DRAFT ENVIRONMENTAL IMPACT ASSESSMENT REPORT

Of

EXTRACTION OF RIVERBED SAND DEPOSITION

From

BARJORA SAND MINE (MIN_BNK_10)

MOUZA –TAJPUR

Plot No.-1582**, J.L. NO-** 56, **P.S. –** Barjora, **State –** West Bengal

Production Capacity: 10,06,892 Cu. M. of Sand

Lease Area: 9.50 Ha (Non- Forest)

Screening Category: B1

LESSEE :

West Bengal Mineral Development & Trading Corporation Limited

WBIIDC Building, 3rd Floor, DJ-Block, DJ-10, Sector- II,

Bidhanagar (Salt Lake City),

Kolkata: 700091

TOR LETTER NO.: *809/EN/T-II-1/336/2023*

SEIAA Online File No.: *SIA/WB/MIN/422801/2023*

Prepared by:

INDIAN MINE PLANNERS AND CONSULTANTS

(A NABET Accredited 'A' Grade Consultants)

GE-61, Rajdanga Main Road, East Kolkata Township, Kolkata-700107, WB

Laboratory Partner:

N.D. International

(A NABL Accredited Laboratory)

Room No. 409,4th Floor, DLF Galleria, New Town, Action Area 1, Kolkata -700156, West Bengal

(Baseline Data: March-May 2023)

August - 2023

Job No :- ENV-22/1

Issue No:-1

Executive Summary

The proposed project is the riverbed sand mining of Damodar River (MIN_BNK_10) located under Mouza- Tajpur, Plot No.- 1582, J.L. No.- 56, P.S: Barjora, District- Bankura, West Bengal of "West Bengal Mineral Development & Trading Corporation Limited". The proposed project got granted 9.50 hectares (23.47 acres) of land for 20 years. The area is located in Survey of India Toposheet No. –73 M/7 and bounded by latitude 23º25'26.229" N to 23°25'16.453" N and longitude 87°21'51.995" E to 87°21'33.568" E. The area is non-forest land in nature. The ground elevation is 54m above mean sea level.

As per MoEFCC, New Delhi Gazette dated 14thSeptember 2006 and amended thereafter, the proposed mining project is categorized as category 'B1' project.

The mining plan has been prepared by Qualified Person Dr. N.B.Chanda and approved for five years by Senior Geologist, G.P. Branch, S.B. Unit, Bankura, Govt. of West Bengal.

The proposed mining activity is supposed to collect approximately 10,06,892 Cu.m of sand for total five years solely by open cast manual method. The extraction of sand will be restricted within the central 3/4thwidth of the river. The proposed mining does not require any drilling and blasting activities. Sand will be lifted from the riverbed for all eight months except the monsoon period from June to September.

The lease area comes under 'waterbody LULC type' as per 'Landuse Landcover Classification' of Bankura district of West Bengal, and the surrounding landuse type is a mixture of agricultural land with settlement.

The area is predominantly flat with river bed sand having elevation ranges from 54m above mean sea level. There is no permanent influx of the population anticipated, as the workers will be hired locally from nearby villages. Unemployment is very pervasive in the study area. The total manpower of 155 nos will be involved with the project, with 5 nos. of technical personnel (manager/supervisor), 50 nos of skilled and 100 nos. of non-skilled labours. It is expected that a large part of the investment in this project will be direct/ indirect role on local population. Hence there will be an overall improvement of socio-economic status of the people of surrounding areas.

A total water requirement of 4.5 KLD will be envisaged with the proposed project, with 1.5 KLD allocated for drinking purpose, 1.5 KLD allocated for maintenance of green belt, and 1.5 KLD for

dust suppression.

3 nos. of excavator of capacity 0.9 cum, 15-20 nos. of tipper truck of capacity 5 cum and 2 nos. of water sprinkler truck of capacity 10 cum will be deployed for the proposed activity.

The total cost of the project for one year would be approx., 3.80 crores and there is a budgetary provision that 5% (0.19 crore peryear) of the project cost will be allocated for the Environmental Management Plan (EMP) and 2% (0.076 crore per year) of the project cost will be allocated for Corporate Environmental Responsibility (CER) and health and hygiene (H&H) for causes of poor people of nearby villages. Health and Hygiene will be allocated for a health check-up once in six-months. Extra budgetary provisions will be allocated to lady workers. The Total expenditure of welfare scheme i.e. EMP + CRP & H&H = 7% (0.266 crore per year).

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List of Abbreviations

Abbreviation	Definitions
AAQ	Ambient Air Quality
bgl	Below Ground Level
BOD	Biochemical Oxygen Demand
COD	Chemical Oxygen Demand
CPCB	Central Pollution Control Board
CSR	Corporate Social Responsibility
dB	Decibel
DO	Dissolved Oxygen
SEAC	State Level Expert Appraisal Committee
EIA	Environmental Impact Assessment
EMC	Environmental Management Cell
EMP	Environment Management Plan
EPA	The Environment Protection Act
GLC	Ground Level Concentration
Ha	Hectare
Ham	Hectare Meter
HFL	High Flood Level
KLD	Kilo litre Per Day
Km	Kilo Meter
Leq	Equivalent Noise Level
LFL	Low Flood Level
LOS	Level of Service
MoEF&CC	Ministry of Environment and Forest & Climate Change
NABET	National Accreditation Board for Education and Training
NGO	Non-Governmental Organization
NH	National Highway
NOC	No Objection Certificate
OSHA	Occupational Safety and Health Administration
PCU	Passenger Car Unit
PM	Particulate Matter

PUC	Pollution Under Control
QCI	Quality Council of India
R & R	Rehabilitation & Resettlement
RBM	River Bed Material
RL	Reduced Level
SH	State Highway
SPCB	State Pollution Control Board
T/cum	Tons Per Cubic Meter
TKN	Total Kjeldahl Nitrogen
TOR	Term of Reference
TPA	Tonnes Per Annum
UNFC	United Nations Framework Classification
VWG	Village Working Group

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CHAPTER- 1

INTRODUCTION

The mining industry in India is a major economic activity which contributes significantly to the economy of India. Mining and quarrying sector contributes around 2.5% of the Gross Domestic Product (GDP). The mining sector under index of Industrial Production (IIP) witnessed a growth of 1.7 percent Year on Year basis. Indian economy is on the aspirational path of becoming a $5 trillion GDP economy by 2024-25. Mining Industry is going to have a sizable contribution to the envisaged GDP and wealth creation. India, being a developing economy, is dependent on the growth of energy sector in order to achieve the desired economic growth. The economic reforms in the past, has propelled Indian mining industry into a new and competitive environment.

Unless mining of the minerals is properly regulated, they can show adverse consequences on environment and socio-economic components of the society. It also disturbs the Air, soil, water and ecological parameters. On the other hand, it develops the economic standard of the region. Issues of Technology for zero waste or low waste mining, relief & rehabilitation, mine closure which otherwise leads to land degradation are important issues which require continuous attention.In order to mitigate the impact of mineral mining on the environment, a scientific assessment is very important for framing sustainable development strategies. Therefore, the implementation of scientific mining principles through EIA & EMP plays a vital role in sustainable economic growthof our country.

Purpose of the Report:

The Environmental Impact Assessment has been prepared to access the present scenario of the study area for the proposed mining activity. Based on the assessment an environment management plan (EMP) has been prepared, which helps in minimizing the adverse effects of the mining on the surrounding Environment. The draft EIA report is being prepared to comply with the Term of reference (TOR) received from MoEF&CC under EIA notification of MoEF dated 14 September and its amendments for seeking environmental clearance for sand mining in Damodar river bed over an area of 9.50 Ha. In Mouza- Tajpur, P.S. Barjora of Bankura District of West Bengal. The project proponent has submitted application for prior Environmental Clearance (EC) and West Bengal State Expert Appraisal Committee has considered the same during the meeting held on 73rd meeting held on 23.03.2023, subsequent to the discussions held on 25.04.2023, State Environmental Impact Assessment Authority (SEIAA) has issued the Terms of Reference (ToR) for conducting the Environmental Impacts Assessment (EIA) study and to prepare EIA report for conducting the Public hearing as part of Environment Clearances Process. This Environmental Impact Assessment (EIA) report is prepared to

comply with the Terms of Reference (TOR) received from SEIAA under EIA notification of the MoEF dated 14-9-2006, and its amendments of MoEF&CC, Govt. of India, for seeking Environmental Clearance (EC) for sand mining in the applied mining lease area measuring 9.5 Ha falling under category "Bl".

Identification of project proponent

The proposed mine lease was granted to **"West Bengal Mineral Development & Trading Corporation Limited"** on 17th February, 2023. The mining plan for the Mine lease (ML) area has been approved by the Senior Geologist, Dte of Mines & Minerals, G. P. Branch, S.B. Unit, Bankura, vide letter no SGP./MP./6-21/2023/31 dated 17th February 2023. Attached as **Annexure-I**.

- ***Project proponent:***

"West Bengal Mineral Development & Trading Corporation Limited"

WBIIDC Building, 3rd Floor, DJ-Block, DJ-10, Sector- II,

Bidhanagar (Salt Lake City), Kolkata: 700091

Brief Description of Nature, Size, and Location of the project:

- ***Nature of the project:***

Open Cast Manual Mining method is proposed in the lease area.

- ***Size of the project:***

As per approved mining plan vide letter no SGP./MP./6-21/2023/31 dated 17th February 2023, river bed sand mining will be undertaken over an area of 9.5 Ha. for production of 10,06,892 Cu. M of Sand for a contract period of Concession of 5 (five) years.

- ***Anticipated Life of Project and Cost of the Project:***

The period of concession of the mine lease is 5 years based on the level of exploration and reserve established. The cost of mining lease, mining equipment, Environmental protection, and socioeconomic development for the present mine lease area is about Rs 3.80 Crores (For initial Years).

The Environmental Impact Assessment has been prepared to access the present scenario of the study area for the proposed mining activity. Based on the assessment an environment management plan (EMP) has been prepared, which helps in minimizing the adverse effects of the mining on the surrounding Environment. The draft EIA report is being prepared to comply with the Term of reference

(TOR) received from MoEF&CC under EIA notification of MoEF dated 14 September and its amendments for seeking environmental clearance for sand mining in Damodar river bed over an area of 9.50 Ha. in Mouza- Tajpur, P.S. Barjora of Bankura District of West Bengal. The project proponent has submitted application for prior Environmental Clearance (EC) and West Bengal State Expert Appraisal Committee has considered the same during the meeting held on 73rd meeting held on 23.03.2023, subsequent to the discussions held on 25.04.2023, State Environmental Impact Assessment Authority (SEIAA) has issued the Terms of Reference (ToR) for conducting the Environmental Impacts Assessment (EIA) study and to prepare EIA report for conducting the Public hearing as part of Environment Clearances Process. This Environmental Impact Assessment (EIA) report is prepared to comply with the Terms of Reference (TOR) received from SEIAA under EIA notification of the MoEF dated 14-9-2006, and its amendments of MoEF&CC, Govt. of India, for seeking Environmental Clearance (EC) for sand mining in the applied mining lease area measuring 9.5 Ha falling under category "Bl".

- ***Location of the project:***

The proposed Barjora sand mine unit comes under Mouza- Tajpur, JL No.: 56, Plot No.: 1582, P.S.- Barjora, of Bankura district of West Bengal. Geographically the ML area extends from latitude 23º25'26.229" N to 23°25'16.453" N and longitude 87°21'51.995" E to 87°21'33.568" E. The highest elevation of the river sand bed is 81m AMSL, and the lowest elevation of the lease area is 76m AMSL. The proposed area falls in SOI top sheet No.73 M/7. The study area map is shown in figure 1-1. The study area of the proposed project comprises 10 Km radius around the mining lease boundary. The map showing the core zone (Mine lease area) and Buffer zone (10 km radius from the lease boundary) is shown in Figure1-2.

The Mine Lease area is approx.36.94 Km of aerial distance from the district headquarters in Bankura. The proposed ML area can be approached by its own conveyance from NH 19, which is 7.10 Km away from the ML area in northern bank of Damodar River.

Table 1-1: Geographical Co-ordinates of the Mine lease area.

Point ID	Latitude	Longitude
1	23°25'26.229" N	87°21'35.029" E
2	23°25'24.905" N	87°21'51.995" E
3	23°25'16.453" N	87°21'45.762" E
4	23°25'21.407" N	87°21'33.568" E

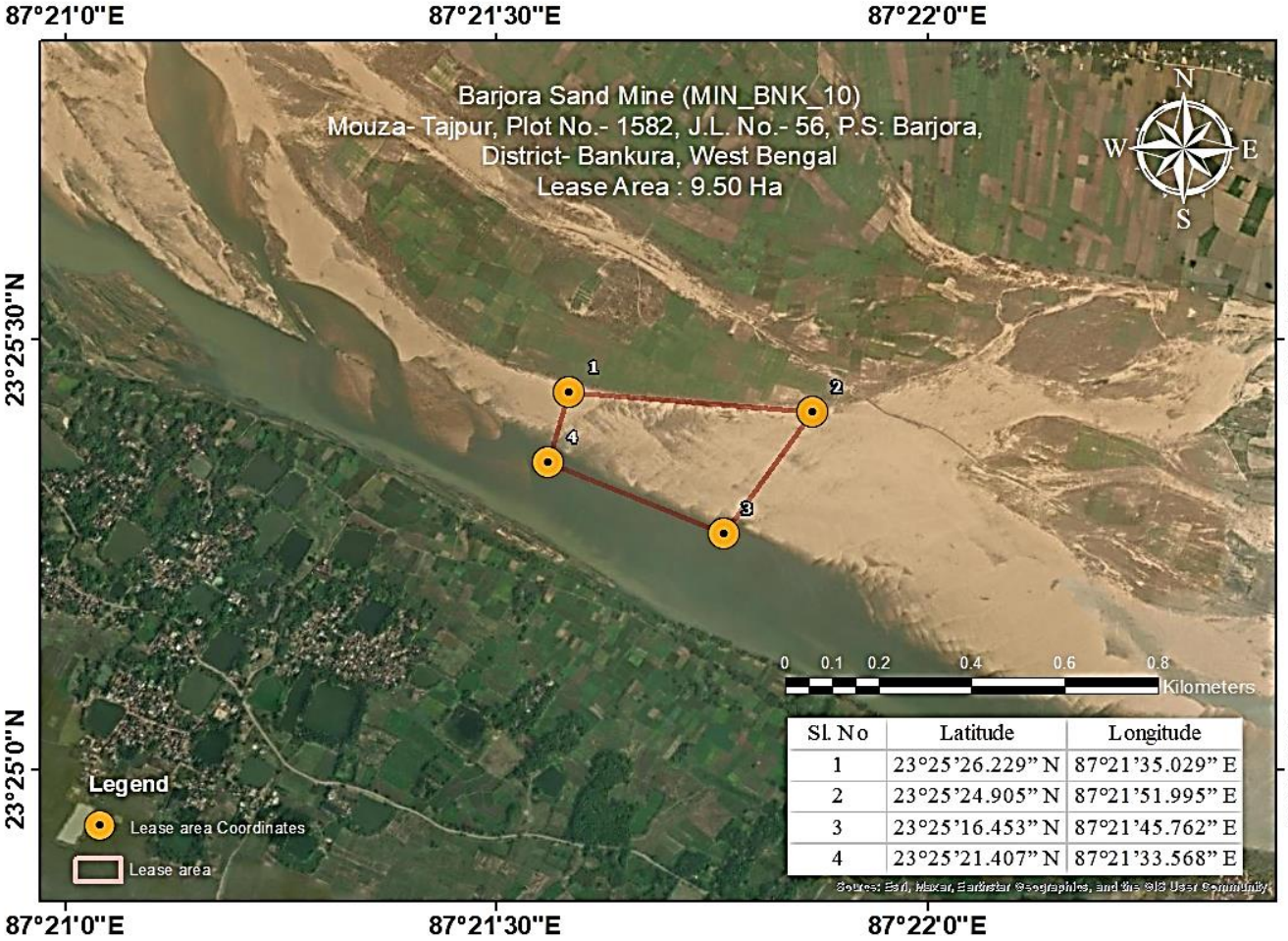


Figure 1-1: Barjora sand mining unit.(MIN_BNK_10)

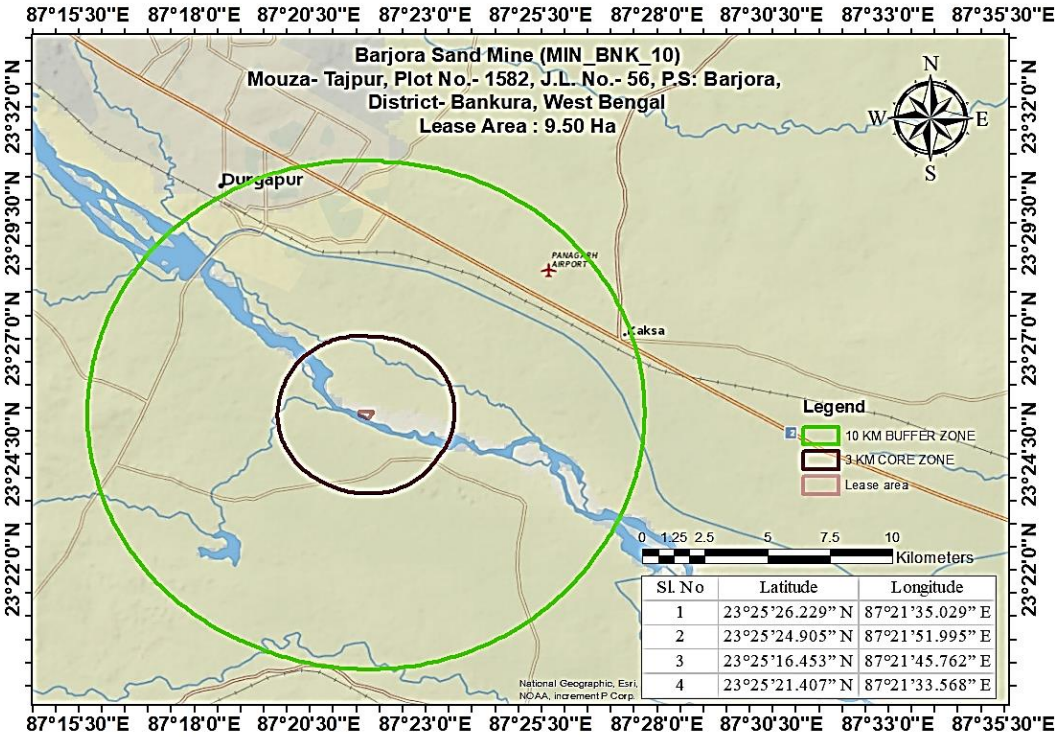


Figure 1-2: The map showing the core zone (Mine lease area) and Buffer zone.

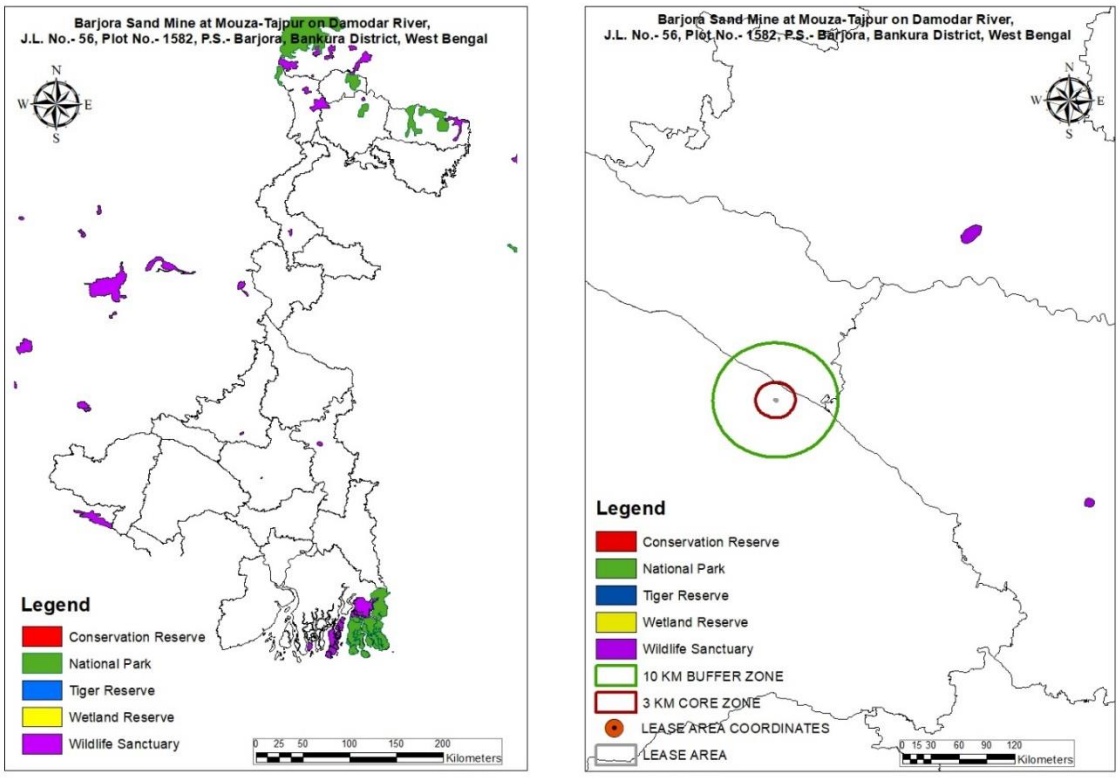


Fig no 1.3 –Map showing core zone and buffer zone of the lease area along with eco-sensitive zones.

Table 1-2: Salient features of the project site.

1.	Project Name	Barjora Sand Mine			
2	Location of the Project	Mouza- Tajpur, Plot No.- 1582, J.L. No.- 56, P.S: Barjora, District- Bankura, West Bengal			
3	Mine Lease Area	9.50 Ha			
4	Latitude & Longitude	Point ID	Latitude	Longitude	
		1.	23°25'26.229" N	87°21'35.029" E	
		2.	23°25'24.905" N	87°21'51.995" E	
		3.	23°25'16.453" N	87°21'45.762" E	
		4.	23°25'21.407" N	87°21'33.568" E	
5	Toposheet Number	73M/7			
6	Type of Land	River Bed			
7	Elevation	Highest Elevation:81m AMSL Lowest Elevation: 76m AMSL			
8	Project Cost	17.8 crores (for 5 years)			
9	Man Power & No. of Working days	155 personnel for 200 Days/Year.			
10	Water Demand & Source	4.5 KLD, Source: Tube well installed at the project site			
11	Mineable Reserves	10,06,892 Cu. M			
12	Targeted Production	20,13,78.4 Cu. M annually			
13	Production Capacity	**Year**	**Production Area (Ha)**	**Thickness (m)**	**Replenishment Rate (%)**	**Volume (m^3)**
		1st	8.53	3.00	100	2,55,816
		2nd	8.53	2.20	73.40	1,87,769
		3rd	8.53	2.20	73.40	1,87,769

		4th	8.53	2.20	73.40	1,87,769
		5th	8.53	2.20	73.40	1,87,769
		Average Mineable Reserve				**2,01,378.40**
		Total Mineable Reserve				**10,06,892**
14	Type of Mining	Opencast manual Method				
15	Seismic Zone	Seismic Zone-III (As per 1893:2002)				
16	End Use of Product	For construction of Buildings and Roads				
17	Nearest Town	Durgapur (8.15 Km in NNW direction)				
18	Nearest Airport	Kazi Nazrul Islam Airport (Durgapur) Airport: 8.55 Km NE				
19	Nearest railway Station	Durgapur Railway Station 8.65 km in NNW Direction				
20	Nearest Highway	Delhi-Kolkata Highway (NH 19): 7.10 km along the northern bank of Damodar River				
21	Nearest Sanctuary/National Park/Eco-Sensitive Zone/Elephant Corridor/Conservation Reserve,	------				
22	Nearest reserve forest (with name and its distance from the proposed project site)	No part of the proposed lease area falls under forest.				
23	Local geology of the area	The applied lease is River bed.				

Scope of the study:

The scope of the study includes a detailed characterization of the environment in an area of 10 Km radius of the Mine Lease Area for various environmental parameters like Ambient Air, Water, Noise, and Land, Biological and Socio-economic aspects.

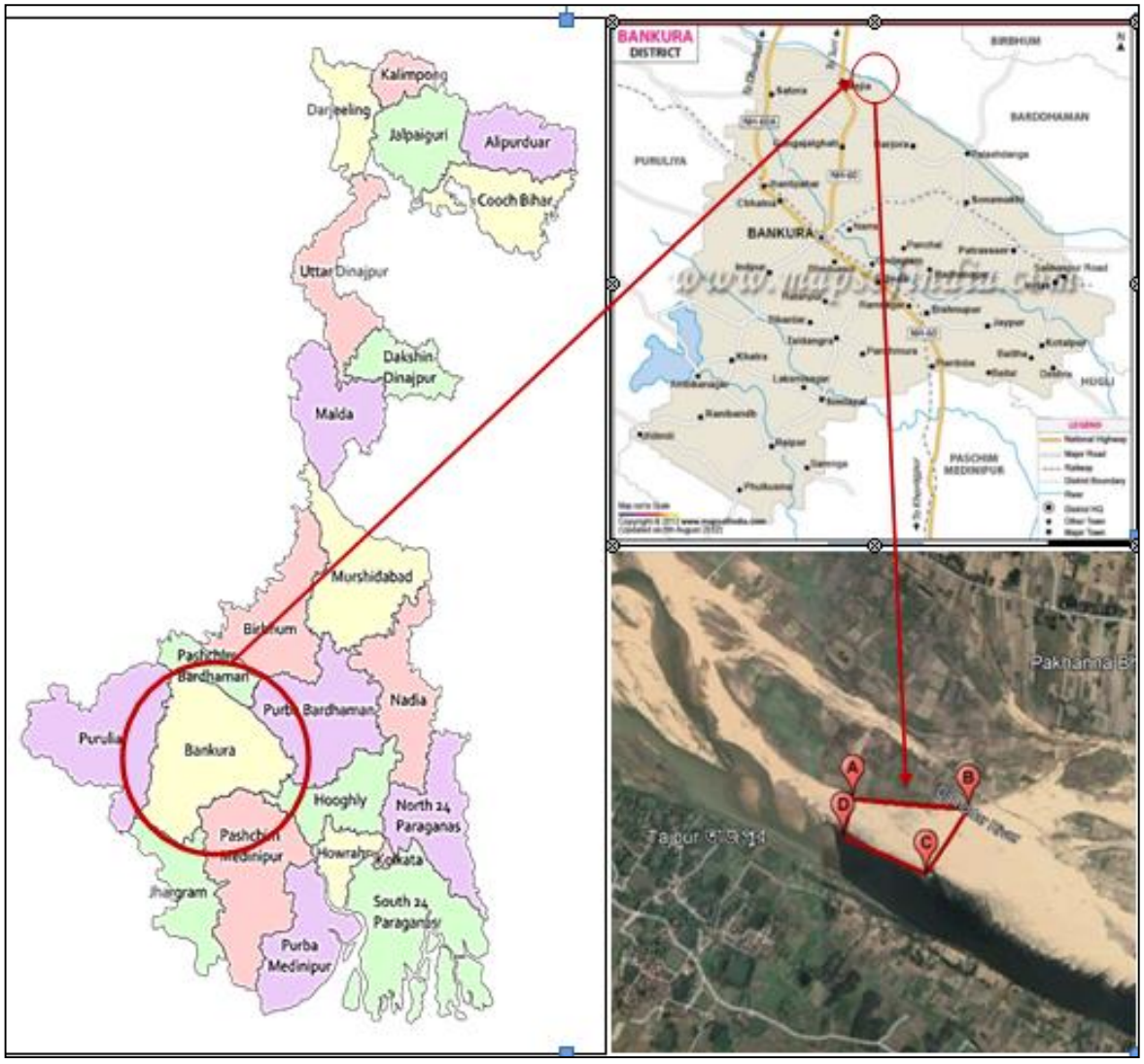


Figure 1-4: The Location Plan of Sand Mine, Barjora.

1.2 Compliance for Term of Reference (TOR)

The project proposal was submitted to State Level Environment Impact Assessment Authority for its appraisal. Based on which, 73rd SEAC meeting held on 23.03.2023 for Terms of Reference (TOR). Based on the data provided, ToR of proposed Sand mining project has been issued by SEIAA, vide File no 809/EN/T-II-1 dated 26.04.2023 (**Annexure-II)**. The compliance of ToR is described below in Table 1-3.

Table 1-3: Point Wise Compliance for ToR

S.No	TOR	Compliance
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.	This is a new Mining Project.
2	A copy of the document in support of the fact that the Proponent is the rightful lessee of the mine should be given.	Copy of document in support of the fact that the Proponent is the rightful lessee of the mine **(LOI)** is enclosed with draft EIA report as **Annexure-II.**
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 documents including mine plan, draft EIA are compatible with one another in terms of mine area, production levels, waste generation and its management if any, mining technology etc. All documents are in the name of the lessee and the sane for final EIA and Public Hearing
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).	All corner coordinates of the mine lease area, are superimposed on a High Resolution Imagery/ toposheet, topographic sheet, geomorphology and geology of the area are provided in figure no.1.1 and 1.2 The land use and other ecological features of the study area (core and buffer zone) are shown in figure 1.3.
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	The topographic map of the study area is presented in Annexure –VI (Original Toposheet with super impose project site).

	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.	The Letter of Intent was issued by Goernment of West Bengal and is enclosed in **Annexure-III**
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.	The proponent company WBMDTCL has well laid down Environment policy to take care of any infringement /deviation/ violation of the environmental or forest norms/ conditions applicable for the mine lease is proposed in the EIA report (Chapter 10, Page no- 109).
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.	Method of mining for the sand mine is open cast semi-mechanized method (No drilling and blasting involved) discussed in Chapter 7, with this EIA report. (Refer Annexure V: Approved Mining Plan).
9	The study area will comprise of 10 km zone	The study area of the proposed project

	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.	comprises of 10 km radius around the mining Lease boundary. Map showing study area (10km radius from the lease boundary) is given in chapter-3 of EIA Report. EIA contains the data regarding proposed production for the life of mine and the same has been incorporated in Chapter-2.
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..	The proposed mine lease areais river bank land. The study area comprises of RF, agricultural land, waterbodies, human settlements and other ecological features involved. LU&LC Statistics presented.
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.	Not applicable, as there is no overburden in the proposed Sand mining activity. No R&R involved.
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	The proposed mine lease area is river bank land. There is no forest / tree clearance involved in the proposed project. However, Letter of Intent for mining lease area was issued by Govt. of West Bengal, Dept. of Industry, Commerce & Tender Price, Mines Branch, vide letter no. 689-ICE-12011(99)/68/2022-MINES SEC-Dept. of ICE dated 30.11.2022 (**Annexure-III**).

	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.	The proposed mine lease area is river bank land. There is no forest/tree clearance involved in the proposed project. However, Letter of Intent for mining lease area was issued by Govt. of West Bengal, Dept. of Industry, Commerce & Tender Price, Mines Branch, vide letter no. 689-ICE-12011(99)/68/2022-MINES SEC- Dept. of ICE dated 30.11.2022 (**Annexure-III**).
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.	Not applicable The area does not comes under tribal area, hence, " Scheduled Tribes and other Traditional Forest Dwellers (Recognition of Forest Rights) Act, 2006" is not applicable.
15	The vegetation in the RF / PF areas in the study area, with necessary details, should be given.	No Reserve Forest is falling within 10 km radius of the proposed mining activity. Joypur Forest is situated 17.50 km WSW direction of the forest.Please refer to figure 1.3.
16	A study shall be got done to ascertain theimpact 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.	In this proposed mining activity there is no impact on wildlife. Biological Study for the project has been conducted. Impact and Mitigation measures areincorporated in Chapter - 4.
17	Location of National Parks, Sanctuaries, Biosphere Reserves, Wildlife Corridors, Ramsar site, Tiger/ Elephant Reserves/(existing	There are no National parks, Sanctuaries, Biosphere Reserves, Wildlife Corridors, Tiger / Elephant Reserves (existing as well

	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.	as proposed) in the core area. A map of west Bengal creating with existing NP (National Park) and (WLS) (Wildlife Life Sanctuaries) is provide in (Refer figure 1.3).
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.	There is no schedule-I fauna present in the study area. A detailed biological study is discussed under Chapter-3.
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	Not Applicable. The proposed project does not fall within 10 Km radius of any "**Critically Polluted**" area and Also The project area does not fall in "Aravali hill" ranges.

	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)	Not Applicable, as the proposed project does not fall within CRZ area.
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 aspect should be discussed in the Report	There will be no resettlement or rehabilitation involved in the project area, hence compensation details are not applicable.
22	One season (non-monsoon) [i.e. March-May(Summer Season); October-December (post monsoonseason); December-February (winter season)] primary baseline data on	One season data of ambient air quality, water quality, noise level, meteorology, soil and flora and fauna has been collected from March' 2023 to May'2023 Details

	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.	are given in Chapter 3.
23	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 themodel used and input parameters used for modelling 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	The detailed Air Quality modelling will be incorporated in Final EIA report.
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.	The total water requirement will be 4.5 KLD which will be sourced from locality. The water required for domestic and drinking purpose will be 1.5 KLD which will be Ground water sourced from nearby localities whose permission would

		be taken from local governmental bodies at the time of CTO. Other 3 KLD's would be required for the purposes of dust suppression and plantation programmer Which would be sourced from near Damodar river.
25	Necessary clearance from the Competent Authority for drawl of requisite quantity of water for the Project should be provided.	Necessary clearance from the Competent Authority for drawl of requisite quantity of water for the Project would be obtained at the time of CTO.
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.	Water requirement will be met from the deep tube wells installed at the site. But later on, when the mine sump will be developed and water will get accumulated in the sumps, then ground water will be drawn only for drinking & sanitation purpose and rest of the requirement will be fulfilled from water accumulated in the mine sump, thereby conserving the natural water resources.
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.	Mining will be done as per approved Mine Plan and applicable Rules & Regulation, so that there is no damage on ground water recharge potential due to sandmining. ➢ There will be no change in surface water quality asriver is seasonal. ➢ Ground water quality will not be affected due to mining activities as it is restricted to 3.0m depth or groundwater level whichever is lower. ➢ The mining will not be allowed below the water table.

		➢ Regular monitoring of water samples will be doneas precautionary measures.
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.	The proposed mining will be done well above the ground water table. Hence no adverse impact on ground water table. Please refer to Hydro Geological map and date furnished in chapter 2, Figure No.- 2.11
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 mine lease area itself is in the river bed. But there is no diversion of the any stream. Hence there is no impact on the water course.
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.	The site is at an elevation of (highest 48 - lowest 38) m AMSL. The slicing of the sand will be done upto 3mts only. No obstruction of the water table.
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	Plantation programmer is given in Chapter- 10.

	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.	There is no major impact on local transport as 202 trips per day will be required for transport of mined out material from proposed project. The LOS value from the proposed mine is excellent and very good for all villages. Traffic Management & Mitigation Measures includes. ➢ Haul roads will be sprinkledwith water to keep the dust suppressed. ➢ Proper route management of the traffic will be done for smooth ingress and egress of traffic. ➢ Supervisors will be appointed to regulate the traffic at the project sites. ➢ Speed breakers will be constructed in accident prone areas to calm the traffic and its speed. ➢ Signposts will be erected at the sensitive and precarious places to caution or provide information to road users.
33	Details of the onsite shelter and facilities to be	Onsite shelter and facilities will be

	provided to the mine workers should be included in the EIA Report	provided to the mine workers as per Approved Mining Plan & as per Mines Rules. ➢ Following are the infrastructural facilities which will be provided to the workers: ➢ First aid facilities will be provided.
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	The proposed mine is in the river bed, the reclamation of the mined out areas will be gradually filled up with sand and carried out by water, during monsoon.Hence rehabilitation of the mined-out areaare not applicable.
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.	All safety measures prescribed under mining laws will be followed strictly. All workers will be medically examined in pre placement phase. Periodical medical examination as per Mines Rule 1955-should be done. The persons working in dusty environment should be examined every year as per the DGMS circular No. 01 of21.01.2010. Medicalexamination will be as per the medical fitness prescribed under Form P and PI of the Mines Rule 1955, amended by Mines (amendment) Rules, 1989. The details of Occupational health impact of project are described under Chapter 10.
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.	The workers' health check-up will be done in every six month. Medical camp will be organized in impact zone under CSR activity.

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.	Measures of socio-economic influence to the local community have been furnished and described under Chapter 10.
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.	Environmental Management Plan is address in Chapter 10.
39	Public Hearing points raised and commitmentof 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.	Will incorporate after Public hearing.
40	Details of litigation pending against the project, if any, with direction /order passed byany Court of Law against the Project should be given.	There is no litigation against the applicant and the lease area in any court of law to the best of our knowledge.
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.	Total Project Cost- 17.8 crores Cost for Environmental Protection Measures Capital Cost- Rs 0.190 crores per annum.
42	A Disaster management Plan shall be prepared and included in the EIA/EMP Report.	Disaster management Plan have been furnished.
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.	The project proponent has proposed to provide financial assistance of 2% of project cost for the development of social infrastructure of the area. Following measure will be taken to

		improve the Social infrastructure of the study area: ➢ Preventive medical care and educational facilities for rural population shall bepromoted. ➢ Priority will be given to local people for employment. Indirect Employment through contractual services shall beprovided. ➢ Extending general benefit by way of development work in the villages throughrespective Gram Panchayat. ➢ Supplementing Govt, efforts in health monitoring camps, social welfare andvarious awareness programmes among the rural population. ➢ Assisting social forestry programme.
44	Besides the above, the below mentioned general points are also to be followed:- a) Executive Summary of the EIA/EMP Report 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,	a) Executive summary has been incorporated. b) Documents have been numbered in continuation and properly referenced w.r.t. Table of Contents(Index), c) The data presented in the report especially in table, along with the period in which the data was collected and the source hasbeen incorporated. d) Analysis/testing reports of water, air, soil, noise hasbeen incorporated. e) Compliance made. f) The relevant questionnaire will be

	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-l 1013/4l/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-l 1011/618/2010-IA.II (I) dated 30.5.2012, certified report of the	incorporated in the final EIA. g) All instruction mentioned in O.M. No. J- 11013/ 41/ 2006- IA.II (I) dated 4th August, 2009 are being complied with. h) There is no change made in the basic scope and project parameter. i) This is new project. Hence, not applicable. j) All Surface plan, Geological cross section plan, conceptual plan has been incorporated EIA Report.

	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, asmay 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) actions of the mine pit and external dumps, if any, clearly showing the land features of the adjoining area.	
B. Additional Terms of Reference		
a)	Means of access and egress between the embankment and sand quarry may be clearly earmarked. The project proponent must commit that no hard toping or paving of any haulage route within the river bed will be attempted.	No hard toping or paving of any haulage route within the river bed will be attempted. Transportation route map is attached as Annexure XIII.
b)	A plan on the management and handling of sand during the period of intermediate stockpiling should be submitted	The management and handling plan of sand has already been submitted in the mining plan.
c)	A progressive green belt plan may be prepared. The project area being entirely on the riverbed, afforestation/vegetation should be attempted alongside the village roads or other public land. This may be done with prior approval of the local Self-Governing bodies. If no public land is available for the purpose the project proponent shall arrange for land with his personal means. To enhance success/survival rate the plantation shall be	The Project area being entirely on the river bed, afforestation/vegetation would be done alongside the village roads or other public land with prior Approval from the Local Self-Governing bodies.

	attempted during the first two years of the project life, and the plantation so done shall be taken care of during the rest of the project life. Species of the plant selected should be self-sustaining in that particular region.	
d)	A need-based EMP may be prepared in accordance with the MoEF&CC Office Memorandum vide F.No.22-65/2017.14.lll dated 30.09.2020. Record of communications made in this regard with the identified/ intended beneficiaries (schools/ institutions etc) may also be uploaded.	CER undertaking is enclosed as Annexure XIV.
e)	A study report on base flow level measured at 5 points with date and supporting photographs may be submitted. lt should be committed that mining will be done at least 1m above the base flow level. Accordingly, if required, the excavation plan may also be revised.	Refer Chapter-3.
f)	Management plan of haul road to the public road.	Refer Annexure XIII

CHAPTER -2

Project description:

This chapter gives broad description of the project, location, type of ore deposit(s), quality of reserve, Mining Methodology, various site utilities and infrastructure, etc. The downstream use of mineral for value addition and its importance is also described.

Type of the Project:

The project is proposed for the excavation of river sand from Damodar River. The proposed project is a new minor mineral mining project. It is an opencast manual method mining project to excavate sand from the river bed.

Need of the project:

River channels and their flood plains are important sources of construction grade aggregate materials like sand and. The durability of river-borne coarser elastics and their sorting by fluvial action make them best suitable raw materials/ingredients for building constructions. The market demand forthe materials extracted from river is high throughout the country for construction of infrastructure projects.

Sand bars formed at various places hinder the flow of water and excess deposition can changed the shape of the river bed. Because of this, during monsoon season, the water may rise above the high flood level causing heavy and devastating floods. Such disasters may damage large tracts ofland laying on both the banks of the river especially the agricultural lands. Hence, it is necessary to remove the materials so that the river gets channelized.

Apart from this the project will also serve the following:

- ❖ Generate various employment opportunities especially to the local people hosting the miningproject.
- ❖ Economic development of the state by contributing to state exchequer.

Description of Mining Lease Area:

The proposed activity of River sand mining is located at Mouza- Tajpur, Plot No.- 1582, J.L. No.- 56, P.S: Barjora, District- Bankura, West Bengal, over an area of 9.50 Ha. The lease

area falls in Survey of India Toposheet (SOI) No 73 M/7. The life of mine was estimated to be 5 years.

Location Details and Connectivity:

Table 2-1: Location Details and Connectivity.

Sr.No.	Permanent Features	Description of the Area &Distance from the Area (Arial distance).
1.	Project site Location	Barjora sand mine Mouza - Tajpur, Plot No.- 1582, J.L. No.- 56, P.S: Barjora, District- Bankura, West Bengal.
2.	Site Coordinates (Middle Axis)	23°25'25.76"N & 87°21'43.22"E 23°25'19.01"N & 87°21'40.46"E
3.	Village/District/State	Mouza: Tajpur District: Bankura State: West Bengal
4.	Maximum temperature	32˚C
5.	Minimum temperature	6˚C
6.	Annual rainfall (total)	>2000mm
7.	Plant site elevation above MSL	Ground elevation level – 82m to 7 5 m AMSL
8.	Present land use at the site	Govt land of 9.50 ha (River bed)
9.	Nearest highway	NH 19- 7.05 km, northern bank of the river.
10.	Nearest Railway Station	Rajbandh Railway Station Distance-6.45 Km(NNE)
11.	Nearest Airport	Airport- Durgapur Airport Distance- 8.50 Km (NE)
12.	Nearest major water bodies	On the bank of Damodar River
13.	Nearest town/City	Nearest Town & District Headquarters: Town – Durgapur City is 7.30 KM NW

Sr. No.	Permanent Features	Description of the Area &Distance from the Area (Arial distance)
14.	Nearest village	Tajpur
15.	Nearest Dispensary and Govt. Hospital, Educational facility	Tajpur Sub Health Centre: 0.67 km (SW) Mangram Kalyanpur Hospital: 3.44 km (SW) Tajpur High School: 0.63 km (W) Baramana shanty Nagar Prathamik Vidayalaya: 1.70 km (N)
16.	Nearest Religious/Worship Places	Baidyapara Durga Mandir: 0.55 km (S) Tajpur Masjid: 1.01 km (W)
17.	Protected areas as per Wildlife Protection Act, 1972 (Tiger reserve, Elephant reserve, Biospheres, National parks, Wildlife sanctuaries, community reserves and conservation reserves)	None - Within 10 km of Project Site
18.	Reserved / Protected Forests	None - Within 10 km of Project Site
19.	Defence Installations	None Within 10 km of Project Site

Geological profile of the area:

Topography of the Area:

Bankura district has an area of 6,788 square kilometre. The district is covered by crystalline rocks of Precambrian age. Granite, Granite gneiss, micaschist, anorthosite, shale, quartzite, sandstone, limestone etc. are the principle types of rock in this district. The district lies within a thick mantle of laterite generally mountainous and with undulation (Figure 3.4). Bankura district can be geologically divided in three categories according to the height of a total land area:

- High hilly region / Hard rock area: The areas as Saltora, Mejia, Khatra,

Ranibandh, Gangajalghati etc., are collectively covering 176915 Ha and located in this region of higher elevation and hard rocks. Therefore, most of this area does not suitable with irrigation facilities.

- Uneven lands / Hard rock ring area: Bankura, Barjora, Chatna, Ondal, Simlapal, Taldangra, Raipur, Sarenga etc., are located in suchuneven lands along with areas of hard rock ring andthe covers 150611 Ha as whole.
- Even alluvial lands / alluvial area: The landmass with evenly distributed alluvium found mainlyin Bishnupur, Sonamukhi, Patrasayer, Indus, Joypur, Kotulpur etc., which covers 56970 Ha.

Bankura consists of two different tracts. The western portion marks the gradual descent from the table land of Chhotanagpur to the delta of lower Bengal, consisting largely of spurs projecting from the western table land and of low swelling ridges. However, there is no marked ridge of hills. In the central portion of the district there are rolling downs eventually merging with the alluvial plains. Biharinath which is located near Saltora is the highest hill of the district having height of 1480 feet (451 metre). Susunia is the second highest hill of Bankura having height of 1450 feet (442 metre). These hills are found in the high hilly region/hard rock area in the western part of the district (Census, 2011).

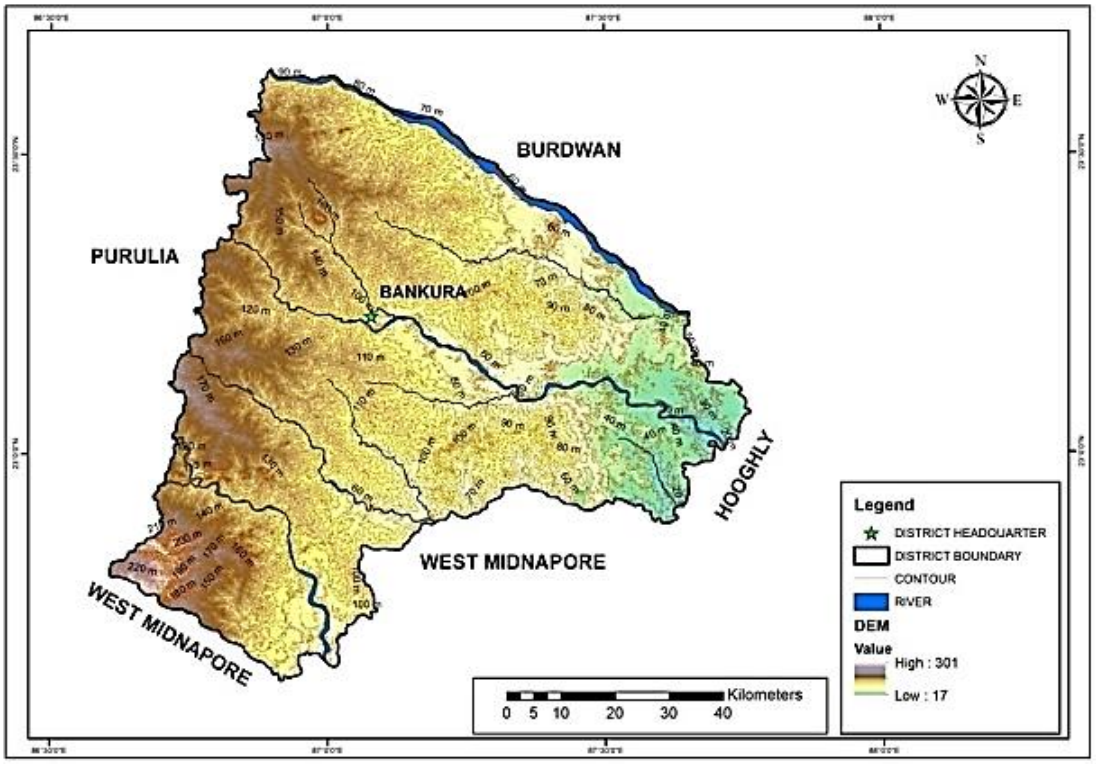


Fig 2-1: Physiographic map of the district

Geology:

The district is divisible geologically into three north-south trending wide belts (Figure 6.1). The westemmost one comprises metamorphics of Archaean age and Chhotanagpur Gneissic Complex, Singhbhum Group of rocks and anorthosites belonging to Proterozoic age.In the northern part occurs Gondwana Supergroup of rocks with commercial coal seams as an extension of the famous Raniganj Coalfield. The central part is occupied by laterite and older alluvium of Pleistocene age, whereas the easternmost part is made up of Quaternary sediments and Recent alluvium. The diverse litho-units along with geological formations and age are presented Table 6.1. A prominent limonitised east-west shear zone occurs in Porapahar area. Number of lineaments (N-S, NE-SW, NW-SE) of indefinite identities have been picked up fromsatellite imageries.

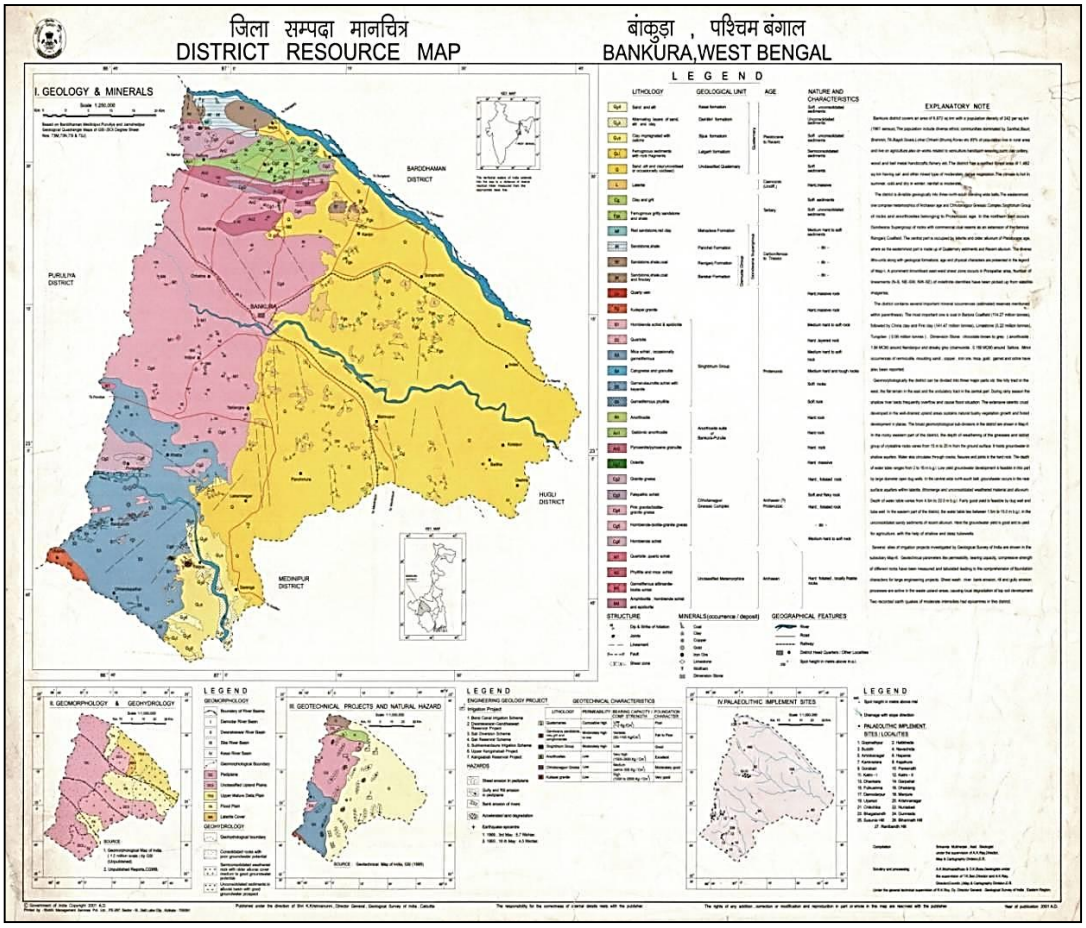


Figure 2-2: Geological map of Bankura district *Source: GSI, 2001*

Table 2-2: Geological Succession of Bankura

AGE			GEOLOGIC UNIT	LITHOLOGY
Pleistocene To Recent	Quaternary		Kasai Formation	Sand and silt
			Daintikri Formation	Alternating layers of sand, silt and clay
			Sijua Formation	Clay impregnated with caliche
			Lalgarh Formation	Ferruginous sediments with rock fragments
			Unclassified Quaternary	Sand, silt and clay (un-oxidized or occasionally oxidized)
Cenozoic (undiff.)				Laterite
Tertiary				Clay and grit Ferruginous gritty sandstone and shale
	Gondwana Supergroup		Mahadeva Formation	Red sandstone, red clay
			Panchet Formation	Sandstone, shale
		Damuda Group	Raniganj Formation	Sandstone, shale, coal
			Barakar Formation	Sandstone, shale, coal and fireclay
Proterozoic				Quartz vein
				Kuilapal granite
	Singhbhum Group			Hornblende schist and epidiorite
				Quartzite
				Mica schist, occasionally garnetiferous
				Calc-gneiss and granulite
				Garnet-staurolite schist with kayanite
				Garnetiferous phyllite
	Anorthosite suite of Bankura-Purulia			Anorthosite
				Gabbroic anorthosite
				Pyroxenite / pyroxene granulite
Archaean (?) Proterozoic	Chhotanagpur Gneissic Complex			Dolerite
				Granite gneiss
				Felspathic schist
				Pink granite / biotite-granite gneiss
				Hornblende-biotite-granite gneiss
				Hornblende schist
Archaean	Unclassified Metamorphics			Quartzite, quartz schist
				Phyllite and mica schist
				Garnetiferous sillimanite-biotite schist
				Amphibolite, hornblende schist and epidiorite

Damodar River:

Damodar River forms the northern boundary of the district along with Bardhaman district for about 72 kilometres and then flows into Bardhaman district. Sali River which is one of the important tributaries of the Damodar drains the northern part of the district. Damodar River rises in the Palamau hills of Chota Nagpur at an elevation of about 609.75 m. It flows in a south-easterly direction and near Burdwan, the river abruptly changes its course to a southerly direction and joins the Hooghly River about 48.27 km below Kolkata. Its slope during the first 241.35 km is about 1.89 m/km, during the next 160.9 km about 0.568 m/km and during the last 144.8 km about 0.189 m/km. The total length of the river is nearly 547 km and a total drainage area is 22,005 sq. km.

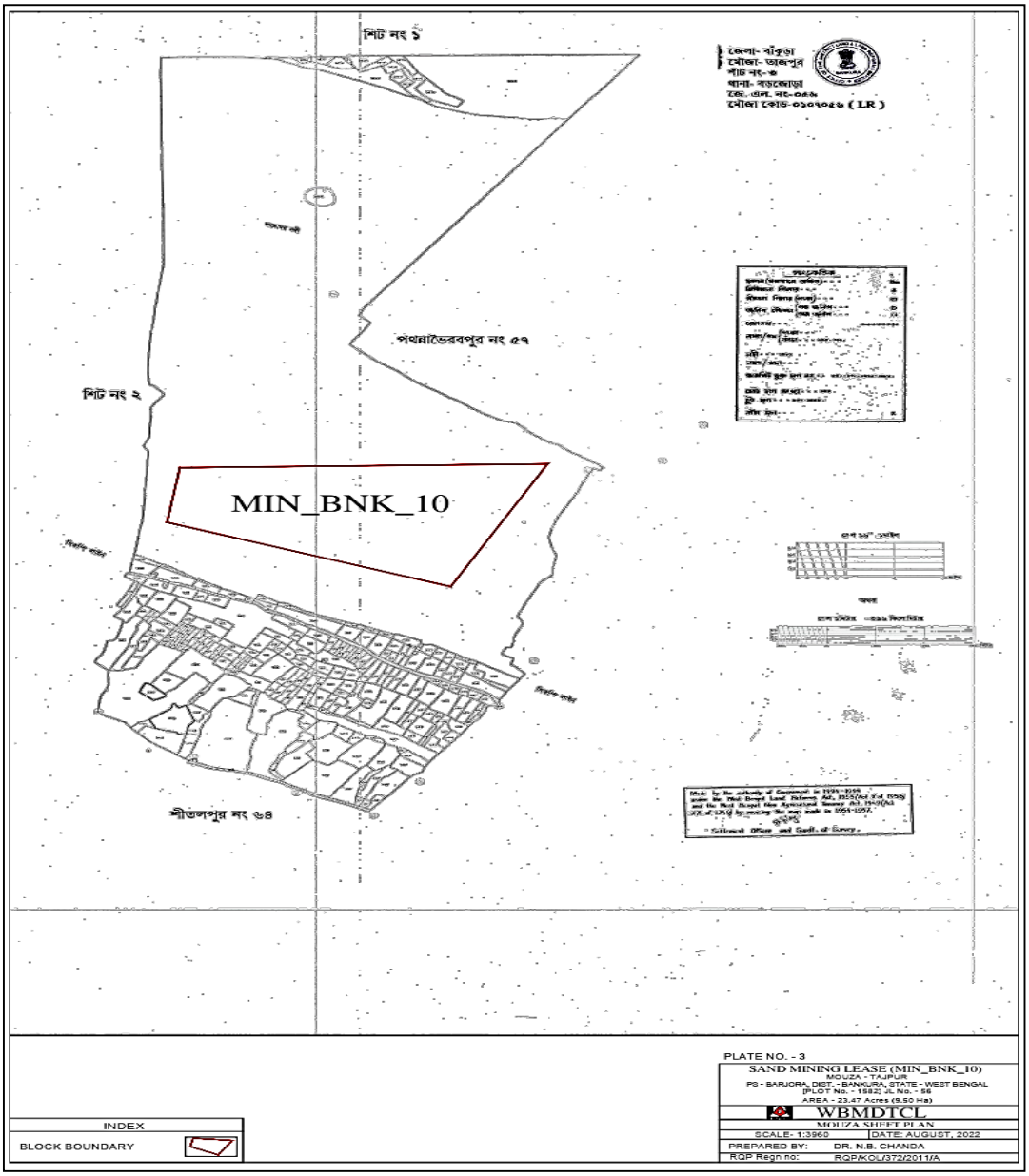


Fig 2-3: Block Boundary

Table 2-3 : Drainage system of Damodar River

Sl.No.	Name of the River	Area drained (Sq.km)	% Area drained in the district
1.	Damodar	102.34	2.36

Table 2-4: Salient Features of Damodar River

Sl.No.	Name of the River	Total Length in District (in Km)	Place of origin	Altitude at Origin
1.	Damodar	97.36	Palamau hills of Choota Nagpur, Jharkhand	600m

The geomorphological characteristic of a river is foremost factor for annual deposition of sedimentary load. The study of the same includes following parameter:

i) **Place of Origin**

Details of place of origin of Damodar River is furnished in Table 2-5.

Table 2-5: Place of Origin of Damodar River

Sl No.	Name of the river	Place of origin
1.	**Damodar**	Palamau hills of Choota Nagpur, Jharkhand

ii) **Catchment Area**

Damodar and its tributary rivers are forming the main catchment area in the district of Bankura.

iii) **General profile of river stream**

River profile has been studied along the cross-section lines which was chosen based on the drastic variation of the river widths, proximity of the operating sand 'ghats' and the position of the sand bars. River profile section is presented in Figures 2-4 .

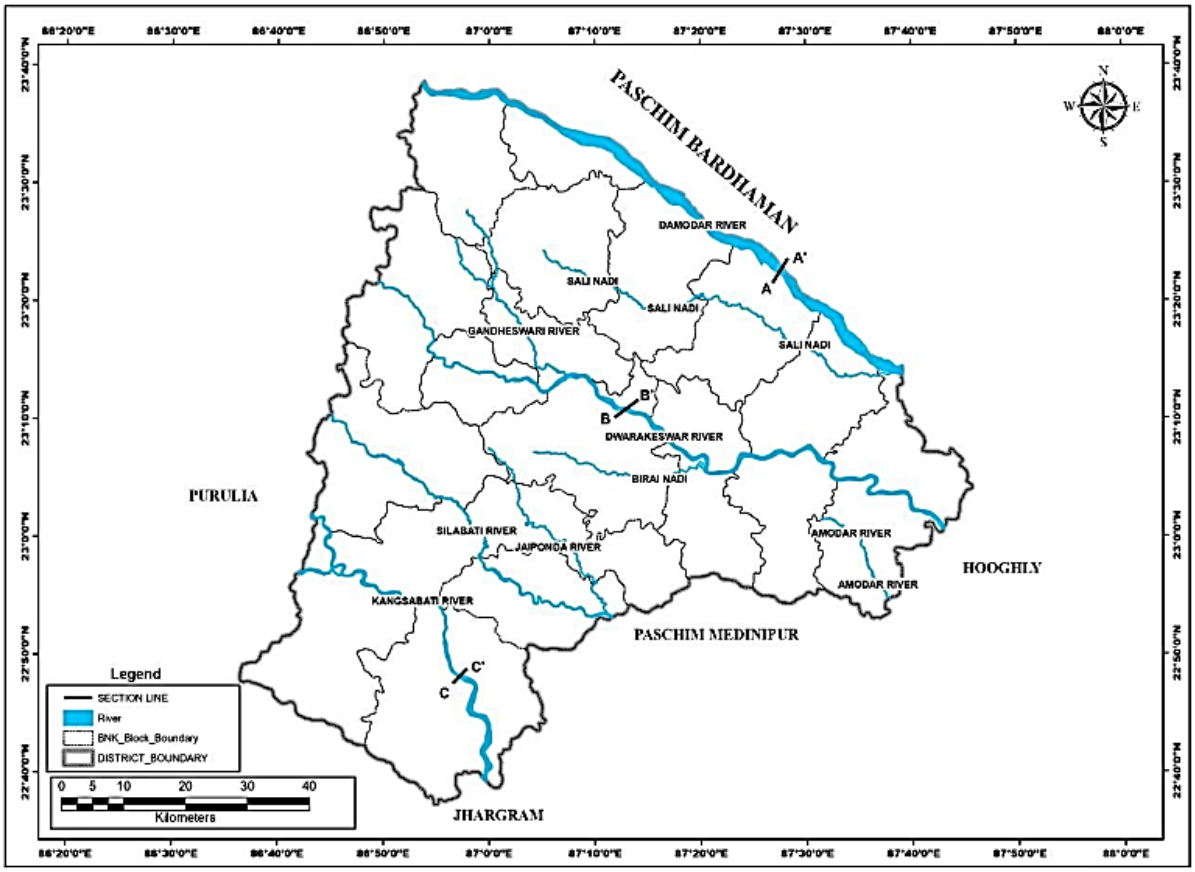


Figure 2-4: Map showing the major rivers along which profile section drawn

Figure 2-5: Profile section of Damodar River

Figure 2-6: Cross section view of Damodar River

Figure 2-7: Drainage map of the district

Table 2-6: Sediment Load comparison between Pre- and Post-monsoon periods for different rivers

River Name	Pre Monsoon no of ghats	Post Monsoon no of ghats	Pre-Monsoon Sediment Load (Mcum)	Post Monsoon Sediment Load (Mcum)	Difference (Mcum)	Difference (%)
Damodar River	29	39	100.90	125.66	24.77	25%

Table 2-7: Replenishment Rate of Damodar River

Replenishment Study Method	Damodar River
Estimated Annual Replenishment based on **Satellite Imageries***	125 %
Estimated Annual Replenishment based on **Field Investigation**	96.83 %
Estimated Annual Replenishment based on **Empirical Formula**	73.40 %

Geomorphology:

The district forms an intermediate tract in between the alluvial plain and the complex plateau of Chhotanagpur and presents a variety of landforms. The principal rivers of the district have a gradual descent from northwest to south- east almost parallel to each other following the natural trend of the landscape having flow of water with their origin in the western upland tract. According to genesis and evolution of landforms, the district can broadly be divided into two divisions viz.

1. Dissected plateau being the eastern fringe of Chhotanagpur region in the west and
2. The undulating alluvial plain in the east.

On the basis of surface forms and stage of development these two groups are further subdivided into the following geomorphic units (Soils of Bankura District, Soil Survey Report No. 491).

Dissected Plateau interspersed with Valleys

a. Moderate to strongly sloping land having residual isolated hills, hillocks and piedmonts occuring in the western part of the district. The surface has been denuded leaving exposed areas of bare hard rocks. Archaean rocks composed of gneiss, schists and granites occupy most of the areas. Quartz veins and pegmatites with phyllites occur in the south west in Ranibandh, Raipur and Khatra areas. Soils developed on hillocks are shallow to moderately deep, gravelly sandy loam and severely eroded.

b. Gently to moderately sloping lands interrupted by mounds and valleys lie

adjacent to the western hill-tract. The latitudinal spurs from the west parallel to the rivers gradually merge into the alluvium in the east. At places, gneissic rocks are exposed. The soils occurring on low mounds and hillocks of low magnitude and piedmont are shallow to very deep and gravelly sandy loam to sandy clay loam.

c. Western upland tract having gneissic rocks underneath is covered with alluvium and lateritic mass. Soils occurring on this gently sloping tract are deep to very deep and sandy loam to clay loam.
d. The highly gullied lands are mostly marked along the courses of the streams and rivulets in the west. On descending slopes they carry the loose material to the lower reaches creating eroded ravine area.

Undulating Alluvial Plain

a. To the east of the dissected piedmont the upper undulating alluvial plain extends up to the western part which is under Joypur Police Station jurisdiction. Soils are mostly derived from decomposed rocks deposited by the streams. The Older Alluvium of middle Pliestocene age occupy comparatively larger land mass and is coarse in texture with reddish colour. The Older Alluvium is capped by lateritic rocks.

b. The Younger Alluvium of sub-Recent to Recent age contains assorted material which covers the eastern part of the district. Such alluvium is thick and is running into several scores of metre. The level topography results in the formation of extensive alluvial tract in the east.

c. Flood plains are mostly confined along the, main rivers and streams. Most of the rivers have steep banks in their upper reaches and allow sudden discharge to move down stream where the low banks fail to contain the water causing floods. Thus, riverbed aggradation and heavy rainfall accelerate the rate of formation of the flood plains. The soils are medium fine to fine in texture.

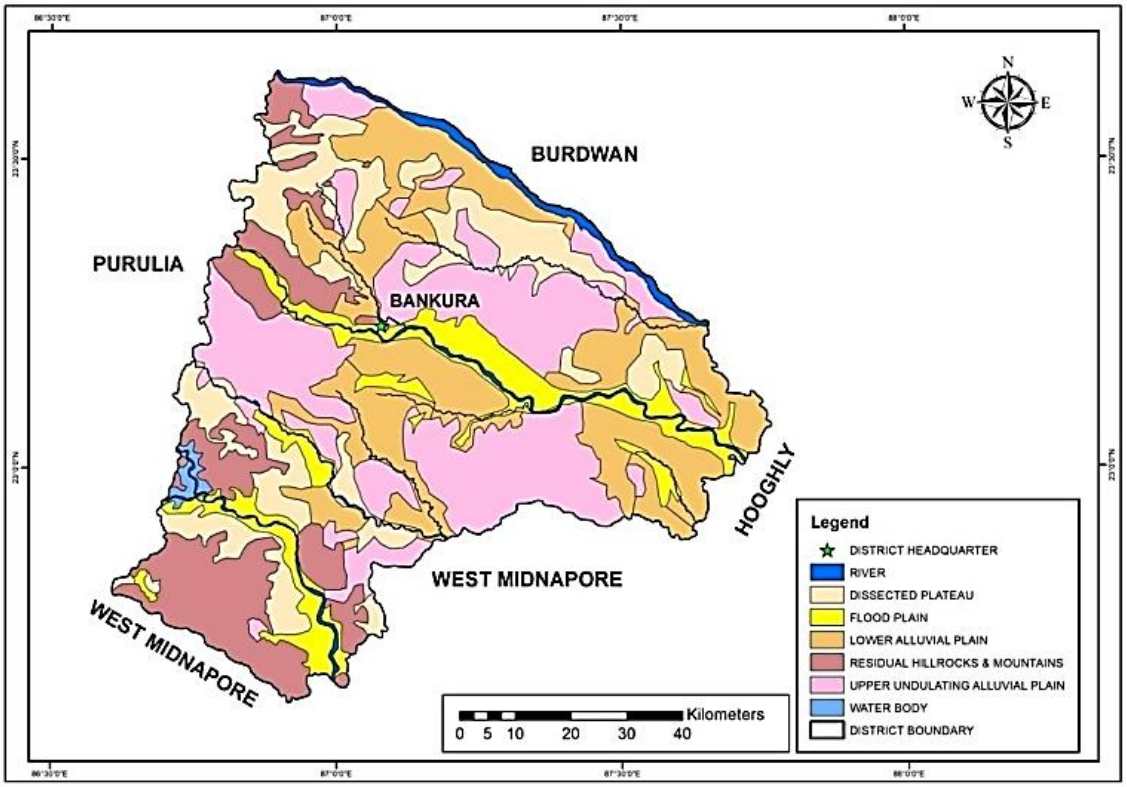


Figure 2-8 : Geomorphological variation of Bankura district.

Soil:

Soil of Bankura district can be broadly grouped into three principal types viz. (1) Red Soil (2) Alluvial Soil and (3) Laterite Soil. Typical red soil has limited distribution in the south central, south-eastern and south western parts of the district around Bishnupur, Kotulpur and Raipur blocks respectively. They are the red coloured sedentary soil (i.e. those formed from residual parent materials) found mainly on laterites supporting Sal vegetation. They are also found along the margins of small hills bare of vegetation. They are free from CaCO3, low in base exchange capacity and have a highly unsaturated base. They may be derived from laterites by a process of resilicification by ascending ground water but cannot be grouped either as laterites or laterite soil.

Brown soils from a group within this class which are also sedentary in nature, mainly derived from rocks like sandstone, granite gneiss and schists. The alluvial soils, which have wide distribution in the east-central and southeastern parts of the district, are grouped according to soil association as Damodar-Rajmahal riverine, Damodar flatlands, Damodar highlands etc.

The older alluvial amongst them is unaffected by floods and siltation and show profile development, whereas the younger or newer alluvial, found mostly in the Damodar flatland areas are enriched by silt deposition during floods. Such areas are characterised by high water table, a heavy sub-soil and occurrence of brown concretion at lower depths.

The laterite soils have wide distribution in the south-central to the south western part of

the district. Such soils are distinguished from the red soils by the occurrence of ferruginous concretions in a definite layer, whereas in the red soils they are distributed throughout the profile.

According to the textural types, soils of the district can be classified under the following types: (1) Sandy (2) Sandy Loam (3) Loam (4) Sandy Clay Loam (5) Clay Loam (6) Clay.

Clay, clay dominated loam and loamy soils are mostly confined to the flood plains of the Damodar and the Dwarkeswar rivers through sporadic occurrences. This type of occurrences is also seen in other small river valleys. The district as a whole is covered generally by sandy loam.

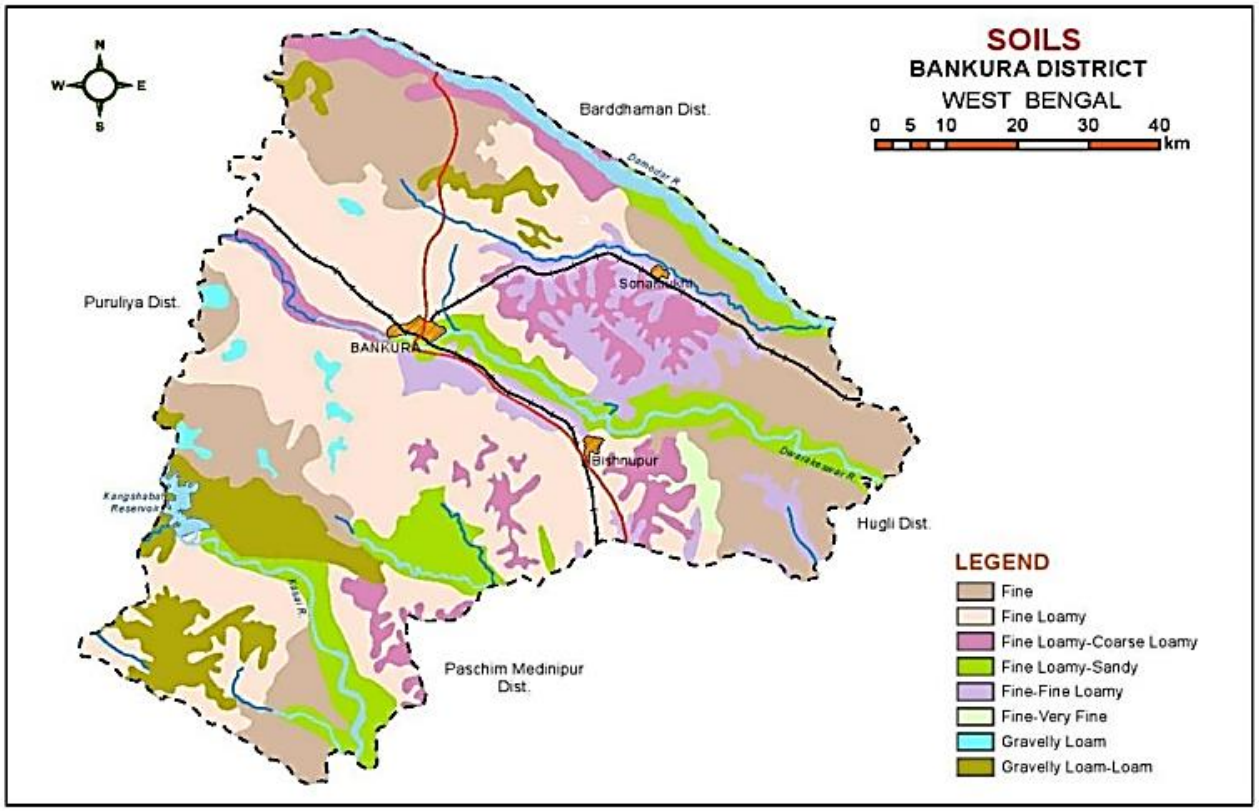


Figure 2-9: Soil pattern of the Bankura district.

Drainage:

The river system of district Bankura primarily consists of Damodar, Darkeswar and Kangsabati and their tributaries of which Gandheswari, Silai and Kumari are the most important.

All the rivers have a south-easterly flow and the rivers are almost parallel to each other. Damodar River rises in hilly country of Palamau district of Chhotonagpur and before it touches the Bankura it receives the water of many smaller hill streams including those of the Barakar, its principal tributary. The Dwarakeswar rises from neighbouring Puruliya district, flows through the middle of Bankura and divides it into two halves. The Silabati, popularly known as Silai, is

the largest tributary of Dwarakeswar, the Joypanda is the principal tributary of the Silabati. The Kangsabati or the Kasai is the third largest river in the district, which rises in the hilly terrain of Jhalda C.D. Block in the adjoining district of Purulia and enters Bankura district in Khatra C.D. Block and after flowing for about 56 kms it enters Midnapur district at the south east corner. Also some other rivers or tributaries, like Gandheswari, Sali, Arkasha, Birai, Bodai etc. plays important role of the districts irrigation. All the rivers are seasonal, hence the district is drought prone. Drainage map of Bankura district is furnished as Figure 2-10.

Figure 2-10: Drainage map of Study area

Climate and Rainfall:

District Bankura belongs to humid tropical monsoon climatic region. According to District Meteorological Department, there are very minor variation of temperature, rainfall and relative humidity in all over the district viz. north to south and west to east.

The district of Bankura experiences an extreme climate with high range of temperature. The climate of the district is characterized by oppressive heat and high humidity in summer with average daily maximum temperature varies between 26ºC and 39ºC. Winter is generally dry and

cold with average winter temperature around 15º C. The year may be divided into four seasons. The cold season is from about the middle of November to the end of February. The period from March to May is the summer season. The south west monsoon season commences about the beginning of June and lasts till the end of September. October and the first half of November may be termed as post monsoon season. (https://www.imdpune.gov.in/library/public/Climate%20of%20WestBengal.pdf)

The Rarh plain of Bankura district in summer is humid and warm, while the winter is dry and cold. The annual average rainfall ranges between 130 cm and 140 cm. The average winter temperature is 15°C and the average summer temperature is about 30°C.

The average annual rainfall in the district is 1481.5mm. The variations in the annual rainfall within the district and from year to year are not large. The rainfall during the monsoon season – June to September – constitutes 74 percent of the annual rainfall; July and August are the rainiest months.The district receives a mean annual rainfall varying from 1334.3 mm. to 1780.2mm.

(https://hydro.imd.gov.in/hydrometweb/(S(c31xot2fu1lahs45tplr2vuh))/DistrictRaifall.aspx)

The information on annual rainfall for the five years from 2016 to 2020 for the district Bankura is given in Table 3.2. Average rainfall of the district explained graphically in Figure 3.3

Table 2-8: Annual rainfall (in milimeter) recorded in Bankura District

Month	2016	2017	2018	2019	2020	Average
Jan	6.1	0	0	0	24.5	6.12
Feb	10.2	0	0.1	33.8	0.z	8.88
Mar	15.6	16.9	9.1	23.2	65.9	26.14
Apr	0.8	27.9	149.6	69.5	113.2	72.2
May	101.3	76.3	76.5	175.9	199.5	125.9
June	175.1	228.8	235	113.8	325.4	215.62
July	264.8	634.2	328.9	226	286.8	348.14
Aug	445.5	330.4	315.4	319.6	342.3	350.64
Sep	268.9	186.1	151	267.3	112.7	197.2
Oct	46.9	249.1	27.6	173.1	55.9	110.52
Nov	0.7	25.3	0.5	11.6	4.6	8.54
Dec	0	5.2	40.6	12.3	0	11.62
Yearly Total	1335.9	1780.2	1334.3	1426.1	1531.1	1481.5
Source: Website of Indian Meteorological Department, Govt. of India						

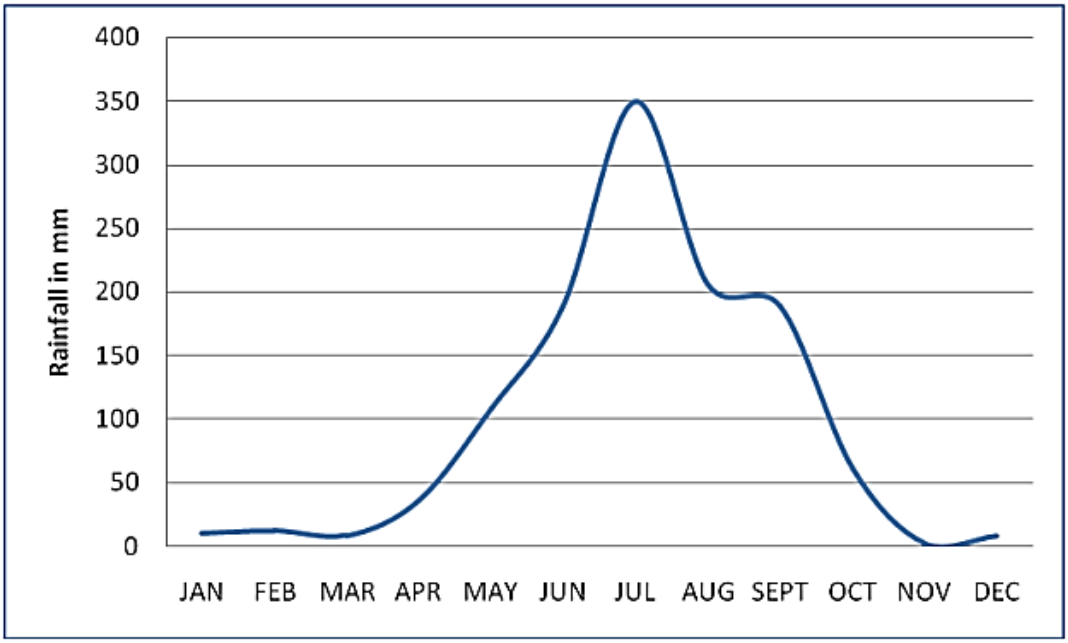


Figure 2-11: Graphical representation of Bankura District rainfall

Temperature:

Temperature along with other meteorological conditions of the district is more or less uniform. The cold season commences by about the middle of November when the temperature begins to decrease. January is the coldest month with the mean daily maximum and minimum temperature at 26 ºC and 12ºC respectively. By about the end of February the temperature begins to increase and April is found as the hottest month, the mean maximum daily temperature is 38 ºC and the mean minimum daily temperature is 26 ºC. (https://en.climatedata.org/asia/india/west-bengal/bankura-55531).

The average maximum and minimum temperature recorded in Bankura is given in Table 3.3.

Table 2-9: Monthly mean temperature (in °C) distribution of Bankura District

Parameters	Jan	Feb	Mar	Apr	May	June	July	Aug	Sep	Oct	Nov	Dec
Average Temperature (°C)	19.3	22.1	27.3	31.4	32.2	31.2	28.9	28.8	28.7	27	22.7	19.7
Minimum Temperature (°C)	12.5	15.2	20	24.3	26.4	26.4	25.7	25.7	25.7	22.7	16.7	13.1
Maximum	26.2	29	34.6	38.6	38	36	32.1	31.9	32.1	31.4	28.8	26.3

Relative Humidity, Wind speed & Wind direction

Humidity is observed as high throughout the year, but in the summer months, March

and April, the relative humidity is comparatively low, begins some 65 to 70 percent in the mornings and 35 to 40 percent in the afternoons. From May the humidity increases. Skies are moderately to heavily cloudy in May. In the south-west monsoon season; the cloudiness increases and skies are mostly heavily clouded or overcast. From October the cloudiness decreases and in the next six months skies are clear or lightly clouded. Winds are generally light or moderate, with a slight increase in force in the summer seasons.

Hydrogeology:

Ground water conditions in the district can be described under two distinct hydrogeological units, i.e. conditions prevailing in the consolidated formations and the conditions prevailing in the unconsolidated formations. Pre-Cambrian gneiss-schist complex projecting abruptly above the vast stretch of alluvium as isolated hills forms the consolidated formation in the district. These rock formations had been subjected to faulting and fracturing at several places through which waterpercolates to facilitate weathering. Weathered zone forms as such are restricted to about 10 m thickness and is often lateritic in character. Occurrence of ground water is limited in these formations and is confined to topographic lows and weathered residuum. The movement of groundwater is controlled by the presence of fractures and fissures. Extraction of ground water in these zones is possible through large diameter dug wells and bore wells in hydro-geologically suitable areas. Ground water occurs under water table conditions in the weathered zone. The unconsolidated formation is represented by the alluvial deposits of the recent age. This formation is found spreading on either side of the River Brahmaputra and comprises medium to coarse grained sand, gravel, pebbles, cobbles, etc., with intercalation of silt and clay. It is characterized by the presence of hard compact lateritic clay (Chapar formation) followed by coarse sand with pebbles and cobbles. Ground water occurs under water table and semi-confined conditions. The water table contour follows the topography of the area and lies more or less parallel to the Brahmaputra River. The movement of ground water is from north to south in the north bank and south to north in the south bank of Brahmaputra. An artesian belt also exists around Mancachar inthe southern part of the district. Detailed hydrogeological surveys aided by exploratory drilling revealed the existence of promising aquifer zones down to the depth of maximum 200 m BGL in the northern bank of the River Brahmaputra and more than 100 m in the southern bank. Aquifer displays various degree of lateral and vertical variation of aquifer indicating various degree of depositional environment both in space and time.

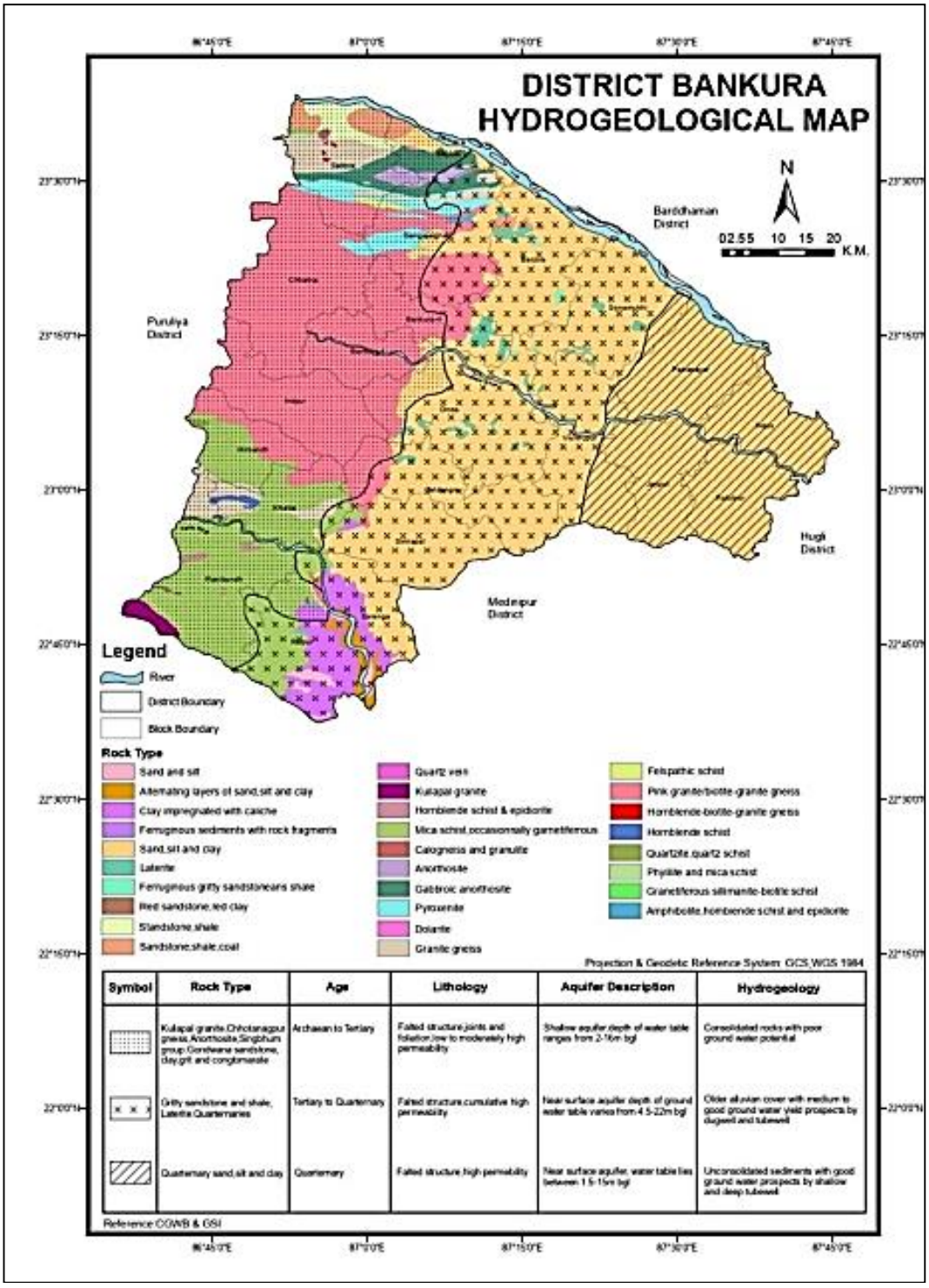


Figure 2-12: Hydrogeology map of Bankura district.

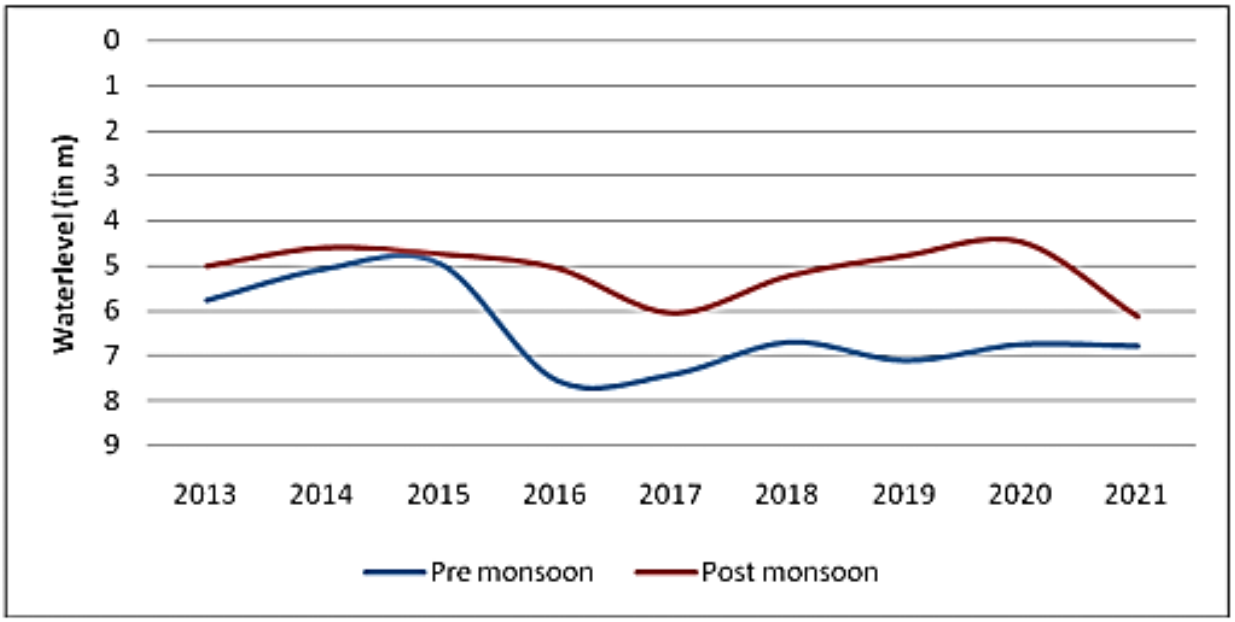


Figure 2-13: Graphical representation of pre-monsoon and post-monsoon water level data of sonamukhi, Bankura

Source: District Survey Report, Bankura, West Bengal

Seismicity of the area:

The district is broadly having three types of landforms, upland peneplain in the western part, undulating upper alluvial plain in the middle and lower alluvial plain in the north eastern part of the district. The uplands in the west accounts for around 25% of the total area are sloping, very often devoid of vegetation and prone to runoff and erosion. The area has shallow acidic soil with poor fertility and low water holding capacity. In the uplands which cover an area of 1,76,915 ha, cultivation of paddy is not remunerative. Seismologically, the district comes under seismic Zone –III.

The seismic hazard map of India was updated in 2000 (Figure 3.11) by the Bureau of Indian Standards (BIS). There are no major changes in the zones in West Bengal with the exception of the merging of Zones I and II of the 1984 BIS map. Western sections of the northern districts of Jalpaiguri and Coochbehar lie in Zone V. The remaining parts of these two districts, along with the districts of Darjeeling, Uttar Dinajpur, Dakshin Dinajpur, Maldah, 24 North Parganas and 24 South Parganas lie in Zone IV. The rest of the state along with the city of Kolkata lies in Zone III.

The maximum area of the district falls under the Seismic Zone III and rest of the part fall under Zone II, indicating the district under safe earthquake–prone zone.

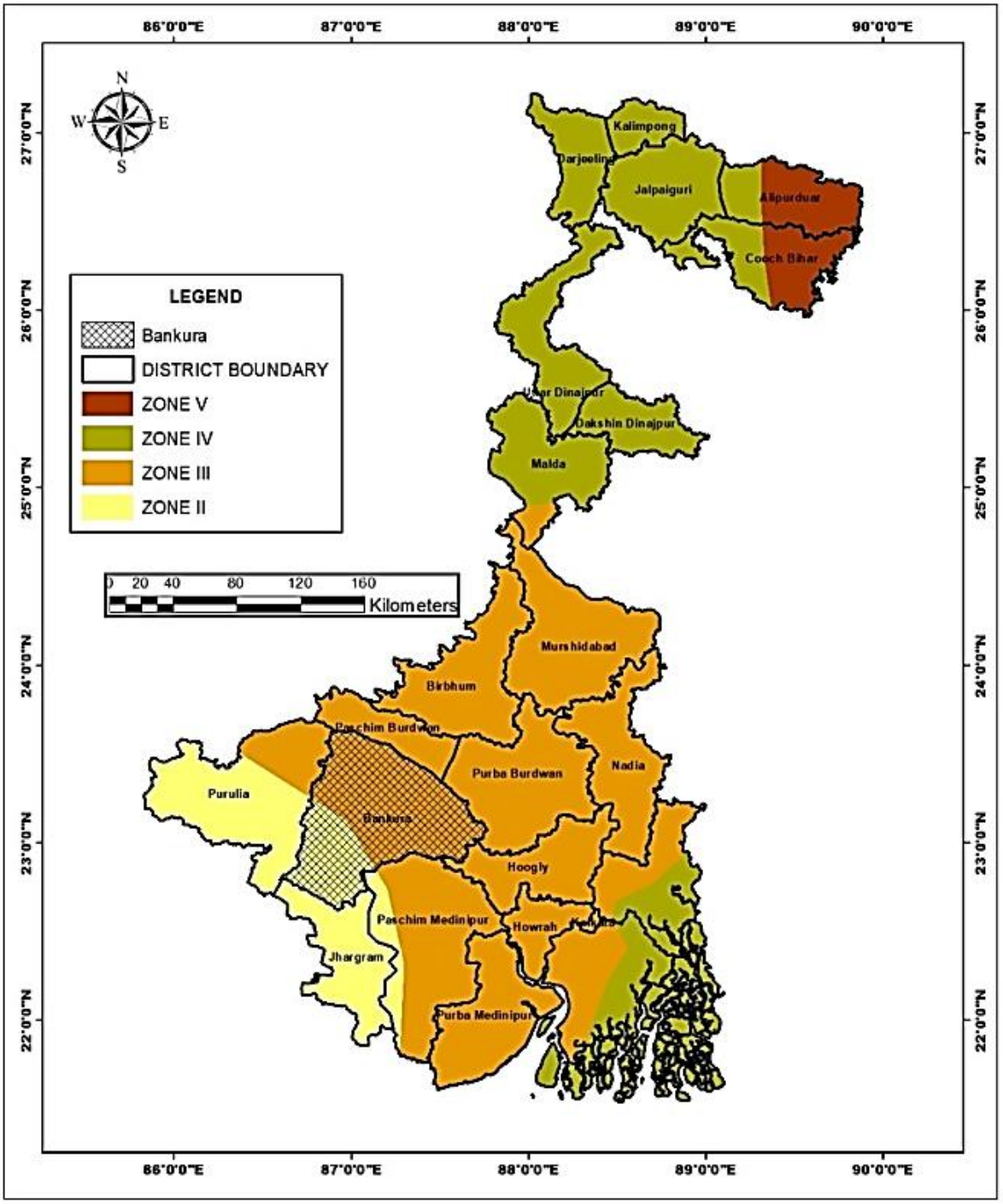


Figure 2-14: Earthquake zonation map of West Bengal highlighting the Bankura district position

(Source: https://pib.gov.in/PressReleasePage.aspx?PRID=1740656)

Available reserves and production:

Geological Reserve:

The total area for lease is 9.50 Ha. Sand is available in the middle portion of the riverbed as well as near the riverbank. It is permitted to remove sand only up to 3.0 m depths or up to groundwater level

whichever is less. Now as per policy of the West Bengal state and West Bengal Minor Mineral and Concession Rules 2016 and approved DSR of Bankura, the estimation of the reserves in term of volume has been drawn on the basis of the area under the lease multiplied by the average 3.0 m depths and the replenishment rate of the river is considered to be 73.40% annually.

Table 2-10: Considerations for Resource & Reserve Calculation of the Lease Area

Total Area (Ha)	Safety Zone (Ha)	Production Area (Ha)	Thickness (m)
9.50	0.9728	8.5272	3.00

Table 2-11: Geological Reserve of the Lease Area

Year	Total Area (Ha)	Total Area (m^2)	Thickness (m)	Replenishment Rate (%)	Geological Resource (m^3)
1st	9.50	95,000	3.00	100	2,85,000
2nd	9.50	95,000	3.00	73.40	2,09,190
3rd	9.50	95,000	3.00	73.40	2,09,190
4th	9.50	95,000	3.00	73.40	2,09,190
5th	9.50	95,000	3.00	73.40	2,09,190
Total Geological Reserve (Cu. M.)					**11,21,760**
Total Geological Reserve (C. Ft.)					**3.961 Cr**

As per the MoEF&CC Guidelines stated above in Section 3.8., We have to consider a Safety Zone in order to move forward with our Mining activities in the allotted lease area, considering an annual replenishment rate of 73.40 % as per the approved DSR of Bankura district.So,

Considering 7.5 m of **Safety Zone** Area is = 9,728m^2 × 3.00 m = **29,184 m^3.**

Now, After Deduction of Safety Zone, The **Total Minable Reserve** is = **2,55,816 m^3**(2,85,000m^3 – 29,184m^3).

Table 2-12: Minable Reserve of the Sand Deposit

Year	Minable Area (Ha)	Thickness (m)	Replenishment Rate (%)	Mineable Reserve (m^3)
1st	8.53	3.00	100	2,55,816
2nd	8.53	2.20	73.40	1,87,769
3rd	8.53	2.20	73.40	1,87,769
4th	8.53	2.20	73.40	1,87,769
5th	8.53	2.20	73.40	1,87,769
Total Mineable Reserve (Cu. M.)				**10,06,892**
Total Mineable Reserve (C. Ft.)				**3.56 Cr**

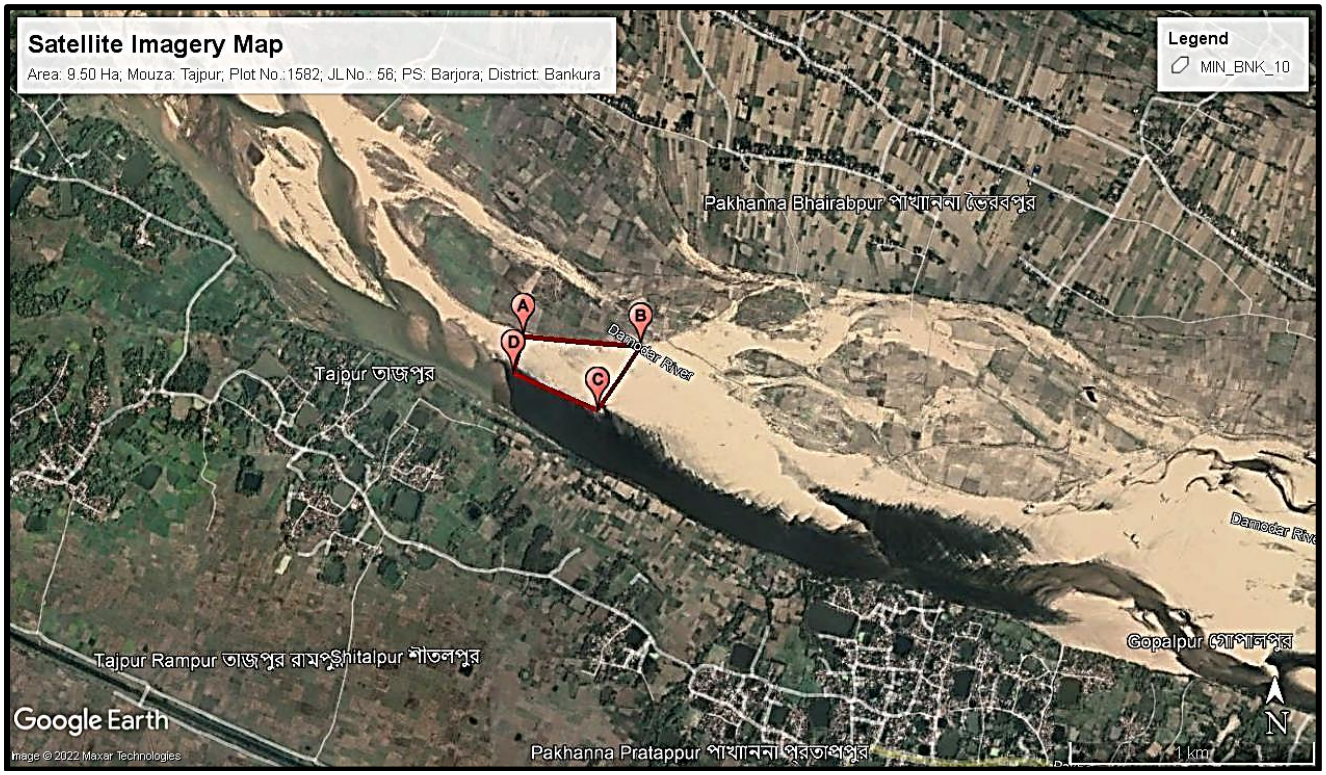


Figure 2-15: Mining location in lease area are marked as red colour polygon

Mineable reserve of the minerals:

Assuming the river bed of the Mining Contract Area to be a level area, the reserve of sand available for extraction can be estimated as stated below:-

The mineable area= 9.50 Hectares = 95000 Sq.

M Maximum depth allowed for river bed mining

= 3M

So, the total reserve of the sand would be = 95000 X 3 = 285000 Cu.M

The void occurring due to the removal of sand from the river bed is gradually filled up with sand carried by the river current. This process is rapid during the rainy season and hence replenishes the reserve of the mineral (sand) every year as there will be an accumulation of sand to a considerable extent during the rainy season.

As per Issued LOI (No. 689/ICE-12011(99)/68/2022-MINES, dt. 30.11.2022, a total 10,06,892 Cu. M of sand may be excavate for 5 Years. Extraction/ collection work of river sand is usually carried out for eight months in a year. The work remains suspended for the rest four months of the year due to seasonal monsoon rainfall and other related problems. Therefore, considering the number of working days in a month to be 25 days and 8 hours per day. So, the total working days in a year would be = (25 X 8) = 200days.

However, the Competent Authority may prescribe the quantity of sand to be extracted by the

Mining Contract Holder as per the terms and conditions of the contract taking into accountthe impact on the ecology and environment of the surrounding areas.

However, the quantity of sand allotted for extraction under the Mining Contract will bewithin the mineable reserve of sand available per year as depicted above.

Production of sand:

The Mining Contract proposed to be granted to the applicant **"West Bengal Mineral Development & Trading Corporation Limited"** in the river bed of Damodar River is for extraction of sand manually. Damodar River is a perennial river and hence, considerable amount of sand is transported by the flow of riverwater. The total quantity of the sand to be produced are 10,06,892 cum.

Sand will be lifted from the riverbed for all eight from June to September. Proposed production for (As per the DSR report of Bankura):

Table 2-13: Year-wise Production details

Year	Production Area (Ha)	Thickness (m)	Replenishment Rate (%)	Volume (m^3)
1st	8.53	3.00	100	2,55,816
2nd	8.53	2.20	73.40	1,87,769
3rd	8.53	2.20	73.40	1,87,769
4th	8.53	2.20	73.40	1,87,769
5th	8.53	2.20	73.40	1,87,769
Average Mineable Reserve				**2,01,378.40**
Total Mineable Reserve				**10,06,892**

Production of Sand

Per Day Production

Total Estimated production of minable reserve during the full lease period will be = **10,06,892 m^3.**

The Average Production of Minor Mineral (Sand) during the full lease Period is: = (10,06,892 /5) m^3

=**2,01,378.4 m^3**

Considering the number of working days in a month to be 25. Since the Mining activities will be on halt during the time of Monsoon (Period of 4 months), Therefore only 8 months of working on the Lease area will be possible.

So, the total working days in a year would be: (*25 × 8*) = 200 days.

So, the Average Extraction of Riverbed Sand deposits per day (i.e., 200 days) would be about:
= (2,01,378.4 / 200) ≅ **1,007 m^3/ Day.**
Considering the carrying capacity of the trucks/ dumpers to be deployed is of average 5 m^3 (10 Ton), the total no. of trips to be made by the dumpers/trucks would be about: = (1007 / 5) m^3 ≅ **202 trips per day**.

Sand will be transported from the mine site to various government, semi-government and private consumers mainly for civil construction and road construction purposes. The quantity of sand stated above is an estimated quantity that may be available for extraction considering the extent of the area of the Mining Contract Site. However, the competent authority shall decide and fix the quantity of sand to be lifted by the Mining Contract Holder as per terms and conditions of the Mining Contract with due emphasis on the impact on environmentand ecology of the surrounding areas.

Working Depth

Taking into consideration the geological parameters of the sand deposit and the geotechnical field observations, it is advised to work in a semi mechanized mode and the method is opencast with a bench system which is adapted to work on the deposit. As per West Bengal Minor Mineral Concession rule 2016, it is advised to keep the working depth of the Mining activities at 3m.

It is only a small-scale sand mining. The extraction of sand is being done using small scale excavators (0.9 ml) and manually with simple hand tools such as shovel pans and crowbars. This activity is followed by sorting pebbles manually or by a screening device.

The year wise projection of working is marked on the Production and Development plan which is enclosed in the section as Plate No. - 5.

Surface Plan of the proposed lease area is shown in Plate No. - 6.

Year-wise Production and Development Plan and Geological Cross-section showing the year-wise bench disposition is enclosed as Plate No. - 7 and 8.

Year Wise Development

No development work is required as the mining is for riverbed sand. Excavation of river sand will be done in combination of both manual method and transportation will be done by loading trucks of l0 Ton (5 m3) capacity. It has been proposed to collect approximately 2,01,378.4 m3/per year. The river bed material will be replenished during the

monsoon season every year.

Life of mine:

Generally, the extraction / collection of river bed sand deposits can be carried out for eight months only in a year. The work remains suspended for four months during the monsoon season for allowing the river bed to replenish. During this period as the river bed remains full with seasonal flood water and other related problems like lack of approach road, heavy vehicles may get destroy connecting roads etc. The ultimate land use of the mine lease area will not change. The life of mine will be up to lease period i.e., 5 years. Based on the reserves with the average established rate of production of 2,01,378.4 m^3 per annum, the anticipated life of the sand mine will be about 5 years.

Mining Method:

Proposed Mining Method:

Presently the said mine is working with the conventional open cast with bench system method with the semi mechanized mode of operation. Based on the mode and method so adopted and taking into the consideration of geological parameters of the sand body, the mining pit is designed such that the height of the bench is kept at about 3 meters maximum and maintains 34'pit slope. However, only 1.5 m benches have been considered for present mining.

- Mode of operation (mining) is a manual open cast supplemented with semi-mechanised operation
- Extraction of sand will be done by both manual labours and small capacity machineries like excavators and tractors for excavation and transportation of the excavated sand.
- The extracted sand will be temporarily stored in the stacking area which then further will be transported to the desired location as per MDO
- The bench height will be 1m, at final stage the slope of the bench will be mantaining 34° slope
- Loading of excavated and sorted sand materials into tippers with the help of manual mode or by small capacity excavator.

Source: *Approved Mine Plan (SGP./MP/6-21/2023/31 dtd. 17th February 2023).*

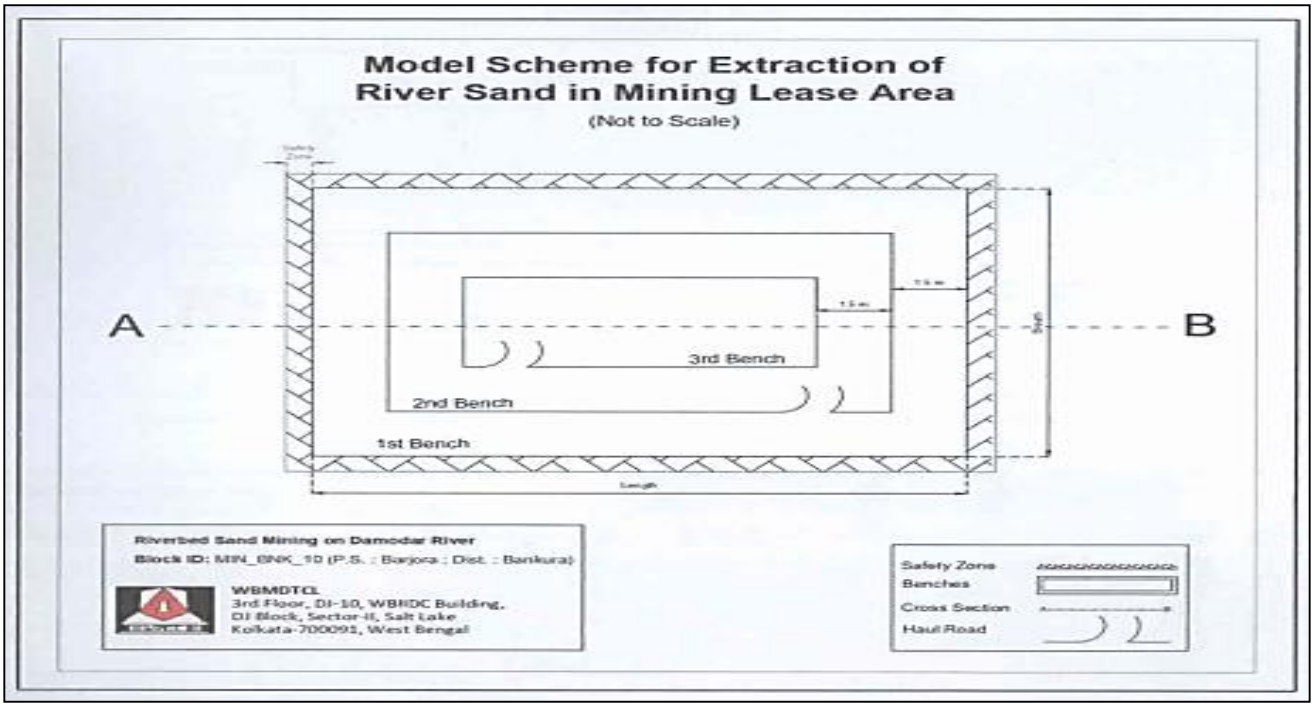


Figure 2-16: Model Scheme of Extraction of River Sand in Mining Contract Area.

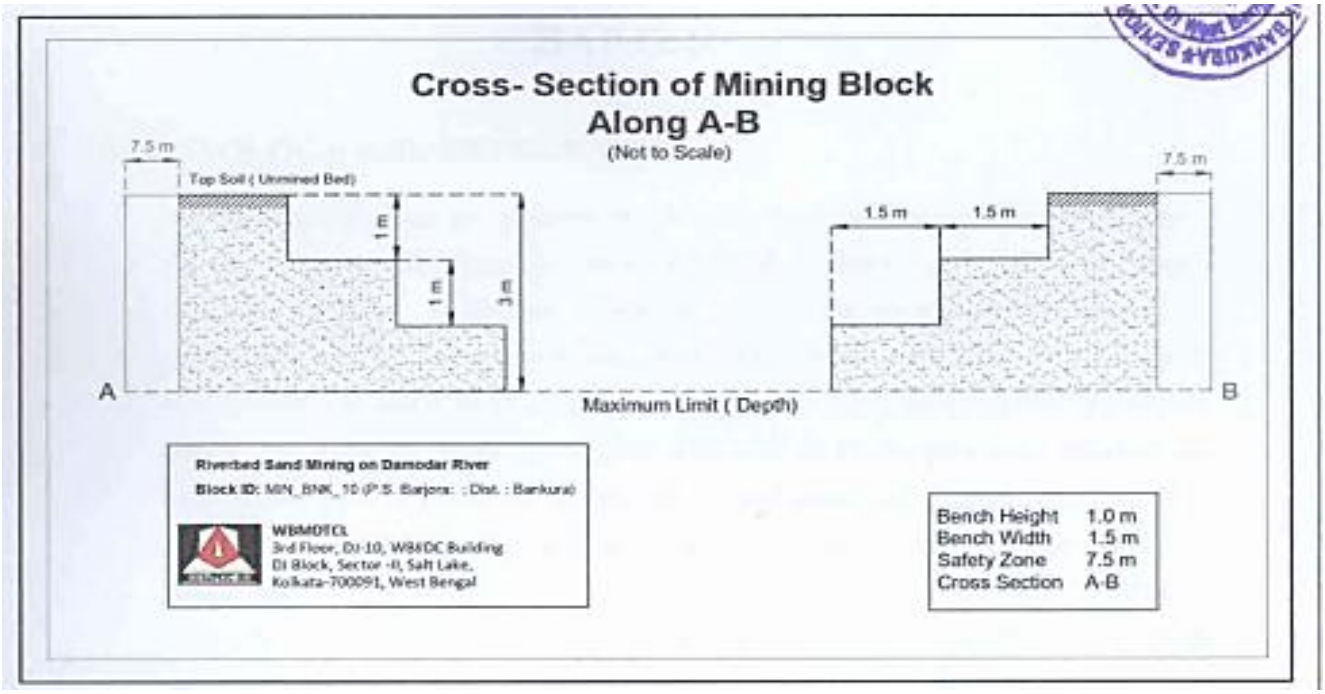


Figure 2-17: Cross Section of Mining Block.

Conceptual Plan of Mining:

Considering individual sand deposits and restricting the mining to top 3 m from the present groundsurface, shall be done. A pole (wooden or metal) shall be fixed in the sand deposit at a suitable location, with datum levels - 0m to 3m painted on it to work as a guide in depth restriction. The river channel is free of water and the ground water table lies about 6-8 m

below the dry channel ofthe river exposed. In general this condition prevails in almost all of the sand deposits on this riverstretch.

The mineralized zone or the sand zone in particular of the river does not follow any specific trend,somewhat it occurs as lensoid body. The relative occurrence of ground surface with the sand zonethickness varies from place to place and depends upon factors such as stream/river flow characteristics, geometry of the river banks, sediment load, rate of water flow, rainfall and surfacerun off characteristics etc.

The longitudinal section of the river channel is explained in the Figure 2-11. The longitudinal section exhibits the generic upstream to downstream flow of river along with the sand deposits contained with it. As seen in the illustration, the top surface of the sand deposit is undulating and gently dipping and the contours of sand deposit vary with the factors as enumerated in above paragraph.

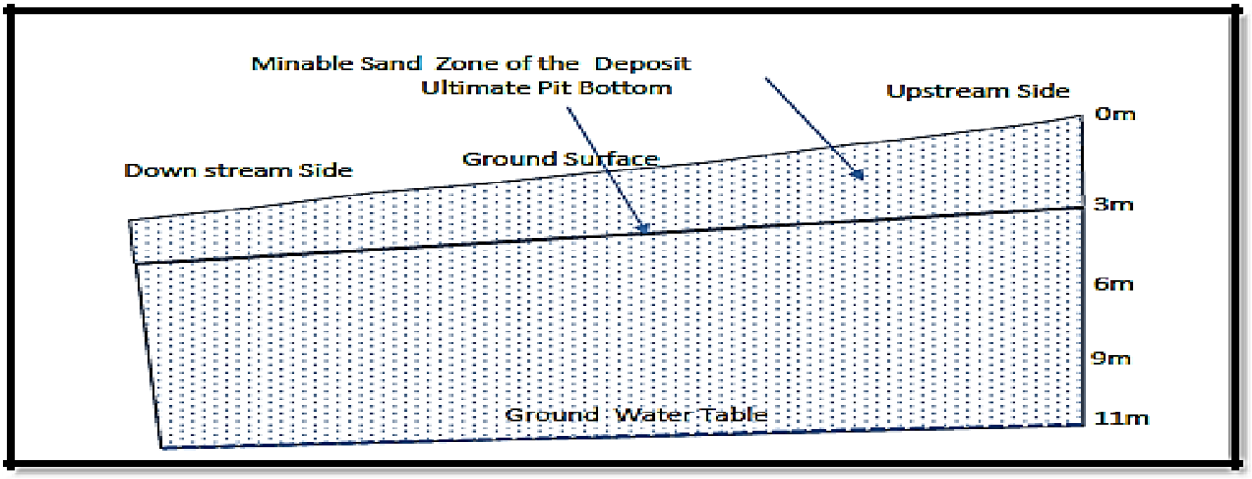


Figure 2-18: Conceptual Longitudinal Section of River Channel.

Machinery Requirement:

This is a new mining contract. Following equipment's are proposed to be deployed for the desiredproduction.

Table 2-14: List of Machinery

S. No.	Name of Machinery	Capacity	Nos.
1.	Excavator	0.9 Cu.M/hrs.	3
2.	Tipper Truck	5.0 Cu.M	15-20
3.	Tractor	15	10-15
4.	Water Sprinkler Truck	10	2

Table 2-15: Manpower Requirement

S. No.	Manpower	Nos.
1.	Manager/ Supervisors/ Technical Professionals	5
2.	Skilled labours	50
3.	Non-skilled labours	100
4.	Water Sprinkler Truck	155

Transportation of Minerals:

As per the official Kolkata Gazette No. 48-ICE/O/MIN/GES-MIS/17/2021 dated 3l't January 2022 and The West Bengal Sand Rule 2016, the following are the rules for transportation, storage & sale of sand:

1. No person shall transport sand without being duly authorized by the State Government and carrying a valid internal permit or e-challan generated on the centralized portal.
2. No person shall store and/or sell sand and or carry out any other allied activities without being duly authorized by the State Government.
3. A person engaged in the transportation of sand shall register itself and every carrier used by it for transporting sand on the centralized portal, in such manner, as may be specified by the State Govemment in a notification published in the Official Gazette.
4. A person engaged in the storage of sand shall register itself and every such stockyard/depot used for storage of sand on the centralized portal, in such manner, as may be specified by the State Government in a notification published in the Official Gazette.
5. A person engaged in sale of sand shall register itself on the centralized portal, in such manner as may be specified by the State Government in a notification published in the Official Gazette.
6. The persons specified in sub-rule (3), (4) and (5) who are engaged in transportation and/or storage and/or sale of sand from before the commencement of these rules, shall register themselves on the centralized portal within sixty days from the commencement thereof.
7. Within such time as may be specified by the State Government in a notification

published in the Official Gazette, such other persons engaged in any activity in connection with sand, if not already registered on the date of publication of such notification in the manner specified in such notification, shall register themselves with the State Government.

8. The time period, terms and conditions of the registration and fees shall be as specified by the State Government in a notification published in the Official Gazette.

Transport from Lease Area to the destination: ROM generated at the mining site will be loaded on tractors with the help of labours followed by transportation by Tipper Trucks.

Transport System: The transportation system is mainly surface transport' assuming the tipper trucks have $5m^3$ (10 Ton) capacities. Therefore, there will be traffic of 202trips per day at the mining site.

Sand Transportation Means: Both own and hired trucks

Conveyor/ rail/ ropeway/ pipeline: Not Applicable

Main destination to which riverbed sand is transported (giving both side travel distance): The material generated at this Mining Lease Area is sand which is used as Road Metal/Building material, hence the distance of destination (both side travel) cannot be furnished, because it varies.
NH 19 is 7.05 km national highway passes across the northern bank of Damodar River. The average distance from project site to PMGSY Rd is approx. 0.83km. The village road has its outlet meeting the tar road on the nearby villages and from where the mineral is sent to various destinations.

Measures related to transportation:

- Regular water spraying on haulage roads during mineral transportation by rotary type water sprinkler, which will cover whole width of the haulage road in one round.
- Avoid over loading of tippers & consequent spillage on the roads.
- Mineral carrying trucks will be effectively covered by tarpaulin to avoid escape of fines to atmosphere.

- Air quality shall be regularly monitored both in the core zone and the buffer zone.

Mine drainage:

During the course of mining, the water table in the river shall not be intercepted .The mining shall be restricted to the top 3 m from the general ground level. Ground water shall not be intercepted during the mining of sand. In view of it, dewatering of sand pits shall not be required or dischargedelsewhere.

Stacking of mineral rejects and disposal of waste:

The present sand mining locations do not have significant top soil/clay layer to be preserved elsewhere during the mining operations. The sand deposits inherit gravels, pebbles with them being a part and parcel of river system. During the field visit and information gathered during discussionswith concerned people, 10% of the geological reserves occurring in the sand ghats are provided for these inclusions and accordingly these have been considered during the minable sand reserves.

Disposal of Waste (Reject) materials Silt:

The proposed project is the mining of sand from dry part of riverbed, all the excavated material will be saleable, and therefore no mines reject will be generated. Some amount of silt may generatewill be used in haul road development.

The land was chosen for disposal of waste with the proposed justification:

There shall be no waste materials generated during the course of sand mining. Therefore, disposalof solid wastes resulting from the sand mine shall not be required.

Use of Mineral:

Sand is used in almost any type of construction activity. Thus, as the focus of the government is on the improvement of basic infrastructure, both in rural & urban areas, there is a constant need for ensuring a regular supply of these construction raw materials inputs. The production of sand will benefit the state in the form of royalty. Apart from this project operation will provide employment directly & indirectly to the people residing in the vicinity, thus improving the Socio-economic status of the area.

There will be also indirect employment in transportation and handling.

Utilities and Proposed Site Facilities:

a) Utilities:

1. Need for the project and importance in the country:

West Bengal is a rich district in terms of sand and mineral deposits. The districts endowed minor mineral resources. The region, where the project is situated, people are mostly dependent on agriculture for livelihood. The developments of mining in the area will lead to infrastructure development, improvement of the road communication and also provided direct and indirect employment opportunities.

2. Demand Supply Gap:

The demand for sand is ever-growing with the growth of the infrastructure sector in our country. The mineral is used mainly in the construction activities like buildings, pillars etc.

The requirement for the mineral is always high in the nearby cities and towns. Therefore, sand has a good demand in the domestic market.

3. Import v/s Indigenous Production:

Only in-situ reserves of sand aggregate occurring in the riverbed of Damodar covering an area of 9.50 Ha shall be mined by opencast as indigenous production.

4. Domestic / Export Markets:

Sand is one of the most important dimensional minerals under listed minor minerals. The domestic demand for sand is also increasing due to large scale development of housing complexes, hotels, hospitals, offices, etc. not only in West Bengal but also in other states.

5. Export Possibility:

Entire quantity of production of sand shall be used for local construction and road- making purposes within the district of Bankura and within the state of West Bengal. There is no possibility of exporting the minor mineral at present.

b) Proposed Site Facilities:

1. Water Requirement:

The water will be required only for drinking purpose. It is projected that not more than 155 laborers will be required for the proposed project. The total water requirement will be 4.5 KLD which will be met by installation of tube well within the project site.

Table 2-16: Water Requirement.

Sr. no.	Activity	Water Requirement (in KLD)
1.	Drinking & Domestic	1.5
2.	Green Belt	1.5
3.	Dust	1.5
4.	**Total**	**4.5**

2. Power:

The material will be excavated by semi open cast method and loaded directly into tractors by the workers themselves. The operation will be done only from sun rise to sun set. So there is no powerrequirement for the mining activity.

3. Manpower:

There is no permanent influx of the population anticipated, as the workers will be hired locally from nearby villages. Unemployment is very pervasive in the study area. The project will provide employment to around 50 nos of skilled labours, and 100 nos. of non-skilled labours from local proximity and 5 nos of managers/supervisors/technical professionals in the project. It is expected that a large partof the investment in this project will be direct/ indirect role on local population. Hence there will be an overall improvement of socio-economic status of the people of surrounding areas.

4. Infrastructure and Site Facilities:

Infrastructure facilities like site office, first aid station, rest shelter, potable drinking water facility etc. will be established within the mine area. The following infrastructure facilities will be made available for the workers:

5. First Aid Facility:

A first aid facility will be made available at site with proper equipment will be maintained as per Mines Act and Mine Rules at the mine site office. First aid -box with all necessary facilities will be maintained and provided.

6. Temporary rest shelter:

The temporary rest shelter with arrangement of drinking water, tea etc., will be provided for the workers working in the mine as they will come from nearby villages at day time only.

7. Washroom:

Washroom facility will be provided to the laborers nearby the site.

8. Land use:

The land of the mine lease area is for Sand Mining & there will be no change in land use after operation. The final land use of the mine lease area will not change. Extracted mineral will be used in construction purposes and other uses, the workers will be hired locally &temporarily, no housing facility will be required. Land use distribution proposed for quarrying andits allied works and ultimate land use details are given:

Table 2-17: Land use of project site before and after project activity.

Sl No.	Year	2009-10	2010-11	2011-12	2012-13	2013-14
1.	Reporting Area (In Thousand Hectares)	688	688	688	688	688
2.	Forest Area	148.93	148.93	148.93	148.93	148.93
3.	Area under Non-aericultural use	147	148.48	156.02	158.52	161.56
4.	Barren & unculturable land	2.31	1.42	2.42	1.65	1.62
5.	Permanent pastures & other grazine land	0.81	0.78.	1.09	0.97	0.89
6.	Land under Misc. tree groves not included in Net area sown	2.82	1.44	1.83	1.89	1.63
7.	Culturable waste land	2.04	2.13	2.42	1.56	1.4
8.	Fallow land other than Current fallow	1.62	1.97	1.18	1.08	0.98
9.	Current fallow	32.32	118.76	44.82	42.21	34.64
10.	**Net area sown**	**350.15**	**264.09**	**329.29**	**331.19**	**336.35**

Project Cost:

The total cost of the project for one year would be approx., 3.80 crores and there is a budgetary provision that 5% (0.19 crore per year) of the project cost will be allocated for the Environmental Management Plan (EMP) and 2% (0.076 crore per year) of the project cost will be allocated for Corporate Environmental Responsibility (CER) and health and hygiene (H&H) for causes of poor people of nearby villages. Health and Hygiene will be allocated for a health check-up once in six-months. Extra budgetary provisions will be allocated to lady workers. The Total expenditure of welfare scheme i.e. EMP + CRP & H&H = 7% (0.266 crore per year).

CHAPTER – 3

Description of Environment:

General:

Sand is a site-specific mineral that occurs mostly along the river bed and sometimes off the river bed. Mining activities invariably affect the current environmental status of the site. It has both adverse and beneficial effects. To maintain the environmental commensuration with the mining operation, it is essential to undertake studies on the existing environmental scenario and assess the impact on different environmental components.

Study area and Sampling Site

The study area is divided into core and buffer zone in view of scientific study. The core zone is the lease area of the mining site and from the boundary of the lease area up to 10 km radius is called buffer zone (Figure: 1-2). The study of the proposed project was undertaken for assessing the base line status of Environmental Parameters like Land, Air, Water (both ground and surface), Soil, Noise and Biological (both flora and fauna) and socio-economic status. Baseline data has been collected out during the Summer Season (March to May, 2023) by M/s N.D. International Kolkata [NABL Accredited Lab, Certificate No. TC: 5910] in accordance with the Guidelines for EIA issued by the Ministry of Environment Forests and Climate Change, Govt. of India and CPCB, New Delhi. Team of Experts visited the study area for Social & Biological Environmentstudy. The following data, through field survey and other sources, has been collected by M/s Indian Mine Planners and Consultants, Kolkata, for preparing the EIA/EMP for the proposed mining area with related facilities.

- Physical environment (Air, Water, Soil and Noise) baseline data.
- Relevant meteorological data, for previous decades from Indian Meteorological Department (IMD) and primary data.
- Identification of water bodies, hills, roads etc. within 10 Km radius.
- Eco-sensitive places, sanctuaries, biosphere reserves within 10 Km radius.
- Religious places / historical monuments and tourist places within 10 Km radius.
- Study of present environmental protection and mitigation measures in nearby operating similar projects, if any

Table 3-1: Salient Features of Baseline Environmental Studies.

Attribute	Parameter	Frequency of Monitoring
Micro - meteorological Studies	Wind Details like speed, direction, Temperature, Relative Humidity and Rainfall	3 months data has been collected to assess air Pollution impacts on the surrounding environment.
Ambient Air Quality	PM10 PM2.5 Sulphur Dioxide (S02) Oxides of Nitrogen (NOx)	3 months data has been collected to assess baseline Air Quality status of the area.
Noise Quality Data	Noise levels	1 middle month data has been collected to identify noise producing areas.
Water Quality, Soil Quality Data and Land Use pattern	Physical & Chemical parameters along with Measurement of heavy metals and land use parameters.	To establish baseline Water Quality, Soil Quality for future reference and Land Use Pattern in the area
Socio-Economic & Demographic Studies	Socio-Economic parameter	To know the present Socio-Economic status of the study area

Land Environment:

Since mining is essentially an excavation of mineral ore, the land environment is greatly affected by it, especially in the case of opencast mines. In contrast, underground mines have limited effect on the surface land.

Land Use Land Cover of the Study Area:

Land Use (LU) refers to man's activities and various uses which are carried on land. Land Cover (LC) refers to natural vegetation, water bodies, rock / soil, artificial cover and others resulting due to land transformation. Although land use is generally inferred based on the cover, yet both the terms land use and land cover are closely related and interchangeable.

Information on the rate and kind of change in the use of land resources is essential to the proper planning, management and regulation of the use of such resources. The satellite imageries are potentially more amenable to digital processing because the remote sensor output can be obtained in digital format. Land use data are needed in the analysis of environmental processes and problems that must be understood if living conditions and standards are to be improved from or maintained at current levels. It is required to carry out the land use/land cover study for the project study area(10 km radius) to obtain the necessary environmental clearances from statutory authorities. The objective of the study

is to carry out land use / land cover study for the proposed project. The LU / LC study is carried out using the Satellite Imageries (IRS RS2 LISS III / IV Rabi and Khariff) in addition to Survey of India toposheets. Appropriate guidelines are followed while preparing the LU / LC map for the project study area.

1) Scope of the Work:

- The LU/LC study shall be carried out for a study area of a 10 km radius, taking the site as the centre using the satellite imageries (IRS RS2 III / IV 5.8 m Resolution) for Rabi/ Khariffseason.
- Procurement of latest satellite imagery (IRS RS2 III/IV 5.8m Resolution) based on availability) Rabi or Khariff seasons. Satellite imagery processing and interpretation of land use as per land use classification covering 10 km radius of proposed Project Site.
- Calculation of land use breakup w. r. t. each land use category covering 10 km of theproposed Project Site.
- Preparation and submission of reports, satellite imageries and maps.

2) Pre-Field Interpretation:

- Collection of Survey of India Topographical maps on a 1: 50,000 scale from Survey ofIndia (SOI).
- Procurement of Satellite Imagery from the National Remote Sensing Centre (NRSC) siteGeo Co-ordinates from the site centre taken 10 Km radius.
- Using ERDAS image processing software processed the raw satellite data.
- Using ArcGIS software, converting all base features from the toposheet and overlaying thesame features on the satellite imagery.
- Using remote Sensing techniques, tone, colour, texture and shadow etc. draft land use mapis prepared.
- Before site/ground truthing, randomly mark field data checked. With which fieldwork willbe carried out.

3) Site/ground truthing:

- Site visit - capture the Geo-Coordinates of Boundary Pillars and record them in a fieldnotebook.
- Take traverses and observe the land use categories and map them on the field map on thedraft map with field photographs.
- Observe each land use category like single crop/double crop, industrial area, settlements,forest lands, water bodies, wastelands, etc.
- The buffer zone area will randomly traverse for correlating mapping units.
- Collecting secondary data from the agricultural department and local people.

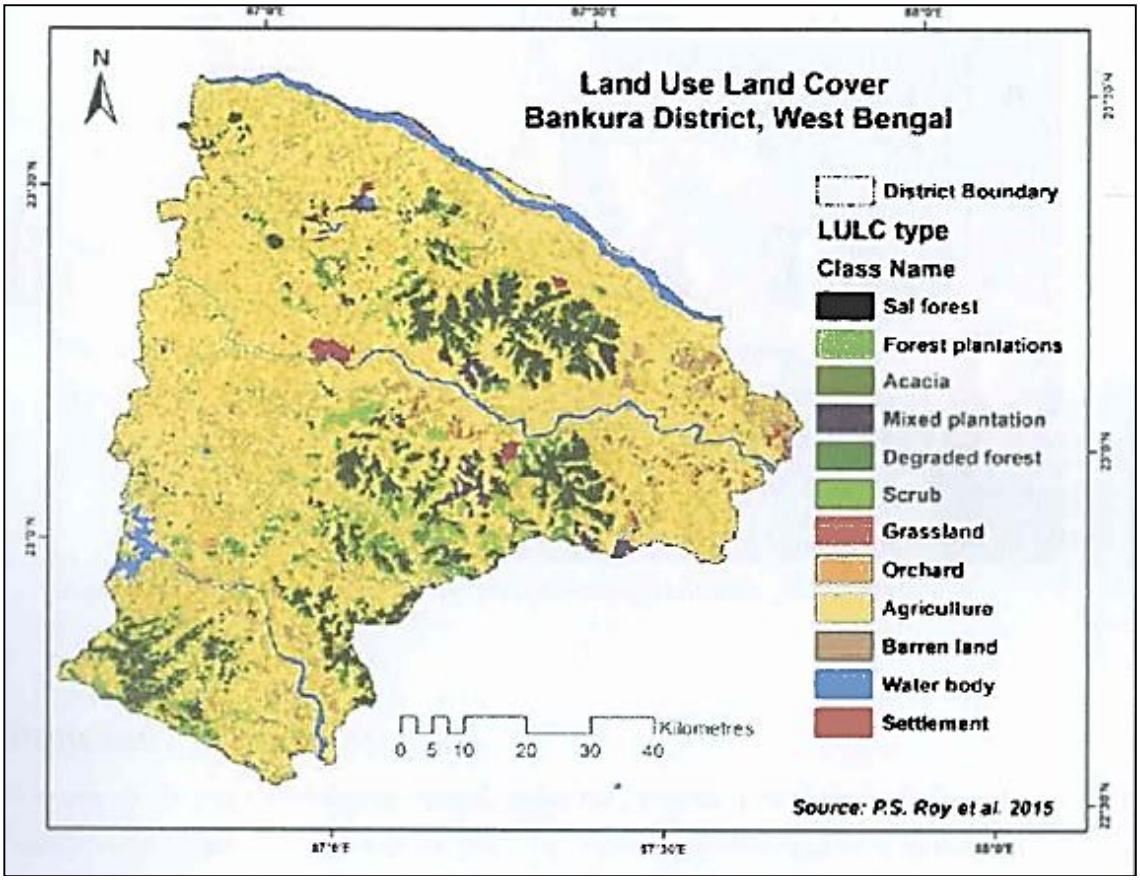


Figure 3-1: Land Use Land Cover map of Bankura.

Table 3-2: Land utilisation statistics of the district

Year	2009-10	2010-11	2011-12	2012-13	2013-14
Reporting Area (In ThousandHectares)	688	688	688	688	688
Forest Area	148.93	148.93	148.93	148.93	148.93
Area under Non-agricultural use	147	148.48	156.02	158.52	161.56
Barren & unculturable land	2.31	1.42	2.42	1.65	1.62
Permanent pastures & other grazing land	0.81	0.78	1.09	0.97	0.89
Land under Misc. tree groves not included in Net area sown	2.82	1.44	1.83	1.89	1.63
Culturable waste land	2.04	2.13	2.42	1.56	1.4
Fallow land other than Current fallow	1.62	1.97	1.18	1.08	0.98
Current fallow	32.32	118.76	44.82	42.21	34.64
Net area sown	350.15	264.09	329.29	331.19	336.35

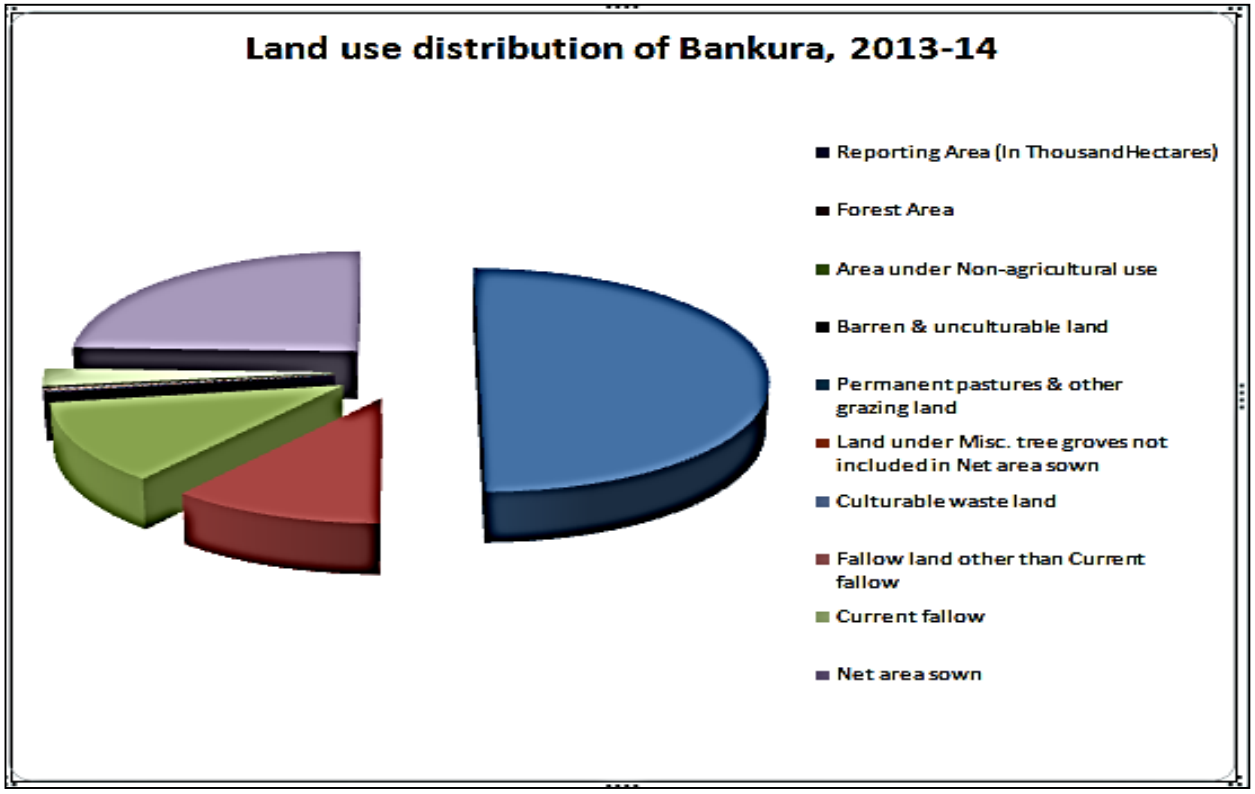


Figure 3-2: Pie chart showing Land use distribution of Bankura District

Table 3-3: Land use and Land cover data of buffer zone

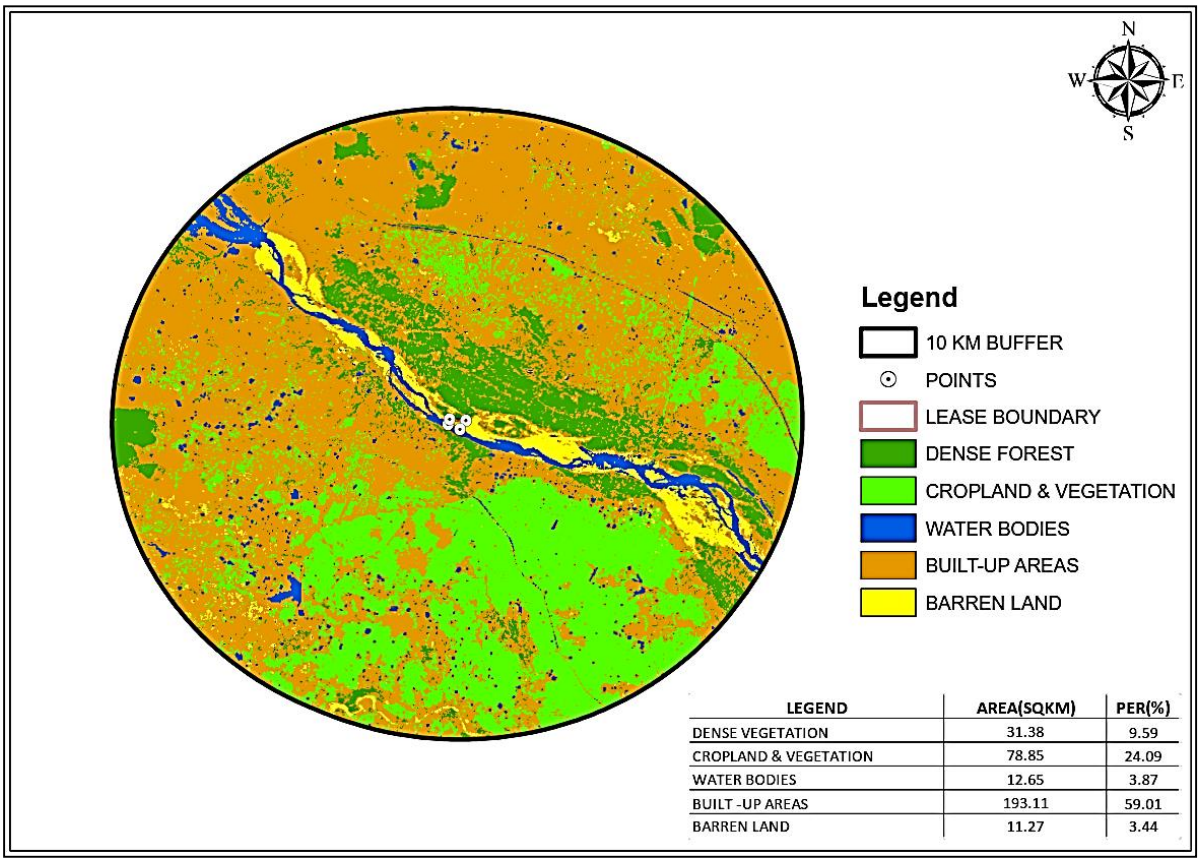
Landuse distribution	Area in sqkm	Percentage (%)
Dense Vegetation	31.38	9.59
Cropland & vegetation	78.85	24.09
Waterbodies	12.65	3.87
Built up Area	193.11	59.01
Barren Land	11.27	3.44

Conclusion of land use and land cover analysis:

The major land use and land cover is Built up Area , which is 59.01%, Cropland & vegetation observe second highest by area 24.09%, dense vegetation covers 9.59%, waterbody covers 3,87%, and barren land covers 3.44% This LULC data are compared with District land use land cover data presented in Figure 3-3.

Soil:

Soil, also commonly referred to as earth or dirt, is a mixture of organic matter, minerals, gases, liquids, and organisms that together support life. Some scientific definitions distinguish dirt from the soil by restricting the former term to displaced soil.



LEGEND	AREA(SQKM)	PER(%)
DENSE VEGETATION	31.38	9.59
CROPLAND & VEGETATION	78.85	24.09
WATER BODIES	12.65	3.87
BUILT -UP AREAS	193.11	59.01
BARREN LAND	11.27	3.44

Figure 3-3: Land use distribution surrounding 10 km buffer of Project Site.

Soil consists of a solid phase of minerals and organic matter (the soil matrix), as well as a porousphase that holds gases (the soil atmosphere) and water (the soil solution). Accordingly, soil is a three-state system of solids, liquids, and gases. Soil is a product of several factors: the influence of climate, relief (elevation, orientation, and slope of terrain), organisms, and the soil's parent materials (original minerals) interacting over time. It continually undergoes development by way of numerous physical, chemical and biological processes, which include weathering with associated erosion. Given its complexity and strong internal connectedness, soil ecologists regard soil as an ecosystem.

To judge the soil properties of the area, soil were taken at 3 locations. The details of the location are given in Table 3-5. Soil samples was collected from surrounding agriculture fields and nearbyarea that are likely to be impacted from the project. Soil quality analysis done for parameters like texture, moisture, organic matter, conductivity, pH, bulk density, and NPK values. Soil parameterlab analysis results of the 3 locations are given in the table 3-4 and 3-5.

Table 3-4: GPS Coordinate of Soil Sample collection location

Sl. No.	Sampling Location	Coordinates		Distancefrom Project Site	Direction from Project Site
		Latitude	Longitude		
1.	Project Site	23°25'20.76"N	87°21'40.98"E	-	-
2.	Babnabera	23°27'21.68"N	87°21'53.32"E	3.6 Km	North
3.	Tajpur	23°25'13.26"N	87°20'58.84"E	1 Km	South-West

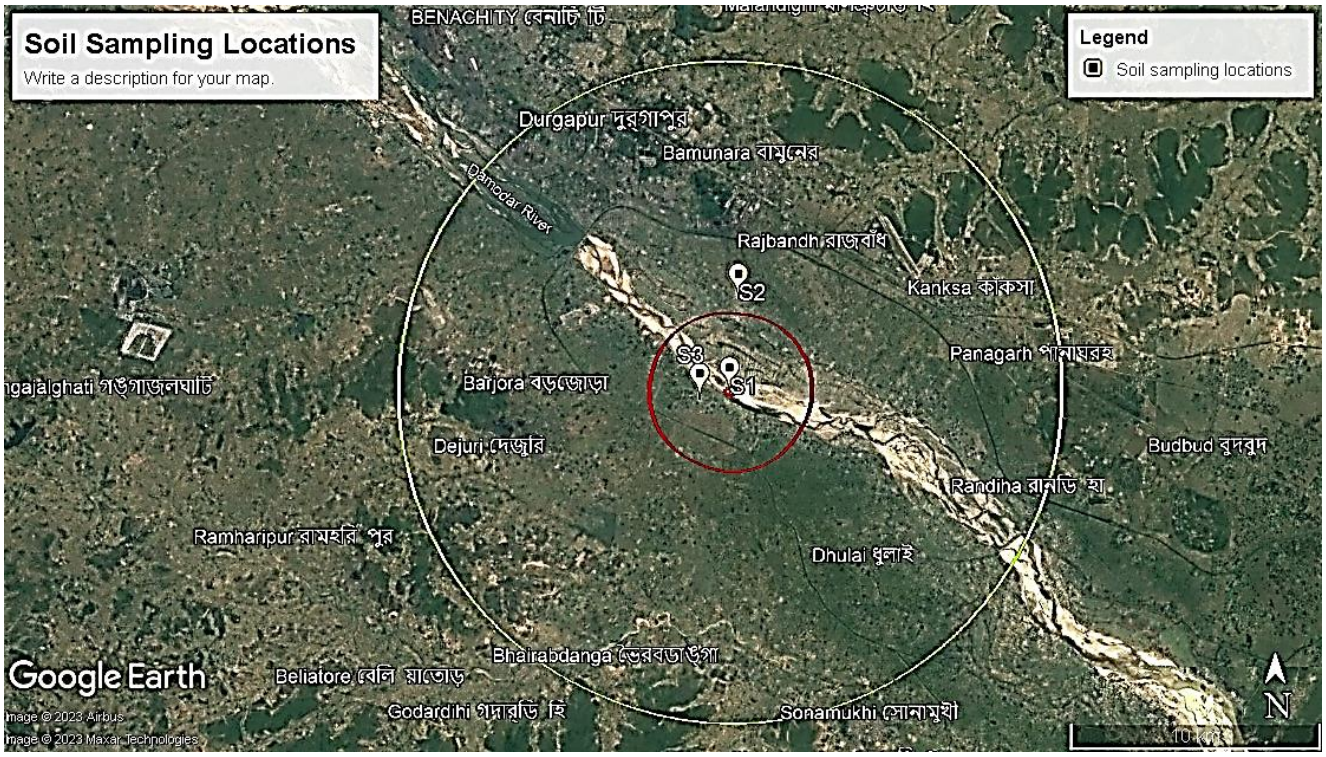


Figure 3-4: Soil Monitoring Locations

Table 3-5: Soil parameters lab analysis results

A. Chemical Test Findings						
Sl No.	**Test Parameter**	**Test Method**	**Unit**	**Result**		
				S1	**S2**	**S3**
1.	Electrical Conductivity (1:2.5 Aqeous Solution)	IS:14767 : 2000 134	µs/cm	208	202	212
2.	Nitrogen	IS:14684 : 1999	%	0.10	0.08	0.11
3.	Moisture	IS:2720 (Part-2) : 1973	%	20.72	20.26	20.88
4.	Specific Gravity	NDI/CHEM/SOP/S-03	--	2.86	2.68	2.91
5.	Bulk Density	FAO Method-2007	gm/cm^3	2.72	2.55	2.79
6.	Phosphorus as P	FAO : (Method) U.N.2007	mg/g	0.216	0.203	0.21
7.	Potassium as K	13.1 of FAO : 2007	mg/g	0.25	0.21	0.22

8.	Sodium Absorption Ratio	IS 11624:2019	-	1.28	1.22	1.29
9.	Permeability	NDI/CHEM/SOP/S-05	cm/h	15.60	14.20	14.68
10.	Calcium	The Fertilizer Control Order 1985	mg/g	0.92	0.82	0.87
Texture of Soil						
11.	Gravel	FAO Method-2007	%	Nil	Nil	Nil
12.	Sand	FAO Method-2007	%	13.23	26.36	22.57
13.	Silt	FAO Method-2007	%	19.26	11.23	12.68
14.	Clay	FAO Method-2007	%	48.25	62.41	64.75

Soil parameters analysis:

The analysis of soil at three locations shows that the soil of the region is predominantly of clayey nature with a percentage of sand and silt and absence of gravel content.

Figure 3-5: Soil Sampling

Air Environment:

Climate:

The climate of the area is characterized by a hot and dry summer from March to May, a south- west monsoon or rainy season from June to September, a pleasant post-monsoon or retreating monsoon from October to November and a cool winter from December to February. Therefore, climatologically, four seasons viz. summer (pre-monsoon), monsoon, post-monsoon and winter could be deciphered

comprising the following months

- Summer: March, April, May
- Monsoon: June, July, August and September
- Post Monsoon: October and November
- Winter: December, January and February

Air pollutants upon discharge to atmosphere pass through a number of mechanisms, which include diffusion and transportation leading to dispersion. These mechanisms are governed by the local atmospheric conditions. All these result in the necessity to collect the meteorological parameters like ambient temperature, wind speed, wind direction, and other weather conditions (relative humidity, atmospheric pressure etc.), which will be ultimately used for the prediction of the ground level concentrations of the air pollutants through mathematical modelling.

For this purpose, a temporary auto weather station was installed to record micro meteorological data on wind speed, wind direction, ambient temperature, solar insolation and Relative humidity on hourly basis.

The primary data from the site was matched with secondary data of IMD nearby station for data proofing. A sophisticated on-site meteorological observatory was established near project site and operated continuously for three months' period (March 2022 to May 2022). The observatorywas located about 10 m above the ground level and ensured to be free from any obstruction to wind. Besides, this location was found to be most suitable one being close to the project site. Thewind rose diagram for the entire period is shown in Figure below.

Figure 3-6: Ambient Air Quality Monitoring

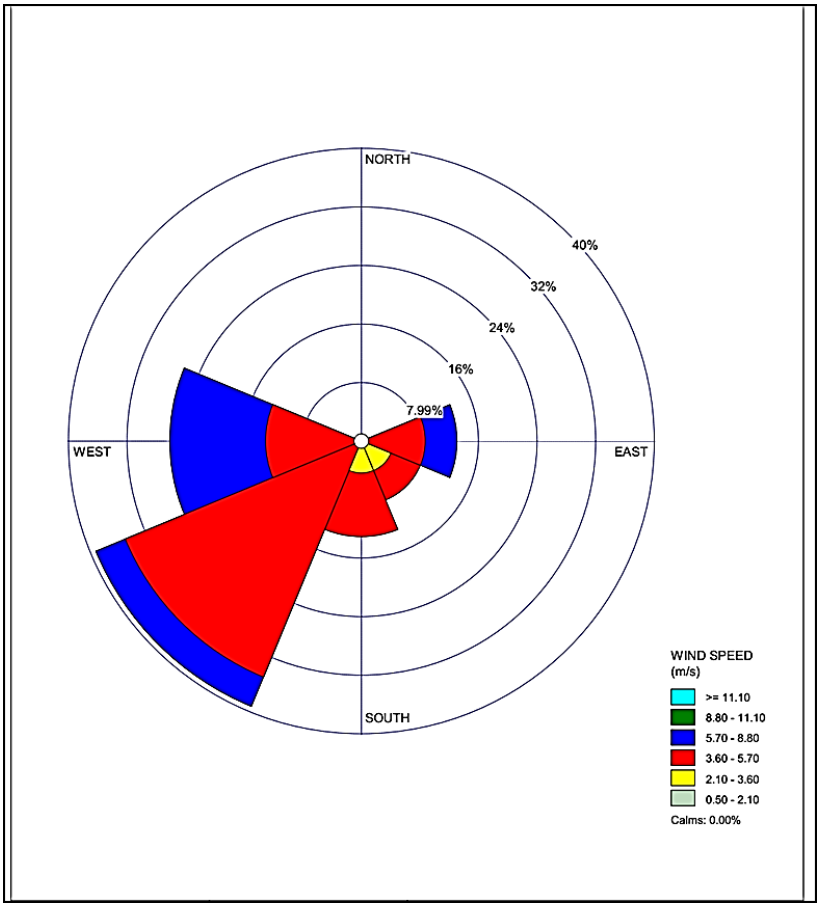


Figure 3-7: Windrose diagram

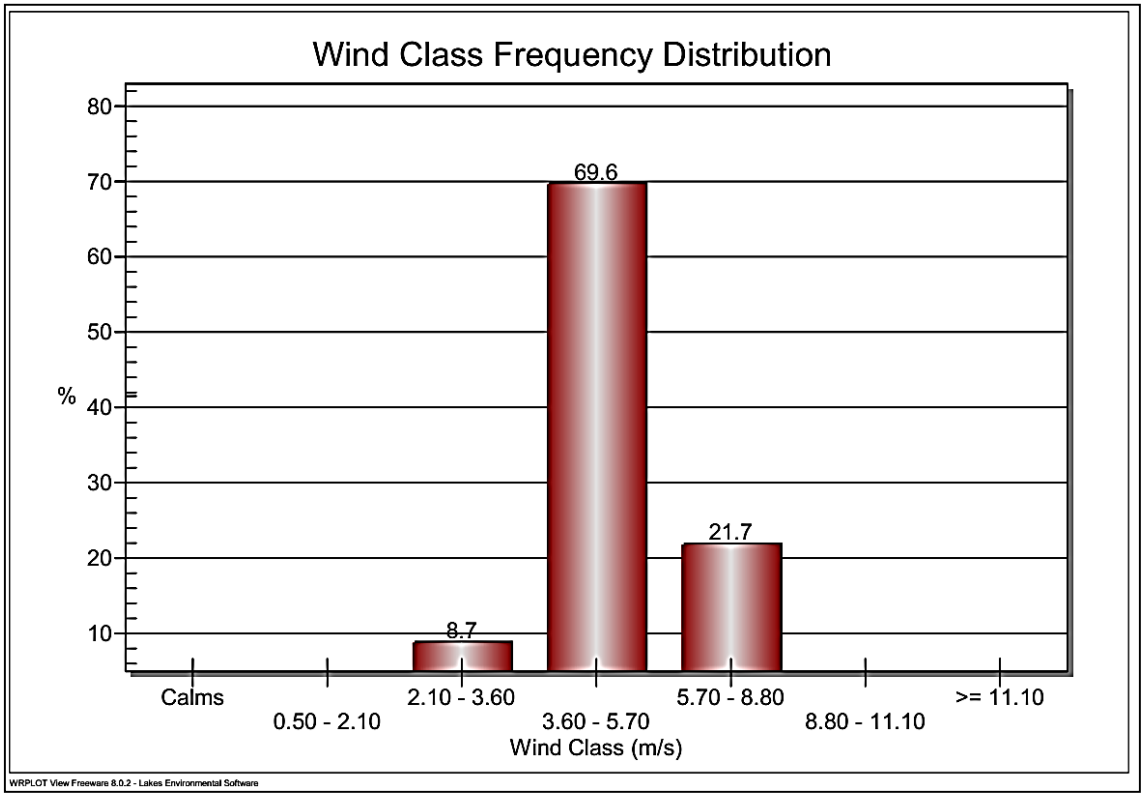


Figure 3-8: Wind Class Frequency Distribution

Wind rose Observations:

The predominant wind direction is from south-west, followed by west. Calm Percentage (69%) of the winddirection is more than that the total time of both predominant directions.

Ambient Air Environment:

An assessment of the existing air quality is required to establish the reference level. To accomplishthis, Ambient Air Quality Monitoring (AAQM) stations were set up within a 10 km radius of the proposed mining area. Data over the baseline status of ambient air quality was generated with following objectives:

- Qualitative analysis of air environment of the area.
- Representation of regional background levels.
- Influence of existing sources of pollution.

The significant contributors/sources of air pollution in the area are

- Vehicular traffic
- Windblown Dust

Ambient Air Quality:

The ambient air quality monitoring was carried out at 4 locations. The location and description of AAQM stations is shown in Table 3-9 & Figure below. The parameters monitored during the study period were particulate Matters (PM10), particulate Matters (PM 2.5), Sulphur dioxide (SO2) and Oxides of Nitrogen (NO_2). The results of AAQM are depicted in the Tables 3-10 to 3-14.

Table 3-6: GPS coordinates of Air sampling collection location

S.N.	Location Name	Coordinates		Distance from Project Site	Direction from Project Site
		Latitude	Longitude		
1	Project Site	23°25'24.53"N	87°21'42.72"E	--	---
2	Baramana post office	23°25'51.05"N	87°22'37.98"E	1.6 KM	North-East
3	Bhairabpur	23°25'40.53"N	87°18'48.91"E	4.6 KM	West
4	Pakhanna	23°24'32.43"N	87°22'34.32"E	2 KM	South-West

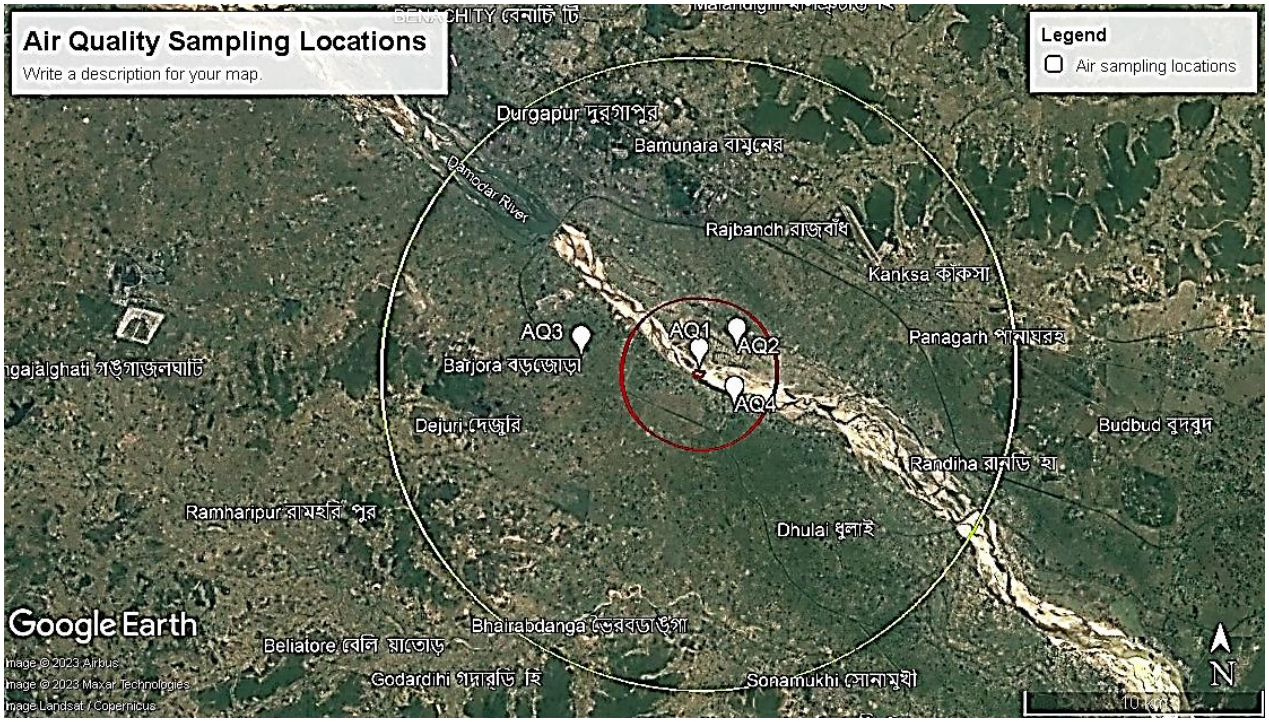


Figure 3-9: Ambient Air Quality Monitoring Locations

able 3-7: Particulate Matter concentration at different site – PM10.

Location	Minimum in ($\mu g/m^3$)	Maximum in ($\mu g/m^3$)	Average in ($\mu g/m^3$)	98^{th} Percentilein ($\mu g/m^3$)
Project Site	55	81	65.6	71
Baramana post office	64	81	72.4	74
Bhairabpur	56	78	63.9	70
Pakhanna	58	81	72.1	78

Table 3-8: Particulate Matter concentration at different site– PM 2.5

Location	Minimum in ($\mu g/m^3$)	Maximum in ($\mu g/m^3$)	Average in ($\mu g/m^3$)	98th Percentilein ($\mu g/m^3$)
Project Site	41	64	51.2	60
Baramana post office	41	61	50.6	58
Bhairabpur	41	59	49.3	56
Pakhanna	41	62	50.3	56

Table 3-9: Sulphur dioxide (SO_2) concentration at different site.

Location	Minimum in ($\mu g/m^3$)	Maximum in ($\mu g/m^3$)	Average in ($\mu g/m^3$)	98th Percentile in ($\mu g/m^3$)
Project Site	11	26	17.9	24
Baramana post office	11	25	17.8	22
Bhairabpur	12	25	16.6	21
Pakhanna	11	25	17.4	22

Table 3-10: Nitrogen dioxide (NO_2) concentration at different site.

Location	Minimum in ($\mu g/m^3$)	Maximum in ($\mu g/m^3$)	Average in ($\mu g/m^3$)	98th Percentilein ($\mu g/m^3$)
Project Site	8	17	12.0	14
Baramana post office	7	15	10.8	12
Bhairabpur	7	17	11.3	14
Pakhanna	7	17	11.4	14

Table 3-11: Carbon Monoxide (CO) concentration at different site.

Location	Minimum in (mg/m^3)	Maximum in (mg/m^3)	Average in (mg/m^3)	98th Percentile in (mg/m^3)
Project Site	1	2	1.3	<1.0
Baramana post office	1	2	1.3	<1.0
Bhairabpur	1	2	1.2	<1.0
Pakhanna	1	2	1.3	<1.0

Table 3-12: Free Silica (Si) concentration at different site.

Location	Minimum in ($\mu g/m^3$)	Maximum in ($\mu g/m^3$)	Average in ($\mu g/m^3$)	98th Percentilein ($\mu g/m^3$)
Project Site	3.1	6.7	5.1	6.2
Baramana post office	2.1	6.7	5.3	6.4
Bhairabpur	3.2	7.1	5.4	6.6
Pakhanna	4.2	6.9	5.5	6.7

Baseline Scenario:

a) Suspended Particulate Matter (PM_{10}):

Suspended particulate matter in general terms is the particulate matter in suspension in ambient air. It includes dust, smoke etc. In general, some of the important sources of suspended particulatematter are mines. The following sources of suspended particulate matter in the study area are identified:

- Emission due to vehicular movement
- Dust generation from the ground or other mining operations

The minimum and maximum level of PM_{10} recorded within the study area was in the range of 55 ($\mu g/m^3$) to 81 ($\mu g/m^3$), with a consolidated 98th percentile range between 70 to 78 ($\mu g/m^3$). The 24-hourly average values of PM_{10} is 72.4 ($\mu g/m^3$) were compared with the National Ambient Air Quality Standards (NAAQS) and found that all sampling stations recorded in the study area are within the applicable limits i.e., 100 ($\mu g/m^3$) for PM_{10} in industrial, residential, rural and other area.

b) Particulate Matter ($PM_{2.5}$):

Fine particulate matter ($PM_{2.5}$) is generated due to all types of fuel combustion and some industrial processes. In general, some of the important sources of particulate matter are Mines.

The following are the sources for particulate matter ($PM_{2.5}$)

- Emission due to vehicular movement
- Dust generation from the ground or other mining operations

($PM_{2.5}$) recorded within the study area is in the range of 41($\mu g/m^3$) to 64($\mu g/m^3$) and 98 percentilerange between 56 ($\mu g/m^3$) to 60 ($\mu g/m^3$). The 24-hourly average values of $PM_{2.5}$ is 51.2($\mu g/m^3$) were compared with the National Ambient Air Quality Standards (NAAQS) and found that all sampling stations recorded in the study area are within the applicable limits, i.e., 60 $\mu g/m^3$ for $PM_{2.5}$ in industrial, residential, rural and other areas.

c) Sulphur Dioxide (SO2):

Sulphur dioxide gas is an inorganic gaseous pollutant. Sulphur dioxide emissions are expected to be emitted wherever combustion of any fuel containing Sulphur takes place. The Sulphur in the fuel will combine with oxygen to form Sulphur dioxide. The following sources of Sulphur dioxide in the study area are identified:

- Emissions from domestic/consumption of fuel (coal, diesel, etc.)
- Emissions from machinery equipment's used for mining activity and local residents

Sulphur dioxide in the atmosphere is significant because of its toxicity, Sulphur dioxide is capableof producing illness and lung injury. Further it can combine with water (moisture) in the air toform toxic acid aerosols that can corrode metal surfaces, fabrics and leaves of plants. Sulphurdioxide is an irritant to the eyes and respiratory system. Excessive exposure to Sulphur dioxidecan cause bronchial asthma and other breathing related diseases as it affects the lungs.

The minimum and maximum levels of SO_2 recorded within the study area was in the range of 11($\mu g/m^3$) to 26($\mu g/m^3$), and the 98th percentile was recorded between 21($\mu g/m^3$) to 24 ($\mu g/m^3$). The24-hourly average values of SO_2 is 17.9($\mu g/m^3$) were compared with the National Ambient Air

Quality Standards (NAAQS) and it was found that all sampling stations recorded in the study area are within the applicable limits, i.e., 80 (µg/m^3) for SO_2 in industrial, residential, rural and other areas.

d) Oxides of Nitrogen (NO_2):

The essential sources of nitrogen oxides are utilities and auto exhaust due to vehicular movementin the mine lease area. The following sources of oxides of Nitrogen in the study area are identified.

- Emissions from field burning of coal
- Emissions from vehicular movements in the study area

Oxides of Nitrogen in the presence of sunlight will undergo reactions with several organic compounds to produce all the effects associated with photochemical smog. NO_x has the inherent ability to produce make deleterious effects by themselves, like toxicity. It causes asphyxiation when its concentration is significant enough to reduce the normal oxygen supply from the air.

The minimum and maximum levels of NO_x recorded within the study area were in the range of 7 (µg/m^3) to 17 (µg/m^3), with the 98th percentile range between 12 (µg/m^3) to 14 (µg/m^3). The 24- hourly average values of NO_x is 12.0 (µg/m^3) were compared with the National Ambient Air Quality Standard (NAAQS) and it was found that all sampling stations recorded in the study area are within the permissible limits, i.e., 80 (µg/m^3) for NO_x in industrial, residential, rural and other areas.

e) Carbon Monoxide (CO):

Carbon monoxide (CO) is an odorless, colorless gas formed by the incomplete combustion of fuels. Exposure to CO gas, results in displacement of oxygen in human bodies eventually leading to CO poisoning. The minimum and maximum levels of CO recorded within the study area were in the range of 1mg/m^3 to 2mg/m^3, with the 98th percentile <1.0mg/m^3. The hourly average values of CO is 1.4 mg/m^3, which is well within the permissible limit as per National Ambient Air Quality Standards (NAAQS) of 4µg/m^3, for CO in industrial, residential, rural and other area.

f) Free Silica (Si)

The minimum and maximum levels of free silica recorded within the study area were in the range of 2.1µg/m^3 to 7.1µg/m^3, with 98th percentile in the range of 6.2 to 6.7 µg/m^3. The hourly average values of free silica are 5.5µg/m^3.

Conclusion of ambient air quality:

The analysis of ambient air quality data for three months consequently indicates excellent ambient air conditions at the site as well as around the site upstream as well as downstream. Particulate matter PM_{10} is within the limits prescribed. SO_2 and NO_2 are well below the limits prescribed. Hence overall scenario of the study area for ambient air quality is good.

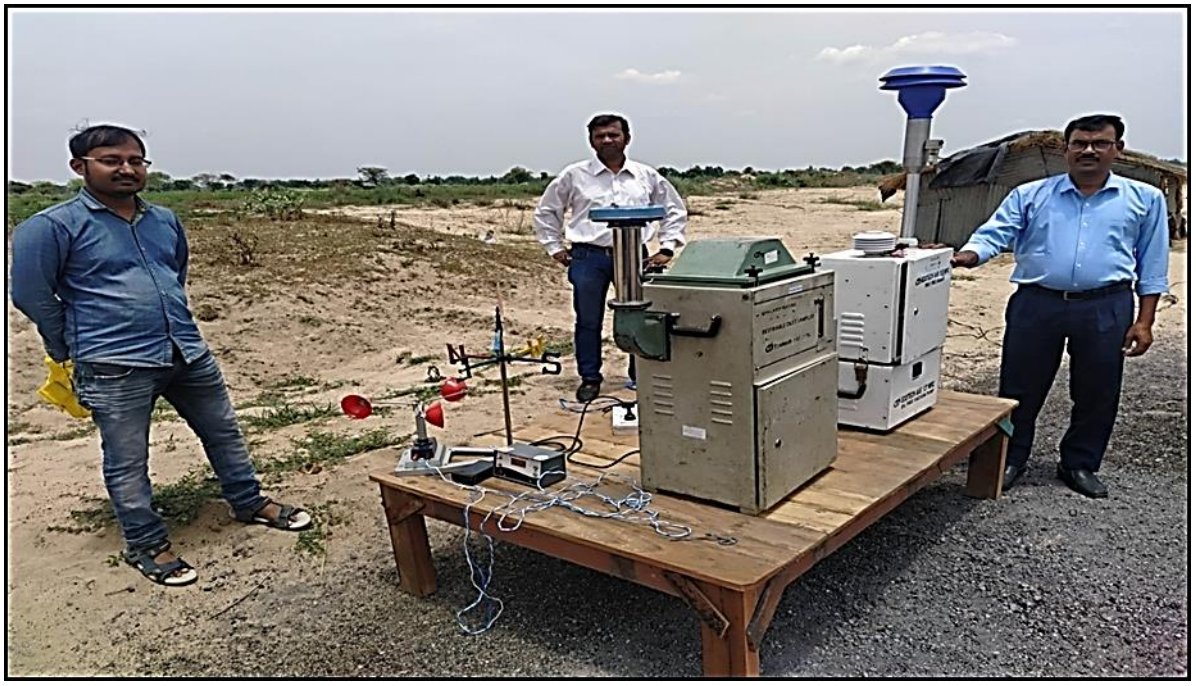


Figure 3-10: Ambient Air Sampling

Ambient Noise Environment:

A noise survey has been conducted in the study area covering residential transportation, commercial and calm zones. The main objective of noise monitoring in the study area is to establish the baseline noise level, which is needed for assessing the impact of total noise, which is expected to be generated in the proposed project activities. Noise is measured in terms of the loudness of the sound. A sound is a form of energy that propagates through an elastic medium at a speed that is determined by the properties of that medium. Since loudness of sound is important to the effects of noise on people, the dependence of loudness upon frequency must be taken into account in environmental noise assessments. Several methods have been developed by researchers using the frequency spectrum of sound to arrive at the loudness index or the given sound. For measuring the intensity of the sound, "A sound level meter" is used, which gives the intensity of sound in terms of dB (A).

The basic step associated with impact assessment on the noise components of the environment involves the identification and evaluation of the present noise status in the general population. Therefore, noise level measurement was carried out at each ambient air quality station and the site. The objectives of Noise environment studies are.

- To assess the ambient noise level in the study area.
- To characterise the noise pollution area.
- To predict the temporal changes in the ambient noise level of the area.

Noise pollution in the study area is associated with Industrial activities, Vehicular traffic. To judge the ambient noise level of the area, noise levels were recorded at 4 locations in dB (A). The details of the

location are given in Table 3-3. Monitoring results of the Noise level recorded at 4 locations are given in the table below.

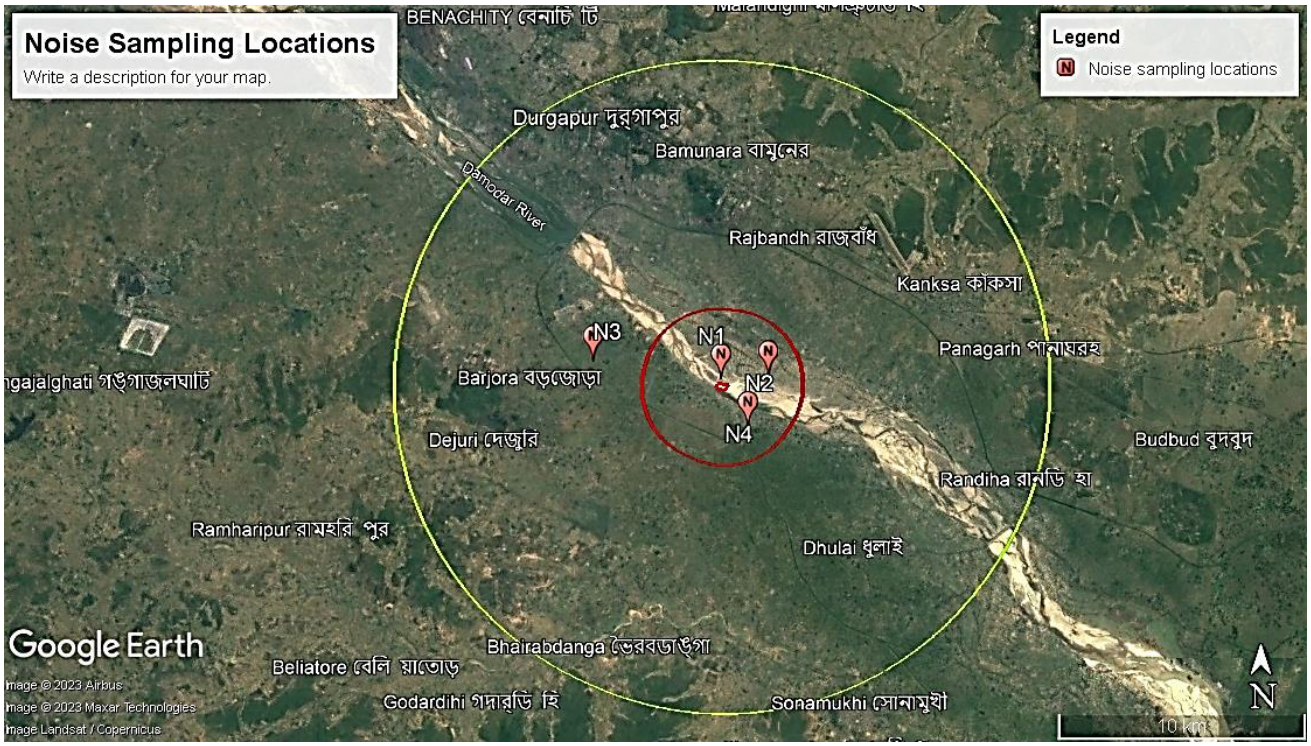


Figure 3-11: Ambient Noise Monitoring Locations

Table 3-13: Monitoring results of the Noise level in and around project site.

Noise Level dB(A)Leq						
Location	**DAY TIME**			**NIGHT TIME**		
	Max	**Min**	**Average**	**Max**	**Min**	**Average**
Project Site	49.8	38.5	44.6	42.5	34.8	38.26
Baramana post office	48.6	38	49.64	42	36.5	39.71
Bhairabpur	51.3	39.4	45.42	42.3	36.8	39.61
Pakhanna	49.6	39.5	44.28	41.1	36.8	32.72

Note:

1) Daytime is from 6.00 am to 10.00 pm and Night time is from 10.00 pm to 6.00 am.
2) Silence zone is defined as area up to 100 meters around premises of hospitals, educational institutions and courts. Use of vehicle hours, loud speakers and bursting of crackers are banned inthese zones.

Conclusion of ambient noise level studies:

The values of noise observed in some of the areas are primarily owing to vehicular traffic and other anthropogenic activities. Noise monitoring reveals that the maximum & minimum noise levels at day

time were recorded between as 38.5 dB(A) & 51.3 dB(A) respectively. The maximum & minimum noise levels at night time were found to be 34.8 dB(A) & 42.5 dB(A) respectively.

The noise level recorded at project site (Station L1) both during day and night time is well within the permissible limit as per "The Noise Pollution (Regulation & Control) Rules, 2000.

The noise level recorded at residential zones (Station L2 and L3) both during day and night time is well within the permissible limit of 55dB(A) and 45dB(A) for residential zone as per "The Noise Pollution (Regulation & Control) Rules, 2000.

The noise level recorded at Silence zones (Station L4) both during day and night time is well within the permissible limit of 50dB(A) and 40dB(A) for Silence zone as per "The Noise Pollution (Regulation & Control) Rules, 2000.

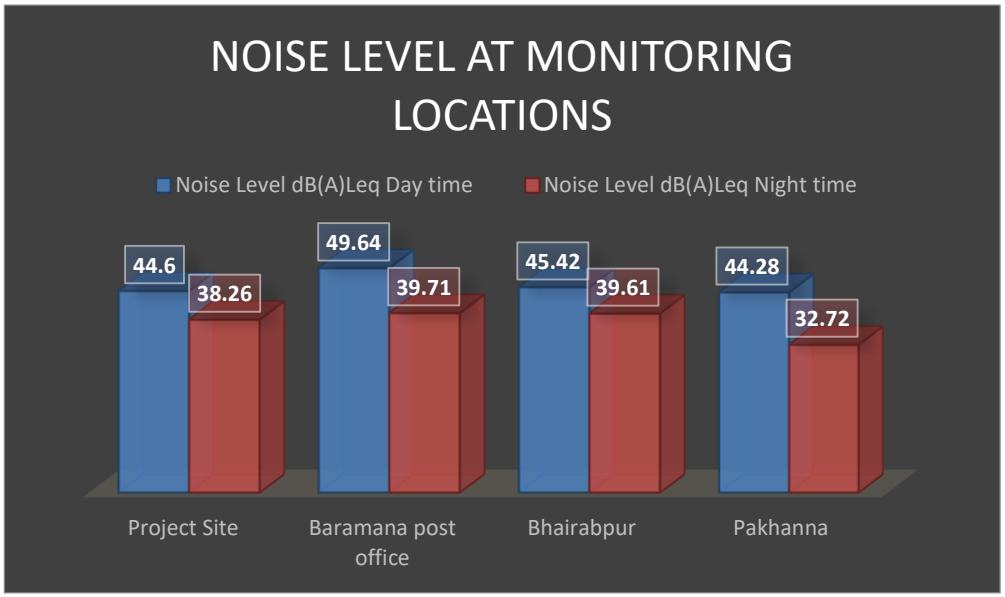


Figure 3-13: Bar Diagram showing day and nighttime noise level in the monitoring locations

Figure 3-12: Ambient Noise Monitoring at site

Water Environment:

Surface water and groundwater samples were collected from different sources within the study area and some important physical and chemical parameters were considered for depicting the baseline status of the study area.

Water Quality Assessment:

Selected water quality parameters for water resource of the study area have been used for describing the water environment and assessing the impacts. About 3 Nos Sampling location area presented in Table 3-16. ground water samples and 3 nos (Table 3-17). surface water samples were collected in the study area to assess the water quality. Water samples are drawn from the hand pumps being used by the villagers for domestic needs.

To evaluate the physico-chemical characteristics of the water resources existing in the study area,water samples of ground water sources were collected during the pre-monsoon season and characterized for physico-chemical parameters. There samples were taken as grab sample and were analyzed for various parameters and compared with standards IS: 10500 and IS 2296 : Class C specifications.

Table 3-14: GPS Coordinates of Ground water Sample collection location

Sl. No.	Sampling Location	Coordinates		Distance from Project Site	Direction from Project Site
		Latitude	Longitude		
1	Tajpur	23°25'12.02"N	87°20'24.57" E	2 Km	West
2	Amlajora	23°28'9.11"N	87°23'0.33"E	5.6 Km	North-East
3	Maitya	23°23'48.39"N	87°24'30.76" E	5.3 Km	South_east

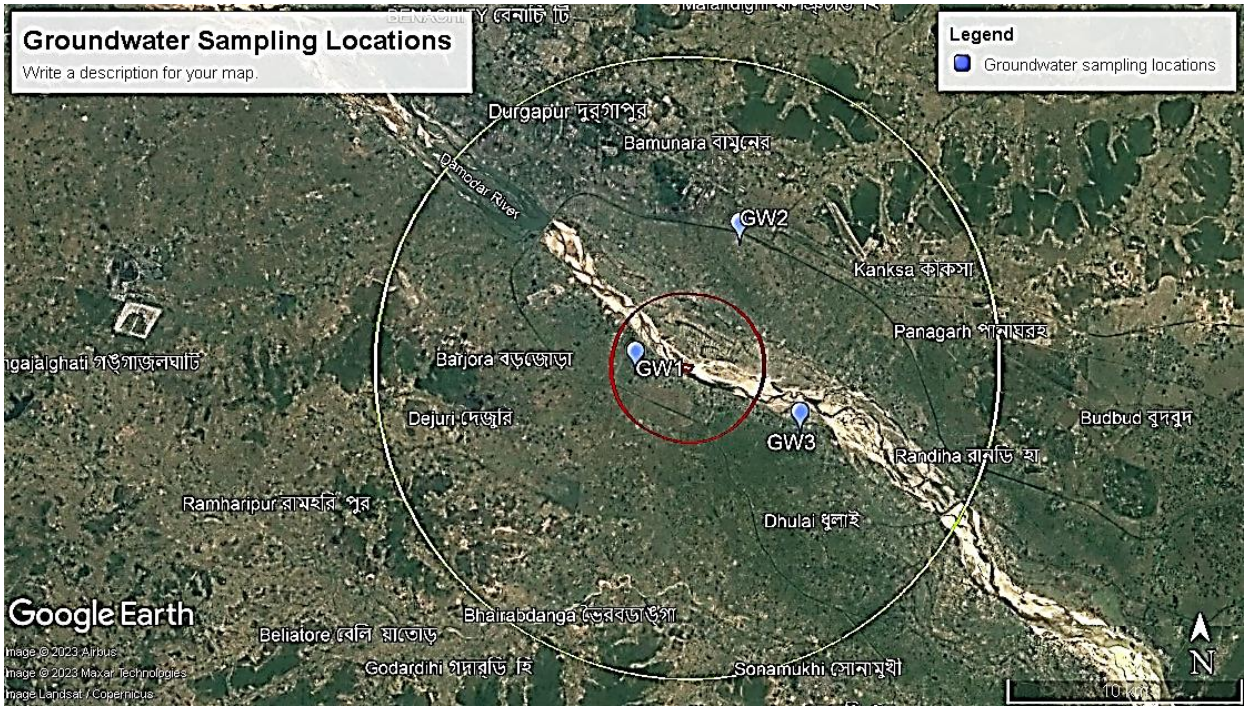


Figure 3-14: Groundwater Quality sampling locations

Table 3-15: GPS Coordinates of Surface water Sample collection location

Sl. No.	Sampling Location	Coordinates		Distance from Project Site	Direction from Project Site
		Latitude	Longitude		
1.	Bamandihi	23°27'9.02"N	87°19'41.67"E	4.4 Km	North_West
2.	Dihipara	23°24'32.04"N	87°24'56.15"E	5.3Km	West
3.	Mandarbani	23°24'6.68"N	87°18'52.74"E	5.3 Km	South-West

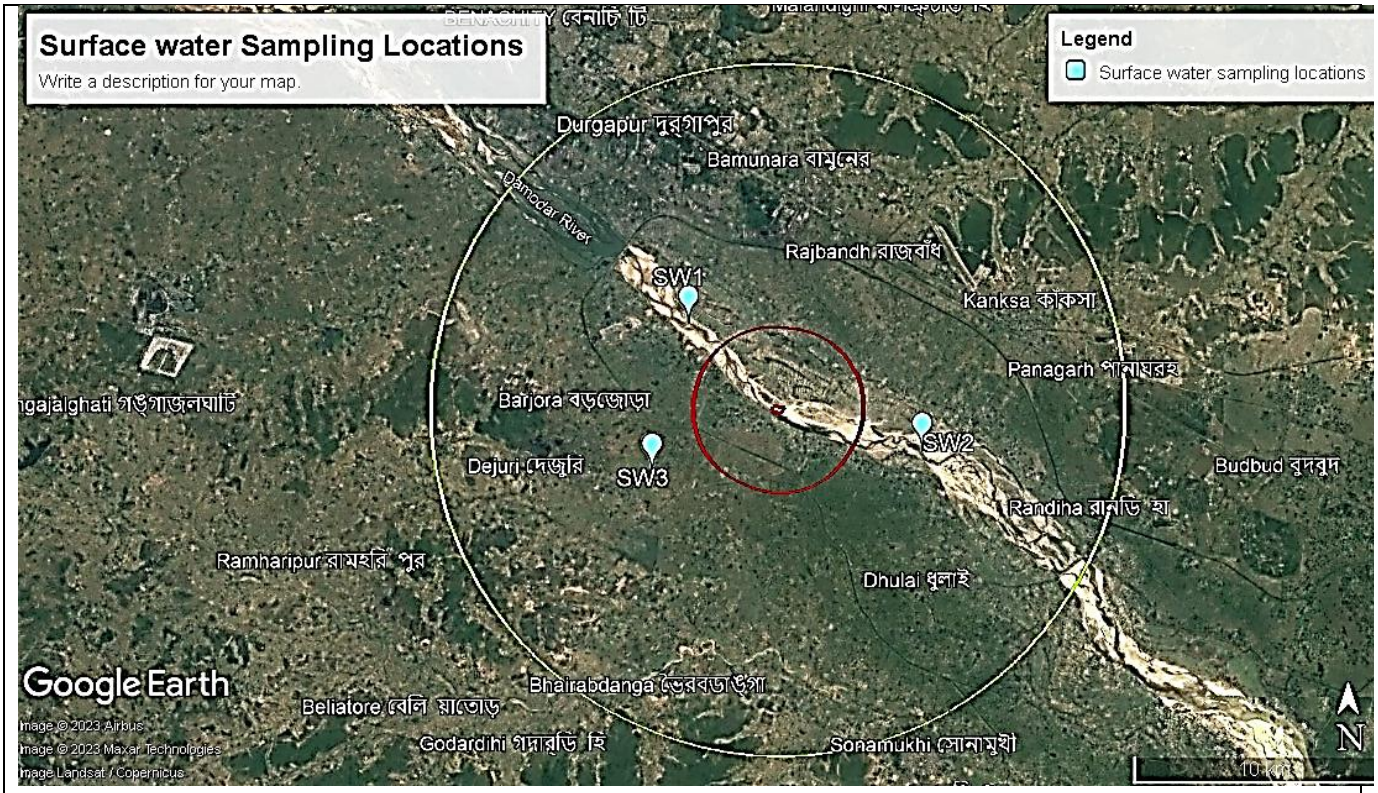


Figure 3-15: Surface water Quality Monitoring Locations

The physico-chemical characteristics of ground water samples presented in Table below.**Table 3-15: Analysis results of ground water**

A. Microbiological Test Findings							
Sl. No	**Parameter**	**Test Method**	**Unit**	**Results**			**Norm as per IS 10500:2012**
				GW-1	**GW-2**	**GW-3**	
1.	Total Coliform/100 ml at 37° for 24 hrs	IS 1622	Cfu	<1 (DL:1)	<1 (DL:1)	<1 (DL:1)	Not Detectable
2.	E. coli/100ml at 44.5° for 24hrs	IS 1622	Cfu	Absent	Absent	Absent	Not Detectable

B. B. Organoleptic and physical parameters								
Sl. No	**Parameter**	**Test Method**	**Unit**	**Results**			**Norm as per IS 10500:2012**	
				GW-1	**GW-2**	**GW-3**	**Al (Max)**	**PL (Max)**
3.	pH at 25°C	APHA, 23rd Edition, 4500 H^+B	-	6.9	7.1	6.5	6.5-8.5	No relaxation
4.	Total Dissolved Solids	APHA, 23rd Edition,2540-C	mg/l	132	126	118	500	2000
C. General Parameters concerning substances undesirable								
5.	Chloride (as Cl)	APHA, 23rd Edition,4500, Cl-B	mg/l	17.4	18.3	12.6	250	1000
6.	Fluoride (as F)	APHA, 23rd Edition,4500, F-C	mg/l	<0.1 (Dl:0.1)	<0.1 (Dl:0.1)	<0.1 (Dl:0.1)	1	1.5

7.	Iron (as Fe)	APHA, 23rd Edition,3500, Fe-B	mg/l	0.18	0.12	0.1	0.3	No relaxation
8.	Nitrate (as NO3)	APHA, 23rd Edition,4500, NO3-B	mg/l	0.72	0.66	0.58	45	No relaxation
9.	Sulphate (as SO4)	APHA, 23rd Edition,4500, SO4-B	mg/l	12.6	8.8	7.6	200	400
10.	Sulphide (as H2S)	APHA, 23rd Edition,4500, S2-B	mg/l	<0.05 (DL:0.05)	<0.05 (DL:0.05)	<0.05 (DL:0.05)	0.05	No relaxation
11.	Total Hardness (as CaCO3)	APHA, 23rd Edition, 2340 C	mg/l	64	63	58	200	600
12.	Arsenic (as As)	APHA, 23rd Edition,3113 B	mg/l	<0.002 (DL:0.002)	<0.002 (DL:0.002)	<0.002 (DL:0.002)	0.01	0.05
13.	Chromium (as Cr)	APHA, 23rd Edition,3111 D	mg/l	<0.01 (DL:0.01)	<0.01 (DL:0.01)	<0.01 (DL:0.01)	0.05	No relaxation
14.	Total Suspended Solids	APHA, 23rd Edition, 2540 D	mg/l	11	10	8	100mg/l(max)	
15.	Biochemical Oxygen Demand at 27°C for 3 days	IS 3025 (Part- 44) 1993	mg/l	3.7	3.8	2.2	30 mg/l(max)	
16.	Chemical Oxygen Demand	APHA, 23rd Edition,5220 B	mg/l	18	19.2	14	250 /l(max)	

Observation & Analysis of Ground Water:

Groundwater samples collected from four locations within a 10 km radius of the proposed site showed all parameters well within the drinking water standards specified in IS 10500 and IS 2296:Class C. So, all sites of water are suitable for drinking purposes.

Figure 3-16: Ground Water Sampling

Surface Water quality

The physico-chemical characteristics of Surface water samples are presented in the Table below.

Table 3-17: Analysis results of surface water

C. Microbiological Test Findings							
Sl. No	**Parameter**	**Test Method**	**Unit**	**Results**			**Norm as per IS 10500:2012**
				SW-1	**SW-2**	**SW-3**	
1.	Total Coliform/100 ml at 37° for 24 hrs	IS 1622	Cfu	<1(DL:1)	<1(DL:1)	<1(DL:1)	Not Detectable
2.	E. coli/100ml at 44.5° for 24hrs	IS 1622	Cfu	Absent	Absent	Absent	Not Detectable

D. B. Organoleptic and physical parameters								
Sl. No	**Parameter**	**Test Method**	**Unit**	**Results**			**Norm as per IS 10500:2012**	
				SW-1	**SW-2**	**SW-3**	**Al (Max)**	**PL (Max)**
3.	pH at 25°C	APHA, 23rd Edition, 4500 H^+B	-	7.3	6.9	7.4	6.5-8.5	No relaxation
4.	Total Dissolved Solids	APHA, 23rd Edition,2540-C	mg/l	88	124	96	500	2000
C. General Parameters concerning substances undesirable								
5.	Chloride (as Cl)	APHA, 23rd Edition,4500,	mg/l	23.6	20.2	21.7	250	1000

		Cl-B						
6.	Fluoride (as F)	APHA, 23rd Edition,4500, F-C	mg/l	<0.1(DL:0.1)	<0.1(DL:0.1)	<0.1(DL:0.1)	1	1.5
7.	Iron (as Fe)	APHA, 23rd Edition,3500, Fe-B	mg/l	0.26	0.23	0.16	0.3	No relaxation
8.	Nitrate (as NO3)	APHA, 23rd Edition,4500, NO3-B	mg/l	1.28	1.00	0.70	45	No relaxation
9.	Sulphate (as SO4)	APHA, 23rd Edition,4500, SO4-B	mg/l	26.4	21.4	16.2	200	400
10.	Sulphide (as H2S)	APHA, 23rd Edition,4500, S2-B	mg/l	<0.05(DL:0.05)	<0.05(DL:0.05)	<0.05(DL:0.05)	0.05	No relaxation
11.	Total Hardness (as CaCO3)	APHA, 23rd Edition, 2340 C	mg/l	39	54	38	200	600
12.	Arsenic (as As)	APHA, 23rd Edition,3113 B	mg/l	<0.002(DL:0.002)	<0.002(DL:0.002)	<0.002(DL:0.002)	0.01	0.05
13.	Chromium (as Cr)	APHA, 23rd Edition,3111 D	mg/l	<0.01(DL:0.01)	<0.01(DL:0.01)	<0.01(DL:0.01)	0.05	No relaxation
14.	Total Suspended Solids	APHA, 23rd Edition, 2540 D	mg/l	18	36	22	100mg/l(max)	
15.	Biochemical Oxygen Demand at 27°C for 3 days	IS 3025 (Part-44) 1993	mg/l	14.5	29	12.6	30 mg/l(max)	
16.	Chemical Oxygen Demand	APHA, 23rd Edition,5220 B	mg/l	52	115	46	250 mg/l(max)	

Observation & Analysis of Surface Water:

Surface water samples collected from four locations within 10 km radius of the proposed siteshowed all parameters well within the drinking water standards specified by CPCB.

Figure 3-17: Surface Water Sampling

Biological Environment:

Biological environment is an essential component that constitutes the total environment of the study area. The study area has a diverse ecological structure and therefore needs a thorough study of all its components.

EIA is essentially a planning tool for preventing environmental problems due to change of any landscape. As per EIA notification, 2006 the study area for biological environment is taken within 5km radius of Sand Mine (MIN_BNK_10) in Barjora block of Bankura district, West Bengal.

Study on biological environment has three components in it.

a. Existing species diversity and ecological structure of the study area,
b. Possible impacts of mining on biological environment, and
c. Mitigation measures.

Existing species diversity and ecological structure of the study area

MIN_BNK_10 proposed sand mine lease area being 9.50 hectare on the river Damodar of Bankura district, falling under Mouzas – Tajpur, JL No. – 56, Plot No – 1582, coming under P.S: Barjora of Bankura district of West Bengal.

A. Methodology for the Study

Ecological study was done collecting baseline data to understand the present status of ecological settings of the area. This data also helped us in designing the pollution mitigation plan biologically in such a way that the harmful impacts of the proposed sand and mine on the vegetation and fauna are avoided or minimised. Different types of habitats with varied vegetation covers are encountered in different ecological condition of the study area. This area is having agricultural lands with very dense human habitation, two reserved forests with some remnants of natural forest, plantation of various exotic species, waterbodies and degraded lands etc.

Random quadrats were laid to study the floral components in the study area in the following manner. The quadrat sizes laid were as follows –

(a) 10m x 10m in agricultural lands
(b) 10m X 10m in the plantation areas

Aquatic flora was studied in line transacts along the aquatic bodies to study aquatic flora

Each studied location for vegetation study was marked with a GPS (etrax 10) and coordinates (latitude and longitude) were noted with site characteristics.

B. Present Land-use pattern of the study area

The land use pattern of this vast landscape has been framed from the Satellite Imagery and Toposheet and duly authenticated. Ground truth was also done in different location marking it with GPS coordinates. The land use / land cover pattern of the study area, may be classified into following

categories: (i) Crop Land (ii) Open areas without scrubs (iii) Settlements and (iv)Water bodies.

The study area is mostly covered with rainfed crops and is under paddy cultivation. A small area is irrigated by ground water for Boro paddy cultivation. A good amount area is also used for cultivation of vegetables etc. The species of herbs, shrubs and trees found in the sampled plots of study area are depicted in the table below.

Table 3-18: List of Tree Species found within 5 km radius of the mining lease area

Sl. No.	Scientific Name	Local name	Family
1.	*Terminalia catappa*	Kat badam	Combretaceae
2.	*Albizzia lebbek*	Shirish	Mimosaceae
3.	*Azadirachta indica*	Neem	Meliaceae
4.	*Swietenia mahagoni*	Mehagoni	Meliaceae
5.	*Tamaridus indica*	Tamarind	Casaelpiniaceae
6.	*Artocarpus heterophyllus*	Kathal	Moraceae
7.	*Alstonia scholaris*	Chatim	Apocynaceae
8.	*Anthocephalus chinensis*	Kadam	Rubiaceae
9.	*Aegle marmelos*	Bel	Rutaceae

Table 3-19: List of Shrub Species found within 5 km radius of the mining lease area

Sl. No.	Scientific Name	Local name	Family
1.	*Dioscorea bulbifera*	Khamalu	Dioscoreaceae
2.	*Dioscorea floribunda*	Panalu	Dioscoreaceae
3.	*Desmodium gangeticum*	-	Fabaceae
4.	*Duranta erecta*	Duranta	Verbenaceae
5.	*Euphorbia pulcherima*	-	Euphorbiaceae
6.	*Clerodendron infortunatum*	Ghentu	Verbenaceae
7.	*Croton bonplandianum*	Chuchhuri	Euphorbiaceae

Table 3-20: List of herb species found within 5 km radius of the mining lease area

Sl. No.	Scientific Name	Family
1.	*Cyperus iria*	Cyperaceous
2.	*Cyperus kyllinga*	Cyperaceae
3.	*Cyperus rotundus*	Cyperaceae
4.	*Dactyloctenium aegypticum*	Poaceae
5.	*Desmodium triflorum*	Papilionaceae
6.	*Desmodium volubilis*	Papilionaceae

7.	*Digitaria sanguinales*	Poaceae
8.	*Eclipta alba*	Asteraceae
9.	*Eragrostis tenella*	Poaceae
10.	*Euphorbia hirta*	Euphorbiaceae
11.	*Euphorbia microphylla*	Euphorbiaceae
12.	*Evolvulu salsenoides*	Convolvulaceae
13.	*Evolvulu snummularius*	Convolvulaceae
14.	*Fimbristylis japonicum*	Cyperaceae

Figure 3-18: Ecology and Biodiversity study around the project site

Socio-Economic Environment:

Socio – Economic has been recognized as an important component of environment. It focuses primarily on the social and economic effects that are likely to occur as a result of the

construction and operation of the proposed mining activities in the area. It includes various factors, viz. demographic structure, availability of basic amenities such as housing, education, health and medical services, occupation, water supply, sanitation, communication and power supply, prevailing diseases in the region as well as features such as places of tourist attraction and monuments of archaeological importance. The study of these parameters helps in identifying predicting and evaluating the likely impacts due to project.

Objectives:

Objectives of Socioeconomic study as follows:

- To study the demographic structure and facilities available in the study area.
- To identify and assess the impact on socio-economic status of the study area.
- To identify all potential significant adverse and beneficial social impacts of the Project.
- To recommend the mitigation measures to reduce the adverse impact of the project.
- To verify compliance with the environmental regulations and industry's standards.
- To recommend cost effective measures to be implemented to mitigate the expected impact.

Data Collection:

Primary Data Collection: Primary data means original data that has been collected specially for the purpose. The data collected from the field under the control and supervision of an investigator. This type of data is generally afresh and collected for the first time. It is useful for current studies as well as for future studies. While collecting primary data collection in study area following methods are uses.

1. Observation Method
2. Focussed group discussion (FGD)
3. Surveys and questionnaires

Secondary Data Collection: Secondary data is usually the "Data gathered and recorded by someone else prior to and for a purpose other than the current project". Secondary data are collected from different offices or Govt. websites like Census offices (India Census 2011), Statistical department, Health offices, Land and Revenue department, Zilla Parishad and Non-Governmental org

Baseline data for the socio-economic and cultural environment plays an important role in conducting

EIA studies. Any development activity will bring about changes to socio-economic pattern. Data on the demographic pattern, population characteristics, employment, land usepattern, transport and recreation facilities were collected from Revenue offices and other Govt, agencies. Test check survey was also conducted in some of the villages. All the above said environmental parameters will be used for identification, prediction and evaluation of significant impacts. The Socio-Economic details of the study area are gathered through:

- Identification of villages falling from the study area map.
- Collection of the demographic pattern of villages falling in the area through 2011 census data.
- Occupational structure of villages falling in the study area through NIC 2011 census data.
- Details of the amenities available in villages falling in the study area through NIC 2011 census data.

Bankura district, situated in Burdwan division is district of West Bengal with administrative headquater located at Bankura city. According to 2011 census, the district has a population of 35,96,674 out of which 18,38,095 are males and 17,58,579 are females. The district has a sex ratio of 957 females for every 1000 males. During the year 2001-2011, the population growth rate in the district was 12.65%, including 12.35% were males and 12.97% were females. As per 2011 census, the major religion in the district is Hindu with 84.34% of the total Population. The population density in the district is 523 person per sqkm. The number of live birth in the district in the district in the year 2020 was 58,485, out of which 29,978 were male and 28,507 were female. In the same year the number of deaths in the district was 27,995 out of which 16,754 were male and 11,241 were female. Average literacy rate of Bankura city is 86.12 percent of which male and female literacy was 91.46 and 80.61 percent

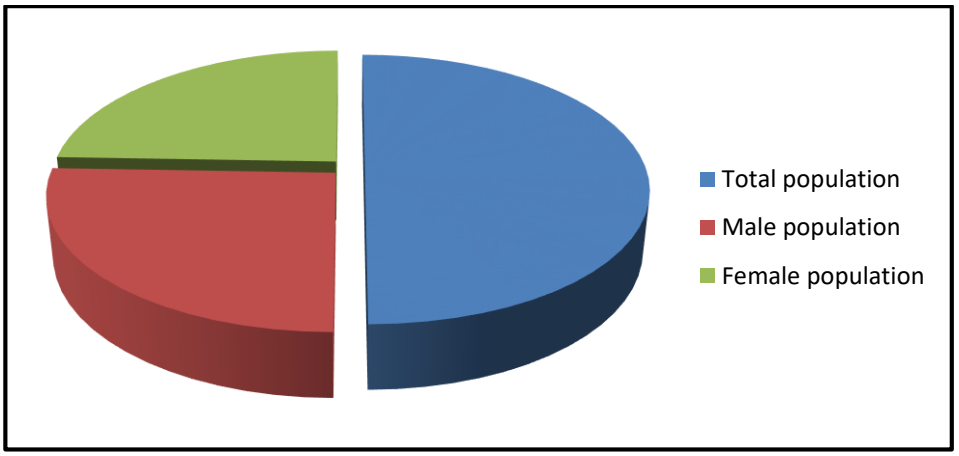


Figure 3-19: Pie Diagram showing distribution of male and female population of the district

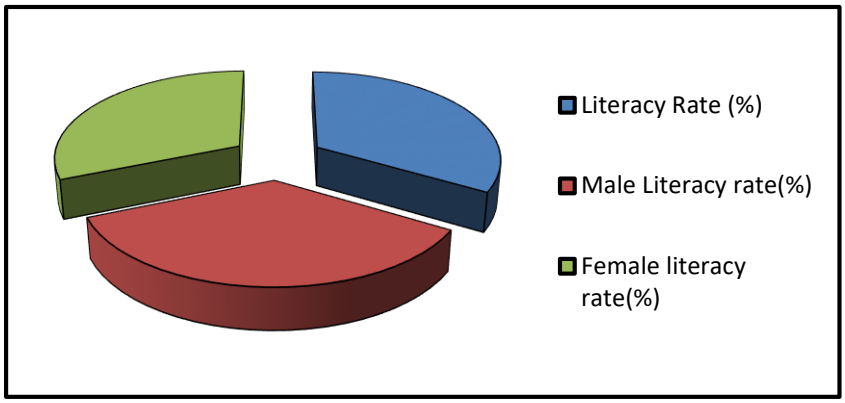


Figure 3-20: Pie Diagram showing distribution of male and female literacy rate of the district

Figure 3-21: School near the project site

Socioeconomic survey has been conducted at 2 nos. of school near the project site. Tajpur Primary school is located at an aerial distance of 0.71 km south-west of the project site. Tajpur Rampur Primary School is located at an aerial distance of 0.81 km, south-west of the project site.

Figure 3-22: Hospitals near the project site

Socioeconomic survey has been conducted at Tajpur Sub health centre located at an aerial distance of 0.65 km south west of the project site and Pakhana PHC hospital located at an aerial distance of 2.05 km, south-east of the project site.Mangram Kalyanpur hospital is situated at an aerial distance of 3.36 km south-west, from the project site.

Table 3-21: Nearest Communication & Infrastructure from the project site

Sl No.	Amenities	Description	Distance from Project site (in kms)	Direction from the project site
1.	Airport	Kazi Nazrul Islam Airport	24.22	NW
2.	Railway	Rajbandh	6.56	NE
3.	Bus stand	Pakhana Road Bus stop	2.87	SE
4.	Police station	Barjora Police station	7.75	W
5.	Fire Station	Panagarh Fire station	10.30	NE
6.	Hospital	Tajpur Sub health centre	0.65	SW
		Pakhana PHC hospital	2.0	SE
		Mangram Kalyanpur hospital	3.36	SW
7.	Post-Office	Baramana Post office	1.58	NE
8.	College	Mahananda B.Ed College	5.93	N
		Durgapur College of Commerce & Science	7.09	NE
9.	Roads	Pakhana Road	2.00	SW
		NH 19	8	NE
10.	Infrastructure	Durgapur Barrage	8.46	NE

CHAPTER – 4

Anticipated Environmental Impacts and Mitigation Measures:

Any human activity in any environment produces impact, modifying it to a status which is considered adverse or beneficial according to the damage or improvement it brings about in the physical, biological and socio-economic status of the baseline environment. Depending on the nature of activities and existing status, the impacts are assessed for their importance. On the basis of the impact analysis, the mitigating action and future monitoring requirements are focused on the Environmental Management Plan for countering or minimizing adverse impacts. The magnitude and significance of the environmental pollution caused by mining depend on the method of mining, scale and concentration of mining activity.

The following parameters are of significance in the EIA and are being discussed in detail:

- Land Environment
- Water Environment
- Air Environment
- Noise Environment
- Biological Environment
- Socio-Economic Environment

Land Environment:

On River Bed: River mining does not involve generation of any overburden/ waste. Thus, no waste dump sites æneeded for the proposed activity. The main aspects likely to feature on the land environment are excavation, loading and transportation activities which will not pose any impact to the surrounding land environment.

On Agriculture Field: Since, dry sand mining will be carried out in the river bed, no impacts on surrounding agricultural lands are envisaged.

Table 4-1: Anticipated Impacts on Land Environment

Anticipated Impacts	Mitigation measures
Obstruction in river flow/ course. ➢ Erosion of channel bed and banks. ➢ Increased in Channel Slope ➢ Change in channel morphology. ➢ Impact on stream's physicalcharacteristics such as channelgeometry,	Mining of minerals will be started from so that water flow / course will not be obstructed. The slicing of the mineral will bedone at 3.0 m. ➢ Mining is to be done leaving safety barrier 7.5 m or offset on both sides and maximum barrier should be on concave side of river preferably the flow channel (excavation void created) should be kept straight so as to help avoid erosion as side cutting or collapsing. ➢ Safety zone or buffer area will be created from

bed elevation in stream roughness of the bed, flowvelocity, discharge capacity,sediment transportation capacity etc. ➢ Impact on ecological equilibrium of riverine regime.	the river banks to minimize the instability & erosion and to increase the stability of structures. These safety zones will not be mined out. ➢ Quantities will be strictly limited so that sand accumulation rates are sufficient to avoid extended impactson channel morphology. ➢ Mining will be carried out as perapproved Mine Plan in scientific andsystematic way. ➢ Sand mining will be restricted down to 3.0m depth or the groundwater level whichever less is. Therefore, the mining will not intersect the ground water table. ➢ Loss of habitat is minimized because the river bed mining will be carried only in dry bed which will not disturb the riverine ecosystem. ➢ The mine working will remain confined to river bed only and in no case mining will disturb any surface area outside the river bed which may affect topography or drainage. ➢ The mining from river bed will not have impact on natural drainage of surrounding areas as the excavated sand from river bed is filled with first heavy flow in river during monsoon season.

Water Environment:

Planned sand mining: To address the issue of loss of aquatic species, it is suggested that sand mining may be done in different streams so that the water stream on another side of the river is allowed to flow in its natural course.

Table 4-2: Anticipated Impacts on Water Environment.

Anticipated Impacts	Mitigation measures
River water flow pattern might be changed due to river bed mining. Mining activities will increased river bed depth, which may result inincrease of flow velocity.	➢ No diversion is proposed. There will not be any adverse impact on flow pattern, surface hydrology and ground water regime. ➢ Mining activities will be restricted to 3.0m depth, which will not cause much change in flow pattern of the river. ➢ An offset of 7.5 m will be left from both sides of river, which will minimize the chances of bank failure

Change in surface water quality and groundwater quality.	➢ There will be no change in surface water quality other than moonsoon season as the river channel remains almost dry during the rest period of time. ➢ Ground water quality will not be affected due to mining activities as it is restricted to 3.0 m depth and the mining will not be allowed below thewater table. ➢ Regular monitoring of water samples will be done as precautionary measures
Impact on ground water recharge potential as the thickness of the natural filter materials(sediments) is reduce causing lessinfiltration	➢ Mining will be done as per approved Mine Plan and applicable Rules and Regulation, so that there is no damage on ground water recharge potential due to sand mining.
Waste water discharge	➢ Portable Bio-toilets will be used, hence no sewage/liquid effluent will be generated and ground or surface water contamination due to percolation is not expected.

Air Environment:

a) Anticipated Impacts on Air Environment:

- The major sources of air pollution from the proposed mining project is dust generation due to extraction, loading and haulage of sand and wind driven erosion of exposed material.
- Exhaust emissions from vehicles and equipment deployed during the operation phase are also likely to increase the levels of SO_2, NOx, PM, CO and un-burnt hydrocarbons.
- The dust generation will affect the health of the workers as well as the nearby habitation/local population.

Table 4-3: Anticipated Impacts on Air Environment.

Anticipated Impacts	Mitigation measures
➢ Dust from excavation and mining. ➢ Loading, unloading and screening. Vehicular movement on the haulroads	➢ Water sprinkling will be done on thehaul roads twice in a day. ➢ Plantation will be carried out on approach roads. ➢ Planning transportation routes of mined material so as to reach the nearest paved roads by shortest route. (minimize transportation overunpaved road); ➢ Dust mask provided to the workers engaged at dust generation points like excavations loading and unloading points. ➢ Speed limit will be enforced to reduce

	airborne fugitive dust from vehicular traffic. ➢ Deploying PUC certified vehicles to reduce their noise emission. ➢ Spillage from the trucks will be prevented by covering tarpaulin overthe trucks.

The Biological mitigation of air pollution can be done by plantation of indigenous species. In thiscase, on the eastern bank of the river Damodar there is a vast stretch of plain-land which is notbeing used for any other purpose. It is, therefore, suggested that the project proponent should take up plantation activity, in consecutive years, as per the suggestion given below. No exotic and quick growing species will be planted as quick-growing species may invite invasive plant species which exist in the forest fringe area of the locality other than the indigenous ones. Plantation of indigenous species may invite associate speciesof the region like grasses, herbs and shrubs to grow out of their own. A species-mix plantation is also suggested for maintaining high species diversity of the area.

Noise Environment:

Since the mining operations are non-mechanized, there will not be any noise and vibrations related impacts. However, only noise-generating activities are due to truck movement carrying sand fromthe mining lease area. The noise sources shall not generate sound levels above 90 dB (A). With the resultant value being less than the ambient noise levels, there is no likelihood of excess additionof noise from the mine operation to the surrounding background noise level. As derived above anddue to the fact that there are human settlements within 200m, no impact of noise on habitation is likely. The same is brought out by the noise measurements, which indicate that the noise levels inthe vicinity are within limits.

Table 4-4: Anticipated Impacts on Noise Environment.

Anticipated Impacts	Mitigation measures
➢ Noise Impact due to mining activities. due to vehicular ➢ Noise impact movement ➢ Auditory Impact	➢ The noise levels from all these sources are periodical and restricted to particular operation. ➢ The noise measurement data indicated that present noise levels in the study area is well within the permissible limits of National Ambient Noise Quality Standards. ➢ Periodical monitoring of noise will be done. ➢ No other equipment except the transportation vehicles will be allowed. Noise generated by this equipment will be intermittent in nature and will not cause much adverse impact. ➢ Proper maintenance of all equipment/ machines will be carried out which help in reducing noise during operations. ➢ Plantation will be taken up along the approach roads and vicinity of river bank which will minimize propagation of noise and also arrests dust by acting as barrier on the pathway between source and receptor. ➢ Ear muffs will be provided while working with mining equipment. Regular health check-up facility for labours will be conducted for avoiding any kind of health implications arising due to noise related activities.

Biological Environment:

There will be no major adverse impact of the mining activity on the biological environment. Minor impacts of sand mining activity on the physical environment will mostly be confined to air pollution due to the excavation and transport of the products. Some impacts may be caused due to the increased load of air-borne particulate matter. The source of suspended particulate matter (SPM) of different sizes will be mostly the stacks of sand. Trucks carrying sand may also add to SPM in the air due to vehicular pollution.

Another negative impact that can affect the aquatic species composition of Damodar River, particularly in the area from where sand will be mined, is the decline in species richness of both aquatic fauna and flora. The dependence of some people on fishing may be affected to some extent due to mining. During mining operations, aquatic flora may be eliminated locally. As aquatic fauna like fish etc., is primarily dependent on aquatic flora, there will likely be a negative impact on fish availability in this particular locality. As per the Approved mining plan, the project activity is only done on the identified sand

deposited area. There are no diversion and excavation activities done in the river water flowing channel. Therefore above mentioned impact will be negligible by the current project.

Sound pollution will have a harmful impact on the wild fauna, provided sand transport is allowed during the night. But in this case, heavy mining equipment and explosives will not be used. Moreover, human habitation and forest are far from the place of mining. This impact will beminimal and will not need any mitigation measure. It is suggested that transport in heavy vehiclesduring the night should be avoided.

To address the possible adverse impacts on the biological environment due to the mining of sand, the some mitigation measures are suggested. Ecological management of possible pollution can be done at the source. The northern bank of the river adjacent to the project site has an open barren land where afforestation for mitigating air and noise pollution will be done.

Socio -Economic Environment:

Table 4-5: Anticipated Impacts on Socio-economic Environment.

Aspect	Anticipated Impacts	Mitigation measures
Habitation	No loss of Habitation	➢ The nearest habitation is beyond 0.60 Km. ➢ All necessary measures are being adopted to avoid disturbance in livelihood to Locality.
Employment	➢ Direct employment to 5 persons. ➢ Indirect employment to about 150 persons. of,human rights andfundamental freedoms for all	➢ Local people will be employed. respect through contribution in various festivities, equal observance and protection among employees and societies at large in all CSR activities.

Aspect	Anticipated Impacts	Mitigation measures
	➢ Improved income expenditure. ➢ Improved micro investments - savingspatterns	➢ Training will be provided to non-workers and unskilled workers. ➢ Awareness program to motivate people for savings and investment.
Health Implications	➢ No health-related problems were reported during the primary survey. ➢ No significant health implications likely to arise to the workers due to mining activities.	➢ Regular health camps will be organized for the local people. ➢ Adequate number of medical facilities are situated in the area.
Health impacts on mental, physical, and social well-being.	The proposed project will not impact the mental, physical and social well-being. It will improve the well-being of the people in and around the surrounding area.	➢ Expectations in fair pay, employee care, social responsibility commitments etc. will be timely met. Grievance redressal mechanism will be made tooverview and manage complaints arising from the study area.
Loss / gain of selfesteem	A rise in the self-esteem due to increase rate of economic growth in the region. Higher degree of self-satisfaction and contentment	➢ Immigration in search of employment will be controlled.
Loss/ gain of culture and religion	The proposed project will follow universal respect for,and observance and protection	➢ The proposed project will promote neither selective,nor relative, but universal
The proposed project is a river bed sand mine and is providing to their employees all basic facilities.	The mine will promote girl child education, women empowerment, scholarship to encourage the students and will provide donation to build toilet for sanitation facility. Community development will be designed and programmed by engaging with the Panchayats and local authorities.	➢ The mine will give boost to local population. Monetary gains, education, health, sanitation, waterconservation, plantation and improvement in generalenvironment will lead to positive growth.

Corporate Environment Responsibility:

Table 4-6: Anticipated Impacts on Corporate Environment Responsibility.

Aspect	Anticipated Impacts	Mitigation measures
The proposed river bed sand mine project will be providing all basic facilities to their employees	➢ The mine will promote girl child education, women empowerment, scholarship to encourage the students and will provide donation to build toiletfor sanitation purpose. ➢ Community development will be designed and programmed by engaging with the Panchayats and local authorities.	➢ The mine will give boost to local population. Monetary gains, education, health, sanitation, water conservation, plantation and improvement in general environment will lead to positive growth.

Green Belt Development Plan:

Avenue plantation shall be done of suitable indigeneous species during the planning period in open and free government land with permission from the competent Authority. Plantation will also be undertaken along the approach road during the plan period. Suggested species to be planted are listed in Plantation Programme section 10.1.8.

CHAPTER - 5

Analysis of Alternatives (Technology & Site):

Analysis of Alternative Site:

No alternative sites have been analyzed, since project is site specific and the sand is available in the proposed site.

Analysis of Alternatives Technology:

The mine will be operated by opencast manual method of mining. No other alternative technologies can be used because of the nature and occurrence of the deposit, cost of operation and PMV, capacity of the mine and specification laid by the consumer industry. Project Proponentof the proposed mine is using eco-friendly measures to minimize the impact of mining on the surrounding environment.

CHAPTER – 6

Environmental Monitoring Program:

Introduction:

Regular monitoring of the various environmental parameters is necessary to evaluate the effectiveness of the management programmer so that the necessary corrective measures can be taken in case there are some drawbacks in the proposed programmer. Since environmental quality parameters at work zone and surrounding area are important for maintaining sound operating practices of the project in conformity with environmental regulations, the post project monitoring work forms part of Environmental Monitoring Program.

Environmental Monitoring and Reporting Procedure:

Post Monitoring of various environmental parameters will be carried out on regular basis to ascertain the following:

- Status of Pollution within the mine site and in its vicinity.
- Generate data for predictive or corrective purpose in respect of pollution.
- Examine the efficiency of pollution control system adopted at site.
- To assess environmental impacts.

Monitoring will be carried out at site as per the norms of CPCB. Environmental Monitoring Programme will be conducted for various environmental components as per conditions stipulatedin Environmental Clearance Letter issued by MoEF&CC and consent to operate issued by SPCB. Six monthly compliance reports will be submitted to MoEF&CC, regional office on 1st of June and 1st of December. Quarterly compliance Report for conditions stipulated in Consent to Operate will be submitted to SPCB on regular basis.

Environmental Management Cell:

In order to maintain the environmental quality within the stipulated standard, regular monitoring of various environmental component is necessary which will complied as per condition for this an Environmental Management team be constituted.

The core responsibilities of the Environmental Monitoring Cell will be:

- The organization and interpretation of the environmental monitoring data to establisha record of change associated with the implementation of a project or the operation ofan organization.
- The process of verification that all or selected parameters measured by Environmental Monitoring Program are in compliance with regulatory requirements, internal policies and standards, and established environmental

quality performance limits.

- The assessment of the effectiveness of the environmental management system, practices and procedures.
- The environmental monitoring and audit work will be carried out by qualified personnel.
- A summary of non-compliance of the environmental quality performance limits.
- To implement and monitor the control and protective measures based on the EMP.
- To coordinate the environment related activities to the top management within as wellas with outside concerned agencies.
- To provide of health checkup of workers and the people living in nearby villages.
- To develop greenbelt in the nearby villages, schools, Govt, offices and transportationroutes.

Environmental Monitoring Schedule:

All the environmental parameters viz. air, water, noise, soil will be monitored regularly in order to detect any changes from the baseline status. Monitoring program will be followed till the mining operations continue as per the CPCB and SPCB guideline.

Methodology Adopted:

Post project monitoring will be carried out as per conditions stipulated in environmental clearance letter and consent issued by SPCB as well as according to CPCB guidelines. The project site is considered as core zone and the area lying within 10km radius from the mine site is considered as buffer zone, where some impacts may be observed on physical and biological environment. In the buffer zone, slight impact may be observed and that too is occasional. The manual sand mining project particularly have low footprint on buffer zone.

Detailed budget & procurement schedules:

The monitoring of the environment parameters will be outsourced and carried out by the lab of SPCB or a lab approved by MoEF/NABL.

Conclusion:

Post Environmental monitoring is an essential step in the EIA process. This justifies the predicted impacts, the efficiency of mitigation measures and the shortcomings of prediction methods, measures and even regulations are to be verified, and EIA practice improved. Environmental indicators could contribute to designing and evaluating monitoring programs, thus improving the establishment of the cause-effect relationship and the reporting and communication of environmental data.

The Environmental Monitoring Cell will coordinate all monitoring programmes at the site and data thus generated will be furnished as per statutory requirements. The frequency of reporting will beon half yearly basis to the SPCB and to SEIAA. The Environmental audit reports will be prepared for the entire year of operations and will be regularly submitted to regulatory authorities.

CHAPTER – 7

Additional Studies:

Public Consultations:

The draft EIA as per the EIA notification dated 14/09/2006 and subsequent amendments is being submitted to SPCB for conducting a Public hearing for the proposed mining within the ML area located in Tajpur Mouza of Bankura district of West Bengal. The report will be updated after conducting the Public hearing by SPCB with the concerns/suggestion of people and stake holders who would attend the public hearing.

Risk Analysis:

Risk analysis is the systematic study of uncertainties and risks encountered in various areas. Risk analysis is to identify the risks involved in mining operations at various phases. Potential locations and activities around the proposed site are identified and probable risks are estimated on a person, business and Govt, establishment.

Risk Prioritisation Based on Hazards of Mining:

Sand mining will be by open cast Manual method. Mining will be only within the river stretch located in Tajpur Mouza of Bankura district of West Bengal. The lease area is 9.50 Ha. There is no land degradation due to mining activities as mining is done only on riverbed surface. There will be no overburden (OB) or waste generation as the sand is exposed in the river bed. There will be neither any stacking of soil nor the creation of OB dumps. So, no dumping area, as well as stockpiling area, is required. Therefore, there is no chance of failure of dumps and no slope failure due to OB dump and stockpiling.

However, there are various factors which can create unsafe working conditions/ hazards in the mining of minerals. The following types of hazards are identified during the sand miningoperations

1) Accidents during Sand/ Mineral loading, transportation and dumping
2) Accident due to vehicular movement
3) Inundation/ Flooding
4) Quick Sand Condition / Bench Slope Failure.

Mitigation Measures:

Measures to prevent accidents during loading:

The following activities will be done to minimize the risk are:

- The truck will be covered with tarpaulin and maintained to prevent any spillage.
- To avoid danger while reversing the trackless vehicles especially at the embankment and tipping points, all areas for reversing of Lorries should be made

man free as far aspossible.

- The vehicles must be maintained in good repairs and checked thoroughly at least oncein a week.
- All transportation within the main working will be carried out directly under the supervision and control of the management.
- Opening of the side covers (pattas) should be done carefully and with warning to prevent injury to the loaders.
- Overloading should not be permitted and the maximum permissible speed limit shouldbe ensured.
- The truck drivers should have proper driving license.
- A statutory provision of the fences, constant education, training etc. will go a long wayin reducing the incidents of such accidents.

Measures to prevent incidents during Inundation/ Flooding:

The following activities will be done to minimize the risk are:

- During monsoon months and heavy rains the mining operations are ceased.
- There should be mechanism/ warning system of heavy rains and discharges from theupstream dams.
- Inundation of flooding is expected and beneficial for these mines as during this timeonly the mineral reserve gets replenished.

Precautionary Measure for Sudden Release of Water from Upstream:

The following activities will be done to minimize the risk are:

- The mining should be done only during the dry season and under strict supervision.
- Mining activities should be avoided during monsoon season.
- No go zones should be clearly marked and made aware to the mine workers.
- Deep water areas must be identified.

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 miningmainly comes under the physical hazards. Possible Physical hazards are as below mention.

Physical Hazards Due To Mining Operations:

Following health related hazards were identified due to mining operations to the workers: -

- **Light:** The workers may be exposed to the risk of poor illumination or excessive brightness. The effects are eye strain, headache, eye pain and lachrymation,

congestionaround the cornea and eye fatigue.

- **Heat and Humidity:** The most common physical hazard is heat. The direct effects ofheat exposure are burns, heat exhaustion, heat stroke and heat cramps; the indirect effects are decreased efficiency, increased fatigue and enhanced accident rates. Heat and humidity are encountered in hot and humid condition when temperatures and air temperatures increase in summer time up to 38°C or above in the mining area.
- **Eye Irritation:** During the high windy days in summer the sand & dust could be the problems for eyes like itching and watering of eyes.
- **Respiratory Problems:** Large amounts of dust in air can be a health hazard, exacerbating respiratory disorders such as asthma and irritating the lungs and bronchial passages.
- **Noise Induced Hearing Loss:** Machinery is the main source of noise pollution at themine site.

Management of Health Hazards:

Table 7-1: Management of Health Hazards.

Particulars	Control Measures
Heat & Light	➢ The mine site will have adequate provision drinking water supply for labours to combat dehydration.
	➢ Lightweight and loose-fitting clothes having light colors will given preference to wear. ➢ Rigorous exercise and more physical activities will be avoided in hot weather.
Noise	➢ Noise exposure measurements will be taken to determine the exposure limits and identify the zones.

Disaster Management Plan:

The following activities will be done to minimize the risk are:

- The shallow depth of activities in river bed mining will not involve any high risk accidentdue to side falls/collapse.
- The complete mining operation will be carried out under the Management and control ofexperienced and qualified Mines Manager.
- All the provisions of Mines Act 1952, MMR 1961 and Mines Rules 1955 and other

lawsapplicable to mine will strictly be complied with.

- During monsoon season the mining activities will be closed.
- All persons in supervisory capacity will be provided with proper communication facilities.
- Proper coordination with Irrigation Department will be maintained so that at the time ofreleasing water, if any, from the dam suitable warning/ information is given in advance.
- Disaster Warning System" as developed will be strictly implemented.
- Security guards will be posted.
- Provision of rest shelters for mine workers with amenities like resting, drinking water,toilets facilities and site specific anti-venom provisioning etc. will be provided by lessee.
- First - Aid facilities in the mining area.

Socio Economic Impact assessment:

Social Impact Assessment:

The proposed mine site has no negative impact on local socio- economic environment. The proposed project willgenerate direct and indirect employment and revenue to Govt, as well as fulfil the demand of construction Sand requirement of the local and regional market.

The project will provide following facilities to workers:

- Safe drinking water and water coolers shall be provided.
- Conveyance arrangements to hospitals or dispensaries from the proposed project sitewill be provided.
- PPE's (Helmets face masks, gloves, shoes etc.) will be provided to the workers as persafety norms.
- Urinal and lavatories, wash basins, bathrooms. One toilet facility per 50 workers shallbe provided.

Assessment Resettlement and Rehabilitation:

No settlements are present within the ML area, thus there is no need to conduct the Rehabilitationand resettlement study.

CHAPTER – 8

Project Benefits:

General:

The demand of Sand has been rising in the state as a result of rising in construction activities and development. The sediment in the form of river bed material (RBM) deposited is of critical importance in civil and other infrastructural activities. The proposed project aims to fulfill the supply of Sand demand. The proposed project lies on the river bed of Damodar River. The quality of Sand is fine and appropriate for the mega infrastructural activities. The mineral is used mainly in the construction activities like buildings, roads and infrastructure etc. The requirement for the mineral is always high in the nearby cities and towns. Therefore, there is always a good demand of the mineral in the domestic market. The local region demand is increasing; hence newer areas for Sand reserves are approached. This will also generate much needed employment to the local people. Economy of the area will get a boost and there will be overall growth of the region in terms of education, health, training, transport, automobile, industry. The standard of living accordingly will also get an up-liftment on the positive side.

Employment:

The Socio-Economic Condition of the surrounding villages is poor as there is no significant source of the income. The occupational activities are agriculture, cattle rearing and employment in minesbut on daily wages.

- **Direct Employment:**

During the operational phase, about 5 nos. of people will be employed directly. Considering that some of the skilled personnel to be employed for the project will be from outside the area and unskilled/semiskilled personnel will be from within the study area, the project will add to the wellbeing of the area. In addition to the workforce the indirect employment will also be generated for local persons. It will help in bringing prosperity to the area.

- **Indirect Employment**

The project will also provide some 150 people indirect employment to the people of nearby area of mine site. It will also provide some need based opportunity to the local public. The project will provide following indirect employment to the local people:

- The sand available will provide agency employment in the value chain analysis,

for place utility and retail.

- Transportation and warehousing in the region required to transfer the mineral will eventually be needed and therefore trucks and jobs in logistical activities will come up.
- Local contractors & villagers will be involved in the extraction of sand which will improve their economic status.

Improvements in Physical Infrastructure:

The proposed project will enhance the socio-economic activities in the adjoining areas. This will result in following benefits:

- Improvements in physical infrastructure.
- Improvements in social Infrastructure.
- Increase in employment potential.
- Contribution to the exchequer.
- Prevention of illegal mining which will help in sustaining the river and its aestheticvalue.
- Post-mining enhancement of green cover.

Improvements in Social Infrastructure:

There will be some obvious changes in various environmental parameters due to mining activity. Increase socio-economic activities, creation of new employment opportunities. There will be positive impact in socio-economic area due to increased economic activities, creation of new employment opportunities. The mine will contribute to the Exchequer of State and Central Government as per norms. .

Plantation:

The lease area is in the river bed and devoid of any vegetation. Mining activities will not cause any harm to riparian vegetation cover as the working will not extend beyond the safety zone left

as per approve mining plan. Plantation will be carried along the village roads through which sandwill be transported and the areas allocated by the Panchayat / State authorities.

Plantation has been proposed on both sides of the roads as greenbelt to provide cover against dustdissemination. Plantation will be done nearby the mine area and available free government land within the study area to mitigate the ill-effects of mining and to improve environment of its

surrounding area. This will increase the consciousness in workers and near-by villagers for greenery. Suggested species to be planted are listed in Plantation Programme section 10.1.8.

Other Benefits:

The other tangible benefits includes metrics and improvements of demonstrating process, system cost savings, compliant inspections, customer audits, faster product approvals, manufacturing throughput, less rejected material, reduced non-conformance issues, more efficient continuous improvement and project implementation. Intangible benefits include improved staff morale, quick, more accurate and transparent decision making, increased staff accountability and an enhanced culture of quality throughout the organization.

CHAPTER – 9

9.1 Environmental Cost Benefit Analysis:

The environmental cost benefit analysis is not recommended for this project during scoping stage.

CHAPTER – 10

Environment Management Plan:

Introduction:

The Environment Management Plan (EMP) is required to ensure sustainable development in the study area. This section covers the proposed measures required for meeting the prevailing statutory requirements for protecting environment by suitable environmental management practices in connection with the proposed mining and related activities in the area.

The Environmental Management Plan (EMP) has been designed within the framework of various Indian legislative and regulatory requirements on environmental and socio-economic aspects so asto attain sustainable development.

Air Quality Management:

Impacts on Air Quality:

The impacts envisaged due to mining activity are evaluated based on various factors like production capacity, vehicles involved, transportations of sand to the stocking yard etc. The emission inventory of the pollutants is as follows:

The main air pollutant would be dust or particulate matter generated by handling and transportation of sand. But the impact of mining operations on air quality is negligible as excavation involved is only scooping of sand deposits from the river bed. There will be negligible generation of dust due to the proposed mining activities because activities are restricted to only scooping of sand from dry river bed manually. The impact of mining operations on air quality is negligible in and around the excavation zone as there is no utilization of machinery.

Dust may be emitted in air due to mineral transportation vehicles. However, this will be temporaryand insignificant as there will be only about approximately 202 trips per day of 5 Cu. M capacity Trucks/ Tractors involved in sand transport.

Controlling Dust Levels:

The environmental control measures proposed to control the fugitive dust includes:

- Haul road will be maintained regularly. Water tankers with spraying arrangement willbe used for regular water sprinkling on the haul roads to ensure effective dust suppression.
- Speed limits will be prescribed for transport vehicle Regular maintenance of transportvehicles;
- Ore carrying trucks will be effectively covered by tarpaulin to avoid escape of fines tothe ambient air.
- Dumpers will not be overloaded to prevent spillage on the road.
- Plantation/green belt development along approach/transportation roads; and Controlling of SO2&NO2 Levels. The source of SO_2& NO_2 would be due to vehicularemissions. This can be controlled by :
    a) Periodic maintenance of the trucks/dumpers used in transport of sand will be done as per manual and/or at regular interval to reduce smoke emissions.
    b) Ambient air quality monitoring will be carried out as per CPCB norms exceptmonsoon season.

Noise Pollution Control:

Noise will be produced at the mine due to movement of transport vehicles only. This will be temporary and insignificant as the noise generated by the mining activity is dissipated within a small zone around the mine.

As the mining process involves only extraction of sand from the riverbed manually, there is no major noise generation. In the mine, no machinery will be used. Major noise sources are transportation vehicles. The noise produced due to vehicle will not be continuous throughout the day.

Water Requirement and Supply:

About 4.5 KLD water will be required in the mine for dust suppression, plantation and drinking purposes. Water will be supplied by authorized water transported through tankers from nearby village.

Water Quality Management:

- **Impacts on water quality:**

There is no wastewater generation in the sand mine. The only water contaminant is rainwater

run-off during the monsoon season. Mining will be carried out in dry river bed and it will remainabove the ground water table. There will be no impact due to the proposed mining on the water environment and the water flow pattern does not disturb the turbidity and velocity. The impact on the aquatic flora & fauna due to the proposed opencast excavation is insignificant as it involves only scooping of sand from the dry river bed which will not disturb

the aquatic life present in the river.

Water pollution control measures:

In order to ensure that the project activities shall not affect the water environment, the followingmeasures will be taken up:

- Mining will be closed during the monsoon season and at the time of floods. This will helpin replenishment of sand in the river bed.
- Sand will be collected in slices up to depth of 3.0m or above the ground water level.
- Mining will be restricted minimum 7.5m away (inward) from river bank to minimize effectof river bank erosion and to avoid consequent channel migration.
- River stream will not be diverted to form in active channels.
- Ground water levels will be monitored regularly in and around sand mining project.
- Mining will be started from north western side and advanced towards eastern side across the river uniformly. In order to maintain safety and stability of river banks, a minimum distance of 7.5 m is left as safety zone.
- Mining at the concave side of the river channel will be avoided to prevent bank erosion.
- Meandering segment of river will be selected for mining in such a way to avoid natural eroding banks and to promote mining on naturally building meander components.
- Water Quality Monitoring for the ground waters, river water and other surface waters shallbe carried out seasonally to ensure that the water quality is not affected by the project activities.

Waste Management:

No waste or overburden is generated hence waste management is not required.

Land Environment:

Land environment control measures:

1) Mining in 14.0 ha will be carried out leaving 7.5m as undisturbed as safety

barrieraround the mine pits.

2) The annual production will be less than replenishment rate of the river.
3) Mining will be restricted minimum 3m away (inward) from river bank to minimize effect of river bank erosion and to avoid consequent channel migration
4) Mining at the concave side of the river channel will be avoided to prevent bank erosion. Plantation will be carried out along the banks of the river to control erosionof banks.
5) Slopes of the mine pits will be maintained below 35°.

Biological Environment:

No RET (Rare, Endanger and Threatened) species has been spotted within the study area. There will be no loss of forest resources like medicinal plants, endangered & rare species during the mining operation. as no deforestation is involved since excavation is done on the deposited sand of a river. The mining will be carried out in dry bed without disturbing the aquatic species and will not disturb the aquatic life in the river. Since there will be no pollution of the river water due to the proposed mining activity the aquatic biodiversity will not be affected. There will be no habitatfragmentation or blocking of migratory corridors due to the proposed mining activity.

Plantation Programme:

As the mine lease area is located within the riverbed, it is not suitable for plantation and green belt development, no plantation is proposed in haul roads of the lease area. However, plantation of local species of trees plantation will be carried out along the banks of the river near the mine lease area to form a green belt which will help in reducing the erosion of the river banks and also to actas a dust and noise arresting screen. Plantation will also be carried out along the mineral transportation roads in the nearby villages. About 2240 saplings per annum will be planted in during plan period. Also plantation will be carried out in the available free government areas with in the study area. Speciessuggested for mixed plantation of species like:

a) ***Acacia sp. (Akashmoni, Sonajhuri)***
b) ***Adina Cordifolia (Haldu, Karam)***
c) ***Aegle marmelos (Bael tree)***

d) ***Albizzia Lebbec (Kalasirish, Kalsish)***

e) ***Anthocephalus cadamba (Kadam)***

f) ***Azadirachta indica (Neem, Nim)***

g) ***Bombax ceiba (Simul, semal)***

h) ***Casuarina equisetifolia (Jhau)***

i) ***Diospyros Melanoxylon (Kend, Tendu)***

Socio-Economic Environment:

The project activities shall not have any adverse impacts on any of the common property resourcesof the village communities, as the mine lease area is not being used for any purpose by any section of the society in this region. There is no Resettlement & Rehabilitation involvement in this project.There is no land acquisition in this project. The project is expected to yield a positive impact on the socio-economic environment. It will help for improving direct and secondary employment opportunities for the local people.

Employment Potential:

Besides the direct and indirect employment to approx 155 persons, the company will provide vocational skill training to the unemployment youth of the neighboring villages through outside agencies. Local villagers residing in the nearby villages shall be employed as semiskilled workers.

Occupational Health & Safety Measures:

There is no environmental pollution due to the proposed mining as it is proposed to be a manual scooping of sand on the banks of Damodar River. Hence there will be no major occupational health hazards. Periodic Medical Examination shall be conducted to the workers, wherein a detailed examination and health survey including routine tests shall be conducted and records shall be maintained.

- Employee will be adequately trained and educated for involvement and commitmentin to the implementation of health and safety guidelines.
- Monitoring the effects of mining activities on safety and health and conducting regular performance reviews through periodical health check-ups.
- Provision of all necessary resources for safety and health of employees and contractors engaged in mining.
- Setting of safety and health objectives based on comprehensive strategic plans and

measure performance against these plans.

- Implementing safety and health management system and assessing the effectiveness through periodic audits.
- Organizing regular health check-up of the employee.

Site Services:

Temporary office shed, Rest shelters, water supply and first aid facilities will be provided at site. Mostly local people will be employed in the mine.

Safety Provision:

All provisions in safety rules and regulation will be maintained by providing required safetyequipment to the employees. The lessee will provide safety shoes, safety helmets to all the employees. The safety precautions will be followed as per the provisions of Mines Rules and standards.

Environmental Monitoring Programme:

Environmental monitoring will be carried out regularly for ensuring the compliance of environmental standards and conditions stipulated by various regulatory agencies. Services of a recognised laboratory will be hired for monitoring work. Compliance with the conditions will be submitted to the regulatory agencies periodically.

Budget for Environmental Protection:

It is necessary to include the environmental cost as a part of the budgetary cost component. For this, a sum of Rs. 47,48,500 lakhs/annum approx., is allocated for environmental protection activities. This will include the cost of water sprinkling, plantation, environmental monitoring,

Table 10-1: Proposed Budget for Environmental Monitoring/Protection.

S.No	Particulars	Amount per annum (INR)
1	Dust suppression	550000
2	Plantation and its protection	800000
3	Environmental Monitoring	550000
Total in INR per annum		19,00000

Corporate Environmental Responsibility and Health and hygiene:

As per the MoEF&CC OM No. 22-65/ 2017-IA II(M) dated 01.05.2018, it has been recommended that 2% of the project cost will be accorded for Corporate Environmental responsibility and 2% for

Health and Hygiene.

Table 10-2: Proposed Budget for Environmental Monitoring/Protection.

S.No	Particulars	Amount per annum (INR)
1	Personal Protective Equipment	153000
2	Social Welfare Measures	303500
3	Health and Hygiene	303500
Total in INR per annum		**760000**

Environment Policy:

we recognize the significance of preserving the environment while undertaking our sand mining project . As a responsible entity, we are committed to ensuring that our operations have minimal adverse impacts on the environment and local communities. This policy outlines our approach to environmental conservation and sustainable sand mining practices:

1. Compliance with Regulations: We will adhere to all relevant national and local environmental laws, regulations, and guidelines pertaining to sand mining in West Bengal. Our operations will be conducted in full compliance with the stipulated permits and licenses.

2. Environmental Impact Assessment (EIA): Before commencing any mining activities, we will conduct a comprehensive Environmental Impact Assessment (EIA). This assessment will identify potential environmental risks and help develop appropriate mitigation measures.

3. Biodiversity Conservation: We will take measures to protect and conserve the local biodiversity in the mining area. Special attention will be given to endangered and sensitive species, and their habitats will be preserved to the greatest extent possible.

4. Water Management: Water resources in the vicinity of the mining site will be managed responsibly. We will implement water recycling and conservation techniques to minimize water consumption and prevent contamination.

5. Dust Control and Air Quality: To mitigate dust emissions, we will implement effective dust control measures throughout the mining process. Regular air quality monitoring will be conducted to ensure compliance with acceptable standards.

6. Rehabilitation and Restoration: Upon the completion of mining activities, we will rehabilitate and restore the mined-out areas. The land will be reclaimed and revegetated to its original ecological condition or transformed into an ecologically viable alternative.

7. Community Engagement: We will engage in open and transparent communication with the local communities. Their concerns, needs, and suggestions will be considered in our decision-making processes.

8. Health and Safety: Employee safety and health will be our top priority. Adequate safety measures will be implemented to prevent accidents and occupational health hazards.

9. Resource Optimization: We will adopt sustainable practices to optimize the use of natural resources. This includes responsible extraction techniques and efficient use of energy during the mining process.

10. Monitoring and Reporting: We will establish a robust monitoring system to continuously assess the environmental impacts of our mining activities. Regular reports will be generated and shared with relevant authorities and stakeholders.

11. Continuous Improvement: We are committed to continuous improvement in our environmental performance. Feedback from stakeholders, scientific advancements, and lessons learned from previous projects will be used to enhance our practices.

12. Emergency Response Plan: We will develop and implement an Emergency Response Plan to address any environmental accidents or unforeseen incidents promptly and effectively.

This environmental policy will serve as a guiding document for our sand mining project. By integrating sustainable practices into our operations, we aim to safeguard the environment and contribute positively to the well-being of local communities and ecosystems. Our commitment to environmental protection aligns with our vision of creating a greener and more sustainable future.

Organization Manpower:

- **Organisational Setup:**

Environmental monitoring and reporting will be designed to provide a close watch on the surrounding natural environment and provide early warnings of any adverse changes that may berelated to some dimension of the mining and allied operations.

- **Man Power:**

Environmental Management & Monitoring Division (EMMD) will be manned by adequate staff. Services of retired forest officials may be taken for the effective implementation of plantation schemes. For the development and maintenance of jobs like drainage, settling tanks etc., assistance from the project civil engineering department may be taken. Manpower

recommended is includedin the Table below.

Figure 10-1: Manpower requirement for environmental management & monitoring.

S.No	Description	Nos.
1.	Manager, (Pollution Control)/ horticultural Supervisor	2
2.	Field assistant	3
3.	Labourers	5
	Total	**10**

CHAPTER – 11

Summary and Conclusion:

The mining industry in India is a major economic activity which contributes significantly to the economy of India. Unless the mining of the minerals is properly regulated, they can show adverse consequences on the environment and socio-economic components of the society. It also disturbs the Air, soil, water and ecological parameters. On the other hand, it develops the economic standard of the region. Issues of Technology for zero waste or low waste mining, relief & rehabilitation, mine closure which otherwise leads to land degradation, are important issues which require continuous attention. In order to mitigate the impact of mineral mining on the environment, a scientific assessment is very important for framing sustainable development strategies. Therefore, the implementation of scientific mining principles through EIA & EMP plays a vital role in sustainable economic growth of our country.

The Environmental Impact Assessment has been prepared to access the present scenario of the study area for the proposed mining activity. Based on the assessment an environment management plan (EMP) has been prepared, which helps in minimizing the adverse effects of the mining on the surrounding Environment.

The draft Environment Impact Assessment report is being prepared to comply with the Term of reference (TOR) received from MoEF&CC under EIA notification of MoEF dated 14 September and its amendments for seeking environmental clearance for sand mining in Damodar river bed over an area of 9.50 Ha. In Tajpur mouza of Bankura district of West Bengal. The project proponent has submitted application for prior Environmental Clearance (EC) and State Expert Appraisal Committee has considered the same during the meeting held on 73rd meeting held on 23.03.2023, subsequent to the discussions held on 25.04.2023, State Environmental Impact Assessment Authority (SEIAA) has issued the Terms of Reference (ToR) for conducting the Environmental Impacts Assessment (EIA) study and to prepare EIA report for conducting the Public hearing as part of Environment Clearances Process. This Environmental Impact Assessment (EIA) report is prepared to comply with the Terms of Reference (TOR) received from SEIAA under EIA notification of the MoEF dated 14-9-2006 and its amendments of MoEF&CC, Govt. of India, for seeking Environmental Clearance (EC) for sand mining in the applied mining lease area measuring 9.50 Ha falling under category "B2".

The proposed mine lease has been granted to "**West Bengal Mineral Development & Trading Corporation Limited"** on 17 February 2023. The mining plan for the Mine lease (ML) area has

been approved by the Senior Geologist Bajlur Rahaman (Dte of Mines & Minerals, G.P. Branch, S.B. Unit Bankura vide letter no SGP/MP/6-21/2023/31 dated 17th September 2023.

Table 11-1: Salient Features of Baseline Environmental Studies.

Attribute	Parameter	Frequency of Monitoring
Micro - meteorological Studies	Wind Details like speed, direction, Temperature, Relative Humidity and Rainfall	3 months data has been collected to assess air pollution impacts on the surrounding environment.
Ambient Air Quality	PM_{10} $PM_{2.5}$ Sulphur Dioxide ($S0_2$) Oxides of Nitrogen (NOx)	3 months data has been collected to assess baseline Air Quality status of the area.
Noise Quality Data	Noise levels	1 middle month data has been collected to identify noise producing areas.
Water Quality, Soil Quality Data and Land Use pattern	Physical & Chemical parameters along with measurement of heavy metals and land use parameters.	To establish baseline Water Quality, Soil Quality for future reference and Land Use Pattern in the area
Socio-Economic & Demographic Studies	Socio-Economic parameter	To know the present Socio-Economic status of the study area

Environmental Monitoring Program:

Regular monitoring of the various environmental parameters is necessary to evaluate the effectiveness of the management programme so that the necessary corrective measures can be taken in case there are some drawbacks in the proposed programme. Since environmental quality parameters at work zone and surrounding area are important for maintaining sound operating practices of the project in conformity with environmental regulations, the post project monitoring work forms part of Environmental Monitoring Program. Post Monitoring of various environmental parameters will be carried out on regular basis to ascertain the following:

- Status of Pollution within the mine site and in its vicinity.
- Generate data for predictive or corrective purpose in respect of pollution.
- Examine the efficiency of pollution control system adopted at site.
- To assess environmental impacts.

Monitoring will be carried out at site as per the norms of CPCB. Environmental Monitoring Programme will be conducted for various environmental components as per conditions stipulated in Environmental Clearance Letter issued by MoEF&CC and consent to operate issued by SPCB.

Six monthly compliance reports will be submitted to MoEF&CC, regional office on 1st of June and 1st of December. Quarterly compliance Report for conditions stipulated in Consent to Operate will be submitted to SPCB on regular basis.

Post Environmental monitoring is an essential step in the EIA process. This justify the predicted impacts, the efficiency of mitigation measures and the shortcomings of prediction methods, measures and even regulations are to be verified and EIA practice improved. Environmental indicators could contribute to designing and evaluating monitoring programs, thus improving establishment of the cause effect relationship and the reporting and communication of environmental data.

The Environmental Monitoring Cell will co-ordinate all monitoring programmes at site and data thus generated will be furnished as per statutory requirements. The frequency of reporting will be on half yearly basis to the SPCB and to SEIAA. The Environmental audit reports will be prepared for the entire year of operations and will be regularly submitted to regulatory authorities.

Environment Management Plan:

- Mining activities will be confined to 3.0 m or ground water level whichever is less depth in the river bed.
- The approach roads from the mining area to the tar road will be properly sprayed with water for dust suppression.
- Greenbelt and plantations will be proposed with the collaborative assistance from local governing bodies. It will help in dust suppression and will also reduce the noise level.
- Plantation will improve the ecology and aesthetic beauty of the area.
- Measures will be taken to Limit the mining activities in the provided lease area by installing proper demarcated pillars and boundaries along the perimeter of the lease area.
- Prior to commencement of mining, a short awareness program will be conducted for labours to make them aware of way of working and various precautions to be taken while at work. Such program will be repeated periodically.
- It will be ensured that noise produced due to vehicles movement while carrying sand is within the permissible noise level.
- No stacking of River Bed Material will be done in the river bed or mining lease area.

DETAILS OF PLANTATION

YEAR	NO. OF PLANTS	LIKELY SPECIES OFPLANTS
1ST YEAR	600	*a) Acacia sp. (Akashmoni, Sonajhuri)* *b) Adina Cordifolia (Haldu, Karam)* *c) Aegle marmelos (Bael tree)* *d) Albizzia Lebbec (Kalasirish, Kalsish)* *e) Anthocephalus cadamba (Kadam)* *f) Azadirachta indica (Neem, Nim)* *g) Bombax ceiba (Simul, semal)* *h) Casuarina equisetifolia (Jhau)* *i) Diospyros Melanoxylon (Kend, Tendu)*
2ND YEAR	600	
3RD YEAR	600	
4TH YEAR	600	
5TH YEAR	600	
Total	**3000**	

MEASURES FOR AIR POLLUTION AND DUST SUPPRESSION

Control of Air Pollution Due to Dust, Exhaust Emissions or Fumes During Mining or Processing Operations for Minor Mineral & Related Activities and Containing the Same Within Permissible Limits Specified Under: -

a) Roadside plantations will be done in order to prevent the spreading of dust.

b) Water spraying will be done twice a day over the haul road & roads leading to adjoining state roads.

c) Dust respirators will be provided to the operators of the mine worker.

d) Preventive maintenance shall be carried out on equipment.

e) Every workplace where the air-borne dust is generated, is to be sampled and the concentration of the respirable dust will be determined regularly. If any measurement at any workplace and at source, the concentration in excess of measurements shall be carried on and a 6 monthly compliance report will be submitted to the appropriate authority respectively.

f) Silencers will be fitted to the dumpers.

MEASURES RELATED TO TRANSPORTATION

- Regular water spraying on haulage roads during mineral transportation by water sprinklers of rotary type, which will cover the whole width of haulage road in one round.

- Avoid over loading of tippers & consequent spillage on the roads.
- Mineral carrying trucks will be effectively covered by tarpaulin to avoid escape of fines to atmosphere.
- Air quality shall be regularly monitored both in the core zone and the buffer zone.

MEASURES FOR CONTROLLING NOX LEVEL

The source of NOx is due to vehicular emission. This can be controlled by proper maintenance and servicing of the vehicles. Only PUC certified vehicles will be permitted.

MEASURES FOR NOISE POLLUTION

There is no drilling and blasting for mineral extraction. Noise pollution will only be due to loading and transporting equipment. Effective steps will be taken to keep the noise level well below the DGMS prescribed limit of 85 dBA. Noise control is achieved by the following:

- Proper care and maintenance of the equipment will be carried out.
- Personal protective equipment will be provided to the workers. Along the haul road plantation shall be done to act as an acoustic barrier.

MEASURES ON WATER QUALITY MANAGEMENT

There is little flow of water in the river bed in the post-monsoon period. The area is having an average of 1400 mm rainfall in a year. During the rainy season, catchments water flows into the river. During the dry period, the Sand is excavated which gets replenished to some extent during this period. No mining activities will be carried out during the rainy season when there is water flowing in the working area.

CHAPTER – 12

Disclosure of the Consultant

This EIA report is prepared on behalf of the proponents, WBMDTCL by the environmental Consultant, "M/s. Indian Mine Planners and Consultants" (IMPCON). The head office of IMPCON is at Kolkata.

Indian Mine Planners & Consultants (IMPCON) was established in 2007 with the prime objective of guiding for total mining solution in Mine Planning for the Mine Entrepreneurs of Government, Public Sectors and Private Sector bodies engaged in the field of mining of Coal, Metallic and non- Metallic deposits. The services are provided by the energetic and highly experienced mine planners and guided by the dynamic, pragmatic, qualified and experienced advisors in the field of mining with an aim to ensure safety, productivity and sustainable mining with due regard to quality and environment.

Currently, IMPCON is an ISO 9001:2015 Certified Company & a QCI – NABET accredited Environment Consultant Organisation (ECO), Accredited Prospecting Agency (APA) & Mining Plan Preparation Agency (MPPA) from Jan-2021 and Accredited Exploration Agency (AEA) for Mineral sector.

IMPCON caters to the need of existing as well as new Mining Entrepreneurs for preparing the geological reports, mining feasibility reports, mining plan, detailed mine design, environment impacts assessment (EIA) reports etc. A group of advisors from various disciplines with over 40 years of experience from organizations like Geological Survey of India, Various subsidiaries of Coal India Limited (CIL) including Central Mine Planning & Design Institute Limited (CMPDIL), Steel Authority of India Limited (SAIL), Indian School of Mines etc. provide their valuable guidance.

IMPCON also delivers advisory services in all aspects of geological exploration, geo technical services, hydro-geology, mine planning & detailed design, electrical installations and maintenance, possible improvement areas of mechanical performance of the high capacity mining machineries, civil and infrastructural job planning, choice of equipment's for mining, manpower, planning and finally total economics for project viability.

NABET Accreditation Details of the Consultants

Table 12-1: EIA Team

NAME	FUNCTUIONAL AREA
Dr. N. B. Chanda	Air Pollution Monitoring, Prevention and Control (AP)
	Water P ollution monitoring,prevention and control (WP)
	Geology (GEO)
Dr.A.S. Shannigrahi	Meteorology, Air Quality Modelling, and Prediction (AQ)
Mr.Gopal Chandra Das	Land Use and Land Cover (LU)
	Soil Conservation (SC)
Dr. Tapan Kumar Mishra	Ecology & Biodiversity (EB)
Mr. Sanjib Chattopadhyay	Noise and Vibration (NV)
	Solid Waste Management (SW)
	Hazardous Waste Management (HW)
Ms. Nidhi Singh Rathod	Socio – Economy (SE)
Mr. Debashish Ghosh	Hydrology, Ground Water and Water Conservation (HG)
Mr. Debashish Basu	Noise and Vibration & Hazards Management (RH)
Mr. Arpan Chakraborty	TEAM MEMBER (TM)

Details of the Laboratory

N.D. International is a multinational organisation located in India and Japan. Their laboratory is accredited by NABL, ISO 9001:2015 Certified and recognised by other governmental departments. The Details of their laboratory are:

Table 12-2: Laboratory Partner

Name of and address of the Laboratory	Scope of services	Accreditation status
ND International Address: 17, Jnan Goswami Sarani, 107b, Block-F,New Alipore, Kolkata, West	Monitoring and Analysis of: •Ambient Air Quality •Noise Quality •Soil Quality • Ground Water Quality	Accredited by NABL, Certificate No. TC-5910 Validity: 06th June 2024

Related all documents are attached as Annexures

Annexure I: Mining Plan Approval Letter

Government of West Bengal
Office of the Senior Geologist
Directorate of Mines and Minerals
Geological Prospecting Branch, South Bengal Unit
Pranabananda Sarani, Bankura – 722 102

No .SGP./MP/6-21/2023/ 31 Dated, Bankura, 17th February, 2023

To,
The Chairman and Managing Director,
West Bengal Mineral Development & Trading Corporation Limited,
WBIIDC Building, 3rd Floor, DJ-Block, DJ-10,
Sector-II, Bidhannagar (Saltlake City),
Kolkata – 700091

Subject- **Approval of 08(Eight) Nos of "Mining Plan" for mining of 'River-bed Sand' in respect of Sand Blocks, bearing I.D. MIN_BNK_5, MIN-BNK-6, MIN_BNK_7, MIN_BNK_10, MIN_BNK_11, MIN_BNK_45, MIN_BNK_46, MIN_BNK_47.**

Ref.- **IC&E Department's Order No. 689/ICE-12011(99)/68/2022-MINES dated 30.11.2022 and submission of Hard Copies of above referred Mining Plans by CEO of INDIAN MINE PLANNERS & CONSULTANT Mr. P. P. Gupta and RQP Dr. N.B. Chanda dt. 23.01.2023.**

Sir,

1. In exercise of power conferred under **Sub rule 2(b) under Rule 4** of the **West Bengal Minor Minerals Concession Rules, 2016** read with **Gazette Notification No. 48-ICE/O/MIN/GEN-MIS/17/2021 dt. 25/01/2022** along with **Order No. 456/2C-672/2022, dt. 22/12/2022**, I, the undersigned, am hereby approving the above mentioned **Mining Plans** for **'River- bed Sand'.** The Mining Plans concerned are applicable to mining of Sand as mentioned in the Mineral Block Code in the following table :

2.

Sl. No.	Block ID	Mouja	Plot No.	JL No.	Area(Ha)	River
1.	MIN_BNK_5	Balarampur	895	62	15.14	Damodar
		Purunia	210	63		
2.	MIN_BNK_6	Dighalgram	964	69	24.59	
		Japamali	3794	70		
3.	MIN_BNK_7	Banjora	2870	73	15.74	
		Jalanpur	2053	74		
4.	MIN_BNK_10	Tajpur	1582	56	9.50	
5.	MIN_BNK_11	Pakhanna Bhairabpur	01	57	16.82	
6.	MIN_BNK_45	Dubrajpur	11/414	110	2.36	Drakeshwar
		Sahapur	429	111		
7.	MIN_BNK_46	Sahapur	429	111	14.50	
		Bathantore	431	113		
		Elyati	847	114		
8	MIN_BNK_47	Elyati	847	114	5.87	
		Belatukri	1603	117		

Annexure II: 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. 809 / EN / T – II – 1/ 336/ 2023 Date: 26th April, 2023

To
M/s. West Bengal Mineral Development and Trading Corporation Limited.
13, Nellie Sengupta, sarani ,
2nd floor, Kol- 700087,

Sub: ToR for doing EIA for the proposed Barjora Riverbed Sand Mine (MIN_BNK_10) over an area of 9.50 ha (23.47 Acres) on Damodar River at JL. No.: 56, Plot No.: 1582, Mouza: Tajpur, P.S. – Onda, Dist. – Bankura, West Bengal, (proposal no SIA/WB/MIN/422801/2023)

Sir,

This is to inform you that SEIAA in its meeting on 25.04.2023 considered your online application (vide Proposal No. SIA/WB/MIN/422801/2023) 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.

Enclo: Annexure 1

(K Balamurugan)
Member Secretary, SEIAA

No. 809/1/EN/T-II-1/336/2023 Date: 26th April, 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

Annexure III: Letter of Intent

ANNEXURE - III

Government of West Bengal
DEPARTMENT OF INDUSTRY, COMMERCE & ENTERPRISES
Mines Branch
4, Abanindranath Tagore Sarani (Camac Street), Kolkata – 16

Memo No.-689/ICE-12011(99)/68/2022-MINES Date: 30/11/2022

To: Chairman & Managing Director
West Bengal Mineral Development & Trading Corporation Ltd.

Sub: Provisional Grant Order for Sand Blocks
Ref: Your Office Memo No. MDTC/SAND/003/987 dated 27.04.2022

Sir,

With reference to the subject mentioned above, I am directed to inform you that Provisional Grant Order is hereby accorded by this department to the West Bengal Mineral Development & Trading Corporation Ltd. for the sand blocks already auctioned from your end (Annexure attached).

You are requested kindly to arrange to prepare the mining plan for the sand blocks, get them approved by competent authority and also to obtain Environmental Clearance and all other statutory clearances as per norms.

On completion of the above-mentioned process, mining lease shall be executed between this department and the corporation in due course.

This has the approval of the competent authority of this department.

Yours faithfully,

Deputy Secretary

No. 689/1(11)-ICE-12011(99)/68/2022-MINES Date: 30/11/2022

Copy forwarded for kind information and necessary action to :

1. The Director of Mines and Minerals,West Bengal.

2-7. ADM & DL&LRO (Alipurduar, Bankura, Birbhum, Darjeeling, Paschim Bardhaman & Paschim Medinipur).

8. The Chief Mining Officer, West Bengal.
9. PA to Principal Secretary, Dept of Environment with request to place it for the appraisal of the authority.
10. PA to Secretary ,Dept of I, C & E with request to place it for the appraisal of the authority
11. PA to Secretary, Dept. Of L&LR and R&RR with request to place it for the appraisal of the authority

Deputy Secretary

MINING PLAN INCLUDING MINE CLOSURE PLAN
RIVER BED MINING FOR SAND
AT DAMODAR RIVER BED
(As per West Bengal Minor Mineral Concession Rules 2016 & Sand Mining Policy, Govt. of WB 2021)

LESSEE: **West Bengal Mineral Development & Trading Corporation Limited**

ADDRESS: 3rd Floor, DJ – 10, WBIIDC Building,
DJ Block, Sector – II, Salt Lake,
Kolkata – 700091, West Bengal

POTENTIAL ZONE CODE (as per DSR): BNK_DA_BJ_20

SAND BLOCK CODE: MIN_BNK_10

MINERAL: Riverbed Sand

MOUZA: Tajpur,

AREA: 9.50 Ha or 23.47 Acres

PLOT NO.: 1582; J.L. No.: 56,

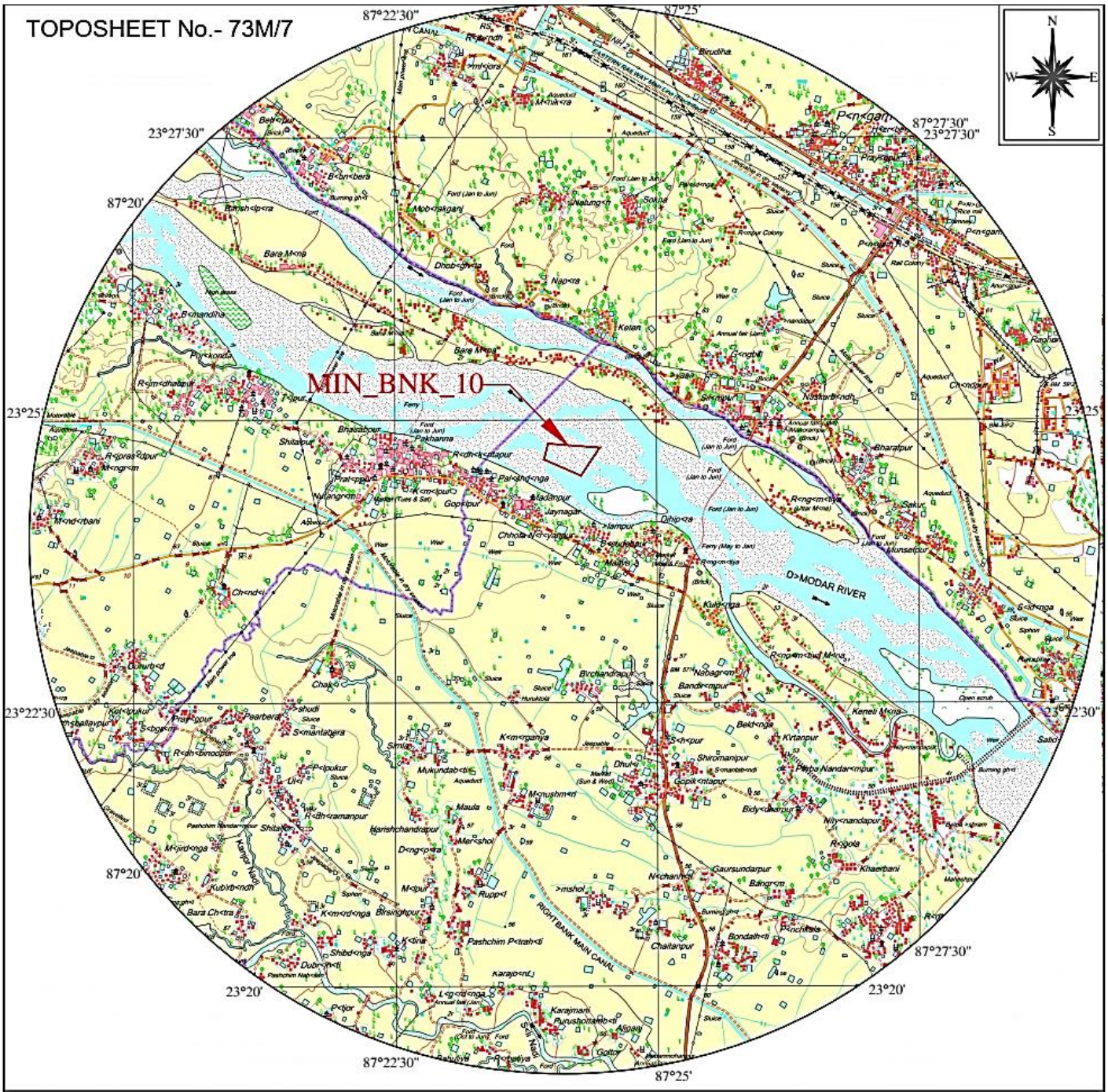
RIVER: Damodar River; P.S.: Barjora,

DISTRICT: Bankura,

PREPARED BY: Dr. N. B. Chanda
RQP Regn No.: Qualified Person
VALID TILL: Not Applicable

APPROVED
Valid for Period

Annexure V: Project Site Located on Toposheet



INDEX

BLOCK BOUNDARY

SCALE: 1:50000
ALL SCALE ARE IN METER

PLATE NO. - 2

SAND MINING LEASE (MIN_BNK_10)
MOUZA - TAJPUR
PS - BARJORA, DIST. - BANKURA, STATE - WEST BENGAL
[PLOT No. - 1582 (P)] JL No. - 56
AREA - 23.47 Acres (9.50 Ha)

WBMDTCL

TOPOGRAPHICAL PLAN

SCALE -1:50000	DATE: AUGUST, 2022
PREPARED BY:	DR. N.B. CHANDA
RQP Regn no:	RQP/KOL/372/2011/A

Annexure VI: Soil Analysis Report

N.D. INTERNATIONAL

GOVERNMENT REGISTERED

An ISO 9001:2015 Company Certificate : 20DQHH82

035-CB-QMS

TEST REPORT

Format No.: NDI/FM/81

Certificate No.: SL(D)-(NN)/23-24/4569 Date: 13.03.2023

SAMPLE SUBMITTED BY PARTY : Page 1 of 2

Name of Customer	: Indian Mine Planners and Consultants
Address	: GA- 61, Rajdanga Main Road, Behind Vivanta Hotel , EM Bypass,
	: Kolkata- 700107
Description of Sample	: Soil
Collection Source	: MIN BNK - 10 (Barjora) L_1
Sampling Done by	: Mr. A. Mondal & R. Mondal
Environmental Condition	: Temperature: 38°C, Humidity: 47% Sample Quantity : 500g
Sample Drawn on	: 08.03.2023 Sample Received on : 08.03.2023
Analysis Started on	: 08.03.2023
Analysis Completed on	: 13.03.2023

A. CHEMICAL TEST FINDINGS :

Sl. No.	Test Parameters	Test Method	Unit	Result
1	Electrical Conductivity (1: 2.5 Aqeous solution)	IS 14767 : 2000 134	µs/cm	208
2	Nitrogen	IS 14684:1999	%	0.10
3	Moisture	IS 2720 (Part-2) :1973	%	20.72
4	Specific Gravity	NDI/CHEM/SOP/S-03	–	2.86
5	Bulk Density	FAO Method: 2007	gm/cm^3	2.72
6	Phosphorus as P	FAO: (METHOD)U.N 2007	mg/g	0.216
7	Potassium as K	13.1 of FAO : 2007	mg/g	0.25
8	Sodium Absorbtion Ratio (SAR)	IS 11624:2019	-	1.28
9	Permeability	NDI/CHEM/SOP/S-05	cm/h	15.60
10	Calcium as Ca	The Fertilizer Control Order 1985	mg/g	0.92
Texture of Soil				
11	Gravel	FAO Method: 2007	%	Nil
12	Sand	FAO Method: 2007	%	13.23
13	Slit	FAO Method: 2007	%	19.26
14	Clay	FAO Method: 2007	%	48.25

...END OF TEST REPORT...

N.D. INTERNATIONAL KOLKATA

For, N.D. International

K. P. De - CEO

(Authorised Signatory)

1. The test report shall not be reproduced,except in full,without written approval of the company.
2. Results relate only to the parameters tested.
3. The remaining sample after test will be retained for 15 days from the date of issue of certificate.

DH

107B, Block-F, New Alipore, Kolkata-700 053, Phone : 4021-6600-17 (18 Lines), 4021 6600 (Direct), Mob.: 9830654565, 9830789456
E-mail : ndinternational@gmail.com, Website : www.ndinternational.in

N.D. INTERNATIONAL

GOVERNMENT REGISTERED

An ISO 9001:2015 Company Certificate : 20DQHH82

035-CB-QMS

TEST REPORT

Format No.: NDI/FM/81
Date: 13.03.2023

Certificate No.: SL(D)-(NN)/23-24/4570

SAMPLE SUBMITTED BY PARTY :

Name of Customer	: Indian Mine Planners and Consultants
Address	: GA- 61, Rajdanga Main Road, Behind Vivanta Hotel , EM Bypass,
	: Kolkata- 700107
Description of Sample	: Soil
Collection Source	: MIN BNK - 10 (Barjora) L_2
Sampling Done by	: Mr. A. Mondal & R. Mondal
Environmental Condition	: Temperature: 38°C, Humidity: 47% Sample Quantity : 500g
Sample Drawn on	: 08.03.2023 Sample Received on : 08.03.2023
Analysis Started on	: 08.03.2023
Analysis Completed on	: 13.03.2023

A. CHEMICAL TEST FINDINGS :

Sl. No.	Test Parameters	Test Method	Unit	Result
1	Electrical Conductivity (1: 2.5 Aqeous solution)	IS 14767 : 2000 134	µs/cm	202
2	Nitrogen	IS 14684:1999	%	0.08
3	Moisture	IS 2720 (Part-2) :1973	%	20.26
4	Specific Gravity	NDI/CHEM/SOP/S-03	--	2.68
5	Bulk Density	FAO Method: 2007	gm/cm^3	2.55
6	Phosphorus as P	FAO: (METHOD)U.N 2007	mg/g	0.203
7	Potassium as K	13.1 of FAO : 2007	mg/g	0.21
8	Sodium Absorbtion Ratio (SAR)	IS 11624:2019	-	1.22
9	Permeability	NDI/CHEM/SOP/S-05	cm/h	14.20
10	Calcium as Ca	The Fertilizer Control Order 1985	mg/g	0.82
Texture of Soil				
11	Gravel	FAO Method: 2007	%	Nil
12	Sand	FAO Method: 2007	%	26.36
13	Slit	FAO Method: 2007	%	11.23
14	Clay	FAO Method: 2007	%	62.41

...END OF TEST REPORT...

N.D. INTERNATIONAL KOLKATA

For, N.D. International

K. P. De - CEO
(Authorised Signatory)

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DH

N.D. INTERNATIONAL

GOVERNMENT REGISTERED

An ISO 9001:2015 Company Certificate : 20DQHH82

035-CB-QMS

TEST REPORT

Format No.: NDI/FM/81
Date: 13.03.2023

Certificate No.: SL(D)-(NN)/23-24/4571

SAMPLE SUBMITTED BY PARTY :

Name of Customer	: Indian Mine Planners and Consultants
Address	: GA- 61, Rajdanga Main Road, Behind Vivanta Hotel , EM Bypass,
	: Kolkata- 700107
Description of Sample	: Soil
Collection Source	: MIN BNK - 10 (Barjora) L_3
Sampling Done by	: Mr. A. Mondal & R. Mondal
Environmental Condition	: Temperature: 38°C, Humidity: 47% Sample Quantity : 500g
Sample Drawn on	: 08.03.2023 Sample Received on : 08.03.2023
Analysis Started on	: 08.03.2023
Analysis Completed on	: 13.03.2023

A. CHEMICAL TEST FINDINGS :

Sl. No.	Test Parameters	Test Method	Unit	Result
1	Electrical Conductivity (1: 2.5 Aqeous solution)	IS 14767 : 2000 134	µs/cm	212
2	Nitrogen	IS 14684:1999	%	0.11
3	Moisture	IS 2720 (Part-2) :1973	%	20.88
4	Specific Gravity	NDI/CHEM/SOP/S-03	--	2.91
5	Bulk Density	FAO Method: 2007	gm/cm^3	2.79
6	Phosphorus as P	FAO: (METHOD)U.N 2007	mg/g	0.21
7	Potassium as K	13.1 of FAO : 2007	mg/g	0.22
8	Sodium Absorbtion Ratio (SAR)	IS 11624:2019	-	1.29
9	Permeability	NDI/CHEM/SOP/S-05	cm/h	14.68
10	Calcium as Ca	The Fertilizer Control Order 1985	mg/g	0.87
Texture of Soil				
11	Gravel	FAO Method: 2007	%	Nil
12	Sand	FAO Method: 2007	%	22.57
13	Slit	FAO Method: 2007	%	12.68
14	Clay	FAO Method: 2007	%	64.75

...END OF TEST REPORT...

N.D. INTERNATIONAL KOLKATA

For, N.D. International

K. P. De - CEO
(Authorised Signatory)

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DH

107B, Block-F, New Alipore, Kolkata-700 053, Phone : 4021-6600-17 (18 Lines), 4021 6600 (Direct), Mob.: 9830654565, 9830789456
E-mail : ndinternational@gmail.com, Website : www.ndinternational.in

Annexure VII: Ambient Air Quality Monitoring Report

N.D. INTERNATIONAL

GOVERNMENT REGISTERED

An ISO 9001:2015 Company Certificate : 20DQHH82

TEST REPORT

SAMPLE DRAWN BY US:

Certificate No. NL(M)/23-24/0130 **Date: May 31, 2023**

Name of Customer : Indian Mine Planners and Consultants.

Address : GE-61,Rajdanga Main road,East Kolkata Township Project,E.M Bypass,Kol-107

: Site Address : MIN-BNK-10(Barjora).

Description of Sample : Ambient Air.

TEST FINDINGS :

SL No.	Date of Monitoring	Collection Source : L-1					
		PM 10 (µg/m^3)	PM 2.5 (µg/m^3)	SO_2 (µg/m^3)	NOx (µg/m^3)	CO (ppm)	Si (µg/m^3)
1	06-Mar-23	78	50	17	12	< 1.0	4.2
2	09-Mar-23	71	47	21	15	< 1.0	3.5
3	12-Mar-23	65	55	21	15	< 1.0	4.1
4	15-Mar-23	65	51	19	10	1	4.2
5	18-Mar-23	64	46	15	12	1.0	4.1
6	21-Mar-23	68	47	18	11	< 1.0	4
7	24-Mar-23	69	48	22	15	< 1.0	5.6
8	27-Mar-23	64	54	26	11	1	5.1
9	30-Mar-23	64	58	20	15	< 1.0	4.4
10	02-Apr-23	65	61	21	10	1	4.1
11	05-Apr-23	66	60	14	10	1.0	4.6
12	08-Apr-23	64	54	15	8	2.0	6
13	11-Apr-23	60	52	11	9	1	6.2
14	14-Apr-23	65	46	21	10	1	6.1
15	17-Apr-23	70	47	14	10	1	6.1
16	20-Apr-23	68	47	11	9	1	6.3
17	23-Apr-23	64	41	13	11	2	5.8
18	26-Apr-23	59	56	14	10	2	5.1
19	29-Apr-23	60	55	16	14	2	4.4
20	02-May-23	69	46	15	12	2	4.8
21	05-May-23	64	51	20	12	< 1.0	6.4
22	08-May-23	67	44	21	11	1	6.7
23	11-May-23	67	56	25	14	1.0	6.1
24	14-May-23	81	54	21	11	< 1.0	5.8
25	17-May-23	64	41	24	17	< 1.0	4.6
26	20-May-23	63	45	19	14	< 1.0	6.2
27	23-May-23	63	46	16	15	1	6.1
28	26-May-23	61	54	16	15	1	3.1
29	29-May-23	64	61	14	12	1	4.1
30	30-May-22	55	64	16	11	1	4.5
MAX		81	64	26	17	2	6.7
MIN		55	41	11	8	1	3.1
Average		65.6	51.2	17.9	12.0	1.3	5.1

...END OF TEST REPORT...

N.D. INTERNATIONAL KOLKATA

For N.D. International

K.P. De - CEO
(Authorised Signatory)

1 The test report shall not be reproduced, except in full, without written approval of the company.

2 Results relate only to the parameters tested.

3 The remaining sample after test will be retained for 15 days from the date of issue of certificate.

SKR

N.D. INTERNATIONAL

GOVERNMENT REGISTERED

An ISO 9001:2015 Company Certificate : 20DQHH82

035-CB-QMS

TEST REPORT

SAMPLE DRAWN BY US:

Certificate No. NL(M)/23-24/0131 **Date: May 31, 2023** **Page -1 of 1**

Name of Customer : Indian Mine Planners and Consultants.

Address : GE-61,Rajdanga Main road,East Kolkata Township Project,E.M Bypass,Kol-107

: Site Address : MIN-BNK-10(Barjora).

Description of Sample : Ambient Air.

TEST FINDINGS :

SL No.	Date of Monitoring	Collection Source : L-2					
		PM 10 (µg/m³)	PM 2.5 (µg/m³)	SO_2 (µg/m³)	NOx (µg/m³)	CO (ppm)	Si (µg/m³)
1	06-Mar-23	69	58	20	9	< 1.0	3.8
2	09-Mar-23	64	61	21	10	< 1.0	6.3
3	12-Mar-23	74	60	14	10	< 1.0	5.8
4	15-Mar-23	81	54	15	9	< 1.0	5.1
5	18-Mar-23	74	52	11	9	1.0	4.4
6	21-Mar-23	71	46	21	12	< 1.0	4.8
7	24-Mar-23	66	47	14	14	< 1.0	6.4
8	27-Mar-23	69	47	11	15	< 1.0	6.7
9	30-Mar-23	74	41	13	10	< 1.0	6.1
10	02-Apr-23	78	56	14	12	< 1.0	5.8
11	05-Apr-23	70	55	16	15	< 1.0	4.6
12	08-Apr-23	81	46	15	15	< 1.0	6.2
13	11-Apr-23	69	51	20	12	< 1.0	6.1
14	14-Apr-23	64	44	21	12	2.0	2.1
15	17-Apr-23	74	56	25	11	< 1.0	4.1
16	20-Apr-23	81	54	21	14	< 1.0	4.5
17	23-Apr-23	71	41	24	11	< 1.0	5.8
18	26-Apr-23	71	45	19	15	< 1.0	5.1
19	29-Apr-23	66	55	16	11	< 1.0	4.4
20	02-May-23	69	46	15	10	< 1.0	4.8
21	05-May-23	74	51	20	8	< 1.0	6.4
22	08-May-23	78	55	21	9	< 1.0	6.7
23	11-May-23	70	46	20	10	1.0	6.1
24	14-May-23	81	51	21	10	< 1.0	5.8
25	17-May-23	70	44	22	9	< 1.0	4.6
26	20-May-23	74	56	19	9	< 1.0	6.2
27	23-May-23	81	54	15	9	< 1.0	6.1
28	26-May-23	71	41	17	8	< 1.0	3.1
29	29-May-23	71	45	14	7	< 1.0	4.1
30	30-May-22	66	61	19	8	< 1.0	6.6
MAX		**81**	**61**	**25**	**15**	**2**	**6.7**
MIN		**64**	**41**	**11**	**7**	**1**	**2.1**
Average		**72.4**	**50.6**	**17.8**	**10.8**	**1.3**	**5.3**

...END OF TEST REPORT...

N.D. INTERNATIONAL KOLKATA

For N.D. International

K.P. De - CEO
(Authorised Signatory)

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GOVERNMENT REGISTERED

An ISO 9001:2015 Company Certificate : 20DQHH82

035-CB-QMS

TEST REPORT

SAMPLE DRAWN BY US:

Certificate No. NL(M)/23-24/0132 **Date: May 31, 2023**

Name of Customer : Indian Mine Planners and Consultants.

Address : GE-61,Rajdanga Main road,East Kolkata Township Project,E.M Bypass,Kol-107

: Site Address : MIN-BNK-10(Barjora).

Description of Sample : Ambient Air.

TEST FINDINGS :

SL No.	Date of Monitoring	Collection Source : L-3					
		PM 10 ($\mu g/m^3$)	PM 2.5 ($\mu g/m^3$)	SO_2 ($\mu g/m^3$)	NOx ($\mu g/m^3$)	CO (ppm)	Si ($\mu g/m^3$)
1	06-Mar-23	64	45	14	8	< 1.0	4.8
2	09-Mar-23	64	45	12	8	< 1.0	4.7
3	12-Mar-23	65	48	12	8	< 1.0	4.6
4	15-Mar-23	66	46	18	8	< 1.0	4.9
5	18-Mar-23	61	47	20	10	1.0	5. 1
6	21-Mar-23	61	50	20	9	1.0	5.5
7	24-Mar-23	62	51	15	9	1.0	5.6
8	27-Mar-23	63	56	16	7	< 1.0	6.2
9	30-Mar-23	61	54	14	9	1	6.3
10	02-Apr-23	57	45	17	12	< 1.0	6.6
11	05-Apr-23	62	46	12	12	1	6.9
12	08-Apr-23	67	59	15	11	1.0	7.1
13	11-Apr-23	65	51	22	12	1.0	6.5
14	14-Apr-23	61	44	21	17	1.0	6.4
15	17-Apr-23	56	56	25	14	1	6.3
16	20-Apr-23	57	54	21	14	< 1.0	5.8
17	23-Apr-23	66	41	20	15	2	4.7
18	26-Apr-23	61	45	14	15	< 1.0	4.9
19	29-Apr-23	64	56	12	14	2	4.6
20	02-May-23	64	44	13	11	< 1.0	4.1
21	05-May-23	78	51	15	8	1	3.2
22	08-May-23	61	56	14	8	1	6.8
23	11-May-23	60	46	14	12	1.0	6.6
24	14-May-23	60	51	14	14	1	6.1
25	17-May-23	65	45	15	15	< 1.0	6.3
26	20-May-23	66	56	20	15	2	3.5
27	23-May-23	69	55	17	12	1.0	3.8
28	26-May-23	71	41	18	12	1	4.5
29	29-May-23	70	46	18	10	2.0	4.4
30	30-May-22	70	48	19	10	1	4.4
MAX		**78**	**59**	**25**	**17**	**2**	**7.1**
MIN		**56**	**41**	**12**	**7**	**1**	**3.2**
Average		**63.9**	**49.3**	**16.6**	**11.3**	**1.2**	**5.4**

...END OF TEST REPORT...

N.D. INTERNATIONAL KOLKATA

For N.D. International

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TEST REPORT

SAMPLE DRAWN BY US:

Certificate No. NL(M)/23-24/0133 **Date: May 31, 2023** **Page -1 of 1**

Name of Customer : Indian Mine Planners and Consultants.

Address : GE-61,Rajdanga Main road,East Kolkata Township Project,E.M. Bypass,Kol-107

: Site Address : MIN-BNK-10(Barjora).

Description of Sample : Ambient Air.

TEST FINDINGS :

SL No.	Date of Monitoring	Collection Source : L-4					
		PM 10 ($\mu g/m^3$)	PM 2.5 ($\mu g/m^3$)	SO_2 ($\mu g/m^3$)	NOx ($\mu g/m^3$)	CO (ppm)	Si ($\mu g/m^3$)
1	06-Mar-23	58	54	17	9	< 1.0	4.2
2	09-Mar-23	58	62	12	10	< 1.0	5.4
3	12-Mar-23	69	60	11	10	2.0	6.1
4	15-Mar-23	64	51	21	12	< 1.0	5.4
5	18-Mar-23	74	56	18	14	< 1.0	5.1
6	21-Mar-23	81	54	13	11	< 1.0	4.7
7	24-Mar-23	74	41	24	13	< 1.0	4.7
8	27-Mar-23	71	45	19	14	< 1.0	4.6
9	30-Mar-23	66	46	16	17	< 1.0	6.6
10	02-Apr-23	69	54	14	15	< 1.0	6.3
11	05-Apr-23	74	55	16	15	< 1.0	6.4
12	08-Apr-23	78	46	15	15	1.0	6.4
13	11-Apr-23	70	51	22	12	< 1.0	5.5
14	14-Apr-23	81	44	21	12	< 1.0	4.7
15	17-Apr-23	70	56	25	11	< 1.0	6.9
16	20-Apr-23	74	54	21	14	1.0	5.5
17	23-Apr-23	71	41	24	11	< 1.0	4.8
18	26-Apr-23	70	45	19	15	2.0	5.4
19	29-Apr-23	79	55	16	11	< 1.0	6.7
20	02-May-23	74	46	11	10	< 1.0	5
21	05-May-23	75	51	11	8	< 1.0	4.8
22	08-May-23	81	55	21	9	< 1.0	4.7
23	11-May-23	75	46	12	10	< 1.0	6.1
24	14-May-23	71	51	21	10	< 1.0	5.4
25	17-May-23	69	44	15	9	1.0	5.7
26	20-May-23	74	56	19	9	< 1.0	4.8
27	23-May-23	81	54	16	9	1.0	5.9
28	26-May-23	70	41	17	8	< 1.0	4.5
29	29-May-23	71	45	17	7	1.0	5.9
30	30-May-22	70	48	19	10	1	4.4
MAX		**81**	**62**	**25**	**17**	**2**	**6.9**
MIN		**58**	**41**	**11**	**7**	**1**	**4.2**
Average		**72.1**	**50.3**	**17.4**	**11.4**	**1.3**	**5.5**

...END OF TEST REPORT...

N.D. INTERNATIONAL KOLKATA

For N.D. International

K.P. De - CEO
(Authorised Signatory)

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Annexure VIII: Weather Data Report

N.D. INTERNATIONAL

GOVERNMENT REGISTERED

An ISO 9001:2015 Company Certificate : 20DQHH82

035-CB-QMS

TEST REPORT

Certificate No. W(M)/23-24/0134 **Date: May 31, 2023** **Page -1 of 1**

Name of Customer : Indian Mine Planners and Consultants.

Address : GE-61,Rajdanga Main road,East Kolkata Township Project,E.M Bypass,Kol-107

: Site Address : MIN-BNK-10(Barjora).

Description of Sample : Weather Monitoring

Sampling Locaton : L-1

TEST FINDINGS :

Sl. No	Date	Time	Temperature (°C)	Humidity (%)	Wind Direction (Degree)	Wind Speed (m/Sec)
1	10-Mar-23	6:00 AM	23.1	66	41	4.3
2	10-Mar-23	10:00 AM	25.6	45	42	4.6
3	10-Mar-23	2:00 PM	29.5	45	26	6.1
4	10-Mar-23	6:00 PM	26.5	45	355	6
5	10-Mar-23	10:00 PM	24.2	46	290	6.3
6	11-Mar-23	2:00 AM	20.6	48	280	5.8
7	11-Mar-23	6:00 AM	21.3	54	225	5.8
8	11-Mar-23	10:00 AM	25.9	58	266	5.4
9	11-Mar-23	2:00 PM	28.6	45	245	5.6
10	11-Mar-23	6:00 PM	25.8	45	180	5.2
11	11-Mar-23	10:00 PM	24.6	65	171	4.8
12	12-Mar-23	2:00 AM	23.1	61	104	4.9
13	12-Mar-23	6:00 AM	22	60	110	5.1
14	12-Mar-23	10:00 AM	24.4	48	70	3.3
15	12-Mar-23	2:00 PM	27.7	47	78	3.7
16	12-Mar-23	6:00 PM	28.9	46	95	2.1
17	12-Mar-23	10:00 PM	23.6	46	66	4.1
18	13-Mar-23	2:00 AM	21.4	52	104	4.2
19	13-Mar-23	6:00 AM	22.5	55	110	3.5
20	13-Mar-23	10:00 AM	26.1	55	169	3.5
21	13-Mar-23	2:00 PM	30.2	54	107	3.8
22	13-Mar-23	6:00 PM	29.9	58	210	3.7
23	13-Mar-23	10:00 PM	23.6	59	251	4.6
24	14-Mar-23	2:00 AM	22.4	51	240	4.5
25	14-Mar-23	6:00 AM	24.1	50	190	6.1
26	14-Mar-23	10:00 AM	28.6	50	198	6.8
27	14-Mar-23	2:00 PM	30.5	53	188	5.8
28	14-Mar-23	6:00 PM	27.4	49	110	6.1
29	14-Mar-23	10:00 PM	24.1	45	64	6.5
30	15-Mar-23	2:00 AM	20.7	46	69	6.4
31	15-Mar-23	6:00 AM	20.4	47	86	5.5
32	15-Mar-23	10:00 AM	23.3	49	45	5.5
33	15-Mar-23	2:00 PM	26.5	42	21	5.4
34	15-Mar-23	6:00 PM	25.4	48	306	5.1
35	15-Mar-23	10:00 PM	24.1	45	330	4.7

...END OF TEST REPORT...

N.D. INTERNATIONAL KOLKATA

For N.D. International

K.P. De - CEO (Authorised Signatory)

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E-mail : ndinternational@gmail.com, Website : www.ndinternational.in

Annexure IX: Ambient Noise Monitoring Report

N.D. INTERNATIONAL

GOVERNMENT REGISTERED

An ISO 9001:2015 Company Certificate : 20DQHH82

035-CB-QMS

TEST REPORT

SAMPLE DRAWN BY US:

Certificate No. NL(M)/23-24/0135 to 0138 **Date: May 31, 2023**

Name of Customer : Indian Mine Planners and Consultants.

Address : GE-61,Rajdanga Main road,East Kolkata Township Project,E.M Bypass,Kol-107

: Site Address : MIN-BNK-10(Barjora).

Description of Sample : Ambient Noise Level.

Sampling Location : L-1, L-2, L-3 & L-4 .

TEST FINDINGS :

Date	Time	Day Time Noise Level in dB(A)-Leq				
		L-1	L2	Date	L3	L4
07-03-2023	6 A.M. - 7 A.M.	38.5	38	09-03-2023	39.4	42.6
	7 A.M. - 8 A.M.	40.1	40.4		41.6	42.2
	8 A.M. - 9 A.M.	42.3	42.6		43.6	43.4
	9 A.M. - 10 A.M.	44.4	45.6		43.3	44
	10 A.M. - 11 A.M.	47.5	45.7		46.4	44
	11 A.M. - 12 P.M.	48.6	47.1		47.1	44.5
	12 P.M. - 1 P.M.	48.6	47.5		45.9	46
	01 P.M. - 2 P.M.	49.8	47.5		46.3	45.7
	2 P.M. - 3 P.M.	47.5	48.6		50.1	44.8
	3 P.M. - 4 P.M.	48.6	44.1		51.3	48.9
	4 P.M. - 5 P.M.	44.1	46.8		48.2	49.6
	5 P.M. - 6 P.M.	46.8	44.4		47.6	48.6
	6 P.M. - 7 P.M.	44.8	42.7		46.6	44.2
	7 P.M. - 8 P.M.	43.4	42.1		46.9	40.5
	8 P.M. - 9 P.M.	40.1	40.7		42.4	39.5
	9 P.M. - 10 P.M.	38.5	39.5		40	39.9
Date	**Time**	**Night Time Noise Level in dB(A)-Leq**				
		L-1	**L2**	**Date**	**L3**	**L4**
07-03-2023	10 P.M. - 11 P.M.	36.5	39.4	09-03-2023	40.2	36.8
	11 P.M. - 12 A.M.	34.8	36.5		41	37.1
08-03-2023	12 A.M. - 1 A.M.	36.6	38.4	10-03-2023	41.2	37
	1 A.M. - 2 A.M.	35.3	39.6		42.3	37.9
	2 A.M. - 3 A.M.	38.7	40.3		40.1	38.6
	3 A.M. - 4 A.M.	40.5	40.4		36.8	40.8
	4 A.M. - 5 A.M.	41.2	41.1		38.4	41.1
	5 A.M. - 6 A.M.	42.5	42		36.9	40.5

Note: Limits as per CPCB for Residencial Area, Day Time (6:00 am to 10:00 pm) : 55 dB(A) , Night Time (10:00 pm to 6:00 am): 45 dB(A) Commercial area Day Time (6:00 am to 10:00 pm) : 65 dB(A) , Night Time (10:00 pm to 6:00 am): 55 dB(A)

...END OF TEST REPORT...

N.D. INTERNATIONAL KOLKATA

For N.D. International

K.P. De - CEO (Authorised Signatory)

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Annexure X: Ground Water Quality Monitoring Report

N.D. INTERNATIONAL

GOVERNMENT REGISTERED

An ISO 9001:2015 Company Certificate : 20DQHH82

035-CB-QMS

TEST REPORT

Certificate No.: W(D)-(NN)/22-23/4563 — Dated: 13.03.2023

SAMPLE DRAWN BY US : — Page - 1 of 2

Name of Customer	: M/s. Indian Mines Planners and Consultants
Address	: GA- 61, Rajdanga Main Road, Behind Vivanta Hotel , EM Bypass, Kolkata- 700107
Description of Sample	: Ground Water
Collection Source	: MIN BNK- 10 (Barjora) L_1
Sampling Done by	: Mr. A. Mondal & R. Mondal
Environmental Condition	: Temperature : 38°C, Humidity : 47%
Sample Drawn on	: 08.03.2023
Sample Received on	: 08.03.2023
Analysis Started on	: 08.03.2023
Analysis Completed on	: 13.03.2023
Method of Sampling	: IS-1622:1981, IS-17614(P-25):2022(Bact), IS-17614(P-5):2021(Chem),
Mode of Sampling	: Grab — Sampling Plan:NDI/FM/52A

A. MICROBIOLOGICAL TEST FINDINGS :

Sl. No.	Test Parameters	Test Method	Unit	Results	Norms as per IS 10500 : 2012
1	Total Coliform/100ml @ 37°C for 24 hours	IS 1622	Cfu	<1 (DL:1)	Not Detectable
2	E. coli/100 ml @ 44.5°C for 24 hours	IS 1622	_	Absent	Not Detectable

B. ORGANOLEPTIC & PHYSICAL PARAMETERS :

Sl. No.	Test Parameters	Test Method	Unit	Results	Norms as per IS 10500 : 2012	
					AL(Max.)	PL(Max.)
3	pH at 25°C	APHA 23rd Edn, 4500 H^+ B	—	6.9	6.5-8.5	No relaxation
4	Total Dissolved Solids	APHA 23rd Edn, 2540-C	mg/L	132	500	2000

C. GENERAL PARAMETERS CONCERNING SUBTANCES UNDESIRABLE :

5	Chloride (as Cl)	APHA 23rd Edn, 4500 Cl-B	mg/L	17.4	250	1000
6	Fluoride (as F)	APHA 23rd Edn, 4500-F-C	mg/L	<0.1 (DL:0.1)	1.0	1.5
7	Iron (as Fe)	APHA 23rd Edn, 3500- Fe B	mg/L	0.18	0.3	No relaxation
8	Nitrate (as NO_3)	APHA 23rd Edn, 4500- NO_3 B	mg/L	0.72	45	No relaxation
9	Sulphate (as SO_4)	APHA 23rd Edn, 4500 SO_4-B	mg/L	12.6	200	400
10	Sulphide as (H_2S)	APHA 23rd Edn, 4500 S^2-D	mg/L	<0.05 (DL:0.05)	0.05	No relaxation
11	Total Hardness (as $CaCO_3$)	APHA 23rd Edn, 2340 C	mg/L	62	200	600
12	Arsenic (as As)	APHA 23rd Edn, 3113 B	mg/L	<0.002 (DL:0.002)	0.01	0.05
13	Total Chromium (as Cr)	APHA 23rd Edn, 3111 D	mg/L	<0.01 (DL:0.01)	0.05	No relaxation
14	Total Suspended Solids	APHA 23rd Edn, 2540 D	mg/L	11	100 mg/L (max)	
15	Biochemical Oxygen Demand at 27°C for 3 days	IS 3025 (Part - 44) 1993	mg/L	3.7	30 mg/L (max)	
16	Chemical Oxygen Demand	APHA 23rd Edn, 5220 B	mg/L	18	250 mg/L (max)	

Note : 1. AL - Acceptable Limit. 2. PL - Permissible Limit. 3. DL - Detection Limit

As per IS 10500:2012 Total Coliform should be Not Detectable/100ml, which is equivalent to <1 Cfu/100 ml as per IS: 1622.

Remarks : Bacteriologically : Satisfactory for the above tested parameters.

Chemically : Satisfactory for the above tested parameters.

Statement of Conformity is applied considering Decision Rule as per ISO Guide 98-4.

...END OF TEST REPORT...

For, N.D. International

Sweta Mukherjee
(Microbiologist)
(Authorised Signatory)

N.D. INTERNATIONAL KOLKATA

For, N.D. International

K.P. De - CEO
Authorised Signatory

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N.D. INTERNATIONAL

GOVERNMENT REGISTERED

An ISO 9001:2015 Company Certificate : 20DQHH82

035-CB-QMS

TEST REPORT

Certificate No.: W(D)-(NN)/22-23/4564 — Dated: 13.03.2023

SAMPLE DRAWN BY US : —

Name of Customer	: M/s. Indian Mines Planners and Consultants
Address	: GA- 61, Rajdanga Main Road, Behind Vivanta Hotel , EM Bypass, Kolkata- 700107
Description of Sample	: Ground Water
Collection Source	: MIN BNK- 10 (Barjora) L_2
Sampling Done by	: Mr. A. Mondal & R. Mondal
Environmental Condition	: Temperature : 38°C, Humidity : 47%
Sample Drawn on	: 08.03.2023
Sample Received on	: 08.03.2023
Analysis Started on	: 08.03.2023
Analysis Completed on	: 13.03.2023
Method of Sampling	: IS-1622:1981, IS-17614(P-25):2022(Bact), IS-17614(P-5):2021(Chem),
Mode of Sampling	: Grab — Sampling Plan:NDI/FM/52A

A. MICROBIOLOGICAL TEST FINDINGS :

Sl. No.	Test Parameters	Test Method	Unit	Results	Norms as per IS 10500 : 2012
1	Total Coliform/100ml @ 37°C for 24 hours	IS 1622	Cfu	<1 (DL:1)	Not Detectable
2	E. coli/100 ml @ 44.5°C for 24 hours	IS 1622	–	Absent	Not Detectable

B. ORGANOLEPTIC & PHYSICAL PARAMETERS :

Sl. No.	Test Parameters	Test Method	Unit	Results	Norms as per IS 10500 : 2012	
					AL(Max.)	PL(Max.)
3	pH at 25°C	APHA 23rd Edn, 4500 H^+ B	—	7.1	6.5-8.5	No relaxation
4	Total Dissolved Solids	APHA 23rd Edn, 2540-C	mg/L	126	500	2000

C. GENERAL PARAMETERS CONCERNING SUBTANCES UNDESIRABLE :

5	Chloride (as Cl)	APHA 23rd Edn, 4500 Cl-B	mg/L	18.3	250	1000
6	Fluoride (as F)	APHA 23rd Edn, 4500-F-C	mg/L	<0.1 (DL:0.1)	1.0	1.5
7	Iron (as Fe)	APHA 23rd Edn, 3500- Fe B	mg/L	0.12	0.3	No relaxation
8	Nitrate (as NO_3)	APHA 23rd Edn, 4500- NO_3 B	mg/L	0.66	45	No relaxation
9	Sulphate (as SO_4)	APHA 23rd Edn, 4500 SO_4-B	mg/L	8.8	200	400
10	Sulphide as (H_2S)	APHA 23rd Edn, 4500 S^2-D	mg/L	<0.05 (DL:0.05)	0.05	No relaxation
11	Total Hardness (as $CaCO_3$)	APHA 23rd Edn, 2340 C	mg/L	63	200	600
12	Arsenic (as As)	APHA 23rd Edn, 3113 B	mg/L	<0.002 (DL:0.002)	0.01	0.05
13	Total Chromium (as Cr)	APHA 23rd Edn, 3111 D	mg/L	<0.01 (DL:0.01)	0.05	No relaxation
14	Total Suspended Solids	APHA 23rd Edn, 2540 D	mg/L	10	100 mg/L (max)	
15	Biochemical Oxygen Demand at 27°C for 3 days	IS 3025 (Part - 44) 1993	mg/L	3.8	30 mg/L (max)	
16	Chemical Oxygen Demand	APHA 23rd Edn, 5220 B	mg/L	19.2	250 mg/L (max)	

Note : 1. AL - Acceptable Limit. 2. PL - Permissible Limit. 3. DL - Detection Limit

As per IS 10500:2012 Total Coliform should be Not Detectable/100ml, which is equivalent to <1 Cfu/100 ml as per IS: 1622.

Remarks : Bacteriologically : Satisfactory for the above tested parameters.

Chemically : Satisfactory for the above tested parameters.

Statement of Conformity is applied considering Decision Rule as per ISO Guide 98-4.

...END OF TEST REPORT...

For, N.D. International

Sweta Mukherjee
(Microbiologist)
(Authorised Signatory)

N.D. INTERNATIONAL KOLKATA

For, N.D. International

K.P. De - CEO
Authorised Signatory

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2. Results relate only to the parameters tested.
3. The remaining sample after test will be retained for 15 days from the date of issue of certificate.

DH

107B, Block-F, New Alipore, Kolkata-700 053, Phone : 4021-6600-17 (18 Lines), 4021 6600 (Direct), Mob.: 9830654565, 9830789456
E-mail : ndinternational@gmail.com, Website : www.ndinternational.in

N.D. INTERNATIONAL

GOVERNMENT REGISTERED

An ISO 9001:2015 Company Certificate : 20DQHH82

035-CB-QMS

TEST REPORT

Certificate No.: W(D)-(NN)/22-23/4565 — Dated: 13.03.2023

SAMPLE DRAWN BY US : —

Name of Customer	: M/s. Indian Mines Planners and Consultants
Address	: GA- 61, Rajdanga Main Road, Behind Vivanta Hotel , EM Bypass, Kolkata- 700107
Description of Sample	: Ground Water
Collection Source	: MIN BNK- 10 (Barjora) L_3
Sampling Done by	: Mr. A. Mondal & R. Mondal
Environmental Condition	: Temperature : 38°C, Humidity : 47%
Sample Drawn on	: 08.03.2023
Sample Received on	: 08.03.2023
Analysis Started on	: 08.03.2023
Analysis Completed on	: 13.03.2023
Method of Sampling	: IS-1622:1981, IS-17614(P-25):2022(Bact), IS-17614(P-5):2021(Chem),
Mode of Sampling	: Grab — Sampling Plan:NDI/FM/52A

A. MICROBIOLOGICAL TEST FINDINGS :

Sl. No.	Test Parameters	Test Method	Unit	Results	Norms as per IS 10500 : 2012
1	Total Coliform/100ml @ 37°C for 24 hours	IS 1622	Cfu	<1 (DL:1)	Not Detectable
2	E. coli/100 ml @ 44.5°C for 24 hours	IS 1622	–	Absent	Not Detectable

B. ORGANOLEPTIC & PHYSICAL PARAMETERS :

Sl. No.	Test Parameters	Test Method	Unit	Results	Norms as per IS 10500 : 2012	
					AL(Max.)	PL(Max.)
3	pH at 25°C	APHA 23rd Edn, 4500 H^+ B	—	6.5	6.5-8.5	No relaxation
4	Total Dissolved Solids	APHA 23rd Edn, 2540-C	mg/L	118	500	2000

C. GENERAL PARAMETERS CONCERNING SUBTANCES UNDESIRABLE :

5	Chloride (as Cl)	APHA 23rd Edn, 4500 Cl-B	mg/L	12.6	250	1000
6	Fluoride (as F)	APHA 23rd Edn, 4500-F-C	mg/L	<0.1 (DL:0.1)	1.0	1.5
7	Iron (as Fe)	APHA 23rd Edn, 3500- Fe B	mg/L	0.1	0.3	No relaxation
8	Nitrate (as NO_3)	APHA 23rd Edn, 4500- NO_3 B	mg/L	0.58	45	No relaxation
9	Sulphate (as SO_4)	APHA 23rd Edn, 4500 SO_4-B	mg/L	7.6	200	400
10	Sulphide as (H_2S)	APHA 23rd Edn, 4500 S^2-D	mg/L	<0.05 (DL:0.05)	0.05	No relaxation
11	Total Hardness (as $CaCO_3$)	APHA 23rd Edn, 2340 C	mg/L	58	200	600
12	Arsenic (as As)	APHA 23rd Edn, 3113 B	mg/L	<0.002 (DL:0.002)	0.01	0.05
13	Total Chromium (as Cr)	APHA 23rd Edn, 3111 D	mg/L	<0.01 (DL:0.01)	0.05	No relaxation
14	Total Suspended Solids	APHA 23rd Edn, 2540 D	mg/L	8	100 mg/L (max)	
15	Biochemical Oxygen Demand at 27°C for 3 days	IS 3025 (Part - 44) 1993	mg/L	2.2	30 mg/L (max)	
16	Chemical Oxygen Demand	APHA 23rd Edn, 5220 B	mg/L	14	250 mg/L (max)	

Note : 1. AL - Acceptable Limit. 2. PL - Permissible Limit. 3. DL - Detection Limit

As per IS 10500:2012 Total Coliform should be Not Detectable/100ml, which is equivalent to <1 Cfu/100 ml as per IS: 1622.

Remarks : Bacteriologically : Satisfactory for the above tested parameters.

Chemically : Satisfactory for the above tested parameters.

Statement of Conformity is applied considering Decision Rule as per ISO Guide 98-4.

...END OF TEST REPORT...

For, N.D. International

Sweta Mukherjee
(Microbiologist)
(Authorised Signatory)

N.D. INTERNATIONAL KOLKATA

For, N.D. International

K.P. De - CEO
Authorised Signatory

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2. Results relate only to the parameters tested.
3. The remaining sample after test will be retained for 15 days from the date of issue of certificate.

DH

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E-mail : ndinternational@gmail.com, Website : www.ndinternational.in

Annexure XI: Surface Water Quality Monitoring Report

N.D. INTERNATIONAL

GOVERNMENT REGISTERED

An ISO 9001:2015 Company Certificate : 20DQHH82

035-CB-QMS

TEST REPORT

Certificate No.: W(D)-(NN)/22-23/4566 — Dated: 13.03.2023

SAMPLE DRAWN BY US : — Page - 1 of 2

Name of Customer	: M/s. Indian Mines Planners and Consultants
Address	: GA- 61, Rajdanga Main Road, Behind Vivanta Hotel , EM Bypass, Kolkata- 700107
Description of Sample	: Surface Water
Collection Source	: MIN BNK- 10 (Barjora) L_1
Sampling Done by	: Mr. A. Mondal & R. Mondal
Environmental Condition	: Temperature : 38°C, Humidity : 47%
Sample Drawn on	: 08.03.2023
Sample Received on	: 08.03.2023
Analysis Started on	: 08.03.2023
Analysis Completed on	: 13.03.2023
Method of Sampling	: IS-1622:1981, IS-17614(P-25):2022(Bact), IS-17614(P-5):2021(Chem),
Mode of Sampling	: Grab — Sampling Plan:NDI/FM/52A

A. MICROBIOLOGICAL TEST FINDINGS :

Sl. No.	Test Parameters	Test Method	Unit	Results	Norms as per IS 10500 : 2012
1	Total Coliform/100ml @ 37°C for 24 hours	IS 1622	Cfu	<1 (DL:1)	Not Detectable
2	E. coli/100 ml @ 44.5°C for 24 hours	IS 1622	_	Absent	Not Detectable

B. ORGANOLEPTIC & PHYSICAL PARAMETERS :

Sl. No.	Test Parameters	Test Method	Unit	Results	Norms as per IS 10500 : 2012	
					AL(Max.)	PL(Max.)
3	pH at 25°C	APHA 23rd Edn, 4500 H^+ B	—	7.3	6.5-8.5	No relaxation
4	Total Dissolved Solids	APHA 23rd Edn, 2540-C	mg/L	88	500	2000

C. GENERAL PARAMETERS CONCERNING SUBTANCES UNDESIRABLE :

5	Chloride (as Cl)	APHA 23rd Edn, 4500 Cl-B	mg/L	23.6	250	1000
6	Fluoride (as F)	APHA 23rd Edn, 4500-F-C	mg/L	<0.1 (DL:0.1)	1.0	1.5
7	Iron (as Fe)	APHA 23rd Edn, 3500- Fe B	mg/L	0.26	0.3	No relaxation
8	Nitrate (as NO_3)	APHA 23rd Edn, 4500- NO_3 B	mg/L	1.28	45	No relaxation
9	Sulphate (as SO_4)	APHA 23rd Edn, 4500 SO_4-B	mg/L	26.4	200	400
10	Sulphide as (H_2S)	APHA 23rd Edn, 4500 S^2-D	mg/L	<0.05 (DL:0.05)	0.05	No relaxation
11	Total Hardness (as $CaCO_3$)	APHA 23rd Edn, 2340 C	mg/L	39	200	600
12	Arsenic (as As)	APHA 23rd Edn, 3113 B	mg/L	<0.002 (DL:0.002)	0.01	0.05
13	Total Chromium (as Cr)	APHA 23rd Edn, 3111 D	mg/L	<0.01 (DL:0.01)	0.05	No relaxation
14	Total Suspended Solids	APHA 23rd Edn, 2540 D	mg/L	18	100 mg/L (max)	
15	Biochemical Oxygen Demand at 27°C for 3 days	IS 3025 (Part - 44) 1993	mg/L	14.5	30 mg/L (max)	
16	Chemical Oxygen Demand	APHA 23rd Edn, 5220 B	mg/L	52	250 mg/L (max)	

Note : 1. AL - Acceptable Limit. 2. PL - Permissible Limit. 3. DL - Detection Limit

As per IS 10500:2012 Total Coliform should be Not Detectable/100ml, which is equivalent to <1 Cfu/100 ml as per IS: 1622.

Remarks : Bacteriologically : Satisfactory for the above tested parameters.

Chemically : Satisfactory for the above tested parameters.

Statement of Conformity is applied considering Decision Rule as per ISO Guide 98-4.

...END OF TEST REPORT...

For, N.D. International

Sweta Mukherjee
(Microbiologist)
(Authorised Signatory)

N.D. INTERNATIONAL KOLKATA

For, N.D. International

K.P. De - CEO
Authorised Signatory

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3. The remaining sample after test will be retained for 15 days from the date of issue of certificate.

DH

N.D. INTERNATIONAL

GOVERNMENT REGISTERED

An ISO 9001:2015 Company Certificate : 20DQHH82

TEST REPORT

Certificate No.: W(D)-(NN)/22-23/45667 — Dated: 13.03.2023

SAMPLE DRAWN BY US : —

Name of Customer	: M/s. Indian Mines Planners and Consultants
Address	: GA- 61, Rajdanga Main Road, Behind Vivanta Hotel , EM Bypass, Kolkata- 700107
Description of Sample	: Surface Water
Collection Source	: MIN BNK- 10 (Barjora) L_2
Sampling Done by	: Mr. A. Mondal & R. Mondal
Environmental Condition	: Temperature : 38°C, Humidity : 47%
Sample Drawn on	: 08.03.2023
Sample Received on	: 08.03.2023
Analysis Started on	: 08.03.2023
Analysis Completed on	: 13.03.2023
Method of Sampling	: IS-1622:1981, IS-17614(P-25):2022(Bact), IS-17614(P-5):2021(Chem),
Mode of Sampling	: Grab — Sampling Plan:NDI/FM/52A

A. MICROBIOLOGICAL TEST FINDINGS :

Sl. No.	Test Parameters	Test Method	Unit	Results	Norms as per IS 10500 : 2012
1	Total Coliform/100ml @ 37°C for 24 hours	IS 1622	Cfu	<1 (DL:1)	Not Detectable
2	E. coli/100 ml @ 44.5°C for 24 hours	IS 1622	_	Absent	Not Detectable

B. ORGANOLEPTIC & PHYSICAL PARAMETERS :

Sl. No.	Test Parameters	Test Method	Unit	Results	Norms as per IS 10500 : 2012	
					AL(Max.)	PL(Max.)
3	pH at 25°C	APHA 23rd Edn, 4500 H^+ B	—	6.9	6.5-8.5	No relaxation
4	Total Dissolved Solids	APHA 23rd Edn, 2540-C	mg/L	124	500	2000

C. GENERAL PARAMETERS CONCERNING SUBTANCES UNDESIRABLE :

5	Chloride (as Cl)	APHA 23rd Edn, 4500 Cl-B	mg/L	20.2	250	1000
6	Fluoride (as F)	APHA 23rd Edn, 4500-F-C	mg/L	<0.1 (DL:0.1)	1.0	1.5
7	Iron (as Fe)	APHA 23rd Edn, 3500- Fe B	mg/L	0.23	0.3	No relaxation
8	Nitrate (as NO_3)	APHA 23rd Edn, 4500- NO_3 B	mg/L	1.00	45	No relaxation
9	Sulphate (as SO_4)	APHA 23rd Edn, 4500 SO_4-B	mg/L	21.4	200	400
10	Sulphide as (H_2S)	APHA 23rd Edn, 4500 S^2-D	mg/L	<0.05 (DL:0.05)	0.05	No relaxation
11	Total Hardness (as $CaCO_3$)	APHA 23rd Edn, 2340 C	mg/L	54	200	600
12	Arsenic (as As)	APHA 23rd Edn, 3113 B	mg/L	<0.002 (DL:0.002)	0.01	0.05
13	Total Chromium (as Cr)	APHA 23rd Edn, 3111 D	mg/L	<0.01 (DL:0.01)	0.05	No relaxation
14	Total Suspended Solids	APHA 23rd Edn, 2540 D	mg/L	36	100 mg/L (max)	
15	Biochemical Oxygen Demand at 27°C for 3 days	IS 3025 (Part - 44) 1993	mg/L	29	30 mg/L (max)	
16	Chemical Oxygen Demand	APHA 23rd Edn, 5220 B	mg/L	115	250 mg/L (max)	

Note : 1. AL - Acceptable Limit. 2. PL - Permissible Limit. 3. DL - Detection Limit

As per IS 10500:2012 Total Coliform should be Not Detectable/100ml, which is equivalent to <1 Cfu/100 ml as per IS: 1622.

Remarks : Bacteriologically : Satisfactory for the above tested parameters.

Chemically : Satisfactory for the above tested parameters.

Statement of Conformity is applied considering Decision Rule as per ISO Guide 98-4.

...END OF TEST REPORT...

For, N.D. International

Sweta Mukherjee
(Microbiologist)
(Authorised Signatory)

N.D. INTERNATIONAL KOLKATA

For, N.D. International

K.P. De - CEO
Authorised Signatory

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DH

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E-mail : ndinternational@gmail.com, Website : www.ndinternational.in

N.D. INTERNATIONAL

GOVERNMENT REGISTERED

An ISO 9001:2015 Company Certificate : 20DQHH82

035-CB-QMS

TEST REPORT

Certificate No.: W(D)-(NN)/22-23/4568 Dated: 13.03.2023

SAMPLE DRAWN BY US :

Name of Customer	: M/s. Indian Mines Planners and Consultants
Address	: GA- 61, Rajdanga Main Road, Behind Vivanta Hotel , EM Bypass, Kolkata- 700107
Description of Sample	: Surface Water
Collection Source	: MIN BNK- 10 (Barjora) L_3
Sampling Done by	: Mr. A. Mondal & R. Mondal
Environmental Condition	: Temperature : 38°C, Humidity : 47%
Sample Drawn on	: 08.03.2023
Sample Received on	: 08.03.2023
Analysis Started on	: 08.03.2023
Analysis Completed on	: 13.03.2023
Method of Sampling	: IS-1622:1981, IS-17614(P-25):2022(Bact), IS-17614(P-5):2021(Chem),
Mode of Sampling	: Grab Sampling Plan:NDI/FM/52A

A. MICROBIOLOGICAL TEST FINDINGS :

Sl. No.	Test Parameters	Test Method	Unit	Results	Norms as per IS 10500 : 2012
1	Total Coliform/100ml @ 37°C for 24 hours	IS 1622	Cfu	<1 (DL:1)	Not Detectable
2	E. coli/100 ml @ 44.5°C for 24 hours	IS 1622	–	Absent	Not Detectable

B. ORGANOLEPTIC & PHYSICAL PARAMETERS :

Sl. No.	Test Parameters	Test Method	Unit	Results	Norms as per IS 10500 : 2012	
					AL(Max.)	PL(Max.)
3	pH at 25°C	APHA 23rd Edn, 4500 H^+ B	—	7.4	6.5-8.5	No relaxation
4	Total Dissolved Solids	APHA 23rd Edn, 2540-C	mg/L	96	500	2000

C. GENERAL PARAMETERS CONCERNING SUBTANCES UNDESIRABLE :

5	Chloride (as Cl)	APHA 23rd Edn, 4500 Cl-B	mg/L	21.7	250	1000
6	Fluoride (as F)	APHA 23rd Edn, 4500-F-C	mg/L	<0.1 (DL:0.1)	1.0	1.5
7	Iron (as Fe)	APHA 23rd Edn, 3500- Fe B	mg/L	0.16	0.3	No relaxation
8	Nitrate (as NO_3)	APHA 23rd Edn, 4500- NO_3 B	mg/L	0.70	45	No relaxation
9	Sulphate (as SO_4)	APHA 23rd Edn, 4500 SO_4-B	mg/L	16.2	200	400
10	Sulphide as (H_2S)	APHA 23rd Edn, 4500 S^2-D	mg/L	<0.05 (DL:0.05)	0.05	No relaxation
11	Total Hardness (as $CaCO_3$)	APHA 23rd Edn, 2340 C	mg/L	38	200	600
12	Arsenic (as As)	APHA 23rd Edn, 3113 B	mg/L	<0.002 (DL:0.002)	0.01	0.05
13	Total Chromium (as Cr)	APHA 23rd Edn, 3111 D	mg/L	<0.01 (DL:0.01)	0.05	No relaxation
14	Total Suspended Solids	APHA 23rd Edn, 2540 D	mg/L	22	100 mg/L (max)	
15	Biochemical Oxygen Demand at 27°C for 3 days	IS 3025 (Part - 44) 1993	mg/L	12.6	30 mg/L (max)	
16	Chemical Oxygen Demand	APHA 23rd Edn, 5220 B	mg/L	46	250 mg/L (max)	

Note : 1. AL - Acceptable Limit. 2. PL - Permissible Limit. 3. DL - Detection Limit

As per IS 10500:2012 Total Coliform should be Not Detectable/100ml, which is equivalent to <1 Cfu/100 ml as per IS: 1622.

Remarks : Bacteriologically : Satisfactory for the above tested parameters.

Chemically : Satisfactory for the above tested parameters.

Statement of Conformity is applied considering Decision Rule as per ISO Guide 98-4.

...END OF TEST REPORT...

For, N.D. International

Sweta Mukherjee
(Microbiologist)
(Authorised Signatory)

N.D. INTERNATIONAL KOLKATA

For, N.D. International

K.P. De - CEO
Authorised Signatory

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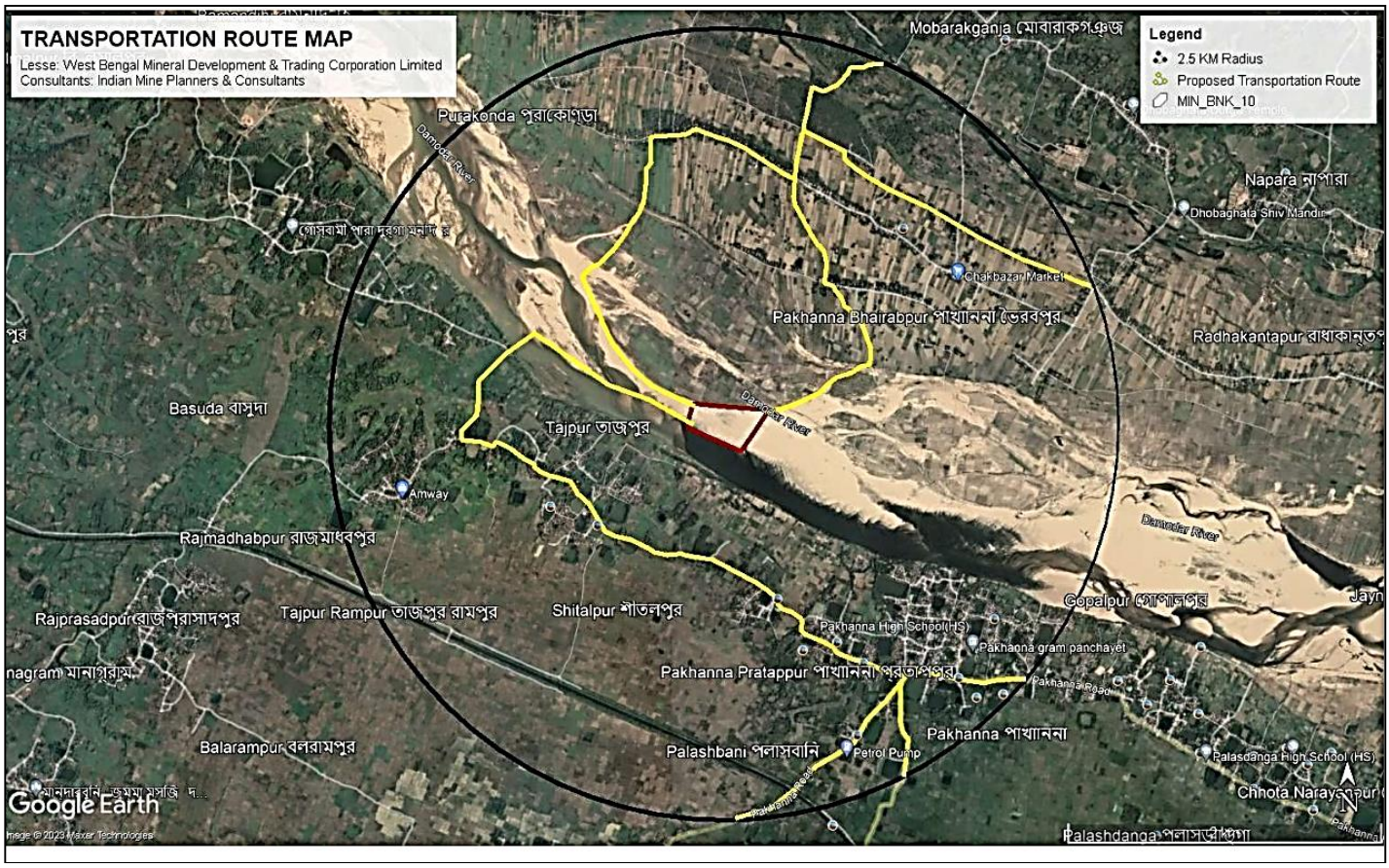
DH

Annexure XII: Transportation Route Map



Annexure XIII: Laboratory Certificate

National Accreditation Board for Testing and Calibration Laboratories

NABL

CERTIFICATE OF ACCREDITATION

N. D. INTERNATIONAL

has been assessed and accredited in accordance with the standard

ISO/IEC 17025:2017

"General Requirements for the Competence of Testing & Calibration Laboratories"

for its facilities at

17, JNAN GOSWAMI SARANI, 107B, BLOCK-F, NEW ALIPORE, KOLKATA, WEST BENGAL, INDIA

in the field of

TESTING

Certificate Number: TC-5910

Issue Date: 07/06/2022 **Valid Until:** 06/06/2024

This certificate remains valid for the Scope of Accreditation as specified in the annexure subject to continued satisfactory compliance to the above standard & the relevant requirements of NABL.
(To see the scope of accreditation of this laboratory, you may also visit NABL website www.nabl-india.org)

Name of Legal Identity : N. D. INTERNATIONAL

Signed for and on behalf of NABL

N. Venkateswaran
Chief Executive Officer

Annexure XIV: NABET Accreditation Certificate

National Accreditation Board for Education and Training

QCI/NABET/ENV/ACO/23/2789 June 30, 2023

To

Indian Mine Planners and Consultants
GE-61, Rajdanga Main Road, Behind Gateway Hotel,
EM-Byepass, Kolkata- 700107, West Bengal

Sub.: Extension of Validity of Accreditation till Sept 29, 2023 – regarding
Ref.. 1. Certificate no NABET/EIA/2023/SA 0182
2. Request e-mail dated June 28, 2023

Dear Sir/Madam

This has reference to the accreditation of your organization under the QCI-NABET EIA Scheme, the validity of Indian Mine Planners and Consultants is hereby extended to Sept 29, 2023, or completion of the assessment process, whichever is earlier.

The above extension is subject to the submitted documents/required information with respect to your application and timely submission and closure of NC/Obs during the process of assessment.

You are requested not to use this letter after the expiry of the above-stated date.

With best regards.

(A K Jha)
Sr. Director, NABET

QUALITY COUNCIL® OF INDIA
Creating an Ecosystem for Quality

National Accreditation Board for Education and Training

Certificate of Accreditation

Indian Mine Planners and Consultants, Kolkata

GE-61, Rajdanga Main Road, Behind Gateway Hotel, Em-Bypass, Kolkata- 700107, West Bengal.

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

S. No	Sector Description	Sector (as per)		Cat.
		NABET	MoEFCC	
1	Mining of minerals including opencast/ underground mining	1	1 (a) (i)	A

Note: Names of approved EIA Coordinators and Functional Area Experts are mentioned in SAAC minutes dated August 02, 2022 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/22/2621 dated December 20, 2022. The accreditation needs to be renewed before the expiry date by Indian Mine Planners and Consultants, Kolkata, following due process of assessment.

Sr. Director, NABET
Dated: December 20, 2022

Certificate No.
NABET/EIA/2023/SA 0182

Valid up to
March 14, 2023

For the updated List of Accredited EIA Consultant Organizations with approved Sectors please refer to QCI-NABET website.