good	**Sampling Method**	As per IS: 5182
Location of performance of Laboratory activities	Laboratory Permanent Facility	**Deviation from the method (if any)**	NO
Discipline	Chemical	**Group**	Atmospheric Pollution
Instrument Used	**Respirable Dust Sampler, Fine Particulate Dust Sampler**		

Location Code	Sampling Location	Date of Sampling	Pb (µg/m³)	Ni (ng/m³)	As (ng/m³)	C6H6 (µg/m³)	BaP (ng/m³)
AAQ-1	Near Vedanta Office	20.11.2024	<0.06	<0.6	<0.44	<5	<1
AAQ-2	Near Mine InGate;	20.11.2024	<0.06	<0.6	<0.44	<5	<1
AAQ-3	Near Rengalberha;	20.11.2024	<0.06	<0.6	<0.44	<5	<1
AAQ-4	Near Kalta;	20.11.2024	<0.06	<0.6	<0.44	<5	<1
AAQ-5	Village Jhirapani;	22.11.2024	<0.06	<0.6	<0.44	<5	<1
AAQ-6	Village Kashira;	22.11.2024	<0.06	<0.6	<0.44	<5	<1
NAAQ* Standard			1	20	6	5	1
Methods of Analysis			IS:5182 (Part-22)	IS:5182 (Part-26)	As per CPCB method followed by AAS	IS:5182 (Part-11)	IS:5182 (Part-12)

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TEST REPORT

Client Name &Address	**M/s. Nadidih Iron Ore & Mn Mines (FEEGRADE),** ***M/s ESL Steel Limited,*** *At/PO:- Koira, Sundargarh, Odisha.*		
Nature of Sampling	**Ambient Air Quality Monitoring (AAQ)**		
Sampling By	**GFAPL's Representative**		
Environmental Condition	Good	**Sampling Method**	As per IS: 5182
Location of performance of Laboratory activities	Laboratory Permanent Facility	**Deviation from the method (if any)**	NO
Discipline	Chemical	**Group**	Atmospheric Pollution
Instrument Used	**Respirable Dust Sampler, Fine Particulate Dust Sampler**		

Location Code	Sampling Location	Date of Sampling	Free Silica ($\mu g/m^3$)
AAQ-1	**Near Vedanta Office;**	**20.11.2024**	<2.0
AAQ-2	**Near Mine InGate;**	**20.11.2024**	<2.0
AAQ-3	**Near Rengalberha;**	**20.11.2024**	<2.0
AAQ-4	**Near Kalta;**	**20.11.2024**	<2.0
AAQ-5	**Village Jhirapani;**	**22.11.2024**	<2.0
AAQ-6	**Village Kashira;**	**22.11.2024**	<2.0
	Methods of Analysis		**NIOSH Method 7500 by X-Ray Diffraction**

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END OF REPORT

Plot No- 1363-3892, Baibhab Realcon, Fulnakhara,
Cuttack, Odisha, India 754001

GREEN FORCE ASSOCIATES PRIVATE LIMITED

Plot No.-1666, Phase-II, Delta Colony, Nilakantheswar Marg,
Baramunda, Bhubaneswar, Dist - Khurdha

Mail Id: greenforceassociates@gmail.com

TC-12258

Report No- GFAPL/24-25/ESLBI/015 **Issued Date-05.12.2024**

TEST REPORT

Client Name &Address	*M/s. Nadidih Iron Ore Mines (BICO),* **M/s ESL Steel Limited,** At/PO:- Koira, Sundargarh, Odisha.		
Nature of Sampling	**Surface Water (SW)**		
Sampling By	**GFAPL's Representative**		
Environmental Condition	Good	**Sampling Method**	As per APHA 24th ED 1060 B: 2023
Location of performance of Laboratory activities	Laboratory Permanent Facility	**Deviation from the method (if any)**	NO
Discipline	Chemical	**Group**	Water
Date of Sampling	**21.11.2024**	**Date of Receiving**	**22.11.2024**
Date of Analysis	**22.11.2024**	**Date of Complete**	**26.11.2024**
Sampling Location & Coordinates	**SW3: Topadih;** **Lat:** 21°59' 42.97"N, **Long:** 85°18' 13.97"E		

Sl. No.	Parameter	Testing Methods	Unit	Standard as per IS-2296 Class-C	SW3
1.	**Colour**	IS 3025: (Part 4)- 2021	**Hazen**	300	**80**
2.	**Total Suspended Solid**	APHA 24th ED 2540-D: 2023	**mg/l**	--	**84**
3.	**pH @25^{0}C**	APHA 24th ED 4500- H+B:2023	**---**	8.5	**7.14**
4.	**Conductivity**	APHA 24th ED 2510-B: 2023	**µS/cm**	--	**196.1**
5.	**Total Dissolved Solid**	APHA 24th ED 2540-C: 2023	**mg/l**	1500	**118**
6.	**Chloride (as Cl)**	APHA 24th ED 4500- Cl-B:2023	**mg/l**	600	**15**
7.	**Cyanide (as CN)**	APHA 24th ED 4500-CN-F	**mg/l**	0.05	**<0.02**
8.	**Hexavalent Chromium(asCr+6)**	APHA 24th ED 3500-Cr-B: 2023	**mg/l**	0.05	**<0.05**
9.	**Iron (as Fe)**	APHA 24th ED 3500-Fe-B: 2023	**mg/l**	50	**0.35**
10.	**Sulfate (as SO4)**	APHA 24th ED 4500-SO4 D: 2023	**mg/l**	400	**6.4**
11.	**Fluoride (as F)**	APHA 24th ED 4500-F-C: 2023	**mg/l**	1.5	**0.09**
12.	**Oil & Grease**	IS 3025 PART 39-1991 RA-2003	**mg/l**	0.1	**<2.0**
13.	**Dissolved oxygen**	APHA 24th ED 4500 O-C:2023	**mg/l**	4	**6.4**
14.	**BOD (3)days at 27^{0}C**	IS 3025 (PART 44): 1993 REA-2009	**mg/l**	3.0	**<2.0**
15.	**Chemical Oxygen Demand as COD**	APHA 24th ED 5220 C:2023	**mg/l**	--	**10**
16.	**Manganese**	IS 3025 PART-59 :2006 RA 2012	**mg/l**	--	**<0.05**

Reviewed By

CHIEF ANALYST
GREENFORCE ASSOCIATES PRIVATE LIMITED
BHUBANESWAR, ODISHA

Chief Analyst
Miss. Arti Sahoo

Authorized Signatory

TECHNICAL MANAGER
GREENFORCE ASSOCIATES PRIVATE LIMITED
BHUBANESWAR, ODISHA

Technical Manager
Mr. Sk. Parid

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Cuttack, Odisha, India 754001

GREEN FORCE ASSOCIATES PRIVATE LIMITED

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(An ISO 14001, 9001, 45001 certified Consulting Organization & NABL Accredited Laboratory)

Report No- GFAPL/24-25/ESLBI/015 **Issued Date-05.12.2024**

TEST REPORT

Client Name &Address	*M/s. Nadidih Iron Ore Mines (BICO),* **M/s ESL Steel Limited,** At/PO:- Koira, Sundargarh, Odisha.		
Nature of Sampling	**Surface Water (SW)**		
Sampling By	**GFAPL's Representative**		
Environmental Condition	Good	**Sampling Method**	As per APHA 24th ED 1060 B: 2023
Location of performance of Laboratory activities	Laboratory Permanent Facility	**Deviation from the method (if any)**	NO
Discipline	Chemical	**Group**	Water
Date of Sampling	**21.11.2024**	**Date of Receiving**	**22.11.2024**
Date of Analysis	**22.11.2024**	**Date of Complete**	**26.11.2024**
Sampling Location & Coordinates	**SW3: Topadih;** **Lat:** 21°59' 42.97"N, **Long:** 85°18' 13.97"E		

Sl. No.	Parameter	Testing Methods	Unit	Standard as per IS-2296 Class-C	SW3
1.	**Nitrate (as NO3)**	APHA 24th ED 4500-NO3-E: 2023	**mg/l**	50	**2.32**
2.	**Phenolic Compounds as C6H5OH**	APHA 24th ED 5530 B,D:2023	**mg/l**	--	**<0.001**
3.	**Copper (as Cu)**	IS: 3025(Part 42)	**mg/l**	0.05	**<0.03**
4.	**Lead (as Pb)**	APHA 24th ED 3500 Pb: 2023	**mg/l**	0.01	**<0.01**
5.	**Zinc (as Zn)**	APHA 24th ED 3500 Zn: 2023	**mg/l**	5	**<0.03**
6.	**Arsenic as As**	IS: 3025 (Part 37)	**mg/l**	--	**<0.001**
7.	**Selenium (as Se)**	APHA 24th ED 3500 B: 2023	**mg/l**	0.005	**<0.001**
8.	**Cadmium (as Cd)**	IS: 3025(Part 41)	**mg/l**	0.003	**<0.001**
9.	**Total Coliform**	APHA 24th ED 9222-H: 2023	**MPN/ 100ml**	---	**900**

Reviewed By **Authorized Signatory**

CHIEF ANALYST
GREENFORCE ASSOCIATES PRIVATE LIMITED
BHUBANESWAR, ODISHA

Chief Analyst
Miss. Arti Sahoo

TECHNICAL MANAGER
GREENFORCE ASSOCIATES PRIVATE LIMITED
BHUBANESWAR, ODISHA

Technical Manager
Mr. S.K. Parhi

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Cuttack, Odisha, India 754001

GREEN FORCE ASSOCIATES PRIVATE LIMITED

Plot No.-1666, Phase-II, Delta Colony, Nilakantheswar Marg,
Baramunda, Bhubaneswar, Dist - Khurdha

Mail Id: greenforceassociates@gmail.com

Report No- GFAPL/24-25/ESLBI/020 Issued Date-05.12.2024

TEST REPORT

Client Name &Address	***M/s. Nadidih Iron Ore Mines (BICO),*** **M/s ESL Steel Limited,** At/PO:- Koira, Sundargarh, Odisha.		
Nature of Sampling	**Mines Discharge Water**		
Sampling By	**GFAPL's Representative**		
Environmental Condition	Good	**Sampling Method**	As per APHA 24th ED 1060 B: 2023
Location of performance of Laboratory activities	Laboratory Permanent Facility	**Deviation from the method (if any)**	NO
Discipline	Chemical	**Group**	Water
Date of Sampling	**21.11.2024**	**Date of Receiving**	**22.11.2024**
Date of Analysis	**22.11.2024**	**Date of Complete**	**26.11.2024**
Sampling Location & Coordinates	**Mines Discharge;**		

Sl. No.	Parameter	Testing Methods	Unit	Standard as per CTO	Result
1.	**Colour**	IS 3025: (Part 4)- 2021	**Hazen**	--	**120**
2.	**Total Suspended Solid**	APHA 24th ED 2540-D: 2023	**mg/l**	100	**91**
3.	**pH @25^{0}C**	APHA 24th ED 4500- H+B:2023	**---**	5.5-9.0	**7.82**
4.	**Conductivity**	APHA 24th ED 2510-B: 2023	**µS/cm**	--	**278.4**
5.	**Total Dissolved Solid**	APHA 24th ED 2540-C: 2023	**mg/l**	--	**162**
6.	**Chloride (as Cl)**	APHA 24th ED 4500- Cl-B:2023	**mg/l**	--	**30**
7.	**Cyanide (as CN)**	APHA 24th ED 4500-CN-F	**mg/l**	--	**<0.02**
8.	**Hexavalent Chromium(asCr+6)**	APHA 24th ED 3500-Cr-B: 2023	**mg/l**	--	**<0.05**
9.	**Iron (as Fe)**	APHA 24th ED 3500-Fe-B: 2023	**mg/l**	--	**0.39**
10.	**Sulfate (as SO4)**	APHA 24th ED 4500-SO4 D: 2023	**mg/l**	--	**12.6**
11.	**Fluoride (as F)**	APHA 24th ED 4500-F-C: 2023	**mg/l**	--	**0.13**
12.	**Oil & Grease**	IS 3025 PART 39-1991 RA-2003	**mg/l**	10	**<2.0**
13.	**Dissolved oxygen**	APHA 24th ED 4500 O-C:2023	**mg/l**	--	**6.1**
14.	**BOD (3)days at 27^{0}C**	IS 3025 (PART 44): 1993 REA-2009	**mg/l**	--	**<2.0**
15.	**Chemical Oxygen Demand as COD**	APHA 24th ED 5220 C:2023	**mg/l**	--	**12**
16.	**Manganese**	IS 3025 PART-59 :2006 RA 2012	**mg/l**	--	**0.15**

Reviewed By

CHIEF ANALYST
GREENFORCE ASSOCIATES PRIVATE LIMITED
BHUBANESWAR, ODISHA

Chief Analyst
Miss. Arti Sahoo

Authorized Signatory

TECHNICAL MANAGER
GREENFORCE ASSOCIATES PRIVATE LIMITED
BHUBANESWAR, ODISHA

Technical Manager
Mr. S.K. Rath

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Report No- GFAPL/24-25/ESLBI/020 **Issued Date-05.12.2024**

TEST REPORT

Client Name &Address	*M/s. Nadidih Iron Ore Mines (BICO),* **M/s ESL Steel Limited,** At/PO:- Koira, Sundargarh, Odisha.		
Nature of Sampling	**Mines Discharge Water**		
Sampling By	**GFAPL's Representative**		
Environmental Condition	Good	**Sampling Method**	As per APHA 24th ED 1060 B: 2023
Location of performance of Laboratory activities	Laboratory Permanent Facility	**Deviation from the method (if any)**	NO
Discipline	Chemical	**Group**	Water
Date of Sampling	**21.11.2024**	**Date of Receiving**	**22.11.2024**
Date of Analysis	**22.11.2024**	**Date of Complete**	**26.11.2024**
Sampling Location & Coordinates	**Mines Discharge;**		

Sl. No.	Parameter	Testing Methods	Unit	Standard as per CTO	Result
1.	**Nitrate (as NO3)**	APHA 24th ED 4500-NO3-E: 2023	**mg/l**	--	**4.28**
2.	**Phenolic Compounds as C6H5OH**	APHA 24th ED 5530 B,D:2023	**mg/l**	--	**<0.001**
3.	**Copper (as Cu)**	IS: 3025(Part 42)	**mg/l**	--	**<0.03**
4.	**Lead (as Pb)**	APHA 24th ED 3500 Pb: 2023	**mg/l**	--	**<0.01**
5.	**Zinc (as Zn)**	APHA 24th ED 3500 Zn: 2023	**mg/l**	--	**<0.03**
6.	**Arsenic as As**	IS: 3025 (Part 37)	**mg/l**	--	**<0.001**
7.	**Selenium (as Se)**	APHA 24th ED 3500 B: 2023	**mg/l**	--	**<0.001**
8.	**Cadmium (as Cd)**	IS: 3025(Part 41)	**mg/l**	--	**<0.001**
9.	**Total Coliform**	APHA 24th ED 9222-H: 2023	**MPN/ 100ml**	--	**900**

Reviewed By

CHIEF ANALYST
GREENFORCE ASSOCIATES PRIVATE LIMITED
BHUBANESWAR, ODISHA

Chief Analyst
Miss. Arti Sahoo

Authorized Signatory

TECHNICAL MANAGER
GREENFORCE ASSOCIATES PRIVATE LIMITED
BHUBANESWAR, ODISHA

Technical Manager
Mr. S.K. Parhi

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END OF REPORT

Plot No- 1363-3892, Baibhab Realcon, Fulnakhara,
Cuttack, Odisha, India 754001

ENVIRONMENT MONITORING REPORT

FOR THE MONTH OF

DECEMBER -2024

NARAYANI

Client- M/s. Nadidih Iron Ore Mines (BICO),

M/s ESL Steel Limited,

Address- Koira, Sundargarh, Odisha.

GREEN FORCE

Monitored By - Green Force Associates Pvt. Ltd.

Address- Plot No-1363-3892 ,

Bhaibhab Realcon, Fulnakhara, Cuttack,

Odisha- 754001

NABL Certificate No:- TC-12258

PHOTOGRAPHS
OF
ENVIRONMENT MONITORING





GREEN FORCE ASSOCIATES PRIVATE LIMITED

Plot No.-1666, Phase-II, Delta Colony, Nilakantheswar Marg,
Baramunda, Bhubaneswar, Dist - Khurdha

Mail Id: greenforceassociates@gmail.com

TC-12258

Report No- GFAPL/24-25/ESLBI/020 **Issued Date-06.01.2025**

TEST REPORT

Client Name &Address	**M/s. Nadidih Iron Ore Mines (BICO),** ***M/s ESL Steel Limited,*** *At/PO:- Koira, Sundargarh, Odisha.*		
Nature of Sampling	**Ambient Air Quality Monitoring (AAQ)**		
Sampling By	**GFAPL's Representative**		
Environmental Condition	Good	**Sampling Method**	As per IS: 5182
Location of performance of Laboratory activities	Laboratory Permanent Facility	**Deviation from the method (if any)**	NO
Discipline	Chemical	**Group**	Atmospheric Pollution
Sampling Location & Coordinates	**AAQ1- Near Mine Office** **Lat:**21°58'9.21"N **& Long:**85°15'33.67"E;		
Instrument Used	**Respirable Dust Sampler, Fine ParticuLate Dust Sampler**		

Date of Sampling	PM_{10} ($\mu g/m^3$)	$PM_{2.5}$ ($\mu g/m^3$)	SO_2 ($\mu g/m^3$)	NO_2 ($\mu g/m^3$)
02.12.2024	57.8	28.8	8.6	14.4
05.12.2024	55.6	27.6	8.2	13.8
09.12.2024	58.2	28.9	8.8	14.6
12.12.2024	60.8	30.4	9.4	15.4
16.12.2024	62.7	31.2	9.8	15.8
19.12.2024	63.8	32.5	10.2	16.4
23.12.2024	40.8	18.5	5.6	10.4
26.12.2024	48.4	24.1	6.8	12.2
30.12.2024	53.5	26.4	7.4	13.6
Max	**63.80**	**32.50**	**10.20**	**16.40**
Min	**40.80**	**18.50**	**5.60**	**10.40**
Average	**55.73**	**27.60**	**8.31**	**14.07**
NAAQ* Standard	**100**	**60**	**80**	**80**
Methods of Analysis	**IS:5182 (Part-23)**	**IS:5182 (Part-24)**	**IS:5182 (Part-2)**	**IS:5182 (Part-6)**

Reviewed By

CHIEF ANALYST
GREENFORCE ASSOCIATES PRIVATE LIMITED
BHUBANESWAR, ODISHA

Chief Analyst
Miss. Arti Sahoo

Authorized Signatory

TECHNICAL MANAGER
GREENFORCE ASSOCIATES PRIVATE LIMITED
BHUBANESWAR, ODISHA

Technical Manager
Mr. S.K. Parhi

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GREEN FORCE ASSOCIATES PRIVATE LIMITED

Plot No.-1666, Phase-II, Delta Colony, Nilakantheswar Marg,
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Mail Id: greenforceassociates@gmail.com

TC-12258

Report No- GFAPL/24-25/ESLBI/021 **Issued Date-06.01.2025**

TEST REPORT

Client Name &Address	**M/s. Nadidih Iron Ore Mines (BICO),** ***M/s ESL Steel Limited,*** *At/PO:- Koira, Sundargarh, Odisha.*		
Nature of Sampling	**Ambient Air Quality Monitoring (AAQ)**		
Sampling By	**GFAPL's Representative**		
Environmental Condition	Good	**Sampling Method**	As per IS: 5182
Location of performance of Laboratory activities	Laboratory Permanent Facility	**Deviation from the method (if any)**	NO
Discipline	Chemical	**Group**	Atmospheric Pollution
Sampling Location & Coordinates	**AAQ2- Near Mine InGate** **Lat:** 21°58'23.32"N **& Long:** 85°15'44.18"E		
Instrument Used	**Respirable Dust Sampler, Fine ParticuLate Dust Sampler**		

Date of Sampling	PM_{10} ($\mu g/m^3$)	$PM_{2.5}$ ($\mu g/m^3$)	SO_2 ($\mu g/m^3$)	NO_2 ($\mu g/m^3$)
02.12.2024	66.4	33.5	10.2	15.4
05.12.2024	63.8	32.1	9.8	14.8
09.12.2024	67.4	33.8	10.6	15.8
12.12.2024	70.5	35.5	11.2	16.4
16.12.2024	73.4	36.4	11.8	17.2
19.12.2024	71.4	35.5	11.6	17.8
23.12.2024	43.8	19.1	6.2	10.8
26.12.2024	52.6	25.6	7.2	12.8
30.12.2024	57.5	28.8	8.4	14.2
Max	**73.40**	**36.40**	**11.80**	**17.80**
Min	**43.80**	**19.10**	**6.20**	**10.80**
Average	**62.98**	**31.14**	**9.67**	**15.02**
NAAQ* Standard	**100**	**60**	**80**	**80**
Methods of Analysis	**IS:5182 (Part-23)**	**IS:5182 (Part-24)**	**IS:5182 (Part-2)**	**IS:5182 (Part-6)**

Reviewed By

CHIEF ANALYST
GREENFORCE ASSOCIATES PRIVATE LIMITED
BHUBANESWAR, ODISHA

Chief Analyst
Miss. Arti Sahoo

Authorized Signatory

TECHNICAL MANAGER
GREENFORCE ASSOCIATES PRIVATE LIMITED
BHUBANESWAR, ODISHA

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GREEN FORCE ASSOCIATES PRIVATE LIMITED

Plot No.-1666, Phase-II, Delta Colony, Nilakantheswar Marg,
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Mail Id: greenforceassociates@gmail.com

TC-12258

Report No- GFAPL/24-25/ESLBI/022 **Issued Date-06.01.2025**

TEST REPORT

Client Name &Address	**M/s. Nadidih Iron Ore Mines (BICO),** *M/s ESL Steel Limited,* *At/PO:- Koira, Sundargarh, Odisha.*		
Nature of Sampling	**Ambient Air Quality Monitoring (AAQ)**		
Sampling By	**GFAPL's Representative**		
Environmental Condition	Good	**Sampling Method**	As per IS: 5182
Location of performance of Laboratory activities	Laboratory Permanent Facility	**Deviation from the method (if any)**	NO
Discipline	Chemical	**Group**	Atmospheric Pollution
Sampling Location & Coordinates	**AAQ3- Village Kenduhidi;** **Lat**21°59'45.70"N **& Long:** 85°16'14.44"E;		
Instrument Used	**Respirable Dust Sampler, Fine Particulate Dust Sampler**		

Date of Sampling	PM_{10} ($\mu g/m^3$)	$PM_{2.5}$ ($\mu g/m^3$)	SO_2 ($\mu g/m^3$)	NO_2 ($\mu g/m^3$)
02.12.2024	45.8	22.6	<4.0	<9.0
05.12.2024	44.2	21.8	<4.0	<9.0
09.12.2024	47.4	23.5	<4.0	<9.0
12.12.2024	51.2	25.4	<4.0	<9.0
16.12.2024	53.5	26.6	<4.0	<9.0
19.12.2024	50.8	25.2	<4.0	<9.0
23.12.2024	34.2	14.2	<4.0	<9.0
26.12.2024	39.4	18.4	<4.0	<9.0
30.12.2024	43.5	21.8	<4.0	<9.0
Max	**53.50**	**26.60**	**<4.0**	**<9.0**
Min	**34.20**	**14.20**	**<4.0**	**<9.0**
Average	**45.56**	**22.17**	**<4.0**	**<9.0**
NAAQ* Standard	**100**	**60**	**80**	**80**
Methods of Analysis	**IS:5182 (Part-23)**	**IS:5182 (Part-24)**	**IS:5182 (Part-2)**	**IS:5182 (Part-6)**

Reviewed By **Authorized Signatory**

CHIEF ANALYST
GREENFORCE ASSOCIATES PRIVATE LIMITED
BHUBANESWAR, ODISHA

Chief Analyst
Miss. Arti Sahoo

TECHNICAL MANAGER
GREENFORCE ASSOCIATES PRIVATE LIMITED
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Cuttack, Odisha, India 754001

GREEN FORCE ASSOCIATES PRIVATE LIMITED

Plot No.-1666, Phase-II, Delta Colony, Nilakantheswar Marg,
Baramunda, Bhubaneswar, Dist - Khurdha

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Report No- GFAPL/24-25/ESLBI/023 **Issued Date-06.01.2025**

TEST REPORT

Client Name &Address	**M/s. Nadidih Iron Ore Mines (BICO),** *M/s ESL Steel Limited,* *At/PO:- Koira, Sundargarh, Odisha.*		
Nature of Sampling	**Ambient Air Quality Monitoring (AAQ)**		
Sampling By	**GFAPL's Representative**		
Environmental Condition	Good	**Sampling Method**	As per IS: 5182
Location of performance of Laboratory activities	Laboratory Permanent Facility	**Deviation from the method (if any)**	NO
Discipline	Chemical	**Group**	Atmospheric Pollution
Sampling Location & Coordinates	**AAQ4- Village Badipada** **Lat:**21°58'4.60"N **& Long:**85°18'33.80"E;		
Instrument Used	**Respirable Dust Sampler, Fine ParticuLate Dust Sampler**		

Date of Sampling	PM_{10} ($\mu g/m^3$)	$PM_{2.5}$ ($\mu g/m^3$)	SO_2 ($\mu g/m^3$)	NO_2 ($\mu g/m^3$)
02.12.2024	46.9	23.3	<4.0	<9.0
05.12.2024	45.2	22.5	<4.0	<9.0
09.12.2024	47.4	23.6	<4.0	<9.0
12.12.2024	49.6	24.6	<4.0	<9.0
16.12.2024	51.2	25.6	<4.0	<9.0
19.12.2024	53.4	23.3	<4.0	<9.0
23.12.2024	36.8	16.2	<4.0	<9.0
26.12.2024	42.8	19.8	<4.0	<9.0
30.12.2024	47.6	23.1	<4.0	<9.0
Max	**53.40**	**25.60**	**<4.0**	**<9.0**
Min	**36.80**	**16.20**	**<4.0**	**<9.0**
Average	**46.77**	**22.44**	**<4.0**	**<9.0**
NAAQ* Standard	**100**	**60**	**80**	**80**
Methods of Analysis	**IS:5182 (Part-23)**	**IS:5182 (Part-24)**	**IS:5182 (Part-2)**	**IS:5182 (Part-6)**

Reviewed By

CHIEF ANALYST
GREENFORCE ASSOCIATES PRIVATE LIMITED
BHUBANESWAR, ODISHA

Chief Analyst
Miss. Arti Sahoo

Authorized Signatory

TECHNICAL MANAGER
GREENFORCE ASSOCIATES PRIVATE LIMITED
BHUBANESWAR, ODISHA

Technical Manager
Mr. S.K. Parhi

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END OF REPORT

**Plot No- 1363-3892, Baibhab Realcon, Fulnakhara,
Cuttack, Odisha, India 754001**

GREEN FORCE ASSOCIATES PRIVATE LIMITED

Plot No.-1666, Phase-II, Delta Colony, Nilakantheswar Marg,
Baramunda, Bhubaneswar, Dist - Khurdha

Mail Id: greenforceassociates@gmail.com

(An ISO 14001, 9001, 45001 certified Consulting Organization & NABL Accredited Laboratory)

Report No- GFAPL/24-25/ESLBI/024 **Issued Date-06.01.2025**

TEST REPORT

Client Name &Address	**M/s. Nadidih Iron Ore Mines (BICO),** ***M/s ESL Steel Limited,*** *At/PO:- Koira, Sundargarh, Odisha.*		
Nature of Sampling	**Ambient Air Quality Monitoring (AAQ)**		
Sampling By	**GFAPL's Representative**		
Environmental Condition	Good	**Sampling Method**	As per IS: 5182
Location of performance of Laboratory activities	Laboratory Permanent Facility	**Deviation from the method (if any)**	NO
Discipline	Chemical	**Group**	Atmospheric Pollution
Sampling Location & Coordinates	**AAQ1- Near Mine Office; Lat:**21°58'9.21"N **& Long**: 85°15'33.67"E; **AAQ2- Near Mine In Gate; Lat:**21°58'23.32"N **& Long**: 85°15'44.18"E **AAQ3- Village Kenduhidi; Lat**21°59'45.70"N **& Long:** 85°16'14.44"E; **AAQ4- Village Badipada; Lat:**21°58'4.60"N **& Long**: 85°18'33.80"E;		
Instrument Used	CO Analyser		

Date of Sampling	**CO (mg/m3)**			
	AAQ1	**AAQ2**	**AAQ3**	**AAQ4**
02.12.2024	0.36	0.4	0.17	0.18
05.12.2024	0.35	0.38	0.16	0.16
09.12.2024	0.37	0.41	0.17	0.18
12.12.2024	0.39	0.43	0.19	0.18
16.12.2024	0.4	0.45	0.21	0.2
19.12.2024	0.42	0.46	0.22	0.21
23.12.2024	0.26	0.28	0.16	0.15
26.12.2024	0.3	0.33	0.18	0.17
30.12.2024	0.34	0.37	0.19	0.19
Max	**0.42**	**0.46**	**0.22**	**0.21**
Min	**0.26**	**0.28**	**0.16**	**0.15**
Average	**0.35**	**0.39**	**0.18**	**0.18**
NAAQ* Standard	**4 mg/m3 (for 1hr)**			
Methods of Analysis	**IS: 5182 (Part- 10)**			

Reviewed By

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BHUBANESWAR, ODISHA

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Miss. Arti Sahoo

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Mr. S.K. Parhi

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GREEN FORCE ASSOCIATES PRIVATE LIMITED

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Report No- GFAPL/24-25/ESLBI/025 **Issued Date-06.01.2025**

TEST REPORT

Client Name &Address	**M/s. Nadidih Iron Ore Mines (BICO),** ***Sukinda Mines (Chromite),*** *At/PO:- Koira, Sundargarh, Odisha.*		
Nature of Sampling	**Ambient Air Quality Monitoring (AAQ)**		
Sampling By	**GFAPL's Representative**		
Environmental Condition	Good	**Sampling Method**	As per IS: 5182
Location of performance of Laboratory activities	Laboratory Permanent Facility	**Deviation from the method (if any)**	NO
Discipline	Chemical	**Group**	Atmospheric Pollution
Sampling Location & Coordinates	**AAQ5- Village Jhirapani;** **Lat:** 21°59'52.38"N, & **Long:** :85°13'9.76"E		
Instrument Used	**Respirable Dust Sampler, Fine ParticuLate Dust Sampler**		

Date of Sampling	PM_{10} ($\mu g/m^3$)	$PM_{2.5}$ ($\mu g/m^3$)	SO_2 ($\mu g/m^3$)	NO_2 ($\mu g/m^3$)
02.12.2024	45.2	22.4	<4.0	<9.0
05.12.2024	44.4	22.1	<4.0	<9.0
09.12.2024	46.8	23.4	<4.0	<9.0
12.12.2024	48.5	24.1	<4.0	<9.0
16.12.2024	49.8	24.6	<4.0	<9.0
19.12.2024	50.6	25.1	<4.0	<9.0
23.12.2024	34.6	15.1	<4.0	<9.0
26.12.2024	40.2	18.6	<4.0	<9.0
30.12.2024	45.4	22.6	<4.0	<9.0
Max	**50.60**	**25.10**	**<4.0**	**<9.0**
Min	**34.60**	**15.10**	**<4.0**	**<9.0**
Average	**45.06**	**22.00**	**<4.0**	**<9.0**
NAAQ* Standard	**100**	**60**	**80**	**80**
Methods of Analysis	**IS:5182 (Part-23)**	**IS:5182 (Part-24)**	**IS:5182 (Part-2)**	**IS:5182 (Part-6)**

Reviewed By

CHIEF ANALYST
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BHUBANESWAR, ODISHA

Chief Analyst
Miss. Arti Sahoo

Authorized Signatory

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BHUBANESWAR, ODISHA

Technical Manager
Mr. S.K. Parhi

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TC-12258

Report No- GFAPL/24-25/ESLBI/026 **Issued Date-06.01.2025**

TEST REPORT

Client Name &Address	**M/s. Nadidih Iron Ore Mines (BICO),** ***M/s ESL Steel Limited,*** *At/PO:- Koira, Sundargarh, Odisha.*		
Nature of Sampling	**Ambient Air Quality Monitoring (AAQ)**		
Sampling By	**GFAPL's Representative**		
Environmental Condition	Good	**Sampling Method**	As per IS: 5182
Location of performance of Laboratory activities	Laboratory Permanent Facility	**Deviation from the method (if any)**	NO
Discipline	Chemical	**Group**	Atmospheric Pollution
Sampling Location & Coordinates	**AAQ6- Village Kashira;** **Lat:**21°55'9.95"N, & **Long:** :85°15'18.13"E		
Instrument Used	**Respirable Dust Sampler, Fine Particulate Dust Sampler**		

Date of Sampling	PM_{10} ($\mu g/m^3$)	$PM_{2.5}$ ($\mu g/m^3$)	SO_2 ($\mu g/m^3$)	NO_2 ($\mu g/m^3$)
02.12.2024	46.8	22.6	<4.0	<9.0
05.12.2024	45.2	22.1	<4.0	<9.0
09.12.2024	47.9	23.5	<4.0	<9.0
12.12.2024	49.8	24.4	<4.0	<9.0
16.12.2024	52.1	25.6	4.4	9.6
19.12.2024	54.6	26.8	4.8	9.8
23.12.2024	33.8	13.6	<4.0	<9.0
26.12.2024	39.4	16.8	<4.0	<9.0
30.12.2024	44.2	22.1	<4.0	<9.0
Max	**54.60**	**26.80**	**4.80**	**9.80**
Min	**33.80**	**13.60**	**<4.0**	**<9.0**
Average	**45.98**	**21.94**	**4.60**	**9.70**
NAAQ* Standard	**100**	**60**	**80**	**80**
Methods of Analysis	**IS:5182 (Part-23)**	**IS:5182 (Part-24)**	**IS:5182 (Part-2)**	**IS:5182 (Part-6)**

Reviewed By **Authorized Signatory**

CHIEF ANALYST
GREENFORCE ASSOCIATES PRIVATE LIMITED
BHUBANESWAR, ODISHA

Chief Analyst
Miss. Arti Sahoo

TECHNICAL MANAGER
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BHUBANESWAR, ODISHA

Technical Manager
Mr. S.K. Parhi

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Plot No- 1363-3892, Baibhab Realcon, Fulnakhara,
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Report No- GFAPL/24-25/ESLBI/027 **Issued Date-06.01.2025**

TEST REPORT

Client Name &Address	**M/s. Nadidih Iron Ore Mines (BICO),** ***M/s ESL Steel Limited,*** *At/PO:- Koira, Sundargarh, Odisha.*		
Nature of Sampling	**Ambient Air Quality Monitoring (AAQ)**		
Sampling By	**GFAPL's Representative**		
Environmental Condition	Good	**Sampling Method**	As per IS: 5182
Location of performance of Laboratory activities	Laboratory Permanent Facility	**Deviation from the method (if any)**	NO
Discipline	Chemical	**Group**	Atmospheric Pollution
Sampling Location & Coordinates	**AAQ5- Village Jhirapani; Lat:**21°59'52.38"N, & **Long:** 85°13'9.76"E **AAQ6- Village Kashira; Lat:**21°55'9.95"N, & **Long:** 85°15'18.13"E		
Instrument Used	**CO Analyser**		

Date of Sampling	**CO (mg/m3)**	
	AAQ5	**AAQ6**
02.12.2024	0.18	0.2
05.12.2024	0.16	0.19
09.12.2024	0.17	0.2
12.12.2024	0.19	0.21
16.12.2024	0.2	0.23
19.12.2024	0.22	0.24
23.12.2024	0.14	0.15
26.12.2024	0.16	0.18
30.12.2024	0.17	0.19
Max	**0.22**	**0.24**
Min	**0.14**	**0.15**
Average	**0.18**	**0.20**
NAAQ* Standard	**4 mg/m3 (for 1hr)**	
Methods of Analysis	**IS: 5182 (Part- 10)**	

Reviewed By

CHIEF ANALYST
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BHUBANESWAR ODISHA

Chief Analyst
Miss. Arti Sahoo

Authorized Signatory

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Technical Manager
Mr. S.K. Parhi

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Plot No- 1363-3892, Baibhab Realcon, Fulnakhara,
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TC-12258

Report No- GFAPL/24-25/ESLBI/028 **Issued Date-06.01.2025**

TEST REPORT

Client Name &Address	**M/s. Nadidih Iron Ore Mines (BICO),** **M/s ESL Steel Limited,** *At/PO:- Koira, Sundargarh, Odisha.*		
Nature of Sampling	**Fugitive Dust Emission (F)**		
Sampling By	**GFAPL's Representative**		
Environmental Condition	Good	**Sampling Method**	As per IS: 5182
Location of performance of Laboratory activities	Laboratory Permanent Facility	**Deviation from the method (if any)**	NO
Discipline	Chemical	**Group**	Atmospheric Pollution
Sampling Location & Coordinates	**F1: Mine Face Area; Lat:** 21° 58' 17.73"N & **Long:** 85° 15' 33.03"E **F2: Haul Road; Lat:** 21° 51' 54.95"N **& Long:**85° 15' 50.13"E **F3: Near Crushing Plant; Lat:** 21° 58' 21.94"N **& Long:** 85° 15' 35.01"E **F4: Near Screening Plant; Lat:** 21° 58' 12.05"N **& Long:** 85° 15' 35.19"E **F5: Ore Storage Area; Lat:** 21° 58' 05.02"N **& Long:** 85° 15' 34.55"E **F6: West Dump; Lat:** 21° 58' 10.99"N **& Long:** 85° 15' 37.47"		
Instrument Used	**Respirable Dust Sampler (RDS)**		

Sl. No.	Date of Sampling	Result (µg/m³)					
		F1	F2	F3	F4	F5	F6
1	03.12.2024	514.2	516.4	509.6	534.2	490.6	472.5
2	06.12.2024	490.5	494.8	484.2	511.8	468.2	460.2
3	10.12.2024	523.5	534.2	528.6	572.5	497.3	488.6
4	13.12.2024	558.6	568.2	578.9	562.8	534.6	527.3
5	17.12.2024	604.2	624.5	636.4	594.6	582.6	564.2
6	20.12.2024	587.6	601.3	215.6	198.4	204.2	197.5
7	24.12.2024	624.3	642.5	198.2	190.4	186.4	184.2
8	27.12.2024	564.1	558.2	342.5	324.1	331.2	328.6
9	31.12.2024	513.8	508.3	412.5	396.8	386.2	379.4
Max		**624.30**	**642.50**	**636.40**	**594.60**	**582.60**	**564.20**
Min		**490.50**	**494.80**	**198.20**	**190.40**	**186.40**	**184.20**
Average		**553.42**	**566.50**	**434.06**	**431.73**	**409.03**	**400.28**
Fugitive Standard		**1200 µg/m³**					
Methods of Analysis		**IS:5182 (Part-4)**					

Reviewed By

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BHUBANESWAR, ODISHA

Technical Manager
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END OF REPORT

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Report No- GFAPL/24-25/ESLBI/029 **Issued Date-06.01.2025**

TEST REPORT

Client Name &Address	**M/s. Nadidih Iron Ore Mines (BICO),** **M/s ESL Steel Limited,** *At/PO:- Koira, Sundargarh, Odisha.*		
Nature of Sampling	**Workzone Noise Monitoring**		
Sampling By	**GFAPL's Representative**		
Location of performance of Laboratory activities	Site Facility	**Deviation from the method (if any)**	NO
Discipline	Chemical	**Group**	Atmospheric Pollution
Environmental Condition	Good	**Time Integration**	1 second
Time Weighing	Fast	**Frequency Weighing**	A- Weighing
Sampling Duration	24 hrs	**Area categorization**	Industrial Area
Date of Sampling	**13.12.2024**	**Date of Completion**	**14.12.2024**
Instrument Used	**Noise Meter**	**Sampling Method**	As per IS: 9989

S. No.	Locations	Day Time	Night Time
		Results in dB(A)	
1	**Near Mine Office; Lat:**21°58'9.21"N **& Long:**85°15'33.67"E	**60.1**	**41.5**
2	**Near Mine In Gate; Lat:**21°58'23.32"N **& Long:**85°15'44.18"E	**65.2**	**50.6**
3	**Near Screening Plant-1; Lat:**21°58'09.21"N **& Long:**85°15'33.66"E	**68.2**	**63.1**
4	**Near Crusher; Lat:**21°58'22.32"N **& Long:**85°15'34.13"E	**69.4**	**62.8**
5	**Near W.Bridge-1; Lat:** 21°57'53.99"N **& Long:**85°15'49.64"E	**66.5**	**56.7**
6	**Near W.Bridge -2; Lat:**21°57'54.26"N **& Long:**85°15'53.53"E	**66.9**	**57.8**

Noise permissible limits as per CPCB Norms in dB(A) Leq

Category of Area	Day Time	Night Time
Industrial Area	**75**	**70**
Commercial Area	65	55
Residential Area	55	45
Sensitive Area/ Silence Zone	50	40

Reviewed By

Chief Analyst
Miss. Arti Sahoo

Authorized Signatory

TECHNICAL MANAGER
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BHUBANESWAR, ODISHA

Technical Manager
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Plot No- 1363-3892, Baibhab Realcon, Fulnakhara,
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Report No- GFAPL/24-25/ESLBI/030 **Issued Date-06.01.2025**

TEST REPORT

Client Name &Address	**M/s. Nadidih Iron Ore Mines (BICO),** **M/s ESL Steel Limited,** *At/PO:- Koira, Sundargarh, Odisha.*		
Nature of Sampling	**Ambient Noise Monitoring**		
Sampling By	**GFAPL's Representative**		
Location of performance of Laboratory activities	Site Facility	**Deviation from the method (if any)**	NO
Discipline	Chemical	**Group**	Atmospheric Pollution
Environmental Condition	Good	**Time Integration**	1 second
Time Weighing	Fast	**Frequency Weighing**	A- Weighing
Sampling Duration	24 hrs	**Area categorization**	Residential Area
Date of Sampling	**13.12.2024**	**Date of Completion**	**14.12.2024**
Instrument Used	**Noise Meter**	**Sampling Method**	As per IS: 9989

S. No.	Locations	Day Time	Night Time
		Results in dB(A)	
1	**Village Kenduhidi;** **Lat:**21°59'45.70"N **& Long:**85°16'14.44"E	**47.9**	**37.2**
2	**Village Badipada;** **Lat:**21°58'4.60"N **& Long:**85°18'33.80"E	**47.8**	**36.9**
3	**Village Jhirapani;** **Lat:**21°59'52.38"N **& Long:**85°13'9.76"E	**48.2**	**37.4**
4	**Village Kashira;** **Lat:**21°55'9.95"N **& Long:**85°15'18.13"E	**48.1**	**37.2**

Noise permissible limits as per CPCB Norms in dB(A) Leq

Category of Area	Day Time	Night Time
Industrial Area	75	70
Commercial Area	65	55
Residential Area	**55**	**45**
Sensitive Area/ Silence Zone	50	40

Reviewed By

CHIEF ANALYST
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END OF REPORT

--1--

GREEN FORCE ASSOCIATES PRIVATE LIMITED

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Mail Id: greenforceassociates@gmail.com

TC-12258

Report No- GFAPL/24-25/ESLBI/031 **Issued Date-06.01.2025**

TEST REPORT

Client Name &Address	**M/s. Nadidih Iron Ore Mines (BICO),** **M/s ESL Steel Limited,** *At/PO:- Koira, Sundargarh, Odisha.*		
Nature of Sampling	**Stack Monitoring (ST)**		
Sampling By	**GFAPL's Representative**		
Environmental Condition	Good	**Sampling Method**	As per IS-11255
Location of performance of Laboratory activities	**Laboratory Permanent Facility**	**Deviation from the method (if any)**	NO
Discipline	**Chemical**	**Group**	Environment & Pollution
Date of Sampling	**13.12.2024**	**Date of Receiving**	**14.12.2024**
Date of Analysis	**14.12.2024**	**Date of Complete**	**18.12.2024**
Sampling Location & Coordinates	**ST- DG SET;** **Lat:** 21°58'23.31"N & **Long:** 85°15'37.17"E		
Instrument Used	**Stack monitoring Kit; Vacuum Pump; Pyrometer**		

Sl. No	Items	Testing Method	Unit	As per CPCB Standard	Result
01	Temperature	IS-11255 (PART-3) 1985	K	---	450
02	Velocity	IS-11255 (PART-3) 1985	m/sec	---	18.12
03	Particulate Matter as PM	IS-11255(PART-1) 1985 Gravimetric Method	mg/Nm3	100	85.4
04	Sulphur dioxide as SO2	IS-11255(PART-2) 1985	mg/Nm3	600	72.8
05	Carbon Monoxide as CO	IS-13270:1992	%	1%	<0.2
06	Carbon Dioxide as CO2	IS-13270:1992	%	---	1.6
07	Oxygen as O2	IS-13270:1992	%	---	16.2

Reviewed By

CHIEF ANALYST
GREENFORCE ASSOCIATES PRIVATE LIMITED
BHUBANESWAR, ODISHA

Chief Analyst
Miss. Arti Sahoo

Authorized Signatory

TECHNICAL MANAGER
GREENFORCE ASSOCIATES PRIVATE LIMITE
BHUBANESWAR, ODISHA

Technical Manager
Mr. S.K. Parlli

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Plot No- 1363-3892, Baibhab Realcon, Fulnakhara,
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GREEN FORCE ASSOCIATES PRIVATE LIMITED

Plot No.-1666, Phase-II, Delta Colony, Nilakantheswar Marg,
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Report No- GFAPL/24-25/ESLBI/031 **Issued Date-06.01.2025**

TEST REPORT

Client Name &Address	**M/s. Nadidih Iron Ore Mines (BICO),** **M/s ESL Steel Limited,** *At/PO:- Koira, Sundargarh, Odisha.*		
Nature of Sampling	**Stack Monitoring (ST)**		
Sampling By	**GFAPL's Representative**		
Location of performance of Laboratory activities	**Laboratory Permanent Facility**	**Deviation from the method (if any)**	NO
Discipline	**Chemical**	**Group**	Atmospheric Pollution
Date of Sampling	**13.12.2024**	**Date of Receiving**	**14.12.2024**
Date of Analysis	**14.12.2024**	**Date of Complete**	**18.12.2024**
Sampling Location & Coordinates	**ST- DG SET;** **Lat:** 21°58'23.31"N & **Long:** 85°15'37.17"E		
Instrument Used	**Stack monitoring Kit; Vacuum Pump; Pyrometer**		

Sl. No	Items	Testing Method	Unit	As per CPCB Standard	Result
01	Nitrogen Oxide as NOx	IS-11255(PART-7) 1985	mg/Nm3	300	56.8

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Report No- GFAPL/24-25/ESLBI/032 Issued Date-06.01.2025

TEST REPORT

Client Name &Address	**M/s. Nadidih Iron Ore Mines (BICO),** **M/s ESL Steel Limited,** *At/PO:- Koira, Sundargarh, Odisha.*		
Nature of Sampling	**Ground Water (GW)**		
Sampling By	**GFAPL's Representative**		
Environmental Condition	Good	**Sampling Method**	As per APHA 24th ED 1060 B: 2023
Location of performance of Laboratory activities	Laboratory Permanent Facility	**Deviation from the method (if any)**	NO
Discipline	Chemical	**Group**	Water
Date of Sampling	**13.12.2024**	**Date of Receiving**	**14.12.2024**
Date of Analysis	**14.12.2024**	**Date of Complete**	**18.12.2024**
Sampling Location & Coordinates	**GW1: Within Mine Lease; Lat:** 21°58'19.62"N & **Long:** 85°15'24.14"E **GW2: Village Rengalberha; Lat:** 21°57'10.45"N & **Long:** 85°14'55.35"E		

Sl. No.	Parameter	Testing Methods	Unit	Standard as per IS: 10500, 2012		GW1	GW2
				AL	PL		
1	**Colour**	IS 3025: (Part 4)- 2021	**Hazen**	5	15	**<5.0**	**<5.0**
2	**Turbidity**	APHA 24th ED: 2130-B -2023	**NTU**	1	5	**<1**	**<1**
3	**pH Value @25°C**	APHA 24th ED 4500- H+B:2023	**--**	6.5-8.5	NR	**7.03**	**7.06**
4	**Total Dissolved Solids (TDS)**	APHA 24th ED: 2540-C: 2023	**mg/l**	500	2000	**179**	**152**
5	**Chloride (as Cl)**	APHA 24th Ed 4500- Cl-B:2023	**mg/l**	250	1000	**16**	**16**
6	**Total Hardness**	APHA 24th ED 2340-C: 2023	**mg/l**	200	600	**118**	**103**
7	**Calcium**	APHA 24th Ed 3500- Ca-B:2023	**mg/l**	75	200	**30.2**	**26.5**
8	**Magnesium**	APHA 24th ED 3500-Mg-B: 2023	**mg/l**	30	100	**9.8**	**8.6**
9	**Total Alkalinity**	APHA 24th ED 2320-B: 2023	**mg/l**	200	600	**108**	**95**
10	**Residual Free Chlorine**	APHA 24th ED 4500 CL-B:2023	**mg/l**	0.2	1.0	**<0.2**	**<0.2**
11	**Cyanide**	APHA 24th ED 4500 CN-F:2023	**mg/l**	0.05	NR	**<0.02**	**<0.02**
12	**Hexavalent Chromium**	APHA 24th ED 3500-Cr-B: 2023	**mg/l**	0.05	NR	**<0.05**	**<0.05**
13	**Total Chromium**	APHA 24th ED 3500-Cr-B: 2023	**mg/l**	0.05	NR	**<0.05**	**<0.05**
14	**Iron**	APHA 24th ED 3500-Fe-B: 2023	**mg/l**	0.3	NR	**0.23**	**0.22**

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Sl. No.	Parameter	Testing Methods	Unit	Standard as per IS: 10500, 2012		GW1	GW2
				AL	PL		
15	Sulfate	APHA 24th ED 4500-SO4 E: 2023	mg/l	200	400	3.1	2.7
16	Fluoride	APHA 24th ED 4500-F-C: 2023	mg/l	1.0	1.5	<0.05	<0.05
18	Boron	APHA 24th ED 4500 B-B:2023	mg/l	0.5	1.0	<0.01	<0.01
18	Manganese	IS 3025 PART-59 :2006 RA 2012	mg/l	0.1	0.3	<0.05	<0.05
19	Sodium as Na	APHA 24th ED 3500- Na-B	mg/l	--	--	9.3	8.7
20	Potassium as K	APHA 24th ED 3500- K-B	mg/l	--	--	0.8	0.8

REMARKS: NR- Not Relaxable; AL-Acceptable Limit; PL- Permissible Limit; al- agreeable;

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Report No- GFAPL/24-25/ESLBI/032 **Issued Date-06.01.2025**

TEST REPORT

Client Name &Address	**M/s. Nadidih Iron Ore Mines (BICO),** **M/s ESL Steel Limited,** *At/PO:- Koira, Sundargarh, Odisha.*		
Nature of Sampling	**Ground Water (GW)**		
Sampling By	**GFAPL's Representative**		
Environmental Condition	Good	**Sampling Method**	As per APHA 24th ED 1060 B: 2023
Location of performance of Laboratory activities	Laboratory Permanent Facility	**Deviation from the method (if any)**	NO
Discipline	Chemical	**Group**	Water
Date of Sampling	**13.12.2024**	**Date of Receiving**	**14.12.2024**
Date of Analysis	**14.12.2024**	**Date of Complete**	**18.12.2024**
Sampling Location & Coordinates	**GW1: Within Mine Lease; Lat:** 21°58'19.62"N & **Long:** 85°15'24.14"E **GW2: Village Rengalberha; Lat:** 21°57'10.45"N & **Long:** 85°14'55.35"E		

Sl. No.	Parameter	Testing Methods	Unit	Standard as per IS: 10500, 2012		GW1	GW2
				AL	PL		
1	**Odour**	APHA 24th ED: 2150-B -2023	---	Agreeable	Agreeable	**U/O**	**U/O**
2	**Taste**	APHA 24th ED: 2160-B -2023	---	Agreeable	Agreeable	**al**	**al**
3	**Nitrate**	APHA 24th ED 4500-NO3-E : 2023	**mg/l**	45	NR	**1.35**	**1.23**
4	**Cadmium (as Cd)**	IS: 3025(Part 41)	**mg/l**	0.003	NR	**<0.001**	**<0.001**
5	**Copper (as Cu)**	IS: 3025(Part 42)	**mg/l**	0.05	1.5	**<0.03**	**<0.03**
6	**Zinc (as Zn)**	APHA 24th ED 3500 Zn: 2023	**mg/l**	5	15	**<0.03**	**<0.03**
7	**Lead (as Pb)**	APHA 24th ED 3500 Pb: 2023	**mg/l**	0.01	NR	**<0.01**	**<0.01**
8	**Selenium (as Se)**	APHA 24th ED 3500 B: 2023	**mg/l**	0.001	NR	**<0.001**	**<0.001**
9	**Mercury (as Hg)**	APHA 24th ED3500Hg: 2023	**mg/l**	0.001	NR	**<0.001**	**<0.001**
10	**Arsenic (as As)**	IS: 3025 (Part 37)	**mg/l**	0.01	0.05	**<0.001**	**<0.001**
11	**Aluminum (as Al)**	APHA 24th ED 3500Al : 2023	**mg/l**	0.03	0.2	**<0.01**	**<0.01**
12	**Mineral Oil**	APHA 24th ED 5220 B: 2023	**mg/l**	0.5	NR	**ND**	**ND**
13	**Anionic Detergents (as MBAS)**	APHA 24th ED 5540 C : 2023	**mg/l**	0.2	1.0	**ND**	**ND**

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Sl. No.	Parameter	Testing Methods	Unit	Standard as per IS: 10500, 2012		GW1	GW2
				AL	AL		
14	Phenolic Compound (as C6H5OH)	APHA 24th ED 5530 B,D: 2023	mg/l	0.001	0.002	<0.001	<0.001
15	Total Coliforms	APHA 24th ED 9222-H: 2023	MPN/ 100ml	-	-	<1.8	<1.8

REMARKS: NR- Not Relaxable; AL-Acceptable Limit; PL- Permissible Limit; al- agreeable;

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Report No- GFAPL/24-25/ESLBI/033 Issued Date-06.01.2025

TEST REPORT

Client Name &Address	**M/s. Nadidih Iron Ore Mines (BICO),** **M/s ESL Steel Limited,** *At/PO:- Koira, Sundargarh, Odisha*		
Nature of Sampling	**Ground Water (GW)**		
Sampling By	**GFAPL's Representative**		
Environmental Condition	Good	**Sampling Method**	As per APHA 24th ED 1060 B: 2023
Location of performance of Laboratory activities	Laboratory Permanent Facility	**Deviation from the method (if any)**	NO
Discipline	Chemical	**Group**	Water
Date of Sampling	**13.12.2024**	**Date of Receiving**	**14.12.2024**
Date of Analysis	**14.12.2024**	**Date of Complete**	**18.12.2024**
Sampling Location & Coordinates	**GW3: Village Kendudihi; Lat:** 21°59'40.63"N & **Long:** 85°16'07.74"E **GW4: Village Kalta; Lat:** 21°57'54.83"N & **Long:** 85°12'49.46"E		

Sl. No.	Parameter	Testing Methods	Unit	Standard as per IS: 10500, 2012		GW3	GW4
				AL	PL		
1	**Colour**	IS 3025: (Part 4)- 2021	**Hazen**	5	15	**<5.0**	**<5.0**
2	**Turbidity**	APHA 24th ED: 2130-B -2023	**NTU**	1	5	**<1**	**<1**
3	**pH Value @25°C**	APHA 24th ED 4500- H+B:2023	**--**	6.5-8.5	NR	**7.19**	**7.21**
4	**Total Dissolved Solids(TDS)**	APHA 24th ED: 2540-C: 2023	**mg/l**	500	2000	**148**	**162**
5	**Chloride (as Cl)**	APHA 24th Ed 4500- Cl-B:2023	**mg/l**	250	1000	**15**	**17**
6	**Total Hardness**	APHA 24th ED 2340-C: 2023	**mg/l**	200	600	**101**	**111**
7	**Calcium**	APHA 24th Ed 3500- Ca-B:2023	**mg/l**	75	200	**26.2**	**27.3**
8	**Magnesium**	APHA 24th ED 3500-Mg-B: 2023	**mg/l**	30	100	**10**	**11**
9	**Total Alkalinity**	APHA 24th ED 2320-B: 2023	**mg/l**	200	600	**98**	**99**
10	**Residual Free Chlorine**	APHA 24th ED 4500 CL-B:2023	**mg/l**	0.2	1.0	**<0.2**	**<0.2**
11	**Cyanide**	APHA 24th ED 4500 CN-F:2023	**mg/l**	0.05	NR	**<0.02**	**<0.02**
12	**Hexavalent Chromium**	APHA 24th ED 3500-Cr-B: 2023	**mg/l**	0.05	NR	**<0.05**	**<0.05**
13	**Total Chromium**	APHA 24th ED 3500-Cr-B: 2023	**mg/l**	0.05	NR	**0.25**	**0.24**
14	**Iron**	APHA 24th ED 3500-Fe-B: 2023	**mg/l**	0.3	NR	**2.8**	**2.9**

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Sl. No.	Parameter	Testing Methods	Unit	Standard as per IS: 10500, 2012		GW3	GW4
				AL	PL		
15	Sulfate	APHA 24th ED 4500-SO4 E: 2023	mg/l	200	400	2.8	2.9
16	Fluoride	APHA 24th ED 4500-F-C: 2023	mg/l	1.0	1.5	<0.05	<0.05
17	Boron	APHA 24th ED 4500 B-B:2023	mg/l	0.5	1.0	<0.01	<0.01
18	Manganese	IS 3025 PART-59 :2006 RA 2012	mg/l	0.1	0.3	<0.05	<0.05
19	Sodium as Na	APHA 24th ED 3500- Na-B	mg/l	--	--	8.7	9.1
20	Potassium as K	APHA 24th ED 3500- K-B	mg/l	--	--	0.7	0.7

REMARKS: NR- Not Relaxable; AL-Acceptable Limit; PL- Permissible Limit

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TEST REPORT

Client Name &Address	**M/s. Nadidih Iron Ore Mines (BICO),** **M/s ESL Steel Limited,** *At/PO:- Koira, Sundargarh, Odisha.*		
Nature of Sampling	**Ground Water (GW)**		
Sampling By	GFAPL's Representative		
Environmental Condition	Good	**Sampling Method**	As per APHA 24th ED 1060 B: 2023
Location of performance of Laboratory activities	Laboratory Permanent Facility	**Deviation from the method (if any)**	NO
Discipline	Chemical	**Group**	Water
Date of Sampling	**13.12.2024**	**Date of Receiving**	**14.12.2024**
Date of Analysis	**14.12.2024**	**Date of Complete**	**18.12.2024**
Sampling Location & Coordinates	**GW3: Village Kendudihi; Lat:** 21°59'40.63"N, **Long:** 85°16'07.74"E **GW4: Village Kalta; Lat:** 21°57'54.83"N, **Long:** 85°12'49.46"E		

Sl. No.	Parameter	Testing Methods	Unit	Standard as per IS: 10500, 2012		GW3	GW4
				AL	PL		
1	**Odour**	APHA 24th ED: 2150-B -2023	---	Agreeable	Agreeable	**U/O**	**U/O**
2	**Taste**	APHA 24th ED: 2160-B -2023	---	Agreeable	Agreeable	**al**	**al**
3	**Nitrate**	APHA 24th ED 4500-NO3-E : 2023	**mg/l**	45	NR	**1.01**	**1.16**
4	**Cadmium (as Cd)**	IS: 3025(Part 41)	**mg/l**	0.003	NR	**<0.001**	**<0.001**
5	**Copper (as Cu)**	IS: 3025(Part 42)	**mg/l**	0.05	1.5	**<0.03**	**<0.03**
6	**Zinc (as Zn)**	APHA 24th ED 3500 Zn: 2023	**mg/l**	5	15	**<0.03**	**<0.03**
7	**Lead (as Pb)**	APHA 24th ED 3500 Pb: 2023	**mg/l**	0.01	NR	**<0.01**	**<0.01**
8	**Selenium (as Se)**	APHA 24th ED 3500 B: 2023	**mg/l**	0.001	NR	**<0.001**	**<0.001**
9	**Mercury (as Hg)**	APHA 24th ED3500Hg: 2023	**mg/l**	0.001	NR	**<0.001**	**<0.001**
10	**Arsenic (as As)**	IS: 3025 (Part 37)	**mg/l**	0.01	0.05	**<0.001**	**<0.001**
11	**Aluminum (as Al)**	APHA 24th ED 3500Al : 2023	**mg/l**	0.03	0.2	**<0.01**	**<0.01**
12	**Mineral Oil**	APHA 24th ED 5220 B: 2023	**mg/l**	0.5	NR	**ND**	**ND**
13	**Anionic Detergents (as MBAS)**	APHA 24th ED 5540 C : 2023	**mg/l**	0.2	1.0	**ND**	**ND**

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Sl. No.	Parameter	Testing Methods	Unit	Standard as per IS: 10500, 2012		GW3	GW4
				AL	AL		
14	Phenolic Compound (as C6H5OH)	APHA 24th ED 5530 B,D: 2023	mg/l	0.001	0.002	<0.001	<0.001
15	Total Coliforms	APHA 24th ED 9222-H: 2023	MPN/ 100ml	-	-	<1.8	<1.8

REMARKS: NR- Not Relaxable; AL-Acceptable Limit; PL- Permissible Limit; al- agreeable;

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GREEN FORCE ASSOCIATES PRIVATE LIMITED

Plot No.-1666, Phase-II, Delta Colony, Nilakantheswar Marg,
Baramunda, Bhubaneswar, Dist - Khurdha

Mail Id: greenforceassociates@gmail.com

Report No- GFAPL/24-25/ESLBI/034 | Issued Date-06.01.2025

TEST REPORT

Client Name &Address	*M/s. Nadidih Iron Ore Mines (BICO),* **M/s ESL Steel Limited,** At/PO:- Koira, Sundargarh, Odisha.		
Nature of Sampling	**Surface Water (SW)**		
Sampling By	**GFAPL's Representative**		
Environmental Condition	Good	**Sampling Method**	As per APHA 24th ED 1060 B: 2023
Location of performance of Laboratory activities	Laboratory Permanent Facility	**Deviation from the method (if any)**	NO
Discipline	Chemical	**Group**	Water
Date of Sampling	**13.12.2024**	**Date of Receiving**	**14.12.2024**
Date of Analysis	**14.12.2024**	**Date of Complete**	**18.12.2024**
Sampling Location & Coordinates	**SW1: Karo River Upstreem(US); Lat:** 21°58'30.34"N & **Long:** 85°15'28.12"E **SW2: Karo River Downstreem(DS); Lat:** 21°59'35.14"N & **Long:** 85°16' 21.42"E		

Sl. No.	Parameter	Testing Methods	Unit	Standard as per IS-2296 Class-C	SW1	SW2
1.	**Colour**	IS 3025: (Part 4)- 2021	**Hazen**	300	**<5.0**	**<5.0**
2.	**Total Suspended Solid**	APHA 24th ED 2540-D: 2023	**mg/l**	--	**<1**	**<1**
3.	**pH @25^{0}C**	APHA 24th ED 4500- H+B:2023	**---**	8.5	**7.19**	**7.21**
4.	**Conductivity**	APHA 24th ED 2510-B: 2023	**µS/cm**	--	**178.6**	**191.4**
5.	**Total Dissolved Solid**	APHA 24th ED 2540-C: 2023	**mg/l**	1500	**112**	**118**
6.	**Chloride (as Cl)**	APHA 24th ED 4500- Cl-B:2023	**mg/l**	600	**15**	**17**
7.	**Cyanide (as CN)**	APHA 24th ED 4500-CN-F	**mg/l**	0.05	**<0.02**	**<0.02**
8.	**Hexavalent Chromium(asCr+6)**	APHA 24th ED 3500-Cr-B: 2023	**mg/l**	0.05	**<0.05**	**<0.05**
9.	**Iron (as Fe)**	APHA 24th ED 3500-Fe-B: 2023	**mg/l**	50	**0.36**	**0.35**
10.	**Sulfate (as SO4)**	APHA 24th ED 4500-SO4 D: 2023	**mg/l**	400	**4.4**	**4.9**
11.	**Fluoride (as F)**	APHA 24th ED 4500-F-C: 2023	**mg/l**	1.5	**<0.05**	**0.09**
12.	**Oil & Grease**	IS 3025 PART 39-1991 RA-2003	**mg/l**	0.1	**<2.0**	**<2.0**
13.	**Dissolved oxygen**	APHA 24th ED 4500 O-C:2023	**mg/l**	4	**6.3**	**6.1**
14.	**BOD (3)days at 27^{0}C**	IS 3025 (PART 44): 1993 REA-2009	**mg/l**	3.0	**<2.0**	**<2.0**
15.	**Chemical Oxygen Demand as COD**	APHA 24th ED 5220 C:2023	**mg/l**	--	**9**	**13**
16.	**Manganese**	IS 3025 PART-59 :2006 RA 2012	**mg/l**	--	**<0.05**	**<0.05**

Reviewed By

CHIEF ANALYST
GREENFORCE ASSOCIATES PRIVATE LIMITED
BHUBANESWAR, ODISHA

Asst. Analyst
Miss. Arti Sahoo

Authorized Signatory

TECHNICAL MANAGER
GREENFORCE ASSOCIATES PRIVATE LIMITED
BHUBANESWAR, ODISHA

Technical Manager
Mr. S.K. Parhi

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END OF REPORT

Plot No- 1363-3892, Baibhab Realcon, Fulnakhara,
Cuttack, Odisha, India 754001

GREEN FORCE ASSOCIATES PRIVATE LIMITED

Plot No.-1666, Phase-II, Delta Colony, Nilakantheswar Marg,
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(An ISO 14001, 9001, 45001 certified Consulting Organization & NABL Accredited Laboratory)

Report No- GFAPL/24-25/ESLBI/034 **Issued Date-06.01.2025**

TEST REPORT

Client Name &Address	*M/s. Nadidih Iron Ore Mines (BICO),* **M/s ESL Steel Limited,** At/PO:- Koira, Sundargarh, Odisha.		
Nature of Sampling	**Surface Water (SW)**		
Sampling By	**GFAPL's Representative**		
Environmental Condition	Good	**Sampling Method**	As per APHA 24th ED 1060 B: 2023
Location of performance of Laboratory activities	Laboratory Permanent Facility	**Deviation from the method (if any)**	NO
Discipline	Chemical	**Group**	Water
Date of Sampling	**13.12.2024**	**Date of Receiving**	**14.12.2024**
Date of Analysis	**14.12.2024**	**Date of Complete**	**18.12.2024**
Sampling Location & Coordinates	**SW1: Karo River Upstreem(US); Lat:** 21°58'30.34"N & **Long:** 85°15'28.12"E **SW2: Karo River Downstreem(DS); Lat:** 21°59'35.14"N & **Long:** 85°16' 21.42"E		

Sl.No.	Parameter	Testing Methods	Unit	Standard as per IS-2296 Class-C	SW1	SW2
1.	**Nitrate (as NO3)**	APHA 24th ED 4500-NO3-E: 2023	**mg/l**	50	**1.32**	**1.72**
2.	**Phenolic Compounds as C6H5OH**	APHA 24th ED 5530 B,D:2023	**mg/l**	--	**<0.001**	**<0.001**
3.	**Copper (as Cu)**	IS: 3025(Part 42)	**mg/l**	0.05	**<0.03**	**<0.03**
4.	**Lead (as Pb)**	APHA 24th ED 3500 Pb: 2023	**mg/l**	0.01	**<0.01**	**<0.01**
5.	**Zinc (as Zn)**	APHA 24th ED 3500 Zn: 2023	**mg/l**	5	**<0.03**	**<0.03**
6.	**Arsenic as As**	IS: 3025 (Part 37)	**mg/l**	--	**<0.001**	**<0.001**
7.	**Selenium (as Se)**	APHA 24th ED 3500 B: 2023	**mg/l**	0.005	**<0.001**	**<0.001**
8.	**Cadmium (as Cd)**	IS: 3025(Part 41)	**mg/l**	0.003	**<0.001**	**<0.001**
9.	**Total Coliform**	APHA 24th ED 9222-H: 2023	**MPN/ 100ml**	---	**510**	**510**

Reviewed By **Authorized Signatory**

CHIEF ANALYST
GREENFORCE ASSOCIATES PRIVATE LIMITED
BHUBANESWAR, ODISHA

Chief Analyst
Miss. Arti Sahoo

TECHNICAL MANAGER
GREENFORCE ASSOCIATES PRIVATE LIMITED
BHUBANESWAR, ODISHA

Technical Manager
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Report No- GFAPL/24-25/ESLBI/035 Issued Date-06.01.2025

TEST REPORT

Client Name &Address	***M/s. Nadidih Iron Ore Mines (BICO),*** **M/s ESL Steel Limited,** At/PO:- Koira, Sundargarh, Odisha.		
Nature of Sampling	**Surface Water (SW)**		
Sampling By	**GFAPL's Representative**		
Environmental Condition	Good	**Sampling Method**	As per APHA 24th ED 1060 B: 2023
Location of performance of Laboratory activities	Laboratory Permanent Facility	**Deviation from the method (if any)**	NO
Discipline	Chemical	**Group**	Water
Date of Sampling	**13.12.2024**	**Date of Receiving**	**14.12.2024**
Date of Analysis	**14.12.2024**	**Date of Complete**	**18.12.2024**
Sampling Location & Coordinates	**SW3: Topadih;** **Lat:** 21°59' 42.97"N, **Long:** 85°18' 13.97"E		

Sl. No.	Parameter	Testing Methods	Unit	Standard as per IS-2296 Class-C	SW3
1.	**Colour**	IS 3025: (Part 4)- 2021	**Hazen**	300	**<5.0**
2.	**Total Suspended Solid**	APHA 24th ED 2540-D: 2023	**mg/l**	--	**<1**
3.	**pH @25^{0}C**	APHA 24th ED 4500- H+B:2023	**---**	8.5	**7.18**
4.	**Conductivity**	APHA 24th ED 2510-B: 2023	**µS/cm**	--	**201.2**
5.	**Total Dissolved Solid**	APHA 24th ED 2540-C: 2023	**mg/l**	1500	**121**
6.	**Chloride (as Cl)**	APHA 24th ED 4500- Cl-B:2023	**mg/l**	600	**18**
7.	**Cyanide (as CN)**	APHA 24th ED 4500-CN-F	**mg/l**	0.05	**<0.02**
8.	**Hexavalent Chromium(asCr+6)**	APHA 24th ED 3500-Cr-B: 2023	**mg/l**	0.05	**<0.05**
9.	**Iron (as Fe)**	APHA 24th ED 3500-Fe-B: 2023	**mg/l**	50	**0.36**
10.	**Sulfate (as SO4)**	APHA 24th ED 4500-SO4 D: 2023	**mg/l**	400	**6.7**
11.	**Fluoride (as F)**	APHA 24th ED 4500-F-C: 2023	**mg/l**	1.5	**1.01**
12.	**Oil & Grease**	IS 3025 PART 39-1991 RA-2003	**mg/l**	0.1	**<2.0**
13.	**Dissolved oxygen**	APHA 24th ED 4500 O-C:2023	**mg/l**	4	**6**
14.	**BOD (3)days at 27^{0}C**	IS 3025 (PART 44): 1993 REA-2009	**mg/l**	3.0	**<2.0**
15.	**Chemical Oxygen Demand as COD**	APHA 24th ED 5220 C:2023	**mg/l**	--	**12**
16.	**Manganese**	IS 3025 PART-59 :2006 RA 2012	**mg/l**	--	**<0.05**

Reviewed By
CHIEF ANALYST
GREENFORCE ASSOCIATES PRIVATE LIMITED
BHUBANESWAR, ODISHA
Chief Analyst
Miss. Arti Sahoo

Authorized Signatory
TECHNICAL MANAGER
GREENFORCE ASSOCIATES PRIVATE LIMITED
BHUBANESWAR, ODISHA
Technical Manager
Mr. S.K. Parhi

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Report No- GFAPL/24-25/ESLBI/035 **Issued Date-06.01.2025**

TEST REPORT

Client Name &Address	***M/s. Nadidih Iron Ore Mines (BICO),*** **M/s ESL Steel Limited,** At/PO:- Koira, Sundargarh, Odisha.		
Nature of Sampling	**Surface Water (SW)**		
Sampling By	**GFAPL's Representative**		
Environmental Condition	Good	**Sampling Method**	As per APHA 24th ED 1060 B: 2023
Location of performance of Laboratory activities	Laboratory Permanent Facility	**Deviation from the method (if any)**	NO
Discipline	Chemical	**Group**	Water
Date of Sampling	**13.12.2024**	**Date of Receiving**	**14.12.2024**
Date of Analysis	**14.12.2024**	**Date of Complete**	**18.12.2024**
Sampling Location & Coordinates	**SW3: Topadih;** **Lat:** 21°59' 42.97"N, **Long:** 85°18' 13.97"E		

Sl. No.	Parameter	Testing Methods	Unit	Standard as per IS-2296 Class-C	SW3
1.	**Nitrate (as NO3)**	APHA 24th ED 4500-NO3-E: 2023	**mg/l**	50	**2.43**
2.	**Phenolic Compounds as C6H5OH**	APHA 24th ED 5530 B,D:2023	**mg/l**	--	**<0.001**
3.	**Copper (as Cu)**	IS: 3025(Part 42)	**mg/l**	0.05	**<0.03**
4.	**Lead (as Pb)**	APHA 24th ED 3500 Pb: 2023	**mg/l**	0.01	**<0.01**
5.	**Zinc (as Zn)**	APHA 24th ED 3500 Zn: 2023	**mg/l**	5	**<0.03**
6.	**Arsenic as As**	IS: 3025 (Part 37)	**mg/l**	--	**<0.001**
7.	**Selenium (as Se)**	APHA 24th ED 3500 B: 2023	**mg/l**	0.005	**<0.001**
8.	**Cadmium (as Cd)**	IS: 3025(Part 41)	**mg/l**	0.003	**<0.001**
9.	**Total Coliform**	APHA 24th ED 9222-H: 2023	**MPN/ 100ml**	---	**510**

Reviewed By

CHIEF ANALYST
GREENFORCE ASSOCIATES PRIVATE LIMITED
BHUBANESWAR, ODISHA

Chief Analyst
Miss. Arti Sahoo

Authorized Signatory

TECHNICAL MANAGER
GREENFORCE ASSOCIATES PRIVATE LIMITED
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Report No- GFAPL/24-25/ESLBI/036 Issued Date-06.01.2025

TEST REPORT

Client Name &Address	*M/s. Nadidih Iron Ore Mines (BICO),* **M/s ESL Steel Limited,** At/PO:- Koira, Sundargarh, Odisha.		
Nature of Sampling	**Mines Discharge Water**		
Sampling By	**GFAPL's Representative**		
Environmental Condition	Good	**Sampling Method**	As per APHA 24th ED 1060 B: 2023
Location of performance of Laboratory activities	Laboratory Permanent Facility	**Deviation from the method (if any)**	NO
Discipline	Chemical	**Group**	Water
Date of Sampling	**13.12.2024**	**Date of Receiving**	**14.12.2024**
Date of Analysis	**14.12.2024**	**Date of Complete**	**18.12.2024**
Sampling Location & Coordinates	**Mines Discharge;**		

Sl. No.	Parameter	Testing Methods	Unit	Standard as per CTO	Result
1.	**Colour**	IS 3025: (Part 4)- 2021	**Hazen**	--	**<5.0**
2.	**Total Suspended Solid**	APHA 24th ED 2540-D: 2023	**mg/l**	100	**86**
3.	**pH @25^{0}C**	APHA 24th ED 4500- H+B:2023	**---**	5.5-9.0	**7.88**
4.	**Conductivity**	APHA 24th ED 2510-B: 2023	**µS/cm**	--	**278.3**
5.	**Total Dissolved Solid**	APHA 24th ED 2540-C: 2023	**mg/l**	--	**162**
6.	**Chloride (as Cl)**	APHA 24th ED 4500- Cl-B:2023	**mg/l**	--	**32**
7.	**Cyanide (as CN)**	APHA 24th ED 4500-CN-F	**mg/l**	--	**<0.02**
8.	**Hexavalent Chromium(asCr+6)**	APHA 24th ED 3500-Cr-B: 2023	**mg/l**	--	**<0.05**
9.	**Iron (as Fe)**	APHA 24th ED 3500-Fe-B: 2023	**mg/l**	--	**0.4**
10.	**Sulfate (as SO4)**	APHA 24th ED 4500-SO4 D: 2023	**mg/l**	--	**12.9**
11.	**Fluoride (as F)**	APHA 24th ED 4500-F-C: 2023	**mg/l**	--	**0.15**
12.	**Oil & Grease**	IS 3025 PART 39-1991 RA-2003	**mg/l**	10	**<2.0**
13.	**Dissolved oxygen**	APHA 24th ED 4500 O-C:2023	**mg/l**	--	**5.7**
14.	**BOD (3)days at 27^{0}C**	IS 3025 (PART 44): 1993 REA-2009	**mg/l**	--	**<2.0**
15.	**Chemical Oxygen Demand as COD**	APHA 24th ED 5220 C:2023	**mg/l**	--	**14**
16.	**Manganese**	IS 3025 PART-59 :2006 RA 2012	**mg/l**	--	**0.16**

Reviewed By
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BHUBANESWAR, ODISHA
Chief Analyst
Miss. Arti Sahoo

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GREENFORCE ASSOCIATES PRIVATE LIMITED
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Report No- GFAPL/24-25/ESLBI/036 **Issued Date-06.01.2025**

TEST REPORT

Client Name &Address	***M/s. Nadidih Iron Ore Mines (BICO),*** **M/s ESL Steel Limited,** At/PO:- Koira, Sundargarh, Odisha.		
Nature of Sampling	**Mines Discharge Water**		
Sampling By	**GFAPL's Representative**		
Environmental Condition	Good	**Sampling Method**	As per APHA 24th ED 1060 B: 2023
Location of performance of Laboratory activities	Laboratory Permanent Facility	**Deviation from the method (if any)**	NO
Discipline	Chemical	**Group**	Water
Date of Sampling	**13.12.2024**	**Date of Receiving**	**14.12.2024**
Date of Analysis	**14.12.2024**	**Date of Complete**	**18.12.2024**
Sampling Location & Coordinates	**Mines Discharge;**		

Sl. No.	Parameter	Testing Methods	Unit	Standard as per CTO	Result
1.	**Nitrate (as NO3)**	APHA 24th ED 4500-NO3-E: 2023	**mg/l**	--	**4.33**
2.	**Phenolic Compounds as C6H5OH**	APHA 24th ED 5530 B.D:2023	**mg/l**	--	**<0.001**
3.	**Copper (as Cu)**	IS: 3025(Part 42)	**mg/l**	--	**<0.03**
4.	**Lead (as Pb)**	APHA 24th ED 3500 Pb: 2023	**mg/l**	--	**<0.01**
5.	**Zinc (as Zn)**	APHA 24th ED 3500 Zn: 2023	**mg/l**	--	**<0.03**
6.	**Arsenic as As**	IS: 3025 (Part 37)	**mg/l**	--	**<0.001**
7.	**Selenium (as Se)**	APHA 24th ED 3500 B: 2023	**mg/l**	--	**<0.001**
8.	**Cadmium (as Cd)**	IS: 3025(Part 41)	**mg/l**	--	**<0.001**
9.	**Total Coliform**	APHA 24th ED 9222-H: 2023	**MPN/ 100ml**	--	**510**

Reviewed By

CHIEF ANALYST
GREENFORCE ASSOCIATES PRIVATE LIMITED
BHUBANESWAR, ODISHA

Chief Analyst
Miss. Arti Sahoo

Authorized Signatory

TECHNICAL MANAGER
GREENFORCE ASSOCIATES PRIVATE LIMIT
BHUBANESWAR, ODISHA

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Mail Id: greenforceassociates@gmail.com

Report No- GFAPL/24-25/ESLBI/037 Issued Date-06.01.2025

TEST REPORT

Client Name &Address	**M/s. Nadidih Iron Ore & Mn Mines (BICO)** ***M/s ESL Steel Limited,*** *At/PO:- Koira, Sundargarh, Odisha.*		
Nature of Sampling	**Ambient Air Quality Monitoring (AAQ)**		
Sampling By	**GFAPL's Representative**		
Environmental Condition	Good	**Sampling Method**	As per IS: 5182
Location of performance of Laboratory activities	Laboratory Permanent Facility	**Deviation from the method (if any)**	NO
Discipline	Chemical	**Group**	Atmospheric Pollution
Instrument Used	**Respirable Dust Sampler, Fine Particulate Dust Sampler**		

Location Code	Sampling Location	Date of Sampling	O3 ($\mu g/m^3$)	NH3 ($\mu g/m^3$)
AAQ-1	Near Mine Office;	23.12.2024	<8.0	<20.0
AAQ-2	Near Mine In Gate;	23.12.2024	<8.0	<20.0
AAQ-3	Village Kenduhidi;	23.12.2024	<8.0	<20.0
AAQ-4	Village Badipada;	23.12.2024	<8.0	<20.0
AAQ-5	Village Jhirapani;	23.12.2024	<8.0	<20.0
AAQ-6	Village Kashira;	23.12.2024	<8.0	<20.0
	NAAQ* Standard		100	400
	Methods of Analysis		IS:5182 (Part-9)	IS:5182 (Part-25)

Reviewed By

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BHUBANESWAR, ODISHA

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TEST REPORT

Client Name &Address	**M/s. Nadidih Iron Ore & Mn Mines (BICO)** ***M/s ESL Steel Limited,*** *At/PO:- Koira, Sundargarh, Odisha.*		
Nature of Sampling	**Ambient Air Quality Monitoring (AAQ)**		
Sampling By	**GFAPL's Representative**		
Environmental Condition	Good	**Sampling Method**	As per IS: 5182
Location of performance of Laboratory activities	Laboratory Permanent Facility	**Deviation from the method (if any)**	NO
Discipline	Chemical	**Group**	Atmospheric Pollution
Instrument Used	**Respirable Dust Sampler, Fine Particulate Dust Sampler**		

Location Code	Sampling Location	Date of Sampling	Pb (µg/m³)	Ni (ng/m³)	As (ng/m³)	C6H6 (µg/m³)	BaP (ng/m³)
AAQ-1	Near Mine Office;	23.12.2024	<0.06	<0.6	<0.44	<5	<1
AAQ-2	Near Mine In Gate;	23.12.2024	<0.06	<0.6	<0.44	<5	<1
AAQ-3	Village Kenduhidi;	23.12.2024	<0.06	<0.6	<0.44	<5	<1
AAQ-4	Village Badipada;	23.12.2024	<0.06	<0.6	<0.44	<5	<1
AAQ-5	Village Jhirapani;	23.12.2024	<0.06	<0.6	<0.44	<5	<1
AAQ-6	Village Kashira;	23.12.2024	<0.06	<0.6	<0.44	<5	<1
NAAQ* Standard			1	20	6	5	1
Methods of Analysis			IS:5182 (Part-22)	IS:5182 (Part-26)	As per CPCB method followed by AAS	IS:5182 (Part-11)	IS:5182 (Part-12)

Reviewed By

CHIEF ANALYST
GREENFORCE ASSOCIATES PRIVATE LIMITED
BHUBANESWAR, ODISHA

Chief Analyst
Miss. Arti Sahoo

Authorized Signatory

TECHNICAL MANAGER
GREENFORCE ASSOCIATES PRIVATE LIMITED
BHUBANESWAR, ODISHA

Technical Manager
Mr. S.K. Parhi

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END OF REPORT

Plot No- 1363-3892, Baibhab Realcon, Fulnakhara,
Cuttack, Odisha, India 754001

GREEN FORCE ASSOCIATES PRIVATE LIMITED

Plot No.-1666, Phase-II, Delta Colony, Nilakantheswar Marg,
Baramunda, Bhubaneswar, Dist - Khurdha

Mail Id: greenforceassociates@gmail.com

(An ISO 14001, 9001, 45001 certified Consulting Organization & NABL Accredited Laboratory)

Report No- GFAPL/24-25/ESLBI/037 **Issued Date-06.01.2025**

TEST REPORT

Client Name &Address	**M/s. Nadidih Iron Ore & Mn Mines (BICO)** ***M/s ESL Steel Limited,*** *At/PO:- Koira, Sundargarh, Odisha.*		
Nature of Sampling	**Ambient Air Quality Monitoring (AAQ)**		
Sampling By	**GFAPL's Representative**		
Environmental Condition	Good	**Sampling Method**	As per IS: 5182
Location of performance of Laboratory activities	Laboratory Permanent Facility	**Deviation from the method (if any)**	NO
Discipline	Chemical	**Group**	Atmospheric Pollution
Instrument Used	**Respirable Dust Sampler, Fine Particulate Dust Sampler**		

Location Code	Sampling Location	Date of Sampling	Free Silica ($\mu g/m^3$)
AAQ-1	Near Mine Office;	23.12.2024	<2.0
AAQ-2	Near Mine In Gate;	23.12.2024	<2.0
AAQ-3	Village Kenduhidi;	23.12.2024	<2.0
AAQ-4	Village Badipada;	23.12.2024	<2.0
AAQ-5	Village Jhirapani;	23.12.2024	<2.0
AAQ-6	Village Kashira;	23.12.2024	<2.0
Methods of Analysis			NIOSH Method 7500 by X-Ray Diffraction

Reviewed By

CHIEF ANALYST
GREENFORCE ASSOCIATES PRIVATE LIMITED
BHUBANESWAR, ODISHA

Chief Analyst
Miss. Arti Sahoo

Authorized Signatory

TECHNICAL MANAGER
GREENFORCE ASSOCIATES PRIVATE LIMITED
BHUBANESWAR, ODISHA

Technical Manager
Mr. S.K. Parhi

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END OF REPORT

Plot No- 1363-3892, Baibhab Realcon, Fulnakhara,
Cuttack, Odisha, India 754001

ENVIRONMENT MONITORING REPORT

FOR THE MONTH OF

JANUARY- 2025

NARAYANI

Client- M/s. Nadidih Iron Ore Mines (BICO),

M/s ESL Steel Limited,

Address- Koira, Sundargarh, Odisha.

GREEN FORCE

Monitored By - Green Force Associates Pvt. Ltd.

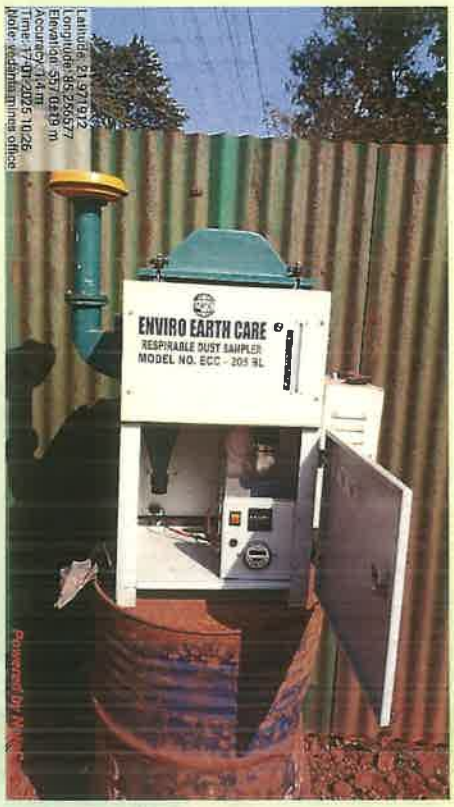
Address- Plot No-1363-3892 ,

Bhaibhab Realcon, Fulnakhara, Cuttack,

Odisha- 754001

NABL Certificate No:- TC-12258

PHOTOGRAPHS
OF
ENVIRONMENT MONITORING





PHOTOGRAPHS
OF
ENVIRONMENT MONITORING







GREEN FORCE ASSOCIATES PRIVATE LIMITED

Plot No.-1666, Phase-II, Delta Colony, Nilakantheswar Marg,
Baramunda, Bhubaneswar, Dist - Khurdha

Mail Id: greenforceassociates@gmail.com

TC-12258

Report No- GFAPL/24-25/ESLBI/038 **Issued Date-05.02.2025**

TEST REPORT

Client Name &Address	**M/s. Nadidih Iron Ore Mines (BICO),** ***M/s ESL Steel Limited,*** *At/PO:- Koira, Sundargarh, Odisha.*		
Nature of Sampling	**Ambient Air Quality Monitoring (AAQ)**		
Sampling By	**GFAPL's Representative**		
Environmental Condition	Good	**Sampling Method**	As per IS: 5182
Location of performance of Laboratory activities	Laboratory Permanent Facility	**Deviation from the method (if any)**	NO
Discipline	Chemical	**Group**	Atmospheric Pollution
Sampling Location & Coordinates	**AAQ1- Near Mine Office** **Lat:**21°58'9.21"N **& Long:**85°15'33.67"E;		
Instrument Used	**Respirable Dust Sampler, Fine ParticuLate Dust Sampler**		

Date of Sampling	PM_{10} ($\mu g/m^3$)	$PM_{2.5}$ ($\mu g/m^3$)	SO_2 ($\mu g/m^3$)	NO_2 ($\mu g/m^3$)
02.01.2025	56.2	28.2	7.6	14.2
06.01.2025	58.7	29.5	7.9	14.6
09.01.2025	61.4	30.8	8.2	14.9
13.01.2025	60.8	30.5	8.6	15.2
16.01.2025	63.4	31.8	9.4	15.8
20.01.2025	61.7	31.2	8.8	15.4
23.01.2025	64.6	32.7	9.8	16.4
27.01.2025	62.8	31.7	9.4	16
30.01.2025	65.4	33.1	10.2	16.8
Max	**65.40**	**33.10**	**10.20**	**16.80**
Min	**56.20**	**28.20**	**7.60**	**14.20**
Average	**61.67**	**31.06**	**8.88**	**15.48**
NAAQ* Standard	**100**	**60**	**80**	**80**
Methods of Analysis	**IS:5182 (Part-23)**	**IS:5182 (Part-24)**	**IS:5182 (Part-2)**	**IS:5182 (Part-6)**

Reviewed By

CHIEF ANALYST
GREENFORCE ASSOCIATES PRIVATE LIMITED
BHUBANESWAR ODISHA

Chief Analyst
Miss. Arti Sahoo

Authorized Signatory

TECHNICAL MANAGER
GREENFORCE ASSOCIATES PRIVATE LIMITED
BHUBANESWAR ODISHA

Technical Manager
Mr. S.K. Parhi

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END OF REPORT

Plot No- 1363-3892, Baibhab Realcon, Fulnakhara,
Cuttack, Odisha, India 754001

GREEN FORCE ASSOCIATES PRIVATE LIMITED

Plot No.-1666, Phase-II, Delta Colony, Nilakantheswar Marg,
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Report No- GFAPL/24-25/ESLBI/039 **Issued Date-05.02.2025**

TEST REPORT

Client Name &Address	**M/s. Nadidih Iron Ore Mines (BICO),** ***M/s ESL Steel Limited,*** *At/PO:- Koira, Sundargarh, Odisha.*		
Nature of Sampling	**Ambient Air Quality Monitoring (AAQ)**		
Sampling By	**GFAPL's Representative**		
Environmental Condition	Good	**Sampling Method**	As per IS: 5182
Location of performance of Laboratory activities	Laboratory Permanent Facility	**Deviation from the method (if any)**	NO
Discipline	Chemical	**Group**	Atmospheric Pollution
Sampling Location & Coordinates	**AAQ2- Near Mine InGate** **Lat:** 21°58'23.32"N **& Long**: 85°15'44.18"E		
Instrument Used	**Respirable Dust Sampler, Fine ParticuLate Dust Sampler**		

Date of Sampling	PM_{10} ($\mu g/m^3$)	$PM_{2.5}$ ($\mu g/m^3$)	SO_2 ($\mu g/m^3$)	NO_2 ($\mu g/m^3$)
02.01.2025	60.4	30.5	8.8	14.6
06.01.2025	64.2	32.4	9.4	15.2
09.01.2025	68.6	34.6	10.2	16.2
13.01.2025	66.8	34.1	9.8	15.8
16.01.2025	69.8	35.6	10.4	16.4
20.01.2025	73.4	37.1	10.8	17.4
23.01.2025	76.2	38.6	11.6	18.2
27.01.2025	74.8	37.5	11.2	17.8
30.01.2025	76.8	38.9	11.8	18.6
Max	**76.80**	**38.90**	**11.80**	**18.60**
Min	**60.40**	**30.50**	**8.80**	**14.60**
Average	**70.11**	**35.48**	**10.44**	**16.69**
NAAQ* Standard	**100**	**60**	**80**	**80**
Methods of Analysis	**IS:5182 (Part-23)**	**IS:5182 (Part-24)**	**IS:5182 (Part-2)**	**IS:5182 (Part-6)**

Reviewed By

CHIEF ANALYST
GREENFORCE ASSOCIATES PRIVATE LIMITED

Chief Analyst
Miss. Arti Sahoo

Authorized Signatory

TECHNICAL MANAGER
GREENFORCE ASSOCIATES PRIVATE LIMITED
BHUBANESWAR, ODISHA

Technical Manager
Mr. S.K. Parhi

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END OF REPORT

**Plot No- 1363-3892, Baibhab Realcon, Fulnakhara,
Cuttack, Odisha, India 754001**

GREEN FORCE ASSOCIATES PRIVATE LIMITED

Plot No.-1666, Phase-II, Delta Colony, Nilakantheswar Marg,
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(An ISO 14001, 9001, 45001 certified Consulting Organization & NABL Accredited Laboratory)

Report No- GFAPL/24-25/ESLBI/040 **Issued Date-05.02.2025**

TEST REPORT

Client Name &Address	**M/s. Nadidih Iron Ore Mines (BICO),** ***M/s ESL Steel Limited,*** *At/PO:- Koira, Sundargarh, Odisha.*		
Nature of Sampling	**Ambient Air Quality Monitoring (AAQ)**		
Sampling By	**GFAPL's Representative**		
Environmental Condition	Good	**Sampling Method**	As per IS: 5182
Location of performance of Laboratory activities	Laboratory Permanent Facility	**Deviation from the method (if any)**	NO
Discipline	Chemical	**Group**	Atmospheric Pollution
Sampling Location & Coordinates	**AAQ1- Near Mine Office; Lat:**21°58'9.21"N **& Long**: 85°15'33.67"E; **AAQ2- Near Mine In Gate; Lat:**21°58'23.32"N **& Long**: 85°15'44.18"E		
Instrument Used	CO Analyser		

Date of Sampling	**CO (mg/m3)**	
	AAQ1	**AAQ2**
02.01.2025	0.35	0.38
06.01.2025	0.35	0.4
09.01.2025	0.37	0.42
13.01.2025	0.38	0.41
16.01.2025	0.4	0.43
20.01.2025	0.39	0.45
23.01.2025	0.42	0.46
27.01.2025	0.41	0.45
30.01.2025	0.43	0.48
Max	**0.43**	**0.48**
Min	**0.35**	**0.38**
Average	**0.39**	**0.43**
NAAQ* Standard	**4 mg/m3 (for 1hr)**	
Methods of Analysis	**IS: 5182 (Part- 10)**	

Reviewed By **Authorized Signatory**

CHIEF ANALYST
GREENFORCE ASSOCIATES PRIVATE LIMITED

Chief Analyst
Miss. Arti Sahoo

TECHNICAL MANAGER
GREENFORCE ASSOCIATES PRIVATE LIMITED
BHUBANESWAR, ODISHA

Technical Manager
Mr. S.K. Dash

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END OF REPORT

Plot No- 1363-3892, Baibhab Realcon, Fulnakhara,
Cuttack, Odisha, India 754001

GREEN FORCE ASSOCIATES PRIVATE LIMITED

Plot No.-1666, Phase-II, Delta Colony, Nilakantheswar Marg,
Baramunda, Bhubaneswar, Dist - Khurdha

Mail Id: greenforceassociates@gmail.com

Report No- GFAPL/24-25/ESLBI/041 **Issued Date-05.02.2025**

TEST REPORT

Client Name &Address	**M/s. Nadidih Iron Ore Mines (BICO),** *M/s ESL Steel Limited,* *At/PO:- Koira, Sundargarh, Odisha.*		
Nature of Sampling	**Ambient Air Quality Monitoring (AAQ)**		
Sampling By	**GFAPL's Representative**		
Environmental Condition	Good	**Sampling Method**	As per IS: 5182
Location of performance of Laboratory activities	Laboratory Permanent Facility	**Deviation from the method (if any)**	NO
Discipline	Chemical	**Group**	Atmospheric Pollution
Sampling Location & Coordinates	**AAQ3- Village Kenduhidi;** **Lat**21°59'45.70"N **& Long:** 85°16'14.44"E;		
Instrument Used	**Respirable Dust Sampler, Fine Particulate Dust Sampler**		

Date of Sampling	PM_{10} ($\mu g/m^3$)	$PM_{2.5}$ ($\mu g/m^3$)	SO_2 ($\mu g/m^3$)	NO_2 ($\mu g/m^3$)
03.01.2025	45.1	22.4	<4.0	<9.0
07.01.2025	49.2	24.2	<4.0	<9.0
10.01.2025	47.6	23.6	4.4	9.5
14.01.2025	50.7	25.2	4.8	9.8
17.01.2025	52.6	26.4	5.2	10.4
21.01.2025	55.6	27.8	5.8	10.8
24.01.2025	54.3	27.2	5.8	11.4
28.01.2025	56.5	28.4	6.2	12.4
31.01.2025	53.9	27.1	5.8	11.8
Max	**56.50**	**28.40**	**6.20**	**12.40**
Min	**45.10**	**22.40**	**<4.0**	**<9.0**
Average	**51.72**	**25.81**	**5.43**	**10.87**
NAAQ* Standard	**100**	**60**	**80**	**80**
Methods of Analysis	**IS:5182 (Part-23)**	**IS:5182 (Part-24)**	**IS:5182 (Part-2)**	**IS:5182 (Part-6)**

Reviewed By

CHIEF ANALYST
GREENFORCE ASSOCIATES PRIVATE LIMITED
BHUBANESWAR, ODISHA

Chief Analyst
Miss. Arti Sahoo

Authorized Signatory

TECHNICAL MANAGER
GREENFORCE ASSOCIATES PRIVATE LIMITED
BHUBANESWAR, ODISHA

Technical Manager
Mr. S.K. Parni

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END OF REPORT

Plot No- 1363-3892, Baibhab Realcon, Fulnakhara,
Cuttack, Odisha, India 754001

GREEN FORCE ASSOCIATES PRIVATE LIMITED

Plot No.-1666, Phase-II, Delta Colony, Nilakantheswar Marg,
Baramunda, Bhubaneswar, Dist - Khurdha

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Report No- GFAPL/24-25/ESLBI/042 **Issued Date-05.02.2025**

TEST REPORT

Client Name &Address	**M/s. Nadidih Iron Ore Mines (BICO),** *M/s ESL Steel Limited,* *At/PO:- Koira, Sundargarh, Odisha.*		
Nature of Sampling	**Ambient Air Quality Monitoring (AAQ)**		
Sampling By	**GFAPL's Representative**		
Environmental Condition	Good	**Sampling Method**	As per IS: 5182
Location of performance of Laboratory activities	Laboratory Permanent Facility	**Deviation from the method (if any)**	NO
Discipline	Chemical	**Group**	Atmospheric Pollution
Sampling Location & Coordinates	**AAQ4- Village Badipada** **Lat:**21°58'4.60"N **& Long:**85°18'33.80"E;		
Instrument Used	**Respirable Dust Sampler, Fine ParticuLate Dust Sampler**		

Date of Sampling	PM_{10} (µg/m³)	$PM_{2.5}$ (µg/m³)	SO_2 (µg/m³)	NO_2 (µg/m³)
03.01.2025	49.4	24.5	<4.0	<9.0
07.01.2025	51.6	25.7	4.6	9.8
10.01.2025	54.2	27.1	4.9	10.2
14.01.2025	55.8	27.7	5.2	10.6
17.01.2025	57.6	28.8	5.8	11.2
21.01.2025	59.4	29.6	6.4	11.8
24.01.2025	58.1	29.2	6.8	12.4
28.01.2025	61.6	30.8	7.2	13.2
31.01.2025	60.2	30.4	6.8	12.8
Max	**61.60**	**30.80**	**7.20**	**13.20**
Min	**49.40**	**24.50**	**<4.0**	**<9.0**
Average	**56.43**	**28.20**	**5.96**	**11.50**
NAAQ* Standard	**100**	**60**	**80**	**80**
Methods of Analysis	**IS:5182 (Part-23)**	**IS:5182 (Part-24)**	**IS:5182 (Part-2)**	**IS:5182 (Part-6)**

Reviewed By

CHIEF ANALYST
GREENFORCE ASSOCIATES PRIVATE LIMITED
BHUBANESWAR, ODISHA

Chief Analyst
Miss. Arti Sahoo

Authorized Signatory

TECHNICAL MANAGER
GREENFORCE ASSOCIATES PRIVATE LIMITED

Technical Manager
Mr. S.K. Parhi

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END OF REPORT

Plot No- 1363-3892, Baibhab Realcon, Fulnakhara,
Cuttack, Odisha, India 754001

GREEN FORCE ASSOCIATES PRIVATE LIMITED

Plot No.-1666, Phase-II, Delta Colony, Nilakantheswar Marg,
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Report No- GFAPL/24-25/ESLBI/043 **Issued Date-05.02.2025**

TEST REPORT

Client Name &Address	**M/s. Nadidih Iron Ore Mines (BICO),** ***Sukinda Mines (Chromite),*** *At/PO:- Koira, Sundargarh, Odisha.*		
Nature of Sampling	**Ambient Air Quality Monitoring (AAQ)**		
Sampling By	**GFAPL's Representative**		
Environmental Condition	Good	**Sampling Method**	As per IS: 5182
Location of performance of Laboratory activities	Laboratory Permanent Facility	**Deviation from the method (if any)**	NO
Discipline	Chemical	**Group**	Atmospheric Pollution
Sampling Location & Coordinates	**AAQ5- Village Jhirapani;** **Lat:** 21°59'52.38"N, & **Long:** :85°13'9.76"E		
Instrument Used	**Respirable Dust Sampler, Fine ParticuLate Dust Sampler**		

Date of Sampling	PM_{10} ($\mu g/m^3$)	$PM_{2.5}$ ($\mu g/m^3$)	SO_2 ($\mu g/m^3$)	NO_2 ($\mu g/m^3$)
03.01.2025	47.9	23.4	<4.0	<9.0
07.01.2025	46.7	23.2	<4.0	<9.0
10.01.2025	50.2	24.8	<4.0	<9.0
14.01.2025	49.4	24.6	4.4	9.6
17.01.2025	51.6	25.5	4.8	10.2
21.01.2025	52.8	26.6	5.2	10.6
24.01.2025	54.1	27.2	5.6	10.8
28.01.2025	53.2	26.9	5.4	10.4
31.01.2025	52.8	26.8	5.4	10.8
Max	**54.10**	**27.20**	**5.60**	**10.80**
Min	**46.70**	**23.20**	**<4.0**	**<9.0**
Average	**50.97**	**25.44**	**5.13**	**10.40**
NAAQ* Standard	**100**	**60**	**80**	**80**
Methods of Analysis	**IS:5182 (Part-23)**	**IS:5182 (Part-24)**	**IS:5182 (Part-2)**	**IS:5182 (Part-6)**

Reviewed By

CHIEF ANALYST
GREENFORCE ASSOCIATES PRIVATE LIMITED
BHUBANESWAR, ODISHA

Chief Analyst
Miss. Arti Sahoo

Authorized Signatory

TECHNICAL MANAGER
GREENFORCE ASSOCIATES PRIVATE LIMITED

Technical Manager
Mr. S.K. Parhi

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END OF REPORT

Plot No- 1363-3892, Baibhab Realcon, Fulnakhara,
Cuttack, Odisha, India 754001

GREEN FORCE ASSOCIATES PRIVATE LIMITED

Plot No.-1666, Phase-II, Delta Colony, Nilakantheswar Marg,
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TC-12259

Report No- GFAPL/24-25/ESLBI/044 **Issued Date-05.02.2025**

TEST REPORT

Client Name &Address	**M/s. Nadidih Iron Ore Mines (BICO),** ***M/s ESL Steel Limited,*** *At/PO:- Koira, Sundargarh, Odisha.*		
Nature of Sampling	**Ambient Air Quality Monitoring (AAQ)**		
Sampling By	**GFAPL's Representative**		
Environmental Condition	Good	**Sampling Method**	As per IS: 5182
Location of performance of Laboratory activities	Laboratory Permanent Facility	**Deviation from the method (if any)**	NO
Discipline	Chemical	**Group**	Atmospheric Pollution
Sampling Location & Coordinates	**AAQ6- Village Kashira;** **Lat:**21°55'9.95"N, & **Long:** :85°15'18.13"E		
Instrument Used	**Respirable Dust Sampler, Fine Particulate Dust Sampler**		

Date of Sampling	PM_{10} ($\mu g/m^3$)	$PM_{2.5}$ ($\mu g/m^3$)	SO_2 ($\mu g/m^3$)	NO_2 ($\mu g/m^3$)
03.01.2025	46.8	23.4	<4.0	<9.0
07.01.2025	47.6	23.8	<4.0	<9.0
10.01.2025	49.2	24.5	<4.0	<9.0
14.01.2025	52.4	25.8	4.6	9.8
17.01.2025	53.8	26.4	5.2	10.4
21.01.2025	51.4	25.8	5.2	10.8
24.01.2025	54.2	27.3	5.6	11.2
28.01.2025	52.7	26.8	5.4	10.8
31.01.2025	55.4	27.9	5.8	11.4
Max	**55.40**	**27.90**	**5.80**	**11.40**
Min	**46.80**	**23.40**	**<4.0**	**<9.0**
Average	**51.50**	**25.74**	**5.30**	**10.73**
NAAQ* Standard	**100**	**60**	**80**	**80**
Methods of Analysis	**IS:5182 (Part-23)**	**IS:5182 (Part-24)**	**IS:5182 (Part-2)**	**IS:5182 (Part-6)**

Reviewed By **Authorized Signatory**

CHIEF ANALYST
GREENFORCE ASSOCIATES PRIVATE LIMITED
BHUBANESWAR, ODISHA

Chief Analyst
Miss. Arti Sahoo

TECHNICAL MANAGER
GREENFORCE ASSOCIATES PRIVATE LIMITED
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Technical Manager
Mr. S.K. Pasha

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END OF REPORT

**Plot No- 1363-3892, Baibhab Realcon, Fulnakhara,
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GREEN FORCE ASSOCIATES PRIVATE LIMITED

Plot No.-1666, Phase-II, Delta Colony, Nilakantheswar Marg,
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(An ISO 14001, 9001, 45001 certified Consulting Organization & NABL Accredited Laboratory)

Report No- GFAPL/24-25/ESLBI/045 **Issued Date-05.02.2025**

TEST REPORT

Client Name &Address	**M/s. Nadidih Iron Ore Mines (BICO),** ***M/s ESL Steel Limited,*** *At/PO:- Koira, Sundargarh, Odisha.*		
Nature of Sampling	**Ambient Air Quality Monitoring (AAQ)**		
Sampling By	**GFAPL's Representative**		
Environmental Condition	Good	**Sampling Method**	As per IS: 5182
Location of performance of Laboratory activities	Laboratory Permanent Facility	**Deviation from the method (if any)**	NO
Discipline	Chemical	**Group**	Atmospheric Pollution
Sampling Location & Coordinates	**AAQ3- Village Kenduhidi; Lat**21°59'45.70"N **& Long:** 85°16'14.44"E; **AAQ4- Village Badipada; Lat:**21°58'4.60"N **& Long:** 85°18'33.80"E; **AAQ5- Village Jhirapani; Lat:**21°59'52.38"N, & **Long:** 85°13'9.76"E **AAQ6- Village Kashira; Lat:**21°55'9.95"N, & **Long:** 85°15'18.13"E		
Instrument Used	**CO Analyser**		

Date of Sampling	**CO (mg/m3)**			
	AAQ3	**AAQ4**	**AAQ5**	**AAQ6**
03.01.2025	0.2	0.2	0.19	0.21
07.01.2025	0.2	0.22	0.2	0.21
10.01.2025	0.23	0.23	0.21	0.21
14.01.2025	0.24	0.25	0.23	0.23
17.01.2025	0.26	0.27	0.24	0.24
21.01.2025	0.27	0.29	0.25	0.25
24.01.2025	0.29	0.3	0.27	0.26
28.01.2025	0.31	0.33	0.26	0.25
31.01.2025	0.3	0.32	0.27	0.26
Max	**0.31**	**0.33**	**0.27**	**0.26**
Min	**0.20**	**0.20**	**0.19**	**0.21**
Average	**0.26**	**0.27**	**0.24**	**0.24**
NAAQ* Standard	**4 mg/m3 (for 1hr)**			
Methods of Analysis	**IS: 5182 (Part- 10)**			

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TC-12258

Report No- GFAPL/24-25/ESLBI/046 **Issued Date-05.02.2025**

TEST REPORT

Client Name &Address	**M/s. Nadidih Iron Ore Mines (BICO),** **M/s ESL Steel Limited,** *At/PO:- Koira, Sundargarh, Odisha.*		
Nature of Sampling	**Fugitive Dust Emission (F)**		
Sampling By	**GFAPL's Representative**		
Environmental Condition	Good	**Sampling Method**	As per IS: 5182
Location of performance of Laboratory activities	Laboratory Permanent Facility	**Deviation from the method (if any)**	NO
Discipline	Chemical	**Group**	Atmospheric Pollution
Sampling Location & Coordinates	**F1: Mine Face Area; Lat:** 21° 58' 17.73"N **& Long**: 85° 15' 33.03"E **F2: Haul Road; Lat:** 21° 51' 54.95"N **& Long**:85° 15' 50.13"E **F3: Near Crushing Plant; Lat:** 21° 58' 21.94"N **& Long**: 85° 15' 35.01"E **F4: Near Screening Plant; Lat:** 21° 58' 12.05"N **& Long:** 85° 15' 35.19"E **F5: Ore Storage Area; Lat:** 21° 58' 05.02"N **& Long:** 85° 15' 34.55"E **F6: West Dump; Lat:** 21° 58' 10.99"N **& Long:** 85° 15' 37.47"		
Instrument Used	**Respirable Dust Sampler (RDS)**		

Sl. No.	Date of Sampling	Result (µg/m³)					
		F1	F2	F3	F4	F5	F6
1	02.01.2025	486.4	476.1	402.5	411.5	398.2	384.2
2	06.01.2025	514.5	526.3	428.6	429.6	416.8	396.5
3	09.01.2025	578.4	557.4	459.3	445.6	456.7	409.7
4	13.01.2025	564.2	570.8	504.2	483.7	519.5	434.5
5	16.01.2025	605.2	618.3	532.5	524.5	524.7	427.6
6	20.01.2025	643.5	634.5	594.2	573.8	556.8	473.8
7	23.01.2025	662.8	659.4	576.2	559.4	539.2	469.2
8	27.01.2025	654.2	671.5	604.1	594.2	574.6	482.7
9	30.01.2025	673.8	669.2	624.3	604.3	586.4	514.6
Max		**673.80**	**671.50**	**624.30**	**604.30**	**586.40**	**514.60**
Min		**486.40**	**526.30**	**402.50**	**411.50**	**398.20**	**384.20**
Average		**598.11**	**613.43**	**525.10**	**514.07**	**508.10**	**443.64**
Fugitive Standard		**1200 µg/m³**					
Methods of Analysis		**IS:5182 (Part-4)**					

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Report No- GFAPL/24-25/ESLBI/047 **Issued Date-05.02.2025**

TEST REPORT

Client Name &Address	**M/s. Nadidih Iron Ore Mines (BICO),** **M/s ESL Steel Limited,** *At/PO:- Koira, Sundargarh, Odisha.*		
Nature of Sampling	**Workzone Noise Monitoring**		
Sampling By	**GFAPL's Representative**		
Location of performance of Laboratory activities	Site Facility	**Deviation from the method (if any)**	NO
Discipline	Chemical	**Group**	Atmospheric Pollution
Environmental Condition	Good	**Time Integration**	1 second
Time Weighing	Fast	**Frequency Weighing**	A- Weighing
Sampling Duration	24 hrs	**Area categorization**	Industrial Area
Date of Sampling	**13.01.2025**	**Date of Completion**	**14.01.2025**
Instrument Used	**Noise Meter**	**Sampling Method**	As per IS: 9989

S. No.	Locations	Day Time	Night Time
		Results in dB(A)	
1	**Near Mine Office; Lat:**21°58'9.21"N **& Long:**85°15'33.67"E	**60.6**	**41.8**
2	**Near Mine In Gate; Lat:**21°58'23.32"N **& Long:**85°15'44.18"E	**66.2**	**52.4**
3	**Near Screening Plant-1; Lat:**21°58'09.21"N **& Long:**85°15'33.66"E	**68.8**	**63.5**
4	**Near Crusher; Lat:**21°58'22.32"N **& Long:**85°15'34.13"E	**69.6**	**63.1**
5	**Near W.Bridge-1; Lat:** 21°57'53.99"N **& Long:**85°15'49.64"E	**66.8**	**56.4**
6	**Near W.Bridge -2; Lat:**21°57'54.26"N **& Long:**85°15'53.53"E	**67.1**	**57.5**

Noise permissible limits as per CPCB Norms in dB(A) Leq

Category of Area	Day Time	Night Time
Industrial Area	**75**	**70**
Commercial Area	65	55
Residential Area	55	45
Sensitive Area/ Silence Zone	50	40

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Chief Analyst
Miss. Arti Sahoo

Authorized Signatory

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Mr. S.K. Parhi

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Report No- GFAPL/24-25/ESLBI/048 **Issued Date-05.02.2025**

TEST REPORT

Client Name &Address	**M/s. Nadidih Iron Ore Mines (BICO),** **M/s ESL Steel Limited,** *At/PO:- Koira, Sundargarh, Odisha.*		
Nature of Sampling	**Ambient Noise Monitoring**		
Sampling By	**GFAPL's Representative**		
Location of performance of Laboratory activities	Site Facility	**Deviation from the method (if any)**	NO
Discipline	Chemical	**Group**	Atmospheric Pollution
Environmental Condition	Good	**Time Integration**	1 second
Time Weighing	Fast	**Frequency Weighing**	A- Weighing
Sampling Duration	24 hrs	**Area categorization**	Residential Area
Date of Sampling	**13.01.2025**	**Date of Completion**	**14.01.2025**
Instrument Used	**Noise Meter**	**Sampling Method**	As per IS: 9989

S. No.	Locations	Day Time	Night Time
		Results in dB(A)	
1	**Village Kenduhidi;** **Lat:**21°59'45.70"N **& Long:**85°16'14.44"E	**48.2**	**37.8**
2	**Village Badipada;** **Lat:**21°58'4.60"N **& Long:**85°18'33.80"E	**48.2**	**37.1**
3	**Village Jhirapani;** **Lat:**21°59'52.38"N **& Long:**85°13'9.76"E	**48.5**	**37.6**
4	**Village Kashira;** **Lat:**21°55'9.95"N **& Long:**85°15'18.13"E	**48.6**	**37.8**

Noise permissible limits as per CPCB Norms in dB(A) Leq

Category of Area	Day Time	Night Time
Industrial Area	75	70
Commercial Area	65	55
Residential Area	**55**	**45**
Sensitive Area/ Silence Zone	50	40

Reviewed By

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TC-12258

Report No- GFAPL/24-25/ESLBI/049 **Issued Date-05.02.2025**

TEST REPORT

Client Name &Address	**M/s. Nadidih Iron Ore Mines (BICO),** **M/s ESL Steel Limited,** *At/PO:- Koira, Sundargarh, Odisha.*		
Nature of Sampling	**Stack Monitoring (ST)**		
Sampling By	**GFAPL's Representative**		
Environmental Condition	Good	**Sampling Method**	As per IS-11255
Location of performance of Laboratory activities	**Laboratory Permanent Facility**	**Deviation from the method (if any)**	NO
Discipline	**Chemical**	**Group**	Environment & Pollution
Date of Sampling	**13.01.2025**	**Date of Receiving**	**14.01.2025**
Date of Analysis	**14.01.2025**	**Date of Complete**	**18.01.2025**
Sampling Location & Coordinates	**ST- DG SET;** **Lat:** 21°58'23.31"N & **Long:** 85°15'37.17"E		
Instrument Used	**Stack monitoring Kit; Vacuum Pump; Pyrometer**		

Sl. No	Items	Testing Method	Unit	As per CPCB Standard	Result
01	Temperature	IS-11255 (PART-3) 1985	K	---	454
02	Velocity	IS-11255 (PART-3) 1985	m/sec	---	17.84
03	Particulate Matter as PM	IS-11255(PART-1) 1985 Gravimetric Method	mg/Nm3	100	81.6
04	Sulphur dioxide as SO2	IS-11255(PART-2) 1985	mg/Nm3	600	68.2
05	Carbon Monoxide as CO	IS-13270:1992	%	1%	64.2
06	Carbon Dioxide as CO2	IS-13270:1992	%	---	<0.2
07	Oxygen as O2	IS-13270:1992	%	---	1.6

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Report No- GFAPL/24-25/ESLBI/049 **Issued Date-05.02.2025**

TEST REPORT

Client Name &Address	**M/s. Nadidih Iron Ore Mines (BICO),** **M/s ESL Steel Limited,** *At/PO:- Koira, Sundargarh, Odisha.*		
Nature of Sampling	**Stack Monitoring (ST)**		
Sampling By	**GFAPL's Representative**		
Location of performance of Laboratory activities	**Laboratory Permanent Facility**	**Deviation from the method (if any)**	NO
Discipline	**Chemical**	**Group**	Atmospheric Pollution
Date of Sampling	**13.01.2025**	**Date of Receiving**	**14.01.2025**
Date of Analysis	**14.01.2025**	**Date of Complete**	**18.01.2025**
Sampling Location & Coordinates	**ST- DG SET;** **Lat:** 21°58'23.31"N & **Long:** 85°15'37.17"E		
Instrument Used	**Stack monitoring Kit; Vacuum Pump; Pyrometer**		

Sl. No	Items	Testing Method	Unit	As per CPCB Standard	Result
01	Nitrogen Oxide as NOx	IS-11255(PART-7) 1985	mg/Nm3	300	57.2

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TC-12258

Report No- GFAPL/24-25/ ESLBI/050 **Issued Date-05.02.2025**

TEST REPORT

Client Name &Address	**M/s. Nadidih Iron Ore & Mn Mines (BICO),** **M/s ESL Steel Limited,** *At/PO:- Koira, Sundargarh, Odisha.*		
Nature of Sampling	**STP Water**		
Sampling By	**GFAPL's Representative**		
Environmental Condition	Good	**Sampling Method**	As per APHA 24th ED 1060 B: 2023
Location of performance of Laboratory activities	Laboratory Permanent Facility	**Deviation from the method (if any)**	NO
Discipline	Chemical	**Group**	Environment & Pollution
Date of Sampling	**13.01.2025**	**Date of Receiving**	**14.01.2025**
Date of Analysis	**14.01.2025**	**Date of Complete**	**18.01.2025**
Sampling Location & Coordinates	**STP1- Inside the ML Area (STP-Inlet);** Lat: 21.971766, Long: 85.255013; **STP2- Inside the ML Area (STP-Outlet);** Lat: 21.971749, Long: 85.255002;		

Sl. No.	Parameter	Testing Methods	Unit	Standard as per CTO	STP1	STP2
1.	**pH**	APHA 24th ED 4500- H+B:2023	--	6.5-9.0	**7.56**	**7.18**
2.	**Total Suspended Solids**	APHA 24th ED 2540-D: 2023	**mg/l**	200	**124**	**10**
3.	**Oil & Grease**	IS 3025 PART 39-1991 RA-2003	**mg/l**	--	**5.8**	**<2.0**
4.	**Biological Oxygen Demand as BOD**	IS 3025 (PART 44):1993	**mg/l**	100	**54**	**2.8**
5.	**Chemical Oxygen Demand as COD**	APHA 24th ED 5220 B:2023	**mg/l**	--	**132**	**16**

Remarks: The Standard as per CTO is only applicable to the Discharge ie., Outlet

Reviewed By

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Report No- GFAPL/24-25/ ESLBI/050 **Issued Date-05.02.2025**

TEST REPORT

Client Name &Address	**M/s. Nadidih Iron Ore & Mn Mines (BICO),** **M/s ESL Steel Limited,** *At/PO:- Koira, Sundargarh, Odisha.*		
Nature of Sampling	**STP Water**		
Sampling By	**GFAPL's Representative**		
Environmental Condition	Good	**Sampling Method**	As per APHA 24th ED 1060 B: 2023
Location of performance of Laboratory activities	Laboratory Permanent Facility	**Deviation from the method (if any)**	NO
Discipline	Chemical	**Group**	Environment & Pollution
Date of Sampling	**13.01.2025**	**Date of Receiving**	**14.01.2025**
Date of Analysis	**14.01.2025**	**Date of Complete**	**18.01.2025**
Sampling Location & Coordinates	**STP1- Inside the ML Area (STP-Inlet);** Lat: 21.971766, Long: 85.255013; **STP2- Inside the ML Area (STP-Outlet);** Lat: 21.971749, Long: 85.255002;		

Sl. No.	Parameter	Testing Methods	Unit	Standard as per CTO	STP1	STP2
1.	**Fecal Coliform**	APHA 24th ED 9222-H: 2023	**MPN/ 100ml**	<1000	**<1.8**	**<1.8**

Remarks: The Standard as per CTO is only applicable to the Discharge ie., Outlet

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END OF REPORT

Plot No- 1363-3892, Baibhab Realcon, Fulnakhara,
Cuttack, Odisha, India 754001

GREEN FORCE ASSOCIATES PRIVATE LIMITED

Plot No.-1666, Phase-II, Delta Colony, Nilakantheswar Marg,
Baramunda, Bhubaneswar, Dist - Khurdha

Mail Id: greenforceassociates@gmail.com

TC-12258

Report No- GFAPL/24-25/ESLBI/051 **Issued Date-05.02.2025**

TEST REPORT

Client Name &Address	*M/s. Nadidih Iron Ore Mines (BICO),* **M/s ESL Steel Limited,** At/PO:- Koira, Sundargarh, Odisha.		
Nature of Sampling	**Surface Water (SW)**		
Sampling By	**GFAPL's Representative**		
Environmental Condition	Good	**Sampling Method**	As per APHA 24th ED 1060 B: 2023
Location of performance of Laboratory activities	Laboratory Permanent Facility	**Deviation from the method (if any)**	NO
Discipline	Chemical	**Group**	Water
Date of Sampling	**13.01.2025**	**Date of Receiving**	**14.01.2025**
Date of Analysis	**14.01.2025**	**Date of Complete**	**18.01.2025**
Sampling Location & Coordinates	**SW1: Karo River Upstreem(US); Lat:** 21°58'30.34"N & **Long:** 85°15'28.12"E **SW2: Karo River Downstreem(DS); Lat:** 21°59'35.14"N & **Long:** 85°16' 21.42"E		

Sl. No.	Parameter	Testing Methods	Unit	Standard as per IS-2296 Class-C	SW1	SW2
1.	Colour	IS 3025: (Part 4)- 2021	Hazen	300	<5.0	<5.0
2.	Total Suspended Solid	APHA 24th ED 2540-D: 2023	mg/l	--	<1.0	<1.0
3.	pH @25^{0}C	APHA 24th ED 4500- H+B:2023	---	8.5	7.19	7.24
4.	Conductivity	APHA 24th ED 2510-B: 2023	µS/cm	--	196.5	207.8
5.	Total Dissolved Solid	APHA 24th ED 2540-C: 2023	mg/l	1500	120	127
6.	Chloride (as Cl)	APHA 24th ED 4500- Cl-B:2023	mg/l	600	15	17
7.	Cyanide (as CN)	APHA 24th ED 4500-CN-F	mg/l	0.05	<0.02	<0.02
8.	Hexavalent Chromium(asCr+6)	APHA 24th ED 3500-Cr-B: 2023	mg/l	0.05	<0.05	<0.05
9.	Iron (as Fe)	APHA 24th ED 3500-Fe-B: 2023	mg/l	50	0.35	0.38
10.	Sulfate (as SO4)	APHA 24th ED 4500-SO4 D: 2023	mg/l	400	4.9	5.4
11.	Fluoride (as F)	APHA 24th ED 4500-F-C: 2023	mg/l	1.5	0.09	0.14
12.	Oil & Grease	IS 3025 PART 39-1991 RA-2003	mg/l	0.1	<2.0	<2.0
13.	Dissolved oxygen	APHA 24th ED 4500 O-C:2023	mg/l	4	5.9	5.8
14.	BOD (3)days at 27^{0}C	IS 3025 (PART 44): 1993 REA-2009	mg/l	3.0	2.8	4.2
15.	Chemical Oxygen Demand as COD	APHA 24th ED 5220 C:2023	mg/l	--	16	20
16.	Manganese	IS 3025 PART-59 :2006 RA 2012	mg/l	--	<0.05	<0.05

Reviewed By

CHIEF ANALYST
GREENFORCE ASSOCIATES PRIVATE LIMITED
BHUBANESWAR, ODISHA

Chief Analyst
Miss. Arti Sahoo

Authorized Signatory

TECHNICAL MANAGER
GREENFORCE ASSOCIATES PRIVATE LIMITED
BHUBANESWAR, ODISHA

Technical Manager
Mr. S.K. Parhi

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GREEN FORCE ASSOCIATES PRIVATE LIMITED

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Mail Id: greenforceassociates@gmail.com

(An ISO 14001, 9001, 45001 certified Consulting Organization & NABL Accredited Laboratory)

Report No- GFAPL/24-25/ESLBI/051 **Issued Date-05.02.2025**

TEST REPORT

Client Name &Address	***M/s. Nadidih Iron Ore Mines (BICO),*** **M/s ESL Steel Limited,** At/PO:- Koira, Sundargarh, Odisha.		
Nature of Sampling	**Surface Water (SW)**		
Sampling By	**GFAPL's Representative**		
Environmental Condition	Good	**Sampling Method**	As per APHA 24th ED 1060 B: 2023
Location of performance of Laboratory activities	Laboratory Permanent Facility	**Deviation from the method (if any)**	NO
Discipline	Chemical	**Group**	Water
Date of Sampling	**13.01.2025**	**Date of Receiving**	**14.01.2025**
Date of Analysis	**14.01.2025**	**Date of Complete**	**18.01.2025**
Sampling Location & Coordinates	**SW1: Karo River Upstreem(US); Lat:** 21°58'30.34"N & **Long:** 85°15'28.12"E **SW2: Karo River Downstreem(DS); Lat:** 21°59'35.14"N & **Long:** 85°16' 21.42"E		

Sl. No.	Parameter	Testing Methods	Unit	Standard as per IS-2296 Class-C	SW1	SW2
1.	**Nitrate (as NO3)**	APHA 24th ED 4500-NO3-E: 2023	**mg/l**	50	**1.62**	**1.98**
2.	**Phenolic Compounds as C6H5OH**	APHA 24th ED 5530 B,D:2023	**mg/l**	--	**<0.001**	**<0.001**
3.	**Copper (as Cu)**	IS: 3025(Part 42)	**mg/l**	0.05	**<0.03**	**<0.03**
4.	**Lead (as Pb)**	APHA 24th ED 3500 Pb: 2023	**mg/l**	0.01	**<0.01**	**<0.01**
5.	**Zinc (as Zn)**	APHA 24th ED 3500 Zn: 2023	**mg/l**	5	**<0.03**	**<0.03**
6.	**Arsenic as As**	IS: 3025 (Part 37)	**mg/l**	--	**<0.001**	**<0.001**
7.	**Selenium (as Se)**	APHA 24th ED 3500 B: 2023	**mg/l**	0.005	**<0.001**	**<0.001**
8.	**Cadmium (as Cd)**	IS: 3025(Part 41)	**mg/l**	0.003	**<0.001**	**<0.001**
9.	**Total Coliform**	APHA 24th ED 9222-H: 2023	**MPN/ 100ml**	---	**470**	**570**

Reviewed By **Authorized Signatory**

CHIEF ANALYST
GREENFORCE ASSOCIATES PRIVATE LIMITED
BHUBANESWAR, ODISHA

Chief Analyst
Miss. Arti Sahoo

TECHNICAL MANAGER
GREENFORCE ASSOCIATES PRIVATE LIMITED
BHUBANESWAR, ODISHA

Technical Manager
Mr. S.K. Padhi

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GREEN FORCE ASSOCIATES PRIVATE LIMITED

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Report No- GFAPL/24-25/ESLBI/052 Issued Date-05.02.2025

TEST REPORT

Client Name &Address	***M/s. Nadidih Iron Ore Mines (BICO),*** **M/s ESL Steel Limited,** At/PO:- Koira, Sundargarh, Odisha.		
Nature of Sampling	**Surface Water (SW)**		
Sampling By	**GFAPL's Representative**		
Environmental Condition	Good	**Sampling Method**	As per APHA 24th ED 1060 B: 2023
Location of performance of Laboratory activities	Laboratory Permanent Facility	**Deviation from the method (if any)**	NO
Discipline	Chemical	**Group**	Water
Date of Sampling	**13.01.2025**	**Date of Receiving**	**14.01.2025**
Date of Analysis	**14.01.2025**	**Date of Complete**	**18.01.2025**
Sampling Location & Coordinates	**SW3: Topadih;** **Lat:** 21°59' 42.97"N, **Long:** 85°18' 13.97"E		

Sl. No.	Parameter	Testing Methods	Unit	Standard as per IS-2296 Class-C	SW3
1.	**Colour**	IS 3025: (Part 4)- 2021	**Hazen**	300	**<5.0**
2.	**Total Suspended Solid**	APHA 24th ED 2540-D: 2023	**mg/l**	--	**<1.0**
3.	**pH @25^{0}C**	APHA 24th ED 4500- H+B:2023	**---**	8.5	**7.22**
4.	**Conductivity**	APHA 24th ED 2510-B: 2023	**µS/cm**	--	**220.4**
5.	**Total Dissolved Solid**	APHA 24th ED 2540-C: 2023	**mg/l**	1500	**132**
6.	**Chloride (as Cl)**	APHA 24th ED 4500- Cl-B:2023	**mg/l**	600	**18**
7.	**Cyanide (as CN)**	APHA 24th ED 4500-CN-F	**mg/l**	0.05	**<0.02**
8.	**Hexavalent Chromium(asCr+6)**	APHA 24th ED 3500-Cr-B: 2023	**mg/l**	0.05	**<0.05**
9.	**Iron (as Fe)**	APHA 24th ED 3500-Fe-B: 2023	**mg/l**	50	**0.38**
10.	**Sulfate (as SO4)**	APHA 24th ED 4500-SO4 D: 2023	**mg/l**	400	**7.1**
11.	**Fluoride (as F)**	APHA 24th ED 4500-F-C: 2023	**mg/l**	1.5	**0.18**
12.	**Oil & Grease**	IS 3025 PART 39-1991 RA-2003	**mg/l**	0.1	**<2.0**
13.	**Dissolved oxygen**	APHA 24th ED 4500 O-C:2023	**mg/l**	4	**5.8**
14.	**BOD (3)days at 27^{0}C**	IS 3025 (PART 44): 1993 REA-2009	**mg/l**	3.0	**4.8**
15.	**Chemical Oxygen Demand as COD**	APHA 24th ED 5220 C:2023	**mg/l**	--	**22**
16.	**Manganese**	IS 3025 PART-59 :2006 RA 2012	**mg/l**	--	**0.08**

Reviewed By

CHIEF ANALYST
GREENFORCE ASSOCIATES PRIVATE LIMITED
BHUBANESWAR, ODISHA

Chief Analyst
Miss. Arti Sahoo

Authorized Signatory

TECHNICAL MANAGER
GREENFORCE ASSOCIATES PRIVATE LIMITED
BHUBANESWAR, ODISHA

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GREEN FORCE ASSOCIATES PRIVATE LIMITED

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(An ISO 14001, 9001, 45001 certified Consulting Organization & NABL Accredited Laboratory)

Report No- GFAPL/24-25/ESLBI/052 **Issued Date-05.02.2025**

TEST REPORT

Client Name &Address	***M/s. Nadidih Iron Ore Mines (BICO),*** **M/s ESL Steel Limited,** At/PO:- Koira, Sundargarh, Odisha.		
Nature of Sampling	**Surface Water (SW)**		
Sampling By	**GFAPL's Representative**		
Environmental Condition	Good	**Sampling Method**	As per APHA 24th ED 1060 B: 2023
Location of performance of Laboratory activities	Laboratory Permanent Facility	**Deviation from the method (if any)**	NO
Discipline	Chemical	**Group**	Water
Date of Sampling	**13.01.2025**	**Date of Receiving**	**14.01.2025**
Date of Analysis	**14.01.2025**	**Date of Complete**	**18.01.2025**
Sampling Location & Coordinates	**SW3: Topadih;** **Lat:** 21°59' 42.97"N, **Long:** 85°18' 13.97"E		

Sl. No.	Parameter	Testing Methods	Unit	Standard as per IS-2296 Class-C	SW3
1.	**Nitrate (as NO3)**	APHA 24th ED 4500-NO3-E: 2023	**mg/l**	50	**2.76**
2.	**Phenolic Compounds as C6H5OH**	APHA 24th ED 5530 B,D:2023	**mg/l**	--	**<0.001**
3.	**Copper (as Cu)**	IS: 3025(Part 42)	**mg/l**	0.05	**<0.03**
4.	**Lead (as Pb)**	APHA 24th ED 3500 Pb: 2023	**mg/l**	0.01	**<0.01**
5.	**Zinc (as Zn)**	APHA 24th ED 3500 Zn: 2023	**mg/l**	5	**<0.03**
6.	**Arsenic as As**	IS: 3025 (Part 37)	**mg/l**	--	**<0.001**
7.	**Selenium (as Se)**	APHA 24th ED 3500 B: 2023	**mg/l**	0.005	**<0.001**
8.	**Cadmium (as Cd)**	IS: 3025(Part 41)	**mg/l**	0.003	**<0.001**
9.	**Total Coliform**	APHA 24th ED 9222-H: 2023	**MPN/ 100ml**	---	**570**

Reviewed By

CHIEF ANALYST
GREENFORCE ASSOCIATES PRIVATE LIMITED
BHUBANESWAR, ODISHA

Chief Analyst
Miss. Arti Sahoo

Authorized Signatory

TECHNICAL MANAGER
GREENFORCE ASSOCIATES PRIVATE LIMITED
BHUBANESWAR, ODISHA

Mr. S.K. Parhi

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GREEN FORCE ASSOCIATES PRIVATE LIMITED

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Mail Id: greenforceassociates@gmail.com

Report No- GFAPL/24-25/ESLBI/053 Issued Date-05.02.2025

TEST REPORT

Client Name &Address	***M/s. Nadidih Iron Ore Mines (BICO),*** **M/s ESL Steel Limited,** At/PO:- Koira, Sundargarh, Odisha.		
Nature of Sampling	**Mines Discharge Water**		
Sampling By	**GFAPL's Representative**		
Environmental Condition	Good	**Sampling Method**	As per APHA 24th ED 1060 B: 2023
Location of performance of Laboratory activities	Laboratory Permanent Facility	**Deviation from the method (if any)**	NO
Discipline	Chemical	**Group**	Water
Date of Sampling	**13.01.2025**	**Date of Receiving**	**14.01.2025**
Date of Analysis	**14.01.2025**	**Date of Complete**	**18.01.2025**
Sampling Location & Coordinates	**Mines Discharge;**		

Sl. No.	Parameter	Testing Methods	Unit	Standard as per CTO	Result
1.	**Colour**	IS 3025: (Part 4)- 2021	**Hazen**	--	**<5.0**
2.	**Total Suspended Solid**	APHA 24th ED 2540-D: 2023	**mg/l**	100	**<1.0**
3.	**pH @25^{0}C**	APHA 24th ED 4500- H+B:2023	**---**	5.5-9.0	**7.89**
4.	**Conductivity**	APHA 24th ED 2510-B: 2023	**µS/cm**	--	**312.2**
5.	**Total Dissolved Solid**	APHA 24th ED 2540-C: 2023	**mg/l**	--	**188**
6.	**Chloride (as Cl)**	APHA 24th ED 4500- Cl-B:2023	**mg/l**	--	**32**
7.	**Cyanide (as CN)**	APHA 24th ED 4500-CN-F	**mg/l**	--	**<0.02**
8.	**Hexavalent Chromium(asCr+6)**	APHA 24th ED 3500-Cr-B: 2023	**mg/l**	--	**<0.05**
9.	**Iron (as Fe)**	APHA 24th ED 3500-Fe-B: 2023	**mg/l**	--	**0.45**
10.	**Sulfate (as SO4)**	APHA 24th ED 4500-SO4 D: 2023	**mg/l**	--	**13.6**
11.	**Fluoride (as F)**	APHA 24th ED 4500-F-C: 2023	**mg/l**	--	**0.2**
12.	**Oil & Grease**	IS 3025 PART 39-1991 RA-2003	**mg/l**	10	**<2.0**
13.	**Dissolved oxygen**	APHA 24th ED 4500 O-C:2023	**mg/l**	--	**5.8**
14.	**BOD (3)days at 27^{0}C**	IS 3025 (PART 44): 1993 REA-2009	**mg/l**	--	**6.8**
15.	**Chemical Oxygen Demand as COD**	APHA 24th ED 5220 C:2023	**mg/l**	--	**32**
16.	**Manganese**	IS 3025 PART-59 :2006 RA 2012	**mg/l**	--	**0.2**

Reviewed By
CHIEF ANALYST
GREENFORCE ASSOCIATES PRIVATE LIMITED
BHUBANESWAR, ODISHA
Chief Analyst
Miss. Arti Sahoo

Authorized Signatory
TECHNICAL MANAGER
GREENFORCE ASSOCIATES PRIVATE LIMITED
BHUBANESWAR, ODISHA
Technical Manager
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Report No- GFAPL/24-25/ESLBI/053 **Issued Date-05.02.2025**

TEST REPORT

Client Name &Address	***M/s. Nadidih Iron Ore Mines (BICO),*** **M/s ESL Steel Limited,** At/PO:- Koira, Sundargarh, Odisha.		
Nature of Sampling	**Mines Discharge Water**		
Sampling By	**GFAPL's Representative**		
Environmental Condition	Good	**Sampling Method**	As per APHA 24th ED 1060 B: 2023
Location of performance of Laboratory activities	Laboratory Permanent Facility	**Deviation from the method (if any)**	NO
Discipline	Chemical	**Group**	Water
Date of Sampling	**13.01.2025**	**Date of Receiving**	**14.01.2025**
Date of Analysis	**14.01.2025**	**Date of Complete**	**18.01.2025**
Sampling Location & Coordinates	**Mines Discharge;**		

Sl. No.	Parameter	Testing Methods	Unit	Standard as per CTO	Result
1.	**Nitrate (as NO3)**	APHA 24th ED 4500-NO3-E: 2023	**mg/l**	--	**4.82**
2.	**Phenolic Compounds as C6H5OH**	APHA 24th ED 5530 B,D:2023	**mg/l**	--	**<0.001**
3.	**Copper (as Cu)**	IS: 3025(Part 42)	**mg/l**	--	**0.08**
4.	**Lead (as Pb)**	APHA 24th ED 3500 Pb: 2023	**mg/l**	--	**<0.01**
5.	**Zinc (as Zn)**	APHA 24th ED 3500 Zn: 2023	**mg/l**	--	**0.14**
6.	**Arsenic as As**	IS: 3025 (Part 37)	**mg/l**	--	**<0.001**
7.	**Selenium (as Se)**	APHA 24th ED 3500 B: 2023	**mg/l**	--	**<0.001**
8.	**Cadmium (as Cd)**	IS: 3025(Part 41)	**mg/l**	--	**<0.001**
9.	**Total Coliform**	APHA 24th ED 9222-H: 2023	**MPN/ 100ml**	--	**510**

Reviewed By

CHIEF ANALYST
GREENFORCE ASSOCIATES PRIVATE LIMITED
BHUBANESWAR, ODISHA

Chief Analyst
Miss. Arti Sahoo

Authorized Signatory

TECHNICAL MANAGER
GREENFORCE ASSOCIATES PRIVATE LIMITED
BHUBANESWAR, ODISHA

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Mr. S.K. Parhi

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END OF REPORT

Plot No- 1363-3892, Baibhab Realcon, Fulnakhara,
Cuttack, Odisha, India 754001

ENVIRONMENT MONITORING REPORT

FOR THE MONTH OF

FEBRUARY- 2025

NARAYANI

Client- M/s. Nadidih Iron Ore Mines (BICO),

M/s ESL Steel Limited,

Address- Koira, Sundargarh, Odisha.

GREEN FORCE

Monitored By - Green Force Associates Pvt. Ltd.

Address- Plot No-1363-3892 ,

Bhaibhab Realcon, Fulnakhara, Cuttack,

Odisha- 754001

NABL Certificate No:- TC-12258

PHOTOGRAPHS
OF
ENVIRONMENT MONITORING





GREEN FORCE ASSOCIATES PRIVATE LIMITED

Plot No.-1666, Phase-II, Delta Colony, Nilakantheswar Marg,
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Mail Id: greenforceassociates@gmail.com

Report No- GFAPL/24-25/ESLBI/055 **Issued Date-05.03.2025**

TEST REPORT

Client Name &Address	**M/s. Nadidih Iron Ore Mines (BICO),** ***M/s ESL Steel Limited,*** *At/PO:- Koira, Sundargarh, Odisha.*		
Nature of Sampling	**Ambient Air Quality Monitoring (AAQ)**		
Sampling By	**GFAPL's Representative**		
Environmental Condition	Good	**Sampling Method**	As per IS: 5182
Location of performance of Laboratory activities	Laboratory Permanent Facility	**Deviation from the method (if any)**	NO
Discipline	Chemical	**Group**	Atmospheric Pollution
Sampling Location & Coordinates	**AAQ1- Near Mine Office** **Lat:**21°58'9.21"N **& Long:**85°15'33.67"E;		
Instrument Used	**Respirable Dust Sampler, Fine ParticuLate Dust Sampler**		

Date of Sampling	PM_{10} ($\mu g/m^3$)	$PM_{2.5}$ ($\mu g/m^3$)	SO_2 ($\mu g/m^3$)	NO_2 ($\mu g/m^3$)
03.02.2025	63.8	31.8	9.8	16.2
06.02.2025	65.7	33.1	10.4	17.2
10.02.2025	68.2	34.3	10.8	17.8
13.02.2025	64.3	32.4	10.4	17.4
17.02.2025	66.2	33.4	10.8	17.8
20.02.2025	60.4	30.5	9.2	15.8
24.02.2025	57.2	28.6	8.8	14.8
27.02.2025	61.3	30.6	9.4	15.4
Max	**68.20**	**34.30**	**10.80**	**17.80**
Min	**57.20**	**28.60**	**8.80**	**14.80**
Average	**63.39**	**31.84**	**9.95**	**16.55**
NAAQ* Standard	**100**	**60**	**80**	**80**
Methods of Analysis	**IS:5182 (Part-23)**	**IS:5182 (Part-24)**	**IS:5182 (Part-2)**	**IS:5182 (Part-6)**

Reviewed By

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Miss. Arti Sahoo

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BHUBANESWAR, ODISHA

Technical Manager
Mr. S.K. Parhi

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END OF REPORT

Plot No- 1363-3892, Baibhab Realcon, Fulnakhara,
Cuttack, Odisha, India 754001

GREEN FORCE ASSOCIATES PRIVATE LIMITED

Plot No.-1666, Phase-II, Delta Colony, Nilakantheswar Marg,
Baramunda, Bhubaneswar, Dist - Khurdha

Mail Id: greenforceassociates@gmail.com

TC-12258

Report No- GFAPL/24-25/ESLBI/056 **Issued Date-05.03.2025**

TEST REPORT

Client Name &Address	**M/s. Nadidih Iron Ore Mines (BICO),** ***M/s ESL Steel Limited,*** *At/PO:- Koira, Sundargarh, Odisha.*		
Nature of Sampling	**Ambient Air Quality Monitoring (AAQ)**		
Sampling By	**GFAPL's Representative**		
Environmental Condition	Good	**Sampling Method**	As per IS: 5182
Location of performance of Laboratory activities	Laboratory Permanent Facility	**Deviation from the method (if any)**	NO
Discipline	Chemical	**Group**	Atmospheric Pollution
Sampling Location & Coordinates	**AAQ2- Near Mine InGate** **Lat:** 21°58'23.32"N **& Long**: 85°15'44.18"E		
Instrument Used	**Respirable Dust Sampler, Fine ParticuLate Dust Sampler**		

Date of Sampling	PM_{10} ($\mu g/m^3$)	$PM_{2.5}$ ($\mu g/m^3$)	SO_2 ($\mu g/m^3$)	NO_2 ($\mu g/m^3$)
03.02.2025	75.1	37.8	11.4	18.8
06.02.2025	77.6	38.6	12.2	19.8
10.02.2025	73.8	36.7	11.8	19.4
13.02.2025	76.2	38.2	12.4	19.8
17.02.2025	79.4	39.8	12.8	20.4
20.02.2025	66.8	33.8	10.8	17.8
24.02.2025	63.4	31.2	10.4	17.4
27.02.2025	65.7	32.6	10.8	17.8
Max	**79.40**	**39.80**	**12.80**	**20.40**
Min	**63.40**	**31.20**	**10.40**	**17.40**
Average	**72.25**	**36.09**	**11.58**	**18.90**
NAAQ* Standard	**100**	**60**	**80**	**80**
Methods of Analysis	**IS:5182 (Part-23)**	**IS:5182 (Part-24)**	**IS:5182 (Part-2)**	**IS:5182 (Part-6)**

Reviewed By

CHIEF ANALYST
GREENFORCE ASSOCIATES PRIVATE LIMITED
BHUBANESWAR, ODISHA

Chief Analyst
Miss. Arti Sahoo

Authorized Signatory

TECHNICAL MANAGER
GREENFORCE ASSOCIATES PRIVATE LIMITED
BHUBANESWAR, ODISHA

Technical Manager
Mr. S.K. Parhi

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END OF REPORT

**Plot No- 1363-3892, Baibhab Realcon, Fulnakhara,
Cuttack, Odisha, India 754001**

GREEN FORCE ASSOCIATES PRIVATE LIMITED

Plot No.-1666, Phase-II, Delta Colony, Nilakantheswar Marg,
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TC-12258

Report No- GFAPL/24-25/ESLBI/057 **Issued Date-05.03.2025**

TEST REPORT

Client Name &Address	**M/s. Nadidih Iron Ore Mines (BICO),** *M/s ESL Steel Limited,* *At/PO:- Koira, Sundargarh, Odisha.*		
Nature of Sampling	**Ambient Air Quality Monitoring (AAQ)**		
Sampling By	**GFAPL's Representative**		
Environmental Condition	Good	**Sampling Method**	As per IS: 5182
Location of performance of Laboratory activities	Laboratory Permanent Facility	**Deviation from the method (if any)**	NO
Discipline	Chemical	**Group**	Atmospheric Pollution
Sampling Location & Coordinates	**AAQ3- Village Kenduhidi;** **Lat**21°59'45.70"N **& Long:** 85°16'14.44"E;		
Instrument Used	**Respirable Dust Sampler, Fine Particulate Dust Sampler**		

Date of Sampling	PM_{10} ($\mu g/m^3$)	$PM_{2.5}$ ($\mu g/m^3$)	SO_2 ($\mu g/m^3$)	NO_2 ($\mu g/m^3$)
03.02.2025	55.2	27.7	6.2	11.8
06.02.2025	54.1	27.2	6.2	12.4
10.02.2025	56.8	28.6	6.4	12.8
13.02.2025	53.7	26.4	6.4	12.4
17.02.2025	56.2	28.2	6.8	12.8
20.02.2025	53.4	26.5	5	10.8
24.02.2025	50.1	24.9	4.8	10.4
27.02.2025	52.6	26.2	5.2	10.8
Max	**56.80**	**28.60**	**6.80**	**12.80**
Min	**50.10**	**24.90**	**4.80**	**10.40**
Average	**54.01**	**26.96**	**5.88**	**11.78**
NAAQ* Standard	**100**	**60**	**80**	**80**
Methods of Analysis	**IS:5182 (Part-23)**	**IS:5182 (Part-24)**	**IS:5182 (Part-2)**	**IS:5182 (Part-6)**

Reviewed By **Authorized Signatory**

CHIEF ANALYST
GREENFORCE ASSOCIATES PRIVATE LIMITED
BHUBANESWAR, ODISHA

Chief Analyst
Miss. Arti Sahoo

TECHNICAL MANAGER
GREENFORCE ASSOCIATES PRIVATE LIMITED
BHUBANESWAR, ODISHA

Technical Manager
Mr. S.K. Parhi

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END OF REPORT

Plot No- 1363-3892, Baibhab Realcon, Fulnakhara,
Cuttack, Odisha, India 754001

GREEN FORCE ASSOCIATES PRIVATE LIMITED

Plot No.-1666, Phase-II, Delta Colony, Nilakantheswar Marg,
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Report No- GFAPL/24-25/ESLBI/058 **Issued Date-05.03.2025**

TEST REPORT

Client Name &Address	**M/s. Nadidih Iron Ore Mines (BICO),** *M/s ESL Steel Limited,* *At/PO:- Koira, Sundargarh, Odisha.*		
Nature of Sampling	**Ambient Air Quality Monitoring (AAQ)**		
Sampling By	**GFAPL's Representative**		
Environmental Condition	Good	**Sampling Method**	As per IS: 5182
Location of performance of Laboratory activities	Laboratory Permanent Facility	**Deviation from the method (if any)**	NO
Discipline	Chemical	**Group**	Atmospheric Pollution
Sampling Location & Coordinates	**AAQ4- Village Badipada** **Lat:**21°58'4.60"N **& Long:**85°18'33.80"E;		
Instrument Used	**Respirable Dust Sampler, Fine ParticuLate Dust Sampler**		

Date of Sampling	PM_{10} ($\mu g/m^3$)	$PM_{2.5}$ ($\mu g/m^3$)	SO_2 ($\mu g/m^3$)	NO_2 ($\mu g/m^3$)
03.02.2025	59.6	29.8	6.8	12.4
06.02.2025	62.4	31.3	7	12.6
10.02.2025	63.7	31.8	7.2	12.9
13.02.2025	60.8	30.5	7.2	12.6
17.02.2025	64.1	32.3	7.4	13
20.02.2025	57.2	28.5	5.8	11.4
24.02.2025	54.2	27.1	5.4	10.8
27.02.2025	55.8	27.6	5.8	11.4
Max	**64.10**	**32.30**	**7.40**	**13.00**
Min	**54.20**	**27.10**	**5.40**	**10.80**
Average	**59.73**	**29.86**	**6.58**	**12.14**
NAAQ* Standard	**100**	**60**	**80**	**80**
Methods of Analysis	**IS:5182 (Part-23)**	**IS:5182 (Part-24)**	**IS:5182 (Part-2)**	**IS:5182 (Part-6)**

Reviewed By

CHIEF ANALYST
GREENFORCE ASSOCIATES PRIVATE LIMITED
BHUBANESWAR, ODISHA

Chief Analyst
Miss. Arti Sahoo

Authorized Signatory

TECHNICAL MANAGER
GREENFORCE ASSOCIATES PRIVATE LIMITED
BHUBANESWAR, ODISHA

Technical Manager
Mr. S.K. Parhi

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END OF REPORT

Plot No- 1363-3892, Baibhab Realcon, Fulnakhara,
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GREEN FORCE ASSOCIATES PRIVATE LIMITED

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Report No- GFAPL/24-25/ESLBI/059 **Issued Date-05.03.2025**

TEST REPORT

Client Name &Address	**M/s. Nadidih Iron Ore Mines (BICO),** ***M/s ESL Steel Limited,*** *At/PO:- Koira, Sundargarh, Odisha.*		
Nature of Sampling	**Ambient Air Quality Monitoring (AAQ)**		
Sampling By	**GFAPL's Representative**		
Environmental Condition	Good	**Sampling Method**	As per IS: 5182
Location of performance of Laboratory activities	Laboratory Permanent Facility	**Deviation from the method (if any)**	NO
Discipline	Chemical	**Group**	Atmospheric Pollution
Sampling Location & Coordinates	**AAQ1- Near Mine Office; Lat:**21°58'9.21"N **& Long**: 85°15'33.67"E; **AAQ2- Near Mine In Gate; Lat:**21°58'23.32"N **& Long**: 85°15'44.18"E; **AAQ3- Village Kenduhidi; Lat**21°59'45.70"N **& Long:** 85°16'14.44"E; **AAQ4- Village Badipada; Lat:**21°58'4.60"N **& Long**: 85°18'33.80"E;		
Instrument Used	CO Analyser		

Date of Sampling	**CO (mg/m3)**			
	AAQ1	**AAQ2**	**AAQ3**	**AAQ4**
03.02.2025	0.41	0.48	0.31	0.32
06.02.2025	0.43	0.5	0.32	0.33
10.02.2025	0.45	0.49	0.34	0.35
13.02.2025	0.44	0.51	0.33	0.36
17.02.2025	0.46	0.53	0.35	0.37
20.02.2025	0.41	0.44	0.31	0.33
24.02.2025	0.39	0.42	0.29	0.31
27.02.2025	0.4	0.43	0.3	0.32
Max	**0.46**	**0.53**	**0.35**	**0.37**
Min	**0.39**	**0.42**	**0.29**	**0.31**
Average	**0.42**	**0.48**	**0.32**	**0.34**
NAAQ* Standard	**4 mg/m3 (for 1hr)**			
Methods of Analysis	**IS: 5182 (Part- 10)**			

Reviewed By **Authorized Signatory**

CHIEF ANALYST
GREENFORCE ASSOCIATES PRIVATE LIMITED
BHUBANESWAR, ODISHA

Chief Analyst
Miss. Arti Sahoo

TECHNICAL MANAGER
GREENFORCE ASSOCIATES PRIVATE LIMITED
BHUBANESWAR, ODISHA

Technical Manager
Mr. S.K. Parhi

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GREEN FORCE ASSOCIATES PRIVATE LIMITED

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Report No- GFAPL/24-25/ESLBI/060 **Issued Date-05.03.2025**

TEST REPORT

Client Name &Address	**M/s. Nadidih Iron Ore Mines (BICO),** ***Sukinda Mines (Chromite),*** *At/PO:- Koira, Sundargarh, Odisha.*		
Nature of Sampling	**Ambient Air Quality Monitoring (AAQ)**		
Sampling By	**GFAPL's Representative**		
Environmental Condition	Good	**Sampling Method**	As per IS: 5182
Location of performance of Laboratory activities	Laboratory Permanent Facility	**Deviation from the method (if any)**	NO
Discipline	Chemical	**Group**	Atmospheric Pollution
Sampling Location & Coordinates	**AAQ5- Village Jhirapani;** **Lat:** 21°59'52.38"N, & **Long:** :85°13'9.76"E		
Instrument Used	**Respirable Dust Sampler, Fine ParticuLate Dust Sampler**		

Date of Sampling	PM_{10} ($\mu g/m^3$)	$PM_{2.5}$ ($\mu g/m^3$)	SO_2 ($\mu g/m^3$)	NO_2 ($\mu g/m^3$)
01.02.2025	53.8	26.5	5.4	10.8
05.02.2025	55.2	27.4	5.8	11.4
08.02.2025	51.6	25.6	5.2	10.4
12.02.2025	56.2	28.2	5.8	11.2
15.02.2025	58.1	29.2	6.4	11.8
19.02.2025	55.1	27.6	5	10.4
22.02.2025	53.4	26.2	4.8	10
26.02.2025	54.7	26.8	5.2	10.4
Max	**58.10**	**29.20**	**6.40**	**11.80**
Min	**51.60**	**25.60**	**4.80**	**10.00**
Average	**54.76**	**27.19**	**5.45**	**10.80**
NAAQ* Standard	**100**	**60**	**80**	**80**
Methods of Analysis	**IS:5182 (Part-23)**	**IS:5182 (Part-24)**	**IS:5182 (Part-2)**	**IS:5182 (Part-6)**

Reviewed By

CHIEF ANALYST
GREENFORCE ASSOCIATES PRIVATE LIMITED
BHUBANESWAR, ODISHA

Chief Analyst
Miss. Arti Sahoo

Authorized Signatory

TECHNICAL MANAGER
GREENFORCE ASSOCIATES PRIVATE LIMITED
BHUBANESWAR, ODISHA

Technical Manager
Mr. S.K. Parhi

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GREEN FORCE ASSOCIATES PRIVATE LIMITED

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TC-12258

Report No- GFAPL/24-25/ESLBI/061 **Issued Date-05.03.2025**

TEST REPORT

Client Name &Address	**M/s. Nadidih Iron Ore Mines (BICO),** ***M/s ESL Steel Limited,*** *At/PO:- Koira, Sundargarh, Odisha.*		
Nature of Sampling	**Ambient Air Quality Monitoring (AAQ)**		
Sampling By	**GFAPL's Representative**		
Environmental Condition	Good	**Sampling Method**	As per IS: 5182
Location of performance of Laboratory activities	Laboratory Permanent Facility	**Deviation from the method (if any)**	NO
Discipline	Chemical	**Group**	Atmospheric Pollution
Sampling Location & Coordinates	**AAQ6- Village Kashira;** **Lat:**21°55'9.95"N, & **Long:** :85°15'18.13"E		
Instrument Used	**Respirable Dust Sampler, Fine Particulate Dust Sampler**		

Date of Sampling	PM_{10} ($\mu g/m^3$)	$PM_{2.5}$ ($\mu g/m^3$)	SO_2 ($\mu g/m^3$)	NO_2 ($\mu g/m^3$)
01.02.2025	56.8	28.5	6	11.4
05.02.2025	53.4	26.8	5.8	10.8
08.02.2025	57.2	28.7	6.4	11.4
12.02.2025	55.1	27.8	6.4	11.8
15.02.2025	56.8	28.5	6.8	12.2
19.02.2025	52.4	26.2	5.2	10.4
22.02.2025	50.6	25.2	4.8	10
26.02.2025	53.8	26.8	5.2	10.4
Max	**57.20**	**28.70**	**6.80**	**12.20**
Min	**50.60**	**25.20**	**4.80**	**10.00**
Average	**54.51**	**27.31**	**5.83**	**11.05**
NAAQ* Standard	**100**	**60**	**80**	**80**
Methods of Analysis	**IS:5182 (Part-23)**	**IS:5182 (Part-24)**	**IS:5182 (Part-2)**	**IS:5182 (Part-6)**

Reviewed By **Authorized Signatory**

CHIEF ANALYST
GREENFORCE ASSOCIATES PRIVATE LIMITED
BHUBANESWAR, ODISHA

Chief Analyst
Miss. Arti Sahoo

TECHNICAL MANAGER
GREENFORCE ASSOCIATES PRIVATE LIMITED
BHUBANESWAR, ODISHA

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END OF REPORT

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Cuttack, Odisha, India 754001**

GREEN FORCE ASSOCIATES PRIVATE LIMITED

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Report No- GFAPL/24-25/ESLBI/062 **Issued Date-05.03.2025**

TEST REPORT

Client Name &Address	**M/s. Nadidih Iron Ore Mines (BICO),** ***M/s ESL Steel Limited,*** *At/PO:- Koira, Sundargarh, Odisha.*		
Nature of Sampling	**Ambient Air Quality Monitoring (AAQ)**		
Sampling By	**GFAPL's Representative**		
Environmental Condition	Good	**Sampling Method**	As per IS: 5182
Location of performance of Laboratory activities	Laboratory Permanent Facility	**Deviation from the method (if any)**	NO
Discipline	Chemical	**Group**	Atmospheric Pollution
Sampling Location & Coordinates	**AAQ5- Village Jhirapani; Lat:**21°59'52.38"N, & **Long:** 85°13'9.76"E **AAQ6- Village Kashira; Lat:**21°55'9.95"N, & **Long:** 85°15'18.13"E		
Instrument Used	**CO Analyser**		

Date of Sampling	**CO (mg/m3)**	
	AAQ5	**AAQ6**
01.02.2025	0.28	0.27
05.02.2025	0.3	0.26
08.02.2025	0.28	0.28
12.02.2025	0.3	0.3
15.02.2025	0.32	0.32
19.02.2025	0.29	0.29
22.02.2025	0.27	0.26
26.02.2025	0.29	0.28
Max	**0.32**	**0.32**
Min	**0.27**	**0.26**
Average	**0.29**	**0.28**
NAAQ* Standard	**4 mg/m3 (for 1hr)**	
Methods of Analysis	**IS: 5182 (Part- 10)**	

Reviewed By

CHIEF ANALYST
GREENFORCE ASSOCIATES PRIVATE LIMITED
BHUBANESWAR, ODISHA

Chief Analyst
Miss. Arti Sahoo

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BHUBANESWAR, ODISHA

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END OF REPORT

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GREEN FORCE ASSOCIATES PRIVATE LIMITED

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Report No- GFAPL/24-25/ESLBI/063 **Issued Date-05.03.2025**

TEST REPORT

Client Name &Address	**M/s. Nadidih Iron Ore Mines (BICO),** **M/s ESL Steel Limited,** *At/PO:- Koira, Sundargarh, Odisha.*		
Nature of Sampling	**Fugitive Dust Emission (F)**		
Sampling By	**GFAPL's Representative**		
Environmental Condition	Good	**Sampling Method**	As per IS: 5182
Location of performance of Laboratory activities	Laboratory Permanent Facility	**Deviation from the method (if any)**	NO
Discipline	Chemical	**Group**	Atmospheric Pollution
Sampling Location & Coordinates	**F1: Mine Face Area; Lat:** 21° 58' 17.73"N & **Long:** 85° 15' 33.03"E **F2: Haul Road; Lat:** 21° 51' 54.95"N **& Long:**85° 15' 50.13"E **F3: Near Crushing Plant; Lat:** 21° 58' 21.94"N **& Long:** 85° 15' 35.01"E **F4: Near Screening Plant; Lat:** 21° 58' 12.05"N **& Long:** 85° 15' 35.19"E **F5: Ore Storage Area; Lat:** 21° 58' 05.02"N **& Long:** 85° 15' 34.55"E **F6: West Dump; Lat:** 21° 58' 10.99"N **& Long:** 85° 15' 37.47"		
Instrument Used	**Respirable Dust Sampler (RDS)**		

Sl. No.	Date of Sampling	Result (µg/m³)					
		F1	F2	F3	F4	F5	F6
1	04.02.2025	642.8	653.4	640.5	624.3	596.3	535.6
2	07.02.2025	672.3	669.2	662.4	643.5	624.5	543.8
3	11.02.2025	690.4	686.4	671.5	658.3	652.4	573.4
4	14.02.2025	705.3	724.2	692.1	684.2	673.4	582.1
5	18.02.2025	728.4	764.2	707.3	697.5	681.5	596.2
6	21.02.2025	456.5	486.8	448.2	421.2	408.2	401.5
7	25.02.2025	482.8	504.2	462.4	443.5	432.6	424.3
8	28.02.2025	543.6	556.4	483.5	467.2	449.2	437.2
Max		**728.40**	**764.20**	**707.30**	**697.50**	**681.50**	**596.20**
Min		**456.50**	**486.80**	**448.20**	**421.20**	**408.20**	**401.50**
Average		**615.26**	**630.60**	**595.99**	**579.96**	**564.76**	**511.76**
Fugitive Standard		**1200 µg/m³**					
Methods of Analysis		**IS:5182 (Part-4)**					

Reviewed By

CHIEF ANALYST
GREENFORCE ASSOCIATES PRIVATE LIMITED
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END OF REPORT

Plot No- 1363-3892, Baibhab Realcon, Fulnakhara,
Cuttack, Odisha, India 754001

GREEN FORCE ASSOCIATES PRIVATE LIMITED

Plot No.-1666, Phase-II, Delta Colony, Nilakantheswar Marg,
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Mail Id: greenforceassociates@gmail.com

Report No- GFAPL/24-25/ESLBI/064 **Issued Date-05.03.2025**

TEST REPORT

Client Name &Address	**M/s. Nadidih Iron Ore Mines (BICO),** **M/s ESL Steel Limited,** *At/PO:- Koira, Sundargarh, Odisha.*		
Nature of Sampling	**Workzone Noise Monitoring**		
Sampling By	**GFAPL's Representative**		
Location of performance of Laboratory activities	Site Facility	**Deviation from the method (if any)**	NO
Discipline	Chemical	**Group**	Atmospheric Pollution
Environmental Condition	Good	**Time Integration**	1 second
Time Weighing	Fast	**Frequency Weighing**	A- Weighing
Sampling Duration	24 hrs	**Area categorization**	Industrial Area
Date of Sampling	**12.02.2025**	**Date of Completion**	**13.02.2025**
Instrument Used	**Noise Meter**	**Sampling Method**	As per IS: 9989

S. No.	Locations	Day Time	Night Time
		Results in dB(A)	
1	**Near Mine Office; Lat:**21°58'9.21"N **& Long:**85°15'33.67"E	**63.8**	**46.9**
2	**Near Mine In Gate; Lat:**21°58'23.32"N **& Long:**85°15'44.18"E	**68.2**	**57.4**
3	**Near Screening Plant-1; Lat:**21°58'09.21"N **& Long:**85°15'33.66"E	**69.2**	**64.1**
4	**Near Crusher; Lat:**21°58'22.32"N **& Long:**85°15'34.13"E	**69.6**	**63.5**
5	**Near W.Bridge-1; Lat:** 21°57'53.99"N **& Long:**85°15'49.64"E	**67.2**	**58.4**
6	**Near W.Bridge -2; Lat:**21°57'54.26"N **& Long:**85°15'53.53"E	**67.8**	**58.6**

Noise permissible limits as per CPCB Norms in dB(A) Leq

Category of Area	Day Time	Night Time
Industrial Area	**75**	**70**
Commercial Area	65	55
Residential Area	55	45
Sensitive Area/ Silence Zone	50	40

Reviewed By

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BHUBANESWAR, ODISHA

Chief Analyst
Miss. Arti Sahoo

Authorized Signatory

TECHNICAL MANAGER
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TC-12258

Report No- GFAPL/24-25/ESLBI/065 **Issued Date-05.03.2025**

TEST REPORT

Client Name &Address	**M/s. Nadidih Iron Ore Mines (BICO),** **M/s ESL Steel Limited,** *At/PO:- Koira, Sundargarh, Odisha.*		
Nature of Sampling	**Ambient Noise Monitoring**		
Sampling By	**GFAPL's Representative**		
Location of performance of Laboratory activities	Site Facility	**Deviation from the method (if any)**	NO
Discipline	Chemical	**Group**	Atmospheric Pollution
Environmental Condition	Good	**Time Integration**	1 second
Time Weighing	Fast	**Frequency Weighing**	A- Weighing
Sampling Duration	24 hrs	**Area categorization**	Residential Area
Date of Sampling	**11.02.2025**	**Date of Completion**	**12.02.2025**
Instrument Used	**Noise Meter**	**Sampling Method**	As per IS: 9989

S. No.	Locations	Day Time	Night Time
		Results in dB(A)	
1	**Village Kenduhidi;** **Lat:**21°59'45.70"N **& Long:**85°16'14.44"E	49.4	39.2
2	**Village Badipada;** **Lat:**21°58'4.60"N **& Long:**85°18'33.80"E	48.9	38.8
3	**Village Jhirapani;** **Lat:**21°59'52.38"N **& Long:**85°13'9.76"E	49.1	39.1
4	**Village Kashira;** **Lat:**21°55'9.95"N **& Long:**85°15'18.13"E	49.3	38.9

Noise permissible limits as per CPCB Norms in dB(A) Leq

Category of Area	Day Time	Night Time
Industrial Area	75	70
Commercial Area	65	55
Residential Area	**55**	**45**
Sensitive Area/ Silence Zone	50	40

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TC-12258

Report No- GFAPL/24-25/ESLBI/066 **Issued Date-05.03.2025**

TEST REPORT

Client Name &Address	**M/s. Nadidih Iron Ore Mines (BICO),** **M/s ESL Steel Limited,** *At/PO:- Koira, Sundargarh, Odisha.*		
Nature of Sampling	**Stack Monitoring (ST)**		
Sampling By	**GFAPL's Representative**		
Environmental Condition	Good	**Sampling Method**	As per IS-11255
Location of performance of Laboratory activities	**Laboratory Permanent Facility**	**Deviation from the method (if any)**	NO
Discipline	**Chemical**	**Group**	Environment & Pollution
Date of Sampling	**12.02.2025**	**Date of Receiving**	**13.02.2025**
Date of Analysis	**13.02.2025**	**Date of Complete**	**17.02.2025**
Sampling Location & Coordinates	**ST- DG SET;** **Lat:** 21°58'23.31"N & **Long:** 85°15'37.17"E		
Instrument Used	**Stack monitoring Kit; Vacuum Pump; Pyrometer**		

Sl. No	Items	Testing Method	Unit	As per CPCB Standard	Result
01	Temperature	IS-11255 (PART-3) 1985	K	---	451
02	Velocity	IS-11255 (PART-3) 1985	m/sec	---	17.99
03	Particulate Matter as PM	IS-11255(PART-1) 1985 Gravimetric Method	mg/Nm3	100	87.6
04	Sulphur dioxide as SO2	IS-11255(PART-2) 1985	mg/Nm3	600	74.2
05	Carbon Monoxide as CO	IS-13270:1992	%	1%	<0.2
06	Carbon Dioxide as CO2	IS-13270:1992	%	---	1.7
07	Oxygen as O2	IS-13270:1992	%	---	16.4

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Report No- GFAPL/24-25/ESLBI/066 **Issued Date-05.03.2025**

TEST REPORT

Client Name &Address	**M/s. Nadidih Iron Ore Mines (BICO),** **M/s ESL Steel Limited,** *At/PO:- Koira, Sundargarh, Odisha.*		
Nature of Sampling	**Stack Monitoring (ST)**		
Sampling By	**GFAPL's Representative**		
Location of performance of Laboratory activities	**Laboratory Permanent Facility**	**Deviation from the method (if any)**	NO
Discipline	**Chemical**	**Group**	Atmospheric Pollution
Date of Sampling	**12.02.2025**	**Date of Receiving**	**13.02.2025**
Date of Analysis	**13.02.2025**	**Date of Complete**	**17.02.2025**
Sampling Location & Coordinates	**ST- DG SET;** **Lat:** 21°58'23.31"N & **Long:** 85°15'37.17"E		
Instrument Used	**Stack monitoring Kit; Vacuum Pump; Pyrometer**		

Sl. No	Items	Testing Method	Unit	As per CPCB Standard	Result
01	Nitrogen Oxide as NOx	IS-11255(PART-7) 1985	mg/Nm3	300	54.4

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Report No- GFAPL/24-25/ ESLBI/067 **Issued Date-05.03.2025**

TEST REPORT

Client Name &Address	**M/s. Nadidih Iron Ore & Mn Mines (BICO),** **M/s ESL Steel Limited,** *At/PO:- Koira, Sundargarh, Odisha.*		
Nature of Sampling	**STP Water**		
Sampling By	**GFAPL's Representative**		
Environmental Condition	Good	**Sampling Method**	As per APHA 24th ED 1060 B: 2023
Location of performance of Laboratory activities	Laboratory Permanent Facility	**Deviation from the method (if any)**	NO
Discipline	Chemical	**Group**	Environment & Pollution
Date of Sampling	**12.02.2025**	**Date of Receiving**	**13.02.2025**
Date of Analysis	**13.02.2025**	**Date of Complete**	**17.02.2025**
Sampling Location & Coordinates	**STP1- Inside the ML Area (STP-Inlet);** Lat: 21.971766, Long: 85.255013; **STP2- Inside the ML Area (STP-Outlet);** Lat: 21.971749, Long: 85.255002;		

Sl. No.	Parameter	Testing Methods	Unit	Standard as per CTO	STP1	STP2
1.	**pH**	APHA 24th ED 4500- H+B:2023	--	6.5-9.0	**7.58**	**7.16**
2.	**Total Suspended Solids**	APHA 24th ED 2540-D: 2023	**mg/l**	200	**122**	**8**
3.	**Oil & Grease**	IS 3025 PART 39-1991 RA-2003	**mg/l**	--	**5.7**	**<2.0**
4.	**Biological Oxygen Demand as BOD**	IS 3025 (PART 44):1993	**mg/l**	100	**56**	**2.8**
5.	**Chemical Oxygen Demand as COD**	APHA 24th ED 5220 B:2023	**mg/l**	--	**134**	**18**

Remarks: The Standard as per CTO is only applicable to the Discharge ie., Outlet

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Report No- GFAPL/24-25/ ESLBI/067 **Issued Date-05.03.2025**

TEST REPORT

Client Name &Address	**M/s. Nadidih Iron Ore & Mn Mines (BICO),** **M/s ESL Steel Limited,** *At/PO:- Koira, Sundargarh, Odisha.*		
Nature of Sampling	**STP Water**		
Sampling By	**GFAPL's Representative**		
Environmental Condition	Good	**Sampling Method**	As per APHA 24th ED 1060 B: 2023
Location of performance of Laboratory activities	Laboratory Permanent Facility	**Deviation from the method (if any)**	NO
Discipline	Chemical	**Group**	Environment & Pollution
Date of Sampling	**12.02.2025**	**Date of Receiving**	**13.02.2025**
Date of Analysis	**13.02.2025**	**Date of Complete**	**17.02.2025**
Sampling Location & Coordinates	**STP1- Inside the ML Area (STP-Inlet);** Lat: 21.971766, Long: 85.255013; **STP2- Inside the ML Area (STP-Outlet);** Lat: 21.971749, Long: 85.255002;		

Sl. No.	Parameter	Testing Methods	Unit	Standard as per CTO	STP1	STP2
1.	**Fecal Coliform**	APHA 24th ED 9222-H: 2023	**MPN/ 100ml**	<1000	**<1.8**	**<1.8**

Remarks: The Standard as per CTO is only applicable to the Discharge ie., Outlet

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Report No- GFAPL/24-25/ESLBI/073 **Issued Date-05.03.2025**

TEST REPORT

Client Name &Address	***M/s. Nadidih Iron Ore Mines (BICO),*** **M/s ESL Steel Limited,** At/PO:- Koira, Sundargarh, Odisha.		
Nature of Sampling	**Soil**		
Sampling By	**GFAPL's Representative**		
Environmental Condition	Good	**Sampling Method**	As per TNAU Agritech Portal
Location of performance of Laboratory activities	Laboratory Permanent Facility	**Deviation from themethod (if any)**	NO
Discipline	Chemical	**Group**	Soil and Rock
Date of Sampling	**11.02.2025**	**Date of Receiving**	**12.02.2025**
Date of Analysis	**12.02.2025**	**Date of Complete**	**15.02.2025**
Sampling Location & Coordinates	**S1: Lease Area; Lat:** 21°58'11.97"N & Long: 85°15'32.81"E **S2: Village Rengalberha; Lat:** 21°57'09.84"N & Long: 85°14'55.34"E		

Sl. No.	Parameters	Standard	Unit	S1	S2
1	**pH**	IS: 2720(Part-26)-1987	%	**5.98**	**6.1**
2	**Organic Carbon Content**	IS: 2720(Part-22)-1972	%	**0.98**	**1.36**
3	**Water Content (Moisture)**	IS: 2720(Part-2)-1973	%	**6.2**	**6.1**
4	**Specific gravity**	IS: 2720(Part-3/Sec1)-1980	Gs	**2.7**	**2.67**
5	**Sulfate**	IS: 2720(Part-27)-1977	mg/Kg	**84**	**120**

Reviewed By **Authorized Signatory**

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Report No- GFAPL/24-25/ESLBI/073 Issued Date-05.03.2025

TEST REPORT

Client Name &Address	***M/s. Nadidih Iron Ore Mines (BICO),*** **M/s ESL Steel Limited,** At/PO:- Koira, Sundargarh, Odisha.		
Nature of Sampling	**Soil**		
Sampling By	**GFAPL's Representative**		
Environmental Condition	Good	**Sampling Method**	As per TNAU Agritech Portal
Location of performance of Laboratory activities	Laboratory Permanent Facility	**Deviation from themethod (if any)**	NO
Discipline	Chemical	**Group**	Soil and Rock
Date of Sampling	**11.02.2025**	**Date of Receiving**	**12.02.2025**
Date of Analysis	**12.02.2025**	**Date of Complete**	**15.02.2025**
Sampling Location & Coordinates	**S1: Lease Area; Lat:** 21°58'11.97"N & Long: 85°15'32.81"E **S2: Village Rengalberha; Lat:** 21°57'09.84"N & Long: 85°14'55.34"E		

Sl. No.	Parameters	Standard	Unit	S1	S2
1.	**Colour**	GFAPL/SOP/Soil & Rock/01-23	--	**Brown**	**Brown**
2.	**Electrical conductivity (as EC)**	IS:14767: 2000	**micro s/cm**	**205.6**	**189.2**
3.	**Soil Texture**	GFAPL/SOP/Soil & Rock/02-23	---	**Sandy loamy**	**Sandy Clay loamy**
4.	**Bulk Density**	GFAPL/SOP/Soil & Rock/03-23	**gm/cc**	**1.36**	**1.27**
5.	**Calcium (as Ca)**	IS: 2720(Part-23)	**mg/kg**	**442**	**362**
6.	**Magnesium (as Mg)**	GFAPL/SOP/Soil & Rock/04-23	**mg/kg**	**220**	**178**
7.	**Nitrogen (as N)**	IS:14684: 1999	**kg/hec**	**68**	**120**
8.	**Phosphorus (as p)**	GFAPL/SOP/Soil & Rock/05-23	**kg/hec**	**30**	**34**
9.	**Potassium (as K)**	GFAPL/SOP/Soil & Rock/06-23	**mg/kg**	**158**	**140**
10.	**Chloride(as Cl)**	GFAPL/SOP/Soil & Rock/07-23	**mg/kg**	**124**	**120**
11.	**Manganese (as Mn)**	GFAPL/SOP/Soil & Rock/08-23	**mg/kg**	**8.8**	**2.5**
12.	**Iron (as Fe)**	GFAPL/SOP/Soil & Rock/09-23	**%**	**2.78**	**1.56**

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Report No- GFAPL/24-25/ESLBI/074 **Issued Date-05.03.2025**

TEST REPORT

Client Name &Address	***M/s. Nadidih Iron Ore Mines (BICO),*** **M/s ESL Steel Limited,** At/PO:- Koira, Sundargarh, Odisha.		
Nature of Sampling	**Soil**		
Sampling By	**GFAPL's Representative**		
Environmental Condition	Good	**Sampling Method**	As per TNAU Agritech Portal
Location of performance of Laboratory activities	Laboratory Permanent Facility	**Deviation from the method (if any)**	NO
Discipline	Chemical	**Group**	Soil and Rock
Date of Sampling	**11.02.2025**	**Date of Receiving**	**12.02.2025**
Date of Analysis	**12.02.2025**	**Date of Complete**	**15.02.2025**
Sampling Location & Coordinates	**S3: Village Kendudihi; Lat:** 21°59'40.58"N & Long: 85°16'09.91"E **S4: Village Kalta; Lat:** 21°57'54.22"N & Long: 85°12'48.59"E		

Sl. No.	Parameters	Standard	Unit	S3	S4
1	**pH**	IS: 2720(Part-26)-1987	%	**6.08**	**6.18**
2	**Organic Carbon Content**	IS: 2720(Part-22)-1972	%	**1.52**	**1.48**
3	**Water Content (Moisture)**	IS: 2720(Part-2)-1973	%	**6.3**	**6.1**
4	**Specific gravity**	IS: 2720(Part-3/Sec1)-1980	Gs	**2.66**	**2.66**
5	**Sulfate**	IS: 2720(Part-27)-1977	mg/Kg	**120**	**128**

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END OF REPORT

Plot No- 1363-3892, Baibhab Realcon, Fulnakhara,
Cuttack, Odisha, India 754001

GREEN FORCE ASSOCIATES PRIVATE LIMITED

Plot No.-1666, Phase-II, Delta Colony, Nilakantheswar Marg,
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Mail Id: greenforceassociates@gmail.com

(An ISO 14001:2001, 45001 certified Consulting Organization & NABL Accredited Laboratory)

Report No- GFAPL/24-25/ESLBI/074 Issued Date- 05.03.2025

TEST REPORT

Client Name &Address	***M/s. Nadidih Iron Ore Mines (BICO),*** **M/s ESL Steel Limited,** At/PO:- Koira, Sundargarh, Odisha.		
Nature of Sampling	**Soil**		
Sampling By	**GFAPL's Representative**		
Environmental Condition	Good	**Sampling Method**	As per TNAU Agritech Portal
Location of performance of Laboratory activities	Laboratory Permanent Facility	**Deviation from the method (if any)**	NO
Discipline	Chemical	**Group**	Soil and Rock
Date of Sampling	**11.02.2025**	**Date of Receiving**	**12.02.2025**
Date of Analysis	**12.02.2025**	**Date of Complete**	**15.02.2025**
Sampling Location & Coordinates	**S3: Village Kendudihi; Lat:** 21°59'40.58"N & Long: 85°16'09.91"E **S4: Village Kalta; Lat:** 21°57'54.22"N & Long: 85°12'48.59"E		

Sl. No.	Parameters	Standard	Unit	S3	S4
1.	**Colour**	GFAPL/SOP/Soil & Rock/01-23	--	**Brown**	**Brown**
2.	**Electrical conductivity (as EC)**	IS:14767: 2000	micro s/cm	**182.5**	**186.4**
3.	**Soil Texture**	GFAPL/SOP/Soil & Rock/02-23	---	**Sandy Clay loamy**	**Sandy Clay loamy**
4.	**Bulk Density**	GFAPL/SOP/Soil & Rock/03-23	gm/cc	**1.27**	**1.28**
5.	**Calcium (as Ca)**	IS: 2720(Part-23)	mg/kg	**342**	**356**
6.	**Magnesium (as Mg)**	GFAPL/SOP/Soil & Rock/04-23	mg/kg	**170**	**168**
7.	**Nitrogen (as N)**	IS:14684: 1999	kg/hec	**120**	**114**
8.	**Phosphorus (as p)**	GFAPL/SOP/Soil & Rock/05-23	kg/hec	**34**	**32**
9.	**Potassium (as K)**	GFAPL/SOP/Soil & Rock/06-23	mg/kg	**140**	**136**
10.	**Chloride(as Cl)**	GFAPL/SOP/Soil & Rock/07-23	mg/kg	**122**	**126**
11.	**Manganese (as Mn)**	GFAPL/SOP/Soil & Rock/08-23	mg/kg	**2.6**	**2.8**
12.	**Iron (as Fe)**	GFAPL/SOP/Soil & Rock/09-23	%	**1.84**	**1.92**

Reviewed By

CHIEF ANALYST
GREENFORCE ASSOCIATES PRIVATE LIMITED
BHUBANESWAR, ODISHA

Chief Analyst
Miss. Arti Sahoo

Authorized Signatory

TECHNICAL MANAGER
GREENFORCE ASSOCIATES PRIVATE LIMITED
BHUBANESWAR, ODISHA

Technical Manager
Mr. S.K. Parhi

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TC-12258

Report No- GFAPL/24-25/ESLBI/068 Issued Date-05.03.2025

TEST REPORT

Client Name &Address	**M/s. Nadidih Iron Ore Mines (BICO),** **M/s ESL Steel Limited,** *At/PO:- Koira, Sundargarh, Odisha.*		
Nature of Sampling	**Ground Water (GW)**		
Sampling By	**GFAPL's Representative**		
Environmental Condition	Good	**Sampling Method**	As per APHA 24th ED 1060 B: 2023
Location of performance of Laboratory activities	Laboratory Permanent Facility	**Deviation from the method (if any)**	NO
Discipline	Chemical	**Group**	Water
Date of Sampling	**11.02.2025**	**Date of Receiving**	**12.02.2025**
Date of Analysis	**12.02.2025**	**Date of Complete**	**15.02.2025**
Sampling Location & Coordinates	**GW1: Within Mine Lease; Lat:** 21°58'19.62"N & **Long:** 85°15'24.14"E **GW2: Village Rengalberha; Lat:** 21°57'10.45"N & **Long:** 85°14'55.35"E		

Sl. No.	Parameter	Testing Methods	Unit	Standard as per IS: 10500, 2012		GW1	GW2
				AL	PL		
1	**Colour**	IS 3025: (Part 4)- 2021	**Hazen**	5	15	<5.0	<5.0
2	**Turbidity**	APHA 24th ED: 2130-B -2023	**NTU**	1	5	<1	<1
3	**pH Value @25°C**	APHA 24th ED 4500- H+B:2023	--	6.5-8.5	NR	6.98	6.97
4	**Total Dissolved Solids (TDS)**	APHA 24th ED: 2540-C: 2023	**mg/l**	500	2000	196	161
5	**Chloride (as Cl)**	APHA 24th Ed 4500- Cl-B:2023	**mg/l**	250	1000	18	15
6	**Total Hardness**	APHA 24th ED 2340-C: 2023	**mg/l**	200	600	126	104
7	**Calcium**	APHA 24th Ed 3500- Ca-B:2023	**mg/l**	75	200	32.9	26.9
8	**Magnesium**	APHA 24th ED 3500-Mg-B: 2023	**mg/l**	30	100	10.7	9
9	**Total Alkalinity**	APHA 24th ED 2320-B: 2023	**mg/l**	200	600	118	97
10	**Residual Free Chlorine**	APHA 24th ED 4500 CL-B:2023	**mg/l**	0.2	1.0	<0.2	<0.2
11	**Cyanide**	APHA 24th ED 4500 CN-F:2023	**mg/l**	0.05	NR	<0.02	<0.02
12	**Hexavalent Chromium**	APHA 24th ED 3500-Cr-B: 2023	**mg/l**	0.05	NR	<0.05	<0.05
13	**Total Chromium**	APHA 24th ED 3500-Cr-B: 2023	**mg/l**	0.05	NR	<0.05	<0.05
14	**Iron**	APHA 24th ED 3500-Fe-B: 2023	**mg/l**	0.3	NR	0.24	0.22

Plot No- 1363-3892, Baibhab Realcon, Fulnakhara,
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Sl. No.	Parameter	Testing Methods	Unit	Standard as per IS: 10500, 2012		GW1	GW2
				AL	PL		
15	Sulfate	APHA 24th ED 4500-SO4 E: 2023	mg/l	200	400	3.9	2.8
16	Fluoride	APHA 24th ED 4500-F-C: 2023	mg/l	1.0	1.5	<0.05	<0.05
18	Boron	APHA 24th ED 4500 B-B:2023	mg/l	0.5	1.0	<0.01	<0.01
18	Manganese	IS 3025 PART-59 :2006 RA 2012	mg/l	0.1	0.3	<0.05	<0.05
19	Sodium as Na	APHA 24th ED 3500- Na-B	mg/l	--	--	10.8	9.1
20	Potassium as K	APHA 24th ED 3500- K-B	mg/l	--	--	1	0.8

REMARKS: NR- Not Relaxable; AL-Acceptable Limit; PL- Permissible Limit; al- agreeable;

Reviewed By

Chief Analyst
Miss. Asti Sahoo

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Authorized Signatory

Technical Manager
Mr. S.K. Parhi

TECHNICAL MANAGER
GREENFORCE ASSOCIATES PRIVATE LIMITE
BHUBANESWAR, ODISHA

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GREEN FORCE ASSOCIATES PRIVATE LIMITED

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Report No- GFAPL/24-25/ESLBI/068 **Issued Date-05.03.2025**

TEST REPORT

Client Name &Address	**M/s. Nadidih Iron Ore Mines (BICO),** **M/s ESL Steel Limited,** *At/PO:- Koira, Sundargarh, Odisha.*		
Nature of Sampling	**Ground Water (GW)**		
Sampling By	**GFAPL's Representative**		
Environmental Condition	Good	**Sampling Method**	As per APHA 24th ED 1060 B: 2023
Location of performance of Laboratory activities	Laboratory Permanent Facility	**Deviation from the method (if any)**	NO
Discipline	Chemical	**Group**	Water
Date of Sampling	**11.02.2025**	**Date of Receiving**	**12.02.2025**
Date of Analysis	**12.02.2025**	**Date of Complete**	**15.02.2025**
Sampling Location & Coordinates	**GW1: Within Mine Lease; Lat:** 21°58'19.62"N & **Long:** 85°15'24.14"E **GW2: Village Rengalberha; Lat:** 21°57'10.45"N & **Long:** 85°14'55.35"E		

Sl. No.	Parameter	Testing Methods	Unit	Standard as per IS: 10500, 2012		GW1	GW2
				AL	PL		
1	**Odour**	APHA 24th ED: 2150-B -2023	---	Agreeable	Agreeable	**U/O**	**U/O**
2	**Taste**	APHA 24th ED: 2160-B -2023	---	Agreeable	Agreeable	**al**	**al**
3	**Nitrate**	APHA 24th ED 4500-NO3-E : 2023	**mg/l**	45	NR	**1.69**	**1.54**
4	**Cadmium (as Cd)**	IS: 3025(Part 41)	**mg/l**	0.003	NR	**<0.001**	**<0.001**
5	**Copper (as Cu)**	IS: 3025(Part 42)	**mg/l**	0.05	1.5	**<0.03**	**<0.03**
6	**Zinc (as Zn)**	APHA 24th ED 3500 Zn: 2023	**mg/l**	5	15	**<0.03**	**<0.03**
7	**Lead (as Pb)**	APHA 24th ED 3500 Pb: 2023	**mg/l**	0.01	NR	**<0.01**	**<0.01**
8	**Selenium (as Se)**	APHA 24th ED 3500 B: 2023	**mg/l**	0.001	NR	**<0.001**	**<0.001**
9	**Mercury (as Hg)**	APHA 24th ED3500Hg: 2023	**mg/l**	0.001	NR	**<0.001**	**<0.001**
10	**Arsenic (as As)**	IS: 3025 (Part 37)	**mg/l**	0.01	0.05	**<0.001**	**<0.001**
11	**Aluminum (as Al)**	APHA 24th ED 3500Al : 2023	**mg/l**	0.03	0.2	**<0.01**	**<0.01**
12	**Mineral Oil**	APHA 24th ED 5220 B: 2023	**mg/l**	0.5	NR	**ND**	**ND**
13	**Anionic Detergents (as MBAS)**	APHA 24th ED 5540 C : 2023	**mg/l**	0.2	1.0	**ND**	**ND**

Plot No- 1363-3892, Baibhab Realcon, Fulnakhara,
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Sl. No.	Parameter	Testing Methods	Unit	Standard as per IS: 10500, 2012		GW1	GW2
				AL	AL		
14	Phenolic Compound (as C6H5OH)	APHA 24th ED 5530 B,D: 2023	mg/l	0.001	0.002	<0.001	<0.001
15	Total Coliforms	APHA 24th ED 9222-H: 2023	MPN/ 100ml	-	-	<1.8	<1.8

REMARKS: NR- Not Relaxable; AL-Acceptable Limit; PL- Permissible Limit; al- agreeable;

Reviewed By

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GREENFORCE ASSOCIATES PRIVATE LIMITED
BHUBANESWAR, ODISHA

Chief Analyst
Miss. Arti Sahoo

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Report No- GFAPL/24-25/ESLBI/069 Issued Date-05.03.2025

TEST REPORT

Client Name &Address	**M/s. Nadidih Iron Ore Mines (BICO),** **M/s ESL Steel Limited,** *At/PO:- Koira, Sundargarh, Odisha.*		
Nature of Sampling	**Ground Water (GW)**		
Sampling By	**GFAPL's Representative**		
Environmental Condition	Good	**Sampling Method**	As per APHA 24th ED 1060 B: 2023
Location of performance of Laboratory activities	Laboratory Permanent Facility	**Deviation from the method (if any)**	NO
Discipline	Chemical	**Group**	Water
Date of Sampling	**11.02.2025**	**Date of Receiving**	**12.02.2025**
Date of Analysis	**12.02.2025**	**Date of Complete**	**15.02.2025**
Sampling Location & Coordinates	**GW3: Village Kendudihi; Lat:** 21°59'40.63"N & **Long:** 85°16'07.74"E **GW4: Village Kalta; Lat:** 21°57'54.83"N & **Long:** 85°12'49.46"E		

Sl. No.	Parameter	Testing Methods	Unit	Standard as per IS: 10500, 2012		GW3	GW4
				AL	PL		
1	**Colour**	IS 3025: (Part 4)- 2021	**Hazen**	5	15	<5.0	<5.0
2	**Turbidity**	APHA 24th ED: 2130-B -2023	**NTU**	1	5	<1	<1
3	**pH Value @25°C**	APHA 24th ED 4500- H+B:2023	--	6.5-8.5	NR	7.04	7.12
4	**Total Dissolved Solids(TDS)**	APHA 24th ED: 2540-C: 2023	**mg/l**	500	2000	162	175
5	**Chloride (as Cl)**	APHA 24th Ed 4500- Cl-B:2023	**mg/l**	250	1000	15	16
6	**Total Hardness**	APHA 24th ED 2340-C: 2023	**mg/l**	200	600	104	114
7	**Calcium**	APHA 24th Ed 3500- Ca-B:2023	**mg/l**	75	200	27.3	29.3
8	**Magnesium**	APHA 24th ED 3500-Mg-B: 2023	**mg/l**	30	100	8.8	10
9	**Total Alkalinity**	APHA 24th ED 2320-B: 2023	**mg/l**	200	600	95	103
10	**Residual Free Chlorine**	APHA 24th ED 4500 CL-B:2023	**mg/l**	0.2	1.0	<0.2	<0.2
11	**Cyanide**	APHA 24th ED 4500 CN-F:2023	**mg/l**	0.05	NR	<0.02	<0.02
12	**Hexavalent Chromium**	APHA 24th ED 3500-Cr-B: 2023	**mg/l**	0.05	NR	<0.05	<0.05
13	**Total Chromium**	APHA 24th ED 3500-Cr-B: 2023	**mg/l**	0.05	NR	<0.05	<0.05
14	**Iron**	APHA 24th ED 3500-Fe-B: 2023	**mg/l**	0.3	NR	0.25	0.24

Plot No- 1363-3892, Baibhab Realcon, Fulnakhara,
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Sl. No.	Parameter	Testing Methods	Unit	Standard as per IS: 10500, 2012		GW3	GW4
				AL	PL		
15	Sulfate	APHA 24th ED 4500-SO4 E: 2023	mg/l	200	400	2.9	3.2
16	Fluoride	APHA 24th ED 4500-F-C: 2023	mg/l	1.0	1.5	<0.05	<0.05
17	Boron	APHA 24th ED 4500 B-B:2023	mg/l	0.5	1.0	<0.01	<0.01
18	Manganese	IS 3025 PART-59 :2006 RA 2012	mg/l	0.1	0.3	<0.05	<0.05
19	Sodium as Na	APHA 24th ED 3500- Na-B	mg/l	--	--	9	9.5
20	Potassium as K	APHA 24th ED 3500- K-B	mg/l	--	--	0.8	0.9

REMARKS: NR- Not Relaxable; AL-Acceptable Limit; PL- Permissible Limit

Reviewed By

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Report No- GFAPL/24-25/ESLBI/069 **Issued Date-05.03.2025**

TEST REPORT

Client Name &Address	**M/s. Nadidih Iron Ore Mines (BICO),** **M/s ESL Steel Limited,** *At/PO:- Koira, Sundargarh, Odisha.*		
Nature of Sampling	**Ground Water (GW)**		
Sampling By	GFAPL's Representative		
Environmental Condition	Good	**Sampling Method**	As per APHA 24th ED 1060 B: 2023
Location of performance of Laboratory activities	Laboratory Permanent Facility	**Deviation from the method (if any)**	NO
Discipline	Chemical	**Group**	Water
Date of Sampling	**11.02.2025**	**Date of Receiving**	**12.02.2025**
Date of Analysis	**12.02.2025**	**Date of Complete**	**15.02.2025**
Sampling Location & Coordinates	**GW3: Village Kendudihi; Lat:** 21°59'40.63"N, **Long:** 85°16'07.74"E **GW4: Village Kalta; Lat:** 21°57'54.83"N, **Long:** 85°12'49.46"E		

Sl. No.	Parameter	Testing Methods	Unit	Standard as per IS: 10500, 2012		GW3	GW4
				AL	PL		
1	**Odour**	APHA 24th ED: 2150-B -2023	---	Agreeable	Agreeable	**U/O**	**U/O**
2	**Taste**	APHA 24th ED: 2160-B -2023	---	Agreeable	Agreeable	**al**	**al**
3	**Nitrate**	APHA 24th ED 4500-NO3-E : 2023	**mg/l**	45	NR	**1.22**	**1.26**
4	**Cadmium (as Cd)**	IS: 3025(Part 41)	**mg/l**	0.003	NR	**<0.001**	**<0.001**
5	**Copper (as Cu)**	IS: 3025(Part 42)	**mg/l**	0.05	1.5	**<0.03**	**<0.03**
6	**Zinc (as Zn)**	APHA 24th ED 3500 Zn: 2023	**mg/l**	5	15	**<0.03**	**<0.03**
7	**Lead (as Pb)**	APHA 24th ED 3500 Pb: 2023	**mg/l**	0.01	NR	**<0.01**	**<0.01**
8	**Selenium (as Se)**	APHA 24th ED 3500 B: 2023	**mg/l**	0.001	NR	**<0.001**	**<0.001**
9	**Mercury (as Hg)**	APHA 24th ED3500Hg: 2023	**mg/l**	0.001	NR	**<0.001**	**<0.001**
10	**Arsenic (as As)**	IS: 3025 (Part 37)	**mg/l**	0.01	0.05	**<0.001**	**<0.001**
11	**Aluminum (as Al)**	APHA 24th ED 3500Al : 2023	**mg/l**	0.03	0.2	**<0.01**	**<0.01**
12	**Mineral Oil**	APHA 24th ED 5220 B: 2023	**mg/l**	0.5	NR	**ND**	**ND**
13	**Anionic Detergents (as MBAS)**	APHA 24th ED 5540 C : 2023	**mg/l**	0.2	1.0	**ND**	**ND**

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Sl. No.	Parameter	Testing Methods	Unit	Standard as per IS: 10500, 2012		GW3	GW4
				AL	AL		
14	Phenolic Compound (as C6H5OH)	APHA 24th ED 5530 B,D: 2023	mg/l	0.001	0.002	<0.001	<0.001
15	Total Coliforms	APHA 24th ED 9222-H: 2023	MPN/ 100ml	-	-	<1.8	<1.8

REMARKS: NR- Not Relaxable; AL-Acceptable Limit; PL- Permissible Limit; al- agreeable;

Reviewed By

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TC-12258

Report No- GFAPL/24-25/ESLBI/070 **Issued Date-05.03.2025**

TEST REPORT

Client Name &Address	***M/s. Nadidih Iron Ore Mines (BICO),*** **M/s ESL Steel Limited,** At/PO:- Koira, Sundargarh, Odisha.		
Nature of Sampling	**Surface Water (SW)**		
Sampling By	**GFAPL's Representative**		
Environmental Condition	Good	**Sampling Method**	As per APHA 24th ED 1060 B: 2023
Location of performance of Laboratory activities	Laboratory Permanent Facility	**Deviation from the method (if any)**	NO
Discipline	Chemical	**Group**	Water
Date of Sampling	**11.02.2025**	**Date of Receiving**	**12.02.2025**
Date of Analysis	**12.02.2025**	**Date of Complete**	**15.02.2025**
Sampling Location & Coordinates	**SW1: Karo River Upstreem(US); Lat:** 21°58'30.34"N & **Long:** 85°15'28.12"E **SW2: Karo River Downstreem(DS); Lat:** 21°59'35.14"N & **Long:** 85°16' 21.42"E		

Sl. No.	Parameter	Testing Methods	Unit	Standard as per IS-2296 Class-C	SW1	SW2
1.	**Colour**	IS 3025: (Part 4)- 2021	**Hazen**	300	**<5.0**	**<5.0**
2.	**Total Suspended Solid**	APHA 24th ED 2540-D: 2023	**mg/l**	--	**<1.0**	**<1.0**
3.	**pH @25^{0}C**	APHA 24th ED 4500- H+B:2023	**---**	8.5	**7.18**	**7.22**
4.	**Conductivity**	APHA 24th ED 2510-B: 2023	**µS/cm**	--	**193.5**	**202.1**
5.	**Total Dissolved Solid**	APHA 24th ED 2540-C: 2023	**mg/l**	1500	**118**	**124**
6.	**Chloride (as Cl)**	APHA 24th ED 4500- Cl-B:2023	**mg/l**	600	**15**	**16**
7.	**Cyanide (as CN)**	APHA 24th ED 4500-CN-F	**mg/l**	0.05	**<0.02**	**<0.02**
8.	**Hexavalent Chromium(asCr+6)**	APHA 24th ED 3500-Cr-B: 2023	**mg/l**	0.05	**<0.05**	**<0.05**
9.	**Iron (as Fe)**	APHA 24th ED 3500-Fe-B: 2023	**mg/l**	50	**0.34**	**0.37**
10.	**Sulfate (as SO4)**	APHA 24th ED 4500-SO4 D: 2023	**mg/l**	400	**4.8**	**5.4**
11.	**Fluoride (as F)**	APHA 24th ED 4500-F-C: 2023	**mg/l**	1.5	**0.08**	**0.12**
12.	**Oil & Grease**	IS 3025 PART 39-1991 RA-2003	**mg/l**	0.1	**<2.0**	**<2.0**
13.	**Dissolved oxygen**	APHA 24th ED 4500 O-C:2023	**mg/l**	4	**6.1**	**5.9**
14.	**BOD (3)days at 27^{0}C**	IS 3025 (PART 44): 1993 REA-2009	**mg/l**	3.0	**2.4**	**3.8**
15.	**Chemical Oxygen Demand as COD**	APHA 24th ED 5220 C:2023	**mg/l**	--	**14**	**18**
16.	**Manganese**	IS 3025 PART-59 :2006 RA 2012	**mg/l**	--	**<0.05**	**<0.05**

Reviewed By

CHIEF ANALYST
GREENFORCE ASSOCIATES PRIVATE LIMITED
BHUBANESWAR, ODISHA

Chief Analyst
Miss. Arti Sahoo

Authorized Signatory

TECHNICAL MANAGER
GREENFORCE ASSOCIATES PRIVATE LIMITED
BHUBANESWAR, ODISHA

Technical Manager
Mr. S.K. Parhi

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END OF REPORT

Plot No- 1363-3892, Baibhab Realcon, Fulnakhara,
Cuttack, Odisha, India 754001

GREEN FORCE ASSOCIATES PRIVATE LIMITED

Plot No.-1666, Phase-II, Delta Colony, Nilakantheswar Marg,
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Mail Id: greenforceassociates@gmail.com

(An ISO 14001, 9001, 45001 certified Consulting Organization & NABL Accredited Laboratory)

Report No- GFAPL/24-25/ESLBI/070 **Issued Date-05.03.2025**

TEST REPORT

Client Name &Address	***M/s. Nadidih Iron Ore Mines (BICO),*** **M/s ESL Steel Limited,** At/PO:- Koira, Sundargarh, Odisha.		
Nature of Sampling	**Surface Water (SW)**		
Sampling By	**GFAPL's Representative**		
Environmental Condition	Good	**Sampling Method**	As per APHA 24th ED 1060 B: 2023
Location of performance of Laboratory activities	Laboratory Permanent Facility	**Deviation from the method (if any)**	NO
Discipline	Chemical	**Group**	Water
Date of Sampling	**11.02.2025**	**Date of Receiving**	**12.02.2025**
Date of Analysis	**12.02.2025**	**Date of Complete**	**15.02.2025**
Sampling Location & Coordinates	**SW1: Karo River Upstreem(US); Lat:** 21°58'30.34"N & **Long:** 85°15'28.12"E **SW2: Karo River Downstreem(DS); Lat:** 21°59'35.14"N & **Long:** 85°16' 21.42"E		

Sl. No.	Parameter	Testing Methods	Unit	Standard as per IS-2296 Class-C	SW1	SW2
1.	**Nitrate (as NO3)**	APHA 24th ED 4500-NO3-E: 2023	**mg/l**	50	**1.56**	**1.88**
2.	**Phenolic Compounds as C6H5OH**	APHA 24th ED 5530 B,D:2023	**mg/l**	--	**<0.001**	**<0.001**
3.	**Copper (as Cu)**	IS: 3025(Part 42)	**mg/l**	0.05	**<0.03**	**<0.03**
4.	**Lead (as Pb)**	APHA 24th ED 3500 Pb: 2023	**mg/l**	0.01	**<0.01**	**<0.01**
5.	**Zinc (as Zn)**	APHA 24th ED 3500 Zn: 2023	**mg/l**	5	**<0.03**	**<0.03**
6.	**Arsenic as As**	IS: 3025 (Part 37)	**mg/l**	--	**<0.001**	**<0.001**
7.	**Selenium (as Se)**	APHA 24th ED 3500 B: 2023	**mg/l**	0.005	**<0.001**	**<0.001**
8.	**Cadmium (as Cd)**	IS: 3025(Part 41)	**mg/l**	0.003	**<0.001**	**<0.001**
9.	**Total Coliform**	APHA 24th ED 9222-H: 2023	**MPN/ 100ml**	---	**510**	**570**

Reviewed By **Authorized Signatory**

CHIEF ANALYST
GREENFORCE ASSOCIATES PRIVATE LIMITED
BHUBANESWAR, ODISHA

Chief Analyst
Miss. Arti Sahoo

TECHNICAL MANAGER
GREENFORCE ASSOCIATES PRIVATE LIMITED
BHUBANESWAR, ODISHA

Technical Manager
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Report No- GFAPL/24-25/ESLBI/071 Issued Date-05.03.2025

TEST REPORT

Client Name &Address	***M/s. Nadidih Iron Ore Mines (BICO),*** **M/s ESL Steel Limited,** At/PO:- Koira, Sundargarh, Odisha.		
Nature of Sampling	**Surface Water (SW)**		
Sampling By	**GFAPL's Representative**		
Environmental Condition	Good	**Sampling Method**	As per APHA 24th ED 1060 B: 2023
Location of performance of Laboratory activities	Laboratory Permanent Facility	**Deviation from the method (if any)**	NO
Discipline	Chemical	**Group**	Water
Date of Sampling	**11.02.2025**	**Date of Receiving**	**12.02.2025**
Date of Analysis	**12.02.2025**	**Date of Complete**	**15.02.2025**
Sampling Location & Coordinates	**SW3: Topadih;** **Lat:** 21°59' 42.97"N, **Long:** 85°18' 13.97"E		

Sl. No.	Parameter	Testing Methods	Unit	Standard as per IS-2296 Class-C	SW3
1.	**Colour**	IS 3025: (Part 4)- 2021	**Hazen**	300	**<5.0**
2.	**Total Suspended Solid**	APHA 24th ED 2540-D: 2023	**mg/l**	--	**<1.0**
3.	**pH @25^{0}C**	APHA 24th ED 4500- H+B:2023	**---**	8.5	**7.19**
4.	**Conductivity**	APHA 24th ED 2510-B: 2023	**µS/cm**	--	**213.2**
5.	**Total Dissolved Solid**	APHA 24th ED 2540-C: 2023	**mg/l**	1500	**128**
6.	**Chloride (as Cl)**	APHA 24th ED 4500- Cl-B:2023	**mg/l**	600	**17**
7.	**Cyanide (as CN)**	APHA 24th ED 4500-CN-F	**mg/l**	0.05	**<0.02**
8.	**Hexavalent Chromium(asCr+6)**	APHA 24th ED 3500-Cr-B: 2023	**mg/l**	0.05	**<0.05**
9.	**Iron (as Fe)**	APHA 24th ED 3500-Fe-B: 2023	**mg/l**	50	**0.38**
10.	**Sulfate (as SO4)**	APHA 24th ED 4500-SO4 D: 2023	**mg/l**	400	**6.9**
11.	**Fluoride (as F)**	APHA 24th ED 4500-F-C: 2023	**mg/l**	1.5	**0.15**
12.	**Oil & Grease**	IS 3025 PART 39-1991 RA-2003	**mg/l**	0.1	**<2.0**
13.	**Dissolved oxygen**	APHA 24th ED 4500 O-C:2023	**mg/l**	4	**5.9**
14.	**BOD (3)days at 27^{0}C**	IS 3025 (PART 44): 1993 REA-2009	**mg/l**	3.0	**4.4**
15.	**Chemical Oxygen Demand as COD**	APHA 24th ED 5220 C:2023	**mg/l**	--	**20**
16.	**Manganese**	IS 3025 PART-59 :2006 RA 2012	**mg/l**	--	**0.08**

Reviewed By

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BHUBANESWAR, ODISHA

Chief Analyst
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Authorized Signatory

TECHNICAL MANAGER
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Report No- GFAPL/24-25/ESLBI/071 **Issued Date-05.03.2025**

TEST REPORT

Client Name &Address	***M/s. Nadidih Iron Ore Mines (BICO),*** **M/s ESL Steel Limited,** At/PO:- Koira, Sundargarh, Odisha.		
Nature of Sampling	**Surface Water (SW)**		
Sampling By	**GFAPL's Representative**		
Environmental Condition	Good	**Sampling Method**	As per APHA 24th ED 1060 B: 2023
Location of performance of Laboratory activities	Laboratory Permanent Facility	**Deviation from the method (if any)**	NO
Discipline	Chemical	**Group**	Water
Date of Sampling	**11.02.2025**	**Date of Receiving**	**12.02.2025**
Date of Analysis	**12.02.2025**	**Date of Complete**	**15.02.2025**
Sampling Location & Coordinates	**SW3: Topadih;** **Lat:** 21°59' 42.97"N, **Long:** 85°18' 13.97"E		

Sl. No.	Parameter	Testing Methods	Unit	Standard as per IS-2296 Class-C	SW3
1.	**Nitrate (as NO3)**	APHA 24th ED 4500-NO3-E: 2023	**mg/l**	50	**2.68**
2.	**Phenolic Compounds as C6H5OH**	APHA 24th ED 5530 B,D:2023	**mg/l**	--	**<0.001**
3.	**Copper (as Cu)**	IS: 3025(Part 42)	**mg/l**	0.05	**<0.03**
4.	**Lead (as Pb)**	APHA 24th ED 3500 Pb: 2023	**mg/l**	0.01	**<0.01**
5.	**Zinc (as Zn)**	APHA 24th ED 3500 Zn: 2023	**mg/l**	5	**<0.03**
6.	**Arsenic as As**	IS: 3025 (Part 37)	**mg/l**	--	**<0.001**
7.	**Selenium (as Se)**	APHA 24th ED 3500 B: 2023	**mg/l**	0.005	**<0.001**
8.	**Cadmium (as Cd)**	IS: 3025(Part 41)	**mg/l**	0.003	**<0.001**
9.	**Total Coliform**	APHA 24th ED 9222-H: 2023	**MPN/ 100ml**	---	**900**

Reviewed By **Authorized Signatory**

CHIEF ANALYST
GREENFORCE ASSOCIATES PRIVATE LIMITED
BHUBANESWAR, ODISHA

Chief Analyst
Miss. Arti Sahoo

TECHNICAL MANAGER
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TC-12258

Report No- GFAPL/24-25/ESLBI/072 **Issued Date-05.03.2025**

TEST REPORT

Client Name &Address	***M/s. Nadidih Iron Ore Mines (BICO),*** **M/s ESL Steel Limited,** At/PO:- Koira, Sundargarh, Odisha.		
Nature of Sampling	**Mines Discharge Water**		
Sampling By	**GFAPL's Representative**		
Environmental Condition	Good	**Sampling Method**	As per APHA 24th ED 1060 B: 2023
Location of performance of Laboratory activities	Laboratory Permanent Facility	**Deviation from the method (if any)**	NO
Discipline	Chemical	**Group**	Water
Date of Sampling	**11.02.2025**	**Date of Receiving**	**12.02.2025**
Date of Analysis	**12.02.2025**	**Date of Complete**	**15.02.2025**
Sampling Location & Coordinates	**Mines Discharge;**		

Sl. No.	Parameter	Testing Methods	Unit	Standard as per CTO	Result
1.	**Colour**	IS 3025: (Part 4)- 2021	**Hazen**	--	**<5.0**
2.	**Total Suspended Solid**	APHA 24th ED 2540-D: 2023	**mg/l**	100	**<1.0**
3.	**pH @25^{0}C**	APHA 24th ED 4500- H+B:2023	**---**	5.5-9.0	**7.94**
4.	**Conductivity**	APHA 24th ED 2510-B: 2023	**µS/cm**	--	**305.2**
5.	**Total Dissolved Solid**	APHA 24th ED 2540-C: 2023	**mg/l**	--	**184**
6.	**Chloride (as Cl)**	APHA 24th ED 4500- Cl-B:2023	**mg/l**	--	**32**
7.	**Cyanide (as CN)**	APHA 24th ED 4500-CN-F	**mg/l**	--	**<0.02**
8.	**Hexavalent Chromium(asCr+6)**	APHA 24th ED 3500-Cr-B: 2023	**mg/l**	--	**<0.05**
9.	**Iron (as Fe)**	APHA 24th ED 3500-Fe-B: 2023	**mg/l**	--	**0.44**
10.	**Sulfate (as SO4)**	APHA 24th ED 4500-SO4 D: 2023	**mg/l**	--	**13.8**
11.	**Fluoride (as F)**	APHA 24th ED 4500-F-C: 2023	**mg/l**	--	**0.18**
12.	**Oil & Grease**	IS 3025 PART 39-1991 RA-2003	**mg/l**	10	**<2.0**
13.	**Dissolved oxygen**	APHA 24th ED 4500 O-C:2023	**mg/l**	--	**5.8**
14.	**BOD (3)days at 27^{0}C**	IS 3025 (PART 44): 1993 REA-2009	**mg/l**	--	**6.2**
15.	**Chemical Oxygen Demand as COD**	APHA 24th ED 5220 C:2023	**mg/l**	--	**28**
16.	**Manganese**	IS 3025 PART-59 :2006 RA 2012	**mg/l**	--	**0.19**

Reviewed By **Authorized Signatory**

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BHUBANESWAR, ODISHA

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Report No- GFAPL/24-25/ESLBI/072 **Issued Date-05.03.2025**

TEST REPORT

Client Name &Address	***M/s. Nadidih Iron Ore Mines (BICO),*** **M/s ESL Steel Limited,** At/PO:- Koira, Sundargarh, Odisha.		
Nature of Sampling	**Mines Discharge Water**		
Sampling By	**GFAPL's Representative**		
Environmental Condition	Good	**Sampling Method**	As per APHA 24th ED 1060 B: 2023
Location of performance of Laboratory activities	Laboratory Permanent Facility	**Deviation from the method (if any)**	NO
Discipline	Chemical	**Group**	Water
Date of Sampling	**11.02.2025**	**Date of Receiving**	**12.02.2025**
Date of Analysis	**12.02.2025**	**Date of Complete**	**15.02.2025**
Sampling Location & Coordinates	**Mines Discharge;**		

Sl. No.	Parameter	Testing Methods	Unit	Standard as per CTO	Result
1.	**Nitrate (as NO3)**	APHA 24th ED 4500-NO3-E: 2023	**mg/l**	--	**4.72**
2.	**Phenolic Compounds as C6H5OH**	APHA 24th ED 5530 B,D:2023	**mg/l**	--	**<0.001**
3.	**Copper (as Cu)**	IS: 3025(Part 42)	**mg/l**	--	**0.06**
4.	**Lead (as Pb)**	APHA 24th ED 3500 Pb: 2023	**mg/l**	--	**<0.01**
5.	**Zinc (as Zn)**	APHA 24th ED 3500 Zn: 2023	**mg/l**	--	**0.12**
6.	**Arsenic as As**	IS: 3025 (Part 37)	**mg/l**	--	**<0.001**
7.	**Selenium (as Se)**	APHA 24th ED 3500 B: 2023	**mg/l**	--	**<0.001**
8.	**Cadmium (as Cd)**	IS: 3025(Part 41)	**mg/l**	--	**<0.001**
9.	**Total Coliform**	APHA 24th ED 9222-H: 2023	**MPN/ 100ml**	--	**570**

Reviewed By **Authorized Signatory**

CHIEF ANALYST
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Report No- GFAPL/24-25/ESLBI/073 **Issued Date-05.03.2025**

TEST REPORT

Client Name &Address	**M/s. Nadidih Iron Ore & Mn Mines (BICO)** ***M/s ESL Steel Limited,*** *At/PO:- Koira, Sundargarh, Odisha.*		
Nature of Sampling	**Ambient Air Quality Monitoring (AAQ)**		
Sampling By	**GFAPL's Representative**		
Environmental Condition	Good	**Sampling Method**	As per IS: 5182
Location of performance of Laboratory activities	Laboratory Permanent Facility	**Deviation from the method (if any)**	NO
Discipline	Chemical	**Group**	Atmospheric Pollution
Instrument Used	**Respirable Dust Sampler, Fine Particulate Dust Sampler**		

Location Code	Sampling Location	Date of Sampling	O3 ($\mu g/m^3$)	NH3 ($\mu g/m^3$)
AAQ-1	Near Mine Office;	20.02.2025	8.8	21.4
AAQ-2	Near Mine In Gate;	20.02.2025	9.8	23.2
AAQ-3	Village Kenduhidi;	20.02.2025	<8.0	<20.0
AAQ-4	Village Badipada;	20.02.2025	<8.0	<20.0
AAQ-5	Village Jhirapani;	19.02.2025	<8.0	<20.0
AAQ-6	Village Kashira;	19.02.2025	<8.0	<20.0
	NAAQ* Standard		100	400
	Methods of Analysis		IS:5182 (Part-9)	IS:5182 (Part-25)

Reviewed By

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TEST REPORT

Client Name &Address	**M/s. Nadidih Iron Ore & Mn Mines (BICO)** ***M/s ESL Steel Limited,*** *At/PO:- Koira, Sundargarh, Odisha.*		
Nature of Sampling	**Ambient Air Quality Monitoring (AAQ)**		
Sampling By	**GFAPL's Representative**		
Environmental Condition	Good	**Sampling Method**	As per IS: 5182
Location of performance of Laboratory activities	Laboratory Permanent Facility	**Deviation from the method (if any)**	NO
Discipline	Chemical	**Group**	Atmospheric Pollution
Instrument Used	**Respirable Dust Sampler, Fine Particulate Dust Sampler**		

Location Code	Sampling Location	Date of Sampling	Pb (µg/m³)	Ni (ng/m³)	As (ng/m³)	C6H6 (µg/m³)	BaP (ng/m³)
AAQ-1	Near Mine Office;	20.02.2025	<0.06	<0.6	<0.44	<5	<1
AAQ-2	Near Mine In Gate;	20.02.2025	<0.06	<0.6	<0.44	<5	<1
AAQ-3	Village Kenduhidi;	20.02.2025	<0.06	<0.6	<0.44	<5	<1
AAQ-4	Village Badipada;	20.02.2025	<0.06	<0.6	<0.44	<5	<1
AAQ-5	Village Jhirapani;	19.02.2025	<0.06	<0.6	<0.44	<5	<1
AAQ-6	Village Kashira;	19.02.2025	<0.06	<0.6	<0.44	<5	<1
NAAQ* Standard			1	20	6	5	1
Methods of Analysis			IS:5182 (Part-22)	IS:5182 (Part-26)	As per CPCB method followed by AAS	IS:5182 (Part-11)	IS:5182 (Part-12)

Reviewed By

CHIEF ANALYST
GREENFORCE ASSOCIATES PRIVATE LIMITED
BHUBANESWAR, ODISHA

Chief Analyst
Miss. Arti Sahoo

Authorized Signatory

TECHNICAL MANAGER
GREENFORCE ASSOCIATES PRIVATE LIMITED
BHUBANESWAR, ODISHA

Technical Manager
Mr. S.K. Parhi

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END OF REPORT

Plot No- 1363-3892, Baibhab Realcon, Fulnakhara,
Cuttack, Odisha, India 754001

GREEN FORCE ASSOCIATES PRIVATE LIMITED

Plot No.-1666, Phase-II, Delta Colony, Nilakantheswar Marg,
Baramunda, Bhubaneswar, Dist - Khurdha

Mail Id: greenforceassociates@gmail.com

(An ISO 14001, 9001, 45001 certified Consulting Organization & NABL Accredited Laboratory)

Report No- GFAPL/24-25/ESLBI/073 **Issued Date-05.03.2025**

TEST REPORT

Client Name &Address	**M/s. Nadidih Iron Ore & Mn Mines (BICO)** ***M/s ESL Steel Limited,*** *At/PO:- Koira, Sundargarh, Odisha.*		
Nature of Sampling	**Ambient Air Quality Monitoring (AAQ)**		
Sampling By	**GFAPL's Representative**		
Environmental Condition	Good	**Sampling Method**	As per IS: 5182
Location of performance of Laboratory activities	Laboratory Permanent Facility	**Deviation from the method (if any)**	NO
Discipline	Chemical	**Group**	Atmospheric Pollution
Instrument Used	**Respirable Dust Sampler, Fine Particulate Dust Sampler**		

Location Code	Sampling Location	Date of Sampling	Free Silica ($\mu g/m^3$)
AAQ-1	Near Mine Office;	20.02.2025	<2.0
AAQ-2	Near Mine In Gate;	20.02.2025	<2.0
AAQ-3	Village Kenduhidi;	20.02.2025	<2.0
AAQ-4	Village Badipada;	20.02.2025	<2.0
AAQ-5	Village Jhirapani;	19.02.2025	<2.0
AAQ-6	Village Kashira;	19.02.2025	<2.0
	Methods of Analysis		NIOSH Method 7500 by X-Ray Diffraction

Reviewed By **Authorized Signatory**

CHIEF ANALYST
GREENFORCE ASSOCIATES PRIVATE LIMITED
BHUBANESWAR, ODISHA

Chief Analyst
Miss. Arti Sahoo

TECHNICAL MANAGER
GREENFORCE ASSOCIATES PRIVATE LIMITED
BHUBANESWAR, ODISHA

Technical Manager
Mr. S.K. Parhi

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END OF REPORT

Plot No- 1363-3892, Baibhab Realcon, Fulnakhara,
Cuttack, Odisha, India 754001

ENVIRONMENT MONITORING REPORT

FOR THE MONTH OF

MARCH- 2025

NARAYANI

Client- M/s. Nadidih Iron Ore Mines (BICO),

M/s ESL Steel Limited,

Address- Koira, Sundargarh, Odisha.

GREEN FORCE

Monitored By - Green Force Associates Pvt. Ltd.

Address- Plot No-1363-3892 ,

Bhaibhab Realcon, Fulnakhara, Cuttack,

Odisha- 754001

NABL Certificate No:- TC-12258

PHOTOGRAPHS
OF
ENVIRONMENT MONITORING





GREEN FORCE ASSOCIATES PRIVATE LIMITED

Plot No.-1666, Phase-II, Delta Colony, Nilakantheswar Marg,
Baramunda, Bhubaneswar, Dist - Khurdha

Mail Id: greenforceassociates@gmail.com

Report No- GFAPL/24-25/ESLBI/075 **Issued Date-05.04.2025**

TEST REPORT

Client Name &Address	**M/s. Nadidih Iron Ore Mines (BICO),** ***M/s ESL Steel Limited,*** *At/PO:- Koira, Sundargarh, Odisha.*		
Nature of Sampling	**Ambient Air Quality Monitoring (AAQ)**		
Sampling By	**GFAPL's Representative**		
Environmental Condition	Good	**Sampling Method**	As per IS: 5182
Location of performance of Laboratory activities	Laboratory Permanent Facility	**Deviation from the method (if any)**	NO
Discipline	Chemical	**Group**	Atmospheric Pollution
Sampling Location & Coordinates	**AAQ1- Near Mine Office** **Lat:**21°58'9.21"N **& Long:**85°15'33.67"E;		
Instrument Used	**Respirable Dust Sampler, Fine Particulate Dust Sampler**		

Date of Sampling	PM_{10} ($\mu g/m^3$)	$PM_{2.5}$ ($\mu g/m^3$)	SO_2 ($\mu g/m^3$)	NO_2 ($\mu g/m^3$)
03.03.2025	63.4	31.7	9.8	15.8
06.03.2025	65.7	32.8	10.2	16.4
10.03.2025	62.8	31.5	9.8	16.4
13.03.2025	64.1	32.1	10.4	16.8
17.03.2025	63.7	31.8	10.6	17.4
20.03.2025	58.2	29.4	9.2	15.4
24.03.2025	54.6	27.1	7.8	13.4
27.03.2025	57.5	28.7	8.4	13.8
31.03.2025	61.4	30.6	8.8	14.8
Max	**65.70**	**32.80**	**10.60**	**17.40**
Min	**54.60**	**27.10**	**7.80**	**13.40**
Average	**61.27**	**30.63**	**9.44**	**15.58**
NAAQ* Standard	**100**	**60**	**80**	**80**
Methods of Analysis	**IS:5182 (Part-23)**	**IS:5182 (Part-24)**	**IS:5182 (Part-2)**	**IS:5182 (Part-6)**

Reviewed By

CHIEF ANALYST
GREENFORCE ASSOCIATES PRIVATE LIMITED
BHUBANESWAR, ODISHA

Chief Analyst
Miss. Arti Sahoo

Authorized Signatory

TECHNICAL MANAGER
GREENFORCE ASSOCIATES PRIVATE LIMITED
BHUBANESWAR, ODISHA

Technical Manager
Mr. S.K. Parhi

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END OF REPORT

Plot No- 1363-3892, Baibhab Realcon, Fulnakhara,
Cuttack, Odisha, India 754001

GREEN FORCE ASSOCIATES PRIVATE LIMITED

Plot No.-1666, Phase-II, Delta Colony, Nilakantheswar Marg,
Baramunda, Bhubaneswar, Dist - Khurdha

Mail Id: greenforceassociates@gmail.com

Report No- GFAPL/24-25/ESLBI/076 Issued Date-05.04.2025

TEST REPORT

Client Name &Address	**M/s. Nadidih Iron Ore Mines (BICO),** ***M/s ESL Steel Limited,*** *At/PO:- Koira, Sundargarh, Odisha.*		
Nature of Sampling	**Ambient Air Quality Monitoring (AAQ)**		
Sampling By	**GFAPL's Representative**		
Environmental Condition	Good	**Sampling Method**	As per IS: 5182
Location of performance of Laboratory activities	Laboratory Permanent Facility	**Deviation from the method (if any)**	NO
Discipline	Chemical	**Group**	Atmospheric Pollution
Sampling Location & Coordinates	**AAQ2- Near Mine InGate** **Lat:** 21°58'23.32"N **& Long**: 85°15'44.18"E		
Instrument Used	**Respirable Dust Sampler, Fine ParticuLate Dust Sampler**		

Date of Sampling	PM_{10} ($\mu g/m^3$)	$PM_{2.5}$ ($\mu g/m^3$)	SO_2 ($\mu g/m^3$)	NO_2 ($\mu g/m^3$)
03.03.2025	68.4	34.3	11.4	18.4
06.03.2025	69.6	35.1	11.8	18.8
10.03.2025	72.4	36.4	12.4	19.4
13.03.2025	76.5	38.3	13.4	19.8
17.03.2025	78.2	39.2	13.8	20.4
20.03.2025	70.4	35.8	12.4	18.2
24.03.2025	65.2	32.6	10.8	16.4
27.03.2025	67.8	33.8	11.4	16.8
31.03.2025	71.6	35.9	11.8	17.4
Max	**78.20**	**39.20**	**13.80**	**20.40**
Min	**65.20**	**32.60**	**10.80**	**16.40**
Average	**71.12**	**35.71**	**12.13**	**18.40**
NAAQ* Standard	**100**	**60**	**80**	**80**
Methods of Analysis	**IS:5182 (Part-23)**	**IS:5182 (Part-24)**	**IS:5182 (Part-2)**	**IS:5182 (Part-6)**

Reviewed By

CHIEF ANALYST
GREENFORCE ASSOCIATES PRIVATE LIMITED
BHUBANESWAR, ODISHA

Chief Analyst
Miss. Arti Sahoo

Authorized Signatory

TECHNICAL MANAGER
GREENFORCE ASSOCIATES PRIVATE LIMITED
BHUBANESWAR, ODISHA

Technical Manager
Mr. S.K.Pachi

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END OF REPORT

Plot No- 1363-3892, Baibhab Realcon, Fulnakhara,
Cuttack, Odisha, India 754001

GREEN FORCE ASSOCIATES PRIVATE LIMITED

Plot No.-1666, Phase-II, Delta Colony, Nilakantheswar Marg,
Baramunda, Bhubaneswar, Dist - Khurdha
Mail Id: greenforceassociates@gmail.com

Report No- GFAPL/24-25/ESLBI/077 **Issued Date-05.04.2025**

TEST REPORT

Client Name &Address	**M/s. Nadidih Iron Ore Mines (BICO),** *M/s ESL Steel Limited,* *At/PO:- Koira, Sundargarh, Odisha.*		
Nature of Sampling	**Ambient Air Quality Monitoring (AAQ)**		
Sampling By	**GFAPL's Representative**		
Environmental Condition	Good	**Sampling Method**	As per IS: 5182
Location of performance of Laboratory activities	Laboratory Permanent Facility	**Deviation from the method (if any)**	NO
Discipline	Chemical	**Group**	Atmospheric Pollution
Sampling Location & Coordinates	**AAQ3- Village Kenduhidi;** **Lat**21°59'45.70"N **& Long:** 85°16'14.44"E;		
Instrument Used	**Respirable Dust Sampler, Fine Particulate Dust Sampler**		

Date of Sampling	PM_{10} ($\mu g/m^3$)	$PM_{2.5}$ ($\mu g/m^3$)	SO_2 ($\mu g/m^3$)	NO_2 ($\mu g/m^3$)
03.03.2025	53.8	27.1	5.4	11
06.03.2025	55.6	27.6	5.6	11.4
10.03.2025	57.1	28.5	5.8	11.6
13.03.2025	56.9	28.8	5.8	11.8
17.03.2025	58.2	29.2	6.2	12.4
20.03.2025	54.2	27.2	5.8	11.2
24.03.2025	50.6	25.1	4.6	9.8
27.03.2025	53.1	26.4	5.2	10.2
31.03.2025	55.6	27.8	5.4	10.6
Max	**58.20**	**29.20**	**6.20**	**12.40**
Min	**50.60**	**25.10**	**4.60**	**9.80**
Average	**55.01**	**27.52**	**5.53**	**11.11**
NAAQ* Standard	**100**	**60**	**80**	**80**
Methods of Analysis	**IS:5182 (Part-23)**	**IS:5182 (Part-24)**	**IS:5182 (Part-2)**	**IS:5182 (Part-6)**

Reviewed By

CHIEF ANALYST
GREENFORCE ASSOCIATES PRIVATE LIMITED
BHUBANESWAR, ODISHA

Chief Analyst
Miss. Arti Sahoo

Authorized Signatory

Technical Manager
Mr. S.K. Parhi

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END OF REPORT

Plot No- 1363-3892, Baibhab Realcon, Fulnakhara,
Cuttack, Odisha, India 754001

GREEN FORCE ASSOCIATES PRIVATE LIMITED

Plot No.-1666, Phase-II, Delta Colony, Nilakantheswar Marg,
Baramunda, Bhubaneswar, Dist - Khurdha

Mail Id: greenforceassociates@gmail.com

TC-12258

Report No- GFAPL/24-25/ESLBI/078 **Issued Date-05.04.2025**

TEST REPORT

Client Name &Address	**M/s. Nadidih Iron Ore Mines (BICO),** *M/s ESL Steel Limited,* *At/PO:- Koira, Sundargarh, Odisha.*		
Nature of Sampling	**Ambient Air Quality Monitoring (AAQ)**		
Sampling By	**GFAPL's Representative**		
Environmental Condition	Good	**Sampling Method**	As per IS: 5182
Location of performance of Laboratory activities	Laboratory Permanent Facility	**Deviation from the method (if any)**	NO
Discipline	Chemical	**Group**	Atmospheric Pollution
Sampling Location & Coordinates	**AAQ4- Village Badipada** **Lat:**21°58'4.60"N **& Long:**85°18'33.80"E;		
Instrument Used	**Respirable Dust Sampler, Fine ParticuLate Dust Sampler**		

Date of Sampling	PM_{10} ($\mu g/m^3$)	$PM_{2.5}$ ($\mu g/m^3$)	SO_2 ($\mu g/m^3$)	NO_2 ($\mu g/m^3$)
03.03.2025	57.2	28.8	6.2	11.8
06.03.2025	59.4	29.6	6.4	12.4
10.03.2025	62.6	31.4	6.8	12.8
13.03.2025	64.8	32.2	7.2	13.4
17.03.2025	61.4	31.6	7	13
20.03.2025	57.4	28.9	6.4	11.8
24.03.2025	51.8	25.6	5.2	10.4
27.03.2025	54.6	27.2	5.4	10.8
31.03.2025	58.2	29.1	5.8	11.2
Max	**64.80**	**32.20**	**7.20**	**13.40**
Min	**51.80**	**25.60**	**5.20**	**10.40**
Average	**58.60**	**29.38**	**6.27**	**11.96**
NAAQ* Standard	**100**	**60**	**80**	**80**
Methods of Analysis	**IS:5182 (Part-23)**	**IS:5182 (Part-24)**	**IS:5182 (Part-2)**	**IS:5182 (Part-6)**

Reviewed By

CHIEF ANALYST
GREENFORCE ASSOCIATES PRIVATE LIMITED
BHUBANESWAR, ODISHA

Chief Analyst
Miss. Arti Sahoo

Authorized Signatory

TECHNICAL MANAGER
GREENFORCE ASSOCIATES PRIVATE LIMITED
BHUBANESWAR, ODISHA

Technical Manager
Dr. S.K. Parhi

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END OF REPORT

Plot No- 1363-3892, Baibhab Realcon, Fulnakhara,
Cuttack, Odisha, India 754001

GREEN FORCE ASSOCIATES PRIVATE LIMITED

Plot No.-1666, Phase-II, Delta Colony, Nilakantheswar Marg,
Baramunda, Bhubaneswar, Dist - Khurdha

Mail Id: greenforceassociates@gmail.com

(An ISO 14001, 9001, 45001 certified Consulting Organization & NABL Accredited Laboratory)

Report No- GFAPL/24-25/ESLBI/079 **Issued Date-05.04.2025**

TEST REPORT

Client Name &Address	**M/s. Nadidih Iron Ore Mines (BICO),** ***M/s ESL Steel Limited,*** *At/PO:- Koira, Sundargarh, Odisha.*		
Nature of Sampling	**Ambient Air Quality Monitoring (AAQ)**		
Sampling By	**GFAPL's Representative**		
Environmental Condition	Good	**Sampling Method**	As per IS: 5182
Location of performance of Laboratory activities	Laboratory Permanent Facility	**Deviation from the method (if any)**	NO
Discipline	Chemical	**Group**	Atmospheric Pollution
Sampling Location & Coordinates	**AAQ1- Near Mine Office; Lat:**21°58'9.21"N **& Long**: 85°15'33.67"E; **AAQ2- Near Mine In Gate; Lat:**21°58'23.32"N **& Long**: 85°15'44.18"E; **AAQ3- Village Kenduhidi; Lat**21°59'45.70"N **& Long:** 85°16'14.44"E; **AAQ4- Village Badipada; Lat:**21°58'4.60"N **& Long**: 85°18'33.80"E;		
Instrument Used	CO Analyser		

Date of Sampling	**CO (mg/m3)**			
	AAQ1	**AAQ2**	**AAQ3**	**AAQ4**
03.03.2025	0.41	0.45	0.31	0.33
06.03.2025	0.43	0.47	0.32	0.35
10.03.2025	0.44	0.5	0.33	0.37
13.03.2025	0.45	0.51	0.33	0.38
17.03.2025	0.46	0.52	0.35	0.37
20.03.2025	0.4	0.46	0.32	0.35
24.03.2025	0.35	0.41	0.27	0.3
27.03.2025	0.36	0.43	0.28	0.31
31.03.2025	0.39	0.45	0.29	0.33
Max	**0.46**	**0.52**	**0.35**	**0.38**
Min	**0.35**	**0.41**	**0.27**	**0.30**
Average	**0.41**	**0.47**	**0.31**	**0.34**
NAAQ* Standard	**4 mg/m3 (for 1hr)**			
Methods of Analysis	**IS: 5182 (Part- 10)**			

Reviewed By **Authorized Signatory**

CHIEF ANALYST
GREENFORCE ASSOCIATES PRIVATE LIMITED
BHUBANESWAR, ODISHA

Chief Analyst
Miss. AEG Sahoo

TECHNICAL MANAGER
GREENFORCE ASSOCIATES PRIVATE LIMITED
BHUBANESWAR, ODISHA

Technical Manager
Mr. S.K. Parai

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END OF REPORT

Plot No- 1363-3892, Baibhab Realcon, Fulnakhara,
Cuttack, Odisha, India 754001

GREEN FORCE ASSOCIATES PRIVATE LIMITED

Plot No.-1666, Phase-II, Delta Colony, Nilakantheswar Marg,
Baramunda, Bhubaneswar, Dist - Khurdha

Mail Id: greenforceassociates@gmail.com

Report No- GFAPL/24-25/ESLBI/080 **Issued Date-05.04.2025**

TEST REPORT

Client Name &Address	**M/s. Nadidih Iron Ore Mines (BICO),** ***Sukinda Mines (Chromite),*** *At/PO:- Koira, Sundargarh, Odisha.*		
Nature of Sampling	**Ambient Air Quality Monitoring (AAQ)**		
Sampling By	**GFAPL's Representative**		
Environmental Condition	Good	**Sampling Method**	As per IS: 5182
Location of performance of Laboratory activities	Laboratory Permanent Facility	**Deviation from the method (if any)**	NO
Discipline	Chemical	**Group**	Atmospheric Pollution
Sampling Location & Coordinates	**AAQ5- Village Jhirapani;** **Lat:** 21°59'52.38"N, & **Long:** :85°13'9.76"E		
Instrument Used	**Respirable Dust Sampler, Fine ParticuLate Dust Sampler**		

Date of Sampling	PM_{10} ($\mu g/m^3$)	$PM_{2.5}$ ($\mu g/m^3$)	SO_2 ($\mu g/m^3$)	NO_2 ($\mu g/m^3$)
05.03.2025	57.2	28.6	5.4	10.8
08.03.2025	59.7	29.5	5.8	10.8
12.03.2025	60.8	30.6	5.8	11.4
14.03.2025	62.4	31.4	6.4	11.8
19.03.2025	64.2	32.3	6.8	12.4
22.03.2025	54.2	26.8	5.4	10.4
26.03.2025	57.4	28.6	5.6	10.8
28.03.2025	59.8	30.1	5.8	11.2
Max	**64.20**	**32.30**	**6.80**	**12.40**
Min	**54.20**	**26.80**	**5.40**	**10.40**
Average	**59.46**	**29.74**	**5.88**	**11.20**
NAAQ* Standard	**100**	**60**	**80**	**80**
Methods of Analysis	**IS:5182 (Part-23)**	**IS:5182 (Part-24)**	**IS:5182 (Part-2)**	**IS:5182 (Part-6)**

Reviewed By

CHIEF ANALYST
GREENFORCE ASSOCIATES PRIVATE LIMITED
BHUBANESWAR, ODISHA

Chief Analyst
Miss. Arti Sahoo

Authorized Signatory

TECHNICAL MANAGER
GREENFORCE ASSOCIATES PRIVATE LIMITED
BHUBANESWAR, ODISHA

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END OF REPORT

Plot No- 1363-3892, Baibhab Realcon, Fulnakhara,
Cuttack, Odisha, India 754001

GREEN FORCE ASSOCIATES PRIVATE LIMITED

Plot No.-1666, Phase-II, Delta Colony, Nilakantheswar Marg,
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Report No- GFAPL/24-25/ESLBI/081 **Issued Date-05.04.2025**

TEST REPORT

Client Name &Address	**M/s. Nadidih Iron Ore Mines (BICO),** ***M/s ESL Steel Limited,*** *At/PO:- Koira, Sundargarh, Odisha.*		
Nature of Sampling	**Ambient Air Quality Monitoring (AAQ)**		
Sampling By	**GFAPL's Representative**		
Environmental Condition	Good	**Sampling Method**	As per IS: 5182
Location of performance of Laboratory activities	Laboratory Permanent Facility	**Deviation from the method (if any)**	NO
Discipline	Chemical	**Group**	Atmospheric Pollution
Sampling Location & Coordinates	**AAQ6- Village Kashira;** **Lat:**21°55'9.95"N, & **Long:** :85°15'18.13"E		
Instrument Used	**Respirable Dust Sampler, Fine Particulate Dust Sampler**		

Date of Sampling	PM_{10} ($\mu g/m^3$)	$PM_{2.5}$ ($\mu g/m^3$)	SO_2 ($\mu g/m^3$)	NO_2 ($\mu g/m^3$)
05.03.2025	54.6	27.5	5.4	10.8
08.03.2025	55.4	27.8	5.6	10.8
12.03.2025	56.8	28.4	5.8	11.4
14.03.2025	58.2	29.2	6	11.6
19.03.2025	60.6	30.4	6.4	11.8
22.03.2025	52.8	26.2	5.2	10
26.03.2025	55.6	27.6	5.4	10.4
28.03.2025	58.4	29.1	5.6	10.6
Max	**60.60**	**30.40**	**6.40**	**11.80**
Min	**52.80**	**26.20**	**5.20**	**10.00**
Average	**56.55**	**28.28**	**5.68**	**10.93**
NAAQ* Standard	**100**	**60**	**80**	**80**
Methods of Analysis	**IS:5182 (Part-23)**	**IS:5182 (Part-24)**	**IS:5182 (Part-2)**	**IS:5182 (Part-6)**

Reviewed By **Authorized Signatory**

CHIEF ANALYST
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BHUBANESWAR, ODISHA

Chief Analyst
Miss. Arti Sahoo

TECHNICAL MANAGER
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Mr. S.K. Parhi

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Plot No- 1363-3892, Baibhab Realcon, Fulnakhara,
Cuttack, Odisha, India 754001

GREEN FORCE ASSOCIATES PRIVATE LIMITED

Plot No.-1666, Phase-II, Delta Colony, Nilakantheswar Marg,
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Report No- GFAPL/24-25/ESLBI/082 **Issued Date-05.04.2025**

TEST REPORT

Client Name &Address	**M/s. Nadidih Iron Ore Mines (BICO),** ***M/s ESL Steel Limited,*** *At/PO:- Koira, Sundargarh, Odisha.*		
Nature of Sampling	**Ambient Air Quality Monitoring (AAQ)**		
Sampling By	**GFAPL's Representative**		
Environmental Condition	Good	**Sampling Method**	As per IS: 5182
Location of performance of Laboratory activities	Laboratory Permanent Facility	**Deviation from the method (if any)**	NO
Discipline	Chemical	**Group**	Atmospheric Pollution
Sampling Location & Coordinates	**AAQ5- Village Jhirapani; Lat:**21°59'52.38"N, & **Long:** 85°13'9.76"E **AAQ6- Village Kashira; Lat:**21°55'9.95"N, & **Long:** 85°15'18.13"E		
Instrument Used	**CO Analyser**		

Date of Sampling	**CO (mg/m3)**	
	AAQ5	**AAQ6**
05.03.2025	0.31	0.3
08.03.2025	0.32	0.31
12.03.2025	0.34	0.33
14.03.2025	0.35	0.33
19.03.2025	0.36	0.34
22.03.2025	0.3	0.28
26.03.2025	0.31	0.29
28.03.2025	0.33	0.3
Max	**0.36**	**0.34**
Min	**0.30**	**0.28**
Average	**0.33**	**0.31**
NAAQ* Standard	**4 mg/m3 (for 1hr)**	
Methods of Analysis	**IS: 5182 (Part- 10)**	

Reviewed By

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Report No- GFAPL/24-25/ESLBI/083 **Issued Date-05.04.2025**

TEST REPORT

Client Name &Address	**M/s. Nadidih Iron Ore Mines (BICO),** **M/s ESL Steel Limited,** *At/PO:- Koira, Sundargarh, Odisha.*		
Nature of Sampling	**Fugitive Dust Emission (F)**		
Sampling By	**GFAPL's Representative**		
Environmental Condition	Good	**Sampling Method**	As per IS: 5182
Location of performance of Laboratory activities	Laboratory Permanent Facility	**Deviation from the method (if any)**	NO
Discipline	Chemical	**Group**	Atmospheric Pollution
Sampling Location & Coordinates	**F1: Mine Face Area; Lat:** 21° 58' 17.73"N & **Long**: 85° 15' 33.03"E **F2: Haul Road; Lat:** 21° 51' 54.95"N **& Long**:85° 15' 50.13"E **F3: Near Crushing Plant; Lat:** 21° 58' 21.94"N **& Long**: 85° 15' 35.01"E **F4: Near Screening Plant; Lat:** 21° 58' 12.05"N **& Long:** 85° 15' 35.19"E **F5: Ore Storage Area; Lat:** 21° 58' 05.02"N **& Long:** 85° 15' 34.55"E **F6: West Dump; Lat:** 21° 58' 10.99"N **& Long:** 85° 15' 37.47"		
Instrument Used	**Respirable Dust Sampler (RDS)**		

Sl. No.	Date of Sampling	Result (µg/m³)					
		F1	F2	F3	F4	F5	F6
1	04.03.2025	572.5	584.2	512.6	498.3	472.5	468.6
2	07.03.2025	604.5	624.6	543.8	542.6	498.3	473.8
3	11.03.2025	628.3	609.5	559.2	582.4	526.3	492.4
4	14.03.2025	667.2	653.2	584.3	619.3	572.4	546.3
5	18.03.2025	619.5	628.3	612.4	643.5	594.6	582.4
6	21.03.2025	423.2	432.5	413.2	452.6	409.6	420.6
7	25.03.2025	456.8	464.2	447.5	489.3	440.5	464.2
8	28.03.2025	506.4	512.2	496.4	528.4	490.6	496.8
Max		**667.20**	**653.20**	**612.40**	**643.50**	**594.60**	**582.40**
Min		**423.20**	**432.50**	**413.20**	**452.60**	**409.60**	**420.60**
Average		**559.80**	**563.59**	**521.18**	**544.55**	**500.60**	**493.14**
Fugitive Standard		**1200 µg/m³**					
Methods of Analysis		**IS:5182 (Part-4)**					

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Report No- GFAPL/24-25/ESLBI/084 **Issued Date-05.04.2025**

TEST REPORT

Client Name &Address	**M/s. Nadidih Iron Ore Mines (BICO),** **M/s ESL Steel Limited,** *At/PO:- Koira, Sundargarh, Odisha.*		
Nature of Sampling	**Workzone Noise Monitoring**		
Sampling By	**GFAPL's Representative**		
Location of performance of Laboratory activities	Site Facility	**Deviation from the method (if any)**	NO
Discipline	Chemical	**Group**	Atmospheric Pollution
Environmental Condition	Good	**Time Integration**	1 second
Time Weighing	Fast	**Frequency Weighing**	A- Weighing
Sampling Duration	24 hrs	**Area categorization**	Industrial Area
Date of Sampling	**10.03.2025**	**Date of Completion**	**11.03.2025**
Instrument Used	**Noise Meter**	**Sampling Method**	As per IS: 9989

S. No.	Locations	Day Time	Night Time
		Results in dB(A)	
1	**Near Mine Office; Lat:**21°58'9.21"N **& Long:**85°15'33.67"E	64.2	46.2
2	**Near Mine In Gate; Lat:**21°58'23.32"N **& Long:**85°15'44.18"E	68.8	57.5
3	**Near Screening Plant-1; Lat:**21°58'09.21"N **& Long:**85°15'33.66"E	69.5	64.8
4	**Near Crusher; Lat:**21°58'22.32"N **& Long:**85°15'34.13"E	69.5	64.1
5	**Near W.Bridge-1; Lat:** 21°57'53.99"N **& Long:**85°15'49.64"E	67.6	58.5
6	**Near W.Bridge -2; Lat:**21°57'54.26"N **& Long:**85°15'53.53"E	67.1	58.2

Noise permissible limits as per CPCB Norms in dB(A) Leq

Category of Area	Day Time	Night Time
Industrial Area	**75**	**70**
Commercial Area	65	55
Residential Area	55	45
Sensitive Area/ Silence Zone	50	40

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TC-12258

Report No- GFAPL/24-25/ESLBI/085 **Issued Date-05.04.2025**

TEST REPORT

Client Name &Address	**M/s. Nadidih Iron Ore Mines (BICO),** **M/s ESL Steel Limited,** *At/PO:- Koira, Sundargarh, Odisha.*		
Nature of Sampling	**Ambient Noise Monitoring**		
Sampling By	**GFAPL's Representative**		
Location of performance of Laboratory activities	Site Facility	**Deviation from the method (if any)**	NO
Discipline	Chemical	**Group**	Atmospheric Pollution
Environmental Condition	Good	**Time Integration**	1 second
Time Weighing	Fast	**Frequency Weighing**	A- Weighing
Sampling Duration	24 hrs	**Area categorization**	Residential Area
Date of Sampling	**12.03.2025**	**Date of Completion**	**13.03.2025**
Instrument Used	**Noise Meter**	**Sampling Method**	As per IS: 9989

S. No.	Locations	Day Time	Night Time
		Results in dB(A)	
1	**Village Kenduhidi;** **Lat:**21°59'45.70"N **& Long:**85°16'14.44"E	49.6	38.8
2	**Village Badipada;** **Lat:**21°58'4.60"N **& Long:**85°18'33.80"E	49.4	39.2
3	**Village Jhirapani;** **Lat:**21°59'52.38"N **& Long:**85°13'9.76"E	49.6	39.7
4	**Village Kashira;** **Lat:**21°55'9.95"N **& Long:**85°15'18.13"E	49.6	39.2

Noise permissible limits as per CPCB Norms in dB(A) Leq

Category of Area	Day Time	Night Time
Industrial Area	75	70
Commercial Area	65	55
Residential Area	**55**	**45**
Sensitive Area/ Silence Zone	50	40

Reviewed By

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Report No- GFAPL/24-25/ESLBI/086 **Issued Date-05.04.2025**

TEST REPORT

Client Name &Address	**M/s. Nadidih Iron Ore Mines (BICO),** **M/s ESL Steel Limited,** *At/PO:- Koira, Sundargarh, Odisha.*		
Nature of Sampling	**Stack Monitoring (ST)**		
Sampling By	**GFAPL's Representative**		
Environmental Condition	Good	**Sampling Method**	As per IS-11255
Location of performance of Laboratory activities	**Laboratory Permanent Facility**	**Deviation from the method (if any)**	NO
Discipline	**Chemical**	**Group**	Environment & Pollution
Date of Sampling	**10.03.2025**	**Date of Receiving**	**11.03.2025**
Date of Analysis	**11.03.2025**	**Date of Complete**	**15.03.2025**
Sampling Location & Coordinates	**ST- DG SET;** **Lat:** 21°58'23.31"N & **Long:** 85°15'37.17"E		
Instrument Used	**Stack monitoring Kit; Vacuum Pump; Pyrometer**		

Sl. No	Items	Testing Method	Unit	As per CPCB Standard	Result
01	Temperature	IS-11255 (PART-3) 1985	K	---	453
02	Velocity	IS-11255 (PART-3) 1985	m/sec	---	18.08
03	Particulate Matter as PM	IS-11255(PART-1) 1985 Gravimetric Method	mg/Nm3	100	83.5
04	Sulphur dioxide as SO2	IS-11255(PART-2) 1985	mg/Nm3	600	64.2
05	Carbon Monoxide as CO	IS-13270:1992	%	1%	<0.2
06	Carbon Dioxide as CO2	IS-13270:1992	%	---	1.5
07	Oxygen as O2	IS-13270:1992	%	---	16.3

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Report No- GFAPL/24-25/ESLBI/086 **Issued Date-05.04.2025**

TEST REPORT

Client Name &Address	**M/s. Nadidih Iron Ore Mines (BICO),** **M/s ESL Steel Limited,** *At/PO:- Koira, Sundargarh, Odisha.*		
Nature of Sampling	**Stack Monitoring (ST)**		
Sampling By	**GFAPL's Representative**		
Location of performance of Laboratory activities	**Laboratory Permanent Facility**	**Deviation from the method (if any)**	NO
Discipline	**Chemical**	**Group**	Atmospheric Pollution
Date of Sampling	**10.03.2025**	**Date of Receiving**	**11.03.2025**
Date of Analysis	**11.03.2025**	**Date of Complete**	**15.03.2025**
Sampling Location & Coordinates	**ST- DG SET;** **Lat:** 21°58'23.31"N & **Long:** 85°15'37.17"E		
Instrument Used	**Stack monitoring Kit; Vacuum Pump; Pyrometer**		

Sl. No	Items	Testing Method	Unit	As per CPCB Standard	Result
01	Nitrogen Oxide as NOx	IS-11255(PART-7) 1985	mg/Nm3	300	64.2

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TC-12258

Report No- GFAPL/24-25/ ESLBI/087 **Issued Date-05.04.2025**

TEST REPORT

Client Name &Address	**M/s. Nadidih Iron Ore & Mn Mines (BICO),** **M/s ESL Steel Limited,** *At/PO:- Koira, Sundargarh, Odisha.*		
Nature of Sampling	**STP Water**		
Sampling By	**GFAPL's Representative**		
Environmental Condition	Good	**Sampling Method**	As per APHA 24th ED 1060 B: 2023
Location of performance of Laboratory activities	Laboratory Permanent Facility	**Deviation from the method (if any)**	NO
Discipline	Chemical	**Group**	Environment & Pollution
Date of Sampling	**10.03.2025**	**Date of Receiving**	**11.03.2025**
Date of Analysis	**11.03.2025**	**Date of Complete**	**15.03.2025**
Sampling Location & Coordinates	**STP1- Inside the ML Area (STP-Inlet);** Lat: 21.971766, Long: 85.255013; **STP2- Inside the ML Area (STP-Outlet);** Lat: 21.971749, Long: 85.255002;		

Sl. No.	Parameter	Testing Methods	Unit	Standard as per CTO	STP1	STP2
1.	**pH**	APHA 24th ED 4500- H+B:2023	--	6.5-9.0	**7.64**	**7.24**
2.	**Total Suspended Solids**	APHA 24th ED 2540-D: 2023	**mg/l**	200	**120**	**14**
3.	**Oil & Grease**	IS 3025 PART 39-1991 RA-2003	**mg/l**	--	**6.8**	**<2.0**
4.	**Biological Oxygen Demand as BOD**	IS 3025 (PART 44):1993	**mg/l**	100	**48**	**<2.0**
5.	**Chemical Oxygen Demand as COD**	APHA 24th ED 5220 B:2023	**mg/l**	--	**140**	**12**

Remarks: The Standard as per CTO is only applicable to the Discharge ie., Outlet

Reviewed By

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Report No- GFAPL/24-25/ ESLBI/087 **Issued Date-05.04.2025**

TEST REPORT

Client Name &Address	**M/s. Nadidih Iron Ore & Mn Mines (BICO),** **M/s ESL Steel Limited,** *At/PO:- Koira, Sundargarh, Odisha.*		
Nature of Sampling	**STP Water**		
Sampling By	**GFAPL's Representative**		
Environmental Condition	Good	**Sampling Method**	As per APHA 24th ED 1060 B: 2023
Location of performance of Laboratory activities	Laboratory Permanent Facility	**Deviation from the method (if any)**	NO
Discipline	Chemical	**Group**	Environment & Pollution
Date of Sampling	**10.03.2025**	**Date of Receiving**	**11.03.2025**
Date of Analysis	**11.03.2025**	**Date of Complete**	**15.03.2025**
Sampling Location & Coordinates	**STP1- Inside the ML Area (STP-Inlet);** Lat: 21.971766, Long: 85.255013; **STP2- Inside the ML Area (STP-Outlet);** Lat: 21.971749, Long: 85.255002;		

Sl. No.	Parameter	Testing Methods	Unit	Standard as per CTO	STP1	STP2
1.	**Fecal Coliform**	APHA 24th ED 9222-H: 2023	**MPN/ 100ml**	<1000	**<1.8**	**<1.8**

Remarks: The Standard as per CTO is only applicable to the Discharge ie., Outlet

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TC-12258

Report No- GFAPL/24-25/ESLBI/088 **Issued Date-05.04.2025**

TEST REPORT

Client Name &Address	***M/s. Nadidih Iron Ore Mines (BICO),*** **M/s ESL Steel Limited,** At/PO:- Koira, Sundargarh, Odisha.		
Nature of Sampling	**Surface Water (SW)**		
Sampling By	**GFAPL's Representative**		
Environmental Condition	Good	**Sampling Method**	As per APHA 24th ED 1060 B: 2023
Location of performance of Laboratory activities	Laboratory Permanent Facility	**Deviation from the method (if any)**	NO
Discipline	Chemical	**Group**	Water
Date of Sampling	**19.03.2025**	**Date of Receiving**	**20.03.2025**
Date of Analysis	**20.03.2025**	**Date of Complete**	**25.03.2025**
Sampling Location & Coordinates	**SW1: Karo River Upstreem(US); Lat:** 21°58'30.34"N & **Long:** 85°15'28.12"E **SW2: Karo River Downstreem(DS); Lat:** 21°59'35.14"N & **Long:** 85°16' 21.42"E		

Sl. No.	Parameter	Testing Methods	Unit	Standard as per IS-2296 Class-C	SW1	SW2
1.	**Colour**	IS 3025: (Part 4)- 2021	**Hazen**	300	**<5.0**	**<5.0**
2.	**Total Suspended Solid**	APHA 24th ED 2540-D: 2023	**mg/l**	--	**<1.0**	**<1.0**
3.	**pH @25^{0}C**	APHA 24th ED 4500- H+B:2023	**----**	8.5	**7.21**	**7.26**
4.	**Conductivity**	APHA 24th ED 2510-B: 2023	**µS/cm**	--	**203.1**	**212.9**
5.	**Total Dissolved Solid**	APHA 24th ED 2540-C: 2023	**mg/l**	1500	**124**	**130**
6.	**Chloride (as Cl)**	APHA 24th ED 4500- Cl-B:2023	**mg/l**	600	**16**	**17**
7.	**Cyanide (as CN)**	APHA 24th ED 4500-CN-F	**mg/l**	0.05	**<0.02**	**<0.02**
8.	**Hexavalent Chromium(asCr+6)**	APHA 24th ED 3500-Cr-B: 2023	**mg/l**	0.05	**<0.05**	**<0.05**
9.	**Iron (as Fe)**	APHA 24th ED 3500-Fe-B: 2023	**mg/l**	50	**0.36**	**0.38**
10.	**Sulfate (as SO4)**	APHA 24th ED 4500-SO4 D: 2023	**mg/l**	400	**4.9**	**5.2**
11.	**Fluoride (as F)**	APHA 24th ED 4500-F-C: 2023	**mg/l**	1.5	**0.1**	**0.15**
12.	**Oil & Grease**	IS 3025 PART 39-1991 RA-2003	**mg/l**	0.1	**<2.0**	**<2.0**
13.	**Dissolved oxygen**	APHA 24th ED 4500 O-C:2023	**mg/l**	4	**6.1**	**6.3**
14.	**BOD (3)days at 27^{0}C**	IS 3025 (PART 44): 1993 REA-2009	**mg/l**	3.0	**3**	**4.3**
15.	**Chemical Oxygen Demand as COD**	APHA 24th ED 5220 C:2023	**mg/l**	--	**18**	**22**
16.	**Manganese**	IS 3025 PART-59 :2006 RA 2012	**mg/l**	--	**0.06**	**0.08**

Reviewed By

CHIEF ANALYST
GREENFORCE ASSOCIATES PRIVATE LIMITED
BHUBANESWAR, ODISHA

Chief Analyst
Miss. Arti Sahoo

Authorized Signatory

TECHNICAL MANAGER
GREENFORCE ASSOCIATES PRIVATE LIMITED
BHUBANESWAR, ODISHA

Technical Manager
Mr. S.K. Parhi

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END OF REPORT

Plot No- 1363-3892, Baibhab Realcon, Fulnakhara,
Cuttack, Odisha, India 754001

GREEN FORCE ASSOCIATES PRIVATE LIMITED

Plot No.-1666, Phase-II, Delta Colony, Nilakantheswar Marg,
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(An ISO 14001, 9001, 45001 certified Consulting Organization & NABL Accredited Laboratory)

Report No- GFAPL/24-25/ESLBI/088 **Issued Date-05.04.2025**

TEST REPORT

Client Name &Address	*M/s. Nadidih Iron Ore Mines (BICO),* **M/s ESL Steel Limited,** At/PO:- Koira, Sundargarh, Odisha.		
Nature of Sampling	**Surface Water (SW)**		
Sampling By	**GFAPL's Representative**		
Environmental Condition	Good	**Sampling Method**	As per APHA 24th ED 1060 B: 2023
Location of performance of Laboratory activities	Laboratory Permanent Facility	**Deviation from the method (if any)**	NO
Discipline	Chemical	**Group**	Water
Date of Sampling	**19.03.2025**	**Date of Receiving**	**20.03.2025**
Date of Analysis	**20.03.2025**	**Date of Complete**	**25.03.2025**
Sampling Location & Coordinates	**SW1: Karo River Upstreem(US); Lat:** 21°58'30.34"N & **Long:** 85°15'28.12"E **SW2: Karo River Downstreem(DS); Lat:** 21°59'35.14"N & **Long:** 85°16' 21.42"E		

Sl. No.	Parameter	Testing Methods	Unit	Standard as per IS-2296 Class-C	SW1	SW2
1.	**Nitrate (as NO3)**	APHA 24th ED 4500-NO3-E: 2023	**mg/l**	50	**1.82**	**2.04**
2.	**Phenolic Compounds as C6H5OH**	APHA 24th ED 5530 B,D:2023	**mg/l**	--	**<0.001**	**<0.001**
3.	**Copper (as Cu)**	IS: 3025(Part 42)	**mg/l**	0.05	**<0.03**	**<0.03**
4.	**Lead (as Pb)**	APHA 24th ED 3500 Pb: 2023	**mg/l**	0.01	**<0.01**	**<0.01**
5.	**Zinc (as Zn)**	APHA 24th ED 3500 Zn: 2023	**mg/l**	5	**<0.03**	**<0.03**
6.	**Arsenic as As**	IS: 3025 (Part 37)	**mg/l**	--	**<0.001**	**<0.001**
7.	**Selenium (as Se)**	APHA 24th ED 3500 B: 2023	**mg/l**	0.005	**<0.001**	**<0.001**
8.	**Cadmium (as Cd)**	IS: 3025(Part 41)	**mg/l**	0.003	**<0.001**	**<0.001**
9.	**Total Coliform**	APHA 24th ED 9222-H: 2023	**MPN/ 100ml**	---	**410**	**450**

Reviewed By

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GREENFORCE ASSOCIATES PRIVATE LIMITED
BHUBANESWAR, ODISHA

Chief Analyst
Miss. Arti Sahoo

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TECHNICAL MANAGER
GREENFORCE ASSOCIATES PRIVATE LIMITED
BHUBANESWAR, ODISHA

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Report No- GFAPL/24-25/ESLBI/089 Issued Date-05.04.2025

TEST REPORT

Client Name &Address	*M/s. Nadidih Iron Ore Mines (BICO),* **M/s ESL Steel Limited,** At/PO:- Koira, Sundargarh, Odisha.		
Nature of Sampling	**Surface Water (SW)**		
Sampling By	**GFAPL's Representative**		
Environmental Condition	Good	**Sampling Method**	As per APHA 24th ED 1060 B: 2023
Location of performance of Laboratory activities	Laboratory Permanent Facility	**Deviation from the method (if any)**	NO
Discipline	Chemical	**Group**	Water
Date of Sampling	**19.03.2025**	**Date of Receiving**	**20.03.2025**
Date of Analysis	**20.03.2025**	**Date of Complete**	**25.03.2025**
Sampling Location & Coordinates	**SW3: Topadih;** **Lat:** 21°59' 42.97"N, **Long:** 85°18' 13.97"E		

Sl. No.	Parameter	Testing Methods	Unit	Standard as per IS-2296 Class-C	SW3
1.	**Colour**	IS 3025: (Part 4)- 2021	**Hazen**	300	**<5.0**
2.	**Total Suspended Solid**	APHA 24th ED 2540-D: 2023	**mg/l**	--	**<1.0**
3.	**pH @25^{0}C**	APHA 24th ED 4500- H+B:2023	---	8.5	**7.25**
4.	**Conductivity**	APHA 24th ED 2510-B: 2023	**µS/cm**	--	**224.1**
5.	**Total Dissolved Solid**	APHA 24th ED 2540-C: 2023	**mg/l**	1500	**134**
6.	**Chloride (as Cl)**	APHA 24th ED 4500- Cl-B:2023	**mg/l**	600	**19**
7.	**Cyanide (as CN)**	APHA 24th ED 4500-CN-F	**mg/l**	0.05	**<0.02**
8.	**Hexavalent Chromium(asCr+6)**	APHA 24th ED 3500-Cr-B: 2023	**mg/l**	0.05	**<0.05**
9.	**Iron (as Fe)**	APHA 24th ED 3500-Fe-B: 2023	**mg/l**	50	**0.39**
10.	**Sulfate (as SO4)**	APHA 24th ED 4500-SO4 D: 2023	**mg/l**	400	**7.4**
11.	**Fluoride (as F)**	APHA 24th ED 4500-F-C: 2023	**mg/l**	1.5	**0.2**
12.	**Oil & Grease**	IS 3025 PART 39-1991 RA-2003	**mg/l**	0.1	**<2.0**
13.	**Dissolved oxygen**	APHA 24th ED 4500 O-C:2023	**mg/l**	4	**6.1**
14.	**BOD (3)days at 27^{0}C**	IS 3025 (PART 44): 1993 REA-2009	**mg/l**	3.0	**4.9**
15.	**Chemical Oxygen Demand as COD**	APHA 24th ED 5220 C:2023	**mg/l**	--	**24**
16.	**Manganese**	IS 3025 PART-59 :2006 RA 2012	**mg/l**	--	**0.1**

Reviewed By

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BHUBANESWAR, ODISHA

Chief Analyst
Miss. Arti Sahoo

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TECHNICAL MANAGER
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Report No- GFAPL/24-25/ESLBI/089 **Issued Date-05.04.2025**

TEST REPORT

Client Name &Address	*M/s. Nadidih Iron Ore Mines (BICO),* **M/s ESL Steel Limited,** At/PO:- Koira, Sundargarh, Odisha.		
Nature of Sampling	**Surface Water (SW)**		
Sampling By	**GFAPL's Representative**		
Environmental Condition	Good	**Sampling Method**	As per APHA 24th ED 1060 B: 2023
Location of performance of Laboratory activities	Laboratory Permanent Facility	**Deviation from the method (if any)**	NO
Discipline	Chemical	**Group**	Water
Date of Sampling	**19.03.2025**	**Date of Receiving**	**20.03.2025**
Date of Analysis	**20.03.2025**	**Date of Complete**	**25.03.2025**
Sampling Location & Coordinates	**SW3: Topadih;** **Lat:** 21°59' 42.97"N, **Long:** 85°18' 13.97"E		

Sl. No.	Parameter	Testing Methods	Unit	Standard as per IS-2296 Class-C	SW3
1.	**Nitrate (as NO3)**	APHA 24th ED 4500-NO3-E: 2023	**mg/l**	50	**2.84**
2.	**Phenolic Compounds as C6H5OH**	APHA 24th ED 5530 B,D:2023	**mg/l**	--	**<0.001**
3.	**Copper (as Cu)**	IS: 3025(Part 42)	**mg/l**	0.05	**<0.03**
4.	**Lead (as Pb)**	APHA 24th ED 3500 Pb: 2023	**mg/l**	0.01	**<0.01**
5.	**Zinc (as Zn)**	APHA 24th ED 3500 Zn: 2023	**mg/l**	5	**<0.03**
6.	**Arsenic as As**	IS: 3025 (Part 37)	**mg/l**	--	**<0.001**
7.	**Selenium (as Se)**	APHA 24th ED 3500 B: 2023	**mg/l**	0.005	**<0.001**
8.	**Cadmium (as Cd)**	IS: 3025(Part 41)	**mg/l**	0.003	**<0.001**
9.	**Total Coliform**	APHA 24th ED 9222-H: 2023	**MPN/ 100ml**	---	**510**

Reviewed By

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TC-12258

Report No- GFAPL/24-25/ESLBI/090 **Issued Date-05.04.2025**

TEST REPORT

Client Name &Address	***M/s. Nadidih Iron Ore Mines (BICO),*** **M/s ESL Steel Limited,** At/PO:- Koira, Sundargarh, Odisha.		
Nature of Sampling	**Mines Discharge Water**		
Sampling By	**GFAPL's Representative**		
Environmental Condition	Good	**Sampling Method**	As per APHA 24th ED 1060 B: 2023
Location of performance of Laboratory activities	Laboratory Permanent Facility	**Deviation from the method (if any)**	NO
Discipline	Chemical	**Group**	Water
Date of Sampling	**19.03.2025**	**Date of Receiving**	**20.03.2025**
Date of Analysis	**20.03.2025**	**Date of Complete**	**25.03.2025**
Sampling Location & Coordinates	**Mines Discharge;**		

Sl. No.	Parameter	Testing Methods	Unit	Standard as per CTO	Result
1.	**Colour**	IS 3025: (Part 4)- 2021	**Hazen**	--	**<5.0**
2.	**Total Suspended Solid**	APHA 24th ED 2540-D: 2023	**mg/l**	100	**<1.0**
3.	**pH @25^{0}C**	APHA 24th ED 4500- H+B:2023	**---**	5.5-9.0	**7.78**
4.	**Conductivity**	APHA 24th ED 2510-B: 2023	**µS/cm**	--	**309.1**
5.	**Total Dissolved Solid**	APHA 24th ED 2540-C: 2023	**mg/l**	--	**186**
6.	**Chloride (as Cl)**	APHA 24th ED 4500- Cl-B:2023	**mg/l**	--	**31**
7.	**Cyanide (as CN)**	APHA 24th ED 4500-CN-F	**mg/l**	--	**<0.02**
8.	**Hexavalent Chromium(asCr+6)**	APHA 24th ED 3500-Cr-B: 2023	**mg/l**	--	**<0.05**
9.	**Iron (as Fe)**	APHA 24th ED 3500-Fe-B: 2023	**mg/l**	--	**0.42**
10.	**Sulfate (as SO4)**	APHA 24th ED 4500-SO4 D: 2023	**mg/l**	--	**12.8**
11.	**Fluoride (as F)**	APHA 24th ED 4500-F-C: 2023	**mg/l**	--	**0.22**
12.	**Oil & Grease**	IS 3025 PART 39-1991 RA-2003	**mg/l**	10	**<2.0**
13.	**Dissolved oxygen**	APHA 24th ED 4500 O-C:2023	**mg/l**	--	**6.8**
14.	**BOD (3)days at 27^{0}C**	IS 3025 (PART 44): 1993 REA-2009	**mg/l**	--	**7.2**
15.	**Chemical Oxygen Demand as COD**	APHA 24th ED 5220 C:2023	**mg/l**	--	**26**
16.	**Manganese**	IS 3025 PART-59 :2006 RA 2012	**mg/l**	--	**0.24**

Reviewed By

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Report No- GFAPL/24-25/ESLBI/090 **Issued Date-05.04.2025**

TEST REPORT

Client Name &Address	***M/s. Nadidih Iron Ore Mines (BICO),*** **M/s ESL Steel Limited,** At/PO:- Koira, Sundargarh, Odisha.		
Nature of Sampling	**Mines Discharge Water**		
Sampling By	**GFAPL's Representative**		
Environmental Condition	Good	**Sampling Method**	As per APHA 24th ED 1060 B: 2023
Location of performance of Laboratory activities	Laboratory Permanent Facility	**Deviation from the method (if any)**	NO
Discipline	Chemical	**Group**	Water
Date of Sampling	**19.03.2025**	**Date of Receiving**	**20.03.2025**
Date of Analysis	**20.03.2025**	**Date of Complete**	**25.03.2025**
Sampling Location & Coordinates	**Mines Discharge;**		

Sl. No.	Parameter	Testing Methods	Unit	Standard as per CTO	Result
1.	**Nitrate (as NO3)**	APHA 24th ED 4500-NO3-E: 2023	**mg/l**	--	**4.52**
2.	**Phenolic Compounds as C6H5OH**	APHA 24th ED 5530 B,D:2023	**mg/l**	--	**<0.001**
3.	**Copper (as Cu)**	IS: 3025(Part 42)	**mg/l**	--	**0.12**
4.	**Lead (as Pb)**	APHA 24th ED 3500 Pb: 2023	**mg/l**	--	**<0.01**
5.	**Zinc (as Zn)**	APHA 24th ED 3500 Zn: 2023	**mg/l**	--	**0.18**
6.	**Arsenic as As**	IS: 3025 (Part 37)	**mg/l**	--	**<0.001**
7.	**Selenium (as Se)**	APHA 24th ED 3500 B: 2023	**mg/l**	--	**<0.001**
8.	**Cadmium (as Cd)**	IS: 3025(Part 41)	**mg/l**	--	**<0.001**
9.	**Total Coliform**	APHA 24th ED 9222-H: 2023	**MPN/ 100ml**	--	**450**

Reviewed By **Authorized Signatory**

CHIEF ANALYST
GREENFORCE ASSOCIATES PRIVATE LIMITED
BHUBANESWAR, ODISHA

Chief Analyst
Miss. Arti Sahoo

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TC-12258

Report No- GFAPL/24-25/ESLBI/091 **Issued Date-05.04.2025**

TEST REPORT

Client Name &Address	**M/s. Nadidih Iron Ore & Mn Mines (BICO)** ***M/s ESL Steel Limited,*** *At/PO:- Koira, Sundargarh, Odisha*		
Nature of Sampling	**Ambient Air Quality Monitoring (AAQ)**		
Sampling By	**GFAPL's Representative**		
Environmental Condition	Good	**Sampling Method**	As per IS: 5182
Location of performance of Laboratory activities	Laboratory Permanent Facility	**Deviation from the method (if any)**	NO
Discipline	Chemical	**Group**	Atmospheric Pollution
Instrument Used	**Respirable Dust Sampler, Fine Particulate Dust Sampler**		

Location Code	Sampling Location	Date of Sampling	O3 (µg/m³)	NH3 (µg/m³)
AAQ-1	Near Mine Office;	17.03.2025	9.6	23.2
AAQ-2	Near Mine In Gate;	17.03.2025	11.6	25.6
AAQ-3	Village Kenduhidi;	17.03.2025	<8.0	<20.0
AAQ-4	Village Badipada;	17.03.2025	<8.0	<20.0
AAQ-5	Village Jhirapani;	19.03.2025	<8.0	<20.0
AAQ-6	Village Kashira;	19.03.2025	<8.0	<20.0
	NAAQ* Standard		100	400
	Methods of Analysis		IS:5182 (Part-9)	IS:5182 (Part-25)

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Report No- GFAPL/24-25/ESLBI/091 **Issued Date-05.04.2025**

TEST REPORT

Client Name &Address	**M/s. Nadidih Iron Ore & Mn Mines (BICO)** ***M/s ESL Steel Limited,*** *At/PO:- Koira, Sundargarh, Odisha.*		
Nature of Sampling	**Ambient Air Quality Monitoring (AAQ)**		
Sampling By	**GFAPL's Representative**		
Environmental Condition	Good	**Sampling Method**	As per IS: 5182
Location of performance of Laboratory activities	Laboratory Permanent Facility	**Deviation from the method (if any)**	NO
Discipline	Chemical	**Group**	Atmospheric Pollution
Instrument Used	**Respirable Dust Sampler, Fine Particulate Dust Sampler**		

Location Code	Sampling Location	Date of Sampling	Pb (µg/m³)	Ni (ng/m³)	As (ng/m³)	C6H6 (µg/m³)	BaP (ng/m³)
AAQ-1	Near Mine Office;	17.03.2025	<0.06	<0.6	<0.44	<5	<1
AAQ-2	Near Mine In Gate;	17.03.2025	<0.06	<0.6	<0.44	<5	<1
AAQ-3	Village Kenduhidi;	17.03.2025	<0.06	<0.6	<0.44	<5	<1
AAQ-4	Village Badipada;	17.03.2025	<0.06	<0.6	<0.44	<5	<1
AAQ-5	Village Jhirapani;	19.03.2025	<0.06	<0.6	<0.44	<5	<1
AAQ-6	Village Kashira;	19.03.2025	<0.06	<0.6	<0.44	<5	<1
NAAQ* Standard			1	20	6	5	1
Methods of Analysis			IS:5182 (Part-22)	IS:5182 (Part-26)	As per CPCB method followed by AAS	IS:5182 (Part-11)	IS:5182 (Part-12)

Reviewed By

CHIEF ANALYST
GREENFORCE ASSOCIATES PRIVATE LIMITED
BHUBANESWAR, ODISHA

Chief Analyst
Miss. Arti Sahoo

Authorized Signatory

TECHNICAL MANAGER
GREENFORCE ASSOCIATES PRIVATE LIMITED
BHUBANESWAR, ODISHA

Technical Manager
Mr. S.K. Parhi

Note:

- The results listed refer only to tested samples and applicable parameters Endorsement of products is neither inferred nor implied.
- Total liability of our lab is limited to the invoiced amount.
- Samples will be destroyed after 30 days from the date of test report unless otherwise specified.
- This report is not to be reproduced wholly or in part and cannot be used as evidence in the court of law and should not be used in any advertising media without our special permission in writing.
- Report refers to the sample submitted to us and not drawn by unless mentioned otherwise.

END OF REPORT

Plot No- 1363-3892, Baibhab Realcon, Fulnakhara,
Cuttack, Odisha, India 754001

GREEN FORCE ASSOCIATES PRIVATE LIMITED

Plot No.-1666, Phase-II, Delta Colony, Nilakantheswar Marg,
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Mail Id: greenforceassociates@gmail.com

(An ISO 14001, 9001, 45001 certified Consulting Organization & NABL Accredited Laboratory)

Report No- GFAPL/24-25/ESLBI/091 **Issued Date-05.04.2025**

TEST REPORT

Client Name &Address	**M/s. Nadidih Iron Ore & Mn Mines (BICO)** ***M/s ESL Steel Limited,*** *At/PO:- Koira, Sundargarh, Odisha.*		
Nature of Sampling	**Ambient Air Quality Monitoring (AAQ)**		
Sampling By	**GFAPL's Representative**		
Environmental Condition	Good	**Sampling Method**	As per IS: 5182
Location of performance of Laboratory activities	Laboratory Permanent Facility	**Deviation from the method (if any)**	NO
Discipline	Chemical	**Group**	Atmospheric Pollution
Instrument Used	**Respirable Dust Sampler, Fine Particulate Dust Sampler**		

Location Code	Sampling Location	Date of Sampling	Free Silica ($\mu g/m^3$)
AAQ-1	Near Mine Office;	17.03.2025	<2.0
AAQ-2	Near Mine In Gate;	17.03.2025	<2.0
AAQ-3	Village Kenduhidi;	17.03.2025	<2.0
AAQ-4	Village Badipada;	17.03.2025	<2.0
AAQ-5	Village Jhirapani;	19.03.2025	<2.0
AAQ-6	Village Kashira;	19.03.2025	<2.0
	Methods of Analysis		**NIOSH Method 7500 by X-Ray Diffraction**

Reviewed By **Authorized Signatory**

CHIEF ANALYST
GREENFORCE ASSOCIATES PRIVATE LIMITED
BHUBANESWAR, ODISHA

Chief Analyst
Miss. Arti Sahoo

TECHNICAL MANAGER
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BHUBANESWAR, ODISHA

Technical Manager
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END OF REPORT

Plot No- 1363-3892, Baibhab Realcon, Fulnakhara,
Cuttack, Odisha, India 754001

Comprehensive Hydrogeological Report for Nadidihi Iron Ore Mine of ESL Steel Limited, Sundargarh District, Odisha

Report Prepared for

ESL Steel Limited



Report Prepared by

srk consulting®

September 2024

Comprehensive Hydrogeological Report for Nadidihi Iron Ore Mine of ESL Steel Limited, Sundargarh District, Odisha

ESL Steel Limited

Nadidihi Iron Ore Mine
Nadikasira and Rengalbeda Village
Tehsil & PO Koira, District Sundargarh
Odisha - 770048

SRK Mining Services (India) Private Limited

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SRK Project Number IN1159

September 2024

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Appendix I: Plates of Mine Development Plan

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List of Abbreviations

Abbreviation	Description
aMSL	Above Mean Sea Level
BDL	Below Detection Level
BGL	Below Ground Level
BHJ	Banded Hematite Jasper
BHQ	Banded Hematite Quartzite
BOD	Biochemical Oxygen Demand
CDT	Constant Discharge Test
CGWA	Central Ground Water Authority
CGWB	Central Ground Water Board
COD	Chemical Oxygen Demand
CTE	Consent to Establish
DEM	Digital Elevation Model
DWLR	Digital Water Level Recorder
EC	Electrical Conductivity
ETP	Effluent Treatment Plant
GW	Ground Water
GWRA	Ground Water Resource Assessment
Ha	Hectare
hp	Horsepower
hr	Hour
IMD	Indian Meteorological Department
IOG	Iron Ore Group
IS	Indian Standard
KL	Kilo Litre
KLD	Kilo Litre per Day
km	Kilometer
lpcd	Litres Per Capita Per Day
lps	Litres per second
LULC	Land Use and Land Cover
m	Meter
mBGL	Meter Below Ground Level
ML	Mining Lease
mm	Millimetre
MoEF & CC	Ministry of Environment, Forest and Climate Change
MSL	Mean Sea Level
MTPA	Million Tonnes Per Annum
NE	Northeast
NOC	No Objection Certificate
NW	Northwest
OC	Open Cast

Abbreviation	Description
PR	Project Report
RGI	Rajiv Gandhi National Ground Water Training & Research Institute
RH	Relative Humid
ROM	Run of Mine
RWH	Rainwater Harvesting
SC	Singhbhum Craton
SE	Southeast
SHL	Shale
SOI	Survey of India
SRTM	Shuttle Radar Topography Mission
STP	Sewage Treatment Plant
SW	Southwest
TDS	Total Dissolved Solid
TH	Total Hardness
TSS	Total Suspended Solid
VES	Vertical Electrical Sounding

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Comprehensive Hydrogeological Report for Nadidihi Iron Ore Mine of ESL Steel Limited, Sundargarh District, Odisha

1. SALIENT FEATURES OF THE PROPOSAL

The basic information regarding the study is presented in the following Table 1-1.

Table 1-1: Salient Features of the Proposal

Sl. No.	Particulars	Information
1.	Application No.	21-4/2146/OR/MIN/2018
2.	Submission Date	16.02.2024
3.	Fresh or Renewal	Renewal
4.	Existing or New/ Proposed	Existing
5.	If Renewal, date of validity of existing/ last NOC	24.01.2021
6.	CTE issued date	22.11.2023
7.	Name of Project with Address	Nadidihi Iron Ore Mine of ESL Steel Limited, Nadidihi Tehsil and PO Koira, District Sundargarh Odisha 770048
8.	State	Odisha
9.	District	Sundargarh
10.	Block/ Taluka	Koira
11.	Category of Block/ Taluka (as per prevailing GWRE)	Safe
12.	Quantum of GW applied (KLD)	2,864
13.	Quantum of GW applied (m^3/Year)	10,45,360
14.	Alluvium/ Non-alluvium	Non-alluvium
15.	GW Modelling Required (Yes/ No)	Yes
16.	Name of Authorized Signatory of Project & Designation	BISWANATH SAHOO Head Technical Services Nadidihi Iron Ore Mines, ESL Steel Limited

Sl. No.	Particulars	Information
17.	Consultant Details with Name of Authorized Signatory (If Institution)	RIJUMON DASGUPTA Consultant - Hydrogeology SRK Mining Services (India) Pvt. Ltd.
18.	In case the report is prepared jointly by accredited Institute and Individual consultant, name/details of chapters prepared by the Individual consultant	The Groundwater Modelling Report has been prepared as a separate report by Individual Consultant Mr. Baddela Jaya Kumar (bilateral MOU signer with SRK Consulting), having CGWA accreditation certificate no. CGWA/RGI/019
19.	Accreditation Certificate No. and Date/ Validity (In case jointly as per Point No. 14, No. and validity of both institution and individual are to be given)	**SRK Consulting** • Certificate No.: CGWA/RGI/006 • Date of Accreditation: 07.07.2021 • Validity upto: 14.02.2026 **Baddela Jayakumar** • Certificate No.: CGWA/RGI/019 • Date of Accreditation: 07.07.2021 • Validity upto: 14.02.2026

2. ABOUT THE PROJECT

ESL Steel Limited (hereinafter referred to as 'ESL' or 'Client'), part of the Vedanta group - a globally diversified metals and mining company, is an Integrated Steel Producer incorporated in 2006 as a Public Limited Company with operations in Bokaro, Jharkhand, India. ESL acquired Nadidihi Iron Ore Mine (hereinafter referred to as 'NIOM') in Nadikasira and Rengalbeda village, Koira tehsil of Sundargarh district, Odisha through the auction process as per Mineral (Auction) Rules 2015. Subsequently, Mine Lease (ML) deed was executed with Govt. of Odisha on 20 November 2021 (Appendix B). The previous lessee of the ML was Bonai Industrial Co. Ltd. (BICO), whose ML period ended on 31 March 2020. The new lease deed has been executed over an area of 74.5 Ha.

As per the Environmental Clearance the total mining lease area of 74.5 Ha comprises of 63.021 Ha forest land and 11.479 Ha of non-forest land. The Environmental Clearance (EC) was from MoEF & CC, Govt. of India (Ref No J-11015/135/2012-IA.II(M) dated 18 June 2019). The mine authority received the renewal Consent Order (CTO) approved by State Pollution Control Board, Odisha (Consent Order No. 4390 dated 28.03.2024) with production level at 3.49 MTPA (Appendix C).

The last CGWA NOC (Appendix D) for ground water withdrawal was issued to the previous lessee on 04 February 2019, which expired on 24 January 2021 (CGWA/NOC/MIN/ORIG/2019/4741). As per the previous NOC, ground water withdrawal was permitted at 73,000 m^3/year through 3 bore wells and 9,000 m^3/year through dewatering from mine pits, totalling maximum of 82,000 m^3/year (225 m^3/day) ground water withdrawal. This comprehensive hydrogeological study has been conducted for the renewal of NOC.

The Comprehensive Hydrogeological Study for Nadidihi Iron Ore Mine encompasses the Hydrogeological conditions of core zone of 2 km radius and buffer zone of 10 km radius around the mine and assessment of impact on the ground water regime for withdrawal for ground water and mining activity. The report has been prepared following the CGWA new guidelines and Standard Operating Procedures for preparation of Impact Assessment Report and Comprehensive Hydrogeological Report published by Ministry of Jal Shakti, Central Ground Water Authority (May 2023).

Location and accessibility

The Nadidihi Iron Ore Mine is located in village Nadikasira and Rengalbeda of Koira tehsil, Sundargarh District, Odisha (Figure 2-1). The mine lease is located between latitude 21.96471616° N to 21.97361998° N and longitude 85.25820042° E to 85.26950323° E which falls in the Survey of India Topo sheet No. 73G/5, and new Open Series Map Sheet No. F45N5.

The Mine is situated around 8 km NE of Koira, and 131 km from Rourkela, by the side of the Barbil-Koira-Rourkela National Highway-520. The highway is around 200m away from the southern ML boundary. Nearest railway siding is Barsuan. The nearest railway station Barbil is 24 km away from the ML. Figure 2-1 shows the location of the study area.

The summary of scope of work as per Work Order (Appendix A) to fulfil the study objective are as follows:

- Collection and Review of all existing data/ reports on geology/ hydrology/ hydrogeology and satellite imageries for preparation of maps and preliminary hydrogeological assessment.
- Detailed field investigation for primary data collection including well inventory, walk over surveys to validate the topography and understand about geological setup, hydrogeological setup, geomorphology, drainage and LULC of the study area.
- Assessment of Ground water situation in and around the project area including water level and quality data and preparation of maps.

- Estimation of Mine seepage as per data collected from mines and preparation of Mine water management plan.
- Review and assessment of existing water abstraction structures, piezometers and water harvesting and replenishment structures.
- Comprehensive assessment of the impact on the ground water regime in and around the project area highlighting the risks and proposed management strategies proposed to overcome any significant environmental issues.
- Review of existing facility for water conservation which include recycling, reuse, treatment, etc. and assessment for further measures to be adopted to reduce/ reuse/ save ground water usage.
- Any other details pertaining to the project.

The Mine falls in Koira block of Sundargarh district, Odisha. As per CGWB assessment (Block wise Ground Water Resource Assessment 2022), the block is categorized as 'Safe'. The Block map of the study area is presented in Figure 2-2.

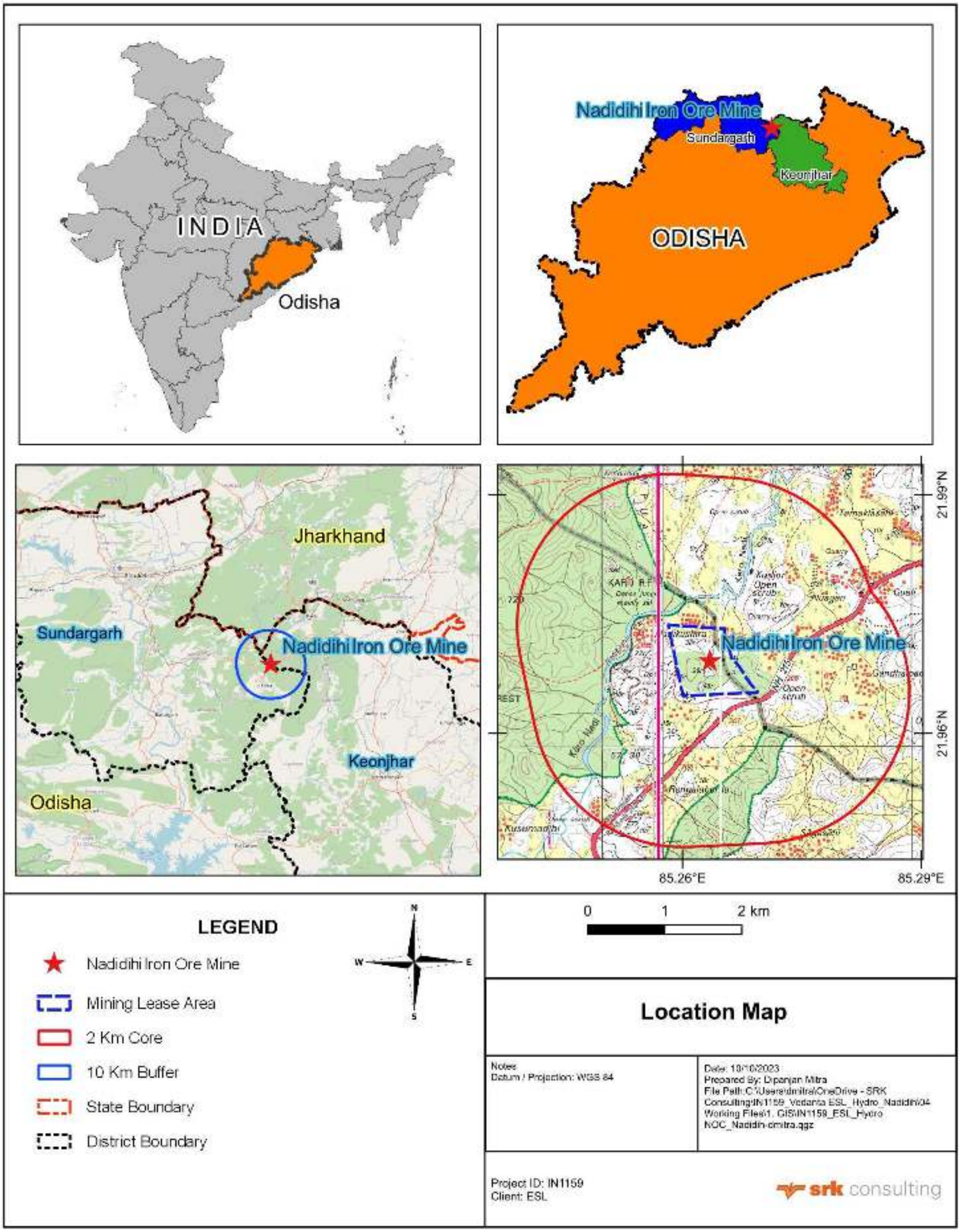


Figure 2-1: Location Map of the Study Area

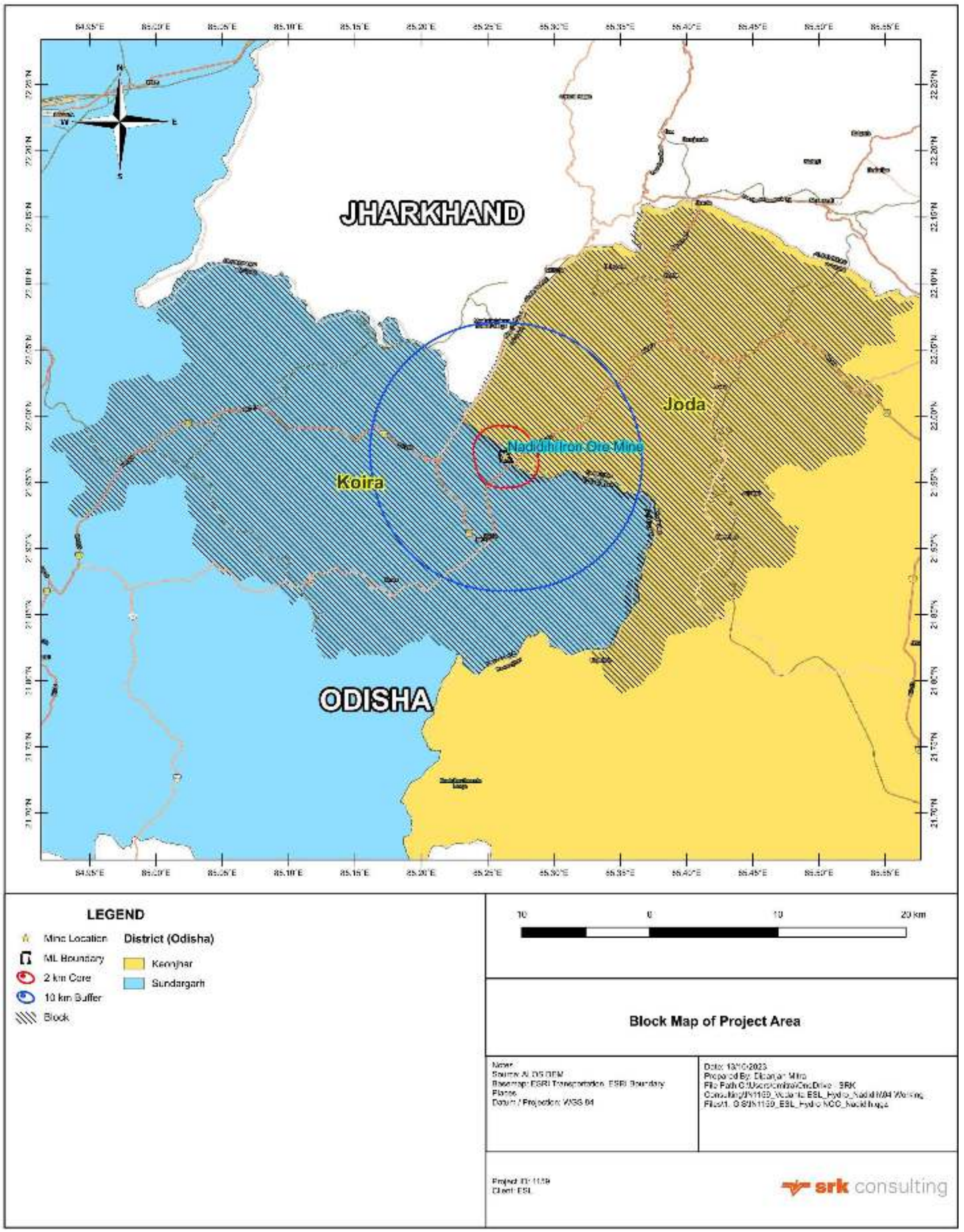


Figure 2-2: Block Map of the Project Area

2.1. Land Use/ Land Cover of the Surrounding Area

The Land Use and Land Cover (LULC) pattern considering 10 km buffer zone around the mine area for 2022 was mapped and interpreted using ESA Sentinel-2 imagery having 10m resolution. Other collateral data as available in the form of maps, charts, census records, other reports and Survey of India (SOI) topographical maps were also consulted for validation along with ground truthing to verify and confirm the ground features. Each feature was identified on image by their image elements like tone, texture, color, shape, size, pattern, and association. The LULC were classified into seven major classes for the analysis. Land use and land cover details in the buffer area are presented in Table 2-1.

The study area in 10km buffer mostly consists of forest with dense vegetation which covers around 73% of the total area. Rangeland occupies a considerable portion with a coverage of around 17%. It is defined as open regions covered with uniform grasses with little or no taller flora, a mix of small groups of plants distributed throughout a landscape with exposed soil or rock, and scrub-filled clearings inside forests. Agricultural land covers around 8% of the study area. Total built up area is around 2%, along with water bodies constitute for only about 0.23%. It indicates that maximum areas within 10 km buffer of the mine allows ground water recharge through the natural land covers.

Table 2-1: Land Use Land Cover Pattern

Sl. No.	Category	Area Covered in 2022 (km^2)	Percentage in 2022 (%)
1	Water	0.77	0.23
2	Forest/ Trees	240.79	73.11
3	Flooded Vegetation	0.09	0.03
4	Crops	25.91	7.87
5	Built Area	5.71	1.73
6	Bare ground	0.05	0.01
7	Rangeland	56.05	17.02
TOTAL		**329.36**	**100.00**

The Figure 2-3 shows the percentage distribution of major LULC categories in the study area and LULC map prepared from satellite image is presented in Figure 2-4.

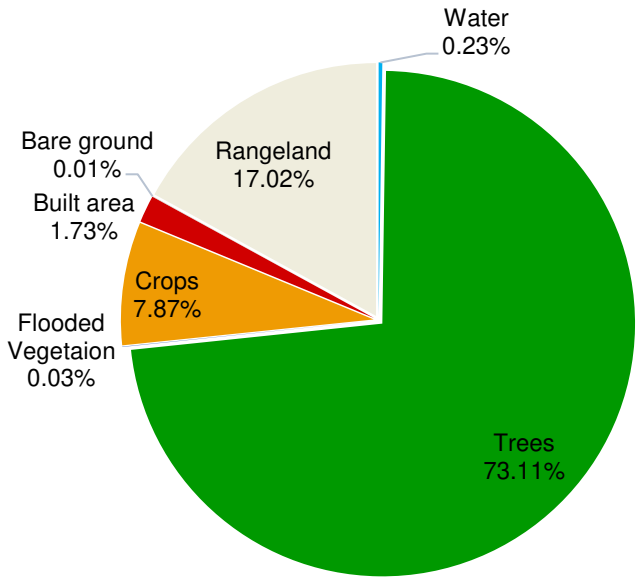


Figure 2-3: Major LULC Classification of the Study Area (2022)

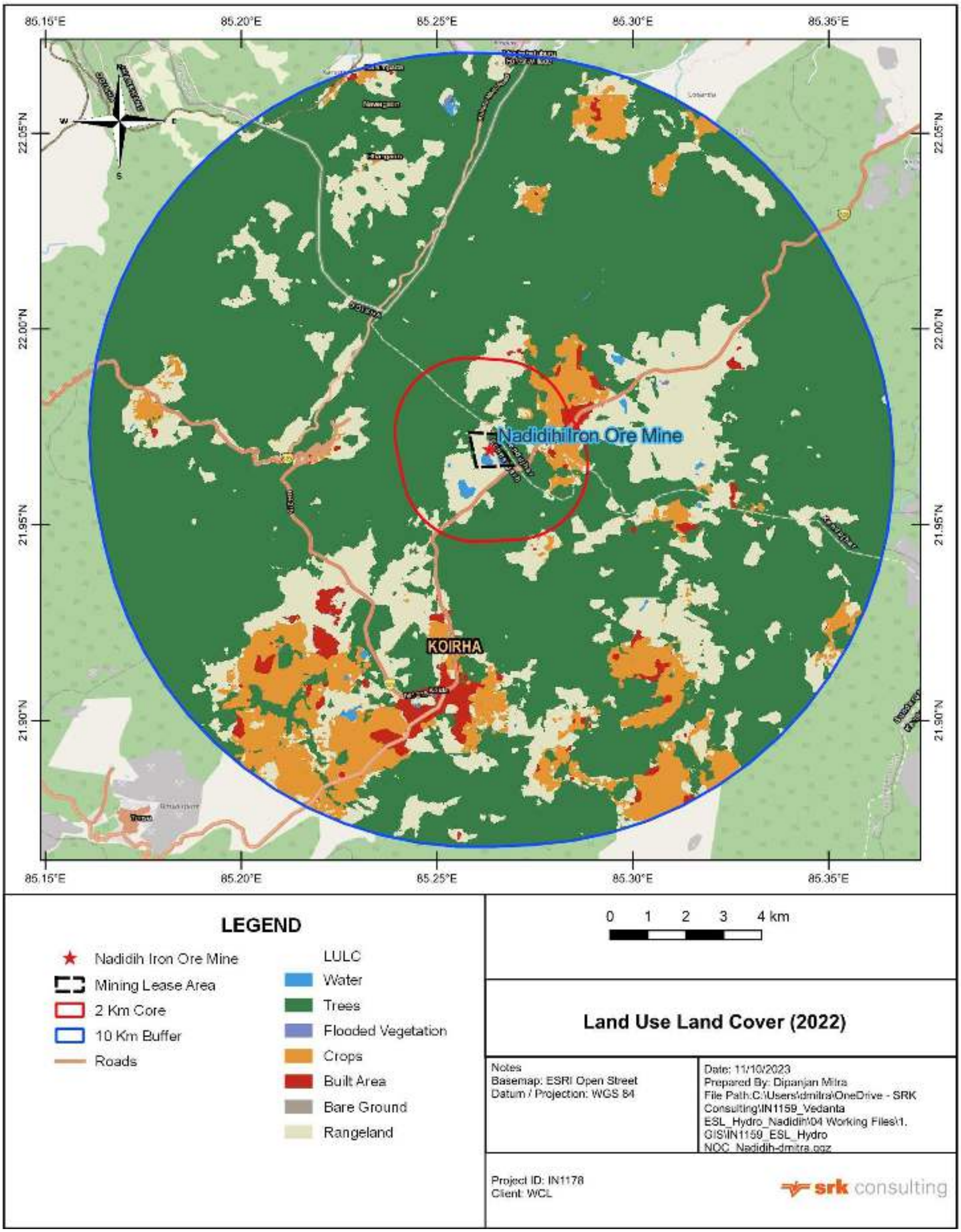


Figure 2-4: LULC Map of the Study Area (2022)

The entire mining lease area of 74.5 Ha comprises of 63.021 Ha Forest land and 11.479 Ha of non-forest land. Green belt has been developed in 2.738 Ha along the safety zone area and over the dump slope. The mine has two active pits, having total 34.782 Ha pit area as per the approved mine plan.

The existing land use details within project ML area as per shared survey data of 30 June 2023 is summarised in the following Table 2-2.

Table 2-2: Existing Land Use Details within Project Area

Sl. No.	Category	Area (m^2)	Area (Ha)	Percentage
1	Area under Mining	3,47,820	34.782	46.69%
2	Overburden / Waste Dumping	1,41,190	14.119	18.95%
3	Mineral Storage	1,43,850	14.385	19.31%
4	Infrastructure (Workshop, Administrative Building etc.)	1,800	0.180	0.24%
5	Roads	29,930	2.993	4.02%
6	Tailing Pond	20,970	2.097	2.81%
7	Beneficiation Plant	15,470	1.547	2.08%
8	Safety Zone	27,380	2.738	3.68%
9	Environment measures (Garland Drain, Retaining Wall, Plantation, Settling ponds etc.)	16,600	1.660	2.23%
	TOTAL	**7,45,000**	**74.50**	**100.00%**

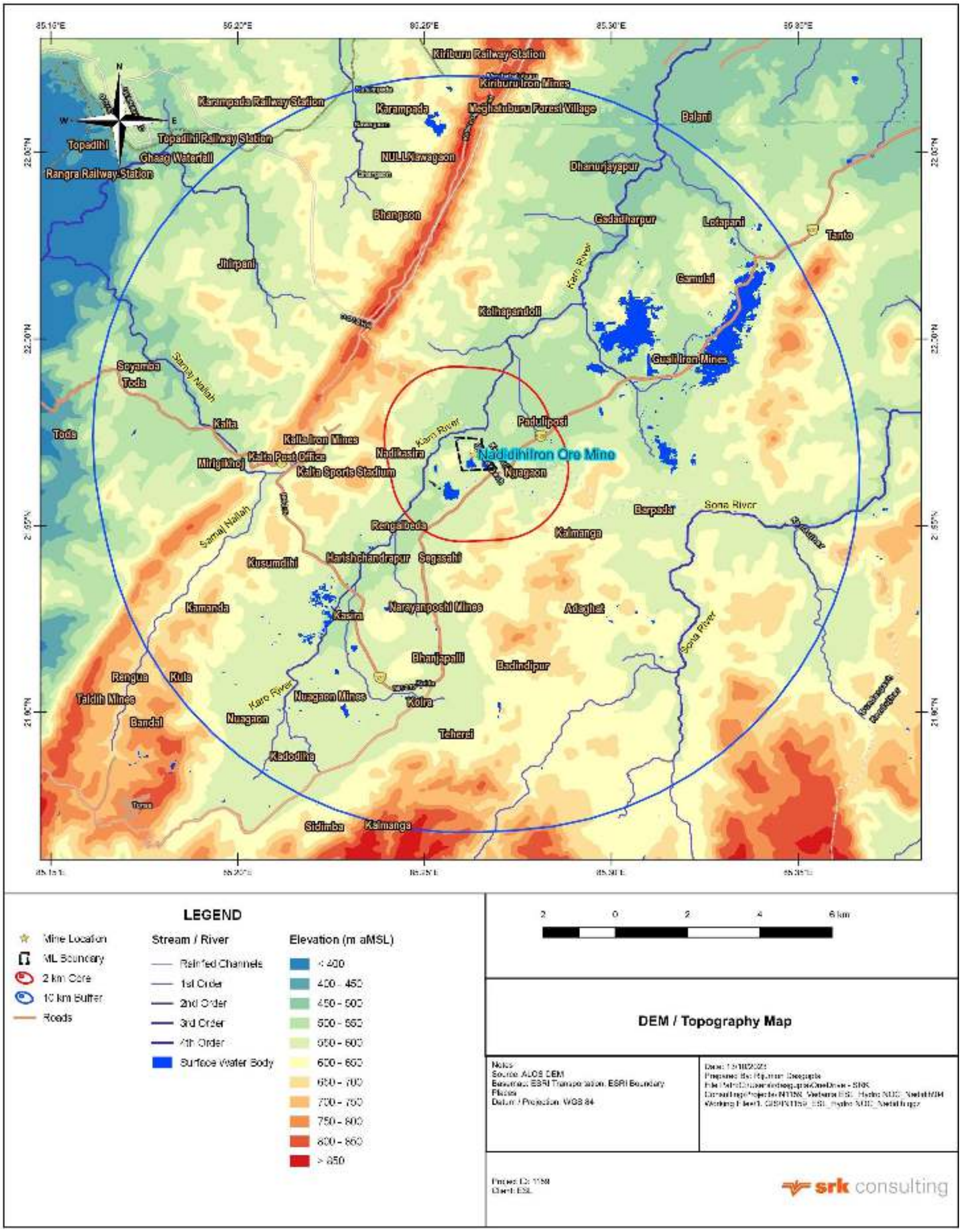
2.2. DEM / Topography

Topography of the study area and its surrounding 2 km core and 10 km buffer zone were studied by processing Digital Elevation Model. Digital Elevation Model (DEM) was derived from ALOS PALSAR Dem data of 12.5 m resolution.

Elevation of the area lies within a range of 400 – 900 m aMSL and gradually decreasing from southwest to northeast direction i.e., overall slope is towards northeast ward. Maximum part of the study area is covered by hillocks and valleys. The elevation of valleys part ranges between 400-500 m aMSL. The elevation of hillocks area is relatively high at about more than 800 m aMSL and it gradually slopes towards valley areas. The study area is mainly covered by Shale and Banded Iron Formation of Iron Ore Group (IOG) of Noamundi-Jamda-Koira belt. Topography of the area is shown in the following Figure 2-5. The topography of the study area has influence on the drainage pattern of the study area. A hill range occurs along the central part of the study area strikes roughly NE-SW.

The mine area is more or less flat terrain with a few hillocks, the highest one is with 636.1 mRL in the NW part and lowest is at 507.6 mRL. The present relief of the locality is being controlled by the erosion resistant rocks presently exposed at the surface. Southern flank of the hill is more inclined in comparison with the northern flank. The south-eastern corner of the area shows a minor trough filled up with recent alluvial sediments.

The present land use indicates that the landscape over an area of 71.763 ha of the total ML area has already changed its natural topography.



LEGEND

- Mine Location
- ML Boundary
- 2 km Core
- 10 km Buffer
- Roads

Stream / River

- Rainfed Channels
- 1st Order
- 2nd Order
- 3rd Order
- 4th Order
- Surface Water Body

Elevation (m aMSL)

- < 400
- 400 - 450
- 450 - 500
- 500 - 550
- 550 - 600
- 600 - 650
- 650 - 700
- 700 - 750
- 750 - 800
- 800 - 850
- > 850

DEM / Topography Map

Notes
Source: ALOS DEM
Datum / Projection: WGS 84

srk consulting

Figure 2-5: DEM of the Study Area

2.3. Geomorphology and Drainage

2.3.1. Geomorphology

Geomorphology and geological structures play a crucial role in identification of groundwater potential. The study area falls in the Sundargarh and Keonjhar district of Odisha. Majority of the study area lies within the Jamda-Koira basin of Iron Ore Supergroup exhibits a diverse landscape characterized by ridges and valleys of structural and denudational origin, pediment-pediplain complex, Quarry and mine dump, and some anthropogenic terrain etc. Major part of the study area covered by moderately dissected hills and intermontane valleys. The highly and moderately dissected hills and valleys are structural origin and low dissected hills, and valleys are denudational origin. Pediment pediplain complex are mainly denudational origin. Geomorphological features were obtained from Bhukosh portal of Geological Survey of India. The details of major hydro-geomorphological unis are as following:

Structural hills

This type of units within study area are mainly developed in Iron ore group of rocks with complex folding. The occurrence of ground water within this type of formation are primarily structurally controlled and facilitates ground water infiltration. These formations are occupied major part of the study area with moderate to high relief and often traversed by prominent lineaments. These units facilitate infiltration through joints/ fractures and act as runoff zone. The ground water prospect in these units remains low.

Denudational hills

These types of formation have undergone through weathering and denudation process and are still under active weathering and denudation. These are restricted to granitic terrain with low to moderate relief and criss-cross by fractures and lineaments (dykes). Denudational Hills are found in very small, isolated parts of the study area. Infiltration capacity of these units is poor except along joints/ fractures and act as run-off zone. Ground water prospects in such units are poor.

Pediments and Pediplain

These units are occupied in the mainly northeastern, southwestern and eastern part of the study area. These formations have gently undulated rocky surface and thin cover of soil, mostly restricted to mountain front and act as run off zones. This type of formation bears moderate groundwater potential. Pediments can be considered as transitional zones between steeper mountain slopes and flatter plains or valleys.

Pediplain is a more extensive and gently sloping erosion surface that covers a larger area. It is often a broad, nearly flat landscape that results from the continued erosion and weathering of a region over a long time. It occurs mainly in the south and southeastern part of the study area. They are typically characterized by a relatively uniform topography, gentle slopes, and often exhibit a thin layer of sediment and soil cover.

Intermontane valleys

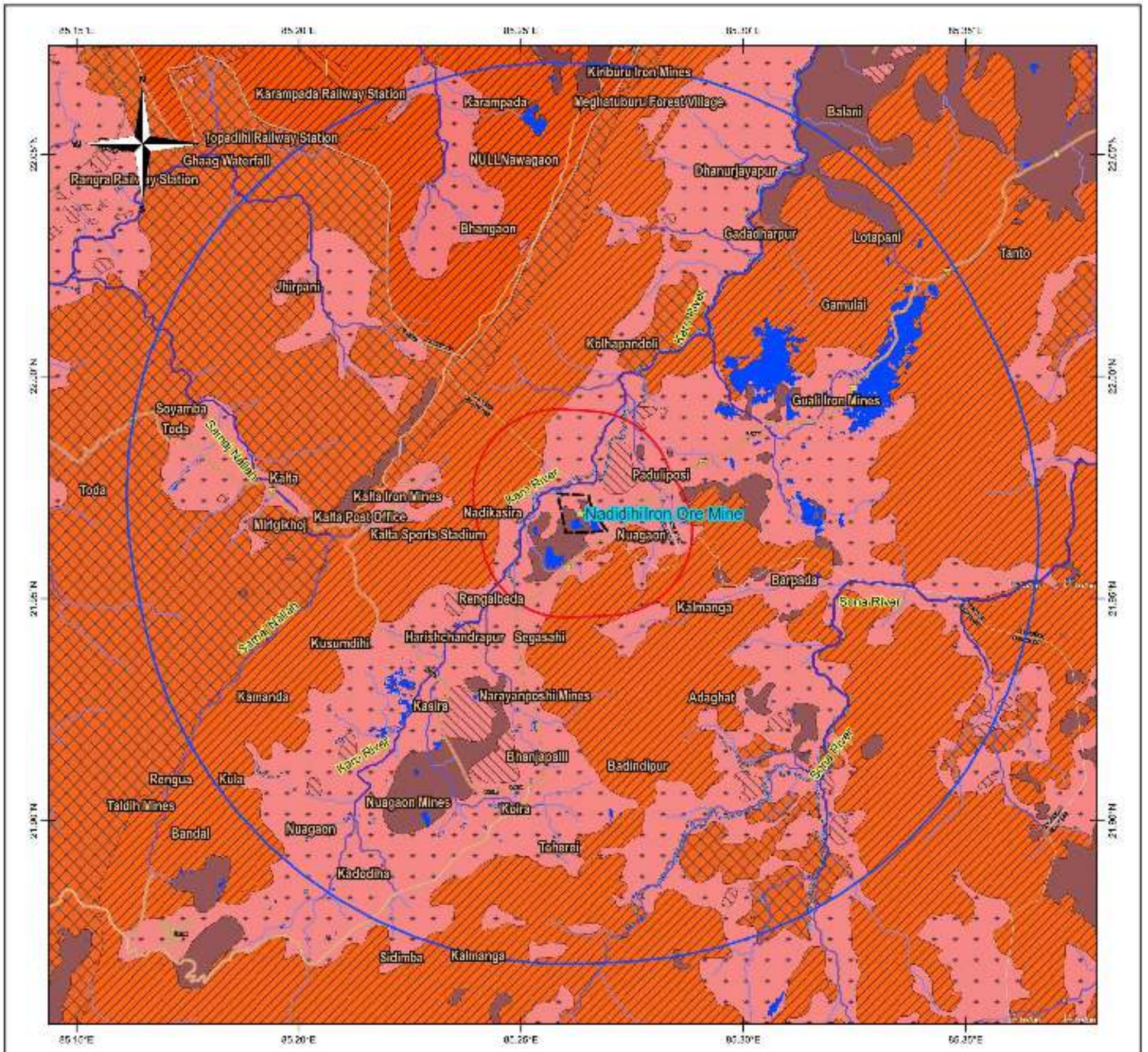
These units are formed within the depression area between hills and mountains developed by rapid weathering of structurally weaker linear zones. These units possess good to moderate ground water potential depends on thickness of valley fill material. Surface run-offs accumulate within these valleys and ground water occurs within the pore space of valley filled material.

2.3.2. Drainage

The study area has distinct dendritic drainage pattern due to hilly terrain. It is an integral part of Brahmani-Baitarani basin and the 10km buffer zone falls within two sub-watersheds of Karo and Sona River. The mining activities are not expected to change the existing drainage pattern of the area. Karo

River is one of the major higher order perennial river in the study area flowing eastward just outside the northern boundary of ML at a distance of 118m, then northeast ward. The river is an effluent one, fed by ground water. The mine lease area is located in the Karo river watershed. The river can complicate water management for the mining operation requiring additional dewatering for mining below the water table. Sona River is another major river located at 5km southeast from the ML area, flowing from Southwest to northeast and meets with Baitarani River. The drainages at southern part of the central ridge flows southwest ward and at northern part of the ridge flows northernly following the topography, originating mostly from the ridge.

The surface water network generated using WMS software package (developed by AQUAVEO) through processing of SRTM data and geomorphological data obtained from ISRO Bhuvan NRSC thematic data source. The lower order flowing features are seasonal in nature. The river system map was derived from satellite images, SRTM data and it was also ground verified near the mine. During dry season, it has been seen that these drainages show very low discharge of water which indicates base flow contributed from groundwater network. The Geomorphological map with Drainage for the study area is shown in the following Figure 2-6.



LEGEND

- Mine Location
- M. Boundary
- 2 km Core
- 10 km Buffer
- Roads

Stream / River

- Rainfed Channels
- 1st Order
- 2nd Order
- 3rd Order
- Surface Water Body

Geomorphology

- Structural Origin-Highly Dissected Hills and Valleys
- Structural Origin-Moderately Dissected Hills and Valleys
- Structural Origin-Low Dissected Hills and Valleys
- Denudational Origin Low Dissected Hills and Valleys
- Denudational Origin Pediment Pediplain Complex
- Anthropogenic Origin Anthropogenic terrain
- Waterbodies

2 0 2 4 6 km

Geomorphology and Drainage Map

Notes
Source: GSI and NRSC (2012), National Geomorphological and Lineament Mapping on 1:50,000 scale
Basemap: ESRI Transportation, ESRI Boundary Places
Datum / Projection: WGS 84

Date: 11/10/2023
Prepared By: Nilamani Dasgupta
File Path: C:\Users\ndasgupta\Desktop - SRK Consulting\Projects\IN1159_Nadidihi ESL Hydro NOC Nadidih\04 Working Files\1_GIS\IN1159_ESL_Hydro NOC_Nadidih.mxd

Project ID: 1159
Client: ESL

srk consulting

Figure 2-6: Geomorphology and Drainage Map of the Study Area

2.4. Details of Wetlands/ Major Water Bodies

There are no protected wetlands and listed major water bodies present within 500 m of project site as per Ministry of Environment, Forest, and Climate Change (MoEF & CC), Government of India.

2.5. Climate

The mines area experiences tropical to sub-tropical climate with hot summer, high and well-distributed rainfall during the monsoon and a cold winter. The summer season lasts from March to May, the rainy season starts in June and continues up to September. October and November constitute the autumn season and winter starts in December. The temperature begins to rise rapidly attaining the maximum in the month of May. Although the highest value of daily maximum temperature during the month of may go up to 42º C, the recorded minimum summer temperature is 24°C at night. Maximum temperature during winter day goes up to 31°C and minimum temperature at night becomes as low as 8°C. The area is humid during the monsoon. The mean monthly morning Relative Humidity (RH) in the district varies from 63% in April-May to 84% in August. The afternoon mean monthly RH varies from 54% in January to 81% in August. The RH reaches as high as 93% and often above 80% in monsoon period.

2.5.1. Rainfall

South-west monsoon is the principal source of rainfall in the district. The rainfall data of last 14 years (2010 - 2023) for Odisha Rainfall Monitoring System, Koira block has been analysed. Average annual rainfall is around 1341 mm. About 78% of the annual rainfall is received during the period from June to September. The monthly rainfall variation and average number of rainy days is graphically shown in Figure 2-7.

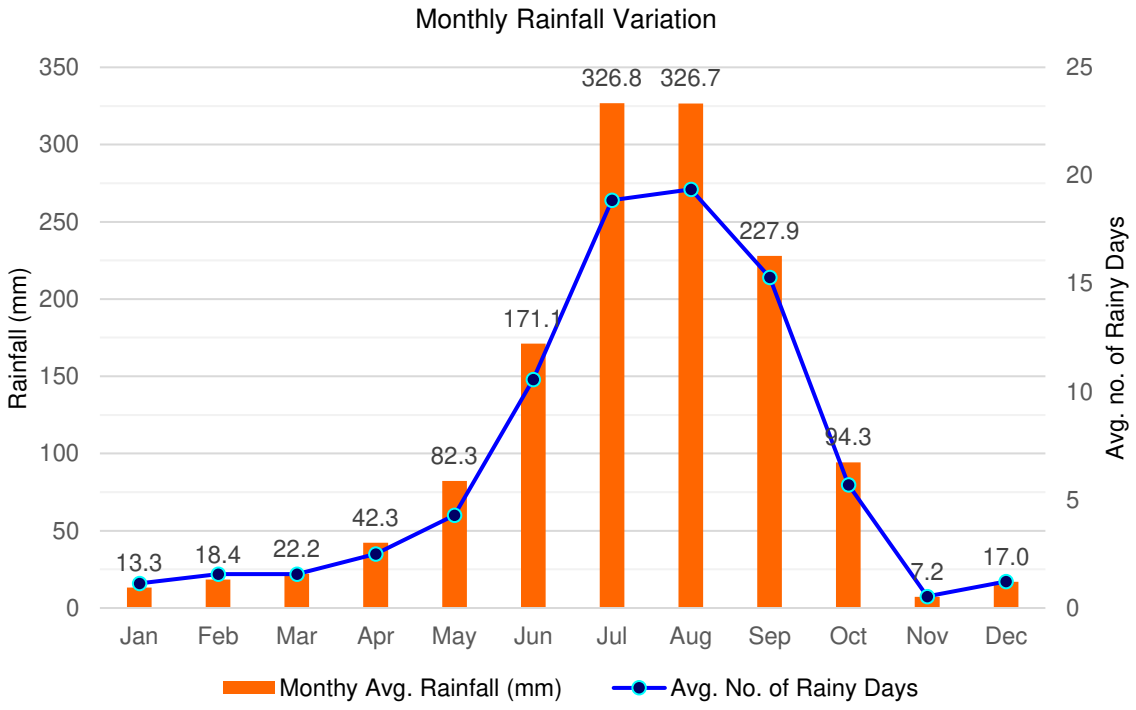


Figure 2-7: Average Monthly Rainfall distribution (2010-2022) for the Koira Block

The annual rainfall data are given in the Table 2-3 below. The rainfall data were segregated into 4 data sets as per the IMD guidelines, i.e., monsoon (June-Sept); post-monsoon (Oct-Nov); winter (Dec-Feb) and pre-monsoon (Mar-May). Available dataset confirms high intensity rainfall events with duration longer than 20 hours are relatively rare in this region.

Table 2-3: Annual Rainfall over study area for 2010-2023

Month / Season	Rainfall (mm)														Average
	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	
January	0.0	47.0	21.0	3.0	0.0	2.0	0.0	0.0	0.0	0.0	37.0	0.0	76.0	0.0	13.3
February	3.0	11.0	9.0	0.0	40.0	0.0	27.0	0.0	0.0	85.0	41.0	7.0	35.0	0.0	18.4
March	0.0	17.0	0.0	5.0	78.0	0.0	4.0	0.0	1.0	59.0	95.0	27.0	0.0	24.2	22.2
April	0.0	113.5	38.0	60.5	0.0	51.0	0.0	0.0	44.0	60.0	131.0	0.0	38.0	56.8	42.3
May	14.0	0.0	0.0	46.0	29.0	5.0	70.0	56.0	152.0	69.0	207.0	433.0	54.6	16.0	82.3
June	95.0	247.6	68.0	192.0	141.0	347.0	76.1	201.3	106.4	151.0	206.0	228.3	120.5	215.2	171.1
July	134.5	146.5	303.0	436.1	484.0	449.0	267.7	546.0	482.0	201.0	115.0	301.9	295.3	412.8	326.8
August	159.5	342.0	397.5	288.0	488.0	154.0	383.4	132.0	379.3	316.0	608.9	115.5	571.6	237.5	326.7
September	111.5	482.0	223.0	212.0	166.0	113.0	267.4	90.0	334.0	188.0	177.0	335.2	223.0	269.0	227.9
October	18.3	57.0	35.0	351.0	62.0	0.0	35.4	107.0	53.0	185.0	54.0	147.2	121.4	-	94.3
November	0.0	0.0	14.0	0.0	0.0	0.0	0.0	9.0	0.0	0.0	2.0	69.0	0.0	-	7.2
December	25.5	0.0	1.0	0.0	0.0	16.0	0.0	0.0	113.0	3.0	0.0	62.0	0.0	-	17.0
Annual Rainfall	561.3	1463.6	1109.5	1593.6	1488.0	1137.0	1131.0	1141.3	1664.7	1317.0	1673.9	1726.1	1535.4	1231.5	1341.0
Pre-monsoon	14.0	130.5	38.0	111.5	107.0	56.0	74.0	56.0	197.0	188.0	433.0	460.0	92.6	97.0	146.8
Monsoon	500.5	1218.1	991.5	1128.1	1279.0	1063.0	994.6	969.3	1301.7	856.0	1106.9	980.9	1210.4	1134.5	1052.5
Post-monsoon	18.3	57.0	49.0	351.0	62.0	0.0	35.4	116.0	53.0	185.0	56.0	216.2	121.4	-	101.6
Winter	28.5	58.0	31.0	3.0	40.0	18.0	27.0	0.0	113.0	88.0	78.0	69.0	111.0	-	51.1

It is prominent from the last 13 years (2010 – 2022) of rainfall data that the annual rainfall trend (Figure 2-8) as well as the seasonal rainfall data has increasing trend (Figure 2-9).

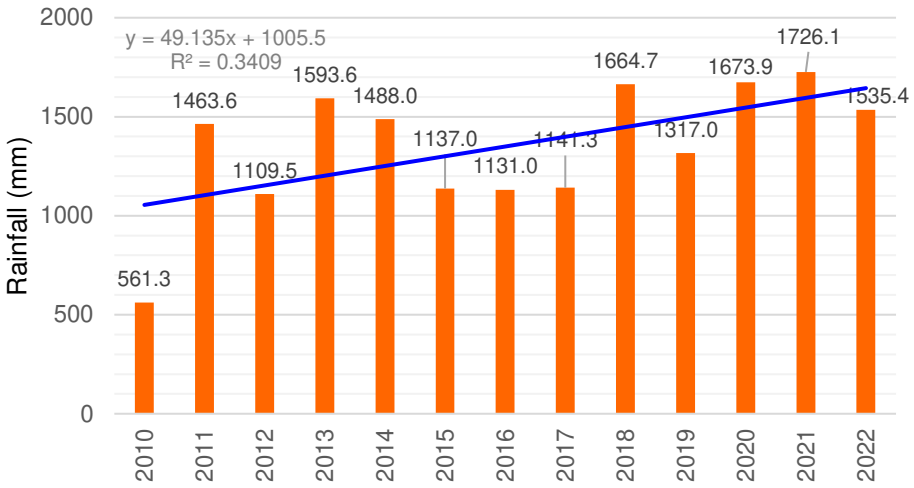


Figure 2-8: Annual Rainfall Variation in Koira Block

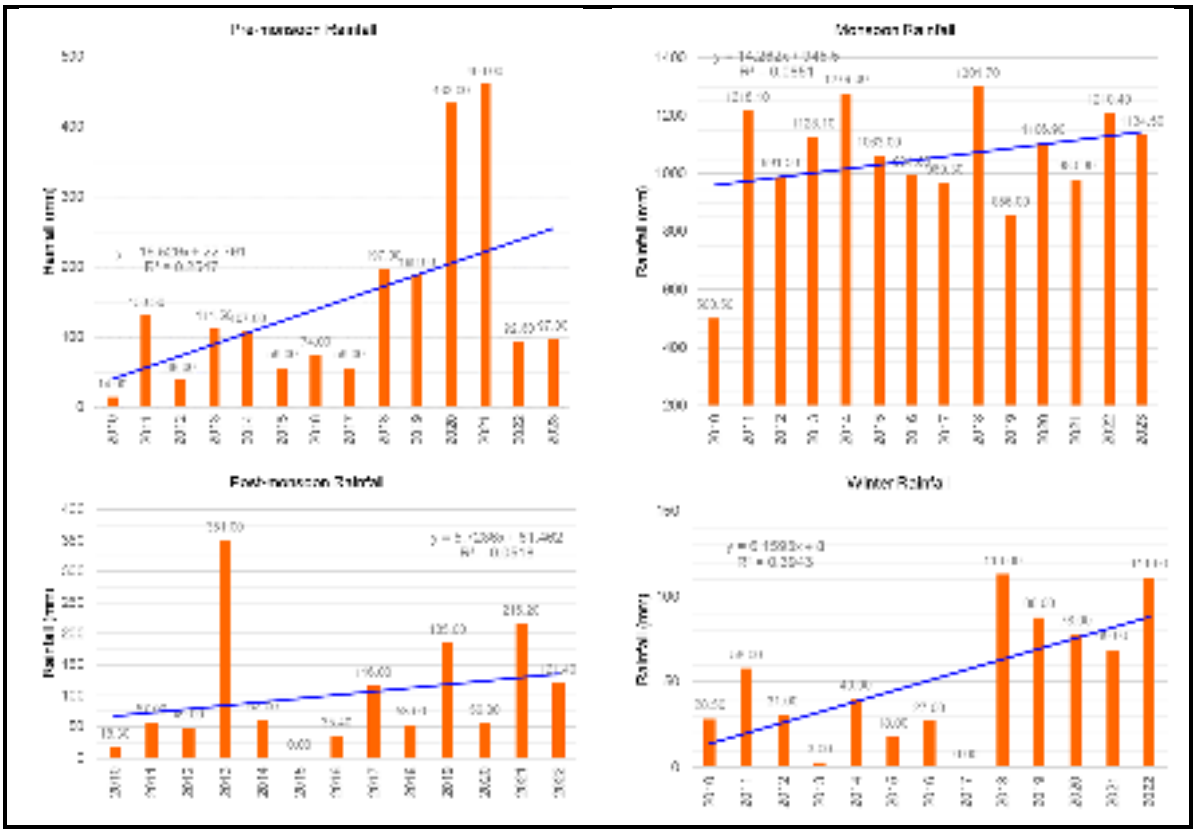


Figure 2-9: Last 10 years Rainfall Trend in Koira Block

In pre-monsoon and winter, the region experienced significant rise in the rainfall. Koira block has experienced maximum rainfall in the month of August 2020 i.e., 608.9 mm in the last 14 years and 244.0 mm is recorded one day maximum rainfall on 05 August 2014.

The rainfall received in monsoon would generate variable water resources potential spatiotemporally, which may be useful for sustainable water resources management planning for domestic, irrigation and industrial sector. Additionally, sudden rainfall induced surface water inflow into the pit may pose problem in mining operations. Therefore, suitable mitigation measures need to be in place in order to withstand the generated surface runoff and avoid any contamination.

3. HYDROGEOLOGY

3.1. Geological Setup

Geological setup of the area along with rainfall and terrain conditions controls the hydrogeological conditions of the area. The Geological information is collected from ESL exploration reports and other secondary sources, such as government reports published in public domain, scientific research papers, etc.

3.1.1. Regional Geology

The mine area forms a part of Precambrian sedimentary formation – Iron Ore series developed in western part of Iron Ore Group (IOG) belt - Noamundi-Jamda-Koira belt. The sequence experienced multi-phase deformation with prominent NE-SW trending series of antiform and synform followed by a cross-folding event that produced superposed folds. As a result, the occurrence of ore at regional scale is selective, depending on the structural position of the ore body and intensity of the ore forming processes[1]. The banded hematite jasper (BHJ) sequence is stratigraphically overlain and underlain by shales, regionally known as upper and lower shales, respectively.

The Quaternary and Recent unconsolidated alluvium occur in the Baitarani River Basin. Broadly the area can be divided into the following geological Units:

i. The patchy occurrence of metamorphics (slate, phyllite, schistose rocks, amphibolite) belonging to Older Metamorphics Group (OMG) of Archaean age;

ii. Swarms of newer dolerite dykes as basic intrusive;

iii. Meta-sedimentary rocks of Banded Haematite Quartzite (BHQ) belonging to Banded Iron Formations (BIF) of Iron Ore Super Group (IOSG) of rocks of Archaean age;

iv. (Meta) volcano-sedimentary sequence (Volcanics/Lava Quartzite/Volcanics) intruded by Bonai granite (granite/younger granites) belonging to lower Bonai group of age ranging between Archaean to Palaeoproterozoic age

v. Sedimentaries and meta-sedimentaries (Quartzite/shale/sandstone) belonging to Kolhan group ranging in age from lower to middle Proterozoic;

vi. Laterites of Cenozoic age;

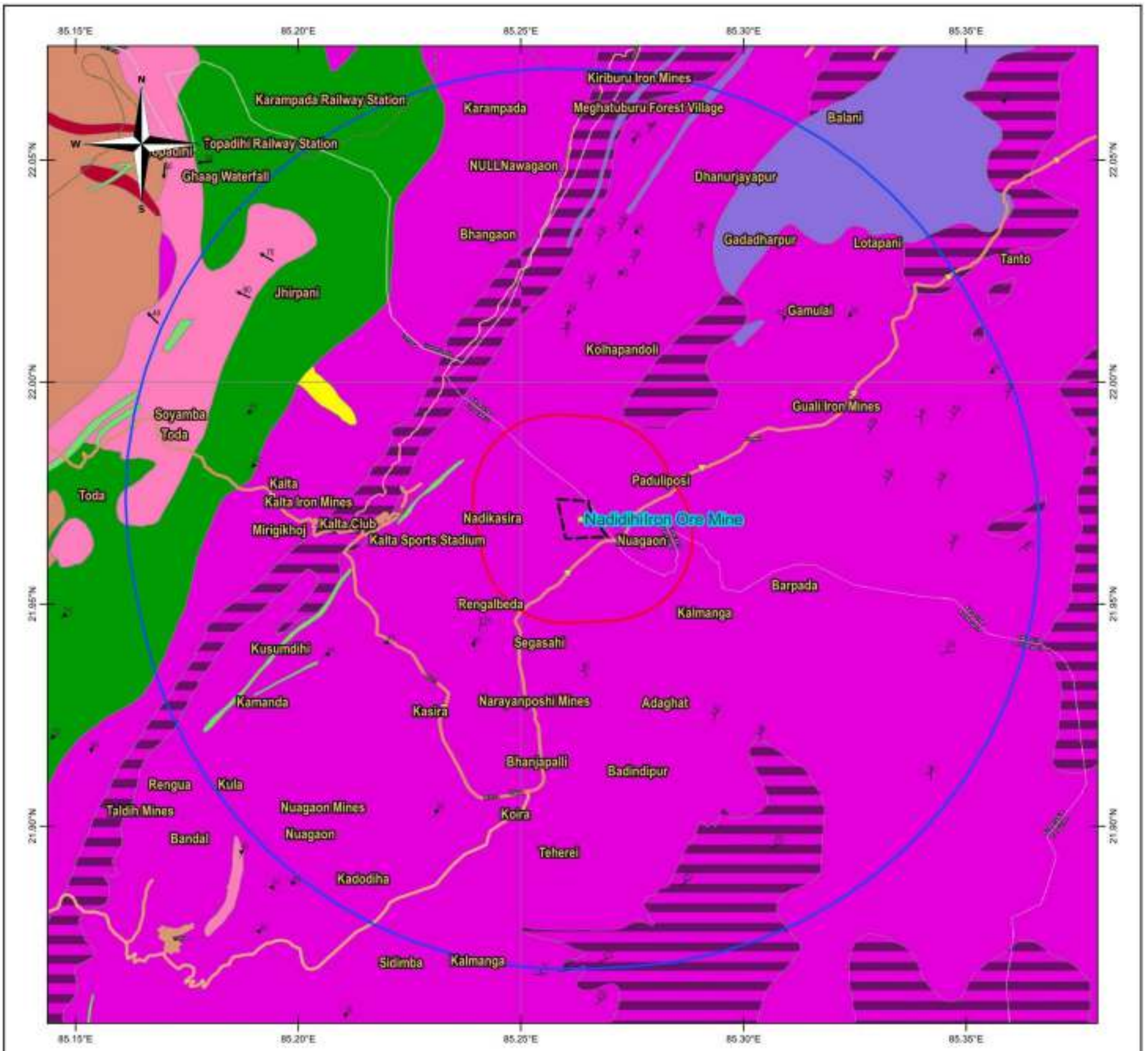
The major stratigraphic succession of Iron Ore Super Group[2] are summarised in the following Table 3-1:

[1] Mukhopadhyay, D. and Matin, A., 2020. The architecture and evolution of the Singhbhum Craton. Episodes Journal of International Geoscience, 43(1), pp.19-50.

[2] Beura, D. (2014) Tectono-Structural Overviews of Iron Formation of North Odisha, India. Journal of Geosciences and Geomatics, 2. 57-61.

Table 3-1: Stratigraphic succession of Iron Ore Super Group

Iron Ore Super Group (IOG)	Kolhan Group	Kolhan Sediments (Sandstone, Limestone, Shale)	
	----------Unconformity----------		
	Bonai-Keonjhar Group	Upper Shale	Fe Shale Banded Shale
		BIF-III	Banded Hematite Chert/ Jasper and Banded Hematite Shale
		Lower Shale	Banded Shale Banded Manganese Formations Variegated shales Tuffs & Tuffaceous Shale
	----------Unconformity----------		
	Dhanjori Group	Dhanjori Volcanics Dhanjori Quartzite	
	----------Unconformity----------		
	Daitari-Tomka Group	Upper Metapelites	Phyllites Slate Fe-Phyllites
		BIF-II	Banded Chert Banded Magnetite/ Hematite Chert/ Jasper and Banded Magnetite/ Hematite Quartzite
		Lower Metapelites	Banded Phyllites Quartz Schist Chlorite Schist
	----------Unconformity----------		
	Badampahar-Gorumahisani-Suleipat Group	Upper Quartzite	Badam Quartzite Micaceous Quartzite
		BIF-I	Banded Magnetite/ Magnetite Quartzite Banded Magnetite/ Granulite Quartzite
		Lower Quartzite	Banded Chert Tremolite-actinolite schist Fuchsite Quartzite
	----------Non-conformity----------		
PRE-IOG PRECAMBRIAN		Singhbhum Granite/ Keonjhar Granite/ Bonai Granite Tonalite Gneiss (OMTG) OMG (Mica Schist, Fuchsite Quartzite, Para-amphibolite, Hornblende-Schist etc.)	



LEGEND

- Mine Location
- ML Boundary
- 2 km_Core
- 10km_Buffer
- Roads

Planar Structural Symbols

- BEDDING
- CLEAVAGE/FOLIATION/SCHISTOSITY (S1)

Linear Structural Symbols

- MINERAL LINEATION

Lithology

- CENOZOIC , LATERITE
- ARCHAEAN-PROTEROZOIC , NEWER DOLERITE
- ARCHAEAN- PALAEOPROTEROZOIC , GRANITE
- ARCHAEAN- PALAEOPROTEROZOIC , BANDED HEMATITE QUARTZITE
- ARCHAEAN- PALAEOPROTEROZOIC , BASIC META-VOLCANICS
- ARCHAEAN- PALAEOPROTEROZOIC , QUARTZITE
- ARCHAEAN- PALAEOPROTEROZOIC , SLATE, PHYLLITE, MICA SCHIST
- ARCHAEAN- PALAEOPROTEROZOIC , AMPHIBOLITE,HORNBLENDE SCHIST,CHLORITE SCHIST
- ARCHAEAN , ULTRABASIC AND ULTRAMAFIC ROCKS

Group

srk consulting

Notes
Source: Bhukosh, GSI
Basemap: ESRI Transportation, ESRI Boundary Places
Datum / Projection: WGS 84

2 0 2 4 6 km

Regional Geology Map

Date: 11/10/2023
Prepared By: Rjumon Dasgupta
File Path:C:\Users\rdasgupta\OneDrive - SRK Consulting\Projects\IN1159_Vedanta ESL_Hydro NOC_Nadidih\04 Working Files\1. GIS\IN1159_ESL_Hydro NOC_Nadidih.qgz
Project ID: 1159
Client: ESL

Figure 3-1: Regional Geological Map

3.1.2. Local Geology

The mine falls in the Upper Shale formation of the Koira Group. It can be divided into the Top Ferruginous Shale unit and the underlying Manganiferous Shale unit, found at some places outside the ML. The lithounits as observed in exploration boreholes within the ML is as following:

- Ferruginous Shale
- Laterite / Iron Ore, Shaly Iron Ore
- BHJ / BHQ / BHC

Geological mapping and exploration data indicate that the area is intensely folded accompanied by low grade metamorphism. The ore body has 20^{o} to 45^{o} dip with dip direction NW to West. The Mine area is covered by soil, laterite and iron ore bodies. All the litho-units within the BIF and Shale are affected by multiple sets of Joints. Haematite variety of Iron ore mainly occurs within the mine area. The iron deposit is classified as:

- Lateritic Iron Ore: found at top or immediately below the lateritic zone, friable in nature;
- Soft Laminated Ore (SLO): Distinct lamination at mm-to cm-scale, with occasional thin jasper bands;
- Hard Laminated Ore (HLO): Having relatively thick jasper bands;
- Friable Ore (FRO)
- Blue Dust

The waste rock lithologies are Shale horizons, structurally occurring below the ore and this intercalated shale layers occurring conformably within the ore. The ore-shale sequence is lateritised at top, with depth of lateritisation varying between less than a meter to a few meters. The distribution of SLO and HLO ore type is heterogeneous with gradational contact. Limonitisation and Goethitisation of the ore is also heterogeneous, found as irregular pockets within the sequence of HLO and/or SLO. The bedded ore and waste rock sequence underwent folding during multiple phases of deformation. Fracture sets (or joints) are developed rarely within the ore. Such sets are developed intermittently within the lower shale with a significant degree of scatter. Few small-scale faults (bench to sub-bench scale) are present on the pit wall, but such local faults do not have significant impact on the distribution of ore and waste rocks within the mine.

The iron ore and the host rock lithologies has undergone varying degree of weathering. The iron ore exposed at the pit are highly weathered with moderate to high alteration. SLO and FRO are sensitive to weathering, are moderately to highly weathered. Whereas the hard laminated and massive ore are moderately to slightly weathered in nature. Shale units are found highly weathered with minor variation in weathering intensity. At places extremely altered limonitized shale exposed at the pit benches. However, alteration intensity varies from moderately to highly altered shale. BHJ and BHQ units also show significant degree of weathering and alteration.

The mine scale geological map is shown in the following Figure 3-2.

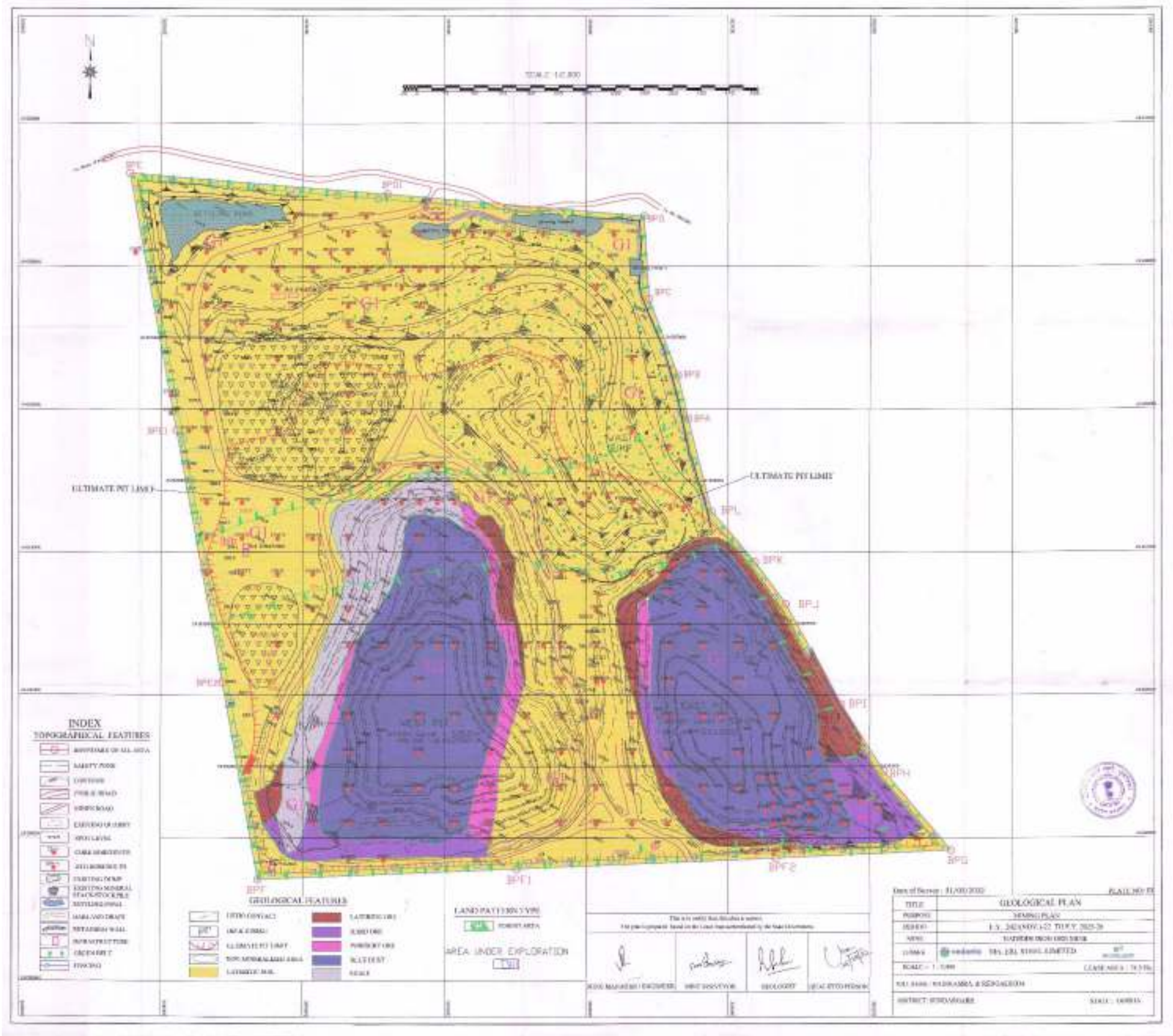


Figure 3-2: Mine Scale Geological Map

3.2. Geophysical Studies

The Geophysical techniques were used to investigate the nature of the subsurface formations by examining the variation of their physical properties through the surveys made at the ground surface. The geophysical methods depend on the principle that each lithology has independent physical properties and identification of these properties helps to distinguish the formation. Electrical character of lithological assemblages is one of the easily detectable geophysical properties. Many types of geophysical methods are available to get idea of geoelectrical characteristics of sub-surface formations. The Geophysical Study comprising of Vertical Electrical Sounding (Resistivity Survey) has been carried out in and around the mine lease area for the current study purpose.

3.2.1. Vertical Electrical Sounding

Electrical Resistivity Method is one of the Geophysical techniques used to investigate the nature of the subsurface formations. In electrical resistivity methods DC Electric currents sent into the ground through a pair of Current Electrodes (A and B) and resulting potential difference across the ground is measured with the help of another pair of electrodes, called potential Electrodes (M and N). Current electrodes are mainly steel rods which are inserted in the ground during test.

The ratio between the Potential difference (ΔV) and Current (I) gives the apparent resistance which depends on the Electrode arrangements and on the resistivity's of the subsurface formation.

In Schlumberger configuration all the four Electrodes are kept in al line as shown in Figure 3-3, the outer Electrode spacing is kept large compared to the inner electrode. For measurement only current electrodes are moved keeping the potential electrodes at the same locations. The potential electrodes are moved only when the signal becomes too weak to be measured. During survey, the centre of the configurations is kept fixed, and the measurement of apparent resistivity is made by progressively increasing the current electrode spacing. The current I is injected into the ground through the outer current electrodes AB and the potential difference ∆V is measured between the inner potential electrodes MN. The ratio between the potential difference and the current (∆V/I) gives the Resistance ∆R. The Apparent Resistivity is calculated by using the following mathematical expression (equation 1). Conventionally the plot between apparent resistivity and electrode separation is used for analysis.

$$\rho_a = \frac{\pi(L^2 - l^2)}{2l} \times \frac{\Delta V}{I} \quad \text{..... equation (1)}$$

Where,

ρ_a = Apparent resistivity;

L = Distance between centre of configuration and current electrode;

l = Distance between centre of configuration and potential electrode;

ΔV = Potential difference;

I = Applied electric current;

The details of instrument used for Resistivity survey is given in the Appendix E.

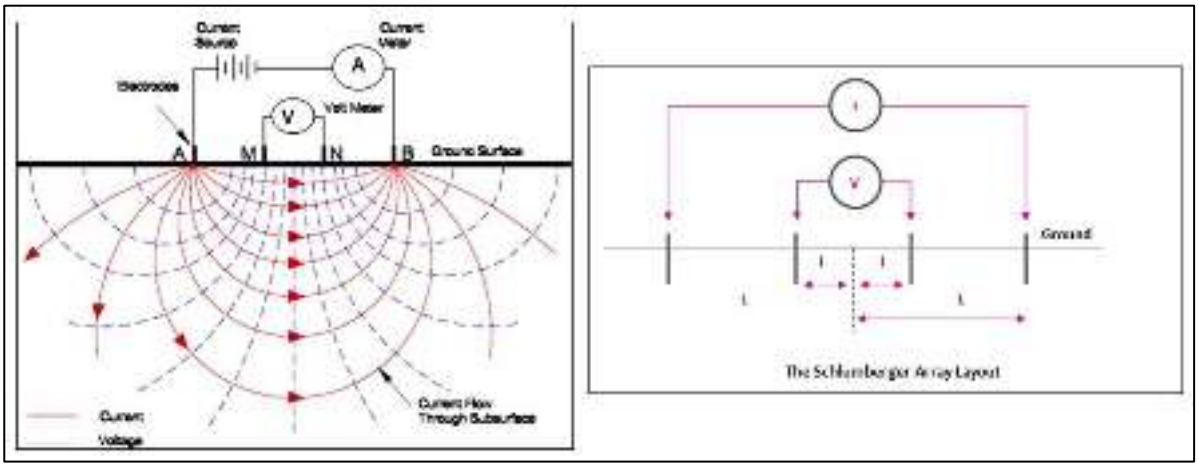


Figure 3-3: Schematic diagram of Schlumberger Array Configuration

Vertical Electrical Sounding (Resistivity Survey) were conducted during October 2023 at four different locations following Schlumberger configuration with maximum AB/2 separation upto 200 m as per availability of space.



Figure 3-4: Photographs of Geophysical Survey (October 2023)

Location for conducting VES were selected considering topography & space to run electrodes, site conditions including surface moisture etc. The location of VES points is given in Table 3-2 and shown in Figure 3-5.

Table 3-2: Location details of VES points

VES ID	Location	Latitude	Longitude	Elevation (m aMSL)
VES 1	Mine approach road near North Gate	21.97356	85.262056	538.6
VES 2	Mine approach road at South Gate	21.96439	85.262147	565.52
VES 3	Western Bench of East pit	21.96744	85.265275	536.04
VES 6	Western ML Boundary	21.96842	85.2590459	586.04



Figure 3-5: Geophysical Survey Locations

From Geophysical Studies through Vertical Electrical Sounding (VES), sub-surface multi layers have been identified within study area. It is observed that within the surveyed depth of 100m, a layer of topsoil exists upto a depth of around 2 m and followed by lateritic soil upto a depth of around 25 m. Below this a zone of saturated fractured rock encountered at the depth of around 50 m. This zone mainly indicates the contact between Iron ore formation and hard rock zone comprises of BHJ/ BHQ. Below this a zone of BHJ/ SHL is identified. The depth of the identified zones has been interpreted based on VES results, but it may vary in real scenario. The summary of VES interpreted results are presented in Table 3-3 and logs are shown in Appendix E.

Table 3-3: Summary of Vertical Electrical Sounding (VES) Survey Outcome

VES ID	Elevation (m aMSL)	Resistivity (Ω m)	Depth (mBGL)		Thickness	Layer
			From	To		
VES 1	538.6	32	0	9.4	9.4	Topsoil and Laterite
		980	9.4	26.9	17.5	Iron Ore Formation
		230	Below 26.9		-	BHJ/ SHL
VES 2	565.52	720	0	19.2	19.2	Dump Material
		72	19.2	24.6	5.4	Laterite
		960	24.6	44.2	19.6	Iron Ore Formation
		640	44.2	61.2	17	BHJ/ SHL
VES 3	536.04	78	0	2	2	Weathered Iron ore Formation
		1230	2	49.2	47.2	Iron Ore Formation
		880	Below 49.2		-	BHJ/ SHL
VES 6	586.04	600	0	8.8	8.8	Dump Material
		860	8.8	54	45.2	Iron Ore Formation
		300	Below 54		-	BHJ/ SHL

Based on geophysical Studies through VES, local geological information and other secondary data, it has been identified that the weathered formation at shallow depth forms the upper group of aquifers and occurs under water table condition. The hard fractured rocks present at greater depth formed the lower group of aquifers which occurs under semi-confined to confined condition.

3.3. Hydrogeology of The Area

The maximum part of Study area is underlain by meta-sedimentary and Iron ore formation of Lower Bonai Group deposits. In the eastern region a small part is composed of Paleo-Proterozoic basic volcanics of Dangoaposi Volcanics. Basic meta-volcanics of lower Bonai group (Archean-Paleo-Proterozoic) are also associated at some places. The ML area occur within the Iron Ore Group (IOG) of Singbhum Craton (SC). The sequence experienced multi-phase deformation with prominent NE-SW trending series of antiform and synform followed by a cross-folding event.

Almost the entire study area is occupied by consolidated formations, except some small strips along major drainage courses. Groundwater is mainly stored in the secondary porosity resulting from the weathering and fracturing of rocks. The aquifer materials are highly heterogeneous, showing both vertical and lateral variations in hydraulic character. The main repository of groundwater is the weathered residuum and circulates through deeper fractures and fissures.

The area has undergone several phases of intense tectonic deformations, which has been responsible for the development of deep-seated intersecting fracture system. The extent of fracturing, aperture and size of fractures, and extent of their interconnections to the near-surface weathered zone largely determine the water-yielding capacity of fractured rocks.

Depending upon the geological setting, water bearing and water yielding properties, two major hydro-geological units have been identified in the study area:

i. Weathered residuum: ground water mainly occurs under water table condition;

ii. Fracture, Joints etc. in Hard rocks: ground water occurs under unconfined condition in shallow fractures and under semi-confined to confined conditions in deeper fractures;

The folded and fractured iron ore formation of rocks underlain by impervious shale give rise to a number of confined ground water bodies with varying profile. Infiltration of the atmospheric precipitation forms the major source of ground water recharge in the study area. However, most part of the precipitation in the high relief areas goes as surface run off.

The Hydrogeological map of the study area has been prepared covering 10 km radius buffer from the mine site, showing the aquifers available in the area and ground water piezometric head contours and flow direction given in Figure 3-8. The existing wells in the study area are mainly used for agriculture and domestic purpose.

3.3.1. Aquifer Characteristics

As discussed above, two major hydrogeological units have been identified in the area depending upon the geological setting, water bearing and water yielding properties. The details of aquifer types are described below.

Unconfined Shallow Aquifer *(predominantly occurs within weathered residuum)*

Laterites and alluvium of Sub-recent to Recent age constitute the unconsolidated formations. Laterites occurring as capping over older formations are highly porous in nature and form good aquifer. The alluvial deposits of recent origin occur as thin discontinuous patches along the prominent drainage channels. Alluvium strips constitute the most potential aquifers due to their high degree of porosity and permeability but are only limited in their occurrence. The thickness of weathered residuum varies within the study area, depending upon topography and lithology. Maximum thickness of the weathered formation is found in the valley region. The weathered residuum is mostly formed in the variegated shale formation of Bonai group, exposed in different parts of the open pit. The average thickness of the weathered zone generally varies from 10 to 30 m or more within the study area. Thin weathered zone on hilly and hill slope areas acts as temporary water bearing zone just after monsoon season and in post-monsoon season ground water from this saturated zone is drained out as base flow and water level starts depleting very fast.

Ground water in these formations occurs under unconfined condition, which form potential shallow aquifers. Yield of the open wells is generally 5-6 lps and may go up to 10 lps at a few places[3]. This zone accommodates the natural recharge from rain that infiltrate, store and circulates through fractures and fissures to the deeper aquifers.

Semi Confined to Confined Deeper Aquifer *(predominantly occurs within fracture, joints etc. in hard rocks)*

The weathered residuum is underlain by a zone of secondary porosity, characterised by the presence of fractures, faults, joints, folds etc. The Consolidated Formation (hard rocks) forms the main hydrogeological unit occurring in the study area. The area has undergone several phases of intense deformation, which are responsible for the development of the deep-seated intersecting fracture system. Ground water in this zone occurs under semi-confined to confined condition. Most of the bore wells present in and around the study area abstract water from this zone. The yield of bore wells tapping deep fracture zones varies from 1 to 5 lps.

In hilly terrains, there are number of springs or streams, flowing even in summer season.

[3] Ground Water Information Booklet of Sundergarh District, March 2013

3.3.2. Pumping Test

ESL engaged SRK Consulting earlier for evaluating historical exploration data, detailed assessment of mining development scenarios through multidisciplinary technical studies at Prefeasibility level, to confirm the technical and economic viability of the optimal scenario and to produce geological models and undertake mining studies. As a part of the study, pumping test in the form of Constant Discharge Tests (CDT) were conducted in the area during integrated exploration, geotechnical and hydrogeological data gathering program. The tests were conducted in two sets of vertical tube wells, with one observation boreholes attached to each pumping well. The tests were planned to assess open pit hydrogeological conditions, i.e., hydraulic characteristics of the following targets:

- Iron Ore formation and its contacts;
- Waste rock (shale, BHJ and their contacts);

The details of pumping test wells are as following Table 3-4 and locations shown in Figure 3-6.

Table 3-4: Details of Pumping Test Wells

Sl.	Particulars	PT01_PW	PT01_OW	PT02_PW	PT02_OW
1.	Date of Testing	03.05.2023	03.05.2023	27.04.2023	27.04.2023
2.	Type of Well	Pumping Well	Observation Well	Pumping Well	Observation Well
3.	Coordinate	21.9636400, 85.2530487	21.96380774, 85.25284257	21.96278265, 85.25483365	21.96302312, 85.25462478
4.	Collar Elevation (m aMSL)	548.28	547.38	562.52	562.28
5.	Depth (m)	75	75	100	100
6.	Bottom Elevation (m aMSL)	473.284	472.384	462.515	462.276
7.	Diameter (mm)	152.4	127	152.5 / 127	152.5 / 127
8.	Crossover Depth (mBGL)	NA	NA	60	12
9.	Filter Zone (From – To in mBGL)	18 - 58	28 - 70	30 – 66 81 - 92	30 – 51 60 – 72 81 - 96
10.	Static Water Level (mBGL)	20.7	19.3	37.6	37
11.	Pump Depth (mBGL)	60	NA	60	NA
12.	Pump Capacity (hp)	5	NA	5	NA
13.	Average Discharge (m^3/hr)	5.4	NA	6.28	NA
14.	Pumping Duration (minute)	4320	NA	4080	NA
15.	Maximum Drawdown (m)	4.4	0.12	4.7	1.58
16.	Recovery Time (minute)	1440	60	1440	1440



Figure 3-6: Location of Pumping Test Wells

Graphical plots of the pumping test data are shown in Figure 3-7. Aquifer properties were estimated by matching combined drawdown and recovery behaviour with theoretical models (type-curves) that have been generated by empirical mathematical models. AQTESOLV software package was used during the analysis as it offers a comprehensive and versatile platform for data interpretation.

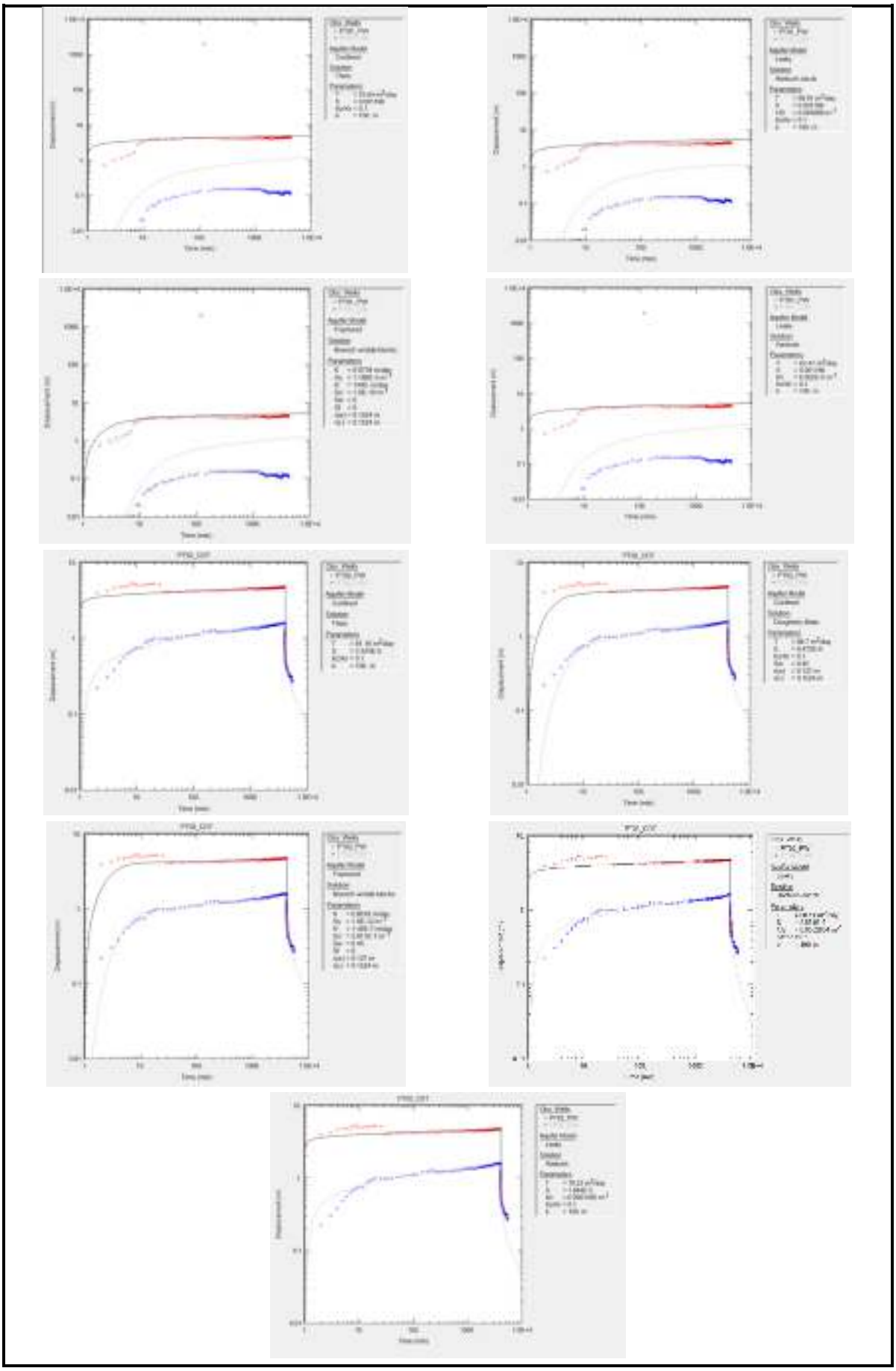


Figure 3-7: Graphical Plot of Pumping Test Data

The aquifer parameters are estimated based on the data collected during pumping and recovery phase. Pumping Test raw data are given in Appendix F. The aquifer parameters help to understand the aquifer behaviour and the estimated values were used to estimate ground water inflow into open pit, radius of influence and impact of dewatering and pumping. A summary of the aquifer parameters of Iron formation and its contacts obtained from the analyses results are shown in Table 3-5.

Table 3-5: Hydraulic Parameters Estimated From PT01 Series Pumping Test

Statistics	Aquifer Thickness (m)	Hydraulic Conductivity (m/day)	Transmissivity (m^2/day)	Storage Coefficient
Arithmetic mean	100	6.4627E-01	64.63	6.1245E-02
Geometric mean	100	6.4463E-01	64.46	2.9323E-03
Minimum	100	5.8890E-01	58.89	1.1860E-05
Maximum	100	7.0640E-01	70.64	2.1320E-01

A summary of the aquifer parameters of Shale and Waste rock lithologies obtained from the analyses results are shown in Table 3-6.

Table 3-6: Hydraulic Parameters Estimated From PT02 Series Pumping Test

Statistics	Aquifer Thickness (m)	Hydraulic Conductivity (m/day)	Transmissivity (m^2/day)	Storage Coefficient
Arithmetic mean	100	8.7108E-01	87.11	1.9073E-05
Geometric mean	100	8.6833E-01	86.83	1.6504E-05
Minimum	100	7.9220E-01	79.22	5.4320E-06
Maximum	100	1.0160E+00	101.60	3.0260E-05

3.3.3. Ground Water Flow and Aquifer Interaction with surface water bodies

Ground Water Flow

The topography and drainage pattern of the study area (Figure 2-5) reveals that the mine is located in valley area, which has slope towards northeast. The ground water piezometric head elevation contours almost follow the topography and drainage system of the study area showing the overall flow direction towards north at eastern part and towards west and northwest at western parts with some local variations during post-monsoon. The NE-SW trending central hill ridge act as recharge zone and a ground water divide.

The groundwater flow pattern and groundwater level behaviour for near surface shallow aquifer is somewhat similar with that of the deeper aquifer which may indicate hydraulic connectivity between shallow weathered zone to deep fracture zone through fractures present at the bottom of the weathered zone connected to some deep-seated fractures. The hydrogeology map with post-monsoon ground water piezometric head contours of deeper aquifer is presented in Figure 3-8. The depth to water level distribution within the study area is described in section 3.3.4.

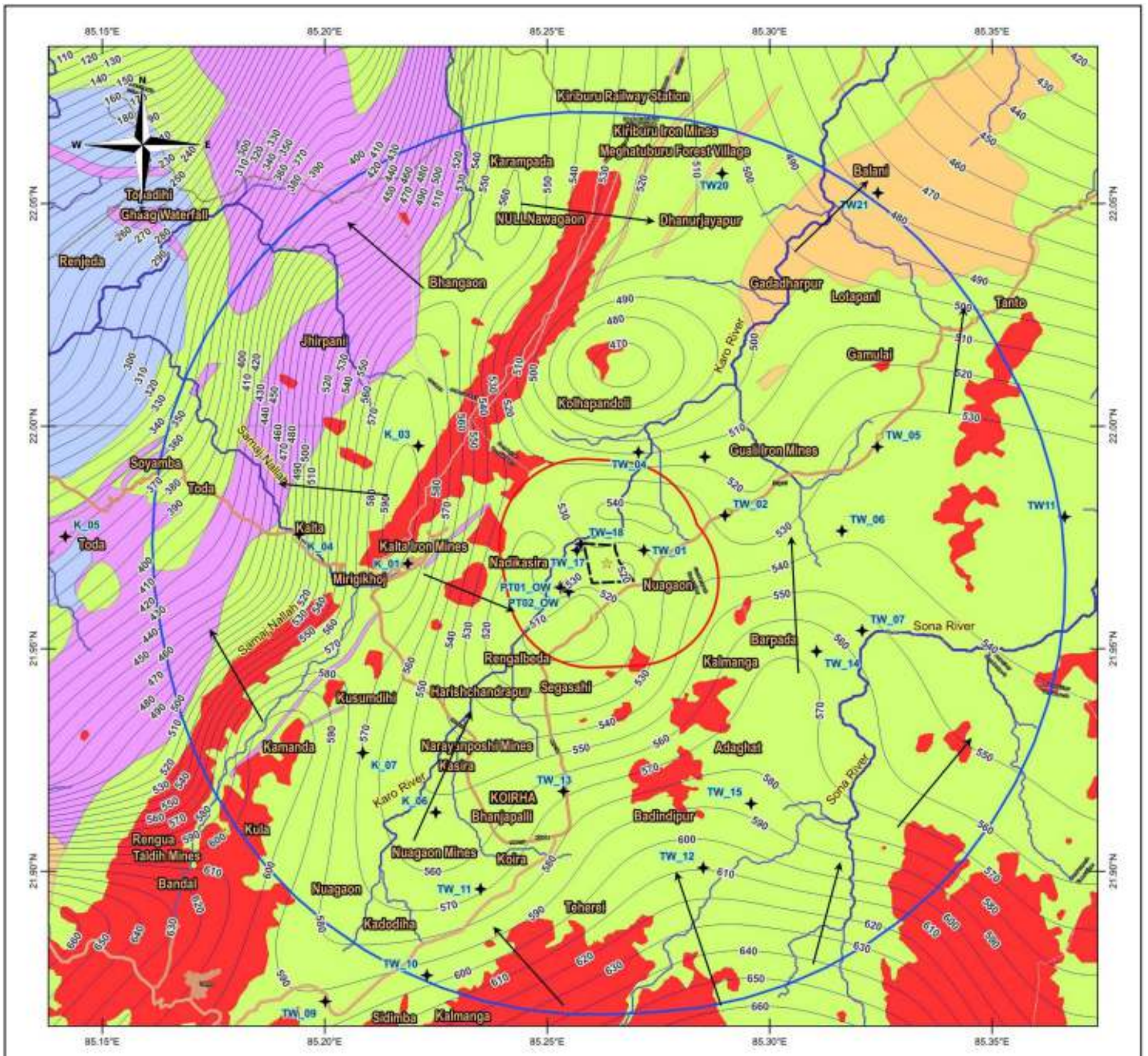
To obtain the ground water elevation with respect to the mean sea level (MSL), the depth to water level (mBGL) was deducted from well collar elevation value (in MSL) at each location. The calculated ground water piezometric head / ground water table elevation based on the water level survey during post-monsoon 2023 varies between 510m and 540m aMSL within 2km core area, whereas in the buffer area, it shows variation from 340m to 660m aMSL. The hydraulic gradient at mine site and 2 km

buffer area was found 0.015 during post-monsoon (October 2023). Ground water flow within the ML area is towards the mine void, which is limited within 2 km core zone of the mine. The regional ground water flow at the valley area is broadly from southwest to northeast following the topography, and the hydraulic gradient was found around 0.0045 in post-monsoon (October 2023).

Aquifer Interaction (Ground Water – Surface Water Connectivity)

The ground water elevation contours indicate that the flow direction follows the topography and surface water flow direction. Karo and Sona River - the major drainages in the study area flow from southwest to northeast along the valley. The lower order drainages originate from the base of highlands and flowing towards major rivers or nallas within study area like Karo river, Sona River and Samaj Nallah. The lower order drainages are mainly fed by springs and observed to be seasonal in nature. The major rivers are perennial in nature.

The flow of water from groundwater network to surface water network or vice versa, depends on the elevation of water surface in both systems. The nature of flow of water also depends upon the hydraulic conductivity of bed formations below surface water bodies and streams. Correlation between topographic contour and ground water piezometric elevation contour indicate that the rivers are fed by ground water at upstream near toe region of ridges, whereas the rivers contribute to the ground water system at downstream parts in the area. Lithology of the study area of indicates that the weathered material of stream bed allows seepage of water to the ground water network.



LEGEND

- Mine Location
- ML Boundary
- 2 km Core
- 10 km Buffer
- Roads
- Water Level Survey Location
- GW Piezometric Elevation Contour

Hydrogeology

- Volcanics / Metavolcanics [>10-15 lps]
- Slate, Phyllite, Gneiss, Intrusives (basic/ultrabasic/ultramafic) [1-5 lps]
- Quartzite, Shale, Sst., BIF [3-10 lps]
- Granite and Granite Gneiss [3-10 lps]
- Hilly Areas with poor aquifers except pockets [<1 lps]
- Ground Water Flow Direction

Stream / River

- 1st Order
- 2nd Order
- 3rd Order
- 4th Order

2 0 2 4 6 km

Hydrogeology Map (Post-monsoon)

Notes
Source: CGWB and Primary Data
Basemap: ESRI Transportation, ESRI Boundary Places
Datum / Projection: WGS 84

Date: 17/10/2023
Prepared By: Rijumoni Dasgupta
File Path:C:\Users\rdasgupta\OneDrive - SRK Consulting\Projects\IN1159_Vedanta ESL_Hydro NOC_Nadidih\04 Working Files\1. GIS\IN1159_ESL_Hydro NOC_Nadidih.qgz

Project ID: 1159
Client: ESL

srk consulting

Figure 3-8: Hydrogeological Map (Post-monsoon)

3.3.4. Depth to Water Level

Involvement of SRK team for the project was from July 2023. Therefore, SRK team could carry out the ground water level survey in and around 10km buffer area during post-monsoon (October 2023) only. The depth of surveyed wells was within range of 55m to 140m BGL. Few wells were monitored outside the 10km buffer to extend interpolation outside study area. Details of the ground water level monitoring data are given in Appendix G.

As per the collected primary data, depth to ground water level within the 2km core zone of the mine varies between 5m and 38m BGL. Depth to ground water level is at shallow level in toe region of ridges and increases towards the open pits of Nadidihi Iron Ore Mine and other adjacent open pit mines in the central southeastern part.

SRK was involved in the project from July 2023, therefore, only the post-monsoon (October 2023) depth to water level map of the study could be prepared, as shown Figure 3-9.

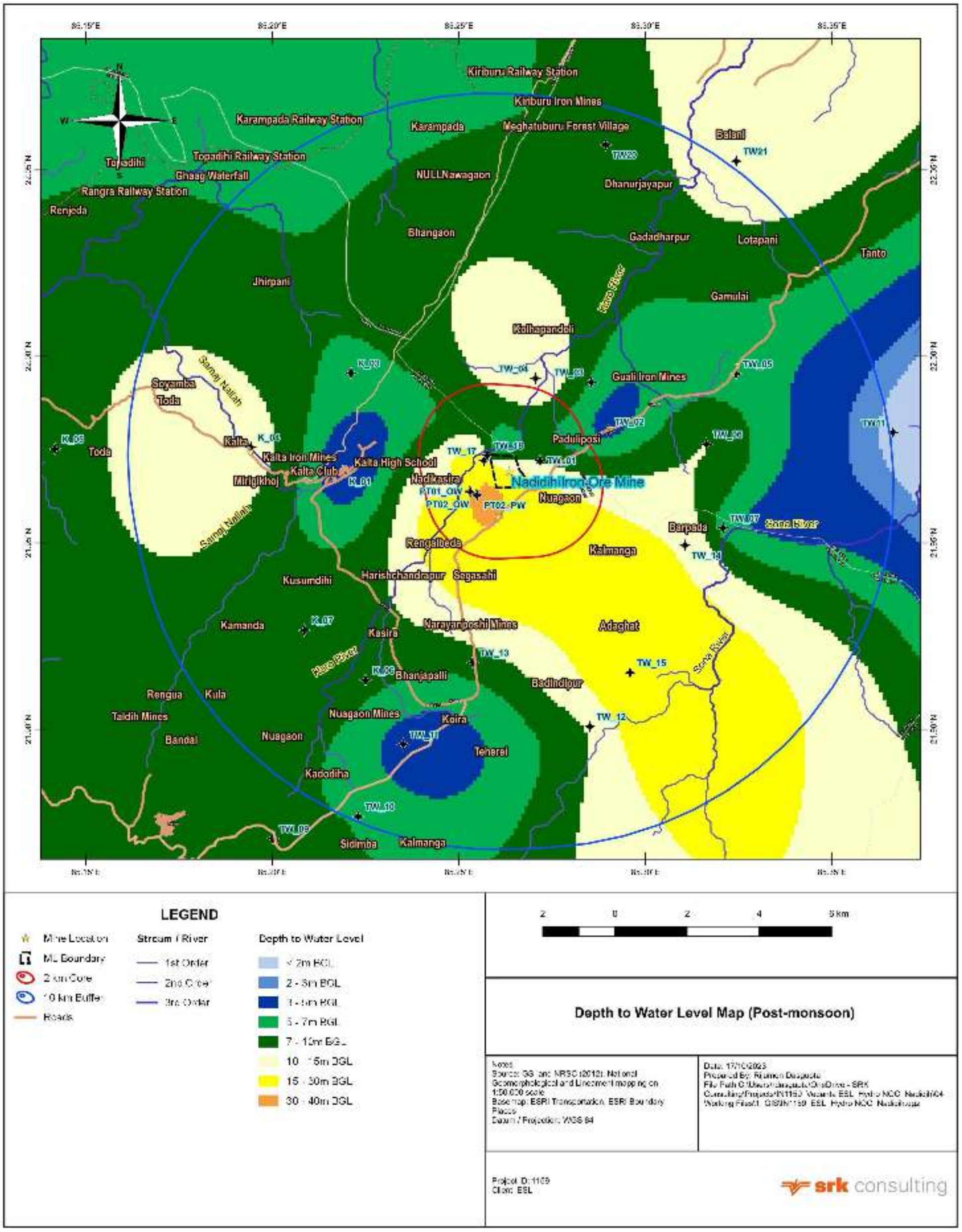


Figure 3-9: Depth to Water Level Map (Post-monsoon)

3.3.5. Long Term Water Level Data Analysis

Groundwater observation well data for a period of 10 years were collected from Central Ground Water Board (CGWB), Govt. of India and analysed for long-term seasonal ground water level trend analysis. The nearest CGWB hydrograph station is located in Guali, around 3.8 km east from the mine site. Rugudi station is around 8 km from the ML boundary. The location of CGWB monitoring stations is presented in Figure 3-10. Details of the same is shown in the Table 3-7.

Table 3-7: Details of CGWB Monitoring Well

Station Name	Block	Type	Latitude	Longitude
Guali	Joda	Dug Well	21.9792	21.9792
Rugudi	Joda	Dug Well	22.0083	85.3347

Water level in the wells are quarterly monitored in winter, pre-monsoon, monsoon, and post-monsoon season by CGWB. Groundwater level data of these wells in between 2014 and 2023 were collected from CGWB portal[4].

[4] https://indiawris.gov.in/wris/#/groundWater

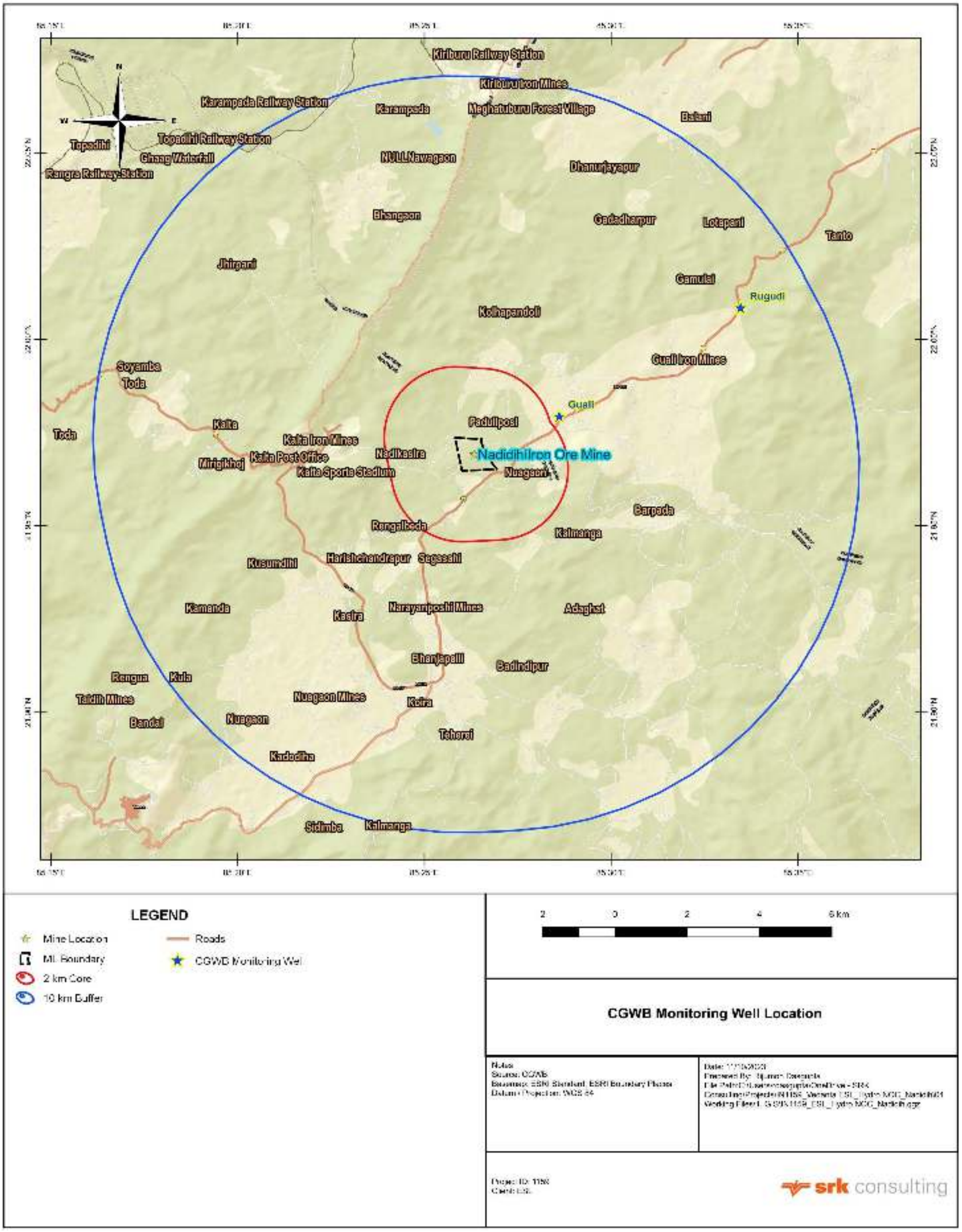


Figure 3-10: Location of CGWB Monitoring Well around Mine Site

Season wise water level monitoring data of all stations presented in Table 3-8 and season wise average water level based on last 10 years data are shown in Figure 3-11 and Figure 3-12.

Table 3-8: 10 Years' Ground Water Level in CGWB Monitoring Well around Study Area

Year of observation	Guali Station Ground Water Level (m BGL)				Fluctuation (m)
	Winter (Jan)	Pre-Monsoon (Apr)	Monsoon (Aug)	Post-Monsoon (Nov)	
2014	6.00	5.88	3.05	4.08	1.80
2015	4.11	5.95	4.01	4.17	1.78
2016	4.24	5.85	4.73	4.46	1.39
2017	4.65	6.02	3.05	6.35	-0.33
2018	7.10	7.80	2.98	-	-
2019	-	-	-	-	-
2020	4.60	-	4.40	5.42	-
2021	5.70	-	4.20	3.86	-
2022	4.25	6.20	3.98	3.65	2.55
2023	6.70	7.38	5.73	-	-
Average	**5.26**	**6.44**	**4.01**	**4.57**	**1.31**
Year of observation	**Rugudi Station Ground Water Level (m BGL)**				**Fluctuation (m)**
	Winter (Jan)	**Pre-Monsoon (Apr)**	**Monsoon (Aug)**	**Post-Monsoon (Nov)**	
2014	3.63	-	2.65	3.85	-
2015	4.38	7.34	3.76	4.11	3.23
2016	-	7.00	3.45	4.46	2.54
2017	4.90	7.44	2.54	5.04	2.40
2018	5.59	5.54	-	-	-
2019	5.34	5.24	-	-	-
2020	4.64	-	4.24	4.53	-
2021	4.02	-	4.29	4.44	-
2022	5.04	5.44	3.65	4.09	1.35
2023	4.24	9.20	4.88		-
Average	**4.64**	**6.74**	**3.68**	**4.36**	**1.67**

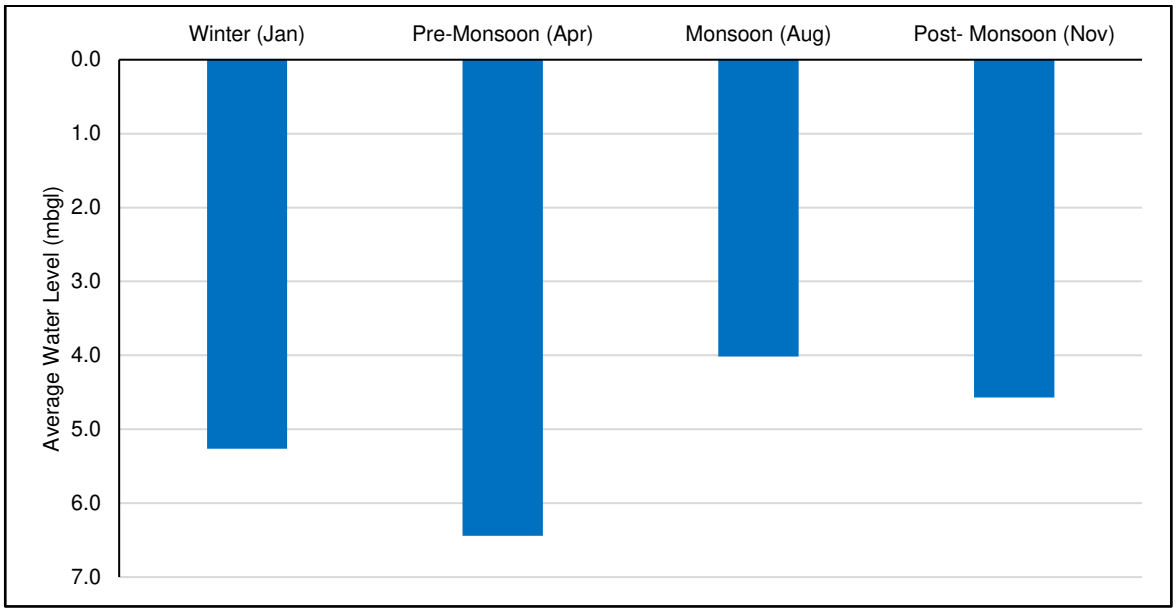


Figure 3-11: Season wise Average Ground Water Level (2014-2023) at Guali Station

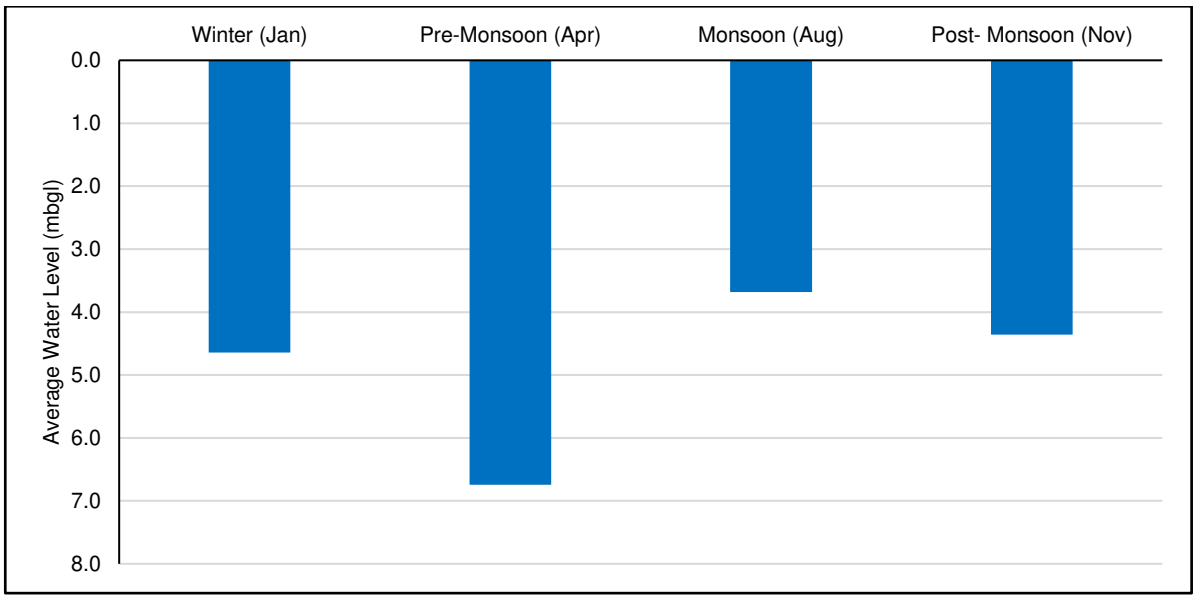


Figure 3-12: Season wise Average Ground Water Level (2014-2023) at Rugudi Station

Hydrograph of the water level for 10 years

Long-term trend of ground water levels for different seasons for the last ten years (2014-2023) were analysed for the CGWB ground water monitoring wells. The season wise hydrograph is presented in Figure 3-13 and Figure 3-14.

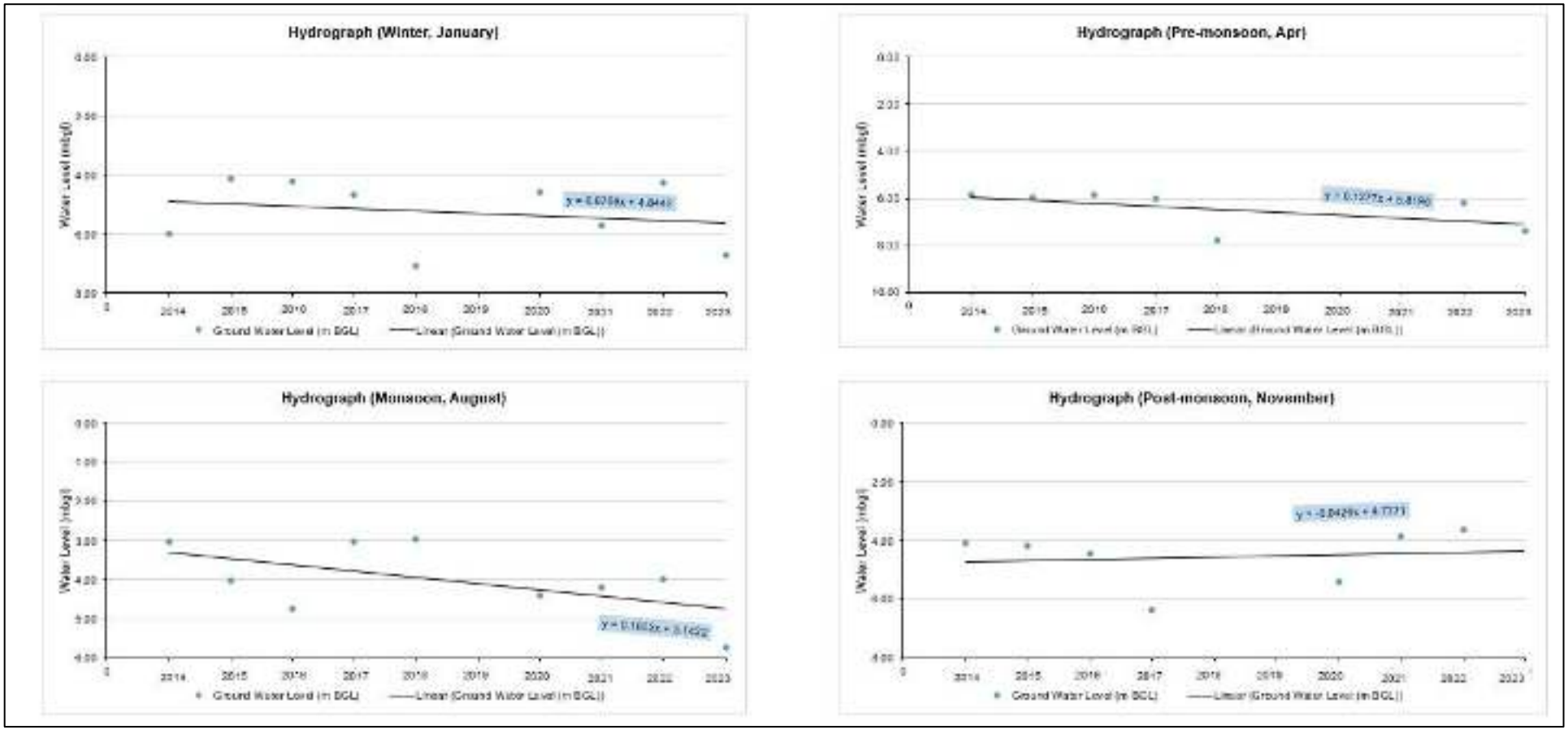


Figure 3-13: Season Wise Hydrograph of Guali Monitoring Well for 10 Years (2014-2023)

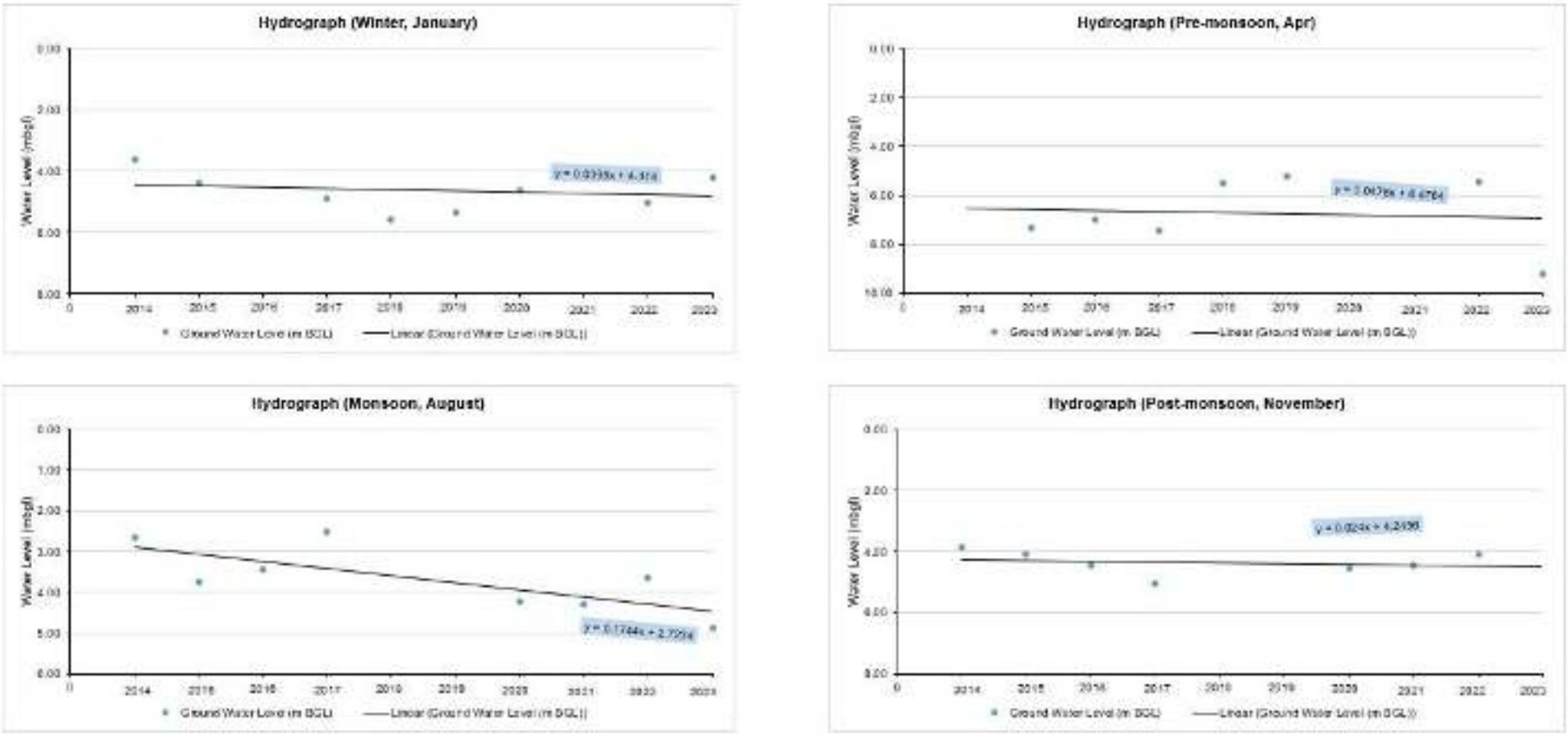


Figure 3-14: Season Wise Hydrograph of Rugudi Monitoring Well for 10 Years (2014-2023)

The hydrographs of Guali and Rugudi monitoring station of CGWB, indicates that the ground water level is in falling trend all over the year over a period of 10 years. The ground water level trend in post-monsoon shows slightly rising at Guali station. The seasonal water level fluctuation is dependent on varying annual rainfall precipitation. The detail analysis for monitoring wells is presented in the Table 3-9, Figure 3-15 and Figure 3-16.

Table 3-9: Long Term Water Level Trend Analysis

Guali monitoring station		
Season	**10 Yrs. Trend (m)**	**Trend Pattern (Rise/ Fall)**
Winter (Jan)	-0.69	Fall
Pre-Monsoon (Apr)	-1.15	Fall
Monsoon (Aug)	-1.44	Fall
Post Monsoon (Nov)	0.38	Rise
Rugudi monitoring station		
Season	**10 Yrs. Trend (m)**	**Trend Pattern (Rise/ Fall)**
Winter (Jan)	-0.36	Fall
Pre-Monsoon (Apr)	-0.43	Fall
Monsoon (Aug)	-1.57	Fall
Post Monsoon (Nov)	-0.22	Fall

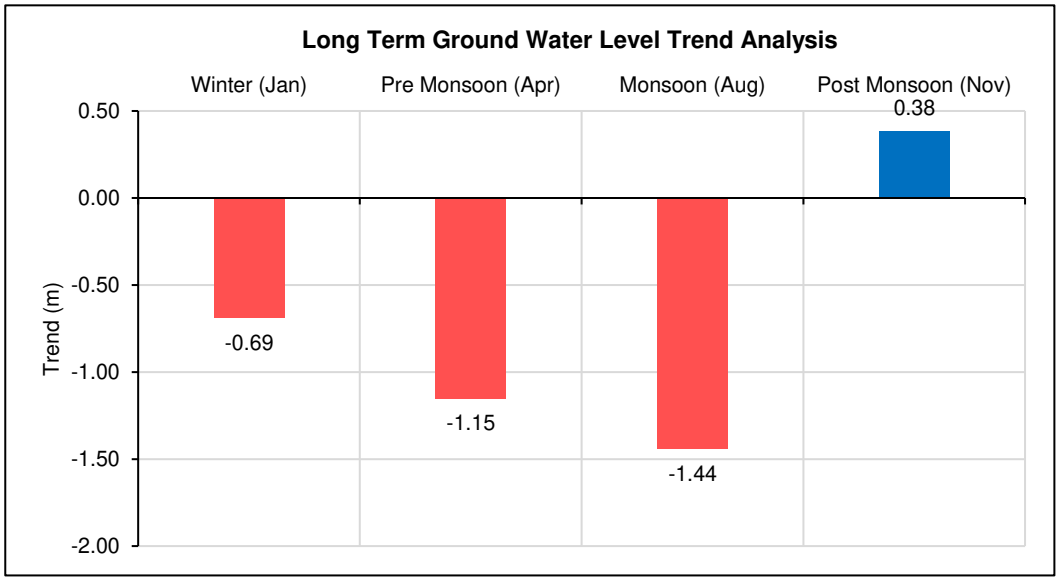


Figure 3-15: Long-Term Ground Water Level Trend of Guali Monitoring Station

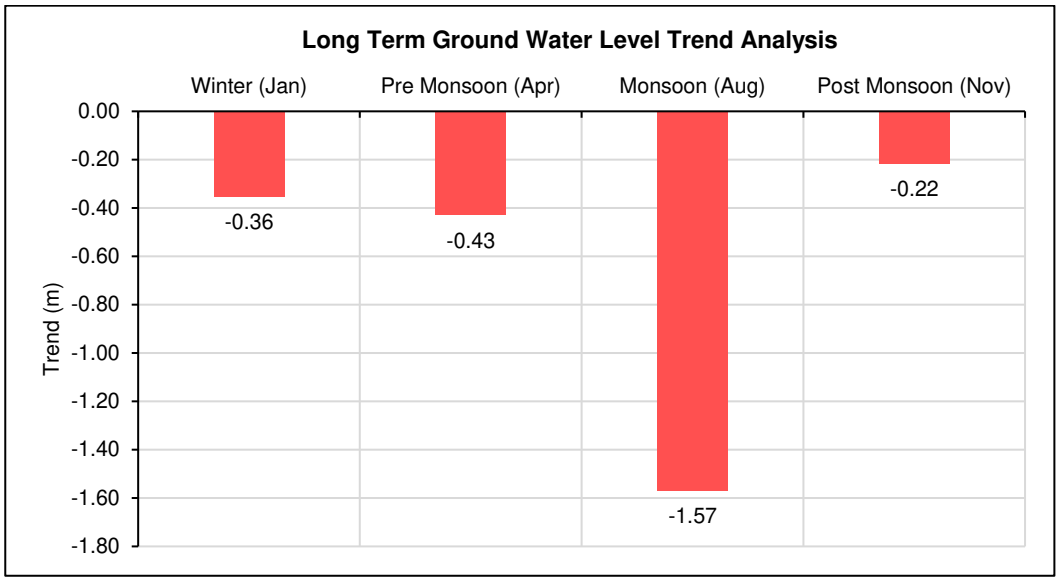


Figure 3-16: Long-Term Ground Water Level Trend of Rugudi Monitoring Station

3.3.6. Ground Water Quality

Groundwater quality depends upon the lithological composition of the aquifers and climatic conditions, to which they are subjected at the time of formation, quantity of water available and its rate of circulation, the activities of microorganism, temperature, and pressure condition etc. The hydro-chemical condition occurring within aquifer causes complex dissolution and decomposition processes which may affect the quality of ground water. To assess the existing water quality, a detailed physicochemical quality study of ground water was undertaken.

Water samples from 16 groundwater abstraction structures within core and buffer zone of the ML were collected in October 2023 (Post-monsoon) to understand the hydro-geochemistry of ground water in and around the study area. The samples were subjected for analysis for both major and minor parameters and were compared with drinking water specification standards of IS 10500: 2012.

In majority of ground water samples from core and buffer zone of the ML, high turbidity values exceeding permissible limits have been observed with the exceptions of the Karmapada and Kolmong areas suggest a higher concentration of suspended particles, which could be attributed to poor or improper well development and maintenance. It is observed that majority of ground water samples except Tonto and Kundruburu area, show pH values less than the acceptable range which reflect that the groundwater quality is slightly acidic in nature.

Concentration of Iron (Fe) varies from 0.14 mg/l to 7.34 mg/l, majority of which is significantly above the permissible limit. All samples show higher concentration of Iron except Kadodiha, Tonto, Karmapada and Kolmong areas. The possible reason for higher Fe values in the ground water may be due to dissolution of Ferromagnesian mineral occurring within the aquifer formation. Fluoride content varies from <0.05 mg/l to 1.96 mg/l exceeding permissible limits, with higher concentrations observed in Kendudihi and Balagoda areas. The possible reason for occurrence of Fluoride in ground water may be due to dissolution of Fluoride bearing hydrous silicate occurs within metamorphic rocks present in study area. The rock–water interaction results in the release of Fluoride to ground water.

Total Dissolved Solids (TDS) in groundwater varies from 28 mg/l to 436 mg/l, which is within acceptable limit as per IS 10500:2012. The Chloride content of ground water samples were found to be within acceptable limit. The Calcium content varies within the acceptable limit except in tonto area which shows a slightly above acceptable limit, but within permissible limit. Total Hardness ranges from 20 mg/l to 332 mg/l falls below permissible limit but above acceptable limit in Kundruburu, Tonto and

Balagoda areas. The ground water samples fall in soft category as inferred from the concentrations of Ca and Mg.

Nitrate of all samples show low concentration and within acceptable limit as per IS 10500:2012. Magnesium concentration in some areas (Kundruburu and Tonto) exceeds the acceptable limit. The laboratory test results are summarised in Table 3-10 and analysis reports are attached in Appendix H.

A review of ground water sample analysis indicates that ground water quality of study area is slightly acidic in nature which needs proper attention before use. The acidic nature of ground water may be due to mixing of surface runoff and leachate that are generated from large volume overburden and tailings produced in the mining belt for prolonged time, subsequent processing activities and discharge of improperly treated water to nearby water bodies. As most of the mines use overburden as backfilling material for mining areas, acidic ground water may also result from leaching activities. The high turbidity values indicate that the water is not clean, emphasizing the necessity for proper well development and maintenance.

The Contour Map of Electrical Conductivity and Chloride Concentration is shown in the Figure 3-17 and Figure 3-18 respectively. The Map of Fluoride and Nitrate concentration in ground water is represented in Figure 3-19 and Figure 3-20 respectively.

Table 3-10: Chemical Analysis Result of Ground Water (Post-monsoon, October 2023)

Sl.	Parameters	Units	Reference: IS 10500:2012		Sample ID	GW01	GW02	GW03	GW04	GW05	GW06	GW07	GW08
			Acceptable Limit	Permissible Limit	Location	Kendudihi	Kundruburu	Toda Colony	Kalta Township	Kamanda	Dengula	Kadodiha	Rugudih
					Lat (N)	21.97350	21.97519	21.98212	21.96718	21.92656	21.87160	21.89598	21.99534
					Long (E)	85.25755	85.14168	85.18093	85.21823	85.20854	85.19998	85.23504	85.32426
					Type	Ground Water							
1	Colour	Hazen	5	15		<5	<5	<5	<5	<5	<5	<5	<5
2	Odour					Agreeable	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable
3	Turbidity	NTU	1	5		24.5	30.3	55.6	32.9	46.9	12.6	36.8	50.2
4	pH Value		6.5 to 8.5	No relaxation		5.62	6.71	6.1	5.98	5.48	5.79	6.09	5.56
5	Total hardness (as $CaCO_3$)	mg/l	200	600		72	320	64	88	20	52	64	86
6	Iron (Fe)	mg/l	0.3	No relaxation		3.78	0.37	0.36	1.82	7.34	4.87	0.23	0.96
7	Chloride (as Cl)	mg/l	250	1000		6.89	42.38	19.71	19.71	3.94	16.75	10.84	30.55
8	Total dissolved solids	mg/l	500	2000		81	420	69	116	28	93	85	109
9	Electrical Conductivity	µS/cm	-	-		132.6	700	115	191.9	4.6	151.4	138.6	175.5
10	Calcium (as Ca)	mg/l	75	200		14.43	68.94	11.22	24.05	4.81	17.64	16.03	9.62
11	Magnesium (as Mg)	mg/l	30	100		8.75	35.96	8.75	6.8	1.94	1.94	5.83	7.78
12	Manganese (as Mn)	mg/l	0.1	0.3		<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
13	Sulphate (as SO_4)	mg/l	200	400		<0.50	13.47	<0.50	<0.50	<0.50	<0.50	4.46	<0.50
14	Total Nitrate (as NO_3)	mg/l	45	No relaxation		<2.20	6.01	<2.20	10.2	<2.20	7.95	<2.20	19.84
15	Carbonate Alkalinity	mg/l	-	-		<4	<4	<4	<4	<4	<4	<4	<4
16	Bicarbonate Alkalinity	mg/l	-	-		48	252	28	48	16	36	48	32
17	Sulphide (as H_2S)	mg/l	0.05	No relaxation		<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
18	Sodium (as Na)	mg/l	-	-		7.17	32.23	4.18	6.24	2.9	6.21	5.05	8.57
19	Potassium (as K)	mg/l	-	-		2.19	6.28	0.27	0.95	0.2	5.54	1.46	0.75
20	Fluoride (as F)	mg/l	1	1.5		1.65	0.1	<0.05	<0.05	<0.05	1.04	0.13	0.2
21	Lead (as Pb)	mg/l	0.01	No relaxation		ND	ND	ND	ND	ND	ND	ND	ND
22	Arsenic (as As)	mg/l	0.01	0.05		<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
23	Zinc (as Zn)	mg/l	5	15		<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
24	Total Chromium (as Cr)	mg/l	0.05	No relaxation		ND	ND	ND	ND	ND	ND	ND	ND

Sl.	Parameters	Units	Reference: IS 10500:2012		Sample ID	GW09	GW10	GW11	GW12	GW13	GW14	GW15	GW16
			Acceptable Limit	Permissible Limit	Location	Tonto	Kundrupani	Balagoda	Lasarda	Karmapada	Patliposi	Thengrai	Kolmong
					Lat (N)	22.03752	21.97966	22.08508	22.05239	22.04325	21.99309	21.90075	21.94938
					Long (E)	85.37552	85.36645	85.32116	85.32432	85.23660	85.28542	85.28506	85.31055
					Type	Ground Water							
1	Colour	Hazen	5	15		<5	<5	<5	<5	<5	<5	<5	<5
2	Odour					Agreeable	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable
3	Turbidity	NTU	1	5		5.1	61.8	24.5	6.6	0.1	41.9	7.2	1.4
4	pH Value		6.5 to 8.5	No relaxation		6.61	6.02	6.41	6.32	6.16	5.44	6.05	5.58
5	Total hardness (as $CaCO_3$)	mg/l	200	600		332	60	212	120	48	44	32	36
6	Iron (Fe)	mg/l	1	No relaxation		0.26	0.33	0.88	0.44	0.14	6.49	0.93	0.19
7	Chloride (as Cl)	mg/l	250	1000		38.43	36.46	19.71	5.91	6.89	4.93	7.88	9.89
8	Total dissolved solids	mg/l	500	2000		436	124	224	127	53	53	43	41
9	Electrical Conductivity	µS/cm	-	-		726	207	368	205	87.6	88	69.8	63.8
10	Calcium (as Ca)	mg/l	75	200		76.95	14.43	54.51	24.05	9.62	14.43	8.02	4.81
11	Magnesium (as Mg)	mg/l	30	100		34.02	5.83	18.45	14.58	5.83	1.94	2.92	5.83
12	Manganese (as Mn)	mg/l	0.1	0.3		<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
13	Sulphate (as SO_4)	mg/l	200	400		35.82	<0.50	10.24	1.82	<0.50	2.84	<0.50	<0.50
14	Total Nitrate (as NO_3)	mg/l	45	No relaxation		14.83	26.92	<0.50	<2.20	<2.20	2.24	<2.20	9.51
15	Carbonate Alkalinity	mg/l	-	-		<4	<4	<4	<4	<4	<4	<4	<4
16	Bicarbonate Alkalinity	mg/l	-	-		52	8	108	72	32	28	24	8
17	Sulphide (as H_2S)	mg/l	0.05	No relaxation		<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
18	Sodium (as Na)	mg/l	-	-		24.06	14.87	12.58	14.59	2.27	1.49	1.88	1.45
19	Potassium (as K)	mg/l	-	-		8.83	1.55	6.32	2.19	0.22	0.18	0.24	0.4
20	Fluoride (as F)	mg/l	1	1.5		0.2	0.3	1.96	0.5	0.2	0.1	0.3	<0.05
21	Lead (as Pb)	mg/l	0.01	No relaxation		ND	ND	ND	ND	ND	ND	ND	ND
22	Arsenic (as As)	mg/l	0.01	0.05		<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
23	Zinc (as Zn)	mg/l	5	15		<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
24	Total Chromium (as Cr)	mg/l	0.05	No relaxation		ND	ND	ND	ND	ND	ND	ND	ND

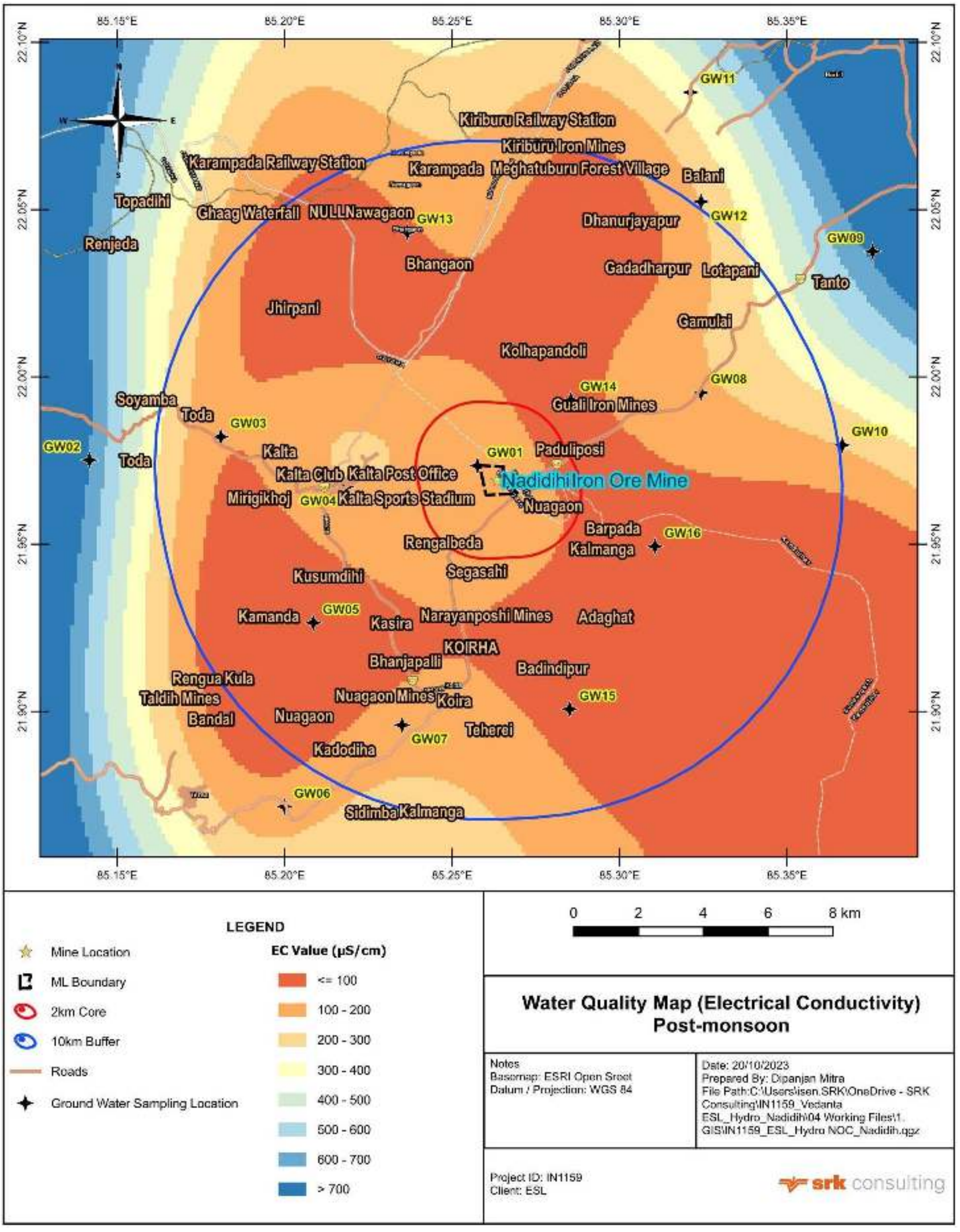


Figure 3-17: Contour Map of Electrical Conductivity in Ground Water (Post-monsoon, October 2023)

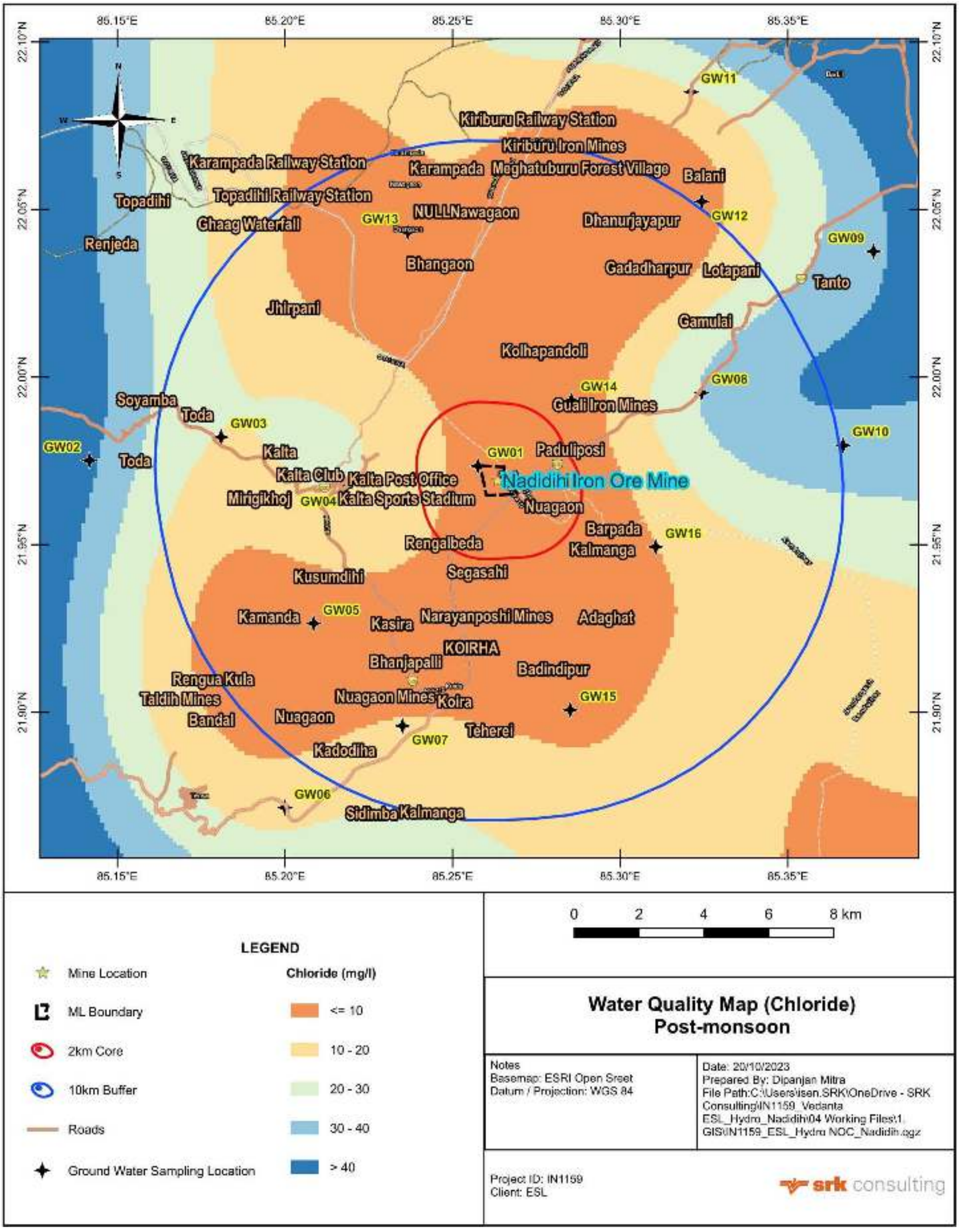


Figure 3-18: Contour Map of Chloride Concentration in Ground Water (Post-monsoon, October 2023)

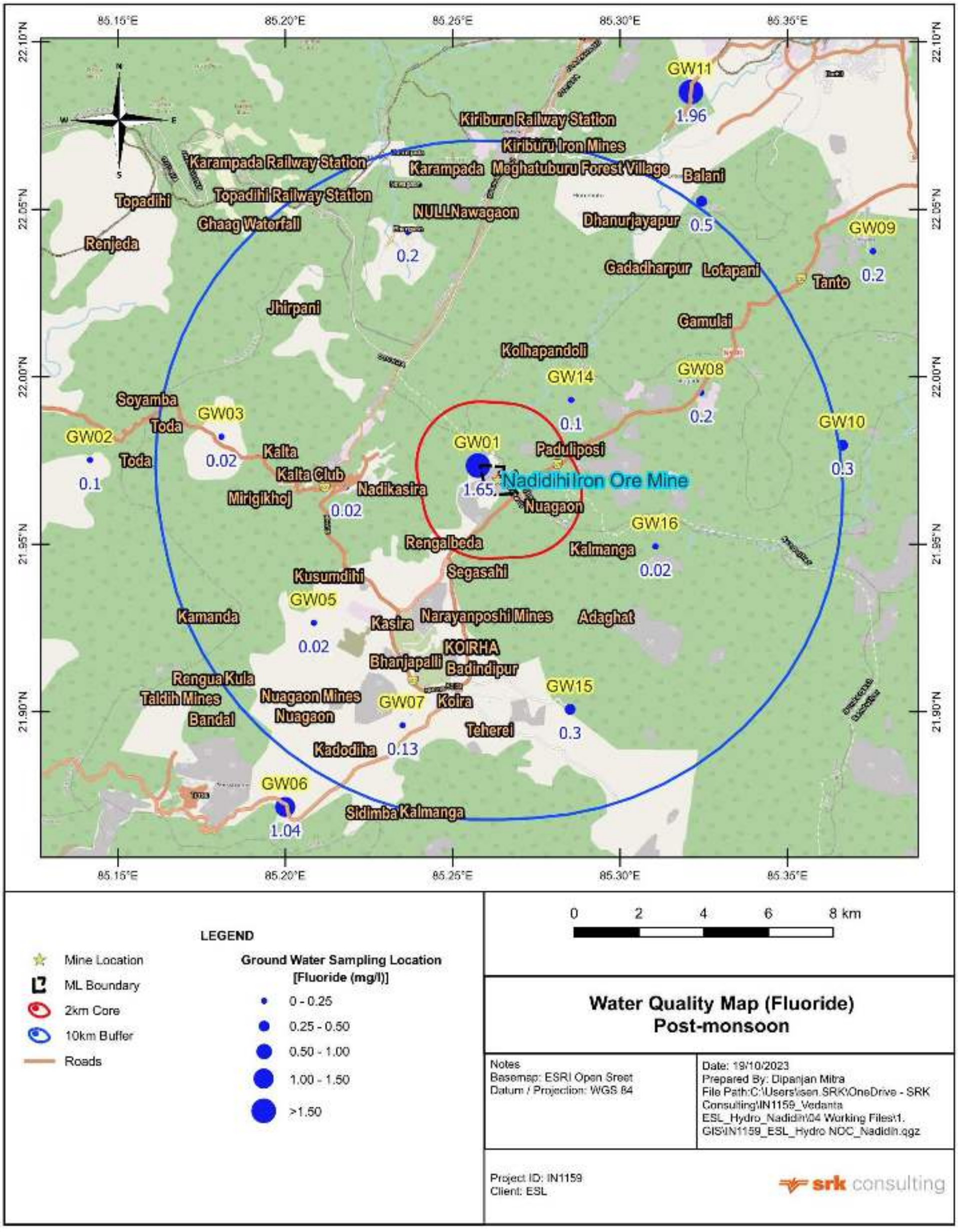


Figure 3-19: Fluoride Concentration in Ground Water (Post-monsoon, October 2023)

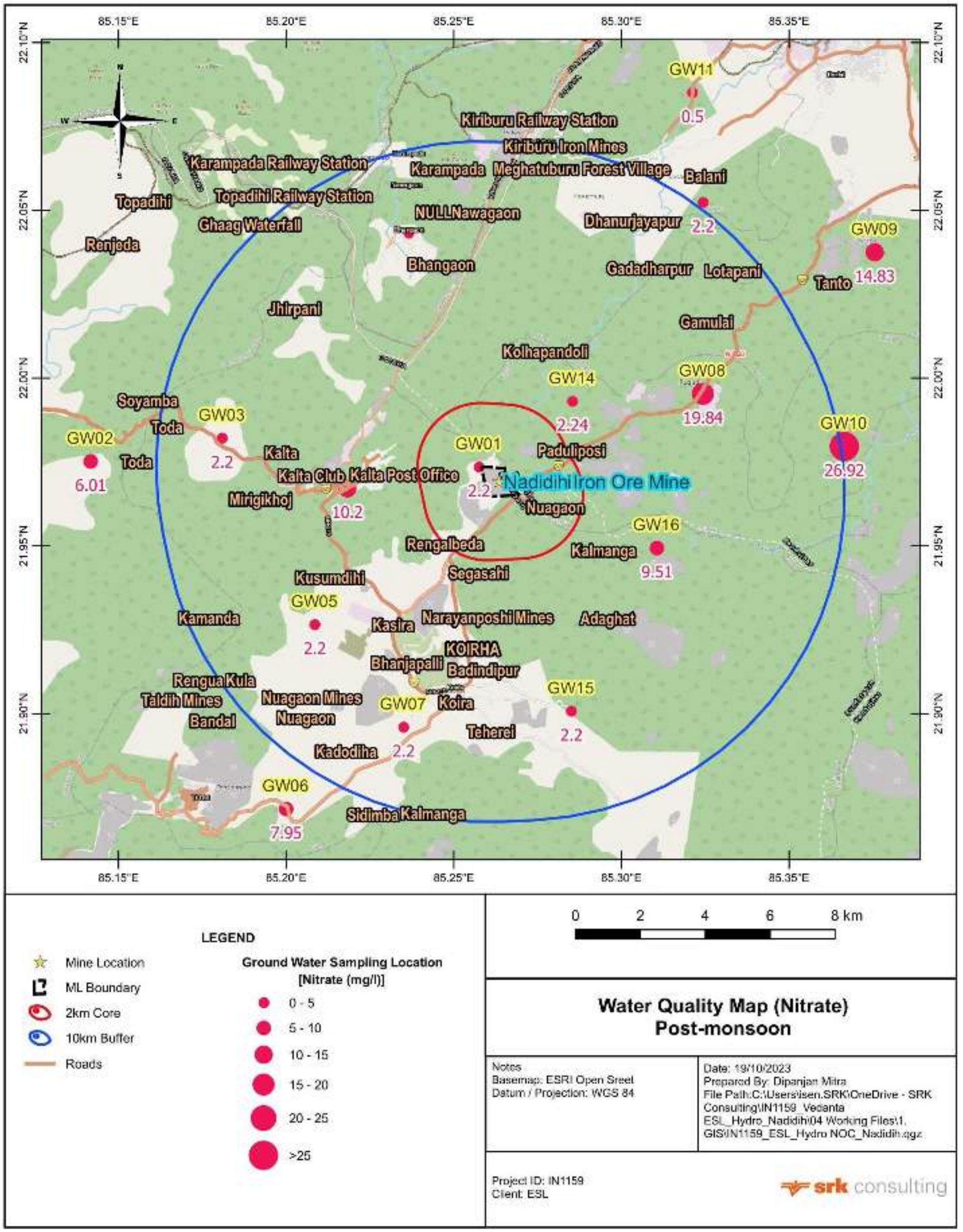


Figure 3-20: Nitrate Concentration in Ground Water (Post-monsoon, October 2023)

3.3.7. Water Quality of Nearby Water Bodies

Generally, the surface water is not suitable for drinking purpose without required treatment. Table 3-11 represents two number of surface water samples were collected from upstream and downstream of Karo river during post-monsoon, October 2023. The samples were subjected for analysis for both major and minor parameters viz. pH, Total Dissolved Solids (TDS), Total Suspended Solids (TSS), Total Hardness, BOD, COD Arsenic, Chloride, Zinc, Fluoride, Iron, Lead, etc. according to the IS: 3025 The laboratory test results are given in Appendix H.

The Surface Water quality results are compared with Indian Standard of Surface Water Quality IS: 2296-1982 class C category which refers that water can be used as drinking water after conventional treatment and disinfection. The pH value in surface water shows within permissible range of 6.5-8.5. The TDS value varies from 47 mg/l to 60 mg/l. The other parameters also show values within the prescribed range of the IS: 2296 category C. The presence of toxic substances is not found within samples. Overall, the surface water can be used for various purpose after proper treatment. Summary result of all sample analysis shown in Table 3-11.

Table 3-11: Chemical Analysis Result of Surface Water (Post-monsoon, October 2023)

Sl.	Parameters	Unit	IS: 2296 class C permissible range	Sample ID	SW1	SW2	Mine Water
				Location	Downstream of karo river	Upstream of karo river	Nadidihi Iron Ore Mine Pit
				Lat (N)	21.97528	21.96015	21.96092
				Long (E)	85.25796	85.250316	85.25655
				Type	River water		Mine Water
1	pH		6.5-8.5		6.47	6.82	6.89
2	Colour	Hazen	300		<5	<5	<5
3	TDS	mg/l	1500		60	60	47
4	Dissolved Oxygen	mg/l	4		6.6	6.4	6.2
5	BOD (5 days at 20°C)	mg/l	3		1	1	2
6	Lead as (Pb)	mg/l	0.1		<0.10	<0.10	<0.10
7	Fluoride (as F)	mg/l	1.5		0.1	1.2	0.1
8	Iron (Fe)	mg/l	50		0.47	1.06	0.21
9	Total Nitrate (as NO_3)	mg/l	50		<2.20	<2.20	<2.20
10	Sulphate (as SO_4)	mg/l	400		6.59	8.98	<0.50
11	Chlorides (as Cl)	mg/l	600		9.89	5.91	5.91
12	Electrical Conductivity	µS/cm	-		93	93.7	78.2
13	Total Suspended solids	mg/l	-		13.9	49.3	<2.5
14	Total hardness (as $CaCO_3$)	mg/l	-		56	56	32
15	Calcium (as Ca)	mg/l	-		14.43	11.22	8.02
16	Magnesium (as Mg)	mg/l	-		4.86	6.8	2.92

Sl.	Parameters	Unit	IS: 2296 class C permissible range	Sample ID	SW1	SW2	Mine Water
				Location	Downstream of karo river	Upstream of karo river	Nadidihi Iron Ore Mine Pit
				Lat (N)	21.97528	21.96015	21.96092
				Long (E)	85.25796	85.250316	85.25655
				Type	River water		Mine Water
17	Manganese (as Mn)	mg/l	-		<0.05	<0.05	<0.05
18	Sodium (as Na)	mg/l	-		1.95	1.89	1.12
19	Potassium (as K)	mg/l	-		0.44	0.52	0.15
20	Carbonate Alkalinity	mg/l	0.01		<4.0	<4.0	<4.0
21	COD	mg/l			3.3	3.2	7.1
22	Odour	-	-		Agreeable	Agreeable	Agreeable
23	Free Ammonia (as NH_3)	mg/l	-		<0.012	<0.012	<0.012

4. APPROVED MINE PLAN

ESL acquired Nadidihi Iron Ore Mine in Nadikasira and Rengalbeda village, Koira Tehsil of Sundargarh district, Odisha through the auction process as per Mineral (Auction) Rules 2015. Subsequently, Mine Lease (ML) deed was executed with Govt. of Odisha on 20 November 2021. The previous lessee of the ML was Bonai Industrial Co. Ltd. (BICO), whose ML period ended on 31 March 2020. The new lease deed has been executed over an area of 74.5 Ha.

Mining at Nadidihi Iron Ore Mine is being carried out by opencast method. As per the MCDR 2017, the mine belongs Category-A (Fully mechanized / FM). Excavators of up to 6.1 m^3 bucket capacity is being utilised for excavation and loading of materials into 35 ton and 100 ton capacity dumpers. The bench height and width of the quarry is maintained up to 9m and 10-12m respectively. Rock breakers are used to break the hard in-situ ore boulders and blasting is done occasionally. The details of mineral handling plants within ML area are as following:

- Mobile crushing plant of 8 x 150 TPH & 2 x 250 TPH;
- Mobile screening plant of 2 x 150 TPH, 1 x 250 TPH, 11 x 300 TPH;
- 600 TPH Fixed dry screening and crushing plant;
- Washing plant of 0.5 MTPA (throughout capacity)

The mine has two pits at present, details of which is as following (Table 4-1) as per the approved mine plan.

Table 4-1: Details of Existing Pits

Pit ID	Present Status	Pit Area (Ha)	Pit Dimension (m)
West Pit	Filled up with Water	19.195	550 x 380 x 88
East Pit	Active	13.219	464 x 370 x 80

4.1. Year Wise Mine Plan Including Excavation Depth

Excavation of ore from Nadidihi Iron Ore Mine by the previous lessee was done from two pits, which exist till date. The West Pit is currently not operational. ESL is planning to excavate from East Pit and progress westward to merge with the West Pit as per the year wise mine development plan prepared till 2026. The year wise dimensions of pit and mining parameters as per approved mine plan till 2026 are presented in Table 4-2.

Table 4-2: Year Wise Pit Dimensions and Mining Parameters

Sl. No.	Particulars	Unit	2022-2023	2023-2024	2024-2025	2025-2026
1.	Max Height of Benches in OB	m	9	9	9	9
2.	Min Width of Benches in OB	m	10-12	10-12	10-12	10-12
3.	Slope of Bench in OB	Degree	70-80	70-80	70-80	70-80
4.	Max Height of Benches in Ore	m	9	9	9	9
5.	Min Width of Benches in Ore	m	10-12	10-12	10-12	10-12
6.	Slope of Bench in Ore	Degree	70-80	70-80	70-80	70-80
7.	Overall Slope of Pit	Degree	24-30	23-33	23-33	28-33
8.	No. of Benches in Topsoil	No.	0	0	0	0
9.	No. of Benches in OB	No.	1	0	4	0
10.	No. of Benches in Ore	No.	5	3	8	6
11.	Top mRL	aMSL	591.61	591.61	592.00	592.00
12.	Bottom mRL	aMSL	511.00	484.00	484.00	462.00

Sl. No.	Particulars	Unit	2022-2023	2023-2024	2024-2025	2025-2026
13.	Total Depth	m	80.61	107.61	108.00	130.00

The year wise mine development details supplied by ESL are furnished in Table 4-3.

Table 4-3: Year wise Mine Development Plan

Sl. No.	Particulars	Unit	2022-2023	2023-2024	2024-2025	2025-2026
1.	No. of Benches in Ore	No.	5	3	8	6
2.	Over Burden Volume	m^3	2,31,120	2,96,400	6,92,000	16,63,200
3.	Over Burden Quantity	Ton	5,77,800	7,41,000	17,30,000	41,58,000
4.	ROM Volume	m^3	12,05,292	11,59,650	11,65,350	11,61,375
5.	ROM Quantity	Ton	36,15,876	34,78,950	34,96,050	34,84,125
6.	Ore Recovery	%	71	99	83	68
7.	Production Main	Ton	25,67,272	34,44,160	29,01,721	23,69,205
8.	OB : Ore Ratio	Ton/m^3	1: 0.17	1: 0.19	1: 0.30	1: 0.58

As per the approved mine plan, backfilling will be done from 2024-2025 onwards in West Pit simultaneously with excavation and extension of the working pit. Year wise details of backfilling are shown in the following Table 4-4.

Table 4-4: Year Wise Backfilling Plan

Sl. No.	Particulars	Unit	2022-2023	2023-2024	2024-2025	2025-2026
1.	Pit ID	NA	NIL	NIL	West Pit	West Pit
2.	Area	m^2	NIL	NIL	14,743	16,663
3.	Top RL	m	NIL	NIL	570	575
4.	Bottom RL	m	NIL	NIL	558	565

5. ESTIMATION OF MINE SEEPAGE AND ADVANCED DEWATERING PLAN

5.1. Estimation of Mine Seepage

In Nadidihi Iron Ore Mine, the upper unconfined aquifer is hydraulically connected with the semi-confined aquifer. The mine seepage & influence is directly proportional to the mine area and depth. An estimation of ground water inflow in Nadidihi Iron Ore Mine pit has been made for increasing development and for pre-monsoon and post-monsoon season of the year. The estimation is based on the yearly mine development as per the approved mine plan. The ground water seepages start in the excavated area once the water table is intersected by the open pit.

Dewatering pumps are deployed at present to pump out the water from working pit area throughout the year. However, the West Pit is partially filled up with water and the water level is below the working bench. The dewatered volume is used in different operational purposes.

The post-monsoon water level (October 2023) in the area was measured by SRK Team. The seepage survey data on mine faces indicates intersection depth of ground water table with the open pit. The ground water level data were collated together with the seepage survey data on mine faces and the interpolated water table (Piezometric Head) elevation contour maps were prepared by SRK. The groundwater flow and hydraulic conductivity along the litho contacts zones are higher than across the contacts.

Year wise mine seepage up to the end of approved mining plan period is obtained from numerical ground water model, prepared by Individual Consultant Mr. Baddela Jaya Kumar (bilateral MOU signer with SRK Consulting), as summarised in the following Table 5-1. The Groundwater Modelling Report is submitted as a separate report.

Table 5-1: Total Mine Seepage[8]

Year	Period	Mine Seepage (m^3/Day)	Weighted Average Mine Seepage (m^3/Day)	Avg. Annul Mine Seepage (m^3/Year)
2024-2025	Monsoon	1,628	1,590	5,80,350
	Non-Monsoon	1,571		
2025-2026	Monsoon	1,891	1,855	6,77,075
	Non-Monsoon	1,838		
2026-2027	Monsoon	1,896	1,868	6,81,820
	Non-Monsoon	1,854		

The seepage estimation shown in the above tables are based on numerical ground water modelling outcome. The actual seepage quantity may vary from the estimated seepage quantity due to the following reasons:

- The available data has some limitation in capturing all the relevant aspects of the hydrogeological system and the estimation method had to depend on certain assumptions;

[8] Obtained from Numerical GW Model

- Unexpected geological formations or discontinuities may be encountered during mining operations. These features can influence groundwater flow and inflow rates;

5.2. Estimation of Rainwater Quantum Dewatered

Catchment of the quarry is divided into the Exposed Pit Area (within the limit of pit crest), and Pit Lake (within the limit of stored water in pit). Standard empirical equation is used for estimation of runoff from the delineated catchments. The runoff was estimated for rainfall events in monsoon, post-monsoon, winter and yearly total rainfall as indicated in Table 2-3. The Exposed Pit Area (within the limit of pit crest) has a slope of more than 10% and the runoff coefficient value of 0.70 is assigned. The entire rainfall amount over waterlogged area of pit will contribute to the surface water inflow component, hence the runoff coefficient value of 1.0 is assigned for the flooded / waterlogged area.

The mine authority has taken precautionary measures to divert surface runoff generated beyond the pit crest by implementing garland drain networks. Therefore, the rainwater dewatering quantity estimated in this section consists of only rainwater received within the limit of open pit crest. The following research publications were consulted for assigning the runoff coefficient:

- Mahmoud et. al, 2015[9];
- Rainwater Harvesting in a Typical Mine Area of Orissa, by A. Sahoo and D. Choudhury[10];
- Runoff calculation guidelines by California State Water Resources Control Board;
- Storm Water Management Model by U.S. Environmental Protection Agency, 2015;
- Hydrologic Analysis and Design by R. H. McCuen, Prentice Hall, 3rd edition, 2004.

Runoff from each category of catchment is estimated using:

Runoff (m^3) = Rainfall (m) x Runoff coefficient x Area (m^2)

Summary of all the analysis result from the pit catchments (East pit and West Pit combined), is shown in the following Table 5-2.

Table 5-2: Runoff Estimation to Open Pit

Particulars	Area (m^2)	Runoff (m^3)		
		Monsoon Daily	Non-Monsoon Daily	Annual
Flooded Area	74,078	650	87	99,339
Effective Pit Area	2,73,742	1,681	226	2,56,962
Total	**3,47,820**	**2,330**	**313**	**3,56,300**

Above analysis indicates runoff assessment during different scenario of rainfall event for the open pit and quantity required to be dewatered is estimated to be 976 KLD on average (annual 3,56,300 m^3). The assessment utilised rainfall analysis outcome. The estimated volumes are indicative at this stage, and useful to suggest the water management scheme. However, the detailed engineering design of the water management structures needs to be done on the basis of hourly rainfall analysis and a detailed hydrological assessment based on slope for each catchment, latest survey data, actual infiltration capacity of soil in different parts of the lease area and time of concentration of the runoff.

[9] Mahmoud, S.H., Alazba, A.A., Adamowski, J. and El-Gindy, A.M., 2015. GIS methods for sustainable stormwater harvesting and storage using remote sensing for land cover data-location assessment. *Environmental monitoring and assessment*, *187*, pp.1-19.

[10] Sahoo, A., Choudhury, D. and Jha, R., 2012. Rainwater harvesting in a typical mine area of Orissa. NIT, Rourkela.

CGWA has notified that in cases of Mine Dewatering, all project proponents have to consider rainfall quantum in ground water dewatering. Since the NOC will be renewed after 2 years, ESL need to proceed for application with maximum dewatering of 2,844 m^3/day (highest ground water seepage of 1,868 m^3/day and average rainwater dewatering requirement of 976 m^3/day in next 2 years).

5.3. Advanced Dewatering Plan in Case of Coal / Lignite Mines

The mine is not a coal mine, hence this section is not applicable.

5.4. GW Modelling

The Nadidihi Iron Ore Mine project is located in Koira block of Sundargarh district, Odisha. The block falls under 'Safe category' block as per CGWB Categorization of Assessment Units GWRA 2022. The estimated amount for mine dewatering will be more than 500 KLD. Hence, the Groundwater Modelling Report has been prepared by Individual Consultant Mr. Baddela Jaya Kumar (bilateral MOU signer with SRK Consulting), having CGWA accreditation certificate no. CGWA/RGI/019, as per the CGWA guidelines. The Groundwater Modelling Report is submitted as a separate report.

6. MINE WATER MANAGEMENT

The mining and its ancillary operations are dependant on ground water to meet the daily requirement. The last CGWA NOC (Appendix D) for ground water withdrawal was issued to the previous lessee on 04 February 2019, which expired on 24 January 2021 (CGWA/NOC/MIN/ORIG/2019/4741). As per the previous NOC, ground water withdrawal was permitted at 73,000 m^3/year through 3 bore wells (2 existing and 1 proposed) and 9,000 m^3/year through dewatering from mine pits, totalling maximum of 82,000 m^3/year (225 m^3/day) ground water withdrawal. The mines authority has already applied for renewal of the NOC.

Currently, only two (2) tube wells are present within the ML area, out of which one is being utilised to supply drinking water for mine workers and another one is used as piezometer. These wells are tapping the fractured hard rock aquifer. Although the previous lessee obtained permission for another proposed borewell, it was not drilled till date. The details of existing wells are given in Table 6-1 and locations are shown in Figure 6-1. The existing wells need to be fitted with tamper proof digital flow meter.

Table 6-1: Details of Existing Tube Wells

Particulars	Details of Piezometer	Details of Tubewell
Well ID	NIBW1	NIBW2
Category	Piezometer	Tubewell
Location	Beside In-Gate Security Office	Beside Security Gate
Latitude	21.97327640	21.97309220
Longitude	85.26255550	85.26221890
Collar Elevation (aMSL)	540.18	540.29
Depth (mBGL)	111	127
Diameter (mm)	127	203
Pump (hp)	NA	3
Type	Telemetric	Submersible
Year of Construction	2016	2006
Make	Engineering and Environmental	NA
Discharge (m^3/hour)	0	4
Operational Hours per Day / Days per Year	24 / 365	5 / 365



Figure 6-1: Location of Existing Well and Piezometer

The existing and future year break-up of water consumption for the mine, as provided by the mines authority is given in the Table 6-2 below. The estimated water requirement for domestic purpose has been calculated as per NBC norms considering 250 workers.

Table 6-2: Proposed Water Consumption and Balance

Sl. No.	Activities	Source	Proposed Maximum Requirement (KLD)	Yearly no. of Operational Days	Projected Yearly Maximum Quantity (KL)
A	Mine Seepage Ground Water Dewatering	Ground Water	1,868	Variable	6,81,820
B	Rainwater Dewatering *(Estimated annual runoff 3,56,300 KL)*	Runoff	976	Variable	3,56,240
C	Pumping from Borewell	Existing Borewell	20	365	7,300
D = [A+B+C]	**Total Water Abstraction**	**Mine Dewatering & Borewell**	**2,864**	**365**	**10,45,360**
1	Water Sprinkling and Dust Suppression	Mine Dewatering	120	245	29,400
2	Mineral Handling Plant		274	365	1,00,010
3	Wheel Washing of Vehicles		5	365	1,825
4 =[1+2+3]	**Subtotal for Regular Industrial Usage**	**Mine Dewatering**	**399**	**Variable**	**1,31,235**
5	Non-potable Domestic @16 lpcd, 250 workers	Pumping from Borewell	4	365	1,460
6	Drinking @4 lpcd, 250 workers		1	365	365
7	Water supply to village		15	365	5,475
8	Flushing @10 lpcd, 250 workers	Mine Dewatering	2.5	365	913
9	Plantation and Green Belt Development		30	245	7,350
E = [4+...+9]	**Total Water Use**		**451.5**	**NA**	**1,46,798**
F = [D - E]	**Surplus**	**Mine Dewatering**	**2,412.5**	**As and When Required**	**8,98,563**

There is no workshop set up within the ML area, therefore generation of effluent is not envisaged. The pumped-out volume from mine dewatering is transferred to series of settling ponds to remove suspended solids effectively. Three (3) no. of Settling Ponds of total capacity of 8,432 m^3 has already been constructed. After settling, the water is seamlessly integrated into proposed water management plan.

As per the CTO (Appendix C), the surplus mine drainage water, surface runoff and other wastewater is allowed to discharge to on land / in land surface water bodies at maximum 10,339 KL per hour only if it meets the prescribed standards (Appendix C).

The requirement of water for dust suppression, mineral handling, plantation, green belt development, wheel washing of vehicles and flushing are met by partially utilizing pumped out water from the mine. The drinking, domestic and and the village water requirement will be supplied from borewell water. Although the water requirement for mineral handling plant is 1,350 KLD, 80% of the water can be reused and recirculated. Hence, 274 KLD water will be supplied from dewatering of working pit. The surplus water from mine dewatering will be stored in the settling pond and will be discharged outside as per requirement after complying the conditions set forth by regulatory authorities. It is advised that

the quality of the pumped-out water is to be monitored regularly and tested from NABL accredited laboratory.

The water balance diagram is shown in the following Figure 6-2.

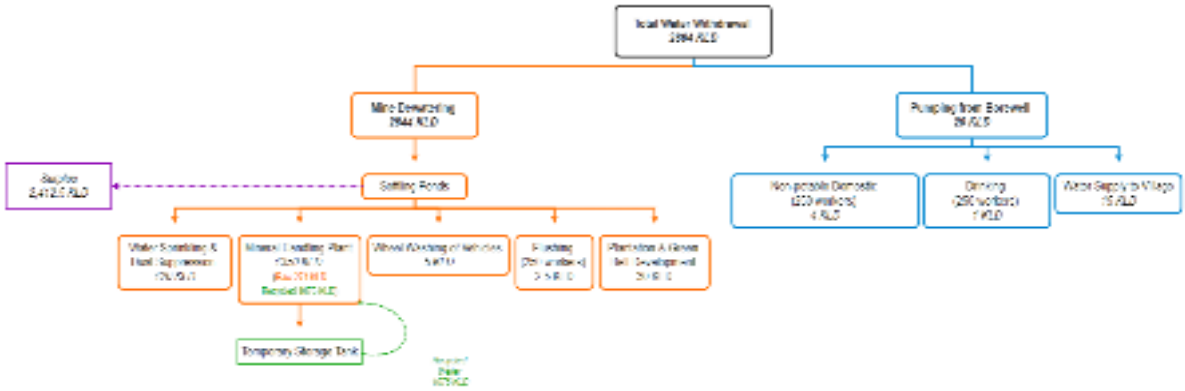


Figure 6-2: Water Balance Diagram

6.1. Impact of Mine Dewatering / Abstraction and Mitigation Measures

The mining projects may have influence on the existing physical, biological, and social components of environment. In case of Nadidihi Iron Ore Mine project, improper mine water management including dewatering of ground water may cause impact on water, environment, and social issues. Proper management of waste material within ML area need to be done properly to mitigate any adverse impact on water regime in terms of quantity and quality. The study area of 10 km radius buffer zone of ML covered by mainly forest land with hillocks with mining activities. All the agricultural activity and domestic water requirement mainly depends on ground water in the study area.

The observed positive impacts on socio-economic environment by the industry are creation of employment opportunities and development of infrastructure such as roads, schools, hospitals etc. The following sections will cover the impact on the ground water regime, surface water sources, water quality due to abstraction groundwater from ground water regime and its mitigation measures.

6.2. Impact on the Ground Water Regime

Mining operations can pose challenges related to groundwater, especially when they occur below the water table. The impact on groundwater depends on various factors such as mining operation, aquifer geometry, groundwater recharge-discharge process etc. The mining process affect the aquifers intersected during progressive development due to continuous seepage from the aquifers above the developed maximum depth of mine. During mining activities in the area, the intersected aquifers are dewatered, resulting in a decline in groundwater level.

There are chances of reduction of ground water reserve in future (due to population growth, dewatering activities of the surrounding mines, industrial water usage, and increased agricultural demand) as envisaged from the long-term ground water level data analysis (Section 3.3.5). However, the overall negative impact on local community and ground water regime solely because of the dewatering of Nadidihi Iron Ore Mines is not envisaged as the mine dewatering effects of this project are temporary and localised as per the study outcome. It is recommended to build water conservation and recharge structures within the core and buffer zones of the ML area to improve the potential of ground water regime and reduce ground water dependency of locals.

In order to understand the extent of dewatering impact up to the end of approved mining plan period and beyond, numerical ground water modelling was utilised, prepared by Individual Consultant Mr.

Baddela Jaya Kumar (bilateral MOU signer with SRK Consulting). The Groundwater Modelling Report is submitted as a separate report.

The effect of dewatering is confined within core zone from the ML area for continuous dewatering of 3 years which shows its localised and temporary influence in the groundwater regime. Even though the estimation has limitations related to the uncertainty of the parameters and boundary conditions, they still provide the most comprehensive information concerning the mine dewatering system and its impact. Existence of surface water bodies, and surface extension of fracture networks has potential to restrict the spread of the drawdown cone.

The Mine authority has installed Digital Water Level Recorder and regularly monitors the water level data to check the effect of mine dewatering. ESL is using one (1) out of the two (2) existing tube wells of previous lessee within the ML area as piezometer, details of which is presented as following Table 6-3.

Table 6-3: Details of Piezometer (DWLR) for of Nadidihi Iron Ore Mine Project

Latitude	Longitude	Depth (m)	Diameter (mm)	Remarks
21.973276	85.262555	111	127	Existing

The piezometer is located at around 40m from the pumping well NIBW2 and more than 500m away from the working pit. Therefore, it does not suffice the requirement as per regulatory guideline owing to its distance from the active mine pit. The piezometer data is reflecting the water level change due to the pumping of tubewell instead of the change in water level due to mine dewatering. Therefore, it is recommended that one more piezometer to be installed / constructed within the ML area at a minimum distance of 15 m from the Quarry. SRK suggests periodic calibration of piezometer data recorder.

The new piezometer well depth should be more than final depth of the mine and the design should conform the CGWA guideline. All the piezometers are to be fitted with DWLR telemetry system. A permanent display board should be installed at piezometer site for providing the location, Piezometer ID, depth and zone tapped for standard referencing and identification. The measurement of water level in the piezometer adjacent to pumping tubewell should be taken, only after the pumping has been stopped for about four to six hours.

6.3. Impact on Surface Water Sources

The ESL mine authority does not withdraw water from existing surface water network for their current mining operation. As per the approved mine plan, the mining operation will not divert any existing drainage channel surrounding the ML area. It is recommended to provide concrete lining in all the drains carrying storm water and pumped out water from mine pits.

Retaining wall, garland drains and settling ponds have been constructed to restrict the flow of surface water from mine site to low lying areas and to allow overflow of water after due settling of suspensions within the settling ponds. The pumped-out water from mine dewatering is routed through drains to the settling tank from where the water is reused for dust suppression, green belt development and processing plants. Three (3) no. of Settling Ponds of total capacity of 8,432 m^3 capacity has already been constructed for controlling the silt in flowing water. The waste dump is already surrounded by retaining wall and garland drains to avoid contamination of surface water bodies. The dump toe drains are connected with a series of settling ponds which allow the settling of suspended silt. The garland drain has check weirs at regular interval to check flow of silt / debris. It is advisable to check the water quality of pit water and final settling tank quarterly from a NABL accredited laboratory and should be

compared with the standard parameters for Discharge of Effluents into Inland Surface water under Schedule VI of Environment (Protection) Rules 1986.

As per the CTO, the mine drainage water, surface runoff and other wastewater is allowed to discharge to on land / in land surface water body at maximum 10,339 KL per hour only if it meets the prescribed standards. Chemical analysis of mine pit water (Table 3-11) reveals that the tested parameter values are within the prescribed range of the Indian Standard of Surface Water Quality IS: 2296-1982 class C category. The study reveals that mining activities are not posing any adverse impact on surface water sources. It is recommended to utilize the pumped-out water from the mine to maintain zero discharge conditions as far as possible.

6.4. Impact on Water Quality

The water quality from various surface and ground water sources within study area were analysed and the results are discussed in Section 3.3.6 and Section 3.3.7. Proper well head protection and sanitary sealing are recommended for all the tubewells and piezometers. Regular external groundwater quality monitoring is also recommended to understand contamination, if any.

The water quality in the Nadidihi Iron Ore Mine area does not directly affect the ground water quality as the mining activity does not involve any chemical process discharge. However, mining operations may be responsible for the increase in suspended solids of iron ore fines and to some extent of acidity, and turbidity in the water. The solid particles generate during disintegration of iron ore and laterite on excavation. The particles are mixed with surface runoff and may pose chance of contamination of nearby drainage channels and ground water. It is therefore, recommended to treat the collected water for acidity and suspended particles prior to reuse and discharge. It is also advisable to provide concrete lining in all the drains carrying storm water and pumped out water from mine pits to avoid contamination of shallow aquifer. Retaining wall, garland drains and settling ponds have been constructed to restrict the flow of surface water from mine site to low lying areas and to allow settling of suspensions within the settling ponds. The pumped-out water from mine dewatering is routed through drains to the settling tank. The waste dump is already surrounded by retaining wall and garland drains to avoid contamination of surface water bodies. The dump toe drains are connected with a series of settling ponds which allow the settling of suspended silt. The garland drain has check weirs at regular interval to check flow of silt / debris.

It is advisable to check the water quality of pit water and final settling tank quarterly from a NABL accredited laboratory and should be compared with the standard parameters for Discharge of Effluents into Inland Surface water under Schedule VI of Environment (Protection) Rules 1986.

Since there is no workshop at the Nadidihi Iron Ore Mine premises, no ETP is provided. The wheel washing facility of the transport vehicles are to be provided at the exit point of the mine, integrated with complete recirculation system. The sewage generated from offices within project premises are sent to septic tanks supplemented with soak pits. Therefore, impact on water quality from effluent or sewage is not anticipated for the project. The domestic water requirement for the project (excluding drinking water) is of meagre quantity, less than 20 m^3/ day. Therefore, installation of STP is not required for this project.

A review of ground water sample analysis indicates that ground water quality of the core and buffer zone of the study area is slightly acidic in nature, which may be due to mixing of surface runoff and leachate that are generated from large volume overburden and tailings produced in the mining belt for prolonged time, subsequent processing activities and discharge of improperly treated water to nearby water bodies. The high turbidity values in some of the ground water samples outside mine lease area indicate that the water is not clean, emphasizing the necessity for proper well development and maintenance.

6.5. Mitigation Measures

It can be inferred from the stakeholder consultation, group discussions and field observations that the project user agency is sharing positive relationship with the key stakeholders. A 'Need based Assessment Survey' in the buffer area should be initiated. This would assist them in capturing the concerns of local people and their representatives regarding water rights and health and sanitation of the area.

During the FY 2022-23, CSR activities were carried out in four villages - Nadidihi, Rengalbeda, Kendudihi, and Nuagaon. These initiatives included providing mobile health unit services, conducting awareness sessions on sanitation and hygiene practices, deploying water storage tanks to meet the villages' drinking water needs, as well as repairing and connecting pipelines. These efforts have benefited 394 families residing in these villages.

It is prudent for the water management team to periodically interact with Government bodies and Panchayats to remain aware of unrest/resentment amongst local people towards the organization. The current water requirement for mineral handling plant is 1,350 KLD and 80% of the water can be reused and recirculated. Hence, 274 KLD will be supplied from dewatering of working pit. Therefore, there will not be any requirement for additional surface water or ground water withdrawal.

The surplus water from mine dewatering (maximum 2,412.5 KLD) will be stored in the settling pond and will be discharged outside as per requirement after complying the conditions set forth by regulatory authorities. It is advised that the quality of the pumped-out water, discharged water and surface water samples from 200m upstream and downstream of the discharge point is to be monitored regularly and tested from NABL accredited laboratory.

6.5.1. Recommendation Pertaining to Water Quality

i. SRK recommends conducting borehole camera surveys in old borewell to visually inspect the condition of the old borewell within the project premises and identify the development strategy. The screens of old borewells may get choked by fine particles, water sediments and bottom part often fills up with sand and small rock fragments. Fine sandy particles in the bottom may eventually choke the pumps during pumping turbulence which will lead to reduction in groundwater yield and quality. Therefore, it is recommended that surging and redevelopment of old defunct borewells need to be carried out to clean the choked and filled up parts and to increase the well efficiency. A bore well is cleaned by surging to increase the rate of water movement from the aquifer into the bore well. Well failure is less likely to occur if wells are developed using best technical standards.

ii. Performance of water storage facilities depends on its maintenance and proper designing. Problems like siltation and impaired water quality of final settling tank may often arise. Therefore, performance of these structures should be checked yearly basis and de-siltation should be done in quinquennially.

iii. ESL needs to ensure that there is no leakage in the septic tanks through periodic monitoring of water levels in them. Any noticeable water level depletion will ascertain the presence of crack/rupture in walls of the septic tanks. ESL need to undertake periodic cleaning of soak pit/septic tank in order to avoid any overflow especially during heavy rainfall.

iv. The wheel washing facility of the transport vehicles are to be provided at the exit point of the mine, integrated with complete recirculation system.

6.5.2. Details of Water Conservation Measures to be Adopted

SRK advises to implement sustainable water conservation measures to minimize the impact on ground water regime that may arise on a long-term basis. As per the conceptual land use of the project site

area shared by ESL (details in Section 2.1), the area under mining covers 3,47,820 m^2, 27,380 m^2 of area will be with green belt in safety zone and Roads will occupy 29,930 m^2.

No artificial ground water recharge measures have been planned within the project site. Rainwater harvesting structures have been implemented during establishment in the form of settling ponds and rain water storage in non-working pit keeping the conceptual land use in view to partially support project water requirement and reduce the ground water dependency for the project use.

To prevent dust from the loading and unloading activity, high-capacity fixed rain guns are recommended to be installed instead of sprinkling by water tankers. This is an effective way of dust suppression reducing the water wastage.

Water availability is estimated for average annual rainfall, using corresponding run-off coefficients of land use in the project site. Roof top areas of the infrastructure units, unused pit, plantation and green belt area within the project site are found to be feasible for taking up rainwater harvesting measures and use for project needs for non-potable purpose. The following Table 6-4 summarizes the potential of runoff generation within the plot.

Table 6-4: Potential Runoff Generation within the Plot

Sl.	Particulars	Area (m^2)	Rainfall (m)	Runoff Coefficient[12]	Quantum of Runoff available (m^3 / Yr)
1	Roof top of building / Shed	1,800	1.341	0.85	2,052
2	Road / Paved area	29,930		0.65	26,088
3	Open Land	6,85,900		0.20	1,83,958
4	Green Belt	27,380		0.15	5,507
TOTAL (sqm)		**7,45,010**	**Total Quantum of Available Runoff**		**2,17,606**

The total volume of runoff available for harvesting within the ML area amounts to be 2,17,606 m^3 per year. Further details are described in the sub-sections. Currently, the mine authority does not have any roof top rain water harvesting structure. The mitigation measures for the anticipated potential impacts are discussed in the following sub-sections.

Rainwater Harvesting from Green Belt & Open Area

Run-off from the dump, mineral storage, roads, plantation and green belt area of 35.23 Ha (3,52,318 m^2) are currently being routed through storm water drains to designated series of settling ponds. The components of this rainwater harvesting system include the following:

- Storm water drains to route run-off;
- Silt trap to filter silt and suspended matter from rainwater diverted from the catchment;
- Series of settling ponds and storage structures;
- Inlet for diverting the run-off into the successive settling ponds in a controlled manner;
- Outlet at a lower level than inlet to avoid any backwater effect and safely discharge excess run-off during peak events from the storage structures;
- Pumping arrangement for abstraction and use;

[12] Manual of Artificial Recharge of Ground Water (CGWB 2007)

The bottom and sides of these water harvesting measures were found unlined. It is recommended to provide concrete lining in the storm water drains to avoid infiltration. The amount of surface runoff annually available from the dump, roads, mineral storage, infrastructure, plantation and safety zone area estimated using run-off coefficients suggested by Manual on Artificial Recharge of Ground Water, CGWB for annual average rainfall of 1341mm is computed to be 1,12,286 m^3. Considering only 80% of the run-off as available volume after evaporation, spillage and other losses and a further 80% efficient rainwater harvesting system, around 71,900 m^3 is the run-off volume estimated as available for project activities annually.

The combined capacity of existing settling ponds and storage structures are 8,432 m^3, which has around 9,700 m^3 of annual recharge potential. Location of settling tanks are shown in Figure 6-3. The number of siltation ponds in ML area may be increased as per requirement. The collected water stored in settling ponds are used for non-potable requirements, such as dust suppression, mineral handling plant, plantation and green belt development.



Figure 6-3: Location of Settling Ponds

Rainwater Harvesting in Non-Working Pit

The west pit of Nadidihi Iron Ore Mine is currently non-operational and filled up with water. The pit has 19.195 Ha of open area with average depth of 88m BGL as per the approved mine plan. The currently non-working mining pit, due to its large surface area and significant depth, presents an excellent potential for rainwater harvesting. Its expansive surface area allows for effective rainwater collection, and its depth serves as a natural surface water storage reservoir.

During rainfall events, the pit intercepts surface runoff, effectively allowing collection of rain water and enhanced infiltration into the underlying aquifer. The stored water in this pit allows suspended solids carried by rainwater to settle before infiltration. The pit contributes replenishing the local groundwater resource.

The average water column above the pit floor as surveyed by ESL was found to be around 10m during post-monsoon 2023. Around 4,28,631 m^3 water is currently stored in the West Pit, which may also be utilised to meet the water requirement of processing / beneficiation plant. Based on the annual rainfall of 1341mm, annual rain water conservation in this pit was estimated around 2,00,000 m^3. Considering 5% infiltration of the stored water, the annual ground water recharge potential was estimated as 10,250m^3.

Desilting and Development of Village Ponds

The long-term data analysis shows declining nature of ground water in 10km radius of the ML area. It is therefore advisable to take renovation and development initiatives for the nearby village ponds. The ponds will act as rain water conservation and recharge structures, which in turn, will improve local ground water condition of the area. Additionally, the water stored in these ponds will be useful for the locals, reducing the ground water dependency. However, ESL needs to explore the opportunity of developing the proposed ponds and actual potential of groundwater recharge by means of detail survey. SRK recommends that ESL need to take more of such sustainable approach in future. Details of the proposed ponds are given below Table 6-5.

Table 6-5: Details of the Village Ponds Proposed for Renovation

Name of Village	Surface Area (m^2)	GPS Coordinates		Dimension (m)			Volume of Pond (m^3)	Annual GW Recharge Potential (m^3)
		Latitude	Longitude	Length	Width	Depth		
Nuagaon	1776	21.961738	85.263534	48	37	2.5	4440	5,100
Guali	2268	21.972918	85.282576	54	42	2.5	5670	6,500
Puduliposi	810	21.976248	85.263906	30	27	2.5	2025	2,300
					TOTAL		**12,135**	**13,900**

The above calculation indicates that annually around 13,900 m^3 volume of ground water recharge could take place from three recharge ponds at nearby villages. The natural infiltration for the existing soil of the study area has been considered at the rate of 1.5 mm/hr based on the experience of infiltration tests conducted within Joda block near Roida. Total annual recharge has been calculated considering recharge for the period of six months monsoon and post-monsoon season i.e., June to November.

6.5.3. Other Mitigation Measures

Following actions can be undertaken by ESL in order to build a friendly bond with the key stakeholders:

- Periodic monitoring of ground water and surface water quality both upstream and downstream of the project area in the buffer zone will help in early warning of presence of contamination / changes in ground water quality due to pollution sources. This will enable the project user agency in having enough time to take corrective steps and knowing whether the facility is contaminating the ground water. Preferably, the monitoring should be done during pre- and post-monsoon season for the parameters stated in IS: 2296 and IS 10500:2012 for surface water and ground water respectively.

- Initiate awareness program on better sanitation and solid waste managing practices in the nearby villages under “Swachh Bharat Abhiyan” Scheme. This can be done in association with representatives of local Panchayats and NGOs;
- Disclose the ground water and surface water quality results with Panchayats of respective villages to make the villagers and water users aware about the water quality being used for potable and non-potable purpose. The wells yielding groundwater with high fluoride content (> 1.5 mg/l) should be stopped immediately from use. In that case, ESL may explore alternate sources of safe drinking water for the villagers as a part of their CSR activity.
- Built-in waste collection bins and incineration bins in surrounding areas within the 5km buffer zone of the project for the improvement of sanitary conditions. Training to group of youth in operation and maintenance of community waste disposal systems along with house-to-house campaigns can prove beneficial;
- One- or two-days’ workshop can be arranged on relevant days, at Block levels, such as World Water Day (22 March), World Environment Day (5 June) and alike, to interact with local communities and exchange ideas on improving the water condition. It is recommended that they also engage with the community and make them conscious of project water usage and their initiatives towards community development;

Ward officers / Panchayat Heads, local youth groups and NGOs should be involved in adequate publicity. Awareness camps can be organized in collaboration with local NGOs on their initiatives on rainwater harvesting and water replenishment schemes.

7. SALINE WATER DISPOSAL STRATEGIES (IN CASE OF SALINE WATER ABSTRACTION)

N/A

8. ANY OTHER DETAILS PERTAINING TO THE PROJECT

N/A

9. SUMMARY AND CONCLUSION

ESL Steel Limited, a part of the Vedanta group, recently acquired the Nadidihi Iron Ore Mine in Koira tehsil of Sundargarh district, Odisha through auction in November 2021. They are currently conducting opencast mining operations on a 74.5 Ha leased area. Under the previous NOC, they were permitted to withdraw 73,000 m^3/year of groundwater through 3 bore wells (2 existing and 1 proposed) and 9,000 m^3/year through mine pit dewatering, totaling a maximum of 82,000 m^3/year (225 m^3/day). The previous lessee's CGWA NOC expired on 24 January 2021.

Within a 10km buffer, the study area primarily consists of forested areas with dense vegetation (73%) and Rangeland (17%). This indicates significant potential for groundwater recharge through natural land covers. The ML area also includes a 2.764 Ha green belt along the safety zone and dump slope.

Majority of the area is characterized by hillocks and valleys. A hill range in the central part strikes NE-SW, with elevations gradually decreasing from southwest to northeast. Hillocks have elevations exceeding 800 m aMSL, while valleys range from 400-500 m aMSL. Majority of the study area lies within the Jamda-Koira basin, part of the Iron Ore Supergroup, exhibits diverse features like ridges, valleys, pediment-pediplain complexes, quarries, and mine dumps. Structural hills play a significant role in infiltration through joints and fractures. Intermontane Valleys are characterised by depression area between hills and mountains having good to moderate ground water potential.

The mining activities are not anticipated to alter the existing drainage pattern. The ML area falls within the Karo river watershed, a major perennial river in the region. It flows eastward just outside the northern boundary of the ML area, then northeastward. The river is replenished by groundwater. No protected wetlands or listed major water bodies are found within 500 m of the project site.

There is a substantial shift in rainfall patterns, with approximately 78% of annual precipitation occurring between June and September. An area averaging 1341 mm of annual rainfall over a 13-year period has seen a notable increase, particularly during pre-monsoon and winter months. This variance in monsoon rainfall has the potential to create dynamic water resources, crucial for sustainable planning in domestic, irrigation, and industrial sectors. Furthermore, the sudden influx of surface water due to intense rainfall poses a challenge for mining operations.

The Nadidihi Iron Ore Mine is a part of Upper Shale formation of the Koira Group, characterized by shaly quartzite, BHJ/BHQ, and iron ore. Some areas exhibit laterite formations overlying both the ore body and shale. Multiple sets of joints affect all litho-units in the BIF and Shale. Hematite iron ore is predominant in the mine area. Waste rock comprises shale horizons below the ore and intercalated shale layers within the ore. The ore-shale sequence is lateritized on top, with depth of lateritization varying. Folding occurred during multiple phases of deformation, and fractures in the ore are infrequent.

Geophysical studies, utilizing Vertical Electrical Sounding (VES) alongside local geological data and other secondary sources, have revealed a shallow weathered formation forming the upper aquifers below the water table. The study identified various subsurface layers, with the weathered zone extending up to 25 m BGL, succeeded by hard rocks with fractures. Two major hydrogeological units have been delineated - an unconfined shallow aquifer comprising Laterites and recent alluvium, and a semi-confined to confined deeper aquifer. Groundwater primarily resides in the weathered residuum, circulating through deeper fractures and fissures.

Constant Discharge Tests (CDT) were conducted in two sets of vertical tube wells, each comprising one pumping and one observation well, lasting 68-72 hours of pumping, followed by 24 hours of recovery. The aim was to evaluate hydraulic properties of the Iron Ore formation and its interfaces, as well as the Waste rock (shale, BHJ) and their interfaces.

Transmissivity values from the tests ranged between 58.89 m²/day to 70.64 m²/day for the Iron formation and its interfaces, and from 79.22 m²/day to 101.60 m²/day for Shale and Waste rock layers, both 100m thick. Corresponding Storage Coefficient values varied from 1.1860E-05 to 2.1320E-01 for Iron formation and its interfaces, and from 5.4320E-06 to 3.0260E-05 for Shale and Waste rock layers.

During the post-monsoon period in October 2023, the hydraulic gradient at both the mine site and a 2 km buffer area was estimated as 0.015. In the valley area, regional groundwater flow generally follows the topography, from southwest to northeast, with a hydraulic gradient of approximately 0.0045 in post-monsoon, October 2023. Groundwater levels within the 2km core zone of the mine ranged from 5m to 38m below ground level, being shallower in the toe region of ridges and increasing towards the open pits of Nadidihi Iron Ore Mine and other adjacent open pit mines in the central southeastern part. The hydrographs from nearby monitoring stations of CGWB indicate a declining trend in groundwater levels throughout the year over a 10-year period, despite an upward trend in rainfall. This suggests a potential risk to local groundwater resources due to mine dewatering and industrial groundwater extraction in the area.

The groundwater quality in the core and buffer zone of the study area is slightly acidic, likely due to the prolonged mixing of surface runoff and leachate from overburden and tailings in the mining region, along with subsequent processing activities and improper discharge into nearby water bodies. The high turbidity levels in some groundwater samples outside the mine lease area indicate poor water quality, underscoring the need for thorough well development and maintenance. Elevated concentrations of Iron in most wells and Fluoride in select wells exceed permissible limits, potentially stemming from the dissolution of Ferromagnesian minerals and Fluoride-bearing hydrous silicate minerals within the aquifer. Surface water samples exhibit Dissolved Oxygen levels slightly above the acceptable range, likely due to increased organic matter and anthropogenic pollution. Chemical analysis of mine pit water aligns with Indian Standard Surface Water Quality guidelines.

The Nadidihi Iron Ore Mine, historically operated from two pits, with the West Pit currently inactive. Future plans by ESL involve excavation from the East Pit, progressing westward to merge with the West Pit in accordance with the outlined mine development plan until 2026. Simultaneous backfilling in the West Pit is slated for 2024-2025. Seepage survey data indicates the depth at which the groundwater table intersects with the open pit faces. Utilizing a numerical ground water model, mine seepage has been estimated up to the approved mining plan period and beyond, with total seepage projected to range between 1,590 m^3/day and 1,868 m^3/day until 2027. While these estimates provide a reasonable approximation, actual seepage quantities may vary. The rainwater required to be dewatered amounts to be 976 m^3/day on average. Considering the impending renewal of the NOC in two years, it is advisable to pursue a mine dewatering rate of 2,844 m^3/day.

The mine possesses two tube wells, one used for drinking and domestic water supply to workers and nearby villagers, and another one as a piezometer. The non-potable domestic purpose and drinking water for 250 workers as well as villagers will be met by pumping 20 KLD water from one existing tube well. Dewatering from mining activities is directed to three settling ponds for effective removal of suspended solids. Water from dewatering is used for dust suppression, mineral handling, plantation, green belt development, wheel washing of vehicles and flushing purpose. Although the water requirement for mineral handling plant is 1,350 KLD, 80% of the water can be reused and recirculated.

The dewatering of intersected aquifers during mining leads to a temporary decline in groundwater levels. However, the overall negative impact on the local community and groundwater regime is limited to the core zone. A piezometer located approximately 40m from the pumping well and over 500m from the working pit falls short of regulatory guidelines due to its distance from the active pit. SRK suggests periodic calibration of the piezometer's data recorder.

The mine authority does not draw water from existing surface water networks for their operations, nor does the mining activity divert any surrounding drainage channels. Chemical process discharges are not part of the mining operation, and measures such as retaining walls and garland drains are in place to prevent surface water contamination. Sewage generated on-site is managed through septic tanks and soak pits, with no anticipated adverse impact on water quality. The wheel washing facility of the transport vehicles are to be provided integrated with complete recirculation system.

The area experiences substantial annual rainfall, allowing for significant rainwater harvesting potential. Annual rainwater harvesting from green belt, open area, non-working pit and settling ponds were estimated to be around 2,80,400 m^3 at present. Additionally, around 24,000 m^3 ground water recharge is taking place at present from non-working pit and settling ponds. These initiative aims to reduce groundwater dependence and mitigate potential long-term impacts on the groundwater regime.

The mine pits were initially waterlogged during the ML handover. The Mine Authority commenced dewatering from then onwards in order to maintain workable condition and initiate the operation. During Site inspection by CGWA on 24.05.2024, the dewatering data for the period from January 2023 to April 2024 was reviewed, indicating an average extraction rate of 3,549 m^3/day. This volume accounted for previously accumulated water, surface runoff, and groundwater seepage. The projected dewatering volume for current and future mine development excludes any previously accumulated water, as the mine is now in an operational state. Consequently, it is anticipated that the renewal application for the next two-year period will be based on the outcomes of this study.

SRK Mining Services (India) Pvt. Ltd. has completed the study and hereby submitting the Comprehensive Hydrogeological Report for Nadidihi Iron Ore Mine Project of ESL Steel Limited as a part of the renewal of NOC. As per the study outcome, it is recommended for renewal of NOC for maximum ground water withdrawal of 2,864 m^3/day (or projected yearly maximum quantity 10,45,360 m^3) out of which, 2,844 m^3/day abstraction will be through mine dewatering and 20 m^3/day will be through bore well.

10. ACCREDITATION CERTIFICATE



Accreditation Board of CGWA

Certificate of Accreditation

M/s. S.R.K. Mining Services (India)
Kolkata, West Bengal

Has been accredited as a Ground Water Professionals to prepare reports in the Functional Areas of

- Impact Assessment of Existing / Proposed GW Extraction
- Hydrogeological conditions in mining projects.

Valid from : 15.02.2021
Valid thru : 14.02.2026

Certificate No. : CGWA/RGI/006
Dated : 07.07.2021

क्षेत्रीय निदेशक
Regional Director
आरजीएनजीडब्ल्यूटीआरआई
RGNGWT&RI

सदस्य
Member
आरजीएनजीडब्ल्यूटीआरआई
RGNGWT&RI

Appendices

Appendix A: Work Order

ESL STEEL LIMITED

NADIDIH IRON & MN. MINE - BICO - AT/PO BARBIL, MAIN ROAD, ODISHA, ODISHA-758035, INDIA

GSTIN: 21AABCE6875H1ZO

ESL STEEL LIMITED
(Formerly known as Electrosteel Steels Limited)

Vendor Details	Purchase Order Details	Buyer Details
Vendor Code 302836	**Order No. :** 4900002396	**Buyer :** Aakash Mittal
Vendor Name SRK Mining Services (India) Private Limi ted	**Date :** 07-Jul-23	**Contact :**
Email: schattopadhyay@srk.co.in	**Order Type :** Service	**Mail ID :** AAKASH.MITTAL@VEDANTA.CO.IN
Address: DD 30, 5th Floor, “Andromeda”, Sector 1, Salt Lake City,, KOLKATA, WEST BENGAL-700064, INDIA	**Version :** **Version Date :**	
GSTIN Number : 19AAKCS1315H1ZD	**Ref Quotation:** **Ref Quotation Date :**	

Header Text:

We are pleased to issue on you the Purchase Order for the Service
Kindly send us the signed and stamped scan copy over mail as token of your acceptance. If the same is not received within 07 days of release of this order, it shall be deemed accepted by you.

Item No	Material	HSN Code	Material Description	Order Qty	UOM	Delivery Date	Gross Price	Gross Value
00010			HYDROGEOLOGICAL Study IOO	1	AU	01-Mar-24	6,50,000	6,50,000

Discount %	0	0
P & F %/Value	0	0
CGST %	0	0
SGST %	0	0
IGST %	18	1,17,000
Compensation Cess	0	0
CST(Agt"C"Form)%	0	0
Net Discount	0	0
Total With Tax :		7,67,000
Currency :		INR

Delivery Schedule

Scheduled Qty	Delivery Date
1	01-Mar-24

Service Details

Line Item	Service Code	SAC Code	Description	Order Qty.	UOM	Rate	CGST	SGST	IGST	Total
0000000010	SHS771015040002	998393	CNSL;EIA/EMP STUDIES CVRNG E	1	EA	6,50,000	0	0	1,17,000	7,67,000

Basic Value : 6,50,000
Discount : 0
P&F charges: 0
Freight: 0

Taxes:	1,17,000	
Net Discount:	0	
Grand Total :	**7,67,000**	INR

Amount in words : **Seven Lacs Sixty Seven Thousand Only (INR)**

Payment Terms :

100% payment within 30 days of receipt of invoice after certification

Incoterm: FOR

Incoterm Location: At IOO Mines

LD Charges:

Other Terms And Conditions:

PR No. - 2100006477
zNFA - NF20236505

Tasks:
1. Preparation of Hydrogeological study report and submission of CGWA application for Nadidihi Iron Ore block (BICO) and the Nadidihi (Feegrade) Iron & Manganese block, Odisha to obtain GW abstraction NOC from CGWA.
2. Groundwater Modelling study

Scope of work:
Study & Comprehensive report preparation and submission on ground water conditions in both core and buffer zones of the mines(10km) for both mines for both above mentioned mines

- Mine seepage calculations, impact assessment of mining and dewatering on ground water regime and its socio-economic impact, details of water consumption, recycling, reuse and recharge, reduction of pumping with use of technology for mining.
- Water requirement for both individual mines.
- Drainage system, Water management plan to minimize and mitigate the adverse impact on ground water.
- Geophysical studies as applicable
- Water balance chart
- Proposed usage of pumped water from mine dewatering
- Format for report will be as per CGWA latest guidelines(Annexure IV & V).
- Rainwater harvesting/ recharge plan within the premises as per Model Building Bye Laws issued by Ministry of Housing & Urban Affairs.

1. Hydrogeological Study is end to end contract.
2. All the activities will be carried out by SRK pertaining to Hydrogeological Study.
3. ESL will provide all the relevant company documents to SRK for filling & processing of application.
4. SRK scope will end after obtaining NOC approval / certificate from CGWA with in the time frame.

SRK will prepare the 2 separate Comprehensive Hydrogeological Reports for Bico and Feegrade Mines of ESL as per CGWA guidelines for obtaining fresh NOC, incorporating the details of the hydrology, hydrogeology, testwork analysis and site visit findings.
After submission the draft report, SRK will address the comments received from the client and incorporate in the report up to satisf action of the Client. The Final Impact Assessment Report will be submitted to the Client within time.

Note - The quoted price is inclusive of the travel expenditure of the field hydrogeologist/ expert to the mines for collecting details and making observations and clarifications.

The expenses related to mobilisation of SRK Team to CGWA office (Delhi) (if any) are not specifically included in the submitted budget and will be charged at cost as and when incurred with prior approval taken TSD Head, CFO & CEO.

Time period:
1. Report to be submitted by Oct'23.
2. NOC to be obtained as per CGWA timelines or within 2 months of application submission to CGWA.

Payment terms:
Payment will be processed within 30days as per the below terms, SRK shall submit the bills accordingly:
• 50% of the Total Fees after completion site visit and testwork activities;
• 30% of the Total Fees after submission of draft Comprehensive Hydrogeological Report;
• Remaining 20% after submission of Final Comprehensive Hydrogeological Report.

Attached annexure need to be followed by SP.
Annexure 2.1.Madatory safety requirements for all hired vehicles
Annexure 2.2. Medical fitness certificate FOR vehicle Operators-ESL
HSE, COC & Sustainability -BP
No.3_Vedanta ESL Sustainability requirements
No.4_ safety requirements
No.5_ PPE for BusinessPartners
No.6_ General terms and conditions
No.7_ESL Supplier_Code_of_Conduct

Terms And Conditions:

Vedanta Limited

And

XXXXXXXXXXXXXXXX

Contract# xxxxxxxxxxxxx

_____

CONTRACT FOR PROVISION OF [ ] SERVICES

_____

THIS AGREEMENT is made on xxxxxxxxx

BETWEEN

(1) COMPANY NAME, a company incorporated in India currently having its registered office at _____, (hereinafter referred to as the "Company", which expression, unless the context requires otherwise, shall include its successors and permitted assignees); and

(2) XXXX a company incorporated under the provisions of Company Act, 1956 and having its registered office at xxxxxxxxxxxxxxxx (hereinafter referred to as the "Service Provider", which expression, unless the

context requires otherwise, shall include its successors and permitted assignees).

RECITALS:

WHEREAS the Company requires the Service Provider to provide certain services and the Service Provider is engaged in the business of providing such services and has agreed to perform the Services for the Company on the terms and conditions set out in this Contract.

NOW THEREFORE IT IS HEREBY AGREED as follows:

1. The Company hereby engages the Service Provider to provide the services ('Services') as more particularly described under Attachment 1 to Schedule I (Scope of Work).

2. The Service Provider agrees to perform the Services in accordance with the terms and conditions of this Contract and, in consideration of its due performance of the Services, the Company agrees to pay the Service Provider according to the rates, terms and conditions herein contained.

3. The Contract shall comprise the following documents:

This Agreement
Schedule I: Standard Terms and Conditions
Attachment 1 to Schedule I: Scope of work
Attachment 2 to Schedule I: Compensation Schedule
Attachment 3 to Schedule I: Advance Bank Guarantee (where applicable)

(all hereinafter the "Agreement").

4. In the event of any inconsistency or discrepancy between any of the documents listed above, the Standard Terms and Conditions shall have preference over any other documents and these Standard Terms and Conditions shall apply and shall be incorporated by reference / deemed incorporated in any Purchase Order issued hereunder and shall prevail at all times between the Parties over any other terms and conditions (including any terms or conditions which Service Provider purports to apply except where the Parties by its/their authorized signatories have specifically agreed in writing to vary and override the said Standard Terms and Conditions.

5. The effective date of this Agreement shall be ****** (hereinafter the "Effective Date") and this Agreement shall be valid for a period of ***** from the Effective Date / up to ***** ("Term") unless terminated earlier in accordance with the provisions of this Agreement.

6. For the purposes of Clause 8 (Payment) of Schedule I (Standard Terms and Conditions), the address for sending invoices shall be as follows:

Accenture *_____
Contact:
Email:
Attention:

7. For the purposes of Notices Clause of Schedule I (Standard Terms and Conditions), the address for notices shall be:

If to the Company:

Vedanta Limited
*_____
Attention:
Email: **********
Ph: **********

If to the Service Provider:

XXXXXXXXXXXXXXXX

8. For the purposes of this Agreement, the Company's representative shall be ********** & for operational matters shall be **********. The Service Provider's representative shall be XXXXXXXXX for all matters, including contractual and operational.

IN WITNESS WHEREOF the Parties hereto have executed this Agreement on the day, month and year herein above written:

Signed by……

…….

for and on behalf of VEDANTA LIMITED

Witness…….

……..[Witness Name]

Signed by…….

……

for and on behalf of XXXXXXXXXXXX

Witness…….

……

PLEASE TICK:
WE HAVE READ THE STANDARD TERMS AND CONDITIONS ENCLOSED WITH THIS AGREEMENT

SCHEDULE 1
STANDARD TERMS AND CONDITIONS

1. DEFINITIONS

1.1. In the Agreement, the following words and expressions shall, unless the context otherwise requires, have the following meanings:
"Affiliate" shall mean with respect to any person, any other person that, directly or indirectly, controls, is controlled by or is under common control of such specified person. For the purposes of this definition, "control" means the direct or indirect beneficial ownership of more than fifty percent (50%) of the issued share capital, stock or other participating interest or the legal power to direct or cause the direction of the general management of the company, partnership or other person in question, and "controlled" shall be construed accordingly;
"Agreement" shall mean the Agreement between the Company and the Service Provider to which this Schedule is attached.
"Contractor's Personnel" or "Personnel" shall mean all personnel provided by the Contractor Group in connection with the performance of this Contract, including, without limitation, those referred to in the Scope of Work;
"Data" means all reports, studies, designs, data and other information and materials as may be prepared, created or developed by the Service Provider Group in the course of provision of Services and/or as a result of the Services or in accordance with this Agreement;
"Fees" shall mean the prices and/or rates payable by the Company in respect of the Services and/or as specified in the relevant Purchase Order.
"Purchase Order" shall mean the document recording the specific Services to be carried out under this Agreement, from time to time.
"Site" shall mean the operating site or any other place where the Contractor/Service Provider is performing the Services and/or any supporting activity in respect thereof;

1.2. Unless otherwise stated, any and all references in the Agreement to Clauses are references to the Clauses of the Agreement.

1.3. The headings in the Agreement are used for convenience only and shall not govern or affect the interpretation of the Agreement.

1.4. Words denoting the singular shall include the plural and vice versa, where the context requires.

1.5. Except as expressly identified, any reference to statute, statutory provision or statutory instrument shall include any reenactment or amendment thereof for the time being in force.

1.6. Unless expressly stated otherwise, all references to days, weeks, months and years shall mean calendar days, weeks, months and years.

2. SCOPE OF CONTRACT

2.1. The terms and conditions of the Agreement shall apply from the Effective Date and shall remain valid for the Term unless this Agreement is terminated earlier by the Company in accordance with Clause 19 (Termination) below.
2.2. Subject to the provisions of this Agreement, the Parties agree that upon request of the Company in terms hereof, the Service Provider shall perform the Services at such locations and for such periods as may be agreed with the Company.
2.3. From time to time, the Company may issue a Purchase Order to the Service Provider. In such case, the terms and conditions of this Agreement shall apply to each such Purchase Order as if repeated in total.
2.4. The Service Provider shall commence the Services on the scheduled commencement date stated under this Agreement or in the relevant Purchase Order and shall continue such Services for the Term or the duration of the Purchase Order as applicable unless terminated earlier in accordance with terms and conditions hereunder. Each Purchase Order is subject to agreement on a case by case basis.

3. SERVICES

3.1. The Service Provider shall perform the Services with all due skill, care and diligence in a safe, competent and timely manner and in accordance with the requirements of the Agreement and/or the relevant Purchase Order. If Company notifies the Service Provider of any defect in the performance of the Services, the Service Provider shall rectify such defect at its own expense.
3.2. Except to the extent that it may be legally or physically impossible, the Service Provider shall comply with the Company's instructions and directions in all matters relating to the Services consistent with the provisions hereunder.
3.3. The Service Provider shall agree with the Company in the relevant Purchase Order from time to time as regards the personnel who will perform the Services and shall:
(a) only provide such Personnel who possess appropriate experience, skills and qualifications necessary for the Services to be performed in accordance with this Agreement;

(b) not remove or replace such Personnel without the prior written consent of the Company (not to be unreasonably withheld); and

(c) nominate a senior manager or director of the Service Provider to have overall responsibility for the provision of the Services in terms stated under this Agreement and/or the relevant Purchase Order, which person shall attend any meetings with the Company on reasonable prior notice.
3.4. Without prejudice to any other rights of the Company under the Agreement or at law, if the Service Provider fails to perform the Services in accordance with the provisions of this Agreement, the Company may use alternative means to perform the Services, by giving a prior written notice of 30 (thirty days) to the Service Provider and the Service Provider shall be liable for any additional cost incurred by the Company in using such alternate means.

4. SERVICE PROVIDER'S REPRESENTATIONS AND WARRANTIES
4.1. The Service Provider represents and warrants that:
(i) It is a duly organized company/business entity validly existing under the laws where it is incorporated/established, and has experience, expertise, ability and skills as required to perform the Services as detailed in this Agreement and as may be necessary to perform its obligations hereunder in a professional manner.
(ii) It has all the requisite power, authority and approvals required to enter into this Agreement and will have all the requisite power, authority to perform fully each and every obligation under this Agreement.
(iii) This Agreement has been duly executed and delivered by its duly authorized representatives and constitutes its legal, valid and binding obligation enforceable against it in accordance with its terms.
(iv) The execution, delivery and performance of this Agreement and all instruments or addenda required hereunder by it does not contravene, violate or constitute a default of or require any consent under the provisions of any other agreement or instrument to which it is bound, including the constitutional documents thereof, or any order, judgment, decree or injunction of any court of law.
(v) No legal proceedings are pending or threatened against it before any court, tribunal or authority which do or may restrain or enjoin its performance or observance of the terms and conditions of this Agreement or which do or may in any other manner question the validity, binding effect or enforceability of this Agreement.
(vi) No order has been made or petition presented for the bankruptcy protection, winding up or dissolution thereof against it.
(vii) It shall maintain high professional standards to ensure performance of this Agreement as per best business practices and in full compliance with statutory obligations.

(viii) It has all necessary statutory and regulatory permissions, approvals and permits for the running and operation of its establishment for the conduct of its business;
(ix) It has full right, title and interest in and to all trade names, trademarks, service marks, logos symbols and other proprietary marks (IPR) (including limited right of use of those owned by any of its vendors, affiliates or subcontractors) which it provides to the Company, for use related to the Services, and that any IPR provided by the Service Provider shall not infringe the IPR of any third party;
(x) The Service Provider represents that there is no inquiry/ investigation pending by the police against the Service Provider or its employees. The Service Provider undertakes that it will confirm at his own cost and expense and shall comply in all respect with the provisions of Government Authority applicable to the Service Provider and /or to the Service Provider's employees;
(xi) The Service Provider shall be liable for all fines, penalties, and the like of parking, traffic and other criminal offences arising out of or concerning the use of any vehicle for performing the Agreement and any toll charges or entry Taxes payable locally and the Service Provider accordingly indemnifies Company against all such liability.
(xii) The Service Provider has sufficient resources available to respond to emergencies/ incidents, which may occur along established transportation routes. In case of any accident resulting in loss or damage to property of life, the sole responsibility for any legal or financial implication would vest with the Service Provider. Company shall have no liability whatsoever.
4.2. Each Party hereby warrants that it has not entered into this Agreement relying on any warranty, representation or undertaking except for any warranty, representation or undertaking expressly set out in this Agreement.

5. SERVICE PROVIDER'S PERSONNEL

5.1. Service Provider's Personnel – General

5.1.1. The Service Provider shall, at its expense, provide and keep available for the Services, the Service Provider's Personnel.

5.1.2. The Service Provider shall ensure that the Service Provider's Personnel shall be sufficient in number and quality to carry out the Services in accordance with the terms and conditions of the Contract and will be suitably qualified and medically fit and certified, if necessary, to perform the tasks required to complete the Services.

5.1.3. Without prejudice to the generality of Clause 5.1.2, the Service Provider shall ensure that the Service Provider's Personnel are experienced and qualified for the Services they are required to carry out hereunder, to a standard not less than that required by the Contract and that which may from time to time be required by the relevant Government authorities and in accordance with good industry practice.

5.1.4. In relation to any member of the Service Provider's Personnel expected to make, in the Company's sole opinion, significant technical contribution to the Services, the Service Provider shall submit full particulars, in the form of a resume, of the qualifications and experience of such member to the Company prior to that member of the Service Provider's Personnel starting any part of the Services. No such member may start any part of the Services unless the Company's written approval has been given. The Service Provider shall submit resumes of any other member of the Service Provider's Personnel assigned to the Services on written request by the Company.

5.1.5. The Company reserves the right to reject any member of the Service Provider's Personnel, prior to that member commencing any part of the Services.

5.2. Removal of Personnel

The Company may, at any time after the commencement of the Services and at its sole discretion, direct the Service Provider in writing to remove any member of the Service Provider's Personnel from the Site. The Service Provider shall immediately comply with such direction and shall, as soon as reasonably practicable, replace, or procure the replacement of, such person with another person suitably qualified and acceptable to Company. The Service Provider shall bear the costs of any such removal and replacement.

5.3. Adjustment to the Service Provider's Personnel

The Service Provider shall not at any time without the Company's prior approval increase or decrease the number of the Service Provider's Personnel.

5.4. Passports and Visas

5.4.1. The Service Provider, if applicable, shall be responsible and bear the cost of obtaining all visas and entry or other permits (including clearance from the Ministry of Home Affairs and immigration authorities, if applicable) required to enable the Service Provider's Personnel to proceed to and work at the Site. The Company may, at the Company's sole discretion, endeavour to assist the Service Provider to obtain such visas and permits.

5.4.2. The Service Provider's Personnel shall have such documents on their person when rendering services and shall make the same available for inspection by any Government Authority, if required.

5.5. Drugs and Alcohol

Neither the Service Provider nor any of the Service Provider's Personnel (including sub-contractors) shall, except for bona fide medical purposes, keep, sell, barter, give, dispense or otherwise dispose of any drugs or alcoholic liquors to any person at the Site or permit the same to be done by any person. Alcohol shall not be permitted at the Site save in a form generally used in medicine and forming a bona fide constituent of a medical kit. The

Company's Representative reserves the right to search the property and person of any member of the Service Provider's Personnel to ensure compliance with the provisions of this Clause 5.5 (Drugs and Alcohol). The Company's Representative may at his absolute discretion prohibit any member of the Service Provider's Personnel to go on to the Site or other facility in the control of Company, or may require such person to leave the Site where he has reasonable grounds to suspect noncompliance with the provisions of this Clause 5.5 (Drugs and Alcohol).

6. FEES

6.1. The Company shall pay for the Services performed in accordance with the prices as per Attachment 2 to Schedule I and/or rates specified in the relevant Purchase Order.

6.2. In case of contingency assignments, the agreed fees for such onetime Services shall be payable on completion of the relevant assignment as per the terms agreed under this Agreement and/or the relevant Purchase Order.

7. SERVICE PROVIDER'S GENERAL OBLIGATIONS

7.1. The Service Provider shall, and the Service Provider shall ensure that its employees and representatives shall, in performing its obligations under this Agreement, comply in all respects with all relevant laws, statutes, regulations and orders for the time being in force.

7.2. Where any of the Service Provider's employees or representatives, including employees or representatives of its subcontractor/(s), if any, is/are present at any of the Company's premises for the purposes of this Agreement, the Service Provider shall at all times remain solely responsible for the conduct (including any misconduct) and safety of such employee/(s) or representative/(s).

7.3. The Service Provider shall not, in performing its obligations under this Agreement, hold itself out or permit any person to hold it out as being authorised to bind the Company in any way and will not commit any act which might reasonably create the impression that it is so authorised.

7.4. The Service Provider shall ensure that it has in place and maintains in place for the duration of this Agreement sufficient insurance to comply with all applicable laws and to cover its potential liabilities under this Agreement and shall provide evidence of such insurances to the Company on request. The Service Provider undertakes that such insurances shall contain waivers of any rights of recourse including, in particular, subrogation rights against the Company arising out of or in connection with the performance of this Contract to the extent of liabilities assumed by the Service Provider hereunder;

7.5. Notwithstanding the provision of the information by the Company, the Service Provider shall be deemed to have satisfied itself in respect of all relevant matters pertaining to the Services, including, but not limited to, the Scope of Work, the nature of the Services, access to the site, local facilities, climatic, sea, other water and weather conditions, working hygiene and working environment conditions and/or all other matters which may affect the performance of the Services. Any failure by the Service Provider to take into account any of the aforementioned matters shall not relieve or excuse the Service Provider from any of its responsibilities, liabilities or obligations hereunder or entitle the Service Provider to any extra payment.

7.6. The Service Provider shall not subcontract any of its obligations under this Agreement without the prior written consent of the Company. The Service Provider shall not be relieved from any of its obligations or liabilities under the Agreement by virtue of any subcontract and the Service Provider shall be responsible for all Services, acts, defaults or omissions of its subcontractors (and its or their employees and consultants) as though they were the services, acts, defaults or omissions of the Service Provider.

7.7. In performing the Services, the Service Provider shall:

(a) give preference to the purchase and use of goods manufactured, produced or supplied in India provided that such goods are available on terms equal or better than imported goods with respect to the timing of delivery, quality, quantity required, price and other terms;

(b) subject to Clause 7.5, employ Indian subcontractors having the required skills or expertise to the maximum extent possible insofar as their services are available on comparable standards with those obtained elsewhere and at competitive prices and on competitive terms, provided that where no such subcontractors are available, preference shall be given to non-Indian subcontractors wh0 utilise Indian goods to the maximum extent possible, subject to the proviso in Clause 7.7 (a) above; and

(c) subject to Clause 7.5, co-operate with and assist Indian companies as subcontractors to enable them to develop skills and technology to service the petroleum industry.

7.8. The Service Provider shall maintain proper and accurate records in relation to the Services and shall provide copies of the same to the Company on request. The Company (or its appointed representative) shall have the right to audit the relevant books and accounts of the Service Provider in relation to any reimbursable charges paid for by the Company under this Agreement. Such audit right shall survive for a period of 2 (two) years following the expiry or termination of the Agreement. Any incorrect payments identified by such audit shall be adjusted between the Parties as appropriate.

8. INTELLECTUAL PROPERTY RIGHTS

8.1. If the Services performed or provided under the Agreement and/or Purchase Order involves a patent, copyright, trademark, or proprietary information (IPR) Intellectual Property Right, the Service Provider hereby grants the Company Group a permanent, irrevocable, worldwide, non-exclusive license to use the same without additional charge.

8.2. The Company is the sole owner of IPR in anything developed and delivered under this Agreement / Purchase Order. Service Provider shall provide at the Company's reasonable request any documentation necessary to confirm Company's ownership interest in such intellectual property rights. Service Provider shall retain ownership of any intellectual property rights vested in Service Provider prior to this Agreement or created by Service Provider outside of its performance of this Agreement during the term of this Agreement.

8.3. Service Provider shall at all times be responsible for, shall release and shall defend, protect, indemnify, hold harmless and defend Company Group, from and against any Claim by a third party for infringement of any IPR which may arise out of the Services performed and/or provided by Service Provider.

8.4. For the purposes of this clause, Intellectual Property Rights includes but is not limited to all vested, contingent and future intellectual property rights including: (i) all inventions, compounds, compositions, substances, methods, processes, techniques, know-how, technology, data, information, discoveries, and materials including ideas, concepts, formulas, assays, practices, software, devices, procedures, designs, constructs, plans, applications, research, regulatory information, manufacturing process, scale-up and other technical data, reports, documentation and samples, including chemical, physical, analytical, safety, manufacturing and quality control data and information, as well as study designs and protocols; and any Patents, trade secrets, confidential information, proprietary processes, or industrial rights directly or indirectly deriving therefrom; (ii) all trademarks, service marks, copyrights, designs, trade styles, logos, trade dress, and corporate names, including all goodwill associated therewith; and (iii) any work of authorship, regardless of copyrightability, all compilations and all copyrights and includes also includes any inventions, made, to be made, discovered, conceived or reduced to practice whether or not patentable.

9. OWNERSHIP OF DATA

9.1. All Data shall be the property of the Company from the date of its creation or development including all Intellectual Property Rights thereto and the Company shall, accordingly, have unfettered right and authority to dispose of, alienate or transfer all Data. No Data created or developed by the Service Provider under this Contract shall become the property of the Service Provider; provided that the risk and responsibility for the loss of, or damage to, any Data shall remain with the Service Provider until delivery of such Data to the Company.

9.2. All Data shall be fit for the purposes specified in the Contract.

9.3. All items created or developed by the Service Provider outside the Contract shall remain the property of the Service Provider, provided that the Company shall have the right to use any such item where it is provided to the Company as part of the Services.

9.4. Notwithstanding anything to the contrary contained in this Contract, it is hereby agreed between the Parties that any Intellectual Property Rights arising out of, from or in relation to this Contract including those created during the course of performance of the Contract, shall belong to and vest in the Company and in this regard, the Service Provider hereby waives any right, title or interest in the same.

10. INDEMNITY

10.1. The Service Provider shall defend, indemnify and hold the Company, its directors, officials & employees etc., harmless from and against any and all against any and all claims, liabilities, costs, damages and expenses (including court costs and legal fees) in connection with any claim made by any third party (including, but not limited to, any claim made by any governmental or statutory authority) against the Company arising out of or in connection with the performance by the Supplier of its obligations under this Agreement.

10.2. The Service Provider shall be liable for and shall defend, indemnify and hold the Company its directors, officials & employees etc., harmless from and against and all claims in connection with any breach, infringement (whether actual or alleged) of Confidentiality, accident, bodily injury, fraud arising out of or in connection with the performance of this Agreement by the Service Provider.

10.3. This indemnity shall be without prejudice to any other rights or remedies, including injunctive or other equitable relief, which the Company may be entitled to.

10.4. Company shall have the right to retain/ withhold out of any payment, to be made to the Service Provider , an amount sufficient to indemnify it completely against any such third-party claims and all associated costs.

10.5. It is the express intention of the Parties hereto that the provisions of this Agreement / Purchase Order shall exclusively govern the allocation of risks and liabilities of the Parties, it being acknowledged that the Agreement reflected herein has been based upon such express understanding. It is acknowledged that the compensation payable to Service provider Supplier as specified in this Agreement and/or applicable Purchase Order has been based upon the express understanding that risks and liabilities shall be determined in accordance with the provisions of this Agreement and/or applicable Purchase Order.

11. LIMITATION OF LIABILITY

11.1. EXCEPT AS MAY BE OTHERWISE PROVIDED IN THIS AGREEMENT, IN NO EVENT SHALL EITHER PARTY BE LIABLE TO THE OTHER, WHETHER ARISING UNDER CONTRACT, TORT (INCLUDING NEGLIGENCE), STRICT LIABILITY OR OTHERWISE, FOR ANY INDIRECT, CONSEQUENTIAL, SPECIAL, PUNITIVE, EXEMPLARY OR INCIDENTAL LOSS OR DAMAGES OF ANY NATURE ARISING AT ANY TIME FROM ANY CAUSE WHATSOEVER.

11.2. The limitations of liability and exclusion of warranties as set out in the Agreement shall be to the maximum extent permitted by applicable law. Nothing in this Agreement purports to exclude or limit liability for fraud, misrepresentation, death or personal injury.

12. PAYMENT

12.1. In addition to any requirements set out in the relevant Purchase Order, if any, each invoice shall:
(a) be in duplicate;
(b) bear the Contract Number stated on the cover sheet to the Agreement;
(c) state the name, e-mail address, mobile telephone number of the Company's Representative; and
(d) be accompanied by supporting evidence and itemised in accordance with the Company's requirements.

Invoices to the Company shall be sent to the address set out in the Agreement. Service Provider must ensure that all invoices for services performed or goods delivered are submitted to the Company within 90 days.

Specifically, the Service Provider shall submit the following information/ documents to the Company unless specifically exempted by the Company representative in writing:

(i) Latest tax residency certificate of the Service Provider as issued by the tax / revenue authorities of Service Provider’s country of residence, stating specifically that the Service Provider is tax resident of country as mentioned in such tax residence certificate.

(ii) Copy of the Permanent Account Number (‘PAN’) card issued by the Indian Tax authorities,

(iii) Copy of registration certificates under applicable Indian tax/other laws including but not limited to GST, Excise, import export code etc., as applicable.

(iv) Copy of the withholding tax certificate issued by Indian tax authorities, enabling the Company to make payments to the Service Provider after deduction of such taxes as per prescribed rate in the withholding tax certificate.

12.2. The Company shall make payment of a correct invoice within 45 days of receipt to the Service Provider’s nominated bank account. Any invoice not complying with the provisions of this Agreement will be returned by the Company and the Service Provider shall submit a rectifying invoice.

12.3. The Company may dispute any amount on an invoice and withhold the disputed amount provided that:
(a) the Company makes payment of any undisputed portion of the invoice and notifies the Service Provider of the disputed amount within 45 days of receipt of the relevant invoice;

(b) if the dispute is resolved in favour of the Service Provider, the Company shall pay the disputed amount within fifteen (15) days of the date of the resolution of the dispute or forty-five (45) days of receipt of the invoice, whichever is later.

If the dispute is resolved in favour of the Company, the Service Provider shall forthwith issue a credit note for the disputed amount.

12.4. The Company shall be entitled to set-off / adjust / deduct from any invoice under this Agreement, any payment due from the Service Provider to the Company or any of its Affiliates.

13. PERFORMANCE BANK GUARANTEE

13.1. The provisions of this clause shall be applicable only in those cases wherein the Service Provider is required to furnish a performance bank guarantee as per the terms and conditions of this Agreement.

13.2. The Service Provider shall furnish, within 7 days of execution of this Agreement, and irrevocable Performance Bank Guarantee of such value as may be mutually agreed between the parties. The Performance Bank Guarantee so furnished by the Service Provider shall be released upon successful completion of the obligations of the Service Provider in terms of the Agreement after the Company duly submits a certificate to the effect that there are no claims against the Company from any of its vendors, subcontractors and/or any other third party, including but not limited to the Service Provider's employees, engaged in performance of the obligations of the Service Provider under the Agreement. If requested by the Company, the Service Provider agrees to extend the validity period of the Performance Bank Guarantee or to issue a further Performance Bank Guarantee in the event that the duration of this Agreement is for any reason extended beyond such validity date.

13.3. The Service Provider shall renew the Performance Bank Guarantee fifteen (15) days prior to the date the Performance Bank Guarantee expires ("Expiry Date") in case of any extension to the Term. If the Service Provider does not submit to the Company a renewed Performance Bank Guarantee fifteen (15) days prior to the Expiry Date, the Company shall have the right to immediately draw down complete Performance Bank Guarantee amount and shall reserve the right to retain such amounts till such time the Service Provider provides a replacement Performance Bank Guarantee for the equivalent amount.

13.4. The Service Provider shall renew the Performance Bank Guarantee or otherwise submit an additional Performance Bank Guarantee, as duly required by the Company, on account of change in the Agreement value pursuant to a variation or amendment to the Agreement, within fifteen (15) days of being so notified by the Company. If the Service Provider does not submit to the Company a renewed Performance Bank Guarantee or an additional performance bank guarantee, as the case may be, within the said period of ten (10) days, the Company shall have the right to immediately draw down complete Performance Bank Guarantee amount and shall reserve the right to retain such amounts till such time the Service Provider provides a replacement performance bank guarantee(/s) for the equivalent amount.

13.5. In addition to the right contained in the preceding clause, the Company shall further have an unqualified right under the Agreement to draw on the Performance Bank Guarantees under the following circumstances:
i) failure by the Service Provider to supply the Services in accordance
with the Agreement resulting in termination; or
ii) failure by the Service Provider to duly perform any of its obligations under
this
Agreement; or iii) Any valid claim made by the Company accruing due to any acts/omission of the Service Provider and the Service Provider fails to pay the Company for such a claim immediately upon such demand.

13.6 The provision and maintenance of the Performance Bank Guarantee by the
Service Provider in accordance with the
terms of the Agreement shall be a condition precedent to any payment by the Company to the Service Provider.

13.7 If the Service Provider fails to provide, maintain or renew the Performance Bank Guarantee in accordance with the terms of the Agreement, then the Company may, without prejudice to any other rights and remedies to which it may be entitled to, invoke the Performance Bank Guarantee and/or terminate the Agreement forthwith by written notice.
13.8 In addition to the other circumstances specified in this Agreement, Company has the right to draw down all or part of the value of the Performance Bank Guarantee and, at Company's discretion, apply the proceeds in remedying any breach by Service Provider of this Contract. Such recourse against the Performance Bank Guarantee shall be without limitation to any other right or remedy of the Company in relation to the relevant Service Provider breach.

14. SPECIFICATION VARIATION
14.1. No adjustment to the Scope of Work, the Specification, the prices and/or rates set out in Compensation Schedule or the Completion Date (or any other date specified in the Agreement for performance by the Service Provider) shall be valid unless a variation order has been issued in writing by the Company (a "Variation Order").

14.2. The Company may at any time issue a Variation Order to the Service Provider requiring the Service Provider to alter, amend, omit, add to, accelerate, reprogramme or otherwise vary any part of the Scope of Work or Purchase Order and/or the Specification. Upon receipt of a Variation Order the Service Provider shall proceed immediately as instructed, and any necessary adjustment to prices and/or rates or dates for performance shall be subsequently made in accordance with Clause 14.3 below.

14.3. Where the Company has issued a Variation Order in accordance with Clause 14.2, the Parties shall use all reasonable endeavours to agree on fair and reasonable adjustments to the prices and/or rates and/or dates for performance, which shall, to the extent possible, be based on the existing prices and/or rates and/or dates for performance specified in the Agreement. Such adjustments shall be recorded in a further Variation Order.

14.4. Notwithstanding anything contained in this Clause 14, if the parties fail to mutually arrive at the terms of the Variation Order, then the decision of the Company shall be final and binding and the Service Provider shall be required to carry out its obligations under the Contract, including the execution of variation in works, as proposed by the Company.

15. ADVANCE BANK GUARANTEE
15.1. The provisions of this clause shall be applicable only in those cases wherein the Service Provider is required to furnish an advance bank guarantee as per the terms and conditions of this Agreement.

15.2. The Service Provider shall furnish an irrevocable, unconditional bank guarantee equivalent to 100% of the Advance Payment, from a scheduled bank acceptable to the Company (acting reasonably) and in the form

attached as Attachment 3 to Schedule I (Advance Bank Guarantee) or otherwise approved by Company and shall be valid till the expiry of the Contract to be paid by the Company to the Service Provider as per the terms and conditions of the Contract as security for the Advance Payment made by the Company to the Service Provider and to secure all other obligations of the Service Provider under this Contract (the "Advance Bank Guarantee") as a condition precedent to the release of Advance Payment.

15.3. The Service Provider shall renew the Advance Bank Guarantee ten (10) days prior to the date the Advance Bank Guarantee expires ("Expiry Date") in case of any extension to the Term. If the Service Provider does not submit a renewed Advance Bank Guarantee ten (10) days prior to the Expiry Date, with the Company, the Service Provider shall have the right to immediately draw down complete Advance Bank Guarantee amount and shall reserve the right to retain such amounts till such time the Service Provider provides a replacement Advance Bank Guarantee for the equivalent amount.

15.4. The Service Provider shall renew the Advance Bank Guarantee or otherwise submit an additional Advance Bank Guarantee, as duly required by the Company, on account of change in the Contract Value or in case of any upward revision to the Advance Payment, pursuant to a variation or amendment to the Contract, within ten (10) days of being so notified by the Company. If the Service Provider does not submit to the Company a renewed Advance Bank Guarantee or an additional advance bank guarantee, as the case may be, within the said period of ten (10) days, the Company shall have the right to immediately draw down the complete Advance Bank Guarantee amount and shall reserve the right to retain such amounts till such time the Service Provider provides a replacement advance bank guarantee(/s) for the equivalent amount.

15.5. In addition to the right contained in the preceding clause, the Company shall further have an unqualified right under the Agreement to draw on the Advance Bank Guarantees under in the following:
i) failure by the Service Provider to perform the Services in accordance with terms and conditions of Service Provider, to the satisfaction of the Company; or
ii) Any inadequate adjustment of the Advance Payment; or
iii) failure by the Service Provider to duly perform any of its obligations under this Agreement; or
iv) any valid claim made by the Company accruing due to any acts/omission of the Service Provider and the Service Provider fails to pay the Company for such a claim immediately upon such demand.

15.6. If the Service Provider fails to provide, maintain or renew the Advance Bank Guarantee in accordance with the terms of the Agreement, then the Company may, without prejudice to any other rights and remedies to which it may be entitled to, invoke the Advance Bank Guarantee and/or terminate the Agreement forthwith by written notice.

16. TAXES

16.1. Definitions
For the purposes of this Clause 16 (Taxation):

(a) "Tax" or "Taxes" means taxes, levies, duties, fees, charges and contributions as amended from time to time and any interest or penalties thereon;
(b) "Government Authority" or "Government Authorities" means any local or national government or authority of any country, competent to levy any Tax;
(c) "Goods & Services Tax" or "GST" shall include Central Goods & Service Tax ("CGST"), State Goods & Service Tax ("SGST"), Integrated Goods & Service Tax ("IGST"), Union Territory Goods & Service Tax ("UTGST") & GST Compensation Cess.

16.2. Person Responsible for payment of Taxes
16.2.1. Taxes General
Except as may be expressly set out in this Contract, the Service Provider shall be responsible for:
(a) the payment of all Taxes now or hereafter levied or imposed on the Service Provider or its subcontractors or on the Service Provider's Personnel or its subcontractors by any Government Authority in respect of any wages, salaries and other remuneration paid directly or indirectly to persons engaged or employed by the Service Provider or its subcontractors (hereinafter referred to as "Personal Income tax");

(b) the payment of all Taxes now or hereafter levied or imposed by any Government Authority on the actual/assumed profits and gains made by the Service Provider or its subcontractors (hereinafter referred to as "Corporate Income tax");

(c) the payment of all GST now or hereafter levied or imposed by any Government Authority on the supply of goods or services, if any, provided to the Company by the Service Provider or its subcontractors;

(d) the payment of all Taxes now or hereafter levied or imposed by any Government Authority on the mentioned goods only, namely, petroleum crude, HSD, Petrol, Natural Gas & ATF, if any, sold to the Company by the Service Provider or its subcontractors (hereinafter referred to as "Sales tax/VAT/CST");

(e) the payment of all Taxes now or hereafter levied or imposed by any Government Authority on the mentioned goods only, namely, petroleum crude, HSD, Petrol, Natural Gas & ATF, if any, manufactured by the

Service Provider or its subcontractors for sale to the Company (hereinafter referred to as "Excise Duty");and

(f) the payment of any other Taxes now or hereafter levied or imposed by any Government Authority on the Service Provider or its subcontractors as a result of the performance of this Agreement.

16.2.2. Exception to General
Prior to commencing the Services, the Service Provider shall notify the Company whether or not it has Fixed Establishment in India. If the Service Provider notifies the Company that it does not have Fixed Establishment in India, then, any Indian GST chargeable on the services provided by the Service Provider under this Agreement shall be paid by the Company directly to the relevant Government Authority.

16.2.3. Reimbursement of Taxes to the Service Provider
It is acknowledged that responsibility for payment of Taxes to the Government
Authority will be governed as per Clause 16.2.1 and 16.2.2, the Service Provider will be reimbursed only for such Taxes which will be agreed to be reimbursed in the Compensation Schedule or any of the Purchase Order(s) issued under the Agreement.

16.2.4. Pricing
The Parties agree that details of Taxes included in, or excluded from, the Service Provider's prices and/or rates shall be as stated in the Compensation Schedule to the Agreement and nothing in this Clause 16 shall be construed to affect or prejudice such details as stated in the Compensation Schedule.

16.3. Withholding taxes and Withholding certificates
16.3.1. The Company shall, at the time of its payments due to the Service Provider, withhold the necessary taxes at such rate as is required by any Government Authority, unless and to the extent that the Service Provider shall produce to the Company any certificate issued by a Government Authority (having authority to issue such certificate) entitling the Service Provider to receive the payments under the Agreement for a prescribed period without deduction of any tax or deduction at a lower rate.
16.3.2. The Company shall provide the necessary withholding tax certificates to the Service Provider within the time stipulated by the relevant law to enable the Service Provider to file the same with the Government Authority as a proof of payment of such taxes.

16.4. Person Responsible for filing of returns / information to Government Authorities
16.4.1. The Service Provider shall be responsible for filing all necessary Tax returns (including, without limitation, returns for Corporate Income tax, Personal Income tax, GST, Sales tax and Excise Duty) with the relevant Government Authorities in accordance with all applicable statutory requirements and shall be responsible for providing all information requested by such Government Authorities.
16.4.2. The Service Provider shall also ensure that its subcontractors file such returns as stipulated by the relevant Government Authorities and furnish such information as requested for by the relevant Government Authorities.
16.4.3. The Company, with respect to the tax withheld from the Service Provider in accordance with Clause 16.3 (Withholding Tax and Withholding Tax Certificates), shall be responsible for filing the withholding tax returns with the relevant Government Authorities in accordance with applicable statutory requirements.

16.5. Company's rights, if treated as representative assessee by Government Authorities
In certain situations, a Government Authority may treat the Company as the representative assessee of the Service Provider and/or its subcontractors and recover the Taxes due to the Government Authority by the Service Provider or its subcontractors from the Company. In such situations, the Company shall have the following rights:

(a) The Company shall be entitled to recover from the Service Provider, the Taxes paid on behalf of the Service Provider or its subcontractors (together with any costs and expenses incurred by the Company in connection therewith) or to retain the same out of any amounts to be paid to the Service Provider or its subcontractors that may be in its possession (whether due under this Agreement or otherwise) and shall pay only the balance, if any, to the Service Provider; and

(b) If the Company is required to furnish any details or documents in such capacity, the Company shall request the details or documents to be furnished to it by the Service Provider and the Service Provider shall immediately furnish the same to the Company. If the Service Provider fails to comply with the foregoing, any penalty/interest levied on the Company for non-filing or late filing of details or documents in this regard shall be recoverable from the Service Provider.

16.6. Indemnity The Service Provider shall defend, indemnify and hold the Company Group harmless from and against any and all claims, liabilities, costs, damages and expenses (including court costs and legal fees) in connection with any Taxes which may be levied or imposed on the Service Provider or its subcontractors by any Government Authority arising out of or in connection with the performance of this Agreement.

16.7. Changes in Law
If, after the date of execution of this Agreement, there is any change in law, excluding any change(s) as result of interpretation by competent authority, tribunal & Court, which results in a change in the rate of any Tax included in the Service Provider's prices or rates or the introduction of a new Tax and such change results in an increase or decrease in the cost to the Service Provider of performing this Agreement then the Parties shall agree to a

revision in pricing to reflect such change provided that:

(a) the Party requesting such revision shall promptly (and in any case prior to submission of the Service Provider's final invoice under this Agreement) but not later than 07 (seven) business days notify the other Party that such change in law has arisen; and

(b) the Party requesting such revision shall provide the other Party with documentary proof of such change in cost to the reasonable satisfaction of the other Party; and

(c) the provisions of this Clause 16.7 shall not apply to changes in Personal Income tax or Corporate Income tax or to changes in non-Indian Taxes.

16.8. GST Compliances by Service Provider

16.8.1. Notwithstanding anything contained hereinabove, the Service Provider shall strictly and in a timely manner, adhere to and undertake all acts, omissions and compliances required under the applicable GST laws to ensure that the Company is able to avail the Input Tax Credit/set off/rebate/refund of the GST (along with cesses and surcharges, if relevant) as applicable on the Services or any supplies if applicable made by the Service Provider under this Agreement to the fullest extent possible under law. In this regard, without limiting the generality of the foregoing obligation in any manner whatsoever, Company reserves the right to specify to the Service Provider, particulars including but not limited to the following:

(a) whether Service Provider should charge IGST or CGST-plus-SGST;

(b) GST registration number of the Company;

(c) whether the Service Provider should be responsible to generate the E-Way Bill;

(d) the format of invoices/credit and debit notes/advance receipt vouchers;

(e) the requirement for maintenance of a 'GST compliance rating score' above a specified threshold; etc. and

(f) the relevant timelines for such compliances based on the applicable GST laws.

16.8.2. The Service Provider acknowledges that any failure in the foregoing obligations (including undertaking the ones specifically instructed by the Company, if any) can cause significant losses to the Company in the form of loss of GST credit, statutory interest liability on such credit loss (under applicable GST laws) and adverse impact on the 'GST compliance rating score' and thus, undertakes to carry out this foregoing obligation with sincerity, due diligence and without any delay or demur.

16.8.3. The Parties agree that the Company reserves the right to reimburse the GST component on supplies received only when the corresponding credit has become available in the electronic credit ledger of the relevant GST registration of Company.

16.8.4. Without prejudice to any other indemnification obligation under this Agreement, the Service Provider agrees to, at all times, to hold harmless and indemnify Company from and against all claims, liabilities, expenses, proceedings, costs and losses that may be suffered or incurred by Company which may arise out of or in connection with any failure by the Service Provider to adhere to its obligations including but not limited to its obligations under Clause 16.8.1 above. In this regard, the Service Provider also hereby indemnifies Company from any costs, claim or liability arising out of any claim or action or omission by any employee or consultant or agent or outsourced staff or subcontractor of the Service Provider.

17. MOST FAVOURED CUSTOMER CLAUSE

If Company obtains a quote from a competitor of the Service Provider to provide Services or similar services on longer payment terms or for fees that are less than the Fees in effect under a Contract, taking into account discounts, rebates and any other conditions with economic value to Company , Company may notify the Service Provider of the same in writing and request that the payment terms be extended and/or the price is reduced under such Contract to meet such quote. Within 10 (ten) Business Days of receipt of such notice, the Service Provider shall advise Company in writing whether it will meet such quote. If the Service Provider elects not to meet such quote, or fails to respond in a timely manner, then Company may terminate such Contract by providing a minimum of 7 (seven) days' prior written notice to the service Provider.

18. SUSPENSION

18.1. Suspension without Cause

18.1.1. Notwithstanding anything contained herein to the contrary, the Company shall have the right, without cause, at any time to require the Service Provider to suspend the Services (or part thereof) under this Contract by giving a prior written notice to the Service Provider.

18.1.2. The Company shall not be liable to make any payments of whatsoever nature during the Suspension Period pursuant to Clause 18.1.1.

18.2. Suspension Due to Default

18.2.1. If the Service Provider is in breach of any of its obligations under this Contract (including, without limitation, any breach of provisions/policies relating to health safety and environment), the Company shall, subject to Clause 18.2.2, be entitled to immediately suspend the Services by written notice to the Service Provider until such time as such breach has been remedied by the Service Provider, in which case no rates or other amounts shall be payable to the Service Provider in respect of such period of suspension.

18.2.2. Except in the case of a breach which in the reasonable opinion of the Company is likely to endanger the safety of any persons or property, the Company shall, prior to issuing any suspension notice pursuant to Clause 18.2.1, notify the Service Provider of the breach. Following receipt of such notice, if the Service Provider fails to immediately commence and thereafter continuously proceed to remedy such breach to the Company's reasonable satisfaction, the Company may issue the suspension notice pursuant to Clause 18.2.1.

19. TERMINATION

19.1. Notwithstanding anything contained herein to the contrary, the Company may immediately terminate all or part of this Agreement/Purchase Order as under:
(i) by a written notice to the Service Provider in case of any breach of the terms of this Agreement by Service Provider and has failed to remedy such breach within 30 days from receiving notice from the Company.
(ii) if Service Provider (a) ceases, or threatens to cease, to function as a going concern or conduct its operations in the normal course of business, (b) commences, or becomes the subject of, any bankruptcy, insolvency, reorganization (other than in the course of a corporate re-organization or to an affiliate), administration, liquidation or similar proceedings, (c) makes, or plans to make, a general assignment for the benefit of its creditors, or (d) creditor attaches or takes possession of all or a substantial part of said Party's assets;
(iii) The foregoing shall not apply to any action or proceeding which is (a) in the reasonable opinion of the Company, frivolous or vexatious; or (b) discharged, stayed or dismissed within ninety (90) days of commencement;
(iv) if Service Provider is unable to carry out its obligations by reason of Force Majeure events and the force majeure continues for a period more than thirty (30) days, then Company may by giving notice in writing, terminate this Agreement with immediate effect. Any such termination shall be without prejudice to any of the right of the Service Provider accrued prior to the date of such termination.

19.2 Notwithstanding anything contained herein to the contrary, the Company may terminate all or part of this Agreement by one (1) months' written notice without assigning any reason whatsoever or if the Service Provider fails to obtain any approval required under the terms of this Agreement.

19.3 Upon termination of this Agreement, both Parties shall be relieved of their respective rights and obligations under this Agreement save such obligations and / or liabilities of the Parties set forth herein which (i) that the Parties have expressly agreed will survive any expiration or termination, or (b) by their nature would be intended to be applicable following any such expiration or termination, or (c) the Parties have accrued before expiration or termination, as the case may be.

19.4. Upon termination, the sole liability of the Company towards the Service Provider under the Agreement shall be to make payment of all direct and documented costs which have been incurred by the Service Provider till the date of termination.

19.5. In the event of Service Provider's breach of its obligations hereunder, no payment shall be due by the Company in respect of such services under the Agreement/Company order.

20. COMPANY'S RIGHT ON TERMINATION FOR DEFAULT
20.1. In case of a termination for default in terms of Clause 19, the Company shall have the right to have completed either by the Company Group or any other third party, the services that the Contractor would have been obliged to perform immediately prior to the termination ("Incomplete Works").

20.2. The Company shall be entitled to recover from the Contractor any additional cost incurred by the Company for procuring the services for the Incomplete Works which are in excess of the amount the Company would have paid the Contractor for the same work, had the Contract not been terminated, including all reasonable costs incurred by the Company as a result of such termination ("Additional Costs"). The Company shall have the right to recover such Additional Costs either directly from the Contractor and/or by invocation of Performance Bank Guarantee and/or by deducting such Additional Costs from any monies due to or that becomes due to the Contractor under the Contract.

20.3. In addition, if such termination occurs prior to mobilization, then no advances, payments or fees of whatsoever nature shall be payable to the Contractor, or, if already paid by the Company, then any such advances, payments or fees shall be repaid by the Contractor to the Company.

21. CONSEQUENCES OF TERMINATION
In the event of termination under any provision of this Contract, the Service Provider shall:

a) promptly cease performance of the Services (or relevant part thereof) and, as directed by the Company, clear all unnecessary Service Provider's Equipment and Service Provider's Personnel from the Site;

b) allow the Company all necessary rights of access to the Site to take over the Services (or relevant part thereof); and

c) if, and to the extent, requested by the Company assign any subcontracts or other rights and titles relating to the Services (or relevant part thereof) which the Service Provider may have entered into or acquired.

22. CONFIDENTIALITY

22.1. The Company and the Service Provider shall keep any information which either Party learns about or receives from the other pursuant to this Agreement in strict confidence and will not disclose the same to any third party without the prior written consent of the other Party. The foregoing restriction shall not apply in respect of information which the Company requires to disclose for the purpose of performing Services or which was in the possession of the disclosing party prior to this Agreement or which is required to be disclosed by any law, rule or regulation of any governmental agency or court order or information which was already within the public domain or which was developed by either Party, independently of and without reference to the Confidential Information and the receiving party has evidence of such independent development. The provisions of this clause shall survive the expiry of termination of the Agreement for a period of 3 years.

22.2. The Service Provider shall not disclose such Information(s) to any potential subcontractors until such time and in manner agreed by Company in writing. The decision of the Company will be final and binding on the Service Provider in this regard. The Service Provider shall use best endeavours to prevent the authorised disclosure of the all information hereunder. Where any information is required to be disclosed under Clause 22.1, the Service Provider shall give prompt notice to the Company and shall use its best commercial endeavours to limit the extent of any such disclosure.

23. Data Protection

23.1. Where necessary to enable the Service Provider to perform the Services, Company may provide the Service Provider with, or the Service provider may have access to, information relating to an identified or identifiable individual (‘personal data’).

23.2. In making personal data available to the Service Provider , the Service Provider and the Company confirms that both the Parties have complied with applicable data protection law ('Data Protection Law') and all other Applicable laws (including the European Union’s General Data Protection Regulations and the SPDI Rules in relation to the personal data.

23.3. The Service Provider agrees that when processing personal data on Company’s behalf in the performance of the Services the Service Provider will:

(a) only process personal data on Company’s documented instructions save where required by law or the order of competent court or tribunal;

(b) ensure that personal data is processed in accordance with applicable Data Protection Law and any other Applicable laws, and to notify Company if an instruction infringes any law to which we are subject;

(c) take all reasonable steps to ensure that the personal data is protected against misuse and accidental loss or disclosure, and from unauthorised or unlawful processing, destruction or alteration, and in case of any personal data breach (as defined by applicable Data Protection Law) the Service Provider will notify the Company without undue delay upon becoming aware of it;

(d) not sub-contract our processing of personal data (save that the Service Provider may subcontract and, in doing so, transfer personal data, to the authorised personnel with prior written approval of the Company in other jurisdictions, or third parties who are bound by appropriate confidentiality and security obligations consistent with the terms of this clause;

(e) only disclose personal data to its authorised personnel to the extent that they have a need to know for the purpose of providing the Services and are subject to appropriate obligations of confidentiality;

(f) answer Company’s reasonable enquiries to enable Company to monitor the Service Provider’s compliance with this clause and provide Company with reasonable assistance to enable Company to comply with applicable Data Protection Laws.

23.4. Where the Service Provider process personal data that originates from a jurisdiction where the applicable Data Protection Law requires additional safeguards to be put in place for the protection of that data, or the Service Provider transfer personal data from such a country, or third parties in accordance with clause 23.3 (d)) the Service Provider agree to take such steps as Company reasonably require, including entering into contractual clauses to meet the requirements of applicable Data Protection Law.

24. NOTICES

24.1. Any notice or other communication required or given under this Agreement shall be delivered in writing either by hand or by courier, registered mail with acknowledgment due, e-mail (e-mail shall be considered as delivered once received by the receiving party) or fax to the address of the relevant Party set out in the Agreement (or such other address as may be notified by the relevant Party from time to time).

24.2. If a notice is delivered by hand or courier during normal business hours of the intended recipient, it shall be deemed to have been received at the time of delivery otherwise on the next business day of the recipient. A notice sent by facsimile shall be deemed to have been received at the time when the sender’s facsimile machine acknowledges transmission provided however that if the time of acknowledgement of transmission is after 5.00pm on a business day of the recipient it shall be deemed to have been received on the next business day of the recipient.

24.3. All notices or other communications between the Parties shall be in the English language.

25. GENERAL LEGAL PROVISIONS

25.1. The Company shall be entitled to assign this Agreement to an affiliate/subsidiary or on giving written notice to the Service Provider. Save as aforesaid, the Service Provider shall not be entitled to assign this Agreement or any part or any benefit or interest in or under it without the prior written approval of the Company which the Company may at its sole discretion accept or refuse.

25.2. This Agreement shall not be amended or modified except by mutual agreement in writing between the Parties.

25.3. This Agreement and the all Schedules and Attachments annexed hereto contains the whole agreement between the Parties relating to the subject matter of this Agreement, and supersedes any previous understandings, commitments, agreements, correspondences or representations in respect of the subject matter. No terms or conditions endorsed upon, delivered or contained in Service Provider’s quotation, acknowledgement or acceptance of

the Agreement, specification or similar document will form part of the Agreement and Service Provider waives any right it otherwise might have to rely on such terms and conditions. No variation to any terms or conditions of this Agreement shall be valid unless expressly agreed in writing by both parties.

25.4. No delay or failure on the part of either Party to enforce from time to time all or any part of the terms and conditions of this Agreement shall be interpreted as a waiver of such terms and conditions.

25.5. Nothing in this Agreement shall, or shall be deemed to, create an agency, a partnership, a joint venture, an association or a relationship of employer and employee, principal and agent or master and servant between the Parties. For the avoidance of doubt, nothing in this Agreement shall prevent or restrict the Company from entering into parallel Agreements with other parties for services similar or related to the Services.

25.6. Unless otherwise specifically stated, both the Company and the Service Provider shall retain all rights and remedies, both under the Agreement and at law, which either may have against the other.

25.7. The Service Provider shall comply with all safety instructions of the Company consistent with the provisions of the Agreement including, without limitation, the safety instructions of any of the Company's other Service Providers. Such instructions shall, if the Service Provider so requires, be confirmed in writing by the Company's Representative, so far as practicable.

25.8. The Service Provider shall not be entitled, without the written consent of Company, to make any news release or public announcement concerning the subject matter of the Agreement or to refer to the Company, use its name or logo, in print or electronic forms for marketing or reference purposes.]

25.9. If any provision of this Agreement is prohibited, invalid or unenforceable in any jurisdiction, that provision will, as to that jurisdiction, be ineffective to the extent of the prohibition, invalidity or unenforceability without invalidating the remaining provisions of this Agreement or affecting the validity or enforceability of that provision in any other jurisdiction, unless it materially alters the nature or material terms of this Agreement.

25.10. The provisions of this Agreement are solely for the benefit of the Parties. No other person are intended to have, nor will have, any rights whatsoever, under this Agreement, whether for injury, loss or damage to person(s) or property or for economic loss.

25.11. This Agreement may be executed in one or more counterparts, each of which will be deemed to be an original copy of this Agreement and all of which, when taken together, will constitute one and the same instrument.

26. FORCE MAJEURE

26.1. For the purposes of this Agreement, “Force Majeure” means the occurrence of any event or circumstance or combination of events or circumstances that is beyond the reasonable control of a Party, has a material and adverse effect on the performance by that Party of its obligations under or pursuant to this Agreement, and that demonstrably could not have been foreseen by the Partiers; provided, however, that such material and adverse effect could not have been prevented, overcome or remedied by the affected Party through the exercise of diligence and reasonable care; but provided, further, that the exercise of diligence and reasonable care will not include the obtaining or maintaining of insurance beyond the requirements of this Agreement.

26.2. Subject to clause 26.1 hereinabove, Force Majeure includes without limitation, the following events and circumstances, but only to the extent that each satisfies the above requirements as provided under Clause 26.1; (a) Act of God, (b) fire, flood, earthquake, epidemic, pandemic, natural disaster or extreme natural event (c) war, riot, insurrection, civil commotion, mobilization or military, call up of a comparable scope, which has been notified in accordance with this Clause 26 any direction, judgement, decree or any other order passed by any judicial/quasijudicial/administrative authority and/or any direction passed by the government authority/(ies) restraining the performance of obligations, whether in part or in full, of the affected party provided that such orders or directions must not emanate out of actions directly attributable to the affected party or (e) any event owing to any restrictions, directives/directions imposed or passed by the government, judicial, quasi-judicial authorities if they impede or delay the performance of the Agreement (Force Majeure Events).

FORCE MAJEURE EXCLUSIONS:

Force Majeure will expressly not include the following conditions, except and to the extent that they result from an event or circumstance otherwise constituting Force Majeure:

(i) unavailability, late delivery or changes in cost of machinery, equipment, materials, spare parts or consumables;
(ii) prevailing weather conditions at the place of performance of the services/works, including during monsoon periods;
(iii) failure or delay in performance by any Subcontractor;
(iv) normal wear and tear or flaws in materials and equipment or breakdowns in equipment.
(v) any labour unrest/strikes or any other event of the like nature caused by the Service Provider (which includes its subcontractors) shall not be considered as a force majeure occurrence

26.3. In the event of a Force Majeure occurrence, the party that is or may be delayed in performing the Agreement shall notify in writing to the other party without delay but not later than fifteen (15) business days on the

initiation of such Force Majeure Event(s) and shall use diligent efforts to end the failure or delay in performance to minimize effects of such Force Majeure Event. Provided, however, that the occurrence of such an event would entitle the parties to renegotiate the time frame for performance of the respective obligations, taking into consideration the nature of such event. . In such a situation, the party, which is not able to perform its obligations under this Agreement on account of Force Majeure Event(s), shall not be liable to the other party for the default or breach of this Agreement for the period of failure or delay. If the said notice is not received by the other party within fifteen (15) business days, after the party who fails to perform knew or ought to have known of the impediment, it is liable for damages resulting from such non-receipt.

26.4. Both Parties agree to use their respective reasonable efforts to cure any event of Force Majeure to the extent that it is reasonably possible to do so. Upon the cessation of the event of Force Majeure, the party declaring Force Majeure shall immediately but not later than three (3) business days give notice thereof to the other party.

26.5. Neither Party shall be liable in any manner whatsoever to the other party in respect of any loss, damage, costs, expense, claims, demands and proceedings relating to or arising out of occurrence or existence of any Force Majeure Event or exercise of any right pursuant hereof. The costs associated with taking all steps required to mitigate the effects of the Force Majeure Event and restore its ability to perform its obligations under this Agreement as soon as reasonably practicable shall be borne by the respective parties.

27. BUSINESS ETHICS

27.1. The Service Provider shall declare any conflicts of interest with the Company including relationship or financial interest of any nature whatsoever with employees, managers, other suppliers, vendors or stakeholders of the Company.

27.2. The Service Provider shall not use the services of any of the employees of the Company, directly or indirectly or enter into any sort of monetary transaction with the employees of the Company. The Service Provider undertakes that he has not given, offered or promised to give directly or indirectly any bribes, commission, gift, consideration, reward, or inducement to any of the employees of the Company or their agent or relatives for showing or agreeing to show favor or disfavor to any person in relation to this Agreement or forbearing to do or for having done or forborne to do any act in relation to the obtaining or execution of the aforesaid undertaking, by the Service Provider, or his partners, agent or servant or any one authorized by him or acting on his behalf.

27.3. The Service Provider agrees to comply with the provisions of the Company's Supplier Code of Conduct which includes Antibribery and Corruption requirements (a copy of which is also available at- https://www.eslsteel.com/investor-relations/pdf/policy-supplier-code-of-conduct.pdf), the Company's Human Rights Policy (a copy of which is available at- https://www.eslsteel.com/investor-relations/pdf/human-rights-policy.pdf) including the Modern Slavery Act 2015, the Company's Sustainability Policies (copies of which are available at- https://www.eslsteel.com/sustainability/sustainability-policies.aspx) as may be amended from time to time and in case of breach thereof, the same shall be treated as a breach of this Agreement.

27.4. The Service Provider shall maintain records and provide to the Company upon request such records and evidences, as the Company may reasonably require, confirming the Service Provider's compliance with the obligations under this clause.

27.5. The Company shall have a right to initiate "audit proceedings" against the Service Provider to verify compliance with the requirements under this clause. Such audit may be carried out by Company or by a reputed agency to be appointed by Company at the sole discretion of Company. The Service Provider shall extend full cooperation for smooth completion of the audit mentioned herein.

27.6. Notwithstanding anything in this agreement, Company shall have right to terminate the Agreement forthwith and recover from the Service Provider, the amount of any loss arising from such termination in case, it is found that the Service Provider has failed to comply with requirements under this clause including any corrupt practices. A decision of the Company or his nominee to this effect that a breach of the undertaking had been committed shall be final and binding on the Service Provider.

27.7. If at any time during execution or performance of this Agreement the Service Provider becomes aware of any unethical practices or is faced with any undue demand, request for gratification or favor from any employee of the Company or a person connection with such employee, the Service Provider must report the same immediately to the Group Head-Management Assurance at the following address:

Group Head – Management Assurance,
Vedanta, 75 Nehru Road
Vile Parle (E), Mumbai 400 099
'Complaints' can also be sent to the designated e-mail id: esl.whistleblower@vedanta.co.in

28. GOVERNING LAW AND DISPUTE RESOLUTION

28.1. This Agreement shall be governed by, construed and enforced in accordance with the laws of India. Subject to Clause 28.2 below, the parties submit to the exclusive jurisdiction of the courts of_____, India and any courts that may hear appeals from those courts in respect of any proceedings in connection with this Contract.

28.2. Any dispute or difference whatsoever arising between the parties out of or relating to the interpretation, meaning, scope, operation or effect of this Agreement or the existence, validity, breach or anticipated breach

thereof or determination and enforcement of respective rights, obligations and liabilities of the parties thereto shall be amicably settled by way of mediation by meeting(s) between senior management representatives of each Party. If the dispute is not conclusively settled within a period of twenty-one (21) days from the date of commencement of mediation or such further period as the parties shall agree in writing, the dispute shall be referred to and finally resolved by arbitration under the Arbitration and Conciliation Act, 1996 (as amended from time to time), which are deemed to be incorporated by reference into this clause. The arbitration shall be conducted as follows:

(i) A sole arbitrator shall be appointed in case the value of claim under dispute is less than ₹ 50,00,000 (Rupees Five Million Only) and in any other event by a forum of three arbitrators with one arbitrator nominated by each Party and the presiding arbitrator selected by the nominated arbitrators.

(ii) The language of the mediation and arbitration proceedings shall be English. The seat and venue of arbitration shall be_____, India.

(iii) The award made in pursuance thereof shall be final and binding on the parties. The right to arbitrate Disputes under this Agreement shall survive the expiry or termination of the Agreement.

28.3. It is clarified that the Services under the Agreement shall be continued by the Service Provider during the arbitration proceedings unless otherwise directed in writing by the Company.

ATTACHMENT 1 to SCHEDULE I SCOPE OF WORK

ATTACHMENT 2 to SCHEDULE I COMPENSATION SCHEDULE

1. COMPLETENESS OF PRICING
All rates, sums, charges and prices referred to in this Schedule:

(a) are stated in Indian rupees (INR).
(b) are considered complete and fully inclusive in respect of the services being provided and no additional rates, sums, charges or prices shall be paid, except as expressly stated in the Agreement;
(c) shall remain fixed and firm and shall not be subject to amendment for any cause, except as expressly stated in the Agreement.

The cost of any item where the price is left blank shall be deemed included elsewhere.

2. Taxes

The prices and rates set out in this Schedule II (Compensation Schedule) are:
(a) inclusive of all Indian direct taxes (including without limitation personnel taxes, withholding taxes and corporate taxes) now or hereafter levied or imposed on the Service Provider; and
(b) inclusive of all non-Indian taxes (whether direct or indirect) now or hereafter levied or imposed on the Service Provider; and
(c) inclusive of the following Indian taxes at the rates/amounts stated below:

Tax Rate (INR) Amount (INR)
Mention IGST or CGST+SGST (as the case may be) Mention rate of GST as applicable on Service Mention whether Vendor will charge under forward charge on its Invoice or Company will pay under reverse charge mechanism
Other Tax As Applicable Included in Price
[Amend above table as applicable for each contract]

The Contractor shall separately state the taxes listed in (c) above in all invoices submitted to the Company under this Contract. [Delete if under reverse charge]

3.Withholding Tax

TDS shall be deducted as per the applicable rates under Income Tax Act and same shall be in Service Provider’s account only.

GST TDS, if applicable shall be deducted as per the applicable rates under relevant GST Act and same shall be in Service Provider’s account only.

4.Pricing Table

Particulars of Service Unit of Measure Base Amount (INR) GST Rate (%) GST Amount

(INR)
All Inclusive Amount (INR)

Attachment 3 to Schedule 1 ADVANCE BANK GUARANTEE

Name: **Authority Signatory**		For, **SRK Mining Services (India) Private Limited** Sujit Roy **Name:** Sujit Roy **Authority Signatory**

Appendix B: Supporting Documents for Nadidihi Iron Ore Mine

GOVERNMENT OF ODISHA
STEEL & MINES DEPARTMENT

*****

ORDER

No. 9576 /SM, Dated 17-11-2021
IV(B)SM-54/2021

Sub: Grant of Mining Lease for Iron ore in favour of M/s ESL Steel Ltd., the successful bidder in respect of Nadidihi (BICO) Iron ore Block over an area of 74.500 ha in Nadikasira & Rengalbeda village, Koira Tahasil of Sundergarh District.

Whereas in pursuance to the "Invitation of bids for grant of Mining Lease" dated 07.07.2021 issued by the Government and subsequent forward auction held on dated 19.09.2021, M/s ESL Steel Ltd. has been declared as the Preferred Bidder for grant of Mining Lease of Nadidihi (BICO) Iron ore Block in Sundergarh district;

And whereas, the said preferred Bidder has made payment of first instalment of the Upfront Payment. Subsequent to this, it has been issued with a Letter of Intent vide letter no: 8469/SM, dated 22.10.2021 and Vesting Order vide order no: 8497/SM dated 22.10.2021 for grant of mining lease;

And whereas, on the request of the preferred bidder, extension of time by a period of 15 (fifteen) days has been granted under the proviso to sub-rule (6B) of rule 10 of the Mineral (Auction) Rules, 2015 (herein after referred as the said rules) vide letter No. 9025/SM, dated 05.11.2021 for complying with all the requirements to execute the mining lease deed;

And whereas, on payment of second instalment of the upfront payment, submission of the performance security and complying with all other requirements as prescribed under rule 10, sub-rule (3) of the said rules, M/s ESL Steel Ltd., has been declared as the successful bidder vide order No. 9258/SM dated 10.11.2021;

And whereas, under sub-rules (4) and (5) of rule 10 of the said rules, the successful bidder has signed the Mine Development and Production Agreement with Collector, Sundergarh district on dated 15.11.2021 and has paid the third instalment of upfront payment as reported by the Director of Mines vide his letter No.8885/DM, dated 16.11.2021.

Now, therefore, State Government, after careful consideration, in exercise of powers conferred under rule 10, sub-rule (5) of the Mineral (Auction) Rules, 2015 have been pleased to grant the mining lease for Iron Ore in favour of M/s ESL Steel Ltd., the successful bidder in respect of Nadidihi (BICO) Iron ore Block over an area of 74.500ha in Nadikasira & Rengalbeda village, Koira tahasil of Sundergarh district for the period of 50 (fifty) years as provided under section 8A, sub-section 2 of the Mines and Minerals Development and Regulation Act, 1957 (67 of 1957) which shall be executed within the stipulated time period as per rules.

By order of Governor

17/11/2021.

Additional Secretary to Government

Memo No. 9577 **/SM** **Dated:** 17.11.2021

Copy forwarded to Sri Nitin Kumar Tiwari ,M/s ESL Steel Ltd., Siyaljori PO Jogidihi, OP Bangaria, PS Chandankyari,Bokaro-828303, Email: praveen2@vedanta.co.in for information and further necessary action. He is requested to ensure the execution & registration of the lease deed within the stipulated time period as per rule.

17/11/2021.

Additional Secretary to Government

Memo No. 9578 **/ SM** **Dated:** 17.11.2021

Copy forwarded to Director of Mines, Odisha, Bhubaneswar/ Deputy Director of Mines, Koira/ DFO, Bonai for information and necessary action.

Additional Secretary to Government

17/11/2021

Memo No. 9579 **/ SM** **Dated:** 17.11.2021

Copy forwarded to the Collector, Sundergarh district for information and necessary action. He is authorized to execute the mining lease deed and transmit a copy of the duly registered deed to all concerned including this Department.

Additional Secretary to Government

17/11/2021

Memo No. 9580 **/ SM** **Dated:** 17.11.2021

Copy forwarded to Forest, Environment & Climate Change Department/ PCCF(Nodal), Bhubaneswar for information and necessary action.

Additional Secretary to Government

17/11/2021

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transforming elements

ESL STEEL LIMITED
(Formerly known as Electrosteel Steels Limited)

ESL/TSD/2021-22/NI-3

Date: 26.11.2021

To,
The Directorate General of Mines Safety,
Dhanbad (Eastern Railway)
P. O. Box No. 73,
Jharkhand – 826001

Sub: Notice of Opening of Nadidihi Iron Ore Mine of ESL STEEL Limited in Nadikesira & Rengalbeda villages, under Koira Tahsil, District Sundargarh, Odisha.

Dear Sir,

This is to inform you that ESL STEEL LIMITED has acquired Nadidihi Iron Ore Mine through the Auction process as per Mineral (Auction) Rules 2015. Subsequently, mine lease deed has been executed dated 20.11.2021 with the Govt. of Odisha.

We are submitting dully filled Form-I on Opening of Nadidihi Iron Ore Mine of ESL STEEL LIMITED as per Regulation 3(1), of MMR,1961.

Thanking you,

Yours Faithfully,
For **ESL STEEL LIMITED**

ESL STEEL LIMITED

(Navnath L. Vhatte)
[Owner]

Enclosed:

1. Mine Lease Deed copy.
2. Form-I, as per First Schedule MMR,1961

Received
Hon
24/12/21

C.C.
1. The Deputy Directorate General of Mines Safety, South East Region, Ranchi, Jharkhand, 834002
2. The Director of Mines Safety, Chaibasa Region, Chaibasa, Jharkhand – 833201
3. The Collector & District Magistrate, Sundargarh District of Odisha.
4. The Regional Labour Commissioner (C), Rourkela.

5. The Controller General, IBM, Nagpur.
6. The Controller of Mines, East Zone, Kolkatta.
7. The Regional Controller of Mines, Indian Bureau of Mines, Bhubaneswar, Odisha.
8. The Directorate of Mines, Bhubaneswar, Odisha
9. The Deputy Director of Mines, Koira.
10. The Divisional Forest Officer, Bonai,
11. Odisha State Pollution Control Board, Bhubaneswar, Odisha.
12. The Regional Officer, OSPCB, Rourkela, Sundergarh District of Odisha.
13. The Tehsildar, Koira, Sundergarh
14. The Inspector Incharge, Koira
15. The L.E.O (C), Rourkela.

FIRST SCHEDULE

FORM I

[See Regulations 3, 6, 7, 8]

Notice of Opening, Closing or Change, etc.

From: **ESL Steel Limited,**
Siyaljori, PO- Jogidih, OP-Bangaria, Bokaro Steel City,
Jharkhand-828303.

To: 1] The Directorate General of Mines Safety, Dhanbad, Jharkhand-826001

2] The Director of Mines Safety, Chaibasa Region, Jharkhand.

3] District Magistrate, Sundargarh – Odisha

Sir,

I have to furnish the following particulars in respect of opening of Nadidihi Iron Ore Mine of ESL STEEL LIMITED.

---

1. In case of CHANGE OF NAME OF MINE : **N.A.**
   Old Name of Mine : --
   Date of change : --

---

2. **a] Situation of the Mine:**
   Village : Nadikasira & Rengalbeda
   Police Station : Koira
   Sub-division [Taluka] : Bonai
   District : Sundargarh
   State : Odisha

   b] In case of NEW MINE, particulars of situation of mine :
   Post office : Koira
   Office :
   Railway Station : Barbil (25 Kms)
   Rest House : Barbil (26 Kms)
   [Give distance therefrom means of travelling]

3.	A] Name and postal address of II		PRESENT	PREVIOUS
	a] Owner	:	ESL STEEL LIMITED Siyaljori, PO- Jogidih, OP-Bangaria, Bokaro Steel City, Jharkhand-828303.	--
	b] Managing agent if any	:	--	--

	c] Agent if any	:	**Mr. Sandeep Naik,** **Diploma in Mining & Mine Surveying,** **1st Class Manager's Certificate of Competency** **(Restricted) under MMR 1961**
	d] Manager	:	-
	B] In case of change, date of change	:	--
4. a]	Name and qualification, etc. of Owner / Agent / Manager /Asst. Manager / Underground Manager / Engineer / Surveyor, Whose appointment is terminated / Who is appointed	:	**Not Applicable**
b]	Date of appointment/termination	:	**Not Applicable**
5.	Date of which it is intended to open/ Re-open/ Abandon/ discontinue the mine:	:	-------
6.	Actual date of **opening** / ~~re-opening~~ ~~Abandonment/ Discontinuance~~ of the mine:	:	**26.11.2021**

Yours faithfully,
For ESL STEEL LIMITED

Signature: .....
Name in full: **Navnath L. Vhatte**
[Owner]
Date: 26.11.2021

Place : Barbil
Dated : 26.11.2021

Appendix C: Copy of CTE / CTO

E-mail: paribesh1@ospcboard.org
Website: www.ospcboard.org

STATE POLLUTION CONTROL BOARD, ODISHA

[DEPARTMENT OF FOREST, ENVIRONMENT& CLIMATE CHANGE, GOVERNMENT OF ODISHA]
Paribesh Bhawan, A/118, Nilakantha Nagar, Unit – VIII
Bhubaneswar – 751012

No. 18458 / IND-II-CTE-6979 Date: 22.11.2023 /
Through online/
By speed post

CONSENT TO ESTABLISH ORDER

In consideration of the online application no. **4865840** for obtaining Consent to Establish for **Nadidihi Iron Ore Mine of M/s ESL Steel Ltd.,** the State Pollution Control Board is pleased to convey its Consent to Establish under Section 25 of Water (Prevention & Control of Pollution) Act, 1974 and under Section 21 of Air (Prevention & Control of Pollution) Act, 1981 for **installation of 600 TPH Fixed Dry Processing Plant (Iron Ore Cushing and Screening Unit) inside the mine lease area of 74.5 Ha. with a Project Cost of Rs. 5 Crores** with removal/dismantling of certain Mineral Handling Plants and the final combination of minerals handling plants in following manner.

Sl No	Plant Type	Existing Facility as per CTO Order No- 10335 dt. 1-07-2023		Final Proposed Facility		Remarks
		Capacity TPH	Numbers	Capacity TPH	Numbers	
1	Dry Mobile Crushing Plant	150	8 (4 Primary + 4 Secondary)	150	2	3 Primary & 3 Secondary Crushers to be removed/ dismantled
		250	2 (1 Primary + 1 Secondary)	250	2	No Change
2	Dry Mobile Screening Plant	150	2	150	0	2 to be removed/ dismantled
		250	1	250	0	1 to be removed/ dismantled
		300	11	300	4	7 to be removed/ dismantled
3	Wet Beneficiation	0.5 MTPA Throughput	1	0.5 MTPA Throughput	1	No Change
4	Fixed Dry Screening & Crushing Plant	NIL		600	1	Proposed Plant

At- Nadidihi, Tehsil- Koira in the District of **Sundargarh** with the following conditions:

GENERAL CONDITIONS:

1. This Consent to Establish is valid for the product, method of mining and capacity mentioned in the application form. This order is valid for **five** years, which means the proponent shall commence mining activities for the proposal within a period of five years from the date of issue of this Consent to Establish order. If the proponent fails to commence mining activities for the proposal within five years, then a renewal of this consent to establish shall be sought by the proponent.
2. The mine shall apply for grant of Consent to Operate under Section 25/26 of Water (Prevention & Control of Pollution) Act, 1974 & under Section 21 of Air (Prevention & Control of Pollution) Act, 1981 at least 3 (three) months before the commencement of production and obtain Consent to Operate from this Board.
3. No change in mining technology and scope of working shall be made without prior approval of the Board.
4. **This Consent to Establish is subject to statutory and other clearances from Govt. of Odisha and/or Govt. of India, as and when applicable.**

SPECIAL CONDITIONS:

GENERAL:

1. This Consent to Establish is granted for the capacity as mentioned above and any expansion in the capacity change or modification in the process, addition, alternation any nature has to be undertaken with prior approval of the Board. For any change in the site or area fresh Consent to Establish has to be obtained from the Board.
2. The present review of mining plan(approved) includes 800TPH fixed Screening Unit. The flow chart of the 800TPH screening plant indicates Jaw Crusher & Cone Crusher are integral part of the 800TPH screening unit, whereas, the equipment list in this regard doesn't include the crushers. Necessary modification in this regard shall be obtained from IBM, Govt. of India to include 600TPH screening & crushing unit in the mining plan and be submitted at the time of application of Consent to Operate.
3. The mine shall implement the Pollution Control Measures and safeguards as proposed in the Environment Management Plan (EMP) of the Project Report.
4. The unit shall obtain NOC from CGWA for using of ground water for getting Consent to Operate of State Pollution Control Board, Odisha.
5. The proponent shall obtain requisite permission from the Water Resources Department, Govt. of Odisha for drawal of surface water and ground water.
6. A green belt of adequate width and density preferably with local species along the periphery of the mine, inactive dumps, backfilled area, vacant area, colony and any other vacant area shall be raised so as to provide protection against particulates and noise to ameliorate the environment.
7. The construction material which has potential to be airborne, shall be transported in covered trucks.
8. The proponent shall implement recommendations of CSIR-NEERI for sustainable mining in Joda-Koida-Rairangpur Region.

9. Necessary preventive measures shall be taken during operation phase so that the ambient air quality including Noise shall confirm to National Ambient Air Quality Standards and standards for noise in industrial area **(Annexure-I & II).**

10. All the conveyors of primary crusher, screen and secondary crusher shall be covered with corrugated GI Sheets.

11. Both dust suppression (dry fog) and extraction (bag filter) system shall be provided at all dust generating source such as screening, jigging & material transfer points etc. such that, particulate matter concentration in ambient air shall not be more than 1200 $\mu g/m^3$ at a distance of 25.0 ± 2.0 m from the source of fugitive emission in the predominant down wind direction as per MoEF & CC, Govt. of India notification No. G.S.R. 809(E), dated 04.10.2010 (copy enclosed as **Annexure –III).**

12. The suction points of dust extraction system shall be provided at screens and all transfer points, secondary crusher discharge chutes and any other dust generating sources. This system shall be connected to bag filters so that particulate matter emission from the stack shall not exceed 100 mg/Nm^3 as per MoEF&CC, Govt. of India Notification no-GSR.-809(E) dated 4th October 2010 (copy enclosed as **Annexure-III).** Stack height for de-dusting unit shall be calculated as per above notification of MoEF&CC, Govt. of India i.e. $H = 74\ Q^{0.27}$ where H and Q are stack height in meter and particulate matter (PM) emission in ton/hr respectively.

13. All the product conveyor of the screens shall discharge the product into a hopper and chute arrangement fitted with dust extraction and bag filter system. Chute shall be maximum 3 meter height from the ground level. Fixed auto sprinklers shall be provided in the stock yard of product.

14. The mine shall make provision to collect the fine products in hopper instead of heaping by free falling to avoid the dust nuisance. Ore fine transportation shall be done in covered truck.

15. Adequate measures shall be taken for control of noise levels in the work environment of mine area so that noise levels at the boundary line of mining lease area shall not exceed 75 dB (A) during day time (06:00 AM to 10:00 PM) and 70 dB(A) during night time (10:00 PM to 06:00 AM).

16. Adequate noise barriers shall be provided surrounding the crushing and screening plants to control noise pollution and avoid impact on wildlife due to operation of crushing and screening plants during night hours.

17. On-line noise monitoring system shall be installed to monitor noise level during night hours.

18. Protective barriers shall be provided for the lights to prevent illumination towards the forest area during night hours.

19. The construction shall be carried out with fly ash bricks. If the fly ash bricks are not available locally the construction may carried out with other bricks with prior intimation to the concerned Regional Office of SPC Board. A quarterly statement indicating the use of fly ash bricks during construction shall be submitted to the Board for record.

20. The Mine shall provide mechanized wheel washing system along with effluent treatment and recycling facilities at the exit point of the mine.

21. The proponent shall abide by the Wildlife Management Plan or wildlife clearance wherever applicable.

22. The proponent shall comply to the provisions of E-Waste (Management) Rules, 2016 and shall handover e-waste to authorized collection centers/ register dismantlers/ recyclers for proper disposal of e-waste.

23. Plastic waste shall be stored in designated space and same shall be sent to authorized cement kiln for co-processing.

24. Municipal solid waste generated from the township shall be disposed-off as per Solid Waste Management Rules, 2016

25. The project proponent shall develop greenbelt in 7.5 m wide safety zone all along the mine lease boundary as per the guidelines of CPCB in order to arrest pollution emanating from mining operations within the lease.

26. A separate environmental management cell with suitable qualified personnel shall be set up under the control of a Senior Executive, who will report directly to the Head of the organization.

27. Appropriate method of disposal of solid waste is to be adopted to avoid environmental pollution.

28. The proponent shall comply to the provisions of Hazardous and Other Wastes (Management and Trans boundary Movement) Rules, 2016 and amended thereafter.

29. The above conditions will be enforced, inter-alia, under the provisions of the water (Prevention & Control of pollution) Act, 1974 and Air (Prevention & Control of Prevention) Act, 1981 and Environment (Protection) Act, 1986 and the Public Liability Insurance Act, 1991 along with their amendments and Rules.

30. The Board may impose further conditions or modify the conditions stipulated in this order during installation and/or at the time of obtaining Consent to Operate and may revoke this clearance in case the stipulated conditions are not implemented.

31. No production activity shall commence prior to installation of all pollution control measures. In case it is found that the mine is operated without installation of adequate pollution control equipment, direction for closure shall be issued u/s 31 (A) of Air (PCP) Act, 1981 and / or u/s 33(A) of Water (PCP) Act, 1974 as the case may be without any further notice.

32. The unit shall abide by Environment (Protection) Act, 1986 and Rules framed thereunder.

Encl: As above

MEMBER SECRETARY

To,

The CEO and W T Director
Nadidihi Iron Ore Mine of M/s ESL Steel Ltd.,
At-Nadidihi, PO & Tehesil-Koira
District- Sundargarh

Memo No. 18459 / Date 22.11.2023 /

Copy forwarded to:

1. The Director, Directorate of Mines, Govt. of Odisha, Bhubaneswar
2. The Collector and District Magistrate, Sundargarh.
3. The DFO, Sundargarh
4. The DDM Koida, Sundargarh
5. Consent to Operate Cell, SPC Board, Bhubaneswar.
6. Hazardous Waste Management Cell, SPC Board, Odisha, Bhubaneswar
7. The Regional Officer, SPC Board, Odisha, Rourkela.
8. Copy to Guard file.

ADDL. CHIEF ENV. ENGINEER

NATIONAL AMBIENT AIR QUALITY STANDARDS

CENTRAL POLLUTION CONTROL BOARD

NOTIFICATION

New Delhi, the 18th November, 2009

No. B-29016/20/90/PCI-L—In exercise of the powers conferred by Sub-section (2) (h) of section 16 of the Air (Prevention and Control of Pollution) Act, 1981 (Act No.14 of 1981), and in supersession of the Notification No(s). S.O. 384(E), dated 11th April, 1994 and S.O. 935(E), dated 14th October, 1998, the Central Pollution Control Board hereby notify the National Ambient Air Quality Standards with immediate effect, namely:-

NATIONAL AMBIENT AIR QUALITY STANDARDS

S. No.	Pollutant	Time Weighted Average	Concentration in Ambient Air		
			Industrial, Residential, Rural and Other Area	Ecologically Sensitive Area (notified by Central Government)	Methods of Measurement
(1)	(2)	(3)	(4)	(5)	(6)
1	Sulphur Dioxide (SO_2), $\mu g/m^3$	Annual*	50	20	- Improved West and Gaeke
		24 hours**	80	80	-Ultraviolet fluorescence
2	Nitrogen Dioxide (NO_2), $\mu g/m^3$	Annual*	40	30	- Modified Jacob & Hochheiser (Na-Arsenite)
		24 hours**	80	80	- Chemiluminescence
3	Particulate Matter (size less than 10µm) or PM_{10} $\mu g/m^3$	Annual*	60	60	- Gravimetric - TOEM
		24 hours**	100	100	- Beta attenuation
4	Particulate Matter (size less than 2.5µm) or $PM_{2.5}$ $\mu g/m^3$	Annual*	40	40	- Gravimetric - TOEM
		24 hours**	60	60	- Beta attenuation
5	Ozone (O_3) $\mu g/m^3$	8 hours**	100	100	- UV photometric - Chemiluminescence
		1 hour**	180	180	- Chemical Method
6	Lead (Pb) $\mu g/m^3$	Annual*	0.50	0.50	- AAS /ICP method after sampling on EPM 2000 or equivalent filter paper - ED-XRF using Teflon filter
		24 hours**	1.0	1.0	
7	Carbon Monoxide (CO) mg/m^3	8 hours**	02	02	- Non Dispersive Infra Red (NDIR) spectroscopy
		1 hour**	04	04	
8	Ammonia (NH_3) $\mu g/m^3$	Annual*	100	100	-Chemiluminescence -Indophenol blue method
		24 hours**	400	400	

(1)	(2)	(3)	(4)	(5)	(6)
9	Benzene (C_6H_6) $\mu g/m^3$	Annual*	05	05	- Gas chromatography based continuous analyzer - Adsorption and Desorption followed by GC analysis
10	Benzo(a)Pyrene (BaP) - particulate phase only, ng/m^3	Annual*	01	01	- Solvent extraction followed by HPLC/GC analysis
11	Arsenic (As), ng/m^3	Annual*	06	06	- AAS /ICP method after sampling on EPM 2000 or equivalent filter paper
12	Nickel (Ni), ng/m^3	Annual*	20	20	- AAS /ICP method after sampling on EPM 2000 or equivalent filter paper

* Annual arithmetic mean of minimum 104 measurements in a year at a particular site taken twice a week 24 hourly at uniform intervals.

** 24 hourly or 08 hourly or 01 hourly monitored values, as applicable, shall be complied with 98% of the time in a year. 2% of the time, they may exceed the limits but not on two consecutive days of monitoring.

Note. — Whenever and wherever monitoring results on two consecutive days of monitoring exceed the limits specified above for the respective category, it shall be considered adequate reason to institute regular or continuous monitoring and further investigation.

SANT PRASAD GAUTAM, Chairman
[ADVT-III/4/184/09/Extv.]

Note: The notifications on National Ambient Air Quality Standards were published by the Central Pollution Control Board in the Gazette of India, Extraordinary vide notification No(s). S.O. 384(E), dated 11th April, 1994 and S.O. 935(E), dated 14th October, 1998.

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ANNEXURE-II

SCHEDULE
(see rule 3(1) and 4(1)

Ambient Air Quality Standards in respect of Noise

Area Code	Category of Area/Zone	Limits in dB(A) Leq *	
		Day Time	Night Time
(A)	Industrial area	75	70
(B)	Commercial area	65	55
(C)	Residential area	55	45
(D)	Silence Zone	50	40

Note

1. Day time shall mean from 06:00 A.M. to 10:00 P.M.
2. Night time shall mean from 10:00 P.M. to 06:00 A.M.
3. Silence zone is defined as an area comprising not less than 100 meters around hospitals, educational institutions and courts. The silence zones are zones which are declared as such by the competent authority.
4. Mixed categories of areas may be declared as one of the four above mentioned categories by the competent authority.

*dB(A) Leq denotes the time weighted average of the level of sound in decibels on scale A which is relatable to human hearing.

A "decibel" is a unit in which noise is measured.

"A", in dB(A) Leq, denotes the frequency weighting in the measurement of noise and corresponds to frequency response characteristics of the human ear.

Leq : It is an energy mean of the noise level, over a specified period.

[F. No. Q-14012/1/96-CPA]
VIJAI SHARMA, R. Secy.

MINISTRY OF ENVIRONMENT AND FORESTS

NOTIFICATION

New Delhi, the 4th October, 2010

G.S.R. 809(E).—In exercise of the powers conferred by Sections 6 and 25 of the Environment (Protection) Act, 1986 (29 of 1986), the Central Government hereby makes the following Rules further to amend the Environment (Protection) Rules, 1986, namely:-

1. (1) These rules may be called the Environment (Protection) (Sixth Amendment) Rules, 2010.

(2) They shall come into force on the date of their publication in the Official Gazette.

2. In the Environment (Protection) Rules, 1986, in schedule I, after serial number 17 and the existing entries relating thereto, the following serial number and entries shall be inserted, namely :-

<table>
<tr><th>S. No.</th><th>Industry</th><th>Parameter</th><th>Standard</th></tr>
<tr><td>(1)</td><td>(2)</td><td>(3)</td><td>(4)</td></tr>
<tr><td>"18</td><td rowspan="6">Iron Ore Mining and Ore Processing</td><td colspan="2">A. Emission Standards for Stack for De-dusting Unit</td></tr>
<tr><td></td><td>Particulate matter</td><td>100 mg/ Nm^3</td></tr>
<tr><td></td><td>Stack height **</td><td>15.0 m</td></tr>
<tr><td></td><td colspan="2">** Stack height for De-dusting unit shall be calculated as $H=74\ Q^{0.27}$, where H and Q are stack height in metre and particulate matter (PM) emission in tonne/hr respectively, i.e

Q (kg/hr) — H (metre)
up to 2.71 — 15
2.72 - 7.86 — 20
7.87 - 17.96 — 25
17.97 - 35.29 — 30

Note:- Stack attached to De-dusting unit shall have minimum height of 15.0 metres and would be atleast 2.50 metres above the top-most point of the nearby building/shed or plant in the mine.</td></tr>
<tr><td></td><td colspan="2">B. Fugitive Emission Standards</td></tr>
<tr><td></td><td>Particulate matter</td><td>1200 µg/m^3</td></tr>
<tr><td></td><td colspan="2">Note:- Fugitive emission shall be monitored in the predominant downwind direction at a distance 25.0±2.0 metres from the source of fugitive emission as per following:</td></tr>
</table>

1	2	3	4
		Area	**Monitoring location**
		Mine face/ Benches	Drilling, excavation and loading applicable for operating benches above watertable
		Haul Roads/ Service Roads	Haul roads to ore processing plant, waste dumps and loading areas and service road
		Crushing plant	Run-off mine unloading at hopper, crushing areas, screens and transfer points
		Screening Plant	Screens, conveying and transportation of ore discharge points
		Ore Storage & Loading	Intermediate stock bin/pile areas, ore stock bin/pile areas, wagon/truck loading areas
		Waste dump	Active waste/reject dumps
		C. Effluent Standards	
		pH	5.5-9.0
		Suspended solids (non-rainy day)	50 mg/l
		Suspended solids (rainy day)	100 mg/l
		Oil & grease	10 mg/l
		Note:- (i) All efforts shall be made to reuse and re-circulate the treated effluent. (ii) The aforesaid effluent standards shall be complied with for sewage, service water, beneficiation of ore washwater and surface run-off put together."	

[F. No. Q-15017/21/2007-CPW]

RAJNEESH DUBE, Jt. Secy.

Note : The principal rules were published in the Gazette of India vide number S.O. 844 (E) 19th November, 1986; and subsequently amended vide S.O. 433 (E) dated 18th April 1987; S.O. 64 (E), dated the 18th January 1988 and recently amended vide G.S.R. 97(E), dated the 16th February, 2009, G.S.R. 149 (E), dated the 4th March, 2009, G.S.R. 512(E), dated the 9th July, 2009; G.S.R. 543 (E), dated the 22nd July, 2009; G.S.R. 595(E), dated the 21st August, 2009, G.S.R. 794 (E), dated the 4th November, 2009, G.S.R. 826 (E), dated the 16th November, 2009, G.S.R. 01 (E), dated the 01st January, 2010, G.S.R. 61 (E), dated the 5th February, 2010; GSR 485(E), dated the 9th June, 2010; GSR 608 (E), dated the 21st July, 2010 and GSR 739 (E), dated, the 9th September, 2010.

Signature Not Verified

Digitally Signed by :CHIRANJIBI MISHRA

Date: 2023.11.21 11:20:00 IST

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BY REGD. POST WITH AD

STATE POLLUTION CONTROL BOARD, ODISHA

[DEPARTMENT OF FOREST, ENVIRONMENT & CLIMATE CHANGE, GOVERNMENT OF ODISHA]
A/118, Nilakantha Nagar, Unit-VIII, Bhubaneswar-751012
Phone-2561909, Fax: 2562822, 2560955 E-mail: paribesh1@ospcboard.org, Website: www.ospcboard.org

CONSENT ORDER

No. 4390 / **IND-I-CON- 2266** Dt. 28.03.2024 /

CONSENT ORDER NO. 3064

Sub : Consent for discharge of sewage and trade effluent under section 25/26 of Water (PCP) Act, 1974 and for existing / new operation of the plant under section 21 of Air (PCP) Act, 1981.

Ref : Your online application No.5248376, Dated 29-11-2023 and your letter No.ESL/TSD/OSPCB/2023-24/NI-05, Dated 21.03.2024.

Consent to operate is hereby granted under section 25/26 of Water (Prevention & Control of Pollution) Act, 1974 and under section 21 of Air (Prevention & Control of Pollution) Act, 1981 and rules framed thereunder to

Name of the Industry: **NADIDIHI IRON ORE BLOCK OF M/S ESL STEEL LTD.**

Name of the Occupier & Designation: **SRI ASHISH KUMAR GUPTA, CEO**

Address: **AT: NADIDIHI, PO: KOIRA, DIST: SUNDARGARH.**

This consent order is valid for the period from **01.04.2024 to 31.03.2025.**

Details of Products Manufactured

Sl. No	Product	Quantity
01.	*Iron Ore*	*3496050 TPA*

Details of Mineral Handling Plants /Units

01	*Operation of mobile crushing plant of 8 x 150 TPH (4 x 150 TPH Primary + 4 x 150 TPH Secondary), 2 x 250 TPH (1x 250 TPH primary + 1 x 250 TPH Secondary)*
02.	*Operation of mobile screening plant 2 x 150 TPH, 1 x 250 TPH, 11 x 300 TPH*
03.	*Operation of wet beneficiation plant 0.5 MTPA (Throughput capacity)*

This consent order is valid for the specified outlets, discharge quantity and quality, specified chimney/stack, emission quantity and quality of emissions as specified below. This consent is granted subject to the general and special conditions stipulated therein.

A. Discharge permitted through the following outlet subject to the standard

Outlet No.	Description of outlet	Point of discharge	Quantity of discharge KLD	Prescribed Standard				
				pH	TSS (mg/l)	BOD (mg/l)	Oil & Grease (mg/l)	Fecal Colliform (MPN/100 ml)
01	Septic tank (Domestic effluent)	Soak pit	--	5.5-9.0	200	100	--	--
02	Mine drainage water/ surface runoff/ other wastewater	On land /Inland surface water body	10339 KL/Hr (Monsoon)	5.5-9.0	100 (Rainy day)	--	10	--
					50 (Non- Rainy day)			

B. Fugitive Emission Standards

Particulate Matter	1200 µg/m^3
Note : Fugitive emission shall be monitored in the predominant downwind direction at a distance 25.0 ± 2.0 metres from the source of fugitive emission as per following :	
Area	**Monitoring Location**
Mine face / Benches	Drilling, excavation and loading applicable for operating benches above water table
Haul Roads/ Service Roads	Haul roads to ore processing plant, waste dumps and loading areas and service road
Crushing plant	Run-off mine unloading at hopper, crushing areas, screens and transfer points.
Screening plant	Screens, conveying and transportation of ore discharge points.
Ore storage and loading	Intermediate stock bin / pile areas, ore stock bin / pile areas, wagon / truck loading areas
Waste dump	Active waste / reject dumps

C. Disposal of solid waste permitted in the following manner

Sl. No.	Type of Solid waste	Quantity generated (TPD)	Quantity to be reused on site(TPD)	Quantity to be reused off site(TPD)	Quantity disposed off (TPD)	Description of disposal site.
01	Top soil/ over burden	As per approved mining plan	--	--	--	As per approved mining plan
02	Slime	--	--	--	--	Non-working quarry/ pit

D. GENERAL CONDITIONS FOR ALL UNITS

1. The consent is given by the Board in consideration of the particulars given in the application. Any change or alternation or deviation made in actual practice from the particulars furnished in the application will also be the ground for liable to review/variation/revocation of the consent order under section 27 of the Water (Prevention & Control of Pollution) Act, 1974 and section 21 of Air (Prevention & Control of Pollution) Act, 1981 and to make such variations as deemed fit for the purpose of the Acts.
2. The occupier would immediately submit revised application for consent to operate to this Board in the event of any change in the quantity and quality of raw material / products / manufacturing process or quantity /quality of the effluent rate of emission / air pollution control equipment / system etc.
3. The applicant shall not change or alter either the quality or quantity or the rate of discharge or temperature or the route of discharge without the previous written permission of the Board.
4. The application shall comply with and carry out the directives/orders issued by the Board in this consent order without any negligence on his/her part. In case of non-compliance of any order/directives issued at any time and/or violation of the terms and conditions of this consent order, the applicant shall be liable for legal action as per the provisions of the Law.
5. The applicant shall make an application for grant of fresh consent at least 90 days before the date of expiry of this consent order.
6. The issuance of this consent does not convey any property right in either real or personal property or any exclusive privileges nor does it authorize any injury to private property or any invasion of personal rights, nor any infringement of Central, State laws or regulation.
7. This consent does not authorize or approve the construction of any physical structure or facilities or the undertaking of any work in any natural water course.
8. The applicant shall display this consent granted to him in a prominent place for perusal of the public and inspecting officers of this Board.
9. An inspection book shall be opened and made available to Board's Officers during the visit to the factory.
10. The applicant shall furnish to the visiting officer of the Board any information regarding the construction, installation or operation of the plant or of effluent treatment system / air pollution control system / stack monitoring system any other particulars as may be pertinent to preventing and controlling pollution of Water / Air.
11. The applicant shall display suitable caution board at the place where the effluent is entering into any water-body or any other place to be indicated by the Board, indicating therein that the area into which the effluents are being discharged is not fit for the domestic use/bathing.
12. Storm water shall not be allowed to mix with the trade and/or domestic effluent on the upstream of the terminal manholes where the flow measuring devices will be installed.
13. The applicant shall maintain good house-keeping both within the factory and the premises. All pipes, valves, sewers and drains shall be leak-proof. Floor washing shall be admitted into the effluent collection system only and shall not be allowed to find their way in storm drains or open areas.
14. The applicant shall at all times maintain in good working order and operate as efficiently as possible all treatment or control facilities or systems install or used by him to achieve with the term(s) and conditions of the consent.
15. Care should be taken to keep the anaerobic lagoons, if any, biologically active and not utilized as mere stagnation ponds. The anaerobic lagoons should be fed with the required nutrients for effective digestion. Lagoons should be constructed impervious.
16. The utilization of treated effluent on factory's own land, if any, should be completed and there should be no possibility of the effluent gaining access into any drainage channel or other water courses either directly or by overflow.
17. The effluent disposal on land, if any, should be done without creating any nuisance to the surroundings or inundation of the lands at any time.
18. If at any time the disposal of treated effluent on land becomes incomplete or unsatisfactory or create any problem or becomes a matter of dispute, the occupier must adopt alternate satisfactory treatment and disposal measures.
19. The sludge from treatment units shall be dried in sludge drying beds and the drained liquid shall be taken to equalization tank.
20. The effluent treatment units and disposal measures shall become operative at the time of commencement of production.
21. The applicant shall provide port holes for sampling the emissions and access platform for carrying out stack sampling and provide electrical outlet points and other arrangements for chimneys/stacks and other sources of emissions so as to collect samples of emission by the Board or the applicant at any time in accordance with the provision of the Acts or Rules made therein.

22. The applicant shall provide all facilities and render required assistance to the Board staff for collection of samples / stack monitoring / inspection.
23. The applicant shall not change or alter either the quality or quantity or rate of emission or install, replace or alter the air pollution control equipment or change the raw material or manufacturing process resulting in any change in quality and/or quantity of emissions, without the previous written permission of the Board.
24. No control equipments or chimney shall be altered or replaced or as the case may be erected or re-erected except with the previous approval of the Board.
25. The liquid effluent arising out of the operation of the air pollution control equipment shall be treated in the manner so as to meet the standards prescribed by the Board in accordance with the provisions of Water (Prevention and Control of Pollution) Act, 1974 (as amended).
26. The stack monitoring system employed by the applicant shall be opened for inspection to this Board at any time.
27. There shall not be any fugitive or episodal discharge from the premises.
28. In case of such episodal discharge/emissions the occupier shall take immediate action to bring down the emission within the limits prescribed by the Board and stop the operation of the plant if required. Report of such accidental discharge /emission shall be brought to the notice of the Board within 24 hours of occurrence.
29. The applicant shall keep the premises and air pollution control equipments clean and make all hoods, pipes, valves, stacks/chimneys leak proof. The air pollution control equipments, location, inspection chambers, sampling port holes shall be made easily accessible at all times.
30. Any upset condition in any of the plant/plants of the factory which is likely to result in increased effluent discharge/emission of air pollutants and / or result in violation of the standards mentioned shall be reported to the Headquarters and Regional Office of the Board by E-mail within 2 hours of its occurrence.
31. The occupier has to ensure that minimum three varieties of trees are planted at the density of not less than 1000 trees per acre. The trees may be planted along boundaries of the premises. This plantation is stipulated over and above the bulk plantation of trees in that area.
32. The solid waste such as sweeping, wastage packages, empty containers residues, sludge including that from air pollution control equipments collected within the premises of the shall be disposed off scientifically to the satisfaction of the Board.
33. All solid wastes arising in the premises shall be properly classified and disposed off to the satisfaction of the Board by :
i) Land fill in case of inert material, care being taken to ensure that the material does not give rise to leachate which may percolate into ground water or carried away with storm run-off.
ii) Controlled incineration, wherever possible in case of combustible organic material.
iii) Composting, in case of bio-degradable material.
34. Any toxic material shall be detoxicated if possible, otherwise be sealed in steel drums and buried in protected areas after obtaining approval of this Board in writing. The detoxication or sealing and burying shall be carried out in the presence of Board's authorized persons only. Letter of authorization shall be obtained for handling and disposal of hazardous wastes.
35. If due to any technological improvement or otherwise this Board is of opinion that all or any of the conditions referred to above requires variation (including the change of any control equipment either in whole or in part) this Board shall after giving the applicant an opportunity of being heard, vary all or any of such condition and thereupon the applicant shall be bound to comply with the conditions so varied.
36. The applicant, his/heirs/legal representatives or assignees shall have no claim whatsoever to the condition or renewal of this consent after the expiry period of this consent.
37. The Board reserves the right to review, impose additional conditions or condition, revoke change or alter the terms and conditions of this consent.
38. Notwithstanding anything contained in this conditional letter of consent, the Board hereby reserves to it the right and power under section 27(2) of the Water (Prevention & Control of Pollution) Act, 1974 to review any and/or all the conditions imposed herein above and to make such variations as deemed fit for the purpose of the Act by the Board.
39. The conditions imposed as above shall continue to be in force until revoked under section 27(2) of the Water (Prevention & Control of Pollution) Act, 1974 and section 21 A of Air (Prevention & Control of Pollution) Act, 1981.
40. The occupier shall comply to the conditions stipulated in CTE order issued by Odisha State Pollution Control Board and conditions stipulated in Environmental Clearances issued by MoEF&CC, Govt. of India.
41. The occupier shall abide by E(P) Act, 1986 and Rules framed there-under.
42. In case the consent fee is revised upward during this period, the industry shall pay the differential fees to the Board (for the remaining years) to keep the consent order in force. If they fail to pay the amount within the period stipulated by the Board the consent order will be revoked without prior notice.

GENERAL CONDITIONS FOR UNITS WITH INVESTMENT OF MORE THAN Rs 50 CRORES, AND 17 CATEGORIES OF HIGHLY POLLUTING INDUSTRIES (RED A).

1. The applicant shall analyse the emissions every month for the parameters indicated in TABLE. B & C as mentioned in this order and shall furnish the report thereof to the Board by the 10th of the succeeding month.

2. The applicant shall provide and maintain at his own cost three ambient air quality monitoring stations for monitoring Suspended Particulate Matter, Sulphur Dioxide, Oxides of Nitrogen, Hydro-Carbon, Carbon-Monoxide and monitor the same once in a day/week/fortnight/month. The data collected shall be maintained in a register and a monthly extract be furnished to the Board.

3. The applicant shall provide and maintain at his own cost a meteorological station to collect the data on wind velocity, direction, temperature, humidity, rainfall, etc. and the daily reading shall be recorded and the extract sent to the Board once in a month.

4. The applicant shall forward the following information to the Member Secretary, State Pollution Control Board, Odisha, Bhubaneswar regularly.

   a) Report of analysis of stack monitoring, ambient air quality monitoring meteorological data as required every month.
   b) Progress on planting of trees quarterly.

5. The applicant shall install mechanical composite sampling equipment and continuous flow measuring / recording devices on the effluent drains of trade as well as domestic effluent. A record of daily discharge shall be maintained.

6. The following information shall be forwarded to the Member Secretary on or before 10th of every month.

   a) Performance / progress of the treatment plant.
   b) Monthly statement of daily discharge of domestic and/or trade effluent.

7. Non-compliance with effluent limitations

   a) If for any reason the applicant does not comply with or is unable to comply with any effluent limitations specified in this consent, the applicant shall immediately notify the consent issuing authority by telephone and provide the consent issuing authority with the following information in writing within 5 days of such notification.

      i) Causes of non-compliance

      ii) A description of the non-compliance discharge including its impact on the receiving waters.

      iii) Anticipated time of continuance of non-compliance if expected to continue or if such condition has been corrected the duration or period of non-compliance.

      iv) Steps taken by the applicant to reduce and eliminate the non-complying discharge and

      v) Steps to be taken by the applicant too prevent the condition of non-compliance.

   b) The applicant shall take all reasonable steps to minimize any adverse impact to natural waters resulting from non-compliance with any effluent limitation specified in this consent including such accelerated or additional monitoring as necessary to determine the nature and impact of the non-complying discharge.

   c) Nothing in this consent shall be construed to relieve the applicant from civil or criminal penalties for non-compliance whether or not such non-compliance is due to factors beyond his control, such as break-down, electric failure, accident or natural disaster.

8. The applicant shall at his own cost get the effluent samples collected both before and after treatment and get them analysed at an approval laboratory every month for the parameters indicated in Part-D and shall submit in duplicate the report thereof to the Board.

9. The addition of various treatment chemicals should be done only with mechanical dozers and proper equipment for regulation of correct dosages determined daily and for proper uniform feeding. Crude practices such as dumping of chemicals in drains or sumps or trickling of acids or alkalies arbitrarily and utilizing poles for stirring etc. should not be resorted to.

10. In the disposal of treated effluent on land for irrigation, the industry shall keep in view of the need for;

    a) Rotation of crops.
    b) Change of point of application of effluent on land.
    c) A portion of land kept fallow.

11. The adoption of these would avoid soil becoming sick or slate, the industry may ensure this in consultation with the Agriculture Department.

12. It is the sole responsibility of the industry to ensure that there are no complaints at any time from the royals in the surrounding areas as a result of discharge of sewage or trade effluent if any.

13. Proper housekeeping shall be maintained by a dedicated team.

14. The industry must constitute a team of responsible and technically qualified personnel who will ensure continuous operation of all pollution control devices round the clock (including night hours) and should be in a position to explain the status of operation of the pollution control measures to the inspecting officers of the Board at any point of time. The name of these persons with their contact telephone numbers shall be intimated to the concerned Regional Officer and Head Office of the Board and in case of any change in the team it shall be intimated to the Board immediately.

E. SPECIAL CONDITIONS:

1. This consent order is subject to compliance of orders of the Hon'ble Supreme Court of India in the matter of W. P. (Civil) 114/2014.
2. This consent order is subject to permission from Steel and Mines Department, Government of Odisha for continuing of mining operation.
3. Mining operation is subject to availability of all other statutory clearances.
4. The quantity of production shall be determined on a monthly pro-rata basis from the date of issue of this order. If the date of issue is 15th of the month, or earlier, then the entire month will be considered for calculation, otherwise the quantity shall be determined from the next month on pro-rata basis.
5. The mine shall confine its activity within the previous lease area of 73.855 ha as EC & CTE are not yet obtained for the new lease deed executed over increased area of 74.5 ha. A declaration to this effect shall be submitted to the Board within 07 days.
6. Drills shall either be operated with dust extractors or equipped with water injection system to minimize dust generation in the work environment.
7. Controlled blasting shall be practiced to minimize generation of dust and fly rocks.
8. Regular water sprinkling shall be carried out in critical areas prone to air pollution such as around crushing and screening plant, haul roads, approach road, active OB dumps and mine benches at frequent interval so that it should always remain in wet condition.
9. Effort shall be made to use chemical binders/wetting agents along with sprinkled water in order to reduce water consumption and to improve retention and re-absorption capacity of water.
10. Haulage roads shall be devoid of ruts and potholes and shall be maintained properly to avoid generation of dust during movement of vehicles.
11. Mobile fog cannons shall be installed for dust suppression haul roads & various work zone areas such as ore stack yard and shall be made functional.
12. The mineral processing plants shall be installed as per the CTE dated 22.11.2023 with adequate pollution control measures and obtain prior permission from Board before commissioning.
13. Dust suppression measures preferably dry fog system shall be provided at all appropriate places of mineral handling plants (crusher & screening plant). Loading the unloading areas including all the transfer points shall also have efficient dust suppression arrangements (dry fog system). These shall be properly maintained and operated.
14. Mechanized wheel washing facility for the ore transport vehicles shall be provided at the exit point of the mine. The wheel washing facility shall be integrated with complete recirculation system.
15. The vehicles carrying ore for transportation from the mine shall be covered with tarpaulin (both bottom & top).

16. Regular water sprinkling on mineral transportation roads passing through the habitation area as well as other strategic point on the National Highway shall be done jointly by the mining lessees in consultation with the Regional Officer.
17. Four Ambient Air Quality Monitoring Stations shall be established in core zone and buffer zone for monitoring of ambient air quality and location of the stations shall be decided in consultation with the Regional Officer, State Pollution Control Board based on the metrological data, topographical features and environmentally and ecologically sensitive targets.
18. The monitoring of ambient air quality shall be carried out twice in a week (24 hourly) at a particular site and the consolidated data shall be submitted to the State Pollution Control Board, once in a year.
19. The ambient air quality shall remain within prescribed national ambient air quality standards.
20. Three Continuous Ambient Air Quality Monitoring Stations (CAAQMS), with data transfer facility to SPCB server shall be established in core and buffer zone. The locations of these stations shall be decided in consultation with the Regional Officer, State Pollution Control Board, based on metrological data, topographical features and environmentally and ecologically sensitive targets. Till installation of all CAAQMS, manual ambient air quality monitoring shall be carried out at 04 places, as stipulated Sl. No. 16 and 17.
21. Fugitive Dust Emission Monitoring shall be carried out at the places as stated in Part-B of this order. The monitoring of fugitive dust shall be carried out twice in a week (24 hourly) at a particular site and consolidated data shall be submitted to the State Pollution Control Board, once in a year.
22. The top soil generated shall be stored at earmarked site (s) only and stabilized with plantation or shall be used for land reclamation and plantation.
23. The over burden generated during the course of mining shall be stacked at earmarked dump site (s) and stabilized with plantation or used for reclamation of excavated land followed by plantation.
24. The project proponent shall ensure that no natural watercourse and / or water resources are obstructed due to any mining operations. In case of diversion of natural watercourse, this shall be done with prior permission of the competent authority.
25. The mine shall quantify the surface runoff based on maximum rainfall in the active mining area. The mine shall provide settling ponds of adequate size at strategic location for collection of runoff and settlement of suspended solids. The settled water shall be reused for dust suppression/plantation/wheel washing/workshop. In case of heavy rain and during monsoon, the excess settled shall be discharged to outside after meeting the prescribed standard for discharge to inland water surface [pH-5.5-9.0, SS-100, O & G-10, Iron (as Fe)-3.0].

26. Check dams and check weirs shall be constructed at appropriate places of the mine lease area to prevent direct flow of runoff to nearby water bodies. The surface run off water from the existing runoff management system shall meet the prescribed standards.
27. Retention wall shall be constructed at the toe of topsoil dump and OB dump. Garland drain shall be constructed around topsoil dumps, over burden dumps and mineral stack yards terminating at settling pit to prevent direct disposal of runoff to nearby water bodies.
28. Garland drain and sedimentation pit shall be de-silted after monsoon or as and when required.
29. Wastewater generated from wet beneficiation plant shall be discharged to tailing pond and the overflow water shall be reused. No wastewater from the tailing pond shall be allowed to discharge to outside.
30. Domestic effluents shall be treated in a sewage treatment plant (STP) and or shall be discharged to soak pit via septic tank constructed as BIS specification. The treated wastewater quality of STP shall remain within the following standards and shall be used for plantation:

pH	-	6.5 -9.0
TSS	-	<100 mg/l
BOD	-	30 mg/l
Fecal Coliform	-	<1000 MPN/100 ml.

31. ETP comprising of oil and grease trap with sedimentation pit shall be provided for treatment of workshop effluent and treated effluent shall remain within the following prescribed standards and shall be re-used for washing of vehicles:

pH	-	6.5 -8.5
TSS	-	50 mg/l
Oil & Grease	-	10 mg/l
COD	-	150 mg/l

32. Regular monitoring of water quality of upstream and downstream of surface water bodies existed if any within 5 Km shall be carried out once in every month and record shall be maintained and submitted to the State Pollution Control Board once in every year. Monitoring shall be carried out through MoEF& CC accredited laboratory.
33. Regular monitoring of ground water level and quality should be carried out by establishing a network of existing wells. The monitoring should be done four times a year in pre-monsoon (April/May), monsoon (August), post-monsoon (November) and winter (January) seasons. Consolidated data thus collected should be submitted to the Board annually.
34. A Bank Guarantee of the 15% of estimated value i.e. Rs.6,22,500/- of the following jobs shall be submitted to Board with the timelines to complete the jobs. The bank guarantee shall be submitted by 30.04.2024.

i) The oil & grease trapping unit in wheel washing facility shall be installed by 31.08.2024.

ii) One CAAQMS, one CEQMS & online noise monitoring system shall be installed by 01.12.2024.

35. The mine shall take necessary action for compliance with the air and water quality standards as stipulated in Part-A and Part-B of this order.

36. Adequate measures shall be taken for control of noise levels in the work environment of mine area so that noise levels at the boundary line of mining lease area shall not exceed 75 dB(A) during day time (6.00 AM to 9.00 PM) and 70 dB(A) during night time (9.00 PM to 6 AM).

37. Adequate noise barriers shall be provided surrounding the crushing and screening plants to control noise pollution and avoid impact on wildlife due to operation of crushing and screening plants during night hours.

38. Online noise monitoring system shall be installed to monitor noise level during night hours.

39. Protective barriers shall be provided for the lights to prevent illumination towards the forest area during night hours.

40. Ambient air quality monitoring data, noise monitoring data and water / wastewater quality monitoring data shall be electronically displayed at the entry point of the mine or at a suitable location of the mine.

41. The height of the stack connected to DG sets of capacity more than 800 KVA shall conform to the following:

i) $14Q^{0.3}$, Q = Total SO_2 emission from the plant in kg/hr.

ii) Minimum 6m. above the building where generator set is installed.

iii) 30 m.

42. The height of the stack connected to DG set of capacity less than and upto 800 KVA shall conform to the following:

i) $H = h+0.2\sqrt{KVA}$

ii) h= Height of the building where it is installed in meter

iii) KVA = Capacity of DG set

iv) H = Height of the stack in meter above ground level.

43. All DG sets installed before 1.7.2004 shall be scrapped. DG sets complying with either State-I or Stage-II emission norms shall reduce Particulate Matter Emission by 70% by installing RECD without affecting any other emission parameters as per the CPCB guidelines and Board's letter vide No.17927, dated 14.11.2023, in this regard.

44. Plantation of trees shall be undertaken in the colony/ township, over top soil dumps, OB dumps, along the side of haul road and in other areas of the mines not being utilized for mining activities. The mine shall take up avenue plantation and plantation in nearby village areas in consultation with DFO/Horticulture Department. The annual plantation details shall be submitted to the Board by 30th April every year.

45. A copy of the annual return (annual return submitted to IBM, Govt. of India/ Directorate of Mines, Govt. of Odisha) shall be submitted to this Board every year.
46. The environmental statement report for the financial year ending 31st March shall be submitted to the Board in Form-V on or before 30th September every year.

MEMBER SECRETARY
STATE POLLUTION CONTROL BOARD, ODISHA

TO

SRI ASHISH KUMAR GUPTA, CEO
NADIDIHI IRON ORE BLOCK OF M/S ESL STEEL LTD.
AT: SIYALJORI, PO: JOGIDIH, PS: CHANDANKYARI, BOKARO,
JHARKHAND, PIN-828303

Memo No._____/Dt._____/

Copy forwarded to :

i) Regional Officer, State Pollution Control Board, **Rourkela.**
ii) District Collector, **Sundargarh**
iii) Director of Mines, Govt. of Odisha, Bhubaneswar
iv) Director, Environment -cum-Special Secretary, F, E & CC Deptt., Govt. of Odisha, Bhubaneswar.
v) D.F.O, **Bonai, Sundargah**
vi) Deputy Director of Mines, Koira, Sundargarh.
vii) Chief Env. Scientist, Central Lab., SPCB, Bhubaneswar
viii) Addl. Chief Env. Engineer (Hazardous Waste Management Cell)
ix) Consent Register

CHIEF ENV. ENGINEER (M)
STATE POLLUTION CONTROL BOARD, ODISHA

GENERAL STANDARDS FOR DISCHARGE OF ENVIRONMENTAL POLLUTANTS

GENERAL STANDARDS FOR DISCHARGE OF ENVIRONMENTAL POLLUTANTS PART –A : EFFLUENTS

Sl. No.	Parameters	Standards			
		Inland surface	Public sewers	Land for irrigation	Marine Costal Areas
		(a)	(b)	(c)	(d)
1.	Colour&odour	Colourless/ Odourless as far as practible	--	See 6 of Annex-1	See 6 of Annex-1
2.	Suspended Solids (mg/l)	100	600	200	a. For process wastewater – 100 b. For cooling water effluent 10% above total suspended matter of influent.
3.	Particular size of SS	Shall pass 850	--	--	--
5.	pH value	5.5 to 9.0	5.5 to 9.0	5.5 to 9.0	5.5 to 9.0
6.	Temperature	Shall not exceed 5°C above the receiving water temperature	--	--	Shall not exceed 5°C above the receiving water temperature
7.	Oil & Grease mg/l max.	10	20	10	20
8.	Total residual chlorine	1.0	--	--	1.0
9.	Ammonical nitrogen (as N) mg/l max.	50	50	--	50
10.	Total Kajeldahl nitrogen (as NH_3) mg/1 max.	100	--	--	100
11.	Free ammonia (as NH_3) mg/1 max.	5.0	--	--	5.0
12.	Biochemical Oxygen Demand (5 days at (20°C) mg/1 max.	30	350	100	100
13.	Chemical Oxygen Demand, mg/1 max.	250	--	--	250
14.	Arsenic (as As) mg/1 max.	0.2	0.2	0.2	0.2
15.	Mercury (as Hg) mg/1 max.	0.01	0.01	--	0.001
16.	Lead (as pb) mg/1 max.	01.	1.0	--	2.0

Sl. No.	Parameters	Standards			
		Inland surface	Public sewers	Land for irrigation	Marine Costal Areas
		(a)	(b)	(c)	(d)
17.	Cardmium (as Cd) mg/1 max.	2.0	1.0	--	2.0
18.	Hexavalent Chromium (as Cr + 6) mg/l max.	0.1	2.0	--	1.0
19.	Total Chromium (as Cr) mg/l max.	2.0	2.0	--	2.0
20.	Copper (as Cu) mg/l max.	3.0	3.0	--	3.0
21.	Zinc (as Zn) mg/l max.	5.0	15	--	15
22.	Selenium (as Sc) mg/l max.	0.05	0.05	--	0.05
23.	Nickel (as Nil) mg/l max.	3.0	3.0	--	5.0
24.	Cyanide (as CN) mg/l max.	0.2	2.0	0.2	0.02
25.	Fluoride (as F) mg/l max.	2.0	15	--	15
26.	Dissolved Phosphates (as P) mg/l max.	5.0	--	--	--
27.	Sulphide (as S) mg/l max.	2.0	--	--	5.0
28.	Phennolic compounds as (C_6H_5OH) mg/l max.	1.0	5.0	--	5.0
29.	Radioactive materials a. Alpha emitter micro curle/ml. b. Beta emitter micro curle/ml.	10^{-7} 10^{-8}	10^{-7} 10^{-8}	10^{-8} 10^{-7}	10^{-7} 10^{-8}
30.	Bio-assay test	90% survival of fish after 96 hours in 100% effluent	90% survival of fish after 96 hours in 100% effluent	90% survival of fish after 96 hours in 100% effluent	90% survival of fish after 96 hours in 100% effluent
31	Manganese (as Mn)	2 mg/l	2 mg/l	--	2 mg/l
32.	Iron (Fe)	3 mg/l	3 mg/l	--	3 mg/l
33.	Vanadium (as V)	0.2 mg/l	0.2 mg/l	--	0.2 mg/l
34.	Nitrate Nitrogen	10 mg/l	--	--	20 mg/l

NATIONAL AMBIENT AIR QUALITY STANDARDS

Sl. No.	Pollutants	Time Weighed Average	Concentrate of Ambient Air		
			Industrial Residential, Rural and other Area	Ecologically Sensitive Area (notified by Central Government)	Methods of Measurement
(1)	(2)	(3)	(4)	(5)	(6)
1.	Sulphur Dioxide (SO_2), µg/m³	Annual *	50	20	-Improved west and Gacke
		24 Hours **	80	80	- Ultraviolet fluorescence
2.	Nitrogen Dioxide (NO_2), µg/m³	Annual *	40	30	- Modified Jacob &d Hochheiser (Na-Arsenite)
		24 Hours **	80	80	- Chemiluminescence
3.	Particulate Matter (size less than 10µm) or PM_{10}µg/m³	Annual *	60	60	-Gravimetric - TOEM
		24 Hours **	100	100	- Beta Attenuation
4.	Particulate Matter (size less than 2.5µm) or $PM_{2.5}$µg/m³	Annual *	40	40	-Gravimetric - TOEM
		24 Hours **	60	60	- Beta Attenuation
5.	Ozone (O_3) µg/m³	8 Hours **	100	100	- UV Photometric - Chemiluminescence
		1 Hours **	180	180	- Chemical Method
6.	Lead (Pb) µg/m³	Annual *	0.50	0.50	-AAS/ICP method after sampling on EMP 2000 or equivalent filter paper.
		24 Hours **	1.0	1.0	- ED-XRF using Teflon filter
7.	Carbon Monoxide (CO) mg/m³	8 Hours **	02	02	- Non Dispersive Infra Red (NDIR) Spectroscopy
		1 Hours **	04	04	
8.	Ammonia (NH_3) µg/m³	Annual*	100	100	-Chemiluminescence
		24 Hours**	400	400	- Indophenol Blue Method
9.	Benzene (C_6H_6) µg/m³	Annul *	05	05	-Gas Chromatography based continuous analyzer - Adsorption and Desorption followed by GC analysis
10.	Benzo (a) Pyrene (BaP)-Particulate phase only, ng/m³	Annual*	01	01	-Solvent extraction followed by HPLC/GC analysis
11.	Arsenic (As), ng/m³	Annual*	06	06	-AAS/ICP method after sampling on EPM 2000 or equivalent filter paper
12.	Nickel (Ni),ng/m³	Annual*	20	20	-AAS/ICP method after sampling on EPM 2000 or equivalent filter paper

* Annual arithmetic mean of minimum 104 measurements in a year at a location taken a week 24 hourly at uniform intervals.

** 24 hourly or 08 hourly or 01 hourly monitored values, as applicable, shall be complied with 98% of the time in a year, 2% of the time, they may exceed the limits but not on two consecutive days of monitoring.

Signature Not Verified
Digitally Signed by :SARITA PATNAIK
Date: 2024.03.28 18:53:19 IST

Appendix D: Last CGWA NOC Copy

Annexure-10

Member (CGWA)

भारत सरकार
केन्द्रीय भूमि जल प्राधिकरण
जल संसाधन, नदी विकास
और गंगा संरक्षण मंत्रालय

Government of India
Central Ground Water Authority
Ministry of Water Resources,
River Development & Ganga Rejuvenation

File No: - 21-4/2146/OR/MIN/2018 –178

NOC No: - CGWA/NOC/MIN/ORIG/2019/4741

Date:- 04 FEB 2019

To

M/s Bonai Industrial Company Ltd.
(Nadidih Iron & Manganese Mines)
Rungta Office, Main Road, Barbil,
Block Joda, District Kendujhar,
Odisha - 758035

Sub: - NOC for ground water withdrawal to M/s Bonai Industrial Company Ltd. in respect of their existing Nadidih Iron & Manganese Mines located at Village Nadikasira & Rengalbeda, Block Koira, District Sundargarh, Odisha – reg.
(Previous NOC No. 21-4/(314)/SER/CGWA/2011-724 dated 05/05/2016)

Refer to your application dated 14/11/2018 for grant of NOC for ground water withdrawal. Based on recommendation of Regional Director, Central Ground Water Board, South Eastern Region, Bhubaneswar vide his letter dated 04/12/2018 and further deliberations on the subject, the NOC of Central Ground Water Authority is hereby accorded to **M/s Bonai Industrial Company Ltd. in respect of their existing Nadidih Iron & Manganese Mines located at Village Nadikasira & Rengalbeda, Block Koira, District Sundargarh, Odisha.** This NOC is valid from 25/01/2019 to 24/01/2021 and is subject to the following conditions:-

1. The firm may abstract **73,000 cu.m/year** of ground water through two (2) existing & one (1) proposed bore wells and **9,000 cu.m/year** through dewatering the mine seepage from one (1) proposed mine pit on account of mining intersecting the water table. The total withdrawal should not exceed **82,000 cu.m/year**. No additional dewatering and ground water abstraction structures shall be constructed for this purpose without prior approval of the CGWA. Any unexpected variation in inflow of ground water into the mine pit should be reported to the concerned Regional Director, Central Ground Water Board, South Eastern Region, Bhubaneswar.
2. The bore wells as well as dewatering structure shall be fitted with digital water flow meters by the firm at its own cost and monitoring of monthly ground water abstraction data of each abstraction structure shall be recorded in a log book. Compliance to this condition shall be reported within one month from the date of issue of this letter.
3. **M/s Bonai Industrial Company Ltd.**, shall continue to implement ground water recharge measures to the tune of **17,450 cu.m/year** for augmenting the ground water resources of the area. Firm shall undertake periodic maintenance of recharge structures at its own cost.
4. The firm shall continue to monitor ground water levels through digital water level recorders installed on four (4) existing piezometers. Further, the firm shall execute

ground water level monitoring four (4) times a year (January, May, August and November) in core and buffer zone by establishing sufficient number of key wells in consultation with the Regional Director, Central Ground Water Board, South Eastern Region, Bhubaneswar.

5. The ground water quality shall be monitored once in a year during pre-monsoon period.

6. The ground water monitoring data in respect of S. No. 2, 4 & 5 shall be submitted to the Regional Director, Central Ground Water Board, South Eastern Region, Bhubaneswar on regular basis at least once in a year.

7. The firm shall ensure proper recycling and reuse of waste water after adequate treatment.

8. Action taken report in respect of S. No. 1 to 7 shall be submitted to CGWA within one year period.

9. This NOC is liable to be cancelled in case of non-compliance of any of the conditions as mentioned in S. No. 1 to 8.

10. This NOC is subject to prevailing Central/State Government rules/laws or Court orders related to construction of tubewell/ground water withdrawal/construction of recharge or conservation structure/discharge of effluents or any such matter as applicable.

11. The firm shall report self-compliance online in the website (www.cgwa-noc.gov.in) within one year from the date of issue of this NOC.

12 This NOC does not absolve the applicant / proponent of this obligation / requirement to obtain other statutory and administrative clearances from other statutory and administrative authorities.

13. The NOC does not imply that other statutory / administrative clearances shall be granted to the project by the concerned authorities. Such authorities would consider the project on merits and be taking decisions independently of the NOC.

Member (CGWA)

Copy to:

1. The Member Secretary, Odisha Pollution Control Board Paribesh Bhawan, A/118, Nilakantha Nagar, Unit - VIII, Bhubaneswar, Odisha - 751012.
2. The District Collector & Magistrate, District Sundargarh, Odisha for necessary action.
3. The Regional Director, Central Ground Water Board, South Eastern Region, Bhubaneswar. This has reference to your recommendation dated 04/12/2018.
4. Guard File 2018-19.

Member (CGWA)

Appendix E: Geophysical Investigation Details

5 INSTRUMENT USED

SIGNAL STACKING RESISTIVITY METER
WDDS 2

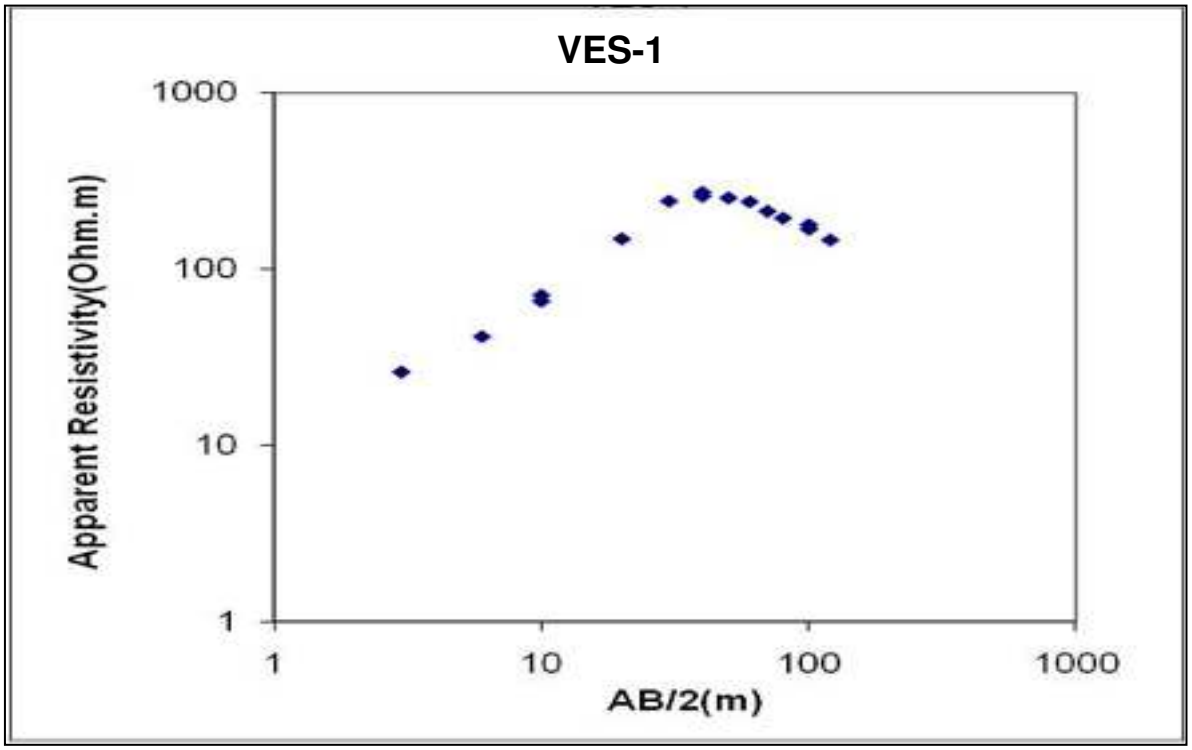


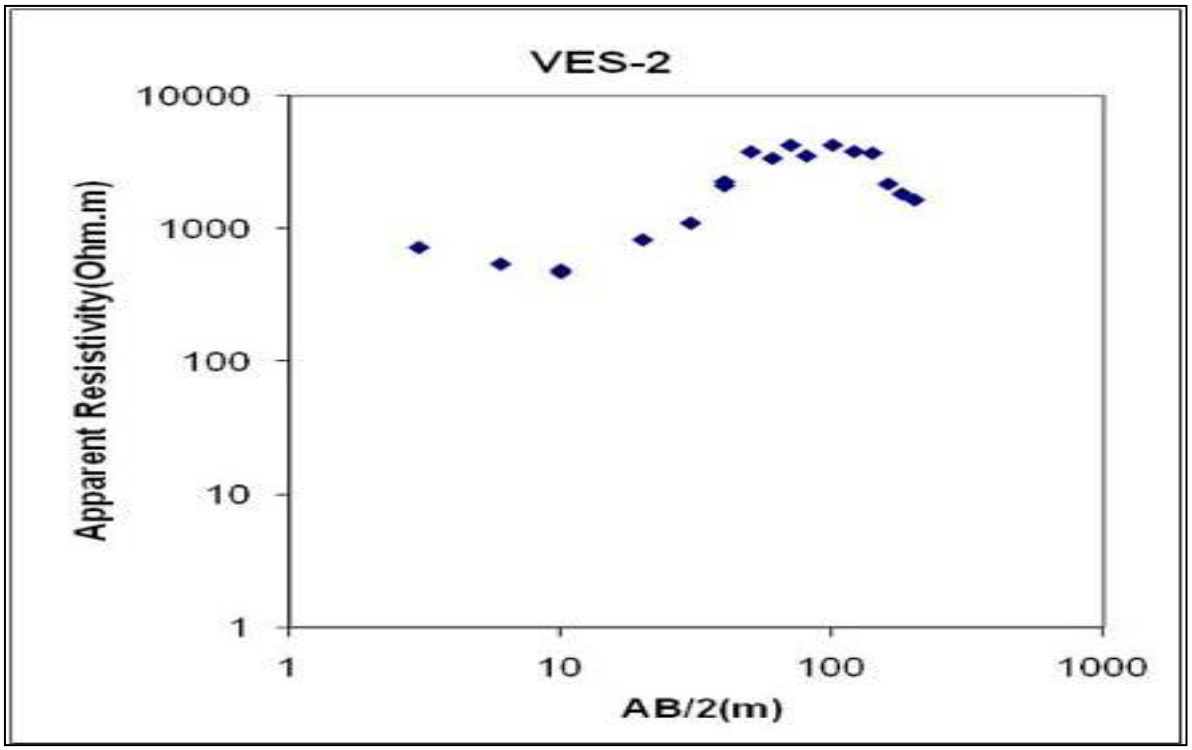


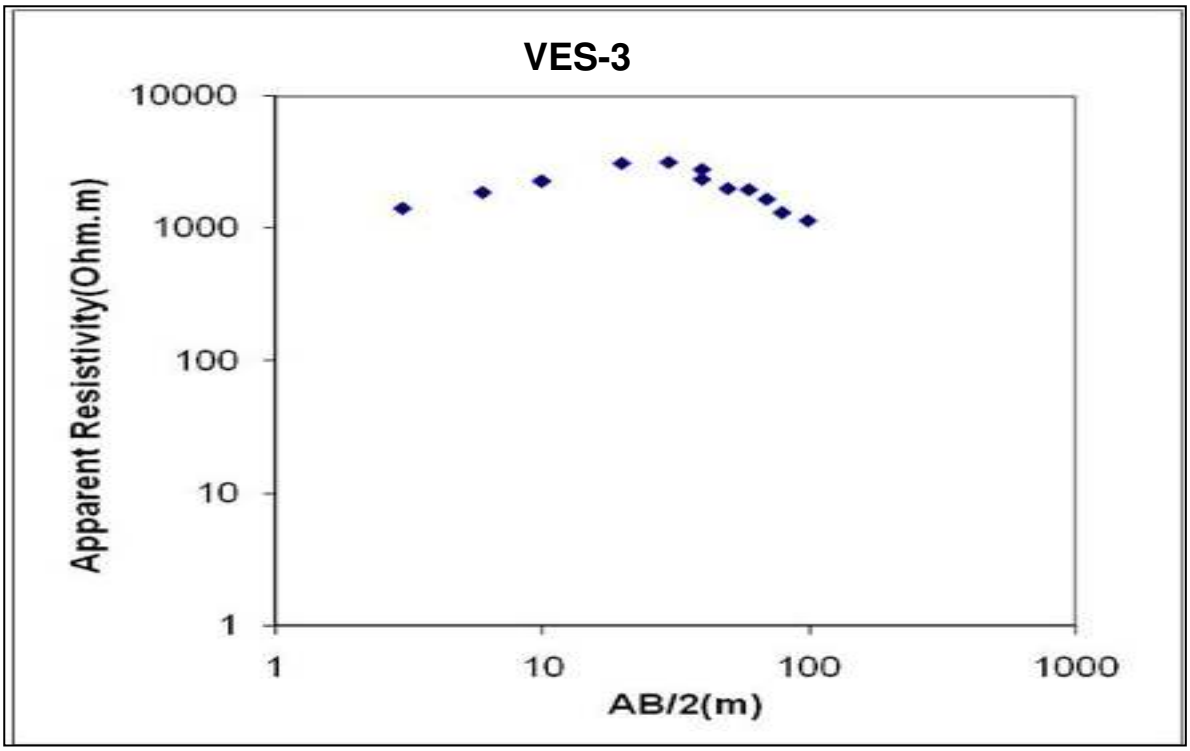
The BTSK (Beneting Digital Control Technology Institute) signal stacking based Signal Enhancement Resistivity MeterModel WDDS 2 is a state of art microprocessor based data acquisition system. The instrument design incorporates several inSeparate features and advanced techniques of digital circuitry to make it a reliable geophysical tool providing high quality data useful for mineral and groundwater exploration and any other geophysical applications.

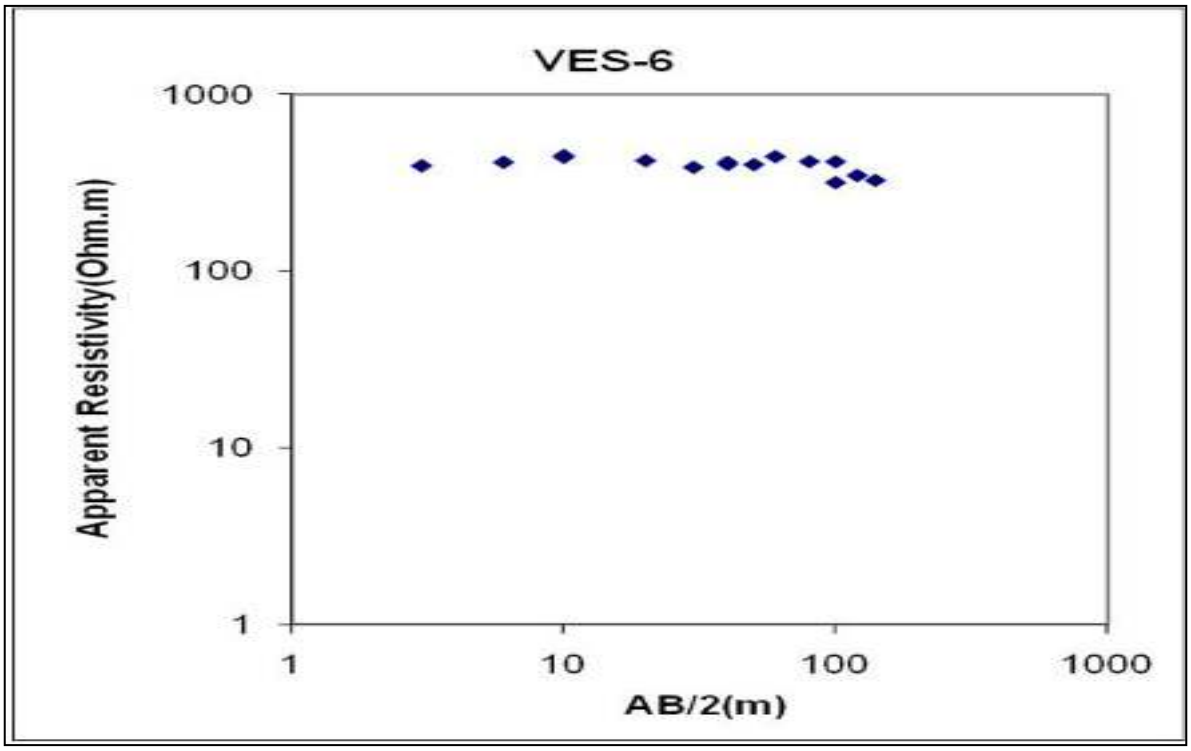
The WDDS 2 sends the entire current into the ground without wasting power for constant current generation thus increasing the signal strength to probe deeper layers.

The advanced design of WDDS 2 Resistivity Meter achieves excellent depth penetration with relatively low power inputs. It utilizes the signal stacking upto 16 successive readings to achieve good signal enhancement. In the presence of random (non-coherent) earth noises, the signal to noise ratio of the SSR-MP-AT measurement will be enhanced by ÖN where N is the number of stacks. Hence WDDS 2 Resistivity Meter can be used for depths of upto 600m under favourable geological field.


VES-1
Apparent Resistivity(Ohm.m)
1000
100
10
1
1
10
100
1000
AB/2(m)


VES-2
Apparent Resistivity(Ohm.m)
10000
1000
100
10
1
1
10
100
1000
AB/2(m)


VES-3
10000
1000
100
10
1
Apparent Resistivity(Ohm.m)
1
10
100
1000
AB/2(m)


VES-6
1000
100
10
1
Apparent Resistivity(Ohm.m)
1
10
100
1000
AB/2(m)

Appendix F: Pumping Test Data

AQUIFER PERFORMANCE TEST SHEET

Date	03-05-2023	**BH No.**	PT01_PW	**BH Co-ordiate**	319613, 2429836
Stick Up (m)	0.30	**SWL (mBMP)**	20.71	**BH Rest Duration**	24 hrs
BH Depth (m)	64	**BH Dia (mm)**	254	**Casing Depth (m)**	64
Pump started	11:00 AM 03-05-2023			**Pump Stopped**	11:00 AM 06-05-2023
Flowmeter typye	Electromagnetic			**Resolution**	0.1 L
Pump make & model	Laxmi Pump (V4)			**Pump dia**	4"
Suction Depth (m)	60			**Pump Hp**	5 HP
Constant Discharge	130 (l/min) or 7.80 ((m^3/hr)			**Pump kw**	

CLOCK TIME	TIME ELAPSED FROM PUMP START (min)	DEPTH TO WATER LEVEL (mBMP)	DRAWDOWN (m)	DISCHARGE (l/min)
11:00 AM	0	20.71	0.00	0
11:01 AM	1	21.17	0.46	130
11:02 AM	2	21.44	0.73	134
11:03 AM	3	21.65	0.94	136
11:04 AM	4	21.85	1.14	131
11:05 AM	5	22.00	1.29	135
11:06 AM	6	22.16	1.45	134
11:07 AM	7	22.41	1.70	133
11:08 AM	8	23.43	2.72	133
11:09 AM	9	23.83	3.12	134
11:10 AM	10	24.10	3.39	129
11:12 AM	12	24.42	3.71	131
11:14 AM	14	24.55	3.84	132
11:16 AM	16	24.61	3.90	130
11:18 AM	18	24.65	3.94	131
11:20 AM	20	24.67	3.96	129
11:25 AM	25	24.67	3.96	128
11:30 AM	30	24.61	3.90	127
11:35 AM	35	24.63	3.92	126
11:40 AM	40	24.64	3.93	124
11:50 AM	50	24.85	4.14	132
12:00 PM	60	24.87	4.16	131
12:15 PM	75	24.86	4.15	134
12:30 PM	90	24.90	4.19	132
12:45 PM	105	24.89	4.18	131
01:00 PM	120	24.89	4.18	130
01:30 PM	150	24.91	4.20	134
02:00 PM	180	24.91	4.20	132
02:30 PM	210	24.92	4.21	134
03:00 PM	240	24.92	4.21	130
03:30 PM	270	24.66	3.95	125
04:00 PM	300	24.66	3.95	126
04:30 PM	330	24.66	3.95	130
05:00 PM	360	24.68	3.97	128
06:00 PM	420	24.70	3.99	125
07:00 PM	480	24.69	3.98	129
08:00 PM	540	24.69	3.98	127

AQUIFER PERFORMANCE TEST SHEET

Date	03-05-2023	**BH No.**	PT01_PW	**BH Co-ordiate**	319613, 2429836
Stick Up (m)	0.30	**SWL (mBMP)**	20.71	**BH Rest Duration**	24 hrs
BH Depth (m)	64	**BH Dia (mm)**	254	**Casing Depth (m)**	64
Pump started	11:00 AM 03-05-2023			**Pump Stopped**	11:00 AM 06-05-2023
Flowmeter typye	Electromagnetic			**Resolution**	0.1 L
Pump make & model	Laxmi Pump (V4)			**Pump dia**	4"
Suction Depth (m)	60			**Pump Hp**	5 HP
Constant Discharge	130 (l/min) or 7.80 ((m^3/hr)			**Pump kw**	

CLOCK TIME	TIME ELAPSED FROM PUMP START (min)	DEPTH TO WATER LEVEL (mBMP)	DRAWDOWN (m)	DISCHARGE (l/min)
09:00 PM	600	24.67	3.96	130
10:00 PM	660	24.72	4.01	131
11:00 PM	720	24.73	4.02	130
12:00 AM	780	24.73	4.02	125
01:00 AM	840	24.73	4.02	129
02:00 AM	900	24.83	4.12	128
03:00 AM	960	24.87	4.16	129
04:00 AM	1020	24.87	4.16	126
05:00 AM	1080	24.87	4.16	128
06:00 AM	1140	24.89	4.18	129
07:00 AM	1200	24.87	4.16	130
08:00 AM	1260	24.88	4.17	132
09:00 AM	1320	24.88	4.17	126
10:00 AM	1380	24.95	4.24	130
11:00 AM	1440	24.94	4.23	129
12:00 PM	1500	24.93	4.22	128
01:00 PM	1560	24.93	4.22	127
02:00 PM	1620	24.92	4.21	126
03:00 PM	1680	24.92	4.21	128
04:00 PM	1740	24.91	4.20	125
05:00 PM	1800	24.92	4.21	126
06:00 PM	1860	24.73	4.02	120
07:00 PM	1920	24.71	4.00	121
08:00 PM	1980	24.71	4.00	122
09:00 PM	2040	24.70	3.99	135
10:00 PM	2100	24.96	4.25	130
11:00 PM	2160	24.96	4.25	129
12:00 AM	2220	24.96	4.25	132
01:00 AM	2280	24.95	4.24	130
02:00 AM	2340	24.94	4.23	128
03:00 AM	2400	24.94	4.23	129
04:00 AM	2460	24.94	4.23	130
05:00 AM	2520	24.94	4.23	131
06:00 AM	2580	24.95	4.24	130
07:00 AM	2640	24.96	4.25	128
08:00 AM	2700	24.95	4.24	129
09:00 AM	2760	24.94	4.23	127

AQUIFER PERFORMANCE TEST SHEET

Date	03-05-2023	**BH No.**	PT01_PW	**BH Co-ordiate**	319613, 2429836
Stick Up (m)	0.30	**SWL (mBMP)**	20.71	**BH Rest Duration**	24 hrs
BH Depth (m)	64	**BH Dia (mm)**	254	**Casing Depth (m)**	64
Pump started	11:00 AM 03-05-2023			**Pump Stopped**	11:00 AM 06-05-2023
Flowmeter typye	Electromagnetic			**Resolution**	0.1 L
Pump make & model	Laxmi Pump (V4)			**Pump dia**	4"
Suction Depth (m)	60			**Pump Hp**	5 HP
Constant Discharge	130 (l/min) or 7.80 ((m^3/hr)			**Pump kw**	

CLOCK TIME	TIME ELAPSED FROM PUMP START (min)	DEPTH TO WATER LEVEL (mBMP)	DRAWDOWN (m)	DISCHARGE (l/min)
10:00 AM	2820	24.94	4.23	125
11:00 AM	2880	24.93	4.22	124
12:00 PM	2940	24.93	4.22	126
01:00 PM	3000	24.95	4.24	130
02:00 PM	3060	25.02	4.31	129
03:00 PM	3120	25.04	4.33	129
04:00 PM	3180	25.02	4.31	129
05:00 PM	3240	25.04	4.33	130
06:00 PM	3300	25.07	4.36	129
07:00 PM	3360	25.07	4.36	132
08:00 PM	3420	25.30	4.59	130
09:00 PM	3480	25.10	4.39	129
10:00 PM	3540	25.09	4.38	128
11:00 PM	3600	25.09	4.38	126
12:00 AM	3660	25.09	4.38	127
01:00 AM	3720	25.08	4.37	128
02:00 AM	3780	25.07	4.36	126
03:00 AM	3840	25.09	4.38	127
04:00 AM	3900	25.04	4.33	127
05:00 AM	3960	25.09	4.38	126
06:00 AM	4020	25.10	4.39	126
07:00 AM	4080	25.09	4.38	128
08:00 AM	4140	25.09	4.38	129
09:00 AM	4200	25.09	4.38	130
10:00 AM	4260	25.09	4.38	129
11:00 AM	4320	25.07	4.36	128
11:00 AM	4320	25.07	4.36	0
11:01 AM	4321	22.37	1.66	0
11:02 AM	4322	22.30	1.59	0
11:03 AM	4323	22.21	1.50	0
11:04 AM	4324	22.14	1.43	0
11:05 AM	4325	22.06	1.35	0
11:06 AM	4326	21.99	1.28	0
11:07 AM	4327	21.92	1.21	0
11:08 AM	4328	21.86	1.15	0
11:09 AM	4329	21.79	1.08	0

AQUIFER PERFORMANCE TEST SHEET

Date	03-05-2023	**BH No.**	PT01_PW	**BH Co-ordiate**	319613, 2429836
Stick Up (m)	0.30	**SWL (mBMP)**	20.71	**BH Rest Duration**	24 hrs
BH Depth (m)	64	**BH Dia (mm)**	254	**Casing Depth (m)**	64
Pump started	11:00 AM 03-05-2023			**Pump Stopped**	11:00 AM 06-05-2023
Flowmeter typye	Electromagnetic			**Resolution**	0.1 L
Pump make & model	Laxmi Pump (V4)			**Pump dia**	4"
Suction Depth (m)	60			**Pump Hp**	5 HP
Constant Discharge	130 (l/min) or 7.80 ((m^3/hr)			**Pump kw**	

CLOCK TIME	TIME ELAPSED FROM PUMP START (min)	DEPTH TO WATER LEVEL (mBMP)	DRAWDOWN (m)	DISCHARGE (l/min)
11:10 AM	4330	21.74	1.03	0
11:12 AM	4332	21.62	0.91	0
11:14 AM	4334	21.53	0.82	0
11:16 AM	4336	21.44	0.73	0
11:18 AM	4338	21.37	0.66	0
11:20 AM	4340	21.30	0.59	0
11:25 AM	4345	21.18	0.47	0
11:30 AM	4350	21.09	0.38	0
11:35 AM	4355	21.04	0.33	0
11:40 AM	4360	21.00	0.29	0
11:50 AM	4370	20.97	0.26	0
12:00 PM	4380	20.95	0.24	0
12:15 PM	4395	20.90	0.19	0
12:30 PM	4410	20.89	0.18	0
12:45 PM	4425	20.88	0.17	0
01:00 PM	4440	20.87	0.16	0
01:30 PM	4470	20.84	0.13	0
02:00 PM	4500	20.83	0.12	0
02:30 PM	4530	20.82	0.11	0
03:00 PM	4560	20.82	0.11	0
03:30 PM	4590	20.82	0.11	0
04:00 PM	4620	20.81	0.10	0
04:30 PM	4650	20.81	0.10	0
05:00 PM	4680	20.81	0.10	0
06:00 PM	4740	20.80	0.09	0
07:00 PM	4800	20.81	0.10	0
08:00 PM	4860	20.80	0.09	0
09:00 PM	4920	20.80	0.09	0
10:00 PM	4980	20.81	0.10	0
11:00 PM	5040	20.81	0.10	0
12:00 AM	5100	20.81	0.10	0
01:00 AM	5160	20.81	0.10	0
02:00 AM	5220	20.80	0.09	0
03:00 AM	5280	20.80	0.09	0
04:00 AM	5340	20.80	0.09	0
05:00 AM	5400	20.81	0.10	0
06:00 AM	5460	20.81	0.10	0

AQUIFER PERFORMANCE TEST SHEET					
Date	03-05-2023	**BH No.**	PT01_PW	**BH Co-ordiate**	319613, 2429836
Stick Up (m)	0.30	**SWL (mBMP)**	20.71	**BH Rest Duration**	24 hrs
BH Depth (m)	64	**BH Dia (mm)**	254	**Casing Depth (m)**	64
Pump started	11:00 AM			**Pump Stopped**	11:00 AM
	03-05-2023				06-05-2023
Flowmeter typye	Electromagnetic			**Resolution**	0.1 L
Pump make & model	Laxmi Pump (V4)			**Pump dia**	4"
Suction Depth (m)	60			**Pump Hp**	5 HP
Constant Discharge	130 (l/min) or 7.80 ((m^3/hr)			**Pump kw**	

CLOCK TIME	TIME ELAPSED FROM PUMP START (min)	DEPTH TO WATER LEVEL (mBMP)	DRAWDOWN (m)	DISCHARGE (l/min)
07:00 AM	5520	20.81	0.10	0
08:00 AM	5580	20.79	0.08	0
09:00 AM	5640	20.79	0.08	0
10:00 AM	5700	20.79	0.08	0
11:00 AM	5760	20.79	0.08	0

AQUIFER PERFORMANCE TEST SHEET

Date	03-05-2023	**BH No.**	PT01_OW	**BH Co-ordiate**	319593, 2429847
Stick Up (m)	0.30	**SWL (mBMP)**	19.30	**BH Rest Duration**	24 hrs
BH Depth (m)	75	**BH Dia (mm)**	254	**Casing Depth (m)**	73
Pump started	11:00 AM 03-05-2023			**Pump Stopped**	11:00 AM 06-05-2023

CLOCK TIME	TIME ELAPSED FROM PUMP START (min)	DEPTH TO WATER LEVEL (mBMP)	DRAWDOWN (m)	DISCHARGE (l/min)
11:00 AM	0	19.30	0.00	0
11:01 AM	1	19.30	0.00	130
11:02 AM	2	19.30	0.00	134
11:03 AM	3	19.30	0.00	136
11:04 AM	4	19.30	0.00	131
11:05 AM	5	19.30	0.00	135
11:06 AM	6	19.31	0.01	134
11:07 AM	7	19.31	0.01	133
11:08 AM	8	19.31	0.01	133
11:09 AM	9	19.32	0.02	134
11:10 AM	10	19.32	0.02	129
11:12 AM	12	19.34	0.04	131
11:14 AM	14	19.35	0.05	132
11:16 AM	16	19.35	0.05	130
11:18 AM	18	19.36	0.06	131
11:20 AM	20	19.37	0.07	129
11:25 AM	25	19.38	0.08	128
11:30 AM	30	19.38	0.08	127
11:35 AM	35	19.39	0.09	126
11:40 AM	40	19.39	0.09	124
11:50 AM	50	19.40	0.10	132
12:00 PM	60	19.41	0.11	131
12:15 PM	75	19.42	0.12	134
12:30 PM	90	19.42	0.12	132
12:45 PM	105	19.43	0.13	131
01:00 PM	120	19.43	0.13	130
01:30 PM	150	19.43	0.13	134
02:00 PM	180	19.45	0.15	132
02:30 PM	210	19.45	0.15	134
03:00 PM	240	19.45	0.15	130
03:30 PM	270	19.45	0.15	125
04:00 PM	300	19.45	0.15	126
04:30 PM	330	19.45	0.15	130
05:00 PM	360	19.45	0.15	128
06:00 PM	420	19.45	0.15	125
07:00 PM	480	19.45	0.15	129
08:00 PM	540	19.45	0.15	127
09:00 PM	600	19.45	0.15	130
10:00 PM	660	19.45	0.15	131
11:00 PM	720	19.45	0.15	130
12:00 AM	780	19.45	0.15	125
01:00 AM	840	19.45	0.15	129

AQUIFER PERFORMANCE TEST SHEET

Date	03-05-2023	**BH No.**	PT01_OW	**BH Co-ordiate**	319593, 2429847
Stick Up (m)	0.30	**SWL (mBMP)**	19.30	**BH Rest Duration**	24 hrs
BH Depth (m)	75	**BH Dia (mm)**	254	**Casing Depth (m)**	73
Pump started	11:00 AM 03-05-2023			**Pump Stopped**	11:00 AM 06-05-2023

CLOCK TIME	TIME ELAPSED FROM PUMP START (min)	DEPTH TO WATER LEVEL (mBMP)	DRAWDOWN (m)	DISCHARGE (l/min)
02:00 AM	900	19.45	0.15	128
03:00 AM	960	19.45	0.15	129
04:00 AM	1020	19.45	0.15	126
05:00 AM	1080	19.45	0.15	128
06:00 AM	1140	19.45	0.15	129
07:00 AM	1200	19.45	0.15	130
08:00 AM	1260	19.45	0.15	132
09:00 AM	1320	19.44	0.14	126
10:00 AM	1380	19.44	0.14	130
11:00 AM	1440	19.43	0.13	129
12:00 PM	1500	19.43	0.13	128
01:00 PM	1560	19.43	0.13	127
02:00 PM	1620	19.42	0.12	126
03:00 PM	1680	19.42	0.12	128
04:00 PM	1740	19.42	0.12	125
05:00 PM	1800	19.41	0.11	126
06:00 PM	1860	19.42	0.12	120
07:00 PM	1920	19.42	0.12	121
08:00 PM	1980	19.42	0.12	122
09:00 PM	2040	19.42	0.12	135
10:00 PM	2100	19.42	0.12	130
11:00 PM	2160	19.42	0.12	129
12:00 AM	2220	19.42	0.12	132
01:00 AM	2280	19.42	0.12	130
02:00 AM	2340	19.42	0.12	128
03:00 AM	2400	19.42	0.12	129
04:00 AM	2460	19.42	0.12	130
05:00 AM	2520	19.42	0.12	131
06:00 AM	2580	19.42	0.12	130
07:00 AM	2640	19.42	0.12	128
08:00 AM	2700	19.41	0.11	129
09:00 AM	2760	19.42	0.12	127
10:00 AM	2820	19.41	0.11	125
11:00 AM	2880	19.42	0.12	124
12:00 PM	2940	19.41	0.11	126
01:00 PM	3000	19.41	0.11	130
02:00 PM	3060	19.41	0.11	129
03:00 PM	3120	19.40	0.10	129
04:00 PM	3180	19.41	0.11	129
05:00 PM	3240	19.41	0.11	130

AQUIFER PERFORMANCE TEST SHEET

Date	03-05-2023	**BH No.**	PT01_OW	**BH Co-ordiate**	319593, 2429847
Stick Up (m)	0.30	**SWL (mBMP)**	19.30	**BH Rest Duration**	24 hrs
BH Depth (m)	75	**BH Dia (mm)**	254	**Casing Depth (m)**	73
Pump started	11:00 AM 03-05-2023			**Pump Stopped**	11:00 AM 06-05-2023

CLOCK TIME	TIME ELAPSED FROM PUMP START (min)	DEPTH TO WATER LEVEL (mBMP)	DRAWDOWN (m)	DISCHARGE (l/min)
06:00 PM	3300	19.41	0.11	129
07:00 PM	3360	19.42	0.12	132
08:00 PM	3420	19.43	0.13	130
09:00 PM	3480	19.42	0.12	129
10:00 PM	3540	19.42	0.12	128
11:00 PM	3600	19.42	0.12	126
12:00 AM	3660	19.42	0.12	127
01:00 AM	3720	19.42	0.12	128
02:00 AM	3780	19.42	0.12	126
03:00 AM	3840	19.42	0.12	127
04:00 AM	3900	19.42	0.12	127
05:00 AM	3960	19.42	0.12	126
06:00 AM	4020	19.42	0.12	126
07:00 AM	4080	19.42	0.12	128
08:00 AM	4140	19.42	0.12	129
09:00 AM	4200	19.41	0.11	130
10:00 AM	4260	19.41	0.11	129
11:00 AM	4320	19.42	0.12	128
11:00 AM	4320	19.42	0.12	0
11:01 AM	4321	19.41	0.11	0
11:02 AM	4322	19.40	0.10	0
11:03 AM	4323	19.40	0.10	0
11:04 AM	4324	19.39	0.09	0
11:05 AM	4325	19.39	0.09	0
11:06 AM	4326	19.38	0.08	0
11:07 AM	4327	19.38	0.08	0
11:08 AM	4328	19.38	0.08	0
11:09 AM	4329	19.37	0.07	0
11:10 AM	4330	19.37	0.07	0
11:12 AM	4332	19.36	0.06	0
11:14 AM	4334	19.36	0.06	0
11:16 AM	4336	19.36	0.06	0
11:18 AM	4338	19.36	0.06	0
11:20 AM	4340	19.35	0.05	0
11:25 AM	4345	19.33	0.03	0
11:30 AM	4350	19.33	0.03	0
11:35 AM	4355	19.32	0.02	0
11:40 AM	4360	19.31	0.01	0
11:50 AM	4370	19.31	0.01	0
12:00 PM	4380	19.30	0.00	0
12:15 PM	4395	19.29	-0.01	0

AQUIFER PERFORMANCE TEST SHEET

Date	03-05-2023	**BH No.**	PT01_OW	**BH Co-ordiate**	319593, 2429847
Stick Up (m)	0.30	**SWL (mBMP)**	19.30	**BH Rest Duration**	24 hrs
BH Depth (m)	75	**BH Dia (mm)**	254	**Casing Depth (m)**	73
Pump started	11:00 AM 03-05-2023			**Pump Stopped**	11:00 AM 06-05-2023

CLOCK TIME	TIME ELAPSED FROM PUMP START (min)	DEPTH TO WATER LEVEL (mBMP)	DRAWDOWN (m)	DISCHARGE (l/min)
12:30 PM	4410	19.29	-0.01	0
12:45 PM	4425	19.28	-0.02	0
01:00 PM	4440	19.27	-0.03	0
01:30 PM	4470	19.25	-0.05	0
02:00 PM	4500	19.25	-0.05	0
02:30 PM	4530	19.25	-0.05	0
03:00 PM	4560	19.25	-0.05	0
03:30 PM	4590	19.25	-0.05	0
04:00 PM	4620	19.25	-0.05	0
04:30 PM	4650	19.25	-0.05	0
05:00 PM	4680	19.25	-0.05	0
06:00 PM	4740	19.25	-0.05	0
07:00 PM	4800	19.27	-0.03	0
08:00 PM	4860	19.27	-0.03	0
09:00 PM	4920	19.27	-0.03	0
10:00 PM	4980	19.28	-0.02	0
11:00 PM	5040	19.28	-0.02	0
12:00 AM	5100	19.29	-0.01	0
01:00 AM	5160	19.29	-0.01	0
02:00 AM	5220	19.30	0.00	0
03:00 AM	5280	19.30	0.00	0
04:00 AM	5340	19.30	0.00	0
05:00 AM	5400	19.31	0.01	0
06:00 AM	5460	19.31	0.01	0
07:00 AM	5520	19.31	0.01	0
08:00 AM	5580	19.31	0.01	0
09:00 AM	5640	19.31	0.01	0
10:00 AM	5700	19.31	0.01	0
11:00 AM	5760	19.31	0.01	0

AQUIFER PERFORMANCE TEST SHEET					
Date	27-04-2023	**BH No.**	PT02_PW	**BH Co-ordiate**	319796, 2429734
Stick Up (m)	0.45	**SWL (mBMP)**	37.62	**BH Rest Duration**	24 hrs
BH Depth (m)	100	**BH Dia (mm)**	254	**Casing Depth (m)**	100
Pump started	06:00 PM 27-04-2023			**Pump Stopped**	02:00 PM 30-04-2023
Flowmeter typye	Electromagnetic			**Resolution**	0.1 L
Pump make & model	Laxmi Pump (V4)			**Pump dia**	4"
Suction Depth (m)	60			**Pump Hp**	5 HP
Constant Discharge	105 (l/min) or 6.3 ((m^3/hr)			**Pump kw**	

CLOCK TIME	TIME ELAPSED FROM PUMP START (min)	DEPTH TO WATER LEVEL (mBMP)	DRAWDOWN (m)	DISCHARGE (l/min)
06:00 PM	0	37.62	0.00	0
06:01 PM	1	41.00	3.38	87
06:02 PM	2	41.53	3.91	88
06:03 PM	3	41.81	4.19	92
06:04 PM	4	42.19	4.57	93
06:05 PM	5	42.30	4.68	103
06:06 PM	6	42.41	4.79	130
06:07 PM	7	42.47	4.85	135
06:08 PM	8	42.81	5.19	130
06:09 PM	9	42.84	5.22	130
06:10 PM	10	42.51	4.89	120
06:12 PM	12	42.59	4.97	120
06:14 PM	14	42.67	5.05	125
06:16 PM	16	42.71	5.09	120
06:18 PM	18	42.76	5.14	110
06:20 PM	20	42.76	5.14	105
06:25 PM	25	42.73	5.11	102
06:30 PM	30	41.64	4.02	103
06:35 PM	35	41.64	4.02	104
06:40 PM	40	41.65	4.03	105
06:50 PM	50	41.66	4.04	106
07:00 PM	60	41.67	4.05	102
07:15 PM	75	41.79	4.17	102
07:30 PM	90	41.78	4.16	105
07:45 PM	105	41.74	4.12	104
08:00 PM	120	41.75	4.13	106
08:30 PM	150	41.77	4.15	106
09:00 PM	180	41.78	4.16	104
09:30 PM	210	41.80	4.18	106
10:00 PM	240	41.83	4.21	102
10:30 PM	270	41.81	4.19	105
11:00 PM	300	41.86	4.24	102
11:30 PM	330	41.85	4.23	106
12:00 AM	360	41.89	4.27	104
01:00 AM	420	41.89	4.27	103
02:00 AM	480	41.89	4.27	107
03:00 AM	540	41.91	4.29	108

AQUIFER PERFORMANCE TEST SHEET					
Date	27-04-2023	**BH No.**	PT02_PW	**BH Co-ordiate**	319796, 2429734
Stick Up (m)	0.45	**SWL (mBMP)**	37.62	**BH Rest Duration**	24 hrs
BH Depth (m)	100	**BH Dia (mm)**	254	**Casing Depth (m)**	100
Pump started	06:00 PM			**Pump Stopped**	02:00 PM
	27-04-2023				30-04-2023
Flowmeter typye	Electromagnetic			**Resolution**	0.1 L
Pump make & model	Laxmi Pump (V4)			**Pump dia**	4"
Suction Depth (m)	60			**Pump Hp**	5 HP
Constant Discharge	105 (l/min) or 6.3 ((m^3/hr)			**Pump kw**	

CLOCK TIME	TIME ELAPSED FROM PUMP START (min)	DEPTH TO WATER LEVEL (mBMP)	DRAWDOWN (m)	DISCHARGE (l/min)
04:00 AM	600	41.92	4.30	100
05:00 AM	660	41.93	4.31	101
06:00 AM	720	41.95	4.33	101
07:00 AM	780	41.95	4.33	103
08:00 AM	840	41.96	4.34	102
09:00 AM	900	42.08	4.46	103
10:00 AM	960	42.08	4.46	106
11:00 AM	1020	42.05	4.43	105
12:00 PM	1080	42.07	4.45	104
01:00 PM	1140	42.07	4.45	102
02:00 PM	1200	42.05	4.43	104
03:00 PM	1260	41.97	4.35	103
04:00 PM	1320	41.96	4.34	102
05:00 PM	1380	42.06	4.44	104
06:00 PM	1440	42.06	4.44	103
07:00 PM	1500	42.08	4.46	103
08:00 PM	1560	42.09	4.47	104
09:00 PM	1620	42.11	4.49	103
10:00 PM	1680	42.12	4.50	105
11:00 PM	1740	42.11	4.49	103
12:00 AM	1800	42.08	4.46	103
01:00 AM	1860	42.09	4.47	103
02:00 AM	1920	42.01	4.39	102
03:00 AM	1980	42.11	4.49	104
04:00 AM	2040	42.11	4.49	103
05:00 AM	2100	42.11	4.49	104
06:00 AM	2160	42.12	4.50	102
07:00 AM	2220	42.14	4.52	105
08:00 AM	2280	42.14	4.52	101
09:00 AM	2340	42.20	4.58	100
10:00 AM	2400	42.21	4.59	102
11:00 AM	2460	42.21	4.59	104
12:00 PM	2520	42.21	4.59	103
01:00 PM	2580	42.20	4.58	105
02:00 PM	2640	42.19	4.57	102
03:00 PM	2700	42.16	4.54	100
04:00 PM	2760	42.15	4.53	102

AQUIFER PERFORMANCE TEST SHEET					
Date	27-04-2023	**BH No.**	PT02_PW	**BH Co-ordiate**	319796, 2429734
Stick Up (m)	0.45	**SWL (mBMP)**	37.62	**BH Rest Duration**	24 hrs
BH Depth (m)	100	**BH Dia (mm)**	254	**Casing Depth (m)**	100
Pump started	06:00 PM			**Pump Stopped**	02:00 PM
	27-04-2023				30-04-2023
Flowmeter typye	Electromagnetic			**Resolution**	0.1 L
Pump make & model	Laxmi Pump (V4)			**Pump dia**	4"
Suction Depth (m)	60			**Pump Hp**	5 HP
Constant Discharge	105 (l/min) or 6.3 ((m^3/hr)			**Pump kw**	

CLOCK TIME	TIME ELAPSED FROM PUMP START (min)	DEPTH TO WATER LEVEL (mBMP)	DRAWDOWN (m)	DISCHARGE (l/min)
05:00 PM	2820	42.16	4.54	104
06:00 PM	2880	42.18	4.56	103
07:00 PM	2940	42.22	4.60	102
08:00 PM	3000	42.23	4.61	103
09:00 PM	3060	42.25	4.63	104
10:00 PM	3120	42.25	4.63	103
11:00 PM	3180	42.26	4.64	104
12:00 AM	3240	42.27	4.65	103
01:00 AM	3300	42.24	4.62	102
02:00 AM	3360	42.25	4.63	105
03:00 AM	3420	42.24	4.62	103
04:00 AM	3480	42.24	4.62	104
05:00 AM	3540	42.24	4.62	103
06:00 AM	3600	42.27	4.65	104
07:00 AM	3660	42.27	4.65	102
08:00 AM	3720	42.28	4.66	103
09:00 AM	3780	42.30	4.68	100
10:00 AM	3840	42.30	4.68	98
11:00 AM	3900	42.29	4.67	99
12:00 PM	3960	42.28	4.66	100
01:00 PM	4020	42.29	4.67	99
02:00 PM	4080	42.29	4.67	102
02:00 PM	4080	42.29	4.67	0
02:01 PM	4081	38.90	1.28	0
02:02 PM	4082	38.87	1.25	0
02:03 PM	4083	38.80	1.18	0
02:04 PM	4084	38.76	1.14	0
02:05 PM	4085	38.67	1.05	0
02:06 PM	4086	38.63	1.01	0
02:07 PM	4087	38.58	0.96	0
02:08 PM	4088	38.55	0.93	0
02:09 PM	4089	38.53	0.91	0
02:10 PM	4090	38.50	0.88	0
02:12 PM	4092	38.47	0.85	0
02:14 PM	4094	38.43	0.81	0
02:16 PM	4096	38.41	0.79	0
02:18 PM	4098	38.39	0.77	0

AQUIFER PERFORMANCE TEST SHEET					
Date	27-04-2023	**BH No.**	PT02_PW	**BH Co-ordiate**	319796, 2429734
Stick Up (m)	0.45	**SWL (mBMP)**	37.62	**BH Rest Duration**	24 hrs
BH Depth (m)	100	**BH Dia (mm)**	254	**Casing Depth (m)**	100
Pump started	06:00 PM 27-04-2023			**Pump Stopped**	02:00 PM 30-04-2023
Flowmeter typye	Electromagnetic			**Resolution**	0.1 L
Pump make & model	Laxmi Pump (V4)			**Pump dia**	4"
Suction Depth (m)	60			**Pump Hp**	5 HP
Constant Discharge	105 (l/min) or 6.3 ((m^3/hr)			**Pump kw**	

CLOCK TIME	TIME ELAPSED FROM PUMP START (min)	DEPTH TO WATER LEVEL (mBMP)	DRAWDOWN (m)	DISCHARGE (l/min)
02:20 PM	4100	38.38	0.76	0
02:25 PM	4105	38.34	0.72	0
02:30 PM	4110	38.31	0.69	0
02:35 PM	4115	38.28	0.66	0
02:40 PM	4120	38.26	0.64	0
02:50 PM	4130	38.22	0.60	0
03:00 PM	4140	38.20	0.58	0
03:15 PM	4155	38.17	0.55	0
03:30 PM	4170	38.15	0.53	0
03:45 PM	4185	38.12	0.50	0
04:00 PM	4200	38.11	0.49	0
04:30 PM	4230	38.09	0.47	0
05:00 PM	4260	38.06	0.44	0
05:30 PM	4290	38.05	0.43	0
06:00 PM	4320	38.04	0.42	0
06:30 PM	4350	38.03	0.41	0
07:00 PM	4380	38.03	0.41	0
07:30 PM	4410	38.02	0.40	0
08:00 PM	4440	38.01	0.39	0
09:00 PM	4500	38.00	0.38	0
10:00 PM	4560	37.99	0.37	0
11:00 PM	4620	37.98	0.36	0
12:00 AM	4680	37.96	0.34	0
01:00 AM	4740	37.95	0.33	0
02:00 AM	4800	37.94	0.32	0
03:00 AM	4860	37.94	0.32	0
04:00 AM	4920	37.93	0.31	0
05:00 AM	4980	37.93	0.31	0
06:00 AM	5040	37.93	0.31	0
07:00 AM	5100	37.93	0.31	0
08:00 AM	5160	37.94	0.32	0
09:00 AM	5220	37.93	0.31	0
10:00 AM	5280	37.92	0.30	0
11:00 AM	5340	37.91	0.29	0
12:00 PM	5400	37.90	0.28	0
01:00 PM	5460	37.89	0.27	0
02:00 PM	5520	37.88	0.26	0

AQUIFER PERFORMANCE TEST SHEET

Date	27-04-2023	**BH No.**	PT02_OW	**BH Co-ordiate**	319769, 2429757
Stick Up (m)	0.40	**SWL (mBMP)**	36.98	**BH Rest Duration**	24 hrs
BH Depth (m)	100	**BH Dia (mm)**	254	**Casing Depth (m)**	99
Pump started	06:00 PM 27-04-2023			**Pump Stopped**	02:00 PM 30-04-2023

CLOCK TIME	TIME ELAPSED FROM PUMP START (min)	DEPTH TO WATER LEVEL (mBMP)	DRAWDOWN (m)	DISCHARGE (l/min)
06:00 PM	0	36.98	0.00	0
06:01 PM	1	37.03	0.05	87
06:02 PM	2	37.20	0.22	88
06:03 PM	3	37.28	0.30	92
06:04 PM	4	37.36	0.38	93
06:05 PM	5	37.46	0.48	103
06:06 PM	6	37.53	0.55	130
06:07 PM	7	37.60	0.62	135
06:08 PM	8	37.65	0.67	130
06:09 PM	9	37.69	0.71	130
06:10 PM	10	37.73	0.75	120
06:12 PM	12	37.73	0.75	120
06:14 PM	14	37.85	0.87	125
06:16 PM	16	37.89	0.91	120
06:18 PM	18	37.93	0.95	110
06:20 PM	20	37.97	0.99	105
06:25 PM	25	37.96	0.98	102
06:30 PM	30	37.95	0.97	103
06:35 PM	35	37.95	0.97	104
06:40 PM	40	37.96	0.98	105
06:50 PM	50	37.99	1.01	106
07:00 PM	60	38.02	1.04	102
07:15 PM	75	38.05	1.07	102
07:30 PM	90	38.07	1.09	105
07:45 PM	105	38.08	1.10	104
08:00 PM	120	38.10	1.12	106
08:30 PM	150	38.20	1.22	106
09:00 PM	180	38.20	1.22	104
09:30 PM	210	38.23	1.25	106
10:00 PM	240	38.24	1.26	102
10:30 PM	270	38.17	1.19	105
11:00 PM	300	38.18	1.20	102
11:30 PM	330	38.19	1.21	106
12:00 AM	360	38.20	1.22	104
01:00 AM	420	38.20	1.22	103
02:00 AM	480	38.21	1.23	107
03:00 AM	540	38.22	1.24	108
04:00 AM	600	38.24	1.26	100
05:00 AM	660	38.26	1.28	101
06:00 AM	720	38.26	1.28	101
07:00 AM	780	38.28	1.30	103

AQUIFER PERFORMANCE TEST SHEET

Date	27-04-2023	**BH No.**	PT02_OW	**BH Co-ordiate**	319769, 2429757
Stick Up (m)	0.40	**SWL (mBMP)**	36.98	**BH Rest Duration**	24 hrs
BH Depth (m)	100	**BH Dia (mm)**	254	**Casing Depth (m)**	99
Pump started	06:00 PM 27-04-2023			**Pump Stopped**	02:00 PM 30-04-2023

CLOCK TIME	TIME ELAPSED FROM PUMP START (min)	DEPTH TO WATER LEVEL (mBMP)	DRAWDOWN (m)	DISCHARGE (l/min)
08:00 AM	840	38.28	1.30	102
09:00 AM	900	38.31	1.33	103
10:00 AM	960	38.32	1.34	106
11:00 AM	1020	38.32	1.34	105
12:00 PM	1080	38.33	1.35	104
01:00 PM	1140	38.33	1.35	102
02:00 PM	1200	38.34	1.36	104
03:00 PM	1260	38.34	1.36	103
04:00 PM	1320	38.30	1.32	102
05:00 PM	1380	38.32	1.34	104
06:00 PM	1440	38.34	1.36	103
07:00 PM	1500	38.36	1.38	103
08:00 PM	1560	38.37	1.39	104
09:00 PM	1620	38.37	1.39	103
10:00 PM	1680	38.38	1.40	105
11:00 PM	1740	38.39	1.41	103
12:00 AM	1800	38.38	1.40	103
01:00 AM	1860	38.38	1.40	103
02:00 AM	1920	38.38	1.40	102
03:00 AM	1980	38.39	1.41	104
04:00 AM	2040	38.40	1.42	103
05:00 AM	2100	38.41	1.43	104
06:00 AM	2160	38.42	1.44	102
07:00 AM	2220	38.43	1.45	105
08:00 AM	2280	38.43	1.45	101
09:00 AM	2340	38.46	1.48	100
10:00 AM	2400	38.46	1.48	102
11:00 AM	2460	38.46	1.48	104
12:00 PM	2520	38.46	1.48	103
01:00 PM	2580	38.46	1.48	105
02:00 PM	2640	38.45	1.47	102
03:00 PM	2700	38.45	1.47	100
04:00 PM	2760	38.45	1.47	102
05:00 PM	2820	38.45	1.47	104
06:00 PM	2880	38.46	1.48	103
07:00 PM	2940	38.50	1.52	102
08:00 PM	3000	38.50	1.52	103
09:00 PM	3060	38.51	1.53	104
10:00 PM	3120	38.51	1.53	103

AQUIFER PERFORMANCE TEST SHEET

Date	27-04-2023	**BH No.**	PT02_OW	**BH Co-ordiate**	319769, 2429757
Stick Up (m)	0.40	**SWL (mBMP)**	36.98	**BH Rest Duration**	24 hrs
BH Depth (m)	100	**BH Dia (mm)**	254	**Casing Depth (m)**	99
Pump started	06:00 PM 27-04-2023			**Pump Stopped**	02:00 PM 30-04-2023

CLOCK TIME	TIME ELAPSED FROM PUMP START (min)	DEPTH TO WATER LEVEL (mBMP)	DRAWDOWN (m)	DISCHARGE (l/min)
11:00 PM	3180	38.52	1.54	104
12:00 AM	3240	38.53	1.55	103
01:00 AM	3300	38.51	1.53	102
02:00 AM	3360	38.51	1.53	105
03:00 AM	3420	38.51	1.53	103
04:00 AM	3480	38.51	1.53	104
05:00 AM	3540	38.53	1.55	103
06:00 AM	3600	38.53	1.55	104
07:00 AM	3660	38.55	1.57	102
08:00 AM	3720	38.56	1.58	103
09:00 AM	3780	38.56	1.58	100
10:00 AM	3840	38.56	1.58	98
11:00 AM	3900	38.56	1.58	99
12:00 PM	3960	38.56	1.58	100
01:00 PM	4020	38.56	1.58	99
02:00 PM	4080	38.56	1.58	102
02:00 PM	4080	38.56	1.58	0
02:01 PM	4081	38.49	1.51	0
02:02 PM	4082	38.37	1.39	0
02:03 PM	4083	38.27	1.29	0
02:04 PM	4084	38.19	1.21	0
02:05 PM	4085	38.14	1.16	0
02:06 PM	4086	38.08	1.10	0
02:07 PM	4087	38.05	1.07	0
02:08 PM	4088	38.01	1.03	0
02:09 PM	4089	37.99	1.01	0
02:10 PM	4090	37.96	0.98	0
02:12 PM	4092	37.91	0.93	0
02:14 PM	4094	37.88	0.90	0
02:16 PM	4096	37.84	0.86	0
02:18 PM	4098	37.82	0.84	0
02:20 PM	4100	37.79	0.81	0
02:25 PM	4105	37.74	0.76	0
02:30 PM	4110	37.70	0.72	0
02:35 PM	4115	37.66	0.68	0
02:40 PM	4120	37.63	0.65	0
02:50 PM	4130	37.59	0.61	0
03:00 PM	4140	37.56	0.58	0
03:15 PM	4155	37.52	0.54	0
03:30 PM	4170	37.49	0.51	0

AQUIFER PERFORMANCE TEST SHEET

Date	27-04-2023	**BH No.**	PT02_OW	**BH Co-ordiate**	319769, 2429757
Stick Up (m)	0.40	**SWL (mBMP)**	36.98	**BH Rest Duration**	24 hrs
BH Depth (m)	100	**BH Dia (mm)**	254	**Casing Depth (m)**	99
Pump started	06:00 PM 27-04-2023			**Pump Stopped**	02:00 PM 30-04-2023

CLOCK TIME	TIME ELAPSED FROM PUMP START (min)	DEPTH TO WATER LEVEL (mBMP)	DRAWDOWN (m)	DISCHARGE (l/min)
03:45 PM	4185	37.47	0.49	0
04:00 PM	4200	37.45	0.47	0
04:30 PM	4230	37.43	0.45	0
05:00 PM	4260	37.41	0.43	0
05:30 PM	4290	37.39	0.41	0
06:00 PM	4320	37.39	0.41	0
06:30 PM	4350	37.39	0.41	0
07:00 PM	4380	37.39	0.41	0
07:30 PM	4410	37.38	0.40	0
08:00 PM	4440	37.37	0.39	0
09:00 PM	4500	37.36	0.38	0
10:00 PM	4560	37.35	0.37	0
11:00 PM	4620	37.35	0.37	0
12:00 AM	4680	37.32	0.34	0
01:00 AM	4740	37.31	0.33	0
02:00 AM	4800	37.30	0.32	0
03:00 AM	4860	37.30	0.32	0
04:00 AM	4920	37.29	0.31	0
05:00 AM	4980	37.29	0.31	0
06:00 AM	5040	37.29	0.31	0
07:00 AM	5100	37.29	0.31	0
08:00 AM	5160	37.30	0.32	0
09:00 AM	5220	37.29	0.31	0
10:00 AM	5280	37.28	0.30	0
11:00 AM	5340	37.27	0.29	0
12:00 PM	5400	37.26	0.28	0
01:00 PM	5460	37.25	0.27	0
02:00 PM	5520	37.24	0.26	0

Appendix G: Ground Water Level Data

Ground Water Level Survey Data (Post Monsoon, October 2023)

Well ID	Name of Village	Latitude	Longitude	Utility	Well Depth (m BGL)	Collar Elevation (m aMSL)	Depth to Water Level (m BGL)	GW Piezometric Elevation (m aMSL)
TW_01	Gudasahi Nugaon	21.972080	85.271740	Handpump	60.00	540.000	9.62	530.38
TW_02	Guali	21.979950	85.289960	Handpump	65.00	530.310	4.58	525.73
TW_03	Patliposi	21.993090	85.285420	Handpump	55.00	522.666	6.49	516.18
TW_04	Kendih	21.994120	85.270490	Handpump	60.00	522.489	13.74	508.75
TW_05	Rugudih	21.995330	85.324220	Handpump	92.00	540.264	5.93	534.33
TW_06	Kalaha Road Kala	21.976440	85.316250	Handpump	90.00	548.215	9.92	538.30
TW_07	Kalamang High School	21.954037	85.320797	Handpump	80.00	560.000	6.08	553.92
TW_09	Dengula	21.870727	85.200104	Handpump	60.00	599.913	7.13	592.78
TW_10	Tentuldihi	21.876586	85.222967	Handpump	85.00	602.328	6.85	595.48
TW_11	Kadodiha	21.895968	85.235020	Handpump	90.00	572.792	4.09	568.70
TW_12	Thengrai	21.900752	85.285063	Handpump	86.00	620.000	10.76	609.24
TW_13	Koira	21.917930	85.253664	Handpump	90.00	575.927	8.45	567.48
TW_14	Kolmong	21.949382	85.310550	Handpump	80.00	580.000	13.47	566.53
TW_15	Badinpur	21.915160	85.295822	Handpump	75.00	610.000	23.42	586.58
TW_17	Nadidih Mine Office	21.972067	85.256679	Handpump	80.00	543.033	19.09	523.94
TW_18	Village near Nadidih Mine Office	21.973502	85.257545	Handpump	85.00	537.110	9.56	527.55
K_01	Kalta Township	21.969096	85.218680	Borewell	120.00	591.417	3.57	587.85
K_03	Jhirpani Sevasram	21.995549	85.221020	Borewell	130.00	594.774	6.22	588.55
K_04	Toda Colony Govt. UGUP School	21.975668	85.194199	Borewell	140.00	510.000	11.81	498.19
K_05	Kundruburu GL Church	21.975185	85.141675	Borewell	120.00	368.002	8.65	359.35
K_06	Harishchandrapur Anganwadi Kendra	21.913182	85.224942	Borewell	140.00	559.749	7.72	552.03
K_07	Kamanda Govt. UGUP School	21.926561	85.208538	Borewell	130.00	578.099	9.25	568.85
PT01_OW	PT01 Observation Well	21.963807	85.252843	Tubewell	75.00	546.597	20.41	526.19
PT01_PW	PT01 Pumping Well	21.963638	85.253049	Tubewell	75.00	550.013	19.00	531.01
PT02_OW	PT02 Observation Well	21.963023	85.254624	Tubewell	100.00	564.087	36.68	527.41
PT02_PW	PT02 Pumping Well	21.962782	85.254831	Tubewell	100.00	563.248	37.31	525.94
TW11	Kundrupani	21.979620	85.366310	Handpump	80	540.000	1.55	538.45
TW20	Dhanurjaypur	22.056760	85.289310	Handpump	80	512.698	7.63	505.07
TW21	Lasarda	22.052390	85.324320	Handpump	92	490.000	12.20	477.80

grk consulting

Appendix H: Water Sample Chemical Analysis Report

Cleenviron Private Limited

Consultant and Engineers in Environmental Pollution Control & Monitoring with NABL Accredited Laboratory.

TC - 6816

TEST REPORT FOR WATER QUALITY ANALYSIS

FORMAT NO:CPL/F/W/03

ULR – TC681623000002325F
REPORT NO: CPL/R/W/OCT-23/7

REPORT ISSUE DATE: 16.10.2023

SAMPLE SUBMITTED BY CUSTOMER

Name of the Customer	:	**SRK MINING SERVICES (INDIA) PRIVATE LIMITED**
Address of the Customer	:	DD 30, 5th Floor, "Andromeda", Sector – 1, Salt Lake City, Kolkata – 700064
Sample ID No	:	CPL/W/OCT-23/2
Sample Description	:	Ground Water
Location of Sampling	:	Kendudihi
Container ID	:	GW01
Condition of Sample while receipt	:	Sealed
Appearance of Sample while receipt	:	Turbid
Sample Received on	:	09.10.2023
Date of Test	:	09.10.2023 – 16.10.2023

Sl No	Parameter	Method of Analysis	Results Obtained	Unit	Permissible Limit in absence of Alternate Source as per IS 10500: 2012
1	Turbidity	APHA 23rd Edition, 2130 B	24.5	NTU	5.0
2	pH Value	APHA 23rd Edition, 4500 H+B	5.62	-	6.5 – 8.5
3	Total Hardness (as $CaCO_3$)	APHA 23rd Edition, 2340 C	72	mg/l	600
4	Iron (as Fe)	APHA 23rd Edition, 3500 Fe B	3.78	mg/l	0.3
5	Chloride (as Cl)	APHA 23rd Edition, 4500 Cl B	6.89	mg/l	1000
6	Total Dissolved Solids	APHA 23rd Edition, 2540 B	81	mg/l	2000
7	Electrical Conductivity	APHA 23rd Edition, 2510 B	132.6	µS/cm	-
8	Calcium (as Ca)	APHA 23rd Edition, 3500 Ca B	14.43	mg/l	200
9	Magnesium (as Mg)	APHA 23rd Edition, 3500 Mg B	8.75	mg/l	100
10	Manganese (as Mn)	APHA 23rd Edition, 3500 Mn B	< 0.05	mg/l	0.3
11	Sulfate (as SO_4)	APHA 23rd Edition, 4500 SO_4^{2-} E	< 0.50	mg/l	400
12	Total Nitrate (as NO_3)	APHA 23rd Edition, 4500 NO_3 B	< 2.20	mg/l	45
13	Carbonate Alkalinity	APHA 23rd Edition, 2320 B	< 4.0	mg/l	-
14	Bicarbonate Alkalinity	APHA 23rd Edition, 2320 B	48	mg/l	-
15	Sulphide (as H_2S)	APHA 23rd Edition, 4500 S^{2-} D	< 0.02	mg/l	0.05
16	Sodium (as Na)	APHA 23rd Edition, 3500 Na B	7.17	mg/l	-
17	Potassium (as K)	APHA 23rd Edition, 3500 K B	2.19	mg/l	-
18	Fluoride (as F)	APHA 23rd Edition, 4500 F D	1.65	mg/l	1.5
19	Lead (as Pb)	APHA 23rd Edition, 3111 B	ND	mg/l	0.01
20	Arsenic (as As)	APHA 23rd Edition, 3114 B	< 0.002	mg/l	0.05
21	Zinc (as Zn)	APHA 23rd Edition, 3111 B	< 0.02	mg/l	15.0
22	Total Chromium (as Cr)	APHA 23rd Edition, 3111 B	ND	mg/l	0.05

ND: Non Detectable.

Test Done By

CLEENVIRON PRIVATE LIMITED ROURKELA

Verified By

Authorized Signatory
Subhanga Praharaj
Managing Director

***** End of Test Report *****

This report refers to the values obtained at the time of testing and results related to the item tested. This report may not be reproduced in part or full without written permission of the Company.

Registered Office:
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Cleenviron Private Limited

Consultant and Engineers in Environmental Pollution Control & Monitoring with Laboratory Facility.

TEST REPORT FOR WATER QUALITY ANALYSIS

FORMAT NO:CPL/FM/80

REPORT NO: CPL/R/W/OCT-23/7N

REPORT ISSUE DATE: 16.10.2023

SAMPLE SUBMITTED BY CUSTOMER

Name of the Customer	:	**SRK MINING SERVICES (INDIA) PRIVATE LIMITED**
Address of the Customer	:	DD 30, 5th Floor, "Andromeda", Sector – 1, Salt Lake City, Kolkata – 700064
Sample ID No	:	CPL/W/OCT-23/2
Sample Description	:	Ground Water
Location of Sampling	:	Kendudihi
Container ID	:	GW01
Condition of Sample while receipt	:	Sealed
Appearance of Sample while receipt	:	Turbid
Sample Received on	:	09.10.2023
Date of Test	:	09.10.2023 – 16.10.2023

Sl No	Parameter	Method of Analysis	Results Obtained	Unit	Permissible Limit in absence of Alternate Source as per IS 10500: 2012
1	Colour	APHA 23rd Edition, 2120 B	< 5	Hazen	15
2	Odour	APHA 23rd Edition, 2150 B	Agreeable	-	Agreeable

Test Done By

Verified By

CLEENVIRON PRIVATE LIMITED ROURKELA

Authorized Signatory
Subhanga Praharaj
Managing Director

***** End of Test Report *****

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Cleenviron Private Limited

Consultant and Engineers in Environmental Pollution Control & Monitoring with NABL Accredited Laboratory.

TC - 8998

TEST REPORT FOR WATER QUALITY ANALYSIS

FORMAT NO:CPL/F/W/60

ULR – TC681623000002326F
REPORT NO: CPL/R/W/OCT-23/8

REPORT ISSUE DATE: 16.10.2023

SAMPLE SUBMITTED BY CUSTOMER

Name of the Customer	:	**SRK MINING SERVICES (INDIA) PRIVATE LIMITED**
Address of the Customer	:	DD 30, 5th Floor, "Andromeda", Sector – 1, Salt Lake City, Kolkata – 700064
Sample ID No	:	**CPL/W/OCT-23/3**
Sample Description	:	Ground Water
Location of Sampling	:	Kundruburu
Container ID	:	**GW02**
Condition of Sample while receipt	:	Sealed
Appearance of Sample while receipt	:	Turbid
Sample Received on	:	09.10.2023
Date of Test	:	09.10.2023 – 16.10.2023

Sl No	Parameter	Method of Analysis	Results Obtained	Unit	Permissible Limit in absence of Alternate Source as per IS 10500: 2012
1	Turbidity	APHA 23rd Edition, 2130 B	30.3	NTU	5.0
2	pH Value	APHA 23rd Edition, 4500 H+B	6.71	-	6.5 – 8.5
3	Total Hardness (as $CaCO_3$)	APHA 23rd Edition, 2340 C	320	mg/l	600
4	Iron (as Fe)	APHA 23rd Edition, 3500 Fe B	0.37	mg/l	0.3
5	Chloride (as Cl)	APHA 23rd Edition, 4500 Cl B	42.38	mg/l	1000
6	Total Dissolved Solids	APHA 23rd Edition, 2540 B	420	mg/l	2000
7	Electrical Conductivity	APHA 23rd Edition, 2510 B	700	µS/cm	-
8	Calcium (as Ca)	APHA 23rd Edition, 3500 Ca B	68.94	mg/l	200
9	Magnesium (as Mg)	APHA 23rd Edition, 3500 Mg B	35.96	mg/l	100
10	Manganese (as Mn)	APHA 23rd Edition, 3500 Mn B	< 0.05	mg/l	0.3
11	Sulfate (as SO_4)	APHA 23rd Edition, 4500 SO_4^{2-} E	13.47	mg/l	400
12	Total Nitrate (as NO_3)	APHA 23rd Edition, 4500 NO_3 B	6.01	mg/l	45
13	Carbonate Alkalinity	APHA 23rd Edition, 2320 B	< 4.0	mg/l	-
14	Bicarbonate Alkalinity	APHA 23rd Edition, 2320 B	252	mg/l	-
15	Sulphide (as H_2S)	APHA 23rd Edition, 4500 S^{2-} D	< 0.02	mg/l	0.05
16	Sodium (as Na)	APHA 23rd Edition, 3500 Na B	32.23	mg/l	-
17	Potassium (as K)	APHA 23rd Edition, 3500 K B	6.28	mg/l	-
18	Fluoride (as F)	APHA 23rd Edition, 4500 F C	0.10	mg/l	1.5
19	Lead (as Pb)	APHA 23rd Edition, 3111 B	ND	mg/l	0.01
20	Arsenic (as As)	APHA 23rd Edition, 3114 B	< 0.002	mg/l	0.05
21	Zinc (as Zn)	APHA 23rd Edition, 3111 B	< 0.02	mg/l	15.0
22	Total Chromium (as Cr)	APHA 23rd Edition, 3111 B	ND	mg/l	0.05

ND: Non Detectable.

Test Done By

Verified By

CLEENVIRON PRIVATE LIMITED ROURKELA

Authorized Signatory
Subhanga Praharaj
Managing Director

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Consultant and Engineers in Environmental Pollution Control & Monitoring with Laboratory Facility.

TEST REPORT FOR WATER QUALITY ANALYSIS

FORMAT NO.CPL/FM/60

REPORT NO: CPL/R/W/OCT-23/8N

REPORT ISSUE DATE: 16.10.2023

SAMPLE SUBMITTED BY CUSTOMER

Name of the Customer	:	**SRK MINING SERVICES (INDIA) PRIVATE LIMITED**
Address of the Customer	:	DD 30, 5th Floor, "Andromeda", Sector – 1, Salt Lake City, Kolkata – 700064
Sample ID No	:	CPL/W/OCT-23/3
Sample Description	:	Ground Water
Location of Sampling	:	Kundruburu
Container ID	:	GW02
Condition of Sample while receipt	:	Sealed
Appearance of Sample while receipt	:	Turbid
Sample Received on	:	09.10.2023
Date of Test	:	09.10.2023 – 16.10.2023

Sl No	Parameter	Method of Analysis	Results Obtained	Unit	Permissible Limit in absence of Alternate Source as per IS 10500: 2012
1	Colour	APHA 23rd Edition, 2120 B	< 5	Hazen	15
2	Odour	APHA 23rd Edition, 2150 B	Agreeable	-	Agreeable

Test Done By

Verified By

CLEENVIRON PRIVATE LIMITED ROURKELA

Authorized Signatory
Subhanga Praharaj
Managing Director

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TC - 6816

TEST REPORT FOR WATER QUALITY ANALYSIS

FORMAT NO:CPL/F/W/60

ULR – TC681623000002327F
REPORT NO: CPL/R/W/OCT-23/9

REPORT ISSUE DATE: 16.10.2023

SAMPLE SUBMITTED BY CUSTOMER

Name of the Customer	:	**SRK MINING SERVICES (INDIA) PRIVATE LIMITED**
Address of the Customer	:	DD 30, 5th Floor, "Andromeda", Sector – 1, Salt Lake City, Kolkata – 700064
Sample ID No	:	CPL/W/OCT-23/4
Sample Description	:	Ground Water
Location of Sampling	:	Toda Colony
Container ID	:	GW03
Condition of Sample while receipt	:	Sealed
Appearance of Sample while receipt	:	Turbid
Sample Received on	:	09.10.2023
Date of Test	:	09.10.2023 – 16.10.2023

Sl No	Parameter	Method of Analysis	Results Obtained	Unit	Permissible Limit in absence of Alternate Source as per IS 10500: 2012
1	Turbidity	APHA 23rd Edition, 2130 B	55.6	NTU	5.0
2	pH Value	APHA 23rd Edition, 4500 H+B	6.10	-	6.5 – 8.5
3	Total Hardness (as $CaCO_3$)	APHA 23rd Edition, 2340 C	64	mg/l	600
4	Iron (as Fe)	APHA 23rd Edition, 3500 Fe B	0.36	mg/l	0.3
5	Chloride (as Cl)	APHA 23rd Edition, 4500 Cl B	19.71	mg/l	1000
6	Total Dissolved Solids	APHA 23rd Edition, 2540 B	69	mg/l	2000
7	Electrical Conductivity	APHA 23rd Edition, 2510 B	115	µS/cm	-
8	Calcium (as Ca)	APHA 23rd Edition, 3500 Ca B	11.22	mg/l	200
9	Magnesium (as Mg)	APHA 23rd Edition, 3500 Mg B	8.75	mg/l	100
10	Manganese (as Mn)	APHA 23rd Edition, 3500 Mn B	< 0.05	mg/l	0.3
11	Sulfate (as SO_4)	APHA 23rd Edition, 4500 SO_4^{2-} E	< 0.50	mg/l	400
12	Total Nitrate (as NO_3)	APHA 23rd Edition, 4500 NO_3 B	< 2.20	mg/l	45
13	Carbonate Alkalinity	APHA 23rd Edition, 2320 B	< 4.0	mg/l	-
14	Bicarbonate Alkalinity	APHA 23rd Edition, 2320 B	28	mg/l	-
15	Sulphide (as H_2S)	APHA 23rd Edition, 4500 S^{2-} D	< 0.02	mg/l	0.05
16	Sodium (as Na)	APHA 23rd Edition, 3500 Na B	4.18	mg/l	-
17	Potassium (as K)	APHA 23rd Edition, 3500 K B	0.27	mg/l	-
18	Fluoride (as F)	APHA 23rd Edition, 4500 F D	< 0.05	mg/l	1.5
19	Lead (as Pb)	APHA 23rd Edition, 3111 B	ND	mg/l	0.01
20	Arsenic (as As)	APHA 23rd Edition, 3114 B	< 0.002	mg/l	0.05
21	Zinc (as Zn)	APHA 23rd Edition, 3111 B	< 0.02	mg/l	15.0
22	Total Chromium (as Cr)	APHA 23rd Edition, 3111 B	ND	mg/l	0.05

ND: Non Detectable.

Test Done By

CLEENVIRON PRIVATE LIMITED ROURKELA

Verified By

Authorized Signatory
Subhanga Praharaj
Managing Director

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TEST REPORT FOR WATER QUALITY ANALYSIS

FORMAT NO:CPL/F/980

REPORT NO: CPL/R/W/OCT-23/9N

REPORT ISSUE DATE: 16.10.2023

SAMPLE SUBMITTED BY CUSTOMER

Name of the Customer	:	**SRK MINING SERVICES (INDIA) PRIVATE LIMITED**
Address of the Customer	:	DD 30, 5th Floor, "Andromeda", Sector – 1, Salt Lake City, Kolkata – 700064
Sample ID No	:	CPL/W/OCT-23/4
Sample Description	:	Ground Water
Location of Sampling	:	Toda Colony
Container ID	:	GW03
Condition of Sample while receipt	:	Sealed
Appearance of Sample while receipt	:	Turbid
Sample Received on	:	09.10.2023
Date of Test	:	09.10.2023 – 16.10.2023

Sl No	Parameter	Method of Analysis	Results Obtained	Unit	Permissible Limit in absence of Alternate Source as per IS:10500: 2012
1	Colour	APHA 23rd Edition, 2120 B	< 5	Hazen	15
2	Odour	APHA 23rd Edition, 2150 B	Agreeable	-	Agreeable

Test Done By

Verified By

CLEENVIRON PRIVATE LIMITED ROURKELA

Authorized Signatory
Subhanga Prahara
Managing Director

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TC - 8818

TEST REPORT FOR WATER QUALITY ANALYSIS

FORMAT NO:CPL/FM/50

ULR – TC681623000002328F
REPORT NO: CPL/R/W/OCT-23/10

REPORT ISSUE DATE: 16.10.2023

SAMPLE SUBMITTED BY CUSTOMER

Name of the Customer	:	**SRK MINING SERVICES (INDIA) PRIVATE LIMITED**
Address of the Customer	:	DD 30, 5th Floor, "Andromeda", Sector – 1, Salt Lake City, Kolkata – 700064
Sample ID No	:	CPL/W/OCT-23/5
Sample Description	:	Ground Water
Location of Sampling	:	Kalta Township
Container ID	:	GW04
Condition of Sample while receipt	:	Sealed
Appearance of Sample while receipt	:	Turbid
Sample Received on	:	09.10.2023
Date of Test	:	09.10.2023 – 16.10.2023

Sl No	Parameter	Method of Analysis	Results Obtained	Unit	Permissible Limit in absence of Alternate Source as per IS 10500: 2012
1	Turbidity	APHA 23rd Edition, 2130 B	32.9	NTU	5.0
2	pH Value	APHA 23rd Edition, 4500 H+B	5.98	-	6.5 – 8.5
3	Total Hardness (as $CaCO_3$)	APHA 23rd Edition, 2340 C	88	mg/l	600
4	Iron (as Fe)	APHA 23rd Edition, 3500 Fe B	1.82	mg/l	0.3
5	Chloride (as Cl)	APHA 23rd Edition, 4500 Cl B	19.71	mg/l	1000
6	Total Dissolved Solids	APHA 23rd Edition, 2540 B	116	mg/l	2000
7	Electrical Conductivity	APHA 23rd Edition, 2510 B	191.9	µS/cm	-
8	Calcium (as Ca)	APHA 23rd Edition, 3500 Ca B	24.05	mg/l	200
9	Magnesium (as Mg)	APHA 23rd Edition, 3500 Mg B	6.80	mg/l	100
10	Manganese (as Mn)	APHA 23rd Edition, 3500 Mn B	< 0.05	mg/l	0.3
11	Sulfate (as SO_4)	APHA 23rd Edition, 4500 SO_4^{2-} E	< 0.50	mg/l	400
12	Total Nitrate (as NO_3)	APHA 23rd Edition, 4500 NO_3 B	10.2	mg/l	45
13	Carbonate Alkalinity	APHA 23rd Edition, 2320 B	< 4.0	mg/l	-
14	Bicarbonate Alkalinity	APHA 23rd Edition, 2320 B	48	mg/l	-
15	Sulphide (as H_2S)	APHA 23rd Edition, 4500 S^{2-} D	< 0.02	mg/l	0.05
16	Sodium (as Na)	APHA 23rd Edition, 3500 Na B	6.24	mg/l	-
17	Potassium (as K)	APHA 23rd Edition, 3500 K B	0.95	mg/l	-
18	Fluoride (as F)	APHA 23rd Edition, 4500 F D	< 0.05	mg/l	1.5
19	Lead (as Pb)	APHA 23rd Edition, 3111 B	ND	mg/l	0.01
20	Arsenic (as As)	APHA 23rd Edition, 3114 B	< 0.002	mg/l	0.05
21	Zinc (as Zn)	APHA 23rd Edition, 3111 B	< 0.02	mg/l	15.0
22	Total Chromium (as Cr)	APHA 23rd Edition, 3111 B	ND	mg/l	0.05

ND: Non Detectable.

Test Done By

CLEENVIRON PRIVATE LIMITED ROURKELA

Verified By

Authorized Signatory
Subhanga Praharaj
Managing Director

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TEST REPORT FOR WATER QUALITY ANALYSIS

FORMAT NO: CPL/FM/00

REPORT NO: CPL/R/W/OCT-23/10N

REPORT ISSUE DATE: 16.10.2023

SAMPLE SUBMITTED BY CUSTOMER

Name of the Customer	:	**SRK MINING SERVICES (INDIA) PRIVATE LIMITED**
Address of the Customer	:	DD 30, 5th Floor, "Andromeda", Sector – 1, Salt Lake City, Kolkata – 700064
Sample ID No	:	**CPL/W/OCT-23/5**
Sample Description	:	Ground Water
Location of Sampling	:	Kalta Township
Container ID	:	**GW04**
Condition of Sample while receipt	:	Sealed
Appearance of Sample while receipt	:	Turbid
Sample Received on	:	09.10.2023
Date of Test	:	09.10.2023 – 16.10.2023

Sl No	Parameter	Method of Analysis	Results Obtained	Unit	Permissible Limit in absence of Alternate Source as per IS 10500: 2012
1	Colour	APHA 23rd Edition, 2120 B	< 5	Hazen	15
2	Odour	APHA 23rd Edition, 2150 B	Agreeable	-	Agreeable

Test Done By

Verified By

CLEENVIRON PRIVATE LIMITED ROURKELA

Authorized Signatory
Subhanga Praharaj
Managing Director

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TC - 6816

TEST REPORT FOR WATER QUALITY ANALYSIS

FORMAT NO:CPL/F/W/03

ULR – TC681623000002329F
REPORT NO: CPL/R/W/OCT-23/11

REPORT ISSUE DATE: 16.10.2023

SAMPLE SUBMITTED BY CUSTOMER

Name of the Customer	:	**SRK MINING SERVICES (INDIA) PRIVATE LIMITED**
Address of the Customer	:	DD 30, 5th Floor, "Andromeda", Sector – 1, Salt Lake City, Kolkata – 700064
Sample ID No	:	**CPL/W/OCT-23/6**
Sample Description	:	Ground Water
Location of Sampling	:	Kamanda
Container ID	:	**GW05**
Condition of Sample while receipt	:	Sealed
Appearance of Sample while receipt	:	Turbid
Sample Received on	:	09.10.2023
Date of Test	:	09.10.2023 – 16.10.2023

Sl No	Parameter	Method of Analysis	Results Obtained	Unit	Permissible Limit in absence of Alternate Source as per IS 10500: 2012
1	Turbidity	APHA 23rd Edition, 2130 B	46.9	NTU	5.0
2	pH Value	APHA 23rd Edition, 4500 H+B	5.48	-	6.5 – 8.5
3	Total Hardness (as $CaCO_3$)	APHA 23rd Edition, 2340 C	20	mg/l	600
4	Iron (as Fe)	APHA 23rd Edition, 3500 Fe B	7.34	mg/l	0.3
5	Chloride (as Cl)	APHA 23rd Edition, 4500 Cl B	3.94	mg/l	1000
6	Total Dissolved Solids	APHA 23rd Edition, 2540 B	28	mg/l	2000
7	Electrical Conductivity	APHA 23rd Edition, 2510 B	45.6	µS/cm	-
8	Calcium (as Ca)	APHA 23rd Edition, 3500 Ca B	4.81	mg/l	200
9	Magnesium (as Mg)	APHA 23rd Edition, 3500 Mg B	1.94	mg/l	100
10	Manganese (as Mn)	APHA 23rd Edition, 3500 Mn B	< 0.05	mg/l	0.3
11	Sulfate (as SO_4)	APHA 23rd Edition, 4500 SO_4^{2-} E	< 0.50	mg/l	400
12	Total Nitrate (as NO_3)	APHA 23rd Edition, 4500 NO_3 B	< 2.20	mg/l	45
13	Carbonate Alkalinity	APHA 23rd Edition, 2320 B	< 4.0	mg/l	-
14	Bicarbonate Alkalinity	APHA 23rd Edition, 2320 B	16	mg/l	-
15	Sulphide (as H_2S)	APHA 23rd Edition, 4500 S^{2-} D	< 0.02	mg/l	0.05
16	Sodium (as Na)	APHA 23rd Edition, 3500 Na B	2.90	mg/l	-
17	Potassium (as K)	APHA 23rd Edition, 3500 K B	0.20	mg/l	-
18	Fluoride (as F)	APHA 23rd Edition, 4500 F D	< 0.05	mg/l	1.5
19	Lead (as Pb)	APHA 23rd Edition, 3111 B	ND	mg/l	0.01
20	Arsenic (as As)	APHA 23rd Edition, 3114 B	< 0.002	mg/l	0.05
21	Zinc (as Zn)	APHA 23rd Edition, 3111 B	< 0.02	mg/l	15.0
22	Total Chromium (as Cr)	APHA 23rd Edition, 3111 B	ND	mg/l	0.05

ND: Non Detectable.

Test Done By

CLEENVIRON PRIVATE LIMITED ROURKELA

Verified By

Authorized Signatory
Subhanga Praharaj
Managing Director

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TEST REPORT FOR WATER QUALITY ANALYSIS

FORMAT NO:CPL/F/8/01

REPORT NO: CPL/R/W/OCT-23/11N

REPORT ISSUE DATE: 16.10.2023

SAMPLE SUBMITTED BY CUSTOMER

Name of the Customer	:	**SRK MINING SERVICES (INDIA) PRIVATE LIMITED**
Address of the Customer	:	DD 30, 5th Floor, "Andromeda", Sector – 1, Salt Lake City, Kolkata – 700064
Sample ID No	:	CPL/W/OCT-23/6
Sample Description	:	Ground Water
Location of Sampling	:	Kamanda
Container ID	:	GW05
Condition of Sample while receipt	:	Sealed
Appearance of Sample while receipt	:	Turbid
Sample Received on	:	09.10.2023
Date of Test	:	09.10.2023 – 16.10.2023

Sl No	Parameter	Method of Analysis	Results Obtained	Unit	Permissible Limit in absence of Alternate Source as per IS 10500: 2012
1	Colour	APHA 23rd Edition, 2120 B	< 5	Hazen	15
2	Odour	APHA 23rd Edition, 2150 B	Agreeable	-	Agreeable

Test Done By

CLEENVIRON PRIVATE LIMITED ROURKELA

Verified By

Authorized Signatory
Subhanga Praharaj
Managing Director

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TC - 6818

TEST REPORT FOR WATER QUALITY ANALYSIS

FORMAT NO:CPL/F/9/00

ULR – TC681623000002330F
REPORT NO: CPL/R/W/OCT-23/12

REPORT ISSUE DATE: 16.10.2023

SAMPLE SUBMITTED BY CUSTOMER

Name of the Customer	:	**SRK MINING SERVICES (INDIA) PRIVATE LIMITED**
Address of the Customer	:	DD 30, 5th Floor, "Andromeda", Sector – 1, Salt Lake City, Kolkata – 700064
Sample ID No	:	**CPL/W/OCT-23/7**
Sample Description	:	Ground Water
Location of Sampling	:	Dengula
Container ID	:	**GW06**
Condition of Sample while receipt	:	Sealed
Appearance of Sample while receipt	:	Slightly Turbid
Sample Received on	:	09.10.2023
Date of Test	:	09.10.2023 – 16.10.2023

Sl No	Parameter	Method of Analysis	Results Obtained	Unit	Permissible Limit in absence of Alternate Source as per IS 10500: 2012
1	Turbidity	APHA 23rd Edition, 2130 B	12.6	NTU	5.0
2	pH Value	APHA 23rd Edition, 4500 H+B	5.79	-	6.5 – 8.5
3	Total Hardness (as $CaCO_3$)	APHA 23rd Edition, 2340 C	52	mg/l	600
4	Iron (as Fe)	APHA 23rd Edition, 3500 Fe B	4.87	mg/l	0.3
5	Chloride (as Cl)	APHA 23rd Edition, 4500 Cl B	16.75	mg/l	1000
6	Total Dissolved Solids	APHA 23rd Edition, 2540 B	93	mg/l	2000
7	Electrical Conductivity	APHA 23rd Edition, 2510 B	151.4	µS/cm	-
8	Calcium (as Ca)	APHA 23rd Edition, 3500 Ca B	17.64	mg/l	200
9	Magnesium (as Mg)	APHA 23rd Edition, 3500 Mg B	1.94	mg/l	100
10	Manganese (as Mn)	APHA 23rd Edition, 3500 Mn B	< 0.05	mg/l	0.3
11	Sulfate (as SO_4)	APHA 23rd Edition, 4500 SO_4^{2-} E	< 0.50	mg/l	400
12	Total Nitrate (as NO_3)	APHA 23rd Edition, 4500 NO_3 B	7.95	mg/l	45
13	Carbonate Alkalinity	APHA 23rd Edition, 2320 B	< 4.0	mg/l	-
14	Bicarbonate Alkalinity	APHA 23rd Edition, 2320 B	36	mg/l	-
15	Sulphide (as H_2S)	APHA 23rd Edition, 4500 S^{2-} D	< 0.02	mg/l	0.05
16	Sodium (as Na)	APHA 23rd Edition, 3500 Na B	6.21	mg/l	-
17	Potassium (as K)	APHA 23rd Edition, 3500 K B	5.54	mg/l	-
18	Fluoride (as F)	APHA 23rd Edition, 4500 F D	1.04	mg/l	1.5
19	Lead (as Pb)	APHA 23rd Edition, 3111 B	ND	mg/l	0.01
20	Arsenic (as As)	APHA 23rd Edition, 3114 B	< 0.002	mg/l	0.05
21	Zinc (as Zn)	APHA 23rd Edition, 3111 B	< 0.02	mg/l	15.0
22	Total Chromium (as Cr)	APHA 23rd Edition, 3111 B	ND	mg/l	0.05

ND: Non Detectable.

Test Done By

CLEENVIRON PRIVATE LIMITED ROURKELA

Verified By

Authorized Signatory
Subhanga Praharaj
Managing Director

***** End of Test Report *****

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Tele Fax: 0661 – 2475748, email: cleenviron@gmail.com

Cleenviron Private Limited

Consultant and Engineers in Environmental Pollution Control & Monitoring with Laboratory Facility.

TEST REPORT FOR WATER QUALITY ANALYSIS

FORMAT NO:CPL/F/8/01

REPORT NO: CPL/R/W/OCT-23/12N

REPORT ISSUE DATE: 16.10.2023

SAMPLE SUBMITTED BY CUSTOMER

Name of the Customer	:	**SRK MINING SERVICES (INDIA) PRIVATE LIMITED**
Address of the Customer	:	DD 30, 5th Floor, "Andromeda", Sector – 1, Salt Lake City, Kolkata – 700064
Sample ID No	:	CPL/W/OCT-23/7
Sample Description	:	Ground Water
Location of Sampling	:	Dengula
Container ID	:	GW06
Condition of Sample while receipt	:	Sealed
Appearance of Sample while receipt	:	Turbid
Sample Received on	:	09.10.2023
Date of Test	:	09.10.2023 – 16.10.2023

Sl No	Parameter	Method of Analysis	Results Obtained	Unit	Permissible Limit in absence of Alternate Source as per IS 10500: 2012
1	Colour	APHA 23rd Edition, 2120 B	< 5	Hazen	15
2	Odour	APHA 23rd Edition, 2150 B	Agreeable	-	Agreeable

Test Done By

CLEENVIRON PRIVATE LIMITED ROURKELA

Verified By

Authorized Signatory
Subhanga Praharaj
Managing Director

***** End of Test Report *****

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TC - 6816

TEST REPORT FOR WATER QUALITY ANALYSIS

FORMAT NO:CPL/F/M/00

ULR – TC681623000002331F
REPORT NO: CPL/R/W/OCT-23/13

REPORT ISSUE DATE: 16.10.2023

SAMPLE SUBMITTED BY CUSTOMER

Name of the Customer	:	**SRK MINING SERVICES (INDIA) PRIVATE LIMITED**
Address of the Customer	:	DD 30, 5th Floor, "Andromeda", Sector – 1, Salt Lake City, Kolkata – 700064
Sample ID No	:	**CPL/W/OCT-23/8**
Sample Description	:	Ground Water
Location of Sampling	:	Kadodiha
Container ID	:	GW07
Condition of Sample while receipt	:	Sealed
Appearance of Sample while receipt	:	Turbid
Sample Received on	:	09.10.2023
Date of Test	:	09.10.2023 – 16.10.2023

Sl No	Parameter	Method of Analysis	Results Obtained	Unit	Permissible Limit in absence of Alternate Source as per IS 10500: 2012
1	Turbidity	APHA 23rd Edition, 2130 B	36.8	NTU	5.0
2	pH Value	APHA 23rd Edition, 4500 H+B	6.09	-	6.5 – 8.5
3	Total Hardness (as $CaCO_3$)	APHA 23rd Edition, 2340 C	64	mg/l	600
4	Iron (as Fe)	APHA 23rd Edition, 3500 Fe B	0.23	mg/l	0.3
5	Chloride (as Cl)	APHA 23rd Edition, 4500 Cl B	10.84	mg/l	1000
6	Total Dissolved Solids	APHA 23rd Edition, 2540 B	85	mg/l	2000
7	Electrical Conductivity	APHA 23rd Edition, 2510 B	138.6	µS/cm	-
8	Calcium (as Ca)	APHA 23rd Edition, 3500 Ca B	16.03	mg/l	200
9	Magnesium (as Mg)	APHA 23rd Edition, 3500 Mg B	5.83	mg/l	100
10	Manganese (as Mn)	APHA 23rd Edition, 3500 Mn B	< 0.05	mg/l	0.3
11	Sulfate (as SO_4)	APHA 23rd Edition, 4500 SO_4^{2-} E	4.46	mg/l	400
12	Total Nitrate (as NO_3)	APHA 23rd Edition, 4500 NO_3 B	< 2.20	mg/l	45
13	Carbonate Alkalinity	APHA 23rd Edition, 2320 B	< 4.0	mg/l	-
14	Bicarbonate Alkalinity	APHA 23rd Edition, 2320 B	48	mg/l	-
15	Sulphide (as H_2S)	APHA 23rd Edition, 4500 S^{2-} D	< 0.02	mg/l	0.05
16	Sodium (as Na)	APHA 23rd Edition, 3500 Na B	5.05	mg/l	-
17	Potassium (as K)	APHA 23rd Edition, 3500 K B	1.46	mg/l	-
18	Fluoride (as F)	APHA 23rd Edition, 4500 F D	0.13	mg/l	1.5
19	Lead (as Pb)	APHA 23rd Edition, 3111 B	ND	mg/l	0.01
20	Arsenic (as As)	APHA 23rd Edition, 3114 B	< 0.002	mg/l	0.05
21	Zinc (as Zn)	APHA 23rd Edition, 3111 B	< 0.02	mg/l	15.0
22	Total Chromium (as Cr)	APHA 23rd Edition, 3111 B	ND	mg/l	0.05

ND: Non Detectable.

Test Done By

CLEENVIRON PRIVATE LIMITED ROURKELA

Verified By

Authorized Signatory
Subhanga Praharaj
Managing Director

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Consultant and Engineers in Environmental Pollution Control & Monitoring with Laboratory Facility.

TEST REPORT FOR WATER QUALITY ANALYSIS

FORMAT NO:CPL/F/W/03

REPORT NO: CPL/R/W/OCT-23/13N

REPORT ISSUE DATE: 16.10.2023

SAMPLE SUBMITTED BY CUSTOMER

Name of the Customer	:	**SRK MINING SERVICES (INDIA) PRIVATE LIMITED**
Address of the Customer	:	DD 30, 5th Floor, "Andromeda", Sector – 1, Salt Lake City, Kolkata – 700064
Sample ID No	:	**CPL/W/OCT-23/8**
Sample Description	:	Ground Water
Location of Sampling	:	Kadodiha
Container ID	:	**GW07**
Condition of Sample while receipt	:	Sealed
Appearance of Sample while receipt	:	Turbid
Sample Received on	:	09.10.2023
Date of Test	:	09.10.2023 – 16.10.2023

Sl No	Parameter	Method of Analysis	Results Obtained	Unit	Permissible Limit in absence of Alternate Source as per IS 10500: 2012
1	Colour	APHA 23rd Edition, 2120 B	< 5	Hazen	15
2	Odour	APHA 23rd Edition, 2150 B	Agreeable	-	Agreeable

Test Done By

CLEENVIRON PRIVATE LIMITED ROURKELA

Verified By

Authorized Signatory
Subhanga Praharaj
Managing Director

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TC - 6816

TEST REPORT FOR WATER QUALITY ANALYSIS

FORMAT NO:CPL/F/6/00

ULR – TC681623000002332F
REPORT NO: CPL/R/W/OCT-23/14

REPORT ISSUE DATE: 16.10.2023

SAMPLE SUBMITTED BY CUSTOMER

Name of the Customer	:	**SRK MINING SERVICES (INDIA) PRIVATE LIMITED**
Address of the Customer	:	DD 30, 5th Floor, "Andromeda", Sector – 1, Salt Lake City, Kolkata – 700064
Sample ID No	:	CPL/W/OCT-23/9
Sample Description	:	Ground Water
Location of Sampling	:	Rugudih
Container ID	:	GW08
Condition of Sample while receipt	:	Sealed
Appearance of Sample while receipt	:	Turbid
Sample Received on	:	09.10.2023
Date of Test	:	09.10.2023 – 16.10.2023

Sl No	Parameter	Method of Analysis	Results Obtained	Unit	Permissible Limit in absence of Alternate Source as per IS 10500: 2012
1	Turbidity	APHA 23rd Edition, 2130 B	50.2	NTU	5.0
2	pH Value	APHA 23rd Edition, 4500 H+B	5.56	-	6.5 – 8.5
3	Total Hardness (as $CaCO_3$)	APHA 23rd Edition, 2340 C	56	mg/l	600
4	Iron (as Fe)	APHA 23rd Edition, 3500 Fe B	0.96	mg/l	0.3
5	Chloride (as Cl)	APHA 23rd Edition, 4500 Cl B	30.55	mg/l	1000
6	Total Dissolved Solids	APHA 23rd Edition, 2540 B	109	mg/l	2000
7	Electrical Conductivity	APHA 23rd Edition, 2510 B	175.5	µS/cm	-
8	Calcium (as Ca)	APHA 23rd Edition, 3500 Ca B	9.62	mg/l	200
9	Magnesium (as Mg)	APHA 23rd Edition, 3500 Mg B	7.78	mg/l	100
10	Manganese (as Mn)	APHA 23rd Edition, 3500 Mn B	< 0.05	mg/l	0.3
11	Sulfate (as SO_4)	APHA 23rd Edition, 4500 SO_4^{2-} E	< 0.50	mg/l	400
12	Total Nitrate (as NO_3)	APHA 23rd Edition, 4500 NO_3 B	19.84	mg/l	45
13	Carbonate Alkalinity	APHA 23rd Edition, 2320 B	< 4.0	mg/l	-
14	Bicarbonate Alkalinity	APHA 23rd Edition, 2320 B	32	mg/l	-
15	Sulphide (as H_2S)	APHA 23rd Edition, 4500 S^{2-} D	< 0.02	mg/l	0.05
16	Sodium (as Na)	APHA 23rd Edition, 3500 Na B	8.57	mg/l	-
17	Potassium (as K)	APHA 23rd Edition, 3500 K B	0.75	mg/l	-
18	Fluoride (as F)	APHA 23rd Edition, 4500 F D	0.20	mg/l	1.5
19	Lead (as Pb)	APHA 23rd Edition, 3111 B	ND	mg/l	0.01
20	Arsenic (as As)	APHA 23rd Edition, 3114 B	< 0.002	mg/l	0.05
21	Zinc (as Zn)	APHA 23rd Edition, 3111 B	< 0.02	mg/l	15.0
22	Total Chromium (as Cr)	APHA 23rd Edition, 3111 B	ND	mg/l	0.05

ND: Non Detectable.

Test Done By

CLEENVIRON PRIVATE LIMITED ROURKELA

Verified By

Authorized Signatory
Subhanga Praharaj
Managing Director

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TEST REPORT FOR WATER QUALITY ANALYSIS

FORMAT NO:CPL/F/8/03

REPORT NO: CPL/R/W/OCT-23/14N

REPORT ISSUE DATE: 16.10.2023

SAMPLE SUBMITTED BY CUSTOMER

Name of the Customer	:	**SRK MINING SERVICES (INDIA) PRIVATE LIMITED**
Address of the Customer	:	DD 30, 5th Floor, "Andromeda", Sector – 1, Salt Lake City, Kolkata – 700064
Sample ID No	:	CPL/W/OCT-23/9
Sample Description	:	Ground Water
Location of Sampling	:	Rugudih
Container ID	:	GW08
Condition of Sample while receipt	:	Sealed
Appearance of Sample while receipt	:	Turbid
Sample Received on	:	09.10.2023
Date of Test	:	09.10.2023 – 16.10.2023

Sl No	Parameter	Method of Analysis	Results Obtained	Unit	Permissible Limit in absence of Alternate Source as per IS 10500: 2012
1	Colour	APHA 23rd Edition, 2120 B	< 5	Hazen	15
2	Odour	APHA 23rd Edition, 2150 B	Agreeable	-	Agreeable

Test Done By

Verified By

CLEENVIRON PRIVATE LIMITED ROURKELA

Authorized Signatory
Subhanga Praharaj
Managing Director

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TC - 8916

TEST REPORT FOR WATER QUALITY ANALYSIS

FORMAT NO:CPL/F/8990

ULR – TC681623000002333F
REPORT NO: CPL/R/W/OCT-23/15

REPORT ISSUE DATE: 16.10.2023

SAMPLE SUBMITTED BY CUSTOMER

Name of the Customer	:	**SRK MINING SERVICES (INDIA) PRIVATE LIMITED**
Address of the Customer	:	DD 30, 5th Floor, "Andromeda", Sector – 1, Salt Lake City, Kolkata – 700064
Sample ID No	:	**CPL/W/OCT-23/10**
Sample Description	:	Ground Water
Location of Sampling	:	Tonto
Container ID	:	**GW09**
Condition of Sample while receipt	:	Sealed
Appearance of Sample while receipt	:	Clear
Sample Received on	:	09.10.2023
Date of Test	:	09.10.2023 – 16.10.2023

Sl No	Parameter	Method of Analysis	Results Obtained	Unit	Permissible Limit in absence of Alternate Source as per IS 10500: 2012
1	Turbidity	APHA 23rd Edition, 2130 B	5.1	NTU	5.0
2	pH Value	APHA 23rd Edition, 4500 H+B	6.61	-	6.5 – 8.5
3	Total Hardness (as $CaCO_3$)	APHA 23rd Edition, 2340 C	332	mg/l	600
4	Iron (as Fe)	APHA 23rd Edition, 3500 Fe B	0.26	mg/l	0.3
5	Chloride (as Cl)	APHA 23rd Edition, 4500 Cl B	38.43	mg/l	1000
6	Total Dissolved Solids	APHA 23rd Edition, 2540 B	436	mg/l	2000
7	Electrical Conductivity	APHA 23rd Edition, 2510 B	726	µS/cm	-
8	Calcium (as Ca)	APHA 23rd Edition, 3500 Ca B	76.95	mg/l	200
9	Magnesium (as Mg)	APHA 23rd Edition, 3500 Mg B	34.02	mg/l	100
10	Manganese (as Mn)	APHA 23rd Edition, 3500 Mn B	< 0.05	mg/l	0.3
11	Sulfate (as SO_4)	APHA 23rd Edition, 4500 SO_4^{2-} E	35.82	mg/l	400
12	Total Nitrate (as NO_3)	APHA 23rd Edition, 4500 NO_3 B	14.83	mg/l	45
13	Carbonate Alkalinity	APHA 23rd Edition, 2320 B	< 4.0	mg/l	-
14	Bicarbonate Alkalinity	APHA 23rd Edition, 2320 B	252	mg/l	-
15	Sulphide (as H_2S)	APHA 23rd Edition, 4500 S^{2-} D	< 0.02	mg/l	0.05
16	Sodium (as Na)	APHA 23rd Edition, 3500 Na B	24.06	mg/l	-
17	Potassium (as K)	APHA 23rd Edition, 3500 K B	8.83	mg/l	-
18	Fluoride (as F)	APHA 23rd Edition, 4500 F C	0.20	mg/l	1.5
19	Lead (as Pb)	APHA 23rd Edition, 3111 B	ND	mg/l	0.01
20	Arsenic (as As)	APHA 23rd Edition, 3114 B	< 0.002	mg/l	0.05
21	Zinc (as Zn)	APHA 23rd Edition, 3111 B	< 0.02	mg/l	15.0
22	Total Chromium (as Cr)	APHA 23rd Edition, 3111 B	ND	mg/l	0.05

ND: Non Detectable.

CLEENVIRON PRIVATE LIMITED ROURKELA

Test Done By

Verified By

Authorized Signatory
Subhanga Praharaj
Managing Director

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TEST REPORT FOR WATER QUALITY ANALYSIS

FORMAT NO: CPL/FM/60

REPORT NO: CPL/R/W/OCT-23/15N

REPORT ISSUE DATE: 16.10.2023

SAMPLE SUBMITTED BY CUSTOMER

Name of the Customer	:	**SRK MINING SERVICES (INDIA) PRIVATE LIMITED**
Address of the Customer	:	DD 30, 5th Floor, "Andromeda", Sector – 1, Salt Lake City, Kolkata – 700064
Sample ID No	:	**CPL/W/OCT-23/10**
Sample Description	:	Ground Water
Location of Sampling	:	Tonto
Container ID	:	**GW09**
Condition of Sample while receipt	:	Sealed
Appearance of Sample while receipt	:	Clear
Sample Received on	:	09.10.2023
Date of Test	:	09.10.2023 – 16.10.2023

Sl No	Parameter	Method of Analysis	Results Obtained	Unit	Permissible Limit in absence of Alternate Source as per IS 10500: 2012
1	Colour	APHA 23rd Edition, 2120 B	< 5	Hazen	15
2	Odour	APHA 23rd Edition, 2150 B	Agreeable	-	Agreeable

Test Done By

CLEENVIRON PRIVATE LIMITED ROURKELA

Verified By

Authorized Signatory
Subhanga Praharaj
Managing Director

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TC - 8916

TEST REPORT FOR WATER QUALITY ANALYSIS

FORMAT NO:CPL/FM/03

ULR – TC681623000002334F
REPORT NO: CPL/R/W/OCT-23/16

REPORT ISSUE DATE: 16.10.2023

SAMPLE SUBMITTED BY CUSTOMER

Name of the Customer	:	**SRK MINING SERVICES (INDIA) PRIVATE LIMITED**
Address of the Customer	:	DD 30, 5th Floor, "Andromeda", Sector – 1, Salt Lake City, Kolkata – 700064
Sample ID No	:	**CPL/W/OCT-23/11**
Sample Description	:	Ground Water
Location of Sampling	:	Kundrupani
Container ID	:	**GW10**
Condition of Sample while receipt	:	Sealed
Appearance of Sample while receipt	:	Turbid
Sample Received on	:	09.10.2023
Date of Test	:	09.10.2023 – 16.10.2023

Sl No	Parameter	Method of Analysis	Results Obtained	Unit	Permissible Limit in absence of Alternate Source as per IS 10500: 2012
1	Turbidity	APHA 23rd Edition, 2130 B	61.8	NTU	5.0
2	pH Value	APHA 23rd Edition, 4500 H+B	6.02	-	6.5 – 8.5
3	Total Hardness (as $CaCO_3$)	APHA 23rd Edition, 2340 C	60	mg/l	600
4	Iron (as Fe)	APHA 23rd Edition, 3500 Fe B	0.33	mg/l	0.3
5	Chloride (as Cl)	APHA 23rd Edition, 4500 Cl B	36.46	mg/l	1000
6	Total Dissolved Solids	APHA 23rd Edition, 2540 B	124	mg/l	2000
7	Electrical Conductivity	APHA 23rd Edition, 2510 B	207	µS/cm	-
8	Calcium (as Ca)	APHA 23rd Edition, 3500 Ca B	14.43	mg/l	200
9	Magnesium (as Mg)	APHA 23rd Edition, 3500 Mg B	5.83	mg/l	100
10	Manganese (as Mn)	APHA 23rd Edition, 3500 Mn B	< 0.05	mg/l	0.3
11	Sulfate (as SO_4)	APHA 23rd Edition, 4500 SO_4^{2-} E	< 0.50	mg/l	400
12	Total Nitrate (as NO_3)	APHA 23rd Edition, 4500 NO_3 B	26.92	mg/l	45
13	Carbonate Alkalinity	APHA 23rd Edition, 2320 B	< 4.0	mg/l	-
14	Bicarbonate Alkalinity	APHA 23rd Edition, 2320 B	08	mg/l	-
15	Sulphide (as H_2S)	APHA 23rd Edition, 4500 S^{2-} D	< 0.02	mg/l	0.05
16	Sodium (as Na)	APHA 23rd Edition, 3500 Na B	14.87	mg/l	-
17	Potassium (as K)	APHA 23rd Edition, 3500 K B	1.55	mg/l	-
18	Fluoride (as F)	APHA 23rd Edition, 4500 F D	0.30	mg/l	1.5
19	Lead (as Pb)	APHA 23rd Edition, 3111 B	ND	mg/l	0.01
20	Arsenic (as As)	APHA 23rd Edition, 3114 B	< 0.002	mg/l	0.05
21	Zinc (as Zn)	APHA 23rd Edition, 3111 B	< 0.02	mg/l	15.0
22	Total Chromium (as Cr)	APHA 23rd Edition, 3111 B	ND	mg/l	0.05

ND: Non Detectable.

Test Done By

CLEENVIRON PRIVATE LIMITED ROURKELA

Verified By

Authorized Signatory
Subhanga Praharaj
Managing Director

***** End of Test Report *****

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TEST REPORT FOR WATER QUALITY ANALYSIS

FORMAT NO:CPL/F/950

REPORT NO: CPL/R/W/OCT-23/16N

REPORT ISSUE DATE: 16.10.2023

SAMPLE SUBMITTED BY CUSTOMER

Name of the Customer	:	**SRK MINING SERVICES (INDIA) PRIVATE LIMITED**
Address of the Customer	:	DD 30, 5th Floor, "Andromeda", Sector – 1, Salt Lake City, Kolkata – 700064
Sample ID No	:	**CPL/W/OCT-23/11**
Sample Description	:	Ground Water
Location of Sampling	:	Kundrupani
Container ID	:	**GW10**
Condition of Sample while receipt	:	Sealed
Appearance of Sample while receipt	:	Turbid
Sample Received on	:	09.10.2023
Date of Test	:	09.10.2023 – 16.10.2023

Sl No	Parameter	Method of Analysis	Results Obtained	Unit	Permissible Limit in absence of Alternate Source as per IS 10500: 2012
1	Colour	APHA 23rd Edition, 2120 B	< 5	Hazen	15
2	Odour	APHA 23rd Edition, 2150 B	Agreeable	-	Agreeable

Test Done By

CLEENVIRON PRIVATE LIMITED ROURKELA

Verified By

Authorized Signatory
Subhanga Praharaj
Managing Director

***** End of Test Report *****

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TC - 6916

TEST REPORT FOR WATER QUALITY ANALYSIS

FORMAT NO:CPL/F/R/01

ULR – TC681623000002335F
REPORT NO: CPL/R/W/OCT-23/17

REPORT ISSUE DATE: 16.10.2023

SAMPLE SUBMITTED BY CUSTOMER

Name of the Customer	:	**SRK MINING SERVICES (INDIA) PRIVATE LIMITED**
Address of the Customer	:	DD 30, 5th Floor, "Andromeda", Sector – 1, Salt Lake City, Kolkata – 700064
Sample ID No	:	CPL/W/OCT-23/12
Sample Description	:	Ground Water
Location of Sampling	:	Balagoda
Container ID	:	GW11
Condition of Sample while receipt	:	Sealed
Appearance of Sample while receipt	:	Turbid
Sample Received on	:	09.10.2023
Date of Test	:	09.10.2023 – 16.10.2023

Sl No	Parameter	Method of Analysis	Results Obtained	Unit	Permissible Limit in absence of Alternate Source as per IS 10500: 2012
1	Turbidity	APHA 23rd Edition, 2130 B	24.5	NTU	5.0
2	pH Value	APHA 23rd Edition, 4500 H+B	6.41	-	6.5 – 8.5
3	Total Hardness (as $CaCO_3$)	APHA 23rd Edition, 2340 C	212	mg/l	600
4	Iron (as Fe)	APHA 23rd Edition, 3500 Fe B	0.88	mg/l	0.3
5	Chloride (as Cl)	APHA 23rd Edition, 4500 Cl B	19.71	mg/l	1000
6	Total Dissolved Solids	APHA 23rd Edition, 2540 B	224	mg/l	2000
7	Electrical Conductivity	APHA 23rd Edition, 2510 B	368	µS/cm	-
8	Calcium (as Ca)	APHA 23rd Edition, 3500 Ca B	54.61	mg/l	200
9	Magnesium (as Mg)	APHA 23rd Edition, 3500 Mg B	18.45	mg/l	100
10	Manganese (as Mn)	APHA 23rd Edition, 3500 Mn B	< 0.05	mg/l	0.3
11	Sulfate (as SO_4)	APHA 23rd Edition, 4500 SO_4^{2-} E	10.24	mg/l	400
12	Total Nitrate (as NO_3)	APHA 23rd Edition, 4500 NO_3 B	< 0.50	mg/l	45
13	Carbonate Alkalinity	APHA 23rd Edition, 2320 B	< 4.0	mg/l	-
14	Bicarbonate Alkalinity	APHA 23rd Edition, 2320 B	108	mg/l	-
15	Sulphide (as H_2S)	APHA 23rd Edition, 4500 S^{2-} D	< 0.02	mg/l	0.05
16	Sodium (as Na)	APHA 23rd Edition, 3500 Na B	12.58	mg/l	-
17	Potassium (as K)	APHA 23rd Edition, 3500 K B	6.32	mg/l	-
18	Fluoride (as F)	APHA 23rd Edition, 4500 F D	1.96	mg/l	1.5
19	Lead (as Pb)	APHA 23rd Edition, 3111 B	ND	mg/l	0.01
20	Arsenic (as As)	APHA 23rd Edition, 3114 B	< 0.002	mg/l	0.05
21	Zinc (as Zn)	APHA 23rd Edition, 3111 B	< 0.02	mg/l	15.0
22	Total Chromium (as Cr)	APHA 23rd Edition, 3111 B	ND	mg/l	0.05

ND: Non Detectable.

Test Done By

CLEENVIRON PRIVATE LIMITED ROURKELA

Verified By

Authorized Signatory
Subhanga Praharaj
Managing Director

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Tele Fax: 0661 – 2475746, email: cleenviron@gmail.com

Cleenviron Private Limited

Consultant and Engineers in Environmental Pollution Control & Monitoring with Laboratory Facility.

TEST REPORT FOR WATER QUALITY ANALYSIS

FORMAT NO:CPL/FM/60

REPORT NO: CPL/R/W/OCT-23/17N

REPORT ISSUE DATE: 16.10.2023

SAMPLE SUBMITTED BY CUSTOMER

Name of the Customer	:	**SRK MINING SERVICES (INDIA) PRIVATE LIMITED**
Address of the Customer	:	DD 30, 5th Floor, "Andromeda", Sector – 1, Salt Lake City, Kolkata – 700064
Sample ID No	:	CPL/W/OCT-23/12
Sample Description	:	Ground Water
Location of Sampling	:	Balagoda
Container ID	:	GW11
Condition of Sample while receipt	:	Sealed
Appearance of Sample while receipt	:	Turbid
Sample Received on	:	09.10.2023
Date of Test	:	09.10.2023 – 16.10.2023

Sl No	Parameter	Method of Analysis	Results Obtained	Unit	Permissible Limit in absence of Alternate Source as per IS 10500: 2012
1	Colour	APHA 23rd Edition, 2120 B	< 5	Hazen	15
2	Odour	APHA 23rd Edition, 2150 B	Agreeable	-	Agreeable

Test Done By

CLEENVIRON PRIVATE LIMITED ROURKELA

Verified By

Authorized Signatory
Subhanga Praharaj
Managing Director

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TC - 8816

TEST REPORT FOR WATER QUALITY ANALYSIS

FORMAT NO:CPL/F/M/00

ULR – TC681623000002336F
REPORT NO: CPL/R/W/OCT-23/18

REPORT ISSUE DATE: 16.10.2023

SAMPLE SUBMITTED BY CUSTOMER

Name of the Customer	:	**SRK MINING SERVICES (INDIA) PRIVATE LIMITED**
Address of the Customer	:	DD 30, 5th Floor, "Andromeda", Sector – 1, Salt Lake City, Kolkata – 700064
Sample ID No	:	**CPL/W/OCT-23/13**
Sample Description	:	Ground Water
Location of Sampling	:	Laserda
Container ID	:	**GW12**
Condition of Sample while receipt	:	Sealed
Appearance of Sample while receipt	:	Clear
Sample Received on	:	09.10.2023
Date of Test	:	09.10.2023 – 16.10.2023

Sl No	Parameter	Method of Analysis	Results Obtained	Unit	Permissible Limit in absence of Alternate Source as per IS 10500: 2012
1	Turbidity	APHA 23rd Edition, 2130 B	6.6	NTU	5.0
2	pH Value	APHA 23rd Edition, 4500 H+B	6.32	-	6.5 – 8.5
3	Total Hardness (as $CaCO_3$)	APHA 23rd Edition, 2340 C	120	mg/l	600
4	Iron (as Fe)	APHA 23rd Edition, 3500 Fe B	0.44	mg/l	0.3
5	Chloride (as Cl)	APHA 23rd Edition, 4500 Cl B	5.91	mg/l	1000
6	Total Dissolved Solids	APHA 23rd Edition, 2540 B	127	mg/l	2000
7	Electrical Conductivity	APHA 23rd Edition, 2510 B	205	µS/cm	-
8	Calcium (as Ca)	APHA 23rd Edition, 3500 Ca B	24.05	mg/l	200
9	Magnesium (as Mg)	APHA 23rd Edition, 3500 Mg B	14.58	mg/l	100
10	Manganese (as Mn)	APHA 23rd Edition, 3500 Mn B	< 0.05	mg/l	0.3
11	Sulfate (as SO_4)	APHA 23rd Edition, 4500 SO_4^{2-} E	1.82	mg/l	400
12	Total Nitrate (as NO_3)	APHA 23rd Edition, 4500 NO_3 B	< 2.20	mg/l	45
13	Carbonate Alkalinity	APHA 23rd Edition, 2320 B	< 4.0	mg/l	-
14	Bicarbonate Alkalinity	APHA 23rd Edition, 2320 B	72	mg/l	-
15	Sulphide (as H_2S)	APHA 23rd Edition, 4500 S^{2-} D	< 0.02	mg/l	0.05
16	Sodium (as Na)	APHA 23rd Edition, 3500 Na B	14.59	mg/l	-
17	Potassium (as K)	APHA 23rd Edition, 3500 K B	2.19	mg/l	-
18	Fluoride (as F)	APHA 23rd Edition, 4500 F C	0.50	mg/l	1.5
19	Lead (as Pb)	APHA 23rd Edition, 3111 B	ND	mg/l	0.01
20	Arsenic (as As)	APHA 23rd Edition, 3114 B	< 0.002	mg/l	0.05
21	Zinc (as Zn)	APHA 23rd Edition, 3111 B	< 0.02	mg/l	15.0
22	Total Chromium (as Cr)	APHA 23rd Edition, 3111 B	ND	mg/l	0.05

ND: Non Detectable.

Test Done By

CLEENVIRON PRIVATE LIMITED ROURKELA

Verified By

Authorized Signatory
Subhanga Praharaj
Managing Director

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TEST REPORT FOR WATER QUALITY ANALYSIS

FORMAT NO:CPL/FR/03

REPORT NO: CPL/R/W/OCT-23/18N

REPORT ISSUE DATE: 16.10.2023

SAMPLE SUBMITTED BY CUSTOMER

Name of the Customer	:	**SRK MINING SERVICES (INDIA) PRIVATE LIMITED**
Address of the Customer	:	DD 30, 5th Floor, "Andromeda", Sector – 1, Salt Lake City, Kolkata – 700064
Sample ID No	:	**CPL/W/OCT-23/13**
Sample Description	:	Ground Water
Location of Sampling	:	Lasarda
Container ID	:	**GW12**
Condition of Sample while receipt	:	Sealed
Appearance of Sample while receipt	:	Clear
Sample Received on	:	09.10.2023
Date of Test	:	09.10.2023 – 16.10.2023

Sl No	Parameter	Method of Analysis	Results Obtained	Unit	Permissible Limit in absence of Alternate Source as per IS 10500: 2012
1	Colour	APHA 23rd Edition, 2120 B	< 5	Hazen	15
2	Odour	APHA 23rd Edition, 2150 B	Agreeable	-	Agreeable

Test Done By

CLEENVIRON PRIVATE LIMITED ROURKELA

Verified By

Authorized Signatory
Subhanga Praharaj
Managing Director

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TC - 6818

TEST REPORT FOR WATER QUALITY ANALYSIS

FORMAT NO:CPL/F/M/60

ULR – TC681623000002337F
REPORT NO: CPL/R/W/OCT-23/19

REPORT ISSUE DATE: 16.10.2023

SAMPLE SUBMITTED BY CUSTOMER

Name of the Customer	:	**SRK MINING SERVICES (INDIA) PRIVATE LIMITED**
Address of the Customer	:	DD 30, 5th Floor, "Andromeda", Sector – 1, Salt Lake City, Kolkata – 700064
Sample ID No	:	CPL/W/OCT-23/14
Sample Description	:	Ground Water
Location of Sampling	:	Karmapada
Container ID	:	GW13
Condition of Sample while receipt	:	Sealed
Appearance of Sample while receipt	:	Clear
Sample Received on	:	09.10.2023
Date of Test	:	09.10.2023 – 16.10.2023

Sl No	Parameter	Method of Analysis	Results Obtained	Unit	Permissible Limit in absence of Alternate Source as per IS 10500: 2012
1	Turbidity	APHA 23rd Edition, 2130 B	0.10	NTU	5.0
2	pH Value	APHA 23rd Edition, 4500 H+B	6.16	-	6.5 – 8.5
3	Total Hardness (as $CaCO_3$)	APHA 23rd Edition, 2340 C	48	mg/l	600
4	Iron (as Fe)	APHA 23rd Edition, 3500 Fe B	0.14	mg/l	0.3
5	Chloride (as Cl)	APHA 23rd Edition, 4500 Cl B	6.89	mg/l	1000
6	Total Dissolved Solids	APHA 23rd Edition, 2540 B	53	mg/l	2000
7	Electrical Conductivity	APHA 23rd Edition, 2510 B	87.6	µS/cm	-
8	Calcium (as Ca)	APHA 23rd Edition, 3500 Ca B	9.62	mg/l	200
9	Magnesium (as Mg)	APHA 23rd Edition, 3500 Mg B	5.83	mg/l	100
10	Manganese (as Mn)	APHA 23rd Edition, 3500 Mn B	< 0.05	mg/l	0.3
11	Sulfate (as SO_4)	APHA 23rd Edition, 4500 SO_4^{2-} E	< 0.50	mg/l	400
12	Total Nitrate (as NO_3)	APHA 23rd Edition, 4500 NO_3 B	< 2.20	mg/l	45
13	Carbonate Alkalinity	APHA 23rd Edition, 2320 B	< 4.0	mg/l	-
14	Bicarbonate Alkalinity	APHA 23rd Edition, 2320 B	32	mg/l	-
15	Sulphide (as H_2S)	APHA 23rd Edition, 4500 S^{2-} D	< 0.02	mg/l	0.05
16	Sodium (as Na)	APHA 23rd Edition, 3500 Na B	2.27	mg/l	-
17	Potassium (as K)	APHA 23rd Edition, 3500 K B	0.22	mg/l	-
18	Fluoride (as F)	APHA 23rd Edition, 4500 F D	0.20	mg/l	1.5
19	Lead (as Pb)	APHA 23rd Edition, 3111 B	ND	mg/l	0.01
20	Arsenic (as As)	APHA 23rd Edition, 3114 B	< 0.002	mg/l	0.05
21	Zinc (as Zn)	APHA 23rd Edition, 3111 B	< 0.02	mg/l	15.0
22	Total Chromium (as Cr)	APHA 23rd Edition, 3111 B	ND	mg/l	0.05

ND: Non Detectable.

Test Done By

CLEENVIRON PRIVATE LIMITED ROURKELA

Verified By

Authorized Signatory
Subhanga Prahsraj
Managing Director

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TEST REPORT FOR WATER QUALITY ANALYSIS

FORMAT NO:CPL/F/W/01

REPORT NO: CPL/R/W/OCT-23/19N

REPORT ISSUE DATE: 16.10.2023

SAMPLE SUBMITTED BY CUSTOMER

Name of the Customer	:	**SRK MINING SERVICES (INDIA) PRIVATE LIMITED**
Address of the Customer	:	DD 30, 5th Floor, "Andromeda", Sector – 1, Salt Lake City, Kolkata – 700064
Sample ID No	:	CPL/W/OCT-23/14
Sample Description	:	Ground Water
Location of Sampling	:	Karmapada
Container ID	:	GW13
Condition of Sample while receipt	:	Sealed
Appearance of Sample while receipt	:	Clear
Sample Received on	:	09.10.2023
Date of Test	:	09.10.2023 – 16.10.2023

Sl No	Parameter	Method of Analysis	Results Obtained	Unit	Permissible Limit in absence of Alternate Source as per IS 10500: 2012
1	Colour	APHA 23rd Edition, 2120 B	< 5	Hazen	15
2	Odour	APHA 23rd Edition, 2150 B	Agreeable	-	Agreeable

Test Done By

CLEENVIRON PRIVATE LIMITED ROURKELA

Verified By

Authorized Signatory
Subhanga Praharaj
Managing Director

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TC - 6818

TEST REPORT FOR WATER QUALITY ANALYSIS

FORMAT NO:CPL/F/950

ULR – TC681623000002338F
REPORT NO: CPL/R/W/OCT-23/20

REPORT ISSUE DATE: 16.10.2023

SAMPLE SUBMITTED BY CUSTOMER

Name of the Customer	:	**SRK MINING SERVICES (INDIA) PRIVATE LIMITED**
Address of the Customer	:	DD 30, 5th Floor, "Andromeda", Sector – 1, Salt Lake City, Kolkata – 700064
Sample ID No	:	CPL/W/OCT-23/15
Sample Description	:	Ground Water
Location of Sampling	:	Patliposi
Container ID	:	GW14
Condition of Sample while receipt	:	Sealed
Appearance of Sample while receipt	:	Turbid
Sample Received on	:	09.10.2023
Date of Test	:	09.10.2023 – 16.10.2023

Sl No	Parameter	Method of Analysis	Results Obtained	Unit	Permissible Limit in absence of Alternate Source as per IS 10500: 2012
1	Turbidity	APHA 23rd Edition, 2130 B	41.9	NTU	5.0
2	pH Value	APHA 23rd Edition, 4500 H+B	5.44	-	6.5 – 8.5
3	Total Hardness (as $CaCO_3$)	APHA 23rd Edition, 2340 C	44	mg/l	600
4	Iron (as Fe)	APHA 23rd Edition, 3500 Fe B	6.49	mg/l	0.3
5	Chloride (as Cl)	APHA 23rd Edition, 4500 Cl B	4.93	mg/l	1000
6	Total Dissolved Solids	APHA 23rd Edition, 2540 B	53	mg/l	2000
7	Electrical Conductivity	APHA 23rd Edition, 2510 B	88	µS/cm	-
8	Calcium (as Ca)	APHA 23rd Edition, 3500 Ca B	14.43	mg/l	200
9	Magnesium (as Mg)	APHA 23rd Edition, 3500 Mg B	1.94	mg/l	100
10	Manganese (as Mn)	APHA 23rd Edition, 3500 Mn B	< 0.05	mg/l	0.3
11	Sulfate (as SO_4)	APHA 23rd Edition, 4500 SO_4^{2-} E	2.84	mg/l	400
12	Total Nitrate (as NO_3)	APHA 23rd Edition, 4500 NO_3 B	2.24	mg/l	45
13	Carbonate Alkalinity	APHA 23rd Edition, 2320 B	< 4.0	mg/l	-
14	Bicarbonate Alkalinity	APHA 23rd Edition, 2320 B	28	mg/l	-
15	Sulphide (as H_2S)	APHA 23rd Edition, 4500 S^{2-} D	< 0.02	mg/l	0.05
16	Sodium (as Na)	APHA 23rd Edition, 3500 Na B	1.49	mg/l	-
17	Potassium (as K)	APHA 23rd Edition, 3500 K B	0.18	mg/l	-
18	Fluoride (as F)	APHA 23rd Edition, 4500 F D	0.10	mg/l	1.5
19	Lead (as Pb)	APHA 23rd Edition, 3111 B	ND	mg/l	0.01
20	Arsenic (as As)	APHA 23rd Edition, 3114 B	< 0.002	mg/l	0.05
21	Zinc (as Zn)	APHA 23rd Edition, 3111 B	< 0.02	mg/l	15.0
22	Total Chromium (as Cr)	APHA 23rd Edition, 3111 B	ND	mg/l	0.05

ND: Non Detectable.

Test Done By

CLEENVIRON PRIVATE LIMITED ROURKELA

Verified By

Authorized Signatory
Subhanga Prahraj
Managing Director

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TEST REPORT FOR WATER QUALITY ANALYSIS

FORMAT NO:CPL/F/990

REPORT NO: CPL/R/W/OCT-23/20N

REPORT ISSUE DATE: 16.10.2023

SAMPLE SUBMITTED BY CUSTOMER

Name of the Customer	:	**SRK MINING SERVICES (INDIA) PRIVATE LIMITED**
Address of the Customer	:	DD 30, 5th Floor, "Andromeda", Sector – 1, Salt Lake City, Kolkata – 700064
Sample ID No	:	**CPL/W/OCT-23/15**
Sample Description	:	Ground Water
Location of Sampling	:	Patliposi
Container ID	:	**GW14**
Condition of Sample while receipt	:	Sealed
Appearance of Sample while receipt	:	Turbid
Sample Received on	:	09.10.2023
Date of Test	:	09.10.2023 – 16.10.2023

Sl No	Parameter	Method of Analysis	Results Obtained	Unit	Permissible Limit in absence of Alternate Source as per IS 10500: 2012
1	Colour	APHA 23rd Edition, 2120 B	< 5	Hazen	15
2	Odour	APHA 23rd Edition, 2150 B	Agreeable	-	Agreeable

Test Done By

CLEENVIRON PRIVATE LIMITED ROURKELA

Verified By

Authorized Signatory
Subhanga Praharaj
Managing Director

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TC - 6898

TEST REPORT FOR WATER QUALITY ANALYSIS

FORMAT NO: CPL/F/M/60

ULR – TC681623000002339F
REPORT NO: CPL/R/W/OCT-23/21

REPORT ISSUE DATE: 16.10.2023

SAMPLE SUBMITTED BY CUSTOMER

Name of the Customer	:	**SRK MINING SERVICES (INDIA) PRIVATE LIMITED**
Address of the Customer	:	DD 30, 5th Floor, "Andromeda", Sector – 1, Salt Lake City, Kolkata – 700064
Sample ID No	:	CPL/W/OCT-23/16
Sample Description	:	Ground Water
Location of Sampling	:	Thengrai
Container ID	:	GW15
Condition of Sample while receipt	:	Sealed
Appearance of Sample while receipt	:	Clear
Sample Received on	:	09.10.2023
Date of Test	:	09.10.2023 – 16.10.2023

Sl No	Parameter	Method of Analysis	Results Obtained	Unit	Permissible Limit in absence of Alternate Source as per IS 10500: 2012
1	Turbidity	APHA 23rd Edition, 2130 B	7.2	NTU	5.0
2	pH Value	APHA 23rd Edition, 4500 H+B	6.05	-	6.5 – 8.5
3	Total Hardness (as $CaCO_3$)	APHA 23rd Edition, 2340 C	32	mg/l	600
4	Iron (as Fe)	APHA 23rd Edition, 3500 Fe B	0.93	mg/l	0.3
5	Chloride (as Cl)	APHA 23rd Edition, 4500 Cl B	7.88	mg/l	1000
6	Total Dissolved Solids	APHA 23rd Edition, 2540 B	43	mg/l	2000
7	Electrical Conductivity	APHA 23rd Edition, 2510 B	69.8	µS/cm	-
8	Calcium (as Ca)	APHA 23rd Edition, 3500 Ca B	8.02	mg/l	200
9	Magnesium (as Mg)	APHA 23rd Edition, 3500 Mg B	2.92	mg/l	100
10	Manganese (as Mn)	APHA 23rd Edition, 3500 Mn B	< 0.05	mg/l	0.3
11	Sulfate (as SO_4)	APHA 23rd Edition, 4500 SO_4^{2-} E	< 0.50	mg/l	400
12	Total Nitrate (as NO_3)	APHA 23rd Edition, 4500 NO_3 B	< 2.20	mg/l	45
13	Carbonate Alkalinity	APHA 23rd Edition, 2320 B	< 4.0	mg/l	-
14	Bicarbonate Alkalinity	APHA 23rd Edition, 2320 B	24	mg/l	-
15	Sulphide (as H_2S)	APHA 23rd Edition, 4500 S^{2-} D	< 0.02	mg/l	0.05
16	Sodium (as Na)	APHA 23rd Edition, 3500 Na B	1.88	mg/l	-
17	Potassium (as K)	APHA 23rd Edition, 3500 K B	0.24	mg/l	-
18	Fluoride (as F)	APHA 23rd Edition, 4500 F D	0.30	mg/l	1.5
19	Lead (as Pb)	APHA 23rd Edition, 3111 B	ND	mg/l	0.01
20	Arsenic (as As)	APHA 23rd Edition, 3114 B	< 0.002	mg/l	0.05
21	Zinc (as Zn)	APHA 23rd Edition, 3111 B	< 0.02	mg/l	15.0
22	Total Chromium (as Cr)	APHA 23rd Edition, 3111 B	ND	mg/l	0.05

ND: Non Detectable.

Test Done By

CLEENVIRON PRIVATE LIMITED ROURKELA

Verified By

Authorized Signatory
Subhanga Praharaj
Managing Director

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TEST REPORT FOR WATER QUALITY ANALYSIS

FORMAT NO:CPL/FM/00

REPORT NO: CPL/R/W/OCT-23/21N

REPORT ISSUE DATE: 16.10.2023

SAMPLE SUBMITTED BY CUSTOMER

Name of the Customer	:	**SRK MINING SERVICES (INDIA) PRIVATE LIMITED**
Address of the Customer	:	DD 30, 5th Floor, "Andromeda", Sector – 1, Salt Lake City, Kolkata – 700064
Sample ID No	:	**CPL/W/OCT-23/16**
Sample Description	:	Ground Water
Location of Sampling	:	Thengrai
Container ID	:	**GW15**
Condition of Sample while receipt	:	Sealed
Appearance of Sample while receipt	:	Clear
Sample Received on	:	09.10.2023
Date of Test	:	09.10.2023 – 16.10.2023

Sl No	Parameter	Method of Analysis	Results Obtained	Unit	Permissible Limit in absence of Alternate Source as per IS 10500: 2012
1	Colour	APHA 23rd Edition, 2120 B	< 5	Hazen	15
2	Odour	APHA 23rd Edition, 2150 B	Agreeable	-	Agreeable

Test Done By

CLEENVIRON PRIVATE LIMITED ROURKELA

Verified By

Authorized Signatory
Subhanga Praharaj
Managing Director

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Cleenviron Private Limited

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TC - 8816

TEST REPORT FOR WATER QUALITY ANALYSIS

FORMAT NO:CPL/F/M/60

ULR – TC681623000002340F
REPORT NO: CPL/R/W/OCT-23/22

REPORT ISSUE DATE: 16.10.2023

SAMPLE SUBMITTED BY CUSTOMER

Name of the Customer	:	**SRK MINING SERVICES (INDIA) PRIVATE LIMITED**
Address of the Customer	:	DD 30, 5th Floor, "Andromeda", Sector – 1, Salt Lake City, Kolkata – 700064
Sample ID No	:	CPL/W/OCT-23/17
Sample Description	:	Ground Water
Location of Sampling	:	Kolmong
Container ID	:	GW16
Condition of Sample while receipt	:	Sealed
Appearance of Sample while receipt	:	Clear
Sample Received on	:	09.10.2023
Date of Test	:	09.10.2023 – 16.10.2023

Sl No	Parameter	Method of Analysis	Results Obtained	Unit	Permissible Limit in absence of Alternate Source as per IS 10500: 2012
1	Turbidity	APHA 23rd Edition, 2130 B	1.4	NTU	5.0
2	pH Value	APHA 23rd Edition, 4500 H+B	5.58	-	6.5 – 8.5
3	Total Hardness (as $CaCO_3$)	APHA 23rd Edition, 2340 C	36	mg/l	600
4	Iron (as Fe)	APHA 23rd Edition, 3500 Fe B	0.19	mg/l	0.3
5	Chloride (as Cl)	APHA 23rd Edition, 4500 Cl B	9.89	mg/l	1000
6	Total Dissolved Solids	APHA 23rd Edition, 2540 B	41	mg/l	2000
7	Electrical Conductivity	APHA 23rd Edition, 2510 B	63.8	µS/cm	-
8	Calcium (as Ca)	APHA 23rd Edition, 3500 Ca B	4.81	mg/l	200
9	Magnesium (as Mg)	APHA 23rd Edition, 3500 Mg B	5.83	mg/l	100
10	Manganese (as Mn)	APHA 23rd Edition, 3500 Mn B	< 0.05	mg/l	0.3
11	Sulfate (as SO_4)	APHA 23rd Edition, 4500 SO_4^{2-} E	< 0.50	mg/l	400
12	Total Nitrate (as NO_3)	APHA 23rd Edition, 4500 NO_3 B	9.51	mg/l	45
13	Carbonate Alkalinity	APHA 23rd Edition, 2320 B	< 4.0	mg/l	-
14	Bicarbonate Alkalinity	APHA 23rd Edition, 2320 B	08	mg/l	-
15	Sulphide (as H_2S)	APHA 23rd Edition, 4500 S^{2-} D	< 0.02	mg/l	0.05
16	Sodium (as Na)	APHA 23rd Edition, 3500 Na B	1.45	mg/l	-
17	Potassium (as K)	APHA 23rd Edition, 3500 K B	0.40	mg/l	-
18	Fluoride (as F)	APHA 23rd Edition, 4500 F D	< 0.05	mg/l	1.5
19	Lead (as Pb)	APHA 23rd Edition, 3111 B	ND	mg/l	0.01
20	Arsenic (as As)	APHA 23rd Edition, 3114 B	< 0.002	mg/l	0.05
21	Zinc (as Zn)	APHA 23rd Edition, 3111 B	< 0.02	mg/l	15.0
22	Total Chromium (as Cr)	APHA 23rd Edition, 3111 B	ND	mg/l	0.05

ND: Non Detectable.

Test Done By

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TEST REPORT FOR WATER QUALITY ANALYSIS

FORMAT NO:CPL/F/M/09

REPORT NO: CPL/R/W/OCT-23/22N

REPORT ISSUE DATE: 16.10.2023

SAMPLE SUBMITTED BY CUSTOMER

Name of the Customer	:	**SRK MINING SERVICES (INDIA) PRIVATE LIMITED**
Address of the Customer	:	DD 30, 5th Floor, "Andromeda", Sector – 1, Salt Lake City, Kolkata – 700064
Sample ID No	:	**CPL/W/OCT-23/17**
Sample Description	:	Ground Water
Location of Sampling	:	Kolmong
Container ID	:	**GW16**
Condition of Sample while receipt	:	Sealed
Appearance of Sample while receipt	:	Clear
Sample Received on	:	09.10.2023
Date of Test	:	09.10.2023 – 16.10.2023

Sl No	Parameter	Method of Analysis	Results Obtained	Unit	Permissible Limit in absence of Alternate Source as per IS 10500: 2012
1	Colour	APHA 23rd Edition, 2120 B	< 5	Hazen	15
2	Odour	APHA 23rd Edition, 2150 B	Agreeable	-	Agreeable

Test Done By

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Managing Director

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TC - 6816

TEST REPORT FOR WATER QUALITY ANALYSIS

FORMAT NO: CPL/F/M/00

ULR – TC681623000002341F
REPORT NO: CPL/R/W/OCT-23/23

REPORT ISSUE DATE: 16.10.2023

SAMPLE SUBMITTED BY CUSTOMER

Name of the Customer	:	**SRK MINING SERVICES (INDIA) PRIVATE LIMITED**
Address of the Customer	:	DD 30, 5th Floor, "Andromeda", Sector – 1, Salt Lake City, Kolkata – 700064
Sample ID No	:	**CPL/W/OCT-23/18**
Sample Description	:	Surface Water
Location of Sampling	:	Karo River Down stream
Container ID	:	**SW01**
Condition of Sample while receipt	:	Sealed
Appearance of Sample while receipt	:	Clear
Sample Received on	:	09.10.2023
Date of Test	:	09.10.2023 – 16.10.2023

Sl No	Parameters	Method of Analysis	Results Obtained	Unit	Surface Water Quality Standard as per IS: 2296 (Class 'C)
1.	pH Value	APHA 23rd Edition, 4500 H+B	6.47	-	6.5 – 8.5
2.	Electrical Conductivity	APHA 23rd Edition, 2510 B	93	µS/cm	-
3.	Total Dissolved Solids	APHA 23rd Edition, 2540 B	60	mg/l	1500
4.	Total Hardness (as $CaCO_3$)	APHA 23rd Edition, 2340 C	56	mg/l	-
5.	Chlorides (as Cl)	APHA 23rd Edition, 4500 Cl B	9.89	mg/l	600
6.	Sulfate (as SO_4)	APHA 23rd Edition, 4500 SO_4^{2-} E	6.59	mg/l	400
7.	Total Nitrate (as NO_3)	APHA 23rd Edition, 4500 NO_3 B	< 2.20	mg/l	50
8.	Fluoride (as F)	APHA 23rd Edition, 4500 F D	0.10	mg/l	1.5
9.	Calcium (as Ca)	APHA 23rd Edition, 3500 Ca B	14.43	mg/l	-
10.	Magnesium (as Mg)	APHA 23rd Edition, 3500 Mg B	4.86	mg/l	-
11.	Iron (as Fe)	APHA 23rd Edition, 3500 Fe B	0.47	mg/l	50
12.	Manganese (as Mn)	APHA 23rd Edition, 3500 Mn B	< 0.05	mg/l	-
13.	Sodium (as Na)	APHA 23rd Edition, 3500 Na B	1.95	mg/l	-
14.	Potassium (as K)	APHA 23rd Edition, 3500 K B	0.44	mg/l	-
15.	Lead (as Pb)	APHA 23rd Edition, 3111 B	< 0.10	mg/l	0.1
16.	Carbonate Alkalinity	APHA 23rd Edition, 2320 B	< 4.0	mg/l	0.01
17.	Total Suspended Solids	APHA 23rd Edition, 2540 D	13.9	mg/l	-

Test Done By

CLEENVIRON PRIVATE LIMITED ROURKELA

Verified By

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Subhanga Praharaj
Managing Director

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TEST REPORT FOR WATER QUALITY ANALYSIS

FORMAT NO: CPL/F/990

REPORT NO: CPL/R/W/OCT-23/23N

REPORT ISSUE DATE: 16.10.2023

SAMPLE SUBMITTED BY CUSTOMER

Name of the Customer	:	**SRK MINING SERVICES (INDIA) PRIVATE LIMITED**
Address of the Customer	:	DD 30, 5th Floor, "Andromeda", Sector – 1, Salt Lake City, Kolkata – 700064
Sample ID No	:	**CPL/W/OCT-23/18**
Sample Description	:	Surface Water
Location of Sampling	:	Karo River Down stream
Container ID	:	**SW01**
Condition of Sample while receipt	:	Sealed
Appearance of Sample while receipt	:	Clear
Sample Received on	:	09.10.2023
Date of Test	:	09.10.2023 – 16.10.2023

Sl No	Parameters	Method of Analysis	Results Obtained	Unit	Surface Water Quality Standard as per IS: 2296 (Class C)
1.	Colour	APHA 23rd Edition, 2120 B	< 5	Hazen	300
2.	Odour	APHA 23rd Edition, 2150 B	Agreeable	-	-
3.	Dissolved Oxygen (Min.)	IS: 3025 (Part 38) 1989, RA 2019	6.6	mg/l	4
4.	BOD 5 days at 20°C	APHA 23rd Edition, 5210 D	01	mg/l	3
5.	COD	APHA 23rd Edition, 5220 D	3.26	mg/l	-
6.	Free Ammonia (as NH_3)	MERCK	< 0.012	mg/l	-

Test Done By

Verified By

CLEENVIRON PRIVATE LIMITED ROURKELA

Authorized Signatory
Subhanga Praharaj
Managing Director

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TC - 6859

TEST REPORT FOR WATER QUALITY ANALYSIS

FORMAT NO: CPL/F/999

ULR – TC681623000002342F
REPORT NO: CPL/R/W/OCT-23/24

REPORT ISSUE DATE: 16.10.2023

SAMPLE SUBMITTED BY CUSTOMER

Name of the Customer	:	**SRK MINING SERVICES (INDIA) PRIVATE LIMITED**
Address of the Customer	:	DD 30, 5th Floor, "Andromeda", Sector – 1, Salt Lake City, Kolkata – 700064
Sample ID No	:	CPL/W/OCT-23/19
Sample Description	:	Surface Water
Location of Sampling	:	Karo River Upstream
Container ID	:	SW02
Condition of Sample while receipt	:	Sealed
Appearance of Sample while receipt	:	Clear
Sample Received on	:	09.10.2023
Date of Test	:	09.10.2023 – 16.10.2023

Sl No	Parameters	Method of Analysis	Results Obtained	Unit	Surface Water Quality Standard as per IS: 2296 (Class C)
1.	pH Value	APHA 23rd Edition, 4500 H+B	6.82	-	6.5 – 8.5
2.	Electrical Conductivity	APHA 23rd Edition, 2510 B	93.7	µS/cm	-
3.	Total Dissolved Solids	APHA 23rd Edition, 2540 B	60	mg/l	1500
4.	Total Hardness (as $CaCO_3$)	APHA 23rd Edition, 2340 C	56	mg/l	-
5.	Chlorides (as Cl)	APHA 23rd Edition, 4500 Cl B	5.91	mg/l	600
6.	Sulfate (as SO_4)	APHA 23rd Edition, 4500 SO_4^{2-} E	8.98	mg/l	400
7.	Total Nitrate (as NO_3)	APHA 23rd Edition, 4500 NO_3 B	< 2.20	mg/l	50
8.	Fluoride (as F)	APHA 23rd Edition, 4500 F D	1.2	mg/l	1.5
9.	Calcium (as Ca)	APHA 23rd Edition, 3500 Ca B	11.22	mg/l	-
10.	Magnesium (as Mg)	APHA 23rd Edition, 3500 Mg B	6.80	mg/l	-
11.	Iron (as Fe)	APHA 23rd Edition, 3500 Fe B	1.06	mg/l	50
12.	Manganese (as Mn)	APHA 23rd Edition, 3500 Mn B	< 0.05	mg/l	-
13.	Sodium (as Na)	APHA 23rd Edition, 3500 Na B	1.89	mg/l	-
14.	Potassium (as K)	APHA 23rd Edition, 3500 K B	0.52	mg/l	-
15.	Lead (as Pb)	APHA 23rd Edition, 3111 B	< 0.10	mg/l	0.1
16.	Carbonate Alkalinity	APHA 23rd Edition, 2320 B	< 4.0	mg/l	0.01
17.	Total Suspended Solids	APHA 23rd Edition, 2540 D	49.3	mg/l	-

Test Done By

CLEENVIRON PRIVATE LIMITED ROURKELA

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Subhanga Praharaj
Managing Director

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TEST REPORT FOR WATER QUALITY ANALYSIS

FORMAT NO: CPL/FM/59

REPORT NO: CPL/R/W/OCT-23/24N

REPORT ISSUE DATE: 16.10.2023

SAMPLE SUBMITTED BY CUSTOMER

Name of the Customer	:	**SRK MINING SERVICES (INDIA) PRIVATE LIMITED**
Address of the Customer	:	DD 30, 5th Floor, "Andromeda", Sector – 1, Salt Lake City, Kolkata – 700064
Sample ID No	:	**CPL/W/OCT-23/19**
Sample Description	:	Surface Water
Location of Sampling	:	Karo River Upstream
Container ID	:	**SW02**
Condition of Sample while receipt	:	Sealed
Appearance of Sample while receipt	:	Clear
Sample Received on	:	09.10.2023
Date of Test	:	09.10.2023 – 16.10.2023

Sl No	Parameters	Method of Analysis	Results Obtained	Unit	Surface Water Quality Standard as per IS: 2296 (Class C)
1.	Colour	APHA 23rd Edition, 2120 B	< 5	Hazen	300
2.	Odour	APHA 23rd Edition, 2150 B	Agreeable	-	-
3.	Dissolved Oxygen (Min.)	IS: 3025 (Part 38) 1989, RA 2019	6.4	mg/l	4
4.	BOD 5 days at 20°C	APHA 23rd Edition, 5210 D	01	mg/l	3
5.	COD	APHA 23rd Edition, 5220 D	3.19	mg/l	-
6.	Free Ammonia (as NH_3)	MERCK	< 0.012	mg/l	-

Test Done By

Verified By

CLEENVIRON PRIVATE LIMITED ROURKELA

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Subhanga Praharaj
Managing Director

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TC - 6816

TEST REPORT FOR WATER QUALITY ANALYSIS

FORMAT NO: CPL/F/W/00

ULR – TC681623000002343F
REPORT NO: CPL/R/W/OCT-23/25N

REPORT ISSUE DATE: 16.10.2023

SAMPLE SUBMITTED BY CUSTOMER

Name of the Customer	:	**SRK MINING SERVICES (INDIA) PRIVATE LIMITED**
Address of the Customer	:	DD 30, 5th Floor, "Andromeda", Sector – 1, Salt Lake City, Kolkata – 700064
Sample ID No	:	**CPL/W/OCT-23/20**
Sample Description	:	Surface Water
Location of Sampling	:	ESL Nadidih Mine Pit
Container ID	:	**Mine Water**
Condition of Sample while receipt	:	Sealed
Appearance of Sample while receipt	:	Clear
Sample Received on	:	09.10.2023
Date of Test	:	09.10.2023 – 16.10.2023

Sl No	Parameters	Method of Analysis	Results Obtained	Unit	Surface Water Quality Standard as per IS: 2296 (Class C)
1.	pH Value	APHA 23rd Edition, 4500 H+B	6.89	-	6.5 – 8.5
2.	Electrical Conductivity	APHA 23rd Edition, 2510 B	78.2	µS/cm	-
3.	Total Dissolved Solids	APHA 23rd Edition, 2540 B	47	mg/l	1500
4.	Total Hardness (as $CaCO_3$)	APHA 23rd Edition, 2340 C	32	mg/l	-
5.	Chlorides (as Cl)	APHA 23rd Edition, 4500 Cl B	5.91	mg/l	600
6.	Sulfate (as SO_4)	APHA 23rd Edition, 4500 SO_4^{2-} E	< 0.50	mg/l	400
7.	Total Nitrate (as NO_3)	APHA 23rd Edition, 4500 NO_3 B	< 2.20	mg/l	50
8.	Fluoride (as F)	APHA 23rd Edition, 4500 F D	0.98	mg/l	1.5
9.	Calcium (as Ca)	APHA 23rd Edition, 3500 Ca B	8.02	mg/l	-
10.	Magnesium (as Mg)	APHA 23rd Edition, 3500 Mg B	2.92	mg/l	-
11.	Iron (as Fe)	APHA 23rd Edition, 3500 Fe B	0.21	mg/l	50
12.	Manganese (as Mn)	APHA 23rd Edition, 3500 Mn B	< 0.05	mg/l	-
13.	Sodium (as Na)	APHA 23rd Edition, 3500 Na B	1.12	mg/l	-
14.	Potassium (as K)	APHA 23rd Edition, 3500 K B	0.15	mg/l	-
15.	Lead (as Pb)	APHA 23rd Edition, 3111 B	< 0.10	mg/l	0.1
16.	Carbonate Alkalinity	APHA 23rd Edition, 2320 B	< 4.0	mg/l	0.01
17.	Total Suspended Solids	APHA 23rd Edition, 2540 D	< 2.5	mg/l	-

Test Done By

CLEENVIRON PRIVATE LIMITED ROURKELA

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Managing Director

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TEST REPORT FOR WATER QUALITY ANALYSIS

FORMAT NO: CPL/F/R/00

REPORT NO: CPL/R/W/OCT-23/25N

REPORT ISSUE DATE: 16.10.2023

SAMPLE SUBMITTED BY CUSTOMER

Name of the Customer	:	**SRK MINING SERVICES (INDIA) PRIVATE LIMITED**
Address of the Customer	:	DD 30, 5th Floor, "Andromeda", Sector – 1, Salt Lake City, Kolkata – 700064
Sample ID No	:	CPL/W/OCT-23/20
Sample Description	:	Surface Water
Location of Sampling	:	ESL Nadidih Mine Pit
Container ID	:	Mine Water
Condition of Sample while receipt	:	Sealed
Appearance of Sample while receipt	:	Clear
Sample Received on	:	09.10.2023
Date of Test	:	09.10.2023 – 16.10.2023

Sl No	Parameters	Method of Analysis	Results Obtained	Unit	Surface Water Quality Standard as per IS: 2296 (Class C)
1.	Colour	APHA 23rd Edition, 2120 B	< 5	Hazen	300
2.	Odour	APHA 23rd Edition, 2150 B	Agreeable	-	-
3.	Dissolved Oxygen (Min.)	IS: 3025 (Part 38) 1989, RA 2019	6.2	mg/l	4
4.	BOD 5 days at 20°C	APHA 23rd Edition, 5210 D	02	mg/l	3
5.	COD	APHA 23rd Edition, 5220 D	7.08	mg/l	-
6.	Free Ammonia (as NH_3)	MERCK	< 0.012	mg/l	-

Test Done By

Verified By

CLEENVIRON PRIVATE LIMITED ROURKELA

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Subhanga Praharaj
Managing Director

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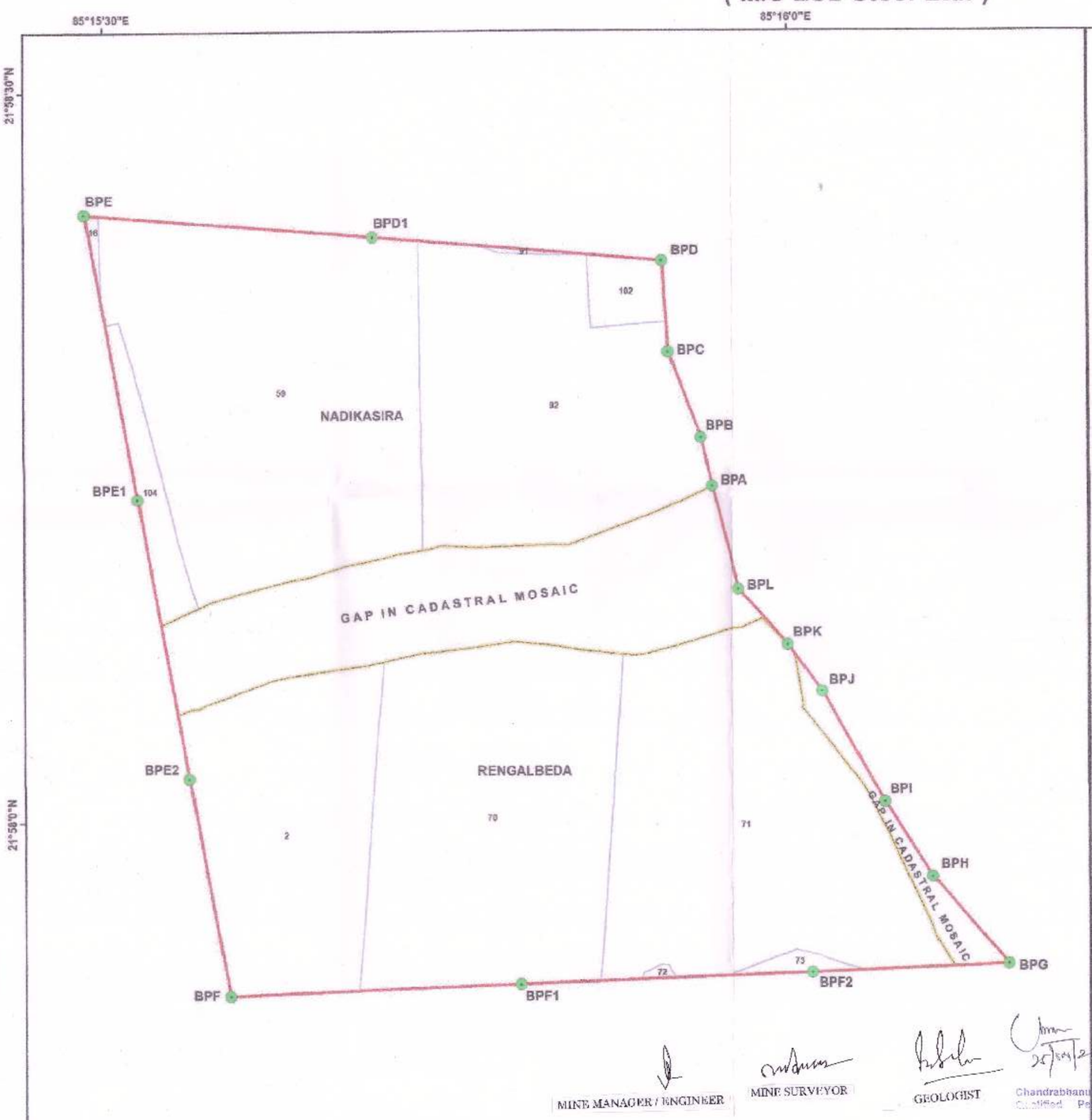
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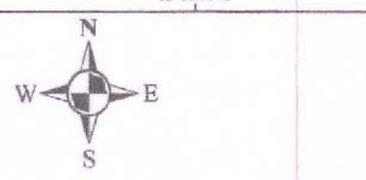
Appendix I: Plates of Mine Development Plan

PLATE - I

DGPS SURVEY GEOREFERENCED MINING LEASE AREA MAP FOR NADIDIHI IRON ORE BLOCK IN SUNDARGARH DISTRICT.

(M/s ESL Steel Ltd.)





Scale-: 1:3960

DGPS SURVEYED ML PILLAR CO-ORDINATES

Sl_No	Pillar_Id	Latitude	Longitude	Easting	Northing
1	BPA	21°58'14.14658"	85°15'57.08069"	320943.4680	2430586.3820
2	BPB	21°58'16.11438"	85°15'56.55766"	320929.1490	2430647.0740
3	BPC	21°58'19.60516"	85°15'55.09301"	320888.3480	2430754.9130
4	BPD	21°58'23.35580"	85°15'54.80270"	320881.3270	2430870.3630
5	BPD1	21°58'24.22418"	85°15'42.17694"	320519.4300	2430901.1800
6	BPE	21°58'25.03192"	85°15'29.52153"	320156.6620	2430930.1500
7	BPE1	21°58'13.36817"	85°15'31.94312"	320222.0510	2430570.6260
8	BPE2	21°58'01.90660"	85°15'34.33601"	320286.6910	2430217.3300
9	BPF	21°57'52.97818"	85°15'36.18968"	320336.7500	2429942.1210
10	BPF1	21°57'53.59140"	85°15'48.90333"	320701.7070	2429956.8410
11	BPF2	21°57'54.22260"	85°16'01.64702"	321067.5310	2429972.1130
12	BPG	21°57'54.65967"	85°16'10.21163"	321313.3930	2429982.7770
13	BPH	21°57'58.22189"	85°16'06.88486"	321219.1900	2430093.4160
14	BPI	21°58'01.24560"	85°16'04.75406"	321159.1120	2430187.1050
15	BPJ	21°58'05.78043"	85°16'01.98834"	321081.3460	2430327.4770
16	BPK	21°58'07.67111"	85°16'00.47040"	321038.4570	2430386.1200
17	BPL	21°58'09.95129"	85°15'58.28344"	320976.5110	2430456.9600

DGPS SURVEYED ML AREA - 74.5 Ha.

Legend

- ML Pillar
- ML Boundary
- Village Boundary
- Plot Boundary

Disclaimer: The map has been prepared based on the field survey data of joint survey team using DGPS/ETS.

MINE MANAGER / ENGINEER

MINE SURVEYOR

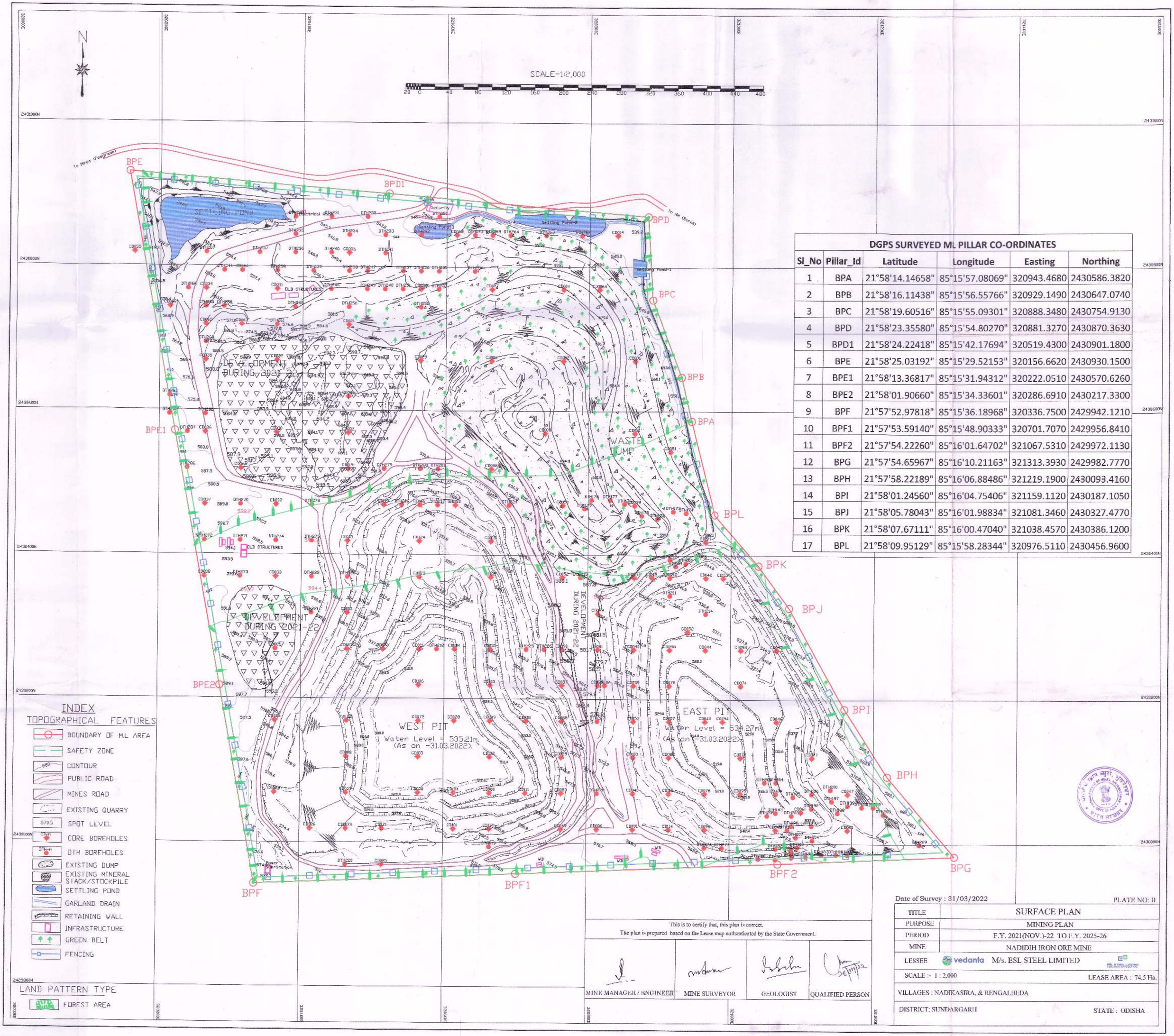
GEOLOGIST

Chandrabhanu Das
Qualified Person

Odisha Space Applications Centre
Dept. of Science and Technology
Govt. of Odisha
Bhubaneswar

ORSAC

ODISSA SPACE APPLICATIONS CENTRE
Map No. 2579/1
Date. 15.11.2021
Auth. Signatory
BHUBANESWAR



DGPS SURVEYED ML PILLAR CO-ORDINATES					
Sl_No	Pillar_Id	Latitude	Longitude	Easting	Northing
1	BPA	21°58'14.14658"	85°15'57.08069"	320943.4680	2430586.3820
2	BPB	21°58'16.11438"	85°15'56.55766"	320929.1490	2430647.0740
3	BPC	21°58'19.60516"	85°15'55.09301"	320888.3480	2430754.9130
4	BPD	21°58'23.35580"	85°15'54.80270"	320881.3270	2430870.3630
5	BPD1	21°58'24.22418"	85°15'42.17694"	320519.4300	2430901.1800
6	BPE	21°58'25.03192"	85°15'29.52153"	320156.6620	2430930.1500
7	BPE1	21°58'13.36817"	85°15'31.94312"	320222.0510	2430570.6260
8	BPE2	21°58'01.90660"	85°15'34.33601"	320286.6910	2430217.3300
9	BPF	21°57'52.97818"	85°15'36.18968"	320336.7500	2429942.1210
10	BPF1	21°57'53.59140"	85°15'48.90333"	320701.7070	2429956.8410
11	BPF2	21°57'54.22260"	85°16'01.64702"	321067.5310	2429972.1130
12	BPG	21°57'54.65967"	85°16'10.21163"	321313.3930	2429982.7770
13	BPH	21°57'58.22189"	85°16'06.88486"	321219.1900	2430093.4160
14	BPI	21°58'01.24560"	85°16'04.75406"	321159.1120	2430187.1050
15	BPJ	21°58'05.78043"	85°16'01.98834"	321081.3460	2430327.4770
16	BPK	21°58'07.67111"	85°16'00.47040"	321038.4570	2430386.1200
17	BPL	21°58'09.95129"	85°15'58.28344"	320976.5110	2430456.9600

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- DTH BOREHOLES
- EXISTING DUMP
- EXISTING MINERAL STACK/STOCKPILE
- SETTLING POND
- GARLAND DRAIN
- RETAINING WALL
- INFRASTRUCTURE
- GREEN BELT
- FENCING

LAND PATTERN TYPE

- FOREST AREA

This is to certify that, this plan is correct.
The plan is prepared based on the Lease map authenticated by the State Government.

MINE MANAGER / ENGINEER | MINE SURVEYOR | GEOLOGIST | QUALIFIED PERSON

Date of Survey : 31/03/2022

PLATE NO: II

TITLE	SURFACE PLAN
PURPOSE	MINING PLAN
PERIOD	F.Y. 2021(NOV.)-22 TO F.Y. 2025-26
MINE	NADIDIH IRON ORE MINE
LESSEE	vedanta M/s. ESL STEEL LIMITED
SCALE :- 1 : 2,000	LEASE AREA : 74.5 Ha.
VILLAGES : NADIKASIRA, & RENGALBEDA	
DISTRICT: SUNDARGARH	STATE : ODISHA

N

SCALE-1:2,000

20 0 40 80 120 160 200 240 280 320 360 400 440 480

SETTLING POND

PROPOSED STOCKPILES/STACKAREA

WASTE DUMP

ULTIMATE PIT LIMIT

ULTIMATE PIT LIMIT

WEST PIT
Water Level = 535.21m
(As on -31.03.2022)

EAST PIT
Water Level = 534.27m
(As on 31.03.2022)

OLD STRUCTURES

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- EXISTING DUMP
- EXISTING MINERAL STACK/STOCKPILE
- SETTLING POND
- GARLAND DRAIN
- RETAINING WALL
- INFRASTRUCTURE
- GREEN BELT
- FENCING

LAND PATTERN TYPE

- FOREST AREA

GEOLOGICAL FEATURES

- LITHO CONTACT
- DIP & STRIKE
- ULTIMATE PIT LIMIT
- NON-MINERALIZED AREA
- LATERITIC SOIL
- LATERITIC ORE
- HARD ORE
- POWDERY ORE
- BLUE DUST
- SHALE

AREA UNDER EXPLORATION

GI

PROPOSED FEATURES

- 2023-24
- 680M RL PROPOSED RL
- PROPOSED DUMP
- PROPOSED MINERAL STACK/STOCKPILE
- PROPOSED RAMP
- PROPOSED BENEFICATION PLANT
- PROPOSED WEIGH BRIDGE
- PROPOSED HAUL ROAD

This is to certify that, this plan is correct.
The plan is prepared based on the Lease map authenticated by the State Government.

MINE MANAGER / ENGINEER	MINE SURVEYOR	GEOLOGIST	QUALIFIED PERSON
			25/04/22

Date of Survey : 31/03/2022

PLATE NO: V(A)

TITLE	DEVELOPMENT PLAN (F.Y. 2022-23)
PURPOSE	MINING PLAN
PERIOD	F.Y. 2021(NOV.)-22 TO F.Y. 2025-26
MINE	NADIDIH IRON ORE MINE
LESSEE	vedanta M/s. ESL STEEL LIMITED
SCALE :- 1 : 2,000	LEASE AREA : 74.5 Ha.
VILLAGES : NADIKASIRA, & RENGALBEDA	
DISTRICT: SUNDARGARH	STATE : ODISHA

N

SCALE-1:2,000

20 0 40 80 120 160 200 240 280 320 360 400 440 480

BPE

BPD1

BPD

BPC

BPB

BPA

BPL

BPK

BPJ

BPI

BPH

BPG

BPF2

BPF1

BPF

BPE1

BPE2

SETTLING POND

PROPOSED STOCKPILE/STACK AREA

WASTE DUMP

OLD STRUCTURES

ULTIMATE PIT LIMIT

ULTIMATE PIT LIMIT

WEST PIT
Water Level = 535.21m
(As on -31.03.2022)

EAST PIT
Water Level = 534.27m
(As on -31.03.2022)

G1

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- INFRASTRUCTURE
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- FENCING
- BENIFICATION PLANT

LAND PATTERN TYPE

- FOREST AREA

GEOLOGICAL FEATURES

- LITHO CONTACT
- DIP & STRIKE
- ULTIMATE PIT LIMIT
- NON-MINERALIZED AREA
- LATERITIC SOIL
- LATERITIC ORE
- HARD ORE
- POWDERY ORE
- BLUE DUST
- SHALE

PROPOSED FEATURES

- 2023-24
- 680M RL PROPOSED RL
- PROPOSED DUMP
- PROPOSED MINERAL STACK / STOCKPILE
- PROPOSED RAMP
- PROPOSED HAUL ROAD

AREA UNDER EXPLORATION G1

This is to certify that, this plan is correct.
The plan is prepared based on the Lease map authenticated by the State Government.

MINE MANAGER / ENGINEER	MINE SURVEYOR	GEOLOGIST	QUALIFIED PERSON

Date of Survey : 31/03/2022

PLATE NO: V(B)

TITLE	DEVELOPMENT PLAN (F.Y. 2023-24)
PURPOSE	MINING PLAN
PERIOD	F.Y. 2021(NOV.)-22 TO F.Y. 2025-26
MINE	NADIDIH IRON ORE MINE
LESSEE	vedanta M/s. ESL STEEL LIMITED
SCALE :- 1 : 2,000	LEASE AREA : 74.5 Ha.
VILLAGES : NADIKASIRA, & RENGALBEDA	
DISTRICT: SUNDARGARH	STATE : ODISHA

N

SCALE-1:2,000

20 0 40 80 120 160 200 240 280 320 360 400 440 480

BPE

BPD1

BPD

BPC

BPB

BPA

BPL

BPK

BPJ

BPI

BPH

BPG

BPF2

BPF1

BPF

BPE1

BPE2

SETTLING POND

PROPOSED STOCKPILE/STACK AREA

OLD STRUCTURES

PROPOSED WEIGH BRIDGE

WASTE DUMP

ULTIMATE PIT LIMIT

ULTIMATE PIT LIMIT

WEST PIT
Water Level = 535.27m
(As on 31.03.2022)

EAST PIT
Water Level = 534.27m
(As on 31.03.2022)

G1

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- SETTLING POND
- GARLAND DRAIN
- RETAINING WALL
- INFRASTRUCTURE
- GREEN BELT
- FENCING
- BENIFICATION PLANT

LAND PATTERN TYPE

- FOREST AREA

GEOLOGICAL FEATURES

- LITHO CONTACT
- DIP & STRIKE
- ULTIMATE PIT LIMIT
- NON-MINERALIZED AREA
- LATERITIC SOIL
- LATERITIC ORE
- HARD ORE
- POWDERY ORE
- BLUE DUST
- SHALE

AREA UNDER EXPLORATION G1

PROPOSED FEATURES

- 2024-25
- 680M RL PROPOSED RL
- PROPOSED DUMP
- PROPOSED MINERAL STACK/ STOCKPILE
- PROPOSED BACKFILLING
- PROPOSED RAMP
- PROPOSED HAUL ROAD

This is to certify that, this plan is correct.
The plan is prepared based on the Lease map authenticated by the State Government.

MINE MANAGER / ENGINEER | MINE SURVEYOR | GEOLOGIST | QUALIFIED PERSON

Date of Survey : 31/03/2022

PLATE NO: V(C)

TITLE	DEVELOPMENT PLAN (F.Y. 2024-25)
PURPOSE	MINING PLAN
PERIOD	F.Y. 2021(NOV.)-22 TO F.Y. 2025-26
MINE	NADIDIH IRON ORE MINE
LESSEE	vedanta M/s. ESL STEEL LIMITED
SCALE :- 1 : 2,000	LEASE AREA : 74.5 Ha.
VILLAGES : NADIKASTRA, & RENGALBEDA	
DISTRICT: SUNDARGARH	STATE : ODISHA

N

SCALE-1:2,000

20 0 40 80 120 160 200 240 280 320 360 400 440 480

BPE

BPD1

BPD

BPC

BPB

BPA

BPL

BPK

BPJ

BPI

BPH

BPG

BPF2

BPF1

BPF

BPE1

BPE2

To Mines (Footpath)

To NH Route

SETTLING POND

Electrical Room

Security

Switing Pond

WASTE DUMP

ULTIMATE PIT LIMIT

ULTIMATE PIT LIMIT

OLD STHUKTURES

WEST PIT
Water Level = 535.21m.
(As on -31.03.2022)

EAST PIT
Water Level = 534.27m.
(As on -31.03.2022)

Power Sub-Station

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- EXISTING QUARRY
- SPOT LEVEL (570.5)
- CORE BOREHOLES (CDH)
- DTH BOREHOLES (DTH-n)
- EXISTING DUMP
- EXISTING MINERAL STACK/STOCKPILE
- SETTLING POND
- GARLAND DRAIN
- RETAINING WALL
- INFRASTRUCTURE
- GREEN BELT
- FENCING
- BENIFICATION PLANT

LAND PATTERN TYPE

- FOREST AREA

GEOLOGICAL FEATURES

- LITHO CONTACT
- DIP & STRIKE (32°)
- ULTIMATE PIT LIMIT
- NON-MINERALIZED AREA
- LATERITIC SOIL
- LATERITIC ORE
- HARD ORE
- POWDERY ORE
- BLUE DUST
- SHALE

AREA UNDER EXPLORATION (G1)

PROPOSED FEATURES

- 2025-26
- PROPOSED RL (680m.)
- PROPOSED DUMP
- PROPOSED MINERAL STACK / STOCKPILE
- PROPOSED BACKFILLING
- PROPOSED RAMP
- PROPOSED HAUL ROAD

This is to certify that, this plan is correct.
The plan is prepared based on the Lease map authenticated by the State Government.

MINE MANAGER / ENGINEER	MINE SURVEYOR	GEOLOGIST	QUALIFIED PERSON

Date of Survey : 31/03/2022

PLATE NO: V(D)

TITLE	DEVELOPMENT PLAN (F.Y. 2025-26)
PURPOSE	MINING PLAN
PERIOD	F.Y. 2021(NOV.)-22 TO F.Y. 2025-26
MINE	NADIDIH IRON ORE MINE
LESSEE	vedanta M/s. ESL STEEL LIMITED
SCALE :- 1 : 2,000	LEASE AREA : 74.5 Ha.
VILLAGES : NADIKASIRA & RENGALBEDA	
DISTRICT: SUNDARGARH	STATE : ODISHA

Appendix J: MOU for Ground Water Modelling

MEMORANDUM OF UNDERSTANDING

THIS MEMORANDUM OF UNDERSTANDING ("THE MOU") IS ENTERED INTO THIS **9TH DAY OF JUNE 2023** ("THE EFFECTIVE DATE")

BY AND BETWEEN:

SRK Mining Services (India) Private Limited, (hereinafter referred as "SRK"), an Indian company duly incorporated under the law of India having its registered office at DD 30, 5th Floor, "Andromeda", Sector 1, Salt Lake City, Kolkata - 700064, West Bengal.

and

Mr. Baddela Jaya Kumar (hereinafter referred as "The Consultant"), an Individual Consultant, residing at Flat A-22, Steel and Mines Complex, Sri Nagar Colony, Hyderabad 500 073;

Each party hereinafter referred to individually as a "Party" or collectively as "the Parties."

Whereas SRK is part of the international Consulting Group 'SRK Consulting' known world-wide for its consulting work in the resources sector, where it is recognized as a leading innovator in geoscience and mining engineering with a strong track record. SRK Mining Services (India) Private Limited is a Consulting Organisation accredited by RGI (Rajiv Ganchi National Ground Water Training & Research Institute) for Impact Assessment Report and Comprehensive Hydrogeological Report without Modelling Studies, having validity of accreditation from 15 February 2021 to 14 February 2026 (Certificate No.: CGWA/RGI/006). SRK offers a dedicated team of in-house consultants that provide specialist expertise in hydrogeological, ground water and surface water consultancy services, underground and open-pit rock engineering, tailings and mine operational and closure consulting services (www.srk.com).

Whereas Mr. Baddela Jaya Kumar, an Individual Consultant accredited by RGI (Rajiv Gandhi National Ground Water Training & Research Institute) for Impact Assessment Report and Comprehensive Hydrogeological Report with Modelling Studies, having validity of accreditation from 15 February 2021 to 14 February 2026 (Certificate No.: CGWA/RGI/019).

Whereas SRK is looking for accredited individual Consultant who could act as an Associate to SRK for hydrogeological and ground water related consultancy projects, particularly for the preparation of Impact Assessment Report, Hydrogeological Report, Ground Water Modelling Report (both for Impact Assessment Report and Comprehensive Hydrogeological Report), related field studies, technical notes, any other job in relation to the same for the hydrogeology projects and as per an agreed scope.

Whereas, Mr. Baddela Jaya Kumar is an independent accredited Consultant having his own infrastructure and software capacity in providing consultancy services in his accredited fields and SRK has an interest in having his services as an Associate, both the Parties desires to work together on a non-exclusive mode, combine their respective expertise and talents to accomplish the above

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15 JUN 2023

objectives regarding consultancy services for Impact Assessment Report and Comprehensive Hydrogeological Report with Modelling Studies as a part of regulatory requirement to obtain NoC from CGWA, as more particularly described herein.

NOW THEREFORE, the Parties have agreed to enter into this MOU:

1. PURPOSE

The purpose of this MOU is to have a relationship of cooperation and to establish the roles of the respective parties in providing certain services (hereinafter "Services"), as associates.

2. GENERAL FIELDS OF COOPERATION

The Parties intend to cooperate in the following fields, primarily in India on a case to case basis, where Mr. Baddela Jaya Kumar acts as an Associate of SRK in suitable components of the projects, depending on opportunities that may arise for hydrogeological and ground water consultancies related to Impact Assessment Report and Comprehensive Hydrogeological Report with Modelling Studies requiring supervision of field activities, reviewing field data collection, data validation and all the activities related to numerical ground water modelling, as required.

3. EFFECTIVE DATE

The effective date of this MOU will be the date of signing of this agreement.

4. THE PARTIES AGREE:

a) Both the parties will identify the details of project specific scope to be undertaken by each.

b) Subject to the Parties agreeing the scope and man-hours involved, the fees of Mr. Baddela Jaya Kumar will be mutually discussed and agreed.

5. INDEPENDENT CONTRACTORS

Nothing in this MOU shall be construed as creating a joint venture, partnership or any other type of business entity between the Parties, nor as constituting either Party as the agent of the other Party for any purpose, nor create any fiduciary obligations between the Parties. As already stated under clause 1 above, the relationship between the Parties is limited to associates only and no Party shall have the power or authority to bind the other Party for any purpose whatsoever without such other Party's prior consent.

6. CONFIDENTIALITY

During the course of this agreement with SRK, the Associate will be exposed to confidential information, inventions and/or ideas, the disclosure of which may result in financial loss or disadvantage or embarrassment to either SRK or its clients. No disclosure or use of such information in any manner may be made by the Associate at any time during or after the termination of this contract.

The Associate must not:

- reserve any right on trade, disclosure by publication or otherwise,
- alienate by patent or any other way, apply or use

any information of whatever nature, due to or belonging wholly or partially to, or being the privilege of SRK or its clients.

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The Associate hereby cedes and assigns to SRK all rights and title to the copyright of Works in any form which is eligible for copyright in terms of the Copyright Act, and which is made, created, produced, written or compiled by the Associate during the course and scope of the consultancy with SRK.

All notes, proposals, reports, memoranda, drawings, designs, sketches or formula (by whatever medium kept or made) relating to the business of SRK or any supplier and/or any client of SRK as may be made or received by the Associate during the course of the contract with SRK, will be the property of SRK and will be surrendered by the Associate at the request of SRK at any time during the course of the contract.

7. CONFLICT OF INTEREST

During the period covered by this agreement the Associate will declare the nature of interest, if any as far as the Associate is aware, in any aspect of the particular project or client, on which the Associate is appointed to work.

8. GOVERNING LAW AND ARBITRATION

- The construction, validity and performance of this MOU shall be governed in all respects by the laws of India.
- Any dispute, controversy or claim arising out of or relating to this MOU shall be settled in the first instance amicably among the Parties. If an amicable settlement cannot be reached as above, the matter shall be referred to Arbitration by a sole arbitrator in accordance with the Indian Arbitration and Conciliation Act 1996 or any amendments thereof. The arbitrator shall be appointed mutually by the Parties. The venue for the arbitration shall be Kolkata, India. Award of the arbitrator shall be final and binding on all Parties to the MOU.

9. LIABILITY

Notwithstanding anything to the contrary, neither Party shall be liable to the other Party under this MOU for any direct, indirect and/or consequential losses whatsoever and howsoever arising including such as but not limited to loss of profit, loss of contract, loss of opportunity, loss of business and other economic loss.

10. TERMINATION AND SURVIVORSHIP

A. Continuation of the MOU is contingent upon managements of the Parties. This MOU shall remain in force from the Effective Date until the earlier of the following:

- Expiry date of the Accreditation Certificate of any one party, and
- Termination by written agreement between the Parties.

This MOU may be terminated by any Party upon written notice to the other Party without prejudice to any rights, commitments or benefits existing under the MOU, if the other Party shall commit a material breach of any terms or conditions of this MOU and if it shall fail to remedy such breach within fifteen (15) days after receipt of notice in writing identifying such breach and requiring remedy thereof.

B. The provisions of Article 7 shall survive and continue to have effect should this MOU be terminated for any reason.

11. NOTICES

Any notice or communication required or permitted to be given under this MOU must be in writing and must be delivered personally or by facsimile, email, courier, recognized overnight delivery service or first-class mail, postage prepaid, to the address of the receiving Party set forth below or to such other address as the receiving Party may have specified by written notice given in accordance with this Clause. Any mailed or couriered communication shall be deemed to have been given upon the date of receipt, and any communication sent by facsimile and confirmed by email in accordance with this

REKHA TEWARI Regd. No. IC29813 GOVT. OF INDIA

15 JUN 2023

Clause shall be deemed to have been given at the time receipt of the facsimile is confirmed by the sending Party's email machine.

If to SRK:

Attention: Mr Rijumon Dasgupta

DD 30, 5th Floor, "Andromeda",
Sector 1, Salt Lake City,
Kolkata - 700064, West Bengal

If to Mr. Baddela Jaya Kumar:

Permanent Address:	Flat A-22, Steel & Mines Complex, Srinagar Colony, Hyderabad – 500 073
Address for Communication:	Flat A-22, Steel & Mines Complex, Srinagar Colony, Hyderabad – 500 073

12. NO OBLIGATIONS

The Parties acknowledge and agree that unless and until a definitive agreement regarding the participation in the Project has been executed and delivered between the Parties, neither Party shall have any obligation of any kind whatsoever to the other Party with respect to such participation by virtue of this MOU or discussions regarding the Project except for the matters specifically agreed to herein.

13. PAYMENTS AND TAX LIABILITY

- Each Party shall be responsible for salaries, fees, social benefits, insurances, and any other payment due to his personnel or payable on behalf of or for the account of his personnel.
- Each Party shall be responsible for payment of personal income tax, corporate tax and any other taxes of whatever nature that may be levied and incurred on each Party in connection with, or as a result of the performance of services required under the RFP or this MOU.

14. MISCELLANEOUS

A. If any of the provisions of this MOU is found by a competent authority to be void or non-enforceable, such provision shall be deemed to be deleted from this MOU and the remaining provisions shall continue in full force and effect, providing the Parties shall thereupon negotiate in good faith in order to agree upon the terms of a mutually satisfactory provision to be substituted for the provision so found to be void and unenforceable.

B. Each Party shall bear all costs, risks and liabilities incurred by it arising out of its obligations and efforts under this MOU.

C. The Parties will be responsible for their own cost of men, material, equipment, services, taxes, duties, reimbursable etc.

D. Each Party shall assign staff with suitable expertise and experience to undertake his own obligations, responsibilities and scope of services as per Client Contract with the Client.

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15 JUN 2023

15. COUNTERPARTS

This MOU may be executed in two or more counterparts (including by facsimile or PDF electronic transmission), with each counterpart constituting a single original.

IN WITNESS WHEREOF THE PARTIES have executed this MOU the day, month and year first before written

RIJUMON DASGUPTA

Digitally signed by RIJUMON DASGUPTA
Date: 2023.06.09 10:40:53 +05'30'

Name: Mr. Rijumon Dasgupta

Designation: Consultant - Hydrogeology

Duly authorized on behalf of: SRK Mining Services (India) Private Limited

Date: 09 / 06 / 2023

WITNESS: Indranil Sen 09/06/2023

Name: INDRANIL SEN

Baddela Jaya Kumar

Digitally signed by Baddela Jaya Kumar
Date: 2023.06.15 09:00:07 +05'30'

Name: Mr. Baddela Jaya Kumar

Signed:

Date:

WITNESS: Jayeeta Dey - 09.06.2023

Name: JAYEETA DEY.

NOTARY REKHA TEWARI Regn. No. 19258/13 GOVT. OF INDIA

REKHA TEWARI
NOTARY
Regn. No.- 19258/13
C.M.M's Court
Kolkata - 700 001
ATTESTED SIGNATURE ONLY
BEFORE ME ON IDENTIFICATION
REKHA TEWARI
NOTARY
15 JUN 2023

ADVOCATE PRASHANTH NATH YADAV PT IBARGHALI

vedanta
transforming for good

ESL STEEL LIMITED
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pAnnexure 3

Occupational Health Survey Report

Initial & Periodical Examination details

- Total PME has done from Oct 2024 to Mar 2025 – 02
- Total IME has completed Oct 2024 to Mar 2025 – 04

Periodical Medical Examination Details

SL NO.	DATE	PME CODE	Name of the Employee	Company/Contractor
1	31-03-2025	CARE/25/2076	Rajendra Nayak	Contractor -NSIPL
2	31-03-2025	CARE/25/2077	Arjun Pradhan	Contractor -NSIPL

IME DETAILS

SL NO.	DATE	IME CODE	NAME OF EMPLOYEE	COMPANY / CONTRACTOR
1.	05/11/2024	CARE/24/5065	Gadadhar Bhuyan	G4S Security
2.	28/10/2024	CARE/24/5062	Dilip Kumar Behera	G4S Security
3	26/10/2024	CARE/24/5057	Kapilendra Mohanta	G4S Security
04.	31/03/2025	CARE/25/2072	Raja Kumar	NSIPL

Occupational Health Survey Summary:

A monthly health camp has occurred in both the mines. The Total number of employees covered in health camp from the month of October 2024 to March 2025 is: 71 (Seventy one)

October 24 – 24 Employees
November 24 – 25 Employees

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December 24 - 22 Employees

There are no such instances of occupational health diseases, and there have been no significant findings related to chronic diseases or health-related abnormalities that may impact their work profile. Some of them have some metabolic disorders like hypertension & diabetes, which have been followed up every month in OHC.

Preventive measures advised during health camp:

1. Diet Modification by advising reduce salt & sugar intake in their daily diet.
2. Reduce oily, spices & fatty raw foods with advice for regular exercise, yoga & lifestyle modification.
3. Cessation of smoking and alcohol. Complete avoid & stop all tobacco, nicotinic elements and sedative things.
4. Attend the regular medical checkup and follow the treatment protocol advised by doctor.

Awareness program held for mine workers during these months :

- Training sessions on burn case management, shock and emergency aid.
- Awareness program on common viral diseases with its prevention & control.
- Basic first aid management & training on Cardiopulmonary resuscitation.
- Training on tobacco & smoking control with cancer management.
- Training in Ergonomics and work-related stress management.
- Training in biomedical waste management.
- Awareness program on HIV- AIDS, its prevention & control.

Medical Officer

Nadidihi Iron ore Mines

Mines Mnage

85°15'30"E

85°16'0"E

LANDUSE / LANDCOVER MAP OF NADIDIHI IRON ORE MINE OF M/s ESL LTD. IN SUNDERGARH DISTRICT

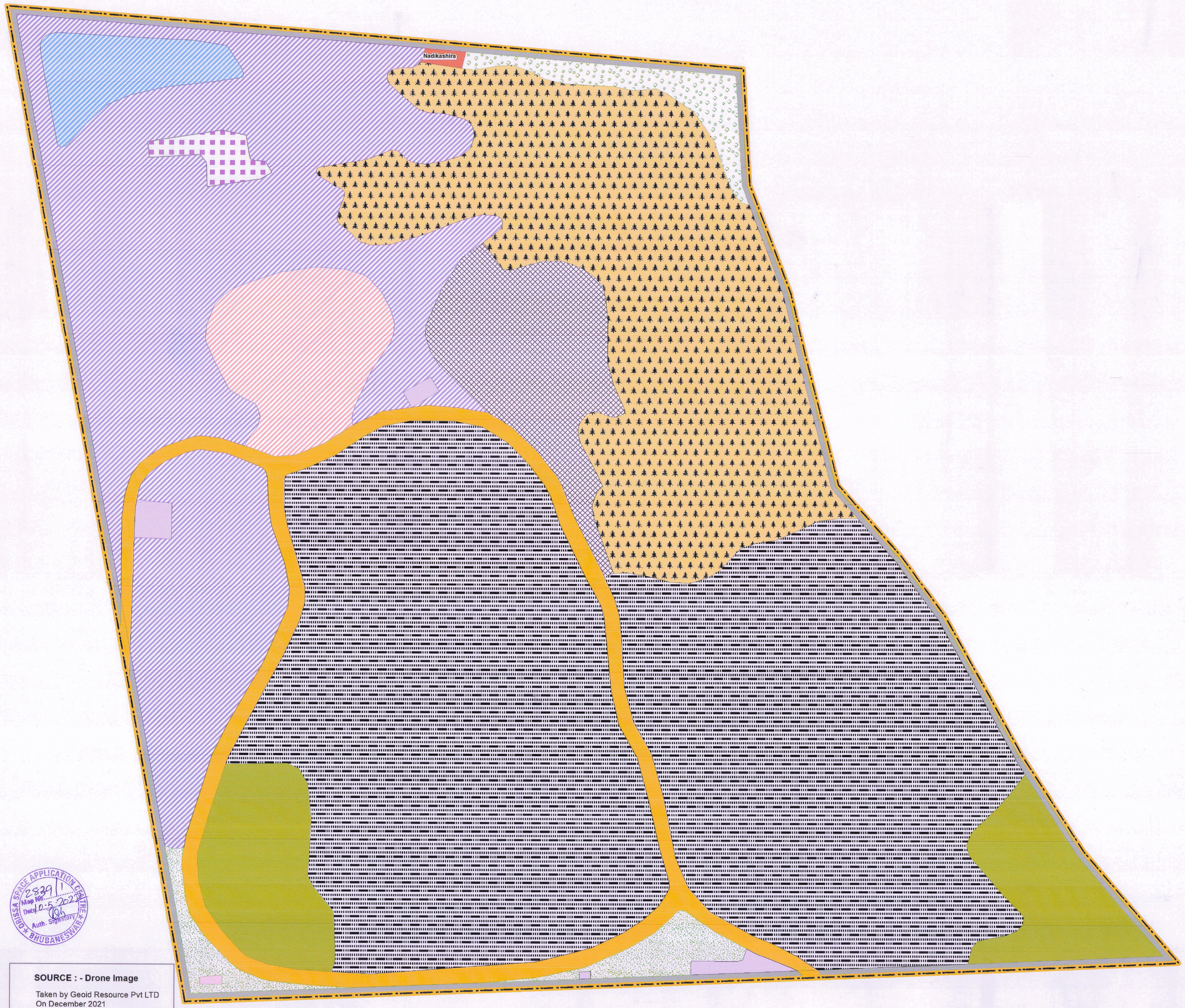
0 0.15 0.3 0.6 Kilometers

SCALE - 1:2,000

N

W E

S



21°58'0"N

Legend

- Habitation
- Plantation Over Dump
- Land With Scrub
- Land Without Scrub
- Mining Quarry
- Sub - Grade Dump / Mineral Reject
- OB Dump
- Stock Yard / Ore Stack
- Back Filling
- Tailing Pond
- Site Services
- Processing Yard / Shorting Yard
- Weigh Bridge
- Haul Road
- Safety Zone
- Mining Lease Boundary

SPACE APPLICATION CENTRE BHUBANESWAR
2339/1
Memo No:
Dated: 05-2022
Auth. Signatory

Odisha Space Applications Centre ,
Dept. of Science and Technology ,
Govt. of Odisha ,
Bhubaneswar

SOURCE : - Drone Image

Taken by Geoid Resource Pvt LTD
On December 2021

85°15'30"E

85°16'0"E

सीएसआईआर-केंद्रीय खनन एवं ईंधन अनुसंधान संस्थान बरवा रोड, धनबाद

CSIR-CENTRAL INSTITUTE OF MINING AND FUEL RESEARCH, BARWA ROAD, DHANBAD

(वैज्ञानिक और औद्योगिक अनुसंधान परिषद)

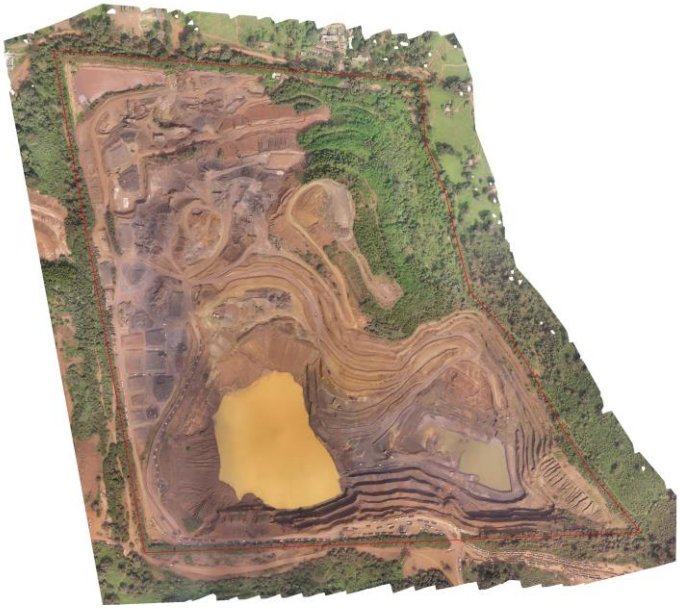
(Council of Scientific and Industrial Research)

परियोजना का शीर्षक /PROJECT TITLE:

मेसर्स ईएसएल स्टील लिमिटेड के नादीडीही लौह अयस्क और नादीडीही लौह & मैंगनीज अयस्क खदानों के पीट और डंप की ढलान स्थिरता पर वैज्ञानिक अध्ययन और सलाह

SCIENTIFIC STUDY AND ADVICE ON SLOPE STABILITY OF PITS AND DUMPS OF NADIDIHI IRON ORE MINE AND NADIDIHI IRON & MANGANESE ORE MINE OF M/S ESL STEEL LTD.

भाग-1 (Part-1) : नादीडीही लौह अयस्क खदान / NADIDIHI IRON ORE MINE (NIOM)



प्रायोजक / SPONSOR

मेसर्स ईएसएल स्टील लिमिटेड (M/s ESL STEEL LIMITED)

जनवरी (JANUARY), 2024

परियोजना क्रमांक (PROJECT NO.): CNP/XXXX/2023-24

CSIR-Central Institute of Mining and Fuel Research, Dhanbad

(Council of Scientific and Industrial Research)

Project Title	:	SCIENTIFIC STUDY AND ADVICE ON SLOPE STABILITY OF PITS AND DUMPS OF NADIDIHI IRON ORE MINE AND NADIDIHI IRON & MANGANESE ORE MINE OF M/S ESL STEEL LTD. Part 1: Nadidihi Iron Ore Mine (NIOM)
CIMFR Project No	:	CNP/XXXX/2023-24
Sponsor	:	M/s ESL Steel Limited
Project Co-ordinator	:	Mr. Kartik Varwade
Project Leader	:	Dr. Sanjay Kumar Roy
Project Collaborator	:	Dr. Ritesh Kumar Mr. Anand Singh Mr. Manish Kumar Mr. Rakesh Kumar Singh Mr. Prince Kumar & Mr. Swapan Mahato

January, 2024

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Conclusions and recommendations mentioned in the report are based on the geo-mining conditions specified in the report. Moreover, CSIR-CIMFR has no control in the implementation of the recommendations stipulated in the report. Therefore, CSIR-CIMFR team will not be responsible for any untoward incidences caused by change in geo-mining conditions as well as due to non-compliance to recommendations of the report.

29/01/2024

Project Leaders
(Sanjay Kumar Roy)
Chief Scientist & HORG
Slope Stabilisation & Landslide Management

29/01/2024

Project Co-ordinator
(Kartik Varwade)
Scientist
Slope Stabilisation & Landslide Management

1.0 Introduction

The importance of safe, properly designed and scientifically engineered slope is well known. The benefit of an open-pit operation largely depends on the use of the steepest slopes possible, which should not fail during the life of the mine. So, the design engineer is faced with the two opposite requirements, stability and steepness, in designing the deep open-pit slopes. Steepening the slopes, thereby reducing the amount of material to be excavated, can save a vast sum of money. At the same time excessive steepening may result into slope failure leading to loss of production, extra stripping costs to remove failed material, reforming of benches, rerouting of haul roads and production delays. Directorate of Mines Safety may even close the mine, in case unsafe conditions are created. Therefore, it is necessary that a balance between economics and safety should be achieved.

Geotechnical studies of opencast mines are helpful in the economically successful completion of opencast mines without creating conditions that may put in danger the entire mining operations. Earlier, slope stability analysis of proposed pits and dumps in the mining plan was not an integral part of the approval of new mines in India. Coal Mines Regulations, 2017 have specified categorically in Regulation 106(2) that before starting a mechanized opencast work, the owner and agent of the mine shall ensure that the mine, including its method of working, ultimate pit slope, dump slope, and monitoring of slope stability, has been planned, designed and worked as determined by a scientific study and the copy of the report of such study had to be kept available in the office of the mine. Provided that in case of the mines where such study has not been made, it shall be the responsibility of the owner and the agent to get the said study made within one year from the date of coming into force of these regulations. Similar clauses are there for metalliferous mines also in the Draft Metalliferous Mines Regulations, 2019 published on February 20, 2020. Moreover, DGMS has issued DGMS (Tech.) Circular no. 02 of 2020 dated 09.01.2020 and DGMS (Tech.) Circular no. 03 of 2020 dated 16.01.2020 related to slope stability analysis and monitoring.

The mine management referred the analysis work on slope stability analysis of pits and waste dumps of Nadidihi Iron Ore Mine and Nadidihi Iron & Manganese Ore Mine of M/s ESL Steel Ltd. to CSIR-CIMFR, Dhanbad vide their work order no. 4900002423 dated 26.07.2023. Nadidihi Iron Ore Mine (NIOM) is fully mechanized mine and situated at Nadikasira and Rangelbeda villages of Koira Tehsil in Sundergarh district of Odisha. The area of the Nadidihi block falls in the upper shale formation of the Koira group.

CSIR – Central Institute of Mining and Fuel Research (CIMFR) is one of the pioneer national research laboratories under the aegis of the Council of Scientific and Industrial Research (CSIR). It has been carrying out R&D activities in the fields of Rock Mechanics, Mining Methods, Mine Environment, Mine Safety as well as Mine Machinery. It consists of experienced, technically skilled, and dedicated experts in these fields.

The slope stability division has been rendering its services for better and safe mining all over India for about 30 years. During the last ten years, CSIR-CIMFR has completed more than 60 projects in coal and non-coal sectors on slope stability. CSIR-CIMFR is well equipped with recent and sophisticated equipment and computer software to study slope stability problems and slope monitoring. CSIR-CIMFR also has a well-equipped rock mechanics laboratory with the latest computerized equipment for the determination of all types of engineering properties of rock and soils.

The stability of the slope primarily depends on the slope geometry and strength properties of the slope materials. The orientation of the discontinuity planes with respect to the slope face determines the types of failure possible within that slope. Generally planar, wedge, toppling and buckling types of failure occur in rock slopes, while in soil slopes and weathered/ fractured rock slopes circular failure is possible. Groundwater and surface water flow conditions also play a critical role in the stability of dump and pit slopes.

Team of CSIR-CIMFR visited Nadidihi Iron Ore Mine of M/s ESL Steel Limited to observe present condition of the pits and dumps. CSIR-CIMFR also tested representative samples of different lithologies and dump mass for estimation of geo-mechanical properties. CSIR-CIMFR conducted the slope stability study of pits and dumps of Nadidihi Iron Ore Mine using numerical modeling by Shear Strength Reduction (SSR) technique.

This report deals with the slope stability analysis of existing pits and dumps of Nadidihi Iron Ore Mine of M/s ESL Steel Ltd. and presents the optimum configurations of ultimate pit and dump slope within the existing leasehold boundaries. Moreover, the report presents general measures to be adopted by the mine management to keep the pit and dump slopes in drained condition and methodology for monitoring of pits and dumps for early detection of instability.

2.0 Mine Location, Climate and Rainfall

Nadidihi Iron Ore Mine (NIOM) is situated at Nadikasira and Rangelbeda villages of Koira Tehsil in Sundergarh district of Odisha. The Nadidihi deposit is located between longitudes 85°15'29.52153" to 85°16'10.21163" and latitudes 21°57'52.97818" to 21°58'25.03192". Drone image of Nadidihi Iron Ore Mine has been shown in Figure 1. It falls in the Survey of India topo-sheet number 73G/5 (F45N5). The total lease area of Nadidihi Iron ore mine is 74.50 Ha and the forest cover area is 63.021 Ha. Nadidihi deposit is a mechanised opencast mine. The block is well connected by Road. The nearest public road is National Highway-520, which is situated 0.2 km away from the lease area. Another Barbil-Koira-Rourkela Road is about 8 km NE of Koira. The nearest railway station, Barbil, is located at 24 kms distance from the mine lease. The region has a hot and arid climate. Karo & Sunanadi are the two rivers which flow at a distance of 0.3 km and 5.3 km towards north east and south east respectively. The average annual rainfall is about 1200 mm.

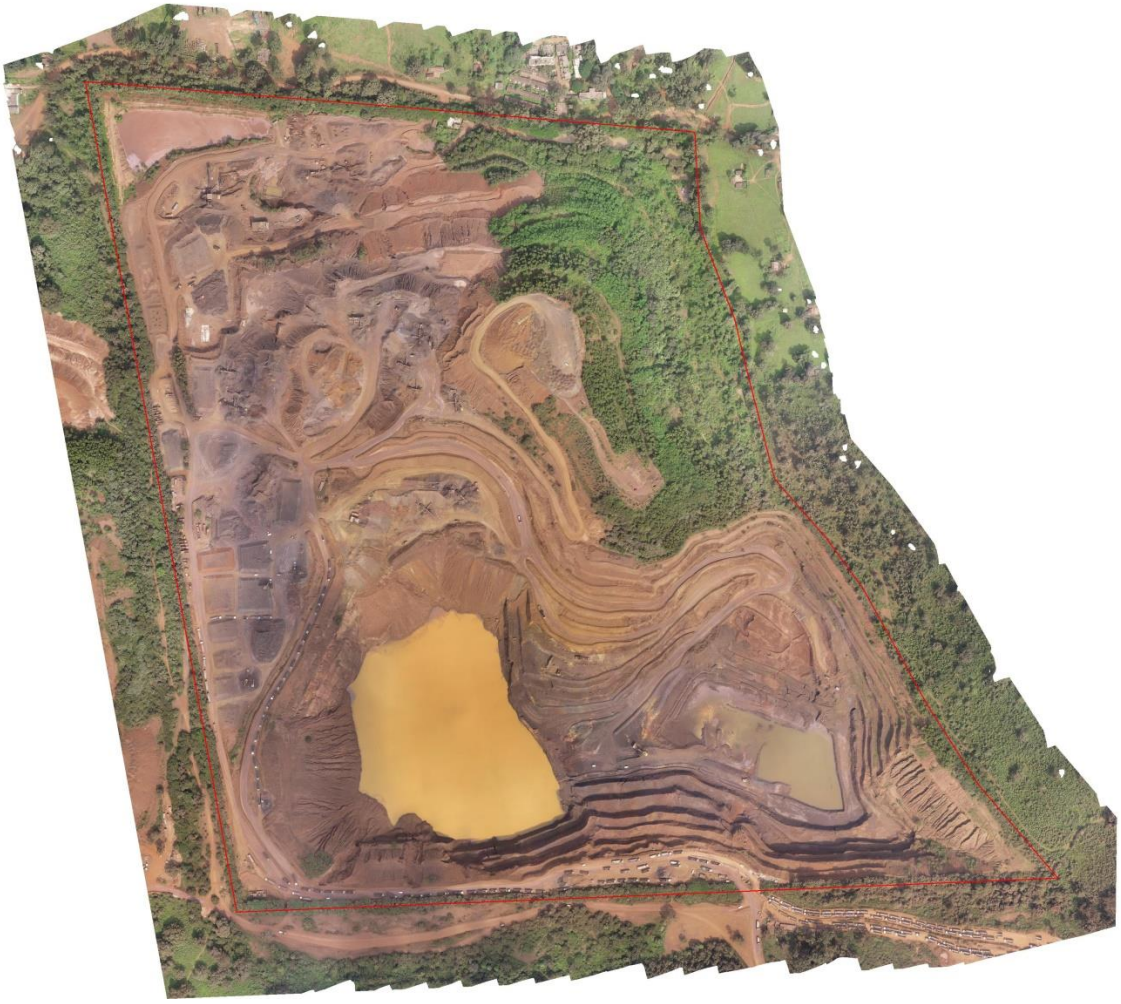


Figure 1: Drone image of Nadidihi Iron Ore Mine

3.0 Geology, Orebody & Drainage

Regional Geology

The Nadidihi Iron Ore Mine forms a part of pre-cambrian sedimentary formation known as the iron-ore series developed in Singhbhum-Keonjhar-Bonai area. The general strike of the formation in Northern Singhbhum is NNE-SSW, but gradually changing over to NW-SE in the eastern part and in the adjoining area of Mayurbhanj. The iron-ore series consist mainly of banded hematite quartzites and shales with intercalations of lava flows and tuffs. There are views that large part of the shales may really consist of tuffaceous material. In some places the phyllites are manganiferous and have been partly replaced by manganese ores. Such manganese ore bodies are of small dimensions and are observed in several places of Keonjhar and Bonai.

Their formation has largely been determined by local topography and drainage in ancient times as they extend only to shallow depths and are mainly composed of pyrolusite, psilomelane and wad. The iron ore series is overlain by the Kolhan series of presumably Cuddapah age (Algonkian) and consists of basalt conglomerates and sandstones which are overlain by limestones and shales.

The general stratigraphical succession of this area is as under:

- Kolhan series (basal conglomerate and sandstone)
- Unconformity
- Phyllite-sand tuffs with manganese and dolomite.
- Banded hematite quartzite.
- Phyllites and tuffs conglomerate and basic igneous rocks.

The rocks of the Iron ore series in West Singhbhum, Keonjhar and Boani give rise to a rugged topography. The beds of banded hematite-jasper form prominent ridges rising to about 2500 to 3000 ft. in altitude. The lower ground is occupied by lava, phyllite and shale. The whole succession of rocks is folded into a series of asymmetrical or slightly over tuned anticlines and synclines. The rocks have a NNE-SSW strike with a general westerly dip. The banded hematite jaspers consist of alternating bands of jasper or chalcedony and hematite containing varying proportions of iron oxide and silica. Owing to their greater hardness they stand up as prominent ridges and cliffs. On weathered surfaces, the hematite band often stand up while the jasper bands from depressions due to high leaching action.

The color of jasper bands varies from grey or white lavender, red and brown to black. Iron ore from the banded hematite-jasper is or different physical types, viz., massive, laminated, shaly, powdery, etc. Massive ore is encountered at the surface of many deposits. It is massive, dark brown to steel-grey in color and Fe content about 68 to 70 percent. This type forms the float ore.

Powdery ore occurs as fairly large pockets and lenses. The material turns to powder if disturbed even slightly when in situ, the ore show bedding and may contain lumps of laminated ore with it. It is dark blue-grey to black in color and consists mainly of hematite with some quantity of martite. It is generally rich in Iron ore containing 60 to 69 percent of iron.

Bore holes drilled by different agencies show that the hard massive ore is largely confined to the surface but they may extend to a depth of 50 to 100 ft. compact and laminated ores may extend to various depths from the surface. They often contain intercalations and masses or un-replaced hematite-Jasper and powdery ores. This may indicate that, while the ore near the surface has been completely leached of its silica and alumina with the consequent filling of all the pore spaces by ore, there are still unfilled spaces left between the layers at depth.

Local Geology and Structure

The area of the Nadidihi block falls in the Upper shale formation of the Koira group. It can be divided into the top Ferruginous Shale unit and its underlying Manganiferrous Shale unit. The Manganiferrrous Shale of the Upper Shale formation has a gradational contact with its underlying litho-units of Banded Iron Formation represented by BHJ, BHQ and BHC. The sequence of litho-units as observed in the boreholes drilled in the area in general is as follows:

- Ferruginous Shale
- Laterite/ lron Ore (+55% Fe) shaly Iron ore (45% to 54.9% Fe)
- Manganiferous shale and/or Mn ore
- BHJ/BHQ/BHC

Though the Koira area is known for good numbers of Manganese (Mn) quarries, the Nadidihi block under study have very scattered low grade Manganese bearing units which cannot be used for commercial purpose. As observed in the field, none of the quarries bear any good manganiferous litho-unit in them. At present there is no workable Manganese ore deposit available within the mine lease area. The iron ore formation directly overlies the BHJ/BHQ litho-unit.

The Nadidihi iron ore blocks form a part of Bamebari syncline on the eastern limb of major 'horse shoe' shaped synclinorium. Systematic geological mapping and drilling reveal that the area is intensely folded with accompanying low-grade metamorphism. Both the blocks are covered either by soil or laterite and the iron ore bodies and different litho units are scarcely exposed on the surface making it difficult to measure the attitude of the beds. However, the attitudes of the beds were measured at a few places in both the blocks. The strike of the bedding planes varies from N30°W to S30°E, N-5 to N30°E to S30°W with dips of 20° to 45° towards NW to W in shale mainly due to compressed nature of beds and dips are rolling mainly due to development of cross folds in BHJ. The litho sequence of the block indicates at least two phases of deformation and folding resulting in broad warps and formation of domes and basins in the area. The Nadidihi block represents the eastern limb of the anticline. All the litho units within the BIF and shale are affected by multiple sets of Joints. The strike of the joints usually follows the regional plunge direction i.e. N30°E, whereas, dip of the joints are mainly sub-vertical to vertical.

Structure

The strike of the bedding planes varies from N30°W to S30°E, N-S to N30°E to S30°W with dips of 20° to 45° towards NW to W in shale mainly due to compressed nature of beds and dips are rolling mainly due to development of cross folds in BHJ.

Lithology, Petrographic & Mineralogical Description for Major, Associated & Indicator Minerals

The sequence of litho units as observed in the boreholes drilled in the area in general is as follows:

- Ferruginous Shale
- Laterite/ Iron Ore (+55% Fe) shaly Iron ore (45% to 54.9% Fe)
- Manganiferous shale and/or Mn ore
- BHJ/BHQ/BHC

Nature/Form of Mineral

Hematite variety of iron ore occurs in the area. Based on physical characteristic like color, hardness, bedding, alumina and silica content, hardness etc. the deposits have been named as lateritic iron ore, soft laminated iron ore, hard laminated iron ore, friable ore and blue dust. Lateritic iron ore is found at the top or immediately below the laterite zone. It is generally with dull luster, rich in alumina, friable nature and lowest in grade. Lateritic iron ore is dominant in iron ore zone. Soft laminated iron ore is soft in nature and characterized by laminations. It can be cherry red to steel grey in color and higher in grade as compared to lateritic iron ore. Very often, it grades in to fines/ powdery ore.

Extent of Mineralization

The extent and viability of Iron ore mineralization of this old mine is already known as well-defined exposures of Iron ore in quarries are already available. From 244 no. of bore holes and operational quarries vertical depth and horizontal extension of the Iron ore is very clearly known.

Deposit Type (as per MEMC Rule)

- Strike/ trend of the ore body: N30°W to S30°E, N-S to N30°E to S30°W
- Amount of dip of ore body: 20° to 45°
- Dip direction of the ore body: NW to W

Drainage

The area is practically devoid of any nala or water-shed. Karo river flows at a distance of 0.3 km towards north east and Sunanadi river flows at a distance of 5.3 km towards south east from mine lease boundary. The mine discharge water will be routed through drains to the settling tank from where the overflowing water will be utilized for plantation and washing of equipment and for beneficiation plant. Retaining wall, garland drains, settling ponds and check dams have been proposed to be constructed to restrict the flow of water from dumps and mine discharge water from the higher to low lying lands and to allow overflow of clean water after due settling of the suspensions within the settling ponds. No groundwater seepage was observed during the field visit except in a small area with very limited quantity.

The lack of groundwater table within the rock mass and the implementation of different remedial drainage measures being taken by the mine management and suggested in this report would result in to effectively drained dump mass for all practical purposes.

4.0 Method of working

Nadidihi Iron Ore Mine (NIOM) is a category-A fully mechanized mine. The conventional opencast mining method is being adopted in NIOM by using excavator, dumper, rock breaker and deep hole drilling, wherever required. For excavation of iron quarry, excavator of capacity upto 6.1m^3 are being used in combination with dumpers of capacity 35 & 100 MT. Deep hole drilling with 115 mm diameter drilling machine and blasting is being done occasionally to fragment the hard rocks / ores, wherever required. Rock breakers have been proposed to be used to break the hard in-situ ore boulders to avoid blasting, wherever possible. It is presently being worked in two pits namely east pit and west pit which will be finally merged to form a single pit. A fixed dry screening and crushing plant of capacity 600 tph will be installed. The bench of maximum height upto 9m and bench width of 10-12m are being practiced in the mine.

The equipment which are currently in operation to achieve the targeted production during the mining period are listed below which seems to be adequate and sufficient for the targeted production in the mine.

Equipment	Type	Make	Capacity	No.
For Transporting & Hauling	Truck-Tipper	VOLVO FMX 460	35 Tonnes	8 to 10
	Dumper-Haulpack	KOMATSU	100 Tonnes	2
	Water Tanker	BEML WS28-2	28 KL	1
For Excavating & Loading	Hydraulic	CAT 395-542 HP	6.1 m^3	1
	Hydraulic	ZAXIS 870-483 HP	4.5 m^3	1
	Hydraulic	ZAXIS 470-315 HP	3.1 m^3	1
	Hydraulic	KOBELCO SK 500-363 HP	3.1 m^3	1
For Drilling	Hydraulic	HYUNDAI LM230	18.96 bar / 115 mm diameter	1

The design parameters of the Nadidihi Iron Ore Mine as proposed in the mining plan for Mining Plan period (2021-22 to 2025-26) are given below which may have to be modified as per slope stability analysis presented in the report.

- Bench height : 9 m
- Minimum width of working bench in overburden (OB) : 10-12 m
- Minimum width of working bench in ore : 10-12 m

- Maximum bench angle in ore : 70° to 80°
- Overall slope angle along different sections : 23° to 33°

Figure 2 shows the existing surface plan of Nadidihi Iron Ore Mine. Mine management provided the sections of the existing and proposed pit configurations at every 100 m interval along section lines 1-1' to 9-9'. Location of these sections lines 1-1' to 9-9' has also been shown in figure 2. These sections 1-1' to 9-9' were drawn in east-west direction only and in some cases not cutting the benches perpendicularly and hence do not give the true overall slope angle. Therefore, on CSIR-CIMFR request mine management provided sections along A-A' to H-H' which were drawn perpendicular to the existing / proposed benches. Location of section lines A-A' to H-H' on the surface plan has been shown in figure 3. Geological index and topographical index used in these sections are shown in figure 4. Sections of the existing as well as proposed profiles of pit/dump of NIOM along section line from 1-1' to 9-9' and from A-A' to H-H' are shown in figures 5(a) to 5(i) and 6(a) to 6(h). In these sections shown in figures 5(a) to 6(h) brown / black lines denote existing pit profile and red lines denote the proposed pit profile.

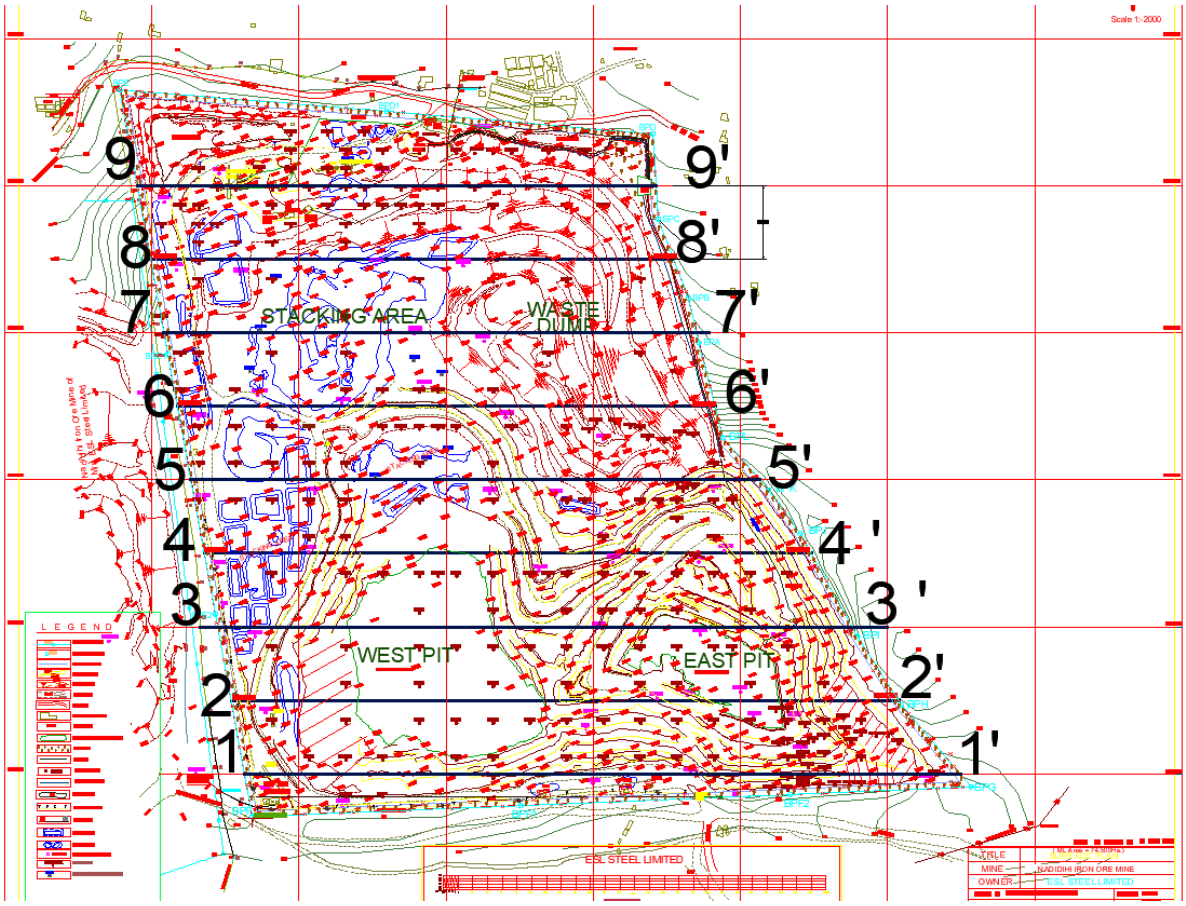


Fig 2: Existing surface plan of NIOM showing location of section line 1-1' to 9-9'

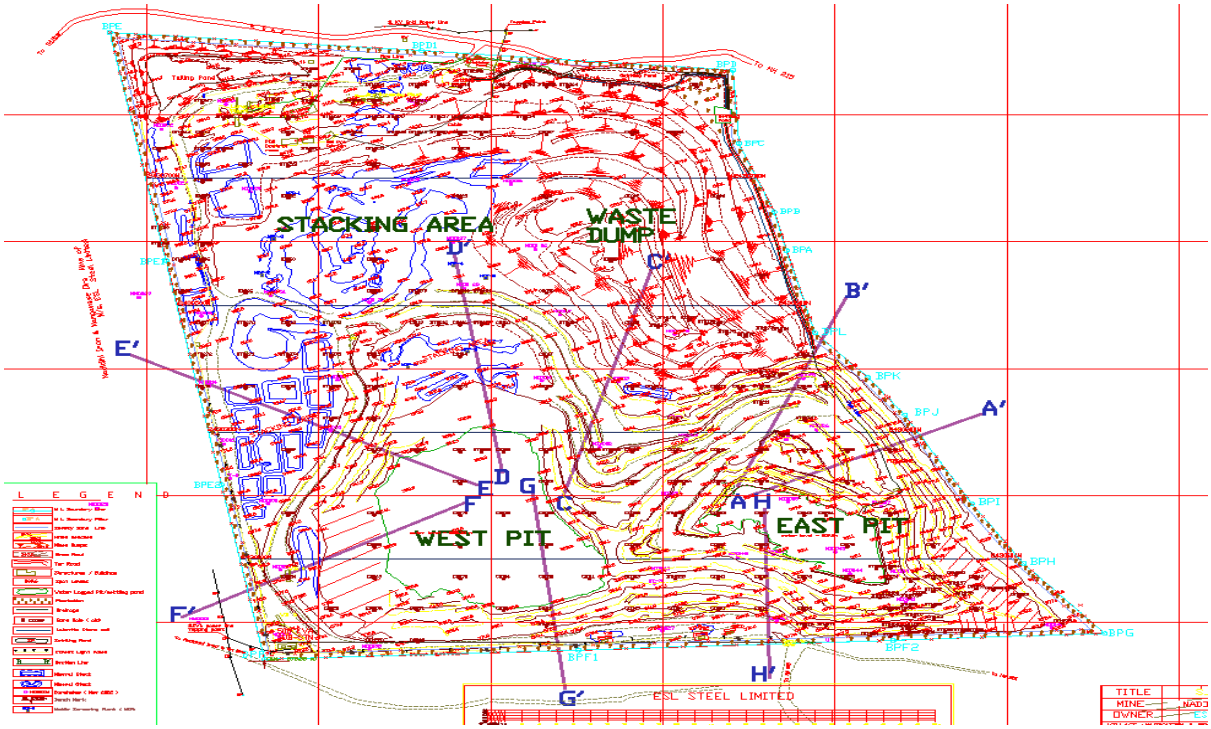


Fig 3: Existing surface plan of NIOM showing location of section lines A-A' to H-H'

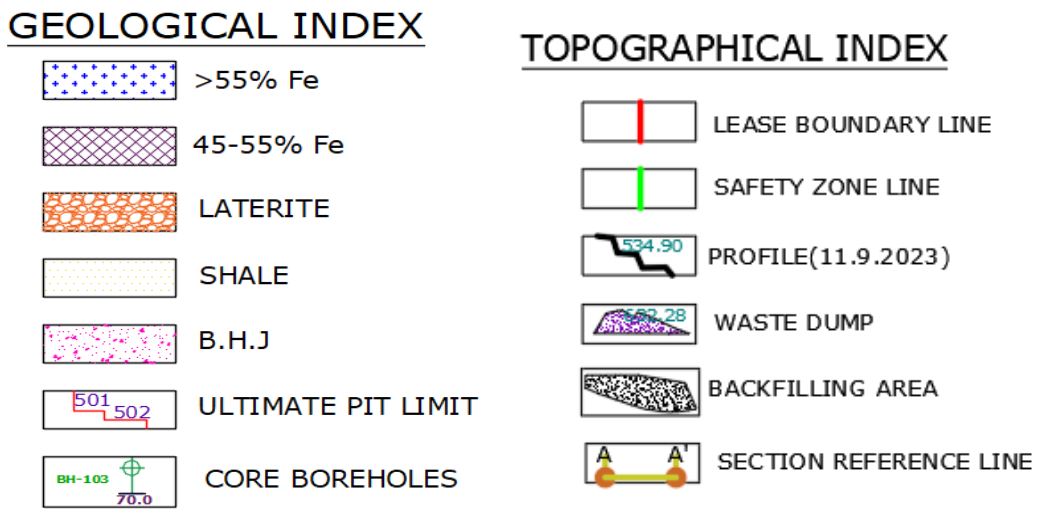


Fig 4: Geological index and topographical index used in sections of NIOM

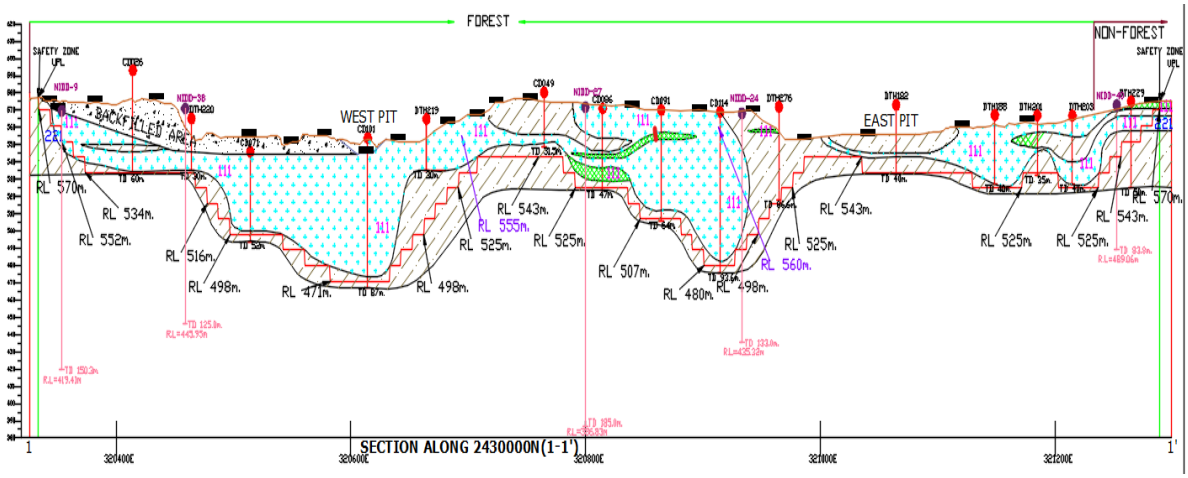


Fig 5(a): Section along 1-1'of Nadidihi Iron Ore Mine

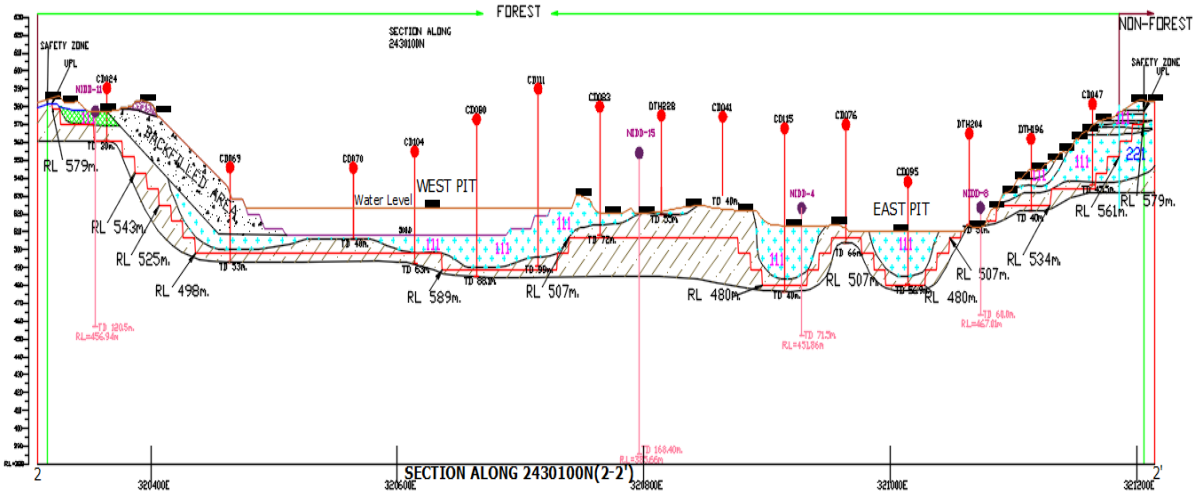


Fig 5(b): Section along 2-2'of Nadidihi Iron Ore Mine

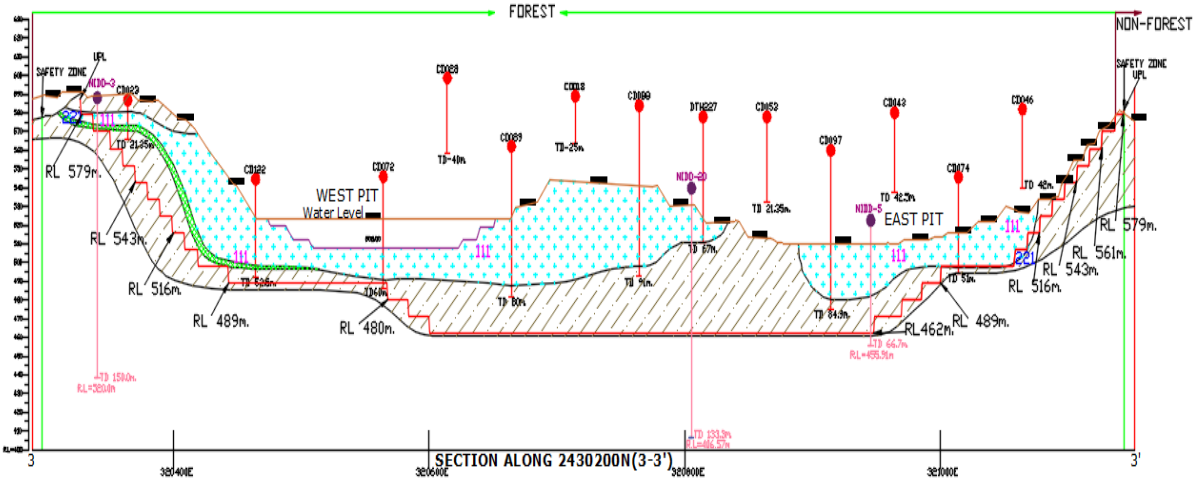


Fig 5(c): Section along 3-3'of Nadidihi Iron Ore Mine

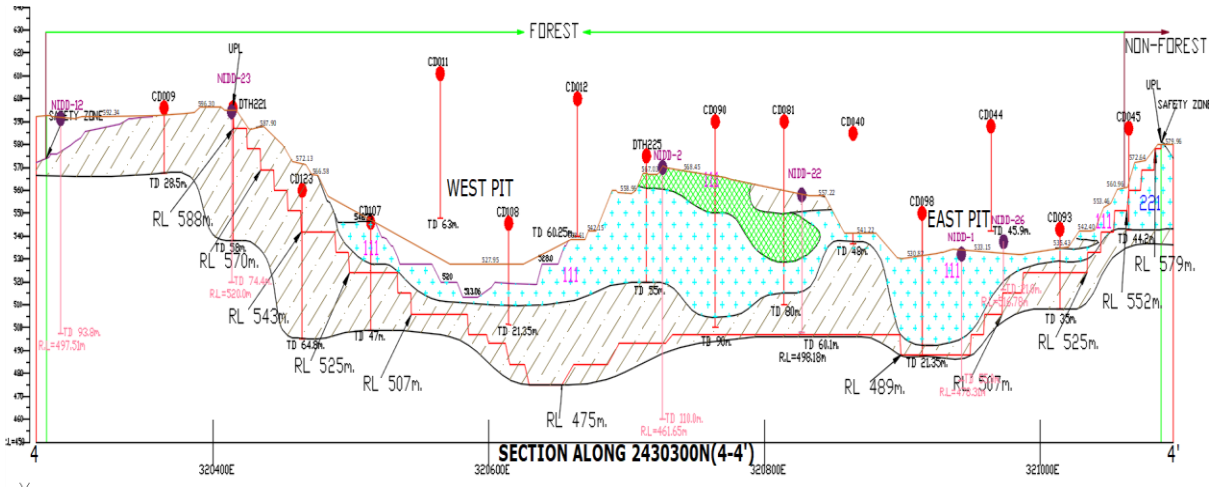


Fig 5(d): Section along 4-4'of Nadidihi Iron Ore Mine

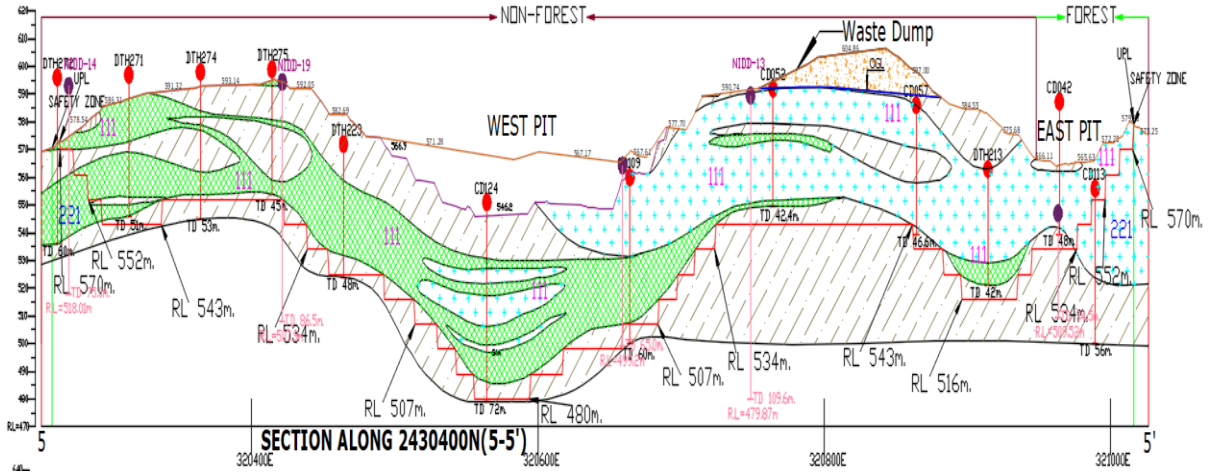


Fig 5(e): Section along 5-5'of Nadidihi Iron Ore Mine

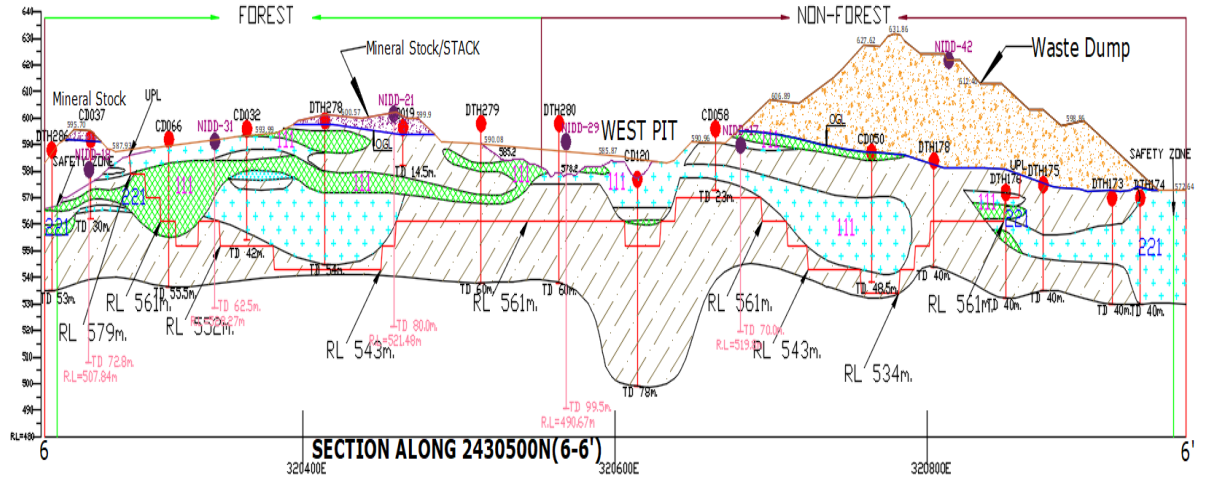


Fig 5(f): Section along 6-6'of Nadidihi Iron Ore Mine

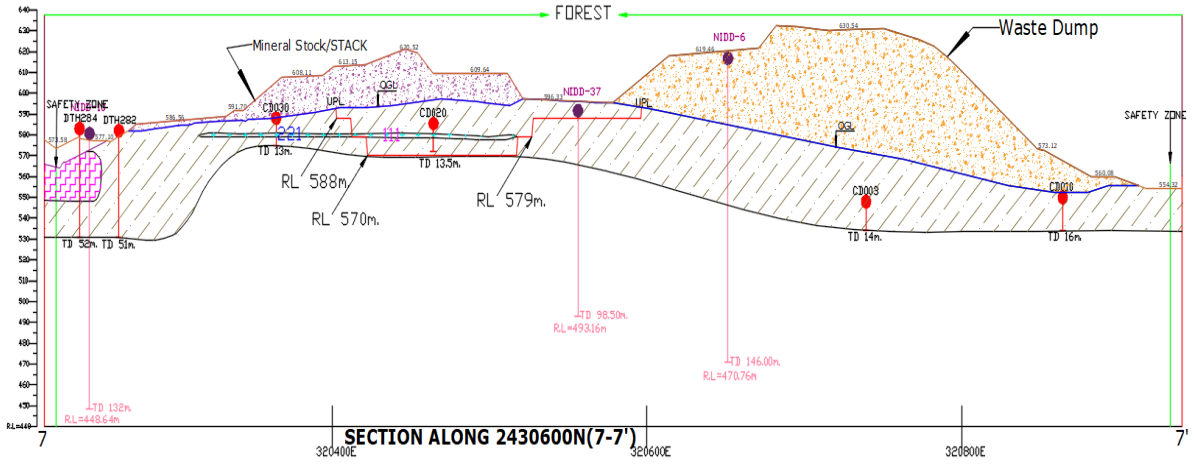


Fig 5(g): Section along 7-7'of Nadidihi Iron Ore Mine

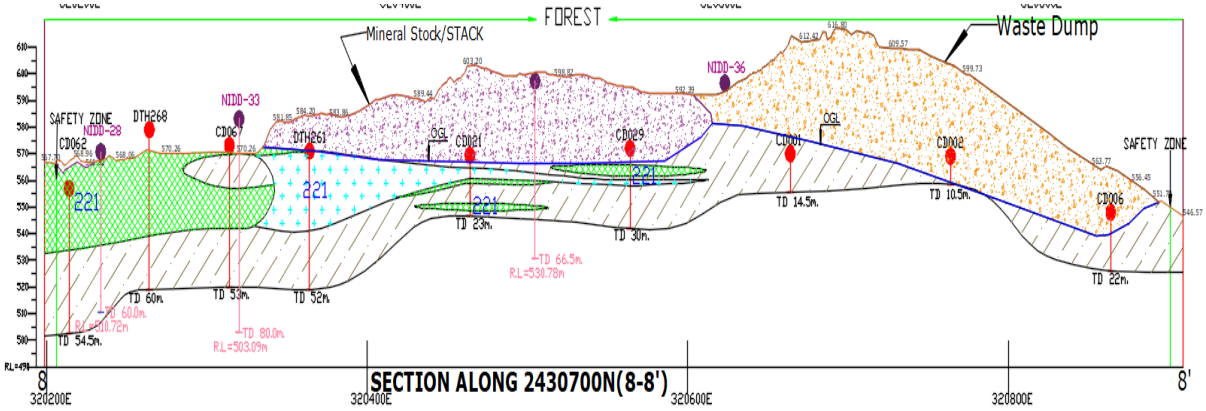


Fig 5(h): Section along 8-8'of Nadidihi Iron Ore Mine

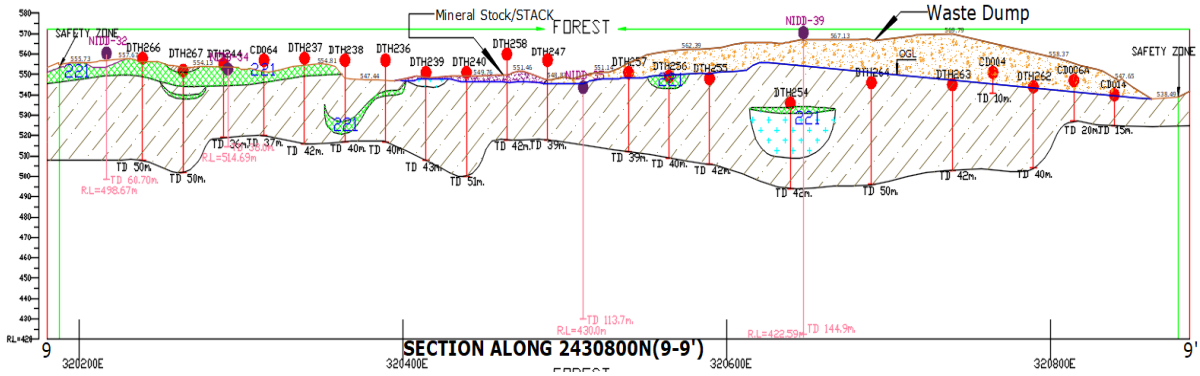


Fig 5(i): Section along 9-9'of Nadidihi Iron Ore Mine

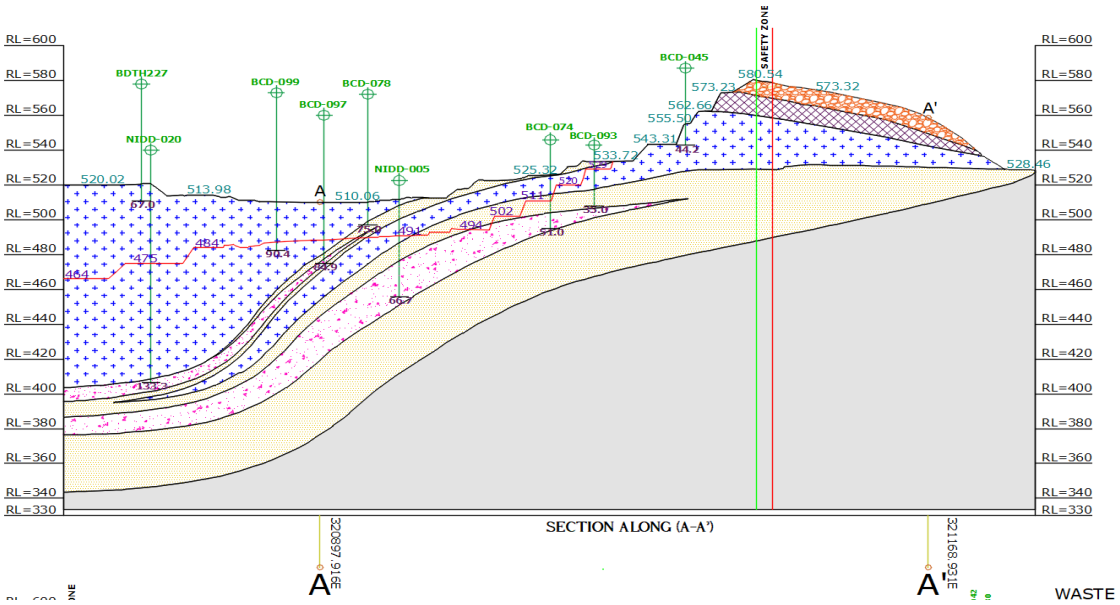


Fig 6(a): Section along A-A'of Nadidihi Iron Ore Mine

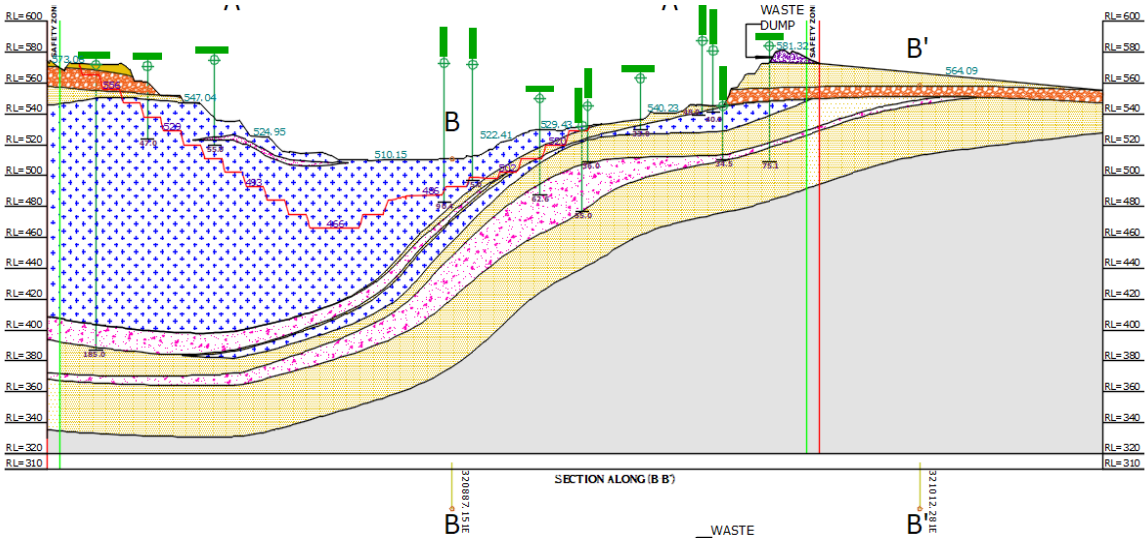


Fig 6(b): Section along B-B'of Nadidihi Iron Ore Mine

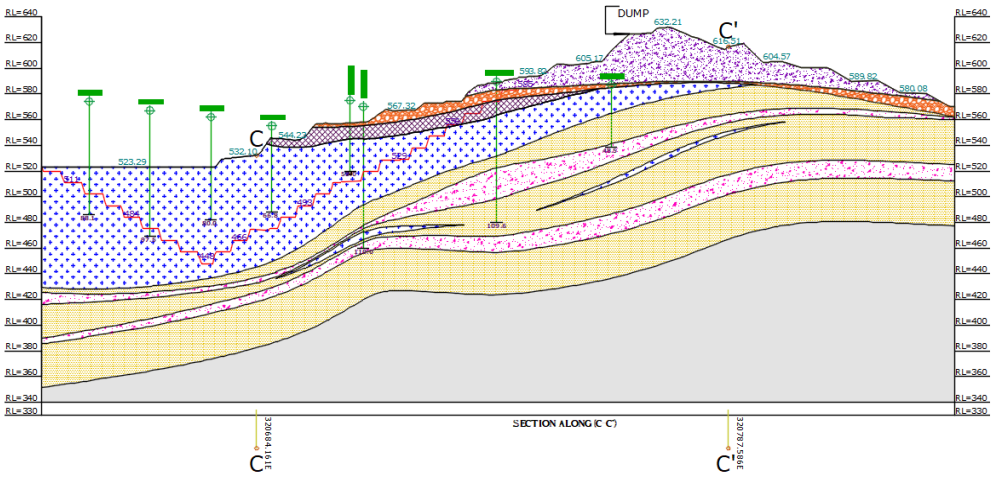


Fig 6(c): Section along C-C'of Nadidihi Iron Ore Mine

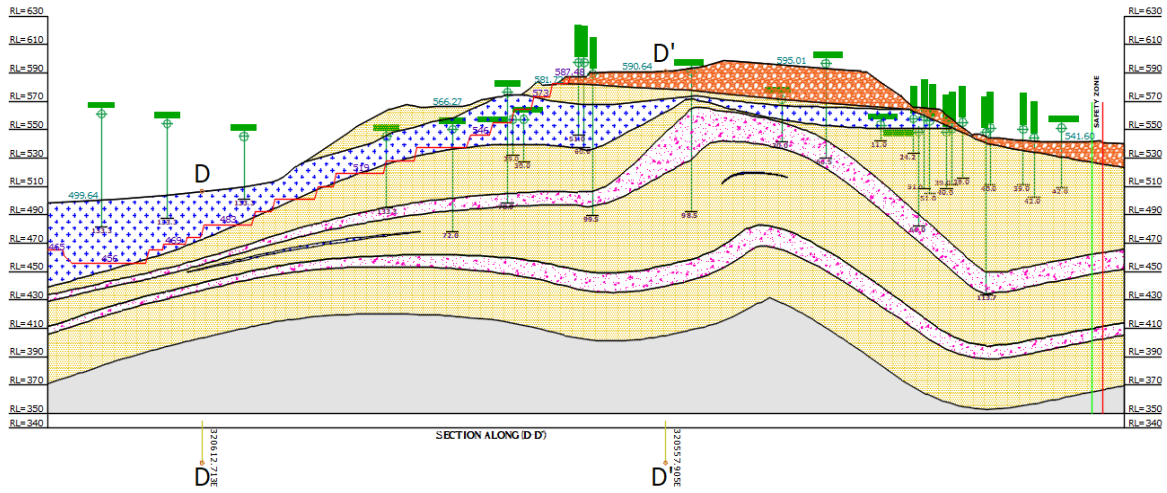


Fig 6(d): Section along D-D'of Nadidihi Iron Ore Mine

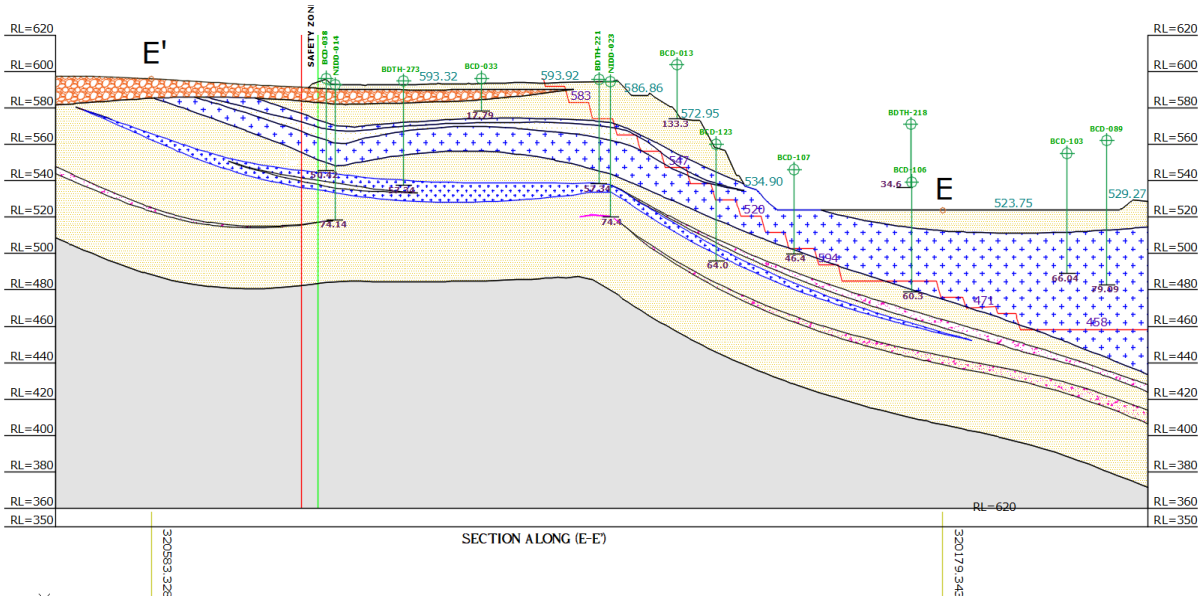


Fig 6(e): Section along E-E'of Nadidihi Iron Ore Mine

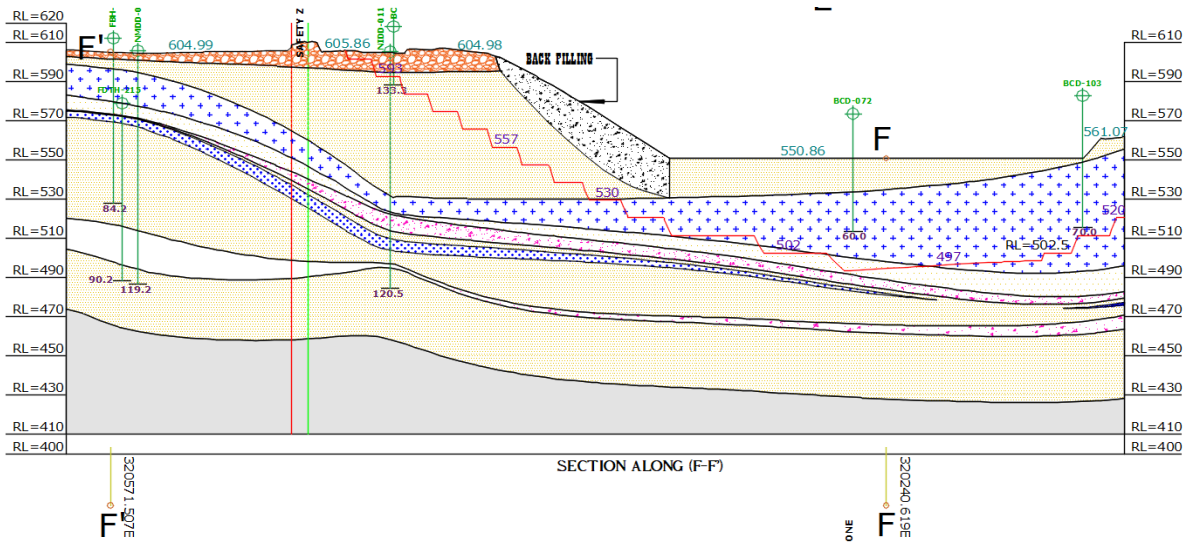


Fig 6(f): Section along F-F'of Nadidihi Iron Ore Mine

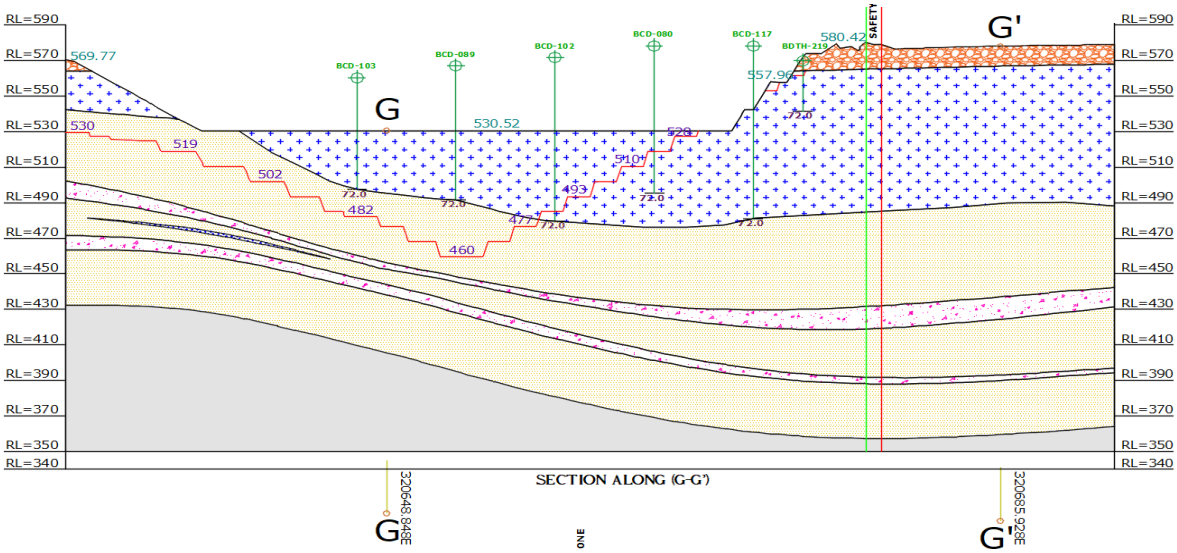


Fig 6(g): Section along G-G'of Nadidihi Iron Ore Mine

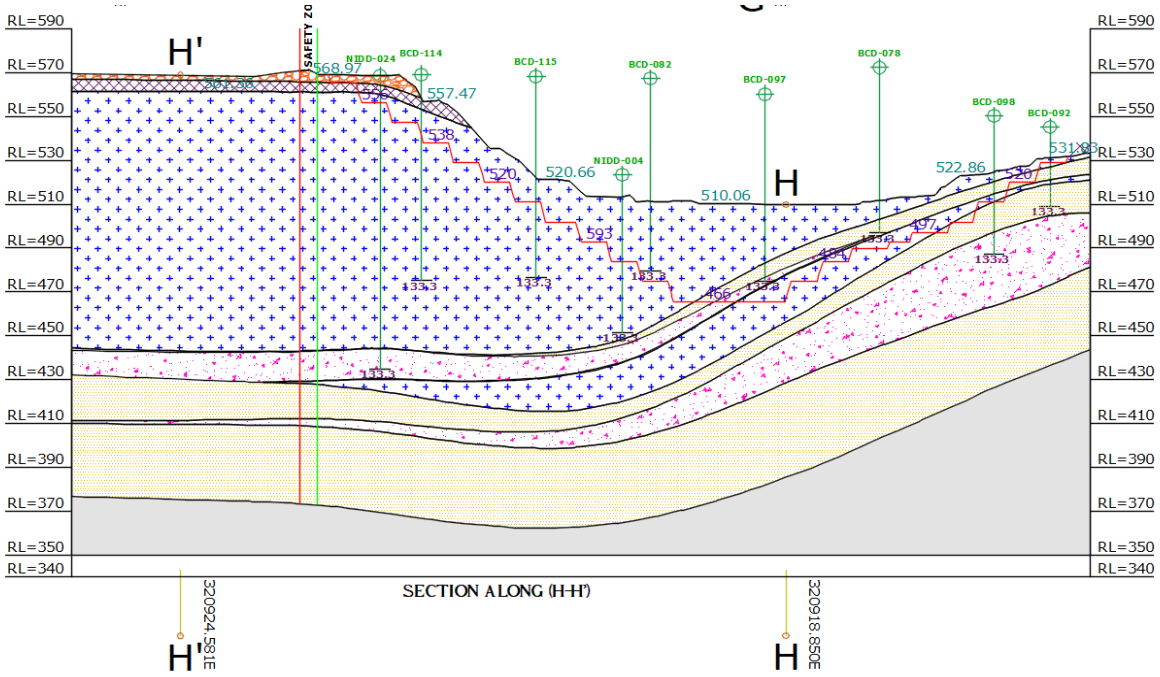


Fig 6(h): Section along H-H'of Nadidihi Iron Ore Mine

From the surface plan in figures 2 & 3 and sections in figures 5(a) to 6(h), the lowest and highest mRL of the existing pit profile and ultimate pit profile along different sections of Nadidihi Iron Ore Mine have been listed in Tables 1(a), 1(b) and 1(c).

Table 1(a): Top and bottom RL of existing and proposed pit profile of west pit along E-W sections

Section No.	Figure No.	Existing Pit (West)			Proposed Pit (West)		
		Top RL	Bottom RL	Difference	Top RL	Bottom RL	Difference
1-1'	5(a)	576	545	31	575	471	104
2-2'	5(b)	585	508	77	585	489	96
3-3'	5(c)	591	508	83	591	462	129
4-4'	5(d)	596	513	83	596	475	121
5-5'	5(e)	595	546	49	573	480	93
6-6'	5(f)	631	577	54	588	534	54
7-7'	5(g)	633	595	38	593	570	23

Table 1(b): Top and bottom RL of existing and proposed pit profile of east pit along E-W sections

Section No.	Figure No.	Existing Pit (East)			Proposed Pit (East)		
		Top RL	Bottom RL	Difference	Top RL	Bottom RL	Difference
1-1'	5(a)	575	545	30	575	480	95
2-2'	5(b)	583	510	73	583	480	103
3-3'	5(c)	582	510	72	582	462	120
4-4'	5(d)	580	530	50	580	489	91
5-5'	5(e)	607	564	43	580	516	64

Table 1(c): Top and bottom RL of existing and proposed pit profile of NIOM along perpendicular sections

Section No.	Figure No.	Existing Pit			Proposed Pit		
		Top RL	Bottom RL	Difference	Top RL	Bottom RL	Difference
A-A'	6(a)	580	510	70	580	466	114
B-B'	6(b)	581	510	71	581	466	115
C-C'	6(c)	585*	523	62	585*	448	137
D-D'	6(d)	582	498	84	582	456	126
E-E'	6(e)	594	524	70	594	458	136
F-F'	6(f)	606	550	56	606	493	117
G-G'	6(g)	580	530	50	580	460	120
H-H'	6(h)	569	510	59	569	466	103

*Presently dump is existing from 585mRL to 632mRL which needs to be pushed back at suitable distance from the pit crest

From Table 1(a) to 1(c) and figures 5(a) to 6(h), it is evident that top RL of the existing pit is generally varying between 575 to 595 mRL but at some places it is even higher upto 633mRL due to existing dump. Bottom RL of the existing west pit and east pit are 508m and 510mRL which is likely go upto 448mRL as per proposed mine development plan. Maximum depth of the existing pits is about 83mRL and that of the proposed pit is about 137m. Maximum height of the present dump is about 47m which may go upto 75m in due course. Therefore, in this report optimum benching configurations for maximum pit depth of 140m and maximum dump height of 75m has been designed.

5.0 Geo-mechanical Properties

It is prudent to know the lithological units in which the slope is to be cut. The engineering properties of these litho units will influence the analysis for slope stability. The samples of soils, rocks, and cores of different lithologies of Nadidihi Iron Ore Mine were collected to assess their geo-mechanical properties at CSIR-CIMFR, Dhanbad. The average values of cohesion (c), friction angle (ϕ), and density (ρ) of representative samples of NIOM have been listed in Table 2 and subsequently used for slope stability analyses. It is however prudent to re-examine the geotechnical data from time to time.

Table 2: Geo-mechanical properties

Sr. No.	Lithology	Cohesion (kPa)	Friction angle (degrees)	Density (g/cm^3)
1	Laterite	80	26	1.9
2	Shale	112	27	2.3
3	Iron Ore	135	27	3.0
4	Dump mass	53	21	2.0
5	BHJ/BHQ	265	33	3.2

6.0 Slope Stability Analysis

The Shear Strength Reduction (SSR) technique is a widely accepted method for performing slope stability analysis. In the SSR technique, the factor of safety (FOS) is defined as the ratio of the material's actual shear strength to the minimum shear strength required to prevent failure. Failure surface is found automatically through the zones within the material, where applied shear stresses cross the shear strength of the material. As the

stability of the slope is a function of the shear strength, the development of failure strain reflects the potential failure zone of slope. The shear strain developed in the slope increases with a reduction in the shear strength and is reflected in the analysis. The slope stability analysis was done by FLAC/SLOPE software, which is based on the SSR technique. FLAC/SLOPE is a two-dimensional explicit finite difference program for engineering mechanics computation. This program simulates the behavior of structures built of soil, rock or other materials that may undergo plastic flow when their yield limits are reached. The lagrangian calculation scheme and the mixed-discretization zoning technique used in *FLAC* ensure that plastic collapse and flow are modeled very accurately.

Due to scatter of test results and the uncertainty of these input parameters, a cut-off value of 1.3 for factor of safety, as suggested by Hoek and Bray (1981), was considered for assessing the stability of existing pit/ dump profiles and for optimizing the benching parameters of proposed ultimate pit and dump slope from stability point of view.

The slope stability analyses of pits and dumps of Nadidihi Iron Ore Mine were conducted on the representative sections provided by the mine management, which take into account the highest and deepest part of pits configurations. Based on the assessment of the proposed mine development plan, mine closure plans and sections, engineering geology, existing geo-mining conditions, strength properties and the related geotechnical controls indicated in the report, optimum design of the ultimate pit slope and dump slope of Nadidihi Iron Ore Mine have been recommended. Implementation of different remedial drainage measures suggested in the report would result into effectively drained slope mass of pit slope and dump slope for all practical purposes.

Slope Stability Analysis of Existing Pit Profiles

Slope Stability analysis of existing east and west pits of Nadidihi Iron Ore Mine were conducted using FLAC/SLOPE software on the representative sections (1-1’ to 5-5’ & A-A’ to H-H’). Result of slope stability analysis of existing pit profile along these sections have been shown in figure 7(a) to 7(r) and factor of safety (FOS) obtained after slope stability analysis along these sections have been listed in Table 3. Along other sections 6-6’ to 9-9’ there is no existing pits and these sections shows profile of existing dumps and their analysis has been presented separately.

Table 3: Stability analyses of existing pit slopes of Nadidihi Iron Ore Mine

Pit Section	Section No.	Pit Name	Figure No.	FOS
Existing Pit Section	1-1’	West Pit	Figure 7(a)	3.72
Existing Pit Section	1-1’	East Pit	Figure 7(b)	3.46
Existing Pit Section	2-2’	West Pit	Figure 7(c)	1.56
Existing Pit Section	2-2’	East Pit	Figure 7(d)	1.69
Existing Pit Section	3-3’	West Pit	Figure 7(e)	1.35
Existing Pit Section	3-3’	East Pit	Figure 7(f)	1.52
Existing Pit Section	4-4’	West Pit	Figure 7(g)	2.06
Existing Pit Section	4-4’	East Pit	Figure 7(h)	1.78
Existing Pit Section	5-5’	West Pit	Figure 7(i)	3.86
Existing Pit Section	5-5’	East Pit	Figure 7(j)	2.92
Existing Pit Section	A-A’	East Pit	Figure 7(k)	1.69
Existing Pit Section	B-B’	East Pit	Figure 7(l)	1.79
Existing Pit Section	C-C’	West Pit	Figure 7(m)	1.70
Existing Pit Section	D-D’	West Pit	Figure 7(n)	1.88
Existing Pit Section	E-E’	West Pit	Figure 7(o)	1.44
Existing Pit Section	F-F’	West Pit	Figure 7(p)	1.39
Existing Pit Section	G-G’	West Pit	Figure 7(q)	1.48
Existing Pit Section	H-H’	East Pit	Figure 7(r)	1.73

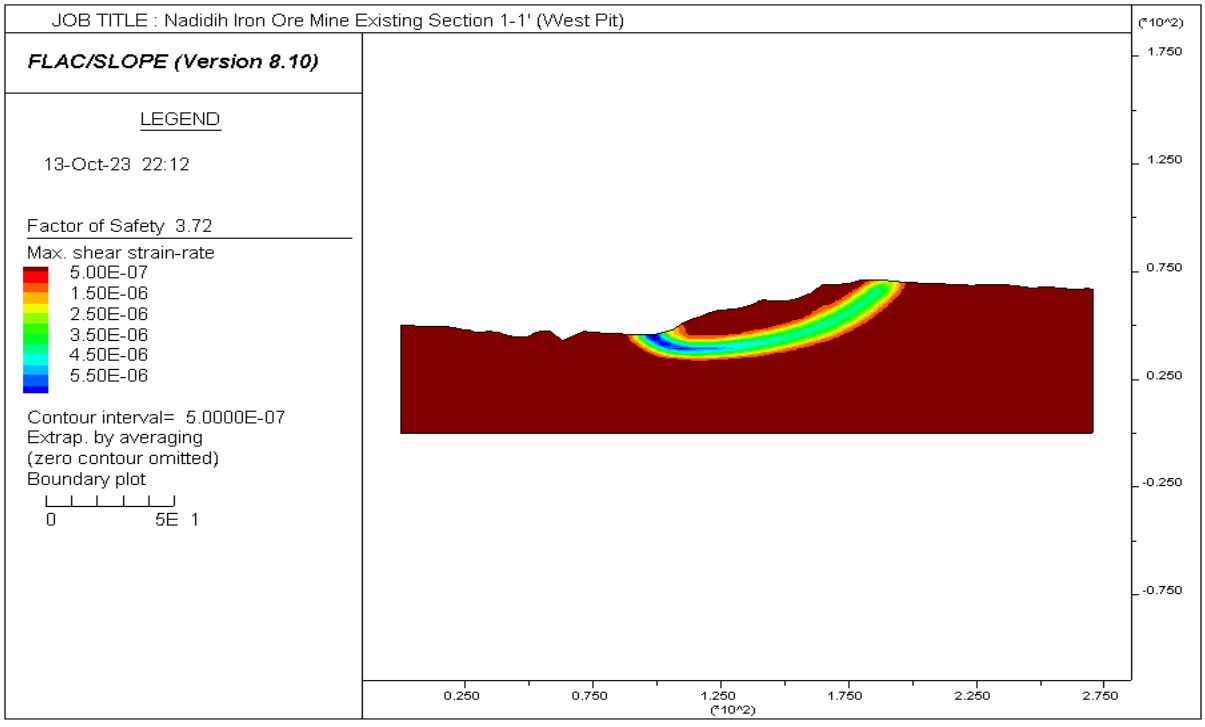


Fig 7(a): Slope stability analysis of existing profile of west pit of NIOM along section 1-1’

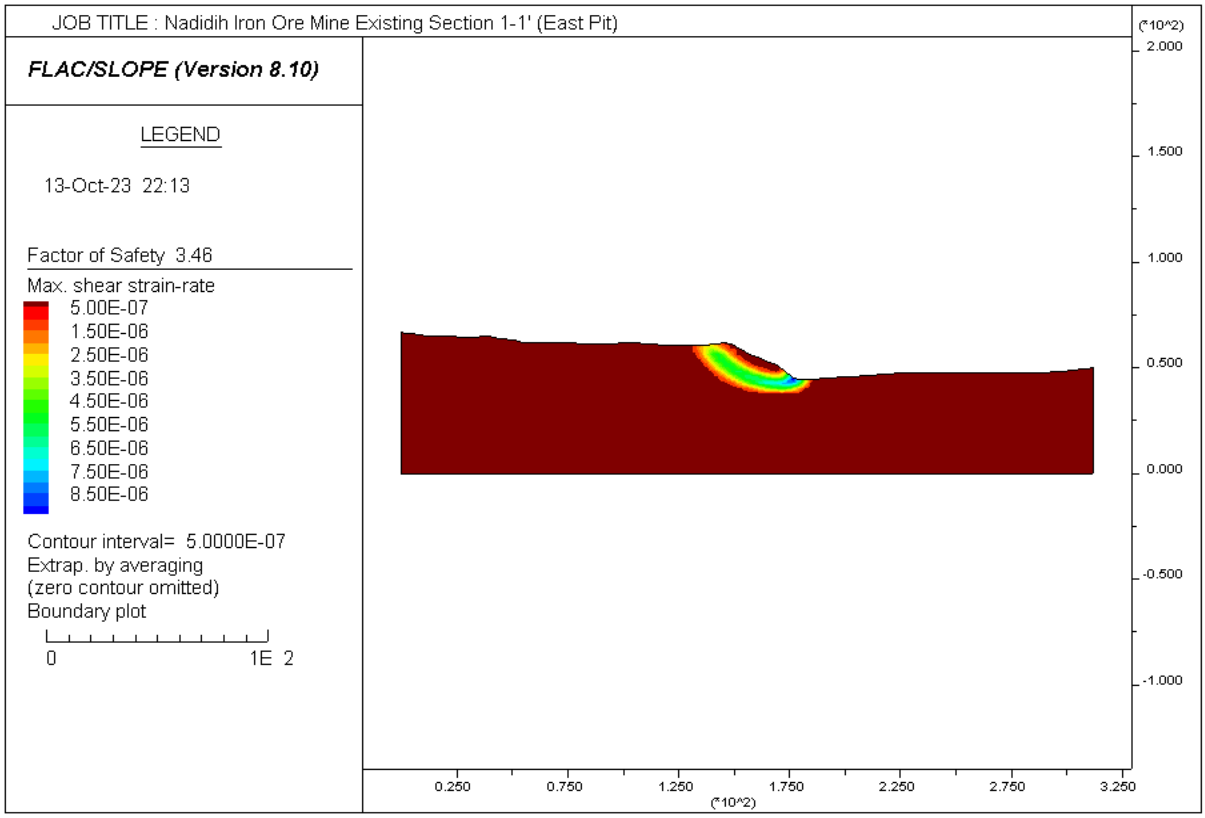


Fig 7(b): Slope stability analysis of existing profile of east pit of NIOM along section 1-1'

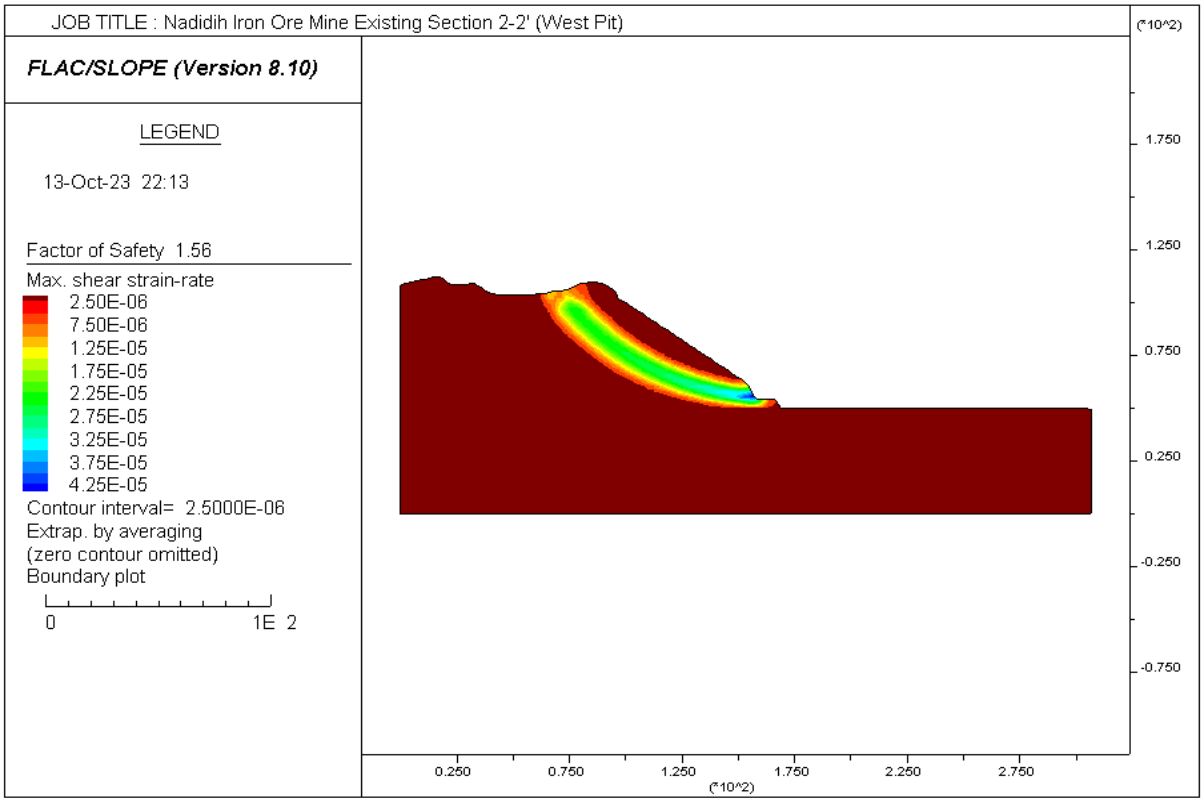


Fig 7(c): Slope stability analysis of existing profile of west pit of NIOM along section 2-2'

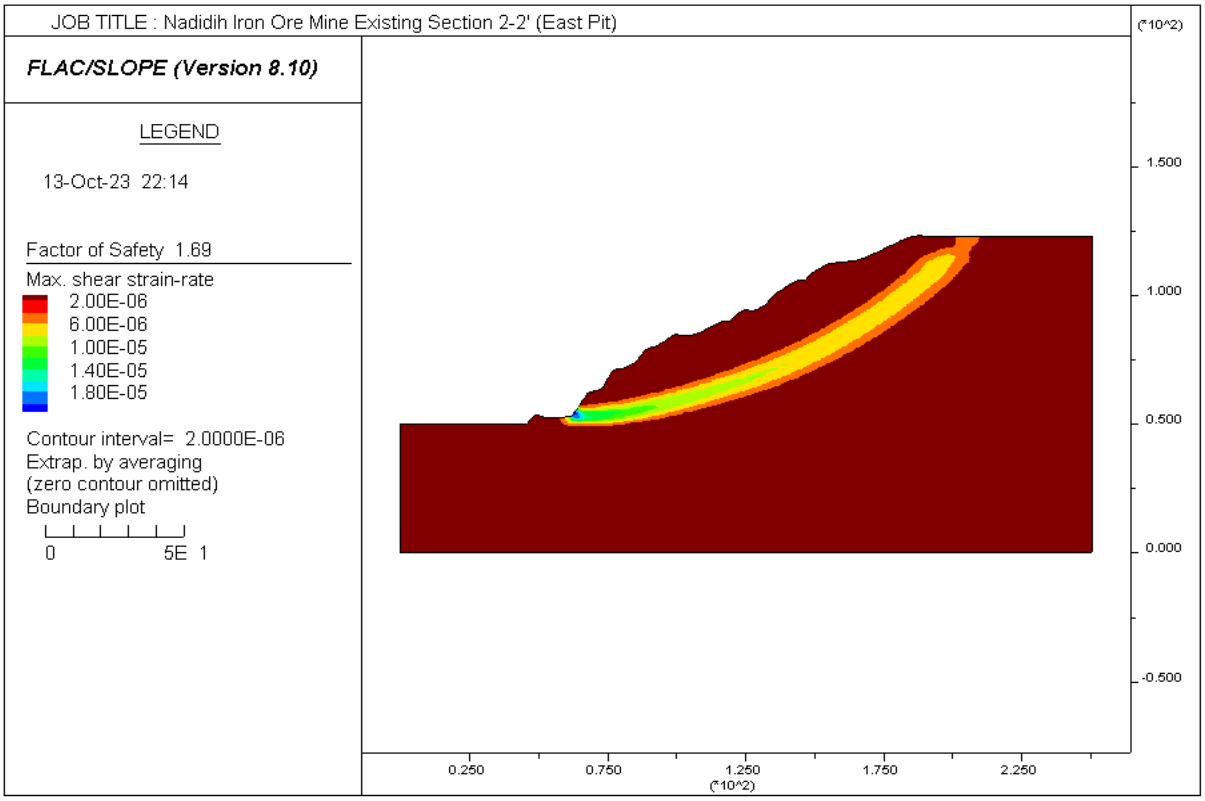


Fig 7(d): Slope stability analysis of existing profile of east pit of NIOM along section 2-2'

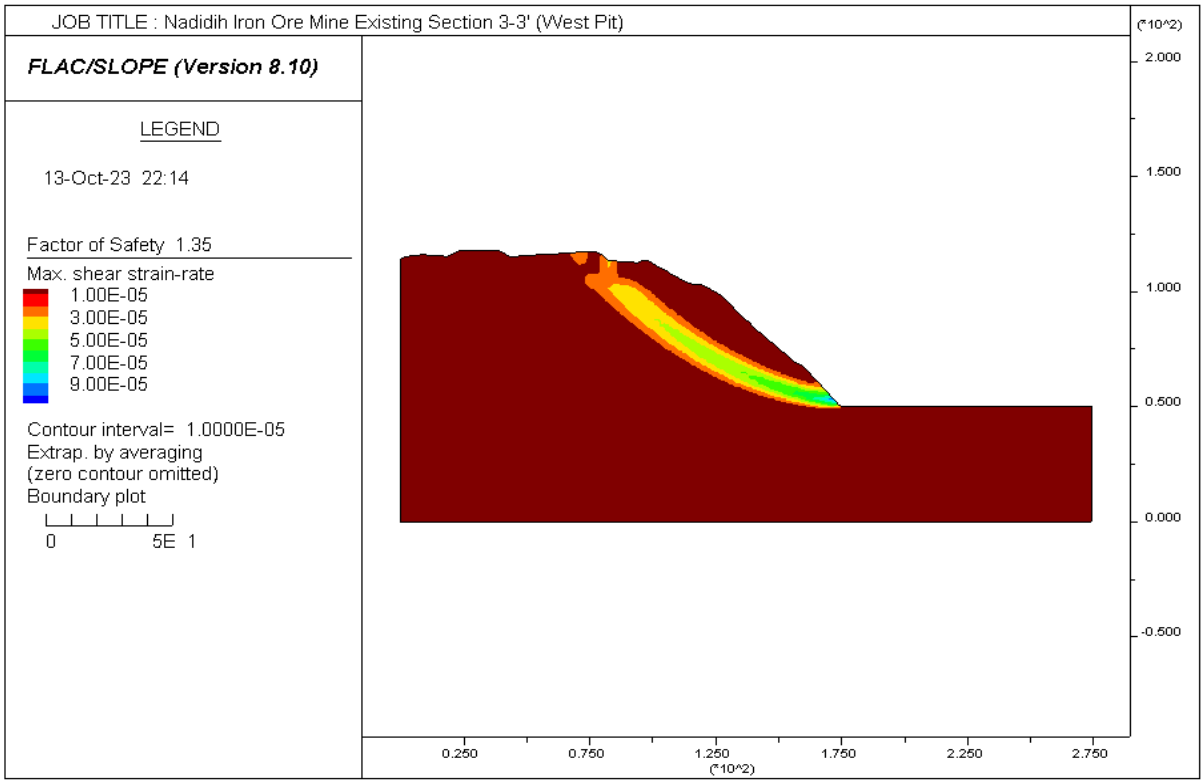


Fig 7(e): Slope stability analysis of existing profile of west pit of NIOM along section 3-3'

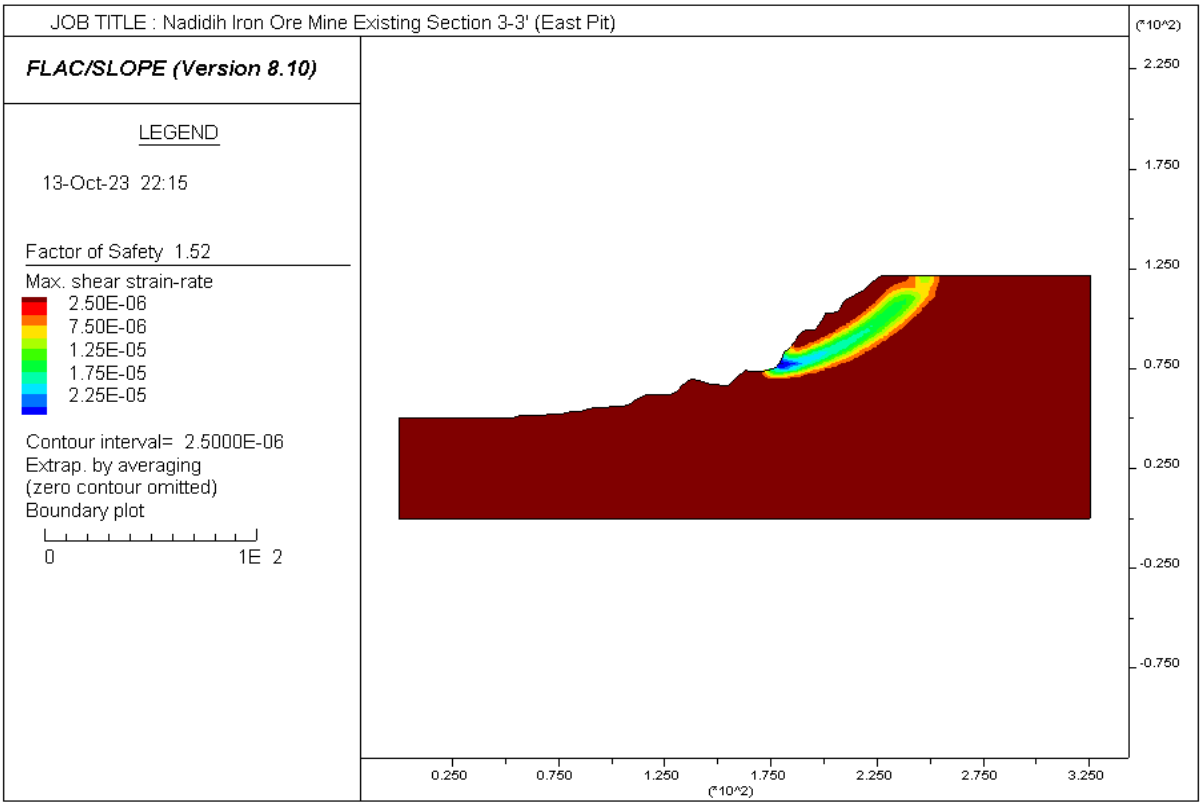


Fig 7(f): Slope stability analysis of existing profile of east pit of NIOM along section 3-3'

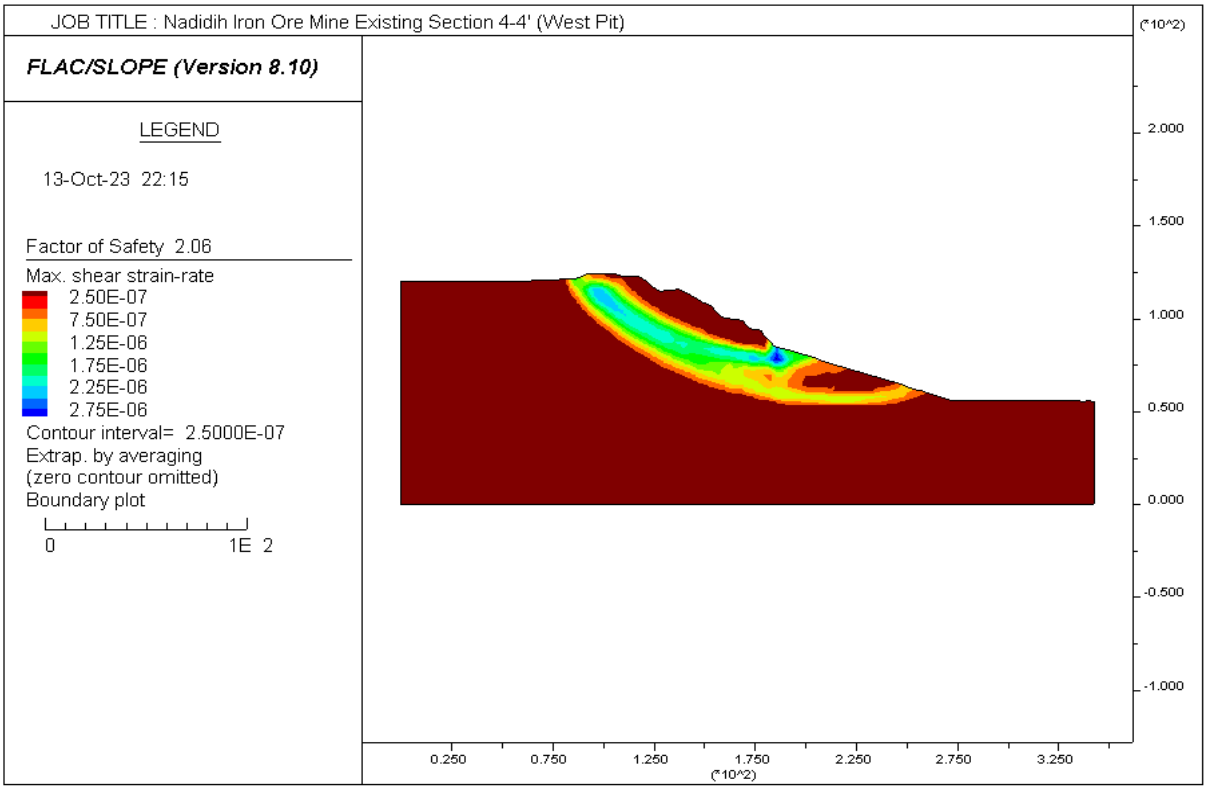


Fig 7(g): Slope stability analysis of existing profile of west pit of NIOM along section 4-4'

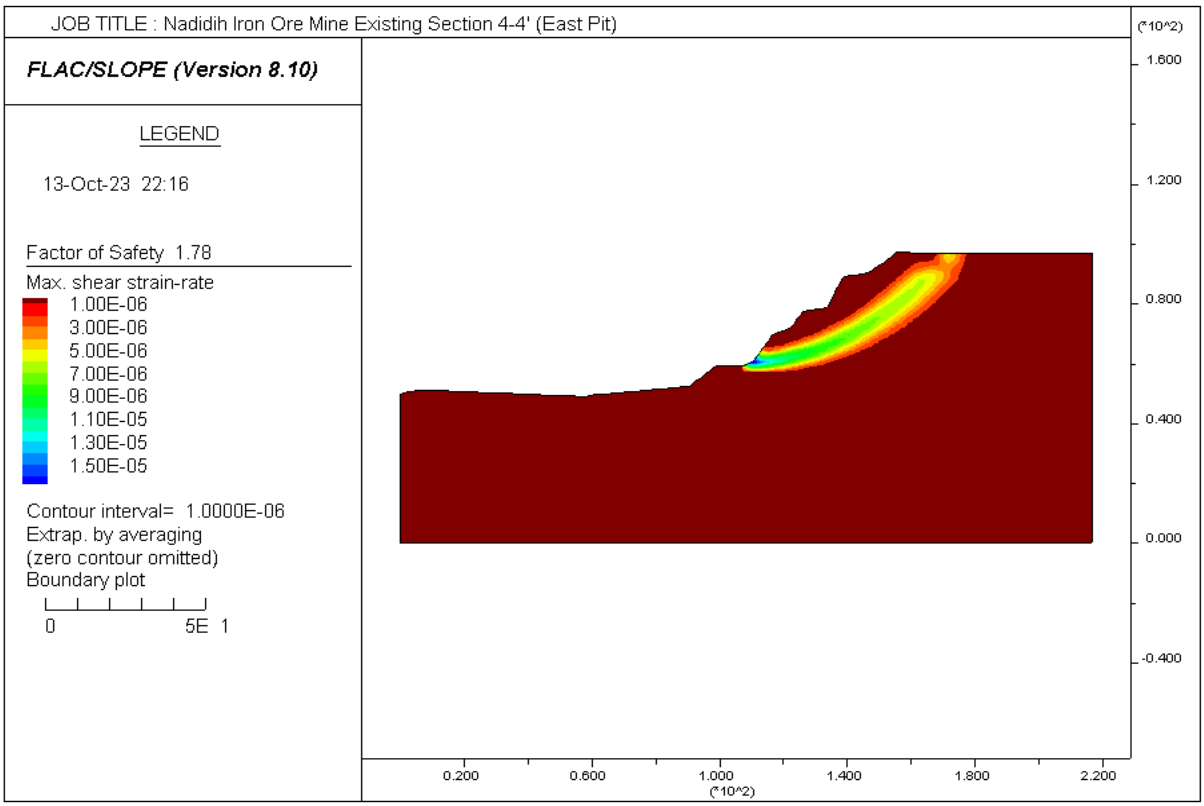


Fig 7(h): Slope stability analysis of existing profile of east pit of NIOM along section 4-4'

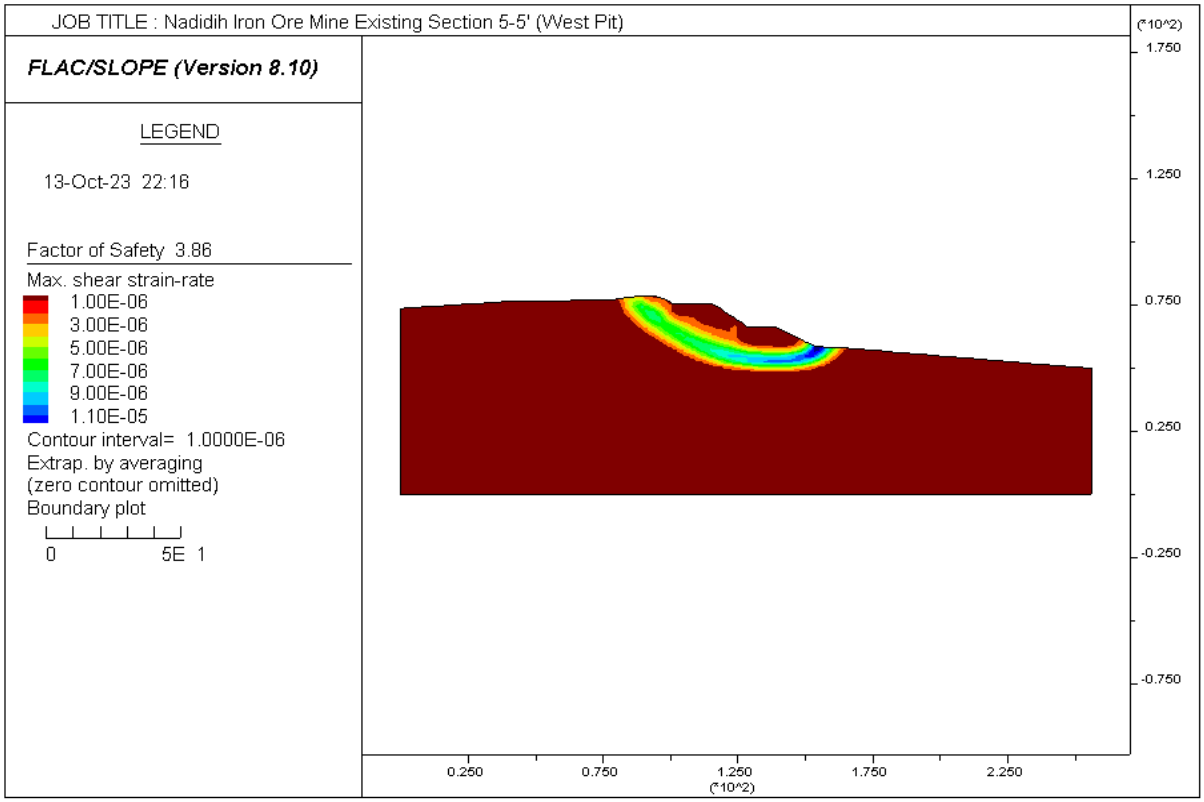


Fig 7(i): Slope stability analysis of existing profile of west pit of NIOM along section 5-5'

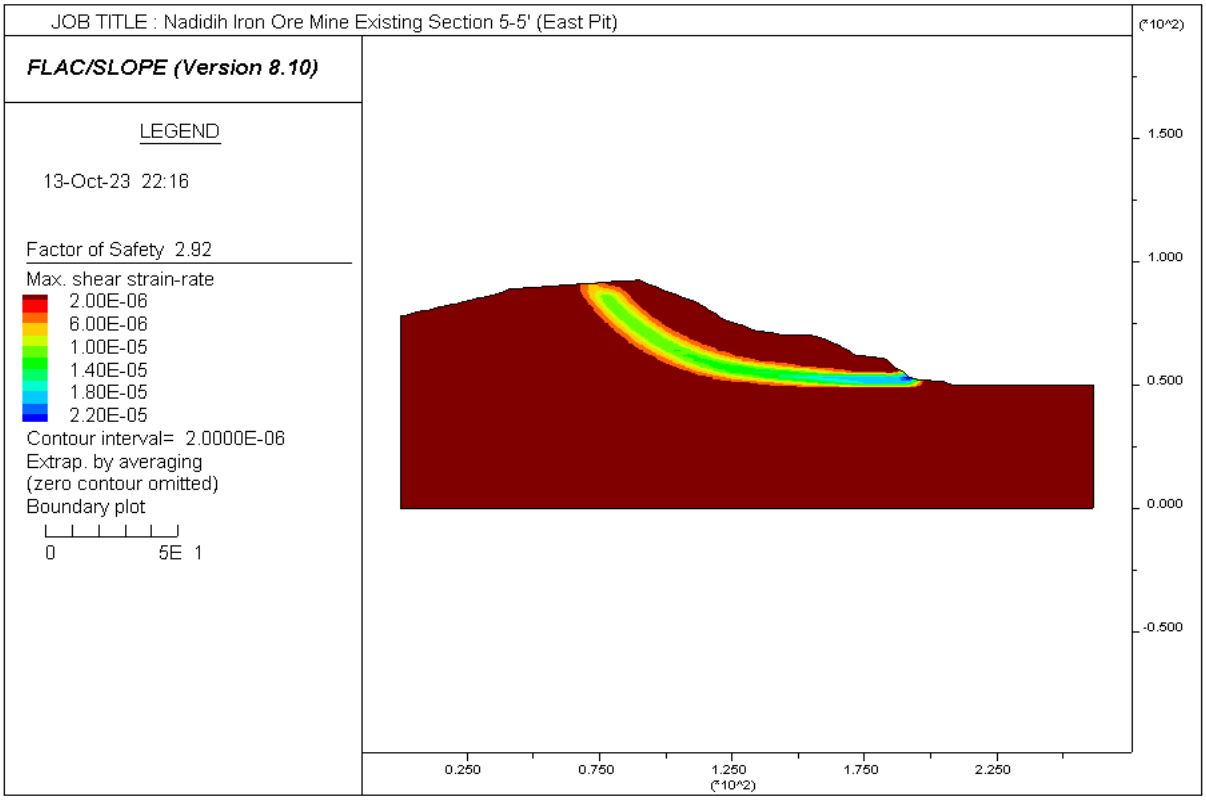


Fig 7(j): Slope stability analysis of existing profile of east pit of NIOM along section 5-5'

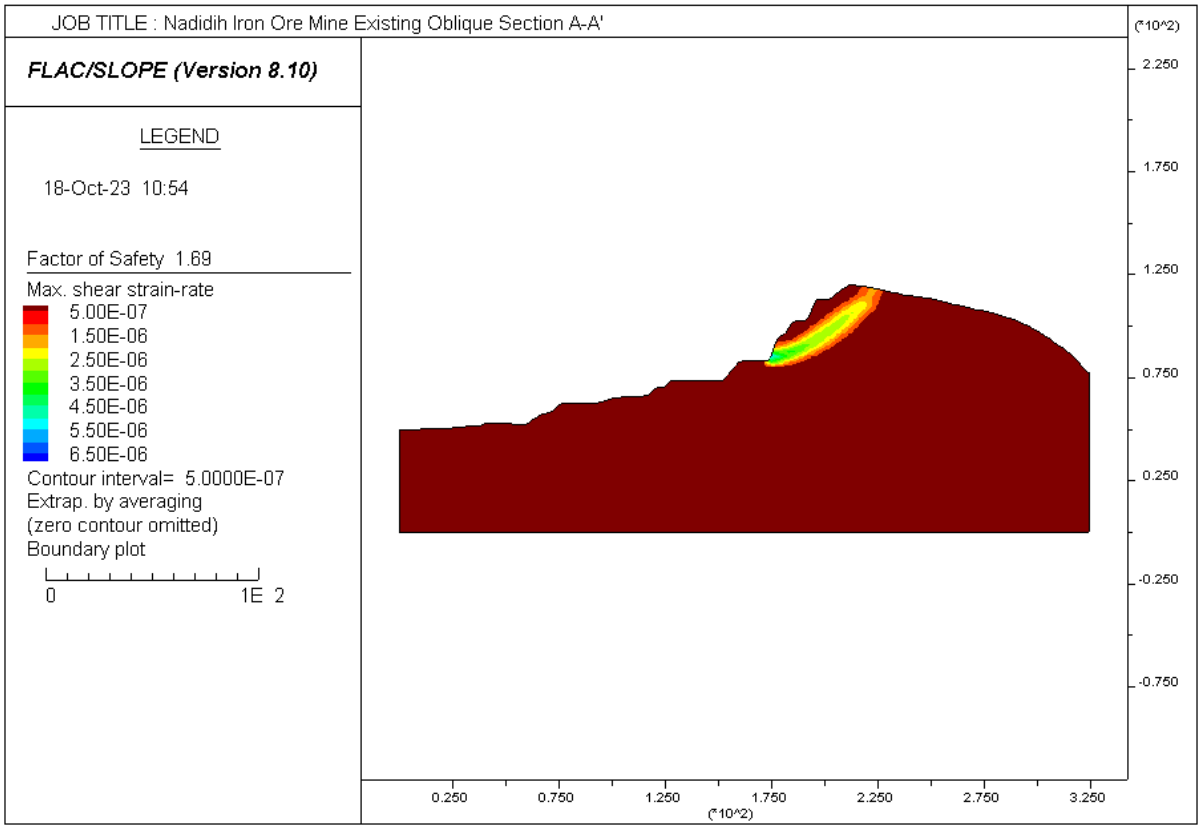


Fig 7(k): Slope stability analysis of existing profile of east pit of NIOM along section A-A'

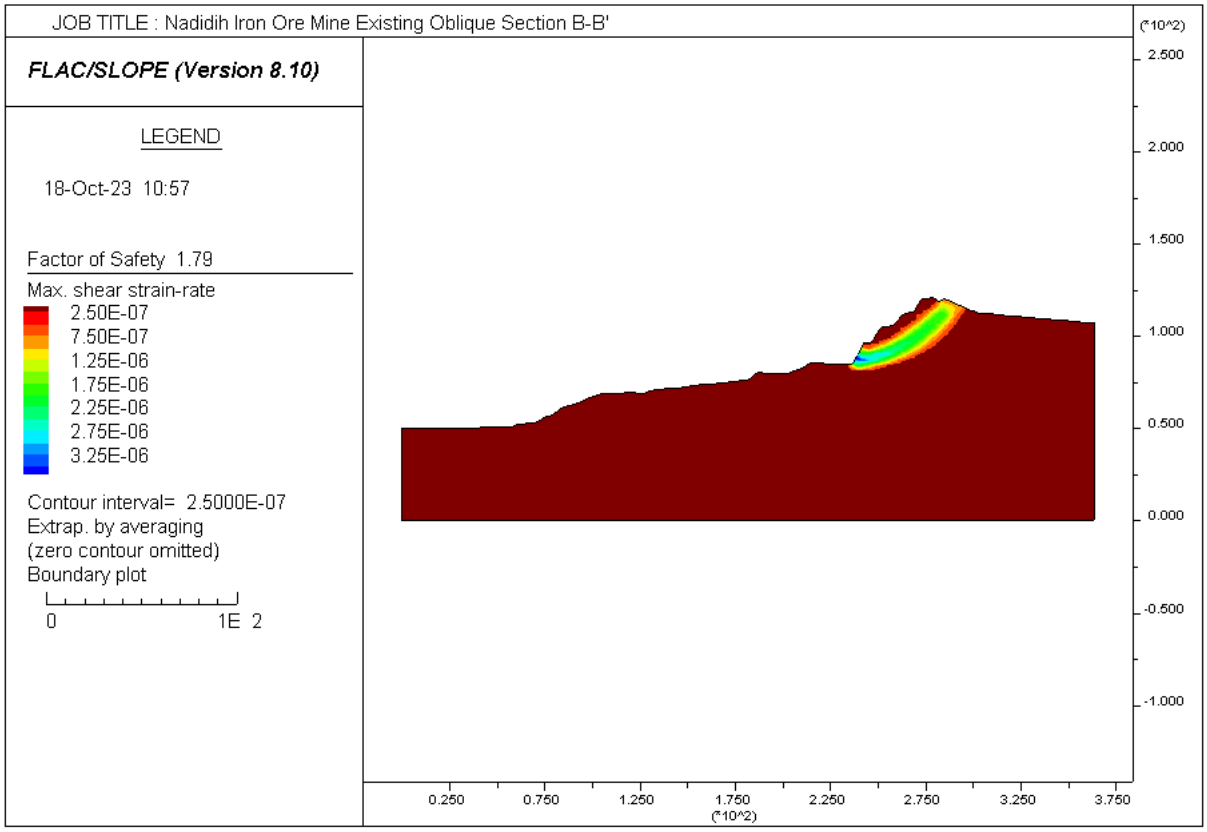


Fig 7(l): Slope stability analysis of existing profile of east pit of NIOM along section B-B'

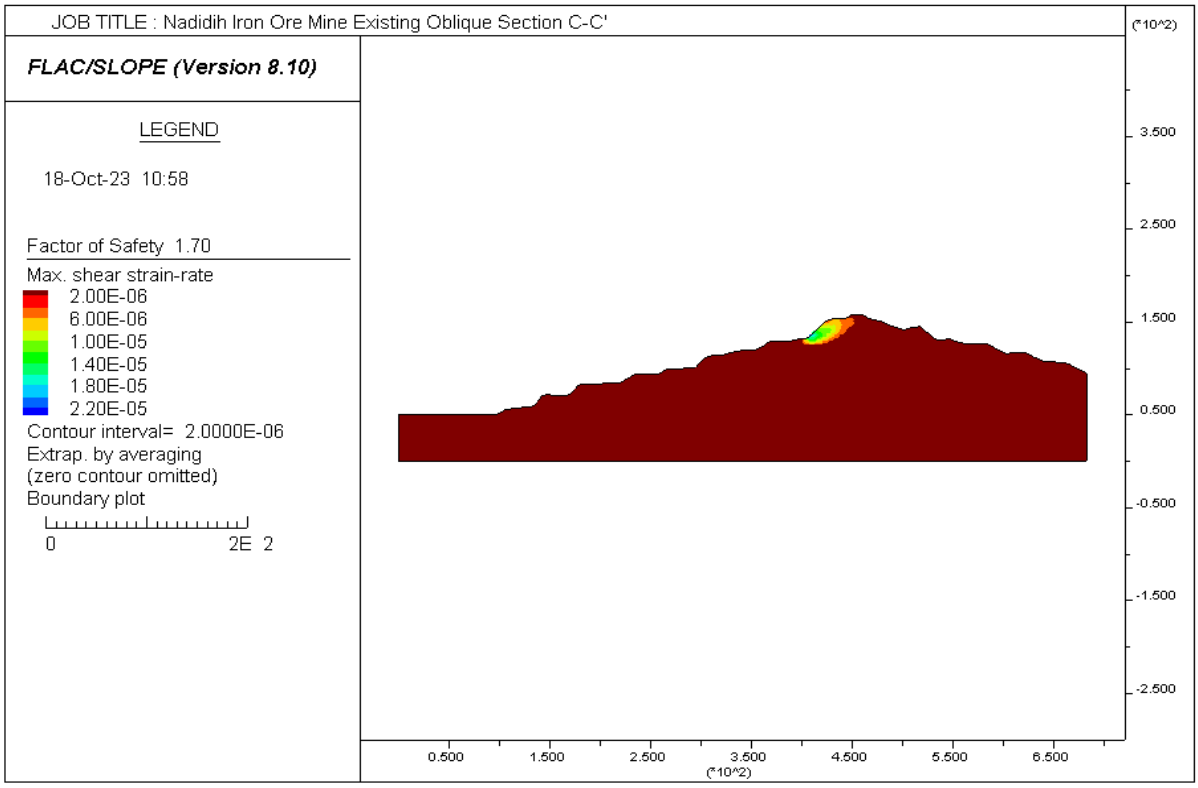


Fig 7(m): Slope stability analysis of existing profile of west pit of NIOM along section C-C'

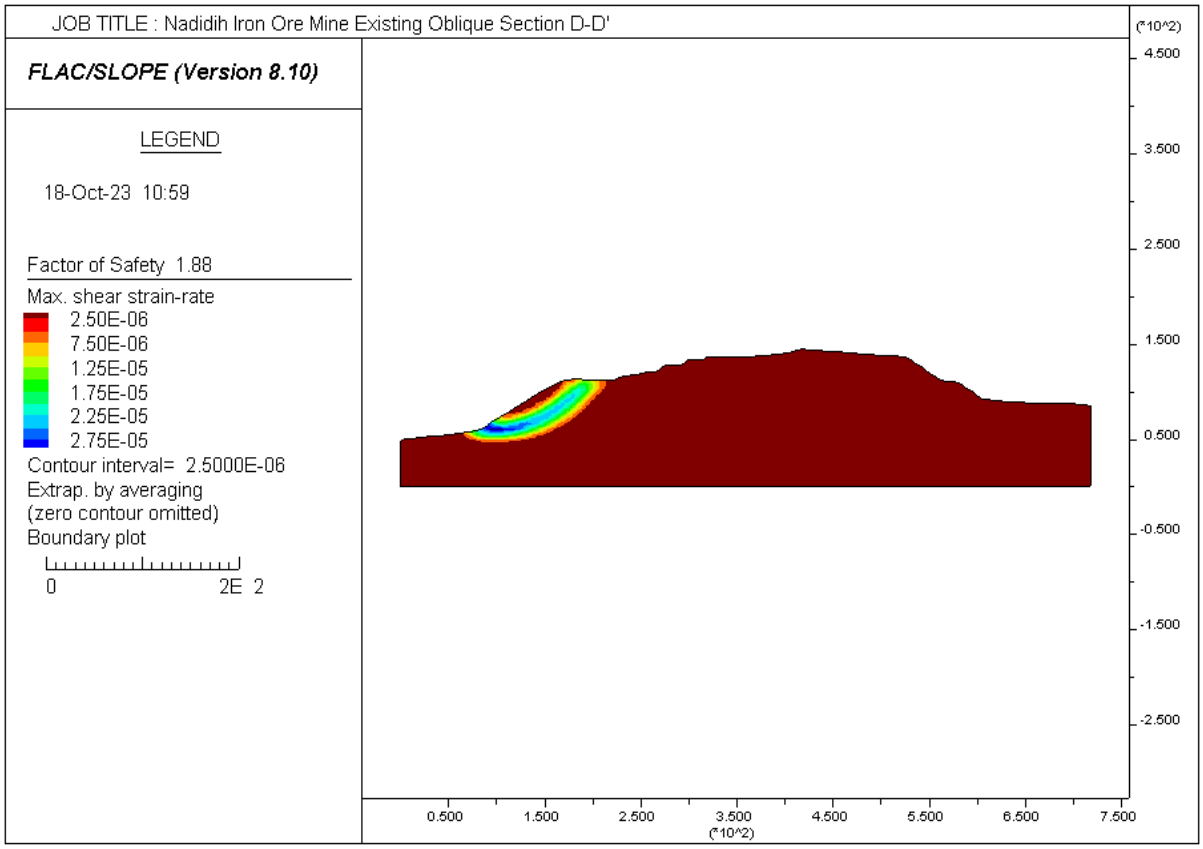


Fig 7(n): Slope stability analysis of existing profile of west pit of NIOM along section D-D'

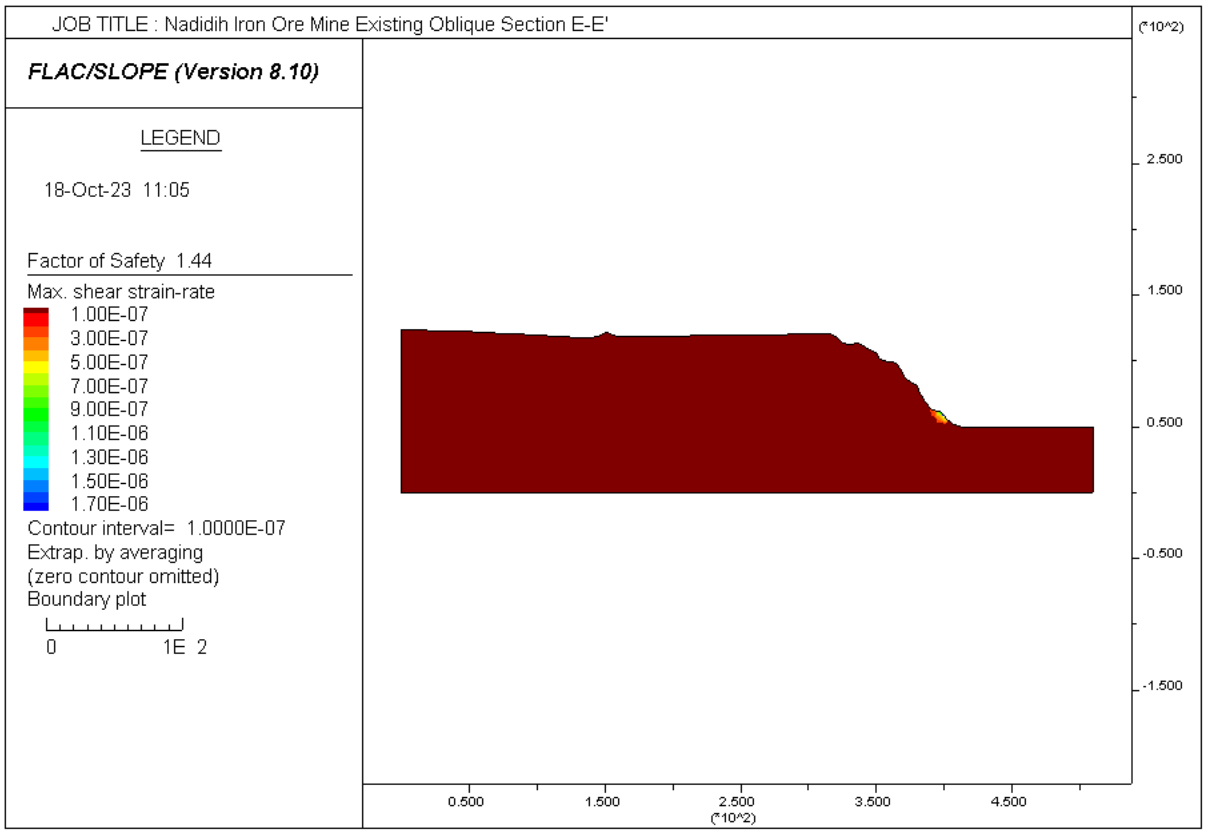


Fig 7(o): Slope stability analysis of existing profile of west pit of NIOM along section E-E'

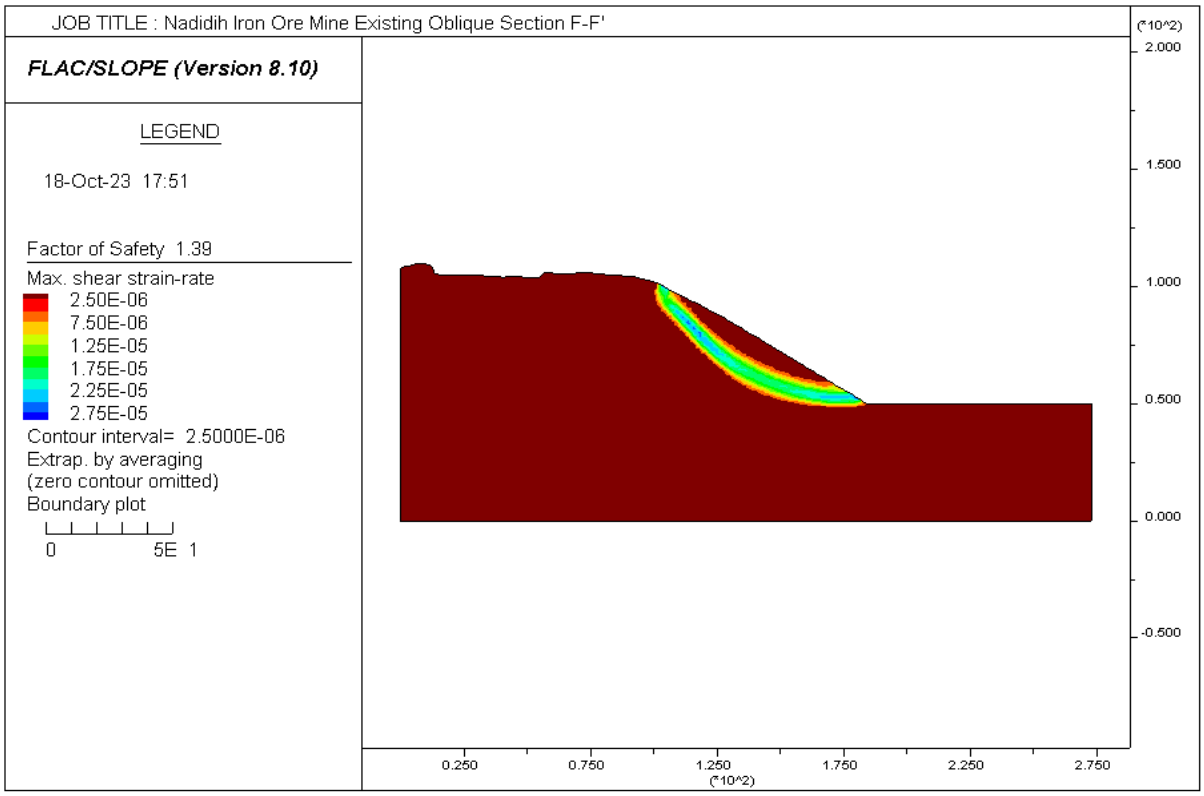


Fig 7(p): Slope stability analysis of existing profile of west pit of NIOM along section F-F'

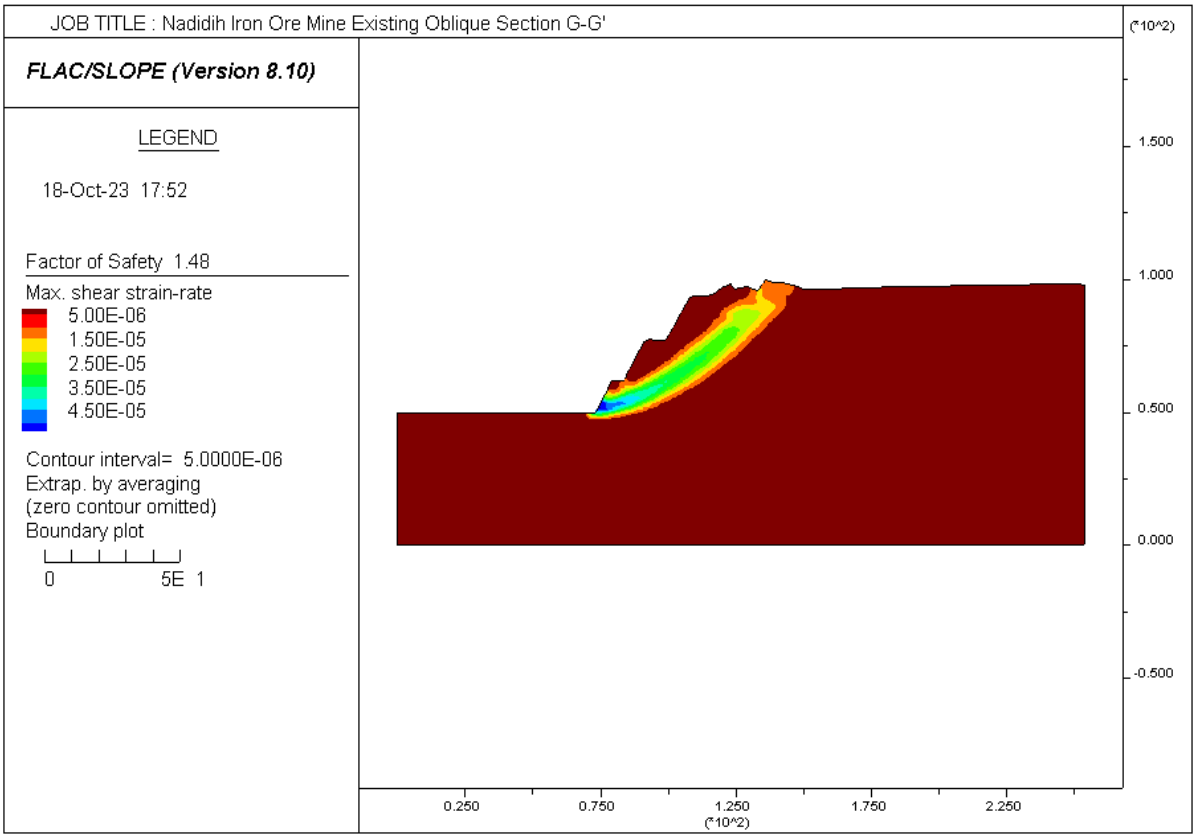


Fig 7(q): Slope stability analysis of existing profile of west pit of NIOM along section G-G'

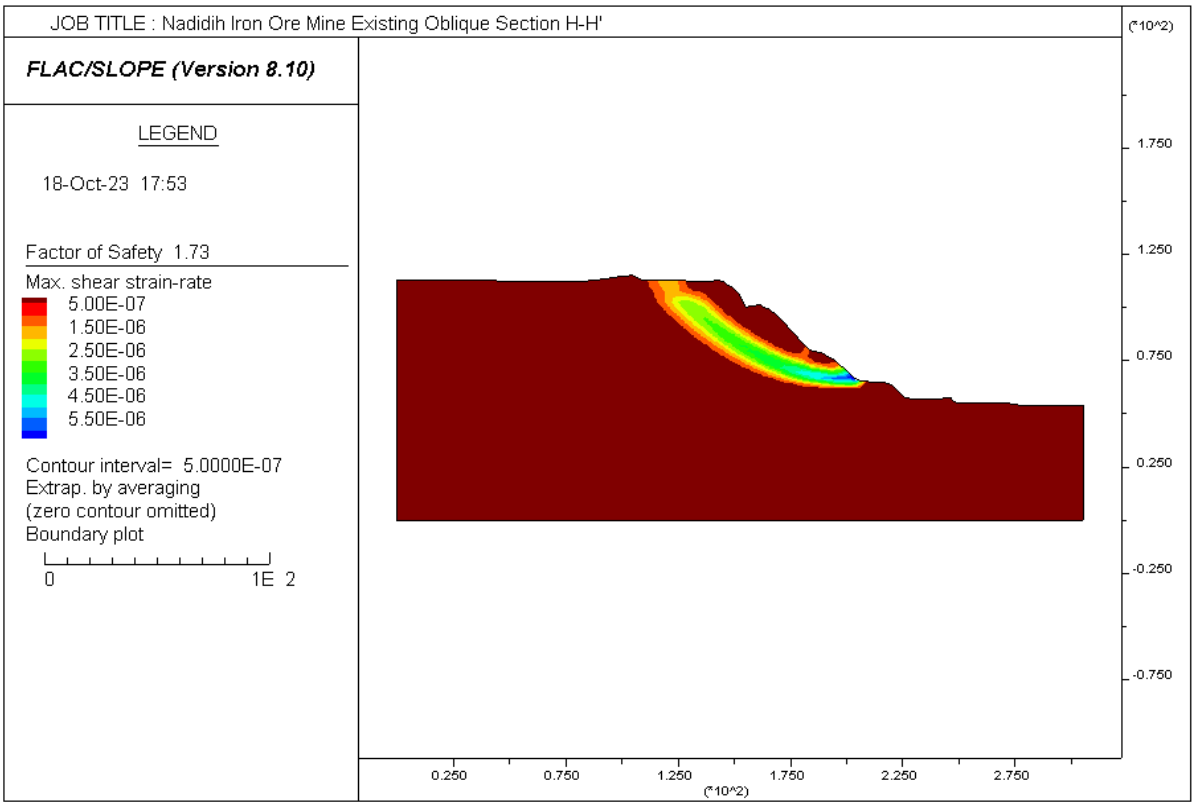


Fig 7(r): Slope stability analysis of existing profile of west pit of NIOM along section H-H'

From Table 3 and Figures 7(a) to 7(r), it is evident that the factor of safety of existing pit profiles along representative section lines from 1-1' to 5-5' and from A-A' to H-H' of Nadidihi Iron Ore Mine were varying between 1.35 to 3.86, which are higher than the desired value of 1.30 and thus existing pit profiles of Nadidihi Iron Ore Mine are considered stable from slope stability point of view.

Slope Stability Analysis of Proposed Pit Profiles

Slope Stability analysis of proposed pit profiles of Nadidihi Iron Ore Mine were conducted using FLAC/SLOPE software on the representative sections (1-1' to 6-6' & A-A' to H-H'). Result of slope stability analysis of proposed pit profile along these sections have been shown in figure 8(a) to 8(s) and factor of safety (FOS) obtained after slope stability analysis along these sections have been listed in Table 4. Along other sections like 7-7' to 9-9' show profile of proposed dump profiles and their analysis has been presented separately.

Table 4: Stability analyses of proposed pit slopes of Nadidihi Iron Ore Mine

Pit Section	Section No.	Pit Name	Figure No.	FOS
Proposed Pit Section	1-1’	West Pit	Figure 8(a)	1.22
Proposed Pit Section	1-1’	East Pit	Figure 8(b)	1.27
Proposed Pit Section	2-2’	West Pit	Figure 8(c)	1.31
Proposed Pit Section	2-2’	East Pit	Figure 8(d)	1.54
Proposed Pit Section	3-3’	West Pit	Figure 8(e)	1.16
Proposed Pit Section	3-3’	East Pit	Figure 8(f)	1.17
Proposed Pit Section	4-4’	West Pit	Figure 8(g)	1.42
Proposed Pit Section	4-4’	East Pit	Figure 8(h)	1.35
Proposed Pit Section	5-5’	West Pit	Figure 8(i)	1.93
Proposed Pit Section	5-5’	East Pit	Figure 8(j)	1.47
Proposed Pit Section	6-6’	East Pit	Figure 8(k)	1.87
Proposed Pit Section	A-A’	East Pit	Figure 8(l)	1.51
Proposed Pit Section	B-B’	East Pit	Figure 8(m)	1.81
Proposed Pit Section	C-C’	West Pit	Figure 8(n)	1.37
Proposed Pit Section	D-D’	West Pit	Figure 8(o)	1.94
Proposed Pit Section	E-E’	West Pit	Figure 8(p)	1.37
Proposed Pit Section	F-F’	West Pit	Figure 8(q)	1.63
Proposed Pit Section	G-G’	West Pit	Figure 8(r)	1.24
Proposed Pit Section	H-H’	East Pit	Figure 8(s)	1.33

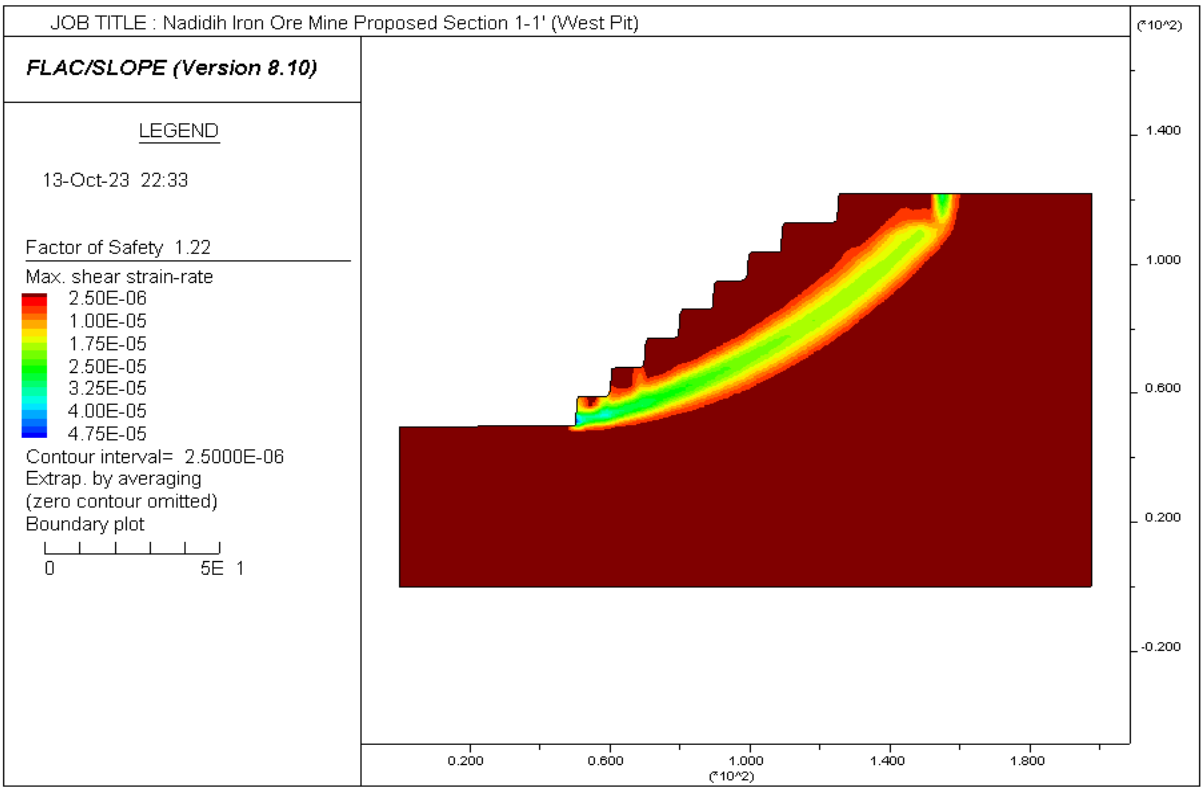


Fig 8(a): Slope stability analysis of proposed profile of west pit of NIOM along section 1-1’

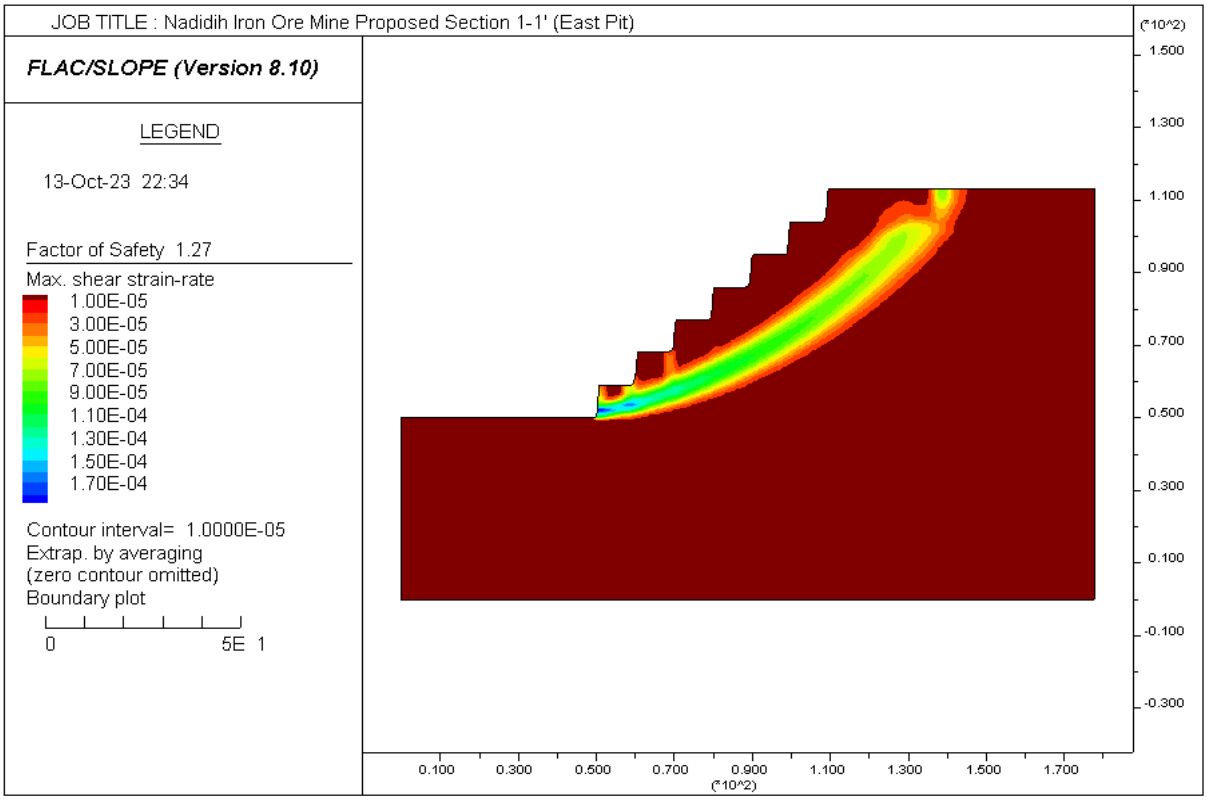


Fig 8(b): Slope stability analysis of proposed profile of east pit of NIOM along section 1-1'

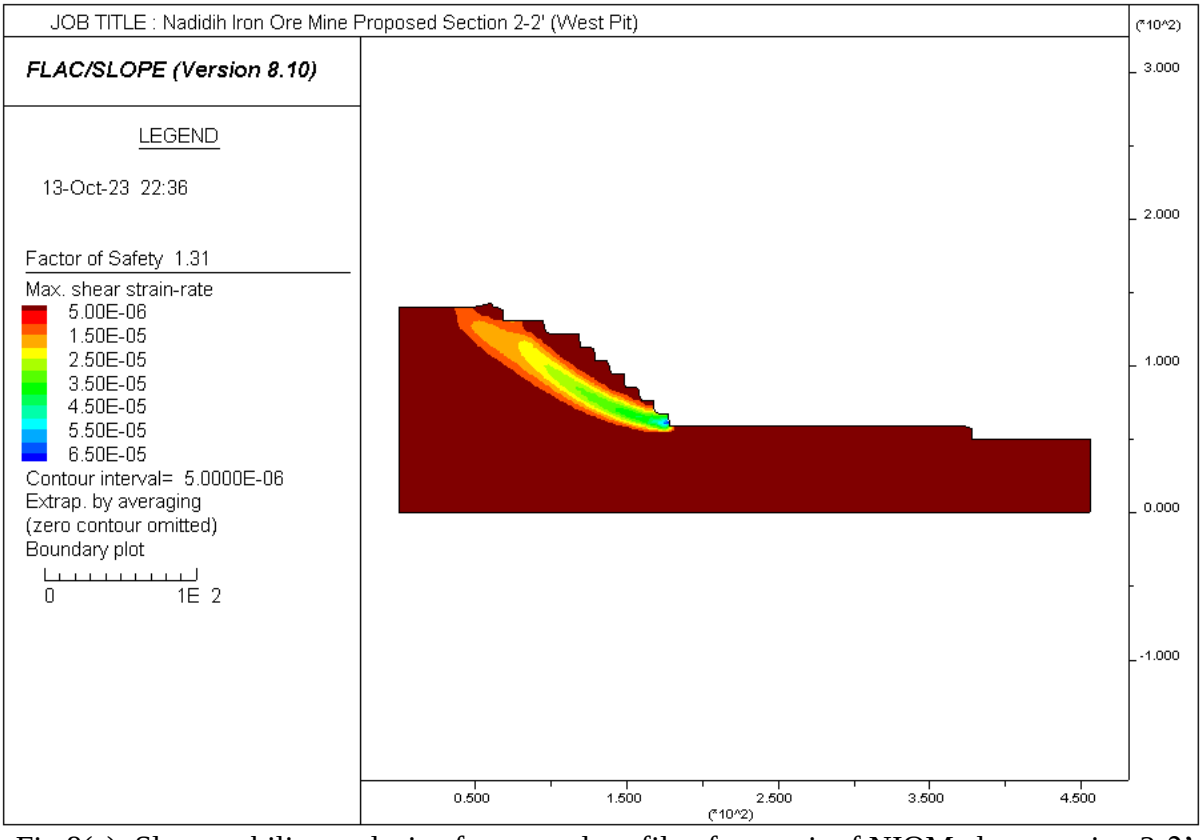


Fig 8(c): Slope stability analysis of proposed profile of west pit of NIOM along section 2-2'

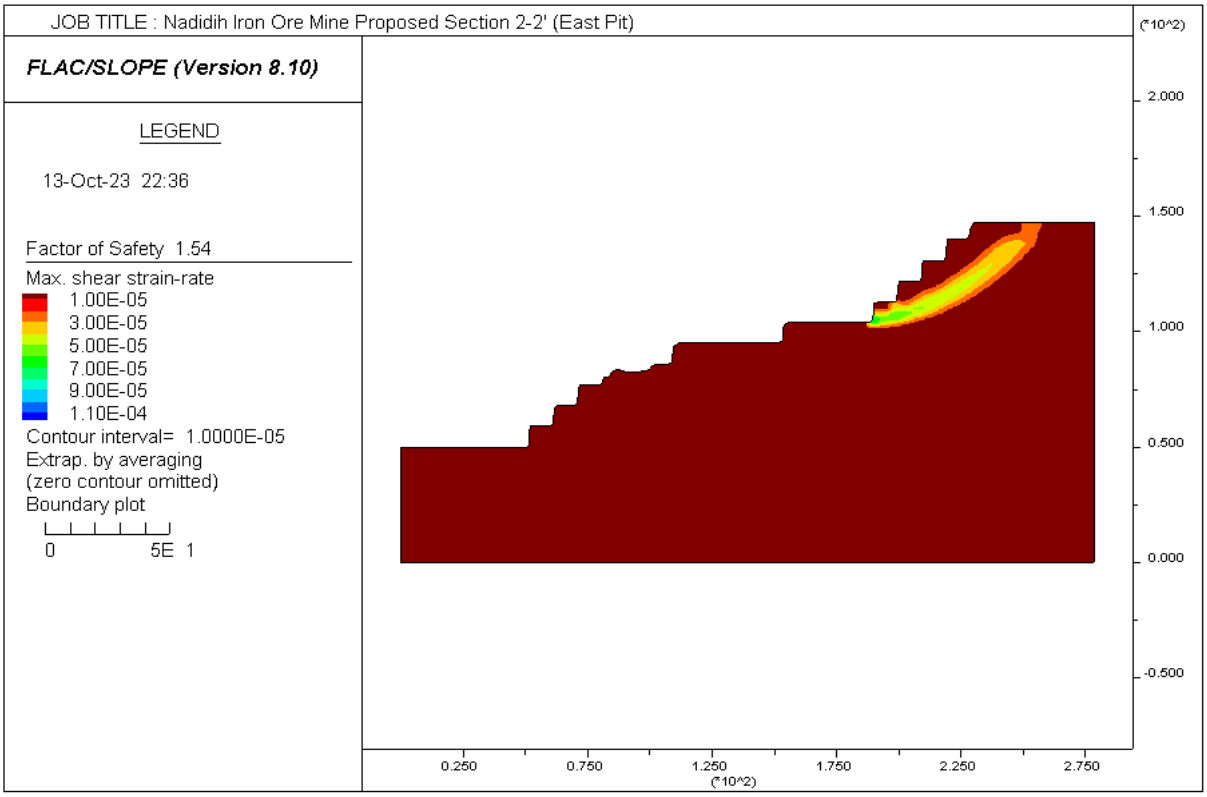


Fig 8(d): Slope stability analysis of proposed profile of east pit of NIOM along section 2-2'

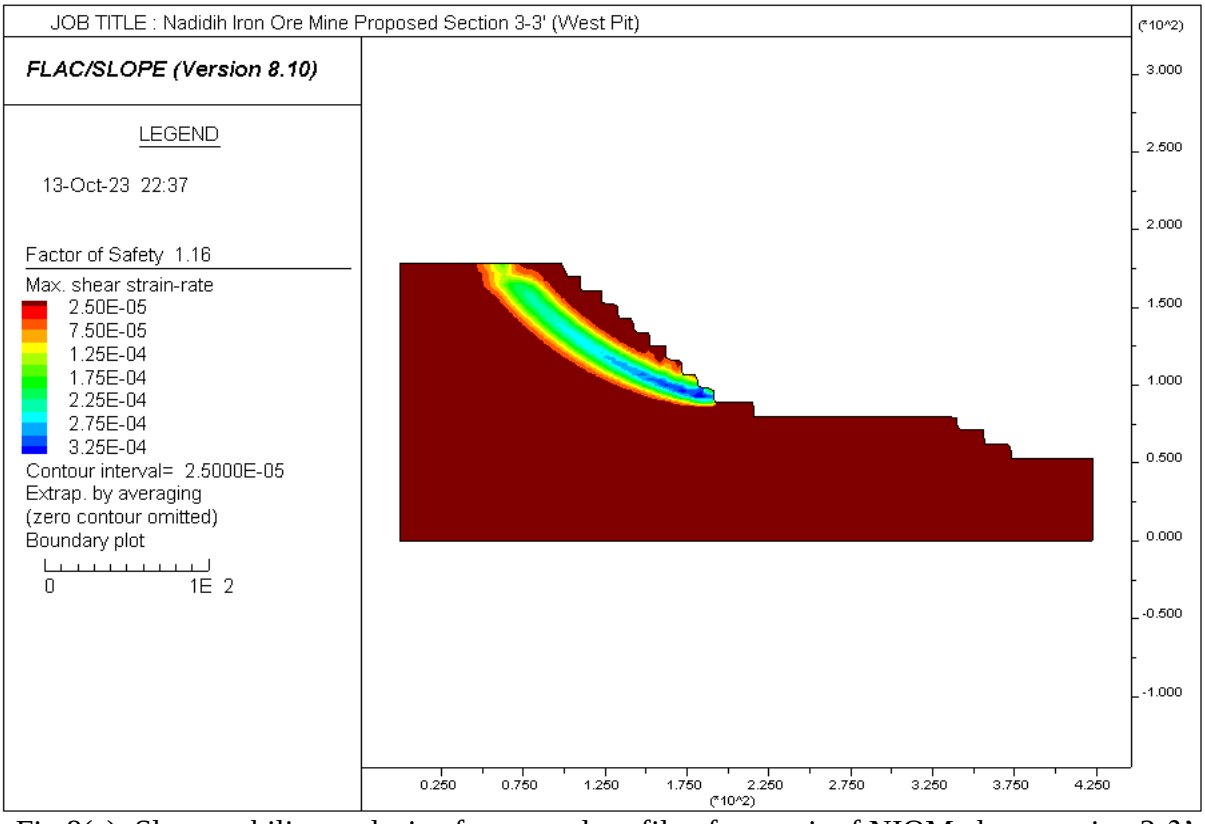


Fig 8(e): Slope stability analysis of proposed profile of west pit of NIOM along section 3-3'

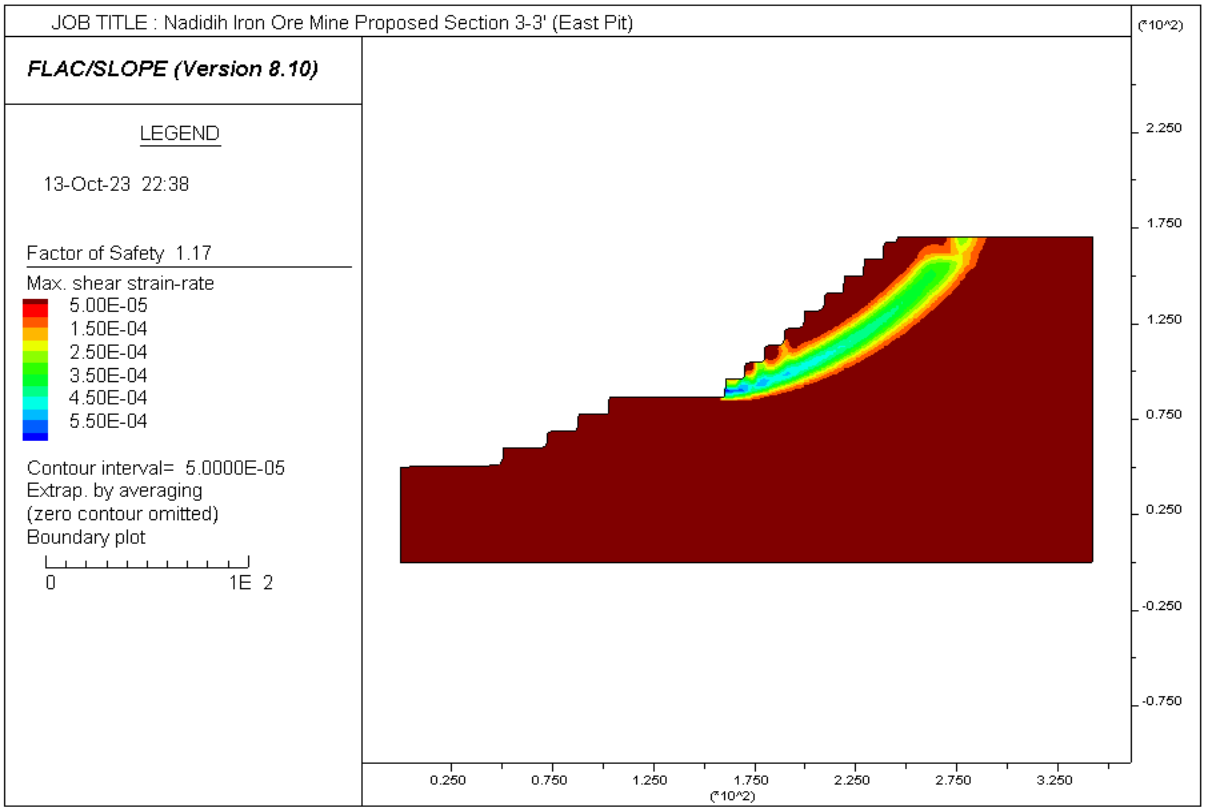


Fig 8(f): Slope stability analysis of proposed profile of east pit of NIOM along section 3-3'

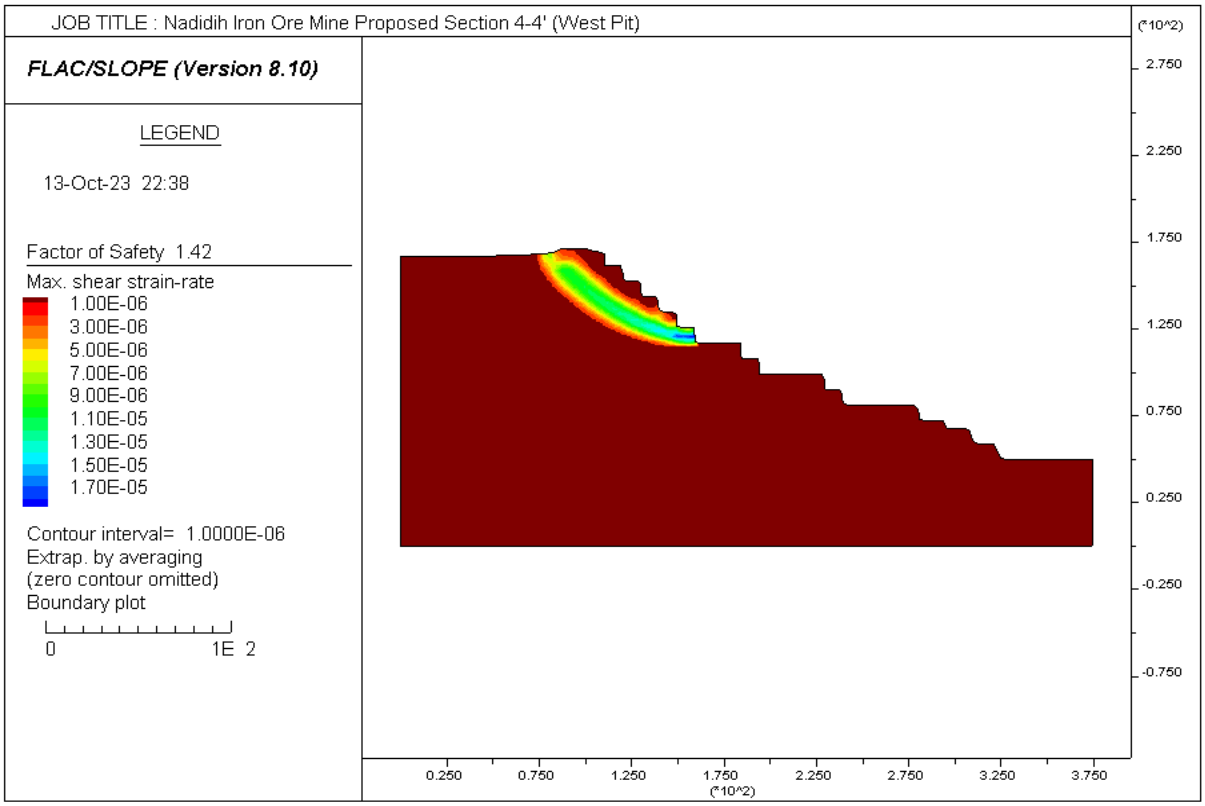


Fig 8(g): Slope stability analysis of proposed profile of west pit of NIOM along section 4-4'

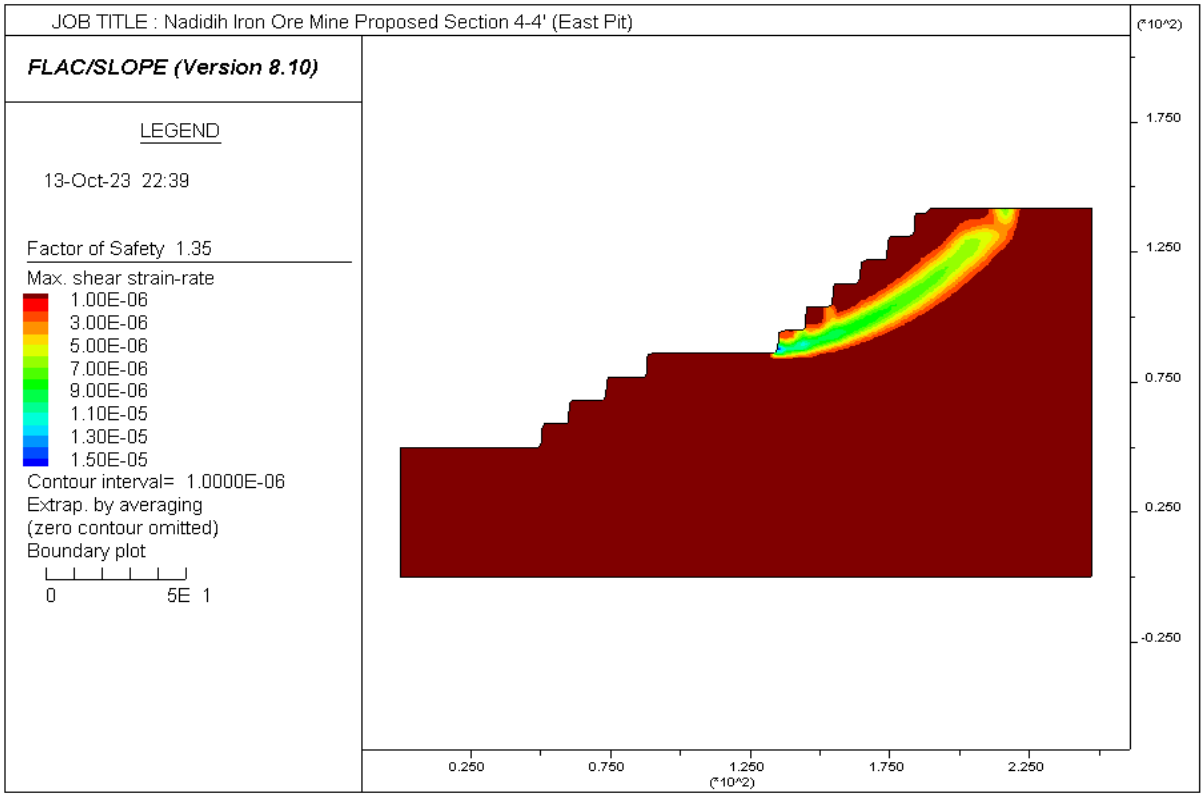


Fig 8(h): Slope stability analysis of proposed profile of east pit of NIOM along section 4-4'

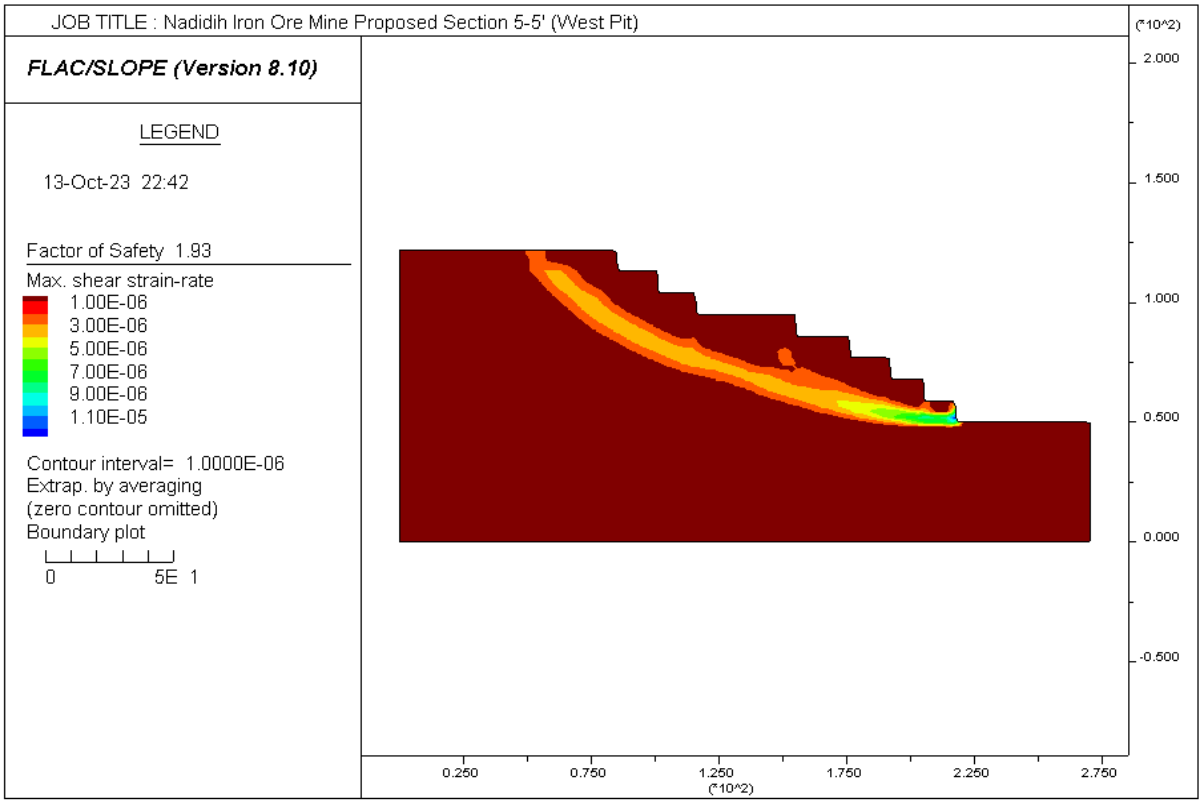


Fig 8(i): Slope stability analysis of proposed profile of west pit of NIOM along section 5-5'

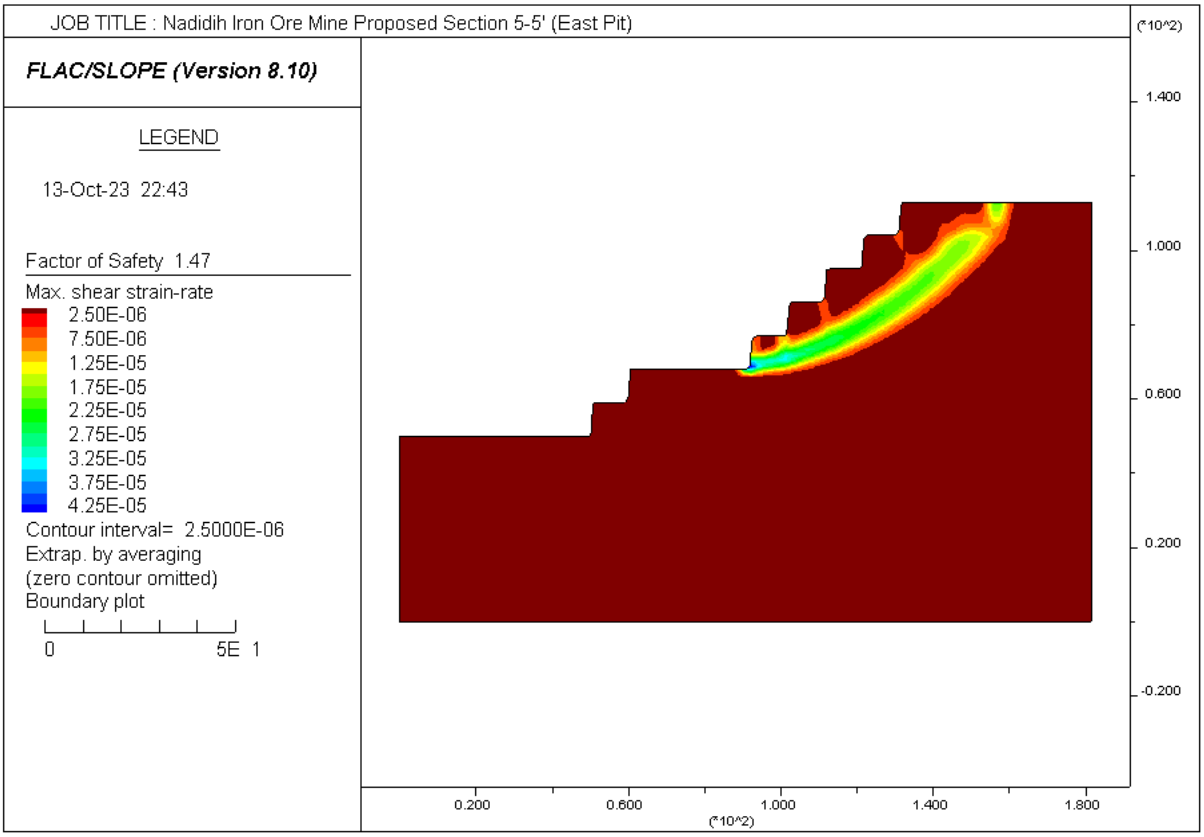


Fig 8(j): Slope stability analysis of proposed profile of east pit of NIOM along section 5-5'

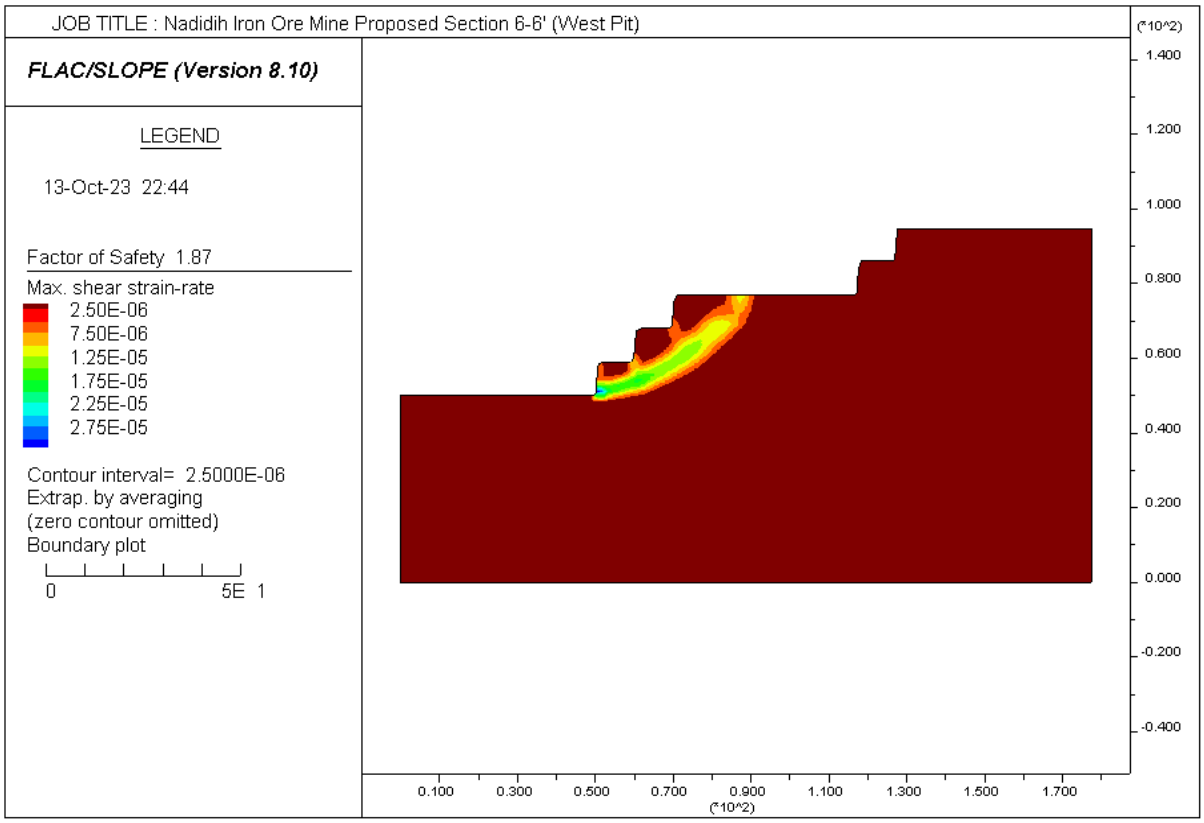


Fig 8(k): Slope stability analysis of proposed profile of west pit of NIOM along section 6-6'

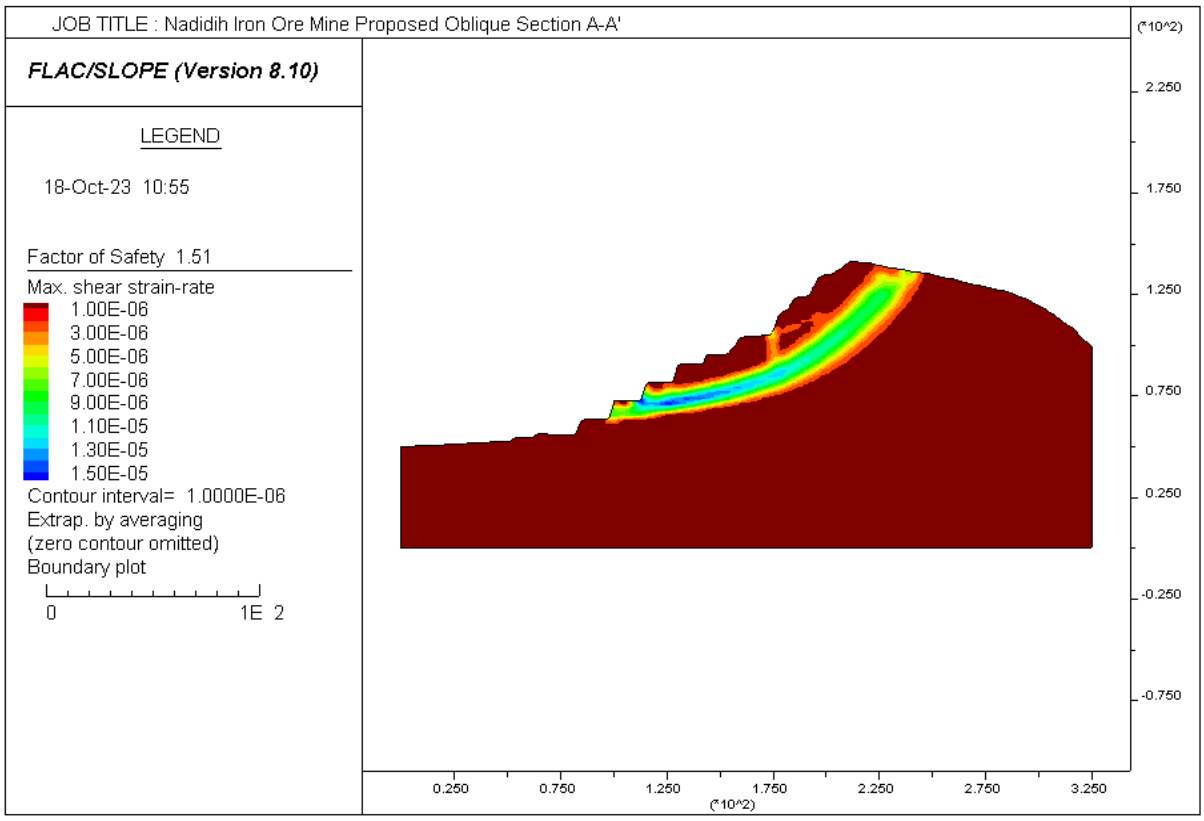


Fig 8(l): Slope stability analysis of proposed profile of east pit of NIOM along section A-A'

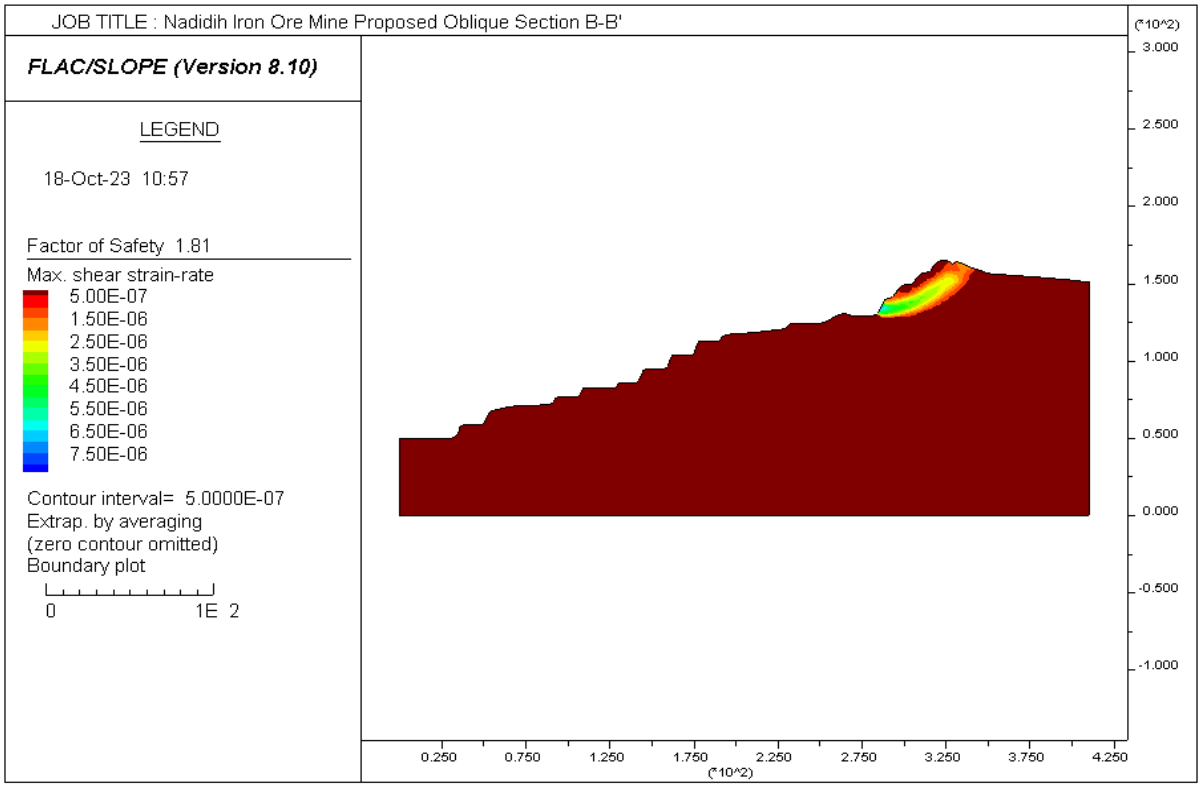


Fig 8(m): Slope stability analysis of proposed profile of east pit of NIOM along section B-B'

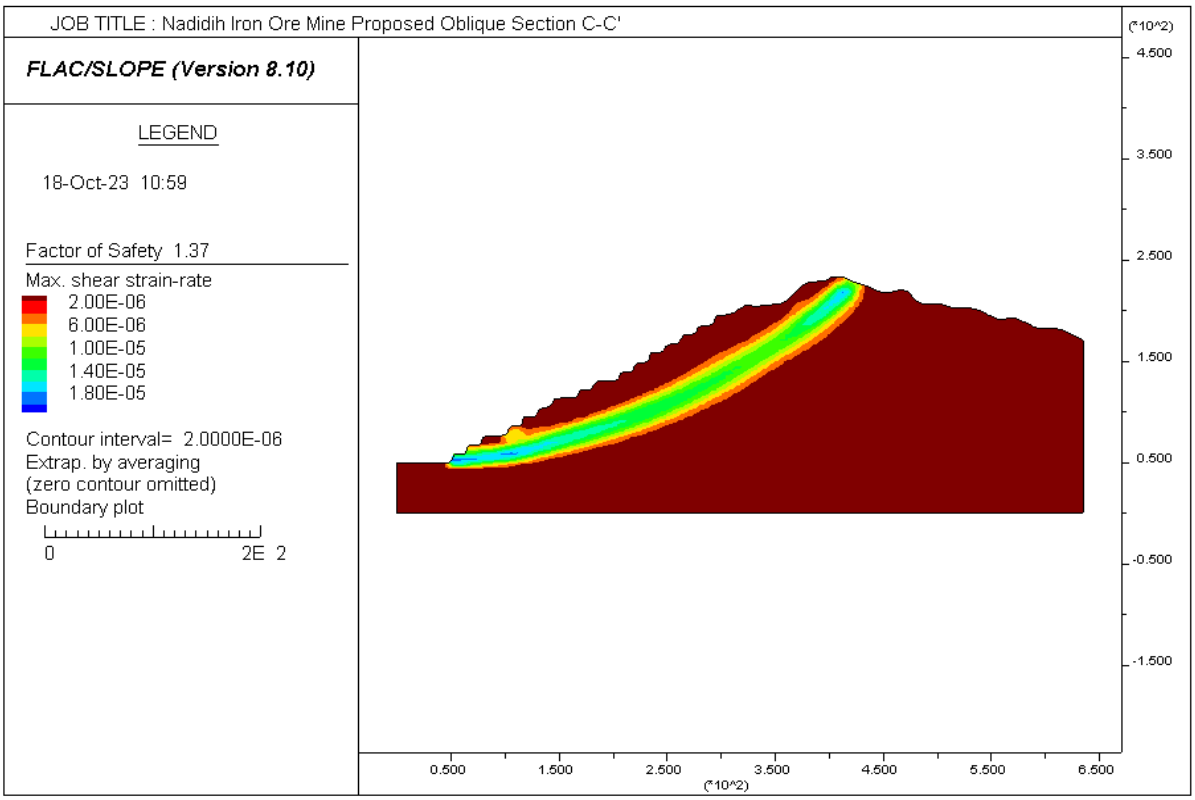


Fig 8(n): Slope stability analysis of proposed profile of west pit of NIOM along section C-C'

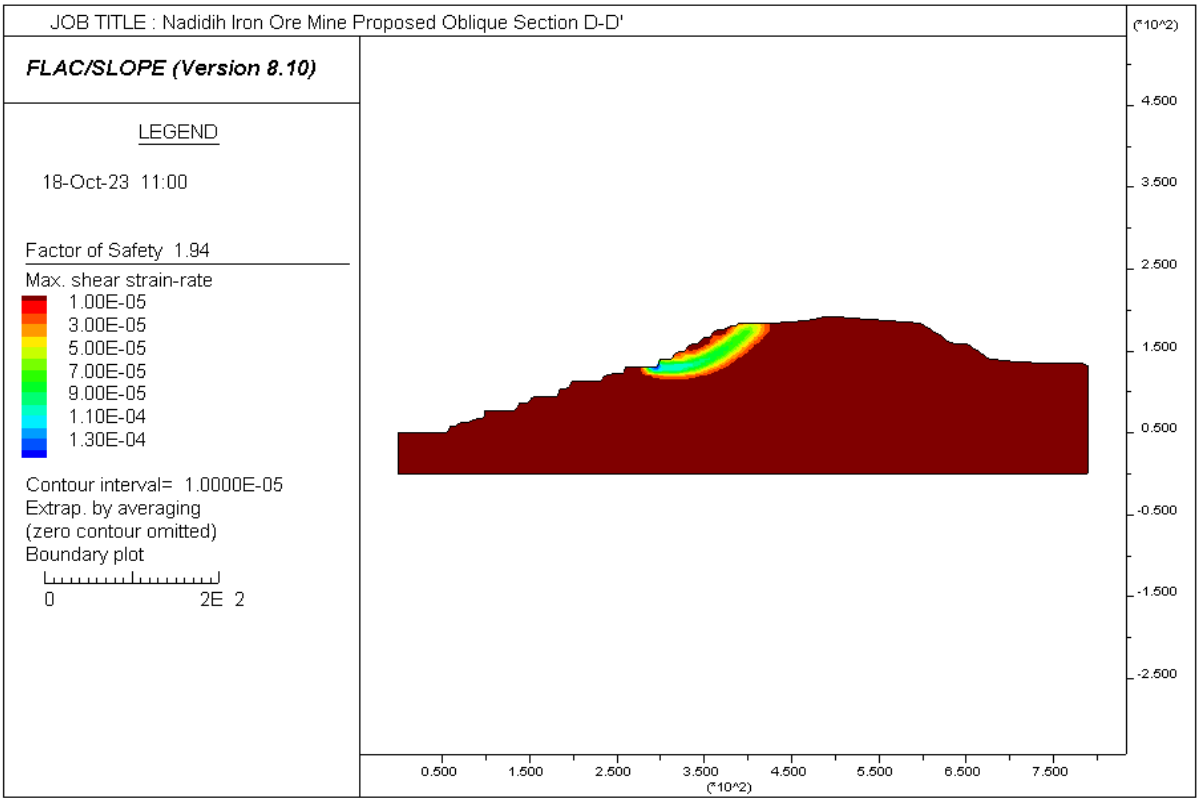


Fig 8(o): Slope stability analysis of proposed profile of west pit of NIOM along section D-D'

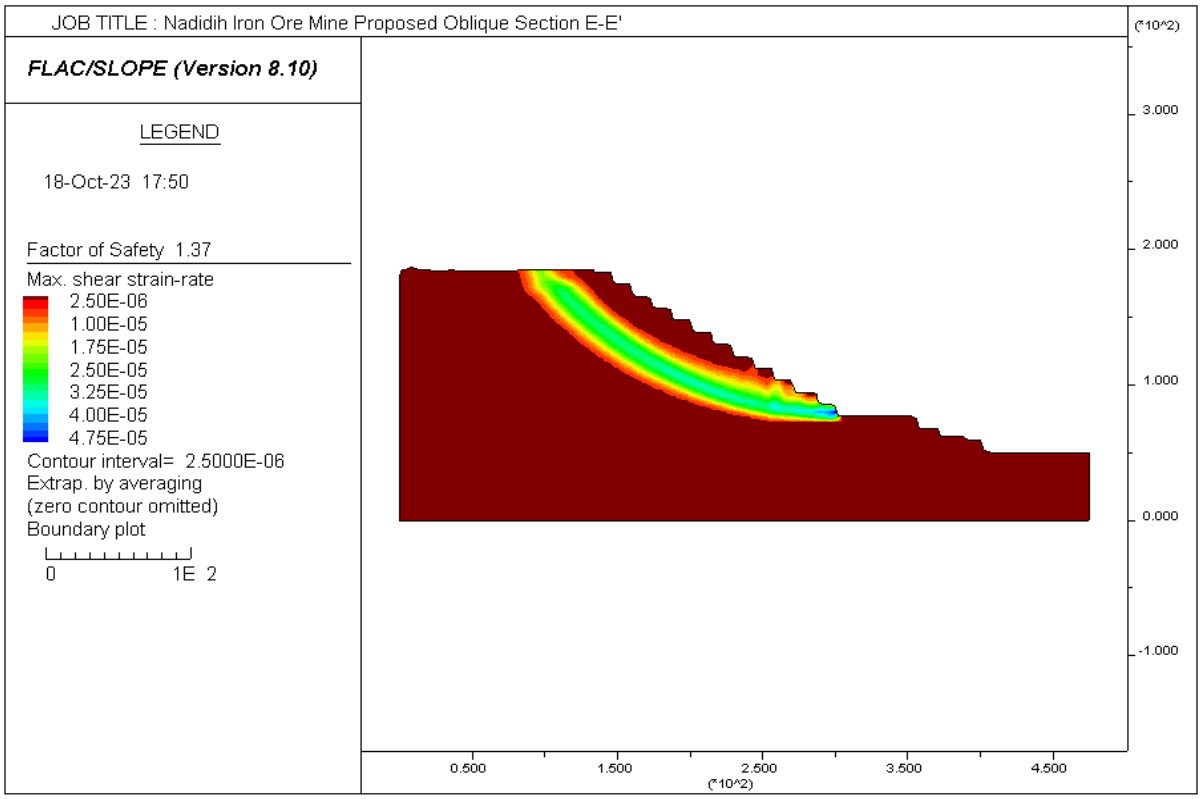


Fig 8(p): Slope stability analysis of proposed profile of west pit of NIOM along section E-E'

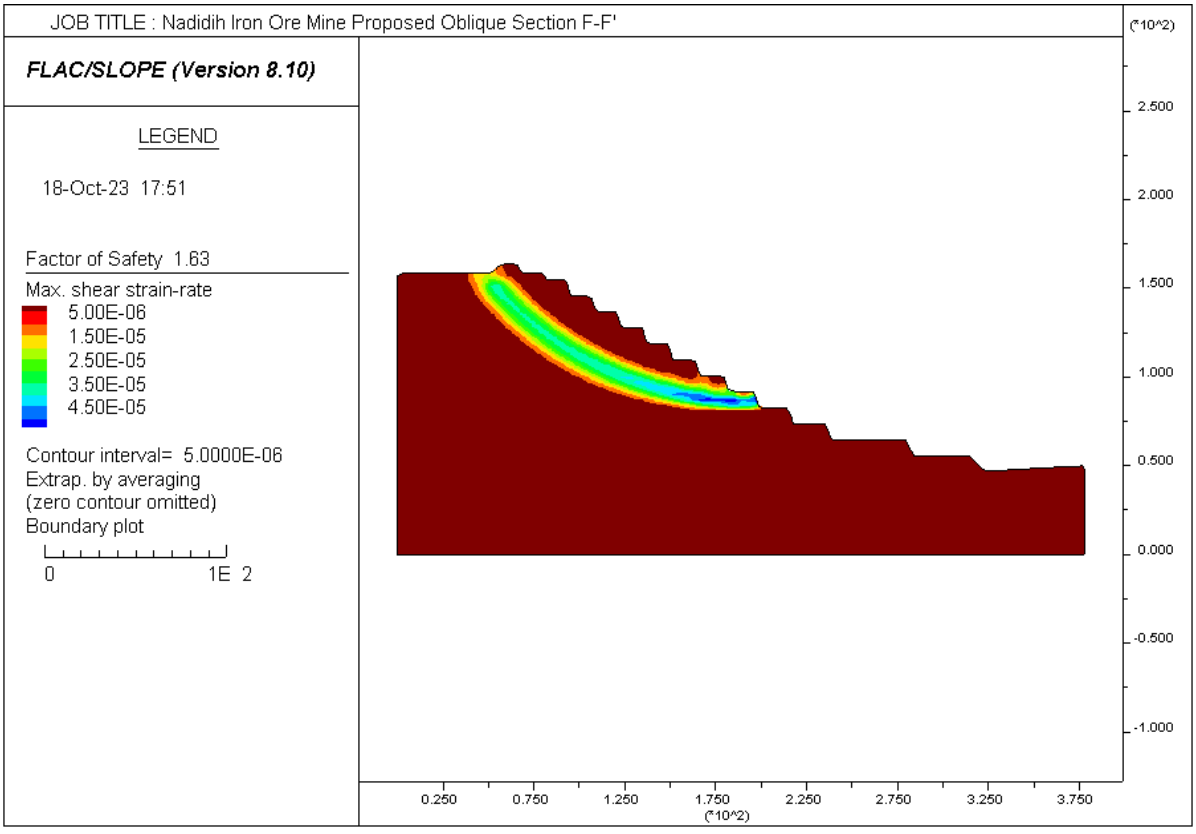


Fig 8(q): Slope stability analysis of proposed profile of west pit of NIOM along section F-F'

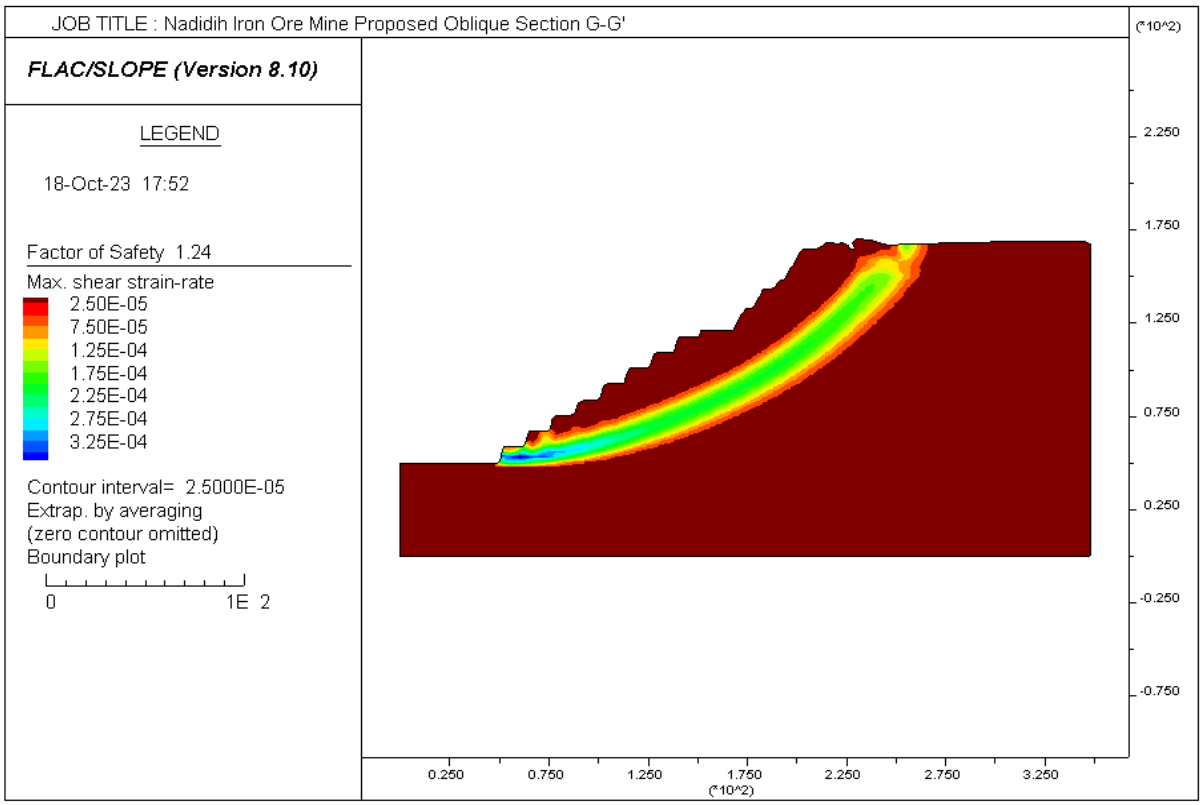


Fig 8(r): Slope stability analysis of proposed profile of west pit of NIOM along section G-G'

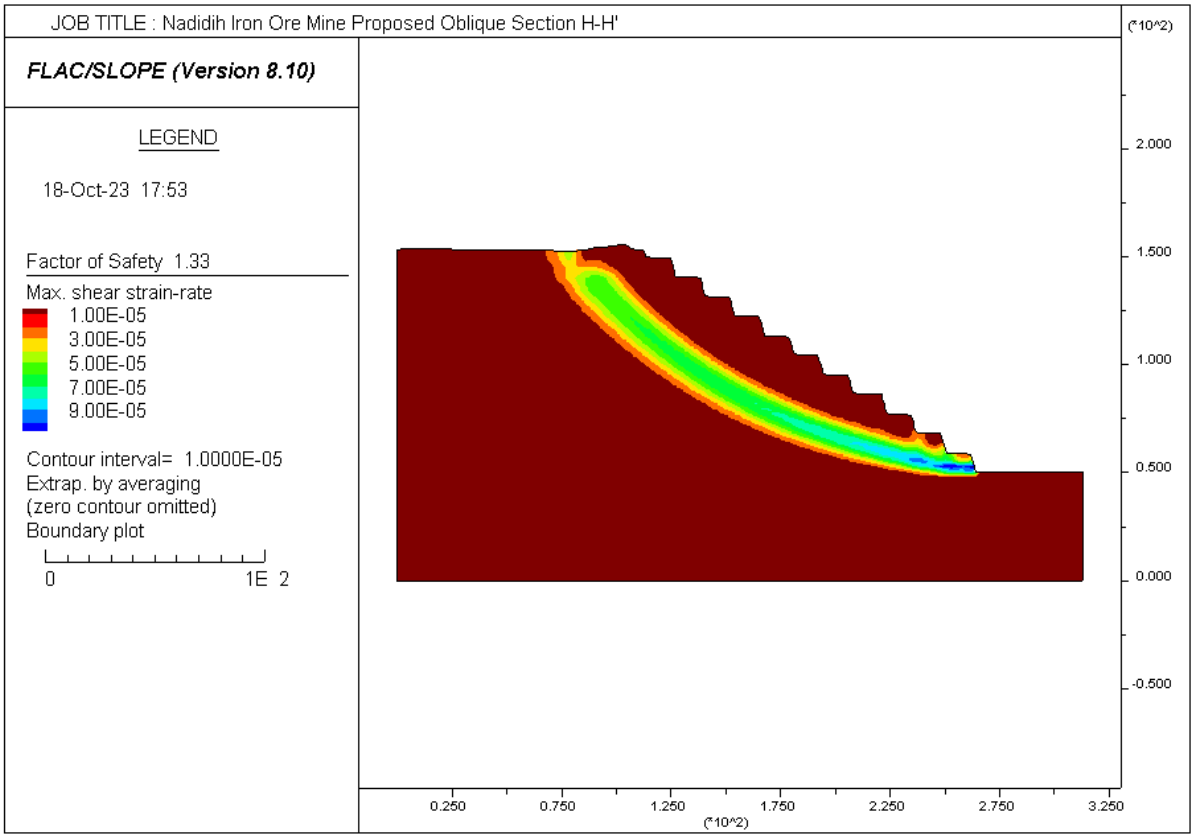


Fig 8(s): Slope stability analysis of proposed profile of east pit of NIOM along section H-H'

From Table 4 and Figures 8 (a) to 8(s), it is evident that the factor of safety (FOS) of ultimate pit slope as proposed by the mine management in approved mining plan of NIOM along section lines from 1-1' to 5-5' and from A-A' to H-H' were varying between between 1.16 to 1.94. As evident from table 4, FOS of proposed ultimate pit profile of NIOM along sections 2-2', 4-4', 5-5', 6-6', A-A' to F-F' and H-H' were found to be higher than the minimum desired value of 1.30 and thus can be considered stable from slope stability point of view. It has been observed that proposed pit depth along these section were either lower or wider bench were left at intermittent stages considering the lithology. But from table 4, it is evident that FOS of proposed ultimate pit profile of NIOM along sections 1-1', 3-3' and G-G' were found less than the minimum requirement of 1.30 and thus needs to be re-profiled / flattened / pushed-back/ stabilised to have FOS more than 1.30 from slope stability point of view. Modified pit profile along the sections 1-1', 3-3' and G-G' of NIOM, when modified as per benching pattern recommended in the report, were found to have factor of safety greater than 1.30 and thus can be considered to be satisfactory from slope stability point of view. Bench angle in all the proposed sections of NIOM has been shown at 90 degree, which needs to be made at 75 degree as recommended in this report in subsequent section of this report even along those sections which were found to have FOS higher than 1.30.

Slope Stability Analysis for optimum design of ultimate pit profile of NIOM

From tables 1(a) to 1(c) and figures 5(a) to 6(h), it is evident that top RL of the existing pit is generally varying between 575 to 595 mRL but at some places it is even higher upto 633mRL due to existing dump or backfilling. Bottom RL of the existing west pit and east pit are 546m and 510mRL which is likely go upto 448mRL as per proposed mine development plan. Maximum depth of the existing pits is about 83mRL and that of the proposed pit is about 137m. Maximum height of the present dump is about 47m which may go upto 75m in due course. Although maximum depth of the pit is upto 137 m along certain directions, in some directions it is less than 120m and in some other directions it is even less than 100m. Therefore, optimum benching configurations for maximum ultimate pit depth of 100m, 120m and 140m were worked out in this report for greater flexibility to the mine management.

Height of all benches have been kept fixed at 9m except one bench to accommodate the desired depth of the pit. Considering the slope angle of benches of the existing pit profile,

bench angle has been fixed at 75 degree. Bench width has been varied to find out the optimum pit slope profile having minimum 1.30 factor of safety. Wherever lithology permits, wider benches may have also been considered to optimise the benching configuration. Based on the number of analyses with varying combinations of bench width, optimum design of ultimate pit profile for different depths of Nadidihi Iron Ore Mine have been listed in tables 5(a) to 5(c).

Table 5(a): Optimum design of ultimate pit slope of NIOM upto maximum 100m depth

Name of mine	Maximum depth of pit at ultimate stage	Geo-mining conditions	Bench Parameters		
			Maximum bench height	Minimum exposed bench width (m)	Maximum bench angle
Nadidihi Iron Ore Mine	100m	Benches in OB and Ore	9m	9m	**75**^{o}
			or		
			9m	7.5m with a wider bench of minimum 22m width on or before 54m of pit depth	**75**^{o}

Table 5(b): Optimum design of ultimate pit slope of NIOM upto maximum 120m depth

Name of the block & mine	Maximum depth of pit at ultimate stage	Geo-mining conditions	Bench Parameters		
			Maximum bench height	Minimum exposed bench width (m)	Maximum bench angle
Nadidihi Iron Ore Mine	120m	Benches in OB and Ore	9m	9.9m	**75**^{o}
			or		
			9m	9.0m with a wider bench of minimum 22m width on or before 95m of pit depth	**75**^{o}

Table 5(c): Optimum design of ultimate pit slope of NIOM upto maximum 140m depth

Name of the block & mine	Maximum depth of pit at ultimate stage	Geo-mining conditions	Bench Parameters		
			Maximum bench height	Minimum exposed bench width (m)	Maximum bench angle
Nadidihi Iron Ore Mine	140m	Benches in OB and Ore	9m	10.8m	**75**^{o}
			or		
			9m	9.0m with a wider bench of minimum 35m width on or before 100m of pit depth	**75**^{o}
			or		

			9m	9.0m with wider benches of minimum 22m width on or before every 54m of pit depth	**75**^{o}

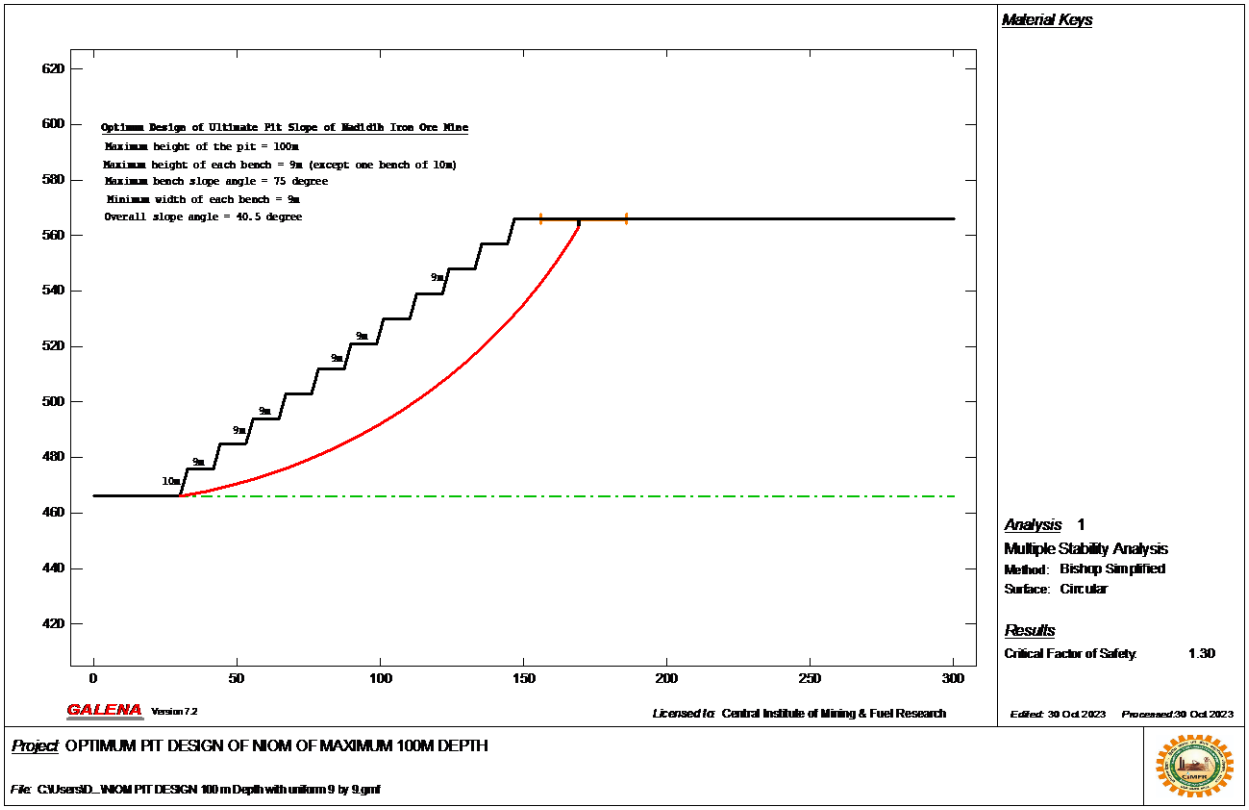


Fig 9(a): Slope stability analysis of proposed ultimate pit profile of NIOM with maximum pit depth of 100m with uniform bench width of 9m

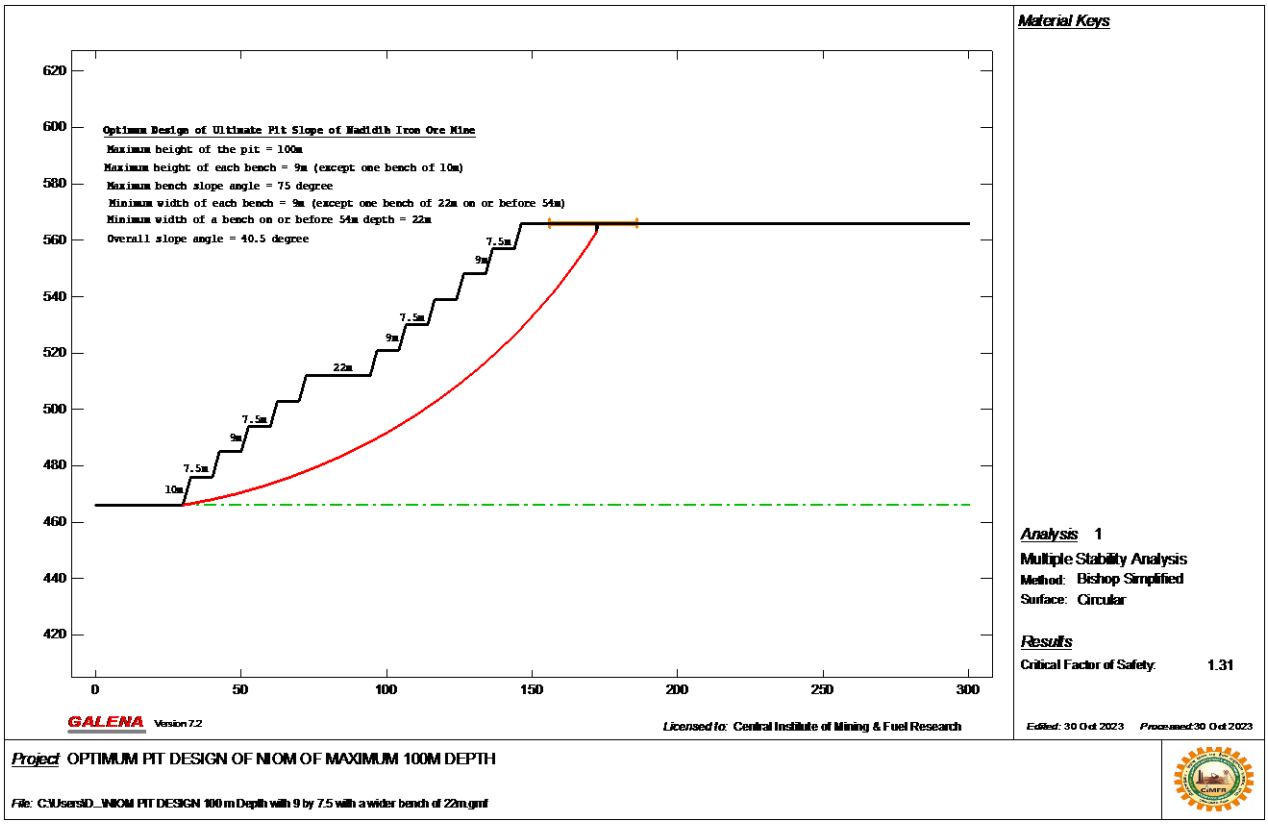


Fig 9(b): Slope stability analysis of proposed ultimate pit profile of NIOM with maximum pit depth of 100m with uniform bench width of 7.5m except one wider bench of 22m on or before 54m depth

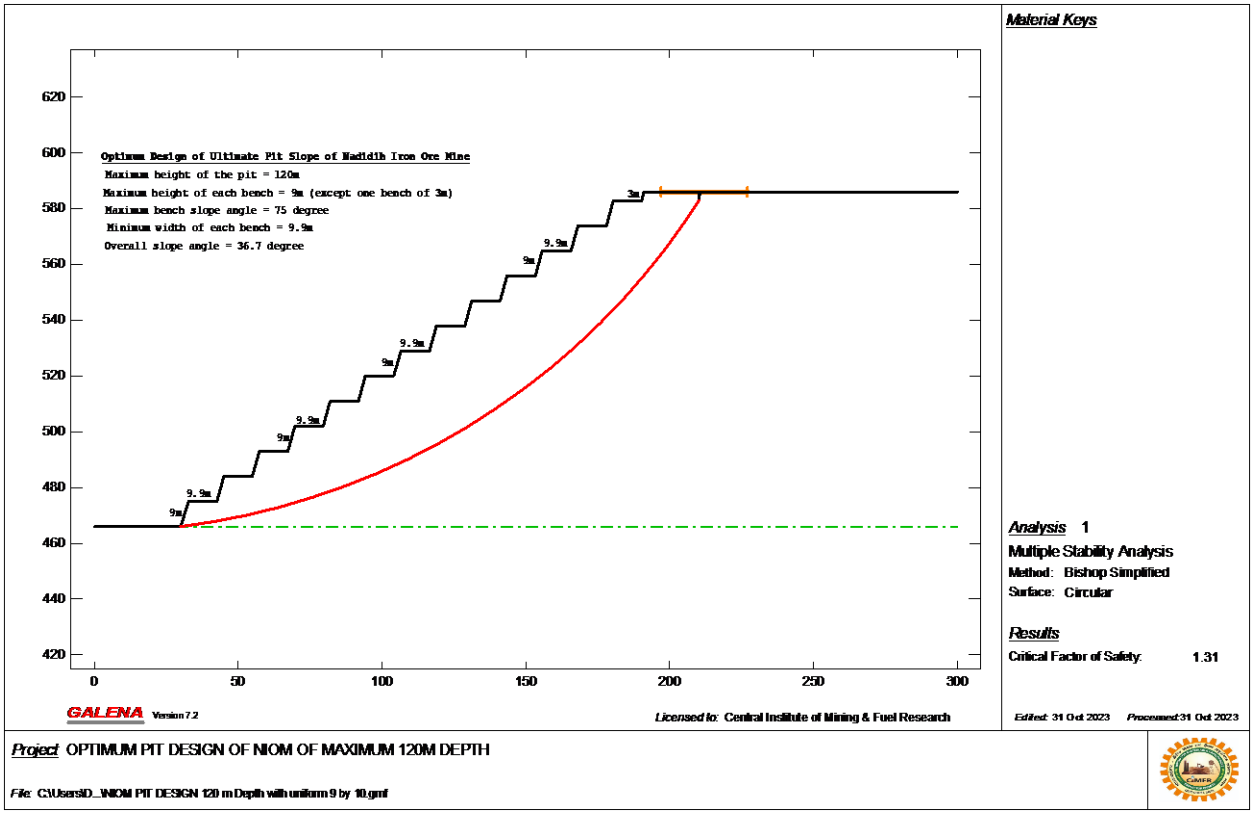


Fig 9(c) : Slope stability analysis of proposed ultimate pit profile of NIOM with maximum pit depth of 120m with uniform bench width of 9.9m

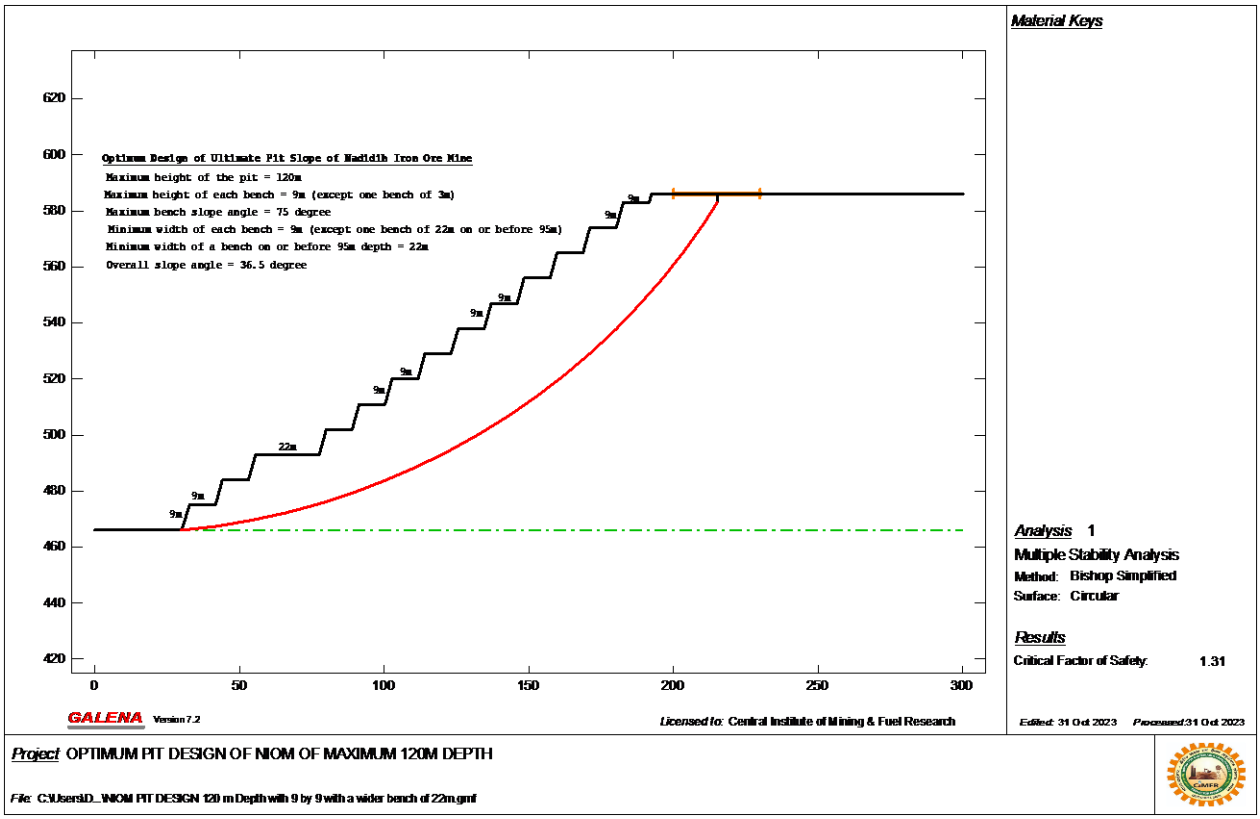


Fig 9(d): Slope stability analysis of proposed ultimate pit profile of NIOM with maximum pit depth of 120m with uniform bench width of 9m except one wider bench of 22m on or before 95m depth

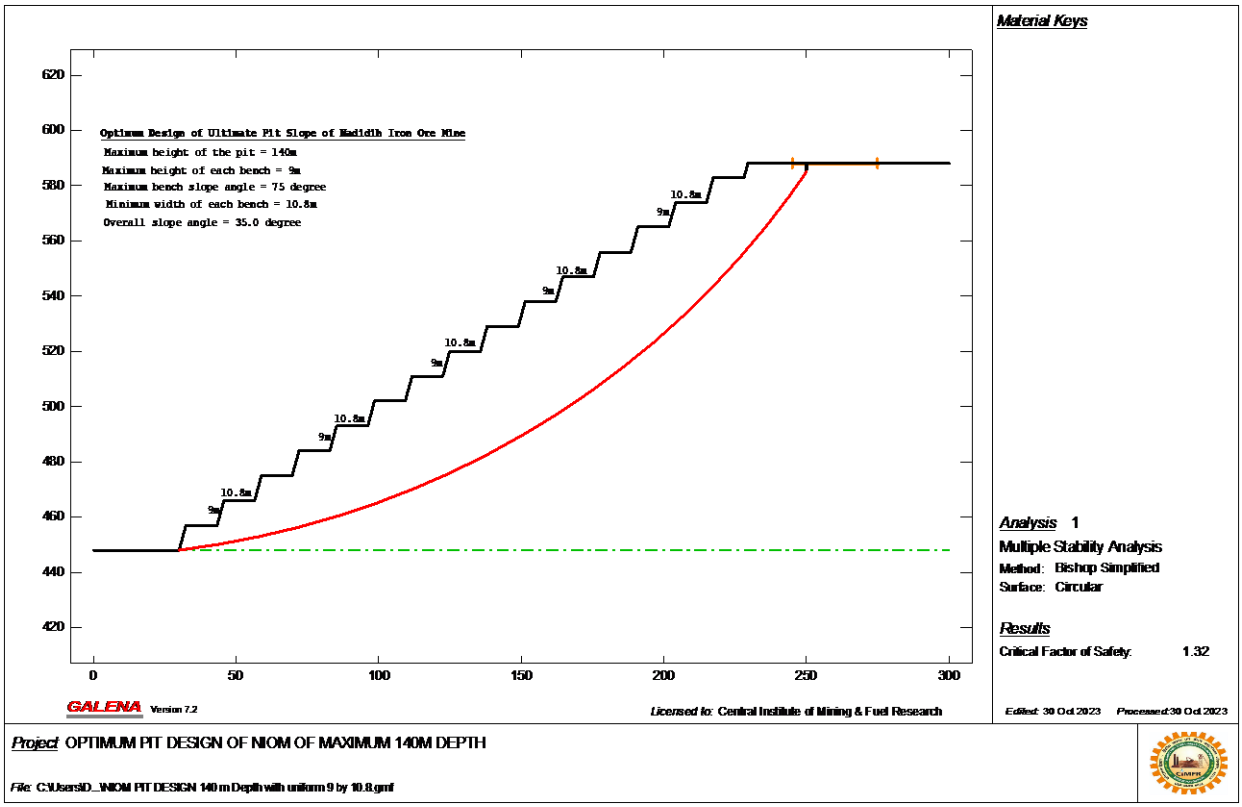


Fig 9(e): Slope stability analysis of proposed ultimate pit profile of NIOM with maximum pit depth of 140m with uniform bench width of 10.8m

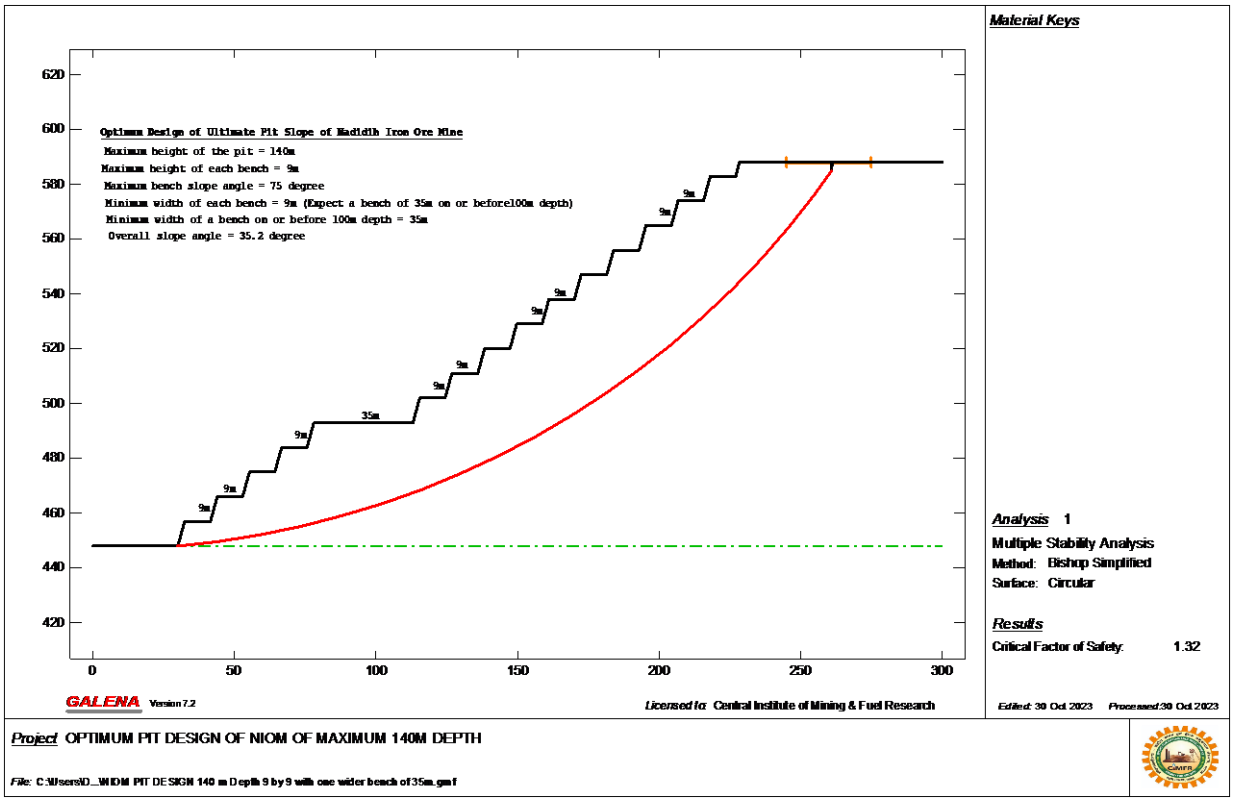


Fig 9(f): Slope stability analysis of proposed ultimate pit profile of NIOM with maximum pit depth of 140m with uniform bench width of 9m except one wider bench of 35m on or before 100m depth

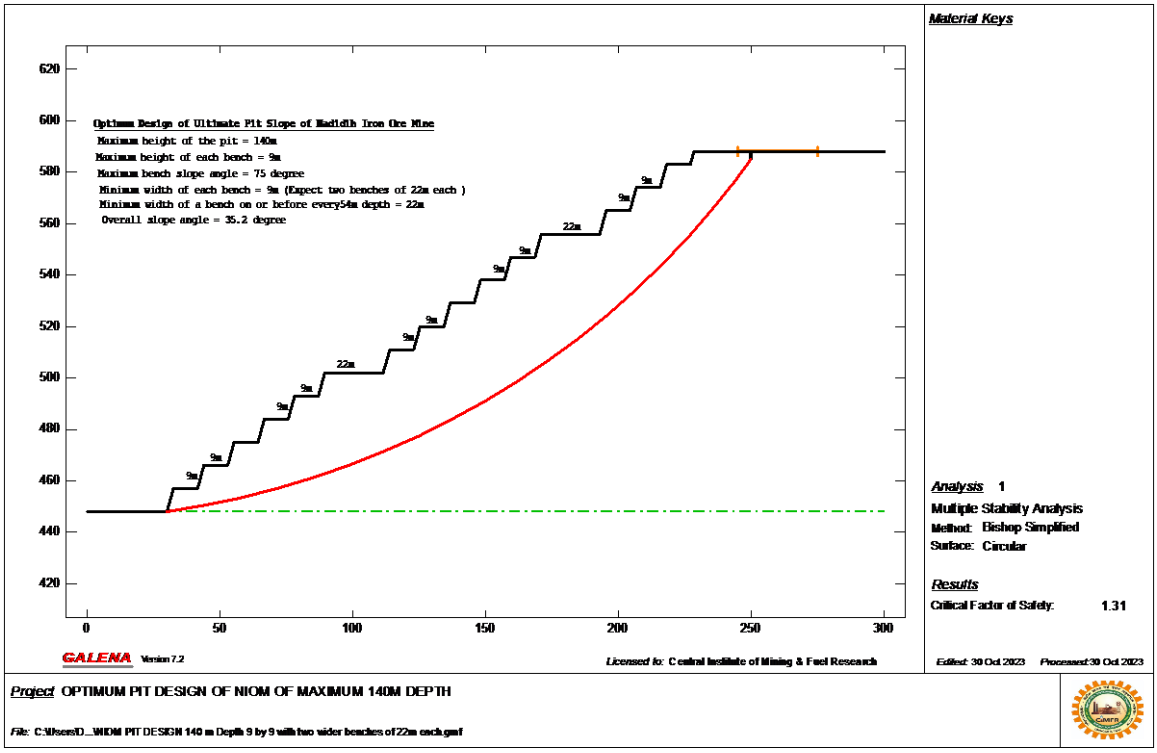


Fig 9(g): Slope stability analysis of proposed ultimate pit profile of NIOM with maximum pit depth of 140m with uniform bench width of 9m except two wider benches each of 22m on or before every 54m depth

Slope stability analysis of optimum design of ultimate pit slope of NIOM for different depths as listed in Tables 5(a) to 5(c) have been shown in figures 9(a) to 9(g) from which it is evident that their factor of safety is more than 1.30. Therefore, optimum design of ultimate pit slope of NIOM for different depths as listed in Tables 5(a) to 5(c) can be considered to be stable from slope stability point of view.

If mine management wish to operate the mine with overall pit slope at steeper angle than the recommended above in this report, suitable slope stabilisation measures have to be adopted to make those steeper pit profiles stable from slope stability point of view. Such slope stabilisation measures have to be designed and implemented by technical consultants (domestic / international) expert in that domain.

Proposed profile along the sections 1-1', 3-3' and G-G', which were found to have factor of safety less than 1.30, were modified as per the recommended optimum design for NIOM as listed in 5(a) to 5(c) considering the overall depth along those sections. Figures 10(a) to 10(c) shows the proposed profile (blue line) as well as modified profile (red line) along the sections 1-1', 3-3' and G-G'. Slope stability analysis of modified sections along 1-1', 3-3' and G-G' has been shown in figure 11(a) to 11(f). From figures 11(a) to 11(f), it is evident that the factor of safety of modified ultimate pit profiles along 1-1', 3-3' and G-G' have factor of safety greater than 1.30 and thus can be considered to be satisfactory from slope stability point of view.

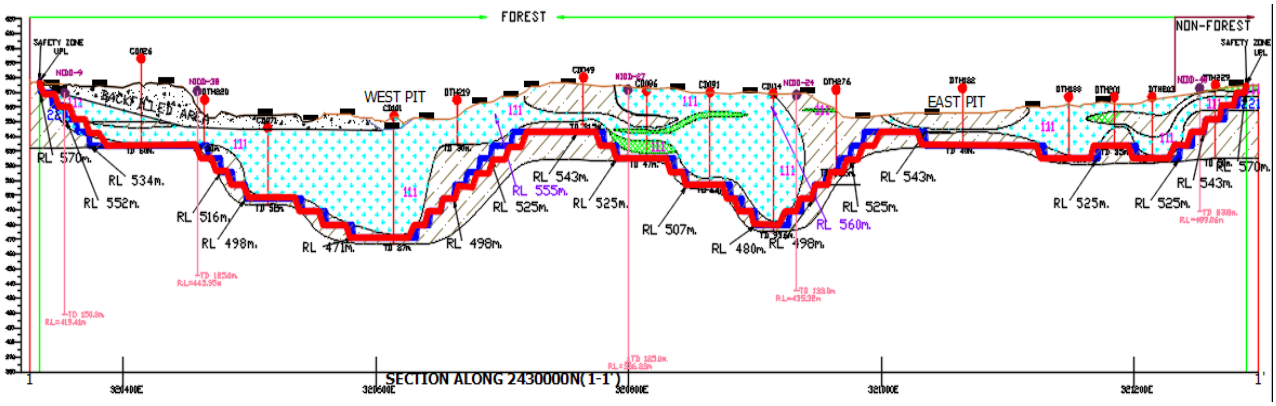


Fig 10(a): Section along 1-1' showing existing (black line), proposed (blue line) and modified (red line) pit profile

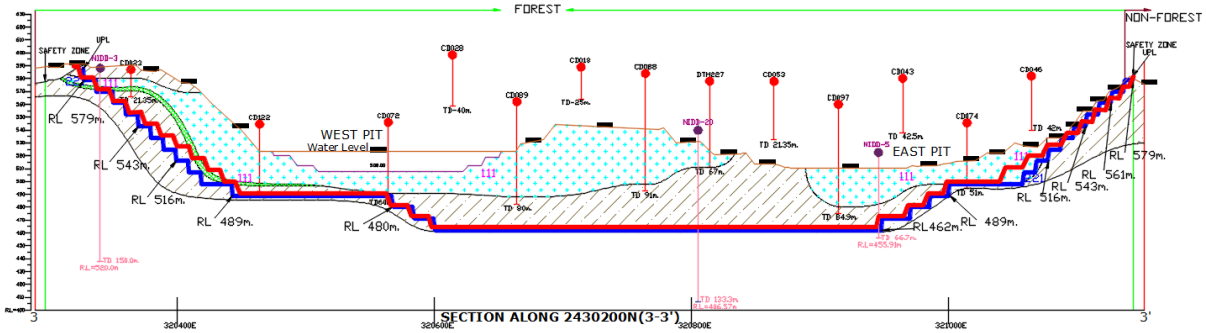


Fig 10(b): Section along 3-3' showing existing (black line), proposed (blue line) and modified (red line) pit profile

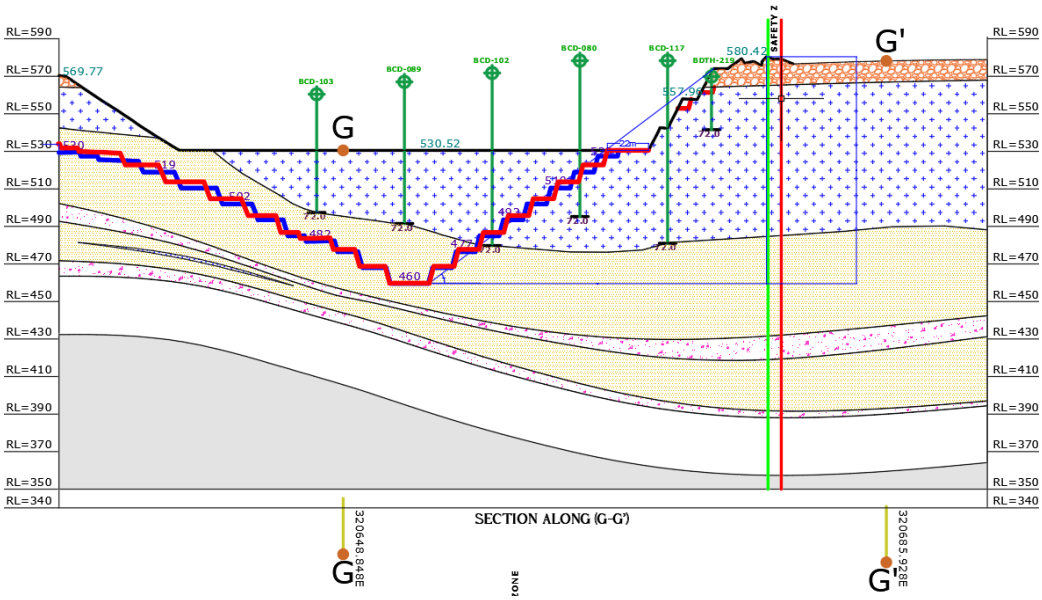


Fig 10(c): Section along G-G' showing existing (black line), proposed (blue line) and modified (red line) pit profile

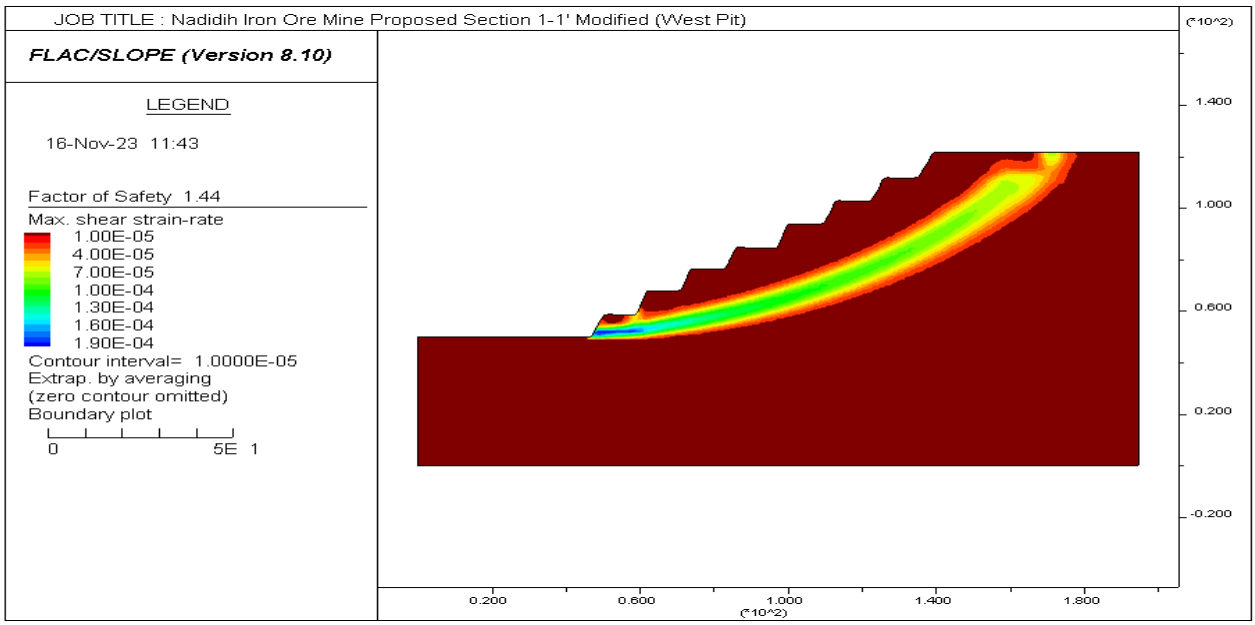


Fig 11(a): Slope stability analysis of modified profile of west pit of NIOM along section 1-1'

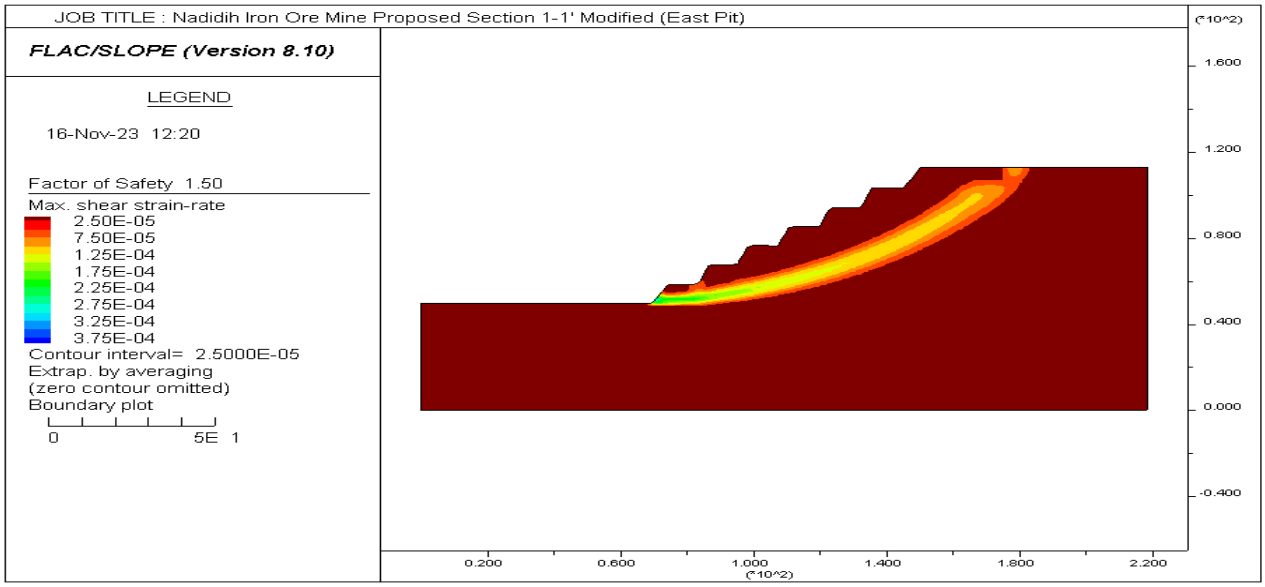


Fig 11(b): Slope stability analysis of modified profile of east pit of NIOM along section 1-1'

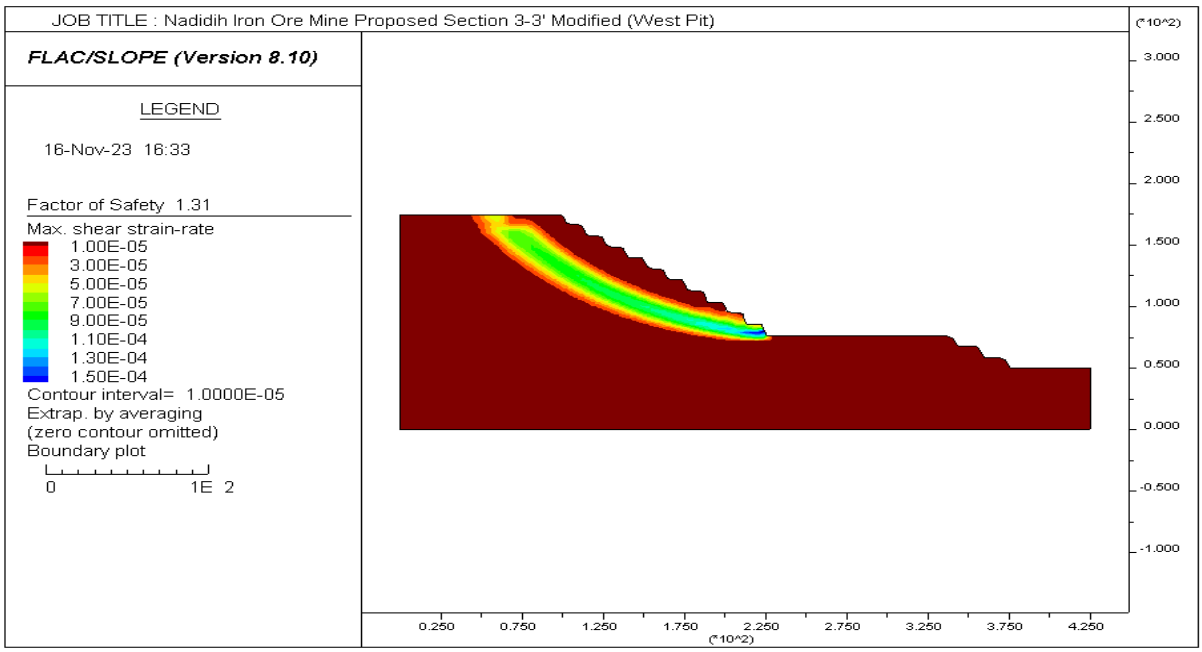


Fig 11(c): Slope stability analysis of modified profile of west pit of NIOM along section 3-3'

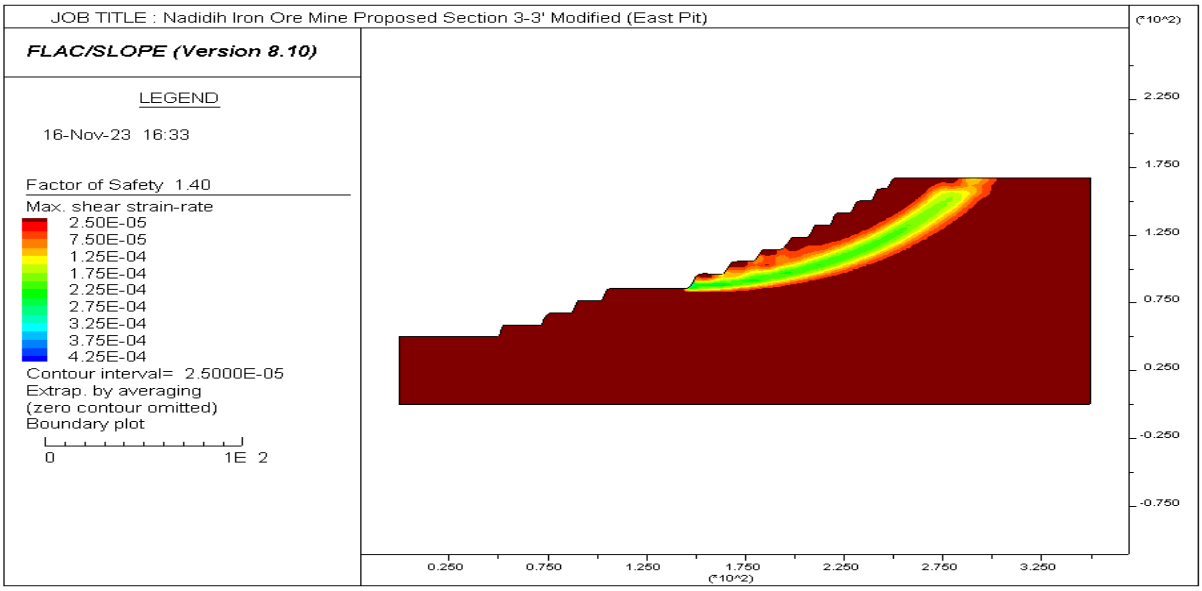


Fig 11(d): Slope stability analysis of modified profile of east pit of NIOM along section 3-3'

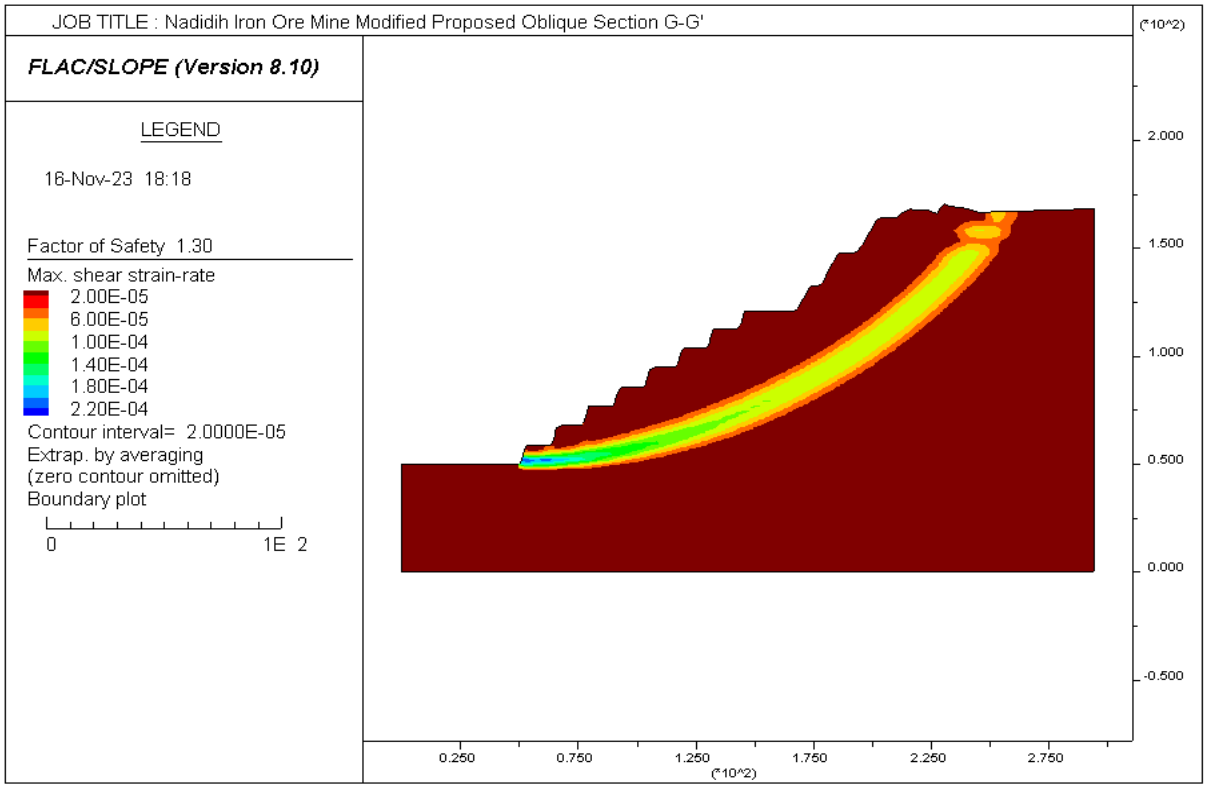


Fig 11(e): Slope stability analysis of modified profile of pit of NIOM along section G-G'

Slope Stability Analysis of Existing & Proposed Dump Profiles of NIOM

There is one dump in the northern part of the Nadidihi Iron Ore Mine and its proposed ultimate configuration has been shown in figure 12. Although, presently the maximum height of the existing dump in NIOM is about 50m, it is evident from the figure 10 that its maximum height will be about 75m with top mRL of 615m. Although, the maximum height of dump is 75m towards the northern side, the maximum height of the dump towards the pit side is 25m only (i.e. from590mRL to 615mRL). As per the plan shown in figure 12, height of individual bench of the dump has been restricted to maximum 15m. Bench width of the proposed dump has been estimated based on the slope stability presented in this report. Moreover, the minimum distance of the dump toe from pit crest has also been estimated in this report for safety of the pit slope.

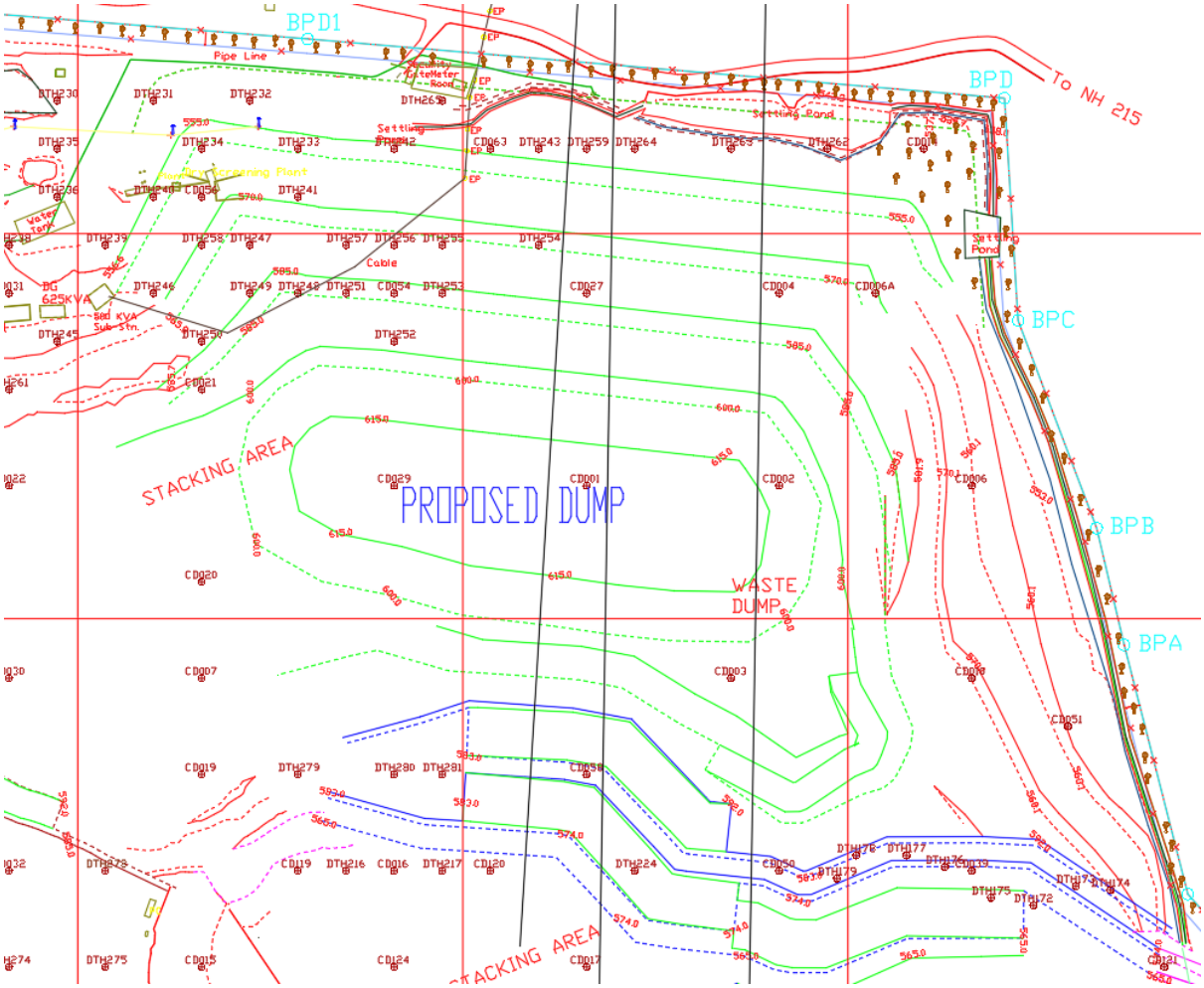


Fig 12: Proposed dump configuration of NIOM

Profile of the existing dump has been shown in figures 5(e) to 5(i) along sections 5-5' to 9-9' respectively. Moreover, profile of the existing dump has also been shown in figure 6(c) along section C-C'. Out of all these sections of dumps, sections along 6-6' and C-C' are having higher height or steeper angles compared to other sections and hence these sections of dumps are analysed for slope stability analysis to assess their factor of safety. Slope stability analysis along sections 6-6' and C-C' are shown in figures 13(a) & 13(b) respectively. From figures 13(a) & 13(b) it is evident that the factor of safety of the existing dump profiles are higher than 1.70 and therefore can be considered to be stable from the slope stability point of view.

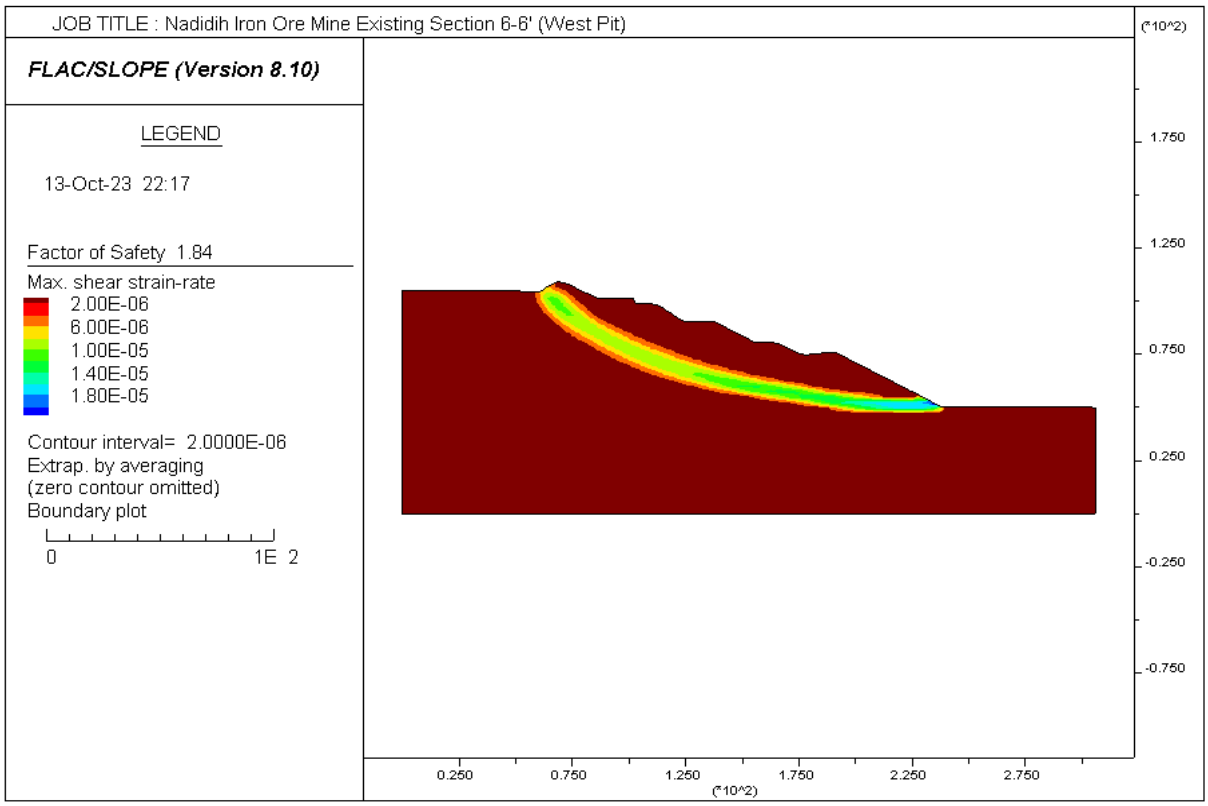


Fig 13(a): Slope stability analysis of existing profile of dump of NIOM along section 6-6'

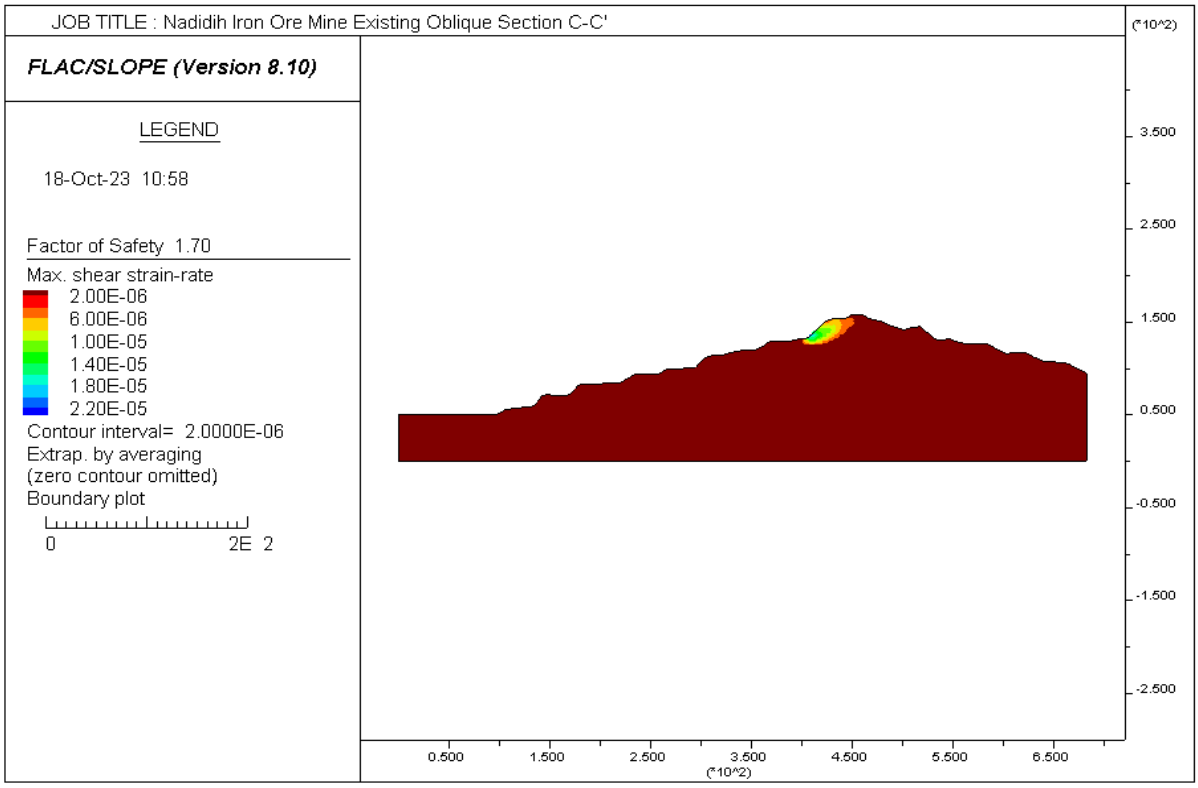


Fig 13(b): Slope stability analysis of existing profile of dump of NIOM along section C-C'

Optimum design of the proposed dump of maximum 75m height of NIOM has been worked out based on the slope stability analysis and listed in Table 6. Slope stability analysis of the optimum design of dump as per parameters listed in Table 6 has been shown in figure 14 from which it is evident that its factor of safety is more than 1.30 and thus it can be considered to be stable from slope stability point of view.

Table 6 : Optimum design of dump of NIOM

Dump design parameters	Values
Maximum height of the dump (i.e. difference of RL of crest of topmost bench and RL of toe of lowermost bench)	75m
Minimum number of bench/deck/lift/stage	5
Maximum height of any bench/deck/lift/stage	15
Minimum exposed width after each bench/deck/lift/ stage	12
Ratio of exposed bench width / bench height	0.80
Bench slope angle / Angle of repose	37^{o}
Factor of safety	1.31
Overall slope angle at ultimate stage	26.9^{o}
Figure No.	14

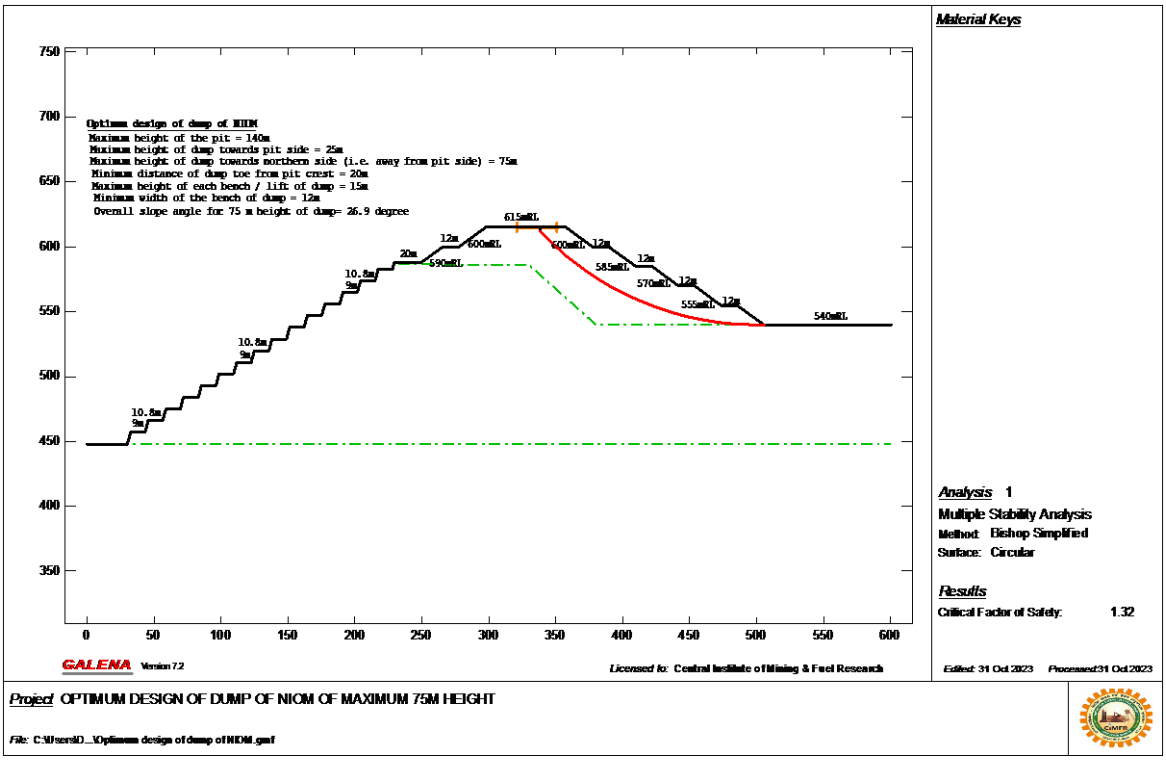


Fig 14: Slope stability analysis of optimum design of dump of NIOM of maximum 75m height

If height of a bench is less than 15m, then bench width should be kept in same ratio as listed above to maintain the overall slope angle. As this dump will be formed close to northern side of the pit crest and maximum height of the dump towards pit will not exceed 25m, a minimum distance of 20m has to be maintained between the dump toe and pit crest to maintain the factor of safety of pit and dump slope together as shown in figure 15.

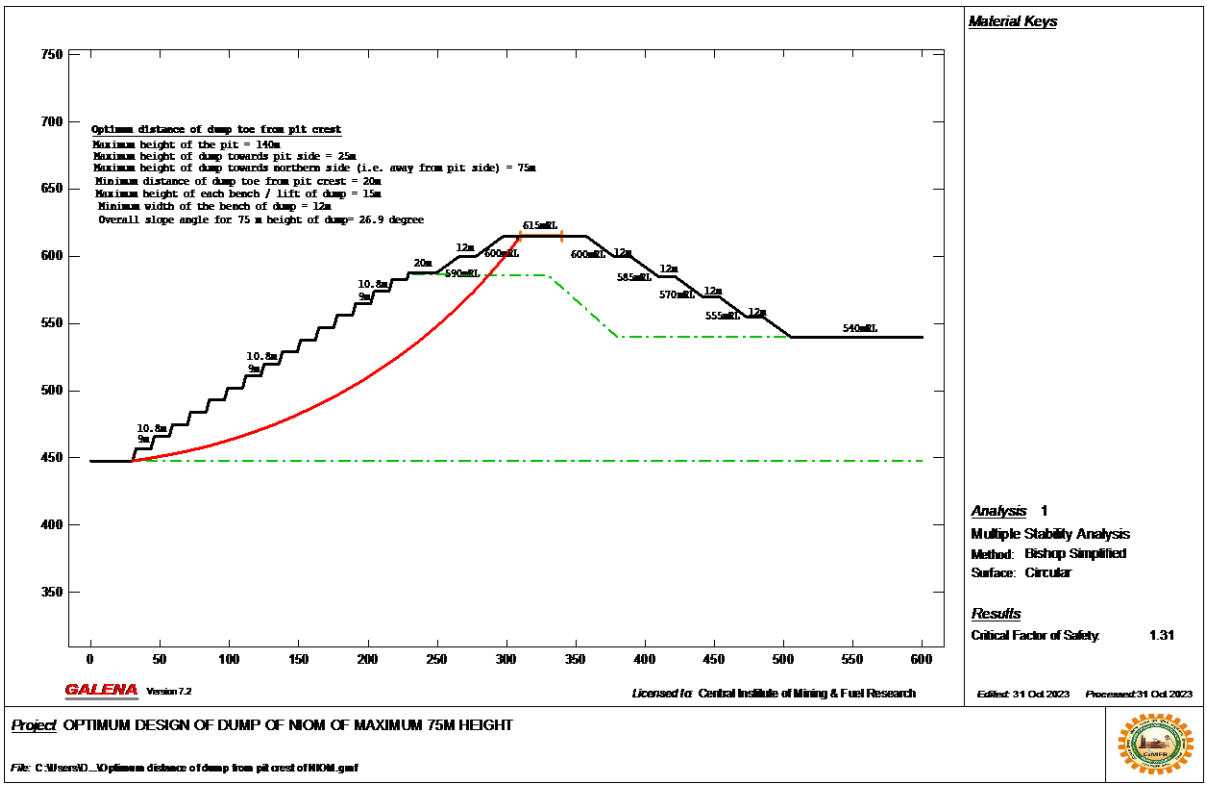


Fig 15: Minimum distance of 20m between toe of the dump toe from the crest of the pit

Considering the prevailing conditions and precautions being taken by the mine management, most likely condition of the pit/ dump slopes were adjudged to be drained condition. The stability analyses for pit and dump slopes were done with a consideration of machine cutting /controlled blasting, drained groundwater condition, proper drainage for rainwater and slope monitoring. Under drained condition, dump slopes are likely to be stable with available shear strength of the slope material. If the pit /dump slopes are kept in undrained condition then the factor of safety would reduce substantially. In order to avoid undrained condition, attention must be paid to avoid uncontrolled entry of rain / surface water in the pit / dump mass by providing suitable drainage in and around the mine and dump, otherwise overall factor of safety of dump may reduce. If any observance is made for the occurrence of adverse condition, then this slope angle has to be corrected accordingly.

The analysis shows that the large-scale failure is unlikely but small-scale failure cannot be completely ruled out. The main philosophy in open pit and dump design is to avoid large-scale failure. Localized bench failure does not cause great concern as it can be arrested on the lower benches, which can be cleaned. So, machinery access on the benches must be maintained.

Drainage and water management

From the slope stability analysis presented in this report, it is evident that the existing profile and recommended ultimate profiles of pits and dumps slopes of NIOM are likely to be safe in drained geo-mining condition. The slopes may have reduced factor of safety in undrained condition or under changed dumping configurations. Therefore, mine management has to take all effective measures considering existing regulations and geo-mining conditions to keep the pit and dumps in drained conditions. In order to keep the pit and waste dumps in drained condition, attention must be paid to avoid entry of rain / surface water in the slope by providing suitable drainage in and around the pit and dumps.

The rainwater of the adjacent catchments area should not be allowed to enter in to pit in an uncontrolled way. It causes erosion and deep gullies in the weak formations, which in turn may result in to failure in due course of time. So, the rainwater of the catchments area should be directed away from the pit. The excavated pit must be provided with an effective garland drain/ bund depending upon the topography to check the entry of rainwater in to the pit during the monsoon. Similarly, all around the periphery of dump, a collector drain/ bund should be formed to divert the rainwater away from the dump. The drainage must always be directed away from the pit. All the drains should be kept clear of soil debris and effective for the free flow of water. The discontinuance of the pre- monsoon preparation at any location will jeopardize the whole effort of maintaining the designed slopes.

The benches should be provided with bench drains to collect the rainwater. The flowing rainwater should not be allowed to flow down to lower benches in an uncontrolled manner. The slope of the upper surface/ benches should be well graded so that the rainwater goes away from the quarry. At few locations it may not be possible to divert the rain/ seepage water away from the pit, in that case a proper drain pattern should be developed to channelize the water into the pit sump. The water should not be allowed to enter into the pit from many

channels or left uncontrolled. By guiding the flow of water in a fixed channel erosion/ failure of soil/ clays can be checked. The unchecked erosion may lead to failure in these soil slopes in due course.

Every attempt should be made to make a proper gradient along the benches, top and floor of the dump. The dump top should be properly levelled with a slope to avoid water retention on dump top/ dump benches and to prevent the rainwater flowing along slope. The upper surface of the mine and dump should be properly graded to divert the run-off of rainwater away from the pit and dump. The proper leveling and grading of benches should be done for quick run-off of rainwater. All benches of external dump should have an effective toe drain. These drains should be interconnected to drain out the rainwater away from the pit.

The dumps should be provided with all necessary protective features wherever required such as toe wall and garland drain to arrest any surface run offs. Afforestation on the dump slopes should be done for stabilizing the dump slopes, once a part of the dump slope become inactive. The terraces should be designed so that rain water is drained out of the dump and there is no accumulation of rain water. The rain water should get channelized to the toe wall and garland drain provided at the base of the dump.

If two or more benches of pit or dumps are made steeper at any level in any part then it may decrease factor of safety. Although, the overall slope angle may be quite low but the steeper slope angle of two or more benches may increase the stress at the toe of relatively steeper part of the slope, which may cause failure. Two or three such small failures may cause a big failure. So, benching should be done properly at each stage of pit and dump formation.

The open cracks, whenever develop, in the partially consolidated new dump mass should be consolidated with the help of dozer/ compactor followed by proper leveling of the benches. It will help to consolidate the dumped material and will minimize infiltration of water inside dumps.

Because of steep slopes and well-connected hilly streams, the run off rate is very high. The rainwater of the adjacent catchments area should not be allowed to enter in the dump in an uncontrolled way. The surplus water flowing down the sloping surface of the dump remove soil particles from large areas causing small channels. These channels in due course

get deepen and widen during each succeeding rains and finally integrate into larger channels called gullies, which sometimes bring instability to the dumps. So, the rainwater of the catchments area should be directed away from the dump. A bund/ garland drain, depending up on the topography of the area, should be made/ cut all around the toe of dumps to collect run-off of the rainwater before it reaches the dump.

Drains should be properly graded to promote rapid water flow and minimize chances of ponding. The drains should be effectively maintained to divert the drained water away from the dump. If this drainage system is not effectively achieved then the dumps may fail due to increase in saturation at the bottom of the dumps. These drainages should be made to handle even heavy rainfall events. Wherever drains are required for a sufficiently long duration, it should be cemented or lined with geo-membrane to avoid percolation of water into the dump mass. At some locations, if it is not possible to divert the rainwater away from the dumps, the rainwater should be diverted to the pit sump through drains.

During the rainy season, a dedicated team should be deputed to go in and around the mine and dump on daily basis to observe any sign of instability and to see the effectiveness of drain. If any blockage is observed, immediately steps should be taken to make it effective. If any deep tension crack is detected in the dump, the entry of water inside the crack should be checked.

Some part of the waste may be used for making the berms, haul roads, ramps and maintenance of bench floors, haul roads & ramps. Moreover, the waste may also be used as landfill for filling up of low-lying areas and for construction activities within the leasehold boundaries. Efforts should be made for use of a part of waste dump material for value added products, whichever are feasible.

Stability of Benches by Controlled Blasting

The damage due to poor blasting has a significant influence upon stability of highwall slopes. Uncontrolled blasting results in rough uneven contours, over breaks, overhangs and extension of tension cracks in the slope. Poor blasting causes opening between various weak planes, which result in loss of resultant cohesion between them. It also results into shattering of the slope mass well behind the desired location and consequently allowing easier

infiltration of surface water, which leads to unfavorable groundwater pressures and related problems.

Thus, ground vibrations from blasting have two-fold action of the rock mass. On one hand, they affect the integrity of rocks or their strength parameters while on the other, they can provoke wall or slope collapses when unstabilizing actions are introduced (Jimeno et. al. 1996). Therefore, peak particle velocity due to blasting should be controlled by proper selection of explosive types, blast pattern, maximum charge per delay etc. Bauer and Calder (1971) proposed the following generalized criteria, as given in Table 7, for damage level of particle velocity due to blasting on rock mass and slopes.

Table 7: Damage level of rock mass based on ground vibration (after Bauer & Calder, 1971)

Particle velocity (mm/s)	Predictable damages
<250	No danger in sound rock
250-600	Possible sliding due to tensile breakage
600-2500	Strong tensile and some radial cracking
>2500	Complete break-up of rock masses

These detrimental after effects, due to poor blasting, can be checked by controlled blasting. The aim of the controlled blasting is to minimize the damage of the slope mass forming the ultimate pit slope. The final slope face of any open pit quarry has to be maintained in the soundest possible condition. Better ultimate wall stability can be achieved with controlled blasting (Langefors and Kihlstrom, 1963). The uncontrolled blasting can make a slope unstable (Hoek and Londe, 1974).

The controlled blast holes should be closely spaced and lightly charged than the regular blast holes. It should be blasted before the main blast by applying the delay mechanism. It will help in making a crack line along the desired slope. The controlled blasting will not damage the slope mass beyond these lightly charged pre-split holes. It is preferable to use electronic detonators in controlled blasting especially during formation of ultimate benches and when the blasting face if closer to dwelling to minimize the back break as well as side effects on vibration / shock generated during the blasting.

The controlled blasting can be tried, experimented and perfected during regular production blasts. The experience of production blast can be applied to ultimate pit slope blast. Mine management may optimize the pre-splitting technique for the site-specific geo-mining conditions to achieve better pit slope stability. The extra effort of controlled blasting is well justified because it checks the instability of the pit slopes thus increasing the profitability of the quarry substantially. It is recommended to optimize the pre-spliting technique for the site-specific geo-mining conditions, if required with help of experts, to ensure smooth surface of the highwalls and to minimize formation of loose boulders.

The blasting near the shear/ fault zone must be optimized. Otherwise, it would be impossible to maintain proper bench width in the zone where faults are present. Poor blasting may result in to merger of the benches which ultimately may lead to failure. Any heavy blast in the proximity of weak/ weathered lithology or near the day lighting major discontinuity would cause sliding of the overlying slope mass. The heavy production blasting should be avoided/ optimized.

Slope Monitoring

The main objective of slope monitoring study is to detect any instability well in advance so that any damage to men and machineries can be avoided. If the failure is unavoidable then it can be brought down in a predictable manner. The instability detected in the early stage can be stabilized by applying a suitable remedial measure. If the instability is detected at a later stage, then it will be very difficult to check the instability.

The early identification of movement zones allows steps to be taken to minimize the impact of mining on stability by the implementation of corrective measures and at the same time provides for optimum mineral extraction. The system contrasts strongly with more common 'passive' systems that frequently only record the occurrence of an event for subsequent post-mortem examination. The active monitoring system permits early and confident decision making by management both for safety purposes and for optimum excavation sequencing.

All geotechnical investigations aimed at collecting input design parameters, however complete, involve an inherent risk of inaccuracy. Hence, any attempt of slope stability analyses and evaluation need to be supported by a sound slope monitoring program in order to ensure the safe and smooth mining operations.

The continuous mining operation, blasting and changes in groundwater conditions continuously disturb the existing stress condition in the field. The whole system tries to come into equilibrium by stress redistribution and adjustment, which results into movement of the slope. Hence, it is advisable to monitor the trench slopes regularly to detect any movement. DGMS(Tech.) Circular No. 2 of 2020 dated 09.01.2020, mine manager should have a structured team of trained competent persons for slope monitoring headed by a slope monitoring officer with clearly defined duties and responsibilities.

The slope monitoring method allows failures to be predicted for ensuring safe working conditions. Slope monitoring can be used to confirm failure mechanisms. The review of monitoring results, visual inspection and regular briefing of field people help to detect the onset of failure.

The first sign of instability is a tension crack. So, it is important to carry out regular inspection to detect the development of tension cracks on the crest of the slope as well as on benches and to carry out prompt remedial measure. They may develop as a function of high stresses in the slopes. The opening of cracks will tell whether any deep - seated failure can occur or not. Tension cracks should be filled and sealed to prevent the entry of water, which may cause failure.

The slope monitoring techniques vary widely ranging from simple visual observations of signs of potential instability such as slope bulging, surface fretting and the formation of tension cracks to the use of somewhat complex instrumentation. The scale of the mining operation, transport system and the nature and location of the potential slope failure decides the application of a particular technique.

Survey based methods can be used for absolute monitoring, that is determining the movement of a point or points relative to some datum believed to be outside the zone of potential deformation.

The slope monitoring based on standard surveying techniques have wide acceptance because of the ability to remotely monitor a wall following the establishment of targets. Use of Total Station techniques along with angular measurements have become most popular because of the perceived advantage of low cost and easy availability of trained manpower.

Suggested Slope Monitoring System for Nadidihi Iron Ore Mine

Considering the size of the mine, configuration of existing dumps, design of ultimate configurations etc., the suggested slope monitoring scheme for pits and dumps of Nadidihi Iron Ore Mine are as follows:

Monitoring of pits and dumps of Nadidihi Iron Ore Mine is recommended to be done with total station by installing monitoring stations. The monitoring pillars should be located initially at 30 to 50 m interval. Monitoring pillars should be installed all along the top most bench as well as on intermittent benches after every five to six benches of the pit. Advancing benches may not be suitable for installation of monitoring stations as these stations will get broken during machineries operation over those benches. Similarly, monitoring stations should be installed on top bench as well as on intermittent benches of the dump. Base station should be located at stable ground in opposite side of the monitoring stations. One or more base stations could be erected to cover all the area. The base station and monitoring stations should be so located that inter-visibility should be there. The gap between the stations can be increased or decreased as per the requirement of the site based on data analysis. It is a general guideline, which may be changed to meet the local requirement. DGMS (Tech.) Circular No. 2 of 2020 dated 09.01.20 requires mine manager to have a structured team of trained competent persons for slope monitoring headed by a slope monitoring officer with clearly defined responsibilities.

To start with the monitoring of pits should be done periodically at least once in a month using total station by mine management and the results of monitoring should be recorded in a bound-paged register or in a temper proof electronic form. These data should be regularly analyzed for rate of movement for assessment of instability. Warning level / withdrawal level of slope movement is site-specific and can be decided based on analysis of monitoring data over a long period only. If the analysis of monitoring data reveals, no ground movement in any part of mine or dump, mine management may increase the

monitoring frequency from once in a month to once in two months on those part of mine. However, if mine management detects an average rate of slope movement of 0.5 mm/day over a period of at least one month for most of the pillars of a zone of mine then the mine management should increase the monitoring frequency to fortnightly. If the movement monitoring data shows average movement rate of more than 1.0 mm/day over a period of at least one month then monitoring system design, frequency, and monitoring technology may have to reviewed by any agency expert in the field of slope design and slope monitoring. Under the condition the working near the affected zone of the mine should also be restricted. The recommendation of such study by expert agency should be implemented by the mine management for the sake of safety of men and machineries.

Conclusions and Recommendations

- Slope stability analysis presented in this report revealed that factor of safety (FOS) of existing pit profiles along different sections of Nadidihi Iron Ore Mine (NIOM) are found satisfactory and hence considered to be stable from slope stability point of view.

- Slope stability analysis presented in this report revealed that factor of safety (FOS) of existing dump profiles along different sections of Nadidihi Iron Ore Mine (NIOM) are found satisfactory and hence considered to be stable from slope stability point of view.

- Slope stability analysis presented in this report revealed that factor of safety (FOS) of ultimate pit slope as proposed by the mine management in approved mining plan of Nadidihi Iron Ore Mine along section lines from 1-1' to 5-5' and from A-A' to H-H' were varying between 1.16 to 1.94. Although, factor of safety of proposed pit profiles along sections 1-1', 3-3' and G-G' were found less than the minimum requirement of 1.30 but when modified as per benching pattern recommended in the report were found to have satisfactory factor of safety and thus can be considered to be satisfactory from slope stability point of view.

- Based on the assessment of the proposed mine development plan and sections, engineering geology, existing geo-mining conditions, strength properties and the related geotechnical controls indicated in the report, the following ultimate pit slope design for different pit depths of Nadidihi Iron Ore Mine have been recommended. Mine management may select amongst these options best suited for a given section depending on the ultimate depth and mineralization along the given section.

Name of mine	Maximum depth of pit at ultimate stage	Geo-mining conditions	Bench Parameters		
			Maximum bench height	Minimum exposed bench width (m)	Maximum bench angle
Nadidihi Iron Ore Mine	100m	Benches in OB and Ore	9m	9m	**75**^{o}
			or		
			9m	7.5m with a wider bench of minimum 22m width on or before 54m of pit depth	**75**^{o}

Table continued on next page

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Name of mine	Maximum depth of pit at ultimate stage	Geo-mining conditions	Bench Parameters		
			Maximum bench height	Minimum exposed bench width (m)	Maximum bench angle
Nadidihi Iron Ore Mine	120m	Benches in OB and Ore	9m	9.9m	**75**^{o}
			or		
			9m	9.0m with a wider bench of minimum 22m width on or before 95m of pit depth	**75**^{o}
Nadidihi Iron Ore Mine	140m	Benches in OB and Ore	9m	10.8m	**75**^{o}
			or		
			9m	9.0m with a wider bench of minimum 35m width on or before 100m of pit depth	**75**^{o}
			or		
			9m	9.0m with wider benches of minimum 22m width on or before every 54m of pit depth	**75**^{o}

- Modified sections of 1-1', 3-3' and G-G', modified as per the above mentioned recommended optimum design considering the overall depth along those sections, were also found to have satisfactory factor of safety and hence considered to be stable from slope stability point of view.

- If mine management wish to operate the mine with overall pit slope at steeper angle than the recommended above in this report, suitable slope stabilisation measures have to be adopted to make those steeper pit profiles stable from slope stability point of view. Such slope stabilisation measures have to be designed and implemented by technical consultants (domestic / international) expert in that domain.

- The operating bench width of pit should never be less than that specified in MMR or as specified above, whichever is higher. Bench height above 10m should be avoided. If height of a bench is less than 9m then bench width should be kept in same proportion to maintain the same overall slope angle.

- Above mentioned optimum pit slope design are valid with well-developed drainage system in and around the mine to maintain the pit slope in drained condition as well as with machine cutting / controlled blasting for ultimate pit slopes as suggested in this report.

- Maximum height (i.e. difference in mRL of crest of topmost bench to mRL of toe of bottommost bench) of dump in NIOM is not expected to exceed 75m at any stage and therefore considering the geo-mining conditions and the slope stability analysis presented in the report, optimum design of ultimate profile of dump of Nadidihi Iron Ore Mine (NIOM) are recommended as follows:

Dump design parameters	Values
Maximum height of the dump (i.e. difference of RL of crest of topmost bench and RL of toe of lowermost bench)	75m
Minimum number of bench/deck/lift/stage	5
Maximum height of any bench/deck/lift/stage	15
Minimum exposed width after each bench/deck/lift/ stage	12
Ratio of exposed bench width / bench height	0.80
Bench slope angle / Angle of repose	37^{o}
Factor of safety	1.31
Overall slope angle at ultimate stage	26.9^{o}

- As the dump of the NIOM will be formed close to northern side of the pit crest and maximum height of the dump towards pit will not exceed 25m, a minimum distance of 20m has to be maintained between the dump toe and pit crest to maintain the factor of safety of pit and dump slope together.

- If height of a bench of dump is less than 15m, then bench width should be kept in same ratio as listed above.

- The large-scale instability of proposed ultimate pits and dumps of Nadidihi Iron Ore Mine as recommended in this report, is unlikely with above mentioned profile if a well-developed drainage system, slope monitoring and other precautions / recommendations are implemented. Any local steepness at any level or saturation of slope mass may reduce the FOS and may cause slope instability even if the overall slope angle is within the recommended slope angle.

- If two to three benches are made steeper at any level in any part/ depth of the pit / dump then it may reduce its factor of safety. Although the overall slope angle may be quite low but the steeper slope angle of three benches may increase the stress at the toe of relatively steeper part of the slope, which may cause failure. Two or three such small failures may cause a big failure. So, benching should be done properly from top to bottom.

- As different pits and dumps of Nadidihi Iron Ore Mine are reaching greater depths / heights or their ultimate stage, the design of pit and dumps of NIOM need to be revalidated or redesigned if there is significant change in the mining plan or before exceeding the maximum recommended depth or four years from issuance of this report, whichever is earlier. Mine management should maintain the benching parameters as recommended for various depths mentioned in the report.

- Cutting of toe of benches of pit and OB dumps should be strictly avoided. Such action reduces the safety factor of the slope.

- Width, gradient and other safety measures like parapet walls, warning notices, signs etc. of all haul roads should meet the criteria specified in MMR and other guidelines.

- The mapping of weak zones, faults and bedding planes in the pit should be a regular process by the departmental geologist. It will help to detect any unfavorable conditions at different stages of mining at the earliest possible which may be utilized in future for re-analysing pit slope stability, or for taking remedial measures. The pits and dumps should be surveyed periodically to produce up-to-date and accurate dump geometry.

- The mine should have an effective garland drain/ bund, all around, to collect/ divert rain water of the catchment area before it reaches the mine slopes. It is essential that these drains should be kept clear of silt and debris. Horizontal drains may be installed in the pit for de-pressurization of adverse groundwater pressure, especially where seepage is observed.

- Every attempt should be made to make a proper gradient along the benches, top and floor of the dump. It will facilitate an effective seepage/ flow of water retained in dumps as well as run-off of rainwater to the drains to take the same away from the dump. The drains should be effectively maintained to divert the drained water away from the dump. During

the rainy season, effectiveness of drains in and around the pit and dump should be checked frequently.

- Mine management should take all precautions and measures to avoid entry of rain / surface water in the dump mass by providing suitable drainage in and around the mine and dump, failing which the slope may become undrained and thus may reduce stability.

- A bund/ garland drain, depending up on the topography of the area, should be made/ cut all around the toe of dumps to collect run-off of the rainwater before it reaches the dump. Drains should be properly graded to promote rapid water flow and minimize chances of ponding. Proper cleaning/ desilting and leveling of the drains would be necessary to keep the drains effective.

- To prevent soil erosion, to arrest washed off solids from the fine stacks / dumps and surface run offs, the following measures are being taken and / or need to be continued / taken in future:
  - · Stabilization of waste dump slopes by timely vegetation with native species
  - · Toe wall and garland drains wherever required,
  - · Contour trenching
  - · Check dams and siltation ponds

- Mine management should make a structured team of trained competent persons for slope monitoring headed by a slope monitoring officer with clearly defined duties and responsibilities as per DGMS(Tech.) Circular No. 2 of 2020 dated 09.01.2020. The monitoring should be done periodically at least once in a month using total station and the results of monitoring should be recorded in a bound-paged register or in a temper proof electronic form. These monitoring data should be regularly analyzed for rate of movement of monitoring pillars. Slope monitoring should, in general, be done by the mine survey/geotechnical team. In case any adverse situation from stability view-point is detected, advice may be sought from expert agencies in the field of slope stability and slope monitoring for monitoring system design, or data analysis & interpretation to assess slope condition.

Acknowledgement

Project team of CSIR-CIMFR is thankful to the mine management of Nadidihi Iron Ore Mine for providing all facilities, information and helpful discussion during the period of study.

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Annexure 6

Expenditure on Environmental Protection and Monitoring

S.no	Line item	Amount spent (In Rs)
1	Continuous Ambient air quality monitoring station	4381700
2	Continuous online water monitoring station	205962
3	Continuous Water Analyser system	205962

Mr. Ulhas R Naik
Mines Manager
Nadidihi Iron Ore Mine