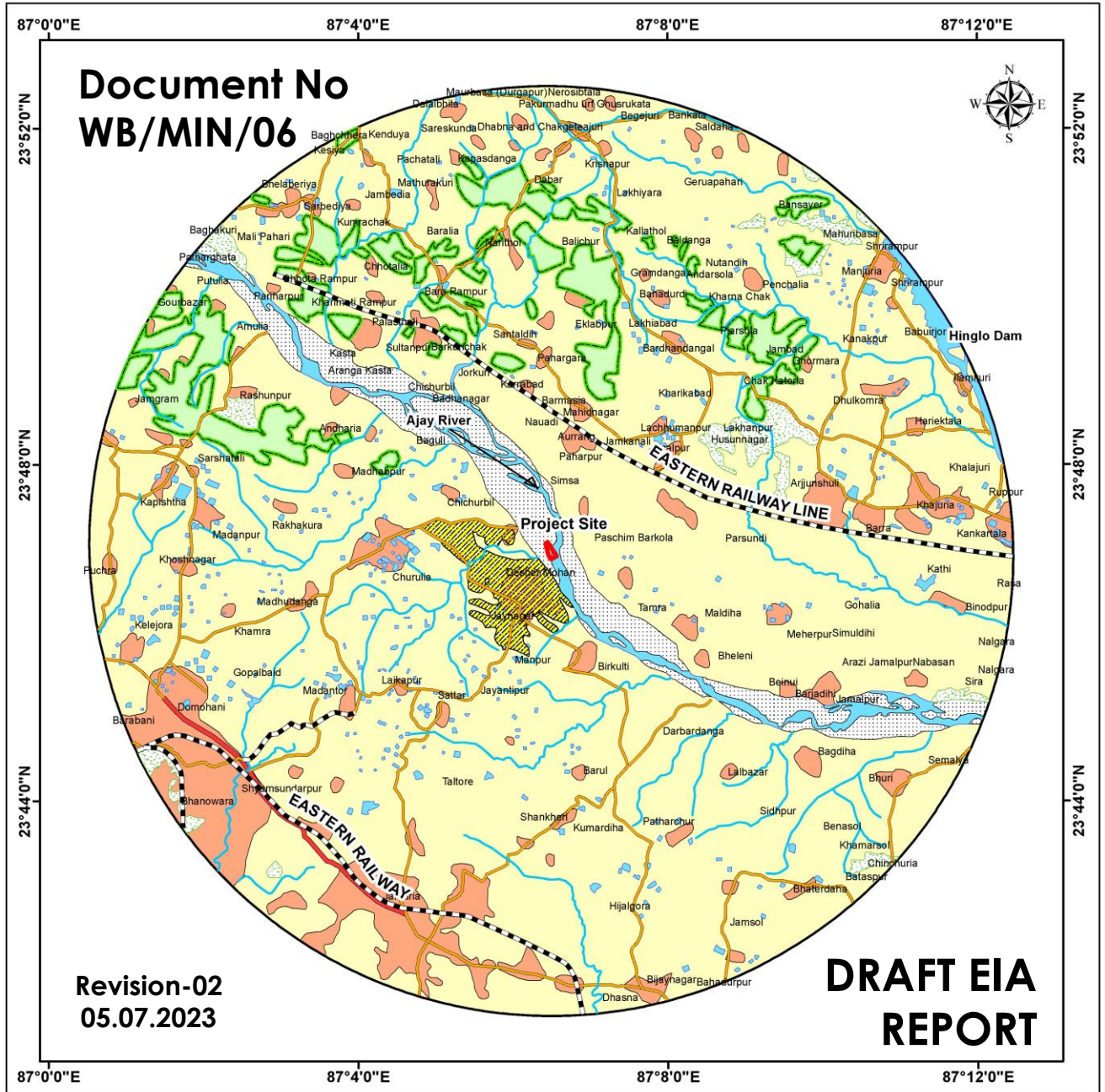


ENVIRONMENT IMPACT ASSESSMENT

FOR DESHER MOHAN SAND MINE ON AJAY RIVER, LOCATED AT MOUZA-
DESHER MOHAN, P.S.- JAMURIA, DISTRICT- PASCHIM BARDHAMAN,
STATE- WEST BENGAL (AREA- 3.82 HA)



PROJECT PROPONENT

KOILASH MAHATO

**BASUDHA, P.O.-MOUKHIRA, DIST.-PASCHIM BARDHAMAN
WEST BENGAL-731214**

ENVIRONMENT CONSULTANT

CHAITANYA PROJECTS CONSULTANCY (P) LTD

**C-5, 2nd Floor, R.K. Tower, Plot No. 21-22, Sector-4, Vaishali,
Ghaziabad, U.P. - 201012**

JULY 2023



National Accreditation Board for Education and Training



Certificate of Accreditation

Chaitanya Projects Consultancy Private Limited

101, 1st Floor, Tower No. 3, Okaya Centre, Sector-62, Noida,
Gautam Budh Nagar, Uttar Pradesh-201301

The organization is accredited as **Category-A** under the QCI-NABET Scheme for Accreditation of EIA Consultant Organizations, Version 3: for preparing EIA-EMP reports in the following Sectors –

S. No	Sector Description	Sector (as per)		Cat.
		NABET	MoEFCC	
1	Mining of mineral-opencast mining only	1	1 (a) (i)	A
2	River Valley projects	3	1 (c)	A
3	Oil & gas transportation pipeline (crude and refinery/ petrochemical products), passing through national parks/ sanctuaries/coral reefs / ecologically sensitive areas including LNG terminal	27	6 (a)	A
4	Ports, harbours, break waters and dredging	33	7 (e)	A
5	Highways,	34	7 (f)	A
6	Building and construction projects	38	8 (a)	B
7	Townships and Area development projects	39	8 (b)	B

Note: Names of approved EIA Coordinators and Functional Area Experts are mentioned in IAAC minutes dated December 17, 2021 posted on QCI-NABET website.

The Accreditation shall remain in force subject to continued compliance to the terms and conditions mentioned in QCI-NABET's letter of accreditation bearing no. QCI/NABET/ENV/ACO/22/2203 dated January 7, 2022. The accreditation needs to be renewed before the expiry date by Chaitanya Projects Consultancy Private Limited, Noida following due process of assessment.

NABET

Sr. Director, NABET
Dated: January 7, 2022

Certificate No.
NABET/EIA/2124/IA 0091

Valid up to
October 28, 2024



TOR COMPLIANCE

DRAFT ENVIRONMENT IMPACT ASSESSMENT REPORT FOR DESHER MOHAN SAND MINE ON AJAY RIVER, LOCATED IN MOUZA-DESHER MOHAN P.S.- JAMURIA, DISTRICT- PASCHIM BARDHAMAN, STATE- WEST BENGAL (AREA- 3.82 HA) PROJECT PROPONENT: KOILASH MAHATO	Doc No. WB/MIN/06
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Sl. No.	ToR Condition	Compliances
1.	Year-wise production details since 1994 should be given, clearly stating the highest production achieved in any one year prior to 1994. It may also be categorically informed whether there had been any increase in production after the EIA notification 1994 came into force, w.r.t the highest production achieved prior to 1994.	Letter of Intent (LoI) was issued by the District Magistrate, Paschim Bardhaman, in favour of Koilash Mahato, dated on 17 th June, 2019. Till now, mineral is not excavated from proposed project area.
2.	A copy of the document in support of the fact that the Proponent is the rightful lessee of the mine should be given.	LOI was granted in favour of Koilash Mahato on dated 17 th June, 2019, vide letter no. 1449/MM/Auction/2019 (Annexur-1.2) and Further LoI was extended by ADM & DL&LRO dated 06 th January, 2023 vide letter no. 87/MM/ADM & DLRO-PAB/23 (Annexure-1.3)
3.	All documents including approved mine plan, EIA and public hearing should be compatible with one another in terms of the mine lease area, production levels, waste generation and its management, mining technology etc. and should be in the name of the lessee.	All the documents including approved Mine plan, draft EIA and all others documents are compatible with one another in terms of the mine lease area (3.82 Ha), production levels (94,500 cum). waste generation and its management and mining technology etc. and are in the name of lessee.
4.	All corner coordinates of the mine lease area, superimposed on a high-Resolution Imagery/ Topo-sheet, Topographic sheet, Geomorphology and Geology of the area should be provided. Such an Imagery of the proposed area should clearly show the land use and other ecological features of the study area (core buffer zone).	Coordinates of the corners of the lease area is attached in Chapter 1 Figure-1.3 and Geomorphology of the site area along with the land use and other ecological features is attached in the Toposheet map in Chapter 1, Figure-1.2 and detail is discussed in chapter 3.
5.	Information should be provided in survey of India Topo-sheet in 1:50,000 scale indicating geological map of the area, Geomorphology of land forms of the area, existing minerals and mining history of the area, important water bodies, streams and rivers and soil characteristics.	Land use map of the study area and Mine Lease area is attached in Chapter 3, Figure no. 3.3 & 3.4.
6.	Details about the land proposed for mining activities should be given with information as to whether mining conforms to the land use policy of the State; land diversion for mining should have approval from State land use board or the concerned authority.	The Land environment is well discussed in Ch-3 section 3.2 and the land proposed for mining activities has obtained through e-tendering from the Govt. of West Bengal.
7.	It should be clearly stated whether the proponent company has a well laid down Environment Policy approved by its Board of Directors? if so,	Here Lessee is Private Individual and Environmental Management will be developed at the time of excavation. Details are given in

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	it may be spelt out in the EIA report with description of the prescribed operating process/procedures to bring into focus any infringement/deviation/violation of the environmental or forest norms/conditions? The hierarchical system or administrative order of the company to deal with the environmental issues and for ensuring compliance with the EC conditions may also be given. The system of reporting of non-compliance /violations of environmental norms to the Board of Directors of the Company and /or shareholders or stakeholders at large, may also be detailed in the EIA Report.	Chapter-6.
8.	Issues relating to Mine Safety, including subsidence study in case of underground mining and slope study in case of open cast mining, blasting study etc. should be detailed. The proposed safeguard measures in each case should also be provided.	Mining will be done through opencast manual method. This is a River bed sand mining Project so there is no need of blasting or underground mining. Details on the issues related to mine Safety and risk assessments are discussed in chapter 7, section 7.3.
9.	The study area will comprise of 10 km zone around the mine lease from lease periphery and the data contained in the EIA such as waste generation etc. should be for the life of the mine /lease period.	The study area comprises of 10 km zone around the mine lease periphery as shown in the study area Map which is enclosed as Figure 2.1 in Chapter 2. No waste will be generated during the 5-year plan period and thus there will be no waste dump during mining.
10.	Land use of the study area delineating forest area, agricultural land, grazing land, wildlife sanctuary, national park, migratory routes of fauna, water bodies, human settlements and other ecological features should be indicated. Land use plan of the mine lease area should be prepared to encompass preoperational, operational and post operational phases and submitted. Impact, if any, of change of land use should be given.	A map delineating all the features such as Forests, Agricultural Land, Grazing Land, Water bodies, Build up area etc. has been prepared as Land use map of the Study area in figure-3.3 and details are provided in the Chapter-3; Section-3.2.2
11.	Details of the land for any Over Burden Dumps outside the mine lease, such as extent of land area, distance from mine lease, it's land use, R&R issues, if any, should be given.	No overburden is generate as it is a Riverbed Sand mine project. No human habitation is present at the project site. So, there will be no R&R (rehabilitation and resettlement) issue.
12.	A certificate from the Competent Authority in the State Forest Department should be provided, confirming the involvement of forest land, if	No forest land is involved in this proposed project area. The applicant has obtained Sand mining lease area through e-tendering from the

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	any, in the forest area. In the event of any contrary claim by the Project Proponent regarding the status of forests, the site may be inspected by the State Forest Department along with the Regional Office of the Ministry to ascertain the status of forests, based on which, the certificate in this regard as mentioned above be issued. In all such cases, it would be desirable for representative of the State Forest Department to assist the Expert Appraisal Committees.	Govt. of West Bengal vide Letter of Intent no. 1449/MM/Auction/2019 dated 17 th June, 2019.
13.	Status of forestry clearance for the broken up area and virgin forestland involved in the Project including deposition of net present value (NPV) and compensatory afforestation (CA) should be indicated. A copy of the forestry clearance should also be furnished.	No forest land is involved in this proposed project area.
14.	Implementation status of recognition of forest rights under the Schedule Tribes and other Traditional Forest Dwellers (Recognition of Forest Rights) Act,2006 should be indicated.	Not applicable
15.	The vegetation in the RF / PF areas in the study area, with necessary details, should be given.	Within a 15 km radius of the study area, there are no RF Sights but there are presence of PF Sights The details of Environment Sensitive Locations can be found in CH-3, Table 3-2.
16.	A study shall be got done to ascertain the impact of the Mining Project on wildlife of the study area and details furnished. Impact of the project on the wildlife in the surrounding and any other protected area and accordingly, detailed mitigative measures required, should be worked out with cost implications and submitted.	Impact on the biological environment including wildlife and other protected areas has been thoroughly given in Chapter 3 of EIA report. Mitigation measures have been proposed in Chapter 4.
17.	Location of National Parks, Sanctuaries, Biosphere Reserves, Wildlife Corridors, Ramsar site Tiger/ Elephant Reserves/ (existing as well as proposed), if any, within 10 km of the mine lease should be clearly indicated, supported by a location map duly authenticated by Chief Wildlife Warden Necessary clearance, as may be applicable to such projects due to proximity of the ecologically sensitive areas as mentioned above, should be obtained from the Standing Committee of National Board of Wildlife and copy furnished.	There are no National Parks, Sanctuaries, Biosphere Reserves, wildlife corridors, Ramsar site within 10 km from the study area. Details are given in Chater-3; table 3-2.
18.	A detailed biological study of the study area (core zone and buffer zone _ 10 km radius of the periphery of the mine lease) shall be carried out. Details of flora and fauna, endangered, endemic	Detailed biological study has been carried out up to 10km from the study area and the same has been given in Chapter-3 of the draft EIA report.

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	and RET Species duly authenticated, separately for core and buffer zone should be furnished based on such primary field survey, clearly indicating the Schedule of the fauna present. In case of any schedule-1 fauna found in the study area, the necessary plan along – with budgetary provisions for their conservation should be prepared in consultation with State Forest and Wildlife Department and details furnished. Necessary allocation of funds for implementing the same should be made as part of the project cost.	
19.	Proximity to Areas declared as 'Critically Polluted' or the Project areas likely to come under the 'Aravali Range', (attracting court restrictions for mining operations), should also be indicated and where so required, clearance certifications from the prescribed Authorities, such as the SPCB or State Mining Department should be secured and furnished to the effect that the proposed mining activities could be considered.	The proposed mining project does not fall under the 'Critically Polluted' or 'Aravali Range'. Environment Sensitive map has attached in chapter-3; Figure No-3.2
20.	Similarly, for coastal Projects, A CRZ map duly authenticated by one of the authorized agencies demarcating LTL. HTL, CRZ area, location of the mine lease w.r.t CRZ, coastal features such as mangroves, if any, should be furnished. (Note: The Mining Projects falling under CRZ would also need to obtain approval of the concerned Coastal Zone Management Authority).	Not applicable. This proposed project is located very far away from the coastal zone.
21.	R&R Plan/compensation details for the Project Affected People (PAP) should be furnished. While preparing the R&R Plan, the relevant State/National Rehabilitation & Resettlement Policy should be kept in view. In respect of SCs /STs and other weaker sections of the society in the study area, a need based sample survey, family-wise, should be undertaken to assess their requirements, and action programmes prepared and submitted accordingly, integrating the sectoral programmes of line departments of the State Government. It may be clearly brought out whether the village(s) located in the mine lease area will be shifted or not. The issues relating to shifting of village(s) including their R&R and socio-economic aspects should be discussed in the Report.	Not applicable. As per the Socio-Economic Survey, no Rehabilitation & Resettlement needed for the respective areas.
22.	One season (non-monsoon) [i.e., March-May	Primary baseline data has been generated for

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	<p>(Summer Season), October-December (post monsoon season); December February (winter season) primary baseline data on ambient air quality as per CPCB Notification of 2009, water quality, noise level soil and flora and fauna shall be collected and the AAQ and other data so compiled presented date-wise in the EIA and EMP Report Sites specific meteorological data should also be collected. The location of the monitoring stations should be such as to represent whole of the study area and justified keeping in view the pre-dominant downwind direction and location of sensitive receptors. There should be at least one monitoring station within 500 m of the mine lease in the pre-dominant downwind direction. The mineralogical composition of PM10, particularly for free silica, should be given.</p>	<p>the pre-monsoon season for a period of Three months.</p> <p>The collected samples undergo analysis at an NABL accredited laboratory, and the results are provided in Annexure 3.2. These results have been incorporated in a tabular format in Chapter 3, which also includes details of monitoring places in EIA Report:</p> <table border="1"> <thead> <tr> <th></th> <th>Particulars</th> <th>Section no of Report</th> </tr> </thead> <tbody> <tr> <td>i.</td> <td>Land Environment</td> <td>3.2</td> </tr> <tr> <td>ii.</td> <td>Soil Quality</td> <td>3.2.5</td> </tr> <tr> <td>iii.</td> <td>Air Environment</td> <td>3.3</td> </tr> <tr> <td>iv.</td> <td>Water Environment</td> <td>3.4</td> </tr> <tr> <td>v.</td> <td>Ecological Environment</td> <td>3.5</td> </tr> <tr> <td>vi.</td> <td>Social Environment</td> <td>3.6</td> </tr> <tr> <td>vii.</td> <td>Noise Level Assesment</td> <td>3.3.5</td> </tr> </tbody> </table>		Particulars	Section no of Report	i.	Land Environment	3.2	ii.	Soil Quality	3.2.5	iii.	Air Environment	3.3	iv.	Water Environment	3.4	v.	Ecological Environment	3.5	vi.	Social Environment	3.6	vii.	Noise Level Assesment	3.3.5
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23.	<p>Air quality modelling should be carried out for prediction of impact of the project on the air quality of the area. It should also take into account the impact of movement of vehicles, for transportation of mineral. The details of the model used and input parameters used for modeling should be provided. The air quality contours may be shown on a location map clearly indicating the location of the site, location of sensitive receptors, if any, and the habitation. The wind roses showing pre-dominant wind direction may also be indicated on the map.</p>	<p>Will be done at the time of final EIA submission.</p>																								
24.	<p>The water requirement for the Project, its availability and source should be furnished. A detailed water balance should also be provided. Fresh water requirement for the Project should be indicated.</p>	<p>Total water requirement is about 5.02 KLD for the proposed project. Details are given in Chapter 2 (Table 2-6)</p>																								
25.	<p>Necessary clearance from the Competent Authority for drawl of requisite quantity of water for the Project should be provided.</p>	<p>Not Required</p>																								
26.	<p>Description of water conservation measures proposed to be adopted in the Project should be given. Details of rainwater harvesting proposed in the Project, if any, should be Provided.</p>	<p>Not applicable</p>																								
27.	<p>Impact of the Project on the water quality, both surface and groundwater, should be assessed and necessary safeguard measures, if any</p>	<p>The impact on water quality on both surface and ground water is negligible. Mining is done above the ground water surface (at least 1m above).The</p>																								

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	required, should be provided.	details of Anticipated Impacts on water environment are discussed in Chapter 4 in Draft EIA report.
28.	Based on actual monitored data, it may clearly be shown whether working will intersect groundwater. Necessary data and documentation in this regard may be provided. In case the working will intersect groundwater table, a detailed Hydro Geological Study should be undertaken and Report furnished. The Report inter-alia, shall include details of the aquifers present and impact of mining activities on these aquifers. Necessary permission from Central Ground Water Authority for working below ground water and for pumping of ground water should also be obtained and copy furnished.	As per approve mine plan, Mining will be done through opencast Manual method, up to the depth of 3 m. Details of Mining method attached in Chapter 2, section-2.6
29.	Details of any stream, seasonal or otherwise, passing through the lease area and modification / diversion proposed, if any, and the impact of the same on the hydrology should be brought out.	The proposed lease area is situated on the Ajoy river bed, and the impact of mining on hydrology is described in Chapter 4.
30.	Information on site elevation, working depth, groundwater table etc. Should be provided both in AMSI, and bgl. A schematic diagram may also be provided for the same.	Systematic diagram of site elevation, working depth is provided in chapter 2 as Year -wise Development Plan and section(5 years) and Conceptual plan & Section .Figure-2.2,figure-2.3&figure-2.4
31.	A time bound Progressive Greenbelt Development Plan shall be prepared in a tabular form (indicating the linear and quantitative coverage, plant species and time frame) and submitted. Keeping in mind, the same will have to be executed up front on commencement of the Project. Phase-wise plan of plantation and compensatory afforestation should be charted clearly indicating the area to be covered under plantation and the species to be planted. The details of plantation already done should be given. The plant species selected for green belt should have greater ecological value and should be of good utility value to the local population with emphasis on local and native species and the species which are tolerant to Pollution.	A green belt development program will cover an area of 1.26 hectares, utilizing local species for plantation. A total of 2,020 trees will be planted over a span of five years, averaging 404 plants per year. Details are given in Chapter 8, Section 8.5.
32.	Impact on local transport infrastructure due to the Project should be indicated Projected increase in truck traffic as a result of the Project in the present road network (including those outside the Project area) should be worked out,	Furnished in (Chapter 4)

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	indicating whether it is capable of handling the incremental load. Arrangement for improving the infrastructure, if contemplated (including action to be taken by other agencies such as State Government) should be covered. Project Proponent shall conduct impact of Transportation study as per Indian Road Congress Guidelines.	
33.	Details of the onsite shelter and facilities to be provided to the mine workers should be included in the EIA Report.	The project proponent will provide designated rest shelters equipped with amenities such as drinking water and toilets in accordance with the approved mine plan.
34.	Conceptual post mining land use and Reclamation and Restoration of mined out areas (with plans and with adequate number of sections) should be given in the EIA report.	Details of land use pattern of the proposed project is described in Chapter 3 (Section 3.2.2)
35.	Occupational Health impacts of the Project should be anticipated and the proposed preventive measures spelt out in detail. Details of pre-placement medical examination and periodical medical examination schedules should be incorporated in the EMP. The project specific occupational health mitigation measures with required facilities proposed in the mining area may be detailed.	The project proponent is fully committed to ensuring the well-being of workers and assumes complete responsibility for protecting them from sickness, disease, and injuries associated with their employment. They have implemented principles focused on occupational health services, including the establishment and maintenance of a safe and healthy work environment that promotes optimal physical and mental health. Chapter 7, Section 7.3.2
36.	Public health implications of the Project and related activities for the population in the impact zone should be systematically evaluated and the proposed remedial measures should be detailed along with budgetary allocations.	Furnished in chapter 7.
37.	Measures of socio-economic significance and influence to the local community proposed to be provided by the Project Proponent should be indicated. As far as possible, quantitative dimensions may be given with time frames for implementation.	Furnished in chapter 3.
38.	Detailed Environmental Management Plan (EMP) to mitigate the environmental impacts which, should inter-alia include the impacts of change of land use, loss of agricultural and grazing land, if any, occupational health impacts besides other impacts specific to the proposed Project.	Furnished in chapter 10.
39.	Public Hearing points raised and commitment of the Project Proponent on the same along with	Public hearing will be arranged by concern authority after submission of Draft EIA.

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	time bound Action Plan with budgetary provisions to implement the same should be provided and also incorporated in the final EIA/EMP Report of the Project.	
40.	Details of litigation pending against the Project, if any, with direction /order passed by any Court of Law against the Project should be given	None
41.	The cost of the Project (capital cost and recurring cost) as well as the cost towards implementation of EMP should be clearly spelt out.	Discussed in Ch-10,section 10.3 & 10.4
42.	A Disaster management Plan shall be prepared and included in the EIA/EMP Report.	Briefly discussed in Ch-7 section 7.3.1.
43.	Benefits of the Project if the Project is implemented should be spelt out. The benefits of the Project shall clearly indicate environmental, social, economic, employment potential.	Benefits of the project are discussed in chapter 8 in draft EIA Report.
44.	Besides the above, the below mentioned general points are also to be followed:-	
a.	Executive Summary of the EIA/EMP Report.	Compiled
b.	All documents to be properly referenced with index and continuous Page numbering	Compiled
c.	Where data are presented in the Report especially in Tables, the period in which the data were collected and the sources, should be indicated.	All these things are provided in Draft EIA Report
d.	project Proponent shall enclose all the analysis/testing reports of water, air, soil, noise etc. using the MoEF & CC/NABL accredited laboratories. All the original analysis/testing reports should be available during appraisal of the Project.	Compiled
e.	Where the documents provided are in a language other than English, an English translation should be provided	Compiled
f.	The Questionnaire for environmental appraisal of mining projects as devised earlier by the Ministry shall also be filled and submitted.	Compiled
g.	While preparing the EIA report, the instructions for the Proponents and instructions for the Consultants issued by MoEF vide O.M. No. J-11013/41/2006- IA.II(I) dated 4th August, 2009, which are available on the website of this Ministry, should be followed.	EIA Report has been prepared according to the instruction issued by MoEF vide O.M. No. J-11013/41/2006- IA.II(I) dated 4th August, 2009.
h.	Changes, if any made in the basic scope and project parameters (as submitted in Form-I and	No Changes are made.

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	the PFR for securing the TOR) should be brought to the attention of the SEIAA, Meghalaya with reasons for such changes and permission should be sought, as the TOR may also have to be altered. Post Public Hearing changes in structure and content of the draft EIA/EMP(other than modifications arising out of the P.H. process)will entail conducting the PH again with the revised documentation.	
i.	As per the circular no. J-11011/618/2010-IA.II(I) dated 30.05.2012 certified report of the status of compliance of the conditions stipulated in the environment clearance for the existing operations of the project, should be obtained from the Regional of the of Ministry of Environment, Forest and climate change, as may be applicable	Compiled
j.	The EIA report should also include (i) surface plan of the area indicating contours of main topographic features, drainage and Mining area, (ii)geological maps and. Sections and(iii)sections of the Mine pit and external dumps, if any, clearly showing the land features of the adjoining area.	Compiled .
B.	Additional Terms of Reference	
1)	Valid LOI from the competent authority.	Compiled
2)	Cluster certificate from the competent authority should be submitted.	Compiled
3)	Reserves to be submitted based on the replenishment rate as per the approved DSR.	Compiled
4)	Need-based EMP, prepared in accordance with the MoEF&CC Office Memorandum vide F. No. 22-65 /2017 .IA.III dated 30.09.2020.	Compiled
5)	Study report on base flow level measured at 5 points with date and supporting photographs. It should be committed that mining will be done at least 1m above the base flow level. Accordingly, if required, the proposal may also be revised.	Compiled

EXECUTIVE SUMMARY

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1. INTRODUCTIONS

The applicant Koilash Mahato has obtained Sand mining lease through e-tendering from the Govt. of West Bengal vide Letter of Intent no. **1449/MM/Auction/2019 dated 17th June 2019** over an area of 3.82 Ha/ 9.44 Acres on Ajay river near Mouza – Desher Mohan, P.S.- Jamuria, Dist. –Paschim Bardhaman, West Bengal, over Plot no.- 583(P), J.L. No.- 14. Further Lol vide no. **87/MM/ADM&DLRO-PAB/23** was extended by DL&LRO dated **06th January, 2023(ANNEXURE 1.3)**. As riverbed Sand is replenished every year hence life of mine is not applicable.

This particular project is considered to be of 'B' category due to the size of the mining lease (3.82 HA). As per notification S.O. 3977(E) published on dated 14th August, 2018, our project is falls under categories "B2" and need not to submit Environmental Impact assessment Study report. Further, another 3 mines with individual lease \leq 100ha are coming within 500m from the proposed project area. So, as per office memorandum issued by MoEF&CC, need to submit Environmental Impact Assessment Study report.

2. PROJECT NAME AND LOCATION:

Desher Mohan Sand Mining Project is located on Ajay River. The Brief Description of the Project is given below:

Table 1: Brief Description of Project

Particulars	Details		
Sanctioned Mining Lease area coordinate of 3.82 ha	Project Co-ordinates		
	Points	Latitude	Longitude
	A	23°47'4.5601"N	87°06'26.6029"E
	B	23°46'54.7036"N	87°06'33.7316"E
	C	23°46'56.3536"N	87°06'29.5186"E
	D	23°46'54.6244"N	87°06'27.6950"E
E	23°47'3.4651"N	87°06'25.3219"E	
Toposheet No.	73M/1		
Total area	3.82 Ha/ 9.44 Acres		
Geological reserve	1,14,600 m ³ /Year		
Mineable Reserves	94,500 m ³ /Year		
Targeted production	94,500 m ³ /year		
Manpower	30		
Elevation	96 mRL to 100 mRL		
Land-use	River bed		

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Particulars	Details
Nearest habitation/town	Deshar Mohan village (0.50 km, SW Direction)
Nearest airport	Kaji Narul Islam Airport (23.00 km, SE Direction)
Nearest railway station	Jamuraia Railway Station (9.00 km, SW Direction)
Nearest highway	NH-19 (14 km, SSW Direction) SH-5 (24.0 km, SW Direction)
Power supply	Electricity connection is not required for the project. Mining will be carried out in day time only.
Nearest Hospital	Barhra primary Health Centre (6.00 km, NE Direction)
Educational Facility in the area	Taldanga Tapasil Primary School (1.00 km, NW Direction) Kazi Nazrul Islam Mahabidyalya (5.50 km, SW Direction)
Water demand & supply	Water will be taken from hired tankers. The water requirement for mining & allied activities, drinking and plantation has been estimated to be 5.02 KLD (Dust suppression- 2.70 KLD, Drinking & domestic- 0.30 KLD and Green Belt- 2.02 KLD).
Nearest tourist places	None in the Study Area
Defense installations	None in the Study Area
Archaeological features	None in the Study Area
Nearest Forest area	Sareshkunda PF(8km, N direction)
Nearest stream/river/water body	Ajay river (onsite)
Seismic zone	Zone III

3. MINING METHOD:

- The mining is confined to collection of sand from the riverbed. The extraction process will involve mining up to a maximum depth of 3 meters at the riverbank or up to the water table, whichever is less. Dry pit mining will be employed
- The riverbed material will be collected in its natural state during the mining process. The mining method will be opencast manual (preferably) or semi mechanized. The river bed material will be collected in its existing form.
- The distance of 7.5 m shall be further marked from the lease boundary and this zone constituting the 'safety zone' shall be identified. No mining activities shall be undertaken within this 'safety zone'. This shall be in accordance of West Bengal Minor Mineral Concession Rules 2016 (WBMMCR-2016).
- The excavation of riverbed minerals will begin from the top of the designated area and progress downwards in 0.50-meter increments, removing the minerals in slices

EXECUTIVE SUMMARY

- Riverbed sand extraction will be done through bench of 1.00m height and 1.00m width, the whole material is mineable. The removal is done without affecting the base flow of the river and in such manner as to maintain the smooth flow of the river during the monsoons. This helps in protection of the banks from erosion.
- The mineral extraction will be done for a period of Five years from the date of Execution. Throughout the mining operation, the areas of the quarry will remain free from submergence, ensuring that there is no flooding or inundation. During mining operation, the river flow will be a way to enable dry pit mining. The ultimate slope of pit by the end of conceptual period shall be same as the shape of area.

Table 2: Required Raw Material

Inputs	Approx. quantity required	Basis
Water Requirement		
Water for Drinking and Domestic Purposes	0.30 KLD	100litre/capita/day
Dust Suppression & others	2.70 KLD	0.5 Liter per plant 2 times a day
Water for green belt development	2.02 KLD	Length of Road (m) x Width of Road (m) x 1litre/m ² x 2times per day)

The proposed mining project has a total water requirement of 5.02 KLD (Kilo Litres per Day). Drinking water needs will be met by sourcing it from the nearest village, while water for sprinkling and plantation purposes will be obtained from private tankers.

4. PRODUCTS AND CAPACITIES:

The mining lease will be granted over an area of 3.82 Ha/ 9.44 Acres on river Ajay at Mouza – Desher Mohan, P.S.- Jamuria, Dist – Paschim Bardhaman, West Bengal, over Plot No. 583(P)J.L. No.- 14.

Sand mining is generally carried out every year based on the replenishment quantities. As the lease is being done for five years, anticipated life of mine has been restricted for five years only. The Production programme from the mine for the next 5 years is given below is shown in **Table no. 3.**

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Table 3: Programme from Mining Lease Area

Year	Geological reserve (m ³)	Production (m ³) as per approved mine plan	Production (m ³) as per replenishment rate mentioned in DSR
1 st	1,14,600	94,500	94,500
2 nd	1,14,600	94,500	70,686 (74.80% replenishment rate)
3 rd	1,14,600	94,500	70,686 (74.80% replenishment rate)
4 th	1,14,600	94,500	70,686 (74.80% replenishment rate)
5 th	1,14,600	94,500	70,686 (74.80% replenishment rate)

5. ANTICIPATED ENVIRONMENTAL IMPACTS AND MITIGATION MEASURES:

Appropriate site selection for mining operations and strict adherence to guidelines such as the Sustainable Sand Mining Guidelines 2016 (SSG), Enforcement & Monitoring Guidelines for Sand Mining 2020, WBMMCR 2016, and The West Bengal Sand Mining Policy 2021 can effectively mitigate the potential adverse impacts of mining on the surrounding environment. A comprehensive assessment has been conducted to identify the potential environmental impacts of the proposed production from the mine on various aspects, including air quality, water use and quality, land-use, ecological considerations, soil quality, and socio-economic factors.

A brief description of impacts by the proposed project is given in **Table 4**.

Table 4: Description of Identifiable Impacts

S.no	Aspects	Identification of Impacts	Mitigation/Minimizing Measures
A	Land Environment		
A.1	Land use & Land Cover	<ul style="list-style-type: none"> ○ The landscape of buffer zone will not be disturbed by the proposed river bed mining. Roads for transportation of mined minerals are already present and may be strengthened and/or maintained if required. ○ Mining within a river bed may have some impact on the 	<ul style="list-style-type: none"> ○ Sand mining will be restricted down to 3.0 m below river bed or the water table whichever is reached first. ○ The riverbed mining will be done in unsaturated zone, to minimizing loss to habitat Dredging will not be allowed. ○ The mining is planned in non-monsoon seasons only, so that

EXECUTIVE SUMMARY

S.no	Aspects	Identification of Impacts	Mitigation/Minimizing Measures
		<p>stream's physical characteristics, such as channel geometry, bed elevation in stream</p> <ul style="list-style-type: none"> ○ There are no R&R issues involved with this project. 	<p>the excavated area gets replenished during the monsoon each year.</p> <ul style="list-style-type: none"> ○ Mining activities are strictly prohibited within a river-bed up to a distance of five times the span of a bridge structure on the upstream side, and ten times the span of the bridge structure on the downstream side.
A-2	Soil Quality	<ul style="list-style-type: none"> ○ Soil compaction may occur due to movement of trucks outside the lease area which may affect the soil characteristics like soil fertility, infiltration rate, porosity etc. This ultimately restricts the growth of deep-rooted plants which finally leads to stagnation of succession. 	<ul style="list-style-type: none"> ○ The movement of trucks will be restricted to haul roads. ○ The roads that will be used for transportation of mined minerals are already constructed. ○ The unpaved roads will be strengthened in order to reduce impact on soil quality.
A-3	Traffic Density	<ul style="list-style-type: none"> ○ The existing Level of Service (LOS) as per IRC on the roads that will be used for transportation of the mined minerals are of Level A and will remain constant after initiation of mining (Appendix 4.2). 	<ul style="list-style-type: none"> ○ Based on the data provided in Appendix 4.2, it is evident that the existing single road connecting the site to road near Desher Mohan requires widening to accommodate double lanes. However, no intervention is necessary for the metal road as it will maintain its Level of Service (LoS) as "A," indicating smooth traffic flow and no congestion issues.
B	Air Environment		
B-1	Air Quality	<ul style="list-style-type: none"> ○ Handling of mined out minerals. ○ Exhaust gas from vehicles. ○ Dust emanating from access road and haul road. 	<p>The only air pollution sources are the road transport network of the trucks/dumpers. The dust suppression measures like the following will be resorted:</p> <ul style="list-style-type: none"> ○ Water sprinkling will be done on the roads regularly. This will reduce dust emission by 75%.

EXECUTIVE SUMMARY

S.no	Aspects	Identification of Impacts	Mitigation/Minimizing Measures
			<ul style="list-style-type: none"> ○ To prevent spillage, appropriate measures will be taken, including covering the carrying vehicles with tarpaulin and sprinkling water if necessary to mitigate dry conditions. ○ Proper tuning of vehicles along with pollution certificate to keep the gas emissions under check.
B-2	Noise Level	<ul style="list-style-type: none"> ○ Noise generated by vehicles transporting the mined minerals is identified as a major source of noise. The trucks used for transportation are expected to produce noise levels ranging from 80-85 dB(A). The material transportation road passes through the villages of Desher Mohan, potentially affecting the residents who will be exposed to increased noise levels. However, considering the relatively low number of trucks (41 trucks or 82 trips), the incremental noise level is expected to be minimal. 	<ul style="list-style-type: none"> ○ Periodical monitoring of noise near sensitive receptors will be done. ○ No other equipment's except the transportation vehicles will be allowed. ○ The well-tuned vehicles will be used and loud noise will be checked every day which help in reducing noise during operations. ○ By reducing the speed and/or volume of traffic on such roads to an acceptably low level.
C	Water Environment		
C-1	Hydrology, Hydro-geology and Water Quality	<ul style="list-style-type: none"> ○ Modifying the riverbed can lead to changes in flow patterns ○ Excessive suspended sediment in the water can cause harm to riparian vegetation and disrupt the natural habitat within the stream. 	<ul style="list-style-type: none"> ○ Project activity will be carried out in the non-monsoon season and on dry bed. ○ Since mining will be done only in central 3/4th portion of the river bed there will be no diversion or modification in the river flow. It is not proposed to divert or truncate any stream in case of river bed mining.
C-2	Waste Generation	<ul style="list-style-type: none"> ○ The estimated municipal solid waste generated will be 	<ul style="list-style-type: none"> ○ Dustbins will provide onsite and will be cleaned with proper

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S.no	Aspects	Identification of Impacts	Mitigation/Minimizing Measures
		<p>3kg/day.</p> <ul style="list-style-type: none"> ○ The liquid waste generated by 30 employees will be 0.06KLD. 	<p>management of food waste. compost pit will be constructed for disposal of food wastes.</p> <ul style="list-style-type: none"> ○ Mobile toilets will be made available on site.
D	Ecological Environment		
D-1	Flora	<ul style="list-style-type: none"> ○ Fugitive emission from vehicle movement will form a layer in leaves thus reducing the gaseous exchange process. This ultimately affects the growth of plants. ○ The construction of a new linear surface, such as a road, can create a new microclimate and alter physical conditions in the surrounding area. This change can impact plant mortality and the biological community, extending from the road edge to varying distances. 	<ul style="list-style-type: none"> ○ The construction of a new linear surface, such as a road, can create a new microclimate and alter physical conditions in the surrounding area. This change can impact plant mortality and the biological community, extending from the road edge to varying distances. ○ Annual bio-monitoring will be conducted on roadside plants to assess their exposure to vehicular pollution. This monitoring will involve evaluating the dust load accumulated on plant surfaces and determining the Air Pollution Tolerance Index (APTI) of the plants.
D-2	Fauna	<ul style="list-style-type: none"> ○ The operational activities such as population influx, transportation and noise generation may have an adverse impact on fauna. ○ The presence of suitable roadside habitats for animals that rely on acoustic signals, like birds, presents a tradeoff between habitat availability and the potential negative impacts of traffic noise and passing vehicles on their survival and breeding success 	<ul style="list-style-type: none"> ○ Efforts will be made to minimize the impact of mining activities on residential areas and crucial wildlife habitats by carefully planning the right-of-way (ROW). This involves avoiding the direct route through residential areas and important wildlife habitats such as rookeries, raptor nesting areas, and calving areas, to the extent possible. ○ All equipment used in the mining operations will be equipped with sound-control devices that are as effective as the original equipment. Motorized equipment will be properly

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S.no	Aspects	Identification of Impacts	Mitigation/Minimizing Measures
			muffled and maintained to ensure optimal noise control measures are in place. <ul style="list-style-type: none"> ○ No mining will be carried out during the rainy season to minimize impact on aquatic life.
E	Social Environment		
E-1	Health	<ul style="list-style-type: none"> ○ The socio-health impacts of transportation primarily arise from truck emissions, dust generation, and traffic movement. There is also a potential increase in accidents due to reckless driving of dumpers transporting minerals along the roads. 	<ul style="list-style-type: none"> ○ It has to be ensured that all the workers are recruited locally to generate employment in the area. ○ Welfare activities should be initiated in the area so as to improve the quality of life of the local people.

6. ESTIMATED CAPITAL COST OF THE PROJECT:

Estimated Capital cost for the project is **1.90 crores**. The details of the estimated capital of the project shall be as follows.

Table 5: EMP Cost

Serial No.	Measures	Description	Investment for EMP
1	Pollution Monitoring	Air pollution	Yearly at 4 locations for air, 3 locations for water and 2 locations for noise during mining and 1 location for soil.
		Water pollution	
		Noise Pollution	
		Soil	
2	Water Sprinkling	Water sprinkling will be done at approach road during the lease period in phases	2,49,000
3	Green Belt	Trees will be planted along the river bank and along the kuchha road during the lease period in phases.	80,000
4	Road maintenance	Repair and maintenance of approach road	4,50,000
Total EMP Cost			9,50,000

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Table 6: CER Budget

Sl. No.	Considerations	CER Cost in Rs.
1	Health camp and free medicine	1,30,000
2	Educational support to poor student especially girls	1,22,000
3	Provide drinking water facility	1,28,000
Total in Rs.		3,80,000

7. PROJECT SITE SELECTION:

Koilash Mahato, emerged as the highest- bidder in the e-bidding process conducted by the Government of West Bengal for the sand mining project on this government land. The site for sand mining was selected by the District Magistrate Office.

River bed mining is a site-specific project depending upon the geological set up and mineable portion of the river. Given the location within the meandering course of the river, there is minimal disturbance to objects of economic importance, making alternative site selection less viable.

The applicant will invest necessary funds for the rejuvenation and progressive reclamation program and other measures necessary to protect the quality of the environment and human health etc.

The land use pattern in the mine lease area undergoes changes throughout the pre-mining, mining, and post-mining phases. The river bed area serves as the initial zone, which gradually transforms into naturally reclaimed areas and restricted zones as the mining activities progress and conclude.

8. BASELINE ENVIRONMENTAL DATA:

The baseline data has been collected from October 2022 to December 2022. The details are given below:

Ambient Air Quality Results: Samples were collected from 6 sampling locations during the period of October 2022 to December 2022 (post-monsoon season). The results are given below

- **Particulate Matter 10 (PM₁₀)**

The results of PM₁₀ of all locations are showing variations from 64.1 µg/m³ in Parsunsi to 84.5 µg/m³ in the Near Project Site. Hence, the results are within the limits of National Ambient Air Quality Standards (NAAQS).

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- **Particulate Matter 2.5 (PM_{2.5})**

The results of PM_{2.5} of all locations are showing variations from 25.7 µg/m³ in the Parsundi to 39.6 µg/m³ in the Near Project Site. However, the results are within the limits of National Ambient Air Quality Standards.

- **Percentage of Free Silica**

The PM₁₀ samples collected from various locations show the presence of free silica (polymorphs of quartz, cristobalite, and tridymite) at the following percentages: 0.44% (Near Project site), 0.48% (Samsa), 0.46% (Paschim Barkola), 0.42% (Parsundi), 0.49% (Chirchurbil), and 0.47% (Birkulti).

- **Gaseous Pollutants**

The results of SO₂ of all locations are showing variations from 10.6 µg/m³ in the Parsundi to 16.9 µg/m³ in the Simsa. However, the results are within the limits of National Ambient Air Quality Standards.

The results of NO₂ of all locations are showing variations from 15.2 µg/m³ in the Parsundi to 20.8 µg/m³ in the Simsa. However, the results are within the limits of National Ambient Air Quality Standards (NAAQS).

The values of both the parameters are well within the prescribed limits.

Noise Quality results: Samples were collected from 6 locations

Daytime ambient noise levels range from 50.3 dB (A) at Birkulti to 54.7 dB(A) at Near Project Site which is within the standard limits of residential area are ~ 55 dB (A). Night-time noise levels range from 41.5 dB (A) at Parsundi to 44.2 dB (A) at Near Project Site which is within the standard limits of residential ~ 45 dB (A).

Ground Water Quality Results: The samples were collected from 4 ground water locations and 2 surface water sources

- **Ground Water results:** All results were found within standard drinking water standards (IS: 10500).
- **Surface Water results:** The surface water quality of the upstream and downstream water of Ajay River is within the prescribed CPCB Water Quality Criteria Class of water.

Soil Quality Results: The samples were collected from 4 locations

pH ranging from 7.08 to 7.29 in the study area. Bulk density of the study area ranges between 1.13 gm/cm³ Chichurbil to 1.29 gm/cm³ at Simsa. Electrical conductivity of the soil samples is

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found to be average and ranges from 219 $\mu\text{mhos/cm}$ to 251 $\mu\text{mhos/cm}$. Organic carbon of the soil samples varies from 0.28% in Near Project Site to 0.39% in Chichurbil. Nitrogen content in the surface soil of the study area varies between 257.2 kg/ha at Chichurbil to 289.5 kg/ha in Near Project Site. Available Phosphorus ranges between 71.5 kg/ha at Nabagram to 79.2 kg/ha at Near Project Site. Potassium content in the study area ranges between 321.5 kg/ha at Near Project Site to 350.1 kg/ha at Chichurbil.

The soil in the study area exhibits low fertility, characterized by low levels of phosphorus and potassium. Any agricultural activity in this area would require significant reliance on external fertilizers. However, the relatively higher nitrogen content suggests favorable conditions for leaf growth.

Ecology and Biodiversity Results:

There is no forest present in the Study area.

A comprehensive biological study was conducted within a 10km radius of the proposed project site to analyze the flora and fauna composition. The study included a phytosociological assessment to determine vegetation density, diversity, frequency, and relative abundance. Faunal identification was performed at random sites. Data from the district forest department was obtained to facilitate these assessments.

For details information go through the **Chapter 3**.

Socio Economic Condition: The sand mine is located in village Desher mohan, District Paschim Bardhaman in West Bengal. The socio economic profile will provide the insight to population growth rate; population density, gender ratio, work participation rate and description of the vulnerable population in the study area.

- **Demographic Profile:** There are 136 villages in the study area. These villages have 39,355 households accumulating 1,90,280 populations. According to the survey, gender ratio of study area was 924 in 2011
- **Population:** The total population of the study area is 1,90,280 in 39,355 households, implying that there is an average of 5 members per households. According to the survey, gender ratio of the study area 924 in 2011.
- **Literacy rate:** Within the study area, the literacy rate accounts for 58.71% of the total population. Out of this, male literacy stands at 59.07% and female literacy at 40.93%.
- **Occupational Structure:** In the villages around the study area, people mainly earn from agriculture and animal rearing

9. IDENTIFICATION OF HAZARDS AND MITIGATION MEASURES:

All types of industries face certain types of hazards which can disrupt normal activities abruptly. Similarly, Riverbed mines also have risks which need to be addressed for which a disaster management plan has been formulated with an aim of taking precautionary steps to avert disasters and also take such action after disaster which limits the damage to minimum. In the sections below, the identification of various hazards, probable risks during the operational phase of the mining, maximum credible accident analysis and consequence analysis are addressed either qualitatively or quantitatively.

- **Risk Due to Inundation:** Mining will be done during the Post-monsoon periods (October-December); therefore, problem of inundation is not likely to happen except in case of accidental flash flood due to upstream dam opening or failure. Communication channels will be opened with government departments to give early warning in such situations and the workers will be immediately taken out.
- **Risks Due to Failure of Pit Slope:** In order to allay dangers due to open cast slope failure, final pit slope stability estimations will be made for the existing mines. Determining the factor of safety, the slopes shall be monitored at regular intervals to check any possible failure.
- **Risks Due to Failure of Waste Dumps:** In order to allay dangers due to open cast slope failure, final pit slope stability estimations will be made for the existing mines. Determining the factor of safety, the slopes shall be monitored at regular intervals to check any possible failure.
- **Risks of Accidents Due to Trucks and Dumpers:** Identifying the hazards that come along with the presence of vehicles at the workplace (e.g. reversing operations, loading) can cause harm if not properly handled. Among some of the factors that may make vehicle accidents more likely are: Rough access roads, Time pressure, Inadequate brakes (possibly from lack of maintenance), Carelessly parked vehicles (e.g. being parked on a slope without being adequately secured), Unsafe coupling and uncoupling of trailers, Untrained drivers, Overturning vehicles. To avoid such instances, we will talk to the workers and their representatives and will involve them in the risk assessment process and tell them what to do, to reduce risk. All transportation within the mine lease area should be carried out directly under the supervision and control of management.

10. IMPACT OF THE PROJECT ON AIR, WATER, LAND, FLORA-FAUNA AND NEARBY POPULATION:

Details of the Impact of the River bed sand mining project on air, water, land, Flora-Fauna and nearby population given in the **section 5 (Anticipated environmental impacts and mitigation)**.

11. EMERGENCY PREPAREDNESS PLAN:

River bed mining projects entail various high-risk accidents such as landslides, subsidence, floods, underground mine inundation, fires, seismic activities, and tailing dam failures. To address these risks, an emergency plan is proposed, encompassing quick evacuation procedures and ameliorative measures. Mining and allied activities inherently carry potential hazards that impact both employees and the general public. To ensure safe and healthy working conditions, adequate safety measures are imperative in mines. Mining Rules & Regulations provide a well-defined framework and procedures for maintaining safety, encompassing the well-being of personnel, machinery, and the overall working environment. By strictly adhering to these regulations, safety is ensured across the mining operation

- The lessee's preparedness to handle eventualities and the required assistance from local authorities should be clearly outlined. The shallow depth of activities in river bed mining will not involve any high risk accident due to side falls/collapse.
- The complete mining operation will be carried out under the Management and control of experienced and qualified Mines Manager.
- All the provisions of Mines Act 1952, MMR 1961 and Mines Rules 1955, RMMCR 1986, WBMMDR 2016, WBS(MTSS) Rules, 2021 and other laws applicable to mine will strictly be complied with.
- During heavy rainfall the mining activities will be closed.
- All persons in supervisory capacity will be provided with proper communication facilities.
- Competent persons will be provided first aid kits which they will always carry.

12. PUBLIC CONSULTATION:

Public Hearing will be done after submission of Draft EIA to concern authority. Hence at this moment there are no issues about this matter.

13. ENVIRONMENT MANAGEMENT PLAN AS PER OFFICE MEMORANDUM:

An EMP is a site specific plan developed to ensure that the project is implemented in an environmentally sustainable manner. An effective EMP should ensure the application of best practice environment management to a project. The purpose of an EMP is to: (i) Assist Management to perform mining operations in an environmental friendly way; (ii) Improve the contribution of Management so that an EMP can be used effectively; (iii) Ensure a minimum standard and consistent approach to the implementation of EMP; (iv) Ensure that the commitments made as part of the project's EIA are implemented throughout the project life, and (v) Ensure that environment management detail is captured and documented at all stages of a project.

For detail EMP Consider **Chapter 10 in EIA Study Report.**

14. Occupational Health Hazards and Mitigation:

At site, during excavation and loading activity, dust is main pollutant which affects the health of workers whereas environmental and climatic conditions also generate the health problems. Addressing the occupational health hazard means gaining an understanding of the source (its location and magnitude or concentration), identifying an exposure pathway (e.g. a means to get it in contact with someone), and determination of likely a receptor (someone receiving the stuff that is migrating). Occupational hazard due to sand mining mainly comes under the physical hazards. Possible physical hazards and mitigation measures are mentioned below:

- **Light:** Workers may face risks associated with poor illumination or excessive brightness, leading to symptoms such as eye strain, headaches, eye pain, tearing, corneal congestion, and eye fatigue.
- **Heat and Humidity:** Heat and humidity are encountered in hot and humid condition when temperatures and air temperatures increase in summer time up to 48°C or above in the river bed mining area. The direct effects of heat exposure are burns, heat exhaustion, heat stroke and heat cramps; the indirect effects are decreased efficiency, increased fatigue and enhanced accident rates.
- **Eye Irritation:** During the high windy days in summer the sand could be the problems for eyes like itching and watering of eyes.
- **Respiratory Problems:** Excessive airborne dust can pose a health hazard, aggravating respiratory conditions like asthma and causing irritation to the lungs and bronchial passages.

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- **Noise Induced Hearing Loss:** Machinery is the main source of noise pollution at the mine site.

Mitigation Measures:

To minimize the health impacts PPE like dust masks, ear plugs/ muffs and other equipment's will be provided for use by the work personnel. All workers will be subjected to Initial Medical Examination as per Mines Rule 1955 at the time of appointment. Periodical Medical Examination will be conducted at least once in five years. Medical camps will be organized.

15. POST PROJECT MONITORING PLAN:

The effectiveness of evaluation of environment mitigation programme, regular monitoring of the important environmental parameters will be taken up after completion of the lease period.

Sl.	Description of Parameters	Location	Schedule and Duration of Monitoring
A	Air Quality (PM₁₀, PM_{2.5}, SO₂, NO₂) monitoring in 4 locations		
A-1	Four monitoring station	one within and three outside the project area at an angle of 120° each-covering upwind and downwind directions.	Will be monitored in every six months as per CPCB/ MoEF&CC Guidelines/ Notifications
B	Quality of surface and ground water around the site will be collected from 4 locations		
B-1	Two Surface Water Samples will be collected as per EIA Report and in consultation with SPCB, out of which one will be taken near the active working area.	Up stream	Will be collected in every quarter as per CPCB/ MoEF&CC Guidelines/ Notifications
		Down stream	
B-2	Two Ground Water Samples will be collected as per EIA Report and in consultation with SPCB, out of which one should be taken near the active working area.	Desher Mohan	
C	Ambient Noise Level monitoring at 2 locations around the site		
C-1	Two Noise Samples will be collected as per EIA Report and in consultation with SPCB.	Onsite	Will be monitored quarterly as per CPCB /MoEF&CC Guidelines/ Notifications
		Approach road connect with main road	
D	Inventory of flora to Judge the comparative status at one locations around the site		
D-1	An Inventory of flora will be prepared at one Location near the mine lease area		

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Sl.	Description of Parameters	Location	Schedule and Duration of Monitoring
E	Soil Quality		
E-1	Soil Samples will be collected from one location.	Desher Mohan	Will be collected half yearly as per CPCB/ MoEF&CC Guidelines/ Notifications
F	Implementation of biological green belt development through block plantation activities.		Every 6 months by a core Soil samples will be collected every six months by a core group consisting of representatives from the management team and the plantation executing agency.

Monitoring data analysis will be done as per CPCB guidelines by NABL/MoEF&CC approved laboratory and shall be submitted to concerned authority (as specified in Environment Clearance Letter issued by SEIAA and Consent issued by SPCB) on regular basis.

CONTENTS

DRAFT ENVIRONMENT IMPACT ASSESSMENT REPORT FOR DESHER MOHAN SAND MINE ON AJAY RIVER, LOCATED IN MOUZA-DESER MOHAN, P.S.- JAMURIA, DISTRICT- PASCHIM BARDHAMAN, STATE- WEST BENGAL (AREA- 3.82 HA) PROJECT PROPONENT: KOILASH MAHATO	Doc No. WB/MIN/06
	REVISION No: 02
	ISSUE DATE: 05.07.2023

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CHAPTER 1

INTRODUCTION

DRAFT ENVIRONMENT IMPACT ASSESSMENT REPORT FOR DESHER MOHAN SAND MINE ON AJAY RIVER, LOCATED IN MOUZA-DESER MOHAN, P.S.- JAMURIA, DISTRICT- PASCHIM BARDHAMAN, STATE- WEST BENGAL (AREA- 3.82 HA) PROJECT PROPONENT: KOILASH MAHATO	Doc No. WB/MIN/06
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1. INTRODUCTION

1.1 PURPOSE OF REPORT

As per the notification of the MoEF&CC of September 2006, as amended in December 2009, mining projects spread over an area less than 250ha are categorized under Category B in the Schedule, including expansion and modernization of existing projects or activities. All these projects require prior environmental clearance from State Environment Impact Assessment Authority (SEIAA), on the recommendations of State Expert Appraisal Committee (SEAC) before the commencement of mining activities. In line with the said notification, a presentation was made to the State Expert Appraisal Committee, W.B. in the meeting held on 08th February 2023 for determining the ToR for the preparation of EIA/EMP report. State Environment Impact Assessment Authority (SEIAA), West Bengal, issued TOR, vide letter no. **495/EN/T-II-1/040/2023 to Koilash Mahato, on 10th March, 2023 (Refer Annex 1.1).**

Based on the ToR conditions stipulated by SEIAA, a draft EIA was prepared. The present draft EIA/EMP prepared for assessing the environmental impacts on the study area (10km from boundary of the project site) due to the proposed mining activities.

1.2 IDENTIFICATION OF PROJECT & PROPONENT

Sand mining involves the extraction of sand from its natural configuration, and it serves as a valuable resource for a wide range of projects, including land reclamations, the construction of artificial islands, coastline stabilization, and various construction. These activities bring about significant social and economic benefits to communities and industries involved. On a global scale, sand and gravel mining represents the largest volume of solid material extraction. Each year, an estimated 47 to 59 billion tonnes of material are mined worldwide (Steinberger et al., 2010). Within this substantial volume, sand and gravel, collectively known as aggregates, account for the largest share, ranging from 68% to 85%, and also exhibit the highest growth rate of extraction (Krausmann et al., 2009). River and marine aggregates continue to serve as the primary sources for building and land reclamation projects. Compared to other sources, in-stream gravel requires less processing and yields high-quality material that is well-suited for concrete production.

The project involves extraction of sand from Paschim Bardhaman District, over Plot no. 583(P), J.L No.- 14 of Desher Mohan mouza in Paschim Bardhaman P.S. Jamuria Letter of Intent was granted to Koilash Mahato for sand mining from the Govt. of West Bengal vide letter no. **1449/MM/Auction/2019**, dated **17.06.2019** over an area of 9.44 acres / 3.82 ha on Ajay River (Refer Annex 1.2). Further Lol vide no. **87/MM/ADM & DLRO-PAB/23** was extended by DL&LRO dated **06.01.2023 (Refer Annex 1.3)**. The validity period of the lease is 5 years from the date of deed registration.

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1.2.1 PROJECT PROPONENT

Koilash Mahato, was the highest bidder in the e-bidding process conducted by government of West Bengal. The applicant is involved in the mining business for last many years. The applicant will invest necessary funds for the scientific and systematic development of mines and other measures necessary to protect the quality of the environment and human health etc. The address of the proponent is provided below:

Name of the Applicant	: Koilash Mahato
Address of the Applicant	: Basudha, P.O.-Moukhira, Dist-Paschim Bardhaman, West Bengal-731214
Period of Lease	: 5 years

1.3 BRIEF DESCRIPTION OF PROJECT

The location of site and the geographical coordinates of the site superimposed on toposheet are provided in **Figures 1.1** and **1.2** respectively as well as project site on satellite image has been shown in **Figure 1.3**. Mining will be carried out up to a maximum depth of 3.0 m in river bed. Mining will be carried out only during day time except monsoon season. A brief description of the project is given in **Table 1.1**.

Table 1-1: Brief Description of Project

Particulars	Details		
Sanctioned Mining Lease area coordinate of 3.82 ha	Project Co-ordinates		
	Points	Latitude	Longitude
	A	23°47'04.5601"N	87°06'26.6029"E
	B	23°46'54.7036"N	87°06'33.7316"E
	C	23°46'52.3536"N	87°06'29.5186"E
	D	23°46'54.6244"N	87°06'27.6950"E
	E	23°47'03.4651"N	87°06'25.3219"E
Toposheet No.	73M/1		
Total area	3.82 Ha/ 9.44 Acres		
Geological reserve	1,14,600 m ³ /Year		
Mineable Reserves	94,500 m ³ /Year		
Targeted production	94,500 m ³ /year		
Manpower	30		
Elevation	96 mRL to 100 mRL		
Land-use	River bed		
Nearest habitation/town	Desher Mohan (0.50 km, SW Direction)		
Nearest airport	Kazi Nazrul Islam Airport (23.0 km, SE Direction)		
Nearest railway station	Jamuria Railway Station (9.00 km, SW Direction)		
Nearest highway	NH-19 (14.0 km, SSW Direction) SH-5 (24.0 km, SW Direction)		
Power supply	Electricity connection is not required for the project. Mining will be		

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Particulars	Details
	carried out in day time only.
Nearest Hospital	Barhra primary Health Centre (6.00 km, NE Direction)
Educational Facility in the area	Taldanga Tapasil Primary School (1.00 km, NW Direction) Kazi Nazrul Islam Mahabidyalyaya (5.50 km, SW Direction)
Water demand & supply	Water will be taken from hired tankers. The water requirement for mining & allied activities, drinking and plantation has been estimated to be 5.02 KLD (Dust suppression- 2.70 KLD, Drinking & domestic- 0.30 KLD and Green Belt-2.02 KLD).
Nearest tourist places	None in the Study Area
Defense installations	None in the Study Area
Archeological features	None in the Study Area
Nearest Forest area	Sareshkunda PF (8 km, N Direction)
Nearest stream/river/water body	Ajay river (onsite)
Seismic zone	Zone III

Source: Pre-Feasibility Report, Koilash Mahato, Paschim Bardhaman

Mining will be carried out by manual (as per approved mine plan) /semi mechanised (as per Sustainable Sand Mine Development, 2016) method of open cast mining with formation of benches. Proposed height & width of benches shall be kept 1 m & 1 m respectively over all pit slopes shall be maintained. No overburden is present over the sand deposit and no waste will be generated as the entire materials are saleable. A barrier of 7.5m will be left all along the boundary. The mined-out minerals will be loaded in dumpers/trucks. The dumpers/trucks and equipment's will be on hire basis or in-house depending upon requirement. The movement of dumpers/trucks after mineral loading will be through approach roads.

The entire mineral produced will be used in construction of roads, buildings and other infrastructures. The entire mineral will be sold to the buyers thereby bridging the gap between demand and supply of these minor minerals in the region. This will also generate much needed employment to the local people. Economy will be boost up of the area and there will be an overall growth of the region in terms of standard of living, education, health and transport.

1.4 SCOPE OF STUDY

As per the EIA Notification of 14th September 2006 and subsequent amendments, all 'Category A' projects require prior clearance by the Expert Appraisal Committee, Ministry of Environment, Forest & Climate Change, New Delhi and all category 'B' projects require prior clearance by the State Environment Impact Assessment Authority of the State. This report is prepared for SEIAA, West Bengal State. The environmental clearance process for new projects comprises of a maximum of four stages. The four stages in sequential order are as given below.

Stage 1 - Screening: It refers to the definite assignment of category to projects or activities where the same is not completely specified. The projects are categorized as 'A', 'B1' and 'B2'. Category 'A'

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projects are scrutinized and cleared through the Environment Appraisal Committee (EAC) at MoEF&CC, Govt. of India. In case of Category 'B' projects, scrutiny of application is done at the State level committee respective to categorize project into 'B1' or 'B2' category. The proposed sand mine is under Category 'B1' project and shall be appraised by State Level Committee of West Bengal.

Stage 2 - Scoping: It refers to the process where EAC or SEAC determines detailed and comprehensive Terms of Reference for the EIA report and can also include site visits by the committee if required.

Stage 3 - Public Consultation: It refers to the process by which concerns of local people and other stakeholders are ascertained and their views taken regarding the project. The public consultation takes part in two steps: public hearing and written responses.

Stage 4 - Appraisal: This refers to detailed scrutiny of the application and EIA report to make categorical recommendations to the regulatory authority.

The detailed scope of work for the sand mining project was conducted in accordance with the Terms of Reference (TOR) issued by the State Environment Impact Assessment Authority (SEIAA), West Bengal. The TOR, referenced as letter no. **495/EN/T-II-1/040/2023** was provided to **Shri Koilash Mahato, on 10th March, 2023**. The scoping process followed the regulatory requirements outlined in Clause 7(i) of the EIA Notification 2006, as amended to date

The overall contents of the EIA report follow the list of contents given in **APPENDIX III, Generic Structure of Environmental Impact Assessment Document** of the Gazette Notification on Environmental Clearance issued by Ministry of Environment, Forests & Climate Change, Government of India vide no. SO 1533 dated 14th September 2006.

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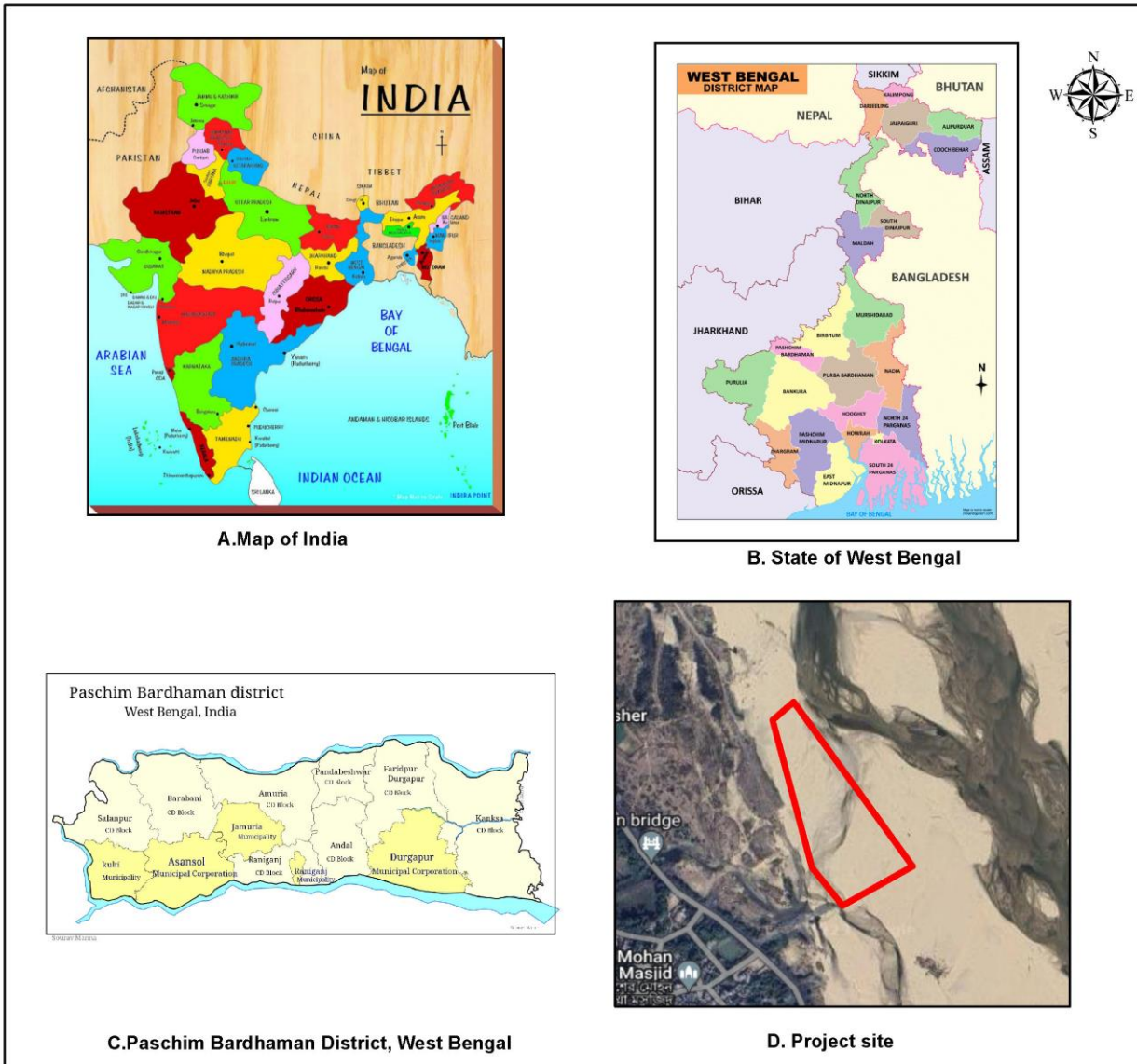
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River Bed Sand Mining Project of Desher Mohan Sand Mine
Mouza-Desher Mohani,P.S.- Jamuria
District- Paschim Bardhaman, W.B.
Area- 9.44 Acre/ 3.82 Ha
Project Proponent
Koilash Mahato

Map
Location Map of the Project site
(Project site location)

Fig no. 1.1: Location Map of the Project site

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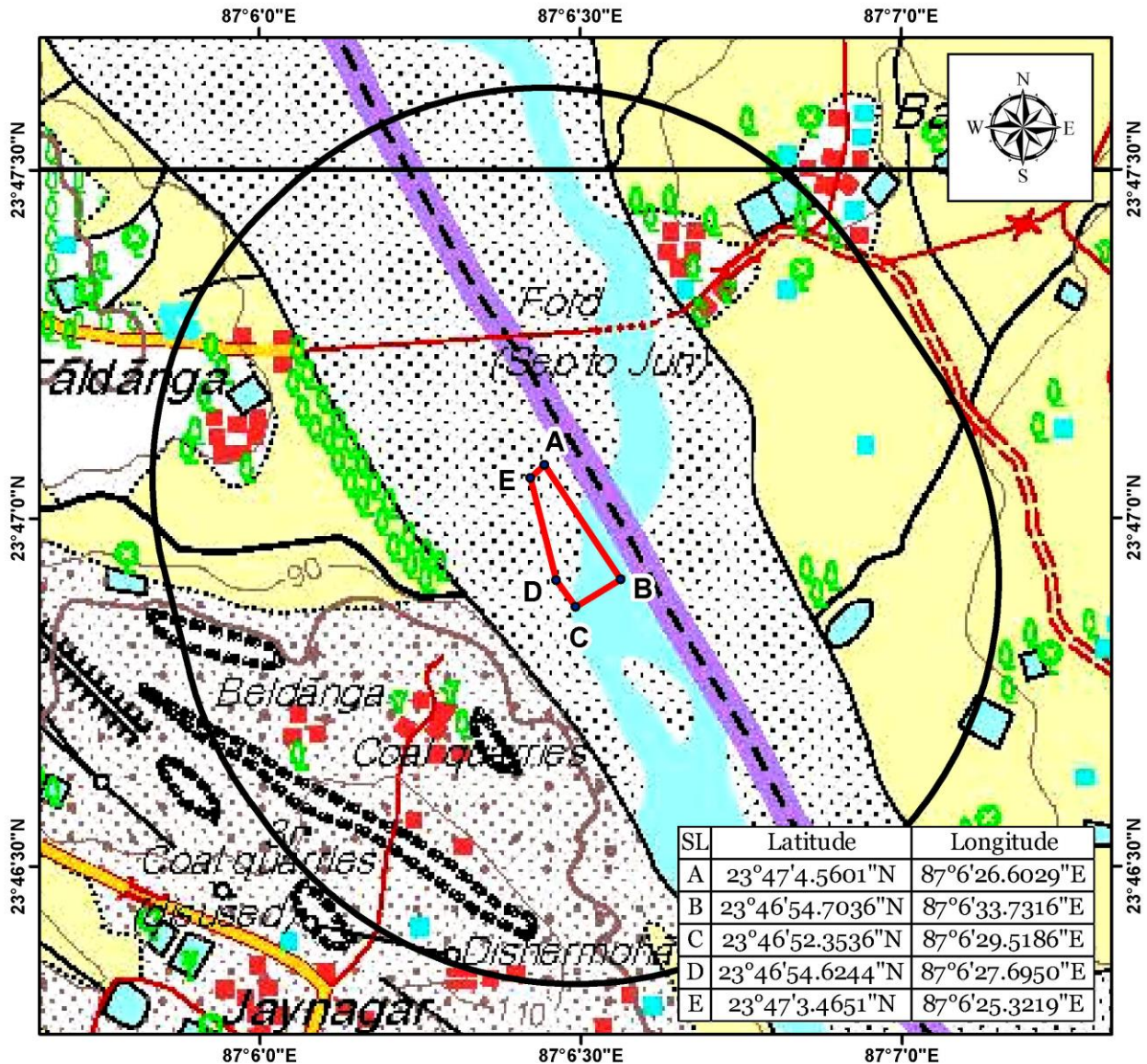
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<p>Legend</p> <ul style="list-style-type: none"> • Co ordinate ◻ 1 Km Buffer ◻ Project Site 	<p>Toposheet No: F45D1(73M/1)</p>	<p>Figure No : 1.2</p> <p>Graphic scale 0 0.125 0.25 0.5 KM</p>
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<p>River Bed Sand Mining Project of Desher Mohan Sand Mine Mouza-Desher Mohani, P.S.- Jamuria District- Paschim Bardhaman, W.B. Area- 9.44 Acre/ 3.82 Ha Project Proponent Koilash Mahato</p>	<p>Map Site on Toposheet (1 Km buffer of the Project site)</p>
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Fig no. 1.2: Site on Toposheet

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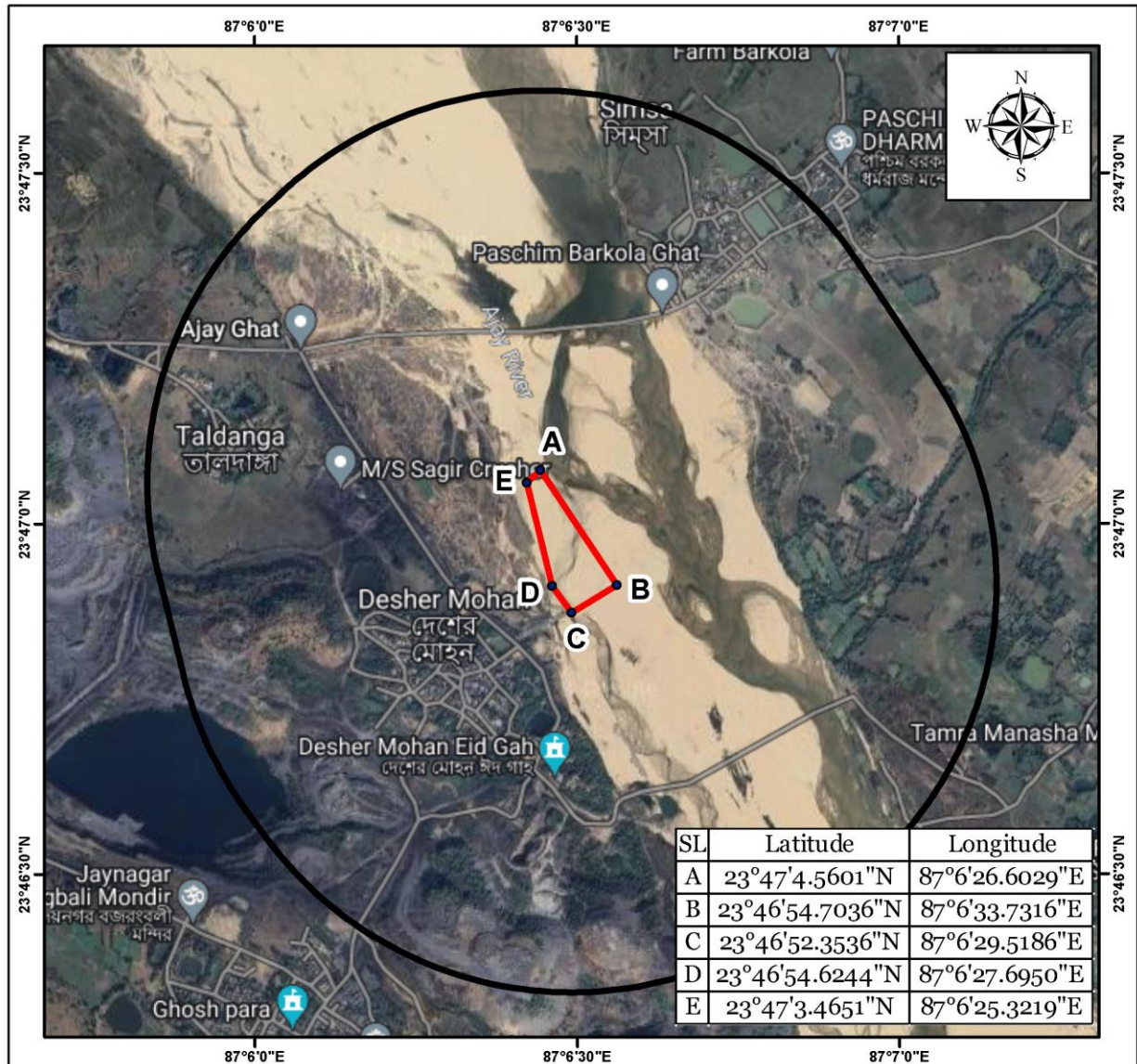
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Legend

- Co ordinate
- 1 Km Buffer
- Project Site

Figure No.: 1.3

Graphic scale

0 0.125 0.25 0.5

 KM

River Bed Sand Mining Project of Desher Mohan Sand Mine

Mouza-Desher Mohani, P.S.- Jamuria
 District- Paschim Bardhaman, W.B.
 Area- 9.44 Acre/ 3.82 Ha
Project Proponent
 Koilash Mahato

Map

Co-ordinate Map
 (1 Km buffer of the Project site)

Fig no. 1.3: Co-ordinate Map

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CHAPTER 2

PROJECT DESCRIPTION

2. PROJECT DESCRIPTION

2.1 CONDENSED DESCRIPTION OF PROJECT

This chapter contains related to the project like type of project, need for the project, project location and its layout details, project schedule and its implementation, technology and process and others on various facets of environment.

The condensed description of the project reveals that the river bed mining project is located on Ajay River, with **3 sand blocks for mining in 500m** of the project. The brief description of the project aspects likely to cause environmental effects are presented in **Table 2.1**.

Table 2-1: Project Aspects likely to Cause Environmental Effects

S.no	Aspects	Description
1	Sanctioned Mining lease area	3.82 Ha/ 9.44 Acres
1(a)	Workable Mining lease area	3.15ha
2	Number of blocks	One
3	River	Ajay River
4	Land Type	Non-Agricultural Government land on river bed
5	Category of the project	"B1"
6	Working days	200 dry days/year except monsoon
7	Minerals of the Mine	Riverbed sand
8	Geological reserve	1,14,600 m ³ /Year
9	Mineable Reserves	94,500 m ³ /Year
10	Proposed production of mine	94,500 m ³ /year
11	Method of Mining	Opencast manual method
12	Ultimate Depth of the Mining	3.00 m from surface
13	Water requirement and source	Water will be taken from hired tankers. The water requirement for mining & allied activities, drinking and plantation has been estimated to be 5.02 KLD (Dust suppression- 2.70 KLD, Drinking & domestic- 0.30 KLD and Green Belt-2.02 KLD).
14	Average Man Power/Day	30
15	Solid waste generation	No solid waste will be generated during mining. Entire excavated materials will be transported.

Source: Pre-Feasibility Report, Koilash Mahato, Paschim Bardhaman

2.2 TYPE AND NEED OF PROJECT

The applicant Koilash Mahato has obtained Sand mining lease through e-tendering from the Govt. of West Bengal vide Letter of Intent no. **1449/MM/Auction/2019** dated **17.06.2019** over an area of 3.82 Ha/9.44 Acres on Ajay river near Mouza – Desher Mohan, P.S.- Jamuria, Dist – Paschim Bardhaman, West Bengal, over Plot No. 583(P) J.L. No.- 14 (**Refer Annex 1.2**). Further Lol vide no. **87/MM/ADM & DLRO-PAB/23** was extended by DL&LRO dated **06.01.2023** (**Refer Annex 1.3**). The validity period of the lease is 5 years from the date of deed registration. As riverbed Sand is replenished every year hence life of mine is not applicable. The proposed mine lease area shown in mouza map is attached as **Annex 2.1**.

Sand is made of quartz or quartzite or its microcrystalline variety i.e. chalcedony which is resistant to weathering. This quality makes these minerals suitable for construction purposes. The proposed project has planned a targeted production of 94,500 m³ per year up to the contract period of 5 years from the date of deed registration. This production will cater the needs of construction material mainly in and around West Bengal thereby bridging the gap between demand and supply of these minor minerals in the region. The consistent supply of sand is crucial for construction activities and industries in the area.

2.3 PROJECT LOCATION

The mine lease area is located in Desher Mohan mouza, Jamuria P.S. of Paschim Bardhaman District. The external coordinates of the mine lease area are **Latitude 23°46'52.3536"N to 23°47'4.5601"N to Longitude 87°06'25.3219"E to Longitude 87°06'33.7316"E**. The details coordinates of allotted mine lease area and working lease area are shown in **Table 1.1 of Chapter-1**.

The project site is conveniently accessible via **NH-19** road located **14.00 km** away from the site, connected by a local metal road. There is also a well-established haul road that provides sufficient transportation capacity for trucks and dumpers to transport materials to and from the project site. **Figure 2.1** in the report showcases the general and specific location of the project, along with the boundaries of the mine lease area and the surrounding environment

2.4 SIZE AND MAGNITUDE OF OPERATION

In the mine lease area covering 3.82 Ha or 9.44 Acres, the annual extraction of sand is projected to be 94,500 cum/year, equivalent to 472.5 cum/day. The mining operations will be carried out manually, employing approximately 30 laborers. To transport the mined material, 41 dumpers/trucks will be utilized. **Annex 2.2** includes a letter from the district magistrate, certifying the presence of adjacent leases within a 500-meter radius of the project site.

2.5 PROPOSED SCHEDULE FOR APPROVAL & IMPLEMENTATION

The project will be implemented after completion of essential administrative procedures, including the signing of a lease deed with the District Collector on issuance of Environment Clearance from SEIAA and Consent to Establish/Operate from SPCB. The project implementation shall be done as per the condition stipulated in approved mine plan and environment clearance. The mine plan, which was approved by the Chief Mining Officer of the Government of West Bengal on 19th February, 2021.

This is a new mining area allotted to the applicant. Future production programme has been planned as per the details given in **Table 2.2**.

Table 2-2: Project implementation Schedule

Aspects	Value	Aspects	Value
Allotted Mine Lease Area in ha	3.82	Workable Mine Lease Area in ha	3.15
Proposed Daily Production in cum	472.50	Working days in a Year	200
Proposed Production per annum in cum (PDP x WDY)	94,500	Period of allotment of Mine Lease in Years	5

2.6 MINING METHOD AND PROCESS DESCRIPTION

- The mining is confined to collection of sand from the riverbed. The extraction process will involve mining up to a maximum depth of 3.0 meters at the riverbank or up to the water table, whichever is less. Dry pit mining will be employed.
- The riverbed material will be collected in its natural state during the mining process. The mining method will be opencast manual (preferably) or semi mechanised. The river bed material will be collected in its existing form.
- The distance of 7.5 m shall be further marked from the lease boundary and this zone constituting the 'safety zone' shall be identified. No mining activities shall be undertaken within this 'safety zone'. This shall be in accordance of West Bengal Minor Mineral Concession Rules 2016 (WBMMCR-2016).
- The excavation of riverbed minerals will begin from the top of the designated area and progress downwards in 0.50-meter increments, removing the minerals in slices.
- Riverbed sand extraction will be done through bench of 1.00m height and 1.00m width, the whole material is mineable. The removal is done without affecting the base flow of the river and in such manner as to maintain the smooth flow of the river during the monsoons. This helps in protection of the banks from erosion.

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- The mineral extraction will be done for a period of Five years from the date of Execution. Throughout the mining operation, the areas of the quarry will remain free from submergence, ensuring that there is no flooding or inundation. During mining operation, the river flow will be a way to enable dry pit mining. The ultimate slope of pit by the end of conceptual period shall be same as the shape of area.

The guidelines related to sand mining will be followed.

2.7 PROJECT DESCRIPTION

Applicant Koilash Mahato is the successful highest bidder of Sand Block No.: **JAMURIA/DESER MOHAN/583(P)/A** after participating in sand block auction conducted by Government of West Bengal and will obtain sand mining lease after deed registration. The mining lease will be granted over an area of **3.82 Ha/ 9.44 Acres** on river Ajay at Mouza – **Deshar Mohan, P.S.- Jamuria, District – Paschim Bardhaman, West Bengal**, over Plot No. **583(P), J.L. No.- 14**.

Mine plan was Prepared by **Mr. Joydeep Banerjee(RQP)** and was approved by **Chief Mining officer, West Bengal**, on **19th February, 2021**.

SH-5 and **NH-19** are passing from about **24.0 km** and **14.0 Km** away from the sand block. Nearest railway station is **Jamuraia Railway Station** is situated at about **9.00 km** away in the **SW** direction.

Table 2.3 provides an overview of the considerations taken into account during the preparation of the mining plan at the lease area. The mine plan layout and mining method are presented in **Figure 2.2** and **Figure 2.3**

Table 2-3: Planning Consideration for Mining

Considerations	Details
Total Lease area	38,200 m ²
Submerged Lease area under water	00 m ²
Total Workable Area	31,500 m ²
Peripheral 7.5m Buffer Area	6,700 m ²
Total Geological Reserves (Considering 3.00 m depth)	1,14,600 m ³ /Year
Total Saleable Reserve as per approved mine plan	94,500 m ³ /Year

Source: As per Approved Mine plan.

The Production programme from the mine for the next 5 years is given below is shown in **Table 2.4**.

Table 2-4: Production Programme from Mining Lease Area

Year	Geological reserve (m ³)	Production (m ³) as per approved mine plan	Production (m ³) as per replenishment rate mentioned in DSR
1 st	1,14,600	94,500	94,500
2 nd	1,14,600	94,500	70,686 (74.80% replenishment rate)

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Year	Geological reserve (m ³)	Production (m ³) as per approved mine plan	Production (m ³) as per replenishment rate mentioned in DSR
3 rd	1,14,600	94,500	70,686 (74.80% replenishment rate)
4 th	1,14,600	94,500	70,686 (74.80% replenishment rate)
5 th	1,14,600	94,500	70,686 (74.80% replenishment rate)

Source: As per Approved Mine plan

The mining operations will primarily be carried out manually. However, if necessary, a semi-mechanized mining method that does not involve drilling and blasting will be adopted. The geometry of the pit, including its current state, at the end of the plan period and conceptual period is presented in Table 2.6.

The land use pattern of the mine lease area across different phases: pre-mining, mining, and post-mining. It includes the categorization of the riverbed area, naturally reclaimed area, and restricted area during these phases (Table 2.5)

Table 2-5: Land use Pattern of Mine Lease Area

Sl. No.	Type of Land Use	Total Value (in Hectares)
A. PRE-MINING AREA		
A-1	Quarry Area	0.00
A-2	Infrastructure (road)	0.00
A-3	Agriculture	0.00
A-4	Plantation	0.00
A-5	Habitation	0.00
A-6	Soil dump	0.00
A-7	OB dump	0.00
A-8	River bed area	3.82
Total		3.82
B. DURING MINING		
B-1	Restricted area (7.5m mining area boundary, safety barrier)	0.67
B-2	Plantation (to be done outside the lease area)	0.00
B-3	Available area for mining	3.15
Total		3.82
C. END OF LEASE PERIOD		
C-1	Restricted area (7.5m mining area boundary, safety barrier)	0.00
C-2	Naturally reclaimed in river bed	3.82
C-3	Un-worked river bed	0.00
C-4	Plantation (to be done outside the lease area)	0.00
Total		3.82

Source: As per Approved Mine plan for Desher Mohan Sand Mine prepared by Shri Joydeep Banerjee Reg. No. RQP/KOL/375/2012/A.

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The project required involvement of transportation system like loading/excavating machine, power, water, manpower and supporting services like mine office, rest shelter, canteen and washroom facility. The detail description of facilities is presented in **Table 2.6**.

Table 2-6: Infrastructure Required at Mine Lease Area

Aspects	Description															
Machineries	<p>Following machineries shall be deployed for the exploitation & transportation of Sand as per requirement: (i) Truck dumper/tipper; (ii) Excavator/Loader (iii) Tractor Trolleys; (iv) Water sprinkler; (v) Other light Vehicles and (vi) Spade, shovels, mattocks, chisel etc.</p> <p>The number of trucks will depend on per day production. As per production Programme (Table 2.4), 41 trips are needed for Desher Mohan sand mining project.</p>															
Manpower	<p>Manpower will be about 162 persons as per the details given below</p> <table border="1"> <thead> <tr> <th>Manpower</th> <th>Number</th> </tr> </thead> <tbody> <tr> <td>Skilled</td> <td>9</td> </tr> <tr> <td>Un-skilled</td> <td>6</td> </tr> <tr> <td>Labour</td> <td>15</td> </tr> <tr> <td>Total</td> <td>30</td> </tr> </tbody> </table> <p>Source: As per Approved Mine plan for Desher Mohan Sand Mine prepared by Shri Joydeep Banerjee Reg. No. RQP/KOL/375/2012/A.</p>	Manpower	Number	Skilled	9	Un-skilled	6	Labour	15	Total	30					
Manpower	Number															
Skilled	9															
Un-skilled	6															
Labour	15															
Total	30															
Power	<p>Electricity connection is not required for the project. Mining will be carried out in day time only. The diesel required for the machinery will be procured from nearby villages through outsourcing.</p>															
Water	<p>The water supply for drinking purpose will be made available by hiring tankers from nearby villages. The total water requirement is 5.02 KLD. The use wise water requirement is presented below.</p> <table border="1"> <thead> <tr> <th>Activities</th> <th>Requirement in KLD</th> <th>Basis</th> </tr> </thead> <tbody> <tr> <td>Drinking and domestic</td> <td>0.30</td> <td>100litre/capita/day</td> </tr> <tr> <td>Green Belt</td> <td>2.02</td> <td>0.5 Liter per plant 2 times a day</td> </tr> <tr> <td>Dust Suppression & others</td> <td>2.70</td> <td>Length of Road (m) x Width of Road (m) x 1litre/m² x 2times per day)</td> </tr> <tr> <td>Total</td> <td>5.02</td> <td></td> </tr> </tbody> </table>	Activities	Requirement in KLD	Basis	Drinking and domestic	0.30	100litre/capita/day	Green Belt	2.02	0.5 Liter per plant 2 times a day	Dust Suppression & others	2.70	Length of Road (m) x Width of Road (m) x 1litre/m ² x 2times per day)	Total	5.02	
Activities	Requirement in KLD	Basis														
Drinking and domestic	0.30	100litre/capita/day														
Green Belt	2.02	0.5 Liter per plant 2 times a day														
Dust Suppression & others	2.70	Length of Road (m) x Width of Road (m) x 1litre/m ² x 2times per day)														
Total	5.02															
Infrastructure	<p>The workers are mostly locals living in the close proximity of area and will work in shifts during day time only thus there is no requirement of major infrastructural facilities at the site. The following infrastructure facilities will be made available for the workers.</p> <p>(i) Mine office: One competent Manager and one Assistant Manager will be required to supervise the mining operations. A temporary office for Manager 15m² (5m x 3m) shall be provided at the River bank. An additional room for other supervisory staff is also proposed at each mine.</p> <p>(ii) Rest shelter: A rest shelter will be provided for the employees to take breaks and have lunch during working hours. The size of the rest shelter will be approximately 30m² (10m x 3m) to accommodate the workers.</p> <p>(iii) Canteen-cum-washroom facility: To fulfill the needs of the workers in the</p>															

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Aspects	Description
	mine, arrangements will be made to install a canteen-cum-washroom facility. This facility will serve as a space where workers can take breaks, have meals, and enjoy amenities like tea. Additionally, the washroom facility will be available for their use. (iv) First Aid Room: For the safety and well-being of workers during mining operations, a small first aid room will be established at each sub-block. These rooms will be equipped with first aid kits and an ample supply of necessary materials and medicines to address any injuries or medical emergencies that may occur.

2.8 DESCRIPTION OF MITIGATION MEASURES IN PROJECT

In the lease area the river flow being reduced and sediment load get deposited During flood season, the area gets sediments and source of erosion at this location is meagre.

The General guidelines of the Ministry of Environment and Forests as also of the Geological Survey of India will be followed the most important is as under:

- Dry pit mining will be followed which means mining at all times will be above the flowing river water level. Mining activity will be immediately stopped when water comes in the mining pits.
- Stream will not be diverted to form inactive channel.
- Mining at the concave side of the river channel will be avoided to prevent bank erosion.
- Mining will be restricted minimum 3m away (inward) from river bank to minimize effect of river bank erosion and to avoid consequent channel migration.
- Mining will be restricted in monsoon season.
- Area of mining lease will be demarcated prior to mining for sustainable development and Pucca Pillars will be erected on ground.
- Mining will be done Manually and or Semi-Mechanized Method.
- No mining operations shall be carried out in proximity of any bridge and or embankment. Gate/Check Post with CCTV camera & R.F.I.D Scanner will be built-up and will be ensured all such facility in working condition by the owner.
- Further Rules & Regulations modified time to time by State Govt. shall be adhered.

2.9 ASSESSMENT OF NEW TECHNOLOGY FOR FAILURE

The mining is done using standard procedure of excavation and loading. Therefore, no new technology is involved or practiced in sand mining. The mining is done as per procedure stipulated in the Sustainable Sand Mining Guideline 2016 and Enforcement & Monitoring Guidelines for Sand Mining 2020 and WBMCR 2016 and The West Bengal Sand Mining Policy 2021.

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Legend

- Project Site
- 10 Km Buffer

Figure No : 2.1

Map

Study area map of the Project site
 (10 Km buffer of the Project site location)

River Bed Sand Mining Project of
Desher Mohan Sand Mine
 Mouza-Desher Mohani,P.S.- Jamuria
 District- Paschim Bardhaman, W.B.
 Area- 9.44 Acre/ 3.82 Ha
Project Proponent
Koilash Mahato

Graphic scale



Figure 2.1: Study Area Map

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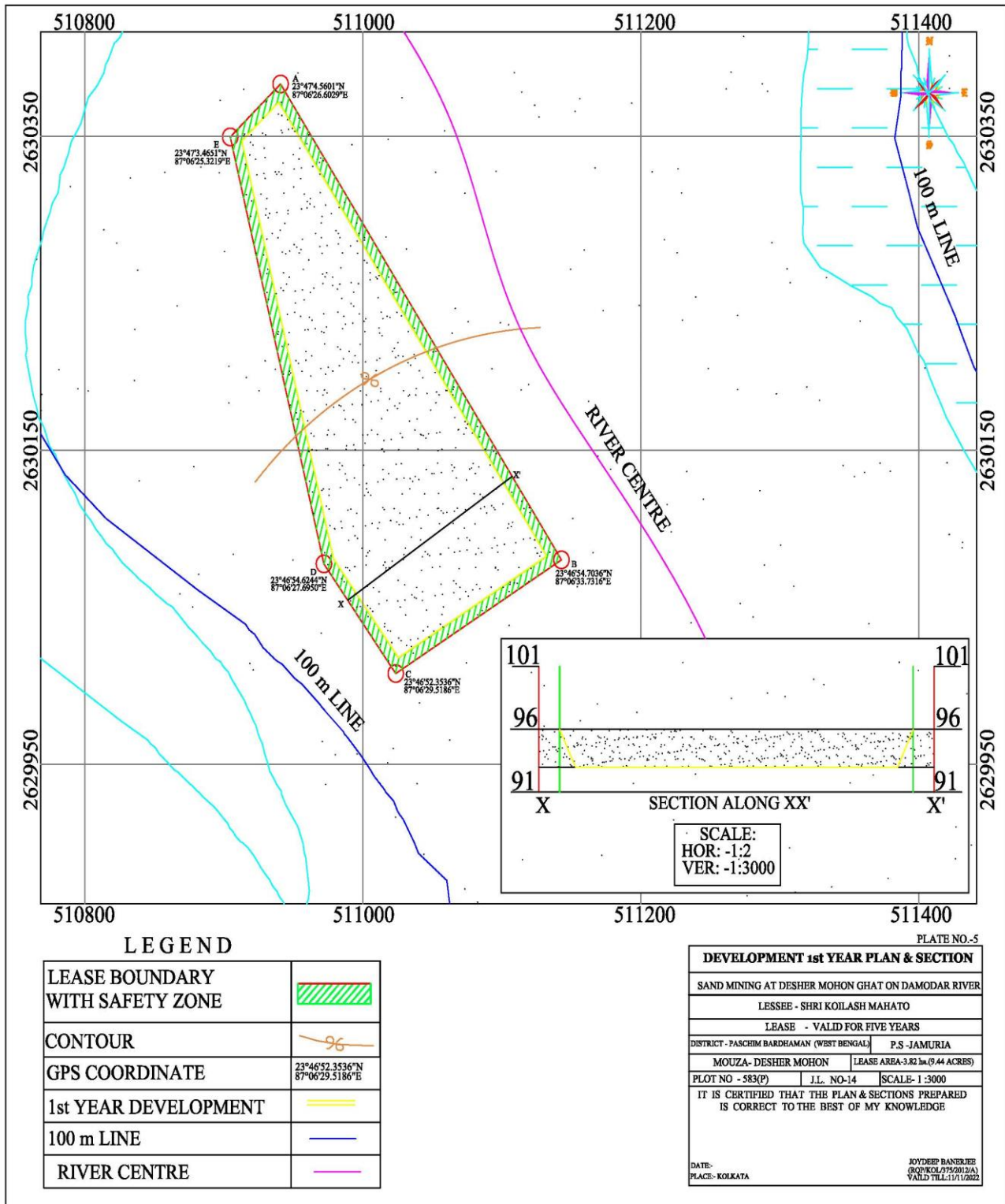


Figure 2.2: Development 1st year plan and section

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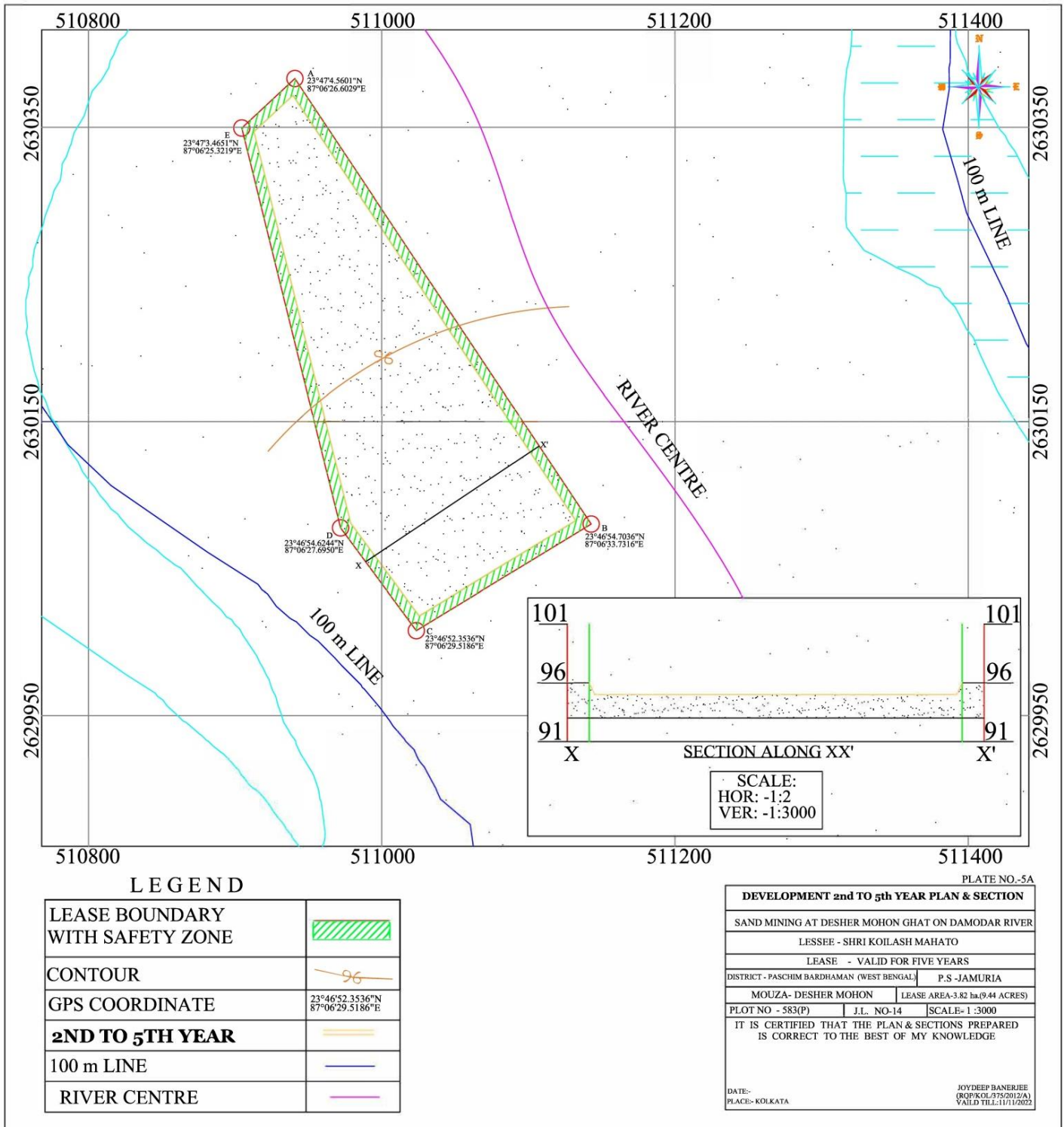


Figure 2.3: Development 2nd to 5th year plan and section

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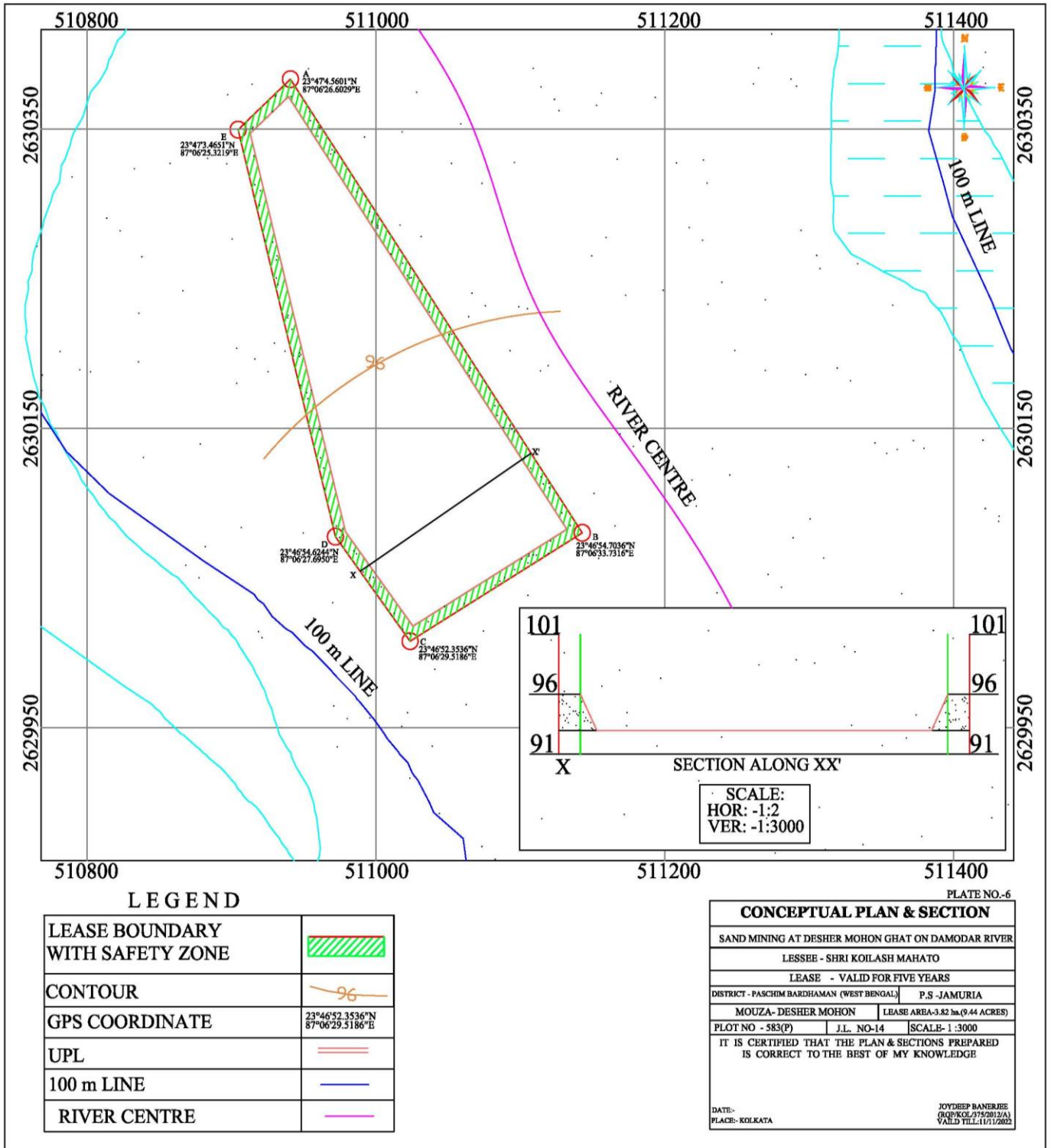


Figure 2.4: Conceptual Plan & Section

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CHAPTER 3

DESCRIPTION OF THE ENVIRONMENT

3. DESCRIPTION OF THE ENVIRONMENT

3.1 STUDY AREA, PERIOD, COMPONENTS & METHOD

Baseline data generation is a crucial component of the Environmental Impact Assessment (EIA) study. It involves gathering comprehensive information on the existing environmental conditions in the study area. This data is essential for evaluating the anticipated impacts of a greenfield project on various environmental aspects using established impact assessment methodologies. Furthermore, baseline data is instrumental in the preparation of an Environmental Management Plan (EMP), which outlines measures to enhance environmental quality and provides a framework for future expansions while ensuring environmentally sustainable development.

3.1.1 STUDY AREA

The study area for the Environmental Impact Assessment (EIA) study encompasses a radius of 10 kilometres (aerial distance) from the boundary of the mine lease area. Project is situated in Mouza – Desher Mohan, P.S.- Jamuria, Dist – Paschim Bardhaman, West Bengal, within the Survey of India topography sheet no. 73M/1. The study area has been divided into two zones: the core zone, which represents the mine lease area, and the buffer zone, which extends 10 kilometres beyond the mine lease boundary, excluding the ML area. The study area map showing core and buffer zone is given in **Figure 3.1**.

3.1.2 STUDY PERIOD

The baseline study for environmental assessment was conducted concurrently with Desher Mohan mouza during the Post Monsoon Season from October to December 2022. It involved an extensive field monitoring study to assess the various environmental attributes of the study area and establish a baseline for comparison.

3.1.3 STUDY METHOD

Baseline data was generated for Valued Environment Components (VEC) including ambient air, surface and groundwater, land and soil, ecology, and socio-economic factors. A temporary field office was established at Jamuria block, close to the mine lease area, to facilitate data collection. The team consisted of experts in relevant fields, along with field and office assistants. The Environment Coordinator visited the site twice during the study period to ensure proper data collection. The team conducted soil and water sampling, monitored air quality and noise levels, and collected other field data from this field station. Table 3.1 in the report provides details on the sampling methodologies, frequency, and analysis methods for the various environmental parameters required for the study.

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Table 3-1: Methodology for Sample Collection & Analysis for VECs

Sl. No	Component	Primary Data					Secondary Sources/References
		Frequency of Sampling	No. of Locations	Parameters	Instrument	Method	
A LAND ENVIRONMENT							
i	Land use & Land cover	Study Area	Core & buffer zone	Land utilization Pattern	-	ArcView, ERDAS, Arc info software	Survey of India Toposheet, LISS-II & Satellite Imagery
ii	Soil Quality	Once in study period	4	pH, Organic Matter, Organic carbon, EC, BD, N, P, K	Kjeldahl Nitrogen, PH meter, conductivity meter, hydrometer	Gravimetric, photometric	Agriculture Handbook
iii.	Classified TVC	7days Once in Study Period	4	Traffic Volume	Manual with Format	-	IRC Code
B AIR ENVIRONMENT							
i	Meteorology & Climatology	Continuous for whole season on hourly basis	1	Temperature, Humidity, rainfall, wind speed and direction	Automatic weather monitoring machine with data logger	-	30-years IMD data from Climatological Tables (1971 – 2000)
ii	Ambient Air Quality	24 hourly samples twice a week for 3-months	6	PM ₁₀	Respirable Dust Samplers (APM 460 BL) with gas attachment	Gravimetric	IS-5182 (23)
				SO ₂		West & Gaek	IS-5182 (2)
				NO ₂		Jacobs & Hochheiser	IS-5182 (6)
				PM _{2.5}	Fine Particle Sample	-	-
				CO	NDIR	Infrared Analysis	-
				% Free Silica	Gravimetric method	-	IS-1760 (6)
iii	Noise Level	-	6		Integrated sound level meter.	Measurements were taken by following CPCB procedure	-
C WATER ENVIRONMENT							
i	Water Quality	Once in study period	4 GW 2 SW	Physical, chemical and heavy metals	Spectrophotometer Atomic Absorption Spectrophotometer	Titrametric, gravimetric, photometric, AAS	APHA IS10500: GW Designated Best Use of Water as per CPCB: SW

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Sl. No	Component	Primary Data					Secondary Sources/References
		Frequency of Sampling	No. of Locations	Parameters	Instrument	Method	
					Flame Photometer		
D	ECOLOGICAL ENVIRONMENT						
i.	Ecology	Once in study period	Study Area	Flora, fauna, Aquatic	Field data collection	Quadrant	Forest Working Plan
E	SOCIO-ECONOMIC ENVIRONMENT						
i.	Socio-economic	Once in Study period	Core & buffer zone	Demographic, social, economic & infrastructure	Survey Schedule	Village-level Survey, Group Discussion	Census of India 2001/ 2011, BPL List, Revenue Dept. data

3.2 LAND ENVIRONMENT

A detailed study was conducted to analyse the characteristics of the study area's land environment, including land use, soil, and vibration. This study aimed to gain a thorough understanding of the study area's land attributes and their potential role in the propagation of pollution.

3.2.1 ENVIRONMENTAL SENSITIVITY

The environmental sensitivity as per Part-III of Appendix-I (Paragraph-6) of Form-I of the EIA notification 2006 amended to date provides for sensitive receptors within 15km radius of the ML area. **Table 3.2** and **Figure 3.2** also provides the spatial locations of these receptors within the 15km radius of the ML area.

Table 3-2: Environment Sensitive Locations in 15km of ML Area

S.no	Particular	Distance in km	Direction
Forest			
1	Nandi Jhor	3.4	SE
2	P.F.	3.5	NNE
3	Mixed Jungle	7.5	NW
4	Sareshkunda P.F.	8	N
5	Galandhara Jhor	8	NE
6	Mara Jhor	9.75	NNE
Water Bodies			
1	Ajay River	onsite	
2	Hingla Nadi	9.8	NE
3	Hingla Dam	9.53	NE
4	Punta Khal	9.4	SW

Source: Eco-sensitivity map Prepared by GCPL, 2023

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DESCRIPTION OF ENVIRONMENT

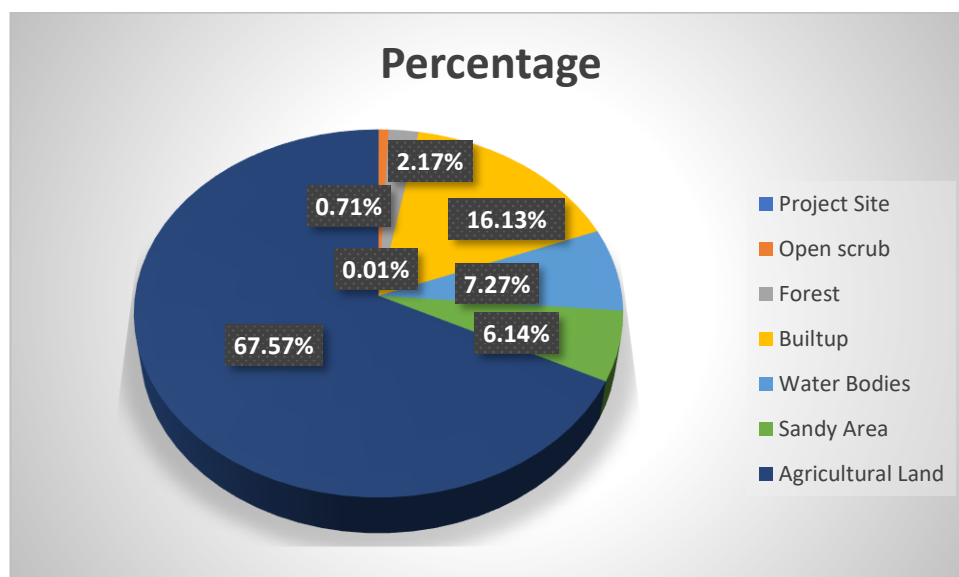
3.2.2 LANDUSE PATTERN-STUDY AREA & ML AREA

The land-use distribution of the study and ML area is given in **Table 3.3**. The land use table can be meaningfully interpreted land-use map of the study area in **Figure 3.3** and from the pie diagram in **Figure 3.4**.

Table 3-3: Land use of Study and ML Area

Land use	Study Area		ML Area	
	Area in hectare	%	Area in hectare	%
Project Site	4.85	0.01	-	-
Open scrub	230.86	0.71	-	-
Forest	703.98	2.17	3.82	100
Built-up	5,241.76	16.13	-	-
Water Bodies	2,362.02	7.27	-	-
Sandy Area	1,994.01	6.14	-	-
Agricultural Land	21,955.94	67.57	-	-
Total Area in hectare	32493.42	100.0	-	-

Source: Land use and Land cover map prepared by GCPL, 2023



The pie chart clearly illustrates the land use distribution in the study area. Agricultural land comprises approximately 67.57% of the area, followed by build-up areas at around 16.13%. Sandy areas and water bodies occupy about 6.14% and 7.27% respectively. The remaining portion consists of Project site and open scrub. Given the dominant presence of agricultural land, human habitation, and some forested areas, it can be inferred that the anticipated impact of mining on the overall area would be minimal.

A comprehensive site visit was conducted across the entire mine lease (ML) area, during which the land features were carefully observed and compared with satellite images for data verification.

Since the mining site is situated on a river bed, the entire area consists of sandy terrain. Hence, the entire ML area can be categorized as sandy land, with no portion falling under river water.

The land where the proposed mining activities will be carried out has been taken on lease by the project proponent. There are no R&R issues involved with this project. The relevant land documents and the Lol are attached as **Annex 1.1**.

3.2.3 SESIMOLOGY

Entire West Bengal is divided into seismic zones II, III, IV and V. The ML area falls under seismic zone III which is a Moderate damage risk zone (MSK VII).

3.2.4 FLOOD HAZARD

The Ajay River starts the journey from the Chakai block of Jamui (Origin of Ajay River) and then enters Jharkhand state near Devipur. Afterward, at Simuji, it enters West Bengal near Chittaranjan. After entering West Bengal, first, it flows between West Bardhaman district and Jharkhand, and then West Bardhaman district and Birbhum district, and forms the borders between the West Bardhaman district and Jharkhand state, and West Bardhaman district and Birbhum district. Finally, the Ajay River enters Purba Bardhaman district's Katwa subdivision at Nareng village in Ketugram police station and joins Bhagirathi River in Katwa town. The 288 km long (179 miles) river has its 152 km (94 miles) in West Bengal alone. And its catchment area is 2300 square miles or 6000 sq. km. While the Ajay flows through alluvial plains in the Bradhaman district, its upper reaches flow through hilly areas with laterite soil. Previously, one could find dense forests filled with trees like Palas, Piyasal, and Saltreese in the valley of the Ajay River.

3.2.5 SOIL QUALITY

Soil quality of the study area is one of the important VEC. The composite soil samples are collected from the study area and analysed for different parameters. The locations of the monitoring sites are given in **Table 3.4** and depicted in **Figure 3.5**.

For studying soil profile of the region, four sampling locations were selected to assess the existing soil conditions in and around the project area representing various land use conditions in Post Monsoon season (October to December 2022). The soil samples were collected using a random grid method, with a grid size of 10m x 10m. A core-cutter was used to extract samples up to a depth of 90cm. Composite samples has been collected from each grid, by mixing of eight sub-samples and reducing the weight to approximately 500gm by conning and quartering method. The samples were packed in polyethylene bags and assigned a number. The collected samples were air dried at room temperature in the laboratory and lightly crushed with mortar-pastel and passed through 2mm sieve. The soil samples were analysed for the physico-chemical properties by standard procedure as presented in **Appendix 3.1**.

The soil quality as analysed from the collected samples is given in **Table 3.4**.

Table 3-4: Soil Characteristics of the Study Area

Sl. no	Parameters	Unit	S-1: Near Project Site	S-2: Simsa	S-3: Paschim Barkola	S-4: Chichurbil
		Direction	SW	NE	ESE	NW
		Distance in km	0.21	0.61	1.69	2.41
1.	Soil colour	----	Brownish	Brownish	Brownish	Brownish
2.	pH	----	7.29	7.21	7.15	7.08
3.	Electrical Conductivity	µmhos/cm	219	231	247	251
4.	Moisture	%	3.1	3.7	4.2	4.5
5.	Soil Texture	----	Clay loam	Clay loam	Clay loam	Clay loam
6.	Clay	%	31	33	34	30
7.	Silt	%	27	23	21	28
8.	Sand	%	42	44	45	41
9.	Infiltration Rate	cm/hr	1.17	1.15	1.13	1.09
10.	Bulk density	gm/cm ³	1.19	1.29	1.21	1.13
11.	Porosity	%	47.6	42.3	40.7	38.5
12.	Nitrogen as N	kg/ha as N	289.5	282.7	265.1	257.2
13.	Phosphorus	kg/ha as P	79.2	77.5	71.5	72.4
14.	Potassium as K	kg/ha as K	321.5	330.2	346.4	350.1
15.	Organic Carbon	%	0.28	0.31	0.37	0.39
16.	Organic matter	%	0.48	0.53	0.64	0.67

Source: Data Collection by CPCPL and Analysis by AGSS Analytical and Research Lab Pvt. Ltd.

The following inferences are drawn from **Table 3.4** and standard soil classification by Handbook of Agriculture, Indian Council of Agriculture Research, New Delhi.

- Soil bulk density is a dynamic characteristic that varies depending on the soil's structural conditions. In general, it increases with profile depth, due to changes in organic matter content, porosity and compaction. It is required for gaseous exchange, such as high bulk density would pose restriction to the growth of deeper-rooted plants and maybe one of the reasons of cessation of plant growth (Ghose et al., 2004). Bulk density of the study area ranges between 1.13 gm/cm³ S₄ (Chichurbil) to 1.29 gm/cm³ at S₂ (Simsa). A normal range of bulk densities for clay is 1.0 to 1.6 mg/m³ and a normal range for sand is 1.2 to 1.8 mg/m³ with potential root restriction occurring at ≥ 1.4 mg/m³ for clay and ≥ 1.6 mg/m³ for sand.
- The soil in the study area is neutral to slightly alkaline with pH ranging from 7.08 to 7.29 in the study area.
- The electrical conductivity of the soil samples is found to be average and ranges from 219 µmhos/cm to 251 µmhos/cm.
- Organic carbon, a major nutrient for soil fertility, was found in "lower" to "medium" in the study area. Organic carbon content is 0.28% in Near Project site, 0.31% in Simsa, 0.37% in Paschim Barkola and 0.39% in Chichurbil.

- Nitrogen is important because it is a major component of chlorophyll, the compound by which plants use sunlight energy to produce sugars from water and carbon dioxide during photosynthesis. It is also a major component of amino acids. Soil nitrogen exists in three general forms: organic nitrogen compounds, ammonium ions and nitrate ions. The majority of plant-available nitrogen is in the inorganic forms and (sometimes called mineral nitrogen). Nitrogen content in the surface soil of the study area varies between 257.2 kg/ha at S₄ (Chirchuribil) to 289.5 kg/ha at S₁ (Near Project Site).
- Phosphorus is the key content which plays an important role in the photosynthesis, respiration, energy storage and transfer, cell division, cell enlargement and several other properties in the living plant. Available Phosphorus ranges between 71.5 kg/ha at S₃ site to 79.2 kg/ha at S₁. As per ICAR classification the phosphorus in the study area present is classified as "less" to "medium".
- Potassium is an essential plant nutrient and is required in large amounts for proper growth and reproduction of plants. Potassium is considered second only to nitrogen, when it comes to nutrients needed by plants, and is commonly considered as the "quality nutrient". It affects the plant shape, size, colour, taste and other measurements attributed to healthy produce. Potassium content in the study area ranges between 321.5 kg/ha at S₁ to 350.1 kg/ha at S₄. As per ICAR classification the potassium in the study area present is classified as "very less".

From the data above we can infer that the soil of the study area is of low fertility with low Phosphorus and Potassium content, and agricultural activity, if any, would be highly dependent on the addition of external fertilizers. The good content of nitrogen (N) will aid in the growth of leaves.

3.2.6 CLASSIFIED TRAFFIC VOLUME COUNT (TVC)

The traffic volume count was conducted at two locations as shown in **Figure 3.6**, and the results are provided in **Table 3.5**. The TVC was conducted in November, 2022, following the guidelines outlined in the IRC code. Two staff members were assigned to monitor vehicular movement in a single direction. The 24-hour classified volume count involved recording the number of heavy motor vehicles (HMV), light motor vehicles (LMV), and two/three wheelers. Analysing the data from **Table 3.5**, it is evident that the traffic density in the roads designated for transporting sand is relatively low. Therefore, these roads have the capacity to accommodate the additional traffic generated by the project without significant congestion or issues.

Table 3-5: Traffic Volume in PCU per day

Code and Location	Distance (km)	Direction	HMV		LMV		2/3Whellers		Total
			No.	PCU	No.	PCU	No.	PCU	
T1*: Bypass Road at Desher Mohan Village	0.2	SW	16	48	74	74	180	90	212
T2*: Jamuria-Churulia Road	4.5	SW	115	345	214	214	321	160.5	719.5

*Rural (calculate on 24hours basis)

**Urban (calculate on per hours basis)

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Source: Traffic Volume Count, AGSS Analytical and Research Lab Pvt. Ltd.

3.3 AIR ENVIRONMENT

3.3.1 METEROLOGY AND CLIMATOLOGY AS PER IMD

This section provides a comparative analysis of the meteorological data collected by the project team in the study area from October to December 2022. The data used for this analysis includes the 30-year average data from the Indian Meteorological Department (IMD) spanning from 1970 to 2000. The data was obtained from the Meteorological Station in Durgapur.

The climate of the region over most of the year is a pronounced continental in character. It is very hot in summer and markedly cold in winter season (Table 3.6).

Table 3-6: Climate Condition in Study Area

Sl. No.	Parameter	Season	Months	Monthly Total (mm)	Heaviest fall in 24 hours (mm)	No. of Rainy Days
i	Rainfall in mm	Winter (Dec to Feb)	December	11.7	60	1.1
			January	7.7	53.6	1
			February	17.2	63.5	1.6
			Total	36.6	177.1	3.7
		Summer (Mar to May)	March	23	42.5	1.8
			April	35.3	52.5	2.2
			May	63.5	92	4.6
			Total	121.8	187	8.6
		Monsoon (Jun to Sept)	June	241.3	211	9.3
			July	600.4	115.5	16.1
			August	364.9	133.5	14.5
			September	442	387.7	11.4
			Total	1648.6	847.7	51.3
		Post Monsoon (Oct to Dec)	October	93.7	139	4
			November	9.6	20.4	0.6
			December	11.7	60	1.1
Total	115		219.4	5.7		
ii	Temperature (Mean daily temperature)	Winter (Dec to Feb)	Months	Max.	Min.	
			December	25.2	Not Available	
			January	24.2	Not Available	
			February	27.8	Not Available	
		Average	25.7	Not Available		
		Summer (Mar to May)	March	34	Not Available	
			April	38.1	Not Available	
			May	37.8	Not Available	
			Average	36.6	Not Available	
		Monsoon (Jun to Sept)	June	36.1	Not Available	
July	32.6		Not Available			

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 FOR DESHER MOHAN SAND MINE ON AJAY RIVER, LOCATED IN MOUZA-DESHER MOHAN,
 P.S.- JAMURIA, DISTRICT- PASCHIM BARDHAMAN, STATE- WEST BENGAL (AREA- 3.82 HA)
PROJECT PROPONENT: KOILASH MAHATO

Doc No. WB/MIN/06

REVISION NO: 02

ISSUE DATE:

05.07.2023

			August	32.2	Not Available		
			September	32.2	Not Available		
			Average	33.3	Not Available		
		Post Monsoon (Oct to Dec)	October	32.1	Not Available		
			November	29.4	Not Available		
			December	25.2	Not Available		
			Average	28.9	Not Available		
iii	Cloud Cover (Oktas of sky)	Winter (Dec to Feb)	All cloud		Low cloud		
				08:30	17:30	08:30	17:30
				1.4	1.2	1.3	1.2
				1.1	1	1	1
				1.2	1.3	1.1	1.1
		Summer (Mar to May)		1.4	1.4	1.2	1.1
				1.5	1.5	1.3	1.2
				2.1	2.3	1.6	1.8
		Monsoon (Jun to Sept)		3.8	4	2.7	2.6
				5.4	5.5	3.6	3.4
				5.5	5.5	3.6	3.4
				4.9	4.9	3.1	3.1
		Post Monsoon (Oct to Dec)		2.6	2.6	2	1.9
				1.4	1.3	1.3	1.2
	1.4		1.2	1.3	1.2		
iv	Relative Humidity in (RH) %	Winter (Dec to Feb)	Months	8.30 hrs	17.30 hrs		
				December	66	62	
				January	64	60	
				February	60	53	
			Average	63.3	58.3		
		Summer (Mar to May)		March	53	45	
				April	61	50	
				May	67	59	
				Average	60.3	51.3	
		Monsoon (Jun to Sept)		June	76	70	
				July	84	81	
				August	84	81	
				September	82	81	
				Average	81.5	78.3	
		Post Monsoon (Oct to Dec)		October	76	75	
				November	68	64	
				December	66	62	
	Average		70	67			
v	Wind pattern	Winter (Dec to Feb)	Months	Wind speed			
				kmph	m/s		
				December	6.2	1.736	
				January	6.9	1.934	
				February	6.8	1.904	
	Average	6.6	1.9				

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FOR DESHER MOHAN SAND MINE ON AJAY RIVER, LOCATED IN MOUZA-DESHER MOHAN,
P.S.- JAMURIA, DISTRICT- PASCHIM BARDHAMAN, STATE- WEST BENGAL (AREA- 3.82 HA)
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Doc No. WB/MIN/06

REVISION NO: 02

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	Summer (Mar to May)	March	7.2	2.016
		April	9	2.52
		May	10.1	2.828
		Average	8.8	2.5
	Monsoon (Jun to Sept)	June	10	2.8
		July	9.3	2.604
		August	9.2	2.576
		September	8.2	2.296
	Post Monsoon (Oct to Dec)	Average	9.2	2.6
		October	5.2	1.456
		November	5.1	1.428
		December	6.2	1.736
Average	5.5	1.5		

Source: Climatological Table 1971-2000, Indian Meteorological Department, Govt. of India, Near Delhi (Durgapur station)

Temperature : The area experiences high temperature during summer accompanied by high humid condition. Based on the average 30 years' data, it is observed that the maximum daily temperature in the study area has reached 38.1°C in the month of May. However, there is no information available regarding the average daily minimum temperature for the given period.

Rainfall : The study area is characterized by heavy rainfall, with an average annual rainfall of approximately 1910 mm based on the 30-year average data from the Indian Meteorological Department (IMD). There are about 68.1 rainy days in a year. The heaviest recorded rainfall within a 24-hour period was 387.7 mm, which occurred on September 27th, 1978. On average, the months of July and September consistently experience the highest rainfall each year, as depicted in **Figure 3.7**.

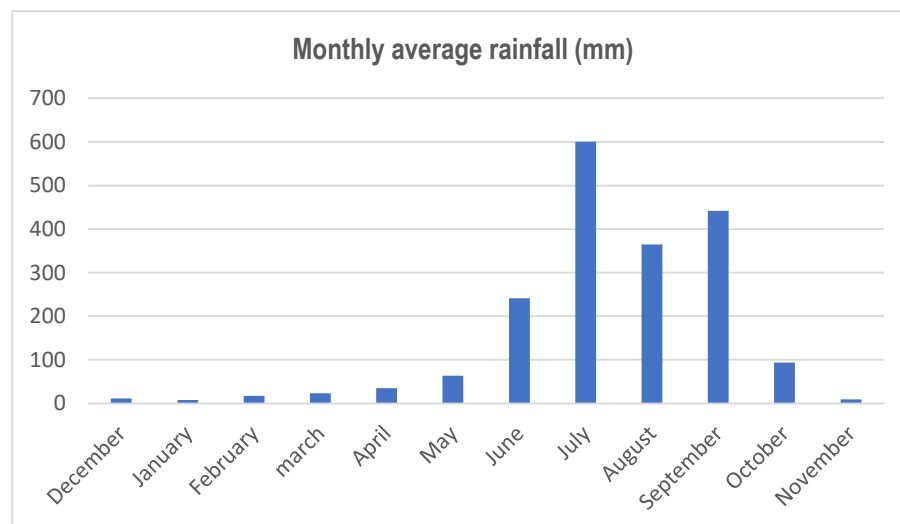


Figure 3-7: Average Rainfall in mm as per IMD

Relative Humidity : The region has reasonably moist climate except with an average value of 72% during morning. The summer season is the driest part of the year when humidity levels go below 30% especially during March and April. July to September, being the rainiest months, experience humidity level of 73% to 82% respectively in the daytime. **Figure 3.8.**

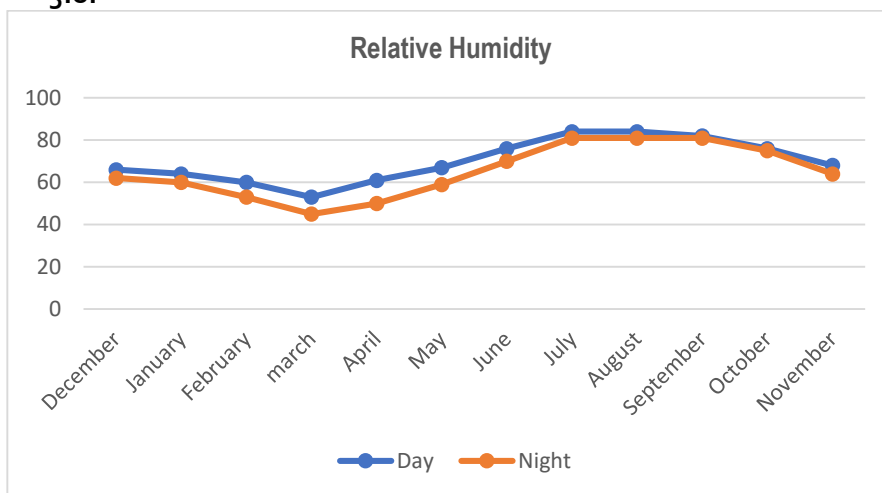
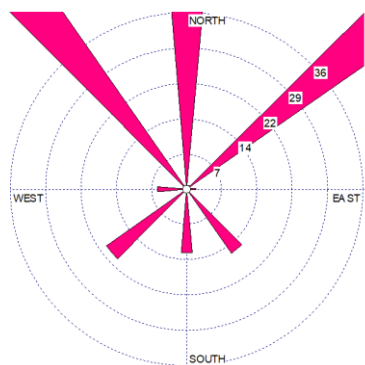
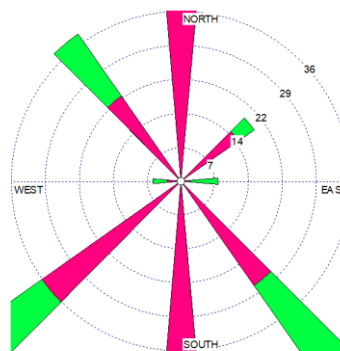


Figure 3-8: Relative Humidity during Day & Evening

Wind Pattern : The general dominant wind direction is from SW to NE. The wind-speed was found to be highest during the summer and monsoon seasons with the average wind speed of 2.6 m/s and 2.7 m/s respectively. The seasonal wind roses for the entire year is provided in **Figure 3.9.**



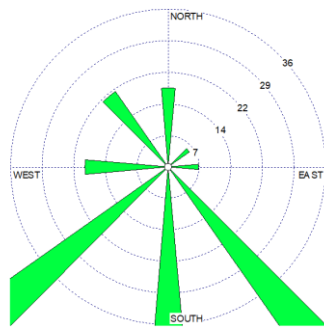
WIND SPEED (m/s)
 >= 11.10
 8.80 - 11.10
 5.70 - 8.80
 3.60 - 5.70
 2.10 - 3.60
 0.10 - 2.10
 Calms: 1.17%



WIND SPEED (m/s)
 >= 11.10
 8.80 - 11.10
 5.70 - 8.80
 3.60 - 5.70
 2.10 - 3.60
 0.10 - 2.10
 Calms: 0.33%

Winter: December - February

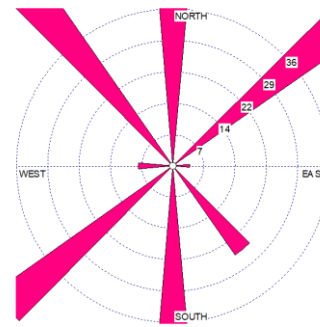
Summer: March - May



WIND SPEED
(m/s)

- >= 11.10
- 8.00 - 11.10
- 5.70 - 8.80
- 3.60 - 5.70
- 2.10 - 3.60
- 0.10 - 2.10

Calm: 0.30%



WIND SPEED
(m/s)

- >= 11.10
- 8.00 - 11.10
- 5.70 - 8.80
- 3.60 - 5.70
- 2.10 - 3.60
- 0.10 - 2.10

Calm: 2.83%

Monsoon: June - September

Post-Monsoon: October – December

Figure 3-9: Wind Direction and Speed as per IMD

3.3.2 ON-SITE METEOROLOGICAL DATA

The data on meteorological parameters in the study area were monitored for the period Post-monsoon season (October to December, 2022). The data was monitored with an automatic weather monitoring station placed near the proposed mining site. The collected data are presented in **Table 3.7** and detailed data is attached as **Annex 3.1**.

The average maximum temperature recorded during the study period was 26.6°C in October 2022 and the minimum was 19.0°C in December 2022. The average maximum Relative Humidity for the study area was 78.1% while the minimum average was 63.2%. The average maximum wind speed recorded was 11.0km/hr. Wind rose diagram (**Figure 3.10**) from the monitored data shows that the predominant wind direction during the study period was mainly North to south.

Table 3-7: Summary of the Site-Specific Meteorological Data

Month		Temperature (°C)	Wind Speed (km/hr)	Humidity (%)	Wind Direction (Degree)
October, 22	Min	17.0	0.0	22.0	45.0
	Max	35.0	9.0	100.0	360.0
	Average	26.6	1.2	78.1	274.2
November, 22	Min	18	0	29	22.5
	Max	37.0	10.0	90.0	360.0
	Average	26.2	2.2	63.2	254.4
December, 22	Min	12	0	14	45
	Max	29.4	11.0	82.0	360.0
	Average	19.0	1.8	64.2	294.8

Source: On-site monitoring by AGSS Analytical and Research Lab Pvt.Ltd.

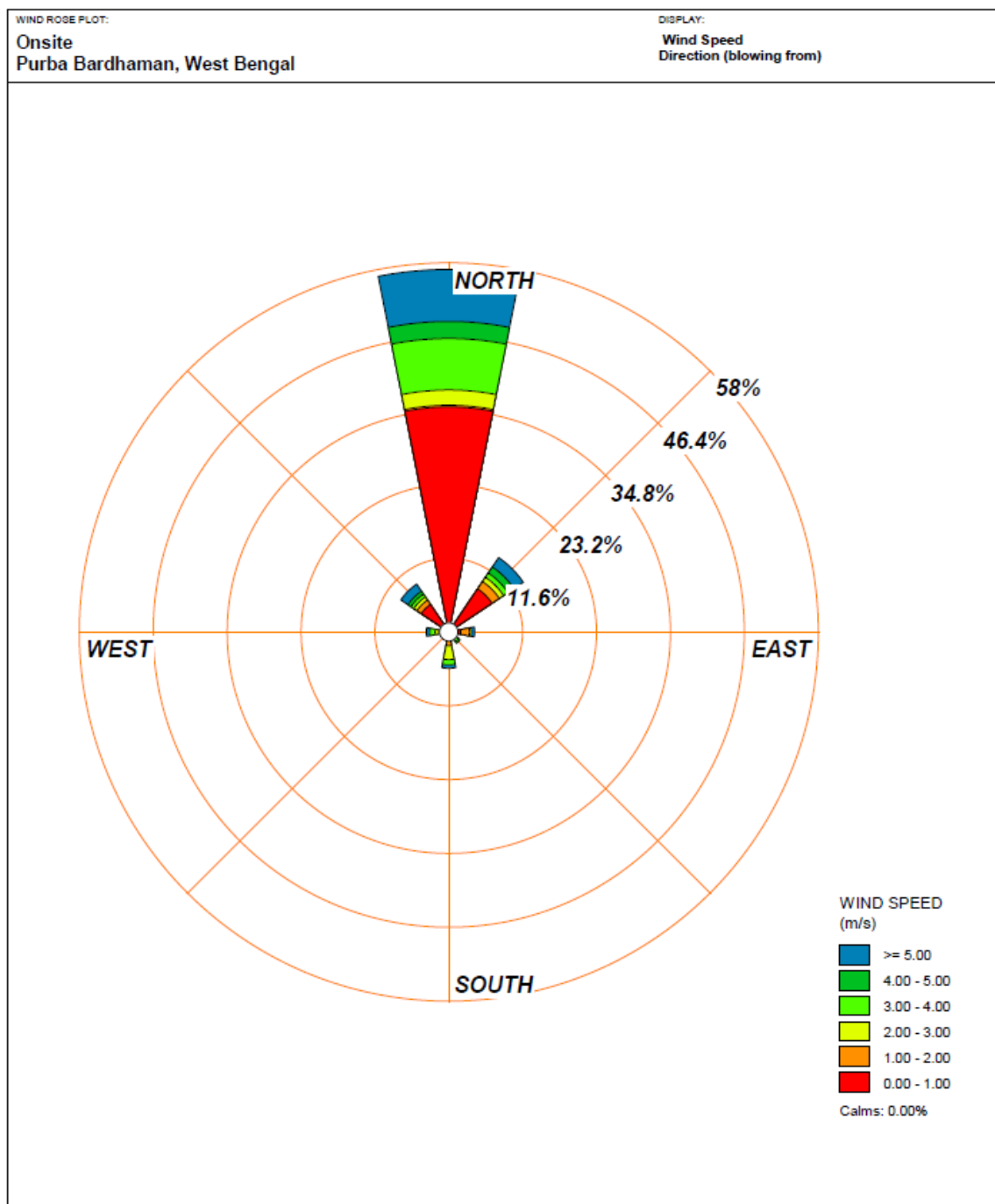


Figure 3-10: On-Site Wind Rose for Winter Season

3.3.3 SELECTION OF SAMPLING LOCATION

The selection of monitoring stations for ambient air quality was based on several factors. These factors included (i) Meteorological conditions (wind direction and wind speed); (ii) Representativeness of regional background air quality for obtaining baseline status; (iii) Representative of likely affected area; (iv) Topography of the study area; and (v) Accessibility and availability of the infrastructure.

Keeping in view the above mentioned points six ambient air quality monitoring locations were selected. The location of human habitation and other sensitive areas within the study area were also considered for selection of ambient air quality monitoring locations. The Ambient Air Quality Monitoring locations are shown in **Figure 3.10**.

3.3.4 OVERALL AMBIENT AIR QUALITY

The detailed survey results from the study period have been analysed, and key statistical values such as the 98th percentile, average, maximum, and minimum values have been calculated for various air pollutants including PM₁₀, PM_{2.5}, SO₂, NO₂, CO, and % Silica at all the ambient air quality (AAQ) monitoring stations. The summarized results for each pollutant at different locations can be found in **Table 3.8**, while more comprehensive data and information are provided in **Appendix 3.2**. The monitoring data are attached as **Annex 3.2** for reference and further analysis.

Table 3-8: Consolidated Values of AAQ (98 Percentiles)

Code & Location	Distance in km	Direction	PM ₁₀	PM _{2.5}	SO ₂	NO ₂	CO***	Si
			µg/m ³				mg/m ³	%
Standard Concentration (24hrs) *			100	60	80	80	02	
AAQ1:Near Project site	0.21	SW	84.5	39.6	14.4	19.5	0.65	0.44
AAQ2: Simsa	0.61	NE	79.8	35.5	16.9	20.8	0.63	0.48
AAQ3: Paschim Barkola	1.69	ESE	74.2	36.1	15.8	17.4	0.62	0.46
AAQ4:Parsundi	2.73	NE	64.1	25.7	10.6	15.2	0.56	0.42
AAQ5: Chichurbil	2.41	NW	82.2	37.9	14.4	18.3	0.60	0.49
AAQ6: Birkulti	2.02	SE	74.7	32.0	15.3	19.4	0.66	0.47

Source: (i) AGSS Analytical and Research Lab Pvt. Ltd. (ii) Gazette of India Notification, dated 18thNov,2009

*Annual Arithmetic Means of minimum 104 measurements in a year at a particular site taken twice a week 24 hourly at uniform intervals, ** 24 hourly or 8 hourly or 1 hourly monitored values, as applicable shall be complied with 98% of the time in a year. 2% of the time they may exceed the limits but not on two consecutive days of monitoring, *** For CO 8 hourly standard is being considered.

The inference from Table 3.8 are stated as under

- **Particulate Matter:** The 98 percentile concentration of PM₁₀ and PM_{2.5} varies from 64.1 µg/m³ (AAQ₄) to 84.5 µg/m³ (AAQ₁) and 25.7 µg/m³ (AAQ₄) to 39.6 µg/m³ (AAQ₁) respectively. The results of the monitored data indicate that concentration of Particulate Matter (PM₁₀) is well within prescribed limit of 100 µg/m³. The values of PM₁₀ obtained at all the four locations are somewhat similar. The PM_{2.5} values are also well within the prescribed limit of 60 µg/m³.
- The percentage of free silica (polymorphs of quartz, cristobalite, and tridymite) as found in the PM₁₀ samples are found as 0.44 % (AAQ₁), 0.48 % (AAQ₂), 0.46 % (AAQ₃), 0.42 % (AAQ₄), 0.49 % (AAQ₅) and 0.47 % (AAQ₆). Inhalation of respirable crystalline silica (RCS) is a cause of one of the oldest known occupational diseases, silicosis. Exposure to airborne respirable silica can also cause lung cancer and is possibly linked to a disease known as chronic obstructive pulmonary disease (COPD). Crystalline silica is abundant in the earth's crust and is found in many products and materials. There are efforts to reduce the occupational exposure limits

(OELs) for exposure to RCS in several countries, thus, many national institutes, companies, and organizations are concerned about the precision and reliability of respirable silica measurements.

- At each monitoring station, the recorded values for respirable free silica are significantly lower than the NIOSH recommended exposure limit for occupational exposure, which is 0.05 mg/m³ as a TWA for up to 10-h work shift. At each station, the values are much less.
- The World Health Organization has ranked particulate matter as the 13th leading cause of worldwide mortality. PM is a portion of air pollution that is made up of extremely small particles and liquid droplets containing acids, organic chemicals, metals, and soil or dust particles. Populations subjected to long-term exposure to particulate matter have a significantly higher cardiovascular incident and mortality rate. Short-term acute exposures subtly increase the rate of cardiovascular events within days of a pollution spike. Particulate matter also forms a film on plant leaves reducing sunlight and subsequently interfering with photosynthesis and plant growth. Acidic and alkaline materials may cause leaf surface injury while other materials may be taken up across the cuticle. The regular deposition of particulate matter on tree leaves increases the concentration of particulate matter at the place.
- **Gaseous Pollutant (SO₂, NO₂ & CO):** The major source of SO₂ and NO₂ emission are traffic density, use of oil and coal as fuel for cooking and other domestic purpose etc. The maximum and minimum SO₂ concentrations were recorded as 10.6 µg/m³ at AAQ₄ and 16.9 µg/m³ at AAQ₂. Whereas, the minimum concentration of 15.2 µg/m³ for NO₂ was recorded at AAQ₄ and maximum concentration of 20.8 µg/m³ was observed at AAQ₂. The concentration of SO₂ and NO₂ was found well within prescribed NAAQ standards.
- The lowest level of CO was observed at AAQ₄ (0.56 mg/m³) while the highest value (0.66 mg/m³) was observed at AAQ₆. These levels are found to be well within the NAAQ standard of 2.0mg/m³ for residential and industrial areas.
- PM₁₀ are particles less than 10micron in size and are mainly caused by traffic on un-metalled roads, dust from mining activities and smoke from factories. Fine particles are caused by all types of combustion, including motor vehicles, residential wood burning, forest fires, agricultural burning, etc. Sulphur dioxide gas is an inorganic gaseous pollutant. Sulphur dioxide emissions occur wherever combustion of any fuel containing sulphur takes place. Sulphur dioxide in atmosphere is significant because of its toxicity; Sulphur dioxide is capable of producing illness and lung injury. The important sources of Nitrogen dioxide are from vehicular movement.
- In the absence of any permanent pollution source in the study area, the overall ambient air quality was found to be satisfactory with all the parameters well within the standard limits as stipulated by CPCB. The only source of present pollution found in the area was from heavy vehicle movements on nearest road and burning of domestic fuel.

3.3.5 NOISE LEVEL ASSESSMENT

Assessing ambient noise levels is a crucial aspect of preparing an impact assessment report. Noise levels, especially during night time, tend to be more bothersome, especially in residential areas. The environmental impact of noise can range from annoyance to potential hearing loss, depending

on the intensity and loudness of the noise levels. Therefore, evaluating and addressing noise pollution is essential to mitigate its adverse effects on human well-being and quality of life. The monitoring for noise levels were done in 6 locations keeping considering the population and traffic of the area. The locations are depicted in **Figure 3.10**. Monitoring data are attached as **Annex 3**.

Table 3-9: Ambient Noise Levels [dB(A)]

Code & Location	Category of Area	Distance in km	Direction	Day Limits	Day			Night Limits	Night		
					L _{max}	L _{min}	L _{eq}		L _{max}	L _{min}	L _{eq}
N1: Near Project site	Residential	0.21	SW	55	57.3	53.1	54.7	45	47.8	42.6	44.2
N2: Simsa	Residential	0.61	NE	55	54.5	47.8	52.2	45	44.6	40.6	42.8
N3: Paschim Barkola	Residential	1.69	ESE	55	55.8	48.8	53.1	45	46.6	41.7	44.1
N4: Parsundi	Residential	2.73	NE	55	54.2	48.1	51.8	45	43.1	40.0	41.5
N5: Chichurbil	Residential	2.41	NW	55	54.6	49.3	52.9	45	45.7	42.1	43.9
N6: Birkulti	Residential	2.02	SE	55	51.9	46.9	50.3	45	44.7	40.0	41.8

* Silence zone is defined as an area up to 100 meters around such premises as hospitals, educational institutions and courts. The silence zones are to be declared by the competent authority.

Source: AGSS Analytical and Research Lab Pvt. Ltd.

From **Table 3.9**, it is observed that the present noise level is not exceeding the standard level of CPCB norms. The L_{eq} was recorded in the range of 50.3 to 54.7 dB(A) during daytime and 41.5 to 44.2 dB(A) during night time.

3.4 WATER ENVIRONMENT

3.4.1 DRAINAGE PATTERN IN STUDY AREA

The river system in Bardhaman includes the Bhagirathi-Hooghly in the east, the Ajay and its tributaries in the north and the Damodar and its branches in the south-west. Besides, there are innumerable Khals and old riverbeds all over the area.

The notable drainage channels are Damodar, Bhagirathi, Barakar, Ajay, Dwarakeswar, Nonia, Singaram, Tamla, Kukua, Kunur, Tumuni, Khari, Banka, Chanda-kanki nala, Behula, Gangur, Brahmani, Khandesvari, Karulia nala, Dwaraka or Babla, Koiya nala, Kandarkahal, Kanadamodar, Kananadi, Ghea, Kakinadi etc.

Ajay River running west to south-east. The Ajay River starts the journey from the Chakai block of Jamui (Origin of Ajay River) and then enters Jharkhand state near Devipur. Afterward, at Simuji, it enters West Bengal near Chittaranjan. After entering West Bengal, first, it flows between West Bardhaman district and Jharkhand, and then West Bardhaman district and Birbhum district, and forms the borders between the West Bardhaman district and Jharkhand state, and West Bardhaman district and Birbhum district. Finally, the Ajay River enters Purba Bardhaman district's Katwa subdivision at Nareng village in Ketugram police station and joins Bhagirathi River in Katwa town. The 288 km long (179 miles) river has its 152 km (94 miles) in West Bengal alone. And its catchment area is 2300 square miles or 6000 square kilometers. While the Ajay flows through

Alluvial plains in the Bradhaman district, its upper reaches flow through hilly areas with laterite soil. Previously, one could find dense forests filled with trees like Palas, Piyasal, and Saltreese in the valley of the Ajay River.

A drainage system of the district and the Study area is shown as **Figure 3.14** and **Figure 3.15**.

3.4.2 HYDROGEOLOGY

In the area underlain by older alluvium, laterite, Tertiary and Quaternary sediments, groundwater occurs under unconfined conditions within a maximum depth of 70 mbgl and the zone is tapped through a system of open dug wells and shallow tube wells. Shallow aquifers in Tertiary Formations are composed of coarse sand and gravel. Whereas, they are represented by layers of fine to medium sand with occasional gravel and pebble in Quaternary Formation. Sometimes these sand and gravels are separated by relatively thin layer of clays which makes them to occur under semi-confined to confined conditions.

Ground water systems are the result of complex combination of different lithological and structural types within an area that together constitutes an aquifer within which ground water accumulates and moves. In the major part of the district, ground water in thick unconsolidated Quaternaries and Tertiaries deposited under fluvial environment, the sand and/or gravel in different proportions of this formation constitute the main aquifer and they occur down to 295 mbgl in the central and eastern part of the district. Deeper aquifers occur under semi-confined to confined condition. Groundwater in the western part of Upper- Palaeozoic- Mesozoic- Tertiary sequences of Gondwana super group of sedimentaries occur under both unconfined and confined conditions down to 150.35 mbgl. Groundwater in the extreme north western small part of Salanpur Block occupied by the Archaean metamorphics occurs down to a depth of about 82 mbgl under both unconfined and confined conditions down to 150.35 mbgl. It mainly occurs under unconfined condition in the dug well zone and under semi confined to confined condition in the deeper horizons. In Bardhaman district, ground water occurs in semi-confined to confined aquifer conditions in the depth span of 12.00-38.00 mbgl, 31.00-55.00 mbgl and 70.00-88.00 mbgl. The hydrogeology of the district is shown in **Figure 3.16**.

3.4.3 SURFACE WATER QUALITY

The surface water samples were collected from Ajay river at two locations. Surface water qualities represent the aquatic life of an area. The parameters of surface water were compared with Designated Best Use of Water of CPCB as shown in **Appendix 3.3** and conclusions for each sample were drawn accordingly. The surface water quality as analysed and the parameter wise results are given in **Table 3.10**. The locations are depicted in **Figure 3.17**. Monitoring data are attached as **Annex 3.2**.

Table 3-10: Surface Water Quality in Study Area

Parameters	Unit	SW ₁ (Upstream)	SW ₂ (Downstream)
	Distance in km	0.57	0.62
	Direction	NE	ESE
Turbidity	NTU	<5	<5

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Parameters	Unit	SW ₁ (Upstream)	SW ₂ (Downstream)
pH	--	7.3	7.8
Conductivity (at 25°C)	µS/cm	796.2	800.5
Total Dissolve Solids	mg/l	495.5	500.9
Alkalinity as CaCO ₃	mg/l	246.0	264.0
Total Hardness as CaCO ₃	mg/l	167.4	183.9
Calcium as Ca	mg/l	43.5	49.3
Magnesium as Mg	mg/l	14.3	14.8
Sodium	mg/l	54.0	58.0
Potassium	mg/l	11.0	16.0
Bi-Carbonate	mg/l	246.0	264.0
Chloride as Cl	mg/l	31.5	35.8
Sulphate as SO ₄	mg/l	52.0	61.0
Nitrate as NO ₃	mg/l	1.20	1.26
Fluoride as F	mg/l	0.54	0.58
Phenolic compound as C ₆ H ₅ OH	mg/l	BDL (DL - 0.001)	BDL (DL - 0.001)
Cyanide	mg/l	BDL (DL - 0.008)	BDL (DL - 0.008)
Arsenic	mg/l	BDL (DL - 0.005)	BDL (DL - 0.005)
Cadmium	mg/l	BDL (DL - 0.005)	BDL (DL - 0.005)
Total Chromium	mg/l	BDL (DL - 0.005)	BDL (DL - 0.005)
Iron	mg/l	0.44	0.46
Copper	mg/l	BDL (DL - 0.005)	BDL (DL - 0.005)
Lead	mg/l	BDL (DL - 0.005)	BDL (DL - 0.005)
Manganese	mg/l	BDL (DL - 0.005)	BDL (DL - 0.005)
Mercury	mg/l	BDL (DL - 0.01)	BDL (DL - 0.01)
Zinc	mg/l	0.17	0.19
Oil & Grease	mg/l	<5	<5
DO	mg/l	7.5	7.2
BOD	mg/l	2.3	3.6
COD	mg/l	14.5	18.4
Total Coliform	MPN/100ml	1200	1400

Source: AGSS Analytical and Research Lab Pvt. Ltd.

The guidelines established by the Central Pollution Control Board (CPCB) focus on a few key parameters that help determine the best use of water for human purposes. These parameters include pH, Dissolved Oxygen (DO), Biological Oxygen Demand (BOD), and Total Coliforms. By evaluating these factors, the quality of water can be assessed and its suitability for various human applications can be determined. These guidelines provide important insights into the water's quality and its potential uses.

The pH of the surficial waters is 7.3 (SW₁) and 7.8 (SW₂) which indicates a slightly alkaline nature. In both the samples, the DO exceeds 6.0 mg/l. Higher DO signifies good quality waters and healthy environment for aquatic life. The BOD concentration is 2.3 mg/l (SW₁) and 3.6 mg/l (SW₂) signifying less pollution in the waters. Higher concentration of harmful bacteria and other microorganisms in polluted water consumes the dissolved oxygen and thus the BOD increases.

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Total coliform in the samples is within 1400 MPN/100ml. Total coliforms are a group of bacteria commonly found in water contaminated by surface water and human or animal waste.

The overall class of water for individual samples comes as "D" which signifies that water of Ajay River can be used as a drinking water source after conventional treatment and disinfection.

3.4.4 GROUND WATER QUALITY

The physico-chemical characteristics of groundwater quality are depicted in **Table 3.11** and the locations are depicted in **Figure 3.17**. Monitoring data are attached as **Annex 3.2**.

- The analysis results indicate that the pH of the samples ranges in between 7.09 to 7.35 which are well within the specified standard of 6.5 to 8.5.
- Total hardness was observed to be ranging from 92.50 to 99.10 mg/l. The maximum hardness (99.10 mg/l) was recorded at GW₄ (Chirchurbil) and the minimum (92.50 mg/l) was recorded at GW₃ (Paschim Barkola). The hardness was found to be within the acceptable limit of 300 mg/l as per IS 10500:2012.
- Chlorides were found to be in the range of 60.70 mg/l at GW₂ to 63.20 mg/l at GW₄ which is well within the specified standard of 250 mg/l, as per IS 10500:2012.
- Sulphate was found to be in the range of 14.80 mg/l to 17.50 mg/l. The maximum value observed at GW₄ whereas the minimum value observed at GW₃, which is well within the specified standard of 200 mg/l as per IS 10500:2012.
- It can be concluded that the ground water quality does not indicate any industrial contamination and meets the standards of IS 10050:2012 and therefore can be used for drinking purposes.

Table 3-11: Ground Water Quality in Study Area

Parameters	Unit	GW ₁ (Near Project Site)	GW ₂ (Simsa)	GW ₃ (Paschim Barkola)	GW ₄ (Chichurbil)
Distance in km		0.21	0.61	1.69	2.41
Direction		SW	NE	ESE	NW
Turbidity	NTU	<1	<1	<1	<1
pH	--	7.24	7.12	7.09	7.35
Conductivity	µS/cm	417.30	401.60	422.80	469.40
Total Dissolve Solids	mg/l	254.10	249.40	256.20	264.10
Alkalinity as CaCO ₃	mg/l	116.00	112.00	109.00	118.00
Total Hardness as CaCO ₃	mg/l	96.45	94.88	92.50	99.10
Calcium as Ca	mg/l	18.70	18.40	18.60	19.10
Magnesium as Mg	mg/l	12.10	11.90	11.20	12.50
Sodium	mg/l	52.50	49.20	50.40	53.60
Potassium	mg/l	2.86	2.69	2.76	2.89
Bicarbonate	mg/l	116.00	112.00	109.00	118.00
Chloride as Cl	mg/l	62.30	60.70	61.50	63.20
Sulphate as SO ₄	mg/l	16.90	15.40	14.80	17.50
Nitrate as NO ₃	mg/l	19.20	17.60	15.10	21.70

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Parameters	Unit	GW1 (Near Project Site)	GW2 (Simsa)	GW3 (Paschim Barkola)	GW4 (Chichurbil)
Fluoride as F	mg/l	0.51	0.47	0.45	0.55
Phenolic compound as C6H5OH	mg/l	BDL (DL- 0.001)	BDL (DL-0.001)	BDL (DL- 0.001)	BDL (DL - 0.001)
Cyanide	mg/l	BDL (DL- 0.008)	BDL (DL-0.008)	BDL (DL- 0.008)	BDL (DL - 0.008)
Aluminum	mg/l	BDL (DL - 0.01)	BDL (DL - 0.01)	BDL (DL - 0.01)	BDL (DL - 0.01)
Arsenic	mg/l	BDL (DL -0.005)	BDL (DL0.005)	BDL (DL-0.005)	BDL (DL-0.005)
Cadmium	mg/l	BDL (DL- 0.005)	BDL (DL-0.005)	BDL (DL- 0.005)	BDL (DL-0.005)
Chromium as Cr+6	mg/l	BDL (DL- 0.005)	BDL (DL0.005)	BDL (DL-0.005)	BDL (DL- 0.005)
Iron	mg/l	0.25	0.23	0.21	0.31
Copper	mg/l	BDL (DL-0.005)	BDL (DL-0.005)	BDL (DL-0.005)	BDL (DL-0.005)
Lead	mg/l	BDL (DL - 0.005)	BDL (DL-0.005)	BDL (DL-0.005)	BDL (DL - 0.005)
Manganese	mg/l	BDL (DL - 0.005)	BDL (DL-0.005)	BDL (DL-0.005)	BDL (DL - 0.005)
Mercury	mg/l	BDL (DL - 0.01)	BDL (DL - 0.01)	BDL (DL - 0.01)	BDL (DL - 0.01)
Zinc	mg/l	0.19	0.17	0.21	0.22

BDL: Below detection limit; DL: Detection Limit; \$: Not Specified

Source: AGSS Analytical and Research Lab Pvt. Ltd.

3.5 ECOLOGICAL ENVIRONMENT

3.5.1 FOREST IN THE STUDY AREA

There is no forest present in the Study area.

A detailed biological study of the study area i.e. 10km radius of the proposed project has been carried out to identify the composition of flora and fauna. Phytosociological study was carried out for assessment of vegetation for density, diversity, frequency and relative abundance. For fauna, random sites were selected for faunal identification. For both the parameters, data from district forest department was obtained.

Flora: The detailed phytosociological study has been attached as **Annex-3.3**. The detailed list of trees which was commonly found in the study area and cross-checked with the secondary list available at the Forest Department is given in **Table 3.13**.

Table 3-12: List of Identified Flora Species

Sl. No.	Scientific Name	Common Name	Family
(A)-TREES			
1	<i>Acacia auriculiformis</i>	<i>Akasmoni</i>	<i>Mimosaceae</i>
2	<i>Acacia nilotica</i>	<i>Indian gum Arabic tree/Babul</i>	<i>Mimosaceae</i>
3	<i>Adina cordifolia</i>	<i>Haldu</i>	<i>Rubiaceae</i>
4	<i>Aegle marmelos</i>	<i>Wood apple</i>	<i>Rutaceae</i>
5	<i>Albizia lebeck</i>	<i>Siris</i>	<i>Mimosaceae</i>
6	<i>Albizia saman</i>	<i>Rain tree</i>	<i>Mimosaceae</i>

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Sl. No.	Scientific Name	Common Name	Family
7	<i>Alstonia scholaris</i>	Chatim	Apocyanaceae
8	<i>Anacardium occidentale</i>	Cashew nut	Anacardiaceae
9	<i>Anthocephalus chinensis</i>	Kadam	Rubiaceae
10	<i>Areca catechu</i>	Betelnut palm	Palmae
11	<i>Artocarpus integrifolia</i>	Jackfruit	Moraceae
12	<i>Azadirachta indica</i>	Neem	Meliaceae
13	<i>Bauhinia accuminata</i>	Camel's foot tree	Caesalpiniae
14	<i>Bombax malabaricum</i>	Silk Cotton Tree/ Simul	Bombacaceae
15	<i>Borassus flabellifer</i>	Plamyra palm	Palmae
16	<i>Butea monosperma</i>	Bastard teak /Palash	Fabaceae
17	<i>Cassia fistula</i>	Indian Laburnum	Caesalpiniae
18	<i>Cassia siamea</i>	Chakunda	Caesalpiniae
19	<i>Casuarina equisetifolia</i>	Jhau	Casuarinaceae
20	<i>Cocos nucifera</i>	Coconut palm	Palmae
21	<i>Dalbergia sisso</i>	Sisso	Fabaceae
22	<i>Dalenia indica</i>	Moving tree/Chalta	Doleniaceae
23	<i>Delonix regia</i>	Royal poinciana /Gulmohar	Caesalpiniae
24	<i>Diospyros melanoxylon</i>	Remove tree/Kendu	Ebenaceae
25	<i>Erythrina indica</i>	Coral tree	Fabaceae
26	<i>Eucalyptus globulus</i>	Eucalyptus	Myrtaceae
27	<i>Ficus bengalensis</i>	Banyan	Moraceae
28	<i>Ficus religiosa</i>	Peepal	Moraceae
29	<i>Ficus semicordata</i>	Fig tree	Moraceae
30	<i>Gliricidia sepium</i>	Saranga	Fabaceae
31	<i>Gmelina arborea</i>	Candahar tree/Gamar	Verbanaceae
32	<i>Grewia asiatica</i>	Falsa	Tiliaceae
33	<i>Holarrhena antidysenterica</i>	Kurchi	Apocynaceae
34	<i>Lagerstroemia flosreginae</i>	Jarul	Lythraceae
35	<i>Leucaena leucocephala</i>	Subabul	Mimosae
36	<i>Litchi chinensis</i>	Litchi	Sapindaceae
37	<i>Madhuca longifolia var. latifolia</i>	Mahua	Sapotaceae
38	<i>Mangifera indica</i>	Mango	Anacardiaceae
39	<i>Manilkara zapota</i>	Sapeda	Sapotaceae
40	<i>Michella champaca</i>	Champak	Magnoliaceae
41	<i>Mimusops elengi</i>	Bullet wood/Bakul	Zapotaceae
42	<i>Moringa oleifera</i>	Drumstick tree/Sajina	Moringaceae
43	<i>Peltophorum inerme</i>	Peacock flower/Radhachura	Caesalpiniae

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Sl. No.	Scientific Name	Common Name	Family
44	<i>Phoenix sylvestris</i>	Date palm	Palmae
45	<i>Polyalthia longifolia</i>	Asoka tree/Debdaru	Anonaceae
46	<i>Pongamia glabra</i>	Karang	Fabaceae
47	<i>Psidium guajava</i>	Guava	Myrtaceae
48	<i>Pterospermum acerifolium</i>	Maple-leaved Bayur tree/Kanak Champa	Sterculiaceae
49	<i>Putranjiva roxburghii</i>	Putranjiva	Putranjivaceae
50	<i>Saraca indica</i>	Ashok	Caesalpiniae
51	<i>Sesbania grandiflora</i>	Bakful	Fabaceae
52	<i>Shorea robusta</i>	Sal Tree	Dipterocarpaceae
53	<i>Sizigium jambos</i>	Jamrul	Myrtaceae
54	<i>Sonneratia apetala</i>	Keora	Lythraceae
55	<i>Spathodea campanulata</i>	Rudrapalash	Bignoniaceae
56	<i>Swetenia mahogini</i>	Mahogany	Meliaceae
57	<i>Tamarindus indica</i>	Tamarind	Caesalpiniae
58	<i>Tectona grandis</i>	Teak	Verbanaceae
59	<i>Terminalia arjuna</i>	Arjun	Combretaceae
60	<i>Terminalia alata</i>	Asan	Combretaceae
61	<i>Thespesia populnea</i>	Tulip tree	Malvaceae
62	<i>Trema orientalis</i>	Indian Charcoal Tree	Cannabaceae
63	<i>Trewia nudiflora</i>	Pituli	Euphorbiaceae
64	<i>Ziziphus mauritiana</i>	Indian jujube	Buckthorns
65	Musaceae	Banana	Bananas
66	<i>Jatropha curcas</i>	Varenda	Spurge
67	<i>Alstonia scholaris</i>	Devil Tree	Dogbanes
68	<i>Sapindus mukorossi</i>	Indian soapberry	Sapindaceae
69	<i>Phyllanthus emblica</i>	Indian gooseberry	Phyllanthaceae
70	Oleaceae	Night Jasmine	Olives
71	<i>Morinda citrifolia</i>	Indian mulberry	Madder family
72	<i>Swietenia macrophyll</i>	Mahogany	Meliaceae
(A)-SHERBS			
1.	<i>Adhatoda vasica</i>	Basaka	Acanthaceae
2.	<i>Barleria prionitis</i>	Kantajhinti	Acanthaceae
3.	<i>Nyctanthas arbortristis</i>	Siuli	Apocyanaceae
4.	<i>Anona squamosa</i>	Custard apple	Anonaceae
5.	<i>Calotropis procera</i>	Akando	Asclepiadaceae
6.	<i>Eupatorium odoratum</i>	Siam Weed	Asteraceae
7.	<i>Ricinus communis</i>	Castorbean	Euphorbiaceae
8.	<i>Cestrum diurnum</i>	Day jasmine	Solanaceae

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Sl. No.	Scientific Name	Common Name	Family
9	<i>Datura metel</i>	<i>Dhutura</i>	<i>Solanaceae</i>
10.	<i>Solanum surattense</i>	<i>Kantakari</i>	<i>Solanaceae</i>
11.	<i>Ixora coccinea</i>	<i>Rangan</i>	<i>Rubiaceae</i>
12.	<i>Zizyphus oenoplia</i>	<i>Kul</i>	<i>Rhamnaceae</i>
13.	<i>Hyptis suaveolens</i>	<i>Bantulsi</i>	<i>Labiatae</i>
14.	<i>Leonurus sibiricus</i>	<i>Mother wort</i>	<i>Labiatae</i>
15.	<i>Tecoma stans</i>	<i>Chandaprabha</i>	<i>Bignoniaceae</i>
16.	<i>Abutilon indicum</i>	<i>Indian Mallow</i>	<i>Malvaceae</i>
17.	<i>Malachra capitata</i>	<i>Ban bhindi</i>	<i>Malvaceae</i>
18.	<i>Urena lobata</i>	<i>Caesarweed</i>	<i>Malvaceae</i>
19.	<i>Hibiscus sabdariffa</i>	<i>Chukar</i>	<i>Malvaceae</i>
20.	<i>Glycosmis pentaphylla</i>	<i>Ash-sheora</i>	<i>Rutaceae</i>
21.	<i>Murraya exotica</i>	<i>Kamini</i>	<i>Rutaceae</i>
22.	<i>Crotalaria alata</i>	<i>Bandar lathi</i>	<i>Fabaceae</i>
23.	<i>Capparis spinosa</i>	<i>Caper Bush</i>	<i>Capparaceae</i>
24.	<i>Ipomea lacunosa</i>	<i>White morning-glory</i>	<i>Convolvulaceae</i>
24.	<i>Bougainvillea spectabilis</i>	<i>Baganbilas</i>	<i>Nyctaginaceae</i>
25.	<i>Pluchea indica</i>	<i>Camphorweed</i>	<i>Asteraceae</i>
26.	<i>Phyllanthus emblicus</i>	<i>Amlaki</i>	<i>Euphorbaceae</i>
27.	<i>Lippia geminata</i>	<i>Mat grass</i>	<i>Verbanaceae</i>
28.	<i>Euphorbia trilobata</i>	-	<i>Euphorbaceae</i>
29.	<i>Opuntia dillenii</i>	<i>Common prickly pear</i>	<i>Opantiaceae</i>
30.	<i>Acanthus ilicifolius</i>	<i>Hargoza</i>	<i>Acanthaceae</i>
31.	<i>Streblus asper</i>	<i>shaora</i>	<i>Moraceae</i>
32.	<i>Ipomea fistulosa</i>	<i>Morning Glory</i>	<i>Convolvulaceae</i>
33.	<i>Jatropha gossypifolia</i>	<i>Lal bherenda</i>	<i>Euphorbaceae</i>
34.	<i>Pedilanthus tithymaloides</i>	<i>Christmas Candle</i>	<i>Euphorbaceae</i>
35.	<i>Abrus precatorius</i>	<i>Gunch</i>	<i>Malvaceae</i>
36.	<i>Lantana camara</i>	<i>Lantana</i>	<i>Vervanaceae</i>
37.	<i>Duranta plumieri</i>	<i>Sky flower</i>	<i>Vervanaceae</i>
38.	<i>Vitex negundo</i>	<i>Nisenda</i>	<i>Vervanaceae</i>
39.	<i>Clerodendron infortunatum</i>	<i>Gaestri</i>	<i>Vervanaceae</i>
40.	<i>Clerodendron inerme</i>	<i>Ghetu</i>	<i>Verbanaceae</i>
(C)- HERBS & CLIMBERS:			
1.	<i>Andrographis paniculata</i>	<i>Kalmegh</i>	<i>Acanthaceae</i>
2.	<i>Justicia simplex</i>	-	<i>Acanthaceae</i>
3.	<i>Ruellia tuberosa</i>	-	<i>Acanthaceae</i>
4.	<i>Rungia parviflora</i>	<i>Comb Rungia</i>	<i>Acanthaceae</i>

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5.	<i>Thunbergia grandiflora</i>	Bengal Clock Vine	Acanthaceae
6.	<i>Daemia extensa</i>	Chagalbati	Asclepiadaceae
7.	<i>Vinca rosea</i>	Nayantara	Apocynaceae
8.	<i>Aganosma caryophyllata</i>	Malati	Apocynaceae
9.	<i>Amaranthus spinosus</i>	Kantanotyia	Amaranthaceae
10.	<i>Celosia cristata</i>	Cockscomb	Amaranthaceae
11.	<i>Achyranthes aspera</i>	Latjira	Amaranthaceae
12.	<i>Alternanthera sessilis</i>	Joyweed	Amaranthaceae
13.	<i>Mikania scandens</i>	Climbing Hempweed	Compositae
14.	<i>Eclipta alba</i>	Bhringaraj	Compositae
15.	<i>Blumea lacera</i>	Kukurmuta	Compositae
16.	<i>Tridax procumbens</i>	Khal-muriya	Compositae
17.	<i>Vernonia cinerea</i>	-	Compositae
18.	<i>Ageratum conyzoides</i>	Uchunti	Compositae
19.	<i>Grangea maderaspatana</i>	Namuti	Compositae
20.	<i>Gnaphalium indicum</i>	-	Compositae
21.	<i>Cephalandra indica</i>	-	Cucurbitaceae
22.	<i>Gynandropsis gynandra</i>	Spider Flower	Cleomaceae
23.	<i>Cassia sophera</i>	Kasaundi	Caesalpiniae
24.	<i>Cassia tora</i>	Chakunda	Caesalpiniae
25.	<i>Acalypha indica</i>	Mukta jhuri	Euphorbiaceae
26.	<i>Croton bonplandianum</i>	Ban tulsi	Euphorbiaceae
27.	<i>Chrozophora plicata</i>	-	Euphorbiaceae
28.	<i>Desmodium gyrans</i>	Nageswar	Fabaceae
29.	<i>Ocimum sanctum</i>	Tulsi	Lamiaceae
30.	<i>Leucas aspera</i>	Ghal ghase	Lamiaceae
31.	<i>Anisomeles ovata</i>	Gopali	Lamiaceae
32.	<i>Oldenlandia corymbosa</i>	Diamond Flower	Rubiaceae
33.	<i>Dentella repens</i>	Creeping Dentella	Rubiaceae
34.	<i>Spermacoce hispida</i>	Shaggy Button Weed	Rubiaceae
35.	<i>Solanum nigrum</i>	Nightshade	Solanaceae
36.	<i>Solanum trilobatum</i>	Purple Fruited Pea Eggplant	Solanaceae
37.	<i>Nicotiana plumbaginifolia</i>	Ban tamaku	Solanaceae
38.	<i>Lippia nodiflora</i>	Lippia	Verbanaceae
39.	<i>Evolvulus nummularius</i>	Roundleaf Bindweed	Convolvulaceae
40.	<i>Ipomea quamoclit</i>	Kunja lota	Convolvulaceae
41.	<i>Canscora diffusa</i>	Kilwar	Gentianaceae
42.	<i>Hydrocotyle asiatica</i>	Thanakuni	Umbeliferae

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43	<i>Passiflora lunata</i>	<i>Jhumka lata</i>	<i>Passifloraceae</i>
44	<i>Sida cordifolia</i>	<i>Berela</i>	<i>Malvaceae</i>
45	<i>Sida rhombifolia</i>	<i>Svetbarela</i>	<i>Malvaceae</i>
46	<i>Triumfetta rhomboidea</i>	<i>Ban okra</i>	<i>Tiliaceae</i>
47	<i>Cardiospermum halicacabum</i>	<i>Lataphatkari</i>	<i>Sapindaceae</i>
48	<i>Cleome viscosa</i>	<i>Asian spider flower</i>	<i>Capparidaceae</i>
49	<i>Boerhavia repens</i>	<i>Red hogweed</i>	<i>Nyctaginaceae</i>
50	<i>Xanthium strumarium</i>	<i>Common Cocklebur</i>	<i>Compositae</i>
51	<i>Chenopodium album</i>	<i>Betho shaak</i>	<i>Chenopodiaceae</i>
52	<i>Polygonum barbatum</i>	<i>Knotweed</i>	<i>Polygonaceae</i>
53	<i>Rumex maritimus</i>	<i>Golden Dock</i>	<i>Polygonaceae</i>
54	<i>Hygrophila spinosa</i>	<i>Shulamardan</i>	<i>Acanthaceae</i>
55	<i>Pouzolzia indica</i>	-	<i>Urticaceae</i>
56	<i>Cyperus rotundus</i>	<i>Common Nut Sedge</i>	<i>Cyperaceae</i>
57	<i>Pennisetum typhoides</i>	-	<i>Poaceae</i>
58	<i>Saccharum spontaneum</i>	<i>Kash</i>	<i>Poaceae</i>
59	<i>Imperata arundinacea</i>	<i>Cogon grass</i>	<i>Poaceae</i>
60	<i>Cynodon dactylon</i>	<i>Durba grass</i>	<i>Poaceae</i>
61	<i>Eleusine aegyptiaca</i>	<i>Goosegrass</i>	<i>Poaceae</i>
62	<i>Setaria glauca</i>	<i>Begun grass</i>	<i>Poaceae</i>
63	<i>Argemone mexicana</i>	<i>Siyal-Kanta</i>	<i>Papavaraceae</i>
64	<i>Potrasia coarctata</i>	-	<i>Poaceae</i>
65	<i>Fleurya interrupta</i>	<i>Bichua/Bichuti</i>	<i>Urticaceae</i>
66	<i>Vitis quadrifida</i>	-	<i>Vitaceae</i>
67	<i>Physalis peruviana</i>	<i>Cape Gooseberry</i>	<i>Solanaceae</i>
68	<i>Oxalis corniculata</i>	<i>Amrulshak</i>	<i>Oxalidaceae</i>
69	<i>Parthenium hysterophorus</i>	<i>Parthenium</i>	<i>Compositae</i>
70	<i>Derris pinnata</i>	<i>Panlata</i>	<i>Papilionaceae</i>
71	<i>Justicia gendarussa</i>	<i>Jagatmadan</i>	<i>Acanthaceae</i>
72	<i>Vallisneria spiralis</i>	<i>Ganj or pata-sola</i>	<i>Hydrocharitaceae</i>
73	<i>Hydrilla verticillata</i>	<i>Jhangi</i>	<i>Hydrocharitaceae</i>
74	<i>Potamogeten indicus</i>	<i>Pond weed</i>	<i>Pondweed family</i>
75	<i>Jussiaea repens</i>	<i>Kesar-dam</i>	<i>Onagraceae</i>
76	<i>Eragrostis Cynosuroides</i>	<i>Kush</i>	<i>Poaceae</i>
77	<i>Utricularia Stellaris</i>	<i>common Jhangi</i>	<i>Lentibulariaceae</i>
78	<i>lemna paucicostata</i>	<i>Pana</i>	<i>Arums</i>
79	<i>Eichhornia crassipes</i>	<i>water hyacinth</i>	<i>Pontederiaceae</i>
80	<i>nelumbo nucifera</i>	<i>Padma</i>	<i>Nelumbonaceae</i>

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Sl. No.	Scientific Name	Common Name	Family
81	<i>Typha domingensis</i>	<i>hogla</i>	<i>Bulrushes</i>
(D)- FERNS			
1.	<i>Pteris longifolia</i>	-	<i>Polypodiaceae</i>
2.	<i>Diplazium sp.</i>	-	<i>Polypodiaceae</i>
3.	<i>Nephrolepis sp.</i>	-	<i>Polypodiaceae</i>
4.	<i>Drinaria sp.</i>	-	<i>Polypodiaceae</i>

Source: (i) Primary survey by Chaitanya Team (ii) Interaction with local people

Fauna: The description is based on the field investigation, reports of Forest Department and queries with local inhabitants. Although the Forest department records the presence of few Schedule I species, no such records could be established during field visit or during interaction with local people.

No significant faunal group was observed during the study period. As reported by local inhabitants, the faunal groups are mostly restricted towards the forested areas. The list of major terrestrial fauna in the study area is given in **Table 3.13**.

Table 3-13: List of Major Terrestrial and Avi-Fauna in the Study Area

Sl. No.	Scientific Name	Common Name	Occurrence
A. Mammals			
1.	<i>Viverricula india indica (Desmarest)</i>	<i>Small Indian Civet</i>	<i>Rare</i>
2.	<i>Paradoxurus hermaphroditus</i>	<i>Palm Civet</i>	<i>Common</i>
3.	<i>Funumbulus pennanti</i>	<i>Five Striped Squirrel</i>	<i>Common</i>
4.	<i>Rattus rattus rufescens (Gray)</i>	<i>House Rat</i>	<i>Common</i>
5.	<i>Rattus rattus arboreus (Horsefield)</i>	<i>Tree Rat</i>	<i>Common</i>
6.	<i>Mus musculus castaneus (Waterhouse)</i>	<i>House Mouse</i>	<i>Common</i>
7.	<i>Mus musculus urbanus (Hodgson)</i>	<i>House Mouse</i>	<i>Common</i>
8.	<i>Cynopterus sphinx sphinx (Vahl)</i>	<i>Short-nosed Fruit-bat</i>	<i>Common</i>
9.	<i>Rousettus leschenaulti leschenaulty (Desmarest)</i>	<i>Fulvous Fruit-Bat</i>	<i>Common</i>
10.	<i>Vulpes bengalensis (Shaw)</i>	<i>Bengal Fox</i>	<i>Rare</i>
11.	<i>Mus booduga booduga Gray</i>		<i>Common</i>
B. Reptiles			
1.	<i>Hemidactylus brooki (Gray)</i>	<i>Brook's gecko</i>	<i>Common</i>
2.	<i>Hemidactylus flaviviridis (Ruppell)</i>	<i>Northern house gecko</i>	<i>Common</i>
3.	<i>Calotes versicolor (Daudin)</i>	<i>Common Garden lizard</i>	<i>Common</i>
4.	<i>Mabuya craniata (Schneider)</i>	<i>Common or Brahminy skink</i>	<i>Common</i>
5.	<i>Mabuya macularia (Blyth)</i>	<i>Little Skink</i>	<i>Common</i>
6.	<i>Typhlops acutus (Dummeril & Bibron)</i>	<i>Beaked worm or Blind Snake</i>	<i>Common</i>

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Sl. No.	Scientific Name	Common Name	Occurrence
7.	<i>Lycodon aulicus</i> (Linn.)	Common wolf snake	Common
8.	<i>Ptyas mucosus</i> (Linn.)	Dhaman or Common Rat Snake	Common
9.	<i>Xenochrophis piscator</i> (Schneider)	Checkedred Keel back	Common
10.	<i>Bungarus caeruleus</i> (Schneider)	Common Indian Krait	Common
11.	<i>Natrix natrix</i>	grass snakes	Common
D. Birds			
1.	<i>Ardea cinerea</i> (Linn.)	Grey Heron	R
2.	<i>Ardea purpurea</i> (Meyea)	Purple Heron	R
3.	<i>Ardeola grayii</i> (Sykes)	Pond Heron	R
4.	<i>Bubulcus ibis coromandra</i> (Boedaert)	Cattle egret	R
5.	<i>Ardea alba</i> (Linn.)	Large Egret	R
6.	<i>Egretta garzetta</i> (Linn.)	Little egret	R
7.	<i>Dendrocygna javanica</i> (Horsefield)	Lesser Whistling Teal	R/M
8.	<i>Anas acuta</i> (Linn.)	Pintail	M
9.	<i>Nettapus coromandelianus</i>	Cotton Teal	R
10.	<i>Sarkidiornis melanotos</i>	Comb Duck	M
11.	<i>Tringa ochropus</i>	Green Sandpiper	M
12.	<i>Tringa hypoleucos</i> Linn.	Common Sandpiper	R/M
13.	<i>Streptopelia decaocto</i> (Frivoldszky)	Indian Ringed Dove	R
14.	<i>Streptopelia tranquebarica</i> (Temminck)	Red Turtle Dove	R
15.	<i>Streptopelia chinensis</i> (Gmelin)	Spotted Dove	R
16.	<i>Eudynamis scolopacea</i> (Linn.)	Koel	R
17.	<i>Centropus sinensis</i> (Stephens)	Coucal	R
18.	<i>Apus affinis</i> (J. E. Gray)	House Swift	R
19.	<i>Cypsiurus parvus</i> (J. E. Gray)	Palm Swift	R
20.	<i>Alecdo athis</i> (Linn.)	Common Kingfisher	R
21.	<i>Merops orientalis</i> (Latham)	Green Bee-eater	R
22.	<i>Coracias benghalensis</i> (Linn.)	Indian Roller	lm
23.	<i>Hirundo rustica</i> Linn.	Swallow	M
24.	<i>Oriolus xanthornus</i> (Linn.)	Black-headed oriole	R
25.	<i>Dicrurus adsimilis macrocercus</i> (Vieillot)	Black Drongo	R
26.	<i>Stunus malabaricus</i>	Greyheaded Myna	R
27.	<i>Sturnus contra</i> (Linn.)	Pied Myna	R
28.	<i>Acredotheres fuscus</i> (Wagler)	Jungle Myna	R

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29.	<i>Acredotheres tristis</i> (Linn.)	Common Myna	R
30.	<i>Corvus splendens</i> (Vieillot)	House Crow	R
31.	<i>Turdoides striatus</i>	Jungle Babbler	R
32.	<i>Cisticola juncidis cursitaus</i> (Franklin)	Streaked Fantail Warbler	R
33.	<i>Orthotomus sutories patia</i> (Hodgson)	Tailor bird	R
34.	<i>Acrocephalus dumetorum</i> (Blyth)	Blyth's Reed Warbler	M
35.	<i>Anthus nonaesuleudiae rufulus</i> (Vieillot)	Paddy Field Pipit	M
36.	<i>Motacilla alba dukhunensis</i> (Sykes)	Pied Wagtail	M
37.	<i>Nectarinia zeylonica sola</i> (Vieillot)	Purple-rumped Sunbird	R
38.	<i>Nectirinia asiatica</i>	Purple Sunbird	R
39.	<i>Passer domesticus</i> (Jardine & Selby)	House Sparrow	R
40.	<i>Lonchura punctulata</i> (Linn.)	Spotted Munia	R
41.	<i>Amaurornis phoenicurus</i> (Boddaert)	Whitebreasted waterhen	R
42.	<i>Gallinula chloropus</i>	Moorhen	R/M
43.	<i>Porphyrio porphyrio poliocephala</i> (Latham)	Purple Moorhen	Lm
44.	<i>Fulica atra</i> (Linn.)	Coot	M
45.	<i>Phalacrocorax carbo</i>	Cormorant	Lm
46.	<i>Phalacrocorax niger</i>	Little Cormorant	R
47.	<i>Anhinga rufa</i>	Darter	R
48.	<i>Psittacula eupatria</i> (Linn.)	Alexandrine Parakeet	R
49.	<i>Psittacula krameri</i> (Neumann)	Roseringed Parakeet	R
50.	<i>Psittacula cyanocephala</i>	Blossom Headed Parakeet	R
51.	<i>Gallus sp.</i>	jungle-fowl	R
52.	<i>Corvus macrorhynchos</i>	jungle crow	R
53.	<i>Dendrocitta Vagabunda</i>	treepie	R
54.	<i>Turdoide scaudata</i>	common babbler	R
55.	<i>chloropsis aurifrons</i>	gold fronted chloropsis	R
56.	<i>Pycnonotus cafer</i>	red-vented bulbul	R
57.	<i>Erythropygia hartlaubi</i>	brown backed robin	R
58.	<i>copsychus malabaricus</i>	Shama	R
59.	<i>Cyornis tickelliae</i>	Tickell's blue flycatcher	R
60.	<i>Tephrodornis pondicerianus</i>	wood shrike	R
61.	<i>dicrurus macrocercus</i>	black drongo	R
62.	<i>Gracupica contra</i>	Indian pied myna	R
63.	<i>Upupidaesp</i>	hoopoe	R

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64.	<i>Bubovirginianus</i>	<i>horne dowl</i>	R
65.	<i>gyps fulvus</i>	<i>griffon vulture</i>	R
66.	<i>Clanga clanga</i>	<i>small spotted eagle</i>	R

Source: (i) Primary survey by Chaitanya Team (ii) Interaction with local people

3.6 SOCIAL ENVIRONMENT

The sand mine is situated in Desher Mohan village, Paschim Bardhaman district, West Bengal. The socio-economic profile of the area offers valuable insights into various aspects such as population growth rate, population density, gender ratio, work participation rate, and a description of the vulnerable population within the study area. This information helps to understand the demographic characteristics, economic activities, and social dynamics of the local population residing in the vicinity of the sand mine.

3.6.1 DEMOGRAPHIC PROFILE

There are 136 villages in the study area. These villages have 39,355 households accumulating 1,90,280 populations. According to the survey, gender ratio of study area was 924 in 2011. The details are given in **Table 3.14**.

Table 3-14: Demographic Profile of Study Area

No. of Households	Total Population	Male	Female	Total (0-6 years)	Male (0-6 years)	Female (0-6 years)
39,355	1,90,280	98,798	91,282	25,365	13,201	12,164

Source: Primary Census Abstract of India 2011 and District and Census Handbook 2001 & 2011

3.6.2 VULNERABLE POPULATION

As per 2011 census, the study area has about 27.47% scheduled caste population and 12.27% scheduled tribe population. (Refer **Table 3.15**).

Table 3-15: Vulnerable Population in the Study Area

SC	in%	Male	Female	ST	in%	Male	Female
52,275	27.47	26,891	25,384	23,352	12.27	11,738	11,614

Source: Primary Census Abstract of India 2011 and District and Census Handbook 2001 & 2011

3.6.3 LITERACY RATE

Literacy is one of the most significant indicators of human and social development. This not only reflects on the educational attainment of the population but also reflects on the status of women, caste equation and economic condition of a particular area. It also shows the skill level of the people and their capability to get trained and work. **Table 3.16** indicates the gender-wise literacy rate of the people in the study area.

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Table 3-16: Literacy Rate in the Study Area

Total Literacy	Male	Female	Total ill-literacy	Male	Female
1,11,716	65,997	45,419	78,564	32,501	46,063

Source: Primary Census Abstract, Census of India, 2011

3.6.4 OCCUPATIONAL STRUCTURE

In the villages around the study area, people mainly earn from agriculture and animal rearing. Details are furnished in Table 3.17.

Table 3-17: Category of Workers in the Block

Total Worker	Male	Female	Main Worker	Male	Female	Marginal Worker	Male	Female
66,560	54,138	12,415	39,001	34,682	4,325	27,553	19,553	8,090

Source: Primary Census Abstract, Census of India, 2011

3.6.5 INFRASTRUCTURE FACILITIES

Educational Facilities: Details of primary schools, numbers of middle school, secondary school and senior secondary schools are furnished in Table 3.18.

Table 3-18: Educational Facilities in the Block

Block name	Primary school	Middle school	Secondary school	Senior Secondary school	Degree college of arts science & commerce	Degree college of engineering
Khoyrasol	119	35	24	15	0	0
Jamuraia	37	12	7	4	1	0
Barabani	45	10	4	1	0	0
Nala	194	82	13	8	1	0
Kundhit	135	53	6	2	1	0

Source: Primary Census Abstract, Census of India, 2011

Health Facilities: Details of Community health centre, primary health centres maternity and child welfare centres, Family welfare centre, are furnished in Table 3.19.

Table 3-19: Health Facilities in the Block

Block name	Community health centre	Primary health centre	Maternity and child welfare centre	Family welfare centre
Khoyrasol	3	4	1	0
Jamuria	2	6	1	2
Barabani	0	2	1	1
Nala	1	5	1	2
Kundhit	0	4	2	0

Source: Primary Census Abstract, Census of India 2011

Banking and Post Office Facilities: Details of Post office, Commercial & Co-operative bank, ATM Agricultural Credit Society, are furnished in **Table 3.20**.

Table 3-20: Financial Institutions in the Block

Block name	P.O.	Commercial & Co-operative bank	ATM	Agricultural credit Society
Khoyrasol	15	5	0	3
Jamuria	5	2	0	1
Barabani	5	1	1	0
Nala	20	12	6	7
Kundhit	11	6	1	1

Source: Primary Census Abstract, Census of India, 2011

Appendix-3.1: Analytical Technique for Soil Sample

Sl. No.	Parameters	Analytical Method	Reference
1	Soil Color	-	-
2	Texture	Sieve analysis & Hygrometer	-
3	Moisture Content	Gravimetric	Department of Agriculture & Cooperation, Govt of India Page No. 76-77:2011
4	pH	pH meter	IS2720- Part 26, 1987 by pH meter
5	Electrical Conductivity (1:2)	Conductivity meter	Department of Agriculture & Cooperation, Govt of India Page No. 81-82:2011
6	Bulk Density	Sand replacement, core cutter	TM-S/34
7	Organic Carbon	Calculation	IS2720-(Part 22),1972, Reaffirmed 2001 (By Calculation)
8	Organic Matter	Black method	IS2720-(Part 22),1972, Reaffirmed 2001
9	Nitrogen	Distillation & Titration	TM-S/17
10	Phosphorus	Spectrophotometric	TM-S/11
11	Potassium	Flame Photometric	TM-S/13
12	Infiltration Rate	-	TM-S/40
13	Porosity	-	TM-S/33

Appendix-3.1: Standard Classification of Soil

1	pH: (i) <4.5 Extremely acidic; (ii) 4.51- 5.50 Very strongly acidic; (iii) 5.51-6.0 moderately acidic; (iv) 6.01-6.50 slightly acidic; (v) 6.51-7.30 Neutral; (vi) 7.31-7.80 slightly alkaline; (vii) 7.81-8.50 moderately alkaline; (viii) 8.51-9.0 strongly alkaline; (ix) 9.01 very strongly alkaline
2	Salinity Electrical Conductivity (ppm) (1 ppm = 640 µmhos/cm): (i) Up to 1.00 Average; (ii) 1.01-2.00 harmful to germination; (iii) 2.01-3.00 harmful to crops (sensitive to salts)
3	Organic Carbon (%): (i) Up to 0.2: very less; (ii) 0.21-0.4: less; (iii) 0.41-0.5 medium; (iv) 0.51-0.8: on an average sufficient; (v) 0.81-1.00: sufficient and (vi) >1.0 more than sufficient
4	Nitrogen (kg/ha): (i) Up to 50 very less; (ii) 51-100 less; (iii) 101-150 good; (iv) 151-300 Better and (v) >300 sufficient
5	Phosphorus (kg/ha): (i) Up to 15 very less; (ii) 16-30 less; (iii) 31-50 medium, (iv) 51-65 on an average sufficient; (v) 66-80 sufficient and (vi) >80 more than sufficient
6	Potassium (kg/ha): (i) 0 -120 very less; (ii) 120-180 less; (iii) 181-240 medium; (iv) 241-300 average; (v) 301-360 better and (vi) >360 more than sufficient

Source: Handbook of Agriculture, Indian Council of Agriculture Research, New Delhi

APPENDIX 3.2: ANALYSIS OF BASELINE CONCENTRATION

The analysis of air samples was carried out as per the method as described in the applicable standard codes. The result of the analysis has been summarized below.

Concentration of Ambient Air Pollutant of Study Area

PM ₁₀						
	Min	Max	STDEV	Percentile g8	Mean	NAAQS
AAQ1	78.5	85.0	1.7	84.5	82.0	100
AAQ2	71.5	80.4	1.9	79.8	75.9	100
AAQ3	65.3	74.3	2.3	74.2	70.1	100
AAQ4	60.1	64.5	1.0	64.1	62.5	100
AAQ5	65.2	83.7	4.6	82.2	74.7	100
AAQ6	64.8	75.1	2.8	74.7	69.1	100

PM _{2.5}						
	Min	Max	STDEV	Percentile g8	Mean	NAAQS
AAQ1	33.2	40.2	2.0	39.6	36.0	60
AAQ2	28.5	35.8	1.9	35.6	32.5	60
AAQ3	26.0	36.6	2.4	36.2	32.4	60
AAQ4	19.6	26.0	1.5	25.7	23.3	60
AAQ5	31.9	38.1	1.9	37.9	34.6	60
AAQ6	24.7	32.5	2.1	32.0	27.5	60

SO ₂						
	Min	Max	STDEV	Percentile g8	Mean	NAAQS
AAQ1	9.9	14.7	1.1	14.4	12.4	80
AAQ2	14.3	17.0	0.8	16.9	15.3	80
AAQ3	13.1	15.8	0.8	15.8	14.2	80
AAQ4	8.3	10.6	0.7	10.6	9.4	80
AAQ5	10.6	14.4	1.2	14.4	12.5	80
AAQ6	10.2	15.3	1.5	15.3	13.8	80

NO ₂						
	Min	Max	STDEV	Percentile g8	Mean	NAAQS
AAQ1	14.2	19.7	1.6	19.5	17.0	80
AAQ2	16.1	20.8	1.4	20.8	18.6	80
AAQ3	13.4	17.5	1.4	17.4	15.3	80
AAQ4	12.0	15.5	1.1	15.2	13.6	80
AAQ5	13.7	18.4	1.4	18.3	16.1	80
AAQ6	13.5	19.4	1.6	19.4	17.2	80

CO						
	Min	Max	STDEV	Percentile g8	Mean	NAAQS
AAQ1	0.56	0.65	0.02	0.65	0.62	2
AAQ2	0.51	0.63	0.03	0.63	0.57	2

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AAQ3	0.44	0.62	0.05	0.62	0.55	2
AAQ4	0.42	0.56	0.04	0.56	0.49	2
AAQ5	0.41	0.60	0.05	0.60	0.50	2
AAQ6	0.42	0.66	0.06	0.66	0.54	2

% Silica						
	Min	Max	STDEV	Percentile 98	Mean	NAAQS
AAQ1	0.35	0.44	0.03	0.44	0.40	-
AAQ2	0.39	0.48	0.02	0.48	0.44	-
AAQ3	0.32	0.46	0.04	0.46	0.40	-
AAQ4	0.36	0.42	0.02	0.42	0.40	-
AAQ5	0.38	0.49	0.02	0.49	0.45	-
AAQ6	0.21	0.47	0.07	0.47	0.39	-

Source: AGSS Analytical and Research Lab Pvt. Ltd.

Appendix 3.3: Designated Best Use of Water as per CPCB

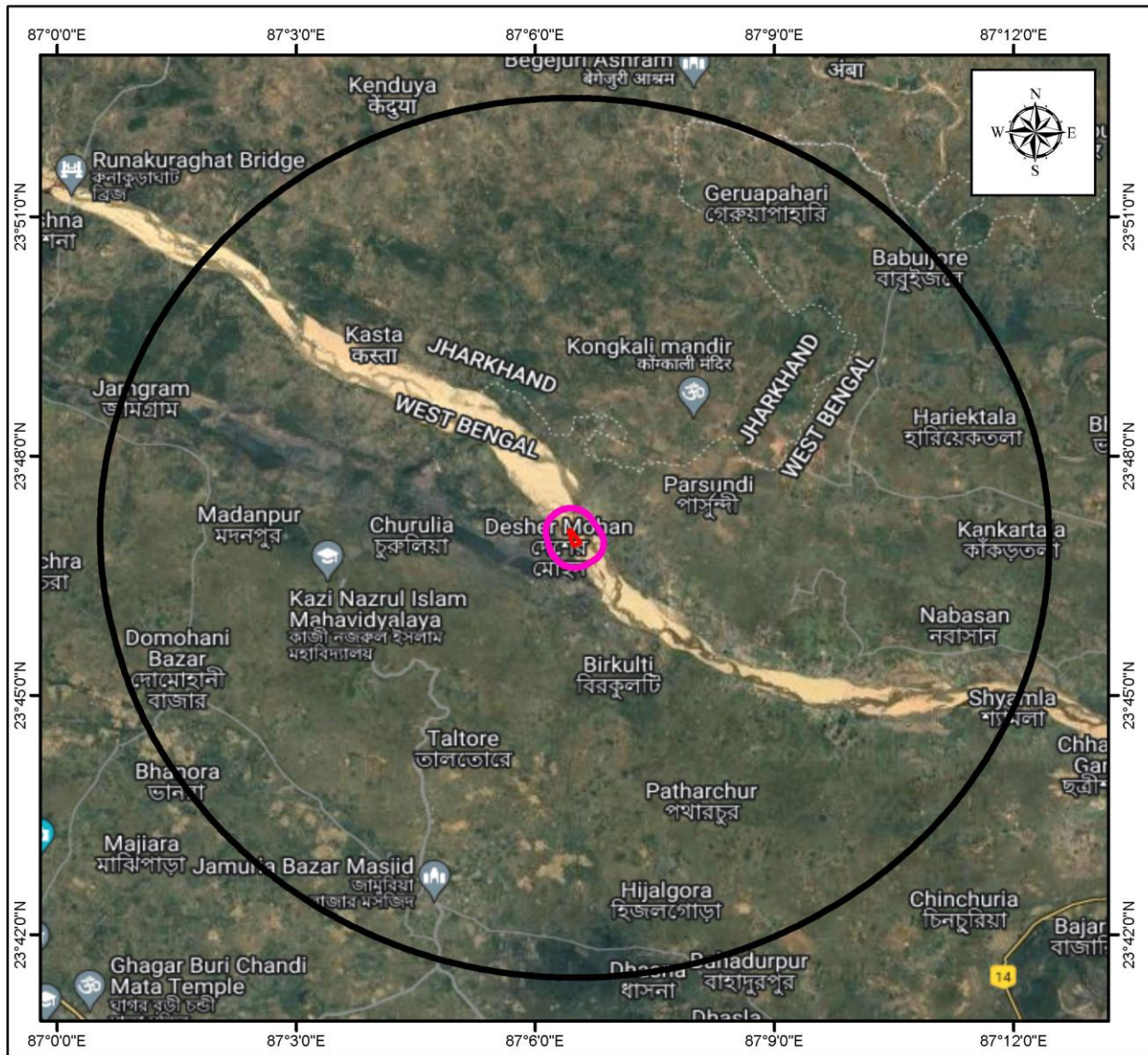
Designated Best Use	Class of Water	Criteria
Drinking water source without conventional treatment but after disinfection	A	<ul style="list-style-type: none"> ○ Total Coliforms Organism MPN/100ml shall be 50 or less ○ pH between 6.5 and 8.5 ○ Dissolved Oxygen 6mg/l or more ○ Biochemical Oxygen Demand 5 days 20°C 2mg/l or less
Outdoor bathing (Organized)	B	<ul style="list-style-type: none"> ○ Total Coliforms Organism MPN/100ml shall be 500 or less ○ pH between 6.5 and 8.5 ○ Dissolved Oxygen 5mg/l or more ○ Biochemical Oxygen Demand 5 days 20°C 3mg/l or less
Drinking water source after conventional treatment and disinfection	C	<ul style="list-style-type: none"> ○ Total Coliforms Organism MPN/100ml shall be 5000 or less ○ pH between 6 to 9 ○ Dissolved Oxygen 4mg/l or more ○ Biochemical Oxygen Demand 5 days 20°C 3mg/l or less
Propagation of Wild life and Fisheries	D	<ul style="list-style-type: none"> ○ pH between 6.5 to 8.5 ○ Dissolved Oxygen 4mg/l or more ○ Free Ammonia (as N) 1.2 mg/l or less
Irrigation, Industrial Cooling, Controlled Waste disposal	E	<ul style="list-style-type: none"> ○ pH between 6.0 to 8.5 ○ Electrical Conductivity at 25°C micro mhos/cm Max.2250 ○ Sodium adsorption Ratio Max. 26 ○ Boron Max. 2mg/l
	Below-E	Not Meeting A, B, C, D & E Criteria

Source: Central Pollution Control Board (CPCB), Delhi

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CHAPTER-03
DESCRIPTION OF ENVIRONMENT



Legend

- Project Site
- 500 m buffer (Core Zone)
- 10 Km Buffer (Buffer Zone)

Figure No : 3.1

Map

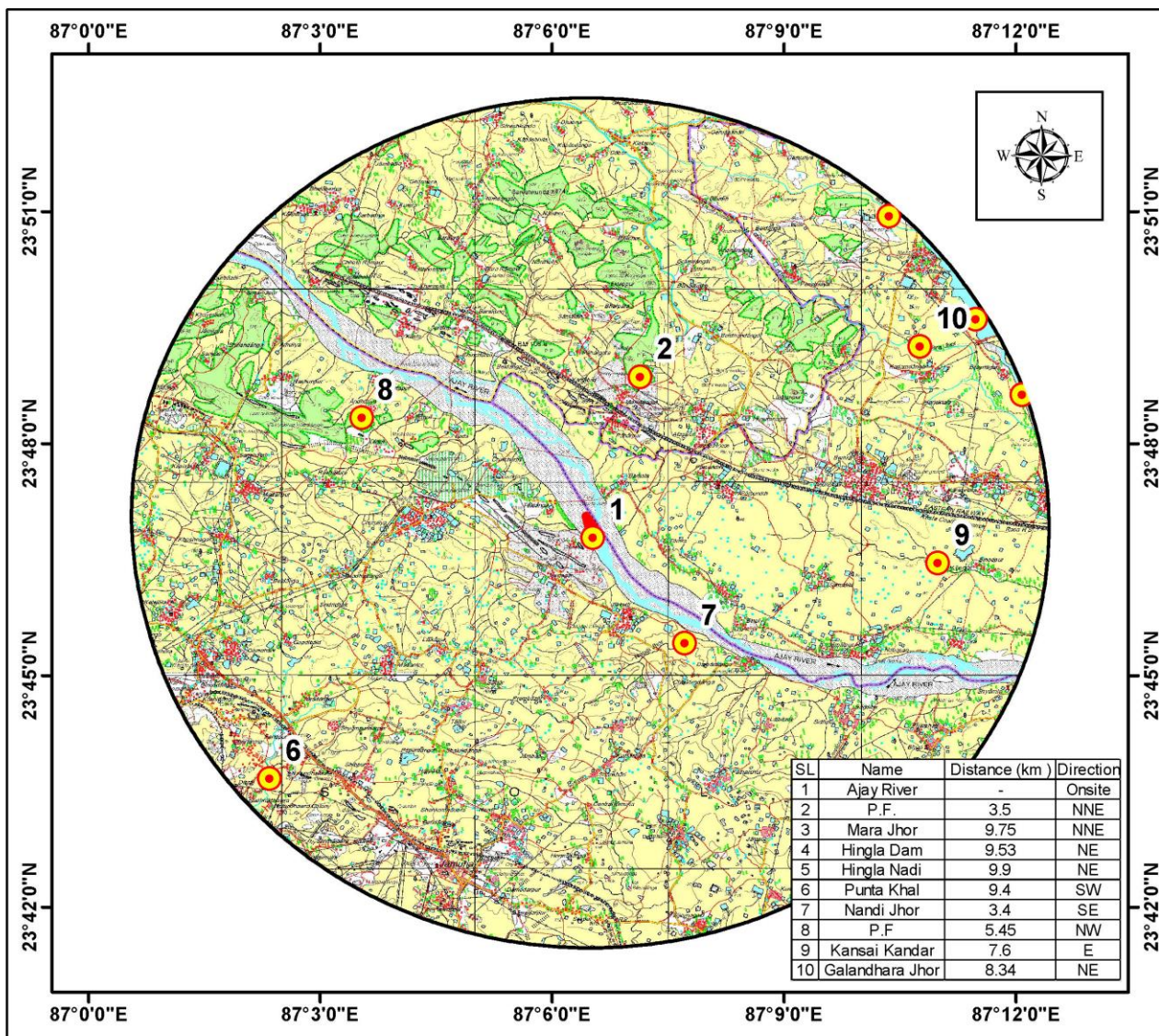
Study area map(Core Zone & Buffer Zone)
 of the Project site
 (10 Km buffer of the Project site location)

**River Bed Sand Mining Project of
 Desher Mohan Sand Mine**
 Mouza-Desher Mohani,P.S.- Jamuria
 District- Paschim Bardhaman, W.B.
 Area- 9.44 Acre/ 3.82 Ha
Project Proponent
 Koilash Mahato

Graphic scale



Figure 3-1: Study area Map (Core Zone & Buffer Zone)

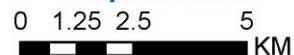


Legend

- Env Sen Location
- 10 Km Buffer
- Project Site

Figure No : 3.2

Graphic scale



River Bed Sand Mining Project of
Desher Mohan Sand Mine
 Mouza-Desher Mohani, P.S.- Jamuria
 District- Paschim Bardhaman, W.B.
 Area- 9.44 Acre/ 3.82 Ha
Project Proponent
 Koilash Mahato

Map
 Environment Sensitive Locations map
 of the Project site
 (10 Km buffer of the Project site location)

Figure 3-2: Environment Sensitive Location Map

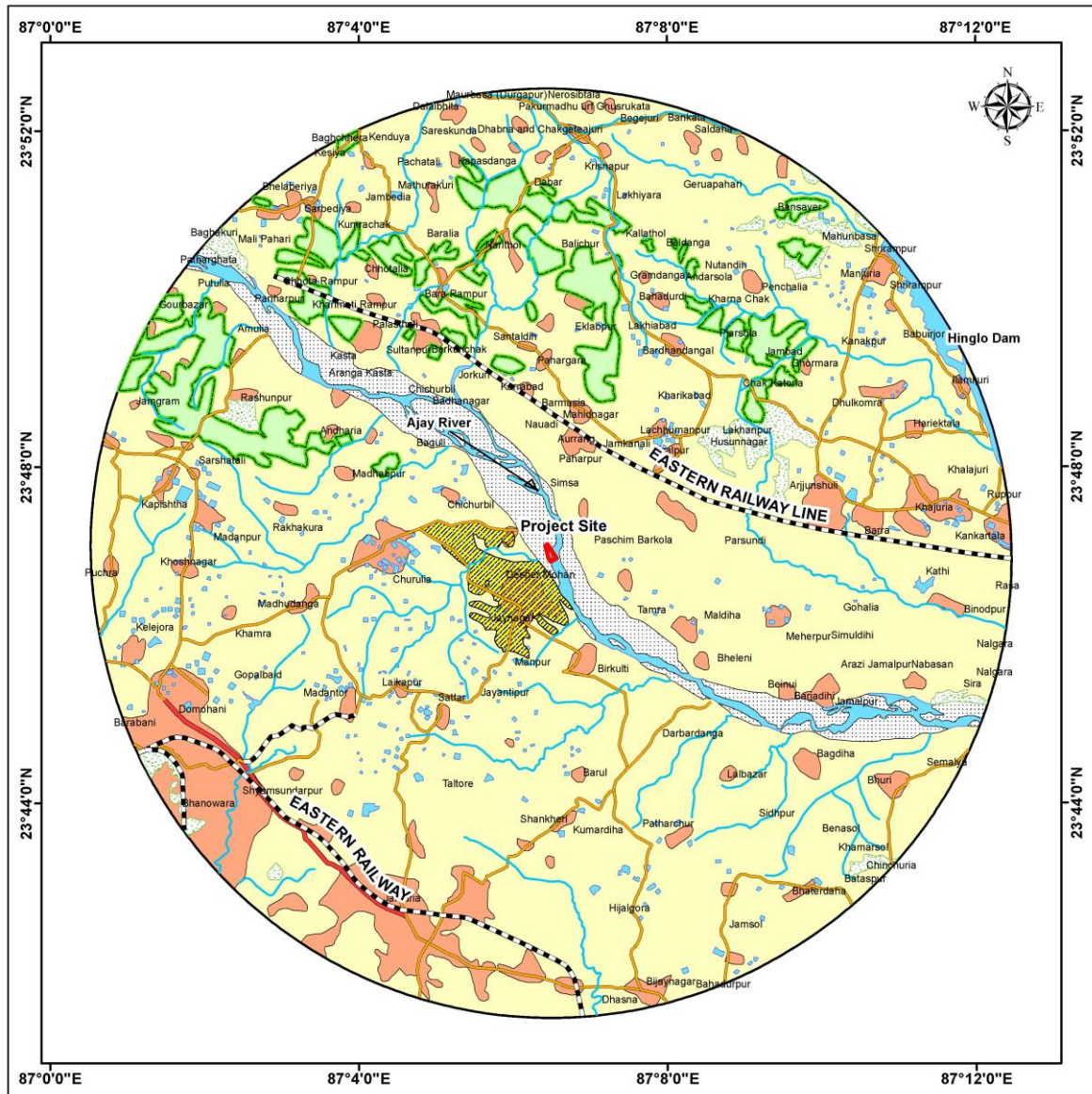
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Legend

- Railway Line
- Nala
- Minor Roads
- Major Roads
- Project Site
- Quarry
- Forest
- Open Scrub
- Sandy Area
- Water Bodies
- Builtup
- Agricultural Land
- 10 Km Buffer

Figure No : 3.3

LULC Breakup			
Sl	Land Types	Area (Ha)	Percentage
1	Project Site	3.82	0.01
2	Open scrub	523.00	1.62
3	Forest	1,672.23	5.18
4	Builtup	3,258.55	10.08
5	Water Bodies	915.79	2.83
6	Sandy Area	1,211.32	3.75
7	Coal Quarry	403.91	1.25
8	Agricultural Land	24,323.93	75.28
Total		32,312.55	100.00

River Bed Sand Mining Project of Desher Mohan Sand Mine
Mouza-Desher Mohani, P.S.- Jamuria
District- Paschim Bardhaman, W.B.
Area- 9.44 Acre/ 3.82 Ha
Project Proponent
Koilash Mahato



Map
Land Use Land Cover map
of the Study Area
(10 Km buffer of the Project site location)

Figure 3-3: Land Use Map of Study Area

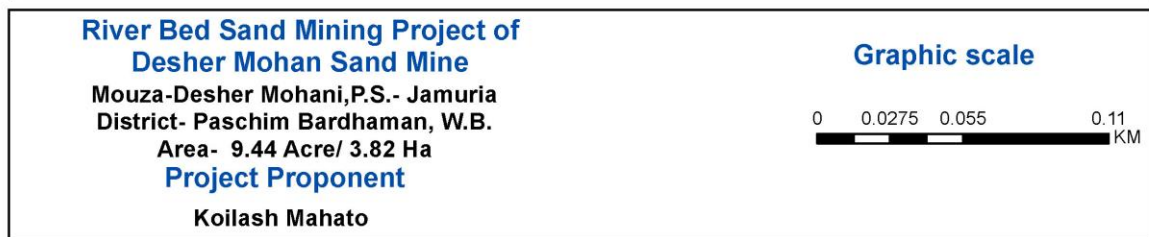
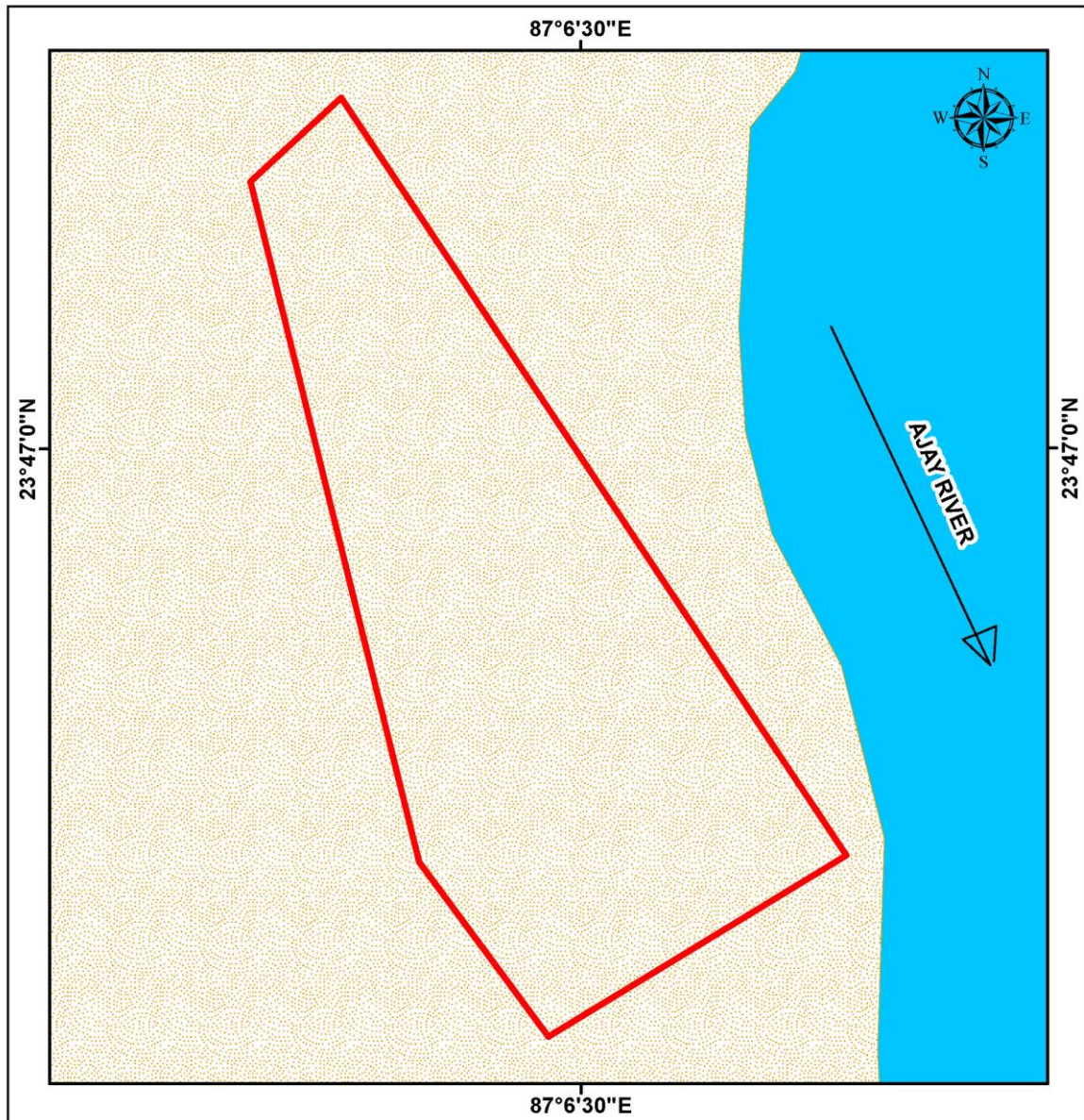


Figure 3-4: Land Use Map of the Mine Lease Area

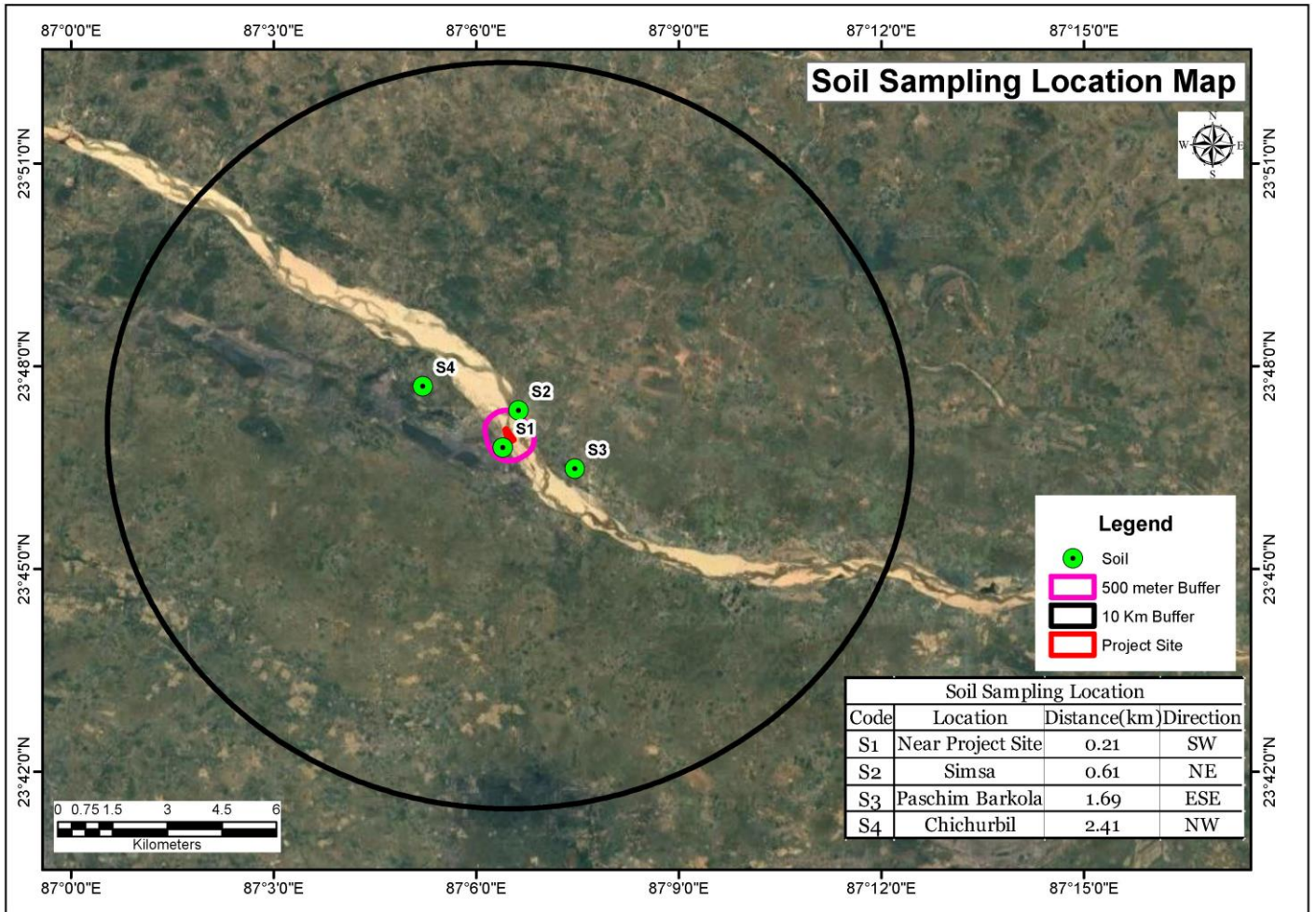


Figure 3-6: Soil Sampling Monitoring Locations Map

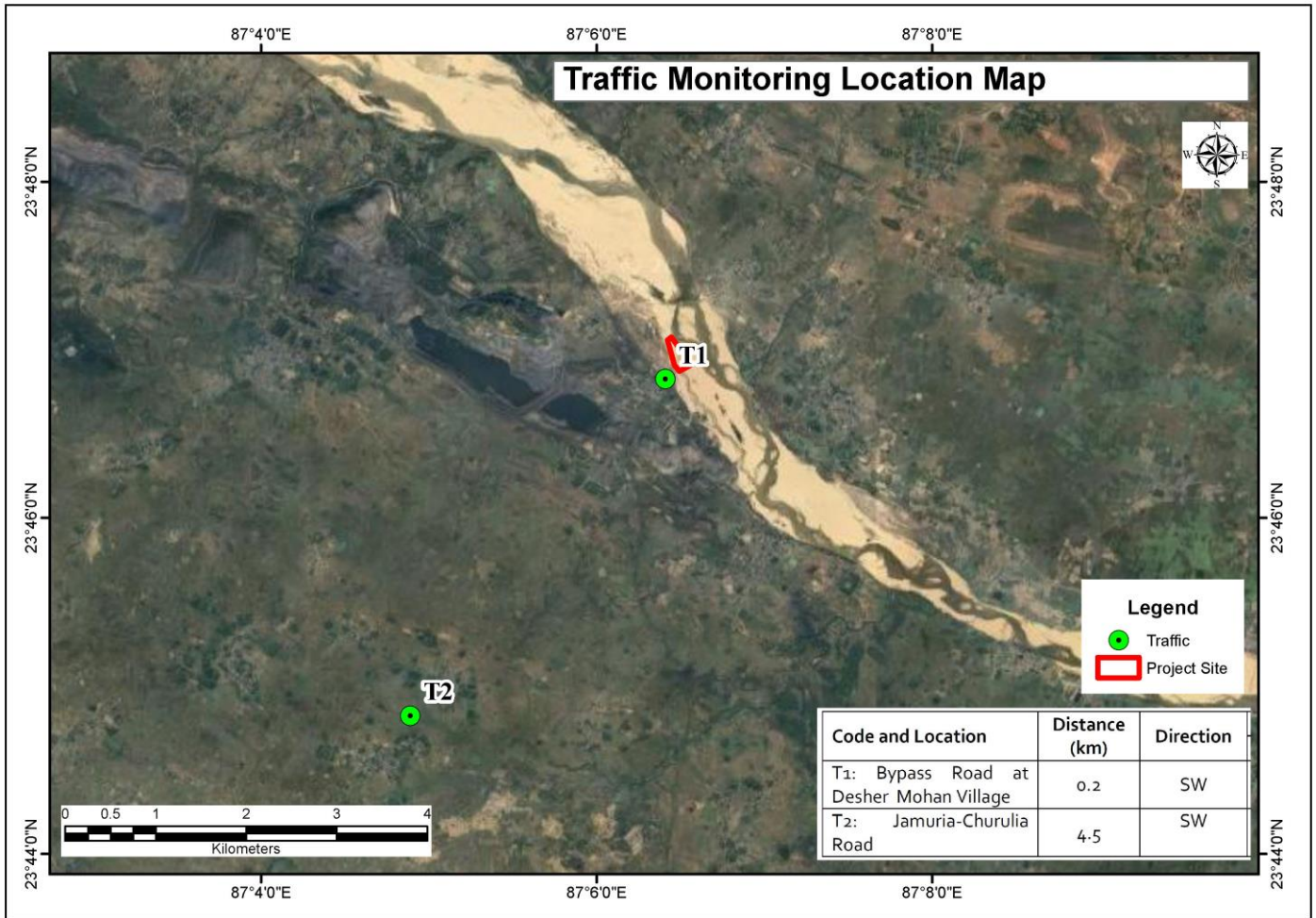


Figure 3-7: Traffic Monitoring Locations Map

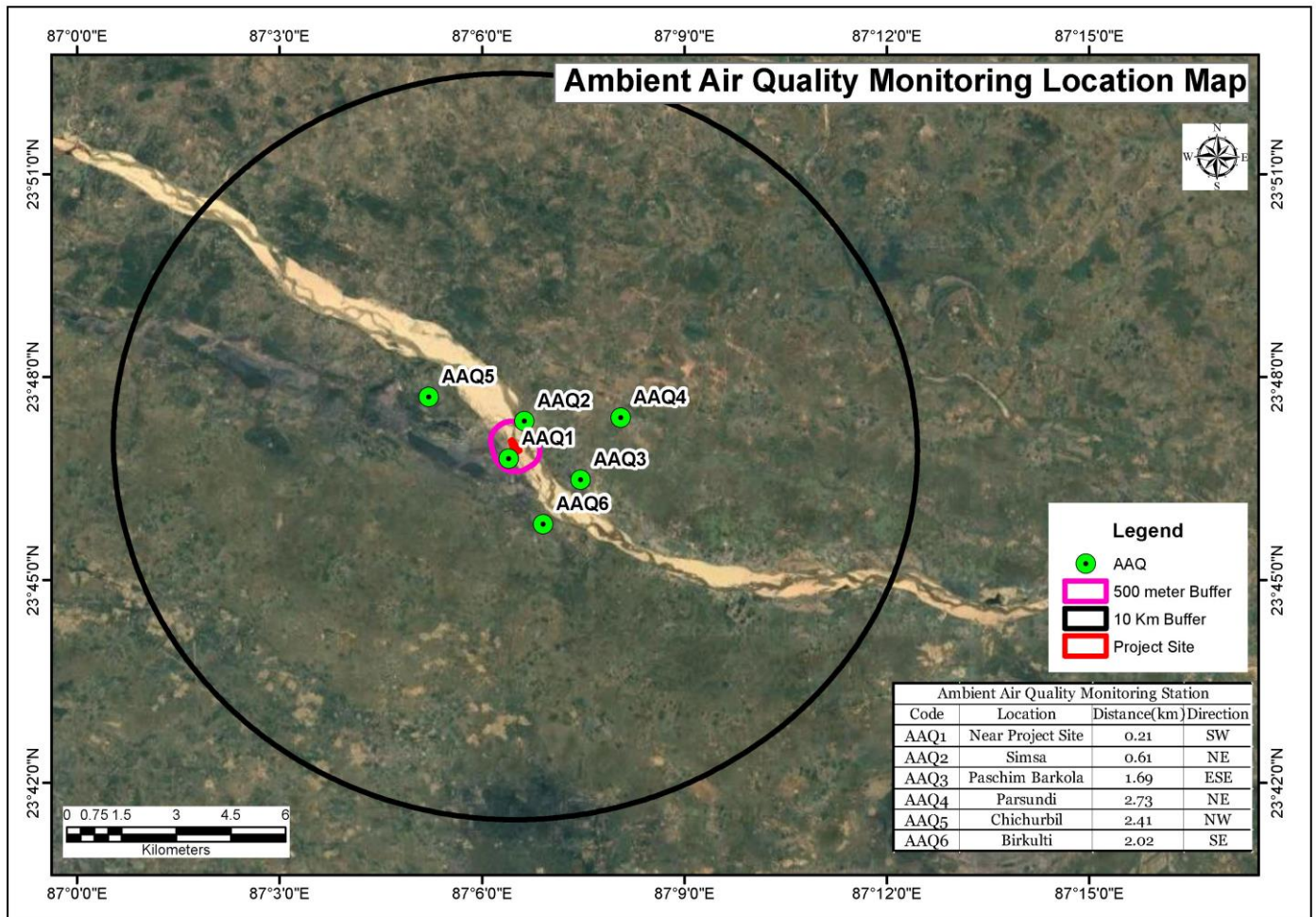


Figure 3-11: Ambient Air Quality Monitoring locations map

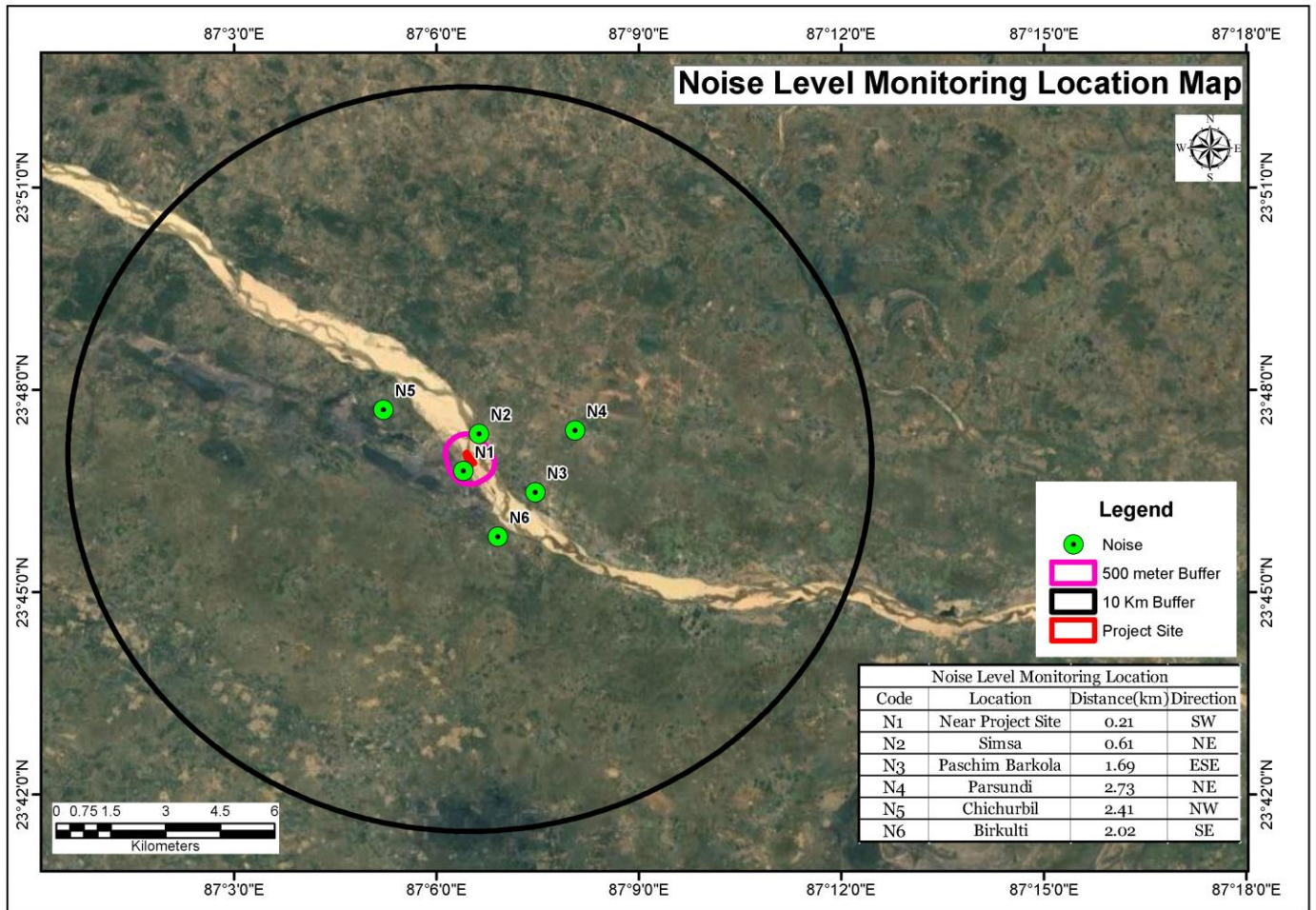


Figure 3-12: Noise Level Monitoring locations map



Figure 3-13: Drainage Map of Paschim Bardhaman District

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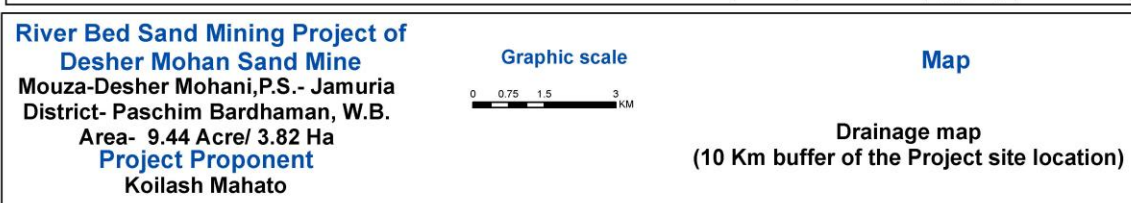
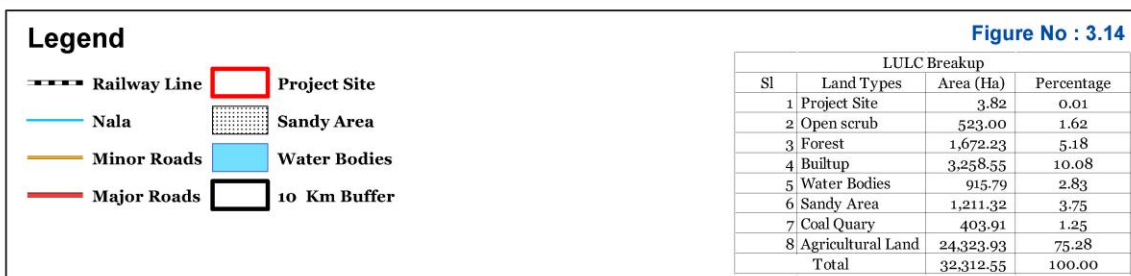
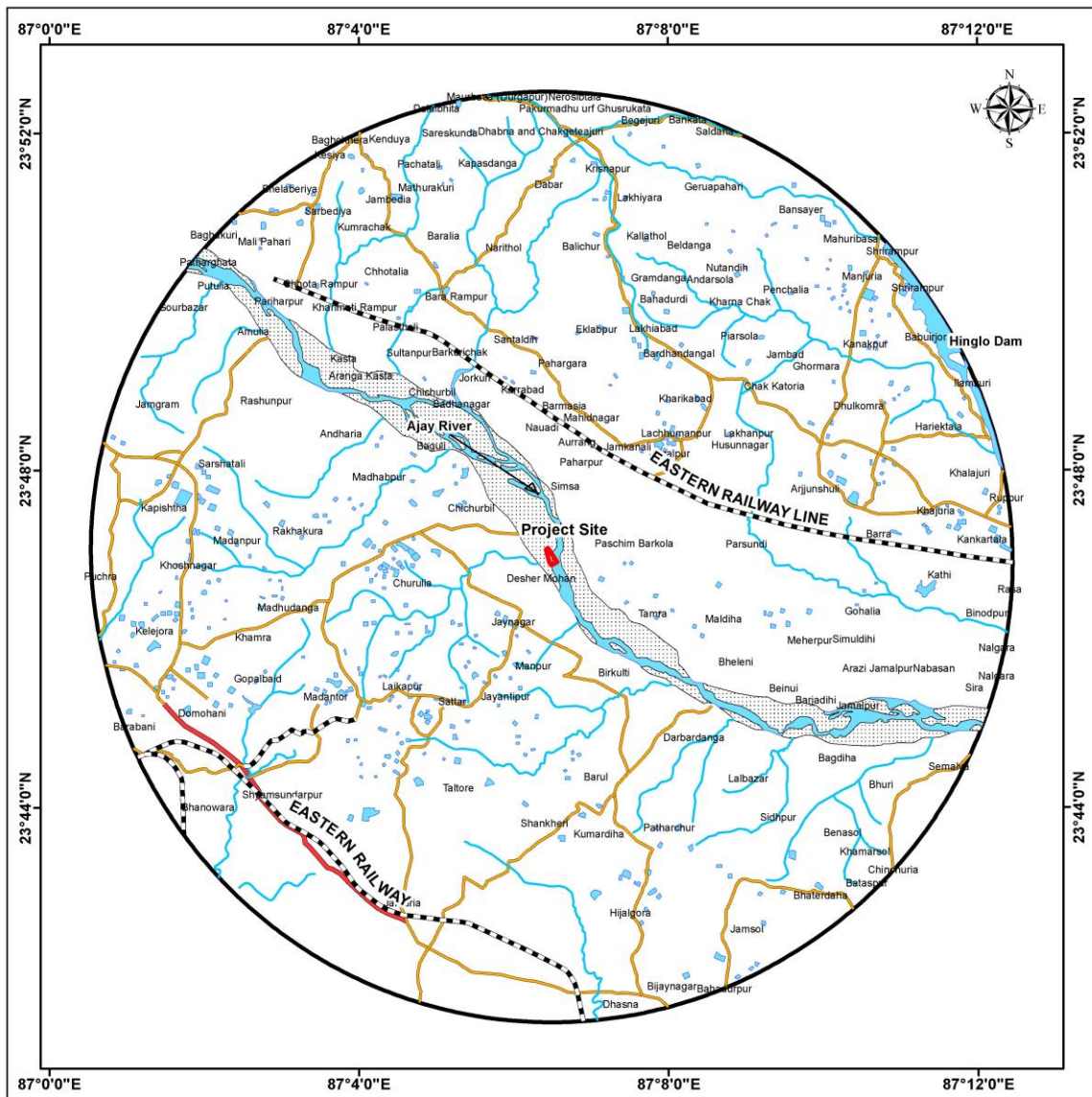


Figure 3.14: Drainage Map of Study area

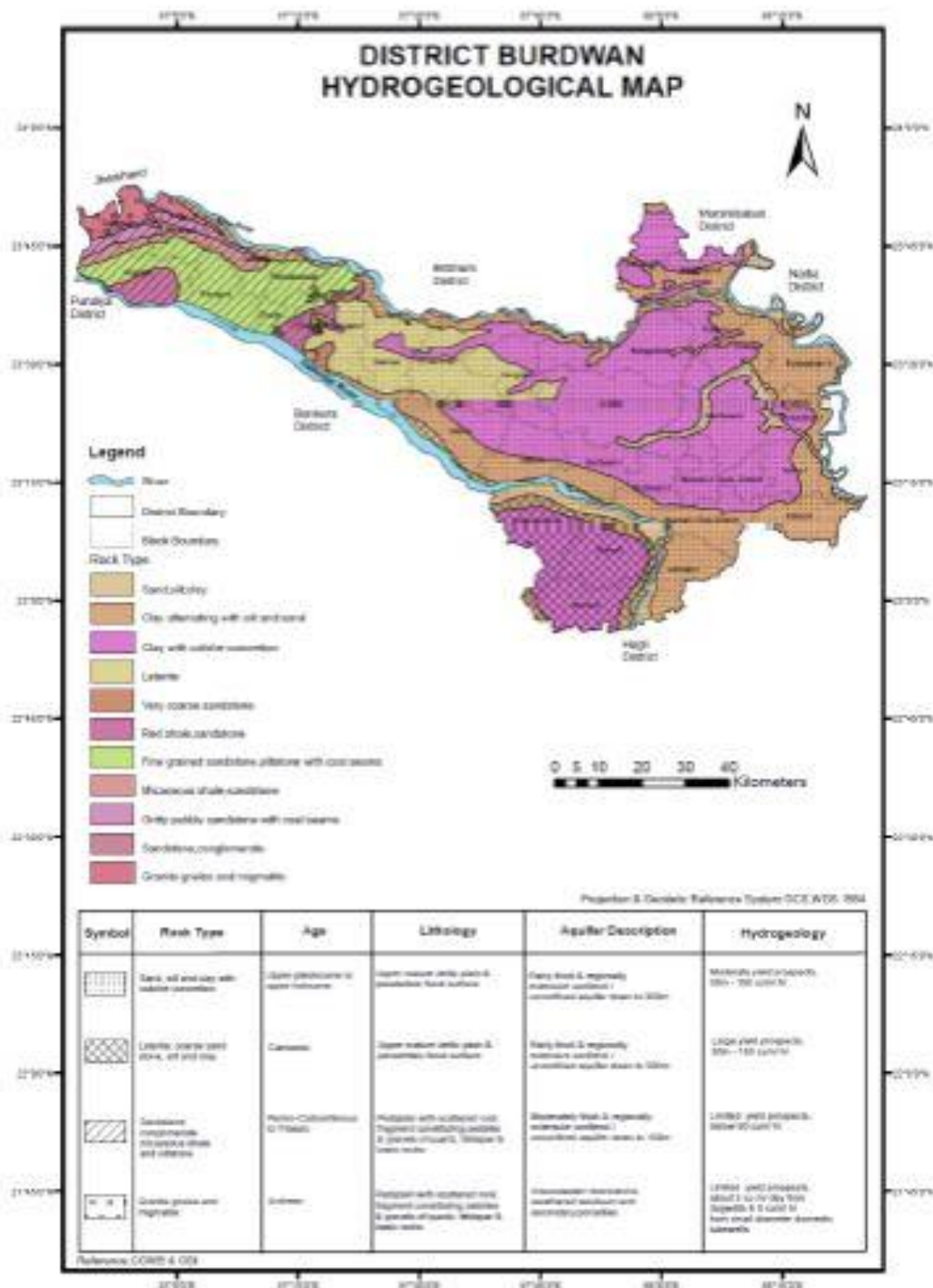


Figure 3-15: Hydrogeology Map of Burdwan District

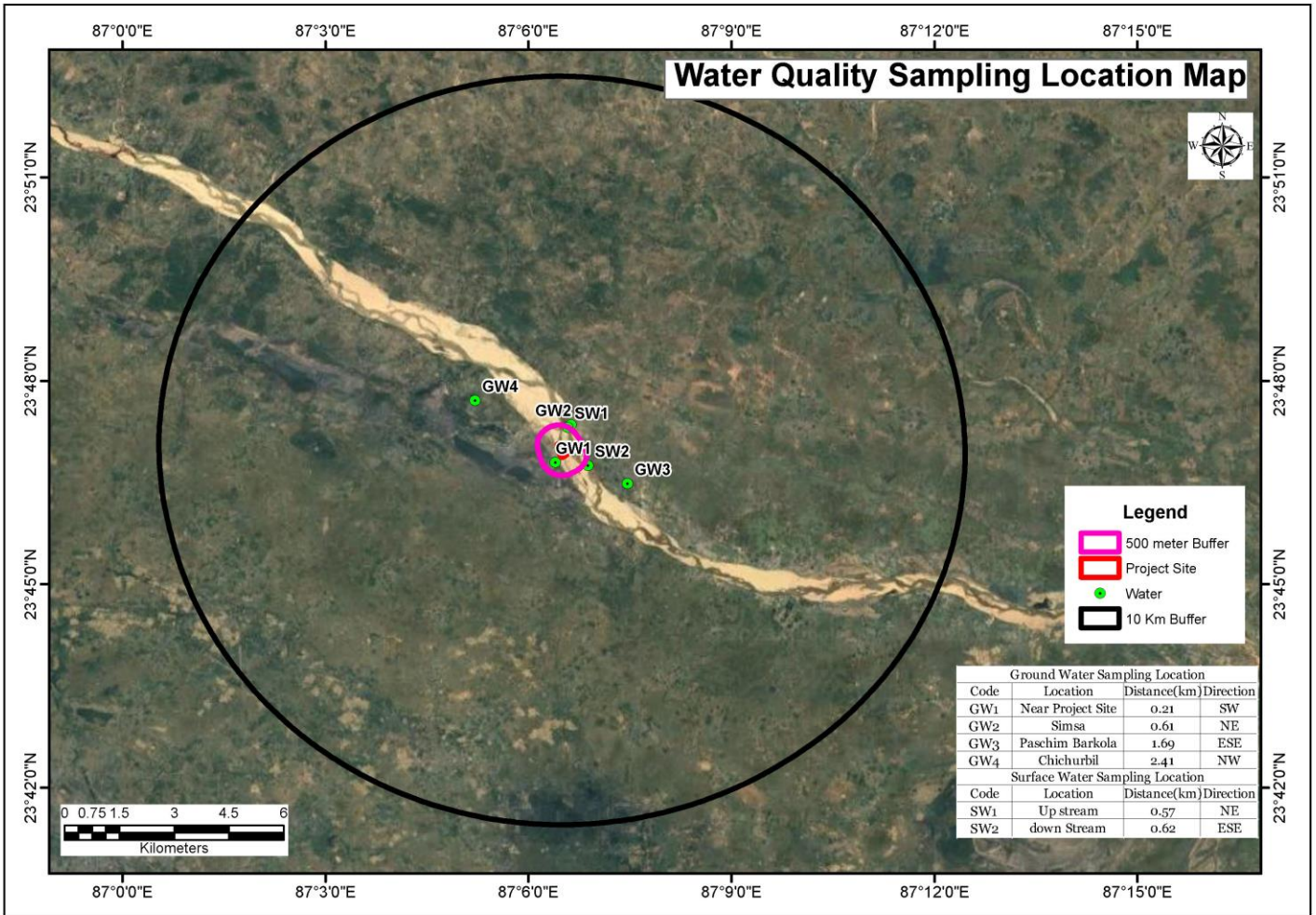


Figure 3.16: Water Quality Sampling Monitoring locations Map

CHAPTER 4

ANTICIPATED ENVIRONMENTAL IMPACTS & MITIGATION MEASURES

4. ANTICIPATED ENVIRONMENTAL IMPACTS & MITIGATION MEASURES

4.1 DETAILS OF INVESTIGATED ENVIRONMENT IMPACTS

Mining activities cause adverse impacts on the surrounding environment unless proper environmental management plan is adopted. Selecting suitable sites for mining and also adopting all the guidelines prescribed by Sustainable Sand Mining Guidelines 2016 (SSG), Enforcement & Monitoring Guidelines for Sand Mining, 2020 and WBMMCR 2016 and The West Bengal Sand Mining Policy 2021 can minimize the major possible impacts.

In this chapter, an attempt is made to quantify or quality the possible environmental impacts on various features such as air quality, water use and quality, land-use, ecological considerations, soil quality and socio-economic factors. The above-mentioned aspects have been studied to identify the impacts of the proposed production from the mine. The magnitude and significance of the environmental pollution caused by mining depends on method of mining, scale and concentration of mining activity. On the basis of the impact analysis, the mitigating action and future monitoring requirement are focused in the Environmental Management Plan for counting or minimizing adverse impacts. The impact matrix is given in **Table 4.1**.

Table 4-1: Environment Impact Matrix

Environmental Factors	Activities						
	Open Cast-Operation	Natural Replenishment	Mineral Transportation	Plantation	Employment Generation	Infrastructure development	Traffic Generation
Ambient Air	●		●	○		●	●
Water Resource	●						
Water Quality	●						
Ambient Noise	●		●			●	●
Flora and Fauna		○	●	○			
Soil Quality	●		●	○			
Land-use					○		
Health & Safety	●		●	○			●
Socio-economic	●		○	○	○	●	

● Adverse Impacts

○ Beneficial Impacts

A brief description of impacts by the proposed project is given in **Table 4.2.**

Table 4-2: Description of Identifiable Impacts

Sl. No.	Activities	Description of Impacts
1	Vegetation	Moderate impact: uprooted plants, damaged to plant parts such as branches, loss of tree species, disturbances to survival, habitat loss
2	Animals	Moderate impact: loss of aquatic habitats (specially for fish and phytoplankton), decreased species diversity due to loss of sensitive species, loss of spawning grounds for aquatic species and river bank dwelling species, disturbances to food webs, habitat loss for bank dwelling species such as aquatic birds, reptiles, amphibians.
3	Ecosystem stability	Moderate impact: soil erosion, loss of fertile soil, bank instability and collapse, loss of protective structures provided by trees, changes to topography due to temporary foot paths and transportation network, obstacles to water flow
4	Water quality	Moderate Impact: Pollution by sedimentation, silt loads, vehicular discharge, solid waste dumping by humans, visible impairment of water quality, decreased dissolved oxygen concentration

4.2 IMPACT MITIGATION/MINIMISING MEASURES

Some of the impacts identified in various phases of operation are insignificant and do not warrant much attention whereas some others are important especially with respect to the present context. Therefore, objective is to identify those impacts, which are significant and require a detailed analysis for decision-making or formulating adequate management measures. This section deals with an assessment of impact of various mining activities on the existing environmental conditions. The methodology of assessment is based upon identification and description of the existing project activities as well as environmental components followed by predicting the impact of mining and associated activities on the environment. The environmental components that are likely to be influenced or modified by the continuation of project activities are: (i) Air environment, (ii) Noise and vibration environment, (iii) Water environment, (iv) Land use; (v) Soil environment; (vi) Hydrology; (vii) Geology; (viii) Biological environment, (ix) Socio-economic status of the area, and (x) Land and soil.

The identification of impact and mitigation/minimising measures of the river bed mining in Desher Mohan are detailed in **Table 4.3.**

Table 4-3: Environmental impact and Mitigation Measures

S.no	Aspects	Identification of Impacts	Mitigation/Minimizing Measures
A	Land Environment		
A.1	Land use & Land Cover	o The landscape of buffer zone will not be disturbed by the proposed river bed mining. Roads for transportation of mined minerals are already present and may be	o Sand mining activities will be limited to a maximum depth of 3.0 meters below the river bed or the water table, whichever is reached first.

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S.no	Aspects	Identification of Impacts	Mitigation/Minimizing Measures
		<p>strengthened and/or maintained if required.</p> <ul style="list-style-type: none"> ○ Mining of minerals from the river bed will create a void which may affect the stream flow. ○ Mining within a river bed may have some impact on the stream's physical characteristics, such as channel geometry, bed elevation in stream roughness of the bed, flow velocity, discharge capacity, sediment transportation capacity etc. ○ Loss of adjacent land and/or structures. ○ There are no R&R issues involved with this project. The ownership will not be changed as the land has been taken on lease which will be returned as it is after the lease period is over. 	<ul style="list-style-type: none"> ○ The riverbed mining will be done in unsaturated zone, to minimizing loss to habitat. ○ Dredging will not be allowed. ○ The mining is planned in non-monsoon seasons only, so that the excavated area gets replenished during the monsoon each year. ○ Grasses and bushes which have fibrous roots at the first instance are proposed to grown along the banks which enhances the binding properties of the soil. ○ The systematic and scientific removal of sand will allow sedimentation during monsoon and not cause bed degradation. ○ Restoration of bank will be ensured at the end of mine closure every year. ○ Mining activities in river-beds will not be allowed within a certain distance from bridge structures. The permissible distance is five times the span of the bridge structure on the upstream side and ten times the span on the downstream side, with a minimum distance of 250 meters on the upstream side and 500 meters on the downstream side. This regulation ensures the protection of bridge structures and maintains the integrity of the river ecosystem. ○ The proposed river-bed mining is unlikely to change any characteristics of the river as the mined minerals will be replenished every monsoon season.
A-2	Soil Quality	<ul style="list-style-type: none"> ○ Soil compaction may occur due to movement of trucks outside the lease area which may affect the soil characteristics like soil fertility, infiltration rate, porosity etc. This ultimately restricts the growth of 	<ul style="list-style-type: none"> ○ The movement of trucks will be restricted to haul roads. ○ The roads that will be used for transportation of mined minerals are already constructed. ○ The unpaved roads will be

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CHAPTER-04
ANTICIPATED ENVIRONMENTAL
IMPACTS & MITIGATION MEASURES

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 P.S.- JAMURIA, DISTRICT- PASCHIM BARDHAMAN, STATE- WEST BENGAL (AREA- 3.82 HA)
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		deep-rooted plants which finally leads to stagnation of succession.	strengthened in order to reduce impact on soil quality.
A-3	Traffic Density	<ul style="list-style-type: none"> ○ The existing Level of Service (LOS) as per IRC on the roads that will be used for transportation of the mined minerals are of Level A and will remain constant after initiation of mining (Appendix 4.2). 	<ul style="list-style-type: none"> ○ Based on the data provided in Appendix 4.2, it is evident that the existing single road connecting the site to the road near desher mohan village requires widening to accommodate double lanes. However, no intervention is necessary for the metal road as it will maintain its Level of Service (LoS) as "A," indicating smooth traffic flow and no congestion issues.
B	Air Environment		
B-1	Air Quality	<ul style="list-style-type: none"> ○ Handling of mined out minerals. ○ Exhaust gas from vehicles. ○ Dust emanating from access road and haul road. 	<p>The only air pollution sources are the road transport network of the trucks/dumpers. The dust suppression measures like the following will be resorted:</p> <ul style="list-style-type: none"> ○ Water sprinkling will be done on the roads regularly. This will reduce dust emission by 75%. ○ Preventive measures will be implemented to minimize spillage during transportation of materials. This includes covering the carrying vehicles with tarpaulin to contain the load and prevent any loose material from escaping. ○ Proper tuning of vehicles along with pollution certificate to keep the gas emissions under check. ○ To prevent overloading of vehicles, automatic weighing machines will be installed at exit points. ○ Traffic management plan will help in avoiding any traffic jams and thus concentration of trucks at one place will be avoided. ○ Plantation of trees along road sides as part of social forestry to help reduce the impact of dust in the nearby villages. ○ Vegetation improves air by

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**CHAPTER-04
 ANTICIPATED ENVIRONMENTAL
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			<p>capturing pollution particles, reducing carbon dioxide and producing oxygen. Photosynthesis in green plant consumes carbon dioxide, plants help in counteracting the increase of this gas in the atmosphere. Thus, planting of trees and shrubs for abatement of air pollution and improvement of environment is an effective way.</p> <ul style="list-style-type: none"> Plants with dust scavenging capacity i.e. plants species which have aesthetic value and high pollution tolerance level will be recommended for planting along the roads.
B-2	Noise Level	<ul style="list-style-type: none"> Noise generated by vehicles transporting the mined minerals is identified as a major source of noise. The trucks used for transportation are expected to produce noise levels ranging from 80-85 dB(A). The material transportation road passes through the villages of desher mohan, potentially affecting the residents who will be exposed to increased noise levels. However, considering the relatively low number of trucks (41 trucks or 82 trips), the incremental noise level is expected to be minimal. 	<ul style="list-style-type: none"> Periodical monitoring of noise near sensitive receptors will be done. No other equipment's except the transportation vehicles will be allowed. The well-tuned vehicles will be used and loud noise will be checked every day which help in reducing noise during operations. Plantation will be taken up along the approach roads and vicinity of river bank. The plantation minimizes propagation of noise and also arrests dust. By reducing the speed and/or volume of traffic on such roads to an acceptably low level.
C	Water Environment		
C-1	Hydrology, Hydro-geology and Water Quality	<ul style="list-style-type: none"> Modifying the riverbed can lead to changes in flow patterns Excessive suspended sediment in the water can cause harm to riparian vegetation and disrupt the natural habitat within the stream. 	<ul style="list-style-type: none"> Project activity will be carried out in the non-monsoon season and on dry bed. Since mining will be done only in central 3/4th portion of the river bed there will be no diversion or modification in the river flow. It is not proposed to divert or truncate any stream in case of river bed mining.
C-2	Waste	<ul style="list-style-type: none"> The estimated municipal solid 	<ul style="list-style-type: none"> Dustbins will provide onsite and will

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	Generation	waste generated will be 3 kg/day. ○ The liquid waste generated by 30 employees will be 0.06KLD.	be cleaned with proper management of food waste. compost pit will be constructed for disposal of food wastes. ○ Mobile toilets will be made available on site.
D	Ecological Environment		
D-1	Flora	○ Fugitive emission from vehicle movement will form a layer in leaves thus reducing the gaseous exchange process. This ultimately affects the growth of plants. ○ The construction of a new linear surface, such as a road, can create a new microclimate and alter physical conditions in the surrounding area. This change can impact plant mortality and the biological community, extending from the road edge to varying distances. ○ Emissions, litter, noise, and other physical disturbances from road activities can affect roadside vegetation, leading to changes in species composition. These impacts may extend to varying distances from the road.	○ To promote healthy roadside vegetation, it is recommended to choose native plant species that are resilient to stress and pollution and well adapted to the local climate. Selection should consider factors such as agro-climatic suitability, height and canopy structure, growth rate, and aesthetic qualities such as foliage and flower color. Hardy plants that can withstand severe weather conditions and require minimal irrigation are preferred ○ Annual bio-monitoring will be conducted on roadside plants to assess their exposure to vehicular pollution. This monitoring will involve evaluating the dust load accumulated on plant surfaces and determining the Air Pollution Tolerance Index (APTI) of the plants.
D-2	Fauna	○ The operational activities such as population influx, transportation and noise generation may have an adverse impact on fauna. ○ The presence of suitable roadside habitats for animals that rely on acoustic signals, like birds, presents a tradeoff between habitat availability and the potential negative impacts of traffic noise and passing vehicles on their survival and breeding success. ○ Indiscriminate mining from active river channels has detrimental	○ Efforts will be made to minimize the impact of mining activities on residential areas and crucial wildlife habitats by carefully planning the right-of-way (ROW). This involves avoiding the direct route through residential areas and important wildlife habitats such as rookeries, raptor nesting areas, and calving areas, to the extent possible ○ All equipment used in the mining operations will be equipped with sound-control devices that are as effective as the original equipment. Motorized equipment will be

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S.no	Aspects	Identification of Impacts	Mitigation/Minimizing Measures
		<p>impacts on the benthic fauna, which resides in the sandy substratum at the river bottom. Excessive extraction of sand from rivers disrupts the eco-biology of various terrestrial insects that rely on aquatic environments during their initial life stages.</p> <ul style="list-style-type: none"> ○ From a fisheries perspective, the loss of benthic invertebrates as a result of mining activities has a significant negative impact. This depletion of food resources can lead to a decline in the inland fishery resources in the area. 	<p>properly muffled and maintained to ensure optimal noise control measures are in place.</p> <ul style="list-style-type: none"> ○ Exhaust silencers and acoustical pipe lagging (wrapping) will be utilized to minimize compressor noise and ensure optimal noise reduction. ○ A strict monitoring of the mining activity is utmost essential for reviving the health of the river ecosystem and in turn aquatic biology will be benefited. ○ No mining will be carried out during the rainy season to minimize impact on aquatic life. ○ Sand extraction in vegetated riparian areas will be avoided. ○ Undercut and incised vegetated banks will not be altered. ○ Large woody debris within the riparian zone will be preserved and left undisturbed. If it needs to be moved, it will be carefully replaced rather than burned. ○ Sand stockpiles and/or vegetative debris will not be stored within the riparian zone. ○ Prompt and immediate action will be taken to evenly redistribute any spillage generated during the mining operation over the mined voids. ○ Operation and storage of heavy equipment within riparian habitat will be restricted. ○ Access roads will not encroach into the riparian zones ○ Efforts will be made to avoid the removal or disturbance of in-stream roughness elements during mineral extraction activities. If any elements are disturbed, they will be promptly replaced or restored.
E	Social Environment		

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S.no	Aspects	Identification of Impacts	Mitigation/Minimizing Measures
E-1	Health	<ul style="list-style-type: none"> ○ The deep pits created during mining activities can pose a significant risk of accidents in the working environment. Additionally, this poses a serious threat to residents in the area who rely on river water for their domestic needs. ○ The socio-health impacts of transportation primarily arise from truck emissions, dust generation, and traffic movement. There is also a potential increase in accidents due to reckless driving of dumpers transporting minerals along the roads. 	<ul style="list-style-type: none"> ○ Appropriate measures will be implemented in each impacted area to minimize significant adverse effects. Additionally, beneficial impacts will be enhanced or augmented to further reduce overall adverse effects to the lowest possible level. ○ It has to be ensured that all the workers are recruited locally to generate employment in the area. ○ Welfare activities should be initiated in the area so as to improve the quality of life of the local people.

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APPENDIX 4.2: IMPACT ON TRAFFIC DENSITY

The information on traffic volume is an important input required for planning, analysis, design and operation of roadway systems. Level of service is defined as a qualitative measure describing operational conditions within a traffic stream and their perception by drivers/passengers. 5 LOS are recognized commonly, designated from A to E. **Table 4.3** below shows the relation between V/C ratio and LOS.

Table 4.3: Relation between V/C ratio and LOS

V/C ratio	LOS	Performance
0.0-0.2	A	Represents a condition of free flow
0.2-0.4	B	Represents a zone of stable flow
0.4-0.6	C	The general level of comfort and convenience declines noticeably at this level
0.6-0.8	D	Represents the limit of stable flow
0.8-1.0	E	Represents operating conditions when traffic volumes are at or close to the capacity level

Source: IRC Guidelines 64-1990

The incremental traffic load during Mine Operation is given below.

Production per day	472.5 m ³
Capacity of truck	11.5 m ³
Total trucks required (round trip)	41
Incremental PCU	162

Table 4.4 below shows the existing Level of Service (LOS) of the roads that will be used for transportation of the mined minerals.

Table 4.4: Traffic Scenario after Mining Operation

Years	Baseline 2022	Projected Traffic						
		2023	Additional Traffic due Mining	2023	2024	2025	2026	2027
Traffic Volume in PCU Per Day (V)								
T1*:	212	223	249	472	496	520	546	574
T2*:	719.5	792	249	1041	1145	1259	1385	1524
VOLUME BY CAPACITY RATIO (V/C)								
T1:	0.11	0.11	0.12	0.24	0.25	0.26	0.27	0.29
T2:	0.12	0.13	0.04	0.17	0.19	0.21	0.23	0.25
LEVEL OF SERVICE (LOS) AS PER IRC GUIDELINE 64-1990								
T1:	A	A	A	B	B	B	B	C
T2:	A	B	A	B	B	B	B	B

*Rural; ** Urban; Source: IRC Guideline 64-1990

CHAPTER 5

**ANALYSIS OF
ALTERNATIVES**

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5. ANALYSIS OF ALTERNATIVES

5.1 ALTERNATIVES OF SITE

Koilash Mahato, was the highest bidder in the e-bidding process conducted by government of West Bengal. The applicant will invest necessary funds for the scientific and systematic development of mines including land rejuvenation and progressive reclamation programme and other measures necessary to protect the quality of the environment and human health etc. The site for sand mining was selected by District Magistrate Office.

5.2 ALTERNATIVES OF TECHNOLOGY

5.2.1 DESCRIPTION OF EACH ALTERNATIVES

Mining is the extraction of valuable minerals or other geological materials from the earth or river bed. There are two methods of mining, (i) Semi-Mechanized Mining and (ii) Manual Mining for removal of sand.

In semi-mechanized mining, a combination of machinery and manpower is utilized for either loading or excavation processes.

On the other hand, manual mining involves the extraction of materials without the use of machinery. It relies solely on manpower for the entire mining process.

5.2.2 SELECTION OF ALTERNATIVES

River bed mining is a site-specific project depending upon the geological set up and mineable portion of the river. Being inside the river meandering course, no objects of economic importance are disturbed. Hence, there is not much scope for site alternative.

The analysis of the technological options it is interpreted that the manual mining is helpful in maintaining the economic and ecological balance and should be preferred over a fully manual option but if required semi mechanised mining method without drilling and blasting will be adopted by project proponent.

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CHAPTER 6

ENVIRONMENTAL MONITORING PROGRAM

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6. ENVIRONMENTAL MONITORING PROGRAM

6.1 MONITORING EFFECTIVENESS OF MITIGATION MEASURES

Regular monitoring of environmental parameters is essential to assess the effectiveness of mitigation plans and identify any potential issues in the project. This allows for timely corrective measures to be implemented. The monitoring program includes evaluating environmental quality at the work zone and surrounding areas to ensure compliance with regulations and maintain proper operating practices. This post-project monitoring work is a vital component of the Environmental Monitoring Programme.

The Environmental Monitoring Programme plays a crucial role in ensuring sustainable development in the project area and its surroundings. It requires collaboration and contribution from various stakeholders including mine operators, government bodies, regulatory agencies such as the State Pollution Control Board and the Ministry of Environment, Forest and Climate Change (MoEF&CC), and most importantly, the affected population. By working together, these stakeholders can establish a comprehensive and inclusive plan that addresses environmental concerns and promotes sustainable practices.

6.2 MEASUREMENT METHODOLOGIES OF MITIGATION MEASURES

The monitoring team will be responsible for planning, execution and monitoring of all aspects of the environment based on the procedures laid out in the guidelines of CPCB through various notifications, starting from start to closure of mines. The said team will be responsible for: (i) Collecting water and air samples, to monitor air and water; (ii) Analysing the water and air samples; (iii) Implementing the control and protective measures; (iv) Coordinating the environment related activities within the project as well as with the outside agencies; (v) Collecting statistical data on the health status of workers; (vi) Green belt development and inventory of flora; (vii) Monitoring the progress of implementation of environmental management programme; (viii) Facilitating effective communication and coordination with statutory authorities; etc.

The organizational set-up for Environment Management Cell is described in **Figure 10.2**.

6.3 MONITORING FREQUENCY, ANALYSIS & REPORTING

Monitoring frequency will adhere to the provisions outlined in the OM and EIA Notification 2006, as amended to date. Additionally, quarterly monitoring will be conducted in accordance with the notifications issued by the State Pollution Control Board (SPCB).

Air, water, soil, and noise monitoring will be conducted at the same locations where the samples were originally collected during the Environmental Impact Assessment (EIA) study.

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To ensure the effectiveness of the environmental mitigation program, regular monitoring of crucial environmental parameters will be conducted. The specific location, schedule, duration, and parameters to be monitored are detailed in **Table 6.1**.

Table 6-1: Location, Monitoring Schedule and Parameters

Sl. No.	Description of Parameters	Location	Schedule and Duration of Monitoring
A	Air Quality (PM₁₀, PM_{2.5}, SO₂, NO₂) monitoring in 4 locations		
A-1	Four monitoring station	one within and three outside the project area at an angle of 120° each- covering upwind and downwind directions.	Will be monitored in every six months as per CPCB/MoEF&CC Guidelines/ Notifications
B	Quality of surface and ground water around the site will be collected from 4 locations		
B-1	Two Surface Water Samples will be collected as per EIA Report and in consultation with SPCB, out of which one will be taken near the active working area.	Up stream	will be collected on a quarterly basis in accordance with the guidelines and notifications provided by the (CPCB) and the Ministry of Environment, Forest and Climate Change (MoEF&CC).
		Down stream	
B-2	Two Ground Water Samples will be collected as per EIA Report and in consultation with SPCB, out of which one should be taken near the active working area.	Desher Mohan	
C	Ambient Noise Level monitoring at 2 locations around the site		
C-1	Two Noise Samples will be collected as per EIA Report and in consultation with SPCB.	Onsite	Will be monitored quarterly as per CPCB /MoEF&CC Guidelines/ Notifications
		Approach road connect with main road	
D	Inventory of flora to Judge the comparative status at one locations around the site		
D-1	An Inventory of flora will be prepared at one Location near the mine lease area		
E	Soil Quality at 1 locations		
E-1	Soil Samples will be collected from one location	Desher Mohan	Will be collected half yearly as per CPCB/MoEF&CC Guidelines/ Notifications
F	Implementation of biological green belt development through block plantation activities.		Soil samples will be collected every six months by a core group consisting of representatives from the management team and the plantation executing agency.

Monitoring data analysis will be done as per CPCB guidelines by NABL/MoEF&CC approved laboratory and shall be submitted to concerned authority (as specified in Environment Clearance

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Letter issued by SEIAA and Consent issued by SPCB) on regular basis. The procedure for monitoring of sand mining or river bed mining will be done as per the Appendix-XII of the EIA notification 2006 amended to date.

The compliance reporting will be done as per paragraph 10(ii) of the EIA notification 2006 amended till date. It says "*It shall be mandatory for the project management to submit half-yearly compliance reports in respect of the stipulated prior environmental clearance terms and conditions in hard and soft copies to the regulatory authority concerned, on 1st June and 1st December of each calendar year*". The report due on 1st June shall be based on data collected from October to December of the previous year, while the report due on 1st December shall be based on data collected from March to April of the same year.

6.4 DETAILED BUDGET & PROCUREMENT SCHEDULES

Adequate budgetary provisions have been made by the company for execution of the EMP. Table 6.2 gives the overall investment on the environmental safeguards and recurring expenditure for monitoring and implementation of control measures including reclamation.

Table 6-2: Budget for EMP including Environment Protection

Serial No.	Measures	Description		Investment for EMP
1	Pollution Monitoring	Air pollution	Yearly at 4 locations for air, 3 locations for water and 2 locations for noise during mining and 1 location for soil.	80,000
		Water pollution		
		Noise Pollution		
		Soil		
2	Water Sprinkling	Water sprinkling will be done at approach road during the lease period in phases		2,49,200
3	Green Belt	Trees will be planted along the river bank and the kuchha road during the lease period in phases		80,800
4	Road maintenance	Repair and maintenance of approach road		4,50,000
Total EMP Cost				9,50,000

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CHAPTER 7

ADDITIONAL STUDIES

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7. ADDITIONAL STUDIES

7.1 INTRODUCTION

The additional studies as suggested in Para 7 & Appendix-III of EIA notification 2006 amended to date are (i) Public Consultation; (ii) Risk Assessment; (iii) Social Impact Assessment and (iv) Rehabilitation & Resettlement (R&R) Action Plan.

The additional studies suggested for Desher Mohan sand mine by the State Level Expert Appraisal Committee (SEAC) in the Terms of Reference (ToR) Point no. A35, A36, A39, A42, B3 and B5 to be included in EIA/EMP Report are (i) Public Consultation and (ii) Risk Assessment/Disaster Management Plan/Occupational Health Impact of Project.

7.2 PUBLIC CONSULTATION

Public consultation will be done after submission of the draft EIA to concern authority.

7.3 RISK ASSESSMENT

All types of industries face certain types of hazards which can disrupt normal activities abruptly. Similarly, Riverbed mines also have risks which need to be addressed for which a disaster management plan has been formulated with an aim of taking precautionary steps to avert disasters and also take such action after disaster which limits the damage to minimum. In the sections below, the identification of various hazards, probable risks during the operational phase of the mining, maximum credible accident analysis and consequence analysis are addressed either qualitatively or quantitatively.

Conducting risk assessments enables mine operators to determine and categorize risks into high, medium, and low levels, as mandated by the Occupational Health and Safety Act 2000. These assessments aid in prioritizing risks and provide valuable insights on the necessary safety measures to control them effectively. By implementing safety improvements based on these assessments, mine owners and operators can enhance overall safety measures within the mining operation. The natural/industrial problems may be encountered during the mining operation are (i) Inundation: filling of the mine pit due to excessive rains or upstream dam opening or failure and (ii) Slope failures at the mine faces.

As per proposal made under the mining plan the area will be developed by means of opencast mining method. Extraction of minerals are to be carried out by semi-mechanized/manual mining method and water table will not be intersected during the mining. No high risk accidents like landslides, subsidence flood etc are apprehended.

Risk Due to Inundation : Mining will be done during the Post-monsoon periods (October-December); therefore, problem of inundation is not likely to happen except in case of accidental flash flood due to upstream dam opening or

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failure. Communication channels will be opened with government departments to give early warning in such situations and the workers will be immediately taken out.

Risks Due to Failure of Pit Slope : In order to allay dangers due to open cast slope failure, final pit slope stability estimations will be made for the existing mines. Determining the factor of safety, the slopes shall be monitored at regular intervals to check any possible failure.

Risks Due to Failure of Waste Dumps : No waste will be generated during the 5-year plan period and thus there will be no waste dump during mining. The entire river-bed material will be transported to the end user. However, Temporary storage of mined sand may be required prior to transportation, during which stacks may be formed for storage purposes.

Risks of Accidents Due to Trucks and Dumpers : Identifying the hazards that come along with the presence of vehicles at the workplace (e.g. reversing operations, loading) can cause harm if not properly handled. Among some of the factors that may make vehicle accidents more likely are: Rough access roads, Time pressure, Inadequate brakes (possibly from lack of maintenance), Carelessly parked vehicles (e.g. being parked on a slope without being adequately secured), Unsafe coupling and uncoupling of trailers, Untrained drivers, Overturning vehicles

To avoid such instances, we will talk to the workers and their representatives and will involve them in the risk assessment process and tell them what to do, to reduce risk. All transportation within the mine lease area should be carried out directly under the supervision and control of management.

- The vehicles will be maintained in good working condition and checked thoroughly at least once in a month by the competent person authorized for the purpose by the management.
- Road signs will be provided at each and every turning point up to the main road (wherever required)
- To avoid danger while reversing the vehicles especially at working place/loading points, stopper should be posted to properly guide reversing/spotting operating.
- Trained drivers will only be hired.

7.3.1 DISASTER MANAGEMENT

River bed mining projects entail various high-risk accidents such as landslides, subsidence, floods, underground mine inundation, fires, seismic activities, and tailing dam failures. To address these risks, an emergency plan is proposed, encompassing quick evacuation procedures and ameliorative measures. Mining and allied activities inherently carry potential hazards that impact both employees and the general public. To ensure safe and healthy working conditions, adequate safety measures are imperative in mines. Mining Rules & Regulations provide a well-defined

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framework and procedures for maintaining safety, encompassing the well-being of personnel, machinery, and the overall working environment. By strictly adhering to these regulations, safety is ensured across the mining operation.

The lessee's preparedness to handle eventualities and the required assistance from local authorities should be clearly outlined.

- The shallow depth of activities in river bed mining will not involve any high risk accident due to side falls/collapse.
- The complete mining operation will be carried out under the Management and control of experienced and qualified Mines Manager.
- All the provisions of Mines Act 1952, MMR 1961 and Mines Rules 1955, RMMCR 1986, WBMMDR 2016, WBS(MTSS) Rules, 2021 and other laws applicable to mine will strictly be complied with.
- During heavy rainfall the mining activities will be closed.
- All persons in supervisory capacity will be provided with proper communication facilities.
- Competent persons will be provided first aid kits which they will always carry.

The probable disaster, its impact and their management measures during sand mining are presented in **Table 7.1.**

Table 7-1: Disaster Management during Sand Mining

Probable Disaster	Impact	Management Measures
Sand Loading: The sand is loaded in the trucks using hand shovels and back-hoe.	<ul style="list-style-type: none"> ○ There are possibilities of hand injuries while loading with shovels and the hazards associated with being underneath moving buckets. ○ There are possibilities that the workers standing on the other side of loading may get injured due to overthrown sands with pebbles. ○ There are possibilities of workers getting injured during opening of side covers of the trucks to facilitate and loading. ○ There are possibilities of river-bank collapse due to close proximity of sand extraction. ○ Chance of workers getting injured due to improper balancing of truck while loading. 	<ul style="list-style-type: none"> ○ No sand will be collected within 100m distance from the river banks or $1/8^{\text{th}}$ of the distance between the bank lines and 7.5m safety barrier from project area. Safe clearance will be mainly determined by the height of the river bank and thickness of sand to be extracted from the close vicinity of that bank. ○ Ponding in the river bed shall not be allowed. ○ The particular operations, approaching river bed from both the banks will be avoided. ○ No foreign material (garbage's) will be allowed to remain/spill in river bed and catchment area, or no Pits/pockets are allowed to be filled with such material. ○ The trucks will be brought to a level so that the sand loading operation suits to the ergonomic

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Probable Disaster	Impact	Management Measures
		<p>condition of the workers and the back-hoe.</p> <ul style="list-style-type: none"> ○ Side covers (pattas) will be opened cautiously with clear warnings to ensure loader safety. Loading will be conducted exclusively from one side of the truck ○ Workers will be equipped with gloves and safety shoes for loading.
<p>Sand Transport: Sands from the mine lease area are loaded onto 11.50-ton trucks, which then travel a 450m approach road before continuing on a metalled road.</p>	<ul style="list-style-type: none"> ○ Road accidents are possible. ○ Accident may also occur during movement in the mine (sand dunes). ○ Overloading may pose a risk of injury to passersby due to the potential presence of pebbles or large boulders. 	<ul style="list-style-type: none"> ○ All transportation within the main working area will be directly supervised and controlled by the management. ○ Vehicles must be well-maintained and undergo thorough weekly inspections by a competent individual authorized by the management. ○ Road signs will be provided at each and every turning point especially for the guidance of the drivers at the evening/night. ○ To avoid danger while reversing the trackless vehicles especially at the embankment and tipping points, all workers will be removed from all areas for reversing of lorries, and the vehicle will have audio-visual alarm during reversing. ○ Implementing statutory provisions such as fences and providing consistent education and training will significantly reduce accident incidents. ○ Overloading is generally prohibited, and the loading of big boulders is not allowed to ensure safety and prevent damage to equipment and storage bunkers. ○ The truck will be covered and maintained to prevent any spillage. ○ The maximum permissible speed limit will be ensured.

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Probable Disaster	Impact	Management Measures
		<ul style="list-style-type: none"> ○ The truck drivers will have valid driving license.
Inundation / Flooding	<ul style="list-style-type: none"> ○ The sand mines have a high risk of inundation/flooding during the monsoon season, heavy rains in the lean season, or due to upstream dam opening or failure, as the mine area lies over the sand dunes of a riverbed. ○ Flooding poses risks to the safety of workers, trucks, and other machinery involved in the operations. 	<ul style="list-style-type: none"> ○ Sand mining operations will be suspended during the monsoon months and heavy rains. ○ A warning system will be implemented to monitor heavy rains and discharges from upstream dams, if applicable.
Drowning	<ul style="list-style-type: none"> ○ There is a risk of drowning in the deeper parts of the river or in water-filled pits left behind. 	<ul style="list-style-type: none"> ○ Safety jackets, floating tube will be kept at the site office to prevent any mishap. ○ The workers are not allowed to go to the deeper areas of the rivers. ○ The workers are not allowed to fishing in the river during working hours. ○ When necessary to cross the river, strict supervision is maintained, and lifelines are used over shallow areas ○ The training of mine personnel shall be provided regularly with respect to environmental protection.
Heavy Machinery: The machinery refers to the trucks and dumpers	<ul style="list-style-type: none"> ○ Accidents during transportation by dumpers, trucks, and other heavy vehicles are primarily caused by mechanical failures, with the possibility of human errors playing a contributing role. 	<ul style="list-style-type: none"> ○ Transportation within the applied mining lease working area will be directly supervised and controlled by the management. ○ To ensure safety during equipment and vehicle reversing, stoppers will be stationed to provide proper guidance at the working place and loading points. Additionally, a minimum 10-meter radius around the machine will be designated as a restricted area for personnel. ○ A statutory provision of the fences, constant education, training etc.

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Probable Disaster	Impact	Management Measures
		will go a long way in reducing the incidents of such accidents.

7.3.2 OCCUPATION HEALTH HAZARDS

At the site, dust is a significant pollutant during excavation and loading activities, posing health risks to workers. Environmental and climatic conditions also contribute to health problems. Addressing occupational health hazards involves understanding the source, exposure pathways, and potential receptors. Occupational hazard due to sand mining mainly comes under the physical hazards. Possible physical hazards and mitigation measures are mentioned below:

Light	Workers may face risks associated with poor illumination or excessive brightness, leading to symptoms such as eye strain, headaches, eye pain, tearing, corneal congestion, and eye fatigue.	To minimize the health impacts PPE like dust masks, ear plugs/ muffs and other equipment's will be provided for use by the work personnel. All workers will be subjected to Initial Medical Examination as per Mines Rule 1955 at the time of appointment. Periodical Medical Examination will be conducted at least once in five years. Medical camps will be organized.
Heat and Humidity	Hot and humid conditions in the riverbed mining area can result in temperatures rising to 48°C or above. Heat exposure can lead to direct effects such as burns, heat exhaustion, heat stroke, and heat cramps, while indirect effects include reduced efficiency, increased fatigue, and higher accident rates.	
Eye Irritation	During the high windy days in summer the sand could be the problems for eyes like itching and watering of eyes.	
Respiratory Problems	Excessive airborne dust can pose a health hazard, aggravating respiratory conditions like asthma and causing irritation to the lungs and bronchial passages.	
Noise Induced Hearing Loss	Machinery is the main source of noise pollution at the mine site.	

Need-based EMP, prepared in accordance with the MoEF&CC Office Memorandum vide F. No. 22-65/20L7.IA.III dated 30.09.2020.

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PROJECT BENEFITS

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8. PROJECT BENEFITS

8.1 INTRODUCTION

The proposed project is expected to provide employment to local people in different activities such as mining, sizing, transportation and plantation activities. The project activity will not have any major impact on the environment. Also the company's Corporate Social Responsibility initiatives will have a positive impact on socio economic fabric of the region. The opening of the proposed project will enhance the socio-economic activities in the adjoining area. This will result in benefits namely, (i) Improvements in physical infrastructure; (ii) Improvements in social infrastructure; (iii) Increase in employment potential; (iv) Prevention of illegal mining; and (v) Enhancement of green cover;

8.2 IMPROVEMENTS IN PHYSICAL INFRASTRUCTURE

The opening of the project will improve the physical infrastructure of the adjoining areas. This will include the following-

- Improved road communication due to opening of the proposed project;
- Strengthening of existing community facilities through the Community Development Program;
- Creation of community assets (infrastructure) like provision for drinking water, village roads/linked roads, market place etc;
- Literacy program, adult education etc;
- Awareness program and community activities, like health camps, medical aids, family welfare programs, immunization camp, sports & cultural activities, plantation etc;

8.3 IMPROVEMENTS IN SOCIAL INFRASTRUCTURE

Mining activities can lead to notable changes in various environmental parameters. These changes include increased socio-economic activities, the creation of new employment opportunities, infrastructural development, and improved access to educational and healthcare facilities.

8.4 EMPLOYMENT POTENTIAL

As mentioned earlier, the people of this area are dependent only on agriculture and find it difficult to sustain their livelihood, mainly due to climatic extremities in the region. It has been estimated that there will be about thirty people who will get employment from the project. Out of this, the unskilled and semi-skilled workers will be preferably recruited from local area. Other than that there will be indirect employment in the form of security, shop-keepers, etc.

8.5 OTHER TANGIBLE BENEFITS

There will be positive impact on socio-economic area due to increased economic activities, creation of new employment opportunities, infrastructural development and better educational and health facilities.

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Health: Company will undertake awareness program and community activities like health camps, medical aids, family welfare camps, AIDS awareness program for truckers etc. Periodic medical check-ups as per Mines Act/ Rules and other social development and promotional activities will be undertaken. All this will assist to lift the general health status of the residents of the area around mines.

Plantation: For screening of dust and attenuation of noise, plantation shall be raised in the safety zone and remaining will be done on both sides of the unmetalled road leading to the mines. By the end of the lease period green belt development programme will be carried out over an area of **1.26 ha**. Local species will be considered for the plantation purpose.

Table No. C8-1: Plantation Schedule for 1st five year

Sl.No.	Year of Plantation	Plantation
1	I year	404
2	II year	404
3	III year	404
4	IV year	404
5	V year	404
Total Plantation		2,020

The project aims to meet the demand for minor minerals in nearby areas, supporting construction activities. It will contribute to the region's economy and social development by providing direct employment to 30 people and indirect employment to many more. This will uplift the socio-economic status of the area, improving transportation facilities and raising awareness. The project will serve as a source of livelihood for households in nearby villages, enhancing their living standards. Additionally, the mining activity promotes sustainable use of mineral resources. The proponent will also undertake development activities in nearby villages as part of corporate environmental responsibility. Overall, the project will bring benefits such as improved lifestyle and area development to the region.

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CHAPTER 9

ENVIRONMENT COST BENEFIT ANALYSIS

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9. ENVIRONMENT COST BENEFIT ANALYSIS

During the scoping stage, the SEIAA did not recommend conducting an environmental cost-benefit analysis for the project. Furthermore, it was not included as a condition in the proposed Terms of Reference granted to the project proponent by the SEIAA/SEAC.

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CHAPTER 10

ENVIRONMENT MANAGEMENT PLAN

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10. ENVIRONMENT MANAGEMENT PLAN

10.1 INTRODUCTION

Success of any Environmental Management Plan (EMP) depends upon the efficiency of the organizational set up responsible for the implementation of the program. The environmental management must be integrated into the process of mine planning so that ecological balance of the area is maintained and adverse effects are minimized.

An EMP is a site specific plan developed to ensure that the project is implemented in an environmentally sustainable manner. An effective EMP should ensure the application of best practice environment management to a project. The purpose of an EMP is to: (i) Assist Management to perform mining operations in an environmental friendly way; (ii) Improve the contribution of Management so that an EMP can be used effectively; (iii) Ensure a minimum standard and consistent approach to the implementation of EMP; (iv) Ensure that the commitments made as part of the project's EIA are implemented throughout the project life, and (v) Ensure that environment management detail is captured and documented at all stages of a project.

10.2 COMPONENTS OF ENVIRONMENT MANAGEMENT PLAN

In the minor mineral mining project EMP is dealt only for operational phase as no construction is involved. The design of EMP for operational phase has been aimed to achieve (i) adoption of practical environmental control measures and implementing them effectively; (ii) Implementation of monitoring program of the surrounding environment; (iii) Institution arrangements to monitor effectively and take suitable corrective steps; and (iv) Implementation of schedule and reporting procedures.

10.2.1 EMP OPERATION PHASE

The probable source and proposed mitigation measures suggested for minimising the impact in the project cycle are provided in **Table 10.1**.

Table 10-1: Probable Source and Mitigation Measures

Aspects	Probable Source	Mitigation Measures
Soil Compaction and Settlement	<ul style="list-style-type: none">The frequent movement of trucks on unpaved roads can result in soil compaction, reducing the infiltration rate and impeding the growth of deep-rooted plants.	<ul style="list-style-type: none">The project will utilize paved roads for vehicle movement. In areas where roads are partially paved, measures will be taken to strengthen them, thereby minimizing the impact on soil quality.The vehicles moving to and from the site will be regularly checked to

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Aspects	Probable Source	Mitigation Measures
		<p>prevent oil leakage.</p> <ul style="list-style-type: none"> ○ There is no toxic element present in the mineral which may contaminate the soil or river water.
Air Pollution due to dust from moving trucks and vehicular emissions	<ul style="list-style-type: none"> ○ In riverbed mining activities, the engines of vehicles used for excavation and transportation of mined materials are the sole source of gaseous emissions. ○ Fugitive dust generation during mining. 	<ul style="list-style-type: none"> ○ Dust screens and water sprinklers are crucial tools employed in mining operations to effectively mitigate the issue of gusting dust. ○ To prevent dust emissions in mining areas, regular water sprinkling is employed on the mining grounds and roads. workers in dust-prone areas are equipped with dust masks, ensuring their respiratory safety. ○ Plantation will be carried out on approach roads and nearby vicinity of river bank. ○ Transportation of mineral will be done in trucks covered with Tarpaulin to avoid fugitive dust emissions. ○ To control emissions, regular preventive maintenance of vehicles is conducted, and all transportation vehicles are required to carry a valid Pollution Under Control (PUC) certificate. ○ No overloading of vehicles to be allowed to avoid any spillages. ○ Periodic air quality monitoring will be carried out to monitor the changes consequent upon mining activities as per the norms of West Bengal State Pollution Control Board.
Noise Pollution	<ul style="list-style-type: none"> ○ Noise generated by trucks, loaders, and dumpers in the mine lease area. 	<ul style="list-style-type: none"> ○ Proper care and maintenance of the equipment's will be carried out. ○ The well-tuned vehicles will be used during operation phase. Fixing of silencers to the trucks will reduce the noise levels. ○ Plantation will be taken up along the approach roads and vicinity of river bank. Plantation serves a dual purpose by minimizing noise

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Aspects	Probable Source	Mitigation Measures
		<p>propagation and effectively controlling dust.</p> <ul style="list-style-type: none"> ○ Efficient traffic management includes implementing speed limits on vehicles and educating drivers to minimize horn usage. ○ Ambient noise monitoring will be conducted regularly at different locations in and around the mining areas.
Water Environment	<ul style="list-style-type: none"> ○ Surface and ground water, although separate entities, must be recognized and managed as an interconnected system due to their interrelated nature. 	<ul style="list-style-type: none"> ○ Mining operations will be conducted at a significant distance above the water table to minimize any potential impact on the water regime. River bed mining will be done up to depth of 3.0 meter from the un-mined bed level at any point in time with proper bench formation; ○ Mining will not intersect the river bed water level or ground water table of the area. Therefore, will not disturb the ground water level. ○ No water pumping from either ground or surface water sources will be conducted, ensuring the conservation and preservation of water resources. ○ There will be no diversion or modification in the river flow as mining will be done in the dry areas.
Solid Waste Generation	<ul style="list-style-type: none"> ○ Waste management is an important fact of environment management. solid waste management holds significance from both aesthetic and environmental perspectives. 	<ul style="list-style-type: none"> ○ The trucks will be tarpaulin covered so that there is minimal spillage. Apart from this, no other solid wastes will be generated from the said mining operations. ○ Food waste or any domestic waste will be collected in dustbins and will be properly disposed. ○ Toilets will be used by employers on site.
Social Environment	<ul style="list-style-type: none"> ○ For improving the socio-economic environment, proper CSR activities will be taken up in vicinity to uplift the condition of people. ○ All workers will be subjected to 	<ul style="list-style-type: none"> ○ Dust masks will be provided to the workers working in the dust prone areas. ○ Comprehensive awareness programs will be implemented to educate

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Aspects	Probable Source	Mitigation Measures
	<p>medical examination as per Mines Rule 1955 both at times of appointment and in every two month.</p>	<p>individuals about potential occupational health hazards, enabling proactive measures to be implemented for prevention and mitigation.</p> <ul style="list-style-type: none"> ○ Occupational health and safety within the organization will be promoted and develop safer and healthier ways of working will be developed; ○ Accident investigations and supervision of unsafe working conditions will identify causes and provide recommendations for remedial action. ○ Comprehensive training sessions on health, safety practices, and legislation will be developed and delivered to management, supervisors, and workers ○ Emergency procedures for mine rescues will be developed and coordinated. ○ Open communication channels will be established to facilitate regular reporting on health, safety, and risk status to management. This will enable the development and review of comprehensive occupational health and safety strategies and systems, encompassing policies, procedures, and manuals.
Tree Plantation	<ul style="list-style-type: none"> ○ As part of the afforestation plan, nearby villages and connecting roads will undergo plantation initiatives. ○ The tree plantation will be done as per these standards. (i) 200 plant per kilometre and (ii) 1600 plant per hectare ○ It is proposed to plant 2,020 numbers of native species along with some fruit bearing and medicinal trees during the plan period. 	<ul style="list-style-type: none"> ○ Native plants like Arjun, Babla, Sris, Ashok, Debbaru and other local species will be planted (Refer Table 10.2). ○ The species to be grown in the areas should be dust tolerant and fast-growing species so that a permanent plantation is possible. ○ Plantation in the barrier zone and roads is necessary as these areas will contain fine particulates resulting from mining operation and vehicle movement.

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Aspects	Probable Source	Mitigation Measures	
	<ul style="list-style-type: none"> Along the approach road total area available for plantation is 450 m, in which 216 trees will be planted. Along the river bank total area available for plantation is 400m, in which 80 trees will be planted. Remaining plantation in 1.01ha area will be done after consultation with gram panchayat and local villagers. 		
Table 10-2: Tree Plantation Plan			
	Scientific Name	Common Name	Number
	Terminalia arjuna	Arjun	475
	Vachellia nilotica	Babla	295
	Polyalthia longifolia	Debdaru	450
	Albizia lebbeck	Siris	410
	Saraca asoca	Ashok	385
			Probable Pollution Control
			Dust, air and noise pollution
			Dust Pollution
			Dust, air and noise pollution
			Air Pollution
			Air Pollution

10.2.2 EMP-IMPLEMENTATION FRAMEWORK

The action plan for mitigation of the environment impact due to the mining activities and the implementing agency is provided in **Table 10.3**.

Table 10-3: Impact Management and Implementation Framework

Impact	Management Action	Implementation Responsibility
Soil Compaction and Settlement	<ul style="list-style-type: none"> The project will involve movement of vehicles along paved roads. The portion that are partly paved will be strengthened to reduce impact on soil quality. The vehicles moving to and from the site will be regularly checked to prevent oil leakage. 	Mine Operator
Air Pollution: Air pollution arises from vehicular emissions and dust generated by vehicle movement.	<ul style="list-style-type: none"> Spraying of water at source of dust emissions. Trucks carrying sand will be duly covered with tarpaulin to avoid spilling. Regular monitoring would be carried out. 	Mine Operator
Noise Pollution: Trucks, loaders, and dumpers contribute to noise pollution. mine lease area and the route of transportation.	<ul style="list-style-type: none"> Identification of structures and vulnerable populations affected by increased noise levels, along with the implementation of remedial measures. Tree plantation along the transport route helps in minimizing the noise level. 	Mine Operator
Water Pollution: The source of water pollution are	<ul style="list-style-type: none"> Mining operations will be conducted at a significant distance above both the water table and river bed 	Mine Operator

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Impact	Management Action	Implementation Responsibility
	water level to minimize any potential impact on the water regime.	
Solid waste generation	<ul style="list-style-type: none"> ○ Solid waste (boulders, clay & silt) that will be generated during mining activities will be utilized for shore management. 	Mine Operator
Social Environment	<ul style="list-style-type: none"> ○ For improving the socio-economic environment, proper CSR activities will be taken up in vicinity to uplift the condition of people. ○ All workers will be subjected to medical examination as per Mines Rule 1955 both at times of appointment and in every two months. ○ Insurance of all employees as per the rules will be carried out. 	Mine Operator
Tree Plantation	<ul style="list-style-type: none"> ○ During the mining activities, plantation will be done for three specific reasons (i) Reduce Noise Level; (ii) Absorb Air Pollutants; (iii) Improvement of Soil Quality ○ Selection of plant species is to be done on the basis of their adaptability to the existing geographical conditions and the vegetation composition of the topography of the region. 	Mine Operator

The Environmental Management Cell (EMC) is structured with a core group dedicated to environmental management, comprising expert members. The supporting group includes members from allied disciplines and areas of activities, including top management personnel.

This is shown as **Figure 10.1**.

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**CHAPTER-10
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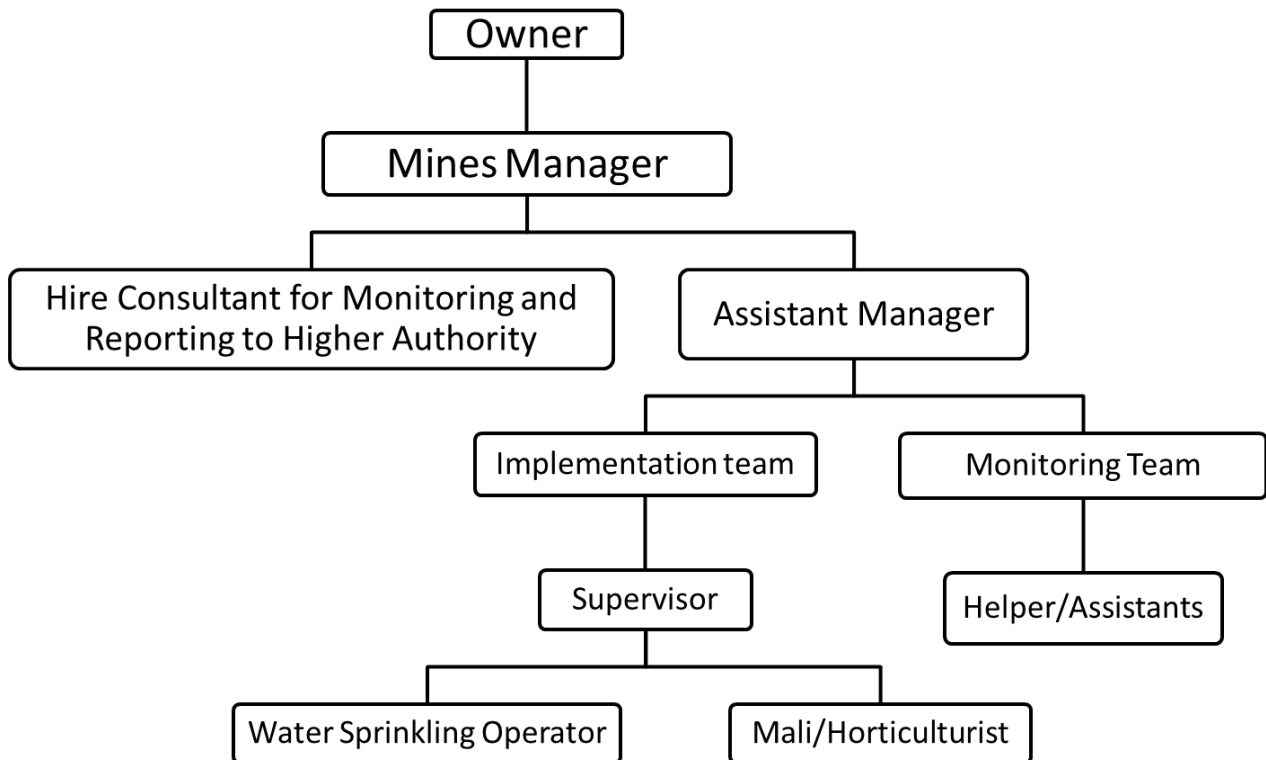


Figure 10-1: Organizational Set-up for Environment Management Cells

10.3 EMP BUDGET

The EMP budget is given in **Table 10-5**. The annual recurring cost is **Rs. 9,50,000/-**

Table 10-5: EMP COST

Serial No.	Measures	Description		Investment for EMP
1	Pollution Monitoring	Air pollution	Yearly at 4 locations for air, 3 locations for water and 2 locations for noise during mining and 1 location for soil.	80,000
		Water pollution		40,000
		Noise Pollution		30,000
		Soil		20,000
2	Water Sprinkling	Water sprinkling will be done at approach road during the lease period in phases		2,49,000
3	Green Belt	Trees will be planted along the river bank and		80,000
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Serial No.	Measures	Description	Investment for EMP
		along the kuchha road during the lease period in phases.	
4	Road maintenance	Repair and maintenance of approach road	4,50,000
Total EMP Cost			9,50,000

10.4 CORPORATE ENVIRONMENTAL RESPONSIBILITY

The Corporate Environmental Responsibility (CER) Policy aims to promote good corporate governance and socially and environmentally responsible business practices. The allocated budget for the CER Programme is Rs. 3,80,000, based on a project cost of Rs. 190 lakhs. This amount will be spent annually. However, as per the OM 22-65/2017.IA.III dated 30th Sept, 2020, the CER activity may be replaced by other activities as deemed appropriate.

Table 10-6: CER Budget

Sl. No.	Considerations	CER Cost in Rs.
1	Health camp and free medicine	1,30,000
2	Educational support to poor student especially girls	1,22,000
3	Provide drinking water facility	1,28,000
Total in Rs.		3,80,000

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SUMMARY AND CONCLUSION

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11. SUMMARY AND CONCLUSION

11.1 INTRODUCTION

The applicant Koilash Mahato has obtained Sand mining lease through e-tendering from the Govt. of West Bengal vide Letter of Intent no. **1449/MM/Auction/2019** dated **17.06.2017** over an area of 3.82Ha/ 9.44 Acres on Ajay river near Mouza – Desher Mohan, P.S.- Jamuria, Dist – Paschim Bardhaman, West Bengal, over Plot No. 583(P), J.L. No.- 14 (**Refer Annex 1.2**). Further Lol vide no. **87/MM/ADM & DLRO-PAB/23** was extended by DL&LRO dated **06.01.2023** (**Refer Annex 1.3**). As riverbed Sand is replenished every year hence life of mine is not applicable. The proposed mine lease area shown in mouza map is attached as **Annex 2.1**.

Issued ToR letter vide no. **495/EN/T-II-1/040/2023** to **Shri Koilash Mahato**, on **10th March, 2023** for undertaking detailed EIA study for the purpose of obtaining environmental clearance in accordance with the provisions of the EIA Notification; 2006. The Terms of Reference (ToR) issued for the project are provided as **Annex 1.1** in the Environmental Impact Assessment (EIA) report

The estimated total reserve within the leasehold area is approximately **1,14,600 m³/year** with sand replenishment planned annually after the monsoon. To protect the riverbanks, mining will occur at a distance of 100m or 1/3rd of the distance between the bank lines, whichever is less. After leaving a safety barrier of 7.5m, a mining area of 3.15 Ha remains, containing the mineable reserve of **94,500 m³/year**. The maximum mining depth will be 3.0 m, and the proposed average production capacity is **472.5 m³/day**.

Mining Method:

- The mining is confined to collection of sand from the riverbed. The extraction process will involve mining up to a maximum depth of 3 meters at the riverbank or up to the water table, whichever is less. Dry pit mining will be employed.
- The riverbed material will be collected in its natural state during the mining process. The mining method will be opencast manual (preferably) or semi mechanised. The river bed material will be collected in its existing form.
- The distance of 7.5 m shall be further marked from the lease boundary and this zone constituting the 'safety zone' shall be identified. No mining activities shall be undertaken within this 'safety zone'. This shall be in accordance of West Bengal Minor Mineral Concession Rules 2016 (WBMMCR-2016)
- The excavation of riverbed minerals will begin from the top of the designated area and progress downwards in 0.50-meter increments, removing the minerals in slices.

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- Riverbed sand extraction will be done through bench of 1.00m height and 1.00m width, the whole material is mineable. The removal is done without affecting the base flow of the river and in such manner as to maintain the smooth flow of the river during the monsoons. This helps in protection of the banks from erosion.
- The mineral extraction will be done for a period of Five years from the date of Execution. Throughout the mining operation, the areas of the quarry will remain free from submergence, ensuring that there is no flooding or inundation. During mining operation, the river flow will be a way to enable dry pit mining. The ultimate slope of pit by the end of conceptual period shall be same as the shape of area.

Raw Material Required:

Inputs	Approx. quantity required	Basis
Water Requirement		
Water for Drinking and Domestic Purposes	0.30 KLD	100litre/capita/day
Dust Suppression & others	2.70 KLD	0.5 Liter per plant 2 times a day
Water for green belt development	2.02 KLD	Length of Road (m) x Width of Road (m) x 1litre/m ² x 2times per day

11.2 DESCRIPTION OF ENVIRONMENT

The baseline data has been collected from October 2022 to December 2022. The details area given below:

Ambient Air Quality Results: Samples were collected from 6 sampling locations during the period of October 2022 to December 2022 (post-monsoon season). The results are given below:

Particulate Matter 10 (Pm₁₀)

The results of PM₁₀ of all locations are showing variations from 64.1 µg/m³ in Parsunsi to 84.5 µg/m³ in the Near Project Site. Hence, the results are within the limits of National Ambient Air Quality Standards (NAAQS).

Particulate Matter 2.5 (PM_{2.5})

The results of PM_{2.5} of all locations are showing variations from 25.7 µg/m³ in the Parsundi to 39.6 µg/m³ in the Near Project Site. However, the results are within the limits of National Ambient Air Quality Standards.

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Percentage of Free Silica

The PM₁₀ samples collected from various locations show the presence of free silica (polymorphs of quartz, cristobalite, and tridymite) at the following percentages: 0.44% (Near Project site), 0.48% (Simsa), 0.46% (Paschim Barkola), 0.42% (Parsundi), 0.49% (Chirchurbil), and 0.47% (Birkulti).

Gaseous Pollutants

The results of SO₂ of all locations are showing variations from 10.6 µg/m³ in the Parsundi to 16.9 µg/m³ in the Simsa. However, the results are within the limits of National Ambient Air Quality Standards.

The results of NO₂ of all locations are showing variations from 15.2 µg/m³ in the Parsundi to 20.8 µg/m³ in the Simsa. However, the results are within the limits of National Ambient Air Quality Standards (NAAQS).

The values of both the parameters are well within the prescribed limits.

Noise Quality results: Samples were collected from 6 locations.

The ambient noise level at day time are varies from 50.3 dB (A) at Birkulti to 54.7 dB(A) at Near Project Site which is within the standard limits of residential area are ~ 55 dB (A). The night time noise result is varying from 41.5 dB (A) at Parsundi to 44.2 dB (A) at Near Project Site which is within the standard limits of residential ~ 45 dB (A).

Ground Water Quality Results: The samples were collected from 4 ground water locations and 2 surface water sources:

Ground Water results: All results were found within standard drinking water standards (IS: 10500).

Surface Water results: The surface water quality of the upstream and downstream water of Ajay River is within the prescribed CPCB Water Quality Criteria Class of water.

Soil Quality Results: The samples were collected from 4 locations:

pH ranging from 7.08 to 7.29 in the study area. Bulk density of the study area ranges between 1.13 gm/cm³ Chichurbil to 1.29 gm/cm³ at Simsa. Electrical conductivity of the soil samples is found to be average and ranges from 219 µmhos /cm to 251 µmhos /cm. Organic carbon of the soil samples varies from 0.28% in Near Project Site to 0.39% in Chichurbil. Nitrogen content in the surface soil of the study area varies between 257.2 kg/ha at Chichurbil to 289.5 kg/ha in Near Project Site. Available Phosphorus ranges between 71.5 kg/ha at Nabagram to 79.2 kg/ha at Near Project Site. Potassium content in the study area ranges between 321.5 kg/ha at Near Project Site to 350.1 kg/ha at Chichurbil.

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From the data above we can infer that the soil of the study area is of high fertility with high Phosphorus and Potassium content, and agricultural activity, if any, would not be dependent on the addition of external fertilizers. The good content of nitrogen (N) will aid in the growth of leaves.

Ecology and Biodiversity Results:

Flora: The flora of Paschim Bardhaman district is composed mostly of tropical dry deciduous trees. Amongst the flora are: Sal (*Shorea robusta*), Mahua (*Madhuea latifolia*), Palas (*Butea monosperma*), Bans (*Bambusa arundinacea*), Arjun (*Terminalia arjuna*), Shireesh (*Albizia saman*) and Kend (*Diospyros melanoxylon*), Simul (*Salmalia malabarica*), neem (*Azadirachta indica*), amlaki (*Phyllanthus emblica*), coconut, date palm, tal (*Palmyra palm / Borassus flabellifer*), bat (banyan/ *Ficus benghalensis*), asvattha (pipal/ *Ficus religiosa*), palash (*Butea monosperma*), krishnachuda (*Caesalpinia pulcherrima*) and Aam (mango/ *Mangifera indica*). There are some shrubby plants: suchashsheoda (orangeberry/ *Glycosmis pentaphylla*), gulancha (*Tinospora cordifolia*), tushi (basil/ *Ocimum tenuiflorum*), Shaora (*Streblus asper*), Dumur (*Ficus hispida*) etc.

The common aquatic or marsh weeds found in jheels (lakes) and swamps of the eastern part of the district are: Kash (*Saccharum spontaneum*), Bena (*Andropogon squarrosus*), Ganj or pata-sola (*Vallisneria spiralis*), Jhangi (*Hydrilla verticillata*), Pond weed (*Potamogeton indicus*), Kesar-dam (*Jussiaea repens*), Kush (*Eragrostis cynosuroides*), common Jhangi (*Utricularia stellaris*), Pana (*Lemna paucicostata*), water hyacinth (*Eichhornia crassipes*), padma (*Nelumbo nucifera*), hogla (*Typha domingensis*) etc. (Census, 2011).

Fauna: Paschim Bardhaman has a rich ecological and wild life heritage. Wild life of Paschim Bardhaman includes diversified mammals, birds, reptiles, amphibians, fishes, birds and reptiles. A newly created research organization, and biodiversity portal of district of West Bengal named as, Biodiversity of Paschim Bardhaman, a sister-group of "Birding Durgapur" has already explored and documented that till date only in Durgapur 238 species of bird, 99 species of butterfly, and about more than 60 species which is a positive indication of larger exploration in whole district. The group is also engaged to explore the species of plant, mollusc, amphibian, reptiles etc.

The District Gazetter, Bardhaman, depicted that, the mammalian carnivore of the district comprises of leopard (*Panthera pardus*), wolf (*Canis lupus*), hyaena (*Hyaena hyaena*), jackal (*Canis aureus*) and other smaller species, but hyaenas are not so common. Wolves are frequently found and are mostly met with in the jungles north of Kanksa. Wild pigs (*Sus scrofa*) are numerous throughout the district and monkeys (*Cercopithecidae* sp.) also abound including the variety known as Hanuman.

The common avifauna of the district are jungle-fowl (*Gallus* sp.), jungle crow (*Corvus macrorhynchos*), house crow (*Corvus splendens*), treepie (*Dendrocitta vagabunda*), common babbler (*Turdoides scudata*), gold fronted chloropsis (*Chloropsis aurifrons*), red-vented bulbul (*Pycnonotus cafer*), brown backed robin (*Erythropgia hartlaubi*), Shama (*Copsychus*

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malabaricus), Tickell's blue flycatcher (*Cyornis tickelliae*), wood shrike (*Tephrodornis pondicerianus*), black drongo (*Dicrurus macrocercus*), streaked fantail warbler (*Cisticola juncidis*), common mayna (*Acridotheres tristis*), pied mayna (*Gracupica contra*), spotted munia (*Lonchura punctulata*), house sparrow (*Passer domesticus*), woodpecker (*Picidae sp.*), koel (*Eudynamis sp.*), parakeet (*Melopsittacus undulatus*), Nilkantha (*Coracias benghalensis*), bee-eater (*Meropidae sp.*), kingfisher (*Alcedo sp.*), hoopoe (*Upupidae sp.*), horned owl (*Bubo virginianus*), griffon vulture (*Gyps fulvus*), small spotted eagle (*Clanga clanga*), various types of pigeon and dove, goose, duck, teal, lap wing, white necked stork and several varieties of egret and heron. District's wildlife heritage is significantly enriched by some species of various migratory birds. Specifically, the low-lying swampy areas of Paschim Bardhaman are an excellent line of migration habitat of birds and provide a very good shelter for the migratory birds throughout the winter season.

Socio Economic Study Results: Results of the socio-economic study: The study area encompasses 136 villages within the buffer zone. The study was conducted using a combination of primary surveys and secondary data sourced from the Census of India 2011 report.

Core Zone: There is no habitation in the core zone

Buffer Zone: The total number of households in the study area in village area is 39,355 as per Census of India, 2011 data. The details are given below:

Population:

Total population of the study area is 1,90,280 in 39,355 households, implying that there is an average of 5 members per household. According to the survey, gender ratio of study area was 924 in 2011.

Social Structure

The proportion of Scheduled Caste (SC) population within the study area is 27.47% of total population and the percentage of Scheduled Tribes (ST) is 12.27% of the total population.

Literacy

The total proportion of literates within the study area is 58.71% of total population. Out of 58.71%, the male literacy is 59.07% and the female literacy is 40.93%, within study area.

The project will generate direct employment for a total of 30 persons - in which, apart from the statutory employment mostly the local people will be hired.

Traffic:

Traffic density measurements were conducted continuously for 24 hours using visual observation and vehicle counting in four categories: heavy motor vehicles, light motor vehicles, two/three

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wheelers, and cycles. To account for low road traffic density, two skilled individuals were deployed during each shift, with one person assigned to each direction for counting the traffic. Hourly counting and recording of vehicles were performed, resulting in the determination of the total number of vehicles in each category per hour.

A summary of the traffic density monitored during survey period is given in Chapter 3.

11.3 ANTICIPATED IMPACTS AND MITIGATION MEASURES

- **Land Environment:** A detailed study was conducted to analyze the characteristics of the study area's land environment, including land use, soil, and vibration. This study aimed to gain a thorough understanding of the study area's land attributes and their potential role in the propagation of pollution.
- **Water Environment:** The proposed mining project has a total water requirement of 5.02 KLD (Kilo Litres per Day). Drinking water needs will be fulfilled by sourcing it from the nearest village. Water for sprinkling and plantation purposes will be obtained through private tankers.
- **Air Environment:** The primary source of air pollution in the area is the road transport network, specifically trucks and dumpers. To mitigate this, regular water sprinkling on the roads will be implemented, resulting in a 75% reduction in dust emissions.
- **Noise Environment:** : The proposed mining operations will employ well-maintained equipment, and workers will be provided with appropriate protective gear, including ear plugs and muffs if necessary. Additionally, plantation activities will be undertaken to establish a natural barrier against noise sources.
- **Biological Environment:** Lease area is in a Non-Forest Land. The proposed project will have no adverse impact on the flora and fauna in the area.
- **Socio-Economic environment:** The project will enhance direct and indirect employment in the area. Therefore, overall economic development is likely to improve after the commencement of the project.
- **Mine Waste:** As the proposed mine does not generate any waste or mineral rejects, onsite dustbins will be provided for proper management of food waste, which will be regularly cleaned. A compost pit will also be constructed to dispose of food waste. Additionally, mobile toilets will be made available on site.
- **Impacts due to transportation:** The mineral will be transported to the market through tippers. Transportation shall be done by Forty-one 11.50 T tippers. As per the study done, there will not be any congestion due to the proposed project on the road.

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11.4 ENVIRONMENT MONITORING PLAN

A systematic environmental monitoring program will be implemented within the mining lease area and a 10 km radius study area. A comprehensive network for monitoring has been developed, considering factors such as pollution sources from mining operations, wind direction, drainage pattern, topography, and the biological environment. Sampling locations have been identified accordingly to ensure comprehensive coverage and accurate assessment of environmental parameters.

11.5 ADDITIONAL STUDIES

Risk Assessment & Disaster Management Plan: During the proposed five-year plan period, there is no anticipation or occurrence of high-risk factors such as landslides, subsidence, floods, fires, or tailing dam failures. Consequently, there is no need for an emergency plan for quick evacuation or additional protective measures. Furthermore, as the working area is distant from any local population, no local inhabitants are present.

Rehabilitation and Resettlement: There is no human habitation at the project site. So, there will be no rehabilitation and resettlement issue.

11.6 PROJECT BENEFITS

The proposed mining project has a substantial positive impact on the socio-economic environment, supporting the overall development of the area. It contributes significantly to economic growth by generating direct employment for 30 individuals and creating numerous indirect employment opportunities for the local community.

11.7 ENVIRONMENT MANAGEMENT PLAN

To ensure effective environmental protection measures throughout and after the commissioning of the proposed mining project, the preparation of an Environmental Management Plan (EMP) is necessary. The EMP serves as a comprehensive framework for formulating, implementing, and monitoring environmental safeguards. With a project cost of Rs. 190 lakhs, the EMP cost is estimated to be Rs. 9.50 lakhs

Budget towards Corporate Environment Responsibility (CER) will be Rs. 3.80 lakh as the annual recurring cost.

By the end of the lease period green belt development programme will be carried out over an area of **1.26 ha**. Local species will be considered for the plantation purpose.

Among other environmental protection measures, following are listed below:

- Sprinkling of water for dust suppression on mine haul roads.
- Regular compaction & grading of haul roads and service roads to clear accumulation of loose material.
- Avoid overloading of dumpers and consequent spillage on the roads.

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- Good maintenance of vehicles & machinery.
Water sprinklers of fixed type will be provided at the mine approach roads to prevent the generation of dust.

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DISCLOSURE OF CONSULTANTES ENGAGED

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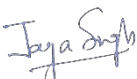
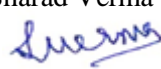



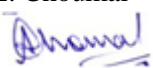






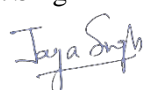

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ENVIRONMENT IMPACT ASSESSMENT & ENVIRONMENT MANAGEMENT PLAN

Functional Area Experts

Sl. No.	Functional Area	FAEs	Associate FAEs
1.	Air Pollution Monitoring, Prevention & Control (AP)	Sanjay Rambhau Shevkar 	Prithwiraj Kundu 
2.	Meteorology, Air Quality Modelling & Prediction (AQ)	Jaya Singh 	
3.	Water Pollution Monitoring, Prevention & Control (WP)	Sharad Verma 	Mohd. Javed 
4.	Land Use (LU)	Radhakrishnamoorthy Periyasamy 	
5.	Ecology and Biodiversity (EB)	Sameer V. Deshpande 	
6.	Noise and Vibration (NV)	Anil L. Choumal 	Prithwiraj Kundu 
7.	Socio-economics (SE)	Yogesh Kumar Mahor	
8.	Hydrology, Ground water and Water Conservation (HG)	Sharad Verma 	Pritam Saha 
9.	Geology (GEO)	Pritam Saha 	
10.	Soil Conservation (SC)	Sameer V. Deshpande 	
11.	Risk Assessment & Hazard Management (RH)	Jaya Singh 	
12.	Solid and Hazardous Waste Management [comprising hazardous wastes (HW), industrial solid wastes (ISW) and	Jaya Singh 	Mohd. Javed 

**ENVIRONMENT CONSULTANT
M/S CHAITANYA PROJECTS
CONSULTANCY (P) LTD.****12-1****CHAPTER-12
DISCLOSURE OF CONSULTANTS
ENGAGED**

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ANNEXURE-1.1

TOR LETTER

STATE LEVEL ENVIRONMENT IMPACT ASSESSMENT AUTHORITY

Pranisampad Bhawan, 5th floor, LB 2, Sector-III, Salt Lake, Kolkata – 700 106

e-mail: environmentwb@gmail.com

Web Portal: www.environmentwb.gov.in

No. 495 / EN / T – II – 1 / 040 / 2023

Date: 10th March, 2023

To
Koilash Mahato.,
Basudha, P.O.-Moukhira,
Dist-Paschim Medinipur Pin:- 731214

Sub: ToR for doing EIA for the proposed Desher Mohan Sand Mine on River Ajay in the area of 3.82 Ha. (9.44 Acres) at Plot No: 583(P), J.L. No.-14, Mouza: Desher Mohan, P.S. & Block - Jamuria, District: Paschim Bardhaman, West Benga, (proposal no. SIA/WB/MIN/411078/2022)

Sir,

This is to inform you that SEIAA in its meeting on 02.03.2023 considered your online application (vide Proposal No. SIA/WB/MIN/411078/2022) as well as the recommendations of SEAC for issuance of ToR and agreed with the recommendation.

The ToR for conducting EIA study is attached herewith (annexure 1).

The ToR is valid for a period of 3(three) years from the date of issue. EIA/EMP is to be submitted before the expiry of the ToR for consideration of EC application.

Encl: Annexure 1



(K Balamurugan)
Member Secretary, SEIAA

No. 495 / EN / T-II-1/040/2023

Date: 10th March, 2023

Copy forwarded for the information to:

The Secretary, State Level Expert Appraisal Committee, 'Paribesh Bhavan', LA, Salt Lake Sector III,
Kolkata- 700106



Member Secretary, SEIAA

A. STANDARD TERMS OF REFERENCE

1. Year-wise production details since 1994 should be given, clearly stating the highest production achieved in any one year prior to 1994. It may also be categorically informed whether there had been any increase in production after the EIA Notification 1994 came into force, w.r.t. the highest production achieved prior to 1994.
2. A copy of the document in support of the fact that the Proponent is the rightful lessee of the mine should be given.
3. All documents including approved mine plan, EIA and Public Hearing should be compatible with one another in terms of the mine lease area, production levels, waste generation and its management, mining technology etc. and should be in the name of the lessee.
4. All corner coordinates of the mine lease area, superimposed on a High Resolution Imagery/ toposheet, topographic sheet, geomorphology and geology of the area should be provided. Such an Imagery of the proposed area should clearly show the land use and other ecological features of the study area (core and buffer zone).
5. Information should be provided in Survey of India Toposheet in 1:50,000 scale indicating geological map of the area, geomorphology of land forms of the area, existing minerals and mining history of the area, important water bodies, streams and rivers and soil characteristics.
6. Details about the land proposed for mining activities should be given with information as to whether mining conforms to the land use policy of the State; land diversion for mining should have approval from State land use board or the concerned authority.
7. It should be clearly stated whether the proponent Company has a well laid down Environment Policy approved by its Board of Directors? If so, it may be spelt out in the EIA Report with description of the prescribed operating process/procedures to bring into focus any infringement/deviation/violation of the environmental or forest norms/ conditions? The hierarchical system or administrative order of the Company to deal with the environmental issues and for ensuring compliance with the EC conditions may also be given. The system of reporting of non-compliances / violations of environmental norms to the Board of Directors of the Company and/or shareholders or stakeholders at large, may also be detailed in the EIA Report.
8. Issues relating to Mine Safety, including subsidence study in case of underground mining and slope study in case of open cast mining, blasting study etc. should be detailed. The proposed safeguard measures in each case should also be provided.
9. The study area will comprise of 10 km zone around the mine lease from lease periphery and the data contained in the EIA such as waste generation etc. should be for the life of the mine / lease period.
10. Land use of the study area delineating forest area, agricultural land, grazing land, wildlife sanctuary, national park, migratory routes of fauna, water bodies, human settlements and other ecological features should be indicated. Land use plan of the mine lease area should be prepared to encompass preoperational, operational and post operational phases and submitted. Impact, if any, of change of land use should be given.
11. Details of the land for any Over Burden Dumps outside the mine lease, such as extent of land area, distance from mine lease, its land use, R&R issues, if any, should be given.
12. A Certificate from the Competent Authority in the State Forest Department should be provided, confirming the involvement of forest land, if any, in the project area. In the event of any contrary claim by the Project Proponent regarding the status of forests, the site may be inspected by the State Forest Department along with the Regional Office of the Ministry to ascertain the status of forests, based on which, the Certificate in this regard as mentioned above be issued. In all such cases, it would be desirable for representative of the State Forest Department to assist the Expert Appraisal Committees.

13. Status of forestry clearance for the broken up area and virgin forestland involved in the Project including deposition of net present value (NPV) and compensatory afforestation (CA) should be indicated. A copy of the forestry clearance should also be furnished.
14. Implementation status of recognition of forest rights under the Scheduled Tribes and other Traditional Forest Dwellers (Recognition of Forest Rights) Act, 2006 should be indicated.
15. The vegetation in the RF / PF areas in the study area, with necessary details, should be given.
16. A study shall be got done to ascertain the impact of the Mining Project on wildlife of the study area and details furnished. Impact of the project on the wildlife in the surrounding and any other protected area and accordingly, detailed mitigative measures required, should be worked out with cost implications and submitted.
17. Location of National Parks, Sanctuaries, Biosphere Reserves, Wildlife Corridors, Ramsar site Tiger/Elephant Reserves/(existing as well as proposed), if any, within 10 km of the mine lease should be clearly indicated, supported by a location map duly authenticated by Chief Wildlife Warden. Necessary clearance, as may be applicable to such projects due to proximity of the ecologically sensitive areas as mentioned above, should be obtained from the Standing Committee of National Board of Wildlife and copy furnished.
18. A detailed biological study of the study area [core zone and buffer zone (10 km radius of the periphery of the mine lease)] shall be carried out. Details of flora and fauna, endangered, endemic and RET Species duly authenticated, separately for core and buffer zone should be furnished based on such primary field survey, clearly indicating the Schedule of the fauna present. In case of any scheduled-I fauna found in the study area, the necessary plan along with budgetary provisions for their conservation should be prepared in consultation with State Forest and Wildlife Department and details furnished. Necessary allocation of funds for implementing the same should be made as part of the project cost.
19. Proximity to Areas declared as 'Critically Polluted' or the Project areas likely to come under the 'Aravali Range', (attracting court restrictions for mining operations), should also be indicated and where so required, clearance certifications from the prescribed Authorities, such as the SPCB or State Mining Department should be secured and furnished to the effect that the proposed mining activities could be considered.
20. Similarly, for coastal Projects, A CRZ map duly authenticated by one of the authorized agencies demarcating LTL. HTL, CRZ area, location of the mine lease w.r.t CRZ, coastal features such as mangroves, if any, should be furnished. (Note: The Mining Projects falling under CRZ would also need to obtain approval of the concerned Coastal Zone Management Authority).
21. R&R Plan/compensation details for the Project Affected People (PAP) should be furnished. While preparing the R&R Plan, the relevant State/National Rehabilitation & Resettlement Policy should be kept in view. In respect of SCs /STs and other weaker sections of the society in the study area, a need based sample survey, family-wise, should be undertaken to assess their requirements, and action programmes prepared and submitted accordingly, integrating the sectorial programmes of line departments of the State Government. It may be clearly brought out whether the village(s) located in the mine lease area will be shifted or not. The issues relating to shifting of village(s) including their R&R and socio-economic aspects should be discussed in the Report.
22. One season (non-monsoon) [i.e. March-May (Summer Season); October-December (post monsoon season) ; December-February (winter season)] primary baseline data on ambient air quality as per CPCB Notification of 2009, water quality, noise level, soil and flora and fauna shall be collected and the AAQ and other data so compiled presented date-wise in the EIA and EMP Report. Site-specific meteorological data should also be collected. The location of the monitoring stations should be such as to represent whole of the study area and justified keeping in view the pre-dominant downwind direction and location of sensitive receptors. There should be at least one monitoring station within 500 m of the mine lease in the pre-dominant downwind direction. The mineralogical composition of PM10, particularly for free silica, should be given.

23. Air quality modeling should be carried out for prediction of impact of the project on the air quality of the area. It should also take into account the impact of movement of vehicles for transportation of mineral. The details of the model used and input parameters used for modeling should be provided. The air quality contours may be shown on a location map clearly indicating the location of the site, location of sensitive receptors, if any, and the habitation. The wind roses showing pre-dominant wind direction may also be indicated on the map.
24. The water requirement for the Project, its availability and source should be furnished. A detailed water balance should also be provided. Fresh water requirement for the Project should be indicated.
25. Necessary clearance from the Competent Authority for drawl of requisite quantity of water for the Project should be provided.
26. Description of water conservation measures proposed to be adopted in the Project should be given. Details of rainwater harvesting proposed in the Project, if any, should be provided.
27. Impact of the Project on the water quality, both surface and groundwater, should be assessed and necessary safeguard measures, if any required, should be provided.
28. Based on actual monitored data, it may clearly be shown whether working will intersect groundwater. Necessary data and documentation in this regard may be provided. In case the working will intersect groundwater table, a detailed Hydro Geological Study should be undertaken and Report furnished. The Report inter-alia, shall include details of the aquifers present and impact of mining activities on these aquifers. Necessary permission from Central Ground Water Authority for working below ground water and for pumping of ground water should also be obtained and copy furnished.
29. Details of any stream, seasonal or otherwise, passing through the lease area and modification / diversion proposed, if any, and the impact of the same on the hydrology should be brought out.
30. Information on site elevation, working depth, groundwater table etc. Should be provided both in AMSL and bgl. A schematic diagram may also be provided for the same.
31. A time bound Progressive Greenbelt Development Plan shall be prepared in a tabular form (indicating the linear and quantitative coverage, plant species and time frame) and submitted, keeping in mind, the same will have to be executed up front on commencement of the Project. Phase-wise plan of plantation and compensatory afforestation should be charted clearly indicating the area to be covered under plantation and the species to be planted. The details of plantation already done should be given. The plant species selected for green belt should have greater ecological value and should be of good utility value to the local population with emphasis on local and native species and the species which are tolerant to pollution.
32. Impact on local transport infrastructure due to the Project should be indicated. Projected increase in truck traffic as a result of the Project in the present road network (including those outside the Project area) should be worked out, indicating whether it is capable of handling the incremental load. Arrangement for improving the infrastructure, if contemplated (including action to be taken by other agencies such as State Government) should be covered. Project Proponent shall conduct Impact of Transportation study as per Indian Road Congress Guidelines.
33. Details of the onsite shelter and facilities to be provided to the mine workers should be included in the EIA Report.
34. Conceptual post mining land use and Reclamation and Restoration of mined out areas (with plans and with adequate number of sections) should be given in the EIA report.
35. Occupational Health impacts of the Project should be anticipated and the proposed preventive measures spelt out in detail. Details of pre-placement medical examination and periodical medical examination schedules should be incorporated in the EMP. The project specific occupational health mitigation measures with required facilities proposed in the mining area may be detailed.

36. Public health implications of the Project and related activities for the population in the impact zone should be systematically evaluated and the proposed remedial measures should be detailed along with budgetary allocations.
37. Measures of socio-economic significance and influence to the local community proposed to be provided by the Project Proponent should be indicated. As far as possible, quantitative dimensions may be given with time frames for implementation.
38. Detailed environmental management plan (EMP) to mitigate the environmental impacts which, should inter-alia include the impacts of change of land use, loss of agricultural and grazing land, if any, occupational health impacts besides other impacts specific to the proposed Project.
39. Public Hearing points raised and commitment of the Project Proponent on the same along with time bound Action Plan with budgetary provisions to implement the same should be provided and also incorporated in the final EIA/EMP Report of the Project.
40. Details of litigation pending against the project, if any, with direction /order passed by any Court of Law against the Project should be given.
41. The cost of the Project (capital cost and recurring cost) as well as the cost towards implementation of EMP should be clearly spelt out.
42. A Disaster management Plan shall be prepared and included in the EIA/EMP Report.
43. Benefits of the Project if the Project is implemented should be spelt out. The benefits of the Project shall clearly indicate environmental, social, economic, employment potential, etc.
44. Besides the above, the below mentioned general points are also to be followed:-
 - a. Executive Summary of the EIA/EMP Report (enclosed as **Annexure – A**).
 - b. All documents to be properly referenced with index and continuous page numbering.
 - c. Where data are presented in the Report especially in Tables, the period in which the data were collected and the sources should be indicated.
 - d. Project Proponent shall enclose all the analysis/testing reports of water, air, soil, noise etc. using the MoEF&CC/NABL accredited laboratories. All the original analysis/testing reports should be available during appraisal of the Project.
 - e. Where the documents provided are in a language other than English, an English translation should be provided.
 - f. The Questionnaire for environmental appraisal of mining projects as devised earlier by the Ministry shall also be filled and submitted.
 - g. While preparing the EIA report, the instructions for the Proponents and instructions for the Consultants issued by MoEF&CC vide O.M. No. J-11013/41/2006-IA.II(I) dated 4th August, 2009, which are available on the website of this Ministry, should be followed.
 - h. Changes, if any made in the basic scope and project parameters (as submitted in Form-I and the PFR for securing the TOR) should be brought to the attention of MoEF&CC with reasons for such changes and permission should be sought, as the TOR may also have to be altered. Post Public Hearing changes in structure and content of the draft EIA/EMP (other than modifications arising out of the P.H. process) will entail conducting the PH again with the revised documentation.
 - i. As per the circular no. J-11011/618/2010-IA.II(I) dated 30.5.2012, certified report of the status of compliance of the conditions stipulated in the environment clearance for the existing operations of the project, should be obtained from the Regional Office of Ministry of Environment, Forest and Climate Change, as may be applicable.
 - j. The EIA report should also include (i) surface plan of the area indicating contours of main topographic features, drainage and mining area, (ii) geological maps and sections and (iii) sections of the mine pit and external dumps, if any, clearly showing the land features of the adjoining area.

B. Additional Terms of Reference

- 1) Valid LOI from the competent authority.
- 2) Cluster certificate from the competent authority should be submitted.
- 3) Reserves to be submitted based on the replenishment rate as per the approved DSR.
- 4) Need-based EMP, prepared in accordance with the MoEF&CC Office Memorandum vide F. No. 22-65/2017.IA.III dated 30.09.2020.
- 5) Study report on base flow level measured at 5 points with date and supporting photographs. It should be committed that mining will be done at least 1m above the base flow level. Accordingly, if required, the proposal may also be revised.

.The project proponent is requested to submit the final EIA/EMP prepared as per the above-mentioned ToRs and incorporating all the issues raised during Public Hearing / Public Consultation to the SEAC for further consideration of the proposal for environmental clearance.

The proponent, – while applying for environmental clearance, shall upload in the PARIVESH portal, the EIA/EMP report along with the documents/ sought above.

Executive Summary

The Executive summary of the EIA/EMP report in about 8-10 pages should be prepared incorporating the information on following points:

- 1) Project name and location (Village, District, State, Industrial Estate (if applicable).
- 2) Products and capacities. If expansion proposal, then existing products with capacities and reference to earlier EC.
- 3) Requirement of land, raw material, water, power, fuel, with source of supply (Quantitative).
- 4) Process description in brief, specifically indicating the gaseous emission, liquid effluent and solid and hazardous wastes.
- 5) Measures for mitigating the impact on the environment and mode of discharge or disposal.
- 6) Capital cost of the project, estimated time of completion.
- 7) Site selected for the project - Nature of land - Agricultural (single/double crop), barren, Govt./private land, status of its acquisition, nearby (in 2-3 km.) water body, population, within 10km. other industries, forest, eco-sensitive zones, accessibility, (note - in case of industrial estate this information may not be necessary).
- 8) Baseline environmental data - air quality, surface and ground water quality, soil characteristic, flora and fauna, socio-economic condition of the nearby population.
- 9) Identification of hazards in handling, processing and storage of hazardous material and safety system provided to mitigate the risk.
- 10) Likely impact of the project on air, water, land, flora-fauna and nearby population.
- 11) Emergency preparedness plan in case of natural or in plant emergencies.
- 12) Issues raised during public hearing (if applicable) and response given.
- 13) Environment Management Plan (EMP) as per Office Memorandum issued by the MoEF & CC vide F. No. 22-65/2017-IA.III dated 30.09.2020 with proposed expenditure.
- 14) Occupational Health Measures.
- 15) Post project monitoring plan.

ANNEXURE-1.2

LETTER OF INTENT



GOVERNMENT OF WEST BENGAL
OFFICE OF THE DISTRICT MAGISTRATE
PASCHIM BARDHAMAN
Vivekananda Sarani, P.O.- R.K. Mission, Asansol-713305

Memo No. 1449 / MM/Auction/2019

Date: 17.06.2019

To
KOILASH MAHATO (Proprietor)
BASUDHA, PO - MOUKHIRA,
DIST PASCHIM BARDHAMAN,
PIN 731214

Sub:- Letter of Intent with reference to e-auction bearing ID No. **2019_WB_1326** conducted on **06/02/2019** and **07/02/2019** for grant of mining lease for sand in sand block **JAMURIA/DESHER MOHAN/583(P)/A** located in plot No. 583(P) in Mouza Desher Mohan, J.L. No. 14, P.S. Jamuria, District Paschim Bardhaman over an area of **9.44** acres (3.82 hectares).

Background

1. The District Committee for Competitive Bidding of Minor Minerals, (henceforth the District Committee) Paschim Bardhaman, pursuant to rules 38 and 41 of the west Bengal Minor Minerals Concession Rules, 2016 and the West Bengal Minor Minerals (Auction) Rules, 2016 (hereinafter auction rules) issued notice inviting tender dated **17/01/2019** to commence the e-auction process for grant of mining lease for sand in respect of sand block **JAMURIA/DESHER MOHAN/583(P)/A** located in plot No. 583(P) in Mouza Desher Mohan, J.L. No. 14, P.S. Jamuria, District Paschim Bardhaman over an area of **9.44** acres (3.82 hectares). The e-auction process was conducted in accordance with the said Rules and also the tender document for the said sand block which was duly published in Government's e-procurement portal as per extant rules and **KOILASH MAHATO** has been declared as successful bidder under Rule 9 (8) of the said Auction Rules.
2. As required under Rule 10(1) of the said Auction Rules, **KOILASH MAHATO** has made payment of the first instalment of the Bid Amount, being one-third of the bid amount, amounting to Rs. **20,33,000.00 (Rupees Twenty Lakh Thirty Three Thousand only)** through GRIPS vide GRN 19-201920-000645527-2 dt. 17/04/19.

Letter of Intent

Accordingly, pursuant to Rule 10 (3) of the said auction Rules, this letter of intent is hereby issued for grant of mining lease for sand in respect of sand block **JAMURIA/DESHER MOHAN/583(P)/A** located in plot No. 583(P) in Mouza Desher Mohan, J.L. No. 14, P.S. Jamuria, District Paschim Bardhaman over an area of **9.44** acres (3.82 hectares) in favour of **KOILASH MAHATO** for a period of **05 (five)** years subject to the following terms and conditions:

Terms and Conditions

1. This letter of intent and subsequent grant of aforementioned mining lease shall be subject to the provisions of the MMDR Act, 1957, West Bengal Minor Minerals Concession Rules, 2016 and West Bengal Minor Minerals (Auction) Rules, 2016 as amended from time to time and **KOILASH MAHATO** shall be granted the mining lease only upon satisfactory completion of the requirements stipulated in the said Rules.
2. The rest of the bid amount, being two-third of the total amount shall be paid in three equal instalments with a gap of maximum 45 days each from the date of first instalment [Notification no. 387/CI/O/MIN/GEN-MIS/21/2017 dated 22/05/2017 of the Department of Industry, Commerce & Enterprises, Mines Branch, Govt. Of West Bengal].
3. **KOILASH MAHATO** (henceforth the successful bidder) shall furnish a Mining Plan along with Mine Closure Plan as per model format issued by the Commerce and Industries Department under letter No. 420-CI/O/MIN/GEN-MIS/16/2016(PT.) dated 28/07/2016, duly approved by the competent authority within one month from the date of issue of the Letter of Intent (Lol).
4. The successful bidder shall furnish Financial Assurance amounting **Rs. 57,300.00 (Rupees Fifty Seven Thousand Three Hundred Only)** in any of the forms mentioned under Rule 18(2) of the West Bengal Minor Minerals Concession Rules, 2016 before execution of the deed of lease.
5. The successful bidder shall furnish performance security, being 10% of the bid amount, amounting to **Rs. 6,09,900.00 (Rupees Six Lakh Nine Thousand Nine Hundred only)** in the form of bank guarantee before

- execution of the deed of lease mentioned under Rule 11 of the West Bengal Minor Minerals Auction Rules, 2016.
6. The successful bidder shall submit Environmental Clearance (E.C) in respect of the above mentioned sand block duly issued by District Level Environment Impact Assessment Authority (DEIAA) or State Level Environment Impact Assessment Authority (SEIAA) or Ministry of Environment, Forests & Climate Change (MoEF&CC) as the case may be as per Environment Impact Assessment Notification 2006, as amended.
 7. The successful bidder shall also obtain all other consents, approval, no-objections and the like as required under applicable laws for execution of deed of lease.
 8. The successful bidder shall be bound to follow the guidelines stipulated in the Sustainable Sand Mining Management Guidelines, 2016 issued by the Ministry of Environment, Forest and Climate Change, Government of India for undertaking mining operation in the concerned sand block after registration of the duly executed mining lease.
 9. The successful bidder have to furnish a Draft Mining Lease Deed in the format as specified in Form - D of the West Bengal Minor Minerals Concession Rules, 2016.
 10. The Draft Mining Lease Deed should be prepared in durable papers neatly and sufficient space should be kept in between two lines in order to permit, if necessary, correction therein.
 11. The Deed of Lease, after execution, shall be registered by the successful bidder at his own cost and no mining operation should be started before registration of the Deed.
 12. The successful bidder shall have to incorporate all the conditions as mentioned in the West Bengal Minor Minerals Concession Rules, 2016 in the Draft Lease Deed.
 13. The successful bidder shall have to comply with all the statutory requirements before presenting the Deed of Lease for execution before the appropriate authority.

This Letter of Intent (LoI) shall remain valid for a period of one month from the date of its issuance and if the successful bidder is unable to fulfil all the above conditions within this period he may submit an application addressed to the District Magistrate for extension of time. Such application may be submitted to this end for due processing. The District Magistrate being the Chairperson of the District Committee, reserves the right to extend the validity of Letter of Intent (LoI) for such reasonable period as it deemed fit.



District Magistrate & Collector
Paschim Bardhaman

Memo No. 1449/1(3)/MM/Auction/2019

Date: 17 06 2019

Copy forwarded for information to:

1. The D.L.&L.R.O., Paschim Bardhaman.
2. Sub-Divisional Magistrate, **Asansol**.
3. The Chief Mining Officer, Court Road, Asansol, Paschim Bardhaman.


District Magistrate & Collector
Paschim Bardhaman

ANNEXURE-1.3

LOI EXTENSION

অতিরিক্ত জেলা শাসক এবং জেলা ভূমি

ও

ভূমি সংস্কার আধিকারকের করণ

পশ্চিম বর্ধমান

বিবেকানন্দ সরণি, রামকৃষ্ণ মিশন, কন্যাপুর

আসানসোল, পিন - ৭১৩৩০৫

ইমেল - dlropaschimbardhaman@gmail.com



Office of the Additional District Magistrate

And

District Land & Land Reforms Officer

Paschim Bardhaman

Vivekananda Sarani, Ramkrishna Mission, Kanyapur

Asansol, PIN - 713305

Email - dlropaschimbardhaman@gmail.com



Memo No. 87 /MM/ADM &DLRO-PAB/23

Date : 06/01/23

ORDER

In pursuance of Communication vide memo.no. 610-ICE/O/MIN/GEN-MIS/27/2021 dated 20.10.2022 of the Secretary to the Government of West Bengal, Department of Industry, Commerce and Enterprises, Mines Branch.

The respective Letter of Intent (Lol) against 9(Nine) number of Sand Blocks as mentioned below with payment of at least 1/3rd of the Bid Money (the Sand lessee (i) Koilash Mahato and (ii) Debnath Enterprise also paid the WBPCB dues) for which the EC could not be obtained will remain valid till 60 days.

Accordingly, the Highest Bidders (H1) are directed to fulfill all the conditions mentioned in the Letter of Intent (Lol) as originally issued for the respective Sand Block while adhering with this Order.

Sl. No.	Sand Block ID	Name of the Highest Bidder (H1)	Name of the Development Block	Lol Extended
1	Barabani/Rasunpur/1673(P)/D	M/s Libra Retailer Pvt. Ltd.	Barabani	60 days from the issuance of this letter
2	Barabani/Putulia/1108(P)/B	M/s Sreenathji Distributors	Barabani	
3	Barabani/Rasunpur/1673(P)/C	M/s Starnet Marketing Pvt. Ltd.	Barabani	
4	Jamuria/Darbardanga/1565(P)/B	M/s Reliance Stone Product	Jamuria	
5	Barabani/Putulia/1108(P)/C	M/s Maihar Developers	Barabani	
6	Barabani/Rasunpur/1673(P)/A	Ajay Tiwari	Barabani	
7	Barabani/Putulia/1108(P)/A	M/s Saran Alcohol Pvt. Ltd.	Barabani	
8	Jamuria/Deshermohan/583(P)/A	Koilash Mahato	Jamuria	
9	Jamuria/Deshermohan/583(P)/B	M/s Debnath Enterprise	Jamuria	

Additional District Magistrate

ADDITIONAL DISTRICT MAGISTRATE

District Land and Land Reforms Officer

DISTRICT LAND & LAND REFORMS OFFICER

Paschim Bardhaman

Date : 06/01/23

Memo No. 87 /1(16)/MM/ADM&DLRO-PAB/23

Copy forwarded for information and necessary action to the :

1. Secretary to the Govt. of W.B. Department of Industry, Commerce and Enterprises
2. Member Secretary, West Bengal Pollution Control Board & Member Secretary, SEIAA.
3. Chairman & Managing Director, WBMDTCL
4. Chief Mining Officer, Asansol, Paschim Bardhaman.
5. C.A. to the District Magistrate, Paschim Bardhaman

6-7. Block Land and Land Reforms Officer, Barabani/Jamuria.

8-16. The Highest Bidder(H1) M/s Libra Retailer Pvt. Ltd./ M/s Libra Retailer Pvt. Ltd./ M/s Starnet Marketing Pvt. Ltd./ M/s Reliance Stone Product/ M/s Maihar Developers/ Ajay Tiwari/ M/s Saran Alcohol Pvt. Ltd./ Koilash Mahato/ M/s Debnath Enterprise.

Additional District Magistrate

and

District Land and Land Reforms Officer

Paschim Bardhaman

ADDITIONAL DISTRICT MAGISTRATE

&

DISTRICT LAND & LAND REFORMS OFFICER

PASCHIM BARDHAMAN

ANNEXURE-2.1

MOUZA MAP

ANNEXURE-2.2

CLUSTER CERTIFICATE

ANNEXURE-3.1

ON-SITE METEOROLOGICAL DATA

Year	Month	Day	Hour	Temp	Wind Speed (km/hr)	Humidity	Wind Direction (Degree)	Wind Direction (Symbol)	Hourly Precipitation
2022	10	1	24	27	1	93	360	0	
2022	10	1	1	26.8	1	93	360	0	
2022	10	1	2	26.6	1	93	360	0	
2022	10	1	3	26.4	1	93	360	0	
2022	10	1	4	26.2	1	93	360	0	
2022	10	1	5	26	1	93	360	0	
2022	10	1	6	29	2	76	315	0	
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2022	12	21	24	20	11	66	360	0
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2022	12	21	6	25.2	8	68	360	0
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2022	12	21	9	16	0	68	315	0
2022	12	21	10	16	0	44	315	0
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2022	12	21	15	17	0	44	225	0
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2022	12	21	17	17	0	82	225	0
2022	12	21	18	17	0	82	225	0
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2022	12	22	20	19	0	56	360	0
2022	12	22	21	19	0	56	360	0
2022	12	22	22	19.2	0	70	360	0
2022	12	22	23	19.4	0	70	360	0
2022	12	23	24	19.6	0	70	360	0
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2022	12	23	4	21	6	70	360	0
2022	12	23	5	22	6	70	360	0
2022	12	23	6	23	6	70	360	0
2022	12	23	7	24	6	70	360	0
2022	12	23	8	25	6	70	360	0
2022	12	23	9	27	0	70	360	0
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2022	12	23	11	27	0	63	360	0
2022	12	23	12	27	0	63	360	0
2022	12	23	13	27	0	63	360	0
2022	12	23	14	27	0	63	360	0

2022	12	23	15	22	0	63	270	0
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2022	12	23	17	21.2	0	39	270	0
2022	12	23	18	20.8	0	39	270	0
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2022	12	26	13	23.6	0	65	315	0
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2022	12	29	19	19.4	0	51	45	0
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2022	12	30	5	24.4	0	78	360	0
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2022	12	30	10	24.8	0	58	315	0
2022	12	30	11	24.6	0	58	315	0
2022	12	30	12	24.4	0	58	315	0
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2022	12	31	13	24.4	0	72	360	0
2022	12	31	14	24	0	72	360	0
2022	12	31	15	21	3	72	270	0
2022	12	31	16	20.8	3	56	270	0
2022	12	31	17	20.6	3	56	270	0
2022	12	31	18	20.4	3	56	270	0
2022	12	31	19	20.2	3	56	270	0
2022	12	31	20	20	3	56	270	0
2022	12	31	21	20	3	56	360	0
2022	12	31	22	19.6	3	70	360	0
2022	12	31	23	19.2	3	70	360	0

2022

12

31

24

18.8

3

70

78

360

0

ANNEXURE-3.2

MONITORING DATA

Soil

Sl. no	Parameters	Unit	S-1: Near Project Site	S-2: Simsa	S-3: Paschim Barkola	S-4: Chichurbil
		Direction	SW	NE	ESE	NW
		Distance in km	0.21	0.61	1.69	2.41
1.	Soil colour	----	Brownish	Brownish	Brownish	Brownish
2.	pH	----	7.29	7.21	7.15	7.08
3.	Electrical Conductivity	µmhos /cm	219	231	247	251
4.	Moisture	%	3.1	3.7	4.2	4.5
5.	Soil Texture	----	Clay loam	Clay loam	Clay loam	Clay loam
6.	Clay	%	31	33	34	30
7.	Silt	%	27	23	21	28
8.	Sand	%	42	44	45	41
9.	Infiltration Rate	cm/hr	1.17	1.15	1.13	1.09
10.	Bulk density	gm/cm ³	1.19	1.29	1.21	1.13
11.	Porosity	%	47.6	42.3	40.7	38.5
12.	Nitrogen as N	kg/ha as N	289.5	282.7	265.1	257.2
13.	Phosphorus	kg/ha as P	79.2	77.5	71.5	72.4
14.	Potassium as K	kg/ha as K	321.5	330.2	346.4	350.1
15.	Organic Carbon	%	0.28	0.31	0.37	0.39
16.	Organic matter	%	0.48	0.53	0.64	0.67

Air

PM ₁₀						
	Min	Max	STDEV	Percentile 98	Mean	NAAQS
AAQ1	78.5	85.0	1.7	84.5	82.0	100
AAQ2	71.5	80.4	1.9	79.8	75.9	100
AAQ3	65.3	74.3	2.3	74.2	70.1	100
AAQ4	60.1	64.5	1.0	64.1	62.5	100
AAQ5	65.2	83.7	4.6	82.2	74.7	100
AAQ6	64.8	75.1	2.8	74.7	69.1	100

PM _{2.5}						
	Min	Max	STDEV	Percentile 98	Mean	NAAQS
AAQ1	33.2	40.2	2.0	39.6	36.0	60
AAQ2	28.5	35.8	1.9	35.6	32.5	60
AAQ3	26.0	36.6	2.4	36.2	32.4	60
AAQ4	19.6	26.0	1.5	25.7	23.3	60
AAQ5	31.9	38.1	1.9	37.9	34.6	60
AAQ6	24.7	32.5	2.1	32.0	27.5	60

SO ₂						
	Min	Max	STDEV	Percentile 98	Mean	NAAQS
AAQ1	9.9	14.7	1.1	14.4	12.4	80

AAQ2	14.3	17.0	0.8	16.9	15.3	80
AAQ3	13.1	15.8	0.8	15.8	14.2	80
AAQ4	8.3	10.6	0.7	10.6	9.4	80
AAQ5	10.6	14.4	1.2	14.4	12.5	80
AAQ6	10.2	15.3	1.5	15.3	13.8	80

NO ₂						
	Min	Max	STDEV	Percentile g8	Mean	NAAQS
AAQ1	14.2	19.7	1.6	19.5	17.0	80
AAQ2	16.1	20.8	1.4	20.8	18.6	80
AAQ3	13.4	17.5	1.4	17.4	15.3	80
AAQ4	12.0	15.5	1.1	15.2	13.6	80
AAQ5	13.7	18.4	1.4	18.3	16.1	80
AAQ6	13.5	19.4	1.6	19.4	17.2	80

CO						
	Min	Max	STDEV	Percentile g8	Mean	NAAQS
AAQ1	0.56	0.65	0.02	0.65	0.62	2
AAQ2	0.51	0.63	0.03	0.63	0.57	2
AAQ3	0.44	0.62	0.05	0.62	0.55	2
AAQ4	0.42	0.56	0.04	0.56	0.49	2
AAQ5	0.41	0.60	0.05	0.60	0.50	2
AAQ6	0.42	0.66	0.06	0.66	0.54	2

% Silica						
	Min	Max	STDEV	Percentile g8	Mean	NAAQS
AAQ1	0.35	0.44	0.03	0.44	0.40	-
AAQ2	0.39	0.48	0.02	0.48	0.44	-
AAQ3	0.32	0.46	0.04	0.46	0.40	-
AAQ4	0.36	0.42	0.02	0.42	0.40	-
AAQ5	0.38	0.49	0.02	0.49	0.45	-
AAQ6	0.21	0.47	0.07	0.47	0.39	-

Noise

Code & Location	Category of Area	Distance in km	Direction	Day Limits	Day			Night Limits	Night		
					L _{max}	L _{min}	L _{eq}		L _{max}	L _{min}	L _{eq}
N1: Near Project site	Residential	0.21	SW	55	57.3	53.1	54.7	45	47.8	42.6	44.2
N2: Simsa	Residential	0.61	NE	55	54.5	47.8	52.2	45	44.6	40.6	42.8
N3: Paschim Barkola	Residential	1.69	ESE	55	55.8	48.8	53.1	45	46.6	41.7	44.1
N4: Parsundi	Residential	2.73	NE	55	54.2	48.1	51.8	45	43.1	40.0	41.5
N5: Chichurbil	Residential	2.41	NW	55	54.6	49.3	52.9	45	45.7	42.1	43.9
N6: Birkulti	Residential	2.02	SE	55	51.9	46.9	50.3	45	44.7	40.0	41.8

Surface water

Parameters	Unit	SW ₁ (Upstream)	SW ₂ (Downstream)
Distance in km		0.57	0.62
Direction		NE	ESE
Turbidity	NTU	<5	<5
pH	--	7.3	7.8
Conductivity (at 25°C)	µS/cm	796.2	800.5
Total Dissolve Solids	mg/l	495.5	500.9
Alkalinity as CaCO ₃	mg/l	246.0	264.0
Total Hardness as CaCO ₃	mg/l	167.4	183.9
Calcium as Ca	mg/l	43.5	49.3
Magnesium as Mg	mg/l	14.3	14.8
Sodium	mg/l	54.0	58.0
Potassium	mg/l	11.0	16.0
Bi-Carbonate	mg/l	246.0	264.0
Chloride as Cl	mg/l	31.5	35.8
Sulphate as SO ₄	mg/l	52.0	61.0
Nitrate as NO ₃	mg/l	1.20	1.26
Fluoride as F	mg/l	0.54	0.58
Phenolic compound as C ₆ H ₅ OH	mg/l	BDL (DL - 0.001)	BDL (DL - 0.001)
Cyanide	mg/l	BDL (DL - 0.008)	BDL (DL - 0.008)
Arsenic	mg/l	BDL (DL - 0.005)	BDL (DL - 0.005)
Cadmium	mg/l	BDL (DL - 0.005)	BDL (DL - 0.005)
Total Chromium	mg/l	BDL (DL - 0.005)	BDL (DL - 0.005)
Iron	mg/l	0.44	0.46
Copper	mg/l	BDL (DL - 0.005)	BDL (DL - 0.005)
Lead	mg/l	BDL (DL - 0.005)	BDL (DL - 0.005)
Manganese	mg/l	BDL (DL - 0.005)	BDL (DL - 0.005)
Mercury	mg/l	BDL (DL - 0.01)	BDL (DL - 0.01)
Zinc	mg/l	0.17	0.19
Oil & Grease	mg/l	<5	<5
DO	mg/l	7.5	7.2
BOD	mg/l	2.3	3.6
COD	mg/l	14.5	18.4
Total Coliform	MPN/100ml	1200	1400

Ground water

Parameters	Unit	GW ₁ (Near Project Site)	GW ₂ (Simsa)	GW ₃ (Paschim Barkola)	GW ₄ (Chichurbil)
Distance in km		0.21	0.61	1.69	2.41
Direction		SW	NE	ESE	NW
Turbidity	NTU	<1	<1	<1	<1
pH	--	7.24	7.12	7.09	7.35
Conductivity	µS/cm	417.30	401.60	422.80	469.40
Total Dissolve Solids	mg/l	254.10	249.40	256.20	264.10
Alkalinity as CaCO ₃	mg/l	116.00	112.00	109.00	118.00

Parameters	Unit	GW1 (Near Project Site)	GW2 (Simsa)	GW3 (Paschim Barkola)	GW4 (Chichurbil)
Total Hardness as CaCO ₃	mg/l	96.45	94.88	92.50	99.10
Calcium as Ca	mg/l	18.70	18.40	18.60	19.10
Magnesium as Mg	mg/l	12.10	11.90	11.20	12.50
Sodium	mg/l	52.50	49.20	50.40	53.60
Potassium	mg/l	2.86	2.69	2.76	2.89
Bicarbonate	mg/l	116.00	112.00	109.00	118.00
Chloride as Cl	mg/l	62.30	60.70	61.50	63.20
Sulphate as SO ₄	mg/l	16.90	15.40	14.80	17.50
Nitrate as NO ₃	mg/l	19.20	17.60	15.10	21.70
Fluoride as F	mg/l	0.51	0.47	0.45	0.55
Phenolic compound as C ₆ H ₅ OH	mg/l	BDL (DL- 0.001)	BDL (DL-0.001)	BDL (DL- 0.001)	BDL (DL - 0.001)
Cyanide	mg/l	BDL (DL- 0.008)	BDL (DL-0.008)	BDL (DL- 0.008)	BDL (DL - 0.008)
Aluminum	mg/l	BDL (DL - 0.01)	BDL (DL - 0.01)	BDL (DL - 0.01)	BDL (DL - 0.01)
Arsenic	mg/l	BDL (DL -0.005)	BDL (DL0.005)	BDL (DL-0.005)	BDL (DL-0.005)
Cadmium	mg/l	BDL (DL- 0.005)	BDL (DL-0.005)	BDL (DL- 0.005)	BDL (DL-0.005)
Chromium as Cr+6	mg/l	BDL (DL- 0.005)	BDL (DL0.005)	BDL (DL-0.005)	BDL (DL - 0.005)
Iron	mg/l	0.25	0.23	0.21	0.31
Copper	mg/l	BDL (DL-0.005)	BDL (DL-0.005)	BDL (DL-0.005)	BDL (DL-0.005)
Lead	mg/l	BDL (DL - 0.005)	BDL (DL-0.005)	BDL (DL-0.005)	BDL (DL - 0.005)
Manganese	mg/l	BDL (DL - 0.005)	BDL (DL-0.005)	BDL (DL-0.005)	BDL (DL - 0.005)
Mercury	mg/l	BDL (DL - 0.01)	BDL (DL - 0.01)	BDL (DL - 0.01)	BDL (DL - 0.01)
Zinc	mg/l	0.19	0.17	0.21	0.22

ANNEXURE-3.3

PHYTOSOCIOLOGICAL STUDY

Sl. No.	Scientific Name	Common Name	Family
(A)-TREES			
1	<i>Acacia auriculiformis</i>	<i>Akasmoni</i>	<i>Mimosaceae</i>
2	<i>Acacia nilotica</i>	<i>Indian gum Arabic tree/Babul</i>	<i>Mimosaceae</i>
3	<i>Adina cordifolia</i>	<i>Haldu</i>	<i>Rubiaceae</i>
4	<i>Aegle marmelos</i>	<i>Wood apple</i>	<i>Rutaceae</i>
5	<i>Albizia lebeck</i>	<i>Siris</i>	<i>Mimosaceae</i>
6	<i>Albizia saman</i>	<i>Rain tree</i>	<i>Mimosaceae</i>
7	<i>Alstonia scholaris</i>	<i>Chatim</i>	<i>Apocyanaceae</i>
8	<i>Anacardium occidentale</i>	<i>Cashew nut</i>	<i>Anacardiaceae</i>
9	<i>Anthocephalus chinensis</i>	<i>Kadam</i>	<i>Rubiaceae</i>
10	<i>Areca catechu</i>	<i>Betelnut palm</i>	<i>Palmae</i>
11	<i>Artocarpus integrifolia</i>	<i>Jackfruit</i>	<i>Moraceae</i>
12	<i>Azadirachta indica</i>	<i>Neem</i>	<i>Meliaceae</i>
13	<i>Bauhinia accuminata</i>	<i>Camel's foot tree</i>	<i>Caesalpiniae</i>
14	<i>Bombax malabaricum</i>	<i>Silk Cotton Tree/ Simul</i>	<i>Bombacaceae</i>
15	<i>Borassus flabellifer</i>	<i>Plamyra palm</i>	<i>Palmae</i>
16	<i>Butea monosperma</i>	<i>Bastard teak /Palash</i>	<i>Fabaceae</i>
17	<i>Cassia fistula</i>	<i>Indian Laburnum</i>	<i>Caesalpiniae</i>
18	<i>Cassia siamea</i>	<i>Chakunda</i>	<i>Caesalpiniae</i>
19	<i>Casuarina equisetifolia</i>	<i>Jhau</i>	<i>Casuarinaceae</i>
20	<i>Cocos nucifera</i>	<i>Coconut palm</i>	<i>Palmae</i>
21	<i>Dalbergia sisso</i>	<i>Sisso</i>	<i>Fabaceae</i>
22	<i>Dalenia indica</i>	<i>Moving tree/Chalta</i>	<i>Doleniaceae</i>
23	<i>Delonix regia</i>	<i>Royal poinciana /Gulmohar</i>	<i>Caesalpiniae</i>
24	<i>Diospyros melanoxylon</i>	<i>Remove tree/Kendu</i>	<i>Ebenaceae</i>
25	<i>Erythrina indica</i>	<i>Coral tree</i>	<i>Fabaceae</i>
26	<i>Eucalyptus globulus</i>	<i>Eucalyptus</i>	<i>Myrtaceae</i>
27	<i>Ficus bengalensis</i>	<i>Banyan</i>	<i>Moraceae</i>
28	<i>Ficus religiosa</i>	<i>Peepal</i>	<i>Moraceae</i>
29	<i>Ficus semicordata</i>	<i>Fig tree</i>	<i>Moraceae</i>
30	<i>Gliricidia sepium</i>	<i>Saranga</i>	<i>Fabaceae</i>
31	<i>Gmelina arborea</i>	<i>Candahar tree/Gamar</i>	<i>Verbanaceae</i>
32	<i>Grewia asiatica</i>	<i>Falsa</i>	<i>Tiliaceae</i>
33	<i>Holarrhena antidysenterica</i>	<i>Kurchi</i>	<i>Apocynaceae</i>
34	<i>Lagerstroemia flosreginae</i>	<i>Jarul</i>	<i>Lythraceae</i>
35	<i>Leucaenea leucocephala</i>	<i>Subabul</i>	<i>Mimosae</i>
36	<i>Litchi chinensis</i>	<i>Litchi</i>	<i>Sapindaceae</i>
37	<i>Madhuca longifolia var. latifolia</i>	<i>Mahua</i>	<i>Sapotaceae</i>
38	<i>Mangifera indica</i>	<i>Mango</i>	<i>Anacardiaceae</i>
39	<i>Manilkara zapota</i>	<i>Sapeda</i>	<i>Sapotaceae</i>

Sl. No.	Scientific Name	Common Name	Family
40	<i>Michella champaca</i>	Champak	Magnoliaceae
41	<i>Mimusops elengi</i>	Bullet wood/Bakul	Zapotaceae
42	<i>Moringa oleifera</i>	Drumstick tree/Sajina	Moringaceae
43	<i>Peltophorum inerme</i>	Peacock flower/Radhachura	Caesalpiniae
44	<i>Phoenix sylvestris</i>	Date palm	Palmae
45	<i>Polyalthia longifolia</i>	Asoka tree/Debdaru	Anonaceae
46	<i>Pongamia glabra</i>	Karang	Fabaceae
47	<i>Psidium guajava</i>	Guava	Myrtaceae
48	<i>Pterospermum acerifolium</i>	Maple-leaved Bayur tree/Kanak Champa	Sterculiaceae
49	<i>Putranjiva roxburghii</i>	Putranjiva	Putranjivaceae
50	<i>Saraca indica</i>	Ashok	Caesalpiniae
51	<i>Sesbania grandiflora</i>	Bakful	Fabaceae
52	<i>Shorea robusta</i>	Sal Tree	Dipterocarpaceae
53	<i>Sizigium jambos</i>	Jamrul	Myrtaceae
54	<i>Sonneratia apetala</i>	Keora	Lythraceae
55	<i>Spathodea campanulata</i>	Rudrapalash	Bignoniaceae
56	<i>Swetenia mahogini</i>	Mahogany	Meliaceae
57	<i>Tamarindus indica</i>	Tamarind	Caesalpiniae
58	<i>Tectona grandis</i>	Teak	Verbanaceae
59	<i>Terminalia arjuna</i>	Arjun	Combretaceae
60	<i>Terminalia alata</i>	Asan	Combretaceae
61	<i>Thespesia populnea</i>	Tulip tree	Malvaceae
62	<i>Trema orientalis</i>	Indian Charcoal Tree	Cannabaceae
63	<i>Trewia nudiflora</i>	Pituli	Euphorbiaceae
64	<i>Ziziphus mauritiana</i>	Indian jujube	Buckthorns
65	Musaceae	Banana	Bananas
66	<i>Jatropha curcas</i>	Varenda	Spurge
67	<i>Alstonia scholaris</i>	Devil Tree	Dogbanes
68	<i>Sapindus mukorossi</i>	Indian soapberry	Sapindaceae
69	<i>Phyllanthus emblica</i>	Indian gooseberry	Phyllanthaceae
70	Oleaceae	Night Jasmine	Olives
71	<i>Morinda citrifolia</i>	Indian mulberry	Madder family
72	<i>Swietenia macrophyll</i>	Mahogany	Meliaceae
(A)-SHERBS			
1.	<i>Adhatoda vasica</i>	Basaka	Acanthaceae
2.	<i>Barleria prionitis</i>	Kantajhinti	Acanthaceae
3.	<i>Nyctanthes arbortristis</i>	Siuli	Apocyanaceae
4.	<i>Anona squamosa</i>	Custard apple	Anonaceae
5.	<i>Calotropis procera</i>	Akando	Asclepiadaceae
6.	<i>Eupatorium odoratum</i>	Siam Weed	Asteraceae
7.	<i>Ricinus communis</i>	Castorbean	Euphorbiaceae
8.	<i>Cestrum diurnum</i>	Day jasmine	Solanaceae

Sl. No.	Scientific Name	Common Name	Family
9	<i>Datura metel</i>	<i>Dhutura</i>	<i>Solanaceae</i>
10.	<i>Solanum surattense</i>	<i>Kantakari</i>	<i>Solanaceae</i>
11.	<i>Ixora coccinea</i>	<i>Rangan</i>	<i>Rubiaceae</i>
12.	<i>Zizyphus oenoplia</i>	<i>Kul</i>	<i>Rhamnaceae</i>
13.	<i>Hyptis suaveolens</i>	<i>Bantulsi</i>	<i>Labiatae</i>
14.	<i>Leonurus sibiricus</i>	<i>Mother wort</i>	<i>Labiatae</i>
15.	<i>Tecoma stans</i>	<i>Chandaprabha</i>	<i>Bignoniaceae</i>
16.	<i>Abutilon indicum</i>	<i>Indian Mallow</i>	<i>Malvaceae</i>
17.	<i>Malachra capitata</i>	<i>Ban bhindi</i>	<i>Malvaceae</i>
18.	<i>Urena lobata</i>	<i>Caesarweed</i>	<i>Malvaceae</i>
19.	<i>Hibiscus sabdariffa</i>	<i>Chukar</i>	<i>Malvaceae</i>
20.	<i>Glycosmis pentaphylla</i>	<i>Ash-sheora</i>	<i>Rutaceae</i>
21.	<i>Murraya exotica</i>	<i>Kamini</i>	<i>Rutaceae</i>
22.	<i>Crotalaria alata</i>	<i>Bandar lathi</i>	<i>Fabaceae</i>
23.	<i>Capparis spinosa</i>	<i>Caper Bush</i>	<i>Capparaceae</i>
24.	<i>Ipomea lacunosa</i>	<i>White morning-glory</i>	<i>Convolvulaceae</i>
24.	<i>Bougainvillea spectabilis</i>	<i>Baganbilas</i>	<i>Nyctaginaceae</i>
25.	<i>Pluchea indica</i>	<i>Camphorweed</i>	<i>Asteraceae</i>
26.	<i>Phyllanthus emblicus</i>	<i>Amlaki</i>	<i>Euphorbaceae</i>
27.	<i>Lippia geminata</i>	<i>Mat grass</i>	<i>Verbanaceae</i>
28.	<i>Euphorbia trilobata</i>	-	<i>Euphorbaceae</i>
29.	<i>Opuntia dillenii</i>	<i>Common prickly pear</i>	<i>Opantiaceae</i>
30.	<i>Acanthus ilicifolius</i>	<i>Hargoza</i>	<i>Acanthaceae</i>
31.	<i>Streblus asper</i>	<i>shaora</i>	<i>Moraceae</i>
32.	<i>Ipomea fistulosa</i>	<i>Morning Glory</i>	<i>Convolvulaceae</i>
33.	<i>Jatropha gossypifolia</i>	<i>Lal bherenda</i>	<i>Euphorbaceae</i>
34.	<i>Pedilanthus tithymaloides</i>	<i>Christmas Candle</i>	<i>Euphorbaceae</i>
35.	<i>Abrus precatorius</i>	<i>Gunch</i>	<i>Malvaceae</i>
36.	<i>Lantana camara</i>	<i>Lantana</i>	<i>Vervanaceae</i>
37.	<i>Duranta plumieri</i>	<i>Sky flower</i>	<i>Vervanaceae</i>
38.	<i>Vitex negundo</i>	<i>Nisenda</i>	<i>Vervanaceae</i>
39.	<i>Clerodendron infortunatum</i>	<i>Gaestri</i>	<i>Vervanaceae</i>
40.	<i>Clerodedron inerme</i>	<i>Ghetu</i>	<i>Verbanaceae</i>
(C)- HERBS & CLIMBERS:			
1.	<i>Andrographis paniculata</i>	<i>Kalmegh</i>	<i>Acanthaceae</i>
2.	<i>Justicia simplex</i>	-	<i>Acanthaceae</i>
3.	<i>Ruellia tuberosa</i>	-	<i>Acanthaceae</i>
4.	<i>Rungia parviflora</i>	<i>Comb Rungia</i>	<i>Acanthaceae</i>
5.	<i>Thunbergia grandiflora</i>	<i>Bengal Clock Vine</i>	<i>Acanthaceae</i>
6.	<i>Daemia extensa</i>	<i>Chagalbati</i>	<i>Asclepiadaceae</i>
7.	<i>Vinca rosea</i>	<i>Nayantara</i>	<i>Apocynaceae</i>
8.	<i>Aganosma caryophyllata</i>	<i>Malati</i>	<i>Apocynaceae</i>

Sl. No.	Scientific Name	Common Name	Family
9.	<i>Amaranthus spinosus</i>	Kantanotyia	Amaranthaceae
10.	<i>Celosia cristata</i>	Cockscomb	Amaranthaceae
11.	<i>Achyranthes aspera</i>	Latjira	Amaranthaceae
12.	<i>Alternanthera sessilis</i>	Joyweed	Amaranthaceae
13.	<i>Mikania scandens</i>	Climbing Hempweed	Compositae
14.	<i>Eclipta alba</i>	Bhringaraj	Compositae
15.	<i>Blumea lacera</i>	Kukurmuta	Compositae
16.	<i>Tridax procumbens</i>	Khal-muriya	Compositae
17.	<i>Vernonia cinerea</i>	-	Compositae
18.	<i>Ageratum conyzoides</i>	Uchunti	Compositae
19.	<i>Grangea maderaspatana</i>	Namuti	Compositae
20.	<i>Gnaphalium indicum</i>	-	Compositae
21.	<i>Cephalandra indica</i>	-	Cucurbitaceae
22.	<i>Gynandropsis gynandra</i>	Spider Flower	Cleomaceae
23.	<i>Cassia sophora</i>	Kasaundi	Caesalpiniae
24.	<i>Cassia tora</i>	Chakunda	Caesalpiniae
25.	<i>Acalypha indica</i>	Mukta jhuri	Euphorbiaceae
26.	<i>Croton bonplandianum</i>	Ban tulsi	Euphorbiaceae
27.	<i>Chrozophora plicata</i>	-	Euphorbiaceae
28.	<i>Desmodium gyrans</i>	Nageswar	Fabaceae
29.	<i>Ocimum sanctum</i>	Tulsi	Lamiaceae
30.	<i>Leucas aspera</i>	Ghal ghase	Lamiaceae
31.	<i>Anisomeles ovata</i>	Gopali	Lamiaceae
32.	<i>Oldenlandia corymbosa</i>	Diamond Flower	Rubiaceae
33.	<i>Dentella repens</i>	Creeping Dentella	Rubiaceae
34.	<i>Spermacoce hispida</i>	Shaggy Button Weed	Rubiaceae
35.	<i>Solanum nigrum</i>	Nightshade	Solanaceae
36.	<i>Solanum trilobatum</i>	Purple Fruited Pea Eggplant	Solanaceae
37.	<i>Nicotiana plumbaginifolia</i>	Ban tamaku	Solanaceae
38.	<i>Lippia nodiflora</i>	Lippia	Verbanaceae
39.	<i>Evolvulus nummularius</i>	Roundleaf Bindweed	Convolvulaceae
40.	<i>Ipomea quamoclit</i>	Kunja lota	Convolvulaceae
41.	<i>Canscora diffusa</i>	Kilwar	Gentianaceae
42.	<i>Hydrocotyle asiatica</i>	Thanakuni	Umbeliferae
43.	<i>Passiflora lunata</i>	Jhumka lata	Passifloraceae
44.	<i>Sida cordifolia</i>	Berela	Malvaceae
45.	<i>Sida rhombifolia</i>	Svetbarela	Malvaceae
46.	<i>Triumfetta rhomboidea</i>	Ban okra	Tiliaceae
47.	<i>Cardiospermum halicacabum</i>	Lataphatkari	Sapindaceae
48.	<i>Cleome viscosa</i>	Asian spider flower	Capparidaceae
49.	<i>Boerhavia repens</i>	Red hogweed	Nyctaginaceae
50.	<i>Xanthium strumarium</i>	Common Cocklebur	Compositae

Sl. No.	Scientific Name	Common Name	Family
51	<i>Chenopodium album</i>	Betho shaak	Chenopodiaceae
52	<i>Polygonum barbatum</i>	Knotweed	Polygonaceae
53	<i>Rumex maritimus</i>	Golden Dock	Polygonaceae
54	<i>Hygrophila spinosa</i>	Shulamardan	Acanthaceae
55	<i>Pouzolzia indica</i>	-	Urticaceae
56	<i>Cyperus rotundus</i>	Common Nut Sedge	Cyperaceae
57	<i>Pennisetum typhoides</i>	-	Poaceae
58	<i>Saccharum spontaneum</i>	Kash	Poaceae
59	<i>Imperata arundinacea</i>	Cogon grass	Poaceae
60	<i>Cynodon dactylon</i>	Durba grass	Poaceae
61	<i>Eleusine aegyptiaca</i>	Goosegrass	Poaceae
62	<i>Setaria glauca</i>	Begun grass	Poaceae
63	<i>Argemone mexicana</i>	Siyal-Kanta	Papavaraceae
64	<i>Potrasia coarctata</i>	-	Poaceae
65	<i>Fleurya interrupta</i>	Bichua/Bichuti	Urticaceae
66	<i>Vitis quadrifida</i>	-	Vitaceae
67	<i>Physalis peruviana</i>	Cape Gooseberry	Solanaceae
68	<i>Oxalis corniculata</i>	Amrulshak	Oxalidaceae
69	<i>Parthenium hysterophorus</i>	Parthenium	Compositae
70	<i>Derris pinnata</i>	Panlata	Papilionaceae
71	<i>Justicia gendarussa</i>	Jagatmadan	Acanthaceae
(D)- FERNS			
1.	<i>Pteris longifolia</i>	-	Polypodiaceae
2.	<i>Diplazium sp.</i>	-	Polypodiaceae
3.	<i>Nephrolepis sp.</i>	-	Polypodiaceae
4.	<i>Drinaria sp.</i>	-	Polypodiaceae