Steel Limited

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No. JSW/S/CO/2024/337

Date: 14/05/2024

To,

The Deputy Director General of Forests (C), Ministry of Environment, Forest and Climate Change, Regional Office (Eastern Zone), A/3, Chandersekharpur, Bhubaneswar – 751023	The Member Secretary, State Level Environment Impact Assessment Authority, 5RF-2/1, Acharya Vihar,Unit – IX, OPTCL Colony, Anand Bazar, Bhoi Nagar, Bhubaneswar, Odisha 751022

Sub: - Submission of Six-monthly EC compliance report for the **Gonua Iron Ore Mine of M/s JSW Steel Ltd for the period October 2023 to March 2024**.

Ref: - 1. Vesting Order dated 30th May 2020 issued by GoO, Steel and Mines Department.
2. Environment Clearance Letter dated 21.12.2019 issued by SEIAA, Odisha.

Dear Sir,

We are submitting herewith a six-monthly EC compliance report of Gonua Iron Ore Mine, M/s JSW Steel Ltd. for the period October 2023 to March 2024 as per EIA notification 2006. The same is also attached in soft copy to your good office on e-mail to seiaaorissa@gmail.com; and roez.bsr-mef@nic.in; for your ready reference.

We trust that the measures taken towards environmental safeguards comply with the stipulated conditions. We look forward to your guidance which shall certainly help us in our endeavor for improving upon our environmental management practices.

Seeking your co-operation as always.

Thanking you,

Yours Faithfully
For JSW Steel Ltd

MrutyunjayaMahapatra
(Authorized Signatory)

Encl: As above

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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, Regional Office, Rourkela Office of the State Pollution Control Board, At – Near Panposh Hockey Chowk, AT/PO. – Panposh, Rourkela – 769 004, Dist – Sundargarh, Odisha

ENVIRONMENT CLEARANCE COMPLIANCE STATUS – GONUA MINE

Six Monthly Compliance report of Environmental Clearance for Gonua Iron Ore Mine, JSW Steel Ltd. for the period from- October 2023 to March 2024.

Reference letter from SEIAA, Odisha - SEIAA File No. 38069/03-MIN-V/09/2019/7685/ SEIAA, Dated 21.12.2019.

Capacity- 1.20 MTPA of Iron ore.

Sl. No.	Environment Clearance Conditions	Self-Declaration	Compliance Remarks
A.	**Specific Conditions**		
1	This Environmental clearance is granted subject to final outcome of Hon'ble Supreme Court of India, Hon'ble High Court of Odisha, Hon'ble NGT and any other Court of Law, if any, as may be applicable to this project.	Being complied	Noted and abided with the conditions given by a court of Law.
2	This Environmental Clearance will not be operational till such time the Project proponent complies with all the statutory requirements and the Judgment of Hon'ble Supreme Court dated the 2nd August 2017 in Writ Petition (Civil) No. 114 of 2014 in the matter of Common Cause versus Union of India and Others applicable to this project.	Agreed to comply	We shall abide by the condition given as per the statutory requirements and Judgment of the Hon'ble Supreme Court dated 2nd August 2017.
3	The Department of Mines and Geology, Government of Odisha shall ensure that mining operation shall not commence till the entire compensation levied, if any, for illegal mining paid by the Project Proponent through their respective Department of Mining & Geology in strict compliance of judgment of Hon'ble Supreme Court dated the 2nd August 2017 in write Petition (Civil) No. 114 of 2014 in the matter of Common Cause versus Union of India and Others.	Agreed to comply	We shall ensure as per the statutory requirements and Judgment of the Hon'ble Supreme Court dated the 2nd August 2017 in writ Petition (Civil) No. 114 of 2014 in the matter of Common Cause versus Union of India and Others.
4	The proponent shall comply all the specific conditions as recommended by CSIR-NEERI on carrying capacity study (as applicable) in time bound manner as proposed.	Being complied	NEERI recommendations such as quantification of air emission load, mobile water sprinklers on haul roads, and dry fog- type dust suppression system material handling plants (crushing and screening) have been adopted. Monitoring of ambient air and fugitive emission data has been implemented. Ambient air quality is being monitored at the buffer zone. PUC check is being conducted for the vehicles. Noise level monitoring is being carried out. Flow rate measurement of perennial nala is being done. Oil and grease trap has been provided at the vehicle washing bay. The environmental

			sustainability report NEERI report & Monitoring report has been attached as **ANNEXURE I**.
5	The project proponent shall mandatorily implement the remediation plan as well as the Natural and Community Resource Augmentation Plan as submitted in the Final EIA/EMP Report in Chapter-10. The status of implementation shall be submitted to the Regional Office, MoEF & CC, SPCB, and SEIAA, Odisha along with six monthly compliance reports.	Being Complied	Will be complied with within the timeline. EIA/EMP report is under progress for project expansion.
6	The Project Proponent shall obtain Consent to Operate from the State Pollution Control Board, Odisha and effectively implement all the conditions stipulated therein.	Being Complied	Regular Ambient air quality monitoring and fugitive dust emission monitoring are carried out and data is well within the limit prescribed. The monitoring report is submitted to the board within the timeline. AAQ Monitoring reports are attached as **ANNEXURE I**.
7	The Project Proponent shall carryout sustainable and scientific mining in conformity with the approved mining plan and accordingly, strict monitoring shall be carried out by the Regional Office, MoEF&CC, Govt. of India, Bhubaneswar, Odisha State Pollution Control Board and Department of Mines and Steel, Government of Odisha.	Being Complied	Sustainable and scientific mining in conformity with the approved mining plan being carried out.
8	The Project Proponent shall carryout monitoring of air quality parameters covered under NAAQS notification, 2009 and Fugitive dust emission monitoring as per the action plan submitted to the Ministry. The frequency of monitoring shall be governed by MoEF&CC, Govt. of India circular dated 27.05.2009 and Consent to Operate issued by Odisha State Pollution Control Board for ambient air and fugitive dust emission respectively.	Being Complied	Regular Ambient air quality monitoring and fugitive dust emission monitoring are carried out and data is well within the limit prescribed. The monitoring report is submitted to the board within the timeline. AAQ Monitoring reports are attached as **ANNEXURE I**.
9	No mining activities will be allowed in forest area for which the Forest Clearance is not available.	Being Complied	The present mining operation is restricted within FC Transfer area over 49.915 Ha vide state Govt Memo no. 13647/FE&CC, dated 02.08.2022. Balance 32.875 Ha of forest land is applied for fresh diversion. The letter for the same is attached as **ANNEXURE II.**

10	The Environmental Clearance is subject to obtaining requisite NBWL Clearance, if any, from the Standing Committee of National Board for Wildlife for Mining project.	Complied	No Wild Life Sanctuary/Tiger Reserve/National Park/ Elephant corridor within the core as well as within the buffer zone of the project. Site specific wildlife conservation plan approval letter has been attached as **ANNEXURE III.**
11	Project Proponent should plant only native species for green belt development. Plantation of local species should be carried out during the Monsoon Season.	Complied	3750 saplings were planted in FY 22-23. 1000 saplings were planted in FY 23-24. Gap plantations are being carried out in the safety zone. Photos for the same is attached as **ANNEXURE IV.**
12	The Proponent shall install online Ambient Air Quality Monitoring System and there should be system for display of digital AAQ data within 03 months at least at three locations as per wind direction. Online provisions of pH and turbidity meters at discharge points of STP and ETP and also at water storage ponds in the mining area may be made. Project Proponent should display the result digitally in front of the main Gate of the mine site.	Being Complied	Regular Ambient air quality monitoring and fugitive dust emission monitoring are being carried out and data is well within the prescribed limit. An Electronic Digital Display Board has already been installed near the Gate No. 2 area for displaying ambient air quality monitoring data noise monitoring data, water/wastewater quality monitoring data. AAQ Monitoring reports are attached as **ANNEXURE I.**
13	Project Proponent shall obtain the necessary prior permission from the Central Ground Water Authority (CGWA) in case of intersecting the groundwater table. The intersecting ground water table can only be commencing after conducting a detailed hydrogeological study and necessary permission from the CGWA/MoEF&CC. The Report on six monthly bases on change in groundwater level and quality shall be submitted to the Regional Office of the Ministry, CGWA, and State Pollution Control Board.	Being Complied	NOC from CGWA for 75 m3/day is vested to JSW for 2 years with vide CGWA/NOC/MIN/ORIG/2022/15411 And valid up to 09/05/2024. A new application for the NOC renewal has been submitted. A Detailed hydrogeological report has been prepared. Report for the same is attached as **ANNEXURE V.**
14	The project should also implement a community Development and Welfare program in the areas of Health, Education Environmental Protection.	Complied	Gonua Mining operation was started on 1st July 2020 and various community development initiatives are under implementation for community upliftment. A need-based assessment survey has been completed and an action plan is under implementation for compliance. Peripheral Activities like SHG training and health camps are being conducted **ANNEXURE VI.**
15	Proponent shall appoint an occupational Health Specialist of regular and periodical medical examination of the workers engaged in the project and maintain records accordingly, also occupational health check-ups for workers having some ailments like BP, diabetes, habitual smoking, etc. shall be undertaken once in six months and necessary remedial/ preventive measures taken accordingly.	Complied	Workers engaged in Operations are provided with PPE's. Besides this, acoustic enclosures are provided for all machines operating within the mines. The noise level is being monitored by a Noise Level Meter the results reveal that the parameter is well within the prescribed norms. Initial Medical Examination and periodical Medical Examinations of the workers engaged in the project are being carried out periodically and records are maintained. A medical dispensary with full time. The doctor has been

	The recommendations of national Institute for ensuring good occupational environment for mine workers shall be implemented. The prevention measure for burns, malaria and provision of anti-snake venom including all other paramedical safeguards may be ensured before initiating the mining activities.		appointed at the mine area for the health check-ups of employees and also the locals. Photos for the same has been attached as **ANNEXURE VII.**
16	Project Proponent shall run an awareness campaign on sanitation for women and utilization of Sanitary Napkin and also to distribute the Sanitary Napkin/pads to the women and provide the training for proper disposal.	Complied	An awareness campaign on sanitation for women and utilization of Sanitary napkins and hygiene awareness is being conducted. Photos for the same has been attached as **ANNEXURE VII.**
17	The Regular monitoring of ground water table to be carried out by establishing a network of existing wells and constructing new piezometers. The reports shall be submitted at interval of six months to the Regional Office of the MoEF&CC, Govt. of India, Bhubaneswar and Odisha State Pollution Control Board.	Being Complied	Regular monitoring of groundwater level and quality is being carried out in both core zone and buffer and monitoring reports are attached as **ANNEXURE I**
18	The water balance/ water auditing shall be carried out and measures for reducing the consumption of water shall be taken up and reported to the Regional Office of the MoEF & CC, Govt. of India, Bhubaneswar and Odisha State Pollution Control Board.	Complied	The total water requirement for Gonua Iron Ore mines is 75 KLD. Rainwater collected in pits is being utilized for dust suppression in the mining operations. Fixed water sprinklers and pressurized mobile water tankers are utilized for dust suppression arrangements to reduce water requirements. Complete water balance the diagram is attached as **ANNEXURE VIII.**
19	The Regular monitoring of water quality upstream and downstream of water bodies shall be carried out and record of monitoring data should be maintained and submitted to the at interval of six months to the Regional Office of the MoEF & CC, Govt. of India, Bhubaneswar and Odisha State Pollution Control Board.	Being Complied	Regular monitoring of water quality of upstream and downstream is being carried out. The Vendor is a recognized NABET, MoEF&CC accredited laboratory. Monitoring reports are attached as **ANNEXURE I.**
20	The Plantation/Green belt at the periphery of the water body, particularly on eastern and western boundaries, shall be maintained in the mined-out area in order to reduce the loss of surface water.	Complied	3750 saplings were planted in FY 2022-23, and 1000 saplings were planted in FY 23-24. Gap plantations are being carried out in the safety zone. Photos for the same is attached as **ANNEXURE IX.**

B.	**General Conditions**		
1	A Final Mine Closure Plan along with details of Corpus Fund shall be submitted to the Ministry of Environment, Forest and Climate Change (MoEF & CC), Govt. of India as well as SEIAA, Odisha 3 years in advance of final mine closure for approval.	Complied	A progressive mine closure plan approved by IBM is in place. The final mine closure plan along with details of the Corpus fund will be submitted to the Ministry of Environment & Forests and SEIAA.
2	No change in mining technology and scope of work should be made without prior approval of the SEIAA, Odisha.	Agreed to comply	There will not be any change in the mining technology and scope of work, without prior approval of the SEIAA, Odisha. The report for the same has been attached as **ANNEXURE X.**
3	No change in the calendar plan including excavation, quantum of minerals and waste should be made.	Complied	All the excavation, production and waste generation are as per the approved mine plan.
4	The project proponent shall obtain the necessary prior permission of the competent authority for the drawl of the requisite quantity of water (surface water and groundwater) for the project.	Complied	There is no drawn down of surface water. NOC from CGWA for 75 m3/day is vested to JSW for 2 years with vide letter No. CGWA/NOC/MIN/ORIG/2022/15411 And valid up to 09/05/2024. A new application for the NOC renewal has been submitted. A Detailed hydrogeological report has been prepared. Report for the same is attached as **ANNEXURE XI.**
5	Mining shall be carried out as per the provisions outlined in the mining plan approved by the Indian Bureau of Mines (IBM) as well as by abiding bythe guidelines of the Directorate General Mines Safety (DGMS).	Complied	Mining shall be carried out as per the approved mine plan
6	The project proponent shall carry out scientific investigation with respect of Blast induced ground vibration, fly rock & and air blast. Based on this study, Project Proponent should design an effective blast design to curb blast induced menace and public annoyance. The Report shall be submitted to the SEIAA, Odisha as well as the Regional Office of the Ministry.	Being Complied	A vibration study is carried out on a monthly basis to study the blast-induced ground vibration, fly rock & and air blast. The Report is submitted to the SEIAA, Odisha as well as the Regional Office of the Ministry. Report for the same has been attached as **ANNEXURE XII.**
7	The lands which are not owned by Proponent, mining will be carried out only after obtaining the consents from all the concerned (and owners as per the provisions of the Mineral Concession Rules, 1960 and MMDR Act,1957.	Complied	A paved road has been provided for the transportation of ore through the NH. Natural Plantation along the road has been carried out. 1 road sweeping along with a dedicated 18 KL water tanker has been deployed to control the dust on the transportation road. Photos for the same has been attached as **ANNEXURE XIII.**
8	Digital processing of the entire lease area using remote sensing techniques shall be carried out regularly once in three years for monitoring land use pattern and report submitted to the SEIAA, Odisha as well as to the Ministry of Environment, Forest and Climate Change and its Regional Office.	Complied	DGPS Surveyed Mining lease boundary superimposed on High-Resolution Satellite image of Gonua Iron Ore Mine duly vetted by M/s ORSAC has been attached as **ANNEXURE XIV.**

9	The critical parameters of ambient air quality as per the Notification 2009 such as PM10, PM2.5, NO2 and SO2 etc. in the ambient air within the impact zone, peak particle velocity at 300m distance or within the nearest habitation, whichever is closer shall be monitored periodically. Further, the quality of discharged water shall also be monitored [(TDS, DO, PH and Total Suspended Solids (TSS)] The monitored data shall be uploaded on the website of company as well as displayed on a display board at the project site at a suitable location near the main gate of the Company in public domain. The circular No. J-20012/1/2006-IA.II (M) dated 27.05.2009 issued by Ministry of Environment, Forest and Climate Change shall also be referred in this regard for its compliance.	Being Complied	Regular Ambient air quality monitoring and Water quality monitoring are being carried out. The Vendor is a recognized NABET, MoEF&CC accredited laboratory. Monitoring reports are attached as **ANNEXURE I**.
10	Effective safeguard measures such as regular water sprinkling shall be carried out in critical areas prone to air pollution and having high levels of PM10 and PM2.5 such as haul road, loading and unloading points and transfer points. Fugitive dust emissions from all the sources shall be controlled regularly. It shall be ensured that the Ambient Air Quality parameters conform to the norms prescribed by the Central Pollution Control Board in this regard Monitoring of Ambient Air Quality to be carried out based on the Notification 2009, as amended from time to time by the Central Pollution Control Board.	Being Complied	Regular water sprinkling through mobile water sprinkler tankers is being carried out on haul roads and nearby mineral dispatch roads to avoid the generation of dust during the movement of vehicles**.** Fixed auto sprinklers on both sides of the major haul road and approach roads of the mine is in the commissioning phase. However, as an interim arrangement frequency of the Mobile water tanker sprinkling has been increased to suppress the dust emission generated due to transportation of vehicles. Regular maintenance of Haul roads is being carried out to avoid the generation of dust during the movement of vehicles. Regular monitoring of ambient air quality parameters is being carried out and data is well within the limit prescribed. Photos for the same is attached as **ANNEXURE XIII**.
11	Regular monitoring of ground water level and quality shall be carried out in and around the mine lease by establishing a network of existing wells and constructing new piezometers during the mining operation. The project proponent shall ensure that no natural water course and/or water resources shall be obstructed due to any mining operations. The monitoring shall be carried out four times in a year pre- monsoon (April-May), monsoon (August), post-monsoon (November) and winter (January) and the data thus collected may be sent regularly to the SEIAA, Odisha as well as Ministry of Environment, Forest and Climate Change and its Regional Office, Central Ground Water Authority and Regional Director, Central Ground Water Board.	Complied	Regular monitoring of groundwater level and quality is being carried out in both core zone and buffer and monitoring reports are attached as **ANNEXURE I.**

12	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 water bodies 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 Project Proponent has to provide water to the 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.	Being Complied	Regular monitoring of the flow rate of the springs and perennial nallahs being carried out around the mine lease and monitoring reports are attached as **ANNEXURE I.**
13	Regular monitoring of water quality upstream and downstream of water bodies shall be carried out and a record of monitoring data should be maintained and submitted to the SEIAA, Odisha as well as the Ministry of Environment, Forest and Climate Change and its Regional Office, Central Ground Water Authority, Regional Director, Central Ground Water Board, State Pollution Control Board and Central Pollution Control Board.	Being Complied	Regular monitoring of water quality of upstream and downstream is being carried out. The Vendor is a recognized NABET, MoEF&CC accredited laboratory. and monitoring reports are attached as **ANNEXURE I.**
14	Transportation of the minerals by road passing through the village shall not be allowed. A 'bypass' road should be constructed (say, leaving a gap of at least 200 meters) for the purpose of transportation of the minerals so that the impact of sound, dust, and accidents could be mitigated. The project proponent shall bear the cost towards the widening and strengthening of the existing public road network in case the same is proposed to be used for the Project. No road movement should be allowed on the existing village road network without appropriately increasing the carrying capacity of such roads.	Complied	Transportation of the minerals is carried out through the by-pass road which is away from the habitation. Regular maintenance including widening of the road is being carried out for maintaining/increasing the carrying capacity of the road.
15	The illumination and sound at night at project sites disturb the villages with respect of 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	Complied	Mining is being carried out in the already broken-up area as per the approved mine plan. Illumination and sound are restricted to the core zone only. No project sites disturb the villages in respect of both human and animal population. Ambient Noise level monitoring is being carried out at 4 different locations in the core zone as well as 4 locations in the buffer zone. Along with this Source noise monitoring is carried out at 15 different locations and the Noise monitoring report is attached as **ANNEXURE I**.

	floodlights/ masks away from the villagers and keeping the noise levels well within the prescribed limits for day light/night hours.		
16	Main haulage road in the mine should be provided with permanent water sprinklers and other roads should be regularly wetted with water tankers fitted with sprinklers. The material transfer points should invariably be provided with Bag filters and or dry logging system. In case of Belt-conveyor facilities the system should be fully covered to avoid airborne dust; the Use of the effective sprinkler system to suppress fugitive dust on haul roads and other transport roads shall be ensured.	Being Complied	Regular water sprinkling through mobile water sprinkler tankers is being carried out on haul roads and nearby mineral dispatch roads to avoid the generation of dust during the movement of vehicles. Fixed auto sprinklers on both sides of major haul roads and approach roads of the mine are operational. However, as an interim arrangement frequency of the Mobile water tanker sprinkling has been increased to suppress the dust emission generated due to the transportation of vehicles. Regular maintenance of Haul roads is being carried out to avoid the generation of dust during the movement of vehicles. Photos of the same has been attached as **ANNEXURE XIII**.
17	A sufficient number of Gullies to be provided for better management of water. Regular Monitoring of pH shall be included in the monitoring plan and a report shall be submitted to the Ministry of Environment, Forest and Climate Change and its Regional Office on a monthly basis.	Being Complied	Regular monitoring of water quality is being carried out. Existing series of settling ponds being maintained for surface water management. Monitoring reports are attached as **ANNEXURE I.**
18	There shall be planning, developing and implementing facility of rainwater harvesting measures on a long-term basis and implementation of conservation measures to augment groundwater resources in the area in consultation with the Central Ground Water Board.	Complied	Maximum rain water has already been channelized to Mine Pits and the same is being utilized in dust suppression and other mining activities. Existing surface run-off, Retention wall, Garland drains, and setting pits are being maintained. Detailed Hydrology study is prepared, recommendations of the study and consultation with CGWB, additional rainwater harvesting measures/structures will be implemented for rainwater harvesting. Hydrological report is attached as **ANNEXURE XI.**
19	The Project Proponent has to take care of gullies formed on slopes. Dump mass should be consolidated with proper filling/leveling with the help of dozers/compactors.	Complied	Overburden is being stacked at the earmarked site and after maturity same will be stabilized with the plantation.
20	The reclamation at waste dump sites shall be ecologically sustainable. Scientific reclamation shall be followed. The local species may be encouraged and species are so chosen that the slope, bottom of the dumps and top of the dumps are able to sustain these species. The aspect of the dump is also a factor which regulates some climatic parameters and allows only species adopted to that micro climate.	Complied	Backfilling and reclamation will be carried out as per the approved mine plan. Plantation will be carried out after the maturity of the same.

21	The top soil, if any, shall temporarily be stored at earmarked site(s) only and it should not be kept unutilized for long. The topsoil shall be used for land reclamation and plantation. The over burden (OB) generated during the mining operations shall be stacked at earmarked dump site(s) only and it should not be kept active for a long period of time. The maximum height of the dumps shall not exceed 8m and width 20m and overall slope of the dumps shall be maintained to 45°. The OB dumps should be scientifically vegetated with suitable native species to prevent erosion and surface runoff. In critical area, use of geo textiles shall be undertaken for stabilization of the dump. The entire excavated area shall be backfilled and afforested. Monitoring and management of rehabilitated area should continue until the vegetation becomes self-sustaining. Compliance status shall be submitted to the ministry of environment forest and climate change and its regional office on six-month basis.	Being complied	There is no topsoil dump within the mine lease area, once it is generated it will be stored at earmarked location. The overburden (OB) generated during the mining operations is stacked at earmarked dump site(s) only. Plantation of the native species is being carried out on the dump for stabilization. Regular monitoring and management of the rehabilitated area is carried out.
22	Catch drains and siltation ponds of appropriate size shall be constructed around the mine working, mineral and OB dumps to prevent run off of water and flow of sediments directly into the river and other water bodies. The water so collected should be utilized for watering the mine area, roads, green belt development etc. The drains shall be developed etc. The drains shall be regularly desilted particularly after monsoon and maintained properly. The drains, settling tanks and check dams of appropriate size, gradient and length shall be constructed both around the mine pit and overburden dumps to prevent runoff of water and flow of sediments directly into the river and other water bodies, and sump capacity should be designed keeping 50% safety margin over and above peak sudden rainfall (based on 50 years' data) and maximum discharge in the area adjoining the mine site. Sump capacity should also provide an adequate retention period to allow proper settling of silt material. Sedimentation pits shall be constructed at the corners of the garland drains and desilated at regular intervals.	Being complied	Garland drain of around 500m and retaining wall of 250m is being constructed and the existing siltation pond is being maintained to prevent runoff of water and flow of sediments directly into the river and other water bodies. The collected water is being used for dust suppression and for greenbelt development. Desiltation of the existing garland drain and the settling pond has been carried out before monsoon. Photos of the same has been attached as **ANNEXURE XV.**

23	Plantation shall be raised in a 7.5m wide green belt in the safety zone around the mining lease, backfilled and reclaimed area, around water bodies, along the roads, etc. by planting the native species in consultation with the local DFO/Agriculture Department and as per CPCB Guidelines. The density of the trees should be around 2500 plants per ha. Greenbelt shall be developed all along the mine lease area in a phased manner and shall be completed within the first five years.	Complied	3750 saplings were planted in FY 2022-23, and 1000 saplings were planted in FY 23-24. Gap plantations are being carried out in the safety zone. Photos of the same has been attached as **ANNEXURE IX.**
24	Project Proponent shall follow the mitigation measures provided in 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 or Habitations and villages are surrounded by the mine lease area", if any, applicable to the project.	Complied.	As per the Office Memorandum No. Z- 11013/57/2014-IA. II (M), dated 29th October 2014, titled "Impact of mining activities on Habitations-Issues of MoEFCCs, mitigative measures are being taken care of. This includes the construction of garland drains, check dams, retaining walls, and settling ponds. OM also states about the regular monitoring of natural streams, illumination surveys, and others which are being carried out.
25	The Project Proponent shall make necessary alternative arrangements, where required, in consultation with the State Government to provide alternate areas for livestock grazing, if any. In this context, Project Proponent should implement the directions of the Hon'ble Supreme Court with regard to acquiring grazing land The sparse trees on such grazing ground, which provide mid-day shelter from the scorching sun, should be scrupulously guarded against felling and plantation of such trees should be promoted.	Complied	No such grazing land is available inside the mine lease area.
26	The project proponent shall take all precautionary measures during mining operations for the conservation and protection of endangered fauna, if any, spotted in the study area. Action plan for the conservation of flora and fauna shall be prepared and implemented in consultation with the State Forest and Wildlife Department. A copy of action plan shall be submitted to the Ministry of Environment, Forest and Climate Change and its Regional Office.	Being complied	No Wild Life Sanctuary/Tiger Reserve/National Park/ Elephant corridor within the core as well as within the buffer zone of the project. The Site-Specific Wildlife Conservation Plan has been duly approved by PCCF, vide Letter No. 990/CWLW-FDWC-FD 0125-2021, Bhubaneshwar dated 31/01/2022. The report for the same is attached as **ANNEXURE III.**
27	The project proponent has to comply with the Corporate Environment Responsibility (CER) as per the	Being complied	Expenditure Plan as per Ex-Lease commitment has been implemented. The Project Proponent has complied with the Corporate Environment Responsibility (CER).

	provisions mentioned in the OM of Ministry no 22-65/2017. IA-III dated 1 May 2018 based on local needs and action plan with financial and physical breakup/details shall be prepared and submitted to the Ministry's Regional Office located at Bhubaneswar. Implementation of such a program shall be ensured accordingly in a time-bound manner.		Expenditure plan is attached as **ANNEXURE XVI.**
28	Provision shall be made for the housing of construction labor within the site with all necessary infrastructure and facilities such as fuel for cooking, mobile toilets, mobile STP, safe drinking water, medical health care, crèche, etc. The housing may be in the form of temporary structures to be removed after the completion of the project.	Being Complied	Facilities such as safe drinking water, a dispensary, mobile toilets, soak pits etc are provided.
29	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 / mulls.	Complied	As per the observation from noise monitoring regularly carried out, the noise level is observed to be below 85 dB in the work zone area. Noise-producing equipment is covered as far as practicable. Workers engaged in Operations are provided with earplugs/muffs. Besides this, acoustic enclosures are provided for all machines operating within the mines. Controlled blasting is in place. Regular Noise Monitoring is being carried out and Monitoring reports are attached as **ANNEXURE I.**
30	Industrial waste water (workshop and wastewater from the mine) should be properly collected, and treated so as to conform to the standards prescribed under GSR 422 (E) dated 19th May, 1993 and 31st December 1993 or as amended from time to time. Oil and grease trap should be installed before discharge of workshop effluents.	Complied	No industrial wastewater is generated from the mine. Workshop equipped with wastewater treatment facilities followed by an Oil and grease trap system and then recycled for captive utilization for HEMM washing. Regular Monitoring of water quality parameters being carried out by NABET Accredited laboratory. Report for the same is attached as **ANNEXURE I.**
31	Personnel working in dusty areas should wear protective respiratory device sand they should also be provided with adequate training and information on safety and health aspects.	Complied	A total 482 number of PPEs like safety shoes, reflective jackets, safety glasses, ear plugs, helmets, etc. have been distributed. Personnel working in dusty areas wear protective respiratory devices and a Total number of 406 Vocational trainings have been carried out. Dust Suppression System (Dry fog system) being provided at all appropriate places of mineral handling plants (crusher & screening plant) and other areas. The same are being maintained for proper dust control. Pre-placement medical examination and periodical examination of the workers engaged are being conducted & and records are maintained. Photos of the same has been attached to the **ANNEXURE XVII.**

32	A separate environmental management cell with suitably qualified personnel should be set- up under the control of a Senior Executive, who will report directly to the Head of the Organization	Complied	A dedicated Environment Management Cell under the leadership of AVP Environment has been formed and reports to Mine Senior Management i.e., Head of Operations (VP). Reports for the same are attached as **ANNEXURE XVIII.**
33	The funds earmarked for environmental protection measures should be kept in separate account and should not be diverted for other purpose. Year wise expenditure should be reported to the Ministry and its Regional Office.	Being Complied	We are in the process for implementation of various measures undertaken for the environment management plan since the operation started in July 2020. Details of environmental protection measures expenditure (head-wise breakup) were submitted along with the last half-yearly EC compliance report vide letter no. 340dated 14/05/2024.
34	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.	Agreed to comply	The project authority will inform to the regional officer regarding the date of final closure of the project.
35	The project proponent shall submit six monthly reports on the status of the implementation of the stipulated environmental safeguards to the Ministry of Environment, Forest and Climate Change, its Regional Office, Central Pollution Control Board and State Pollution Control Board.	Being complied.	Being complied. The last six-monthly compliance report along with monitoring data vide letter no JSW/S/CO/2023/755 dated 18/11/2023 was submitted to Regional Office, MOEF&CC, Bhubaneswar, SEIAA, Bhubaneswar, Zonal Office, CPCB, Kolkata, MS and RO Offices SPCB, Odisha
36	The Regional Office of this Ministry shall monitor compliance of the stipulated conditions. The project authorities should extend full cooperation to the officer (s) of the Regional Office by furnishing the requisite data / information / monitoring reports.	Agreed to comply	We will extend full cooperation to the officers of the Regional Office during their visit and furnish the required data, information, and monitoring reports.
37	A copy of clearance letter will be marked to concerned Panchayat / local NGO, if any, from whom suggestion / representation has been received while processing the proposal.	Complied	A copy of the EC letter is marked to the concerned Panchayat.
38	State Pollution Control Board should display a copy of the clearance letter at the regional office. District Industry Centre and collector's office / Tehsildar's Office for 30 days.	Complied	State Pollution Control Board/Committee has displayed the EC letter at its Regional Office, District Industries Centre, and Collector 's Office/ Tehsildar 's Office.
39	The project authorities should advertise at least in two local newspapers widely circulated, one of which shall be in the vernacular language of the locality concerned, within 7 days of the issue of the clearance letter informing that the project	Complied	It was Published in the Newspaper informing that the project has been accorded environmental clearance. A photo of the same has been attached as **Annexure XIX.**

	has been accorded environmental clearance and a copy of the clearance letter is available with the State Pollution Control Board and also at web site of the Ministry of Environment, Forest and Climate Change at www.environmentclearanee.nic.in and a copy of the same should be forwarded to the Regional Office.		
40	The SEIAA, Odisha, or any other competent authority may alter/modify the above conditions or stipulate any further condition in the interest of environmental protection	Noted	Noted
41	Concealing factual data or submission of false/fabricated data and failure to comply with any of the conditions mentioned above may result in the withdrawal of this clearance and attract action under the provisions of the Environment (Protection) Act, 1986.	Agreed to comply	Noted
42	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, the Environment (Protection) Act, 1986 and the Public Liability Insurance Act, 1991 along with their amendments and rules made there under and also any other orders passed by the Hon'ble Supreme Court of India/ High Court of Odisha and any other Court of Law relating to the subject matter.	Noted	Noted
43	Any appeal against this environmental clearance shall lie with the National Green Tribunal, if preferred, within a period of 30 days as prescribed under Section 16 of the National Green Tribunal Act, 2010	Noted	There is no such appeal against EC given.

ANNEXURE I

SUMMARY

OF

ENVIRONMENTAL MONITORING REPORT

(OCTOBER 2023 TO MARCH 2024)

FOR

GONUA IRON ORE MINE

DISTRICT—KEONJHAR, ODISHA

OF

M/S JSW STEEL LIMITED, ODISHA

ENV MONITORING CARRIED OUT

BY

ECOMEN MINING PVT.LTD

Ecomen Mining Pvt. Ltd.
(An approved Laboratory from MoEF & CC & NABL)
B-1/8, Sector-H, Aliganj, Lucknow 226 024 (U.P.)
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Environmental Monitoring Report- Gonua Iron Ore Mines of M/s JSW Steel Limited, Odisha during the period (October 2023 to March 2024)

1. Ambient Air Quality Lease Area

Si. No.	Location	Month	Concentration	PM_{10} µg/m^3	$PM_{2.5}$ lug/m^3	SO_2 lug/m^3	NO_2 lug/m^3	CO mg/m^3
1.	Near Mines Office	October'23	Maximum	70.7	29.2	19.7	19.8	0.59
			Minimum	51.3	15.3	11.5	12.3	0.42
			Average	61.99	21.03	15.75	16.23	0.51
		November'23	Maximum	72.9	22.8	18.8	16.9	0.51
			Minimum	65.3	16.0	16.0	14.0	0.43
			Average	69.08	18.86	17.23	15.40	0.47
		December'23	Maximum	75.0	23.9	18.7	17.9	0.62
			Minimum	67.5	17.0	16.1	15.0	0.53
			Average	71.76	20.90	17.45	16.42	0.58
		January'24	Maximum	76.5	24.7	18.9	19.0	0.64
			Minimum	69.0	18.2	16.0	15.2	0.55
			Average	72.34	21.53	17.39	16.74	0.60
		February'24	Maximum	76.0	25.0	19.0	19.0	0.64
			Minimum	69.3	18.8	16.0	15.0	0.55
			Average	72.92	21.58	17.58	16.93	0.59
		March'24	Maximum	76.8	24.5	18.7	18.9	0.64
			Minimum	69.1	18.1	16.3	15	0.55
			Average	72.18	21.16	17.32	16.56	0.60
		October'23	Maximum	69.3	25.4	19.2	18.9	0.59
			Minimum	52.4	14.4	12.4	12.6	0.42
			Average	59.83	19.89	15.51	16.42	0.50

Si. No.	Location	Month	Concentration	PIlio µg/m³	PM2.5 lug/m³	SO2 lug/m³	NO2 lug/m³	CO mg/m³
2.	Near Pillar No 22 & 23	November'23	Maximum	73	22.9	18.6	16.9	0.52
			Minimum	65.2	16.1	16.0	14.1	0.43
			Average	68.81	19.37	17.42	15.52	0.47
		December'23	Maximum	70.9	20.9	14.8	15.9	0.6
			Minimum	63.1	14.6	12.1	13.2	0.51
			Average	66.63	17.85	13.50	14.30	0.56
		January'24	Maximum	77.0	24.3	19.0	18.9	0.64
			Minimum	69.1	18.0	16.1	15.1	0.55
			Average	73.11	21.10	17.47	17.05	0.60
		February'24	Maximum	76.9	24.3	18.8	18.9	0.64
			Minimum	69.1	18.1	16	15.1	0.55
			Average	72.73	21.57	17.64	16.98	0.59
		March'24	Maximum	76.1	25	18.9	19.0	0.64
			Minimum	69.0	18.8	16.0	15.0	0.6
			Average	72.35	22.23	17.60	17.06	0.59
3.	Near Dispensary (Hutting Area)	October'23	Maximum	69.4	26.6	19.6	23.7	0.63
			Minimum	50.5	15.6	12.3	12.2	0.43
			Average	60.32	19.93	16.02	17.68	0.52
		November'23	Maximum	72.9	22.7	19.0	16.9	0.52
			Minimum	65.3	16.2	16.2	14.0	0.43
			Average	68.98	19.56	17.54	15.57	0.48
		December'23	Maximum	67.8	18.9	17.0	18.0	0.57
			Minimum	60.2	12.0	14.0	15.3	0.49
			Average	63.02	15.43	15.40	16.79	0.54
		January'24	Maximum	77.0	24.7	19.0	18.9	0.64
			Minimum	69.2	18.1	16.2	15.2	0.55
			Average	72.52	21.03	17.48	17.00	0.59

Sl. No.	Location	Month	Concentration	PM_{10} µg/m^3	$PM_{2.5}$ µg/m^3	SO_2 µg/m^3	NO_2 µg/m^3	CO mg/m^3
		February'24	Maximum	77.0	24.9	18.8	18.8	0.63
			Minimum	69.1	18.2	16.0	15.0	0.56
			Average	72.89	21.55	17.49	17.11	0.60
		March'24	Maximum	76.4	24.7	19.0	19.0	0.64
			Minimum	69.6	18.1	16.1	15.1	0.56
			Average	72.40	20.97	17.37	17.06	0.60
4.	Entry And Exit Gate (Gate No-2)	October'23	Maximum	69.4	25.7	18.6	22.9	0.65
			Minimum	57.2	14.4	12.2	14.3	0.48
			Average	63.51	20.31	15.14	18.07	0.57
		November'23	Maximum	72.9	22.7	19.0	16.9	0.51
			Minimum	65.1	16.2	16.0	14.0	0.43
			Average	68.69	20.11	17.20	15.64	0.48
		December'23	Maximum	76.9	24.8	18.8	19.0	0.63
			Minimum	69.2	18.0	16.0	15.1	0.55
			Average	72.91	20.74	17.23	16.81	0.59
		January'24	Maximum	76.6	24.9	18.7	19.0	0.64
			Minimum	69.1	18.0	16.1	15.0	0.55
			Average	72.64	21.43	17.38	17.24	0.59
		February'24	Maximum	77.0	24.9	19.0	18.7	0.64
			Minimum	69.3	18.0	16.2	15.1	0.55
			Average	72.40	21.99	17.61	17.25	0.60
		March'24	Maximum	76.8	25	19	18.7	0.63
			Minimum	69.4	18.0	16.0	15.0	0.55
			Average	73.26	21.24	17.17	16.86	0.59
CPCB Standard			**24 Hrly**	**100**	**60**	**80**	**80**	**4 (1Hrly)**
			Annual Average	**60**	**40**	**40**	**50**	**--**

2. Ambient Air Quality Buffer Area

Si. No.	Location	Month	Concentration	PM_{10} µg/m^3	$PM_{2.5}$ lug/m^3	SO_2 lug/m^3	NO_2 lug/m^3	CO mg/m^3
1.	Palssa Village	October'23	Maximum	43.4	14.8	15.4	16.6	0.45
			Minimum	38.2	11.3	11.3	13.5	0.36
			Average	40.68	12.76	13.09	15.25	0.40
		November'23	Maximum	37.9	12.9	12.9	12.2	0.42
			Minimum	34.2	10.0	9.1	10.1	0.32
			Average	35.74	11.89	11.63	11.34	0.36
		December'23	Maximum	57.7	20.1	14.5	15.0	0.53
			Minimum	52.4	13.9	11.4	12.4	0.43
			Average	55.24	17.19	12.65	13.45	0.49
		January'24	Maximum	37.5	12.7	12.4	12.9	0.43
			Minimum	34.8	11.9	9.7	10.1	0.31
			Average	35.90	12.44	11.13	11.03	0.35
		February'24	Maximum	39.1	12.4	12.8	12.9	0.39
			Minimum	34.8	10.6	10.6	10.0	0.32
			Average	36.74	11.31	11.68	11.80	0.36
		March'24	Maximum	39.9	12.8	12.5	12.9	0.43
			Minimum	34.9	10.2	9.3	11.3	0.3
			Average	38.01	11.84	10.84	12.14	0.37
		October'23	Maximum	44.2	14.4	19.7	19.2	0.44
			Minimum	37.6	11.3	13.7	13.6	0.34
			Average	40.35	12.73	16.06	15.80	0.37

Si. No.	Location	Month	Concentration	PIlio µg/m³	PM2.5 lug/m³	SO2 lug/m³	NO2 lug/m³	CO mg/m³
2.	Khandbandh Village	November'23	Maximum	41.4	13.3	13.5	12.9	0.49
			Minimum	37.3	11	10.2	11.1	0.4
			Average	38.64	12.13	11.58	12.40	0.44
		December'23	Maximum	53.5	15.2	14	14.7	0.54
			Minimum	48.2	12.1	10.2	12	0.42
			Average	50.40	13.54	12.15	13.40	0.47
		January'24	Maximum	38.4	12.8	12.6	13	0.43
			Minimum	34.3	10.6	9.3	10.4	0.32
			Average	36.43	11.71	11.06	11.38	0.37
		February'24	Maximum	39.5	12.5	12.3	12.4	0.43
			Minimum	34.5	10.2	9.7	10.1	0.3
			Average	37.45	11.30	11.21	11.01	0.34
		March'24	Maximum	38.4	13	12.6	13	0.41
			Minimum	34.7	10.1	9.1	10.3	0.31
			Average	36.9	11.35	10.29	11.98	0.35
3.	Sargighar Village	October'23	Maximum	43.6	15.7	15.8	17.5	0.49
			Minimum	35.6	11.6	12.6	12.5	0.35
			Average	40.00	13.38	14.14	14.44	0.40
		November'23	Maximum	41.9	13.6	13.7	14	0.49
			Minimum	37.9	11.5	10.2	11.3	0.4
			Average	39.75	12.66	12.15	13.16	0.46
		December'23	Maximum	47.8	15.6	14.7	15.8	0.48
			Minimum	43.3	12.8	12.3	14.3	0.41
			Average	45.81	14.16	13.73	15.15	0.45
		January'24	Maximum	38.8	12.9	12	12.7	0.43
			Minimum	34.5	10.3	9.6	10.5	0.32
			Average	36.49	11.69	10.93	11.60	0.38

Sl. No.	Location	Month	Concentration	PM_{10} µg/m^3	$PM_{2.5}$ µg/m^3	SO_2 µg/m^3	NO_2 µg/m^3	CO mg/m^3
		February'24	Maximum	39.9	12.1	12.6	12.5	0.42
			Minimum	34.1	10.1	9.0	10.8	0.32
			Average	37.13	11.23	10.04	11.64	0.37
		March'24	Maximum	38.8	12.9	11.9	12.7	0.43
			Minimum	34.3	10.5	9.5	10.2	0.34
			Average	35.6	11.71	10.51	11.49	0.38
4.	Malda Village	October'23	Maximum	45.8	15.5	15.8	16.4	0.43
			Minimum	36.7	13.4	11.2	12.4	0.34
			Average	40.83	14.45	13.20	14.75	0.37
		November'23	Maximum	41.9	13.8	14	13.3	0.51
			Minimum	37.1	11.3	10.3	11.7	0.4
			Average	39.51	12.28	11.71	12.80	0.45
		December'23	Maximum	38.9	12.9	12.1	12.5	0.41
			Minimum	34.3	10.3	9.2	10.4	0.31
			Average	36.18	11.66	10.20	11.21	0.36
		January'24	Maximum	38.5	13	12.9	13	0.42
			Minimum	34.4	10.2	10.0	10.5	0.3
			Average	37.05	11.75	11.51	12.01	0.39
		February'24	Maximum	39.6	13.0	12.7	13.0	0.37
			Minimum	34.6	10.2	9.9	10.5	0.31
			Average	37.01	11.46	11.73	11.74	0.34
		March'24	Maximum	38.9	12.1	12.3	12.7	0.42
			Minimum	34.2	10.2	9.1	10	0.32
			Average	36.7	11.19	10.59	11.78	0.36
CPCB Standard			**24 Hrly**	**100**	**60**	**80**	**80**	**4 (1Hrly)**
			Annual Average	**60**	**40**	**40**	**50**	**--**

3. Fugitive Emission Monitoring (µg/m³)

Sl. No.	Month	Crusher Plant		Mines Haulage Road		Screen Plant	
1.	October'23	Max	Min	Max	Min	Max	Min
		668.7	512.5	674.8	524.7	694.7	634.8
2.	November'23	668.7	512.5	760.9	701.2	751.7	692.2
3.	December'23	720.4	667.0	726.7	647.8	703.4	644.8
4.	January'24	725.3	648.6	721.4	649.6	717.6	646.1
5.	February'24	723.2	646.4	724.2	642.3	718.9	644.2
6.	March'24	727.4	642.0	720.1	646.3	707.6	648.4
Six Month Average		**705.6**	**604.8**	**721.3**	**635.3**	**715.6**	**651.7**

Sl. No.	Month	Mines face Bench		Ore storage & Loading Point		Waste Dump	
1.	October'23	Max	Min	Max	Min	Max	Min
		586.4	534.8	691.8	556.1	659.8	534.2
2.	November'23	751.5	696.7	777.3	694.5	774.9	698.5

3.	December'23	722.7	650.8	720.8	654.1	722.0	646.7
4.	January'24	720.0	646.8	727.8	652.1	715.0	642.1
5.	February'24	716.7	643.4	720.6	647.2	716.8	649.1
6.	March'24	725.0	642.1	695.4	647.3	723.9	643.0
Six Month Average		**703.7**	**635.8**	**722.3**	**641.9**	**718.7**	**635.6**

4. ILLUMINATION MONITORING (Lux)

	October 23		November 23		December23	
LOCATION	**Horizontal**	**Vertical**	**Horizontal**	**Vertical**	**Horizontal**	**Vertical**
Workshop Area	95.0	88.0	185.0	124.0	161.9	96.7
Screen Plant	72.0	79.0	151.0	105.8	62.6	118.1
Haul Road	46.0	55.0	51.0	42.0	52.5	58.3
Loading Point	88.0	75.0	39.0	41.0	21.6	26.4
Crusher Plant	78.0	92.0	169.0	75.0	84.3	109.9
Parking Yard	65.0	48.0	71.0	65.0	83.5	116.1
Permanent Path	75.0	110.0	286.0	135.0	47.1	110.2
Electric Substation	78.0	88.0	119.0	95.0	144.5	91.4
Rest Shelter	49.0	64.0	42.0	58.0	39.8	27.5
Mines Bench Foot Path	68.0	74.0	57.0	49.0	31.6	26.2
	January 24		**February 24**		**March 24**	
LOCATION	**Horizontal**	**Vertical**	**Horizontal**	**Vertical**	**Horizontal**	**Vertical**
Workshop Area	182.0	120.0	182.0	120.0	172.0	122.0
Screen Plant	117.0	74.0	117.0	74.0	107.0	84.0
Haul Road	62.0	43.0	62.0	43.0	67.0	45.0
Loading Point	98.0	75.0	98.0	75.0	101.0	78.0
Crusher Plant	140.0	139.0	140.0	139.0	142.0	140.0
Parking Yard	58.0	69.0	58.0	69.0	68.0	79.0
Permanent Path	98.0	65.0	98.0	65.0	95.0	67.0
Electric Substation	120.0	75.0	120.0	75.0	125.0	85.0
Rest Shelter	36.0	45.0	36.0	45.0	39.0	45.0
Mines Bench Foot Path	48.0	54.0	48.0	54.0	46.0	54.0

5. Noise Level {dB(A)}

A. Ambient Noise Monitoring

Location	October-23		November-23		December-23		Standards	
	Leq Day	Leq Night	Leq Day	Leq Night	Leq Day	Leq Night	Leq Day	Leq Night
EAST BOUNDARY	62.2	54.9	72.6	65.4	69.1	66.4	75 dB(A)	70 dB(A)
WEST BOUNDARY	60.2	54.5	70.0	65.0	68.3	68.7	75 dB(A)	70 dB(A)
NORTH BOUNDARY	64.2	57.8	70.2	65.6	73.3	68.9	75 dB(A)	70 dB(A)
SOUTH BOUNDARY	59.9	52.3	73.1	64.1	70.1	66.8	75 dB(A)	70 dB(A)
Location	**January-24**		**February-24**		**March-24**		**Standards**	
	Leq Day	**Leq Night**	**Leq Day**	**Leq Night**	**Leq Day**	**Leq Night**	**Leq Day**	**Leq Night**
EAST BOUNDARY	68.3	69.1	68.6	61.8	61.7	62.6	75 dB(A)	70 dB(A)
WEST BOUNDARY	70.1	68.3	69.5	68.4	60.6	66.9	75 dB(A)	70 dB(A)
NORTH BOUNDARY	71.3	66.1	68.5	64.8	67.2	68.2	75 dB(A)	70 dB(A)
SOUTH BOUNDARY	70.2	67.6	70.2	67.6	68.9	67.5	75 dB(A)	70 dB(A)

B. Source Noise Monitoring

CORE ZONE	October-23				November-23			
	Week-1	Week-2	Week-3	Week-4	Week-1	Week-2	Week-3	Week-4
	Leq				Leq			
Near Ore Crushing Plant	74.7	72.6	72.9	70.5	70.0	69.3	68.5	72.6
Near Weigh Bridge	73.3	70.7	71.4	69.9	69.2	69.6	70.1	69.1
Near Workshop	71.4	74.5	73.7	71.2	72.3	72.7	72.4	70.2
Near Mines Office	72.8	73.5	72.9	73.2	70.8	71.1	69.2	71.4

CORE ZONE	December-23				January-24			
_	Week-1	Week-2	Week-3	Week-4	Week-1	Week-2	Week-3	Week-4
_	Leq				Leq			
Near Ore Crushing Plant	70.5	71.8	68.9	71.8	72.6	72.6	73.0	68.6
Near Weigh Bridge	72.3	68	67.3	71.6	67.8	70.3	72.5	71.5
Near Workshop	70.9	69.5	73.7	72.9	71.8	70.1	68.8	68.0
Near Mines Office	68.7	71.2	69.0	72.8	70.7	71.6	71.2	67.2
CORE ZONE	**February-24**				**March-24**			
_	Week-1	Week-2	Week-3	Week-4	Week-1	Week-2	Week-3	Week-4
_	Leq				Leq			
Near Ore Crushing Plant	70.2	69.5	68.4	73.9	67.8	69.7	72.5	70.6
Near Weigh Bridge	74.0	68.9	70.2	69.6	67.8	73.9	70.0	69.6
Near Workshop	73.3	72.5	68.2	74.0	71.7	68.1	72.6	71.3
Near Mines Office	70.0	73.2	70.7	68.0	72.4	70.6	69.4	71.6

6. Surface Water Quality

GONUA IRON ORE MINE								
Gonua nala UpStream								
Parameter	**Units**	**October-23**	**Novembe r-23**	**December-23**	**January-24**	**February-24**	**March-24**	**Limits for Stream Water Standards**
PH	**-**	7.25	7.39	7.33	7.45	7.45	7.45	**6.5-8.5**
Total Dissolved Solids	**mg/l**	180.0	190.0	163.0	180.0	180.0	180.0	**1500**
BOD	**mg/l**	2.6	2.4	2.2	2.6	2.7	2.7	**3**
DO	**mg/l**	6.7	6.8	6.2	6.6	6.9	6.9	**4**
Chlorides	**mg/l**	12.0	16.0	16.0	20.0	20.0	20.0	**600**
Fluorides	**mg/l**	0.17	0.13	0.18	0.15	0.15	0.15	**1.5**
Iron	**mg/l**	0.05	0.08	0.12	0.06	0.09	0.09	**50**
Gonua Nala DownStream								
Parameter	**Units**	**October-23**	**Novembe r-23**	**December-23**	**January-24**	**February-24**	**March-24**	**Limits for Stream Water Standards**
PH	**-**	7.36	7.48	7.38	7.60	7.56	7.56	**6.5-8.5**
Total Dissolved Solids	**mg/l**	242.0	256.0	263.0	268.0	268.0	268.0	**1500**
BOD	**mg/l**	3.8	3.5	4.2	3.2	3.8	3.8	**3**
DO	**mg/l**	6.3	6.1	5.6	6.3	6.4	6.4	**4**
Chlorides	**mg/l**	28.0	32.0	26.0	30.0	36.0	36.0	**600**
Fluorides	**mg/l**	0.21	0.24	0.23	0.26	0.26	0.26	**1.5**
Iron	**mg/l**	0.08	0.09	0.16	0.07	0.10	0.10	**50**

Kakarpani Nala Upstream								
Parameter	**Units**	**October-23**	**November-23**	**December-23**	**January-24**	**February-24**	**March-24**	**Limits for Stream Water Standards**
PH	**-**	7.48	7.62	7.45	7.50	7.74	7.74	**6.5-8.5**
Total Dissolved Solids	**mg/l**	156.0	168.0	176.0	176.0	180.0	180.0	**1500**
BOD	**mg/l**	3.9	4.2	3.2	4.7	4.5	4.5	**3**
DO	**mg/l**	6.4	6.7	6.3	6.9	6.5	6.5	**4**
Chlorides	**mg/l**	18.0	0.18	24.0	24.0	24.0	24.0	**600**
Fluorides	**mg/l**	0.16	0.15	0.21	0.16	0.20	0.20	**1.5**
Iron	**mg/l**	0.18	7.62	0.13	0.13	0.18	0.18	**50**
Kakarpani Nala Downstream								
Parameter	**Units**	**October-23**	**November-23**	**December-23**	**January-24**	**February-24**	**March-24**	**Limits for Stream Water Standards**
PH	**-**	7.2	7.35	7.65	7.26	7.41	7.41	**6.5-8.5**
Total Dissolved Solids	**mg/l**	242.0	258.0	246.0	270.0	275.0	275.0	**1500**
BOD	**mg/l**	8.0	7.5	6.2	6.3	8.2	8.2	**3**
DO	**mg/l**	6.8	6.5	5.8	36.0	6.7	6.7	**4**
Chlorides	**mg/l**	30.0	32.0	34.0	0.23	38.0	38.0	**600**
Fluorides	**mg/l**	0.17	0.21	0.25	0.20	0.24	0.24	**1.5**
Iron	**mg/l**	0.26	0.22	0.12	7.26	0.19	0.19	**50**

7. Surface Water Flow Rate

LOCATION NAME	**October-23**	**November-23**	**December-23**	**January-24**	**February-24**	**March-24**
Gonua nala	0.91	0.95	0.94	0.52	0.58	0.58
Kakarpani nala	0.98	0.70	0.69	0.57	0.61	0.61

8. Ground Water Quality

Location		Gonua Village	Canabeda Village	Minjoda Village	Doughar Village
Parameter	Units	November-23			
pH	-	6.85	7.15	6.94	6.85
Total Dissolved Solids as TDS	mg/l	136.0	156.0	144.0	132.0
Total Hardness as CaCO3	mg/l	52.0	60.0	68.0	64.0
Sulfate as SO4	mg/l	5.8	12.5	20.15	14.5
Chloride as Cl	mg/l	14.0	16.0	16.0	12.0
Fluorides as F	mg/l	0.2	0.26	0.21	0.28
Iron as Fe	mg/l	0.1	0.15	0.22	0.1
Location		Gonua Village	Canabeda Village	Minjoda Village	Doughar Village
Parameter	Units	January-24			
pH	-	6.85	7.04	6.91	6.62
Total Dissolved Solids as TDS	mg/l	105.6	121	122	102
Total Hardness as CaCO3	mg/l	44.0	58.0	64.0	55.0
Sulfate as SO4	mg/l	7.11	14.8	18.3	16.2
Chloride as Cl	mg/l	15.0	17.2	14.2	13.3
Fluorides as F	mg/l	0.15	0.38	0.28	0.18
Iron as Fe	mg/l	BDL	0.12	0.19	0.06

9. Drinking Water Quality

Parameter	Units	October-23	November-23	December-23	January-24	February-24	March-24	Acceptable Limits	Permissible Limits
pH	-	7.35	7.25	7.34	6.91	7.34	7.34	6.5-8.5	No Relaxation
Total Dissolved Solids as TDS	mg/l	196.0	184.0	192.0	122.0	194.0	194.0	500	2000
Total Hardness as CaCO3	mg/l	84.0	88.0	96.0	64.0	84.0	84.0	200	600
Sulfate as SO4	mg/l	16.5	14.5	17.5	18.3	15.4	15.4	200	400
Chloride as Cl	mg/l	18.0	22.0	18.0	14.2	24.0	6.10	250	1000
Fluorides as F	mg/l	0.17	0.15	0.12	0.28	0.13	24.0	1	1.5
Iron as Fe	mg/l	0.09	0.06	0.08	0.19	0.08	0.08	0.3	No Relax

10. ETP

Parameter	Units	October-23	November-23	December-23	January-24	February-24	March-24	Detection Range
ETP Inlet								
pH	-	6.74	6.85	6.96	6.94	6.94	6.94	2.0 -12
Total Suspended Solid as TSS	mg/l	61.0	64.5	77.6	68.0	69.5	69.5	5 - 5000
Total Dissolved Solids as TDS	mg/l	560.0	572.0	623.0	560.0	590.0	590.0	10-10000
Biochemical Oxygen Demand as BOD 3days at 27^0C	mg/l	24.0	24.0	27.0	25.5	25.0	25.0	5-10000
Chemical Oxygen Demand as COD	mg/l	296.0	284.0	298.0	276.0	272.0	272.0	5-50000
Oil & Grease as O & G	mg/l	6.9	7.20	6.5	6.94	6.45	6.45	5-600
Parameter	**Units**	**October-23**	**November-23**	**December-23**	**January-24**	**February-24**	**March-24**	**Acceptable Limits**
ETP Outlet								
pH	-	7.51	7.42	7.45	7.56	7.56	7.56	6.5-9.0
Total Suspended Solid as TSS	mg/l	21.0	24.5	18.2	27.0	28.0	28.0	100.0
Total Dissolved Solids as TDS	mg/l	640.0	656.0	687.0	664.0	672.0	672.0	-
Biochemical Oxygen Demand as BOD 3days at 27^0C	mg/l	16.0	17.5	13.0	16.0	18.0	18.0	30.0
Chemical Oxygen Demand as COD	mg/l	144.0	136.0	120.0	124.0	144.0	144.0	250.0
Oil & Grease as O & G	mg/l	BDL	BDL	BDL	BDL	BDL	BDL	10.0

11. Vibration Monitoring

Sl no.	Station Name	Instrument location	Season (Summer/Winter/Monsoon/post monsoon	Peak particle velocity	Air Over pressure	Frequency	Remark
1	Bench Area	Near workshop area (250m away from blasting location)	Winter	1.2 mm/s	137.7dbl@36.5hz/.1534kpa	7.2 Hz	Within Permissible limits
2	Bench Area	Near Rest Shelter (250m away from blasting location)	Winter	4.09 mm/s	126.9dbl@26.9Hz/.0445kpa	13.8 Hz	Within Permissible limits
3	Bench Area	Near workshop area (250m away from blasting location)	Winter	1.45 mm/s	124.4dbl@3.5Hz/.0332kpa	13.5 Hz	Within Permissible limits
4	7th Bench	Near workshop area (250m away from blasting location)	Winter	2.13 mm/s	113.3dbl@6.7Hz/.0092kpa	51.2 Hz	Within Permissible limits

Verified By

Technical Manager

Authorized By

Quality Manager

Steel Limited

Regd. Office: JSW Centre
Bandra Kurla Complex,
Bandra (East), Mumbai – 400 051
CIN : L27102MH1994PLC152925
Phone : +91 22 4286 1000
Fax : +91 22 4286 3000
Website : www.jsw.in

No. JSW/S/CO/2024/331 Date: 11/05/2024

To,
The Member Secretary
State Pollution Control Board, Odisha,
Paribesh Bhawan, A/118, Nilakantha Nagar, Unit-8,
BHUBANESWAR- 751012

Sub: - Submission of 9 Points NEERI Compliance Status Report of FY 2023-2024 for **Gonua Iron Ore Mine of M/s JSW Steel Ltd.**

Ref: - 1. New Consent Order No 2941 vide letter number 4854/IND-I-CON-1539 dated 31.03.2024

Dear Sir,

With reference to aforesaid subject, please find enclosed herewith the 9 Points NEERI Compliance Status Report and carrying capacity study made by CSIR-NEERI, for environmentally sustainable iron and manganese ore mining activity of FY 2023-24 for **Gonua Iron Ore Mine of M/s JSW Steel Ltd**.

Seeking your co-operation as always.

Thanking you,

Yours Faithfully

For JSW Steel Ltd

Mrutyunjaya Mahapatra
(Authorized Signatory)

Encl: As above

Copy to- The Regional Officer, Regional Office, At- Near Panposh Hockey Chowk, At./ P.O. - Panposh, Rourkela – 769 004, Dist – Sundargarh

NEERI REPORT COMPLIANCE STATUS -GONUA MINE

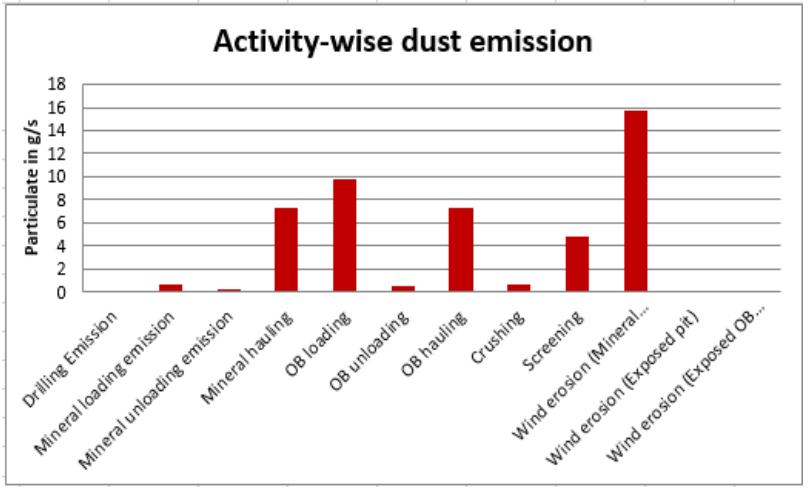
Sl. No.	Recommendation by CSIR-NEERI	Action Taken
1	The individual lease holders shall make assessment and quantification of emission load generation (in terms of air pollution, noise, wastewater and solid waste) from each of the mining activity (including transportation) for the period starting from1st April to 31stMarch and submit report by June of every year. 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. Necessary guidance many be sought from Regional Officer, SPCB on load calculation.	The project has already been practicing different environmental safeguard measures for prevention of the air pollution. The measures are- 1. Mobile water sprinkling arrangement has been provided for the haul roads, processing area and loading / unloading points to minimize dispersion of air borne dust particles. 2. Existing Fixed water sprinkling being maintained and operated. 3. Wet drilling arrangement with acousticenclosure is in practice to control dustright at the source. 4. Dust Suppression System (Dry fog system) being provided at all appropriate places of mineral handling plants (crusher & screening plant) and other areas. Same are being maintained for proper dust control. Regular Monitoring of ambient air quality parameters being carried out through M/s Ecomen Private Limited. Monitoring reports of FY 2023-24 were submitted in your good office vide letter no. JSW/C/O/2024/330 dated 11.05.2024. 5. No process water being discharged from the mine. Regular Monitoring of water quality parameters being carried out and Monitoring reports of FY 2023-24 were submitted in your good office vide letter no. JSW/C/O/2024/330 dated 11.05.2024. 6. Noise producing equipment's are coveredas far as practicable. Workers engaged in Operations are provided with ear plugs / muffs. Besides this, acoustic enclosures are provided for all machines operating within the mines. Regular Noise Monitoring being carried out and Monitoring reports of FY 2023-24 were submitted in your good office vide letter no. JSW/C/O/2024/330 dated 11.05.2024. 7. The overburden generated as solid waste is stacked at the earmarked areas and are covered by Coir matting. Additional coir matting of 3867 Sq.m is being done as per requirement which will be followed by tree plantation after arrival of monsoon. 8. The vehicles carrying the loaded materials are being covered with tarpaulin. 9. Annual Assessment and quantification of emission load generation (in terms of air pollution, noise, waste water and solid waste) as per prescribed standards is enclosed as **ANNEXURE I.**

2	Monitoring of ambient air and fugitive emission in core zone shall be carried out on daily basis. Minimum four ambient airquality monitoring station shall be installed in the core zone. Out of four, at least one on-line monitoring station shall be installed in case of mines having EC capacity of 3 MTPA of more. Moreover, one station should be located near the ore carrying truck entry and exit gate of mine.A letter in this regard has already been communicated to individual leaseholder of capacity 3 MTPA and above vide Board's Letter no-7807, dt. 30.06.2018.	Regular monitoring of ambient air and fugitive emission is being carried out through M/s Ecomen Private Ltd. Monitoring reports ofFY 2023-24 were submitted in your good office vide letter no. JSW/C/O/2024/330 dated 11.05.2024. We have installed Three Continuous Ambient Air Quality Monitoring Stations (CAAQMS) and Digital Display Board in consultation with Regional Officer, Keonjhar. All 3 CAAQMS are equipped with data transfer facility to SPCB and we haveauthorized Phoenix Robotix Pvt. Ltd. (Datoms) for transmitting data to OSPCB andalready completed the necessary setup for data transfer from all 3 locations to OSPCB Server.
3	Monitoring in buffer zone shall becarried out by through NABET accredited agency preferably, at locations of nearest human habitation including schools and other public amenities located nearest to source of dust generation as applicable. The monitoring station shall be installed in core and buffer zone in consultation with Regional Officer, SPCB.	Regular Monitoring in buffer zone is being carried out at locations of nearest human habitation (residential area) engaging anNABET Accredited laboratory (Ecomen PrivateLtd). Monitoring reports of FY 2023-24 were submitted in your good office vide letter no. JSW/C/O/2024/330 dated 11.05.2024.
4	Monitoring stations shall be facilated for measurement of CO as an additional parameter to the other parameters SPM, PM10, PM2.5, SO2 and NO2. The monitoring result shall be compiled and submitted to Board on annual basis.	Regular Monitoring of CO as an additional parameter being carried out along with other AAQ data. Monitoring reports of FY 2023-24 were submitted in your good office vide letter no. JSW/C/O/2024/330 dated 11.05.2024.
5	All the vehicles engaged in mining and transporting activity in the mine shallhave Pollution under Control (PUC) certificate. A record of the same shall bemaintained for verification of inspectingagency.	Mineral carrying trucks are not allowed to goout of the lease area without tarpaulin cover and is being monitored by security personnel at the exit gate. Similarly, Security personnel are also do notallow the vehicles to enter into the mines without having valid PUC.
6	Noise level should be monitored near the major sources of noise generation within the core zone once in week andsubmit the report annually. Further, date, time and distance of measurement shall also be indicated with the noise levels inthe report. The data shall be used to mapthe noise generation from different activities and efforts should be made tomaintain the noise levels with the acceptable	Weekly Noise monitoring is being carriedout through M/s Ecomen Private Ltd. (Accredited Laboratory). Monitoring reports of FY 2023-24 were submitted in your good officevide letter no. JSW/C/O/2024/330 dated 11.05.2024.

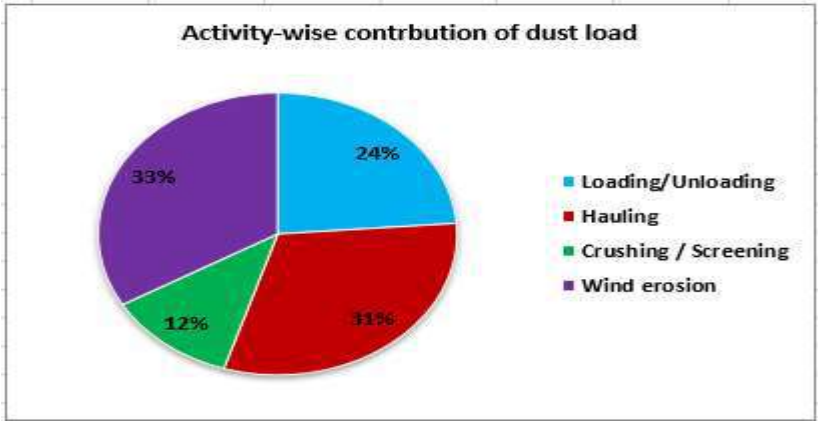
	Limits of CPCB. Themonitoring schedule shall be informed to Regional Officer, SPCB in order to ensure his presence 25% of the monitoring programme.	
7	Measurement of flow rate of the springs and perennial nallah passing through the mining lease area shall be done on monthly basis. Identification of the perennial streams to be brought under the monitoring programme and the location the flow measurement shall be determined in consultation with Regional Officer, SPCB. The consolidates report shall be submitted to Board on annualbasis.	No natural watercourse and water resources are obstructed due to mining operations & thesame will be taken care. Monitoring of flow rate measurement of the different water bodies is being carried out through M/s Ecomen Private Ltd. Monitoring reports of FY2023-24 were submitted in your good office vide letter no. JSW/C/O/2024/330 dated 11.05.2024.
8	Effort shall be made to recycle or reuse the treated wastewater from ETP of work shop and STP of residential colony instead of discharging to outside.	No colony provided in the working lease area.STP will be provided during colonyconstruction. Workshop with Oil & Grease trap system is provided in the mine area.
9	Annual environmental sustainability report (ESR) shall be made highlighting the efforts made towards environmental protection with respect to different environmental components vis-à-vis production performance of the mine on monthly basis. The data collected as per EC and CTE/CTO conditions should be utilized to prepare the annual sustainability report. The report shall be submitted to SPCB and RO, MoEF&CC by June of every year.	Gonua Mine started operations since July 2020. Annual environmental sustainability report (ESR) is enclosed as **ANNEXURE II.**

RESULTS OF DUST LOAD CALCULATIONS

	Particulate matter in (g/s)	Particulate matter in (kg/d)	Particulate matter (kg per ton of ore)
Drilling Emission	0.0390406	3.373112007	0.00014666
Mineral loading emission	0.6134877	53.00534004	0.00230458
Mineral unloading emission	0.2789402	24.10043085	0.00104784
Mineral hauling	7.2921675	630.0432702	0.02739319
OB loading	9.8323191	849.5123733	0.03693532
OB unloading	0.4785983	41.35088885	0.00179786
OB hauling	7.3332373	633.5916991	0.02754747
Crushing	0.6944444	60	0.0026087
Screening	4.8611111	420	0.01826087
Wind erosion (Mineral stack)	15.669508	1353.845486	0.05886285
Wind erosion (Exposed pit)	0.037219	3.215719799	0.00013981
Wind erosion (Exposed OB dump)	0.0003177	0.027446842	1.1933E-06
Total	**47.1304**	**4072.066**	**0.17705**



Major Activity	Dust load (kg/day)
Loading/Unloading	967.96903
Hauling	1263.635
Crushing / Screening	480
Wind erosion	1357.0887



GO TO MAIN PAGE

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Annual Environmental Sustainability Report (ESR) for Gonua Iron Ore Mine of M/s JSW Steel Ltd.

Introduction-

The Gonua Iron Ore Mine (erstwhile lessee M/s Pawan Kumar Ahluwalia) was one of the mines whose lease expired on 31.03.2020. The lease area is located in villages Ganua and Patabeda, Tehsil Koira, District Sundargarh, Odisha State.

In pursuant to the Mines and Minerals (Development and Regulation) Act, 1957 and the Mineral (Auction) Rules, 2015, Govt. of Odisha issued the notice inviting tender dated 6th December, 2019 for commencement of the auction process to grant the mining lease in respect of Gonua Iron Ore Block over an area of 88.516 ha (As per DGPS) / 86.886 ha(As per ROR) in villages Ganua and Patabeda under Koira Tehsil of Sundergarh District, Odisha for a resource size of about 118.731 Million tonnes (Mt). The e-auction process was conducted in accordance with the tender document and the mineral auction rule, 2015for the said mineral block and M/s JSW Steel Limited was declared as the preferred bidder under Rule 9(9)(iii) of Mineral (Auction) Rules 2015.

Without prejudice to the generality of the provisions of section 8B (2) of the MMDR Act, 1957, the details of the valid rights, approvals, clearances, licenses and the like held by the previous lessee are vested in favor of M/S JSW Steel Ltd by the Govt. of Odisha fora period of 2 years from the date of execution of lease deed or till the date of getting fresh approvals, clearances, licenses, permits, and the like, whichever is earlier vide vesting order No-4253/SM, dated 30.05.2020. M/s JSW Steel Limited being successful bidder upon execution of mining lease deed, the successful bidder shall immediately, but not later than one hundred twenty days from the date of execution of mining lease, apply afresh for all necessary rights, approvals, clearances, licenses and the like under the applicable statutes, rules or regulations, as the case may be, for obtaining the necessary clearances to enable further continuance of the mining operations beyond two years and vesting order shall be valid for a period of two years from the date of execution of new lease deed or till the date of getting all fresh approvals, clearances, licenses, permits, and the like, whichever is earlier.

The mining lease was granted in favor of M/s JSW Steel Limited for a period of 50 years w.e.f 27.06.2020. Subsequent to signing of the MDPA with the Collector, Sundargarh**, M/s JSW Steel Limited** has made payment of the third instalment being the eighty percent of the upfront value and executed and registered the mining lease with the Government of Odisha on 27.06.2020.

Indicative Coordinates Range of the Gonua Iron Ore Mine

Latitudes : 21°55’00.52356” N - 21°55’46.03440” N
Longitudes : 85°22’04.13616” E - 85°22’36.35616” E

Fully mechanized open cast method of mining by drilling and blasting and by deploying HEMM equipment’s like hydraulic drills and excavators, wheel loaders, dumpers, will be undertaken. The height and width of the benches for iron ore will be kept at 9 m and 15 m respectively. The working of benches will be commenced from top and extended to bottom benches. The excavated ROM ore is proposed to be processed in the crushing and screening plants to obtain the lump and fine ore as product mix. The iron ore lumps and iron ore fines extracted from the mine will be transported through railway/port/road to JSW Steel Plants.

Production in FY 2023-24

From April 2023 to March 2024, Gonua Mine has produced 620126.63 MT Iron Ore (ROM) andsame is dispatched to steel plants.

Environment Management in Gonua Mine

Air Management-

Blasting Operation

- Controlled blasting method is in practice by restriction of explosive charge in the holes.
- Well-designed blast by effective stemming and use of mili second delay detonators, Proper blasting designing to see that the optimum breakage occurs.
- To control ground vibrations and arrest fly rocks, advanced initiation system is being used for blasting
- Ground vibrations are also being monitored and the results are well within limits.

Excavation, Hauling and Crushing & Screening

- Dry fog system for crusher & screen plants are provided.
- Proper maintenance of HEMM
- Using sharp teeth for shovels and other soil excavation equipment, and their periodical replacements.
- Acoustic enclosures for operator cabin.
- Avoiding overloading of dumpers.
- Provision of dust filters / masks to workers working at highly dust prone and affected areas.
- Imparting sufficient training to operators on safety and Environmental parameters.

Transportation

- Regular water sprinkling is being carried out by engaging mobile water tankers on the mine benches, mine haul, loading and unloading points and transfer points for dust suppressions.
- Maintenance of haul road by regular grading is carried out through grader, dozer.
- Ensuring that all mineral trucks are covered by tarpaulin.
- Vehicular emissions controlled through regular and proper preventive maintenance schedules.
- It is ensured that there is no overloading of trucks by having Quick Dispatch system at the weigh bridge near the dispatch gate.

- Regular water sprinkling arrangements have been made on the transportation roads/public road through mobile water tankers.

Wet Drilling System in Drilling Operation

Water Tanker Arrangement For Haul Road Dust Suppression

Fixed water sprinkling arrangements

Dry Fog System in Mineral Handling Plants

Consolidated Air Quality Monitoring Data of FY 2023-2024

GONUA MINE AAQ DATA FOR THE PERIOD APRIL 2023 TO MARCH 2024										
	PM10		**PM2.5**		**SO2**		**NO2**		**CO**	
	Maximum	**Minimum**	**Maximum**	**Minimum**	**Maximum**	**Minimum**	**Maximum**	**Minimum**	**Maximum**	**Minimum**
CORE ZONE										
MinesOffice	76.8	35.1	29.2	10.6	19.7	9.3	19.8	10.2	0.64	0.33
Near Pillar no 22 & 23	77.0	37.3	25.4	11.8	19.9	9.6	19	10.1	0.64	0.34
Near Dispensary	77.0	32.1	26.6	11.2	19.6	9.0	23.7	10.1	0.64	0.33
Near Entry and Exit Gate no 2	77.0	35.1	25.7	11.1	19.7	9.2	22.9	10.2	0.65	0.33
BUFF ER ZON E										
PalsaVillage	73.8	29.3	23.4	8.7	19.6	9.1	18.5	9.2	0.57	0.30
Khandbandh Village	73.5	29.3	23.5	8.2	19.7	9.1	19.2	9.6	0.54	0.30
Sargighar Village	68.6	29.3	22.7	9.1	19.5	8.9	19.6	9.5	0.53	0.30
Malda Village	68.7	29.2	23.3	8.1	19.5	9.1	17.9	9.1	0.52	0.30
NAAQ (24hr Standard)	**100 [µg/m3]**		**60 [µg/m3]**		**80 [µg/m3]**		**80 [µg/m3]**		**2 [mg/m3] (8hourly)**	

Water & OB Dump Management

- Garland drains maintained of suitable size around mine area and dump with proper gradients to prevent rain water descent into active mine area.
- Settling ponds maintained to prevent flow of fine particles from OB / Waste dumps, check dams, parapet / retaining walls & garland drains.
- Usage of stored water in the settling ponds for watering of haul roads, vehicle washing and green belt development etc.
- De- silting of garland drains & settling ponds are being carried out at regular intervals.
- Maintenance of all the runoff management structures.

Retaining Wall

Series of Settling Ponds

Dump Plantation

Safety Zone Plantation

Coir Matting on Dump

Plantation on BHQ Dump

Consolidated Ground Water Quality Monitoring Data of FY 2023-2024

Gonua Village (Borewell)					
Parameter	**Units**	**Max**	**Min**	**Acceptabl eLimits**	**Permissible Limits**
pH	-	6.95	6.8	**6.5-8.5**	**No Relaxation**
Total Dissolved Solids as TDS	mg/l	136	105.6	**500**	**2000**

Total Hardness as CaCO3	mg/l	52	40	**200**	**600**
Sulfate as SO4	mg/l	7.11	5.8	**200**	**400**
Chloride as Cl	mg/l	17	14	**250**	**1000**
Fluorides as F	mg/l	0.23	0.15	**1**	**1.5**
Iron as Fe	mg/l	0.1	0.1	**1**	**No Relaxation**
Canabeda Village (Borewell)					
Parameter	**Units**	**Max**	**Min**	**Acceptable Limits**	**PermissibleLimits**
pH	-	7.15	7.04	**6.5-8.5**	**No Relaxation**
Total Dissolved Solids as TDS	mg/l	156	121	**500**	**2000**
Total Hardness as CaCO3	mg/l	60	52	**200**	**600**
Sulfate as SO4	mg/l	15.1	12.5	**200**	**400**
Chloride as Cl	mg/l	18.5	16	**250**	**1000**
Fluorides as F	mg/l	0.38	0.26	**1**	**1.5**
Iron as Fe	mg/l	0.19	0.12	**1**	**No Relaxation**
Munjoda Village (Dug Well)					
Parameter	**Units**	**Max**	**Min**	**Acceptable Limits**	**PermissibleLimits**
PH	-	6.91	6.36	**6.5-8.5**	**No Relaxation**
Total Hardness	mg/l	64	52	**500**	**2000**
Iron	mg/l	0.20	0.14	**200**	**600**
Chlorides	mg/l	18	12	**200**	**400**
Total Dissolved Solids	mg/l	324	116	**250**	**1000**
Sulphates	mg/l	21.6	10.5	**1**	**1.5**
Fluoride	mg/l	0.28	0.23	**1**	**No Relaxation**
Doughar Village (Borewell)					
Parameter	**Units**	**Max**	**Min**	**Acceptable Limits**	**PermissibleLimits**
pH	-	6.9	6.62	**6.5-8.5**	**No Relaxation**

Total Dissolved Solids as TDS	mg/l	132	96	**500**	**2000**
Total Hardness as CaCO3	mg/l	64	54	**200**	**600**
Sulfate as SO4	mg/l	18.2	14.5	**200**	**400**
Chloride as Cl	mg/l	15.3	12	**250**	**1000**
Fluorides as F	mg/l	0.28	0.18	**1**	**1.5**
Iron as Fe	mg/l	0.12	0.04	**1**	**No Relaxation**

Consolidated Surface Water Quality Monitoring Data of FY 2023-2024

Gonua Nala UpStream				
Parameter	**Units**	**Max**	**Min**	**Limits for StreamWater Standards**
PH	-	7.45	6.31	**6.5-8.5**
Total Dissolved Solids	mg/l	241	152	**1500**
BOD	mg/l	3.6	2.1	**3**
DO	mg/l	7.1	2.8	**4**
Chlorides	mg/l	24	12	**600**
Fluorides	mg/l	0.23	0.13	**1.5**
Iron	mg/l	0.28	0.05	**50**
Gonua Nala DownStream				
Parameter	**Units**	**Max**	**Min**	**Limits for StreamWater Standards**
PH	-	7.6	6.18	**6.5-8.5**
Total Dissolved Solids	mg/l	287	148	**1500**
BOD	mg/l	4.5	2	**3**
DO	mg/l	6.9	3.6	**4**
Chlorides	mg/l	36	20	**600**
Fluorides	mg/l	0.26	0.14	**1.5**
Iron	mg/l	0.22	0.07	**50**

Kakarpani Nala UpStream				
Parameter	**Units**	**Max**	**Min**	**Limits for StreamWater Standards**
PH	-	7.74	7.05	**6.5-8.5**
Total Dissolved Solids	mg/l	180	130	**1500**
BOD	mg/l	4.7	2.2	**3**
DO	mg/l	6.9	2.8	**4**
Chlorides	mg/l	24	0.18	**600**
Fluorides	mg/l	0.21	0.1	**1.5**
Iron	mg/l	7.62	0.1	**50**
Kakarpani Nala DownStream				
Parameter	**Units**	**Max**	**Min**	**Limits for StreamWater Standards**
PH	-	7.65	7.09	**6.5-8.5**
Total Dissolved Solids	mg/l	275	142	**1500**
BOD	mg/l	8.2	2.5	**3**
DO	mg/l	36	3.1	**4**
Chlorides	mg/l	38	0.23	**600**
Fluorides	mg/l	0.25	0.1	**1.5**
Iron	mg/l	7.26	0.06	**50**

Noise Management

- Providing sound proof operator's cabin for equipment like dumpers, shovel, tippers, etc.
- Planting trees at various places within the lease area to act as acoustic barriers.
- Proper and regular maintenance of vehicles, machinery and other equipment. All HEMMs are monitored for any abnormal sound and rectified with due precaution by maintenance personnel.
- Providing workers with ear muffs & earplugs against high noise levels.
- Conducting regular health check-ups of workers including Audiometry test
- Controlling the time of exposure of workers towards high noise areas.

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- Controlling the time of exposure of workers towards high noise areas.

Consolidated Noise Quality Monitoring Data of FY 2023-2024

Gonua Iron Ore Mine			
CORE ZONE	**max**	**min**	**Standards**
Near Ore Crushing Plant	74.7	63.3	**75 dB(A)**
Near Weigh Bridge	74	64.5	
Near Workshop	74.5	60.1	
Near Mines Office	73.5	48.6	

BUFFER ZONE					**STANDARDS**	
	Leq Day		Leq Night		**Day Equivalent**	**Night Equivalent**
	MAX	**MIN**	**MAX**	**MIN**		
EAST BOUNDARY	72.6	53.2	69.1	42.6	75 dB(A)	70 dB(A)
WEST BOUNDARY	70.1	52.5	68.7	42.1		
NORTH BOUNDARY	73.3	50.4	68.9	42.6		
SOUTH BOUNDARY	73.1	51.7	67.6	42.5		

Electronic Digital Display Board at Gonua Mine Gate

Gonua Environmental Protection Measures Expenditure (head wise breakup) incurredfrom in FY 2023-24

Expenditure Incurred for 2023-24

SI No.	Expenditure Head -Particulars (INR)	Gonua
1	Plantation and maintenance services	7,30,000
2	Construction & Maintenance of retaining walls	10,80,838
3	Geo-textiling- Coir Mating/ slope stabilization etc.	6,15,433
4	Dust Suppression activities- Water Sprinkling (fixed and mobile), Dust suppression chemicals	6,66,960
5	Maintenance of of Wheel Washing	1752300
6	Manual Environment parameters monitoring (AIR, WATER, NOISE and Ground Vibration)	11,28,320
7	Online CAAMS Environment parameters monitoring	5,57,148
8	Installation and Service of Flowmeter and Piezometer	2,77,500
9	Environmental Awareness Programmes/ MEMC program	3,80,567
10	Land Scaping/ Land Restoration	0
11	Any other expenses related to Environment protection, Infrastructure, machineries, etc.(if any)	0
		71,89,066

ANNEXURE II

By Speed Post/ e-mail

GOVERNMENT OF ODISHA

FOREST, ENVIRONMENT & CLIMATE CHANGE DEPARTMENT

*****

No.FE-DIV-FLD-0072-2021-13647/FE&CC, Date 02-08-22

10F (Cons) 23/2018

From

Sri Lingaraj Otta

OSD-cum-Special Secretary to Government

To

The Principal Chief Conservator of Forests & HoFF, Odisha,

Bhubaneswar.

Sub: Transfer of FC approval granted under the Forest (Conservation) Act, 1980 for mining lease from Old lessee M/s P.K. Ahluwalia to New Lessee M/s JSW Steel Ltd as per the provision of the Mines and Minerals (Development and Regulation) Amendment Act, 2021 in respect of Gonua Iron Ore Block under Bonai Forest Division, Koira Tahasil, Sundargarh District for diversion of 54.40 ha of forest land - Compliance of Final approval Order-regarding.

Sir,

I am directed to invite a reference to your letter No.8987/9F(MG)-75/2021 dtd.27.04.2022, letter No.10481/9F(MG)-75/2021 dtd.21.05.2022 and letter No.13591/9F(MG)-83/2021 dtd.11.07.2022 seeking transfer of FC approval granted under the Forest (Conservation) Act, 1980 for mining lease from Old lessee M/s P.K. Ahluwalia to New Lessee M/s JSW Steel Ltd as per the provision of the Mines and Minerals (Development and Regulation) Amendment Act, 2021 in respect of Gonua Iron Ore Block under Bonai Forest Division, Koira Tahasil, Sundargarh District for diversion of 54.40 ha of forest land - Compliance of Final approval Order and with reference to letter File No.FC-11/112/2020-FC (Pt) dtd.07.07.2021 of Govt. of India, MoEF&CC, FC Division, New Delhi.

After careful consideration of the proposal of PCCF & HoFF, Odisha and in pursuance of the guidelines issued by Govt. of India, MoEF &CC vide File No. FC-11/112/2020-FC (Pt) Dated 7th July, 2021, the transfer of approval granted by Govt. of India, MoEF&CC under Section-2 of the Forest (Conservation) Act, 1980 vide No.8-47/93-

FC dtd 07/09.08.1996 in favour of Smt. Maitri Shukla in Sundargarh District and the change of the name of the User Agency from M/s Maitri Shukla to M/s Pawan Kumar Ahluwalia vide letter F.No.8-47/1993-FC (Pt) dtd.31.05.2018 from the erstwhile User Agency M/s P.K. Ahluwalia to M/s JSW Steel Ltd is hereby accorded by the State Govt. for non-forestry use of 41.04 ha of forest land for mining in Gonua Iron Ore Block under Bonai Forest Division, Koira Tahasil, Dist-Sundargarh, Odisha subject to fulfilment of the following conditions.

i. DGPS Survey of 41.04 ha diverted forest area is to be ensured by DFO, Bonai Forest Division in the field before handing over the area.
ii. The DFO, Bonai Forest Division shall upload the KML files of the area under diversion and the accepted non-forest land for raising Compensatory Afforestation in the E-Green Watch portal of FSI before handing over forest land to the new lessee.
iii. Old lessee has deposited the NPV over 76.882 ha forest land which includes the diverted forest area of 41.04 ha. The amount deposited by the new lessee @ Rs.7.50 Lakh per ha is the lumpsum amount realized by State Government on issue of LoI (for the total forest area within the mining lease), may be adjusted towards balance NPV, CA and any compensatory levies payable in future.
iv. The new lessee shall furnish an undertaking to pay the additional NPV, if so determined, as per the decision of the Hon'ble Supreme Court of India.
v. The new lessee shall also comply the non-complied conditions and if any by Govt. of India, MoEF & CC, IRO, Bhubaneswar, after conducting the inspection of the area for the appraisal of compliance of approval granted under Forest (Conservation) Act, 1980.
vi. The new lessee, after ceasing mining operation, undertake re-grassing the mining area and any other areas which may have been disturbed due to their mining activities and restore the land to a condition which is fit for growth of fodder, flora, fauna etc.
vii. Forest Clearance over 41.04 ha forest land will be transferred to the new lessee after issue of FC transfer order.
viii. Forest Clearance of balance 8.875 ha diverted forest land will be transferred to the new lessee after providing 8.665 ha (49.915 ha – 41.25 ha) non-forest land for CA and acceptance of the CA land by DFO, Bonai Forest Division as per the extant procedure for acceptance of CA land.
ix. The new lessee shall have to submit fresh diversion proposal for the balance forest area of 32.809 ha (82.724 ha – 49.915 ha) for seeking approval under Section 2 (ii) of FC Act, 1980.
x. Execution of project activities by the new lessee will be subject to availability of all other statutory clearances required under relevant Acts/ Rules for this mining project and compliance of Court's order, if any.

Yours faithfully,

21/8/2022

OSD-cum-Special Secretary to Government

Memo No. 13648 /FE&CC, Date 02-08-22

Copy forwarded to the Assistant Inspector General of Forests (FC), Government of India, Ministry of Environment, Forests & Climate Change (F.C. Division), Indira Paryavaran Bhawan, Alinganj, Jor Bagh Road, New Delhi-110003 for information and necessary action.

2/8/2022

OSD-cum-Special Secretary to Government

Memo No. 13649 /FE&CC, Date 02-08-22

Copy forwarded to the Deputy Director General of Forests (Central), Govt. of India, MoEF&CC, IRO, A/3, Chandrasekharpur, Bhubaneswar for information and necessary action.

2/8/2022

OSD-cum-Special Secretary to Government

Memo No. 13650 /FE&CC, Date 02-08-22

Copy forwarded to the Principal Chief Conservator of Forests (Wildlife) & Chief Wildlife Warden, Odisha / Chief Conservator of Forests (FD&NO), FC Act, O/o PCCF & HoFF, Odisha for information and necessary action.

2/8/2022

OSD-cum-Special Secretary to Government

Memo No. 13651 /FE&CC, Date 02-08-22

Copy forwarded to the Regional Chief Conservator of Forests, Rourkela Circle/ Divisional Forest Officer, Bonai Forest Division for information and necessary action.

2/8/2022

OSD-cum-Special Secretary to Government

Memo No. 13652 /FE&CC, Date 02-08-22

Copy forwarded to Steel & Mines Department/ R&DM Department/ Director Environment-cum-Special Secretary to Government, FE&CC Department/ Director of Mines, Odisha/ Member Secretary, SPCB, Odisha/ Collector, Sundargarh for information and necessary action.

2/8/2022

OSD-cum-Special Secretary to Government

Memo No. 13653 /FE&CC, Date 02-08-22

Copy forwarded to the Authorized Signatory, M/s JSW Steel Ltd, Plot No.3, Forest Park, Sishu Bhawan Square, Bhubaneswar-751009 for information and necessary action.

2/8/2022

OSD-cum-Special Secretary to Government

Memo No. 13654 /FE&CC, Date 02-08-22

Copy forwarded to M/s Pawan Kumar Ahluwalia, PB No.3, Infront of MMTC Weigh Bridge, At/Po-Barbil, Dist-Keonjhar, Odisha, Pin-758035 for information and necessary action.

2/8/2022

OSD-cum-Special Secretary to Government

JSW Steel Limited

Regd. Office: JSW Centre
Bandra Kurla Complex,
Bandra (East), Mumbai – 400 051
CIN : L27102MH1994PLC152925
Phone : +91 22 4286 1000
Fax : +91 22 4286 3000
Website : www.jsw.in

Letter No.- JSW/S/CO/2023/613 **Date-27.09.2023**

To,

The Divisional Forest Officer
Bonai Forest Division
Bonai

Sub: Diversion of 32.875 ha of forest land (Including 1.693 ha Safety Zone) within the mining lease of 88.516 Ha in Ganua Iron ore Block of M/s. JSW Steel Ltd. under Bonai Forest Division, District Sundargarh, Odisha (Single Window No. SW/118326/2023, Proposal No. FP/OR/MIN/QRY/418017/2023)

Sir,

In reference to the subject cited above, we would like to inform you that we have submitted the online application of diversion proposal over 32.875 ha forest land (Including 1.693 Ha Safety zone) in respect of Ganua Iron Ore Mines of M/s JSW Steel Ltd under Bonai Forest Division of Sundargarh District.

Now, we are submitting herewith the hard copy of the said proposal for your kind information and necessary action.

Thanking You

Yours faithfully

FOR JSW STEEL LTD.

Mrityunjaya Mahapatra

(Authorized Signatory)

Encl: Hard Copies of Forest Diversion proposal.

Received
27.9.23

JSW Steel Limited

Regd. Office: JSW Centre
Bandra Kurla Complex,
Bandra (East), Mumbai – 400 051
CIN : L27102MH1994PLC152925
Phone : +91 22 4286 1000
Fax : +91 22 4286 3000
Website : www.jsw.in

Letter No.- JSW/S/CO/2023/615 **Date-27.09.2023**

To,

The Divisional Forest Officer
Bonai Forest Division
Bonai

Sub: Diversion of 19.256 ha of forest land (Including 1.014 ha Safety Zone) within the mining lease of 347.008 Ha in Narayanposhi Iron & Mn Block of M/s. JSW Steel Ltd. under Bonai Forest Division, District Sundargarh, Odisha (Single Window No. SW/141235/2023, Proposal No. FP/OR/MIN/QRY/441754/2023)

Sir,

In reference to the subject cited above, we would like to inform you that we have submitted the online application of diversion proposal over 19.256 ha forest land (Including 1.014 Ha Safety zone) in respect of Narayanposhi Iron & Mn Mines of M/s JSW Steel Ltd under Bonai Forest Division of Sundargarh District.

Now, we are submitting herewith the hard copy of the said proposal for your kind information and necessary action.

Thanking You

Yours faithfully

FOR JSW STEEL LTD.

Mrityunjaya Mahapatra

(Authorized Signatory)

Encl: Hard Copies of Forest Diversion proposal.

Received
B. Krishna
27.9.23

ANNEXURE III

OFFICE OF THE PRINCIPAL CHIEF CONSERVATOR OF FORESTS (WILDLIFE)
& CHIEF WILDLIFE WARDEN, ODISHA
Government of Odisha, Forest, Environment & Climate Change Department
PRAKRUTI BHAWAN, PLOT NO.1459, SAHEED NAGAR, BHUBANESWAR- 751007
Phone: 0674-2602250. Website. www.wHdlife.odjsha.gov.in. Email:)J1 I1al-'nldlife,1>gmail_.c_o111

No. C\C:, 0 / CWLW-FDWC-FD-0125-2021
Shubaneswar. Dated the 2:)\ , January, 2022

To /
V'M/s JSW Steel Limited,
JSW Centre Sandra Kurla Complex,
Sandra West, Mumbai - 400051

Sub: Approval of Site Specific Wildlife Conservation Plan for Gonua Iron Ore mines of M/s JSW Steel Ltd. In Bonai Forest Division of Sundargarh District

Sir,

It is to intimate that you have to implement one Site Specific Wildlife Conservation Plan for the above project in compliance to ToR No.A-19 & B-26 (iii) of Proceeding of the meeting held on 9.4.2021 by SEIAA. The Site Specific Wildlife Conservation Plan in respect of the above proJect is hereby approved with financial forecast of **I397.033 lakh** (Rupees three crore ninety-seven lakh three thousand three hundred) only for implementation of activities in project impact area as detailed in the approved plan.

The total cost of 397.033 lakh (Rupees three crore ninety-seven lakh three thousand three hundred) only may kindly be deposited in State CAMPA fund for implementation of activities in project impact area by the DFO, Bonai Division and DFO, Keonjhar Division as per jurisdiction. It is further requested to take note of the following conditions for future compliance.

- The Plan may be revisited after 5 years and the User Agency will give undertaking to contribute towards the revised cost of the Conservation Plan till the project period, if any.
- Should there be need for Site Specific Wildlife Conservation Plan after expiry of the present plan period, the User agency shall submit another such plan at least one year before the expiry of the present Conservation Plan and deposit the outlay amount upon its approval. In case of delay, it will be dealt as per law for violations of Forest (Conservation) Act, 1980/ Environment (Protection) Act, 1986.
- The User Agency shall give an undertaking to bear the differential cost in case of enhancement of wage rate during implementation of the Plan.

Yougy

Encl: Copy of approved SSWLCP

Principal CCF (WL) & CWLW, Odisha

Memo No. 99) /dt 2) \ • <YI"\• j___
Copy forwarded for information and necessary action to the -

1. Special Secretary to Government of Odisha, FE&CC Department, Bhubaneswar
2. Principal Chief Conservator of Forests, Odisha with reference to memo No.57 dt 05.12.2021 of RCCF, Rourkela Circle
3. Regional Chief Conservator of Forests, Rourkela Circle with reference to his memo No.56 dt 05.01.2021
4. DFO, sonai/ Keonjhar Division alongwith a copy of the approved S

Principal CCF (WL) & CWLW, Odisha

SITE SPECIFIC

WILDLIFE CONSERVATION PLAN

For

GONUA IRON ORE MINE

IN VILLAGE GONUA AND PATABEDA UNDER KOIRA TAHASIL

OF BONAI FOREST DIVISION

OF

M/S JSW STEEL LIMITED

BASING ON THE PROCEEDINGS OF THE TOR STANDARD CONDITIONS FOR MINING PROJECT CONDITION NO. 17 & 18

PREPARED BY

DIVISIONAL FOREST OFFICER

BONAI FOREST DIVISION

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ANNEXURES

ANNEXURE NO.	DESCRIPTION
ANNEXURE-I	COPY OF PROCEEDINGS OF THE MEETING OF SEAC DATED. 09.04.2021.
ANNEXURE-II	COST NORM FOR SAL PLANTATION.
ANNEXURE-III	COST NORM FOR SIALI PLANTATION.
ANNEXURE-IV	AUTHENTICATED LIST OF FLORA & FAUNA.

MAPS

PLATE NO.	DESCRIPTION
PLATE-I	MAP SHOWING PROJECT AREA WITH 10 K.M. BUFFER.
PLATE-II	MAP INDICATING ELEPHANT MOVEMENT OF THE AREA.
PLATE-III	MAP INDICATING THE DISTANCE OF PROTECTED AREA TO PROJECT AREA.
PLATE-IV	MAP SHOWING PROJECT AREA WITH 15 K.M. BUFFER.

PREFACE

Pursuant to the Mines and Minerals (Development and Regulation) Act, 1957 and the Mineral (Auction) Rules, 2015, Govt. of Odisha in Steel and Mines Dept. vide their letter No.2279/S&M-JV(Misc.) SM-66I2016 (Pt.-1) Dt.02.03.2020 has *granted Loi in favour of "Preferred bidderN Mis JSW Steel Ltd. for mining in Gonua Iron Ore Mine in villages Gonua and Patabeda for 50 years. The lease Deed has been executed on 27.06.2020 valid upto 26.06.2070.*

This lease area over 88.516 ha includes Forest land over 82. 790 *ha and non-forest land over 5.726 ha. In the Zol five R.* Fs *exist* i.e., *Baitarani R.F. &* Siddhamatha *R.F. of Keonjhar Division and Mendhamaruni R.F., Chamakpur. R.F and Khajurdihi R.F. of Bonai Division. In proceedings of the meeting of SEAC dated. 09.04.2021 put a Condition for preparation of Site-specific Wildlife Conservation Plan for Schedule I faun* i.e., *Elephant, Bear and Python which are noticed in the buffer zone.*

We are thankful to management of Ml s *JSW Steel. Ltd. for providing* us *documents and accompanying during field* visits *which has given fruitful inputs to* this *Plan. We hope if the suggestions prescribed in* this *plan* is *implemented to the true letter and spirit theforest density of the buffer zone will increase and the fauna will get ample of food and water which will diminish man-animal interface.*

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!HH... Jlro!fiPJ}

{Bonai Forest Division)

EXECUTIVE SUMMARY

1. ***Gonua Iron Ore Mine of M/S JSW Steel Ltd*.** is located in villages Patabeda and Gonua in Koira Tahasil of Bonai Forest Division, Sundergarh Dist.
2. The lease area is 88.516 Ha. (As per DGPS) and 86.886 Ha. (As per RoR) ha (Forest area 82.790 Ha. and non-forest area over 5.726 Ha.) has been granted to M/S JSW Steel Ltd vide letter No.2279/S&M Dt.02.03.2020 and executed on 27.06.2020 for 50 years ending 26.06.2070.
3. M/S JSW Steel Ltd. is having Steel Plant with around 27.0 MTPA capacity at five different locations i.e., at Vizianagaram, Karnataka (12 mtpa), Dolvi, Maharashtra (10 mtpa), Salem Tamil Nadu (1.0 mtpa), Bhusan Steel and Power ltd, Jharsuguda (3.0 mtpa) and Monnet Ispat Pvt. Ltd (1.0 mtpa).
4. The forest area included in the lease is Khesera Forest (50.727 ha) and DLC Forest (32.063 ha).
5. Mining Plan has been approved by Regional Control of Mines Bhubaneswar vide letter No.MP/A/20-ORI/BHU/2020-21-2039 Dt.05.11.2020.
6. All the Statutory clearances were obtained by the previous lessee Sri Pawan Kumar Ahluwalia.
7. Pursuant to the provision contained in Rule 9A (2) of the MMD&R Rules, 2016 order that all the valid rights, clearances, licenses and the like vested in the previous lessee in respect of this mine are deemed to have been vested in favour of JSW Steel Plant for a period of 2 years as per State Govt. in Steel & Mines Dept. as per Order No.4212/SM Dt.30.05.2020. It shall be lawful for JSW Steel Limited to commence and continue mining operation on the land in which mining operations were being carried out by ex-lessee (Sri Pawan Kumar Ahluwalia) from the date of execution i.e., 27.06.2020 for a period of two years as provided in Rule 8B (2) of MMD&R Act 1957.
8. Proposal for forest clearance has been applied by M/s JSW Steel Ltd. to MoEF&CC vide Proposal No. FP/OR/MIN/51003/2020 and presently the proposal is under scrutiny by DFO, Bonai Division for compilation of Part II.
9. Environmental clearance has been granted by State Level Environment Impact Assessment Authority vide letter No.7685/SEIAA Dt.21.12.2019 to previous lessee for the production capacity of 1.2 MTPA which will be enhanced to 2.99 mtpa in near future by M/s JSW Steel Ltd.
10. The EC has been transferred to M/s JSW Steel Limited as on 13/12/2021 vide proposal no. SIA/OR/MIN/38069/2005.
11. Consent to operate has been granted by SPCB, ODISHA vide their **letter No. 5515/ IND-I-CON-1539 Dt. 31.03.2021** for air and water.

12. The end use of Iron Ore of Gonua Block will be used in the Plants at Vizianagaram, Karnataka (12 mtpa), Dolvi, Maharashtra (10 mtpa), Salem Tamil Nadu (1.0 mtpa), Bhusan Steel and Power ltd, Jharsuguda (3.0 mtpa) and Monnet Ispat Pvt. Ltd (1.0 mtpa) for manufacturing of Steel.
13. M/S JSW Steel ltd is also having two more leases i.e., Jajang Iron ore mines and Narayanposi Iron and Manganese ore mines in Bonai Forest Division in Sundergarh Dist. Of Odisha.
14. Surface right was granted over the full lease area 102.89 ha (254.25 acres) to the previous lessee during 1967 by ADM, Sundergarh vide letter No.193 Dt.08.03.1967.
15. The total Mineable reserve of Iron Ore under Proved category is 103.009 million Ton Fe grade is +45-55%. Hence reserve available for conceptual period will be 92.50 million Ton. Annual rate of production is 1.2 million ton and hence the life of mine is 31 years with enhanced production capacity.
16. The lease area is hilly with slopes to west with altitude varying from 585-705m above MSL. There is one nala (valley) named as Kakrpani nala which is dividing the lease in to two parts i.e., Gonua and Patabeda.
17. Deposits form part of SE limb of horse shoe shaped Singhbhum-Bonai-Keonjhar synclinorium of Iron ore group.
18. The forests in ZoI (Baitarani R.F. & Siddhamatha RF of Keonjhar Division and Mendhamaruni R.F., Chamakpur RF & Khajurdihi RF in Bonai Division) consists Moist Deciduous, Dry Deciduous and Semi-evergreen types of forests (3C, 5B and 2 B). Pre-dominant sub-type is moist Peninsular high-level Sal with *Anogeissus latifolia* as major associates. Forests are largely, moderately dense with open and scrub types in the mining areas.
19. The fauna noticed in ZoI includes movement of Elephants, Sloth Bear and Python which are in Schedule I of Wildlife Protection Act, 1972 and considered as endangered.
20. This mine area does not form part of any Protected area.
21. The mining process is fully mechanised. There are mainly three numbers of Iron quarries existing. One is in-situ quarry with float iron ore on eastern to western side (Block A), another in north with small workings areas (Block B) and the third in north-middle with trail pits (Block-C).
22. Bench height and width are kept at 6m and 9 m respectively. Ultimate pit at conceptual period will be two large ones.
23. Two screening plants and one crushing plant has been set up by ex-lessee.
24. The perceived impact of mining in Core Zone are habitat loss due to loss of forests, fire hazard, soil erosion, accidental fall of wildlife in to working pits, dust/noise/light pollution and garbage generation.

25. Similarly, the impact in ZoI is fragmentation of habitat, habitat quality loss, for hazard, biodiversity loss, animal depredation, and water pollution from sediments.

26. With a view to mitigate above impacts in Core Zone interventions like Solar fencing around pits over 2.0 Kms, awareness promotion to mine workers, provision of one 2-wheeler & one Four-wheeler has been suggested.

27. Mitigative measures in ZoI consists of Plantation of Provision for plantation of Siali (5000 nos.) in open patch of Mendhamaruni RF, construction of check dams, engagement of fire fighting squad, anti-depredation squad, awareness promotion and providing signage at sensitive locations of elephant pass etc.

This Management Plan has addressed all the above threats with remedial measures to minimize the adversities as detailed below: -

Within the Project area

- Photovoltaic fencing around the active Pit over 2.0 K.M.
- To create awareness among the mine workers.
- Provision of One Motorcycle for protection work to be used by Foresters along with POL.
- Provision of One Four-wheeler (Mahindra Bolero) along with driver and POL for DFO, Bonai.

Within the Impact Area/Buffer zone

BONAI DIVISION

- Provision for plantation of Siali (5000 nos.) in gaps of Mendhamaruni RF.
- Construction of series of check dam.
- Engagement of Fire fighting squad during fire season (February to June).
- Provision of elephant squad to watch movement of the Pachyderms and distract their depredation to villages for crop raiding, house damage and human-wildlife interface.
- Provide Solar Street lights in villages prone to elephant movement
- Fixing of glow signages.
- Awareness Publicity.
- Support to VSS members to mitigate HEC by Provision of Grain Bins.
- Purchase of Wildlife Monitoring equipments.
- Intelligence gathering.
- Elephant Proof Trench.

KEONJHAR DIVISION

- ✓ Provision for plantation of Sal (5000 nos.) in open patch of Baitarani RF.
- ✓ Provision for plantation of Siali (5000 nos.) in gaps of Baitarani RF.

Soil Moisture Conservation activities.

Provision of Solar Street Lights & Provision for a Grain Store House.

Fixing of glow signages particularly on Animal Pass.

Provision for providing Grain Bins.

"'11is Plan has been prepared for 10 years 2021-22 to 2030-31.

""'here shall be a monitoring Committee under the Chairmanship of DFO, Bonai, along with represstentative of Mine Owner, Range Forest Officer, Koira as members. Assistant Conservator of Forests of Bonai Division will be the Member Secretary.

.,..his plan has been prepared as per Condition No.17, 18 and 19 of ToR. However, In the Stage-I approval (Forest Clearance) if any condition will be imposed by MoEF&CC for preparation of Wildlife Conservation Plan, then additional plan may be required to be prepared adding additional interventions.

As per condition no. 1 of revised guideline issued by PCCF (WL) & CWLW, Odisha vide his 'Tierno no. 9094 cit. 17.09.2021, we have taken 10 Km radius from the periphery of the ning Lease area. Since, this project although located in Bonai Forest Division but In ZoI overlaps to Keonjhar Forest Division also; we have taken another ring of 5 Kms extra. So, Plate-IV the map is shown for 10 Kms & 15 Kms also.

""'nis Site-Specific Wildlife Conservation Plan has been prepared basing on Mining Project Condition No.17, 18 and 19 of Proceedings of the ToR Standard Conditions issued by SEAC \State Level Expert Appraisal Committee) dt. 09.04.21.

ne total cost of the conservation plan is **Rs.397.033 Lakhs (Rs. 272.797 lakhs for Bonai Forest Division and Rs.124.236 lakhs for Keonjhar Forest Division)** including **escalation cost @ 20%. To accommodate un-foreseen expenditure the entire amount will be deposited by the User Agency in CAMPA excepting infrastructures loke Motor Cycle and Bolero to be procured by the User Agency and delivered to DFO, Bonai Forest Division.**

Divisional Forest Officer
Bonai Division

CHAPTER-1

INTRODUCTION AND METHODOLOGY

INTRODUCTION

Sundergarh district constitutes three forest divisions namely Sundergarh, Bonai and Rourkela. The important minerals found are iron ore, manganese, bauxite and lime stone. Gonua lease rea is in Bonai Forest Division.

1. A) i) Project Description

Gonua Iron Ore Mine of M/s JSW Steel Ltd. is located in villages Patabeda and Gonua in Koira Tahasil, Bonai Forest Division, Sundergarh Dist.

The 88.516 ha (as per DGPS)/ 86.886 ha (as per RoR) ha (Forest area 82.790 ha and non-forest area over 5.726 ha) has been granted to M/s JSW Steel Ltd vide letter No.2279/ S&M Dt.02.03.2020 and executed on 27.06.2020 for 50 years ending 26.06.2070.

1. A) ii) Extent of project area, land schedule and land use pattern:

Govt. of Odisha in Steel & Mines Dept. vide letter No.2279/S&M Dt.02.03.2020 has granted Gonua Iron Ore Block over an area of 86.886 ha (As per RoR) and 88.516 Ha (As per DGPS) in Villages Patabeda and Gonua in Koira Tahasil, Bonai Forest Division, Sundergarh Dist. in Koira Tahasil of Bonai Forest Division in Koira Tahasil of Sundergarh Dist. for a period of 20 years. Pursuant to the Provisions of 9A (2) of the Rules 2016 order that all the valid rights, approvals, clearances, vested with Sri P.K. Ahluwalia (the previous lessee) are deemed to have been vested with M/S JSW Steel Ltd. As per provisions of Section 8B (2) of the MMDR Act, 1957 all the valid rights, approvals, clearances, are vested in favour of M/S JSW Steel Ltd by Govt. of Odisha for a period of 2 years from the date of execution of the lease i.e., 27.06.2020 which is valid upto 26.06.2070.

This lease area is in Koira Forest Range, Koira Section, Koira Beat. The total land schedule has been furnished in the diversion proposal. It is bounded by Latitude $21^0$55'00.52356" to $21^0$55'46.03440" N & Longitude $85^0$22'04.13616" to $85^0$22'36.35616" E in Survey of India Toposheet NO. 73G/5 (F45L5). This is located at a distance of 05 Kms from Koira Township in Bonai Sub-Division. The nearest railhead is Barsuan on South Eastern Railway, located at a distance of 33 K.Ms. Besides, Barbil and Badjamada are also nearer railheads.

Land use of the project area:

The breakup of the land use is as given below:

Sl. No.	Head	Total Area (ha)	Conceptual Land Use (ha)
1	Area under mining	79.197	79.197
2	Storage for top soil	--	--
3	Waste dump site	--	--
4	Mineral storage	6.04	6.04
5	Infrastructure facilities (Weigh bridge, Work shop, Office, CPU etc.) workshop, administrative building etc.	1.472	1.472
6	Road	1.007	1.007
7	Railways	--	--
8	Green belt	--	1.888
9	Others (Water harvesting Pong, Magazine, road for public use)	1.878	1.878
10	Sub-total	44.926	82.963
11	Safety Zone (along the M.L. boundary and village and Dry nala)	5.553	5
12	Untouched	38.037	0
Grand total		**88.516**	**88.516**

1. A) iii) Project Status of Forest Diversion Proposal and Environmental Clearance:

Forest Diversion Proposal:

The total lease area is 86.886 ha which includes 76.882 ha of forest land (Khesera Forest over 49.513 ha and DLC Forest 27.369 ha). MoEF&CC granted Stage-II vide their letter No.8-47/93-FC dated 07/09.08.1996 for diversion of 54.40 ha of forest land. Diversion proposal for 74.603 ha forest land excluding 2.279 ha for Safety Zone was under process by the ex-lessee. Total broken up area is 48.568 ha which includes 29.379 ha of Khesera Forest and 17.760 ha o DLC Forest and 1.429 ha of non-forest land.

Other statutory clearances:

The ex- lessee was granted Environmental Clearance over 0.36 mtpa of Iron Ore vide MoEF letter No. J-11015/201/2005. IA. II(M) Dt.07.10.2005 For enhancement of production to 1.2 million ton per annum production for Iron Ore, the ex-lessee had applied to MoEF for issue of ToR and MoEF ide their letter No. J-11015/211/2010. IA. II(M) 19.08.2010 had issued ToR. vide SEIAA File No.38069/03-Min-V/09-2019 Dt.21.12.2019. State Level Environment Impact Assessment Authority, Odisha vide their letter No. SEIAA:38069/03-MIN-V/09-2019 Dt.21.12.2019 had granted Environmental clearance to the ex-lessee. ***As per Condition No.26 "the Project Proponent shall take all precautionary measures during mining operation for conservation and protection of endangered fauna, if any, spotted in the study area. Action plan for conservation of flora and fauna shall be prepared and implemented in consultation with the State Forest and Wildlife Dept. A copy of the action plan shall be submitted to MoEF&CC and Regional Office. Accordingly, this Plan has been prepared.***

M/S JSW Steel Ltd. Prepared the Mining Plan of Gonua Iron Ore Block along with Progressive Mine Closure Plan over 88.886 ha as per RoR and 88.516 ha as per DGPS Survey, which has been approved by Regional Control of Mines, Orissa, Bhubaneswar vide his letter No.MP/A/20-ORI-BHU/2020-21 / 2039 Dt. 05.11.2020.

The following Forest Blocks exist in the ZoI. Baitarani R.F. & Siddhamatha R.F. of Keonjhar Forest Division and Mendhamaruni R.F., Chamakpur R.F. & Khajurdihi R.F. of Bonai Forest Division exist in ZoI. Both the Forest Blocks have been included in forest type 3cc 2e(i) i.e., Moist Peninsular High-level Sal. The sub type is confined to the upper slopes, ridges and flat tops of Mendhamaruni R.F. The quality of Sal is IV but the crop is somewhat open. Within the Sal belt there are patches of mixed forest with *Anogeissus latifolia* as dominant species. Regeneration of Sal is fairly good but repeated fire every year, influence floristic composition significantly. Indicative species composition is as under: -

Top Canopy *Terminalia alata* (Asan), *Anogeissus latifolia* (Dhaura), *Syzygium cuminii* (Jamun), *Pterocarpus marsupium* (Bija), *Madhuca indica* (Mahul).

Middle Canopy *Careya arborea* (Kumbhi), *Bauhinia purpurea* (Lebha), *Bridelia retusa* (Kasi), *Ougeinia oogeinensis* (Bandhan), *Lannea coromandelica* (Mai).

Under Growth *Indigofera pulchela* (Giliri), *Helecteris isora* (Moda fal), *Flemengia bracteata* (Salparni).

Climbers *Bahunia valii* (Siali), *Smilax macrophylla* (Muturi).
Grasses *Themeda triandra* and *Imperata cyndicral*.

Bamboo is significantly absent.

1. B) VILLAGES LOCATED WITHIN THE STUDY AREA, THEIR DEMOGRAPHIC AND OCCUPATIONAL PROFILE:

There are 26 villages in the project impact area i.e., 10KM radius. There are 4 villages with population more than 1000, 11 villages with population between 501-999 and 11 villages with population less than 500. Total population in the above 26 villages are 18,883 out of which SC population is 87%. The level of literacy is 24%, main workers constitute 37% and non-workers 52%. Cultivators and agriculture labour constitute 10% and marginal workers only 1%.

1. B) i) Existing cropping pattern:

The study area is drought prone with a large extent of unfertile land. People of this area mainly depend on mining for their day-to-day livelihood. In course of time, cultivation has become less important for them. However, paddy is the main crop and people also grow vegetable for their own consumption. From the present survey it reveals that agriculture is not the major source of livelihood for the inhabitants of the ZoI. Climatic condition is also not conducive for agriculture. Even then a good farming community is there in the buffer zone. The following table reals that about 34% respondents are in marginal and small farms category. Thus, these two categories jointly account for about 68% of the total house hold in the study area. There are 24% medium and 8% large farmers. These two categories together account for about 32% of the house hold.

Sl. No.	Holding Size (Acre)	Household (5)
1.	Marginal (, 2.5)	34.2
2.	Small (2.5 to 5.0)	34.2
3.	Medium (5.0 – 10.0)	23.7
4.	Large (. = 10.0)	7.9
	Total	**100.0**

The local people are mostly tribal. They do not have their own wood-lot. The majority of forest blocks of Bonai Forest Division are dominated with plants like Sal and its associates i.e., Asan, Kusum, Char, Mahul, Myrabolans etc. Tribal collect small timber, fire wood, Sal seeds, Sal leaves, Sal resin, char seeds, Kusum seeds, Myrabolans, mahua flower and Karanja seeds, babul seeds, Siali leaf and fibers, Dhatuki flower, Bhuineem, Banahaladi, Bana kulthi, jangli mango, ambada, tamarind, kanta bandhuni, phul bandhuni, bana tulsi, gums and resins etc. Kendu leaf is another important NTFP in Keonjhar Dist. In the leisure period, tribal prefer to go inside the forest in a group for poaching of small game like hare, civet, mongoose, monitor lizard, Quail, etc. Besides, in seasonal nala, tribals also practice fishing by draining the water and share the collection mostly for their house consumption. In

addition, they are in the practice of collecting climbers for basket making (Atundi), rope from murga (Agave sp.) and Siali fiber for house roof thatching. They also collect bamboo twigs for fishing-rod and green bamboo for basket making.

The local inhabitants also depend on forests for grazing their cattle and at places for shifting cultivation. The village cattle herd normally visit the adjoining forest area. The cattle those visit the forest for grazing every morning, at times suffer from seasonal diseases like FYM. This disease possibly may contaminate to Wildlife like Chital, Sambar, Wild boar, etc. (hooved animal).

1. B) ii) Extent of biotic pressure of villages on forest resources:

The extent of biotic pressure of adjoining villagers on forest is heavy. Villagers entirely depend on forest for their firewood, small timber for mud-hut construction and fodder for their cattle. They let loose their cattle every morning in the forest for grazing who return back at their own accord when dusk drops down. At times they set fire to the forest facilitation of collection of Non-Timber Forest Produce especially Kendu leaf, Mahua, Char seeds etc.

1. B) iii) NTFP (Non-Timber Forest Product) Collection (Method of Collection and Impact on Wildlife):

This is a tribal belt. Tribal are the nomadic inhabitants of the forest. The tribal are in habit of collecting fruits and nuts, bamboo, thatching grass, Mahua, Myrabolans, Root tubers (Dioscoreaceae), neem seeds, Char, Bel, Kaitha *(Feronia elephantum*), Babul (*Acacia nilotica*), Bana Bhalia (*Semicarpus anacardium*), *Rohini (Soymida febrifuga),* Medicinal plants, Wax, broomstick, resin, Mango Kernel etc. from the forest. They are also in the practice of collecting tender Sal leaves for plate making. Honey and Jhuna (resin from Sal tree) collection are infrequent in the study area. However, during our survey, we did not find any family entirely dependent on NTFP collection. The leftover family members of the main workforce (old age people and women) are mostly engaged in NTFP collection. They collect their fencing materials and material required for preparing agricultural tools from timber from the adjoining forests.

Tribal are still in the practice of hand-picking of NTFP like Mahua flower, Sal seeds etc. Self–help group formulated in these areas are in practice of preparing pampad, pickle, Juice, incense stick etc. but still more emphasis needs to be given for the commercial collection of NTFP and marketing by ORMAS. The tribal of this area find exposure only during District level Fair, or during the tribal fair held at Bhubaneswar every year from January 26th for a month.

1. B) iv) Method of NTFP collection

Many local villagers depend on adjoining forests areas for collection of Mahua flower, Kendu leaf, Sal Seed etc. For their bonafied consumption and trade. No specific Guideline in this regard is in operation. NTFP like Kendu Leaf, Sal Seeds, Mohua flower, Myrabolans et. Are a major source of income of tribal. The State Forest Dept, Odisha, OFDC, TDCC purchase NTFP to save tribal being mishandled by traders. In the ZoI around 300 families depend on collection of NTFP. Especially for collection of Mahua flower and Sal Seed, the undergrowth available is cleared by Tribal and burn twice in a year for smooth collection of the same. Collection of Mahua flowers, Myrabolans, fruits of Kendu, Char, the tribal deprive the Wildlife like ungulates, bear, birds and rodents from their share of food.

Now Gram Panchayat is empowered to deal with NTFP and they are not aware of its sustainability. A calendar of collection of NTFP and process should be supplied to the Gram Panchayat Office, Range Office and Beat Office. For collecting NTFP from the ground, villagers clean the forest floor by igniting fire, which destroys the ground vegetation, as well as restricts the regeneration of tree species. Repeated use of fire adversely affects the ground nesting mammals, birds and reptile population. Due to the impact of this unscientific cleaning process, the ground becomes completely barren at places to infiltrate the rainwater flow resulting in reduced sub-soil water table and accelerating the process of soil erosion.

1. B) v) Cattle Population and Grazing Habit:

It is ascertained from the local villagers that, they have nearly 5,000 cattle, 3000 goat and 2,000 Pigs not for mulching but for trade. These animals are allowed to graze in the forest freely as stall feeding has not yet been adopted by tribal. Sometimes these cattle become the source of contaminating wildlife for disease like FYM.

1. C) Description of Topography, Natural Drainage Lines

Topography

The lease area is moderately flat, though their area occasional mounds within the area studded with flat topped low ridges, reassembling a relict type of topography controlled by differential harness of rocks. The maximum RL within the area is 684 K.M. to the southern part of the lease area and minimum RL is 621 M at the north east side.

Drainage

There is a dry nala originating from the middle of northern half of M.L. area at 605m, 1.5 Km to the west of lease boundary flows northwards and drains to Kundra nala as well as Karapani nala. Other major drainage channels are Tehrai nala of South West of the M.L., Kundra nala on South West as well as North of the lease and Baitarani River on the east.

Climate

Climate and meteorology of a place play an important role in the implementation of any developmental Project. Meteorology is also the key to understand local air quality as there is essential relationship between meteorology and atmospheric dispersion involving the wind in the broad sense of them.

Temperature

The climate of the study area is characterized by an oppressively hot summer with high humidity. Summer generally commences in the month of March and continue till end of June. Temperature begins to rise rapidly attaining the maximum in the month of May (47.4^0) Celsius. No doubt the weather becomes pleasant on the unset of monsoon in 2^{nd} week of June an continues upto end of October. The temperature in the month of December cools down to 07^0 Celsius.

Relative Humidity:

The air is dry excepting during the South-West monsoon season. The maximum humidity ranges from 55% to 76% with annual average of 64.83% while the minimum humidity range from 26% to 43% with an annual average of 34%.

Rainfall

There is variation of rainfall in the catchment area and around 10 Kms radius of buffer zone of this mine. The average annual rainfall of Bonai sub-division is 1364.66mm as computed from last 10 years data out of which a major portion i.e., 92% occurs from July to September.

Pre-dominant wind direction

This is south-west area which remains calm for nearly 50% of the year.

1. D) Details of linear infrastructures

Rail: The nearest railhead is at Barbil of S.E. Railways and is 33 km. away. The station is connected to Howrah by a daily Jan Shatabdi Express, Barbil being the nearest loading point.

Road: The mine is approximately 106 km from Chaibasa and 122 km away from Rourkela. It is 9 km from Barbil-Rourkela National Highway No. 215.

River: Baitarani River is existing on the ZoI on the East of the M.L. area.

1. E) Description of Flora and Fauna:

As per the field study, the list of flora and fauna available in the area is as detailed below.

FLORAL DIVERSITY:

Table: Habit-wise status of floristic composition of study area

Sl.No.	Habit	Core Zone	Buffer Zone
1	Trees	15	13
2	Shrubs & Herbs	05	05
3	Climbers	06	06
4	Grasses	02	02
5.	Aquatic Flora	-	10
6.	Agricultural Crops	-	16
TOTAL		**28**	**52**

Core Zone:

In total 28 plant species belong to 15 trees, 06 climbers and 02 grasses, 05 shrubs and herbs were recorded during the field survey. The details list of flora is given in list of Flora is given in Table No. I.

Buffer Zone:

In total 52 plant species belong to 13 trees, 05 shrubs, 06 climbers, 02 grasses, 10 aquatic flora and 16 species of agricultural crops were recorded during the field survey. The details list of flora is given in list of Flora is given in Table No. II.

Table No. I

LIST OF FLORA IN THE CORE ZONE GONUA IRON ORE MINES			
TREES			
Sl.No.	**Local Name**	**Scientific Name**	**Family**
1.	Asan	*Terminalia alata*	Combretaceae
2.	Bahada	*Terminalia belerica*	Combretaceae
3.	Bana Bhalia	*Semicarpus anacardium*	Anacardiaceae
4.	Char	*Buchnania lanzan*	Anacardiaceae
5.	Chhatian	*Alstonia scholaris*	Apocynaceae
6.	Dhaura	*Anogeissus latifolia*	Combretaceae
7.	Harida	*Terminalia belerica*	Combretaceae
8.	Jamun	*Syzygium cuminii*	Myrtaceae
9.	Kendu	*Diospyrus melanoxylon*	Ebenaceae
10.	Kasi	*Bridelia retusa*	Euphorbiaceae

11.	Kumbhi	*Careya arborea*	Myrtaceae
12.	Kusum	*Schleichera oleosa*	Sapindaceae
13.	Kurum	*Adina cordifolica*	Rubiaceae
14.	Mahul	*Madhuca indica*	Sapotaceae
15.	Sal	*Shorea robusta*	Dipterocorpaceae
LIST OF FLORA IN THE CORE ZONE GONUA IRON ORE MINES			
SHRUBS/HERBS			
Sl.No.	**Local Name**	**Scientific Name**	**Family**
1.	Anantamula	*Hemidesmus indicus*	Asclepidaceae
2.	Arakha	*Calotropis gigantia*	Asclepidaceae
3.	Basanga	*Adhatoda vasica*	Acanthaceae
4.	Dhatki	*Woodfordia fruticosa*	Lythraceae
5.	Kurei	*Holarrhena antidysenterica*	Apcynaceae
LIST OF FLORA IN THE CORE ZONE GONUA IRON ORE MINES			
CLIMBERS			
Sl.No.	**Local Name**	**Scientific Name**	**Family**
1.	Atundi	*Combretum decandrum*	Combretaceae
2.	Baidanka	*Mucuna monosperma*	Papilonaceae
3.	Bichhuati	*Urtica dioica*	Euphorbiaceae
4.	Mututri	*Smylax macrophylla*	Liliaceae
5.	Siali	*Bauhinia valii*	Papilonaceae
6.	Satabari	*Asparagus racemosus*	Liliaceae
LIST OF FLORA IN THE CORE ZONE GONUA IRON ORE MINES			
GRASSES			
Sl.No.	**Local Name**	**Scientific Name**	**Family**
1.	Khara grass	*Imperata cylindrical*	Gramineae
2.	Phulabandhuni	*Thysanolaena maxima*	Gramineae

Table No. II

LIST OF FLORA IN THE BUFFER ZONE GONUA IRON ORE MINES			
TREES			
Sl.No.	**Local Name**	**Scientific Name**	**Family**
1.	Bel	*Aegle marmelos*	Rutaceae
2.	Bahada	*Terminalia belerica*	Combretaceae
3.	Bana Bhalia	*Semicarpus anacardium*	Anacardiaceae
4.	Dhaura	*Anogeissus latifolia*	Combretaceae

5.	Dimiri	*Ficus glomerata*	Moraceae
6.	Haldu/Karam	*Adina cordifolia*	Rubaceae
7.	Harida	*Terminalia chebula*	Combretaceae
8.	Jamun	*Syzygium cuminii*	Myrtaceae
9.	Jack fruit	*Artocarpus heterophyllus*	Moraceae
10.	Kendu	*Diospyrus melanoxylon*	Ebenaceae
11.	Kusum	*Schleichera oleosa*	Sapindaceae
12.	Kasi	*Bridelia retusa*	Euphorbiaceae
13.	Tamarind	*Tamarindus indicus*	Ceasalpiniaceae
LIST OF FLORA IN THE BUFFER ZONE GONUA IRON ORE MINES			
SHRUBS/HERBS			
Sl.No.	**Local Name**	**Scientific Name**	**Family**
1.	Anantamula	*Hemidesmus indicus*	Asclepidaceae
2.	Arakha	*Calotropis gigantia*	Asclepidaceae
3.	Basanga	*Adhatoda vasica*	Acanthaceae
4.	Dhatki	*Woodfordiafruticosa*	Lythraceae
5.	Kurei	*Holarrhena antidysenterica*	Apcynaceae
LIST OF FLORA IN THE BUFFER ZONE GONUA IRON ORE MINES			
CLIMBERS			
Sl.No.	**Local Name**	**Scientific Name**	**Family**
1.	Atundi	*Combretum decandrum*	Combretaceae
2.	Baidanka	*Mucuna monosperma*	Papilonaceae
3.	Bichhuati	*Urtica dioica*	Euphorbiaceae
4.	Mututri	*Smylax macrophylla*	Liliaceae
5.	Siali	*Bauhinia valii*	Papilonaceae
6.	Satabari	*Asparagus racemosus*	Liliaceae
LIST OF FLORA IN THE BUFFER ZONE GONUA IRON ORE MINES			
GRASSES			
Sl.No.	**Local Name**	**Scientific Name**	**Family**
1.	Khara grass	*Imperata cylindrical*	Gramineae
2.	Phulabandhuni	*Thysanolaena maxima*	Gramineae
LIST OF FLORA IN THE BUFFER ZONE GONUA IRON ORE MINES			
AQUATIC FLORA			
1.	Padma	*Nilumbo nucifera*	Nymphaeaceae
2.	Dhala Kain	*Nymphaea alba*	Nymphaeaceae
3.	Lal kain	*Nymphaeanouchalli*	Nymphaeaceae
4.	Boro Jhanji	*Pistia stratiotes*	Araceae

5.	Pani siuli	*Nymphoides indiccum*	Nymphaeaceae
6.	Chingudia dala	*Hydrilla verticillata*	Hydrocharitaceae
7.	Kalama Saga	*Ipomoea aquatica*	Convuolvulaceae
8.	Sunsunia saga	*Marsilea minuta*	Marsileaceae
9.	Fern	*Azolla imbricata*	Azollaceae
10.	Fern	*Pteridium aqullinum*	Dennstaedtiaceae
LIST OF FLORA IN THE BUFFER ZONE GONUA IRON ORE MINES			
AGRICULTURAL CROPS			
1.	Mung	*Vigna radiata*	Fabaceae
2.	Horsegram	*Delichos biflorus*	Fabaceae
3.	Groundnut	*Arachis hypogeae*	Fabaceae
4.	Alasi	*Guizotia abyssinica*	Asteraceae
5.	Kandula	*Cjanus cajan*	Fabaceae
6.	Onion	*Allium cepa*	Amaryllidaceae
7.	Garlic	*Allium sativum*	Amaryllidaceae
8.	Mustard	*Brassica campestris*	Brassicaceae
9.	Maize	*Zea mays*	Poaceae
10.	Paddy	*Oryza sativa*	Poaceae
11.	Wheat	*Triticum aestivum*	Poaceae
12.	Brinjal	*Solanum melangena*	Solanaceae
13.	Tomao	*Lycopersicum esculantum*	Solanaceae
14.	Chilly	*Capsicum annum*	Solanaceae
15.	Bitter gourd	*Momordica charantia*	Cucurbitaceae
16.	Cucumber	*Cucurbita sativa*	Cucurbitaceae

FAUNAL DIVERSITY:

The Core site is a mining dominating landscape and therefore not much sightings of animal was possible. The faunal diversity in the core area was limited to squirrels and rats and. The core area has a very poor Avifaunal diversity. Possibility of bigger mammals is very low due to the cumulative disturbance caused by the mine dominated landscape. In the Buffer region due to the presence of Reserve forests, there was a good diversity of Birds.

To study faunal diversity and richness in the area, random sightings were preferred and various methods of observation were practiced. For reptiles, stone lifting was done; rock crevices and wall space of structures in the site were checked. Amphibians were searched near the stagnant water pools and small streams. Insects were observed on underside of leaves, nests, rock crevices, bushes and other places. Birds were studied by undertaking several field trails in and around the site.

The observations made during the study phase in the site are as follows:

Mammal diversity:

No mammals other than common squirrel and domesticated cows or dogs were seen in and around the core site. On random survey and talking with local people, it was learnt that Jackals, elephants and Sloth bear are found in the reserve forest areas in the buffer region. On the basis of direct sightings, questioners and indirect evidences, the presence of faunal species such as Barking deer, Jackals and Chital were validated.

List of Mammals that can be found in the buffer region is attached in the **Table.**

Avian diversity:

In areas falling within the core zone (lease area) and adjoining areas, 08 species of birds were observed during the study. The observation was made based on direct sightings and birdcalls. In the observed list of birds, none of the species were classified as Endangered or rare. All of these birds observed were of least concern classification. It must be noted here that though the bird's species recorded during the survey are of least concern classification, necessary steps must be undertaken to reduce the impact on the reserve forest areas that support majority of the Avian diversity. A list of Bird species observed during the study is shown in Table.

Reptile and Amphibian diversity:

During the survey, 2 species of reptiles was found in areas close to the project site. On expanding the survey to nearby ranges in the Buffer region, 06 Species of reptiles were encountered. The list of Reptiles species is shown in **Table.**

There is no Wild Life Sanctuary or National Park within the study area of 10 km. The detailed faunal species is as follows:

FAUNA WITHIN CORE ZONE:

MAMMALS			
Sl.No.	**English Name**	**Scientific Name**	**Schedule as per WPA**
1.	Indian Palm Squirrel	*Funambulus pennanti*	II
2.	Jungle Cat	*Felis chaus*	II

3.	Rat	*Rattus rattus*	V
4.	Rabbit	*Lepus nigricolis*	IV
REPTILES			
Sl.No.	**English Name**	**Scientific Name**	**Schedule as per WPA**
1.	Chameleon	*Chameleon zeylanicus*	II
2.	Krait	*Bungarus caeruleus*	II
BIRDS			
Sl.No.	**English Name**	**Scientific Name**	**Schedule**
1.	Weaver bird	*Ploccus phillipinus*	IV
2.	Cuckoo	*Eudynamis Scolopaceus*	IV
3.	Crow	*Corvus splendens*	V
4.	Parrot	*Psittacula krameri*	IV
5.	Pigeon	*Columba livia*	IV
6.	Sparrow	*Passer domesticus*	IV

FAUNA WITHIN BUFFER ZONE:

MAMMALS			
Sl.No.	**English Name**	**Scientific Name**	**Schedule**
1.	Indian Elephant	*Elephas maximas*	I
2.	Sloth Bear	*Melursus ursinus*	I
3.	Jackal	*Canis aureus linnaeus*	II
4.	Rhesus Macaque	*Macaca mulata*	II
5.	Hanuman Langur	*Presbytis entellus*	II
6.	Spotted Deer	*Axis axis*	II
7.	Jungle cat	*Felis chaus*	II
8.	Barking deer	*Muntiacu muntjak*	III
9.	Mongoose	*Herpesres edwardis*	IV

10.	Rabbit	*Presbytes entellus*	IV
11.	House Rat	*Rattus rattus*	V
REPTILES			
Sl.No.	**English Name**	**Scientific Name**	**Schedule**
1.	Indian Python	*Python molurus*	I
2.	Rat Snake	*Ptyas mucosus*	II
3.	Cobra	*Naja naja*	II
4.	Russel's viper	*Viper russelli*	II
5.	House gecko	*Hemidactylus flaviviridis*	IV
6.	Indian Chameleon	*Chamaeleo zeylanicus*	IV
BIRDS			
Sl.No.	**English Name**	**Scientific Name**	**Schedule**
1.	Weaver bird	*Ploccu phillipinus*	IV
2.	Cuckoo	*Eudynamis Scolopaceus*	IV
3.	Crow	*Corvus splendens*	V
4.	Parrot	*Psittacula krameri*	IV
5.	Pigeon	*Columba livia*	IV
6.	Sparrow	*Passer domesticus*	IV
7.	Red Jungle fowl	*Gallus gallus*	IV
8.	Blue Jay	*Coracias benghalensis*	IV

FISH DIVERSITY RECORDED IN BUFFER ZONE:

BIRDS		
Sl. No.	**English Name**	**Scientific Name**
1	Bata	*Labeo bata*
2	Labeo kalbasu	*Labeo calbasu*
3	Katla	*Catla catla*
4	Magur	*Clarias batrachus*
5	Mirgal	*Cirrhina mrigala*
6	Rohu	*Labeo rohita*

N.B.- The authenticated list of Flora and Fauna for both the Project area (Core Zone) and the buffer zone has been attached in Annexure-III.

Details of Endemic, threatened and Scheduled Species

No endemic species is noticed either in the Core or Zone of Influence. As far as, threatened fauna is concerned, all Schedule-I species is threatened. **Schedule-I species like Elephant, Sloth Bear, Python** are noticed in ZoI.

1. F) i) Description of Forest and habitat condition

Forest Type:

This lease area is in Koira Range, Malda Section and Gonua beat of Bonai Division. This proposal covers 86.886 ha (as per RoR) and 88.516 Ha (as per DGPS) which is distributed in two Villages i.e. Patabeda over 19.918 ha and Gonua over 66.968 ha. Out of the total lease area, forest land covers 76.882 ha which includes 49.513 ha of Khesera Forest and 27.369 ha of DLC land. Out of the balance area 10.004 ha is non-forest land including private tenanted land of 3.003 ha.

In the ZoI Baitarani R.F. & Siddhamatha R.F. of Keonjhar Divn. Exist and Mendhamaruni R.F. Chamakpur R.F.& Khajurdihi R.F. of Bonai Division. These R.Fs have been classified in Champion and Seth's classification as forest type 3C/C2e(i) Moist Peninsular High level Sal. The sub-type is confined to upper slopes, ridges and flat tops of Mendhamaruni and Karo blocks. The quality of Sal is IV but the crop is somewhat open. Regeneration of Sal is fairly good but repeated fire (every year) influences floristic significantly indicating species composition as mentioned below: - Within the Sal belt there are patches of mixed forest with Dhaura (*Anogeissus latifolia*) as dominant species. Sundergarh Dist. has a Forest Cover of However, Karo RF, Baitarani R.F. and Mendhmaruni R.F. exist in the ZoI. These forests have been included in forest type sub-group 3C-Northern Indian Tropical Moist Deciduous Forest, 5B-Northern Tropical Dry Deciduous Forest, 2B Northern tropical semi-evergreen forest. The quality of Sal is usually IV but the crop is somewhat open. In these areas, the patches of mixed forests with predominance of *Anogesissus latifolia* are also found within the Sal belts. Regeneration of Sal is fairly good but there is risk of repeated annual fire. The area is however free from frost. The common associates of Sal in the top canopy are *Terminalia alata* (Asan), *Anogeissus latifolia* (Dhaura), *Syzygium cuminii* (Jamun), *Lagerstroemia parviflora* (Patuli), *Pterocarpus marsupium* (Bija). The middle storey contains *Careya arborea* (Kumbhi), *Bauhinia purpurea* (Kanchan), *Bridelia retusa* (Kasi), *Ougeinia oogeinensis* (Bandhan). *Wedlandia excelsa*. *Helectoris isora* (Modaphal) and *Indigofera pulchela* are commonly found as undergrowth. The common species of climbers available are *Bauhinia vahlii* (Siali) and *Smylax macrophylla* (Muturi). *Themida* and *Imperata* are the common grasses. Bamboo species like *Dendrocalamus strictus* (Salia) does not occur in this sub-type.

Forest Condition According to FSI Report:

As per FSI Report 2019, Sundergarh Dist has a Geographical area over 9712 Sq.Km. Total Forest Area is 4273.37 ha (44% of Geographical area) which include 1020.87 Sq.K.M. of Very Dense Forest (Canopy Density above 70%), 1858.39 Sq.K.M. of Moderate Dense Forest (Canopy density 40% to 70%), Open Forest 1394.12 Sq.K.M. (Canopy Density 10 to 40%). Within last two years (2017 to 2019) forest in this district has increased over 9.37 Sq.K.M.

1. F) ii) Wildlife habitat and prevailing wildlife scenario:

From the Data Collected from villagers of ZoI and field executives of Forest Dept. it appears the presence of Elephants in the area and from the wildlife-human conflict data, presence of bear is confirmed. Presence of other wildlife is mentioned in the list of fauna**.**

The habit and habitats of particularly Schedule-I species are narrated below-

Elephant (*Elephas maximus*):

Habit: Elephants are social animals and live-in herds, which vary between 3–6. The Elephants are matriarchal and the herd is led by the oldest female. Herd usually breaks into clans and rejoins again. For long-distance movement some time a few herd mixes and form a big group which is coordinated by the oldest female for searching for better habitat – food and water. Several herds maintain contact through sub-sonic vocalization according to findings on work with African Elephants. Adult males remain away from the herd and occasionally join with the herd when females are in oestrous. They are polygamous. Only dominant males have the chance to mate with females. Old males usually lead a solitary life, while sub-adult males some time form an unstable group of 2 to 7 animals. Such a group is known as *Muljuria* group. Elephants are very sensitive to hot and prefer shady moist areas during noontime. The matriarch herds, as well as males, are long-ranging. Their home Range varies between 150 and 1200 sq km, depending on the habitat condition. An Elephant may run at a speed of 45 km per hour for a short distance for two to five minutes. Their average life span is the same as human beings, and around 70 years. In Elephant there is no seasonality in oestrous cycle, and the interbirth interval varies from 3 to 5 years, depending on the habitat quality. The gestation period is 18 to 22 months and the suckling period is around one and a half years. Young calves start taking grass from 6 months onwards. Mother continues to bestow maternal care to their offspring for several years after weaning. The sense of touch and hearing is well developed in Elephant but its eyesight is poor. Most males have prominent tusks, while some time females have tushes which are hardly visible from

outside. Male Elephants sometime have only one tusk (known as *Ganesh*), or even without tusk (known as *Makhna*). They have 6 sets of molar teeth, of which only one set is in use at a given time. With the loss of the last set of molar teeth they are deprived of taking any food and eventually do not survive. The unique identity of Elephant is his trunk with a single finger-like tip at the end and it has versatile utility, used in eating, drinking, smelling, breathing, touching, washing & dusting of the body, fighting, and vocalizing. Mud wallowing is fun for the Elephants, though it protects them from insects and sun.

Habitat: The body size and food requirement of this non-ruminant "mega-herbivore" have made the Elephant a generalist vegetarian to feed on a variety of plant species. Even within one region, they feed on well over a hundred species of plants. They not only depend on leaves, fruits & twigs but also consume barks, roots, stem pith, flowers, grasses and salt with soil. Though, depending on seasons they select distinctly different plant parts depending on their availability. In the dry deciduous Forest region, their dietary habit usually alternates between predominantly grazing during the wet season and browsing during the dry season. In quantitative terms, they prefer grasses, reeds, and sedges (Poaceae and Cyperaceae). Their preferred tree families are Combretaceae, Euphorbiaceae, Moraceae, Malvaceae, and Legumes. They cannot survive entirely as grazers. Thus, browse species are extremely important in the nutrition of Elephant. On average, take 150 kg of vegetation and 100 liters of water per day. The efficiency of digestion is poor (40 to 45%) with the symbiotic bacteria in the stomach. They are in constant motion while feeding and generally cover 15 to 20 km in a day. Elephants are well established in dry deciduous Forests to moist evergreen Forest.

Human activities like agriculture (cultivation of crop, irrigation system); development works (Roads, Railways, Townships, Dams, Industries, and Mines etc.) are fragmenting their habitat and creating obstructions to their movement which they traditionally follow. They are in conflict with human when they move through that fragmented area and also damage various cultivated crops (like paddy, ragi, banana, sugar cane etc.

Sloth Bear (*Melursus ursinus*):

Distributed throughout the Odisha, except a few areas of the coastal Districts and is an endangered species.

Habit: Sloth Bear has a long snout and lips are detached from the gum and are well adapted to the forceful intake and expulsion of air. The absence of a middle pair of incisors in the upper jaw permits the passage of air freely. The tongue is large protractible. Long claws of the forelimbs (longer than hind limbs) are good instruments of digging. The animal produces enough suction force to suck out termites from mounds.

Bears are nocturnal in habit, their sense of smell is well developed than their sight and hearing. During an accidental encounter with a human being, they cause severe damage to the human or even death. When they have cubs, they move with them, otherwise, they are solitary or are in pair with the opposite sex. They have a specific breeding season. Mating takes place in June or July and they give birth to cubs in caves during December and January. Litter varies between 1 and 3 cubs. Parental care lies with mother only. Their average life span is around 40 years.

Habitat: They are in good number in drier and secondary Forests are also found in dense forests. They are omnivorous in nature. They feed on tubers, roots, grubs, various fruits, various insects, honey, termites, flowers (mahua, simul, etc.). It also damages sugar cane crop, maize, etc. Their home Range is limited and restricted. In the quest of food, they may travel several kilometres. It is believed that their gall bladder and bile have medicinal properties and hence they are exposed to poaching, particularly due to the demand of these parts in China and other southeast Asian countries.

Indian Python (*Python molurus*):

Habit: This is a non-venomous snake and can grow up to 4m and weigh 45 kg. The colour is dark brown to yellowish-white in a blotched pattern. They are very good swimmers and take to water when disturbed but on land, they hiss and remain motionless. The species is oviparous and lay up to 100 eggs in a clutch protected and incubated by the female. Being exothermic, python basks in open but can also raise body temperature by muscular contraction.

Habitat: Python occurs in wide Range of habitats viz. rocky foothills, grasslands, marshes, swamps, woodlands, open jungle. At times, they take refuge in mammal burrows, hollow trees etc. It has also been reported close to habitation and crop fields. The snake feeds on small mammals, birds, and reptiles but prefers the first. Chital deer, fawns, hares, mouse deer, jungle fowl are natural food.

It can swallow prey bigger than its size as the jaw bones are not hinged. The prey is constricted to death by muscular movement and swallows headfirst. Once held in the jaw, prey cannot escape because of inward bent teeth.

It is listed as one of the Lower Risk /Near Threatened species according to IUCN Red List.

1. G) Movement of mega Wildlife

Elephant is the flagship species of this area and the only mega herbivore (wildlife) with long ranging movement behaviour, present in the study area. Elephants follow streams but move in valleys and unless hard pressed try to avoid hilly terrain to conserve energy. There was movement of elephant between:

Baitarani - Siddhamath - Karo - Mendhamaruni - Khajuridihi and vice versa.

1. H) Man-animal conflict and Depredation caused by the wild animals:

As per the record available in **Bonai Forest Division** 33 house damage cases have yet been recorded, 12 in 2016-17, 15 in 2017-18 and 06 in 2018-19.

So far human kill is concerned, 01 case have been reported in 2017-18 and01 case in 2018-19. So far human injury is concerned, no case has been reported.

From 2016-17 to 2018-19, 01 elephant and 01 wild boar have died due to Human-Animal conflict i.e., 01in 2016-17 and 01 in 2018-19.

As per the Divisional record found 68.62 acre of crops were damaged by the elephant have yet been recorded,40.30 acre in 2016-17 197.followed by 5.44 acre in 2017-18 and 22.88 acre in 2018-19. In all the cases compensation has been paid to the victims.

House damage by Elephants

Year	No. of Houses damaged
2016-17	12
2017-18	15
2018-19	6

Human Death by Wild Animal

Year	Human Death	Animal causing human death
2016-17	Nil	-
2017-18	One	Elephant
2018-19	One	Elephant

Human Injury by Wild Animal

Year	No. of Human involved	Animal causing injury
2016-17	Nil	-

2017-18	Nil	-
2018-19	Nil	-

Details of death of wild animals

Year	Date	Animal killed	Location	Cause of death
2016-17	12.05.2016	Female Elephant-1	Teherai Khesra Forest, Tehrai Beat. 21o54'33.5" N & 85o17'0.7" E	Natural
2017-18	-	Nil	-	-
2018-19	11.10.2018	Wild Boar - 1	Podadihi Khajuridihi Beat	Poaching

Crop damage by Elephants

Year	Crop area damaged in Ac.	Compensation paid in Rs.
2016-17	40.30	4,03,000
2017-18	5.44	54,400
2018-19	22.88	2,28,800

Cattle kill by Wild Animal

Year	Name of Human Kill	Date & place of occurrence	Location
2016-17	- NIL -		
2017-18	- NIL -		
2018-19	- NIL -		

1. I) Working Plan Prescription

The Project area consists of Revenue Forest and DLC Forest which have not been included in the Working Plan. However, Baitarani Reserve Forest of Keonjhar Forest Division and Mendhamaruni R.F. of Bonai Divn. exists in the ZoI.

Baitarani Reserve Forest was included in Selection Working Circle in the last Working Plan ending 2016-17. Sal conversion and coppice system which had been adopted in the last plan could not achieve the desired objective and therefore it has been included in Selection Working Circle. The special objects of management for this Working Circle are given below:

1. To improve the density and composition of forest crop and to encourage the natural regeneration and establishment of principal species by taking suitable silvicultural operation with due emphasis on soil and water conservation.
2. To resort to artificial regeneration wherever necessary.
3. In consistence with primary objective, removal of mature and silvicultural available trees before they become unsound, on sustained yield basis.
4. Removal of unsound and defective trees under improvement felling so as to improve and increase the stocking of principal species.

Likewise, this M.L. area being revenue forest and DLC Forest may be required to be treated according to the prescriptions for **Rehabilitation Working Circle.** The objects of management of this working circle as per the approved Working Plan **of Bonai Division** are: -

1. To tend and improve the existing growing stock through suitable silvicultural measures.
2. To regenerate the barren and blank patches by planting suitable site exacting hardy species.
3. To rehabilitate and improve the productivity of the depleted and degraded forest through enrichment plantation and other suitable measures.
4. To tend the existing plantation so as to get maximum annual increment.
5. To raise block plantation preferably of economically important species in the large gaps having extent of more than 4 Ha.
6. To improve micro-edaphic conditions, especially in dry and open patches by taking suitable soil and water conservation measures.
7. To provide effective protection against illicit felling, encroachment, shifting cultivation, over grazing and fire hazards so as to check further retrogression of site.
8. To meet the bonafied needs and requirements of local inhabitants in regards of fire wood, small timber and fodder etc.

1. J) Location of other project in the Zone of Impact of the current project

In the buffer zone of this project site, another 15 industries exist. The list of projects is furnished below: -

Sl. No.	Name of Industry
1	Oraghat Iron Ore of M/s Rungta sons (P) Ltd.
2	Sanindpur Iron & Mn. Mines of M/s National Enterprisers
3	Ranisal Mn. Mines of M/s O.M.& M
4	Teherai Iron & Mn. Mines of M/s N.K.Pal
5	Teheral Iron &Mn. Mines of M/s Tarini Minerals
6	Kanther Koira Iron& Mn. Mines of M/s B.S.Mishra
7	Kanther Koira Mn. Mines of M/s Rungta Mines Ltd.
8	Teherai Iron & Mn. Mines of M/s B.I.CO.Ltd.
9	Banjhikusum Mn. Mines of M/s O.M.& M
10	Kasira Iron ore Mines of M/s O.M.C.Ltd.
11	Nadidih Iron & Mn. Mine of M/s Feegrade & Co.Pvt.Ltd.
12	Nadidih Iron & Mn. Mine of M/sB.I.CO. Ltd
13	Kolmong Manganese Mine of M/s Rungta Mines Ltd.
14	Malda Manganese Mine of M/s TISCO Ltd.
15	Patamunda Mines of M/s O.M.& M

1. K) Experts involved in the study

Sl. No.	Name	Expertise
1.	Mr. L. K. Das, IFS (Retd.)	Forest, Biodiversity & Wildlife
2.	Mr. Siba Kumar Mohanty, OFS (Retd.)	Forest & Wildlife
3.	Dr. Bidyut Kumar Patra	Environment
4.	Mr. Debasis Mohanty	Coordination
5.	Miss. Swetagni Mohanty	Wildlife & Biodiversity

The above personnel conducted the study being assisted by local Forest Officers of Bonai forest division. The site was visited during January, 2020, April,2020 and the flora and fauna available in the study area was listed through field observations synchronizing with the list given in the Working Plan. In the course of study, dropping of wild animals, pug marks, burrows, nests, scratching, scat/dung and physical presence on ground, tress bushes were recorded.

METHODOLOGY

- The study is based on Survey of India Topo Maps F45N1, F45N5, F45H8 & F45H4.
- The Village list and demographic composition has been collected from 2011 Census Report.

- A model questionnaire has been prepared with our own developed model for the survey of the surrounding Villages and collection of data.
- Human-animal Conflict data has been collected from the Bonai Forest Division.
- Active search method applied for listing of the flora and fauna. Villagers were shown photographs from a book compiled by Sri N.C. Mohanty, IFS (Retd.) to identify the faunal species for confirmation.
- For Socio-economic study and environmental impact study, random sampling method was followed.

Findings:

In the Project area the Scheduled (I) species like **Asiatic Elephant, Sloth Bear, Indian Rock Python** and scheduled (II) species like Jackal, Jungle cat and common Indian mongoose were observed. Similarly Scheduled III and IV species like Barking Deer, Rabbit and Chital were found besides birds and reptiles.

CHAPTER-2

THE PERCEIVED IMPACTS OF THE PROJECT ON THE ENVIRONMENT

A. Impact of the Project on the environment in general:

Any mining project has its impacts on the biotic, physical and socio-economic environment. Some are beneficial to the society some are not. Evaluating these impacts, all projects are implemented. This project is not left untouched in these aspects. When certain impacts are disasters, it necessitates mitigating such problem with established technology and scientific study. Such negative impacts are discussed here to help in implementing mitigative measures.

The environmental impacts can be categorized as either primary or secondary. Primary impacts are those, which are attributed directly to the project and secondary impacts are those, which are indirectly induced and typically include the associated changed pattern of social and economic activities of surrounding community.

Before any attempt is made to reduce various stresses and to avoid/minimize or mitigate their adverse impacts, it is necessary to identify various factors that have negative influence on the biodiversity (flora and fauna). These are specified below considering the terms of reference for the preparation of Site-Specific Wildlife Conservation Plan.

i) Impact on soil

Impact on soil will arise during operation, it is due to open yard storage of raw materials like iron ore. Further, dumping of solid wastes and storage of lump ore, fines etc. On land would also deteriorate soil quality, if appropriate control and mitigation measures will not be implemented. The top soil and other stored material may erode and thereby affect the soil of the periphery and introduce toxic materials to the soil If not properly stored and will affect to the wildlife like rodents and other burrowing animal present in that area.

Geomorphic changes:

This lease area mainly consists of two parts of separate hills, where iron ore deposits occur at various level. Geographically, the Iron Ore Block over 88.516 ha has been designated as Patabeda quarry, situated in the Since Gonua Block is already in operation by northern part of the lease and Gonua quarry which is in the Southern part of the lease. Keeping in view the production requirement, the mining operation will be carried out in both the blocks. 70% of total RoM production has been planned in Gonua block. Since Gonua block is already in operation by the ex-lessee Sri P.K. Ahluwalia, existence of higher grade and Patabeda block is in development side 15 to 20% of the total production is from this block.

Moisture loss:

There is no perennial stream in the lease area. But there exist one seasonal nala which divides the lease area physically into two parts as northern part in Patabeda village and southern in Gonua village. The gradient of the nala is from east to west. This nala becomes active during rainy season and ultimately drains to Karapani nala which is perennial and flowing at a distance of 1.5 Km west of the lease area. Keeping in view the evapo-transpiration and seepage into sub-surface at 40% water flow within the lease area will be 711,596.4 m^3 which will be drained. Other major drainage channels are Tehrai nala of South West of the M.L., Kundra nala on South West as well as North of the lease and Baitarani River on the east.

There will be soil erosion from the mining area specially from the quarries, Over Burden dump, Road cuttings, till the soil is stabilised through engineering and vegetative methods. This sediment load will go into water course. Turbid water curtails sunlight as a result the submerged plant growth is affected due to the reduced photosynthesis. Fish and other aquatic fauna dependent on such plant and phytoplankton will ultimately be affected. Fishes will also be affected by chocking of their gills by silt. Spillage of diesel and Engine oil from vehicles as well as machineries will ultimately find way to aquatic eco-system and affect invertebrates, fishes and frogs.

Moisture loss will be occurred in both the core and the buffer zone of the Mining Lease due to release of very high temperature from the machineries like crusher plant, screening plant, if adequate measures will not be taken. Operation of heavy vehicle for transportation and loss of vegetation due to the project will also cause moisture loss. Under such circumstances, re-establishment of vegetation is delayed and difficult but constant attention if imparted for establishment of saplings planted on Dump, Safety Zone etc., the growth of plants will not be affected.

ii) Impact on Vegetation

Deforestation without proper reclamation will have an ecological / biodiversity loss at the conceptual stage, if not followed up by a proper conservation management plan. Apart from the loss of forest in the mining, there is infrastructure development for mining, establishment of hutments, Kiosks and the subsequent population pressure certainly put a huge anthropogenic pressure on the flora on the locality directly and indirectly.

Habitat loss:

Habitat destruction is a process, which alters or eliminates conditions needed for animals and plants to survive. Rendered functionally weak by mining activities, the ecosystems' ability to support species is reduced. Reduced carrying capacity of the habitat means decline in population and sudden disappearance of species. Habitat loss is manifested in loss of food

plants and failure of the plant in regenerating itself. So is the case with horizontal cover (loss of undergrowth) and vertical cover (canopy contiguity). Habitat loss impacts nitrogen, phosphorous, sulphur, carbon and hydrological cycles, which affects ecosystem values adversely and culminates in either emigration of species or outright extinction.

iii) Impact on Water Regime

The daily requirement of water for mining and ancillary operation will be collected from Baitarani River.

Water pollution:

Soil erosion leads to carriage of sediment load in water. Proposed haulage roads are earthen roads, with 1: 12 gradients. As there will be accumulation of dust on the slopping surface, the first run off will usually carry silt and the colour of turbid water will be brownish red. Higher the gradient more is the velocity of running water. If the velocity increases two-fold, with change in slope, the erosive power will be considerably increased. Moreover, from the O.B. Dump will also pollute the Suna Nadi flowing within a close proximity of the lease area.

iv) Impact on Air

The mining area and as well as surroundings is affected by the following ways:

Dust pollution:

Mining activity particularly blasting, transport mechanism and dumping generate considerable dust, which will settle on nearby vegetation or on the ground. While the former component will affect the net production of organic matter, the latter will be awaiting to be washed away during rains. Blow of dust, will definitely settle on the smaller animal fur, affects its respiration and push the animal to a zone of stress.

The broad impacts of dust pollution are:

- Reduced photosynthesis leading to reduced growth rates of plants.
- Increased incidences of plant pests and diseases from both fungi and insecticides. Reduced seeding, less viable seeds and hence, lowered or absence of regeneration.

Noise pollution:

Drilling - blasting, loading, dumping, transportation and working activities all will produce noise. One can well imagine the nature of stress from the fact that a mere whisper in tranquil forest is enough to alarm the approaching animal to water hole, who takes to flight at once. Small reptiles manage to adapt in such a noisy environment because their facility of escape by such noise is limited. This is one of the factors contributing to displacement of species, even large ones like deer and elephants.

Hearing impairment:

Signal masking i.e., inability to hear important environmental clues and alarm.
Increased heart rate, respiration and stress reaction. Loss of fecundity or inability to litter or increase in abortion. Decline in bird population due to muffling of mating calls.

Light pollution:

The animals are adapted to natural light. Depending on the intensity of light in which an animal is most active, it is either classified as diurnal, crepuscular or nocturnal. Animals are not accustomed and adapted to artificial light, which usually prevail in mining area in the night shift, from the tippers carrying ore after evening and other fixed lights. All animals in the forest area of either the lease or ZoI area will be affected by the incidence of light as artificial lights are very sensitive to the cornea. So, it causes flight of animal from the ZoI of the mining area. Animals are adapted to constant phase of light, when changes happen, they move to area of their choice. Sudden lighting, off and on after dusk by the moving vehicles is harmful. At times, animals will face accidental death, unable to escape and get distracted from their natural path will lead to depredation to the nearby villages or accidental fall in the deep mining pit. The above activities will increase the stress condition. Animals exposed to light exhibit erratic behaviour pattern (mauling by bear, causing injury by elephant), expressed in their deflected movement and aggressive behaviour.

B. Quantum of pollutants that may be produced by the project and effect on soil, water, air, vegetation and animals.

During mining operation, dust and water pollution is inevitable due to functioning of heavy earth moving machineries (HEMM), movement of loaded tippers, drilling and blasting etc. The monitoring data as observed in the region envisage that SO_2& NO_x concentration are within the permissible limit of AAQ standard of CPCB. It has been mentioned that the pollutants are within the permissible limit. Also, there will be accumulation of garbage/ solid waste due to anthropogenic pressure.

C. Degradation Anticipated on account of the project implementation in quantified terms on appropriate models to be explained. Qualitative change in the wildlife habitat pattern in the study area due to project implementation should also be detailed in the plan.

Direct degradation is observed in the form of loss of forest growth in area of mining. This complete removal of forest growth displaced the wildlife existing in that area due to loss of abode, food, water and tranquillity. The mine workers will collect fuel wood for their bonafied

use from the ZoI which will cause degradation. The consequence of these stress on forest are discussed below:

Habitat fragmentation:

This is the result of clearance of natural vegetation either by mining or by allied development activities like haul road, infrastructure etc. Habitats, once fragmented, the resident wildlife will face insurmountable difficulties. After clearance of existing vegetation, small units of fragmented forest area will be formed exposing animals to non-forest/ village area during movement from one patch to another habitat patch. Food resources and cover types get limited in a small patch. Habitat fragmentation involves some habitat impairment of the isolated forest land as well. Fragmentation involves increase in edge habitats and decrease in interior habitats. Biodiversity of each of the fragmented area get reduced for the above reason. Habitat fragmentations are rarely representative samples of the initial landscape. Species like elephants, deer, move between the fragments and make use of both. Small species like lizards, mongoose, civets, ground nesting birds, snakes etc. having low cruising radii adjust/ adapt to small habitat patches.

Microclimate changes alter ecology of interior and exterior habitats. Species adapted to interior habitats are less likely to survive in an edge habitat of smaller units. Smaller units support smaller population with reduced carrying capacity. Small population face decreased heterozygosity, increase in inbreeding and possibly inbreeding depression. If there is no migration between populations and genetic exchange, genetic drift sets in. This means, directional selection for advantageous alleles can cause certain alleles to become fixed in a population, thereby decreasing variation. Such loss of diversity, however, will not affect elephants, as movement path of elephant changes with available alternatives. But, species with low cruising radius will be affected. However, alternate corridors exist for elephants although it is difficult to conclusively say whether this is traditional or deflected route. Another dimension to fragmentation is the propensity of depredation.

Loss of biodiversity:

Biodiversity is an important component for maintaining natural balance and sustainable ecosystems. Clearly, biodiversity loss is critical for survival of human and wildlife in many ways. Development activities such as mining can significantly alter the biodiversity of an area. Its biggest impact is due to felling of trees for mining purpose and forest fire.

The forests are home to huge number of organisms. Felling of trees for mining purpose leads to loss of habitat of wildlife. This puts the survival of animal species at stake. The cutting down of trees itself is a bigger threat to number of plants, birds and animals growing in the forests.

Deforestation in clusters leads to land cover change in the landscape. Fragmentation of habitat through tree felling, pollution of soil, air and water are direct drivers in loss of biodiversity. Indirect divers include human population growth in mining areas (due to increased opportunity of employment) and their demand on forest resources and improved technology introduced in mining and transport. As the forest canopy is opened up, casualty descends fast on shade bearing plants, they fail to regenerate and with this, the dependent animal community's loose foothold. The area vacated by the native shade bearers is partially compensated by the regeneration of light demanding plants. Similarly, fires which occur annually, favour fire hardy annuals and destroy insect life. Plant biomass is affected as it is related to insect inter relations. Blanks created in forest areas get invaded by alien species of plant which increase in area every year at the cost of indigenous species. With the loss of plant diversity, animal diversity also diminishes. The irony is, diversity is getting lost at a faster rate than it is even assessed and scientifically documented, closing all future options of development.

Habitat destruction by illicit felling:

The mine workers are in habit of collection of fuel wood for their bonafied use. The villagers of the ZoI also collect fuel wood, small timber, NTFP etc. from the adjoining forest. These are designated as illicit felling. Such action will not only create gaps in the forest but also decreases percentage of qualifier species required for wildlife. This results in depredation of wildlife to adjoining villages in search of alternate palatable food substance like paddy, sugarcane, mahua and in search of water to satisfy their thirst.

Habitat destruction by Grazing and transmission of disease:

Tribal households have average 3-5 cattle/ pigs which are not in the practice of stall feeding rather let loose in the forest without any watch and ward. Cattle are reared more for dung in local villages than milching. They return to the village after grazing in evening. Cattle are considered a sign of wealth by tribal. Uncontrolled grazing has created sub-optimal habitats around habitations and has introduced agricultural weeds in forest areas. Wild animals like chital and barking deer are susceptible to pathogens of FMD (Foot and mouth Disease), by grazing cattle.

Forest fire:

Forest fire affects both vegetation and soil. It is also helpful in maintaining diversity and stability of ecosystems. Effect of forest fire and prescribed fire on forest soil is very complex. It affects soil organic matter, macro and micro-nutrients, physical properties of soil like texture, color, pH, Bulk Density as well as soil biota. The impact of fire on forest soil depends on various factors such as intensity of fire, fuel-wood and soil moisture. Fire is beneficial as well as harmful for the forest soil depending on its severity. In low intensity fire, combustion

of litter and soil organic matter increase plant available nutrients, which results in rapid growth of herbaceous plants and a significant increase in plant storage of nutrients. Whereas high intensity fire can result into complete loss of soil organic matter, death of microbes, etc. Intense forest fire results into formation of some organic compounds with hydrophobic properties, which results into high water repellent soils. Forest fire also causes long term effect on forest soil.

D. Nature of threats to the flora and fauna

Habitat loss, habitat fragmentation, fire are the major threats as discussed above, there are other threats also emerges due to degradation of forests and those are mentioned below.

Encroachment:

Increase in human presence occur due to implementation of projects. This also results in development of town and human habitation near the industry area. This plant does not involve any forest land and interestingly the workers are most recruited from local villages.

Litter generation:

Labourers generate much litter in shape of polythene wrappers, carry bags, paper wrappers, leaf plates and left- over food. This is not only is obtrusive to sight but can attract animals like pigs, Hyena. Wolf and jackals. Ingestion of indigestible polythene can lead to blockade of gut and eventual death of these animals. The workshop will produce mobile cans, plastic jars, spent mobile and grease. The canteen and office will also produce various wastes. Litters strewn all over not only destroy aesthetic appeal but are injurious to plant and animal life in many other respects.

E. Probable increase in the vehicular traffic and its impact.

Presently about 2500-3000 vehicles move in and out of the mining belt, creating traffic congestion. This happens due to poor road surface, narrow mine roads, breakdown of vehicles and both to and frow traffic of loaded vehicles going out and empty vehicles coming in. This, for sure, can prevent wild animals from their natural movement, confining them to small unfavourable patches of habitat. Such artificial confinement usually manifests in aggressiveness and deflected movement apart from physiological stress.

F. Noise Pollution, Air and underground pollutions etc. and it's probable impact on flora and fauna:

These are discussed in details in this chapter in Section **(a)** above.

G. Study techniques adopted and Details of Visit

The experts comprising of experienced and retired Forest Officers visited the Core and parts of the ZoI of the mine extending over 10Km radius. They were accompanied by the local Forest Range Officer, Koira and his subordinates besides the local staff of the lessee JSW Steel limited. The team also visited Oraghat Iron Ore Mine of M/s Rungta Sons (P) Ltd, San-Indiur Iron & Manganese Ore Mines of M/s National Enterpruise, Kanther Koida Manganese Mines of M/S Rungta Mines Ltd and Kalmong Manganese Mines of M/s Rungta Mines Ltd. And interacted with local villagers regarding implementation of various interventions.

Duration of Visit: - 25.04.2021 to 28.04.2021

The site was visited during April,2021 and the flora and fauna available in the study area was listed through field observations synchronizing with the list given in the Working Plan. In the course of study, dropping of wild animals, pug marks, burrows, nests, scratching, scat/dung and physical presence on ground, tress bushes were recorded.

Observation of Visit

To maintain ecological balance and check harmful effects due to mining and allied activities, environmental control measures have been integrated on to the process of planning. Many of the areas of EMP requires multi-disciplinary approach as per field requirement, suggestion from experts in relevant fields like forestry, ground water etc. Are to be taken from time to time to meet statutory requirements.

Records Referred:

Details of the reference are given below:

1. Champion H G. and Seth S K. (1968). *A revised survey of forest types of India.* Govt. of India: New Delhi.
2. Flora of Orissa-Bihar, Saxena & Brahman.
3. E.I.A. & E.M.P. Report of Gonua Iron Ore Mines of M/S JSW STEEL Ltd.
4. Right of Passage-elephant corridors of India - Wildlife Trust of India.
5. Sar C. K. and Lahiri-Choudhury D.K. (2009). Project: Elephant – Human Conflict in Asia, Report on Orissa, India (Part-I), State Report. Education Centre, Kolkata.
6. Sar C K & Lahiri-Choudhury D K. (2002). Project**:** Elephant - Human Conflict in Asia, Report on Orissa - India (Pt.-II-e), Keonjhar Forest Division, Keonjhar District (1992-April 2000). Kolkata.
7. State of India's Forest Report (2019). Forest Survey of India. Dehradun.
8. Working Plan of Bonai Division.
9. Wildlife Odisha, 2020

10. Fundamentals of Wildlife Management by Rajesh Gopal, IFS

Sampling method adopted

a) Point sampling method on road side adopted to enlist Flora and fauna.
b) Local forest officials and villagers were taken into confidence about movement of Elephants besides man-animal conflict.
c) Data on elephant depredation/ death report of wild animals.

Justification in extrapolation

As no data is available on the exact impact of the mining on flora and fauna, the perceived impact has been extrapolated based on interaction with local staff, villagers and study teams personal experience.

CHAPTER-3

OBJECTIVE OF MANAGEMENT AND MITIGATION STRATEGIES

A. Objective of Management:

Gonua iron ore mine is surrounded by about 15 mines. Hence, the synergetic adverse impact is felt in the ZoI. However, there being medium dense forests in patches but, more or less interconnected, big animals manage to thrive in the area despite enormous biotic interferences.

As can be seen from the land use pattern hardly half of the lease area i.e., 50.479 ha has so far been used leaving aside 38.037 ha (Page 73 of Mining Plan) untouched which will be used during the lease period. Therefore, the lessee has to be vigilant about the forests standing over 38.037 ha which is now serving as abode for small and large wildlife. Therefore, the management in the M.L. area will focus on creating congenial conditions for restoration of lost cover at the earliest. The management of buffer zone primarily will focus on maintenance of optimal habitats for all varieties of wild animals, small and big, maintenance of biodiversity and migration corridors.

In the ZoI 03 species of Schedule I fauna e.g., Elephants, Beer and Pythons are noticed and care has to be taken for their food, cover and protection, which are narrated below: -

Elephant- Elephants chiefly frequent areas covered with tall forests where the ground is hilly or undulating and where bamboos grow in profusion. Elephants sleep during hot hours of the day being intolerant of the sun, feed early in the morning and evening and come out after nightfall to feed in open forest or to raid crops, retiring to sleep after midnight. Their food consists of various kinds of grasses and leaves and stems and leaves of wild bamboo and plantains, all species of crops and the bark of particular kinds of fibrous trees (moraceae family). A full-grown elephant, consumes 240 kg of green fodder per day. Besides it requires 30 kg of grass and 150 ltrs of water per day. In order to meet this, we have given provision for bamboo ball technology to increase percentage of bamboo in the forest. There is also a provision for 2 water holes to be excavated in slanting manner (1:6) so that in the upper slope big animals can consume water and at the dead end the reptiles can quench their thirst.

Sloth Bear- Sloth bear prefer places where out cropping's of rock and tumbled boulders offer them shelter during the hot weather and the rains. They come out of their cave shortly before sunset, hunt for food throughout the night and retire at the dawn. Their food consists mainly of fruit and insects. Fruit available in our forests is more plentiful during summer like

banyan, wild figs, mangoes, jamun, dates, jack fruit etc. They are also fund of honey (*Apis dorsata* or *Apis indica*). During monsoon insect food is more plentiful and bears find many insects under stone, fallen logs, under bark and in the crevices of trees, but main insect it likes is **termite.**

They also prefer sugar cane, maize and where date palms are tapped, they climb the trees to drink the toddy (neera) from the pots fixed by villagers. In the cold weather ber fruit and between Mach-April, mohua trees bloom and carpet the ground with heavy scented flowers. Therefore, plantation of jamun, mango, bel, date palm etc. has been prescribed. Attempts should be made to protect Termite mounds.

Indian Rock Python– Python is a good swimmer and therefore provision of water holes has been provided. After a long swimming when it feels hungry, go for preying in the adjoining forests. It prefers to swallow fawn of deer group, civets, even calf, goat, sheep and twist around a tree to break the bone of the prey for easy digestion.
They are nocturnal, mostly found on ground or bushes, also found in crevices or tree holes, below rock boulders and active during evening hours. They feed on small insects, lizards and small snakes which are plentily available in the ZoI.

The strategic measures to be taken are: -

- Habitat restoration of the mine pits and O.B. dumps by reclamation concurrently with advancement of mines and abandonment of pits through afforestation for colonization/return of displaced animals.
- Management of safety zone covered with vegetation of mine as a wildlife refuge by provision of habitat essentials as far as practicable.
- Maintenance of biodiversity in the mine surrounds to create optimal conditions for all species of wildlife. Maintain habitat contiguity or corridors for migrant wildlife.

Wildlife management planning has 5 steps viz.

- Wildlife survey and range inventory
- Census/ status survey
- Yield determination, i.e., annual productivity
- Diagnosis, i.e., evaluation of range factors as inventoried in (i) above in relation to wildlife numbers.
- Manipulation of population and range.

Data on (i) has been collected from field inspection, reference to working plan and discussion with local officials. (ii) Census has been omitted due to paucity of time. Step (iii) has not been attempted as this is conservation management without harvest. (iv) Diagnosis has been attempted in Chapter-IV. (v) The W.L. (Protection) Act does not provide for population management except by translocation. Hence, this is not touched. Hence, range manipulation

has been prescribed with a view to improve the habitat conditions rather than making any radical change.

The under mentioned prescriptions are aimed at promoting welfare factors, arresting decimating factors, neutralizing limiting factors by providing the same in the range and control of animal damage.

B. Strategies to mitigate and minimize adverse impacts:

Undertake appropriate remedial measures to minimize the adverse impacts of mining on Wildlife Conservation and protection in the Core and buffer zone of the mine.

Improve ecological status and quality of the Wildlife habitat in and around the mine, through restorative interventions.

Enlist people's participation in conservation initiatives through awareness, motivation and capacity building and through suitable incentives.

Undertake strategic fire protection measures over the entire project/ ZoI by creating suitable fire lines with annual maintenance, engagement of fire watcher, awareness and involvement of VSS in fire fighting measures.

Undertake deployment of anti-depredation squad to overcome elephant menace and crop raiding.

Providing glow signage at sensitive locations of elephant movement to aware the people and avoid man-elephant accident.

I) Strategies for Core Zone:

I.1) Photovoltaic fencing:

Wild Elephants move through forests of Bonai division area regularly. They come to near Villages for crop raiding, house damage and thus starts human elephant conflict and ends at injury or casualty to either of them. To prevent accidental fall of wildlife into mining pit, it is suggested to install Solar Fencing (Photo Voltaic Fencing) over 2 KMs with RCC Pillar with 5 strands with Energiser machine and keep provision for Annual Maintenance contract for a period of 10 years.

I.2) Awareness Promotion:

The User Agency will create awareness among the Mines Executive, staffs and workers and sensitize them to maintain cleanliness of the project premises. They will also be aware to protect any type of wildlife including snakes if noticed in the project area. In such an event instead of killing it being afraid, they should intimate the nearest Forest staff or snake charmer available in every Division Office now-a-days for rescue of the wildlife and safe

release in the nearby forest. They should also be aware not domesticate any wildlife as it goes against the Rule 49 of Wildlife Protection Act, 1972. The Drivers of heave earth moving vehicles will be conveyed to keep the noise levels to the barest minimum, take all precaution against fire, damage to trees etc. Drivers will be cautioned to control speed so as not to run over slow-moving wildlife like snakes, lizards, mongoose, civets etc. Behavioural change will be expected from each worker on the above points and use of garbage bins. Any sick and injured wildlife will have to be rescued and given first aid and water. Such animal is to be subsequently handed over to the nearest forest official and released after healing the wound. No worker shall get involved in crime against poaching & illicit felling or business of wildlife trophies as per Rule 49 B of Wildlife Protection Act, 1972.

I.3) Provision of One 2-wheeler:

One Motorcycle to be procured by the User Agency and delivered to DFO, Bonai for used by the protection squad. There is also a provision of POL to be provided by the User Agency.

I.4) Provision of One Four-wheeler:

One Four-wheeler (Mahindra Bolero) to be procured by the User Agency and delivered to DFO, Bonai for used by protection squad There is also a provision of driver and POL to be provided by the User Agency.

II) Strategies to mitigate and minimize the adverse impact so observed in the Zone of Influence (ZoI).

(IN BONAI DIVISION)

Habitat Improvement

II.1) Plantation of Siali in Open Patch of Mendhamaruni RF:

Siali (*Bauhinia vahlii*- Fabaceae) is a climber having tendency to twine the tree and go to the top canopy. The leaf of this species is bi-lobbed which is suitable for leaf plate making (eco-friendly). Therefore, such plantation will eventually help the SHG group for one of their sustenance. TDCC (Tribal Development Cooperative Cooperation)/ ORMAS (Odisha Rural Management Agricultural Society) are the marketing agency of this product.

II.2) Construction of Check Dam:

There is only one stream i.e., Kakrpani nala which is passing on the western side of Gonua Iron ore Mine, this nala drains to Suna Nadi which is a tributary of Baitarani River. In order to check deposition of silt in Baitarani River, it has been proposed to construct series of check

dams of size 10m x 5m x 5m in Kakrpani nala. The distance between consecutive check dams will be according to site condition.

Protection and Surveillance

II.3) Fire Watchers:

Five fire watchers will be deployed for 5 months in a year during February-June to take up regular patrolling, extinguishing ground fire by using bunch of green branches. They will be informing the local Forest Guard/Forester/ Range Officer regarding location of fire incidence and extent of damage. They will organize fire fighting with the help of VSS/eco-development members in case of emergency situations. They are expected to maintain good rapport with village committees.

II.4) Anti-depredation Squad:

A squad of 5 members will be engaged for anti-depredation activities. Their place of posting will be according to wildlife particularly elephant movement in the ZoI of Gonua Iron Ore Mine. They will be equipped with mobile phone with recharge facility, medicine. Besides they will also be given contingent fund to meet exigencies. They will be engaged throughout the year but particularly during crop harvesting period, pre-harvesting period and storage in mud huts.

II.5) Provision of Solar lighting system:

From the study, it was evident that in the Zone of Influence (ZoI), the main problem is man-animal conflict, particularly with the mega herbivore i.e., elephant. Elephants make their frequent depredation to the nearby villages located in the ZOI of the project area, especially from dusk to dawn. One of the causes of conflict occur in the wee hours when the whole area become darker, due to absence of a regular stretch of lighted areas around the villages, because of lack of electric supply. It results in direct confrontation between the people and the elephant, which usually hide itself in dark and bushy areas.

Hence, taking in to account the whole scenario of conflict, there is a provision to install solar street lights, most preferably at strategic locations around the elephant affected village areas in Bonai Forest Division.

As these lights can work even without electricity, it will help the villagers to get rid of elephant attack. The solar lights will be provided at the required strategic locations in the ZoI of the project area considering the elephant movement.

II.6) Glow Signage (Sign Boards):

To promote coexistence with wildlife and to aware people, good quality sign boards with display of wildlife features should be placed along the Project premises, road etc. Fluorescent Sign Boards with good write ups about movement of wild animals will be provided on in order to make aware the passers-by about occurrence of accident if they confront with wildlife.

II.7) Awareness Publicity:

<u>Public Awareness Programme</u>

Strong awareness will be built up among mine workers and villagers about working ethics in the Project area. They will be appraised to keep the noise levels to the barest minimum, take all precaution against fire, damage to trees etc. Drivers will be convinced to control speed so as not to run over slow-moving creatures. Behavioral change will be expected from each worker on the above points and use of garbage bins. Any sick and injured animal will have to be rescued and given first-aid and water. Such animal is to be subsequently handed over to the nearest forest official and released after healing the wound. No worker shall get involved in poaching and illicit felling.

Documentary

Important events of the division will be documented by engaging some professional wildlifers, so that annually a brochure can be published which will be helpful for Forest Guard (in Odia), Forester and Range Officer in English. It is to be shown in all villages for awareness generation. This document will include important information's of the division.

II.8) Support to VSS members to mitigate HEC by Providing Grain Bins:

VSS have been constituted with the aim to protect forest & wildlife and to support their livelihood they have also been included to maintain eco-tourism sites. On the other hand, whatever paddy, store in bamboo made bins (Doli), after harvesting periods elephants invade into the villages in search of food including paddy. So, they break mud walls of the hutment and damage the bamboo made bins. In order to safeguard their hard-earned food grains, it has been proposed to provide Grain Bins to villagers to prevent loss of paddy.

II.9) Purchase of Wildlife Monitoring equipments:

Purchase of Wildlife Monitoring Equipments like camera traps, etc. will be procured for monitoring wildlife and conducting periodical census.

II.10) Intelligence gathering:

Periodical meetings will be conducted in a place where villagers adjacent 4-5 villages will gather and they will be appraised to provide information to the nearest forest field executives like Forest Guard, Forester and Range Forest Officer about presence of elephants and /or causing damage to crops, so that the villagers will be vigilant and the Forest Officers too. The villagers will also be adviced to communicate information to local Forest Officers about illicit felling, poaching & encroachment.

II.11) Elephant Proof Trench:

In order to prevent elephants coming out of Khajurdihi RF it has been proposed to excavate elephant proof trench over 03 KM of size 3m top, 1m bottom and 2.5m depth and heap the dug-up earth inside the forest. A mixture of grass seeds, leguminous species should be sown over the dug-up earth.

III) Strategies to mitigate and minimize the adverse impact so observed in the Zone of Influence (ZoI).

(IN KEONJHAR DIVISION)

III.1) Plantation of Sal in Open Patch of Baitarani RF:

Baitarani RF comes under Rehabilitation Working Circle. The average canopy density is below 0.4. The natural regeneration percentage of dominant species of the area like Sal (*Shorea robusta*-Diplocarpaceae) is low in this RF. Therefore, it has been suggested to raise 5000 nos. of Sal seedlings in vacant but permanent gaps (4 Ha.). In order to supplement the percentage of Sal and gradually to cover the open areas. While raising plantations of Sal it should be kept in mind that Sal is a shade bearer. Therefore, no individual seedlings should be planted below any tree.

III.2) Plantation of Siali in Open Patch of Baitarani RF:

Siali (*Bauhinia vahlii*- Fabaceae) is a climber having tendency to twine the tree and go to the top canopy. The leaf of this species is bi-lobbed which is suitable for leaf plate making (eco-friendly). Therefore, such plantation will eventually help the SHG group for one of their sustenance. TDCC (Tribal Development Cooperative Cooperation)/ ORMAS (Odisha Rural Management Agricultural Society) are the marketing agency of this product.

III.3) Soil Moisture Conservation:

Baitarani is the only river passing through Keonjhar district whose main tributaries are Kundra and Suna. If soil conservation measures like Graded Bonds, wire mesh & check dam are undertaken in these two nallas, siltation in Kanhupur Medium Irrigation Project will be reduced considerably.

III.4) a) Provision of Solar lighting system:

From the study, it was evident that in the Zone of Influence (ZoI), the main problem is man-animal conflict, particularly with the mega herbivore i.e., elephant. Elephants make their frequent depredation to the nearby villages located in the ZOI of the project area, especially from dusk to dawn. One of the causes of conflict occur in the wee hours when the whole area become darker, due to absence of a regular stretch of lighted areas around the villages, because of lack of electric supply. It results in direct confrontation between the people and the elephant, which usually hide itself in dark and bushy areas.

Hence, taking into account the whole scenario of conflict, there is a provision to install solar street lights, most preferably at strategic locations around the elephant affected village areas in Keonjhar Forest Division.

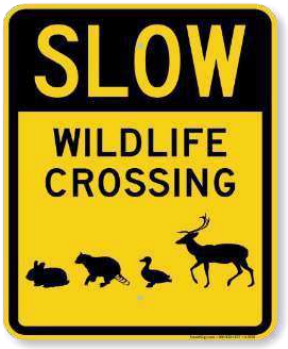
As these lights can work even without electricity, it will help the villagers to get rid of elephant attack. The solar lights will be provided at the required strategic locations in the ZoI of the project area considering the elephant movement.

b) Provision for Grain Store House for Villagers:

Villages prone to repeated Elephant Depredation, the farmers apprehend damage to their crop which is stored in individual households with maximum precaution. Still then the megafauna damage the house and consume paddy stored therein. Here it has been proposed to construct community paddy storage house where paddy of the whole village can be stored by giving some marks to identify whose paddy is stored where. And during elephant depredation, the villagers will unitedly expel the elephant group because this is a community stored house. Besides, all precaution will be taken to protect the paddy from damage by insects by adopting biological method i.e., heaping leaf of Begunia (*Vitex negundo*-Verbenaceae).

III.5) Glow Signage (Sign Boards):

To promote coexistence with wildlife and to aware people, good quality sign boards with display of wildlife features should be placed along the Project premises, road etc. Fluorescent Sign Boards with good write ups about movement of wild animals will be provided on in order to make aware the passers-by about occurrence of accident if they confront with wildlife.



III.6) Provision for providing Grain bins:

In remote villages located deep in the forest, people store paddy in bamboo bins or in sacks. Elephants are very intelligent and therefore after harvesting i.e., from February to June they depredate to villages, and damages mud huts in search of paddy. To prevent this, it is proposed to provide Grain Bins to villagers to prevent loss of paddy which has been harvested by extorting hard labour of villagers.

CHAPTER-4

MANAGEMENT STRATEGIES WITHIN THE PROJECT AREA WITH FINANCIAL FORECAST

A. Interventions with Justification:

All measures for protection of bio-diversity of the site as well as wildlife have been discussed in **Chapter-3.** The financial requirement of various interventions suggested in the plan as per current costs of Rs.315/- day is given in the following table for the plan period of 10 years i.e., 2021-22 to 2029-30 and annual cash flow there-of. All activities within the project area will be implemented by the project proponent.

B. Location of the proposed intervention

The map showing the intervention implemented inside the project area by the project authority has been furnished in **Chapter 6** of this plan.

Table 4.1: Financial provision of works in the project area (Wage rate@ Rs.315.00)

Sl.No.	Para Ref.	Management Interventions	Amount in lakh
1.	3.B.I. 1)	Photovoltaic fencing around the active Pit over 2.0 K.M. @Rs.4.0 lac per K.M. + Rs.1.0 lac maintenance cost per year. = **Rs. 17.00 Lakhs**	**Cost will be borne by User Agency**
2.	3.B.I. 2)	To create awareness among the mine workers regarding operation of the overhead piped conveyor belt @Rs. 1.00 lac per year x 10 years = **Rs. 10.00 Lakhs**	
3.	3.B.I. 3)	**a)** Provision of One Motorcycle for protection work to be used by Foresters= **Rs 1.00 Lakhs** **b)** Cost of POL @ 10,000/- PM x 12 months x 10 years = **Rs 12.00 Lakhs**	
4.	3.B.I. 4)	**a)** Cost of one Four-wheeler = **Rs.12.00 Lakhs** **b)** Cost of POL @ 15000/- PM x 12 months x 10 years = **Rs 18.00 Lakhs** **c)** Cost of Driver @ 16,250/-PM x 12 months x 10 years = **Rs 19.50 Lakhs**	
Total			
20% Escalation			
Grand Total			

Plan period preferably for 10 years with suitable provision for interim review and suitable modification

Annual Work Programme:

Details of the flow of funds for different years of the plan for project area are given below: (Rs. in Lakh)

Sl. No.	Para Ref	Type of interventions	y1	y2	y3	y4	y5	y6	y7	y8	y9	y10	Total
1.	**3.B.I. 1)**	Photovoltaic Fencing	-	-	-	-	-	-	-	-	-	-	**Cost will be borne by User Agency**
2.	**3.B.I. 2)**	Awareness Programme	-	-	-	-	-	-	-	-	-	-	
3.	**3.B.I. 3)**	Provision of One 2-wheeler	-	-	-	-	-	-	-	-	-	-	
4.	**3.B.I. 4)**	Provision of One Four-wheeler	-	-	-	-	-	-	-	-	-	-	
Total													
20 % escalation													
Grand Total													

CHAPTER- 5

MANAGEMENT STRATEGIES WITHIN THE ZONE OF INFLUENCE OF THE PROJECT WITH FINANCIAL FORECAST

A. Financial Provision of Works in Zone of Influence (ZoI):

The financial requirement of various interventions suggested in the conservation plan as per current costs is given in following table for a plan period of 10 years and annual cash flow for the buffer zone of the project area. All activities in the buffer zone will be implemented by the respective Divisional Forest Officer.

Financial provision of works in Zone of Influence (Wage rate @ Rs.315.00)

FOR BONAI DIVISION

Sl. No.	Para Ref.	Description of work	Amount in lakh
		Wildlife Habitat Improvement	
1.	**3.B. II. 1)**	Cost of Siali plantation (5000 Nos.) with 200 Plants per ha. with 10 years maintenance@Rs.79,274/- for 200 plants. Hence, for 5000 plants @Rs.79,274 x 25=Rs.19,81,850/- or **Rs.19.82 Lakh** in Open Patch of Mendhamaruni RF	**19.82**
2.	**3.B. II. 2)**	Treatment of identified Nallas in the impact area by constructing series of Check dams on L.S. = **Rs. 20.00 Lakhs**	**20.00**
		Protection and Surveillance	
3.	**3.B. II. 3)**	a. 05 nos. of **Fire watchers** will be engaged a period of 5 months (February to June) for 10 years @ Rs.9,450/- per month/watcher x 05 nos. x 05 months x 10 years = **Rs. 23.625 Lakhs** **b.** Recharge of Mobile Phone @ Rs.1000/- PM/ per Squad x 05 months x 10 years = **Rs. 0.50 lakhs** **c.** Medicinal Expenses Rs.5,000/- per Squad/ per year x 10 years = **Rs. 0.50 lakh** **d.** Contingencies expenses on L.S. = **Rs 0.50 lakhs**	**25.125**

4.	**3.B.** II. 4)	a. One No. **Elephant Squad** consisting of 05 members Rs.13,950 (Highly skilled@Rs.465.00 Pm)- x 05 members x 12 months x 10 years= **Rs 83.70 lakhs** b. Recharge of Mobile Phone @ Rs.1000/- PM/ per Squad x 12 months x 10 years = **Rs. 1.20 lakhs** c. Medicinal Expenses Rs.10,000/- per Squad per year x 10 years = **Rs. 1.00 lakh** d. Contingencies expenses on L.S. = **Rs. 0.50 lakhs**	**86.40**
5.	**3.B.** II. 5)	**Solar lighting system.** Solar Street Light In villages affected by Elephant depredation @ Rs. 0.3 Lakh/- per light x 50 nos. = **Rs. 15.00 Lakhs** (Locations to be decided by DFO)	**15.00**
6.	**3.B.** II. **6)**	Fixing glow elephant signages at strategic location sensitive to elephant pass and to make aware the passer-by to be vigilant.	**5.00**
7.	**3.B.** II. 7)	Awareness Publicity	**10.00**
8.	**3.B.** II. **8)**	Support to VSS members to mitigate HEC by Provision of providing Grain Bins 250 nos. @Rs.2000/- each	**5.00**
9.	**3.B.** II. **9)**	Purchase of Wildlife Monitoring equipments	**10.00**
10.	**3.B.** II. **10)**	Intelligence gathering	**5.00**
11.	**3.B.** II. **11)**	Elephant Proof Trench 3 KM of size 3m top width + lm bottom width x 2m depth @Rs/8.662 Lakh per **K.M.**	**25.986**
		Total	**227.331**
		200/o Escalation	**45.466**
		Grand Total	**272.797**

(Rupees Two Hundred Seventy-Two Lakhs Seventy-Nine Thousand and Seven Hundred Only)

Annual Work Programme:

Details of the flow of funds for different years of the plan for ZoI area are given below (Rs. In Lakh)

Sl. No.	Para Ref	Type of interventions	y1	y2	y3	y4	y5	y6	y7	y8	y9	y10	Total
1.	3.B. II. 1)	Siali plantation in Mendhamaruni RF	7.742	2.001	1.675	1.200	1.200	1.200	1.200	1.200	1.200	1.202	**19.82**
2.	3.B. II. 2)	Construction of Check dams	10.00	10.00	-	-	**-**	**-**	**-**	**-**	**-**	**-**	**20.00**
3.	3.B. II. 3)	Fire watcher	2.5125	2.5125	2.5125	2.5125	2.5125	2.5125	2.5125	2.5125	2.5125	2.5125	**25.125**
4.	3.B. II. 4)	Elephant squad	8.64	8.64	8.64	8.64	8.64	8.64	8.64	8.64	8.64	8.64	**86.40**
5.	3.B. II. 5)	Solar lightning system	15.00	-	-	-	-	-	-	-	-	-	**15.00**
6.	3.B. II. 6)	Fixing Glow Elephant Signages	5.00	-	-	-	-	-	-	-	-	-	**5.00**
7.	3.B. II. 7)	Awareness Publicity	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	**10.00**
8.	3.B. II. 8)	Support to VSS by Provision for providing Grain bins	5.00	-	-	-	-	-	-	-	-	-	**5.00**

9.	3.B. II. 9)	PUI ClhJ C of Wildlife Monitoring equipments	10.00	-	-	-	-	-	-	-	-	-	**10.00**
10.	3.8. II. 10)	Intelligence gathering	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	**5.00**
11.	3.B. II. 11)	Elephant Proof Trench	25.986	-	-	-	-	-	-	-	-	-	**25.986**
		Total	**91.3805**	**24.6535**	**14.3275**	**13.8525**	**13.8525**	**13.8525**	**13.8525**	**13.8525**	**13.8525**	**13.8545**	**227.331**
												Cost escalation 20%	**45.466**
												Grand total	**272.797**

FOR KEONJHAR DIVISION

Sl. No.	Para Ref.	Description of work	Amount in lakh
		Wildlife Habitat Improvement	
1.	3.B. III. 1)	Cost of Sal plantation (5000 nos.) with 500 Plants per ha. with 10 years maintenance@Rs.1,17,087/- for 500 plants. Hence, for 5000 plants @Rs.1,17,087 x l0=Rs.11,70,870/- or **Rs.11.71 Lakh** in Open Patch of Baitarani RF	**11.71**
2.	3.B. III. 2)	Cost of Siali plantation (5000 Nos.) with 200 Plants per ha. with 10 years maintenance@Rs.79,274/- for 200 plants. Hence, for 5000 plants @Rs.79,274 x 25=Rs.19,81,850/- or **Rs.19.82 Lakh** In Open Patch of Baitaranl RF	**19.82**
3.	3.B. III. 3)	Soil Moisture Conservation activities	**30.00**
4.	3.B. III. 4)	a) Solar Street Light 25 nos. @20,000/-per light=**Rs.5.00 Lakh** b) Provision for a Grain Store House for villagers= **Rs. 25.00 Lakh**	**30.00**
		Protection and Surveillance	
S.	3.B. III. 5)	Fixing glow Elephant signages at strategic location sensitive to elephant pass and to make aware the passer-by to be vigilant.	**5.00**
6.	3.B. III. 6)	Provision for providing Grain bins of 350 nos. @Rs.2000/- each = **Rs.7.00 lakhs**	**7.00**
		Total	**103.53**
		20% Escalation	**20.706**
		Grand Total	**124.236**

(Rupees One Hundred Twenty-Four Lakhs Twenty-Three Thousand and Six Hundred Only)

Divisional Forest Officer
Keonjhar Division

Annual Work Programme:

Details of the flow of funds for different years of the plan for ZoI area are given below (Rs. In Lakh)

Sl. No.	Para Ref	Type of interventions	y1	y2	y3	y4	y5	y6	y7	y8	y9	y10	Total
1.	3.B. III. 1)	Sal plantation in Baitarani RF	6.23	1.23	0.89	0.48	0.48	0.48	0.48	0.48	0.48	0.48	**11.71**
2.	3.B. III. 2)	Siali plantation in Baitarani RF	7.742	2.001	1.675	1.200	1.200	1.200	1.200	1.200	1.200	1.202	**19.82**
3.	3.B. III. 3)	Soil Moisture Conservation activities	10.00	10.00	10.00	-	-	-	-	-	-	-	**30.00**
4.	3.B. III. 4)	a) Solar Street Lights b) Provision for Grain Store House	5.00 25.00	- -	- -	- -	- -	- -	- -	- -	- -	- -	**30.00**
5.	3.B. III. 5)	Fixing glow Elephant signages	5.00	-	-	-	-	-	-	-	-	-	**5.00**
6.	3.B. III. 6)	Provision for providing Grain bins	7.00	-	-	-	-	-	-	-	-	-	**7.00**

	Total	**65.972**	**13.231**	**12.565**	**1.68**	**1.68**	**1.68**	**1.68**	**1.68**	**1.68**	**1.682**	**103.53**
										20% Escalation		**20.706**
										Grand Total		**124.236**

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B. Location of the proposed Interventions

Location of the above-mentioned interventions will be decided by DFO, Bonai Division & DFO, Keonjhar Division according to availability of space and requirement.

C. Monitoring Committee

There shall be a monitoring committee for proper implementation, planning, site selection providing guidance and review of the activities/interventions. The committee will be headed by the DFO Bonai and DFO Keonjhar Forest Division with representative of the Project proponent, Range officers, Foresters as members. ACF (HQ) will be the member Secretary of the committee.

D. Plan period

This plan is for 10-year period from 2021-22 to 2030-31. No revision of plan is anticipated during the period except escalation of cost. However, interim revision may be necessary if there is any drastic change in policy or departure from the present method of mine working or reduced / enhanced rates of production due to slump / escalation in market demand. All deviations will be brought on record with reasons thereof for subsequent plan revision.

E. Cumulative total of Interventions for both Project Area and Zone of Influence: The total cost of the conservation plan is **Rs.397.033 Lakhs (Rs. 272.797 lakhs for Bonai Forest Division and Rs.124.236 lakhs for Keonjhar Forest Division)** including **cost escalation @ 20%**. **The entire amount will be deposited by the User Agency in CAMPA.**

ABSTRACT OF COST

Division	Core	Buffer	Total Amount in lakh(s)
BONAI	-	272.797	272.797
KEONJHAR	-	124.236	124.236
TOTAL AMOUNT IN LAKH(S)	-	397.033	397.033

(Rupees Three Hundred Ninety-Seven Lakhs Three Thousand and Three Hundred Only)

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& Chtef Wlldffll Wardell, Odleha,BBSR

CHAPTER- 6

ANNEXURE AND MAPS

a) MAP INDICATING PROJECT AREA WITH 10 K.M RADIUS. **(PLATE-I)**

b) MAP INDICATING ELEPHANT MOVEMENT OF THE AREA. **(PLATE-II)**

c) MAP INDICATING THE DISTANCE OF PROTECTED AREA TO PROJECT AREA. **(PLATE-III)**

d) MAP INDICATING PROJECT AREA WITH 15 K.M RADIUS. **(PLATE-IV)**

e) COPY OF PROCEEDINGS OF THE MEETING OF SEAC DATED. 09.04.2021 **(ANNEXURE-I)**

f) COPY OF COST NORM OF SAL PLANTATION. **(ANNEXURE-II)**

g) COPY OF COST NORM OF SIALI PLANTATION. **(ANNEXURE-III)**

h) AUTHENTICATED LIST OF FLORA & FAUNA **(ANNEXURE-IV)**

ANNEXURE IV

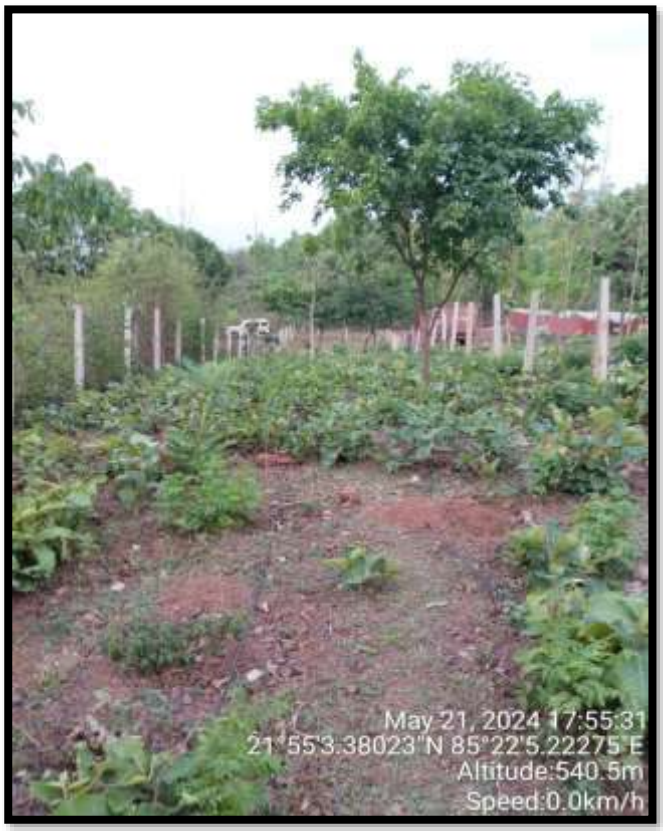
GONUA IRON ORE MINES PLANTATION

1. DLC Area Plantation

2. Safety Zone, Office front dump area


May 21, 2024 17:54:31
21°55'3.76424"N 85°22'5.27531"E
Altitude:537.8m
Speed:0.0km/h


May 21, 2024 17:52:46
21°55'5.45826"N 85°22'5.77862"E
Altitude:532.0m
Speed:0.0km/h


May 21, 2024 17:55:31
21°55'3.38023"N 85°22'5.22275"E
Altitude:540.5m
Speed:0.0km/h

3. Dump Plantation

ANNEXURE V

Government of India
Ministry of Jal Shakti
Department of Water Resources, River Development and Ganga Rejuvenation
Central Ground Water Authority (CGWA)
Application for Issue of NOC to Abstract Ground Water (NOCAP)

Application for Renewal of NOC to Dewater Ground Water for Mining Industry (Application for Renewal of NOC)

Application Number : 21-4/3339/OR/MIN/2022

Applied For Renewal : 1st

1.	**General Information:**	
	Water Quality:	Fresh Water
	Purpose of Renewal Application:	Existing Ground Water
	Application Type Category/ Type of Application	Iron ore
2.	**Name of Mine/Project:**	M/S JSW STEEL LIMITED GONUA IRON ORE MINE
3.	**Location Details of the Mining Unit- (Attach Site, Approved Mining Plan, Toposketch of Surrounding 10km Radius Outside) ($) :**	
	Address Line 1 :	VILLAGE: GANUA, POST:PATAMUNDA,
	Address Line 2 :	GP: MALDA, PS: KOIDA, BLOCK: KOIDA
	Address Line 3 :	TEHSIL-KOIDA, DISTRICT-SUNDARGARH, ODISHA , 770048
	State:	ODISHA
	District:	SUNDARGARH
	Sub-District:	KOIDA
	Village/Town:	Ganua
	Latitude:	21.916800
	Logitude:	85.367800
	Area Type :	Non-Notified
	Area Type Category :	Safe
	Whether industry is MSME:	No
4.	**Communication Address**	
	Address Line 1:	VILLAGE: GANUA , POST:PATAMUNDA,
	Address Line 2:	GP: MALDA, PS: KOIDA
	Address Line 3:	TEHSIL-KOIDA, DISTRICT-SUNDARGARH, ODISHA, 770048
	State:	ODISHA
	District:	SUNDARGARH
	Sub-District:	KOIDA
	Pincode:	770048
	Phone Number with Area Code:	
	Mobile Number:	91 9934311367
	Fax Number:	
	E-Mail:	baswaraj.dalgade@jsw.in
5.	**Details of Existing NOC issued by CGWA (enclose copy)**	

	NOC Letter No:	CGWA/NOC/MIN/ORIG/2022/15411
	Date of Issuance:	10/05/2022
	Vailidity (Start):	10/05/2022
	Validity (End):	09/05/2024
	Reason for not applying for renewal before expiry of NOC Validity (Attach Affidavit):	NA

6.	**Change in Land Use Pattern after execution of Project and Surroundings (10 km Radius - Outside)**
	NA

7. Land Use Detail of Project Area

	Land Use Details	Existing (sq meter)	Proposed (sq meter)	Grand Total (sq meter)
	Green Belt Area	18880.00	0.00	18880.00
	Open Land	841490.00	0.00	841490.00
	Road/ Paved Area	10070.00	0.00	10070.00
	Rooftop area of building/ sheds	14720.00	0.00	14720.00
	Total	885160.00	0.00	885160.00

8.	**Whether there is a change in Topography of the Area after the execution of the Project:**	No

ANNEXURE VI

TRAINING AND AWARENESS CAMPAIGN ON SANITATION

ANNEXURE VII

Medical Examination and Periodical Examination of the Workers

ANNEXURE VIII

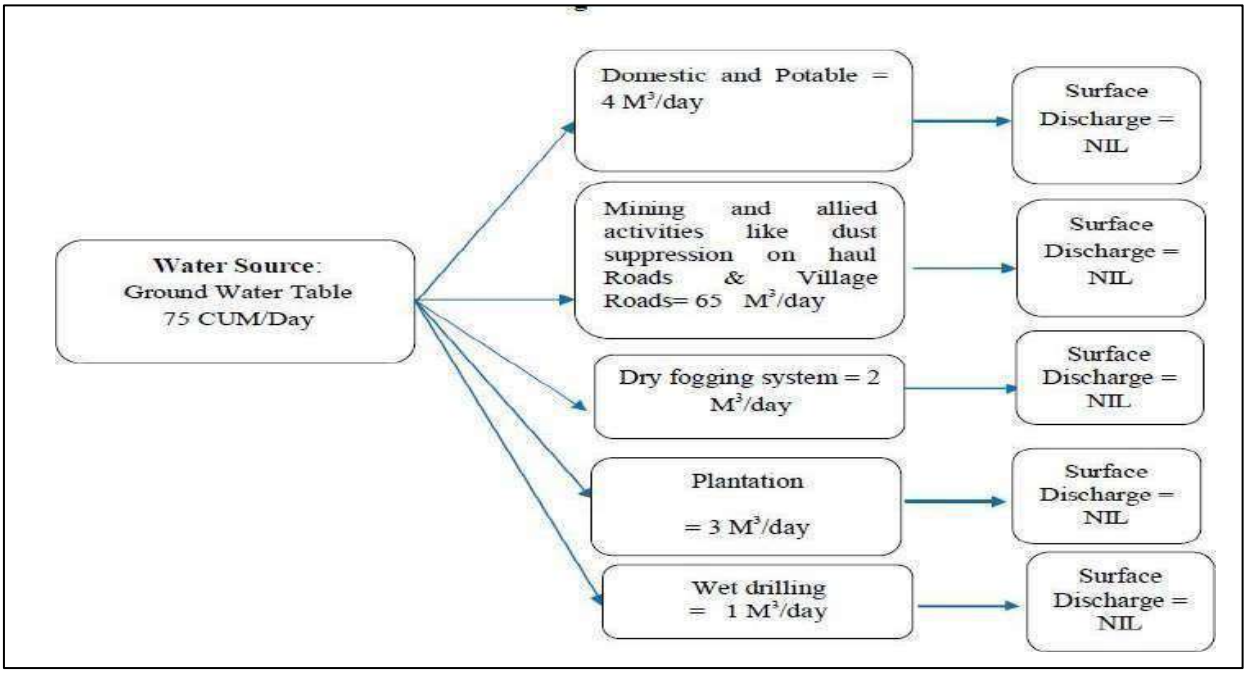
TOTAL WATER BALANCE CHART SHOWING THE USAGE OF WATER FOR VARIOUS PROCESSES

The mine requires 75 m^3/day water for drinking & domestic uses, dust suppression, green belt development and dry fogging. The mine meets its groundwater requirement from one (1) borewell. Water requirement for the project site is tabulated in **Table.**

Table: Water requirements.

Activities	**Avg. demand (m^3/d)**
Mining activities and dust Suspension on haul andvillage roads.	65
Plantation	3
Drinking & Domestic	4
Dry Fogging system	2
Wet drilling	1
Total	**75**

The total water requirement of the project site is 75 m3/day out of which, 4 m^3/day will be used for drinking and domestic purposes, 65 m^3/day will be used for mining activities and dust suspension, 2 m^3/day will be used in dry fogging system, 3 m^3/day for plantation, and 1 m^3/day will be used for wet drilling. The water balance chart is represented in **Figure.**



ANNEXURE XI

Comprehensive Hydrogeological Report

for

Gonua Iron Ore Mine

of

M/s JSW Steel Limited

Address
Gonua Iron Ore Mine,
Village- Gonua & Patabeda,
Tehsil- Koira, District- Sundargarh,
Odisha

Prepared By

Geo Climate Risk Solutions Pvt Ltd
Accredited by CGWA and ISO 9001:2015 Certified Company
CGWB Accreditation number & Validity: CGWB/RGI/005 & 14.02.2026
APIS, Sunrise Incubation Tower, Hill No.3, Madhurawada,
Visakhapatnam, 530048
Website: www.gcrs.co.in
Email: business@gcrs.co.in

MAY 2024

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1 SALIENT FEATURES OF THE PROPOSAL

Sl No.	Particulars	Information
1	Application No.	21-4/3339/OR/MIN/2022
2	Submission Date	09.05.2024
3	Fresh or Renewal	Renewal
4	Existing or New/Proposed	Existing
5	If Renewal, date of validity of existing /last NOC	Valid upto: 09.05.2024
6	CTE issue Date	13.04.2021
7	Name of the Project with Address	**Gonua Iron Ore Mine** Village: Ganua, Post: Patamunda, Gp: Malda, Ps: Koira, Block: Koira, Tehsil-Koira, District-Sundargarh, Odisha -770048
8	State	Odisha
9	District	Sundargarh
10	Block/Taluka	Koida
11	Category of Block/Taluka (as per Prevailing GWRE	Koida block comes under “Safe” category
12	Quantum of GW Applied (KLD)	75 KLD
13	Quantum of GW Applied ($m^{3/}$year)	27,375m^3/year
14	Alluvium/ Non-alluvium	Non-Alluvium
15	Ground water Modelling Required (Yes/No)	No
16	Name of Authorized Signatory of the Project and Designation	Mr. Baswaraj Dalgade, General Manager Administration
17	Consultant Details with Name of Authorized Signatory (If Institution)	Geo Climate Risk Solutions Pvt. Ltd. Mr. G Prasad Babu (Founder & CEO)
18	In case the report is prepared jointly by accredited Institute and Individual consultant, name details of chapters prepared by the Individual consultant	NA
19	Accreditation Certificate No. and Date/ Validity (In case jointly as per Point No. 18, No. and validity of both institution and individual are to be given)	CGWB Accreditation number & Validity: CGWB/RGI/005 & 14.02.2026

Mr. G Prasad Babu (Founder & CEO)
Signature with Name

2 ABOUT THE PROJECT

Gonua Iron Ore Mine of M/s JSW Steel Ltd is an existing mine located in village Gonua & Patabeda of Koira tehsil in Sundargarh district of Odisha (Figure **2.1**). The mine lease area falls under Survey of India Toposheet No. 73 F/8 & G/5. The indicative coordinates of the Gonua Iron Ore Mine are: Latitudes:$21^0$55'00.52356" N to $21^0$55'46.03440" N and Longitudes:$85^0$22'04.13616" E to $85^0$22'36.35616" E. The Gonua Iron Ore mine targets for production of 2.99 MTPA (ROM) of Iron ore with total excavation of 3.4086 MTPA (ROM 2.99 MTPA + OB/SB/IB 0.4186 MTPA) along with screening, crushing, 1000 TPH Central processing unit (CPU) in lease area of 88.516 ha (As per DGPS) / 86.886 ha (As per ROR) in Villages Gonua and Patabeda, Tehsil Koira, District Sundargarh, Odisha State. The total lease area includes Forest: 82.724 ha and non-Forest: 5.662 ha.

Forest clearance was approved by Ministry of Environment and Forest, GOI, for the forest clearance of Out of total 76.882Ha of forest land Forest Clearance obtained over an area of 54.50Ha vide MoEF letter No 847/93-FC dated 07/09.08.1996 for mining and ancillary activities.

The aforesaid project area is approachable from Barbil or Koira via public road NH-520 at 9 km, which further connecting to Panikoili at NH-5 and Rourkela, via Keonjhar, Joda, Barbil and Koida. The nearest railway station is Jaroli railway station at 5 km & Barbil railway station is at 40 km away from the block on Tatanagar-Barbil section from South-Eastern railway.

The existing NOC of Gonua Iron Ore Mine has been issued from CGWA vide NOC no. CGWA/NOC/MIN/ORIG/2022/15411 for groundwater abstraction/ dewatering quantum of 75 m^3/day with a validity from 10.05.2022 to 09.05.2024. Presently, this application is for applying the total abstraction quantum of 75 m^3/day (from borewell only) for the issue of groundwater NOC from the authority.

OBJECTIVE

The study's overall objective is to carry out hydrogeological study as per the new SOP notified on May 2023 (Version 9.1) by the CGWA for the preparation of comprehensive hydrogeological report on the groundwater conditions in the core and buffer zones within the radius of 2 km and 10 km respectively from the project boundary in order to obtain NOC approval from the Central Ground Water Authority for dewatering of 75 m^3/day of ground water abstraction.

APPROACH AND METHODOLOGY

In order to achieve the objectives hand in hand with the scope of work outlined above, a multidisciplinary approach has been adopted, dovetailing the domain skills of hydrogeological

and groundwater modelling, giving equal opportunities to arrive at an optimal strategy addressing the issues holistically. The methodology encompasses detailed hydrogeological investigation in and around the mine lease area, establishing an aquifer extent and an optimal groundwater monitoring network to monitor water quantity and quality changes. Estimating mine seepage in time and space has been attempted, evaluating the influence on groundwater in terms of space and quantifying contribution from groundwater. Further, an attempt has been made to arrive at technically viable engineering interventions for water harvesting and groundwater recharge following standard norms and guidelines within the statutory framework of various regulatory authorities.

For the hydrogeological study and assessment of groundwater resources, a core zone of 2 km and a buffer zone of 10 km from the mine lease boundary have been considered as per the norms of the Central Ground Water Authority (CGWA). The Toposheet map and Google Earth Imagery of the study area are given in Figure 2.2 and Figure **2**.**3**, respectively.

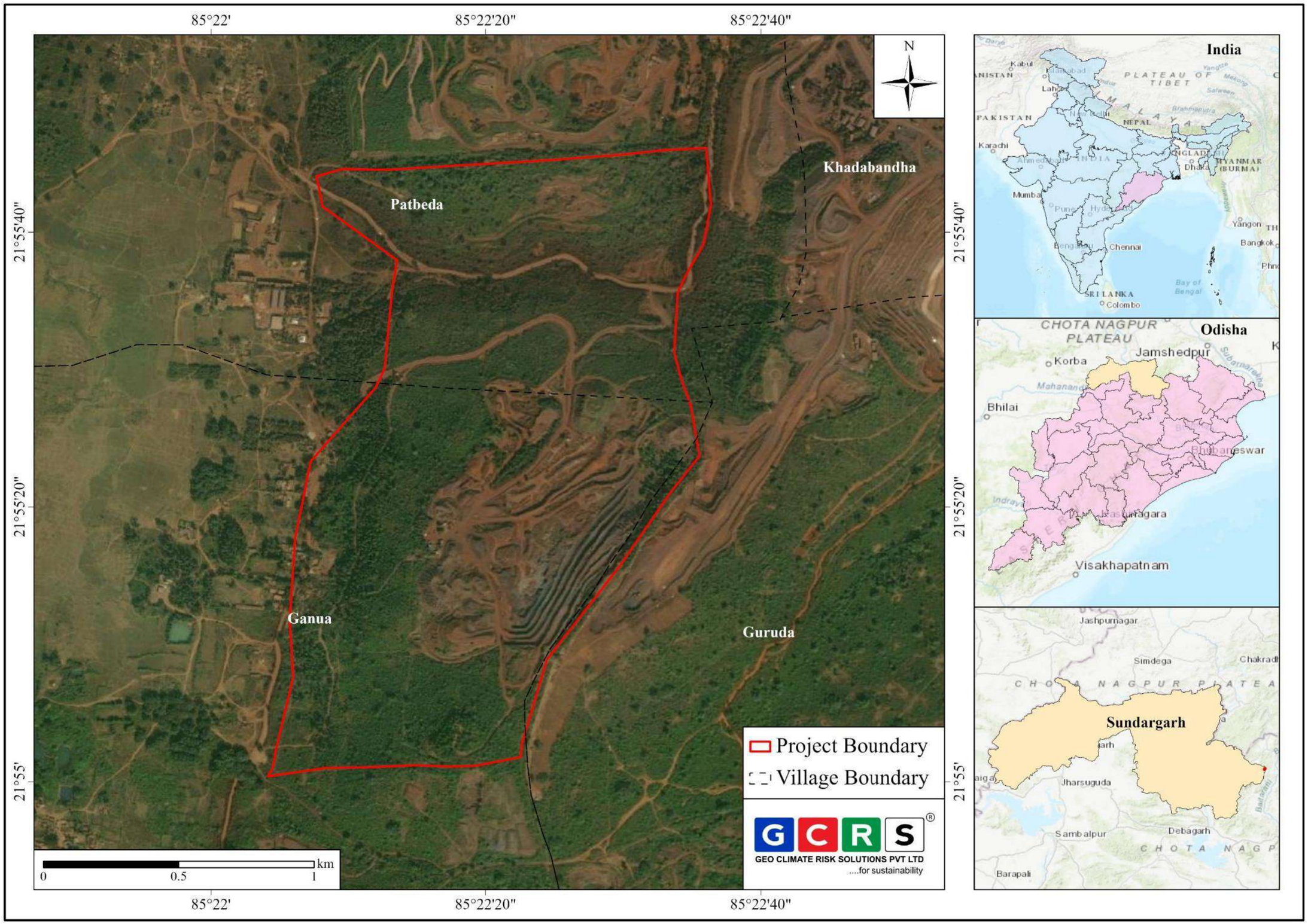


Figure 2.1: Location map of the project area.

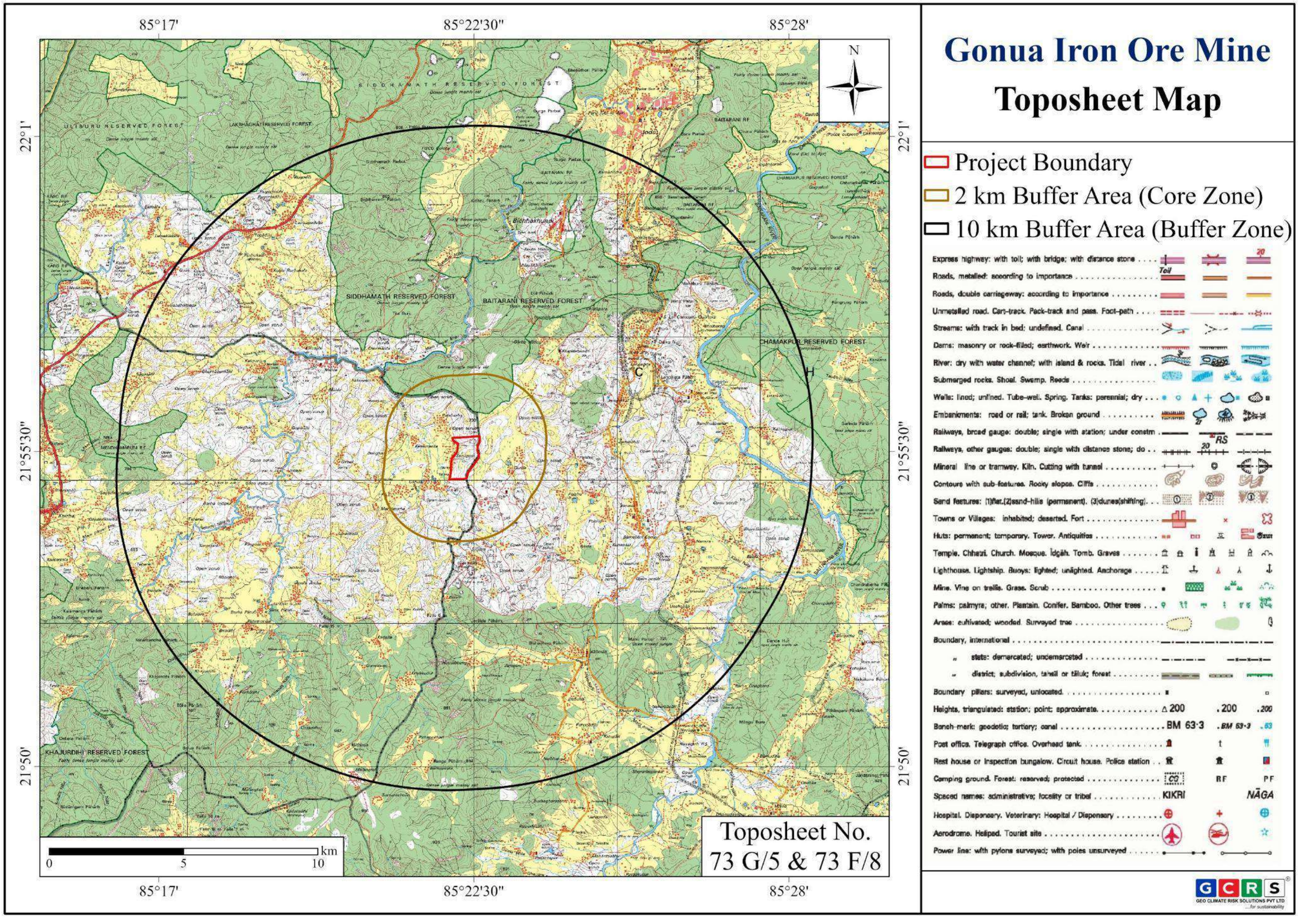


Figure 2.2: Toposheet of the study and project area (Source: Survey of India Toposheet map).

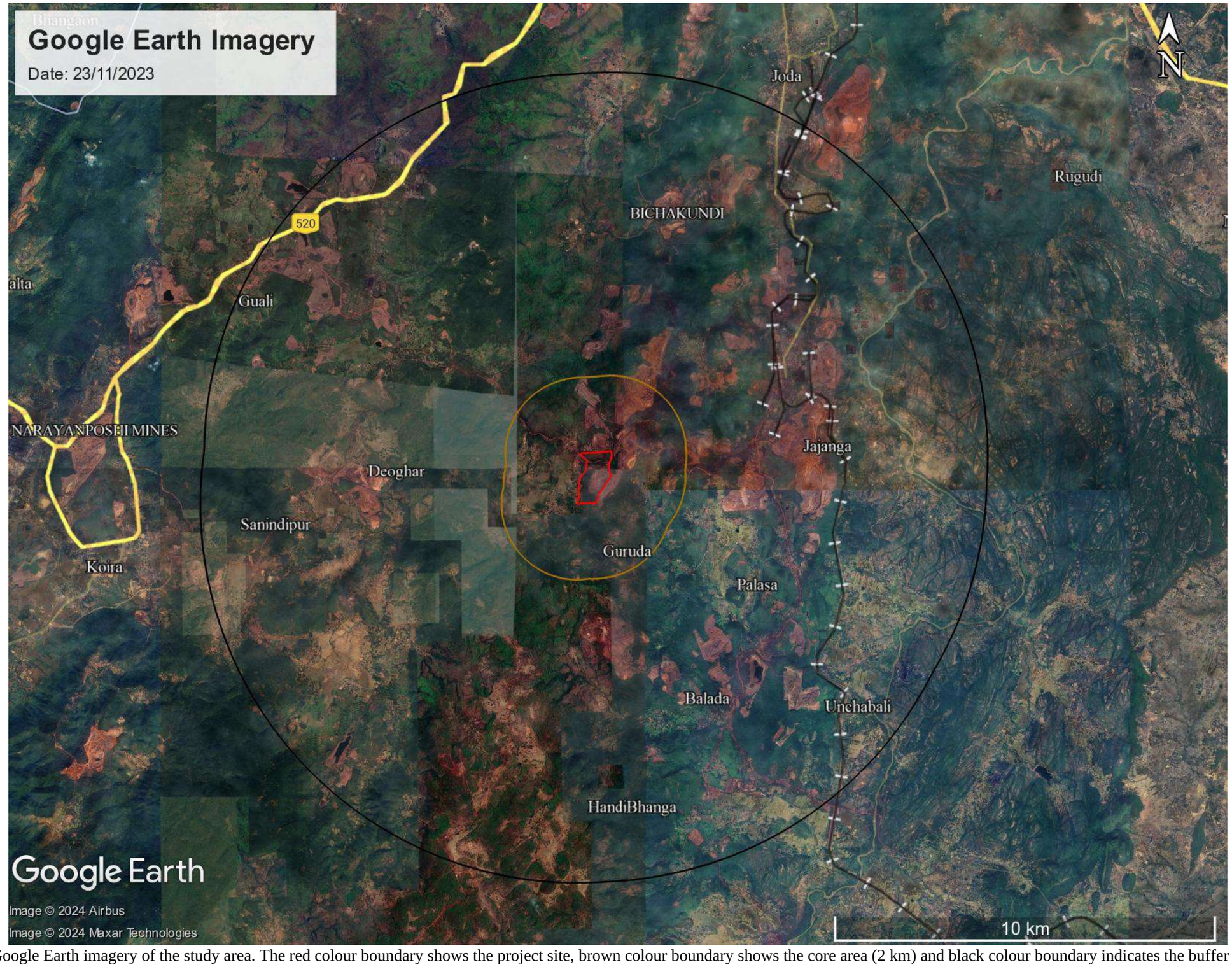


Figure 2.3: Google Earth imagery of the study area. The red colour boundary shows the project site, brown colour boundary shows the core area (2 km) and black colour boundary indicates the buffer area (10 km).

2.1 LANDUSE / LAND COVER OF LEASE AREA AND SURROUNDING AREA

The land use and land cover (LULC) maps are the fundamental data source for land management and planning. The accurate mapping of LULC classes is a valuable tool for understanding the relationship between humans and the environment (Pratico et al., 2021; Schulz et al., 2021; Viana et al., 2019; Qian and Zhang, 2022). The LULC maps for the present study were prepared using Sentinel-2 data on Google Earth Engine (GEE) platform. The GEE platform is widely used to shorten the processing time, which helps the user to store decades of data and removes the need, to download satellite imagery. The spatial resolution of LULC classes in the present study area is mainly related to the topographic factors/conditions. In the present study, a map has been prepared with 8 LULC classes for the month of March,2024 (Figure 2.4). The predominant land use in the study is forest (73.07%), followed by scrub land (8.87%), crop land (8.23%), mining (7.12%), built-up (1.92%), water bodies (0.36%), river (0.30%) and barren land (0.12%). The different land-use classes present in the study area are given in Table 2.1.

Table 2.1: Land Use Pattern of the study area.

Sl. No.	LULC Classes	Area (%)
1	Forest	73.07
2	Scrub land	8.87
3	Crop land	8.23
4	Mining	7.12
5	Built-up	1.92
6	Water Bodies	0.36
7	River	0.30
8	Barren land	0.12
Total		**100**

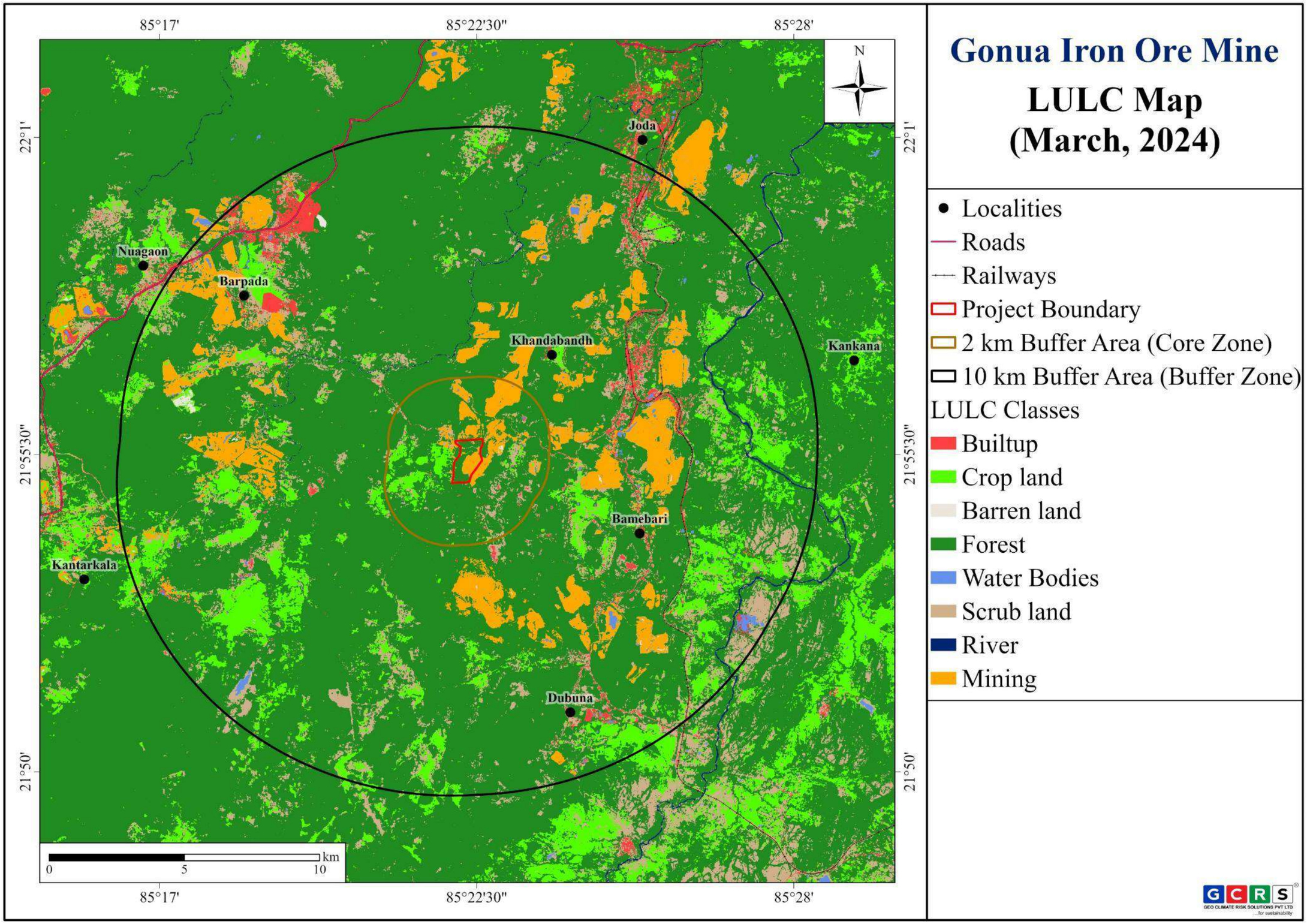


Figure 2.4: Land use map of the study area for the month of March, 2024.

2.2 DEM / TOPOGRAPHY

Digital Elevation Model (DEM) is the digital representation of the land surface elevation with respect to any reference datum. It reflects the physical surface of the earth and helps us to understand the nature of terrain using interpreting the landscape using modern techniques and high-resolution images. It is profitable to comprehend the nature of the topography, address the practical problems and fix them by applying new insights, upcoming high resolutions, satellite images, and techniques. In contrast, the topography is land surface's physical and natural features. A topographic map shows natural and manmade features (Balasubramanian, 2017).

The surface topography/DEM map is prepared using ArcGIS Pro software from SRTM-DEM of 30 m spatial resolution data. The topography of the study area is highly undulating in the southern and south-western part due presence hilly terrain with variation in slopes. The northern part of the study area also moderately elevated due to presence of few mounds. The e north-eastern & Eastern part of the study area exhibits low elevated topography which guides the surface water flow too. The elevation in the project area (mine lease area) ranges from 586 to 718 mamsl, whereas the elevation ranges from 444 to 961 mamsl in the overall study area (10 km buffer area). The topography map of the study area is shown in Figure 2.5.

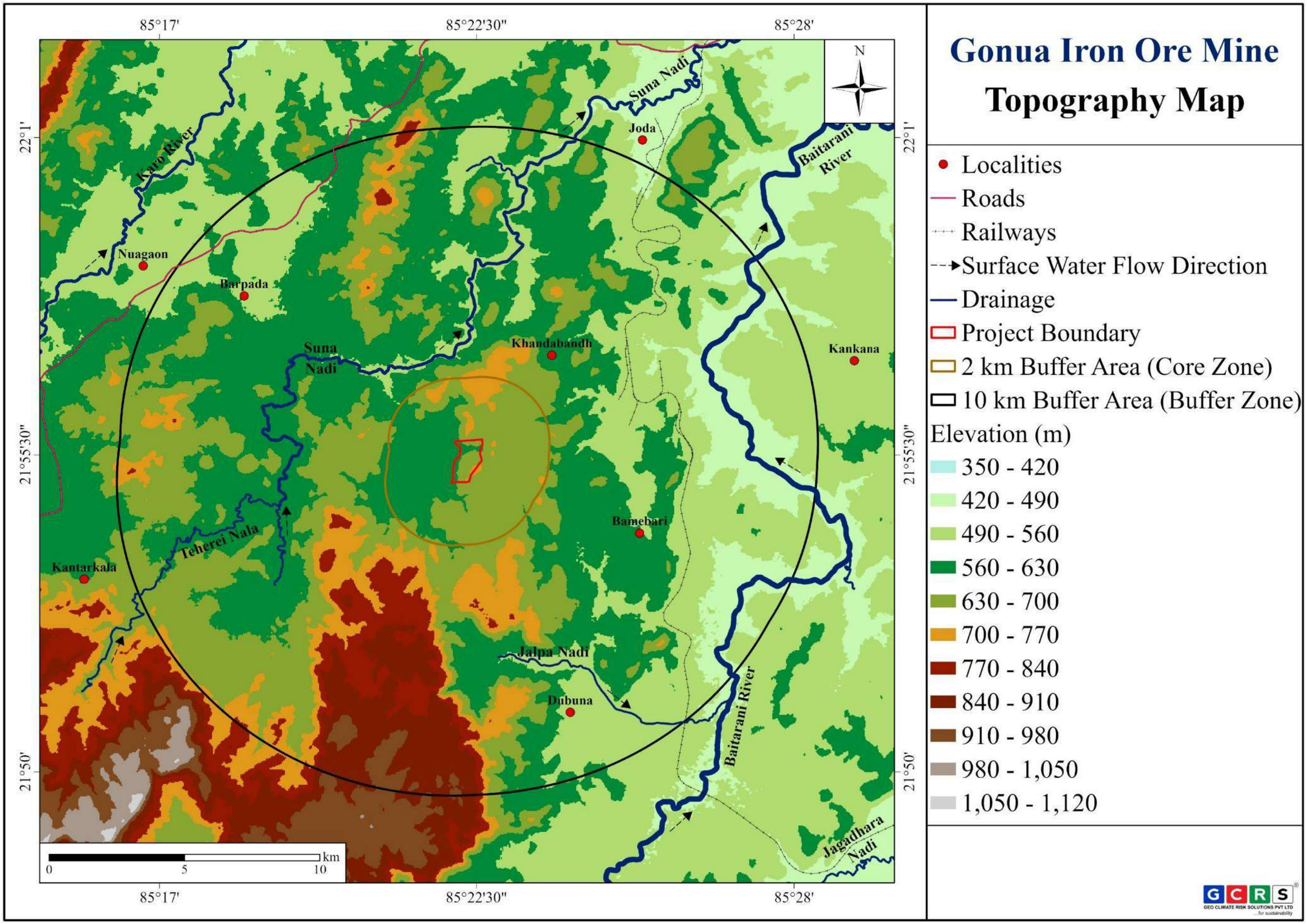


Figure 2.5: DEM/Topography of the study area (Source: SRTM-DEM).

2.3 GEOMORPHOLOGY AND DRAINAGE

The predominant geomorphological features present in the study area, are moderately dissected hills and valleys of structural origin, followed by pediment of denudational origin, active quarry of anthropogenic origin, pediplain of denudational origin, highly dissected hills and valleys of structural origin, intermontane valley of fluvial origin and so on (Figure 2.6).

The drainage network of the study area is extracted from SRTM-DEM of 30 m spatial resolution (USGS website) using the Hydrology tool of ArcGIS Pro software. The study area's drainage system is predominantly dendritic (Figure 2.7). The principle drainage system of the study area is controlled by Baitarani River & Suna Nadi, both are traverse from south-west to north-east direction in this region. Along with these, many Nalas/Streams can be observed in the study area which contributes towards the drainage system of the area. Jalpa Nadi, Kashi Nala, Dalko Nala flows south-east direction and Tapaikiri Nala flows in north-west direction to discharge their water into Baitarani River. Teherei Nala acts an important tributary to form Suna Nadi. Khajurdihi Nala, Archanda Nala & Gahirajala Nala contributes their water into Suna Nala. Kakarpani Nala, Kalmang Nala & Kunduru Nala are the important tributaries to the Suna Nadi in this region.

Other than these many seasonal Nalas also can be observed during the peak rainfall time. No perennial drainage is flowing inside the project area. Kakarpani Nala is the perennial stream that is flowing at 0.6 km west to the project area.

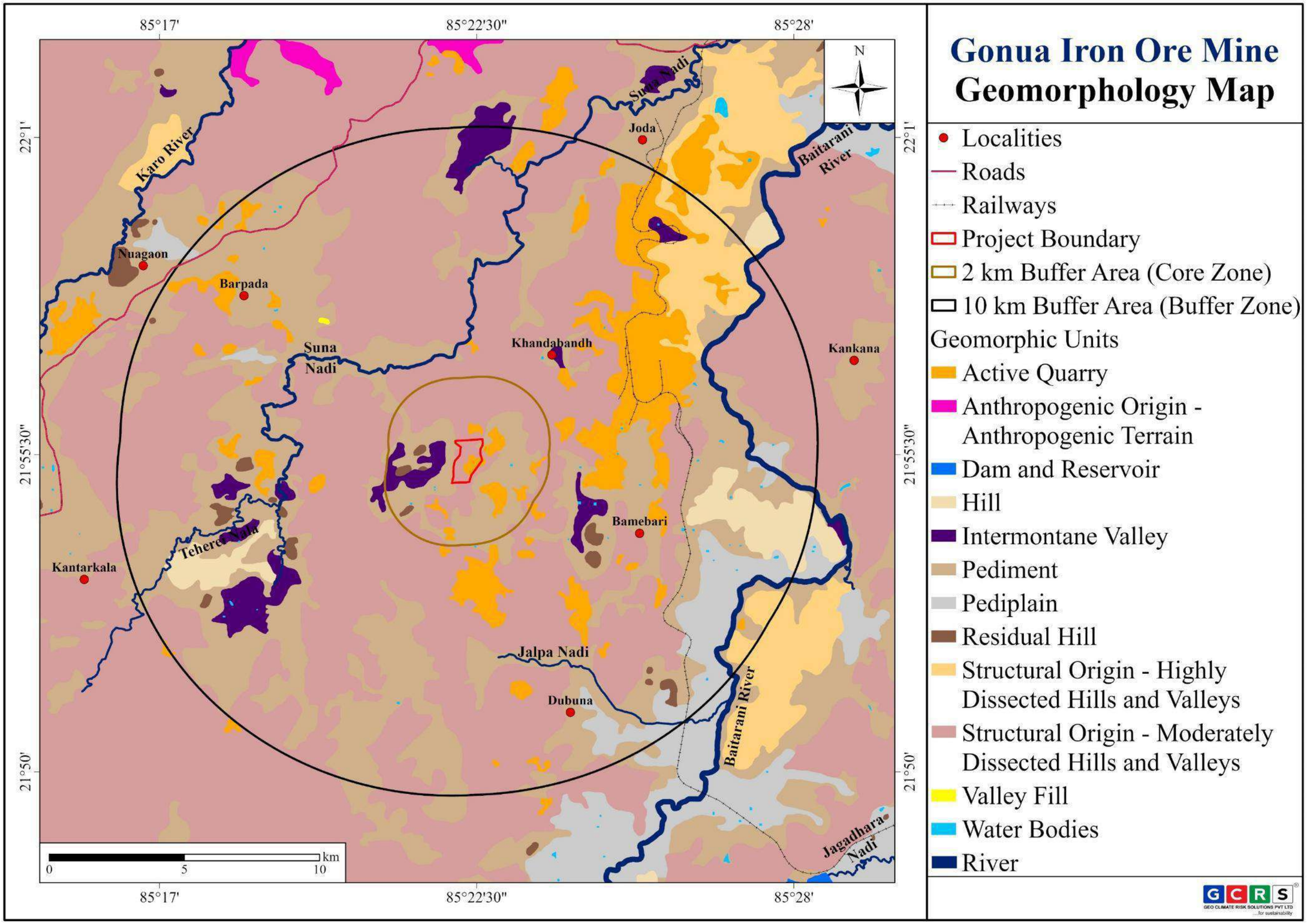


Figure 2.6: Geomorphology map of the study area (Source: Bhukosh, GSI, https://bhukos.gsi.gov.in/Bhukosh/MapViewer.aspx).

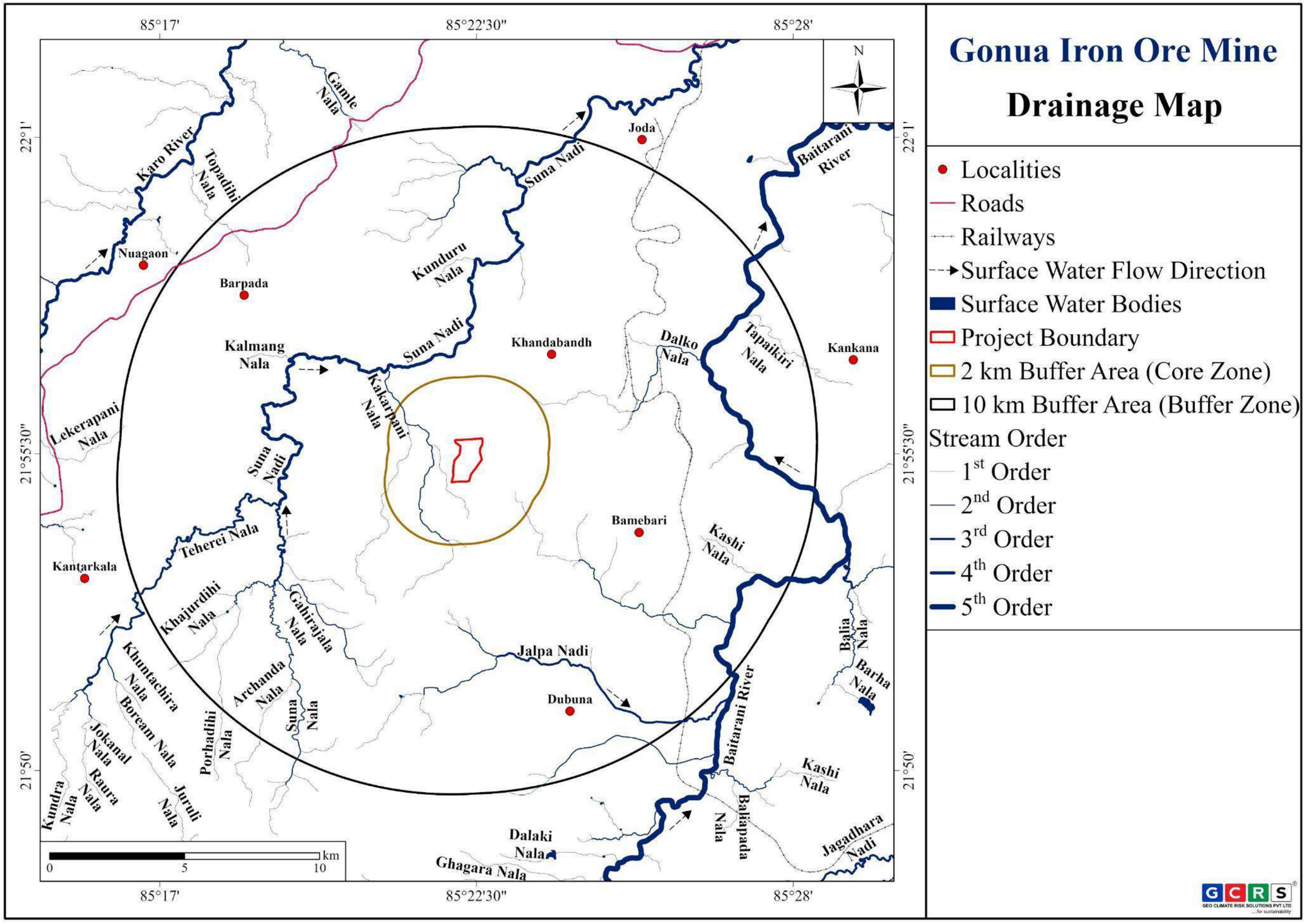
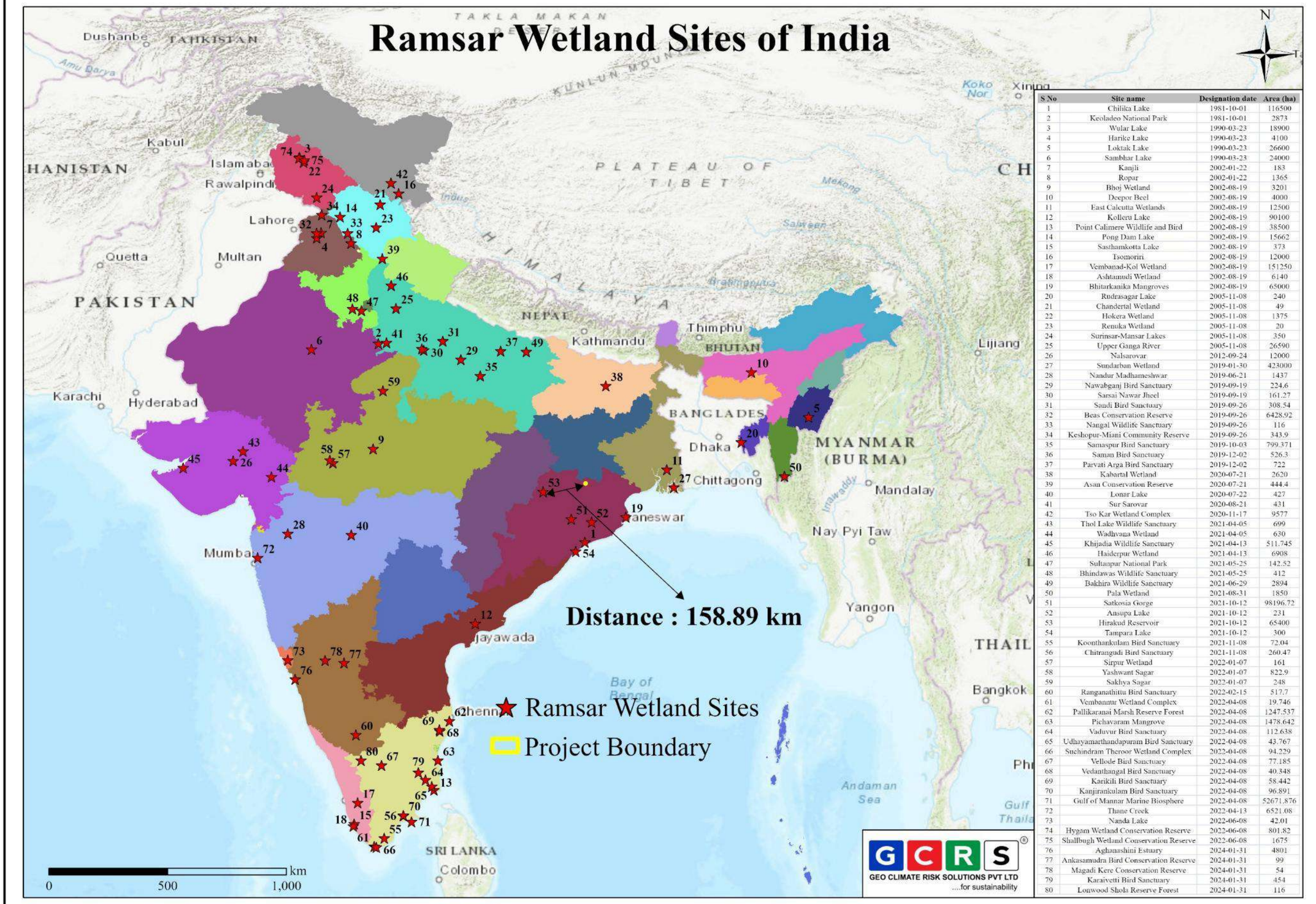


Figure 2.7: Drainage map of the study area (Source: SRTM-DEM).

2.4 DETAILS OF WETLANDS / MAJOR WATER BODIES

A wetland is a distinct ecosystem flooded by water, either permanently or seasonally, where oxygen-free processes prevail. The primary factor that distinguishes wetlands from other landforms or water bodies is the characteristic vegetation of aquatic plants, adapted to the unique hydric soil. Any wetland site listed under the Ramsar Convention that aims to conserve it and promote sustainable use of its natural resources is called a Ramsar Site. There are total of 80 Ramsar wetland sites present in India as of January, 2024. (http://wiienvis.nic.in/ Database/ramsar_wetland_sites_8224.aspx) (Figure 2.8).

The nearest Ramsar Wetland site from the project area is Hirakud Reservoir, situated at an aerial distance of 158.89 km in the State of Odisha. Hence, no Ramsar wetland sites are present in the vicinity of 500 m from the mine lease or within the study area. A certificate regarding the same is not applicable for the particular proposal.



S No	Site name	Designation date	Area (ha)
1	Chilika Lake	1981-10-01	116500
2	Keoladeo National Park	1981-10-01	2873
3	Wular Lake	1990-03-23	18900
4	Harike Lake	1990-03-23	4100
5	Loktak Lake	1990-03-23	26600
6	Sambhar Lake	1990-03-23	24000
7	Kanjli	2002-01-22	183
8	Ropar	2002-01-22	1365
9	Bhoj Wetland	2002-08-19	3201
10	Deepor Beel	2002-08-19	4000
11	East Calcutta Wetlands	2002-08-19	12500
12	Kolleru Lake	2002-08-19	90100
13	Point Calimere Wildlife and Bird	2002-08-19	38500
14	Pong Dam Lake	2002-08-19	15662
15	Sasthamkotta Lake	2002-08-19	373
16	Tsomoriri	2002-08-19	12000
17	Vembanad-Kol Wetland	2002-08-19	151250
18	Ashtamudi Wetland	2002-08-19	6140
19	Bhitarkanika Mangroves	2002-08-19	65000
20	Rudrasagar Lake	2005-11-08	240
21	Chandertal Wetland	2005-11-08	49
22	Hokera Wetland	2005-11-08	1375
23	Renuka Wetland	2005-11-08	20
24	Surinsar-Mansar Lakes	2005-11-08	350
25	Upper Ganga River	2005-11-08	26590
26	Nalsarovar	2012-09-24	12000
27	Sundarban Wetland	2019-01-30	423000
28	Nandur Madhameshwar	2019-06-21	1437
29	Nawabganj Bird Sanctuary	2019-09-19	224.6
30	Sarsai Nawar Jheel	2019-09-19	161.27
31	Sandi Bird Sanctuary	2019-09-26	308.54
32	Beas Conservation Reserve	2019-09-26	6428.92
33	Nangal Wildlife Sanctuary	2019-09-26	116
34	Keshopur-Miani Community Reserve	2019-09-26	343.9
35	Samaspur Bird Sanctuary	2019-10-03	799.371
36	Saman Bird Sanctuary	2019-12-02	526.3
37	Parvati Arga Bird Sanctuary	2019-12-02	722
38	Kabartal Wetland	2020-07-21	2620
39	Asan Conservation Reserve	2020-07-21	444.4
40	Lonar Lake	2020-07-22	427
41	Sur Sarovar	2020-08-21	431
42	Tso Kar Wetland Complex	2020-11-17	9577
43	Thol Lake Wildlife Sanctuary	2021-04-05	699
44	Wadhvana Wetland	2021-04-05	630
45	Khijadia Wildlife Sanctuary	2021-04-13	511.745
46	Haiderpur Wetland	2021-04-13	6908
47	Sultanpur National Park	2021-05-25	142.52
48	Bhindawas Wildlife Sanctuary	2021-05-25	412
49	Bakhira Wildlife Sanctuary	2021-06-29	2894
50	Pala Wetland	2021-08-31	1850
51	Satkosia Gorge	2021-10-12	98196.72
52	Ansupa Lake	2021-10-12	231
53	Hirakud Reservoir	2021-10-12	65400
54	Tampara Lake	2021-10-12	300
55	Koonthankulam Bird Sanctuary	2021-11-08	72.04
56	Chitrangudi Bird Sanctuary	2021-11-08	260.47
57	Sirpur Wetland	2022-01-07	161
58	Yashwant Sagar	2022-01-07	822.9
59	Sakhya Sagar	2022-01-07	248
60	Ranganathittu Bird Sanctuary	2022-02-15	517.7
61	Vembannur Wetland Complex	2022-04-08	19.746
62	Pallikaranai Marsh Reserve Forest	2022-04-08	1247.537
63	Pichavaram Mangrove	2022-04-08	1478.642
64	Vaduvur Bird Sanctuary	2022-04-08	112.638
65	Udhayamarthandapuram Bird Sanctuary	2022-04-08	43.767
66	Suchindram Theroor Wetland Complex	2022-04-08	94.229
67	Vellode Bird Sanctuary	2022-04-08	77.185
68	Vedanthangal Bird Sanctuary	2022-04-08	40.348
69	Karikili Bird Sanctuary	2022-04-08	58.442
70	Kanjirankulam Bird Sanctuary	2022-04-08	96.891
71	Gulf of Mannar Marine Biosphere	2022-04-08	52671.876
72	Thane Creek	2022-04-13	6521.08
73	Nanda Lake	2022-06-08	42.01
74	Hygam Wetland Conservation Reserve	2022-06-08	801.82
75	Shallbugh Wetland Conservation Reserve	2022-06-08	1675
76	Aghanashini Estuary	2024-01-31	4801
77	Ankasamudra Bird Conservation Reserve	2024-01-31	99
78	Magadi Kere Conservation Reserve	2024-01-31	54
79	Karaivetti Bird Sanctuary	2024-01-31	454
80	Lonwood Shola Reserve Forest	2024-01-31	116

Figure 2.8: Ramsar Wetland sites of India (modified after http://wiienvis.nic.in/Database/ramsar_wetland_sites_8224.aspx).

3 HYDROGEOLOGY

3.1 GEOLOGICAL SET UP

The Gonua Iron Ore Mine is a part of the Bonai - Kendujhar belt falling in Sundargarh districts. The feebly metamorphosed Precambrian volcano-sedimentary rocks exposed in this belt between the Singhbhum granite on the east and Bonai granite on the west and are classified as 'Iron ore Group' (Sarkar & Saha, 1962) or 'Koira Group' (Murty and Acharya, 1975). These rocks are disposed in form of a low northerly plunging 'Horse-shoe' shaped synclinorium (Jones, 1934).

The base of the Koira Group is marked by a pronounced unconformity over the Singhbhum granite in the eastern side and has a sheared inter-fingering contact relationship with Bonai granite on the western side. The basal formation comprises of gritty sandstone, which ranges from orthoquartzite on one hand to pebbly sandstone and conglomerate on the other, this arenaceous unit is followed by mafic volcanic Which is found all along the outer periphery of the horse-shoe synclinorium. The volcanic formation comprises predominantly of Lower volcanic flows dominantly of mafic composition and an upper tuffaceous zone. The lava is pillowed at the bottom part and amygdaloidal at the top indicating its sub-aqueous and subsequent sub-aerial character. The lava grades into purple color tuffaceous shale conformably towards the upper part and described as lower shale formation' (Murty and Acharya, op. cit.). By the appearance of jasper and banded jasper inter banded with the greenish and black shale towards the top, the lower shale pass into the 'Banded Iron Formation'.

The 'Banded iron Formation' is represented by Banded hematite jasper (BHJ)/ Banded hematite quartzite (BHQ)/ Banded magnetite quartzite (BMQ), inter-bedded black or green shale and banded ferruginous chert. Due to high resistance to erosion these litho-units form high ridges conspicuously marking the outline of the 'horse-shoe' synclinorium and depict the major structural pattern of the belt.

The 'Banded Iron Formation' is overlain by the 'Upper Shale Formation' comprising of thick sequence of tuffaceous purple, white and buff coloured shale, black shale, banded ferruginous shale with inter-bedded chert and Banded hematite jasper (BHJ)/ Banded hematite quartzite (BHQ)/ Banded magnetite quartzite (BMQ) bands and spreading over the entire core of the synclinorium. The 'Upper Shale Formation' can be divided into two horizons/ zones (Patel, et.al. 2005) namely, lower manganiferous shale horizon/ zone and upper ferruginous shale horizon/ zone. These two horizons/zones exhibit conformable relationship.

Regional geology: Iron ore deposit of the M.L area forms apart of the eastern limb of the Singhbhum Keonjhar-Bonai belt, also known as the Jamda-Koira valley and is represented by

a narrow NNE-SSW trending synclinorium of 60 km length and 25 km width. The Precambrian horseshoe shaped belt is well known for its large reserves of iron and manganese ore.

strike is north-east to north and dips are moderate to steep. The western limb of the synclinorium is slightly over-turned at some places.

The belt was first reported by Jones in 1934 and has been studied in detail by several eminent geo-scientists, since then. The major litho types are metamorphosed sandstone, lithic wacke mostly in the east, BIF and iron ore fragments. Shale, lavas, volcanic, pyroclastic tuffs, phyllite and Banded Iron Formation (BIF) including Banded Hematite Quartzite (BHQ) and the Kolhan Group of rocks are exposed.

The Precambrian rocks of this region comprising of basic lava, tuffs, banded iron formation (BIF), shales, conglomerates and sandstones etc. were mapped for the first time by Jones (1934). The stratigraphic succession established by Jones has largely been modified later by Dunn (1940) based on detailed mapping in the northern parts of the belt. Dunn recognized a new group lying unconformably over the Iron Ore Group which he named as the "Kolhan Group". The rock types of the area belonging to the Kolhan group lies to the north of the Noamundi in Bihar.

The most acceptable litho-stratigraphic succession for the belt was proposed by Murthy and Acharaya (1975). They identified different depositional facies and proposed a more detailed stratigraphic succession. They also proposed a new name the "Kolhan Group" to the rocks of Bonai-Keonjhar belt. The stratigraphic succession suggested by Murthy and Acharya (1975) is given in Table 3.1.

Table 3.1: The stratigraphic succession of the region.

KOLHAN GROUP	Sandstone, Conglomerate, Breccias
Unconformity	
Mixed Facies Formation	• Basic Lava, tuffs and tuffites of volcanic facies. • Iron, Manganese, Lenses of Iron formation, Chert, small dolomite patches of chemical facies. • Minor lenses of sandy and silty shale of clastic facies.
Banded Shale Formation	• Banded shale member • Black shale member • Black shale – chert member

Banded Iron formation	• Finally banded Jaspilite Member • Coarsely banded jaspilite member
Volcanic Formation	• Tuffaceous shale • Basic Lava
Basal Sandstone	Gritty Sandstone, Quartzite, Conglomeratic at places with interbedded Lava at top
Unconformity	
Singhbhum Granite with enclaves of older meta-basic and meta-sedimentary rocks.	

Geology of the Block

Gonua region is observed with the litho-members including lower shale, banded iron formation, laterite, soil and alluvium. Banded Iron Formation (BIF) hosted iron ores with their variants are abundant in the middle part of Gonua area. Banded Hematite Jasper (BHJ), Banded Hematite Quartzite (BHQ), Manganiferous Laterite with shale and patches of Hard Massive Ore (HMO). The BIF members found associated with hematitic ore in the form of soft laminated, hard laminated, hard massive and powdery form. Manganiferous laterite is found in parts of both the quarries. In the eastern part of the lease area. The area is disturbed due to compressive pressure which is visible in the BIF formations.

Gonua Quarry - The Iron Ore in Gonua Quarry is mainly found in eastern part of the mines. Lateritic Ore occurs in two patches, i.e NE part and SW part. Some insitu Iron Ore patches are found in Gonua Quarry. The general trend of the ore body in NE-SW and dipping towards the centre of the Gonua Quarry from both the limbs. The Quarry has some patches of hard ore exposed in the eastern limb of the syncline. Float ores are also exposed in the top of the Gonua Quarry in the eastern slope.

Patabeda Quarry - Float Ore is found in and around Patabeda Quarry and shows biscuity structure. This ore is associated in a groundmass of laterite and shale. The general trend of the lithounits is E-W. As the Patabeda Quarry is unexplored, a very little amount of information is known.

(Source: Modification of Mining plan, Gonua Iron Ore Mines)

The major geology of the study area consists of Slate, Phyllite, Mica Schist of Archaean - Paleoproterozoic, followed by Banded Hematite Quartzite of Archaean - Paleoproterozoic, Sandstone & Conglomerate of Paleoproterozoic - Mesoproterozoic, Basic Meta-Volcanics of Archaean - Paleoproterozoic. The geological map of the study area is presented in Figure 3.1.

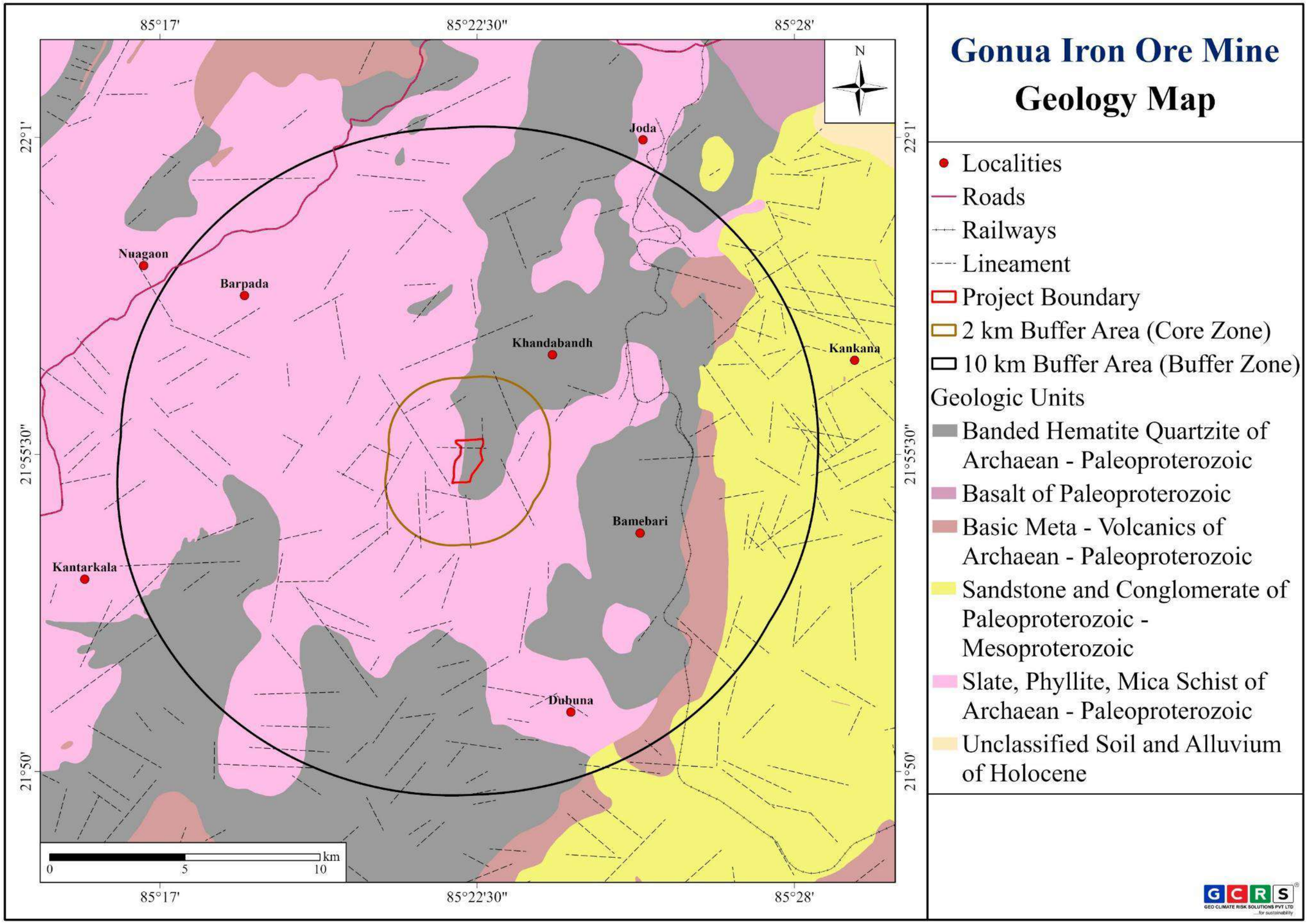


Figure 3.1: Geology map of the study area (Source: https://bhukosh.gsi.gov.in/Bhukosh/MapViewer.aspx).

3.2 GEOPHYSICAL STUDIES

In order to reconstruct the sub-surface geometry of the study area, a detailed geophysical investigation has been carried out using Vertical Electrical Sounding (VES) survey. In the present study, the VES data were interpreted using the physical parameters, such as the thickness of the formation and resistivity upon comparing the VES section graph with the available lithology in the vicinity of each VES transect to interpret the sub-surface stratigraphy. The present study used depth-wise resistivity variation in VES data to interpret the sub-surface stratigraphy (Telford et al., 1990; Reynolds, 2011). The apparent resistivity of the formation is calculated by measuring the change in the potential in the proximity of the applied external electric current to the electrodes, excluding the self-potential of the formation (Chandra, 2015).

Methodology

The resistivity soundings were carried out in the study area by applying the Schlumberger configuration with possible current electrode separation to get the maximum depth of investigation. Apparent resistivity (ρa) can be measured at different depths in the form of the pseudo-depth section by using four electrodes (2 current and 2 potential) system by placing electrodes in different spacing. In this technique, the current electrode/ potential electrode separation is increased in a sequence. The investigation depth depends on the total spread length and the array configuration used for data collection. The configuration of the VES technique is shown in Figure 3.2.

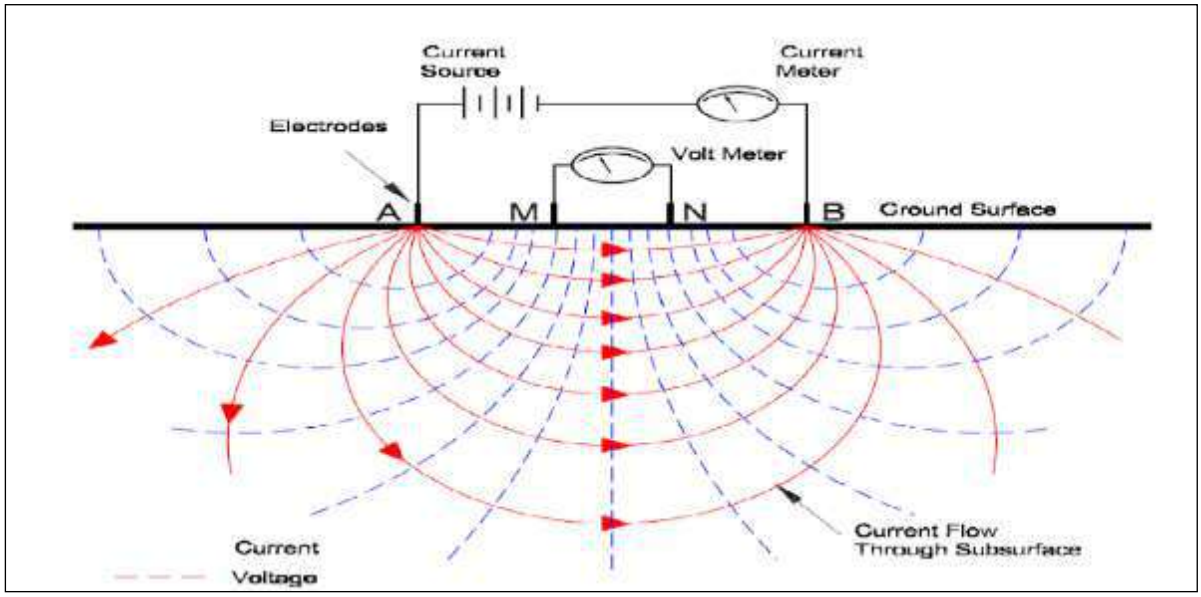


Figure 3.2: Configuration of Vertical electrical sounding technique.

Schlumberger Array Configuration

In this array, four electrodes are placed in a line around a common midpoint. The two outer electrodes, A and B, are current electrodes, and the two inner electrodes, M and N, are potential

electrodes, as shown in Figure 3.3. With the Schlumberger array, for each measurement, the current electrodes A and B are moved outward to a greater separation throughout the survey, while the potential electrodes M and N stay in the same position until the observed voltage becomes too small to measure (Figure 3.3; Bhattacharya, 2012). At this point, the potential electrodes M and N are moved outward to a new spacing. As a thumb rule, the reasonable distance between M and N should be equal to or less than one-fifth of the distance between A and B at the beginning. This ratio goes about up to one-tenth or one-fifteenth, depending on the signal strength. The formula for the derivation of the apparent resistivity with the Schlumberger array is given below.

$$\rho_a = \frac{\pi}{4}\frac{V}{I}\frac{(L^2 - a^2)}{a}$$

Where, ρ_a is apparent resistivity; I is current intensity; V is the potential difference between M and N Point, L is the distance between outer electrodes A and B, and "a" is the distance between inner electrodes M & N.

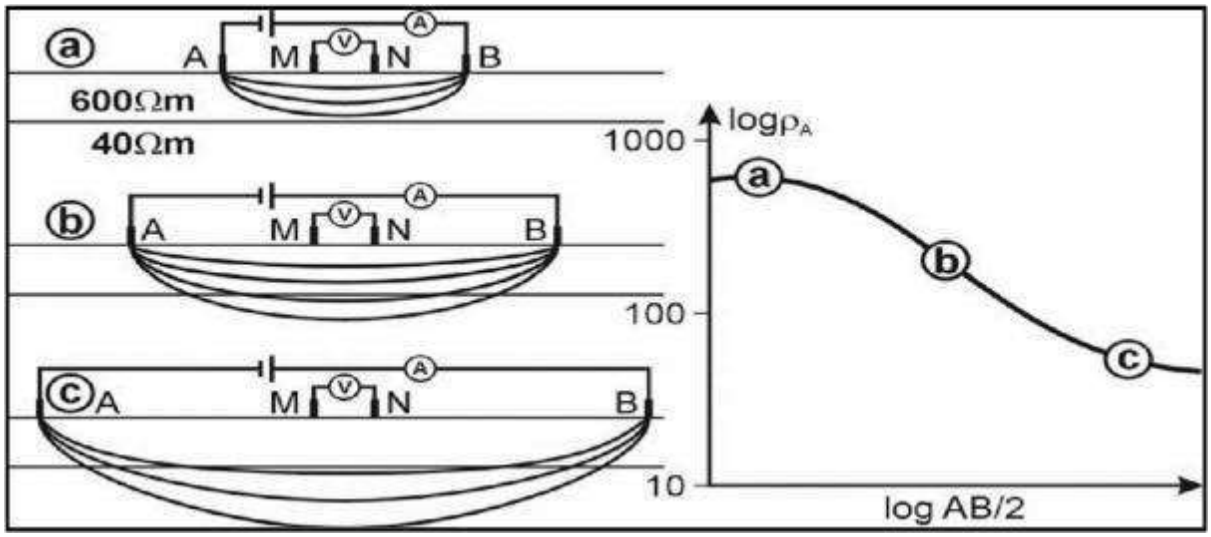


Figure 3.3: Schlumberger Array Configuration. From (a) to (c), A and B (current electrodes) are moved outward to a greater separation from the centre.

Data Processing and Interpretation:

Surface geophysical survey comprised of seven Vertical Electrical Sounding (VES) have been conducted at two different locations in the lease area to identify the subsurface condition. The observed resistance values from the instrument have been multiplied with geometric factor (K) to get the apparent resistivity values for each electrode spacing. The apparent resistivity values for different potential dipole were brought to single common potential dipole. The field

apparent resistivity data were plotted on log-log graph paper against the half current electrode separation to get the VES curves (X axis-$C_1C_2/2$ value and Y axis apparent resistivity value). These data of $C_1C_2/2$ and apparent resistivity were interpreted with the help of two layer master curve by curve matching technique and further checked with the help of IPI2WIN software. The final results were corroborated with the known hydrogeological conditions existing in the area. The geoelectric layer parameters (layer resistivity and layer thickness) were obtained for each VES. The interpreted results are given in the Table 3.2.

Table 3.2: Results of VES Survey.

VES1					**VES2**			
SI. No.	AB/2 (m) (C.E.)	MN (m) (P.E.)	Resistivity (ohm - mt.)		SI. No.	AB/2 (m) (C.E.)	MN in (m)(P.E.)	Resistivity (ohm - mt.)
1	2	2	210		1	2	2	257
2	5	2	310		2	5	2	297
3	10	2	300		3	10	2	271
4	20	20	234		4	20	20	157
5	30	20	137		5	30	20	125
6	40	20	101		6	40	20	121
7	50	20	94		7	50	20	123
8	60	20	84		8	60	20	124
9	70	20	97		9	70	20	119
10	80	20	105		10	80	20	125
11	90	20	114		11	90	20	125
12	100	20	120		12	100	20	131
13	120	40	132		13	120	40	136
14	140	40	150		14	140	40	146
15	150	40	159		15	150	40	156

Description of VES transect:

A total 02 numbers of VES have been carried out at different points. Aquameter CRM 500 Resistivity meter has been used for conducting the VES. Schlumberger and half Schlumberger configurations have been used for conducting the VES survey. The maximum current electrode spread for conducting VES was 300 m (AB). The data is plotted on double logarithmic graph paper and matched with standard curves to know the true resistivity and thickness of various layers. The data is also interpreted by Computer using IPI2WIN software to verify the results of partial curve matching. From interpreted results of VES the resistivity (Table 3.3) and thickness of different layers are given in VES 1 (Figure 3.4).and VES 2 (Figure 3.5).

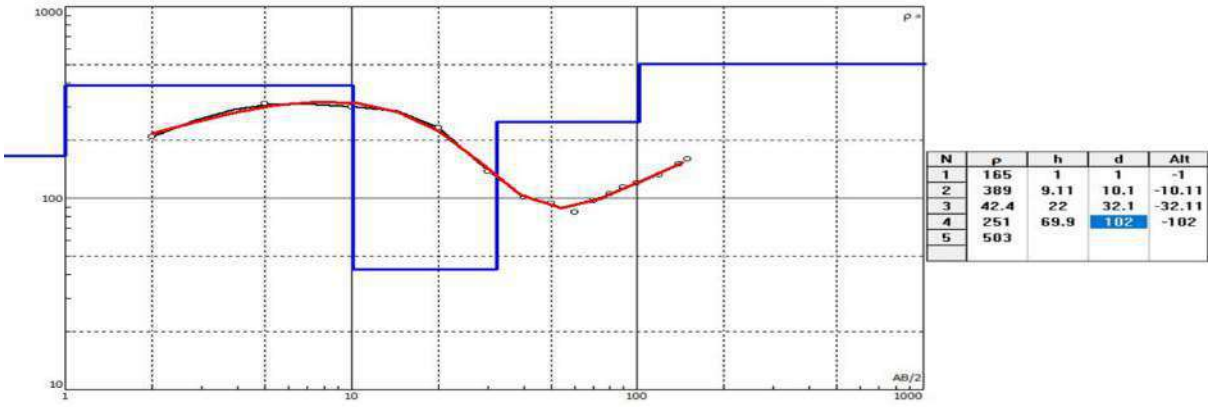


Figure 3.4: Electrode spacing (AB/2) vs resistivity for VES1.

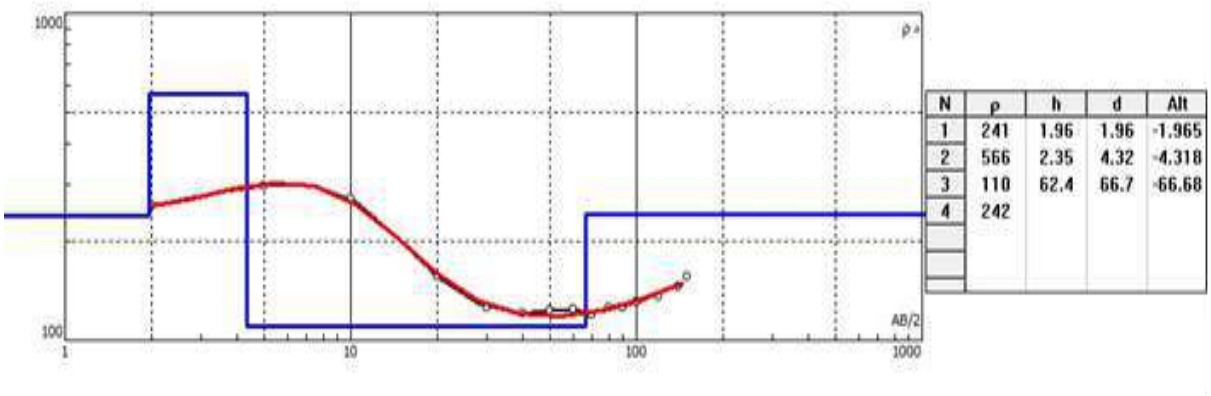


Figure 3.5: Electrode spacing (AB/2) vs resistivity for VES2.

Table 3.3: Description of VES.

VES No.	Layer	Depth in (M)	Probable Litho-Layer	Topography	Expected Geology
VES-1	1	1	Top Soil	Plain	Precambrian (Singhbhum)
	2	10.1	Weathered Zone		
	3	32.1	Highly Fractured		
	4	102	Fractured Rock		
	5	inf.	Hard Rock		
VES-2	1	1.96	Top Soil	Plain	Precambrian (Singhbhum)
	2	4.32	Weathered Zone		
	3	66.7	Fractured Rock		
	4	inf.	Hard Rock		

3.3 HYDROGEOLOGICAL SET UP

The hydrogeological structure of the study area is mainly controlled by geological settings, intensity and distribution pattern of rainfall, and the degree of primary and secondary porosities in the prevailing geological formations for storage and movement of groundwater.

To understand the proper hydrogeological scenario of the study area, an approach has been made to decipher the orientation of the groundwater in the area under the water table configuration. To undertake the same, the groundwater level monitoring has been carried out in the core zone, buffer zone and some locations outside the buffer zone.

Water level monitoring is carried out during May 2024 and October 2023 to get the water table elevation of the area above means sea level is derived from the monitored data (Table 3.4). The same has been used to generate the water table elevation contours. However, the wells considered beyond the study area is used for the interpolation of the water levels and its derivatives within the buffer area and their subsequent presentation in the concerned maps. The location map of the groundwater monitoring wells is presented as Figure 3.6.

A hydrogeological map of the study area covering core and buffer zones within 2 km and 10 km from the project area is prepared (Figure 3.7). The predominant aquifer of the study area is Slate, Phyllite, Mica Schist with yield capacity of 1 to 5 lps followed by Banded Hematite Quartzite with yield of 3 to 10 lps, Sandstone & Conglomerate with yield of 3 to 10 lps and Basic Meta having yield of 10 to 15 lps.

Table 3.4: Details of water level monitoring stations in & around the study area.

Sl. No.	Well ID.	Longitude	Latitude	Locations (Village Name)	Elevation (m)	Water Level (mbgl)		Water Table Contours (mamsl)		Fluctuation (m)
						May, 2024	October, 2023	May, 2024	October, 2023	
1	G1	85.38568	21.92028	Guruda	639	5.94	1.03	633.06	637.97	4.91
2	G2	85.31084	21.87426	Badpatuli	627	4.45	3.58	622.55	623.42	0.87
3	G3	85.31977	21.95253	Kalmanga	565	7.20	5.20	557.80	559.80	2.00
4	G4	85.35306	21.95341	Chormalda	560	6.67	5.62	553.33	554.38	1.05
5	G5	85.33168	22.034391	Gamulai	507	5.34	4.95	501.66	502.05	0.39
6	G6	85.36132	21.91581	Ganua	593	4.00	3.24	589.00	589.76	0.76
7	G7	85.37808	22.01194	Camp of Tisco	534	3.41	1.77	530.59	532.23	1.64
8	G8	85.31931	21.99009	Laidapada	550	8.46	5.82	541.54	544.18	2.64
9	G9	85.40508	21.89318	Balada	563	2.52	1.83	560.48	561.17	0.69
10	G10	85.4223	21.99168	Joda M	508	8.64	6.79	499.36	501.21	1.85
11	G11	85.4526	21.89578	Namira	487	7.72	6.25	479.28	480.75	1.47
12	G12	85.44125	21.84316	Nayagarh	499	10.64	6.09	488.36	492.91	4.55
13	G13	85.42577	21.9512	Jaroli	488	3.17	2.50	484.83	485.50	0.67
14	G14	85.4017	21.8147	Basantapur	515	2.74	1.80	512.26	513.20	0.94
15	G15	85.3397	21.8395	Mithirda	877	1.75	1.37	875.25	875.63	0.38
16	G16	85.254058	21.91755	Kashira	583	12.54	7.75	570.46	575.25	4.79

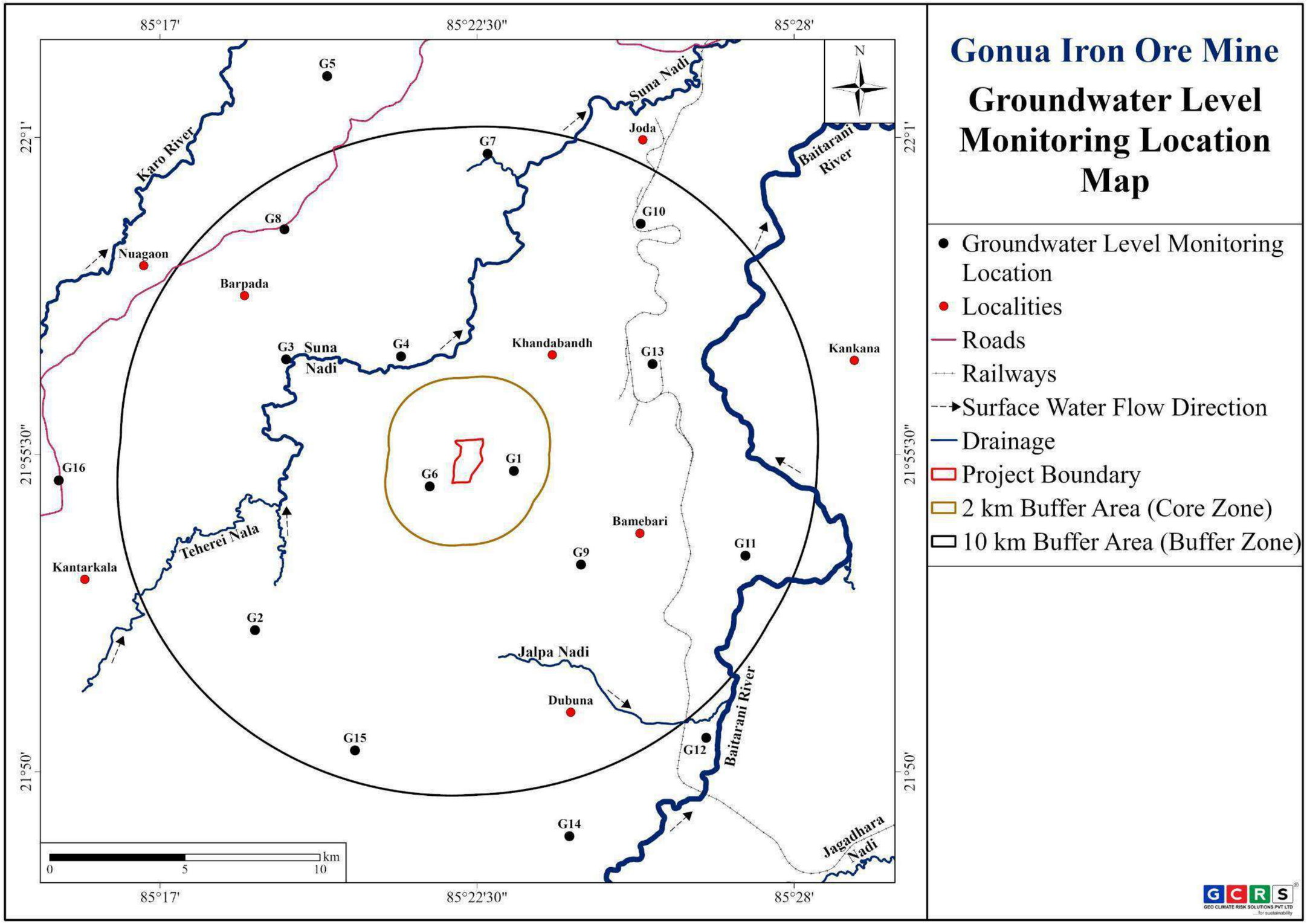


Figure 3.6: Location map of groundwater monitoring stations in and around the study area.

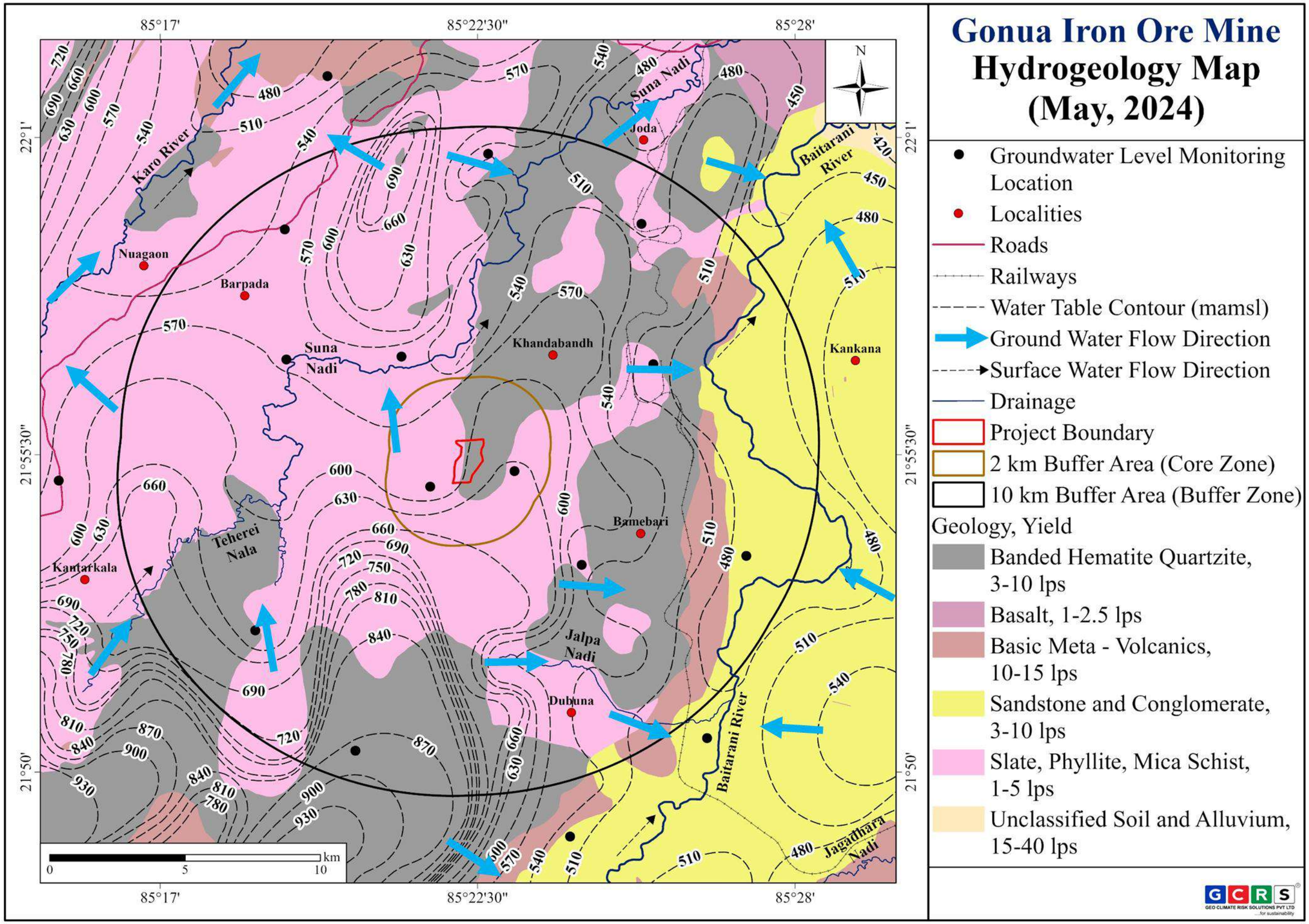


Figure 3.7: Hydrogeology map of the study area (Source: CGWB data & Field data).

3.3.1 Aquifer Characteristics

A pumping test is a method used to determine the hydraulic properties of an aquifer, such as Transmissivity, Storativity, and Permeability of the subsurface material. These properties are important for understanding how water moves through an aquifer and how much water can be pumped from a well without depleting the aquifer. The test involves pumping water from a well at a constant rate for a specified period and measuring the resulting water level changes. The data collected during the test is then used to calculate the aquifer's properties using mathematical models. This method is widely used in groundwater exploration, management, and remediation (Figure 3.8).

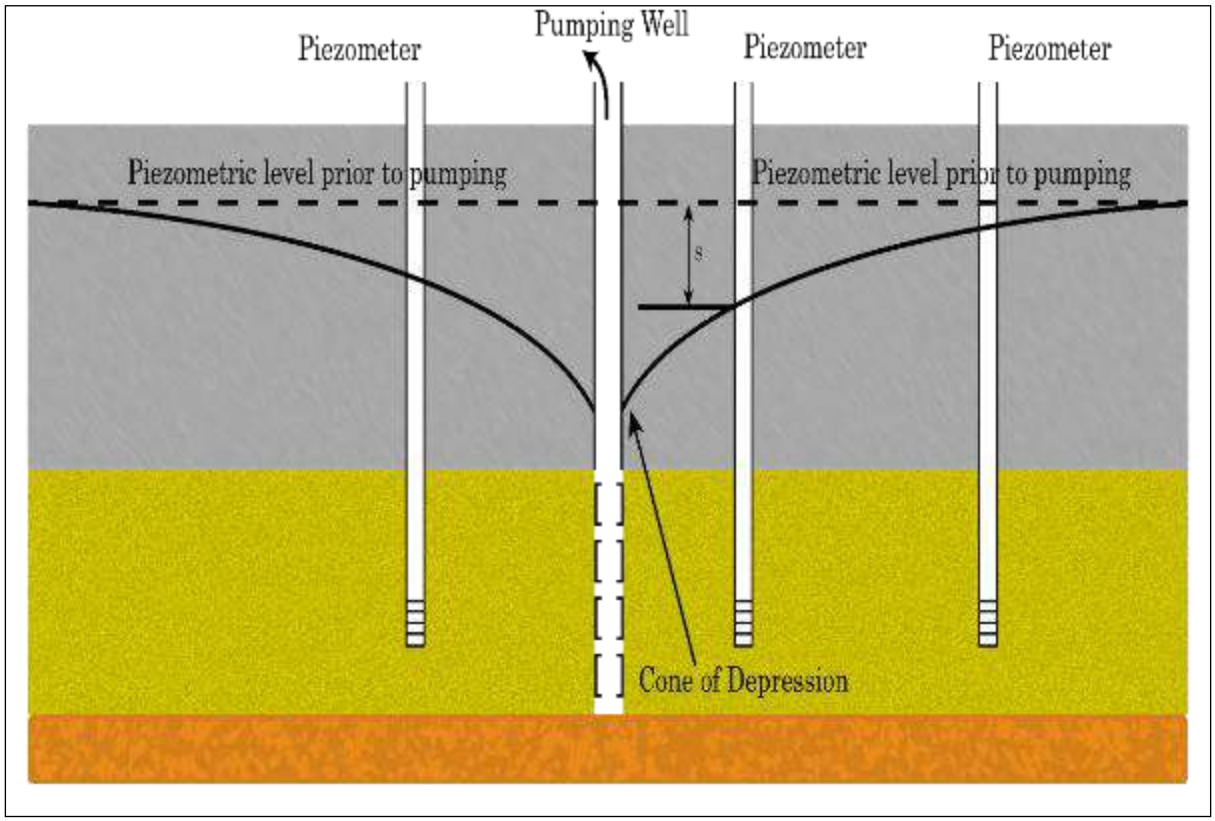


Figure 3.8: Drawdown in a pumped well.

PUMPING TEST DETAILS

To verify the aquifer parameters of the study area, short-duration pumping tests were conducted on a bore well in “Joda” area. The pumping test results are discussed below & the pumping test details are given in Table 3.5.

Table 3.5: Pumping test details

HYDROGEOLOGICAL DATA				
Particulars	**Details**	**Discharge m^3/hr**		7.2
Location	Joda	**Pumping water level (m)**		31.7
Formation	BHQ/BHJ &Shales	**Residual drawdown (m)**		26.55
Depth (m)	85	**Δ S (m)**		19.75
Water level (mbgl)	5.15	**Transmissivity (m^2/day)**		1.6
Duration of pumping(min)	180	**Specific capacity l p m /min/m**		4.52
RECOVERY DATA				
Time (min) since pump started (t)	**Time (min) since pump stopped (t')**	**t/t'**	**DTWL (m)**	**RDD (m)**
181	1	181	31.7	26.55
182	2	91	25.5	20.35
183	3	61	21.85	16.7
184	4	46	19.7	14.55
185	5	37	17.55	12.4
186	6	31	16.02	10.87
187	7	26.7	14.82	9.67
188	8	23.5	13.5	8.35
189	9	21	12.66	7.51
190	10	19	11.68	6.53
192	12	16	10.55	5.4
194	14	13.9	9.64	4.49
196	16	12.25	8.82	3.67
198	18	11	8.02	2.87
200	20	10	7.72	2.57
210	30	7	6.84	1.69
220	40	5.5	6.42	1.27
230	50	4.6	5.92	0.77
240	60	4	5.82	0.67
255	75	3.4	5.65	0.5
270	90	3	5.58	0.43
300	120	2.5	5.52	0.37
330	150	2.2	5.46	0.31

The Transmissivity and Storativity is calculated by using following formulae.

$T = 2.3Q/4\pi\Delta s$

where, T = kD = Transmissivity, m^2/day

Q = Discharge m3/day, Δs = Slope of straight line per log cycle of time

$T = 2.3Q/4\pi\Delta s$

$= 2.3*172.8/4*3.14*19.75=$**1.60219 m^2/day**

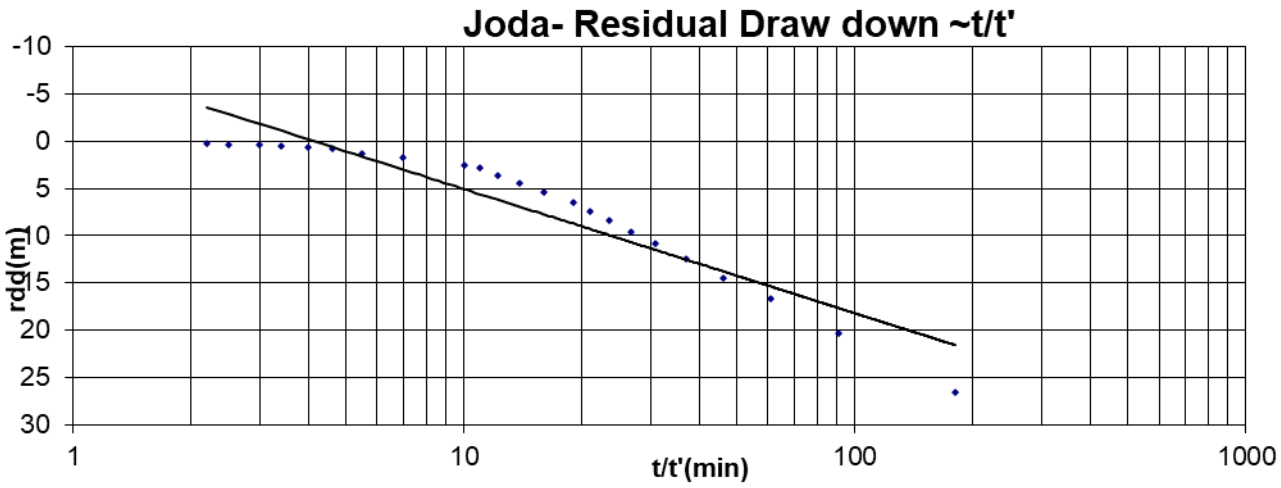


Figure 3.9: Drawdown in a pumped well.

3.3.2 Groundwater flow and aquifer interaction with surface water bodies

The Groundwater flow and aquifer interaction with surface water bodies section provides valuable insights into the groundwater movement and interaction with surface water features in the study area. By analysing various factors such as water table contours and water table elevations, a comprehensive understanding of the groundwater has been obtained and presented as Hydrogeology map with flow direction (Figure 3.7). The water table elevation in the study area & its outer periphery ranges between 479.28 to 875.25 mamsl during May 2024 and 480.75 to 875.63 mamsl during October 2023 (Table 3.4). The ground water flow direction based on these contours have been drawn and presented as water table contour maps both for May 2024 & October 2023 (Figure 3.10 & Figure 3.11). The ground water moves both locally and regionally. The groundwater flow direction in the project area (lease area) is mainly from east to west whereas in the overall study area it is towards north-east direction.

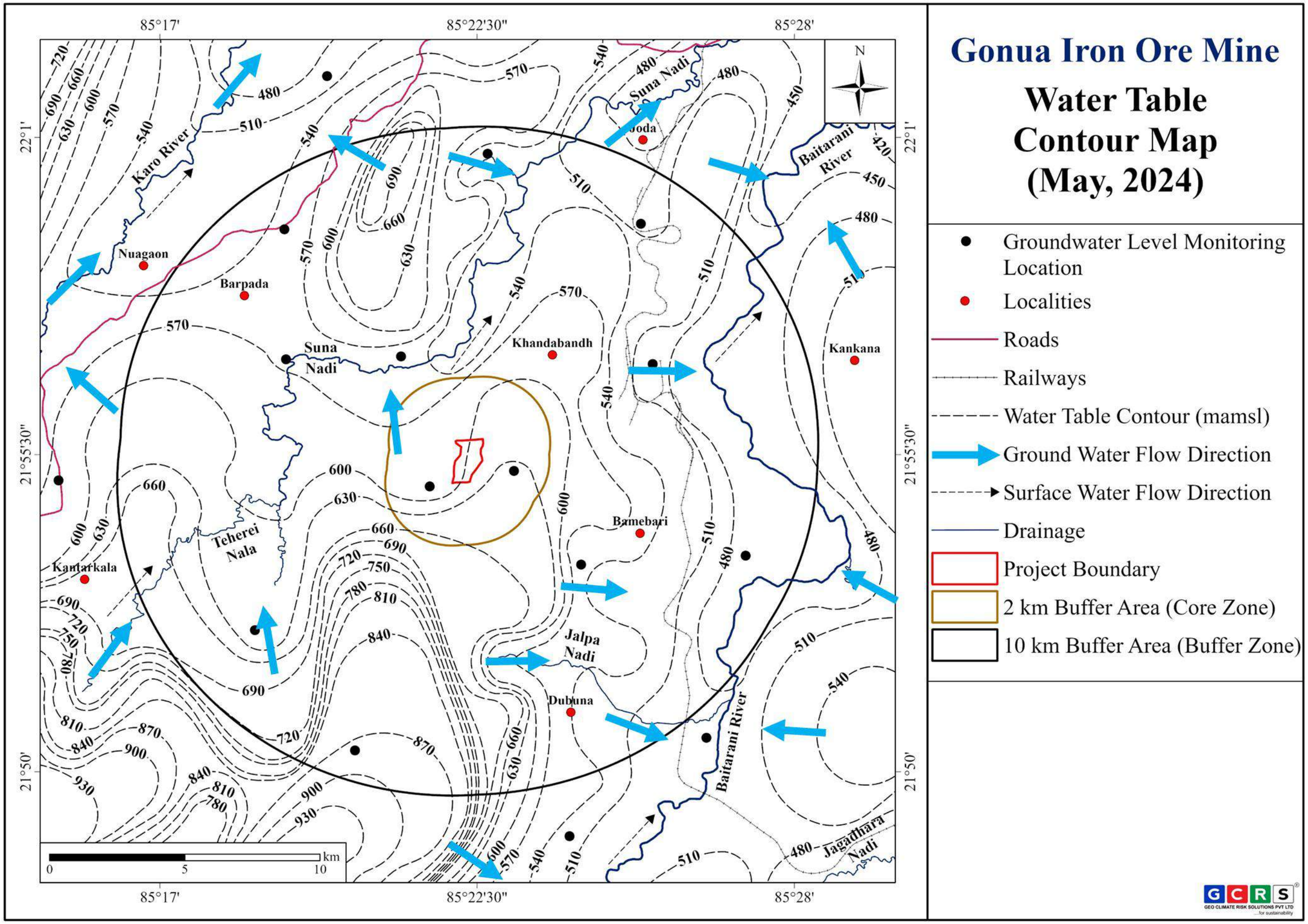


Figure 3.10: Water table contour map for May 2024.

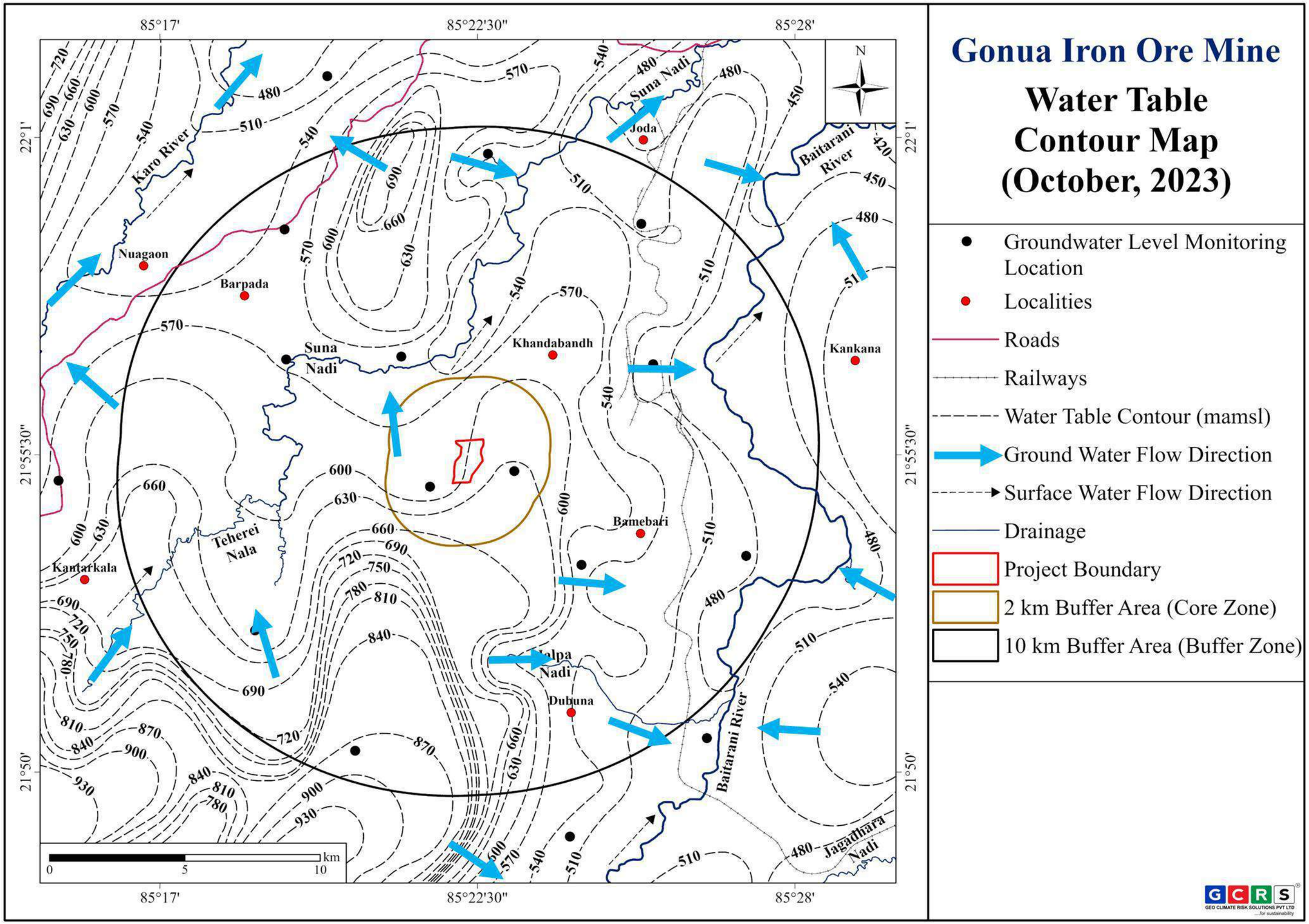


Figure 3.11: Water table contour map for October, 2023.

3.3.3 Depth to Water Level

Groundwater always remains under the influence of time-dependent recharging and discharging factors. Due to this continuous influence, water levels of the aquifer system fluctuate, and the range depends on the period of influence. The recharge to the groundwater system is controlled by several factors such as rainfall, seepage from reservoirs, lakes, ponds, rivers, and irrigation. The output from the groundwater system includes groundwater withdrawal, natural seepage to rivers and sea, evaporation from the shallow water table and transpiration through vegetation also influences the water levels prevailing in each area.

The depth of water level in the study area and its outer periphery ranges from 1.75 to 12.54 mbgl during May 2024 and ranges from 1.03 to 7.75 mbgl during October 2023 (Table 3.4). Accordingly, in the core zone the water level varies from 4.00 to 5.94 mbgl during May 2024 and varies from 1.03 to 3.24 during October 2023. In the buffer zone, it ranges from 1.75 to 8.64 mbgl during May 2024 & 1.03 to 6.79 mbgl during October 2023. Whereas, outside the buffer zone the water level ranges from 2.74 to 12.54 mbgl during May 2024 & 1.80 to 7.75 mbgl during October 2023. The depth to water level map of the study area is shown in Figure 3.12 & Figure 3.13. The water level data of December, 2022 and May,2023 has been compiled to identify the water level fluctuation in the study area (Table 3.4). The water fluctuation varied from 0.38 to 4.91 m in the study area and beyond it. The water level fluctuation map is shown as Figure 3.14 and the summarised water level & water table data is given in Table 3.6.

Table 3.6: Summarised results of water level & water table data

	Water level (mbgl)					
	May 2024			**October 2023**		
	Minimum	Maximum	Standard Deviation	Minimum	Maximum	Standard Deviation
Core zone	4.00	5.94	0.97	1.03	3.24	1.11
Buffer zone (Study area)	1.75	8.64	2.30	1.03	6.79	2.00
Outside buffer zone	2.74	12.54	3.94	1.80	7.75	2.17
	Water table contour (mamsl)					
	May 2024			**October 2023**		
	Minimum	Maximum	Standard Deviation	Minimum	Maximum	Standard Deviation
Core zone	589.00	633.06	22.03	589.76	637.97	24.11
Buffer zone (Study area)	479.28	875.25	101.24	480.75	875.63	101.12
Outside buffer zone	488.36	570.46	31.35	492.91	575.25	32.22

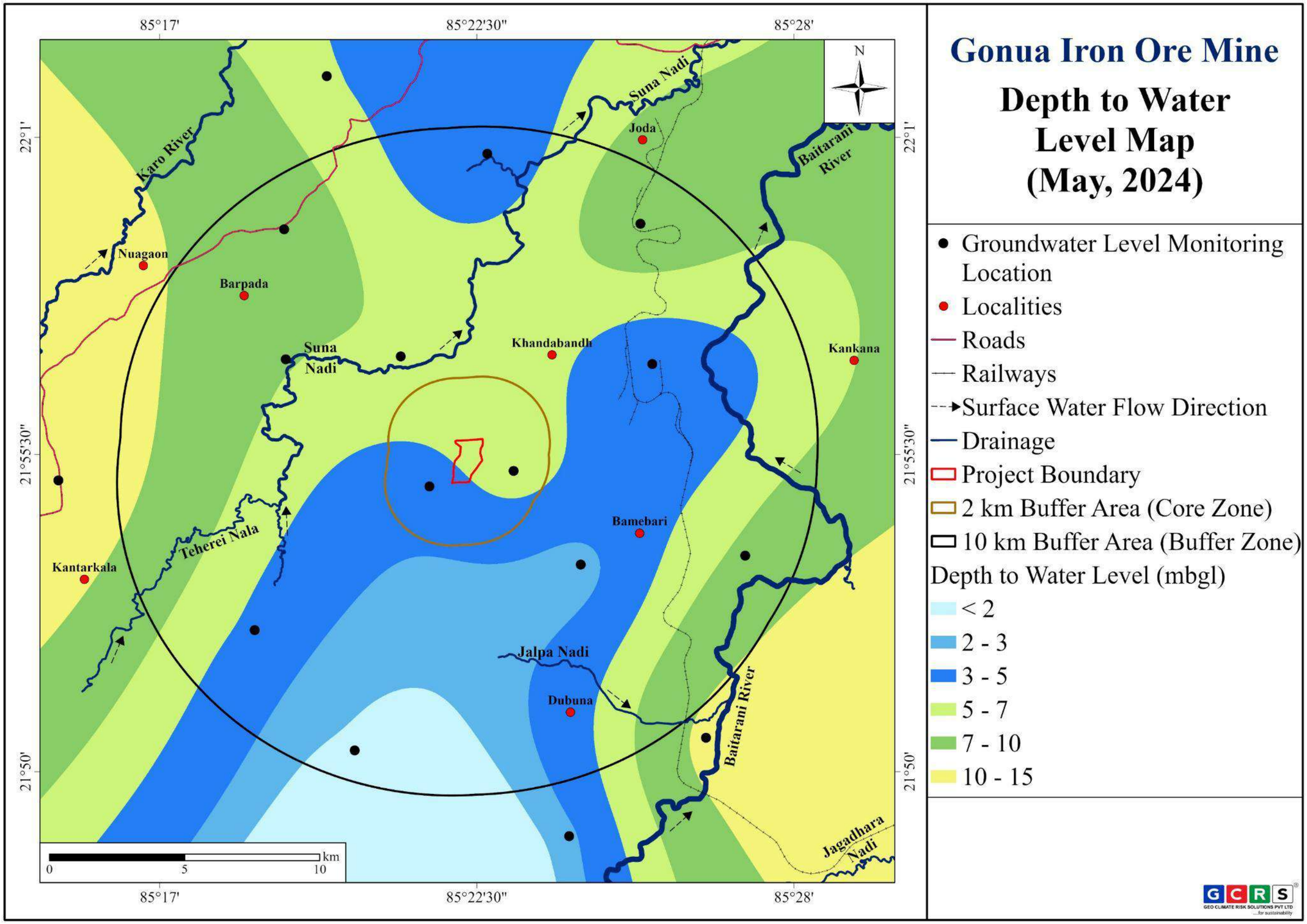


Figure 3.12: Water level map for the month of May 2024 (Source: Field data).

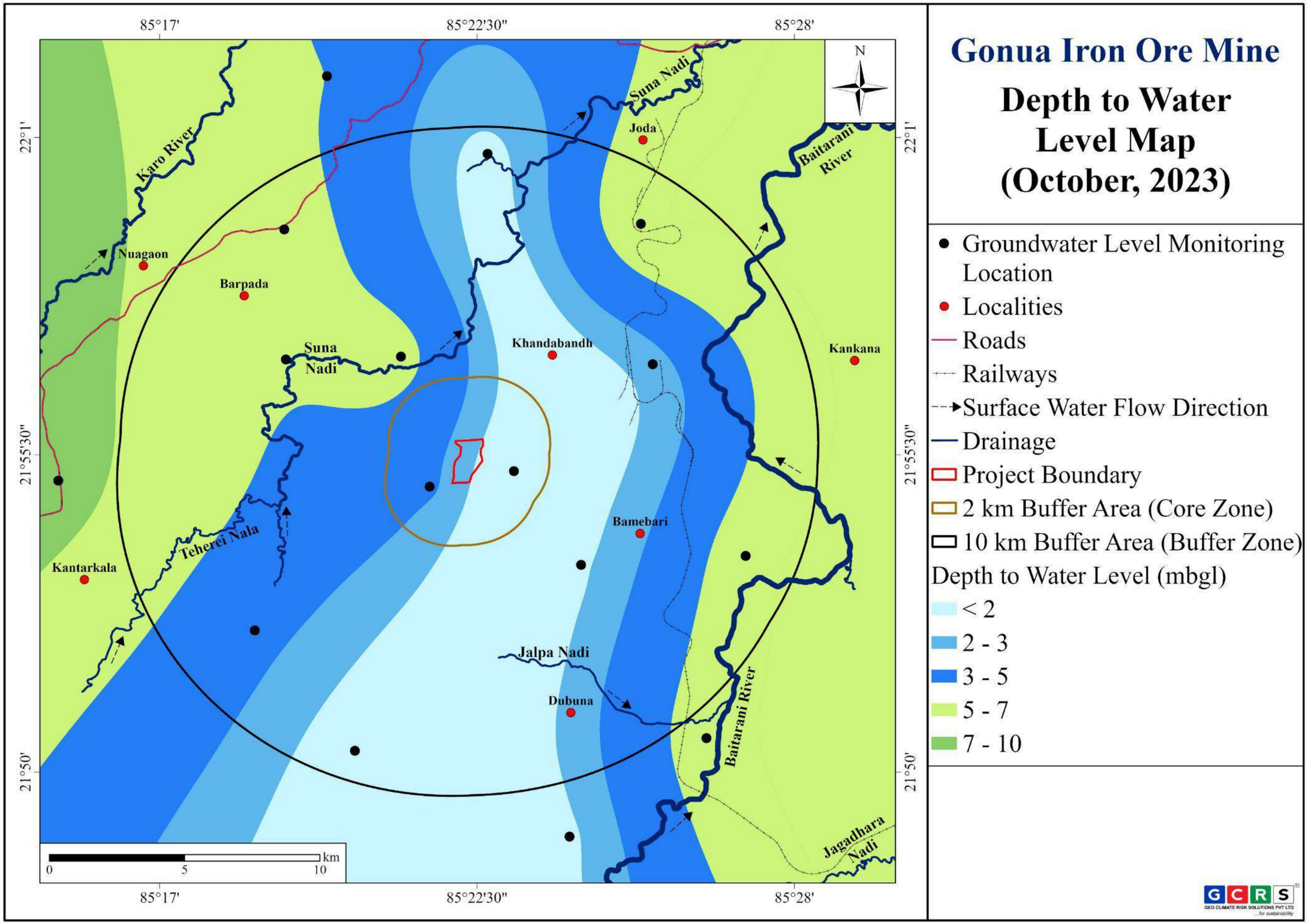


Figure 3.13: Water level map for the month of October 2023 (Source: Field data).

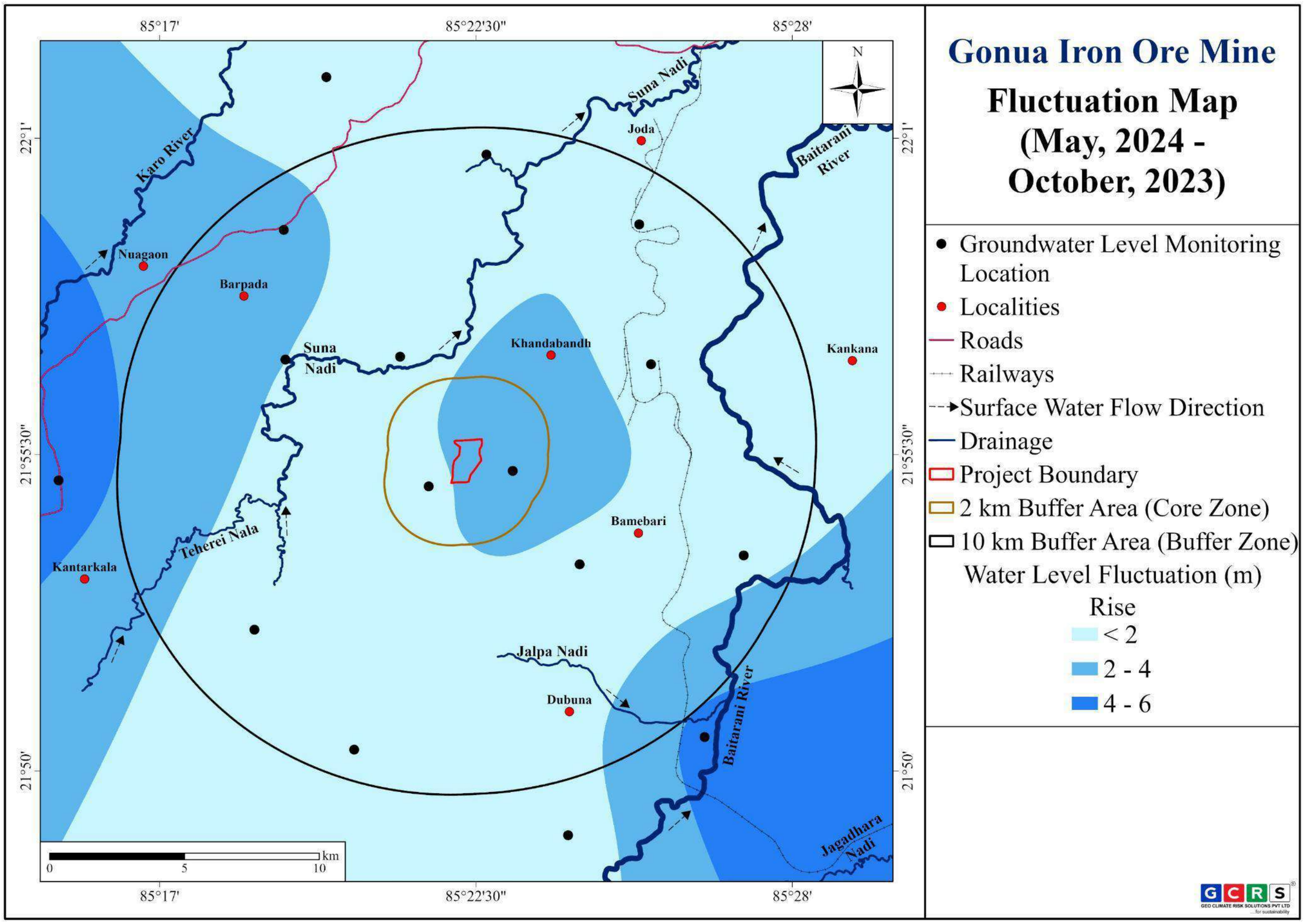
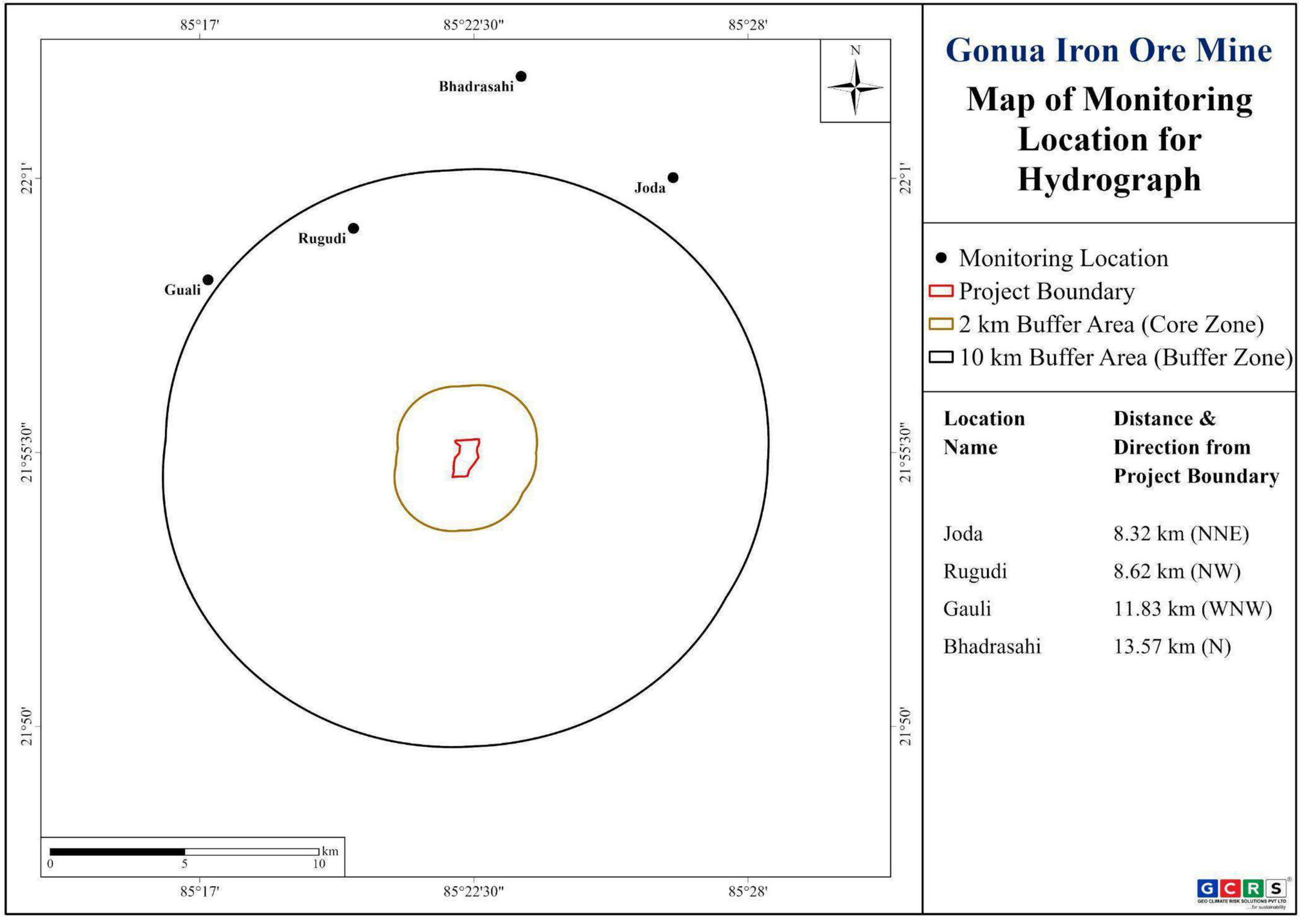


Figure 3.14: Fluctuation map of the study area (May 2024 vs October 2023).

3.3.4 Long-term water level data analysis

It also an important factor to analyse the long-term data of ground water level which changes with respect to time. To do the same time series analysis through hydrographs has been attempted. The variation in groundwater level recorded systematically for a longer period is plotted in the form of a hydrograph. The long-term water level data of the study area and its nearby has been considered based on the CGWB water level monitoring station (two numbers) (ANNEXURE – I). The long-term data for CGWB monitoring stations are analysed from the year 2013 to 2022 (Figure 3.15).

The hydrographs of the aforesaid data are presented in Figure 3.16 & Figure 3.17. Only seasonal fluctuation with cyclic and sinusoidal changes representing the recharge and discharge of groundwater during the different periods has been observed, which can be due to variations in rainfall patterns and no significant decline in water level is identical during the observation period.



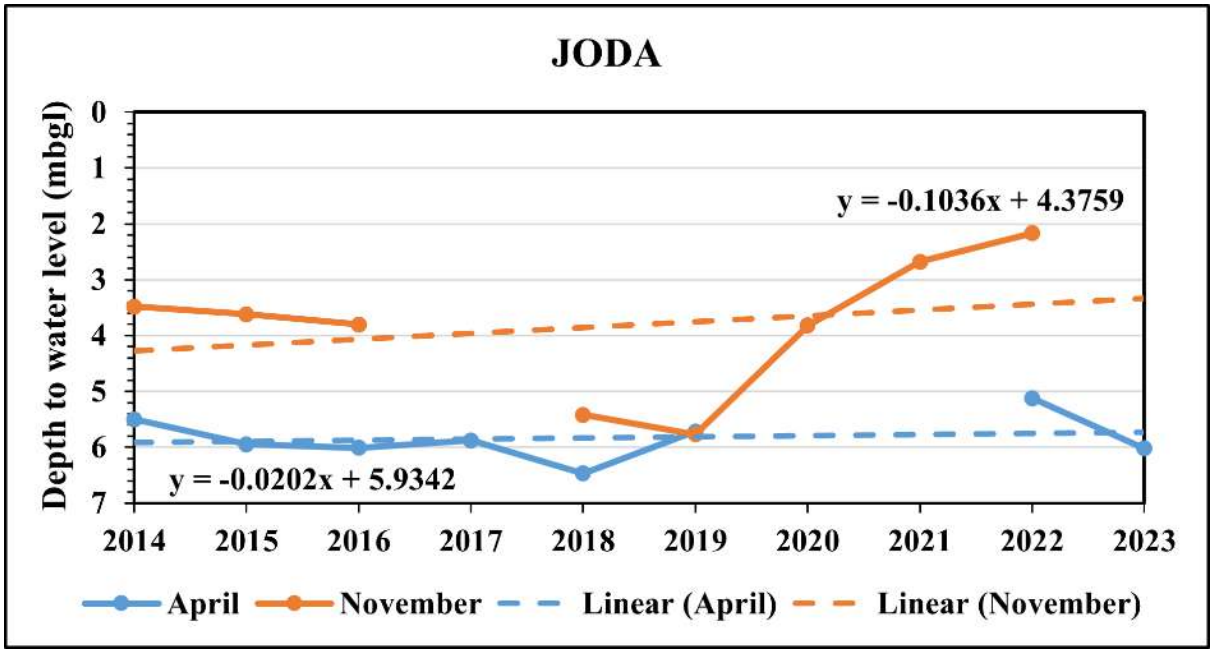
Gonua Iron Ore Mine

Map of Monitoring Location for Hydrograph

- Monitoring Location
- Project Boundary
- 2 km Buffer Area (Core Zone)
- 10 km Buffer Area (Buffer Zone)

Location Name	Distance & Direction from Project Boundary
Joda	8.32 km (NNE)
Rugudi	8.62 km (NW)
Gauli	11.83 km (WNW)
Bhadrasahi	13.57 km (N)

Figure 3.15: Location Map of monitoring station of hydrographs.



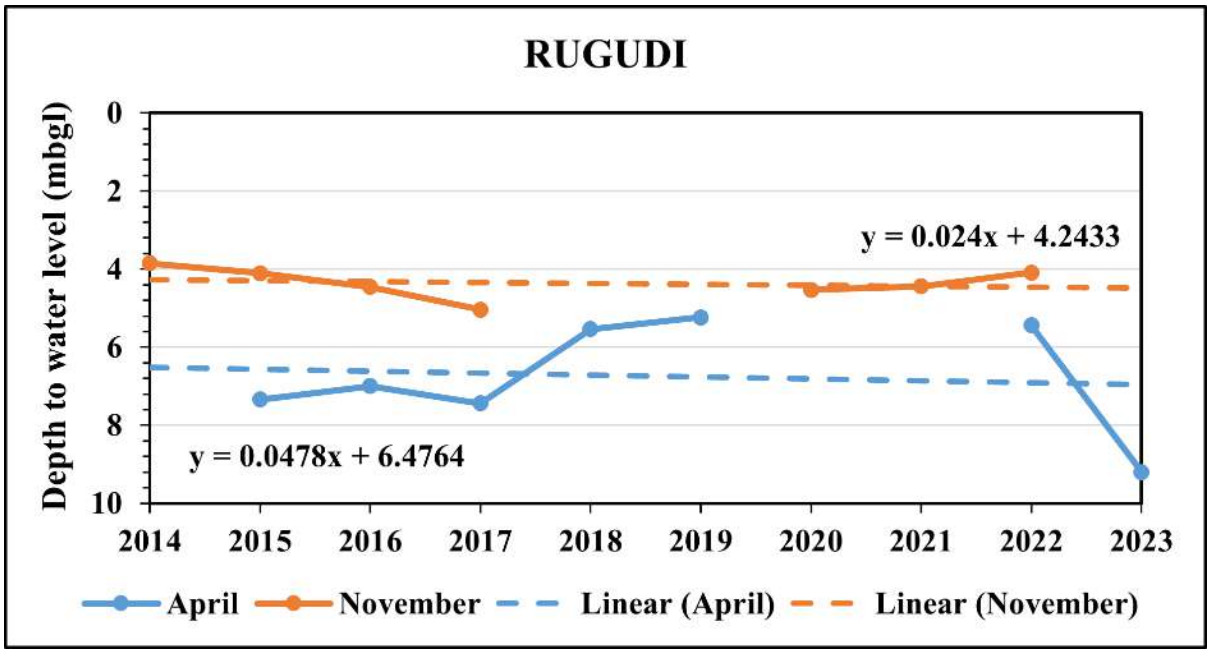


Figure 3.16: Hydrographs of CGWB monitoring locations (Joda & Rugudi).

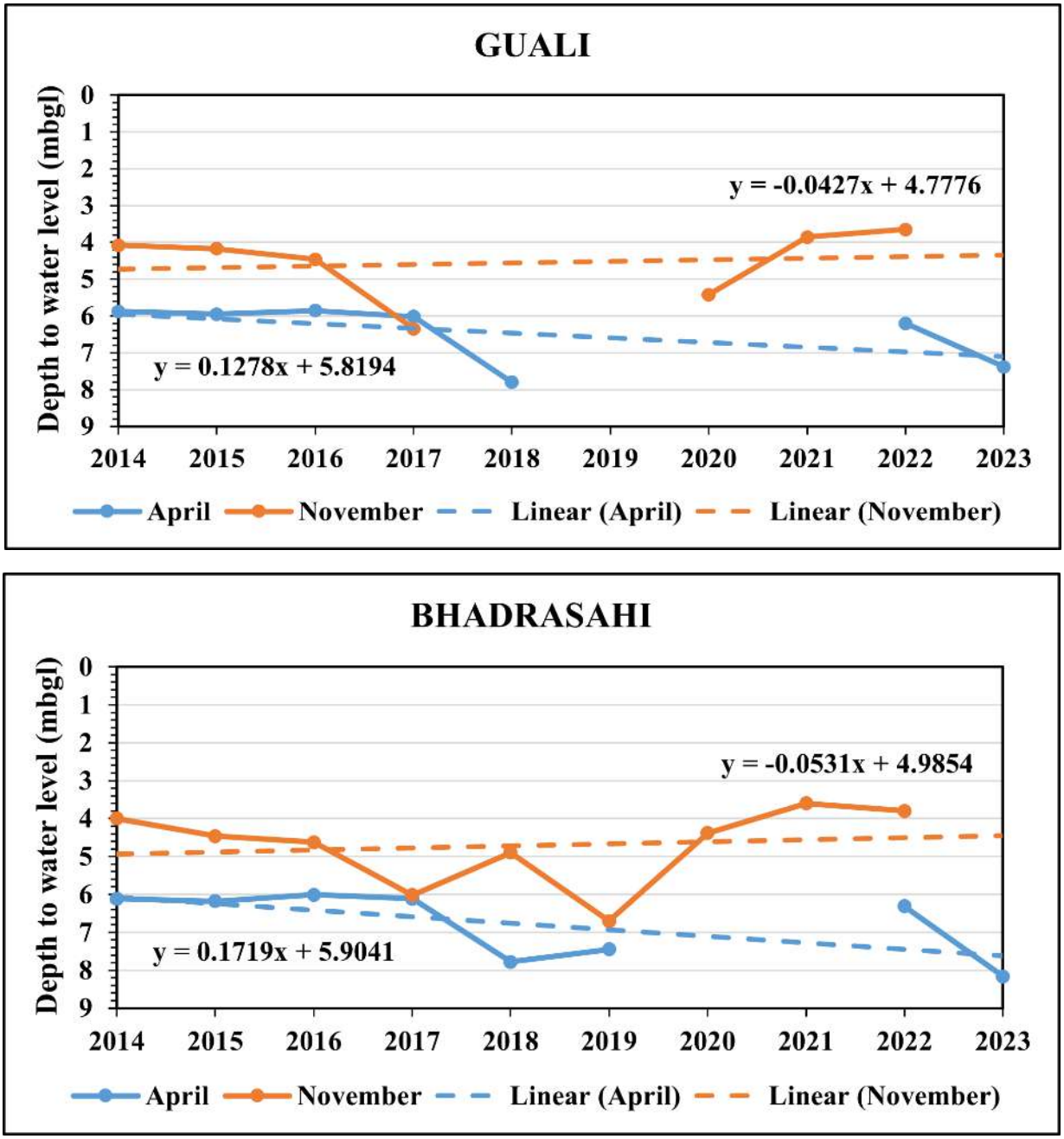


Figure 3.17: Hydrographs of CGWB monitoring locations (Guali & Bhadrasahi).

3.3.5 Groundwater quality

The suitability of groundwater for drinking/irrigation/industrial purposes is determined keeping in view the effects of various chemical constituents present in water on the growth of human beings, animals, and various plants and the industrial requirement. However, many ions are essential for the growth of plants and the human body, but when present in excess, they have an adverse effect on health and growth.

To analyse the ground water quality of ground water, samples were collected from various locations in and around the study area (Figure 3.18). Further, these samples were sent to NABL accredited laboratory for qualitative analysis (Annexure-II). The values

pertaining to the analysis report (Table 3.7) indicates that all the quality parameters lie within the permissible limits stipulated by IS: 10500:2012.

The values for the Electrical Conductivity and the Chloride content have been used to prepare EC and Chloride contours (Figure 3.19 and Figure 3.20). Further, the values for the Fluoride and Nitrate are plotted as point data in terms of their magnitude of concentration proportional to the size of the point and their distribution is shown in the form of Nitrate and Fluoride distribution map of the study area and presented in Figure 3.21 and Figure 3.22 respectively.

The electrical conductivity (EC) contour ranges from 52 to 148 µS/cm in the study area and its outer periphery. The values of chloride are ranging from 14.4 mg/L to 26.0 mg/L in the overall study area including the outer periphery. Nitrate value in and around the study area ranges from 4.86 to 8.20 mg/L. The fluoride concentration is observed to be low in overall study area & beyond it. The value of fluoride ranges 0.16 to 0.40 mg/L.

Table 3.7: Summarised water quality analysis report

Sl. No.	Well Id.	Locations	Longitude	Latitude	pH	Total Alkalinity	Total Hardness	Ca	Mg	S	NO3	Cl	F	Fe	Mn	EC	Na	K
1	G1	Guruda village	85.38568	21.92028	6.74	42.0	61.0	17.60	8.83	21.15	6.45	21.0	0.23	0.22	BDL	102.2	2.8	1.12
2	G2	Badpatuli Village	85.31084	21.87426	7.01	51.0	74.0	26.60	10.83	18.15	6.85	22.0	0.31	0.22	BDL	88.2	2.2	0.98
3	G3	Kalmanga Village	85.31977	21.95253	6.78	32.0	50.0	10.2	5.42	18.16	6.26	24.0	0.38	0.18	BDL	88.2	3.2	0.88
4	G4	Chormalda Village	85.35306	21.95341	7.02	52.0	72.0	20.40	15.83	28.15	7.45	26.0	0.18	0.18	BDL	108	5.1	0.92
5	G5	Gamulai Village	85.33168	22.034391	6.78	66	62.4	12.68	10.22	12.2	7.12	14.4	0.26	0.22	BDL	77.2	3.0	0.78
6	G6	Gonua Village	85.36132	21.91581	7.02	44.4	48	16.2	8.85	12.62	5.28	16.6	0.18	0.26	BDL	97.2	4.0	1.1
7	G7	Camp of Tisco Village	85.37808	22.01194	6.58	58.0	72.0	16.22	13.42	18.15	6.80	20.4	0.40	0.20	BDL	88.2	2.6	0.90
8	G8	Laidapada Village	85.31931	21.99009	6.98	46.0	54.6	17.60	7.72	18.15	8.20	24.2	0.25	0.22	BDL	68.2	2.8	0.86
9	G9	Balada Village	85.40508	21.89318	6.68	46.2	50.4	16.5	6.26	14.6	4.86	22.8	0.21	0.16	BDL	93.6	3.4	0.82
10	G10	Joda M	85.4223	21.99168	6.80	56.2	72.8	20.2	16.8	26.2	6.45	22.60	0.24	0.12	BDL	82.5	4.0	1.06
11	G11	Namira Village	85.4526	21.89578	6.60	52.2	76.2	18.4	16.2	20.4	7.23	18	0.16	0.10	BDL	76.8	3.2	0.92
12	G12	Nayagarh Village	85.44125	21.84316	6.87	42.4	66.2	16.2	9.2	16.8	7.20	18.4	0.24	0.26	BDL	148	2.42	1.01
13	G13	Jaroli Village	85.42577	21.9512	7.12	36.6	61.2	16.8	7.53	20.22	5.56	16.0	0.18	0.08	BDL	52	3.87	1.14
14	G14	Basantapur Village	85.4017	21.8147	6.64	32.0	58.2	16.4	8.24	21.24	6.66	20.2	0.26	0.12	BDL	101	3.02	1.12
15	G15	Mithirda Village	85.3397	21.8395	6.82	37.8	54.8	20.2	12.1	14.2	6.22	21.5	0.23	0.20	BDL	118	2.88	0.76
16	G16	Kashira Village	85.254058	21.91755	6.92	40.0	58.0	16.2	11.6	24.0	6.12	21.5	0.16	0.08	BDL	98.2	4.0	1.14

Note: All the units are in mg/L except EC (µS/cm).

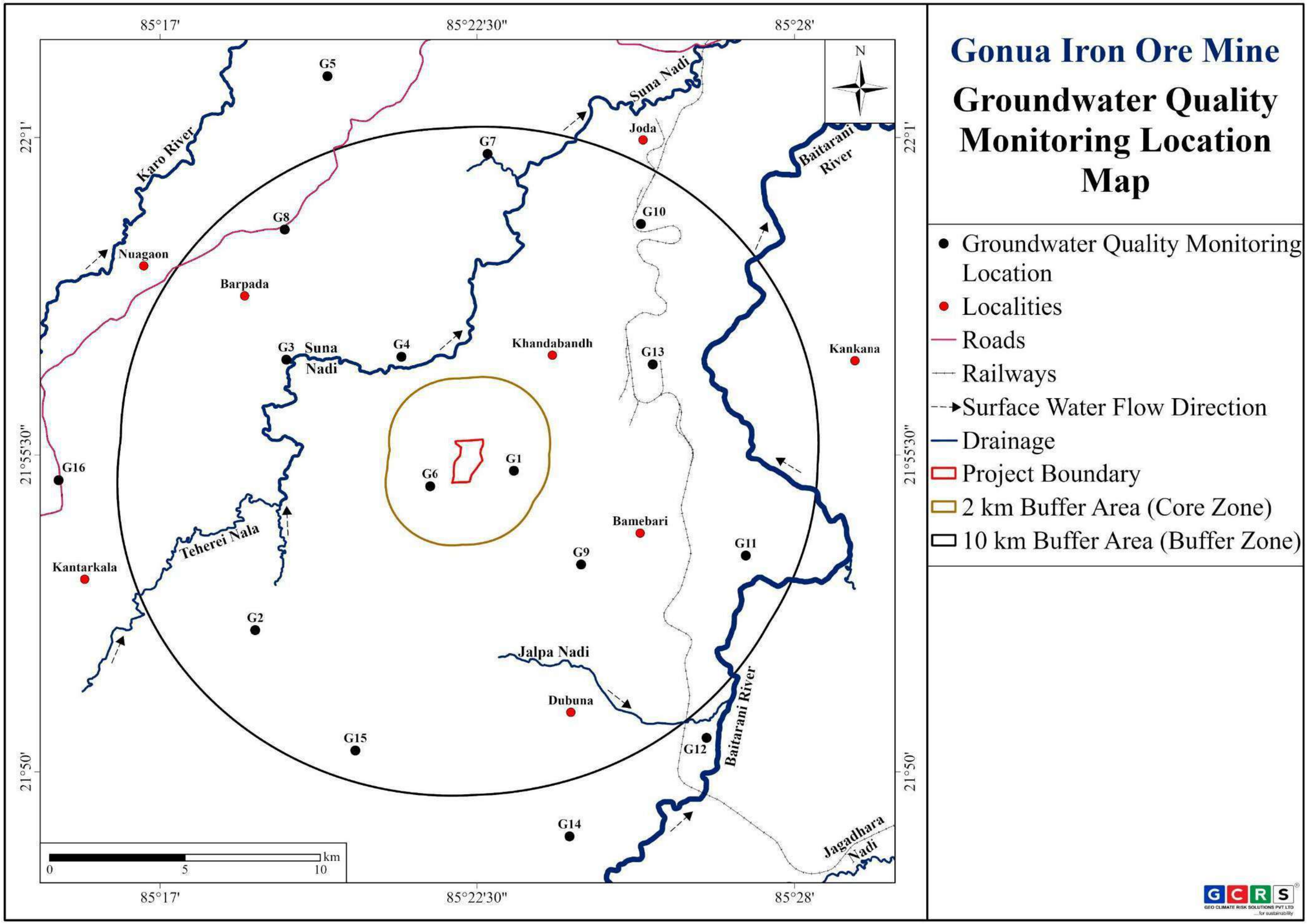


Figure 3.18: Location map of groundwater quality monitoring locations in and around the study area.

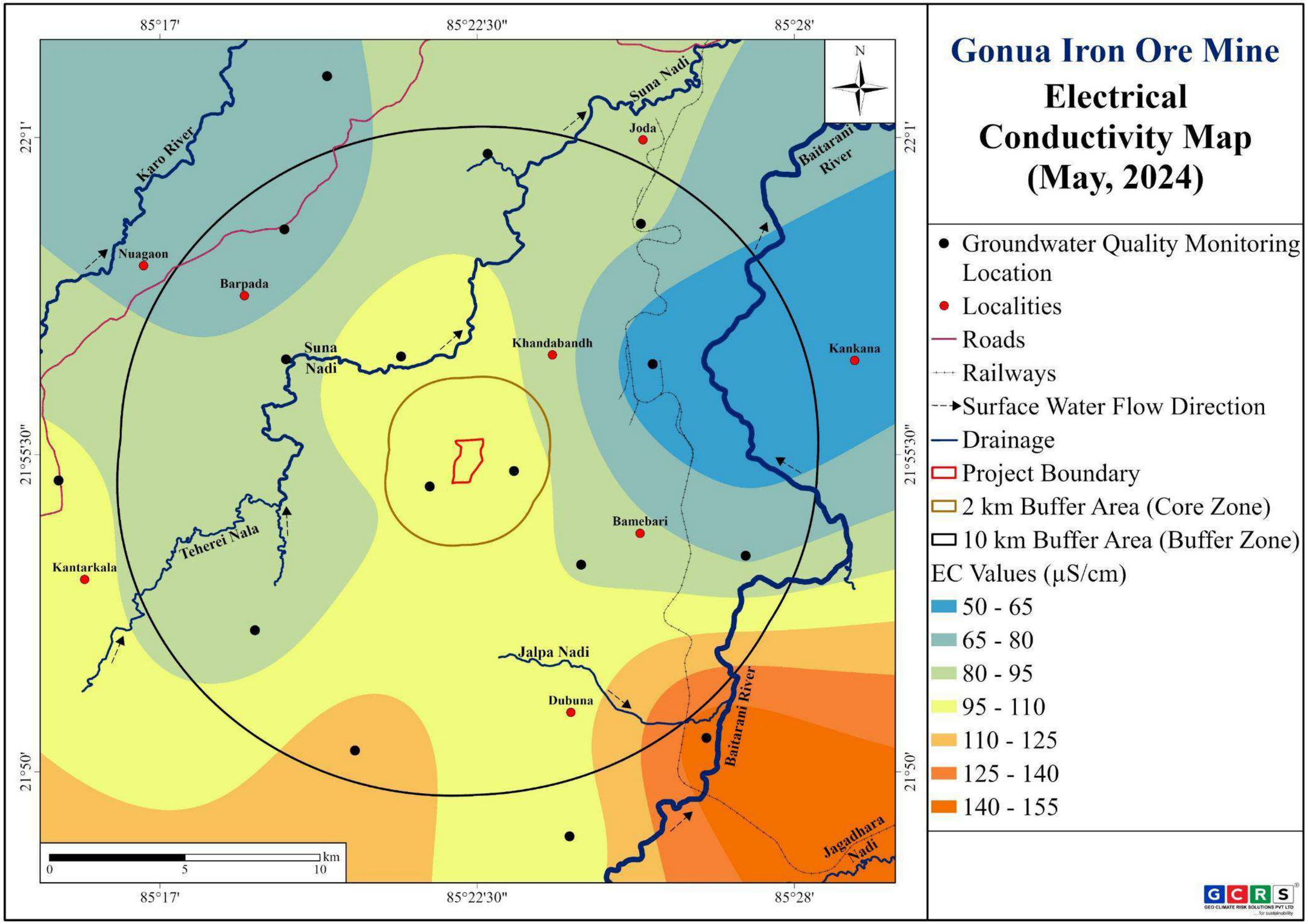


Figure 3.19: EC contour map in and around the study area (Source: Field data).

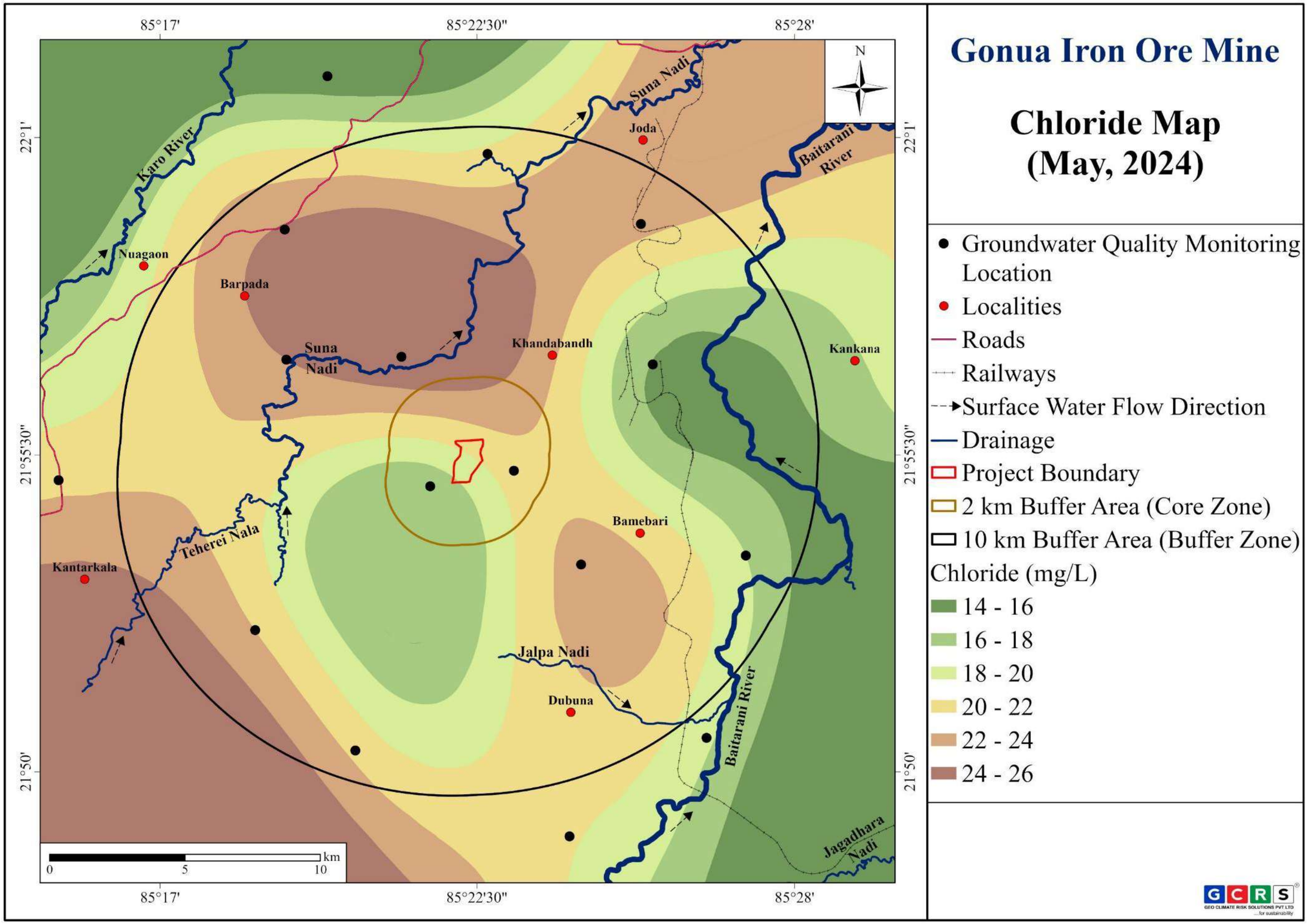


Figure 3.20: Chloride map in and around the study area (Source: Field data).

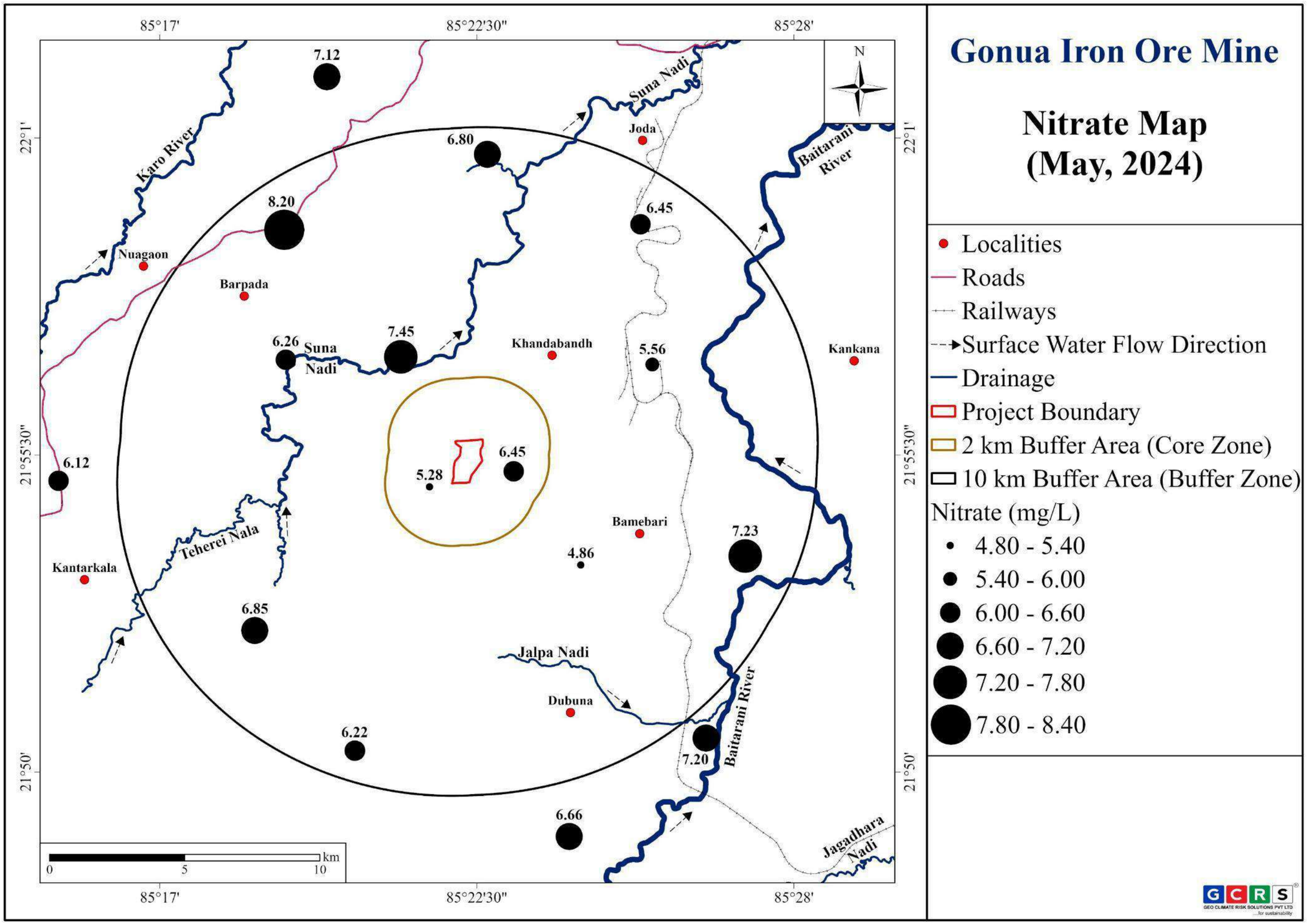


Figure 3.21: Nitrate map in and around the study area (Source: Field data).

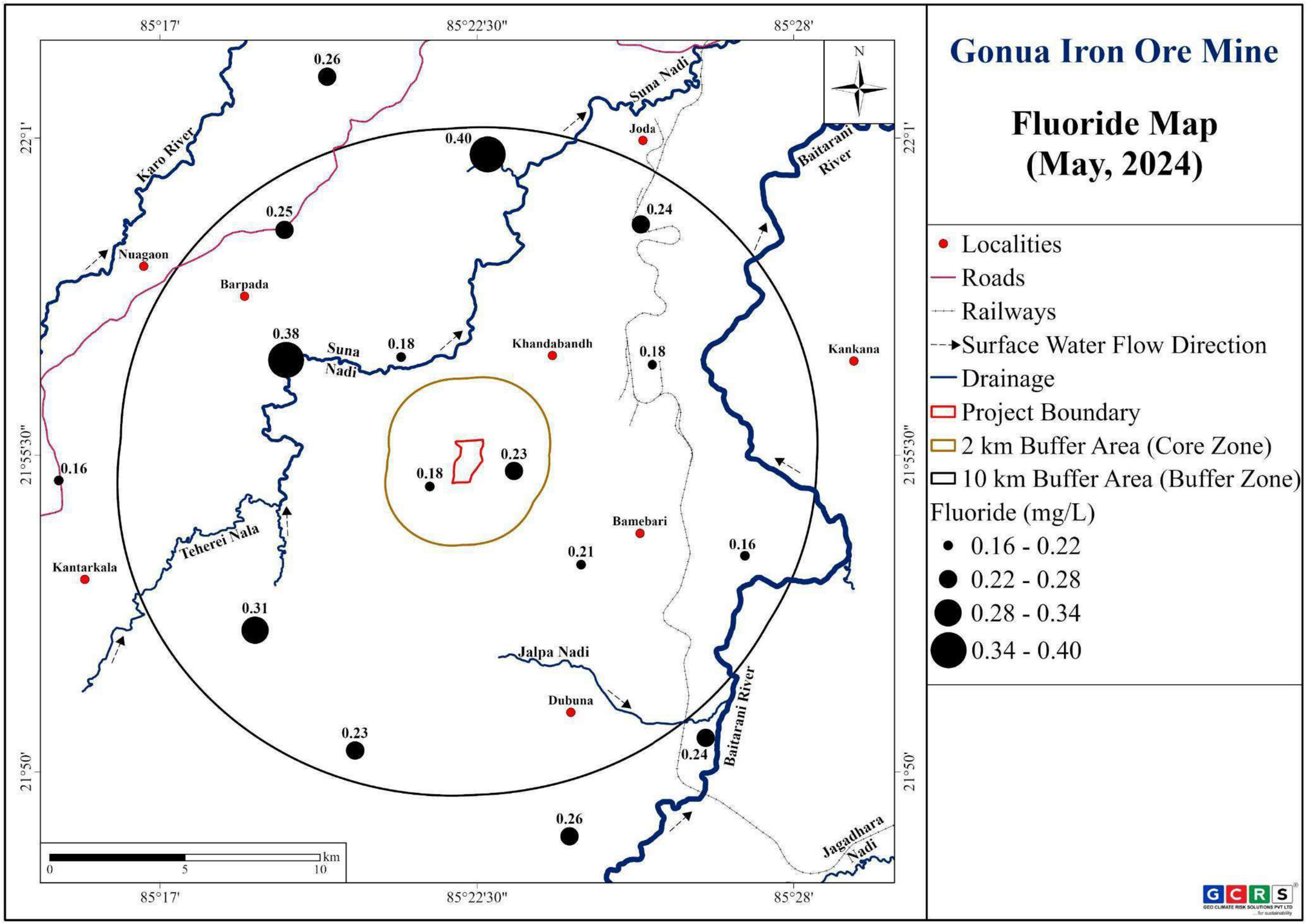


Figure 3.22: Fluoride map in and around the study area (Source: Field data).

4 APPROVED MINE PLAN

The Modification of Mining Plan of Gonua Iron Ore Mine along with Progressive Mine Closure Plan (PMCP) is approved by The Regional Controller of Mines, IBM, Bhubaneswar and communicated its approval vide no. MPMA/A/26-ORI/BHU/2021-22 dated 22.02.2022. The copy of Mining plan approval letter is enclosed as Annexure-III.

The Gonua Iron Ore mine is an "A" category mine & mining operation is fully mechanized and opencast. There are two pits in the mine lease area namely Gonua Quarry & Patabeda Pit. Gonua Quarry is active and fully developed while Patabeda Pit is partially worked by the ex-lessee. In both the pits the bench height is maintained upto 9m and with upto 10m. The type of ore in the mining lease area is lateritic iron ore, soft laminated ore, blue dust etc which is processed by crushing and screening. The current production capacity of the mine is 2.99 MTPA. The year wise tentative in-situ exaction is given in Table 4.1.

Table 4.1: Year wise in-situ excavation

SI.No.	Year	Total Handling (t)	Waste Quantity (t)	ROM Quantity (t)	ROM Quantity Saleable Mineral (t) [85%]	ROM Quantity Mineral Reject (t) (15%]	OB to Ore Ratio (Waste Quantity / ROM Quantity)	Grade Range (%)
1	Year 1 (2020-21)	NA	NA	NA	NA	NA	NA	NA
2	Year 2 (2021-22)	NA	NA	NA	NA	NA	NA	NA
3	Year 3 (2022-23)	2414643	414643	2000000	1700000	300000	1: 0.21	> 45 % Fe
4	Year 4 (2023-24)	2415538	415538	2000000	1700000	300000	1 :0.21	> 45 % Fe
5	Year 5 (2024-25)	3408600	418600	2990000	2541500	448500	1 :0.14	> 45 % Fe

5 ESTIMATION OF MINE SEEPAGE AND ADVANCED DEWATERING PLAN

5.1 ESTIMATION OF MINE SEEPAGE

In open-cast mining, as soon as the water table is encountered in the mine pit, the groundwater seepages start.

The mine pits are situated in the hilly area. The ultimate pit limit of the mine pits will be about 608 mamsl during the plan period (2020-2021 to 2024-2025) and also in the next five year, while the water table near mine lease area is about 545.58 to 547.48 mamsl. So, it is envisaged that there will be no mine seepage during the plan period. If any seepage is encountered during the NOC period, it will be immediately inform to the Authority.

5.2 ESTIMATION OF RAINWATER QUANTUM DEWATERED

There will be no abstraction of rainwater accumulated in the mine pit for this project. This water will be kept in the mine pits to recharge naturally to ground without dewatering. So, there will be no dewatering from the mine pits during the plan period.

5.3 ADVANCED DEWATERING PLAN IN CASE OF COAL/LIGNITE MINES

Not applicable as this is a metal mine project (Iron Ore).

5.4 GROUNDWATER MODELLING

The ground water modelling study report is not required because the ground water abstraction for this project (75 KLD) is below 500 KLD.

6 MINE WATER MANAGEMENT

There is no mine water dewatering envisaged during the plan period. Only one borewell is existing in the lease area. The total ground water abstraction through that borewell is 75 m^3/day. Out of which, 4 m^3/day will be used for drinking and domestic purposes, 65 m^3/day will be used for mining activities and dust suppression on haul & village roads, 3 m^3/day for plantation, 2 m^3/day will be used in dry fogging system and 1 m^3/day will be used for wet drilling. The water utilization details are given in Table 6.1 and the water balance chart for the same is shown in Figure 6.1.

Table 6.1: Details of water utilization.

Sl. No.	Activities	Water utilization (m^3/day)	Water utilization (m^3/year)
1	Drinking & Domestic	4	1,460
2	Mining activities and Dust suppression on haul and village roads	65	23,725
3	Plantation	3	1,095
4	Dry Fogging system	2	730
5	Wet drilling	1	365
Total		**75**	**27,375**

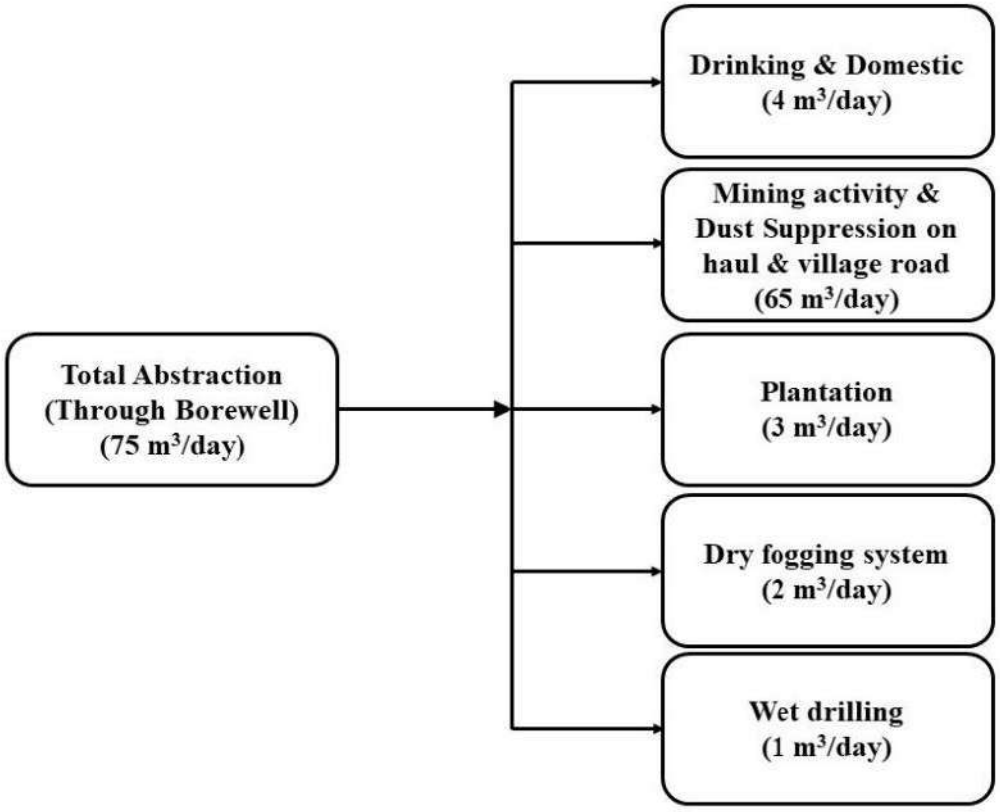


Figure 6.1: Water balance chart.

There is one piezometer with DWLR with non-telemetry system has been installed in the project area & one abstraction structure (borewell) has been constructed. The detail of borewell is given in

Table 6.2: Details of borewell

S.N.	Borewell Location	Lat/Long	Remark	Pump Capacity
1.	Dispensary area near gate-01	N 21° 55' 4.63"/ E 85^0 22' 5.92"	Flow meter Installed and bore well is fully functional	5HP

6.1 IMPACT OF MINE DEWATERING/ABSTRACTION AND MITIGATION MEASURES.

The mining plays an important role towards the development of the socio-economy. In the other hand, mining activities will invariably have an impact on water environment through direct or indirect contact of either the surface or ground water. Groundwater resources which constitute the main use for the extraction and different mining activities are accompanied by a strong withdrawal affecting quantitative and qualitative parameters. Indeed, without preventive measurements, the mining activities can have a negative effect on the environment: hazardous tailings, the mine drainage, infiltration of the polluted liquid effluents in the underground, the degradation of the water quality, and the ecological environment (vegetal and animal biodiversity). Proper mitigation measure can reduce these impacts.

6.2 IMPACT ON THE GROUNDWATER REGIME

The downward movement of the toxic substances from the stack, dump and exposed quarry faces during seepage and percolation of ground water normally affects the ground water quality adversely in mining area. The water table in the area is comparatively at a greater depth (10m below ground level). Since the ground water table will not be punctured during the course of mining water pollution will be negligible. Therefore, the chances of ground water pollution will be nil. There is also no occurrence of toxic materials which can pollute the water & jeopardize the human health.

The Depth to water level and long-term water level data analysis (sections 3.3.3 & 3.3.4) along with the groundwater modelling study depict that there has not been any significant decline in water level observed in the study area due to this project. It is envisaged that there will be no significant impacts on the groundwater regime due to this mining activity.

6.3 IMPACT ON SURFACE WATER SOURCES

As there is no perennial water body near the work zone & no mine discharge is involved in this project, so it doesn't have any impact on surface water sources. Secondly, Ore as well as waste material does not contain any toxic elements and precipitated water passing through the quarry floor will not contaminate surface water.

Heavy rainfall can cause the runoff of pollutants from mine sites into nearby water sources. This can occur when rainwater picks up pollutants from the mining site and carries them into nearby streams, rivers, or groundwater sources. The runoff can carry heavy metals, acids, and other substances that can contaminate the water supply and have long-lasting environmental consequences.

Precautionary measures such as constructing check dams & settling sumps at appropriate places will help in making the discharge water free from any silt during rains. Toe walls & garland drains around & dumps will be provided to check the run-off. To arrest the surface runoff into the quarry, garland drains with suitable dimensions to carry the peak discharge are constructed and these drains shift with the mine boundary in time and space.

6.4 IMPACT ON WATER QUALITY

During the plan period of this project, the ground water table will not be intersected. As there is also no occurrence of toxic materials which can pollute the water. No mine discharge is envisaged to the nearby water bodies in this project. So, no negative impacts on the water quality will be anticipitated during the plan period due to this project.

6.5 MITIGATION MEASURES

Some of the important measures that should be adopted is given below:

- The mine discharge, after passing through sedimentation tanks for removal of suspended solids will be used for dust suppression, greenbelt development, etc. and excess water will be let out into nearby streams.
- Water catchment areas should be build up in the working areas for settlement of suspended solids before pumping water out of the mine.
- Oil and grease traps must be planned in HEMM workshop for removal of TSS and Oil and Grease from vehicle wash needed to completely collect, store, treat, and redeliver. Treated water can be used for dust suppression and for raising plantations within the workshop premises.
- Regular monitoring is being carried out in the study area to access the impact the mining on groundwater quality. The groundwater chemistry indicates that the groundwater in the area is potable and not containing any toxic elements.

- Proper groundwater recharge measures have been implemented in the study area to reduce impacts on groundwater.

Rain Water Harvesting & Artificial recharge Structure:

To maintain the groundwater regime in the area unaffected, all the major buildings of the project should be facilitated by suitable rainwater harvesting structures. Rain water harvesting means collection and storage of rain water that runs off on natural or manmade catchments areas. Catchment includes rooftops, compounds, rocky surface or hill slopes or artificially prepared impervious/ semi-pervious land surface. The amount of water harvested depends on the frequency and intensity of rainfall, catchment characteristics, water demands and how much runoff occurs & how quickly or how easy it is for the water to infiltrate through the subsoil and percolate down to recharge the aquifers.

Estimation of Quantum of runoff available through rain water harvesting (within premises)

Table 6.3: Run-off water estimation

Sl. No.	Particulars	Area (Sqm)	Rainfall (m)	Runoff Coefficient*	Quantum of Run off available (Cum/Year)
	1	2	3	4	5 (2*3*4)
1	Roof Top of building/Shed/	9370	1.32	0.85	10513.14
2	Road/Paved area	12160	1.32	0.65	10433.28
3	Open Land	348690	1.32	0.20	92054.16
4	Green Belt	514940	1.32	0.15	101958.12
5	Total (sqm)	885160		Total Quantum of available runoff (cum/y)	214958.7

* Ref: Manual of Artificial Recharge of Ground Water, (CGWB, 2007)

So, the total quantity of run off rainwater available in the project area is around 214958.7 m^3/year (Table 6.3). This can be stored and used for different mining purposes, reducing groundwater consumption and minimizing the impact on groundwater. Further, any excess amount than the estimated amount may be used to increase the recharge potential in the area.

MITIGATION MEASURES ADOPTED:

Water Pollution Control System adopted:

- Garland drains maintained of suitable size around mine area and dump with proper gradients to prevent rain water descent into active mine area.

- Settling ponds maintained to prevent flow of fine particles from OB / Waste dumps, check dams, parapet / retaining walls & garland drains.
- Usage of stored water in the settling ponds for watering of haul roads, vehicle washing and green belt development etc.
- De- silting of garland drains & settling ponds are being carried out at regular intervals.
- Maintenance of all the runoff management structures.
- No workshop and effluent generation from the mines. Workshop along with Mechanised Oil Grease Trap System is in process.

7 SALINE WATER DISPOSAL STRATEGIES (IN CASE OF SALINE WATER ABSTRACTION)

In the mine lease area and surrounding there is no saline water as a source of groundwater. Accordingly, the mine has no interaction with saline water therefore this section is not applicable in the instance assessment.

8 OTHER DETAILS PERTAINING TO THE PROJECT

Not Applicable

9 SUMMARY AND CONCLUSION

Gonua Iron Ore Mine of M/s JSW Steel Ltd is an existing mine located in village Gonua & Patabeda of Koira tehsil in Sundargarh district of Odisha. The mine lease area falls under Survey of India Toposheet No. 73 F/8 & G/5. The indicative coordinates of the Gonua Iron Ore Mine are: Latitudes:21055'00.52356" N to 21055'46.03440" N and Longitudes:85022'04.13616" E to 85022'36.35616" E.

The predominant land use in the study is forest (73.07%), followed by scrub land (8.87%), crop land (8.23%), mining (7.12%), built-up (1.92%), water bodies (0.36%), river (0.30%) and barren land (0.12%). The topography of the study area is highly undulating in the southern and south-western part due presence hilly terrain with variation in slopes. The northern part of the study area also moderately elevated due to presence of few mounds. The e north-eastern & Eastern part of the study area exhibits low elevated topography which guides the surface water flow too. The elevation in the project area ranges from 586 to 718 mamsl, whereas the elevation ranges from 444 to 961 mamsl in the overall study area.

The predominant geomorphological features present in the study area, are moderately dissected hills and valleys of structural origin, followed by pediment of denudational origin, active quarry of anthropogenic origin, pediplain of denudational origin, highly dissected hills and valleys of structural origin, intermontane valley of fluvial origin and so on. The principle drainage system of the study area is controlled by Baitarani River & Suna Nadi, both are traverse from south-west to north-east direction in this region. Along with these, many Nalas/Streams can be observed in the study area which contributes towards the drainage system of the area. Jalpa Nadi, Kashi Nala, Dalko Nala flows south-east direction and Tapaikiri Nala flows in north-west direction to discharge their water into Baitarani River. Teherei Nala acts an important tributary to form Suna Nadi. Khajurdihi Nala, Archanda Nala & Gahirajala Nala contributes their water into Suna Nala. Kakarpani Nala, Kalmang Nala & Kunduru Nala are the important tributaries to the Suna Nadi in this region. No perennial drainage is flowing inside the project area. Kakarpani Nala is the perennial stream that is flowing at 0.6 km west to the project area.

The Gonua Iron Ore Mine is a part of the Bonai - Kendujhar belt falling in Sundargarh districts. The feebly metamorphosed Precambrian volcano-sedimentary rocks exposed in this belt between the Singhbhum granite on the east and Bonai granite on the west and are classified as 'Iron ore Group' (Sarkar & Saha, 1962) or 'Koira Group' (Murty and Acharya, 1975). These rocks are disposed in form of a low northerly plunging 'Horse-shoe' shaped synclinorium (Jones, 1934).

The predominant aquifer of the study area is Slate, Phyllite, Mica Schist with yield capacity of 1 to 5 lps followed by Banded Hematite Quartzite with yield of 3 to 10 lps, Sandstone & Conglomerate with yield of 3 to 10 lps and Basic Meta having yield of 10 to 15 lps.

The water table elevation in the study area & its outer periphery ranges between 479.28 to 875.25 mamsl during May 2024 and 480.75 to 875.63 mamsl during October 2023. The ground water moves both locally and regionally. The groundwater flow direction in the project area (lease area) is mainly from east to west whereas in the overall study area it is towards north-east direction.

The depth of water level in the study area and its outer periphery ranges from 1.75 to 12.54 mbgl during May 2024 and ranges from 1.03 to 7.75 mbgl during October 2023. The water level fluctuation varies from 0.38 to 4.91m in and around the study area. The long-term water level data shows, only seasonal fluctuation with cyclic and sinusoidal changes representing the recharge and discharge of ground water during the different period has been observed, which can be due to variations in rainfall patterns and no significant decline in water level is identical during observation period. It is observed that all the water quality parameters are within the permissible limits as per the IS standard.

There is no mine water dewatering envisaged during the plan period. Only one borewell is existing in the lease area. The total ground water abstraction through that borewell is 75 m^3/day. Out of which, 4 m^3/day will be used for drinking and domestic purposes, 65 m^3/day will be used for mining activities and dust suppression on haul & village roads, 3 m^3/day for plantation, 2 m^3/day will be used in dry fogging system and 1 m^3/day will be used for wet drilling.

As per the criteria for categorization of area made by Central Ground Water Authority for the development point of view (GWRA, 2023) the present study area falls under ‘Safe Category’. So, the withdrawal of 75 m^3/ day of ground water will not have any appreciable impact on ground water resources in the area.

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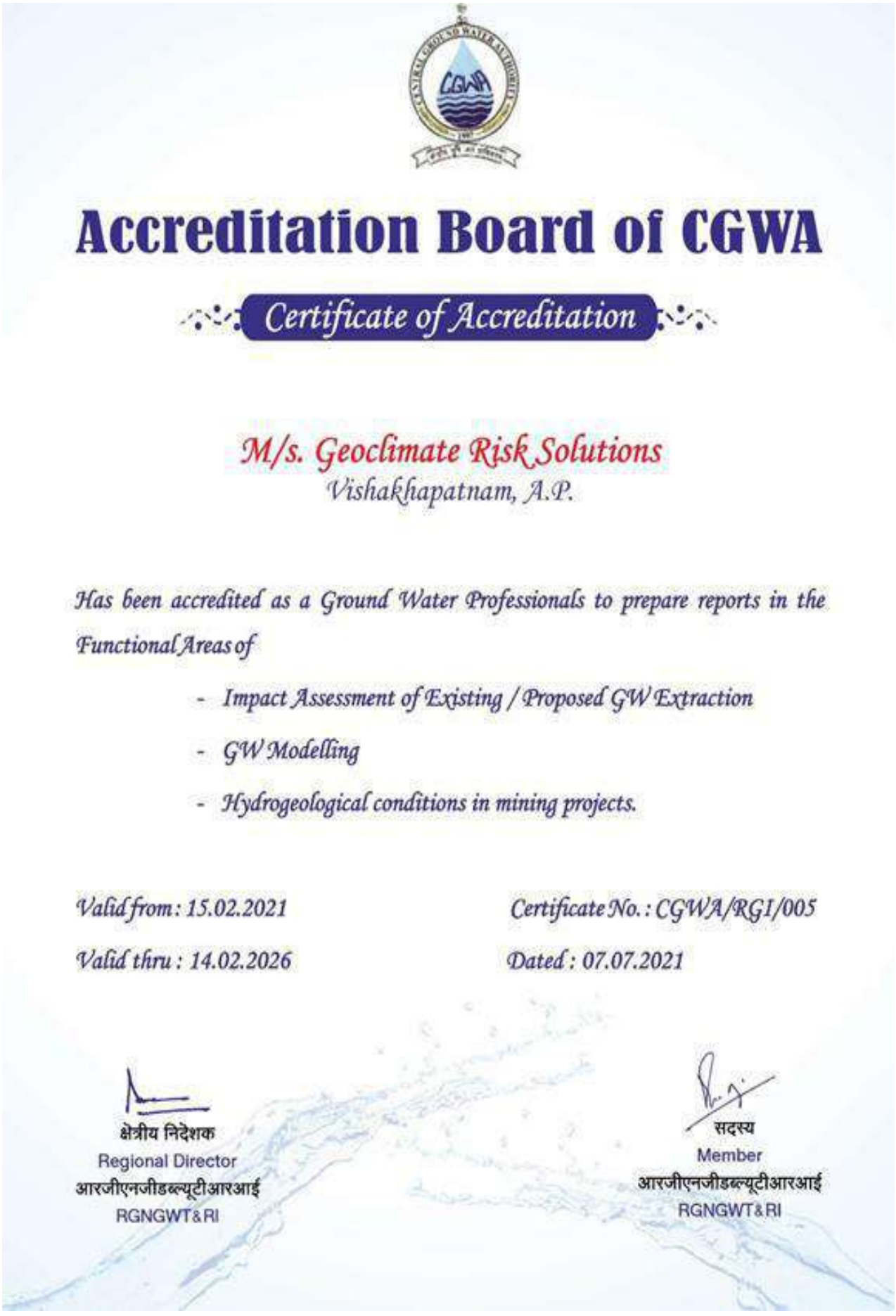
11 ACCREDITATION CERTIFICATE



Accreditation Board of CGWA

Certificate of Accreditation

M/s. Geoclimate Risk Solutions
Vishakhapatnam, A.P.

Has been accredited as a Ground Water Professionals to prepare reports in the Functional Areas of

- *Impact Assessment of Existing / Proposed GW Extraction*
- *GW Modelling*
- *Hydrogeological conditions in mining projects.*

Valid from: 15.02.2021 *Certificate No.: CGWA/RG1/005*

Valid thru : 14.02.2026 *Dated : 07.07.2021*

क्षेत्रीय निदेशक
Regional Director
आरजीएनजीडब्ल्यूटीआरआई
RGNGWT&RI

सदस्य
Member
आरजीएनजीडब्ल्यूटीआरआई
RGNGWT&RI

ANNEXURE – I: Long-term water level data of CGWB used in Hydrograph

Site Name	BHADRASAHI		GUALI		JODA		RUGUDI	
Year & Month	April	November	April	November	April	November	April	November
2014	6.11	4.00	5.88	4.08	5.50	3.48		3.85
2015	6.18	4.46	5.95	4.17	5.95	3.62	7.34	4.11
2016	6.01	4.62	5.85	4.46	6.01	3.80	7.00	4.46
2017	6.11	6.02	6.02	6.35	5.88		7.44	5.04
2018	7.78	4.90	7.80		6.47	5.42	5.54	
2019	7.45	6.70			5.72	5.77	5.24	
2020		4.38		5.42		3.82		4.53
2021		3.60		3.86		2.68		4.44
2022	6.31	3.80	6.20	3.65	5.12	2.17	5.44	4.09
2023	8.16		7.38		6.02		9.20	

(Note: All values are in meters below ground level)

ANNEXURE – II: Groundwater quality analysis reports

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Second Floor Hall, House No. B-1/8, Sector-H, Aliganj, Lucknow - 226 024
Phone No. : 0522 - 4079201/2746282
E-mail: contactus@ecomen.in, Website: www.ecomen.in, CIN - U74210UP1989PTC010601,GSTIN : 09AAACE6076H1ZI
An approved Laboratory from Ministry of Environment, Forest and Climate Change, Govt. of India, New Delhi

TEST REPORT

FORMAT NO. ECO/QS/FORMAT/11

NAME & ADDRESS OF CUSTOMER:	**M/s JSW Steel Ltd.**	**Test Report No.**	**ECO/LAB/GW/0210/4012/05/2024**
		Issue Date of Test Report	**06.05.2024**
Type of Sample	Ground Water		
Sample Registration No.	0210	**Name of Location**	Guruda village
Sampling Method	As per Reference Method	**Sample Collected By**	Ecomen Lab Team
Date of Sample Collection	04.05.2024	**Time of Sample Collection**	-
Date of Sample Received	04.05.2024	**Time of Sample Received**	10:00 AM
Start Date of Analysis	04.05.2024	**End Date of Analysis**	06.05.2024
Laboratory Environmental Condition	Temperature: 27 ± 2 °C	**Sample Quantity**	As per Requirement
	Humidity: 53 %	**Sample ID Code**	ECO/LAB/4012/05/2024

Sl. No.	TESTS	Unit	PROTOCOL	RESULT	Detection Range	INDIAN STANDARDS as per IS 10500:2012(Reaff:2018)	
						Desirable	Permissible
1.	pH	-	APHA, 23rd Ed. 2017, 4500H+ A+B	6.74	2.0 -12	6.5-8.5	No Relax.
2.	Total Alkalinity	mg/l	APHA, 23rd Ed. 2017, 2320 A+ B	42.0	5-1500	200	600
3.	Total Hardness as $CaCO_3$	mg/l	APHA, 23rd Ed. 2017, 2340 A+C	61.0	5-1500	200.0	600.0
4.	Calcium as Ca	mg/l	APHA, 23rd Ed. 2017, 3500 Ca A+B	17.60	5 – 1000	75.0	200.0
5.	Magnesium as Mg	mg/l	APHA, 23rd Ed. 2017, 3500 Mg A+B	8.83	5-1000	30.0	100.0
6.	Sulfate as SO_4	mg/l	APHA, 23rd Ed. 2017, 4500-SO_4^{2-} E	21.15	1.0 -250	200.0	400.0
7.	Nitrate Nitrogen as NO_3	mg/l	APHA, 23rd Ed. 2017, 4500-NO_3^- B	6.45	5.0 - 100	45.0	No Relax.
8.	Chloride as Cl	mg/l	APHA, 23rd Ed. 2017, 4500 Cl A+B	21.0	5-1000	250.0	1000.0
9.	Fluorides as F	mg/l	APHA, 23rd Ed. 2017, 4500-C	0.23	0.05-10	1.0	1.5
10.	Iron as Fe	mg/l	APHA, 23rd Ed. 2017, 3500 Fe B	0.22	0.02-50	0.3	No Relax.
11.	Manganese as Mn	mg/l	APHA, 23rd Ed. 2017, 3111 A+B	BDL	0.1-5	0.10	0.30
12.	Electrical Conductivity as EC	µs/cm	APHA, 24th Ed. 2023, 2510 A+B	102.2	10-2000	-	-
13.	Sodium as Na	mg/l	APHA, 24th Ed. 2023, 3500 Na A+B	2.8	1.00-100	-	-
14.	Potassium as k	mg/l	APHA, 24th Ed. 2023, 3500 K A+B	1.12	1-100	-	-

Statement of Conformity: The above tested parameters confirm as per IS-10500-2012 (Reaff.-2018) limits for above tested parameters and the results are related to the sample tested. **Note:** - BDL- Below Detection Limit.

Verified By
Technical Manager

Authorized By
Quality Manager

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An approved Laboratory from Ministry of Environment, Forest and Climate Change, Govt. of India, New Delhi

TEST REPORT

FORMAT NO. ECO/QS/FORMAT/11

NAME & ADDRESS OF CUSTOMER:	**Gunua Iron Ore Mines of M/s JSW Steel Ltd.**	**Test Report No.**	**ECO/LAB/GW/0210/4013/05/2024**
		Issue Date of Test Report	**06.05.2024**
Type of Sample	Ground Water		
Sample Registration No.	0210	**Name of Location**	Badpatuli Village
Sampling Method	As per Reference Method	**Sample Collected By**	Ecomen Lab Team
Date of Sample Collection	04.05.2024	**Time of Sample Collection**	-
Date of Sample Received	04.05.2024	**Time of Sample Received**	10:00 AM
Start Date of Analysis	04.05.2024	**End Date of Analysis**	06.05.2024
Laboratory Environmental Condition	Temperature: 27 ± 2 °C	**Sample Quantity**	As per Requirement
	Humidity: 53 %	**Sample ID Code**	ECO/LAB/4013/05/2024

Sl. No.	TESTS	Unit	PROTOCOL	RESULT	Detection Range	INDIAN STANDARDS as per IS 10500:2012(Reaff:2018)	
						Desirable	Permissible
1.	pH	-	APHA, 23rd Ed. 2017, 4500H+ A+B	7.01	2.0 -12	6.5-8.5	No Relax.
2.	Total Alkalinity	mg/l	APHA, 23rd Ed. 2017, 2320 A+ B	51.0	5-1500	200	600
3.	Total Hardness as $CaCO_3$	mg/l	APHA, 23rd Ed. 2017, 2340 A+C	74.0	5-1500	200.0	600.0
4.	Calcium as Ca	mg/l	APHA, 23rd Ed. 2017, 3500 Ca A+B	26.60	5 – 1000	75.0	200.0
5.	Magnesium as Mg	mg/l	APHA, 23rd Ed. 2017, 3500 Mg A+B	10.83	5-1000	30.0	100.0
6.	Sulfate as SO_4	mg/l	APHA, 23rd Ed. 2017, 4500-SO_4^{2-} E	18.15	1.0 -250	200.0	400.0
7.	Nitrate Nitrogen as NO_3	mg/l	APHA, 23rd Ed. 2017, 4500-NO_3^- B	6.85	5.0 - 100	45.0	No Relax.
8.	Chloride as Cl	mg/l	APHA, 23rd Ed. 2017, 4500 Cl A+B	22.0	5-1000	250.0	1000.0
9.	Fluorides as F	mg/l	APHA, 23rd Ed. 2017, 4500-C	0.31	0.05-10	1.0	1.5
10.	Iron as Fe	mg/l	APHA, 23rd Ed. 2017, 3500 Fe B	0.22	0.02-50	0.3	No Relax.
11.	Manganese as Mn	mg/l	APHA, 23rd Ed. 2017, 3111 A+B	BDL	0.1-5	0.10	0.30
12.	Electrical Cunductivity as EC	µs/cm	APHA, 24th Ed. 2023, 2510 A+B	88.2	10-2000	-	-
13.	Sodium as Na	mg/l	APHA, 24th Ed. 2023, 3500 Na A+B	2.2	1.00-100	-	-
14.	Potassium as k	mg/l	APHA, 24th Ed. 2023, 3500 K A+B	0.98	1-100	-	-

Statement of Conformity: The above tested parameters confirm as per IS-10500-2012 (Reaff.-2018) limits for above tested parameters and the results are related to the sample tested. **Note: -** BDL- Below Detection Limit.

Verified By
Technical Manager

Authorized By
Quality Manager

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TEST REPORT

FORMAT NO. ECO/QS/FORMAT/11

NAME & ADDRESS OF CUSTOMER:	**Gunua Iron Ore Mines of M/s JSW Steel Ltd.**	**Test Report No.**	**ECO/LAB/GW/0210/4014/05/2024**
		Issue Date of Test Report	**06.05.2024**
Type of Sample	Ground Water		
Sample Registration No.	0210	**Name of Location**	Kalmanga Village
Sampling Method	As per Reference Method	**Sample Collected By**	Ecomen Lab Team
Date of Sample Collection	04.05.2024	**Time of Sample Collection**	-
Date of Sample Received	04.05.2024	**Time of Sample Received**	10:00 AM
Start Date of Analysis	04.05.2024	**End Date of Analysis**	06.05.2024
Laboratory Environmental Condition	Temperature: 27 ± 2 °C	**Sample Quantity**	As per Requirement
	Humidity: 53 %	**Sample ID Code**	ECO/LAB/4014/05/2024

Sl. No.	TESTS	Unit	PROTOCOL	RESULT	Detection Range	INDIAN STANDARDS as per IS 10500:2012(Reaff:2018)	
						Desirable	Permissible
15.	pH	-	APHA, 23rd Ed. 2017, 4500H+ A+B	6.78	2.0 -12	6.5-8.5	No Relax.
16.	Total Alkalinity	mg/l	APHA, 23rd Ed. 2017, 2320 A+ B	32.0	5-1500	200	600
17.	Total Hardness as $CaCO_3$	mg/l	APHA, 23rd Ed. 2017, 2340 A+C	50.0	5-1500	200.0	600.0
18.	Calcium as Ca	mg/l	APHA, 23rd Ed. 2017, 3500 Ca A+B	10.2	5 – 1000	75.0	200.0
19.	Magnesium as Mg	mg/l	APHA, 23rd Ed. 2017, 3500 Mg A+B	5.42	5-1000	30.0	100.0
20.	Sulfate as SO_4	mg/l	APHA, 23rd Ed. 2017, 4500-SO_4^{2-} E	18.16	1.0 -250	200.0	400.0
21.	Nitrate Nitrogen as NO_3	mg/l	APHA, 23rd Ed. 2017, 4500-NO_3^- B	6.26	5.0 - 100	45.0	No Relax.
22.	Chloride as Cl	mg/l	APHA, 23rd Ed. 2017, 4500 Cl A+B	24.0	5-1000	250.0	1000.0
23.	Fluorides as F	mg/l	APHA, 23rd Ed. 2017, 4500-C	0.38	0.05-10	1.0	1.5
24.	Iron as Fe	mg/l	APHA, 23rd Ed. 2017, 3500 Fe B	0.18	0.02-50	0.3	No Relax.
25.	Manganese as Mn	mg/l	APHA, 23rd Ed. 2017, 3111 A+B	BDL	0.1-5	0.10	0.30
26.	Electrical Cunductivity as EC	µs/cm	APHA, 24th Ed. 2023, 2510 A+B	88.2	10-2000	-	-
27.	Sodium as Na	mg/l	APHA, 24th Ed. 2023, 3500 Na A+B	3.2	1.00-100	-	-
28.	Potassium as k	mg/l	APHA, 24th Ed. 2023, 3500 K A+B	0.88	1-100	-	-

Statement of Conformity: The above tested parameters confirm as per IS-10500-2012 (Reaff.-2018) limits for above tested parameters and the results are related to the sample tested. **Note: -** BDL- Below Detection Limit.

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TEST REPORT

FORMAT NO. ECO/QS/FORMAT/11

NAME & ADDRESS OF CUSTOMER:	**Gunua Iron Ore Mines of M/s JSW Steel Ltd.**	**Test Report No.**	**ECO/LAB/GW/0210/4015/05/2024**
		Issue Date of Test Report	**06.05.2024**
Type of Sample	Ground Water		
Sample Registration No.	0210	**Name of Location**	Chormalda Village
Sampling Method	As per Reference Method	**Sample Collected By**	Ecomen Lab Team
Date of Sample Collection	04.05.2024	**Time of Sample Collection**	-
Date of Sample Received	04.05.2024	**Time of Sample Received**	10:00 AM
Start Date of Analysis	04.05.2024	**End Date of Analysis**	06.05.2024
Laboratory Environmental Condition	Temperature: 27 ± 2 °C	**Sample Quantity**	As per Requirement
	Humidity: 53 %	**Sample ID Code**	ECO/LAB/4015/05/2024

Sl. No.	TESTS	Unit	PROTOCOL	RESULT	Detection Range	INDIAN STANDARDS as per IS 10500:2012(Reaff:2018)	
						Desirable	Permissible
15.	pH	-	APHA, 23rd Ed. 2017, 4500H+ A+B	7.02	2.0 -12	6.5-8.5	No Relax.
16.	Total Alkalinity	mg/l	APHA, 23rd Ed. 2017, 2320 A+ B	52.0	5-1500	200	600
17.	Total Hardness as $CaCO_3$	mg/l	APHA, 23rd Ed. 2017, 2340 A+C	72.0	5-1500	200.0	600.0
18.	Calcium as Ca	mg/l	APHA, 23rd Ed. 2017, 3500 Ca A+B	20.40	5 – 1000	75.0	200.0
19.	Magnesium as Mg	mg/l	APHA, 23rd Ed. 2017, 3500 Mg A+B	15.83	5-1000	30.0	100.0
20.	Sulfate as SO_4	mg/l	APHA, 23rd Ed. 2017, 4500-SO_4^{2-} E	28.15	1.0 -250	200.0	400.0
21.	Nitrate Nitrogen as NO_3	mg/l	APHA, 23rd Ed. 2017, 4500-NO_3^- B	7.45	5.0 - 100	45.0	No Relax.
22.	Chloride as Cl	mg/l	APHA, 23rd Ed. 2017, 4500 Cl A+B	26.0	5-1000	250.0	1000.0
23.	Fluorides as F	mg/l	APHA, 23rd Ed. 2017, 4500-C	0.18	0.05-10	1.0	1.5
24.	Iron as Fe	mg/l	APHA, 23rd Ed. 2017, 3500 Fe B	0.18	0.02-50	0.3	No Relax.
25.	Manganese as Mn	mg/l	APHA, 23rd Ed. 2017, 3111 A+B	BDL	0.1-5	0.10	0.30
26.	Electrical Cunductivity as EC	µs/cm	APHA, 24th Ed. 2023, 2510 A+B	108	10-2000	-	-
27.	Sodium as Na	mg/l	APHA, 24th Ed. 2023, 3500 Na A+B	5.1	1.00-100	-	-
28.	Potassium as k	mg/l	APHA, 24th Ed. 2023, 3500 K A+B	0.92	1-100	-	-

Statement of Conformity: The above tested parameters confirm as per IS-10500-2012 (Reaff. -2018) limits for above tested parameters and the results are related to the sample tested. **Note: -** BDL- Below Detection Limit.

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TEST REPORT

FORMAT NO. ECO/QS/FORMAT/11

NAME & ADDRESS OF CUSTOMER:	**Gunua Iron Ore Mines of M/s JSW Steel Ltd.**	**Test Report No.**	**ECO/LAB/GW/0210/4016/05/2024**
		Issue Date of Test Report	**06.05.2024**
Type of Sample	Ground Water		
Sample Registration No.	0210	**Name of Location**	Gamulai Village
Sampling Method	As per Reference Method	**Sample Collected By**	Ecomen Lab Team
Date of Sample Collection	04.05.2024	**Time of Sample Collection**	-
Date of Sample Received	04.05.2024	**Time of Sample Received**	10:00 AM
Start Date of Analysis	04.05.2024	**End Date of Analysis**	06.05.2024
Laboratory Environmental Condition	Temperature: 27 ± 2 °C	**Sample Quantity**	As per Requirement
	Humidity: 53 %	**Sample ID Code**	ECO/LAB/4016/05/2024

Sl. No.	TESTS	Unit	PROTOCOL	RESULT	Detection Range	INDIAN STANDARDS as per IS 10500:2012(Reaff:2018)	
						Desirable	Permissible
29.	pH	-	APHA, 23rd Ed. 2017, 4500H+ A+B	6.78	2.0 -12	6.5-8.5	No Relax.
30.	Total Alkalinity	mg/l	APHA, 23rd Ed. 2017, 2320 A+ B	66	5-1500	200	600
31.	Total Hardness as $CaCO_3$	mg/l	APHA, 23rd Ed. 2017, 2340 A+C	62.4	5-1500	200.0	600.0
32.	Calcium as Ca	mg/l	APHA, 23rd Ed. 2017, 3500 Ca A+B	12.68	5 – 1000	75.0	200.0
33.	Magnesium as Mg	mg/l	APHA, 23rd Ed. 2017, 3500 Mg A+B	10.22	5-1000	30.0	100.0
34.	Sulfate as SO_4	mg/l	APHA, 23rd Ed. 2017, 4500-SO_4^{2-} E	12.2	1.0 -250	200.0	400.0
35.	Nitrate Nitrogen as NO_3	mg/l	APHA, 23rd Ed. 2017, 4500-NO_3^- B	7.12	5.0 - 100	45.0	No Relax.
36.	Chloride as Cl	mg/l	APHA, 23rd Ed. 2017, 4500 Cl A+B	14.4	5-1000	250.0	1000.0
37.	Fluorides as F	mg/l	APHA, 23rd Ed. 2017, 4500-C	0.26	0.05-10	1.0	1.5
38.	Iron as Fe	mg/l	APHA, 23rd Ed. 2017, 3500 Fe B	0.22	0.02-50	0.3	No Relax.
39.	Manganese as Mn	mg/l	APHA, 23rd Ed. 2017, 3111 A+B	BDL	0.1-5	0.10	0.30
40.	Electrical Conductivity as EC	µs/cm	APHA, 24th Ed. 2023, 2510 A+B	77.2	10-2000	-	-
41.	Sodium as Na	mg/l	APHA, 24th Ed. 2023, 3500 Na A+B	3.0	1.00-100	-	-
42.	Potassium as k	mg/l	APHA, 24th Ed. 2023, 3500 K A+B	0.78	1-100	-	-

Statement of Conformity: The above tested parameters confirm as per IS-10500-2012 (Reaff.-2018) limits for above tested parameters and the results are related to the sample tested. **Note: -** BDL- Below Detection Limit.

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TEST REPORT

FORMAT NO. ECO/QS/FORMAT/11

NAME & ADDRESS OF CUSTOMER:	**Gunua Iron Ore Mines of M/s JSW Steel Ltd.**	**Test Report No.**	**ECO/LAB/GW/0210/4017/05/2024**
		Issue Date of Test Report	**06.05.2024**
Type of Sample	Ground Water		
Sample Registration No.	0210	**Name of Location**	Gonua Village
Sampling Method	As per Reference Method	**Sample Collected By**	Ecomen Lab Team
Date of Sample Collection	04.05.2024	**Time of Sample Collection**	-
Date of Sample Received	04.05.2024	**Time of Sample Received**	10:00 AM
Start Date of Analysis	04.05.2024	**End Date of Analysis**	06.05.2024
Laboratory Environmental Condition	Temperature: 27 ± 2 °C	**Sample Quantity**	As per Requirement
	Humidity: 53 %	**Sample ID Code**	ECO/LAB/4017/05/2024

Sl. No.	TESTS	Unit	PROTOCOL	RESULT	Detection Range	INDIAN STANDARDS as per IS 10500:2012(Reaff:2018)	
						Desirable	Permissible
43.	pH	-	APHA, 23rd Ed. 2017, 4500H+ A+B	7.02	2.0 -12	6.5-8.5	No Relax.
44.	Total Alkalinity	mg/l	APHA, 23rd Ed. 2017, 2320 A+ B	44.4	5-1500	200	600
45.	Total Hardness as $CaCO_3$	mg/l	APHA, 23rd Ed. 2017, 2340 A+C	48	5-1500	200.0	600.0
46.	Calcium as Ca	mg/l	APHA, 23rd Ed. 2017, 3500 Ca A+B	16.2	5 – 1000	75.0	200.0
47.	Magnesium as Mg	mg/l	APHA, 23rd Ed. 2017, 3500 Mg A+B	8.85	5-1000	30.0	100.0
48.	Sulfate as SO_4	mg/l	APHA, 23rd Ed. 2017, 4500-SO_4^{2-} E	12.62	1.0 -250	200.0	400.0
49.	Nitrate Nitrogen as NO_3	mg/l	APHA, 23rd Ed. 2017, 4500-NO_3^- B	5.28	5.0 - 100	45.0	No Relax.
50.	Chloride as Cl	mg/l	APHA, 23rd Ed. 2017, 4500 Cl A+B	16.6	5-1000	250.0	1000.0
51.	Fluorides as F	mg/l	APHA, 23rd Ed. 2017, 4500-C	0.18	0.05-10	1.0	1.5
52.	Iron as Fe	mg/l	APHA, 23rd Ed. 2017, 3500 Fe B	0.26	0.02-50	0.3	No Relax.
53.	Manganese as Mn	mg/l	APHA, 23rd Ed. 2017, 3111 A+B	BDL	0.1-5	0.10	0.30
54.	Electrical Conductivity as EC	µs/cm	APHA, 24th Ed. 2023, 2510 A+B	97.2	10-2000	-	-
55.	Sodium as Na	mg/l	APHA, 24th Ed. 2023, 3500 Na A+B	4.0	1.00-100	-	-
56.	Potassium as k	mg/l	APHA, 24th Ed. 2023, 3500 K A+B	1.1	1-100	-	-

Statement of Conformity: The above tested parameters confirm as per IS-10500-2012 (Reaff.-2018) limits for above tested parameters and the results are related to the sample tested. **Note:** - BDL- Below Detection Limit.

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TEST REPORT

FORMAT NO. ECO/QS/FORMAT/11

NAME & ADDRESS OF CUSTOMER:	**Gunua Iron Ore Mines of M/s JSW Steel Ltd.**	**Test Report No.**	**ECO/LAB/GW/0210/4018/05/2024**
		Issue Date of Test Report	**06.05.2024**
Type of Sample	Ground Water		
Sample Registration No.	0210	**Name of Location**	Camp of Tisco Village
Sampling Method	As per Reference Method	**Sample Collected By**	Ecomen Lab Team
Date of Sample Collection	04.05.2024	**Time of Sample Collection**	-
Date of Sample Received	04.05.2024	**Time of Sample Received**	10:00 AM
Start Date of Analysis	04.05.2024	**End Date of Analysis**	06.05.2024
Laboratory Environmental Condition	Temperature: 27 ± 2 °C	**Sample Quantity**	As per Requirement
	Humidity: 53 %	**Sample ID Code**	ECO/LAB/4018/05/2024

Sl. No.	TESTS	Unit	PROTOCOL	RESULT	Detection Range	INDIAN STANDARDS as per IS 10500:2012(Reaff:2018)	
						Desirable	Permissible
57.	pH	-	APHA, 23rd Ed. 2017, 4500H+ A+B	6.58	2.0 -12	6.5-8.5	No Relax.
58.	Total Alkalinity	mg/l	APHA, 23rd Ed. 2017, 2320 A+ B	58.0	5-1500	200	600
59.	Total Hardness as $CaCO_3$	mg/l	APHA, 23rd Ed. 2017, 2340 A+C	72.0	5-1500	200.0	600.0
60.	Calcium as Ca	mg/l	APHA, 23rd Ed. 2017, 3500 Ca A+B	16.22	5 – 1000	75.0	200.0
61.	Magnesium as Mg	mg/l	APHA, 23rd Ed. 2017, 3500 Mg A+B	13.42	5-1000	30.0	100.0
62.	Sulfate as SO_4	mg/l	APHA, 23rd Ed. 2017, 4500-SO_4^{2-} E	18.15	1.0 -250	200.0	400.0
63.	Nitrate Nitrogen as NO_3	mg/l	APHA, 23rd Ed. 2017, 4500-NO_3^- B	6.8	5.0 - 100	45.0	No Relax.
64.	Chloride as Cl	mg/l	APHA, 23rd Ed. 2017, 4500 Cl A+B	20.4	5-1000	250.0	1000.0
65.	Fluorides as F	mg/l	APHA, 23rd Ed. 2017, 4500-C	0.40	0.05-10	1.0	1.5
66.	Iron as Fe	mg/l	APHA, 23rd Ed. 2017, 3500 Fe B	0.20	0.02-50	0.3	No Relax.
67.	Manganese as Mn	mg/l	APHA, 23rd Ed. 2017, 3111 A+B	BDL	0.1-5	0.10	0.30
68.	Electrical Conductivity as EC	µs/cm	APHA, 24th Ed. 2023, 2510 A+B	88.2	10-2000	-	-
69.	Sodium as Na	mg/l	APHA, 24th Ed. 2023, 3500 Na A+B	2.6	1.00-100	-	-
70.	Potassium as k	mg/l	APHA, 24th Ed. 2023, 3500 K A+B	0.90	1-100	-	-

Statement of Conformity: The above tested parameters confirm as per IS-10500-2012 (Reaff.-2018) limits for above tested parameters and the results are related to the sample tested. **Note:** - BDL- Below Detection Limit.

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TEST REPORT

FORMAT NO. ECO/QS/FORMAT/11

NAME & ADDRESS OF CUSTOMER:	**Gunua Iron Ore Mines of M/s JSW Steel Ltd.**	**Test Report No.**	**ECO/LAB/GW/0210/4019/05/2024**
		Issue Date of Test Report	**06.05.2024**
Type of Sample	Ground Water		
Sample Registration No.	0210	**Name of Location**	Laidapada Village
Sampling Method	As per Reference Method	**Sample Collected By**	Ecomen Lab Team
Date of Sample Collection	04.05.2024	**Time of Sample Collection**	-
Date of Sample Received	04.05.2024	**Time of Sample Received**	10:00 AM
Start Date of Analysis	04.05.2024	**End Date of Analysis**	06.05.2024
Laboratory Environmental Condition	Temperature: 27 ± 2 °C	**Sample Quantity**	As per Requirement
	Humidity: 53 %	**Sample ID Code**	ECO/LAB/4019/05/2024

Sl. No.	TESTS	Unit	PROTOCOL	RESULT	Detection Range	INDIAN STANDARDS as per IS 10500:2012(Reaff:2018)	
						Desirable	Permissible
71.	pH	-	APHA, 23rd Ed. 2017, 4500H+ A+B	6.98	2.0 -12	6.5-8.5	No Relax.
72.	Total Alkalinity	mg/l	APHA, 23rd Ed. 2017, 2320 A+ B	46.0	5-1500	200	600
73.	Total Hardness as $CaCO_3$	mg/l	APHA, 23rd Ed. 2017, 2340 A+C	54.6	5-1500	200.0	600.0
74.	Calcium as Ca	mg/l	APHA, 23rd Ed. 2017, 3500 Ca A+B	17.60	5 – 1000	75.0	200.0
75.	Magnesium as Mg	mg/l	APHA, 23rd Ed. 2017, 3500 Mg A+B	7.72	5-1000	30.0	100.0
76.	Sulfate as SO_4	mg/l	APHA, 23rd Ed. 2017, 4500-SO_4^{2-} E	18.15	1.0 -250	200.0	400.0
77.	Nitrate Nitrogen as NO_3	mg/l	APHA, 23rd Ed. 2017, 4500-NO_3^- B	8.2	5.0 - 100	45.0	No Relax.
78.	Chloride as Cl	mg/l	APHA, 23rd Ed. 2017, 4500 Cl A+B	24.2	5-1000	250.0	1000.0
79.	Fluorides as F	mg/l	APHA, 23rd Ed. 2017, 4500-C	0.25	0.05-10	1.0	1.5
80.	Iron as Fe	mg/l	APHA, 23rd Ed. 2017, 3500 Fe B	0.22	0.02-50	0.3	No Relax.
81.	Manganese as Mn	mg/l	APHA, 23rd Ed. 2017, 3111 A+B	BDL	0.1-5	0.10	0.30
82.	Electrical Conductivity as EC	µs/cm	APHA, 24th Ed. 2023, 2510 A+B	68.2	10-2000	-	-
83.	Sodium as Na	mg/l	APHA, 24th Ed. 2023, 3500 Na A+B	2.8	1.00-100	-	-
84.	Potassium as k	mg/l	APHA, 24th Ed. 2023, 3500 K A+B	0.86	1-100	-	-

Statement of Conformity: The above tested parameters confirm as per IS-10500-2012 (Reaff. -2018) limits for above tested parameters and the results are related to the sample tested. **Note: -** BDL- Below Detection Limit.

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TEST REPORT

FORMAT NO. ECO/QS/FORMAT/11

NAME & ADDRESS OF CUSTOMER:	**Gunua Iron Ore Mines of M/s JSW Steel Ltd.**	**Test Report No.**	**ECO/LAB/GW/0210/4020/05/2024**
		Issue Date of Test Report	**06.05.2024**
Type of Sample	Ground Water		
Sample Registration No.	0210	**Name of Location**	Balada Village
Sampling Method	As per Reference Method	**Sample Collected By**	Ecomen Lab Team
Date of Sample Collection	02.05.2024	**Time of Sample Collection**	-
Date of Sample Received	02.05.2024	**Time of Sample Received**	10:00 AM
Start Date of Analysis	02.05.2024	**End Date of Analysis**	04.05.2023
Laboratory Environmental Condition	Temperature: 27 ± 2 °C	**Sample Quantity**	As per Requirement
	Humidity: 53 %	**Sample ID Code**	ECO/LAB/4020/05/2024

Sl. No.	TESTS	Unit	PROTOCOL	RESULT	Detection Range	INDIAN STANDARDS as per IS 10500:2012(Reaff:2018)	
						Desirable	Permissible
85.	pH	-	APHA, 23rd Ed. 2017, 4500H+ A+B	6.68	2.0 -12	6.5-8.5	No Relax.
86.	Total Alkalinity	mg/l	APHA, 23rd Ed. 2017, 2320 A+ B	46.2	5-1500	200	600
87.	Total Hardness as $CaCO_3$	mg/l	APHA, 23rd Ed. 2017, 2340 A+C	50.4	5-1500	200.0	600.0
88.	Calcium as Ca	mg/l	APHA, 23rd Ed. 2017, 3500 Ca A+B	16.5	5 – 1000	75.0	200.0
89.	Magnesium as Mg	mg/l	APHA, 23rd Ed. 2017, 3500 Mg A+B	6.26	5-1000	30.0	100.0
90.	Sulfate as SO_4	mg/l	APHA, 23rd Ed. 2017, 4500-SO_4^{2-} E	14.6	1.0 -250	200.0	400.0
91.	Nitrate Nitrogen as NO_3	mg/l	APHA, 23rd Ed. 2017, 4500-NO_3^- B	4..86	5.0 - 100	45.0	No Relax.
92.	Chloride as Cl	mg/l	APHA, 23rd Ed. 2017, 4500 Cl A+B	22.8	5-1000	250.0	1000.0
93.	Fluorides as F	mg/l	APHA, 23rd Ed. 2017, 4500-C	0.21	0.05-10	1.0	1.5
94.	Iron as Fe	mg/l	APHA, 23rd Ed. 2017, 3500 Fe B	0.16	0.02-50	0.3	No Relax.
95.	Manganese as Mn	mg/l	APHA, 23rd Ed. 2017, 3111 A+B	BDL	0.1-5	0.10	0.30
96.	Electrical Conductivity as EC	µs/cm	APHA, 24th Ed. 2023, 2510 A+B	93.6	10-2000	-	-
97.	Sodium as Na	mg/l	APHA, 24th Ed. 2023, 3500 Na A+B	3.4	1.00-100	-	-
98.	Potassium as k	mg/l	APHA, 24th Ed. 2023, 3500 K A+B	0.82	1-100	-	-

Statement of Conformity: The above tested parameters confirm as per IS-10500-2012 (Reaff.-2018) limits for above tested parameters and the results are related to the sample tested. **Note:** - BDL- Below Detection Limit.

Verified By
Technical Manager

Authorized By
Quality Manager

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TEST REPORT

FORMAT NO. ECO/QS/FORMAT/11

NAME & ADDRESS OF CUSTOMER:	**Gunua Iron Ore Mines of M/s JSW Steel Ltd.**	**Test Report No.**	**ECO/LAB/GW/0210/4021/05/2024**
		Issue Date of Test Report	**06.05.2024**
Type of Sample	Ground Water		
Sample Registration No.	0210	**Name of Location**	Joda M
Sampling Method	As per Reference Method	**Sample Collected By**	Ecomen Lab Team
Date of Sample Collection	02.05.2024	**Time of Sample Collection**	-
Date of Sample Received	02.05.2024	**Time of Sample Received**	10:00 AM
Start Date of Analysis	02.05.2024	**End Date of Analysis**	04.05.2024
Laboratory Environmental Condition	Temperature: 27 ± 2 °C	**Sample Quantity**	As per Requirement
	Humidity: 53 %	**Sample ID Code**	ECO/LAB/4021/05/2024

Sl. No.	TESTS	Unit	PROTOCOL	RESULT	Detection Range	INDIAN STANDARDS as per IS 10500:2012(Reaff:2018)	
						Desirable	Permissible
99.	pH	-	APHA, 23rd Ed. 2017, 4500H+ A+B	6.80	2.0 -12	6.5-8.5	No Relax.
100.	Total Alkalinity	mgl	APHA, 23rd Ed. 2017, 2320 A+ B	56.2	5-1500	200	600
101.	Total Hardness as $CaCO_3$	mgl	APHA, 23rd Ed. 2017, 2340 A+C	72.8	5-1500	200.0	600.0
102.	Calcium as Ca	mgl	APHA, 23rd Ed. 2017, 3500 Ca A+B	20.2	5 – 1000	75.0	200.0
103.	Magnesium as Mg	mgl	APHA, 23rd Ed. 2017, 3500 Mg A+B	16.8	5-1000	30.0	100.0
104.	Sulfate as SO_4	mgl	APHA, 23rd Ed. 2017, 4500-SO_4^{2-} E	26.2	1.0 -250	200.0	400.0
105.	Nitrate Nitrogen as NO_3	mgl	APHA, 23rd Ed. 2017, 4500-NO_3^- B	6.45	5.0 - 100	45.0	No Relax.
106.	Chloride as Cl	mgl	APHA, 23rd Ed. 2017, 4500 Cl A+B	22.60	5-1000	250.0	1000.0
107.	Fluorides as F	mgl	APHA, 23rd Ed. 2017, 4500-C	0.24	0.05-10	1.0	1.5
108.	Iron as Fe	mgl	APHA, 23rd Ed. 2017, 3500 Fe B	0.12	0.02-50	0.3	No Relax.
109.	Manganese as Mn	mgl	APHA, 23rd Ed. 2017, 3111 A+B	BDL	0.1-5	0.10	0.30
110.	Electrical Conductivity as EC	µs/cm	APHA, 24th Ed. 2023, 2510 A+B	82.5	10-2000	-	-
111.	Sodium as Na	mgl	APHA, 24th Ed. 2023, 3500 Na A+B	4.0	1.00-100	-	-
112.	Potassium as k	mgl	APHA, 24th Ed. 2023, 3500 K A+B	1.06	1-100	-	-

Statement of Conformity: The above tested parameters confirm as per IS-10500-2012 (Reaff.-2018) limits for above tested parameters and the results are related to the sample tested. **Note: -** BDL- Below Detection Limit.

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TEST REPORT

FORMAT NO. ECO/QS/FORMAT/11

NAME & ADDRESS OF CUSTOMER:	**Gunua Iron Ore Mines of M/s JSW Steel Ltd.**	**Test Report No.**	**ECO/LAB/GW/0210/4022/05/2024**
		Issue Date of Test Report	**06.05.2024**
Type of Sample	Ground Water		
Sample Registration No.	0210	**Name of Location**	Namira Village
Sampling Method	As per Reference Method	**Sample Collected By**	Ecomen Lab Team
Date of Sample Collection	02.05.2024	**Time of Sample Collection**	-
Date of Sample Received	02.05.2024	**Time of Sample Received**	10:00 AM
Start Date of Analysis	02.05.2024	**End Date of Analysis**	04.05.2024
Laboratory Environmental Condition	Temperature: 27 ± 2 °C	**Sample Quantity**	As per Requirement
	Humidity: 53 %	**Sample ID Code**	ECO/LAB/4022/05/2024

Sl. No.	TESTS	Unit	PROTOCOL	RESULT	Detection Range	INDIAN STANDARDS as per IS 10500:2012(Reaff:2018)	
						Desirable	Permissible
113.	pH	-	APHA, 23rd Ed. 2017, 4500H+ A+B	6.60	2.0 -12	6.5-8.5	No Relax.
114.	Total Alkalinity	mg/l	APHA, 23rd Ed. 2017, 2320 A+ B	52.2	5-1500	200	600
115.	Total Hardness as $CaCO_3$	mg/l	APHA, 23rd Ed. 2017, 2340 A+C	76.2	5-1500	200.0	600.0
116.	Calcium as Ca	mg/l	APHA, 23rd Ed. 2017, 3500 Ca A+B	18.4	5 – 1000	75.0	200.0
117.	Magnesium as Mg	mg/l	APHA, 23rd Ed. 2017, 3500 Mg A+B	16.2	5-1000	30.0	100.0
118.	Sulfate as SO_4	mg/l	APHA, 23rd Ed. 2017, 4500-SO_4^{2-} E	20.4	1.0 -250	200.0	400.0
119.	Nitrate Nitrogen as NO_3	mg/l	APHA, 23rd Ed. 2017, 4500-NO_3^- B	7.23	5.0 - 100	45.0	No Relax.
120.	Chloride as Cl	mg/l	APHA, 23rd Ed. 2017, 4500 Cl A+B	18	5-1000	250.0	1000.0
121.	Fluorides as F	mg/l	APHA, 23rd Ed. 2017, 4500-C	0.16	0.05-10	1.0	1.5
122.	Iron as Fe	mg/l	APHA, 23rd Ed. 2017, 3500 Fe B	0.10	0.02-50	0.3	No Relax.
123.	Manganese as Mn	mg/l	APHA, 23rd Ed. 2017, 3111 A+B	BDL	0.1-5	0.10	0.30
124.	Electrical Conductivity as EC	1 µs/cm	APHA, 24th Ed. 2023, 2510 A+B	76.8	10-2000	-	-
125.	Sodium as Na	mg/l	APHA, 24th Ed. 2023, 3500 Na A+B	3.2	1.00-100	-	-
126.	Potassium as k	mg/l	APHA, 24th Ed. 2023, 3500 K A+B	0.92	1-100	-	-

Statement of Conformity: The above tested parameters confirm as per IS-10500-2012 (Reaff.-2018) limits for above tested parameters and the results are related to the sample tested. **Note: -** BDL- Below Detection Limit.

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TEST REPORT

FORMAT NO. ECO/QS/FORMAT/11

NAME & ADDRESS OF CUSTOMER:	**Gunua Iron Ore Mines of M/s JSW Steel Ltd.**	**Test Report No.**	**ECO/LAB/GW/0210/4023/05/2024**
		Issue Date of Test Report	**06.05.2024**
Type of Sample	Ground Water		
Sample Registration No.	0210	**Name of Location**	Nayagarh Village
Sampling Method	As per Reference Method	**Sample Collected By**	Ecomen Lab Team
Date of Sample Collection	02.05.2024	**Time of Sample Collection**	-
Date of Sample Received	02.05.2024	**Time of Sample Received**	10:00 AM
Start Date of Analysis	02.05.2024	**End Date of Analysis**	04.05.2024
Laboratory Environmental Condition	Temperature: 27 ± 2 °C	**Sample Quantity**	As per Requirement
	Humidity: 53 %	**Sample ID Code**	ECO/LAB/4023/05/2024

Sl. No.	TESTS	Unit	PROTOCOL	RESULT	Detection Range	INDIAN STANDARDS as per IS 10500:2012(Reaff:2018)	
						Desirable	Permissible
127.	pH	-	APHA, 23rd Ed. 2017, 4500H+ A+B	6.87	2.0 -12	6.5-8.5	No Relax.
128.	Total Alkalinity	mg/l	APHA, 23rd Ed. 2017, 2320 A+ B	42.4	5-1500	200	600
129.	Total Hardness as $CaCO_3$	mg/l	APHA, 23rd Ed. 2017, 2340 A+C	66.2	5-1500	200.0	600.0
130.	Calcium as Ca	mg/l	APHA, 23rd Ed. 2017, 3500 Ca A+B	16.2	5 – 1000	75.0	200.0
131.	Magnesium as Mg	mg/l	APHA, 23rd Ed. 2017, 3500 Mg A+B	9.2	5-1000	30.0	100.0
132.	Sulfate as SO_4	mg/l	APHA, 23rd Ed. 2017, 4500-SO_4^{2-} E	16.8	1.0 -250	200.0	400.0
133.	Nitrate Nitrogen as NO_3	mg/l	APHA, 23rd Ed. 2017, 4500-NO_3^- B	7.2	5.0 - 100	45.0	No Relax.
134.	Chloride as Cl	mg/l	APHA, 23rd Ed. 2017, 4500 Cl A+B	18.4	5-1000	250.0	1000.0
135.	Fluorides as F	mg/l	APHA, 23rd Ed. 2017, 4500-C	0.24	0.05-10	1.0	1.5
136.	Iron as Fe	mg/l	APHA, 23rd Ed. 2017, 3500 Fe B	0.26	0.02-50	0.3	No Relax.
137.	Manganese as Mn	mg/l	APHA, 23rd Ed. 2017, 3111 A+B	BDL	0.1-5	0.10	0.30
138.	Electrical Conductivity as EC	µs/cm	APHA, 24th Ed. 2023, 2510 A+B	148	10-2000	-	-
139.	Sodium as Na	mg/l	APHA, 24th Ed. 2023, 3500 Na A+B	2.42	1.00-100	-	-
140.	Potassium as k	mg/l	APHA, 24th Ed. 2023, 3500 K A+B	1.01	1-100	-	-

Statement of Conformity: The above tested parameters confirm as per IS-10500-2012 (Reaff. -2018) limits for above tested parameters and the results are related to the sample tested. **Note:** - BDL- Below Detection Limit.

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TEST REPORT

FORMAT NO. ECO/QS/FORMAT/11

NAME & ADDRESS OF CUSTOMER:	**Gunua Iron Ore Mines of M/s JSW Steel Ltd.**	**Test Report No.**	**ECO/LAB/GW/0210/4024/05/2024**
		Issue Date of Test Report	**06.05.2024**
Type of Sample	Ground Water		
Sample Registration No.	0210	**Name of Location**	Jaroli Village
Sampling Method	As per Reference Method	**Sample Collected By**	Ecomen Lab Team
Date of Sample Collection	02.05.2024	**Time of Sample Collection**	-
Date of Sample Received	02.05.2024	**Time of Sample Received**	10:00 AM
Start Date of Analysis	02.05.2024	**End Date of Analysis**	04.05.2024
Laboratory Environmental Condition	Temperature: 27 ± 2 °C	**Sample Quantity**	As per Requirement
	Humidity: 53 %	**Sample ID Code**	ECO/LAB/4024/05/2024

Sl. No.	TESTS	Unit	PROTOCOL	RESULT	Detection Range	INDIAN STANDARDS as per IS 10500:2012(Reaff:2018)	
						Desirable	Permissible
141.	pH	-	APHA, 23rd Ed. 2017, 4500H+ A+B	7.12	2.0 -12	6.5-8.5	No Relax.
142.	Total Alkalinity	mg/l	APHA, 23rd Ed. 2017, 2320 A+ B	36.6	5-1500	200	600
143.	Total Hardness as $CaCO_3$	mg/l	APHA, 23rd Ed. 2017, 2340 A+C	61.2	5-1500	200.0	600.0
144.	Calcium as Ca	mg/l	APHA, 23rd Ed. 2017, 3500 Ca A+B	16.8	5 – 1000	75.0	200.0
145.	Magnesium as Mg	mg/l	APHA, 23rd Ed. 2017, 3500 Mg A+B	7.53	5-1000	30.0	100.0
146.	Sulfate as SO_4	mg/l	APHA, 23rd Ed. 2017, 4500-SO_4^{2-} E	20.22	1.0 -250	200.0	400.0
147.	Nitrate Nitrogen as NO_3	mg/l	APHA, 23rd Ed. 2017, 4500-NO_3^- B	5.56	5.0 - 100	45.0	No Relax.
148.	Chloride as Cl	mg/l	APHA, 23rd Ed. 2017, 4500 Cl A+B	16.0	5-1000	250.0	1000.0
149.	Fluorides as F	mg/l	APHA, 23rd Ed. 2017, 4500-C	0.18	0.05-10	1.0	1.5
150.	Iron as Fe	mg/l	APHA, 23rd Ed. 2017, 3500 Fe B	0.08	0.02-50	0.3	No Relax.
151.	Manganese as Mn	mg/l	APHA, 23rd Ed. 2017, 3111 A+B	BDL	0.1-5	0.10	0.30
152.	Electrical Conductivity as EC	µs/cm	APHA, 24th Ed. 2023, 2510 A+B	52	10-2000	-	-
153.	Sodium as Na	mg/l	APHA, 24th Ed. 2023, 3500 Na A+B	3.87	1.00-100	-	-
154.	Potassium as k	mg/l	APHA, 24th Ed. 2023, 3500 K A+B	1.14	1-100	-	-

Statement of Conformity: The above tested parameters confirm as per IS-10500-2012 (Reaff.-2018) limits for above tested parameters and the results are related to the sample tested. **Note: -** BDL- Below Detection Limit.

Verified By
Technical Manager

Authorized By
Quality Manager

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TEST REPORT

FORMAT NO. ECO/QS/FORMAT/11

NAME & ADDRESS OF CUSTOMER:	**Gunua Iron Ore Mines of M/s JSW Steel Ltd.**	**Test Report No.**	**ECO/LAB/GW/0210/4025/05/2024**
		Issue Date of Test Report	**06.05.2024**
Type of Sample	Ground Water		
Sample Registration No.	0210	**Name of Location**	Basantapur Village
Sampling Method	As per Reference Method	**Sample Collected By**	Ecomen Lab Team
Date of Sample Collection	02.05.2024	**Time of Sample Collection**	-
Date of Sample Received	02.05.2024	**Time of Sample Received**	10:00 AM
Start Date of Analysis	02.05.2024	**End Date of Analysis**	04.05.2024
Laboratory Environmental Condition	Temperature: 27 ± 2 °C	**Sample Quantity**	As per Requirement
	Humidity: 53 %	**Sample ID Code**	ECO/LAB/4025/05/2024

Sl. No.	TESTS	Unit	PROTOCOL	RESULT	Detection Range	INDIAN STANDARDS as per IS 10500:2012(Reaff:2018)	
						Desirable	Permissible
155.	pH	-	APHA, 23rd Ed. 2017, 4500H+ A+B	6.64	2.0 -12	6.5-8.5	No Relax.
156.	Total Alkalinity	mg/l	APHA, 23rd Ed. 2017, 2320 A+ B	32.0	5-1500	200	600
157.	Total Hardness as $CaCO_3$	mg/l	APHA, 23rd Ed. 2017, 2340 A+C	58.2	5-1500	200.0	600.0
158.	Calcium as Ca	mg/l	APHA, 23rd Ed. 2017, 3500 Ca A+B	16.4	5 – 1000	75.0	200.0
159.	Magnesium as Mg	mg/l	APHA, 23rd Ed. 2017, 3500 Mg A+B	8.24	5-1000	30.0	100.0
160.	Sulfate as SO_4	mg/l	APHA, 23rd Ed. 2017, 4500-SO_4^{2-} E	21.24	1.0 -250	200.0	400.0
161.	Nitrate Nitrogen as NO_3	mg/l	APHA, 23rd Ed. 2017, 4500-NO_3^- B	6.66	5.0 - 100	45.0	No Relax.
162.	Chloride as Cl	mg/l	APHA, 23rd Ed. 2017, 4500 Cl A+B	20.2	5-1000	250.0	1000.0
163.	Fluorides as F	mg/l	APHA, 23rd Ed. 2017, 4500-C	0.26	0.05-10	1.0	1.5
164.	Iron as Fe	mg/l	APHA, 23rd Ed. 2017, 3500 Fe B	0.12	0.02-50	0.3	No Relax.
165.	Manganese as Mn	mg/l	APHA, 23rd Ed. 2017, 3111 A+B	BDL	0.1-5	0.10	0.30
166.	Electrical Conductivity as EC	µs/cm	APHA, 24th Ed. 2023, 2510 A+B	101	10-2000	-	-
167.	Sodium as Na	mg/l	APHA, 24th Ed. 2023, 3500 Na A+B	3.02	1.00-100	-	-
168.	Potassium as k	mg/l	APHA, 24th Ed. 2023, 3500 K A+B	1.12	1-100	-	-

Statement of Conformity: The above tested parameters confirm as per IS-10500-2012 (Reaff.-2018) limits for above tested parameters and the results are related to the sample tested. **Note:** - BDL- Below Detection Limit.

Verified By
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Authorized By
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TEST REPORT

FORMAT NO. ECO/QS/FORMAT/11

NAME & ADDRESS OF CUSTOMER:	**Gunua Iron Ore Mines of M/s JSW Steel Ltd.**	**Test Report No.**	**ECO/LAB/GW/0210/4026/05/2024**
		Issue Date of Test Report	**06.05.2024**
Type of Sample	Ground Water		
Sample Registration No.	0210	**Name of Location**	Mithirda Village
Sampling Method	As per Reference Method	**Sample Collected By**	Ecomen Lab Team
Date of Sample Collection	04.05.2024	**Time of Sample Collection**	-
Date of Sample Received	04.05.2024	**Time of Sample Received**	10:00 AM
Start Date of Analysis	04.05.2024	**End Date of Analysis**	06.05.2024
Laboratory Environmental Condition	Temperature: 27 ± 2 °C	**Sample Quantity**	As per Requirement
	Humidity: 53 %	**Sample ID Code**	ECO/LAB/4026/05/2024

Sl. No.	TESTS	Unit	PROTOCOL	RESULT	Detection Range	INDIAN STANDARDS as per IS 10500:2012(Reaff:2018)	
						Desirable	Permissible
169.	pH	-	APHA, 23rd Ed. 2017, 4500H+ A+B	6.82	2.0 -12	6.5-8.5	No Relax.
170.	Total Alkalinity	mg/l	APHA, 23rd Ed. 2017, 2320 A+ B	37.8	5-1500	200	600
171.	Total Hardness as $CaCO_3$	mg/l	APHA, 23rd Ed. 2017, 2340 A+C	54.8	5-1500	200.0	600.0
172.	Calcium as Ca	mg/l	APHA, 23rd Ed. 2017, 3500 Ca A+B	20.2	5 – 1000	75.0	200.0
173.	Magnesium as Mg	mg/l	APHA, 23rd Ed. 2017, 3500 Mg A+B	12.1	5-1000	30.0	100.0
174.	Sulfate as SO_4	mg/l	APHA, 23rd Ed. 2017, 4500-SO_4^{2-} E	14.2	1.0 -250	200.0	400.0
175.	Nitrate Nitrogen as NO_3	mg/l	APHA, 23rd Ed. 2017, 4500-NO_3^- B	6.22	5.0 - 100	45.0	No Relax.
176.	Chloride as Cl	mg/l	APHA, 23rd Ed. 2017, 4500 Cl A+B	21.5	5-1000	250.0	1000.0
177.	Fluorides as F	mg/l	APHA, 23rd Ed. 2017, 4500-C	0.23	0.05-10	1.0	1.5
178.	Iron as Fe	mg/l	APHA, 23rd Ed. 2017, 3500 Fe B	0.20	0.02-50	0.3	No Relax.
179.	Manganese as Mn	mg/l	APHA, 23rd Ed. 2017, 3111 A+B	BDL	0.1-5	0.10	0.30
180.	Electrical Conductivity as EC	µs/cm	APHA, 24th Ed. 2023, 2510 A+B	118	10-2000	-	-
181.	Sodium as Na	mg/l	APHA, 24th Ed. 2023, 3500 Na A+B	2.88	1.00-100	-	-
182.	Potassium as k	mg/l	APHA, 24th Ed. 2023, 3500 K A+B	0.76	1-100	-	-

Statement of Conformity: The above tested parameters confirm as per IS-10500-2012 (Reaff.-2018) limits for above tested parameters and the results are related to the sample tested. **Note: -** BDL- Below Detection Limit.

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Quality Manager

ECOMEN LABORATORIES PVT. LTD.
Second Floor Hall, House No. B-1/8, Sector-H, Aliganj, Lucknow - 226 024
Phone No. : 0522 - 4079201/2746282
E-mail: contactus@ecomen.in, Website: www.ecomen.in, CIN - U74210UP1989PTC010601,GSTIN : 09AAACE6076H1ZI
An approved Laboratory from Ministry of Environment, Forest and Climate Change, Govt. of India, New Delhi

TEST REPORT

FORMAT NO. ECO/QS/FORMAT/11

NAME & ADDRESS OF CUSTOMER:	**Gunua Iron Ore Mines of M/s JSW Steel Ltd.**	**Test Report No.**	**ECO/LAB/GW/0210/4027/05/2024**
		Issue Date of Test Report	**06.05.2024**
Type of Sample	Ground Water		
Sample Registration No.	0210	**Name of Location**	Kashira Village
Sampling Method	As per Reference Method	**Sample Collected By**	Ecomen Lab Team
Date of Sample Collection	04.05.2024	**Time of Sample Collection**	-
Date of Sample Received	04.05.2024	**Time of Sample Received**	10:00 AM
Start Date of Analysis	04.05.2024	**End Date of Analysis**	06.05.2024
Laboratory Environmental Condition	Temperature: 27 ± 2 °C	**Sample Quantity**	As per Requirement
	Humidity: 53 %	**Sample ID Code**	ECO/LAB/4027/05/2024

Sl. No.	TESTS	Unit	PROTOCOL	RESULT	Detection Range	INDIAN STANDARDS as per IS 10500:2012(Reaff:2018)	
						Desirable	Permissible
183.	pH	-	APHA, 23rd Ed. 2017, 4500H+ A+B	6.92	2.0 -12	6.5-8.5	No Relax.
184.	Total Alkalinity	mg/l	APHA, 23rd Ed. 2017, 2320 A+ B	40.0	5-1500	200	600
185.	Total Hardness as $CaCO_3$	mg/l	APHA, 23rd Ed. 2017, 2340 A+C	58.0	5-1500	200.0	600.0
186.	Calcium as Ca	mg/l	APHA, 23rd Ed. 2017, 3500 Ca A+B	16.2	5 – 1000	75.0	200.0
187.	Magnesium as Mg	mg/l	APHA, 23rd Ed. 2017, 3500 Mg A+B	11.6	5-1000	30.0	100.0
188.	Sulfate as SO_4	mg/l	APHA, 23rd Ed. 2017, 4500-SO_4^{2-} E	24.0	1.0 -250	200.0	400.0
189.	Nitrate Nitrogen as NO_3	mg/l	APHA, 23rd Ed. 2017, 4500-NO_3^- B	6.12	5.0 - 100	45.0	No Relax.
190.	Chloride as Cl	mg/l	APHA, 23rd Ed. 2017, 4500 Cl A+B	21.5	5-1000	250.0	1000.0
191.	Fluorides as F	mg/l	APHA, 23rd Ed. 2017, 4500-C	0.16	0.05-10	1.0	1.5
192.	Iron as Fe	mg/l	APHA, 23rd Ed. 2017, 3500 Fe B	0.08	0.02-50	0.3	No Relax.
193.	Manganese as Mn	mg/l	APHA, 23rd Ed. 2017, 3111 A+B	BDL	0.1-5	0.10	0.30
194.	Electrical Cunductivity as EC	µs/cm	APHA, 24th Ed. 2023, 2510 A+B	98.2	10-2000	-	-
195.	Sodium as Na	mg/l	APHA, 24th Ed. 2023, 3500 Na A+B	4.0	1.00-100	-	-
196.	Potassium as k	mg/l	APHA, 24th Ed. 2023, 3500 K A+B	1.14	1-100	-	-

Statement of Conformity: The above tested parameters confirm as per IS-10500-2012 (Reaff. -2018) limits for above tested parameters and the results are related to the sample tested. **Note:** - BDL- Below Detection Limit.

Verified By
Technical Manager

Authorized By
Quality Manager

ANNEXURE – III: Copy of mine plan approval letter

भारत सरकार GOVERNMENT OF INDIA
खान मंत्रालय MINISTRY OF MINES
भारतीय खान ब्यूरो INDIAN BUREAU OF MINES
क्षेत्रीय खान नियंत्रक के कार्यालय
OFFICE OF THE REGIONAL CONTROLLER OF MINES

आज़ादी का अमृत महोत्सव

BY REGD PARCEL
Phone: 0674-2352463
Tele Fax: 0674-2352490
E-mail: ro.bhubaneshwar@ibm.gov.in
Plot No.149, Pokhariput
BHUBANESWAR-751020

No. MPM/A/26-ORI/BHU/2021-22 Date:22.02.2022

सेवामे

1517

Shri Vinod Nowal, Nominated Owner,
M/s JSW Steel Ltd,
Plot No-468/1075, At- Sundara 13,
Po- Barbil, Dist- Keonjhar,
Odisha-758035.

विषय: Approval of modification of Mining Plan of Gonua Iron Ore Mine along with Progressive Mine Closure Plan (PMCP), over an area of 88.516 ha (As per DGPS)/86.886 ha (As per ROR) in Sundargarh district of Odisha State, submitted by M/s JSW Steel Ltd under Rule 17(3) of Minerals (Other than Atomic and Hydro Carbons Energy Minerals) Concession Rules, 2016.

संदर्भ: - i) Your letter No. JSW/S/ CO/2022 /14 dated 11.01.2022 received on 12.01.2022.
ii) This office letter of even no. dated 12.01.2022.
iii) This office letter of even no. dated 27.01.2022.
iv) Your letter No. JSW/S/ CO/2022/57 dated 10.02.2022.

महोदय,

In exercise of the power delegated to me vide Gazette Notification No. S.O. 1857(E) dated 18.05.2016, I hereby **Approve** the Modification of Mining Plan of Gonua Iron Ore Mine along with Progressive Mine Closure Plan (PMCP), over an area of 88.516 ha (As per DGPS)/86.886 ha (As per ROR) in Sundargarh district of Odisha State, submitted by M/s JSW Steel Ltd under Rule 17(3) of Minerals (Other than Atomic and Hydro Carbons Energy Minerals) Concession Rules, 2016. This approval is subject to the following conditions:

I. The Modification of Mining Plan is approved without prejudice to any other law applicable to the mine area from time to time whether made by the Central Government, State Government or any other authority and without prejudice to any order or direction from any court of competent jurisdiction.
II. The proposals shown on the plates and/or given in the document is based on the lease map /sketch submitted by the applicant/ lessee and is applicable from the date of approval.
III. It is clarified that the approval of aforesaid Modification of Mining Plan does not in any way imply the approval of the Government in terms of any other provision of Mines & Minerals (Development & Regulation) Act, 1957, or the Mineral Concession Rules, 2016 and any other laws including Forest (Conservation) Act, 1980, Environment (Protection) Act, 1986 or the rules made there under, the Occupational Safety, Health and Working Conditions Code, 2020 and Rule & Regulations made there under.
IV. Indian Bureau of Mines has not undertaken verification of the mining lease boundary on the ground and does not undertake any responsibility regarding

correctness of the boundaries of the leasehold shown on the ground with reference to lease map & other plans furnished by the applicant / lessee.

V. At any stage, if it is observed that the information furnished, data incorporated in the document are incorrect or misrepresent facts, the approval of the document shall be revoked with immediate effect.

VI. This approval has been given for mining proposal for the year 2022-23 to 2024-25 and are subject to the validity of lease period.

VII. If this approval conflicts with any other law or court order/ Direction under any statute, it shall be revoked immediately.

VIII. The feasibility report considered for reserve/resource estimation as per UNFC is submitted by the preferred bidder / lessee which is prepared based on the current data as reported and it may not establishes the future economic viability of mining project, which may be affected by the market dynamics and other related factors.

IX. The performance surety deposited to State Government was valid till 12.06.2025. You should ensure the deposit of new performance surety before expiry of the same.

भवदीय,

22/12/22

(बाबुलाल गुर्जर)
क्षेत्रीय खान नियंत्रक

Encl: - One copy of Modification of Mining Plan

Copy for kind information to:-

1. The Controller of Mines (EZ), Indian Bureau of Mines, CP-13, Sector V, Salt Lake City, Kolkatta- 700 091.
2. The Director of Mines, Directorate of Mines, Government of Odisha, Heads of the Department Building, Bhubaneswar– 751001, Odisha along with one copy of Modification of Mining Plan by **REGISTERED PARCEL.**
3. Shri Padmaraja Tumati, Qualified Person and Shri Basavaraj Bogone Qualified Person. Email- padma.tumati@jsw.in, basavaraj.bogone @jsw.in.
4. Concerned MCDR file.

(बाबुलाल गुर्जर)
क्षेत्रीय खान नियंत्रक

ANNEXURE X

STATE LEVEL ENVIRONMENT IMPACT ASSESSMENT AUTHORITY, ODISHA, BHUBANESWAR

Ref. No. 7685/SEIAA

Dt. 21.12.19

SEIAA File No: 38069/03-MIN-V/09-2019

To

Shri Pawan Kumar Ahluwalia,
Gonua Iron & Manganese Mines,
PB No. 3, Infront of MMTC, Weigh Bridge,
At/Po-Barbil, Dist-Keonjhar-758035

Sub: Proposal for expansion of Gonua Iron & Manganese Mines for enhancement of production of iron ore from 0.36 MTPA to 1.2 MTPA with crushing and screening plant extent over an area of 86.886 ha. located at village-Gonua & Patabeda, Dist-Sundargarh of Sri Pawan Kumar Ahluwalia - environmental clearance regarding.

Ref: Your online application dated 27.06.2019 for issue of EC vide File No: SIA/OR/MIN/38069/2019.

Sir,

This has reference to your online application seeking environmental clearance of the project proposal for expansion of Gonua Iron & Manganese Mines for Enhancement of Production of Iron Ore from 0.36 MTPA to 1.2 MTPA with Crushing and Screening Plant extent over an area of 86.886 ha. located at village-Gonua & Patabeda, Dist-Sundargarh. The proposal falls in the category 1(a) of the schedule of EIA Notification, 2006 as amended from time to time. The proposal has been appraised on the basis of the documents enclosed with the application, such as form-1, form-2, prefeasibility report, approved mining plan, final EIA /EMP, public hearing proceedings, certified compliance report and clarifications furnished to SEIAA/SEAC in response to their observations.

Background:

1. This is an expansion proposal of Gonua Iron & Manganese Mine of M/s Pawan Kumar Ahluwalia. The said Gonua Iron & Manganese Mine extent over an area of 86.886 Ha located at Village Gonua & Patabeda, District Sundargarh, Odisha and the proponent has applied for expansion of Iron ore production from 0.36 MTPA to 1.2 MTPA with crushing & screening plant.

[Constituted under the Environment Protection Act, 1986 and Environment Impact Assessment Notification, 2006 vide Notification No. S.O. 1217(E) dated the 8th March, 2019 of Ministry of Environment, Forests & Climate Change, Govt. of India]
Address: 5RF-2/1, Unit – IX, Bhubaneswar – 751022,
Tel: 0674-2540669, E-Mail-seiaaorissa@gmail.com

ANNEXURE XII

ECOMEN LABORATORIES PVT. LTD.
Second Floor Hall, House No. B-1/8, Sector-H, Aliganj, Lucknow - 226 024
Phone No. : 0522 - 4079201/2746282
E-mail: contactus@ecomen.in, Website: www.ecomen.in, CIN - U74210UP1989PTC010601,GSTIN : 09AAACE6076H1ZI
An approved Laboratory from Ministry of Environment, Forest and Climate Change, Govt. of India, New Delhi

FORMAT NO. ECO/QS/FORMAT/1 TEST REPORT ISSUE DATE: 01.03.2024

TEST REPORT OF BLASTING VIBRATION

Name of the Customer : M/s JSW Steel Limited
Address of the Customer : JSW STEEL LIMITED, SHINGANIA TOWER, MAUJA BHUSUGOAN NO. 15, TEHSIL – BARBIL 02, BHADRASAHI – 758 051, KEONJHAR, ODISHA
Name of the mine : Gonua Mines
Sample Collected By : Ecomen Team (Mr. Tapas Kr. Jena)
Location : 150 m Away from Blasting Point (Mine Site)
Date & time of Study : 10.01.2024 (14.56 Hrs)

Date	Distance from Blasting point	Vector Sum (mm/s)	Frequency (Hz)	Event No
10/03/2024	150 m	1.45mm/s	13.5Hz	180

As per DGMS (1997) guideline the Permissible PPV in mm/s and Frequency of ground vibrations for various types of structures is given below:

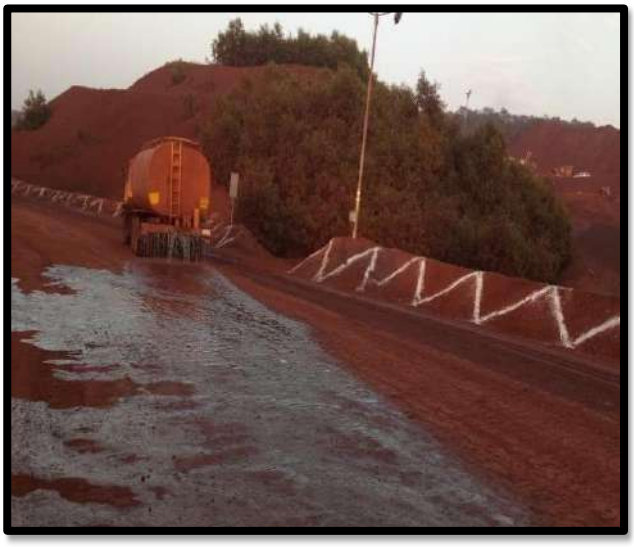
Type of Structures	Dominant excitation Frequency, Hz		
	<8 Hz	8-25 Hz	>25 Hz
(A) Building/structures not belong to the owner			
(i) Domestic house/structures (kuchha, brick & cement)	5	10	15
(ii) Industrial Building (RCC & Framed structures)	10	20	25
(iii) Objects of historical importance & sensitive structures	2	5	10
(B) Building belonging to owner with limited span of life			
(i) Domestic house/structures (kuchha, brick & cement)	10	15	25
(ii) Industrial Building (RCC & Framed structures)	15	25	50

Authorized Signatory
Abhishek Kumar Singh
Quality Manager

ECOMEN LABORATORIES PVT. LTD
Second Floor Hall, House No. B-1/8
Sector -H, Aliganj, Lucknow - 226024

ANNEXURE XIII

Haul Road sprinkling



(1) Mobile water sprinkler

(2) Fixed water sprinkler

Dry Fog Arrangement at Crushing & Screening Plant

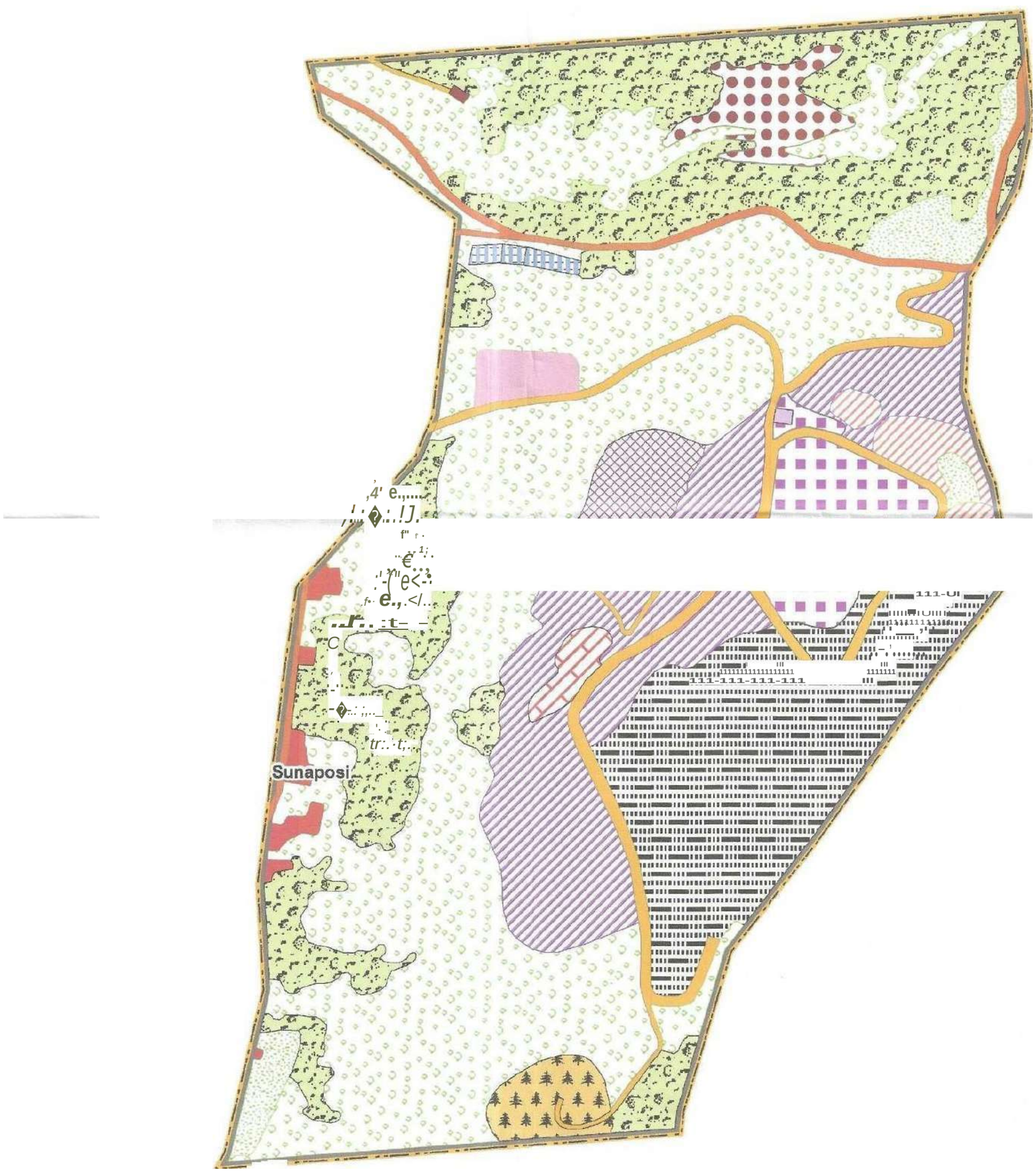
ANNEXURE XIV

LANDUSE / LANDCOVER MAP OF GANUA IRON ORE MINE IN SUNDERGARH DITRICT OF M/5 JSW STEEL LTD.

0 0.15 0.3 0.6 Kilometers

W. .E
S

SCALE -1 :5,000



Legend

- Habitation
- Plantation Over Dump
- Tree Clad Area
- Tree Felling Area
- Land With Scrub
- Land Without Scrub
- Mining Quarry
- Old Quarry
- Sub - Grade Dump
- OB Dump
- Stock Yard / Ore Stack
- Settling Pond
- Site Services
- Workshop
- Processing Yard
- Weigh Bridge
- Magazine
- Haul Road
- Other Road
- Safety Zone
- Mining Lease Boundary

Map No. 2599/1
Date 09-12-2021
Auth. Signatory

SOURCE: -

Drone Image Supplied By M/s JSW Steel Ltd.
Month -August, Year- 2021

ANNEXURE XV

Check Dam

Garland Drains

Retaining Wall

Coir Matting

ANNEXURE XVI

Gonua Mines Expenditure Incurred for 2023-24

SI No.	Expenditure Head -Particulars (INR)	Gonua
1	Plantation and maintenance services	7,30,000
2	Construction & Maintenance of retaining walls	10,80,838
3	Geo-textiling- Coir Mating/ slope stabilisation etc.	6,15,433
4	Dust Suppression activities- Water Sprinkling (fixed and mobile), Dust suppression chemicals	6,66,960
5	Maintenance of of Wheel Washing	1752300
6	Manual Environment parameters monitoring (AIR, WATER, NOISE and Ground Vibration)	11,28,320
7	Online CAAMS Environment parameters monitoring	5,57,148
8	Installation and Service of Flowmeter and Piezometer	2,77,500
9	Environmental Awareness Programmes/ MEMC program	3,80,567
10	Land Scaping/ Land Restoration	0
11	Any other expenses related to Environment protection, Infrastructure, machineries, etc.(if any)	0
		71,89,066

ANNEXURE XVII

Personal Protective Equipment

ANNEXURE XVIII

Steel Limited

Regd. Office: JSW Centre
Bandra Kurla Complex,
Bandra (East), Mumbai – 400 051
CIN : L27102MH1994PLC152925
Phone : +91 22 4286 1000
Fax : +91 22 4286 3000
Website : www.jsw.in

OFFICE ORDER

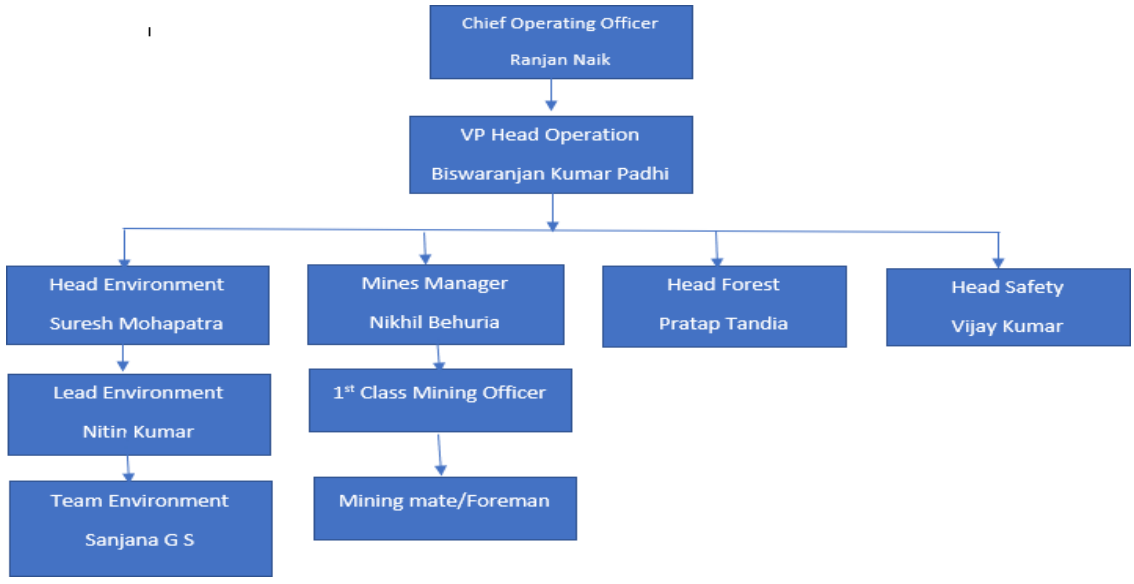
GONUA IRON ORE MINES

Environment Management Cell

Environment management cell (EMC) working for the management of Environmental monitoring of the mines and to act upon mitigation measures on the impacts of the production of mine with its surrounding environment so that pollution load, water and air quality can be maintained. Key functioning of EMC would be for compliance monitoring and to adhere with Environmental aspects and issues of the project during operation phase. EMC created with an objective of organizational framework for operating Environment Management System (EMS) and other functions of responsibilities for environmental betterment; and formulating Environmental Action Plans (EAPs) which specify mitigation, periodic and annual monitoring activities during project implementation and operation phase of mining.

The potential activities structured for the control mechanism by EMC, such activities are: Air pollution due to the emission of particulate matter, Gaseous pollutants and fugitive emissions; Noise pollution due to various noise generating equipment and mining activities; Wastewater generation from domestic activities; and Solid waste disposal. In order to minimize these impacts and to ensure that the environment in and around the project site as well as the neighboring population is well protected; an effective environment management plan to be developed and maintained by Environment management cell.

Organogram



Ranjan Nayak
Chief Operating Officer

ANNEXURE XIX

THE NEW INDIAN EXPRESS

27.12.19

PUBLIC NOTICE

This is to inform to the public that Sri Pawan Kumar Ahluwalia is having a mining lease in Gonua Iron & Manganese Mines unde Koira Tehesil of Sundargarh District, Odisha. They have enhance f ron Ore Production from **0.36 MTPA to** 1.20 **MTPA** by the State Level Environment Impact Assessment Authority, Odisha, Bhub neswar vide their letter No. **76851/SEIAA Dt 21-12-2019.** Copy is available in the State Pollution Control Board, as well as in Forest & Environment department, Odisha, Bhubaneswar in the website www. **environmentalclearance.nic.in**

MANAGER, Mines
M/s Sri Pawan Kumar Ahluwalia