DRAFT ENVIRONMENTAL IMPACT ASSESSMENT REPORT
FOR
PROPOSED RIVER BED MINING FOR BARAK SAND MINOR MINERAL UNIT NO. 1
ON BARAK RIVER BED UNDER KALAIN RANGE OF KARIMGANJ FOREST DIVISION, DISTRICT: CACHAR, STATE: ASSAM
(Cat – B1, Area -12.7 Ha)
Capacity- 45,094 Cu.m per year

Project Proponent

SRI ABDUL MUNIM BARBHUIYA
Vill: Bhangarpar Part I, P.O: Bhangarpar
P.S: Borkhola. Cachar. Pin - 788817

Prepared by

ÜLTRA-TECH

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Annexure – VII

PART A: DECLARATION BY ACO AND EXPERTS CONTRIBUTING TO THE EIA REPORT

Declaration by Experts contributing to the EIA/EMP report of Greenfield Project for the ***Proposed Barak River Sand Minor Mineral Unit No. 1 near Kalain, District: Cachar, Assam"***, under Kalian Range of Karimganj Forest Division, Assam.

I, hereby, certify that I was a part of the EIA team in the following capacity that developed the above EIA.

EIA coordinator (EC):

Name**:** Mr. Arun Kumar

Date and Signature:
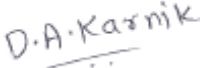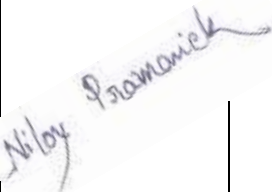
Period of Involvement**:** April 2024 to July 2024

Contact information:
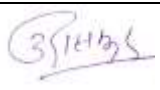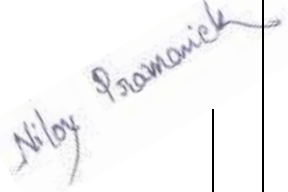
Email ID: utdelhienv@gmail.com ; Phone No: 8587053336

Functional Area Experts

S. No.	Functional Areas	Name of the Expert/s	Involvement		Signature & Date
			Period	**Task**	
1	AP	Mr. Debasish Sengupta	April 2024 to July 2024	➤ Selection of AAQ stations in compliance with CPCB/MoEF&CC guidelines ➤ Interpretation of baseline data w.r.t CPCB standards ➤ Identification of sources of pollution and its inventorization ➤ Preparation of Management plan with budgetary provision for all the sources of pollution ➤ Suggestion of Operational monitoring program to verify and keep the levels well within the norms from time to time	

S. No.	Functional Areas	Name of the Expert/s	Involvement		Signature & Date
			Period	**Task**	
2	WP	Mr. Debasish Sengupta		➢ Selection of water monitoring locations in line with CPCB norms ➢ Interpretation of baseline data w.r.t to CPCB standards ➢ Identification of pollution sources with relevant inventorization ➢ Preparation of Water Balance ➢ Prediction of water pollution and its management plan.	
3	SHW	Mrs. Deepa Tamhane (Karnik)		➢ Identification of nature of waste, categorization, and quantity of generated waste. ➢ Prediction of waste pollution and preparation of its management.	D.A.Karnik
4	SE	Mr. Yogesh Raskar		➢ Collection of Secondary data (Census of India & District Handbook) ➢ Collection of primary data of the study area through Questionnaire method ➢ Compilation and analysis of primary & secondary data to identify the various activities required on need basis ➢ Identification and prediction of Socio-economic impacts ➢ Enumerating the benefits of the project in terms of employment, development, etc. Preparation of Environmental Social Responsibility activities based on the need basis with budgetary provisions in compliance with Companies act and MoEF&CC guidelines	
		Team Member: Mr. Niloy Pramanik			Niloy Pramanik

S. No.	Functional Areas	Name of the Expert/s	Involvement		Signature & Date
			Period	Task	
5	EB	Mrs. Padmini Sindhey Barde	April 2024 to July 2024	➤ Identification of samples and its size based on the present land use and land cover pattern. ➤ Collection of primary data of flora and fauna for the study area with standard methodology and guidelines ➤ Collection of secondary data for cross verification of the primary data ➤ Inventorization and compilation of biological aspects of the study area ➤ Identification and prediction of various impacts on Ecological and biodiversity ➤ Preparation of management plan including greenbelt development plan with budgetary allocation	
6	HG	Dr. Vinay Nikam		➤ Collection of secondary data ➤ Interpretation of Water resource evaluation of the area.	
7	AQ	Mr. Arun Kumar		➤ Collection of primary data ➤ Quantification of Air pollution sources (point and line sources) ➤ Impact prediction using AERMOD View Modelling and its interpretation. ➤ Delineating the Incremental load on the existing scenario ➤ Suggesting management plan with budgetary provision ➤ Suggestion of Operational monitoring program to verify and follow up to keep the levels well within the norms from time to time	

S. No.	Functional Areas	Name of the Expert/s	Involvement		Signature & Date
			Period	**Task**	
8	NV	Mr. Chintan Athalye		➢ Identification and selection of noise quality monitoring locations. ➢ Identification of Noise pollution sources. ➢ Impact prediction of noise pollution sources and its interpretation ➢ Preparation of management plan with budgetary provision ➢ Suggestion of Operational monitoring program to verify and follow up to keep the levels well within the norms from time to time	
9	LU	Mr. Yogesh Raskar Team Member: Mr. Niloy Pramanik		➢ Collection of Primary and secondary data (Topo sheet, satellite imaginary, coordinates of known vectors, etc.) ➢ Geo-referencing the primary data with secondary data GIS software ➢ Preparation of Land use and Land cover map ➢ Identification and its Impact prediction	
10	RH	Mrs. Ashwini Ganvir		➢ Identification of risk and hazards ➢ Management of Hazard controls ➢ Preparation of Disaster Management Plan with Onsite and Offsite Emergency Plan ➢ Delineating fire fighting facilities and system ➢ Preparation of Occupational Health and Safety Management Plan with budgetary allocations.	

S. No.	Functional Areas	Name of the Expert/s	Involvement		Signature & Date
			Period	**Task**	
11	SC	Mrs. Padmini Sindhey Barde		➢ Collection of primary data ➢ Interpretation of existing quality of soil. ➢ Prediction of Impact and its management.	

*One TM against each FAE may be shown

**Please attach additional sheet if required

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EXECUTIVE SUMMARY

1.0   Introduction

Department of Environment & Forest, Govt. of Assam has allotted area of 12.7 Ha located at near Kalain, Cachar district of Assam under Kalain Range of Karimganj Forest Division, Assam in favour of Sri Abdul Munim Barbhuiya for extraction of sand for a period of 5 (five) years with production capacity of 45,094 Cu.M/year.

The Mining contract holder will extract sand from the river bed of Barak River, which is a perennial river. The Barak River rises from the Manipur hills, south of Mao in Swnapati district of Manipur at an elevation of 2332 m and flows along Nagaland-Manipur border through hilly terrains and enters into the State of Assam.The sand available in the river bed for extraction is basically small to medium mixed with medium to sand. The river bed sand is suitable for use as civil construction material and road metal.

Project Location
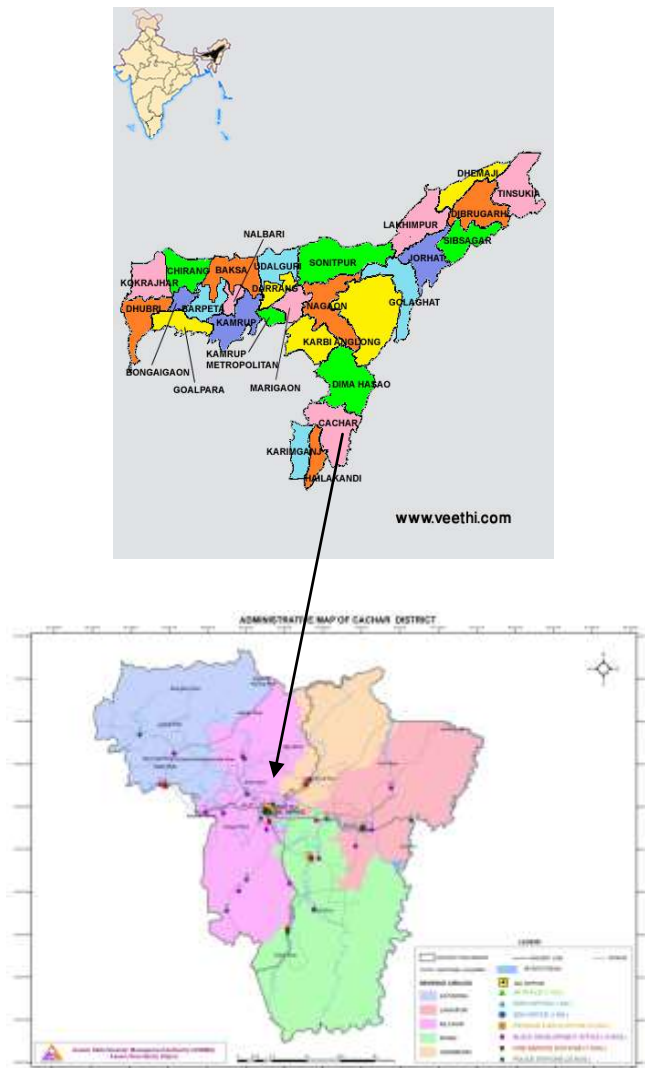
Figure E-1: Location map of the Project Site

The details of environmental setting are given below.

Table E.1: Environmental Setting around Project Site

SN	Component	Description			
1	Plant Location	**Barak Sand Minor Mineral Unit No. 1** near Kalain **P. O & P.S:** Kalain **District**: Cachar, Assam **Left bank**: Pratapi Para, Buribali Pt – 1, Buribali Pt –II, Rakhal Khaler Par Pt –I, Ganigram 4**;** **Right bank:** Krishna Pur, buribali Pt III, Rakhal Khaler Par Pt –II, Hatirhar Pt II			
2	Approx Site Coordinates	**BLOCK**	**POINT**	**LATITUDE**	**LONGITUDE**
		BLOCK A	1.	24°54'21.31"N	92°42'46.23"E
			2.	24°54'21.90"N	92°42'45.38"E
			3.	24°54'11.03"N	92°42'39.27"E
			4.	24°54'11.46"N	92°42'38.61"E
		BLOCK B	1.	24°53'41.84"N	92°42'22.09"E
			2.	24°53'43.35"N	92°42'21.51"E
			3.	24°53'11.63"N	92°42'9.35"E
			4.	24°53'12.22"N	92°42'7.38"E
		BLOCK C	1.	24°52'30.63"N	92°43'6.20"E
			2.	24°52'32.32"N	92°43'5.68"E
			3.	24°52'23.39"N	92°43'40.19"
			4.	24°52'22.52"N	92°43'39.18"E
		BLOCK D	1.	24°52'8.45"N	92°42'8.94"E
			2.	24°52'7.58"N	92°42'8.64"E
			3.	24°52'2.91"N	92°41'49.20"E
			4.	24°52'3.91"N	92°41'48.63"E
3	Village/District/State	**Village:** Near Kalain **District:** Cachar **State:** Assam			
4	Maximum temperature	35˚C			
5	Minimum temperature	12˚C			
6	Annual rainfall (total)	>4000mm			
7	Plant site elevation above MSL	-			
8	Present land use at the site	River Bed			
9	Nearest highway	**SH -38 (From Block A)** Road Distance- 600 m, South West, Aerial Distance-238 m, South West **NH -37 (From Block D)**			

SN	Component	Description
		Road Distance- 5.5 Kms South East , Aerial Distance-3.83 Km, South **NH-27 (From Block A)** Road Distance- 7.1Km, North East, Aerial Distance-5.09 Km, North East,
10	Nearest Railway Station	**Railway Station:** Arunachal Junction Railway Station - Road Distance-6 Km, South East (From Block D) Aerial Distance-4.33 Km , South East
11	Nearest Airport	**Airport:** Silchar Airport Road Distance- 38.7 Km, East (From Block A) Aerial Distance- 26.93 Km East
12	Nearest major water bodies	**Barak River –**Project Site itself Jatinga River- 3.53 km, East (From Block B) Katakal River – 7.62 Km, South West (From Block D) Dolasor River – 8.75 km, West, (From Block D) Dalu River – 4.5 km, North (From Block A)
13	Nearest town/City	**Nearest Town** : Silchar Town 8.68 Km South East (Aerial Distance) (From Block D)
14	Nearest village	1. Dudpur Pt III Village– 3.44 km, South West (From Block B)
15	Nearest Dispensary and Govt. Hospital, Educational facility	1. Borkhola Primary Health Center - 4.10 km, North East (From Block A) 2. Dholchara Health Sub Center – 4.90 km, North West (From Block A) 3. Ganirgram State Dispensary -0.24 km , North (From Block D) All major educational Institutions are : 4. PL School – 4.13 km, West (From Block A) 5. Holy Crown School - 1.56 km, South East (From Block C)
16	Nearest Religious/Worship Places:	1. Shiv Temple, Chandpur Pt - III – 3.70 km, West (From Block A) 2. Mahadev Temple , Dudhpatil Pt III – 4.92 km, East (From Block C) 3. West Sorail Jame Masjid – 1.58 km, East (From Block B)
17	Protected areas as per Wildlife Protection Act, 1972 (Tiger reserve, Elephant reserve, Biospheres, National parks, Wildlife sanctuaries, community reserves and conservation reserves)	Barail WLS (East Block) - 7.43 km, North East Barail WLS (West Block) - 12.83 km, North West

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SN	Component	Description
18	Reserved / Protected Forests	Barail Reserve Forest – 9.55 km, North East North Cachar Reserved Forest – 14.74 km, North
19.	Defence Installations	None within 15 Km

2.0   Project Description

The Proposed River-bed project on Barak River over an allotted area of 12.7 hectare is located near Kalain at Cachar district of Assam under Kalain Range of Karimganj Forest Division, Assam was granted in favour of Sri Abdul Munim Barbhuiya for collection of sand against their developmental work for a period of 7 (seven) years, as recommended by the Divisonal Forest Officer, Government of Assam. Mining Plan has been prepared by RQP Mr. Prabal Kumar Goswami, which was approved by Department of mining and Geology, Govt. of Assam for five years with production capacity of 45,094 Cu. M per year over an allotted area of 12.7 hectare. River bed mining activities do not involve top soil removal. Excavation of sand will be done manually using hand tools like hand shovel, pan, sieve and other advanced machineries on a temporary basis, if required. There will be no or minimum waste generation as the sand is exposed in the river bed. The copy of the mining plan is attached as **Annexure II**.

Project Proponent Sri Abdul Munim Barbhuiya is resident of Village –Bhangarpar Part I, P.O. - Bhangarpar, P.S –Borkhola, District- Cachar in Assam. He has good record of project execution in schedule time. He has track record of Environmental Management Plan (EMP) and compliance of Environmental Conditions. Separate funds for EMP, CSR and Health and Hygiene are allocated from project cost for all statutory requirements. Work is executed as per Mining Plan and Environmental Compliance is completed as statutory requirements and environmental policy.

Figure E-2: Area of the proposed Mining site

Table E.2: Salient Features of Proposed Project

S. N.	Information	Details			
1.	Location	**"Barak Sand Minor Mineral Unit No. 1"** near Kalain **P. O & P.S**: Kalain **District:** Cachar, Assam **Left bank**: Pratapi Para, Buribali Pt – 1, Buribali Pt –II, Rakhal Khaler Par Pt –I, Ganigram 4**;** **Right bank:** Krishna Pur, buribali Pt III, Rakhal Khaler Par Pt –II, Hatirhar Pt II			
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			3.	24°52'2.91"N	92°41'49.20"E
			4.	24°52'3.91"N	92°41'48.63"E
	Toposheet No.	83 D/9 of zone 46			
	Village	Near Kalain			
	Tehsil	Silchar			
	District	Cachar			
	State	Assam			
2.	Name of the Mineral to be mined	Sand will be collected from River bed			
3.	Capacity of Proposed Production per annum	45,094Cu. m per year Production in 5 Years – 225,470 Cu.M			
4.	Drilling Blasting	The mining does not require any drilling and blasting in mining activities.			
5.	Method of Mining	Open cast manual method of mining will be applied in river bed of Barak River to collect sand from river bed.			
6.	Lease Period	7 Years Approved mine plan for 5 years.			
7.	Lease Area	12.7 Hectares			

S. N.	Information	Details
8.	Land Use Pattern of the Lease Area	River bed of area 12.7 Hectare of Barak River. Ownership/Occupancy: The Divisional Forest Officer, Karimganj Forest Division, District- Cachar, Assam
9.	Inferred Reserve	Area of proposed site = 12.7 Hectare s Mineable area=12.7 Hectare s (1,27,000 Sq. m) The maximum depth allowed for extraction of the mineral = 3 m Total reserve of the minerals available would be = 1,27,000 X 3= 3,81,000 Cu.M Considering 1.2 times replenishment total reserve for 5 years would be 4,57,200 CUM
10.	Mineable Reserve	As there will be accumulation of sand to a considerable extent during the rainy season. Mine plan is approved for five years. It is assessed that production in 5 years is 1.2 times of estimated quantity of material (in 5 years) i.e. 3,81,000 x 1.2 = 4,57,200 Cu.M. The reserve of sand available for extraction per year would be about (4,57,200 /5) = 91,440 Cu M. Mining Loss being assumed approximately 10% during the extraction operation would be = (91,440 X 10%) = 9,144 Cu.M per year. The mineable reserve of sand per year = (91,440–9,144) = 82,296 Cu.M So, mineable reserve of sand during the awarded Mining Contract period of 5 years = 82,296 X 5= 4,11,480 Cu.M.
11.	Manpower to be involved	30
12.	Water requirements and source	3 KLD Source: Ground/ surface water
13.	Solid Waste Generation	The generation of Over burden and top soil are envisaged to be nil. No solid waste except small amount of municipal solid waste by the workers at the site will be generated.
14.	Cost of the Project	2 Cr (Approx.)
15.	Budgetary Provision for EMP	5% of project cost is allocated for Environmental Management Plan
16.	Corporate Social Responsibility (CSR) cost	2% of project cost is allocated for CSR cost
17.	Health and Hygiene	2% of project cost is allocated for health and hygiene cost

2.1   Mining methodology

In order to ensure the conservation of mineral, systematic mining and protection of environment, the Assam Minor Mineral concession Rules (AMMCR), 1994 had been replaced by Assam Minor Mineral concession Rules (AMMCR, 2013).It has been mandatory to prepare Mining Plan and Progressive Mine Closure Plan for grant of any mineral concession like "Mining Lease",

"Mining Contract" or "Mining Permit" in respect of minor minerals for systematic and scientific development of all mines, quarries as well as river bed mining.

Here, the Mining Plan is prepared to extract sands of the Barak River bed deposits.

The proposed Mining area is basically almost loose deposit of river bed sands and to extract the same from this deposit, manual opencast method of mining is suggested. Use of machinery is sternly not advisable. The procedure to be adopted for open cast mining is elaborately described below:

1. The entire boundary of the Mining Contract area will be marked with boundary lines and pillars in all the corner points. The boundary pillars are to be numbered and marked with GPS coordinate there on. Extraction of sand is to be carried out with a bench height of 0.5 meter to 1.0 meter for the whole area. Use of explosives for mining is not required.

2. The river bed deposits to be extracted and stacked by the Mining Permit Holder will not exceed twice the average monthly production.

3. No mining would be permissible in a river bed up to a distance of five times of the span of a bridge on upstream side and ten times the span of such bridge on downstream side, subject to minimum of 250M on upstream and 500M on the downstream side. (Rule 39(i) of AMMCR, 2013).

4. There shall be maintained an un-mined block of 50M width after every block of 1000M over which mining is undertaken or at such distance as may be directed by the competent authority. (Rule 39(ii) of AMMCR, 2013).

5. Depth of the river bed mining will not in any way exceed 3 meters at any point in the Permit area from the top of the un-mined river bed as per (rule 39 (iii) of AMMCR 2013).

6. The extraction of sand will be restricted within the central 3/4th width of the river. Here, in Barak Sand MMU No. (C), the average mineable width of the Permit area is to be kept 128.25 meters out of the average width of the river being 171 meters as per rule 39(iv) of AMMCR, 2013and amendments.

2.2 Power Requirement

There is no power demand in the project. Work will be carried out in day time only.

2.3 Water Requirement

The total water requirement shall be 3 KLD for domestic, green belt development and sprinkling purpose, which will be sourced from Ground / surface water.

- Dust suppression – 2KLD
- Green Belt – 0.5KLD
- Domestic – 0.5 KLD

2.4 Manpower

The mining activity shall generate employment opportunity of 30 nos. from nearby villages and business opportunity for others.

3.0 Description of Environment

The area around the proposed mining site has been surveyed for physical features and existing environmental scenario. The field survey and baseline monitoring has been done from the period of **October 2023 to December 2023.**

3.1 Meteorology

The meteorological parameters are recorded on hourly basis during the study period near proposed project site and the summary of meteorological data generated at site is presented in following **Table E.3.**

Table E.3: Summary of the Meteorological Data generated at Site

Period	Wind Speed (m/s)		Temperature (°C)		Relative Humidity (%)		Rainfall (mm)
	Max	Min	Max	Min	Max	Min	
Oct-23	4.56	0.09	32.94	17.33	99	50.12	319.39
Nov-23	6.43	0.05	29.51	14.2	98.31	50.81	66.11
Dec-23	3.89	0.03	28.57	9.72	100	42.25	48.51

Source - www. imdpune.gov.in/

3.2 Air Environment

The results of the monitored data indicate that the ambient air quality of the region in general is in conformity with respect to rural/residential norms of the National Ambient Air Quality Standards of CPCB, with present level of activities.

PM_{10}: The maximum value for PM_{10} is **91 μg/m³** observed at AAQ3, Near Project Location (Near Block C) while the minimum value is **64 μg/m³** observed at AAQ8, Ujangram during the study period.

$PM_{2.5}$: The maximum value for $PM_{2.5}$ is 43 **μg/m³** observed at AAQ1, Near Project Location (Near Block A) with the minimum value is **25 μg/m³** observed at AAQ8, Ujangram during the study period.

SO_2: The maximum value for SO_2 is **14 μg/m³** observed at AAQ1, Near Project Location (Near Block A) with the minimum value is **5 μg/m³** observed at AAQ2, Near Project Location (Near Block B); AAQ4, Near Project Location (Near Block D); AAQ5, Near Dudpur Footbal Ground; AAQ6, Hatirhar part II and AAQ8, Ujangram during the study period.

NO$_2$: The maximum value for NO$_2$ is **21 μg/m^3**observed at AAQ1, Near Project Location (Near Block A) with the minimum value is **10 μg/m^3**observed at AAQ2, Near Project Location (Near Block B); AAQ6, Hatirhar part II and AAQ8, Ujangram during the study period.

CO: The maximum value for CO is **2.0 mg/m^3**observed at AAQ1, Near Project Location (Near Block A) with the minimum value is **0.6 mg/m^3**observed at AAQ6, Hatirhar part II and AAQ8, Ujangram during the study period.

3.3 Noise Environment

The noise monitoring has been conducted for determination of noise levels at 8 locations in the study area. Noise level of the study area varied from 53.2 to 64.8 dB (A) in day time and from 43.7 to 55.9 dB (A) in the night time.

3.4 Water Environment

Ground Water Quality

- The analysis results indicate that the pH ranges in between 7.3 to 7.8. The minimum pH of 7.3 was observed at GW5, Fulbari PHC, sripur Pt I ; GW6, Behera GP Office and GW8, Kharilpar M.E school, Kalinagar Pt I; the maximum pH of 7.8 was observed at GW1, Public ME School, Durgapur.
- Total hardness was observed to be ranging from 208 to 332 mg/l. The minimum hardness (208 mg/l) was recorded at GW2, Yasin High school, Ganirgram 4 and the maximum (332 mg/l) was recorded at GW6, Behera GP Office.
- Chlorides were found to be in the range of 55 to 76 mg/l, the minimum concentration of chlorides 55 mg/l was observed at GW7, New Model Degree COLLAGE , Sunapur Pt II whereas the maximum value of 76 mg/l was observed at GW4, Rajnagar M.E. School, Patheri Gram.
- Sulphates were found to be in the range of 59 to 76 mg/l. The minimum value observed at GW7, New Model Degree COLLAGE , Sunapur Pt II (59 mg/l) whereas the maximum value observed at GW5, Fulbari PHC, sripur Pt I (76 mg/l).
- The Total Dissolved Solids (TDS) concentrations were found to be ranging in between 304 to 646 mg/l, the minimum TDS observed at GW7, New Model Degree COLLAGE , Sunapur Pt II (304 mg/l) and maximum concentration of TDS observed at GW1, Public ME School, Durgapur (646 mg/l).
- Iron & Zinc found below detectable limit.

Surface Water Quality

- The analysis results indicate that the pH values in the range of 7.1 to 7.8, the minimum value was observed at SW1, Barak river (US) and maximum value was observed at SW8, Pa Dhowar Bill, Bhangarpar.

- DO was observed to be in the range of 5.6 to 7.1 mg/l. The minimum DO value was observed at SW7, Anua Bill, Ramnagar and maximum DO was observed at SW3, Katakal River and SW5, Jatinga River.
- The TDS was observed in the range of 198 to 338 mg/l, the minimum TDS value was observed at SW1, Barak river (Upstream) and where as maximum value was observed at SW8, Pa Dhowar Bill, Bhangarpar.
- The chlorides and Sulphates were found to be in the range of 41 to 57 mg/l and 26 to 35 mg/l, respectively.
- Total hardness expressed as $CaCO_3$ ranges between 108 to 154 mg/l.
- The calcium & magnesium were found to be in the range of 24 to 34 mg/l and 11 to 19 mg/l, respectively. Zinc is found below detectable limit.

According to the surface water quality criteria set by the CPCB, the Surface water sample 1,2 and 3 falls under class B. Surface Water Sample 6 falls under Class D and rest of the water samples falls under Class C

pH value is in the range of 6.5 to 8.5 on the pH scale indicates normal water in the samples of water collected from ground and surface. Hardness of water indicates that very hards water in the ground water sample (208 – 332 mg /l) i.e. veryhard (>180 mg/l); surface water is moderate to hard water (108 to 154 mg/l) as per the presence of $CaCO_3$ in water sample.

3.5 Soil Quality

- It has been observed that the pH of the soil in the study area varied from 6.8 to 7.9. The maximum pH value of 6.8 was observed at S7, Badarpur part II where as the minimum value of 7.9 was observed at S6, Hatirhar part II.
- The electrical conductivity was observed to range from 316 to 564 μs/cm, with the maximum observed at S2, Near Project Location (Near Block B) with the minimum observed in S4, Near Project Location (Near Block D).
- The available Nitrogen value varies from 123 to 154 kg/ha.
- The available Phosphorus value varies from 63 to 90 kg/ha.
- The available Potassium value varies from 231 to 278 kg/ha.

3.6 Ecology and Biodiversity

The project site is situated in Barak riverbed under Kalain Range of Karimganj Forest Division, Assam. As per records of the forest Department there is Barail East Wildlife sanctuary in 7.43 meters in North East, Barail West Wildlife sanctuary in 12.83 meters in North West direction, Barail Reserve Forest in 9.55 km in North East and North Cachar Reserved Forest in 14.74 km towards North direction.

3.7 Socio Economics

An environmental factor is a socioeconomic concern. The emphasis is mostly on the social and economic consequences of the proposed development's construction and operation. It covers characteristics such as demographic composition, access to basic utilities such as housing, education, health and health services, occupation, water supply, sanitation, connectivity, and power, prevalent local diseases, and characteristics such as tourist sites and ancient monuments. The examination of these criteria aids in defining and assessing the potential implications of project activity on the surrounding area. Every development effort has an immediate and indirect, positive and negative impact. Every development activity has an immediate and indirect, good and bad impact on the region's socioeconomic environment.

4.0   Anticipated Environment Impacts and Environment Management Plan

Land/Soil Environment Impact Mitigation

Adopting suitable, site-specific mitigation measures can reduce the degree of impact of mining on land & soil. Some of the land & soil related mitigation measures are as follows:

- Present land use pattern of the lease area is riverbed and at the conceptual stage the land use pattern will remain the same, hence will not be changed.
- There will be no mining near the banks. This is to protect the bank erosion and river migration.
- There is no generation of waste material in case of River Bed mining. No back filling is proposed as river Bed will be replenished by sediments during rainy season.
- Minimum number of haul roads to river bed for which cutting of river banks will be avoided.
- Mining is avoided during the monsoon season and at the time of floods.
- Vegetation development is proposed along the road sides of the haul roads, to stop soil erosion. While selecting the plant species, preference will be given for planting native species of the area.

Air Impact Mitigation

- The long life WBM (Water Bound Macadam) haul roads will be constructed and maintained for traffic movement.
- The speed of dumpers/ trucks on haul road will be controlled as increased speed increases dust emissions. Overloading of transport vehicles will be avoided. The trucks/ tippers will have sufficient free board. Spillage of ore on public roads will be cleared immediately and vehicles will play in safe speed.
- Planting of trees all along main mine haul road and regular grading of haul roads will be practiced to prevent the generation of dust due to movement of dumpers/trucks.

Noise Impact Mitigation

- Proper maintenance of all transportation vehicles will be carried out which helps in reducing noise during operation.
- Regular maintenance and proper management of deployed machinery will be ascertained and entire mining operation will be carried out in day time only.

- Awareness will be imparted to the workers about the permissible noise levels & maximum exposure to those levels.

Water Impact Mitigation

- Ground water table will not be intersected during the mining activity. During the entire lease period, the deposit will be worked from the top surface up to 3 m bgl or above ground water table, whichever comes first.
- No diversion of surface water is proposed. There will not be any adverse impact on flow pattern, surface hydrology and ground water regime.

Ecology and Biodiversity Impact Mitigation

Flora

- Plantation proposed along the haul roads and other areas in the vicinity will improve the vegetation cover of the study area over a period of time.
- Native plant species which are stress and pollution tolerant and comparatively well acclimatized should be grown along roadsides.
- The trucks carrying sand shall be covered with tarpaulin to avoid dust generation during transportation and protection of agriculture fields along the approach road.

Fauna

- ❖ All workers and drivers involved in the project will be trained to avoid harming any animal spotted. No mining activity shall be carried out at night.
- ❖ No night time mining will be allowed which will disturb wildlife.
- ❖ Workers will be made aware of the importance of the wildlife and signage will be displayed at the sensitive areas to caution the workers & other passerby.
- ❖ Access roads will not encroach into the riparian zones and if any riparian vegetation cleared off for the mining activity will be restored at the end of closure of mine.

Socio-Economic Environment Impact Mitigation

- The implementation of the sand mining project will generate both direct and indirect employment.
- Mining in this lease will give job opportunities to the local people. Thus, mining will benefit the local people.
- The various indirect employment opportunities will also be generated. Several persons of the neighbouring villages will be benefited with contract works, employment through contractors, running of jeeps, trucks, tractors water tankers and bullock carts on hire, and transport related business avenues.
- There will be some people who are engaged in trading of sand. Therefore due to mining of sand, there is possibility of the per capital income improving.

5.0 Environmental Monitoring Programme

It is imperative that the project proponent shall continue to monitor environmental health, post clearance.

- It helps to verify the predictions on environmental impacts presented in this study.
- It helps to indicate warnings of the development of any alarming environmental situations, and thus, provides opportunities for adopting appropriate control measures in advance.

Detailed EMP plan during construction and operation phase is given Chapter 6 of EIA/EMP report.

6.0 Capital Investment and Project Schedule

The proposed mining project is estimated to cost Rs 2 Crores (approx.). Once the statutory clearance being obtained, the mine will start operating. Mine activity will be carried out for five years as per approved mining plan.

7.0 Project Benefits

Mining is backbone of infra-structure development of country. Proposed project has following benefits as given below:

1. Employment for local people
2. Revenue for the State Govt. in form of excise duties, GST, tax cess, levies etc.
3. Sand will be used in construction of road, bridges, buildings etc.
4. Generate business opportunity
5. CSR/CER funds will be used for welfare of people in villages
6. EMP funds will improve environmental quality.
7. Proposed project adds to improve infrastructure that will attract business houses.

The operation of the Mining would help in up-liftment of socio-economic scenario of the locality.

8.0 Need Based Activity

The proposed mining project is aware of the obligations towards the society and to fulfill the social obligations. The proposed project will employ semi-skilled and unskilled labor from the nearby villages for the proposed project as far as possible. The project will also try to generate maximum direct & indirect employment in the nearby villages. The Project Proponents will allocate fund (2% of the project cost) as part of their Need Based Activity and will carry out various activities in nearby villages for the causes of poor people in the nearby villages.

The total estimated cost of the project is 2 Crores. The project Proponent will allot 2% of the project cost i.e., around 4 Lacs towards the Need Based Activity.

9.0 Conclusions

The proposed project will have certain level of marginal impacts on the local environment which will be improved by Environmental Management Plan (EMP). However, it would also generate direct/indirect employment improve the social and economic environment in the vicinity and meets the need of the state.

CHAPTER 1: INTRODUCTION

1.1 Introduction

Rivers are the most important life supporting system of nature. For centuries, humans have been enjoying the natural benefits provided by rivers without understanding much on how the river ecosystem functions and maintains its vitality. Man has changed the nature of many of the world's rivers by controlling their floods, construction large impoundments, over-exploitation of living and non-living resources and using rivers for disposal of wastes. Among these, unscientific and indiscriminate extractions of river bed material from river bed are the rampant activities which are threatening the very existence of the river ecosystem. In order to mitigate the impact of river bed mining on the environment, a scientific assessment is a pre-requisite for framing sustainable development strategies.

Indeed, in a developing country like India, the supply of sand as a raw material for infrastructure development has a paramount importance. Therefore, the implementation of scientific mining principles through EIA & EMP plays a vital role in sustainable economic growth of our country.

Benefits of Sustainable River Bed Mining

- Prevents the river bed from becoming shallow due to the deposition of sediments.
- Scientific mining prevents the excessive erosion, which can damage flora, agriculture land and Settlements situated in close proximity.
- It maintains the water retention capacity and stops flood that destroys the life and property of people living close to the river.
- It generates useful economic resources for construction and generate employment opportunity in local areas.

The proposed extraction area on Barak River Bed is Boundary by the given GPS coordinates, lying on the Barak River and this sand quarry will certainly achive the requirement for various constructions and other filling works. The location of the mining concession area is demarcated by the Department of Environment and Forest, Government of Assam for collection of river bed sand. The location of the quarry site is well connected with SH – 38, NH 37 and NH-27. The proposed mining area is located under Kalain Range of Karimganj Forest Division, Assam. The proposed site is not within any protected area under Archaeological, religious, Cultural heritage or defence establishments. By opening a time bound sand quarry as proposed, the surrounding area will be benefitted by both direct and indirect employment generation opportunities for the local people and thereby growth of economy.

The mining sites being open river courses free from any human habitation, vegetation, infrastructural construction including those which do not fall within any restricted areas as notified in the guideline, coupled with natural replenishment of mining materials through fluvial deposition during rainy season, offers negligible impact on the environment.

The proposed allotted area is 12.7 Hectares , it is under the jurisdiction of Kalain Range of Karimganj Forest Division, Cachar, Assam. The area has been leased to Sri Abdul Munim Barbhuiya for mining of river bed sand for a period of seven (7) years.

This chapter describes the purpose of the report, identification of the proposed project, project proponent, brief description of nature, size and location of the project and importance to the region and country. This chapter also describes the scope of the study and details of regulatory scoping carried out as per Terms of Reference (TOR) issued by SEIAA, Assam.

1.2   Purpose of the Report

As per Environmental Impact Assessment Notification dated 14th September 2006, the proposed project comes under Item No. 1(a) of Category 'B' for which Environmental Clearance (EC) from SEIAA is necessary.

TOR has been issued by SEIAA, Assam proposal No. SIA/AS/MIN/453198/2023, dated 04.04.2024. This EIA report is prepared in line with TOR conditions recommended by SEIAA, Assam. The compliance of TOR is attached as **Annexure I**.

ULTRA-TECH (Environmental Consultancy & Laboratory), Thane, Maharashtra (India) is accredited Environmental Consultant by QCI-NABET, MoEF&CC, Govt. of India hired by Project Proponent Mr. Abdul Munim Barbhuiya to undertake Environmental Impact Assessment (EIA) study and to obtain Environmental Clearance for the proposed project. The process for obtaining the Environmental clearance is depicted in **Figure 1.1**
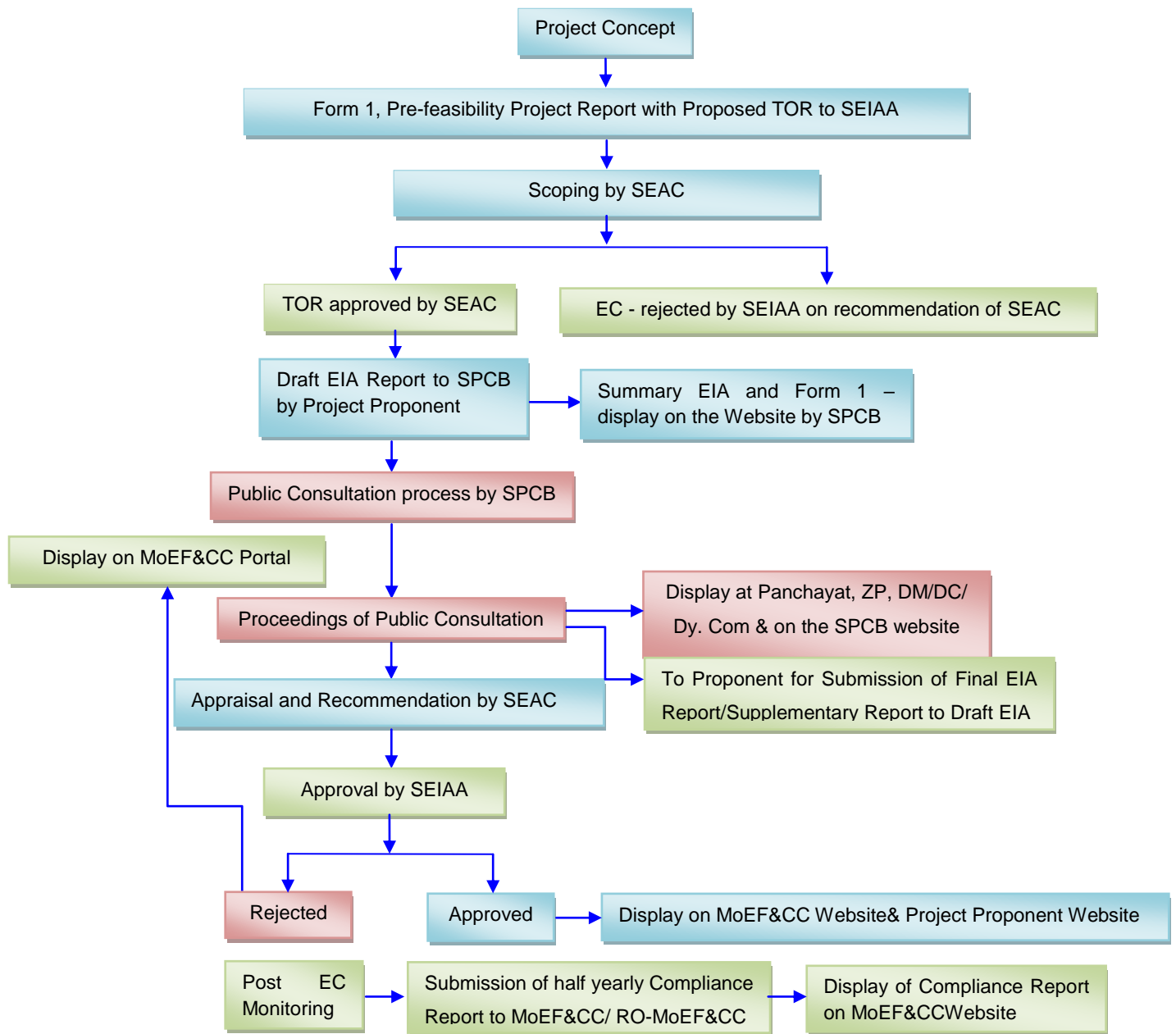
Figure.1.1. Steps for obtaining Environmental clearance

1.3. Identification of Project and Project Proponent

The Proposed River-bed project on Barak River over an area of 12.7 hectare is located near Kalain at Cachar district of Assam under Kalain Range of Karimganj Forest Division, Assam. Lease was granted to Sri Abdul Munim Barbhuiya for collection of sand against their developmental work for a period of 7 (seven) years, as recommended by the Divisonal Forest Officer, Government of Assam. Mining Plan has been prepared by RQP Mr. Prabal Kumar Goswami, which was approved by Department of mining and Geology, Govt. of Assam for five years with production capacity of 45,094 Cu. M per year over an allotted area of 12.7 Hectares . River bed mining activities do not involve top soil removal. Excavation of sand will be done manual open cast method of mining using hand tools like hand shovel, pan, sieve and other

advanced machineries on a temporary basis, if required. There will be no or minimum waste generation as the sand is exposed in the river bed.

Project Proponent Sri Abdul Munim Barbhuiya has experience in mining of minerals residing at District Cachar in Assam. He has good record of project execution in schedule time. He has track record of Environmental Management Plan (EMP) and compliance of Environmental Conditions. Separate funds for EMP, CSR and Health and Hygiene (EHS) are allocated from project cost. All statutory clearances will be complied as per requirements. Work will be executed as per approved Mining Plan and Environmental Compliance will be completed as a statutory requirements and conditions in environmental clearances. The copy of the mining plan is attached as **Annexure II.**

1.4   Project Details

Office of the Divisional Forest Officer, Karimganj Forest Division, Govt. of Assam has leased out river bed area of 12.7 hectare in "Barak Sand Minor Mineral Unit No. 1 " near Kalain under Kalain Range of Karaimganj Forest Division, Assam in favour of Sri Abdul Munim Barbhuiya for extraction of sand for a period of 7 (seven) years with production capacity of 45,094 Cu.M/year. The Mining contract holder will extract Sand from the river bed of Barak perinnial River. The sand available in the river bed for extraction is basically mixed with medium to coarse grained sand. The river bed sand is suitable for use as civil construction material and road construction. The mining area being a compact deposit of river sand to extract the same from this deposit, opencast method of mining will be used. Extraction of sand will be carried out up to a maximum depth of 3m. Use of explosives for mining is not required. Estimated project cost is Rs. 2 Cr.

Brief description of the river bed project at Barak River is discussed as below:

Table 1.1: Brief description of project

S. No	Information	Details
1.	Project Name	Proposed River bed mining project of **Barak Sand Minor Mineral Unit No. 1 "** near Kalain, **Post Office& Police Station**: Kalain, **District:** Cachar, Kalain Range of Karimganj Forest Division, Assam.
2.	Project Proponent (Lease Holder)	Sri Abdul Munim Barbhuiya
3.	Address	Post Office: Kalain, Police Station: Kalain, District-Cachar, Assam
4.	Location of the project	Post Office: Kalain, Police Station: Kalain, District-Cachar, Assam
5.	Name of the river	Barak River
6.	Mine lease area	The allotted area is 12.7 Ha
7.	Production capacity	45,094 Cu. m/ year

1.5   Need for the Project and Its Importance to the Country and or Region

River bed mining project of Barak River has rich source of mineral resources of sand, used in infrastructure development and in production of tiles, ceramics, and lead and in cement

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manufacturing. These minerals are backbone of country infrastructure providing employment in all sections in society.

The sand available in the Barak River bed for extraction is basically coarse-grained sand is often used as building material. Its strength and long life make it suitable for a number of purposes; it had become a major source for infrastructure development i.e. construction of roads, building and bridges etc. and are used as raw materials in production of tiles, ceramic, glass and cement used for houses internal beautification. The sand will be transported from river bed site to various government, semi-government and private consumers. Sand is used in concrete making for building construction. Aggregate is made from sand collected from river bed of Barak River. These are the core constituents in building construction, road or bridge making. Proposed project will provide employment to thirty people from the villages / local areas and business opportunity to others in mining activities. Proposed project provides revenue to Govt. exchequer in GST, cess and excise duties till mine lease contract period of seven years.

1.6   Scope of the Study

EIA integrates the environmental concerns in the developmental activities so that it can enable the integration of environmental concerns and mitigation measures in project development. The study includes detailed characterization of existing status of environment in an area of 10 km radius around project site. In order to get an idea about the existing state of the environment, various environmental attributes such as meteorology, air quality, water quality, soil quality, noise level, ecology and socio-economic environment are studied /monitored. Environmental baseline monitoring has been carried out during **October 2023 to December 2023** representing Post-monsoon season and used to identify potential significant impacts. The report is prepared as per the TOR granted by the SEIAA, Assam.

The scope of the study broadly includes:

- To describe the project and associated works together with the requirements for carrying out the proposed development
- To establish the baseline environmental and social scenario of the project site and its surroundings
- To identify and describe the elements of the community and environment likely to be affected by the project
- To identify, predict and evaluate environmental and social impacts during the construction and operation phase of the project
- To study the existing traffic load, predict the increment in traffic due the project and to suggest the management plan for the same
- To design and specify the monitoring and audit requirements necessary to ensure the implementation and the effectiveness of the mitigation measures adopted
- To access risk during construction and operation phase and formulate the disaster management plan onsite and offsite
- To evaluate proposed pollution control measures and delineate Environmental Management Plan (EMP)

- To delineate post-project environmental quality monitoring program

1.7   Applicable Environmental Regulations

With respect to prevention and control of environmental pollution, the following Acts and Rules of Ministry of Environment and Forest, Government of India govern the proposed project:

- Water (Prevention and Control of Pollution) Act, 1974 as amended in 1988
- Air (Prevention and Control of Pollution) Act, 1981 as amended in 1987
- Environment (Protection) Act, 1986 amended in 1991 and Environment (Protection) rules, 1986 and amendments thereafter
- The Solid Waste Management Rules, 2016
- Hazardous and Other Wastes (Management and Transboundary Movement) Rules, 2016.
- The Manufacture, Storage and Import of Hazardous Chemical Rules, 1989
- E- Waste (Management) Amendment Rules, 2018
- The Noise Pollution (Regulation and Control) Rules, 2000 and as amended
- EIA Notification dated 14.09.2006 as amended

1.8   Structure of EIA Report

EIA report contains baseline data, project description and assessment of impacts and preparation of Environmental Management Plan and Disaster Management Plan. The report is organized in following ten chapters:

Executive Summary

This chapter describes the summary of the environmental impact assessment studies.

Chapter 1: Introduction

This chapter describes objectives and methodology for EIA.

Chapter 2: Project Description

This chapter gives a brief description of the project and method of mining as per approved mining plan etc.

Chapter 3: Description of the Environment

This chapter presents details of the baseline environmental status for meteorology, micro-meteorology, air quality, noise, traffic, water quality, soil quality, flora, fauna and socio-economic status etc.

Chapter 4: Anticipated Environmental Impact and Mitigation Measures

This chapter discusses the possible sources of pollution and environmental impacts due to the project during construction and operation phases and suggests the mitigation measures.

Chapter 5: Analysis of Alternative Sites and Technology

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This chapter describes the analysis of various alternative sites and the technology required for the project. Technology adopted in approved mining plan.

Chapter 6: Environmental Monitoring Program

This chapter provides recommendations for Environment Management Plan (EMP) including mitigation measures for minimizing the negative environmental impacts of the project. Environmental monitoring requirements for effective implementation of mitigative measures during construction as well as during operation of the project along with required institutional arrangements for their implementation. Budgetary cost estimates of EMP for mitigation measures are also brought out.

Chapter 7: Additional Studies

This chapter covers information about Public Consultation and Risk Assessment Studies for the construction and operation phase, the safety precautions that are taken during construction phase.

Chapter 8: Project Benefits

This chapter presents the benefits from this project.

Chapter 9: Environmental Cost Benefit Analysis

Chapter 10: Environmental Management Plan

This chapter deals with the Environmental Management Plan (EMP) for the proposed Project and indicates measures proposed to minimize the likely impacts on the environment during construction and operation phases and budgetary allocation for the same.

Chapter 11: Summary and Conclusion

This will constitute the summary of the report

Chapter 12: Disclosure of Consultants

This chapter deals with the details of consultants engaged and the NABET accreditation details of environmental consultants.

1.9 ToR Compliance

Table 1.2: Compliance of Terms of Reference

SN	Description	Compliance in the Draft EIA Report
	TOR Conditions	
	Standard Terms of Reference	
1.	Year-wise production details since 1994 should be given, clearly stating the highest production achieved in any one year prior to 1994. It may also be categorically informed whether there had been any increase in production after the EIA Notification 1994 came into force, w.r.t. the highest production achieved prior to 1994.	This is green field project; There is no production details
2.	A copy of the document in support of the fact that Proponent is the rightful lessee of the mine should be given.	Proponent is the rightful lessee of the mine. The mining lease has been recived from the DFO of Karimganj forest Division vide LOI office Order No. KJ(T)/40(D)/Sand/ Barak - 1/3504 dated 26/05/2023 in favour of Sri Abdul Munim Barbhuiya . Copy of LOI is attached in **Anmnexure III**.
3.	All documents including approved mine plan, EIA and Public Hearing should be compatible with one another in terms of the lease area, production levels, waste generation and its management, mining technology etc. and should be in the name of the lessee.	All documents including Form 1, PFR, Approved mine plan, EIA has been Complied in the EIA/EMP report.
4.	All corner coordinates of the mine lease area, superimposed on 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 and other ecological features of the study area (core and buffer zone).	All corner coordinates of the mine lease area, superimposed on a High Resolution Imagery are incorporated. For more details please, Refer- Figure 3.3 of Chapter 3, of the EIA/EMP Report.
5.	Information should be provided in Survey of India Toposheet in 1:50,000 scale indicating geological map of the area, geomorphology of land forms of the area, existing minerals and mining history of the area, important water bodies, stream and rivers and soil characteristics.	Topographical sheet covering the project location and its surroundings is given in Figure 3.2 of chapter 3 in the EIA/EMP Report.
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.	Under Rule-52(1) of the Assam Minor Mineral Concession Rules (AMMCR) 2013 is applied to prepare Mining Plan and Progressive Mine Closure Plan for the proposed mining contract for collection of sand in the river bed of Barak River. Sri Abdul Munim Barbhuiya issued was allotted area of 12.7 hectare in riverbed of Barak River near Kalain, Cachar district of Assam under Kalain Range of Karimganj Forest Division, Assam. Mine lease was granted on on 26/05/2023 Office order no. .

SN	Description	Compliance in the Draft EIA Report
	TOR Conditions	
		KJ(T)/40(D)/Sand/ Barak -1/3504 for a period of 7 years by Department of Environment & Forest, Govt. of Assam. Mine plan was prepared by registered RQP Mr. Prabal Kumar Goswami of Directorate of Geology and Mining, Govt. of Assam. The copy of mining plan is attached in **Annexure II**.
7.	It should be clearly stated whether the proponent Company has a well laid down Environment Policy approve 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 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.	Proponent Company has a well laid down Environment Policy discussed in Chpter 7 of EIA report. Policy states that 1. Company complies Environmental Conditions as directed in EC, CTE and CTO letters and directions given by statutory bodies' time- to-time under Environmental Protection Act 1986 and its amendments. 2. General Manager (Project – Management) is Head of Environment Management. He will be responsible for Environmental issues, Compliance of EC conditions, implementation of EMP, EHS & CER yearly till the project continues. He will report to management of the company. 3. Violation/ non-compliance of environmental norms/conditions is reported to the management (owner / CMD) of the company, which will be strictly handled by management may lead to termination of employee. 4. Implementation of Environmental monitoring, EMP, CER and EHS is as per schedule discussed in EIA report and report will be provided to the office of statutory bodies. 5. Company has policy for health checkup prior to employment in the company and will be facilitated routine health checkup under EHS policy of company. 6. On-site shelter, crutch at site and first aid and tie up with District Hospital for ambulance and other medical facilities (if requires) as per company policy.
8.	The study area will comprise of 10 km zone around the mine lease from lease periphery and the data contained in the EIA such as waste generation etc. should be for the life of the mine / lease period.	This riverbed mining project doesn't involve generation of waste. Amount of domestic waste generated by the labours will be used as manure. Details have been given in Chapter 4 of the EIA/EMP report.

SN	Description	Compliance in the Draft EIA Report
TOR Conditions		
9.	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 beprepared to encompass preoperational, operational and post operational phases and submitted. Impact, if any, of change of land use should be given.	Land Use/Land Cover of the study are with LULC map & classification is given in section 3.3 of Chapter 3 of EIA-EMP Report. <table><tr><th>Sl. No.</th><th>Feature</th><th>Area in Sq.km</th><th>Area in %</th></tr><tr><td>1</td><td>Water Body</td><td>43.34</td><td>9.90</td></tr><tr><td>2</td><td>River</td><td>12.79</td><td>2.92</td></tr><tr><td>3</td><td>Crop Land</td><td>168.69</td><td>38.53</td></tr><tr><td>4</td><td>Settlement</td><td>12.67</td><td>2.89</td></tr><tr><td>5</td><td>Vegetation</td><td>73.24</td><td>16.73</td></tr><tr><td>6</td><td>Sand</td><td>0.62</td><td>0.14</td></tr><tr><td>7</td><td>Barren Land</td><td>16.08</td><td>3.67</td></tr><tr><td>8</td><td>Tea Garden</td><td>9.1</td><td>2.08</td></tr><tr><td>9</td><td>Forest</td><td>101.31</td><td>23.14</td></tr><tr><td colspan="2">Total area</td><td>437.84</td><td>100</td></tr></table> *Croplad rea is 38.53% in LULC map which is followed by area with Forest 23.14 %.*
10.	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. This is riverbed project. Sand is the riverbed product which is salable. There is no overburden/byproduct generated.
11.	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 beinspected by the State Forest Department along with the Regional Office of the Ministry to ascertain the status of forests, based on which, the Certificate in this regard as mentioned above be issued. In all such cases, it would be desirable for representative of the State Forest Department to assist the Expert Appraisal Committees.	The project area falling under Kalain Range of Karimganj Forest Division, Dist- Cachar, Assam. The mining lease is granted by the Divisional Forest Officer, Karimganj Forest Division, Karimganj, Dharakuna District-Cachar, Assam Office Order No. . KJ(T)/40(D)/Sand/ Barak -1/3504 dated 26/05/2023.
12.	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.	Not applicable.
13.	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.
14.	The vegetation in the RF / PF areas in the study area, with necessary details, should be given.	A detailed study on the Ecology & Biodiversity of the study area has been done and the same

SN	Description	Compliance in the Draft EIA Report
TOR Conditions		
		has been incorporated in section 3.9 of Chapter 3 of the EIA/EMP Report. 1. **Barak River** –Project Site itself 2. **Jatinga River-** 3.53 km, East (From Block B) 3. **Katakal River –** 7.62 Km, South West (From Block D) 4. **Dolasor River –** 8.75 km, West, (From Block D) 5. **Dalu River – 4**.5 km, North (From Block A) 6. **Barail WLS (East Block) -** 7.43 km, North East 7. **Barail Reserve Forest –** 9.55 km, North East
15.	A study shall be got done to ascertain the impact of the Mining Project on wildlife of the study area and details furnished. Impact of the project on the wildlife in the surrounding and any other protected area and accordingly, detailed mitigative measures required, should be worked out with cost implications and submitted.	The impact & mitigation measure on wildlife of the project area is given in the chapter 4 of the EIA/EMP report.
16.	Location of National Parks, Sanctuaries, Biosphere Reserves, Wildlife Corridors, Ramsar site Tiger/ Elephant Reserves/ (existing as well as proposed), if any, within 10 km of the mine lease should be clearly indicated, supported by a location map duly authenticated by Chief Wildlife Warden. Necessary clearance, as may be applicable to such projects due to proximity of the ecologically sensitive areas as mentioned above, should be obtained from the Standing Committee of National Board of Wildlife and copy furnished.	The details of the Location of National Park, Sancturies, Biosphere Reserve, Wildlife Corridors, Ramsar site Tiger/Elephant Reserves is given in Table 2.1 in Chapter 2 of the EIA/EMP report. under environmental setting criteria.
17.	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, thenecessary plan alongwith 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.	A detailed study on the Ecology & Biodiversity of the study area (10 km radius from the project site) has been done and the same has been incorporated in the section 3.9 of Chapter 3 of EIA/EMP Report.
18.	Proximity to Areas declared as 'Critically Polluted' or the Project areas likely to come under the 'Aravali Range', (attracting court restrictions for	Not Applicable.

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SN	Description	Compliance in the Draft EIA Report
TOR Conditions		
	mining operations), should also be indicated and where so required, clearance certifications from the prescribed Authorities, such as the SPCB or State Mining Departmentshould be secured and furnished to the effect that the proposed mining activities could be considered.	
19.	One season (non-monsoon) [i.e., March- May (Summer Season); October-December (post monsoon season); December- February (winter season)] primary baseline data on ambient air quality as per CPCB Notification of 2009, water quality, noise level, soil and flora and fauna shall be collected and the AAQ and other data so compiled presented date-wise in the EIA and EMP Report. Site-specific meteorological data should also be collected. The location of the monitoring stations should be such as to represent whole of the study area and justified keeping in view the pre-dominant downwind direction and location of sensitive receptors. There should be at least one monitoring station within 500 m of the mine lease in the pre-dominant downwind direction. The mineralogical composition of PM10, particularly for free silica, should be given.	Primary Baseline data has been collected from 01st October 2023 to 31st December 2023 (Post-monsoon season). The Ambient Air Quality parameters PM_{10}, $PM_{2.5}$, SO_2 and NO_2 are in the range of 64 to 91, 25 to 43, 5 to 14, 10 to 21 $\mu g/m^3$ and CO is in range of 0.6 to 2.0 mg/m^3. Ambient Noise are in the range of 53.2 to 64.8 dB (A) in day time and from 43.7 to 55.9 dB (A) in the night time. The raw data of ambient air quality as per CPCB Notification of 2009, water quality, noise level, soil and flora and fauna including the monitoring locations has been given in the Chapter 3 of the EIA-EMP Report. It is given in **Annexure IV**.
20.	Air quality modeling should be carried out for prediction of impact of the project on the air quality of the area. It should also take into account the impact of movement of vehicles for transportation of mineral. The details of the model used and input parameters used for modeling should be provided. The air quality contours may be shown on a location map clearly indicating the location of the site, location of sensitive receptors, if any, and the habitation. The wind roses showing predominant wind direction may also be indicated on the map.	Air quality modeling should be carried out for prediction of impact of the project on the air quality of the area. Details have been given in section 4.2 of Chapter 4 in the EIA/EMP report. The maximum incremental values of PM_{10} & $PM_{2.5}$ 9.44 and 5.66 are superimposed on the max. base-line values 89 and 42.54 $\mu g/m^3$. These values are within the permissible limit of CPCB standards.
21.	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.	Water requirement for the project is 3.0 KLD and its availability from Ground/River water source. Dust suppression- 2.0 KLD Green Belt- 0.5 KLD Domestic - 0.5 KLD Total 3.0 KLD A detailed water balance diagram is given in Section 2.9.1 of Chapter 2 of the EIA/EMP Report.
22.	Necessary clearance from the Competent Authority for drawl of requisite quantity of water for the Project should be provided.	Not Applicable No groundwater will be abstracted for use at mine site. Water will be arranged from local body through tankers.
23.	Description of water conservation measures proposed to be adopted in the Project should be	No water conservation measures are Proposed.

SN	Description	Compliance in the Draft EIA Report
TOR Conditions		
	given.	
24.	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.	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. It is complied in Section 3.7 of Chapter 3 of the EIA/EMP report.
25.	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.	It is complied in Section 3.2 of Chapter 3 of the EIA report. During the entire lease period, the deposit will be worked from the top surface up to 3 m bgl or above ground water table, whichever comes first.
26.	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.	No diversion, modification is proposed of any stream.
27.	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.	Please refer to Chapter 3, section 3.2 of EIA/EMP Report for detailed information on the Geology & Hydrology of the project area.
28.	A time bound Progressive Greenbelt Development Plan shall be prepared in a tabular form (indicating the linear and quantitative coverage, plant species and time frame) and submitted, keeping in mind, the same will have to be executed up front on commencement of the Project. Phase-wise plan of plantation and compensatory afforestation should be charted clearly indicating the area to be covered under plantation and the species to be planted. The details of plantation already done should be given. The plant species selected for green belt should have greater ecological value and should be of good utility value to the local population with emphasis on local and native species and the species which are tolerant to pollution.	A greenbelt development plan has been prepared which has been given in paragraph 10.7 of Chapter 10, Table 10.1 of EIA/EMP Report.
29.	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	A traffic study on the junction of SH 38 connecting road i.e. Borkhola Road to mining site of Barak Riverbed (node-1) has been done considering the increase of traffic movement due to the proposed project. The details have been given in the section 3.11 of chapter 3 of the EIA/EMP report.

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SN	Description	Compliance in the Draft EIA Report
TOR Conditions		
	Transportation study as per Indian Road Congress Guidelines.	
30.	Details of the onsite shelter and facilities to be provided to the mine workers should be included in the EIA Report.	Local workers will be engaged for the project. So, no labour camps will be needed. Bio-toilets will be provided.
31.	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 lease has been granted for a period of 7 years. The mining plan has been prepared for 5 years initially. So, no mine closure plan has been suggested.
32.	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 mitigationmeasures with required facilities proposed in the mining area may be detailed.	Occupational Health Hazards & Management has been given as a part of Environmental Risk assessment in section 7.2 of the Chapter 7 of EIA-EMP Report.
33.	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.	Public health implications of the Project and related activities is mentioned in Chapter 10, of the EIA/EMP Report
34.	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 significance is mentioned in Section 3.10 in Chapter 3, of the EIA/EMP Report
35.	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.	Environment Management Plan is given in the Chapter 10 of the EIA/EMP Report.
36.	Public Hearing points raised and commitment of the Project Proponent on the same along with time bound Action Plan with budgetary provisions to implement the same should be provided and also incorporated in the final EIA/EMP Report of the project.	Public hearing preceedings will be incorporated after completion of PH.
37.	Details of litigation pending against the project, if any, with direction /order passed by any Court of Law against the Project should be given.	No litigation pending against the project.
38.	The cost of the Project (capital cost and recurring cost) as well as the cost towards implementation of EMP should be clearly spelt out.	Details the budgetary provision for environmental management for EMP is given in Section 10.8 of Chapter 10 of the EIA/EMP Report.
39.	A Disaster management Plan shall be prepared and included in the EIA/EMP Report.	A Disaster Management Plan has been prepared and incorporated in Section 7.2 of chapter 7 of the EIA/EMP report.
40.	Benefits of the Project if the Project is	The benefits of the project have been discussed

SN		Description	Compliance in the Draft EIA Report
TOR Conditions			
		implemented should be spelt out. The benefits of the Project shall clearly indicate environmental, social, economic, employment potential, etc.	in the Chapter 8, of the EIA/EMP Report.
41.		Besides the above, the below mentioned general points are also to be followed: -	
	a	Executive Summary of the EIA/EMP Report	Compiled in the EIA/EMP report.
	b	All documents to be properly referenced with index and continuous page numbering.	Compiled in the EIA/EMP report.
	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.	Compiled in the EIA/EMP report.
	d	Project Proponent shall enclose all the analysis/testing reports of water, air, soil, noise etc. using the MoEF&CC/NABL accredited laboratories. All the original analysis/testing reports should be available during appraisal of the Project.	Compiled in the EIA/EMP report. It is given in **Annexure IV**.
	e	Where the documents provided are in a language other than English, an English translation should be provided.	Not Applicable
	f	The Questionnaire for environmental appraisal of mining projects as devised earlier by the Ministry shall also be filled and submitted.	Noted and Agreed to the condition
	g	While preparing the EIA report, the instructions for the Proponents and instructions for the Consultants issued by MoEF vide O.M. No. J-11013/41/2006-IA.II (I) dated 4th August, 2009, which are available on the website of this Ministry, should be followed.	Agreed to the condition.
	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.	Agreed and the proceeding of public hearing will be incorporated after public hearing.
	i	As per the circular no. J-11011/618/2010-IA. II (I) dated 30.5.2012, certified report of the status of compliance of the conditions stipulated in the environment clearance for the existing operations of the project, should be obtained from the Regional Office of Ministry of Environment, Forest and Climate Change, as may be applicable.	This is a fresh new EC application.
	j	The EIA report should also include (i) Surface plan of the area indicating	All the figures have been incorporated in the EIA/EMP report.

SN		Description	Compliance in the Draft EIA Report
TOR Conditions			
		contours of main topographic features, drainage and mining area, (ii) geological maps and sections and (iii) Sections of the mine pit and external dumps, if any, clearly showing the land features of the adjoining area.	
42.		Specific Conditions by SEAC	
	a	The NOC from the Water Resources Department for the proposed mining operation in the area bounded by Geo-coordinates is required	Agreed and will be Complied
	b	The guidelines for sustainable sand mining as per SSGM-2016 & EMGSM-2020 needs to be strictly adhered to and the deficiencies, if any, in the approved mining plan needs to be attended carefully with due rectification at the initial stage itself.	Agreed and will be Complied
	c	Plantations proposed need o be attended with utmost sincerity and care. The proponent shall consult the DFO concerned and come up with realistic plantation scheme covering an area of 4.2 Ha with endemic and rare species, locally called Garjan (*Dipterocarpus turbinatus*) and Defol (*Garcinia nervosa*) to be carried out in 2 different plots of these two species of plants specially in order to make a holistic effort in conserving and propagating the species endemic to Barak Valley. The expenditure involved up-to its establishment need to be worked out and the requisite fund, as work out should be made available to the DFO for proper execution in the field and accountability. This may be decided by the concern ed DFO. It is to be noted that educational institutions, public places (Graveyard, Namghar, Temples, masjids) etc may also be given priority for plantation works involving the local population, School Children, NGO's etc. with adequate safe guard measures for survival and success of plants. In sucg cases the species of plants should be aesthetic in nature, of medicinal importance and of Evergreen in nature etc. each of the plants so planted should be with proper labelling showing its scientific name, local name and its medicinal importance when done in Educational Institutions.	Agreed and will be Complied
	d	The recommended species of plants in the locality could be of species like Bakul (*Mimoups elengi),* Agor (*Aquillaria malaccensis),*Amloki (*Phyllanthus emblica)*, Hilikha (*Terminalia chebula),*	The recommended plants will be planted for compensatory green belt plantation.

SN		Description	Compliance in the Draft EIA Report
TOR Conditions			
		Asoca (*Saraca asoca)*, Bel (*Aegle marmelos)*, Bokphul (*Sesbania grandiflora)*, Mohaneem (*Azediracta indica)*, Jamun (*Syzygium cuminii)*, Kordoi (*Averrhoa carambola)*, Arjun (*Terminalia arjuna)*etc.	
	e	Details of plantation in the areas are to be qualified and worked out meticulously covering the area as enmarked.	Agreed and will be Complied
	f	In the process of Public Hearing to be conducted in due course, all stake holders are to be invited including Public representative and the Registered NGOs with their up to date renewal of the Registrations (of the respective NGOs) and such PH shall be conducted by PCBA & district administration and a detailed report with summary of public demands in physical terms showing the financial involvement not less than 2% of the total cost of the project are to be submitted accordingly to the SEAC.	Agreed and will be Complied
	g	For the purpose of the EMP budget and CST, ECR etc all the details indicating the proposed targets in physical terms involving financial expenditures are to be accordingly reflected for each year for due consideration and reasonable decisions by the SEAC in due course.	Detailed EMP budget , ECR details have been discussed in details in Chapter 10 of EIA/EMP report.

CHAPTER 2: PROJECT DISCRIPTION

2.1   Type of project

Sri Abdul Munim Barbhuiya with his residence at Village –Bhangarpar Part I, P.O. - Bhangarpar, P.S –Borkhola, District- Cachar, Assam, intends to operate a sand Quarry in the Barak River bed measuring 12.7 Ha located near Kalain, Post Office & Police Station - Kalain, District: Cachar, (Assam) under Kalain Range of Karimganj Forest Division, District-Cachar, Assam. This is a Mining Contract awarded to Sri Abdul Munim Barbhuiya for extraction of sand for a period of 7 (seven) years, as recommendation by the Office of the Divisional Forest Officer, Karimganj Forest Division, Government of Assam. The present Mining Plan is prepared and approved for the period of 5 (five) years. As per the sanctioned mining plan, the total minable reserve is 225,470 Cu.M and the total quantity of sand to be extracted per year is 45,094 Cu.M. There is no interlinked and interdependent project with respect to this proposed project. The sand produced will be supplied to the consumers as per the consumer's demand locally.

2.2   Need and Justification of the Project

River bed mining project of Barak River has rich source of mineral resources of sand used in infrastructure development and in production of tiles, ceramics, and lead and in cement manufacturing. Crusher unit is set up for grinding or conversion of big size sand into small one. These minerals are backbone of country infrastructure providing employment in all sections in society.

The sand available in the Barak River bed for extraction is basically Coarse-grained sand is often used as building material. Its strength and long life make it suitable for a number of purposes; it had become a major source for infrastructure development i.e. construction of roads, building and bridges etc. and are used as raw materials in production of tiles, ceramic, glass and cement used for houses internal beautification. The sand will be transported from river bed site to various government, semi-government and private consumers. Sand is used in concrete making for building construction. Aggregate is made from sand collected from river bed of Barak River. These are the core constituents in building construction, road or bridge making. Proposed project will provide employment to thirty people from the villages / local areas and business opportunity to others in mining activities. Proposed project provides royalty, revenue to Govt. exchequer in GST, cess and excise duties till mine lease contract period of seven years.

2.3   Location of the Project:

The proposed project site is strategically located on the river bed of Barak River under Kalain Range of Karimganj Forest Division, District- Cachar, Assam at Post Office & Police Station- Kalain, District- Cachar, Assam (**Left bank**: Pratapi Para, Buribali Pt – 1, Buribali Pt –II, Rakhal Khaler Par Pt –I, Ganigram 4**; Right bank:** Krishna Pur, buribali Pt III, Rakhal Khaler Par Pt –II, Hatirhar Pt II).

Table 2.1: Geographical Location and Environmental Setting around Project Site

SN	Component	Description
1	Plant Location	**Barak Sand Minor Mineral Unit No. 1** near Kalain **P. O & P.S:** Kalain **District**: Cachar, Assam **Left bank**: Pratapi Para, Buribali Pt – 1, Buribali Pt –II, Rakhal Khaler Par Pt –I, Ganigram 4**;** **Right bank:** Krishna Pur, buribali Pt III, Rakhal Khaler Par Pt –II, Hatirhar Pt II
2	Approx Site Coordinates	

BLOCK	POINT	LATITUDE	LONGITUDE
BLOCK A	1.	24°54'21.31"N	92°42'46.23"E
	2.	24°54'21.90"N	92°42'45.38"E
	3.	24°54'11.03"N	92°42'39.27"E
	4.	24°54'11.46"N	92°42'38.61"E
BLOCK B	1.	24°53'41.84"N	92°42'22.09"E
	2.	24°53'43.35"N	92°42'21.51"E
	3.	24°53'11.63"N	92°42'9.35"E
	4.	24°53'12.22"N	92°42'7.38"E
BLOCK C	1.	24°52'30.63"N	92°43'6.20"E
	2.	24°52'32.32"N	92°43'5.68"E
	3.	24°52'23.39"N	92°43'40.19"
	4.	24°52'22.52"N	92°43'39.18"E
BLOCK D	1.	24°52'8.45"N	92°42'8.94"E
	2.	24°52'7.58"N	92°42'8.64"E
	3.	24°52'2.91"N	92°41'49.20"E
	4.	24°52'3.91"N	92°41'48.63"E

SN	Component	Description
3	Village/District/State	**Village:** Near Kalain **District:** Cachar **State:** Assam
4	Maximum temperature	35˚C
5	Minimum temperature	12˚C
6	Annual rainfall (total)	>4000mm
7	Plant site elevation above MSL	-
8	Present land use at the site	River Bed
9	Nearest highway	**SH -38 (From Block A)** Road Distance- 600 m, South West, Aerial Distance-238 m, South West **NH -37 (From Block D)** Road Distance- 5.5 Kms South East , Aerial Distance-3.83 Km, South

SN	Component	Description
		NH-27 (From Block A) Road Distance- 7.1Km, North East, Aerial Distance-5.09 Km, North East,
10	Nearest Railway Station	**Railway Station:** Arunachal Junction Railway Station - Road Distance-6 Km, South East (From Block D) Aerial Distance-4.33 Km , South East
11	Nearest Airport	**Airport:** Silchar Airport Road Distance- 38.7 Km, East (From Block A) Aerial Distance- 26.93 Km East
12	Nearest major water bodies	**Barak River –**Project Site itself Jatinga River- 3.53 km, East (From Block B) Katakal River – 7.62 Km, South West (From Block D) Dolasor River – 8.75 km, West, (From Block D) Dalu River – 4.5 km, North (From Block A)
13	Nearest town/City	**Nearest Town** : Silchar Town 8.68 Km South East (Aerial Distance) (From Block D)
14	Nearest village	2. Dudpur Pt III Village– 3.44 km, South West (From Block B)
15	Nearest Dispensary and Govt. Hospital, Educational facility	6. Borkhola Primary Health Center - 4.10 km, North East (From Block A) 7. Dholchara Health Sub Center – 4.90 km, North West (From Block A) 8. Ganirgram State Dispensary -0.24 km , North (From Block D) All major educational Institutions are : 9. PL School – 4.13 km, West (From Block A) 10. Holy Crown School - 1.56 km, South East (From Block C)
16	Nearest Religious/Worship Places:	4. Shiv Temple, Chandpur Pt - III – 3.70 km, West (From Block A) 5. Mahadev Temple , Dudhpatil Pt III – 4.92 km, East (From Block C) 6. West Sorail Jame Masjid – 1.58 km, East (From Block B)
17	Protected areas as per Wildlife Protection Act, 1972 (Tiger reserve, Elephant reserve, Biospheres, National parks, Wildlife sanctuaries, community reserves and conservation reserves)	Barail WLS (East Block) - 7.43 km, North East Barail WLS (West Block) - 12.83 km, North West
18	Reserved / Protected Forests	Barail Reserve Forest – 9.55 km, North East North Cachar Reserved Forest – 14.74 km,North

SN	Component	Description
19.	Defence Installations	None within 15 Km

The Index map and Location map of the project area is shown below as **Figure 2.1** and **Figure 2.2.**
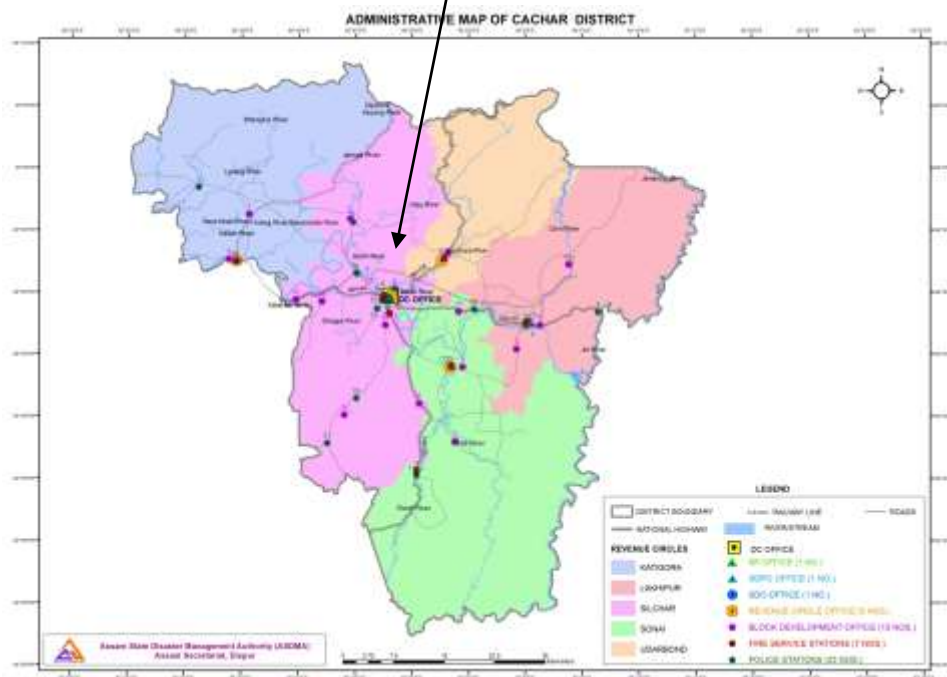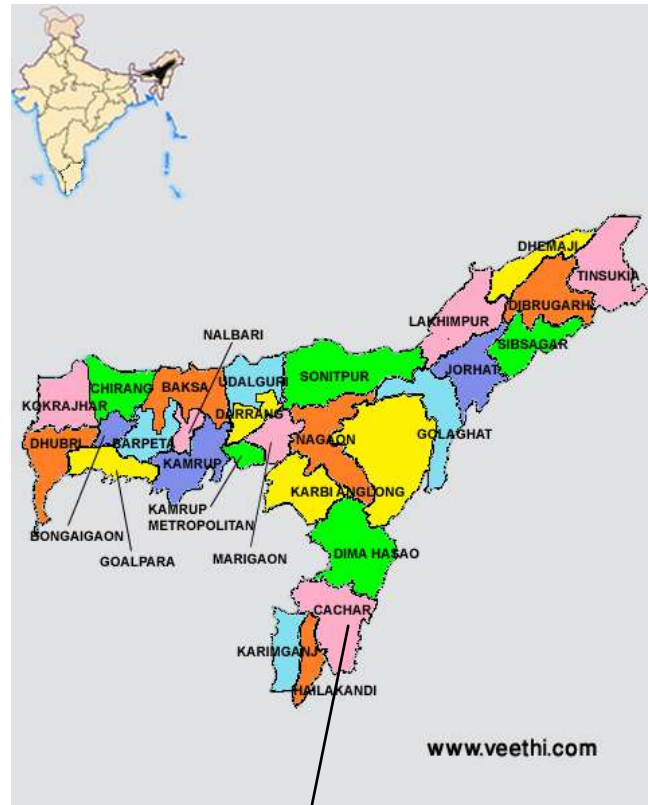
Figure 2.1: Index map of Project Site

Figure 2.2: Location Map of Project

Figure 2.3: Photographs of Project site

2.4   Project Details

2.4.1   *Salient Feature of the Project*

Office of the Divisional Forest Officer, Karimganj Forest Division, Govt. of Assam has leased out river bed area of 12.7 hectare in "Barak Sand Minor Mineral Unit No. 1 " near Kalain under Kalain Range of Karaimganj Forest Division, Assam in favour of Sri Abdul Munim Barbhuiya for extraction of sand for a period of 7 (seven) years with production capacity of 45,094 Cu.M/year. Salient features of river bed project at Barak River are discussed as below:

Table 2.2: Salient Features of the Project

S. N.	Information	Details
1.	Location	**"Barak Sand Minor Mineral Unit No. 1"** near Kalain **P. O & P.S**: Kalain **District:** Cachar, Assam **Left bank**: Pratapi Para, Buribali Pt – 1, Buribali Pt –II, Rakhal Khaler Par Pt –I, Ganigram 4**;** **Right bank:** Krishna Pur, buribali Pt III, Rakhal Khaler Par Pt –II, Hatirhar Pt II

BLOCK	POINT	LATITUDE	LONGITUDE
BLOCK A	1.	24°54'21.31"N	92°42'46.23"E
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	2.	24°53'43.35"N	92°42'21.51"E
	3.	24°53'11.63"N	92°42'9.35"E
	4.	24°53'12.22"N	92°42'7.38"E
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	4.	24°52'22.52"N	92°43'39.18"E
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	2.	24°52'7.58"N	92°42'8.64"E
	3.	24°52'2.91"N	92°41'49.20"E
	4.	24°52'3.91"N	92°41'48.63"E

S. N.	Information	Details
	Toposheet No.	83 D/9 of zone 46
	Village	Near Kalain
	Tehsil	Silchar
	District	Cachar
	State	Assam
2.	Name of the Mineral to be mined	Sand will be collected from River bed

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S. N.	Information	Details
3.	Capacity of Proposed Production per annum	45,094Cu. m per year Production in 5 Years – 225,470 Cu.M
4.	Drilling Blasting	The mining does not require any drilling and blasting in mining activities.
5.	Method of Mining	Open cast manual method of mining will be applied in river bed of Barak River to collect sand from river bed.
6.	Lease Period	7 Years Approved mine plan for 5 years.
7.	Lease Area	12.7 Hectares
8.	Land Use Pattern of the Lease Area	River bed of area 12.7 Hectare of Barak River. Ownership/Occupancy: The Divisional Forest Officer, Karimganj Forest Division, District- Cachar, Assam
9.	Inferred Reserve	Area of proposed site = 12.7 Hectare s Mineable area=12.7 Hectare s (1,27,000 Sq. m) The maximum depth allowed for extraction of the mineral = 3 m Total reserve of the minerals available would be = 1,27,000 X 3= 3,81,000 Cu.M Considering 1.2 times replenishment total reserve for 5 years would be 4,57,200 CUM
10.	Mineable Reserve	As there will be accumulation of sand to a considerable extent during the rainy season. Mine plan is approved for five years. It is assessed that production in 5 years is 1.2 times of estimated quantity of material (in 5 years) i.e. 3,81,000 x 1.2 = 4,57,200 Cu.M. The reserve of sand available for extraction per year would be about (4,57,200 /5) = 91,440 Cu M. Mining Loss being assumed approximately 10% during the extraction operation would be = (91,440 X 10%) = 9,144 Cu.M per year. The mineable reserve of sand per year = (91,440–9,144) = 82,296 Cu.M So, mineable reserve of sand during the awarded Mining Contract period of 5 years = 82,296 X 5= 4,11,480 Cu.M.
11.	Manpower to be involved	30
12.	Water requirements and source	3 KLD Source: Ground/ surface water
13.	Solid Waste Generation	The generation of Over burden and top soil are envisaged to be nil. No solid waste except small amount of municipal solid waste by the workers at the site will be generated.
14.	Cost of the Project	2 Cr (Approx.)
15.	Budgetary Provision for EMP	5% of project cost is allocated for Environmental Management Plan
16.	Corporate Social Responsibility (CSR) cost	2% of project cost is allocated for CSR cost

S. N.	Information	Details
17.	Health and Hygiene	2% of project cost is allocated for health and hygiene cost

2.5   Alternative Sites

No other site is considered for the proposed project. The location of the quarry site as has been recommended by the Office of the Divisional Forest Officer, Karimganj Forest Division, and Government of Assam to issue the Mining Contract in the river bed of River Barak, for collection of sand. The mining sites being open river courses free from any habitation, vegetation, infrastructural construction including those which do not fall within any restricted areas as notified in the guideline, coupled with natural replenishment of mining materials through fluvial deposition during rainy season, offers negligible impact on the environment.

The void occurring due to removal of sand from the river bed is gradually filled up with sand carried by the river current. This process is rapid and natural during rainy season and hence replenishes the reserve of the minerals (sand) every year for fresh mining.

2.6   Size or Magnitude of Operation

Open cast manual method of mining will be applied on the river bed of Barak River. The allotted area is 12.7 Ha . The proposed capacity of the project within a period of five years will be 45,094 Cu.M per year for sand. The average number of working days in the year would be 200. Mining will be carried out only up to a maximum depth of 3m along with using hand tools like shovel, pan, sieve and other more advanced instruments if necessary. Extraction of river bed material will be done depending upon the sedimentation rate i.e. production capacity will not exceed the replenishment capacity of the river.

Calculation of Reserve

The estimated mineral reserve of the proposed mining area to be available for extraction is as stated below.

The area of the Mining Site	**12.7 Ha = 1,27,000 Sq. M**
The maximum depth allowed for extraction of the mineral in River bed	**3 M**
Total reserve of the minerals available would be	**1,27,000 x 3 = 3,81,000 Cu.M**

The above quantity may be termed as 'Inferred Reserve' of the mineral. The actual mineral reserve will be less than that of the inferred reserve, since a considerable volume of the minerals will have to be left un-mined for preparation of the benches/ steps in Open cast mining method.

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Mineable Reserve Calculation

Considering a maximum depth of 3M allowed, the reserve of river bed available for extraction can be estimated as stated below -

The area of the mining Permit site   **= 12.7 Hectare s = 1, 27,000 Sq.M**

Maximum depth allowed for mining   **= 3 M**

So, the total reserve of the minerals available would be   **= 1,27,000 x 3 = 3,81,000 Cu.M**

At this time, the Barak is a perennial river flowing from the nearly Kalain Range of NC Hills and carries a considerable amount of sediments in the form of sand/silt etc. from its catchment area. The amount of carrying material is considerably enormous during rainy season. These materials will replenish gradually by filling the mined out area in subsequent years. So, one rough assumption is made that 1.2 times of the estimated quantity of minor minerals (here, silt/earth) will be available for extraction for the allowable mining period of 5(five) years would be

Inferred Reserve (Cu.M)	Replenishment	Estimated Reserve (Cu.M)
3,81,000	1.2	4,57,200

And, the reserve of river bed available for extraction in one year would be about: 4,57,200/ 5 = 91,440 Cu.M.

For extraction of the river bed deposits (in the form of sand) under the opencast mining method, three numbers of benches each of 1M depth and 1.5M width may be maintained. Assuming the Mining Loss as 10% during the extraction operation would be:

(91,440 x 10%) = 9,144 Cu.M per year

The mineable reserve of river bed deposits in one year = (91,440 -9,144) Cu.M = 82,296 Cu.M

So, mineable reserve of river bed sand for the period of 5(five) years would be = 82,296 x 5 = 4,11,480 Cu.M.

Generally the extraction/ collection of river bed deposits can be carried out for 8 (eight) months only in a year. The work remains suspended for four months of rainy season. During these periods as the river bed remains full with flood water and other related problems (lack of approach road, heavy vehicles may destroy connecting roads, etc.). Considering the number of working days in a month to be 25, the total working days in a year would be 25 X 8= 200 days

So, the extraction of river bed deposits in the form of sand in a year (i.e. for 200 days) would be about:

= (82,296 /365) x 200 Cu.M = 45,093.69 Cu.M = 45,094Cu.M

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The aforesaid quantity of 45,094Cu.M of river bed deposits in 1 year has been estimated considering extraction up to the maximum permissible depth of 3 metres from the ground level/ top surface.

The mineable reserve of river bed sand available for extraction in one year up to different depths is assessed as shown below:-

Depth (Meter)	Mineable Reserve of the Mineral
3	45,094Cu.M Per Year
2	30,062.66 Cu.M Per Year
1	15,031.33 Cu.M Per Year
0.5	7,515.66 Cu.M Per Year

The quantity of river bed sand to be allotted for extraction under the Mining contract will be within the mineable reserve of river bed deposits in the form of sand available per year as depicted above. However, the Competent Authority may prescribe the quantity of river bed deposits of sand to be, extracted by the Mining Permit/contract holder as per the terms and conditions of the Permit/contract by taking into account the impact on the ecology and environment of the surrounding areas.

Production of River Bed Deposits

The proposed Mining area is to be granted for extraction of river bed sand manually from the Barak river.

The letter Office order No KJ(T) / 40(D)/Sand/barak -1/3504, dated. Kxj., the 26/05/2023 of the Divisional Forest Officer, Karimganj Forest Division, the total Mining period is 5(five) years (See Rule 18(1) & 19(7), AMMCR, 2013)

It has been estimated and recommended in the aforesaid letter that the total quantity of the river bed sand available for extraction in a year up to a depth of 3 metres would be = 45,094Cu.M

Considering the total working days as 200 days in a year for transportation of the minerals, the transportation of the mineral per day would be = 45,094Cu.M/200 days = 225.47 Cu.M per day = 226 Cu.M per day

Considering the carrying capacity of the Trucks/Dumpers to be deployed is of 5 Cu.M. The total trips to be made by the Trucks/ Dumpers would be about= 226/5= 45.2= 45 trips per day.

The quantity of river bed sand stated above is an estimated quantity that may be available for extraction considering the extent of the area of the proposed Site. However, the competent authority shall decide and fix the quantity of the river bed sand to be lifted as per terms and conditions of the Mining Rules with due emphasis on the impact on environment and ecology of the surrounding area.

2.7   Project Description with Process Detail

Method of Working

In order to ensure the conservation of mineral, systematic mining and protection of environment, the Assam Minor Mineral concession Rules (AMMCR), 1994 and amendment AMMCR, 2013. It has been mandatory to prepare Mining Plan and Progressive Mine Closure Plan for grant of any mineral concession like "Mining Lease", "Mining Contract" or "Mining Permit" in respect of minor minerals for systematic and scientific development of all mines, quarries as well as river bed mining.

Here, the Mining Plan is prepared to extract sands of the Barak river bed deposits.

The proposed Mining area is basically almost loose deposit of river bed sands and to extract the same from this deposit, manual opencast method of mining is suggested. Use of machinery is sternly not advisable. The procedure to be adopted for open cast mining is elaborately described below:

1. The entire boundary of the Mining Contract area will be marked with boundary lines and pillars in all the corner points. The boundary pillars are to be numbered and marked with GPS coordinate there on. Extraction of sand is to be carried out with a bench height of 0.5 meter to 1.0 meter for the whole area. Use of explosives for mining is not required.

2. The river bed deposits to be extracted and stacked by the Mining Permit Holder will not exceed twice the average monthly production.

3. No mining would be permissible in a river bed up to a distance of five times of the span of a bridge on upstream side and ten times the span of such bridge on downstream side, subject to minimum of 250M on upstream and 500M on the downstream side. (Rule 39(i) of AMMCR, 2013).

4. There shall be maintained an un-mined block of 50M width after every block of 1000M over which mining is undertaken or at such distance as may be directed by the competent authority. (Rule 39(ii) of AMMCR, 2013)

5. Depth of the river bed mining will not in any way exceed 3 meters at any point in the Permit area from the top of the un-mined river bed as per (rule 39 (iii) of AMMCR 2013).

6. The extraction of sand will be restricted within the central 3/4th width of the river. Here, in Barak Sand MMU No. (C), the average mineable width of the Permit area is to be kept kept 128.25 meters out of the average width of the river being 171 meters as per rule 39(iv) of AMMCR, 2013.

Postulates of mining methodology
- Mining will be carried out strictly as per Mining Act/Rules.
- Blasting & drilling not required
- Main stream will not be disturbed.
- Mining will be done in Day time and dry seasons only.
- Required safe corridor will be maintained.
- Mining will be restricted to the depth of 3m.
- Mining will not intersect the ground water table.

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- Angle of repose for mining will not be more than 30 degrees.
- Mining will be carried out on the dry park of river only.

2.8   Progressive Mine Closure Plan

The "Assam Minor Mineral Concession Rule 2013" published in March 2013, has made it mandatory to incorporate "Progressive Mine Closure Plan" in the Mining Plan vide Rule 52(5)(VIII) of the said rules. Such a Mine Closure Plan is useful in case of opencast mines or quarries only wherein the question of phased restoration and/or rehabilitation through afforestation, land reclamation and rehabilitation of land affected by mining operation.

The Barak River is a perennial river and hence, during the monsoon rains, considerable amount of minerals (earth, silt, sand etc.) are transported by the river flow. This Mining permit is a river bed mining for sands only. The sand is to be extracted from the river bed in a scientific manner. The void created by extraction of sand from the river bed would gradually be filled up with the sediments carried by the flow of river channel and would be replenished every year during monsoon. This filling up process is slow in the dry season and rapid during the rainy season. The restoration of the river bed to its original position through natural process is more congenial to the aquamarine environment than the reclamation with earth/ silt/clay etc. brought from elsewhere. Since the river bed will regain its original position through natural process after closure of the mine on expiry of the Permit Period, a progressive mine closure plan would not be necessary in this case.

2.9   Utilities

2.9.1 Water Requirement:

The total water requirement shall be 3 KLD for domestic and sprinkling purpose, which will be sourced from Ground / River water.
- Dust suppression – 2KLD
- Plantation/Green Belt – 0.5KLD
- Domestic use – 0.5 KLD

2.9.2 Power Requirement

There is no power demand in the project. Work will be carried out in day time only.

2.9.3 Manpower Requirement

The mining activity shall generate employment opportunity of 30 nos. from nearby villages and business opportunity for others.

Table 2.3: Manpower Details

S.No.	Category	No. of persons
1	Mine Manager	2
2	Mining Supervisor	4
4	Office Staff	13
5	Security Personnel	11
Total		**30**

CHAPTER 3: DESCRIPTION OF THE ENVIRONMENT

3.1   General

This chapter illustrates the description of the existing environmental status of the study area with reference to the prominent environmental attributes. The study area covers the region falling within 10 km radius around the proposed mining site. The existing environmental setting is considered to adjudge the baseline environmental conditions, which are described with respect to climate, hydro- geological aspects, atmospheric conditions, water quality, soil quality, vegetation pattern, ecology, socio-economic profiles of people, hydro-geological aspects, land use and archaeological importance.

The present report incorporates the data monitored over a period of three months from **October 2023 to December 2023** . The primary baseline monitoring consists of meteorology, ambient air quality, noise levels, water quality, soil quality and ecology (aquatic and terrestrial). The land use, geology, demography data is based on the secondary data collected from various Government, semi-Government and public-sector organizations.

Methodology

The methodology for conducting the baseline environmental survey obtained from the guidelines given in the EIA Manual of the MoEF&CC. Baseline information with respect to air, noise, water and land quality in the study area are collected by primary sampling/field studies during the period of **October 2023 to December 2023   (Post-monsoon Season).**

The meteorological parameters play a vital role in transport and dispersion of pollutants in the atmosphere. The collection and analyses of meteorological data, therefore, is an essential component of environmental impact assessment studies. The long term and short-term impact assessment could be made through utilization and interpretation of meteorological data collected over long and short periods. Since the meteorological parameters exhibit significant variation in time and space, meaningful interpretation can only be done through a careful analysis of reliable data collected very close to the site.

3.2   Geology and Hydrogeology

3.2.1   General profile of the district: Cachar

Located in the Southern most part of Assam, the Cachar District covers an area of approximately 3775 Sq. Km bounded between the latitude 24° 22' to 25° 07' North and longitude 92° 38' to 93° 16' East. The Cachar district is surrounded by hill ranges on three sides, i.e., North, South and East while the Western boundary falls in plains as shown below:-

The Geographical boundaries of Cachar District are: -

North - Barail Hill Range & District of Dima Hasao
South - Lusai Hills & State of Mizoram

East - Manipur Hills & State of Manipur & Part of Lusai Hills
West - Districts of Karimganj & Hailakandi

3.2.2 *Geology*

The Cachar area forms a part of north – south trending compressed thrust fold belt of Assam - Arakan basin having an area of 7000 sq.km. The structural style of sedimentary cover in this area is depicted by a series of North- northeast – South-southwest trending, sub- parallel, arcuate, elongated narrow, tightly folded, doubly plunging and highly faulted anticlines. These anticlines are en-echelon to each other. The anticlines are asymmetrical & are separated by the synclines. Characteristically, the folding intensity shows a gradual increase from west to east. The area has a huge sedimentary cover of approximately 10-11 km. The sediment thickness increases from west to east. This consists of alternating sandstone, siltstone, shale and clay stone beds ranging in age from Eocene to Recent.

3.2.3 *Topography*

Topographical configuration of Cachar District can be broadly divided into two parts. The Central Narrow Valley of plains comprising mainly the alluvial deposition of river Barak and its tributaries, and bounded on 3 sides by the outer undulating regions of foot hills of different hill Ranges.

The District's topography is highly undulating with numerous hills/hillocks. Most ofthe hillocks are under Tea cultivation and a good number of hillocks are covered by tress and manyare un-surveyed revenue land. The overall morphology of the district consists of a series of N-Shillswith intervening narrow as well as wide and flat valley.

3.2.4 *Hydrology*

The entire area of Cachar district is represented by i) unconsolidated, ii) semi-consolidated and iii) consolidated (Compact formation of Tertiary) formations and these units are as follows.

1) Very compact formations comprising the Surma and Dihing series of rocks,
2) Semi-consolidated rocks comprising Tipam and Dupitila formations, and
3) Unconsolidated formation of alluvial deposits.

The semi-consolidated Tipam sandstones form good repository in the area. The depth to water level varies from a few metre to 4 m bgl in alluvial sediments particularly in north and south of Silchar and in western parts while it varies from a few metre to 2 m bgl in the central parts. The hydraulic gradient of ground water is from North to South in northern parts and ground water flows from South to North-West in southern parts. The static water level in shallow aquifers (within 5 m) is within 1.3 to 4.0 m bgl in the North of the Barak River and it varies from 1.8 to 2.22 m bgl in southern parts. Discharge of tube well varies from 5.5 to 8 m 3 /hr with drawdown of 6.0 m. The storativity value varies from 8.8×10^{-4} to 4.14×10^{-3} . The hydraulic conductivity is low in Badribasti area and ranges between 6.1 to 45.23 m/day in the district.

In the deeper aquifer, the granular zone occurs below a confining layer of clay, thus it is a confined aquifer. The static water level ranges from 1.92 to 6.88 m bgl in northern parts and from 0.50 to 8.50 m bgl in the southern parts of the River Barak. The yield of the tube well varies from 33 to 88 m^3/hr with drawdown varying between 9.9 to 32.65 m.

The water level fluctuation, in general, is less than 1 m, however, in places like Mohanpur, Srikona, Kashipur, Rajabazar etc. it is from 4.52 to 7.0 m. In the central parts of the district around Dholai, Palanghat etc. it is only 0.20 m indicating low fluctuation in fine grained deposits.

3.2.5   *Ground Water Resources*

Methodology adopted for ground water resource estimation of Cachar District of Assam is as per GEC 1997 Report, i.e. Ground Water Level Fluctuation and Rainfall infiltration factor QMethod.

The net ground water availability estimated in the year 2009 is 1020.02 mcm. The existing gross ground water draft 39.21 mcm and the stages of development are 4% only. Future provision for domestic and Industrial use is 52.46 mcm and for Irrigation use is 966.99 mcm.

Assessment unit can be categorized into 4 categories as SAFE, SEMI-CRITICAL, CRITICAL, and OVER-EXPLOITED. In Cachar district stage of ground water development is 4%, which shows under the SAFE category. As long-term water level trend does not show any major change so the whole district may be considered as SAFE.

Status of Ground Water Development:

It has been observed that the ground water development in the district is only 2% against the availability of ground water resources in the tune of 2,239 mcm. There is almost no deep tube well scheme for irrigation purposes. The only utilization of ground water is through shallow tube well (50 m depth) and deep tube wells for water supply in the district.

The alluvial deposit comprising sand, clay, silt with occasional gravel has a good thickness in the central part of the district. The deep tube wells constructed by C.G.W.B. reveal medium thick aquifer zones intercalated with clay bands down to depth of 300 m. These tube wells have medium yields up to 88 m^3/hr. Because of fine nature of the aquifer materials, sand rushing to the well screen reduces the ultimate yield of the tube well.

Shallow tube wells down to 50 m depth are feasible in the fringe areas where the alluvial patch thins out and area is dominated by semi-consolidated Dupitila and Tipam rocks. The maximum discharge of such tube wells is up to 8 m^3/hr. Such tube wells tapping clean aquifer zones are feasible in the low lying mounds and hills dominated by young Tertiary rocks.

Dug wells are less feasible in the alluvial plains of the district. The silty and clayey nature of the shallow aquifer zones tapped by dug wells cannot yield much and as a result, heavy drawdown resulting complete dryness of the zone. The dug wells are however, feasible in low mounds and hills of Tertiary rocks surrounding the plain and in fractures of the hard rocks. Atthe base of

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Tipam hills, such dug wells maintain constant water level throughout the year as observed in field.

The district is represented by depressions in its western and central parts resulting water logged conditions. Some of such structures are permanent water bodies known as 'beel'. Because of clayey nature of the superficial layers and seepages from the surrounding hills, the surface sustains the water and prevents percolation to underground aquifers.

The frequent flood in the district spoils the quality of soil resulting water logging. Presently, this problem of water logging in the district creates hazards for irrigation of land during cultivation.

3.2.6 Seismicity

According to IS:1893-1984, the study area falls under Zone-V. It means that the area is covered under "High Risk Zone". There is no major earthquake episode recorded in the study area. Seismic map of the Assam including indication of the Project Site presented in **Figure 3.1**.
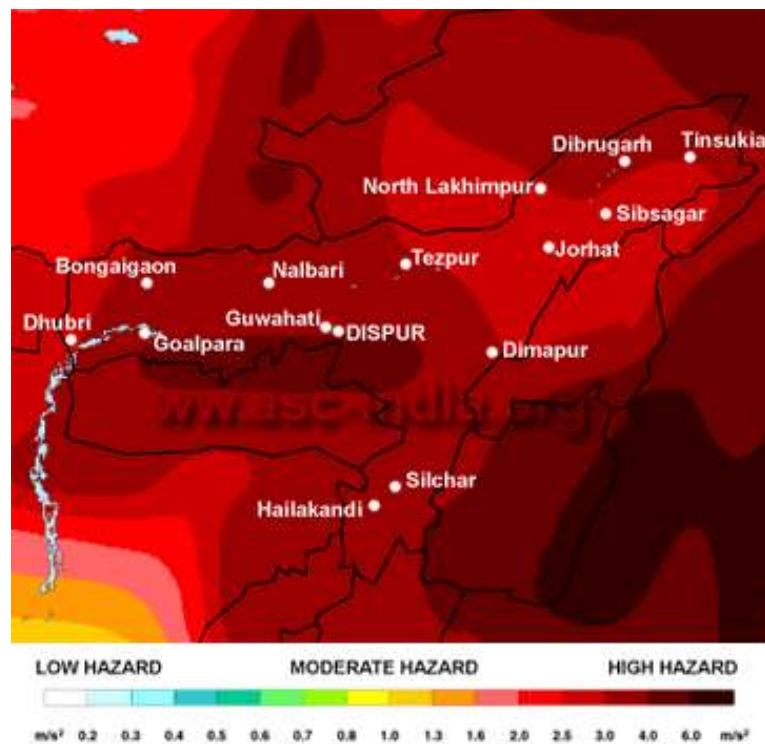
Figure 3.1: Seismic Map of Assam

3.3 Land Use/Land Cover of the Study Area

3.3.1 Introduction

Remote sensing data is a general source of information on natural resources in a region or territory that tracks the state of those resources over time due to its continuous scope. Remote sensing is a powerful and rigorous data collection process. Satellite imaging surveys provide a

great way to measure both the quantitative scale of natural vegetation and the changes in conditions brought on by climate change. Understanding the complexities of the earth's surface properties, as well as phenomena such as complex environments, is also fascinating.

3.3.2   Methodology

Land use area and land use classification analysis as follows:

- ❖ Development of an input database.
- ❖ Data processing and Analysis.
- ❖ End planning of development.

3.3.3   Data input

3.3.3.1 Toposheet:

Figure 3.2 is is showing the project location and its surrounding area on the toposheet of series 83D/9 and 83D/13 of SOI (Survey of India).
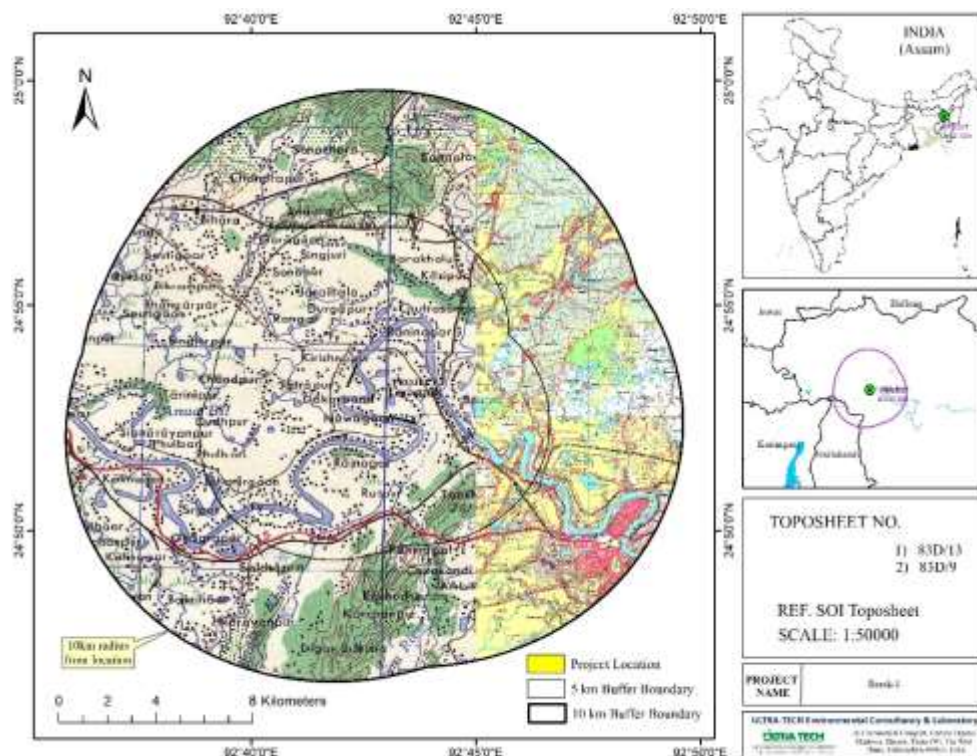
Figure 3.2: Topographical sheetcovering the project location and its surroundings

3.3.3.2 Google Earth image:

Google Earth images have been analyzed for spatial characteristics, soil sensors, latitude, longitude, and geo-recording of satellite images.
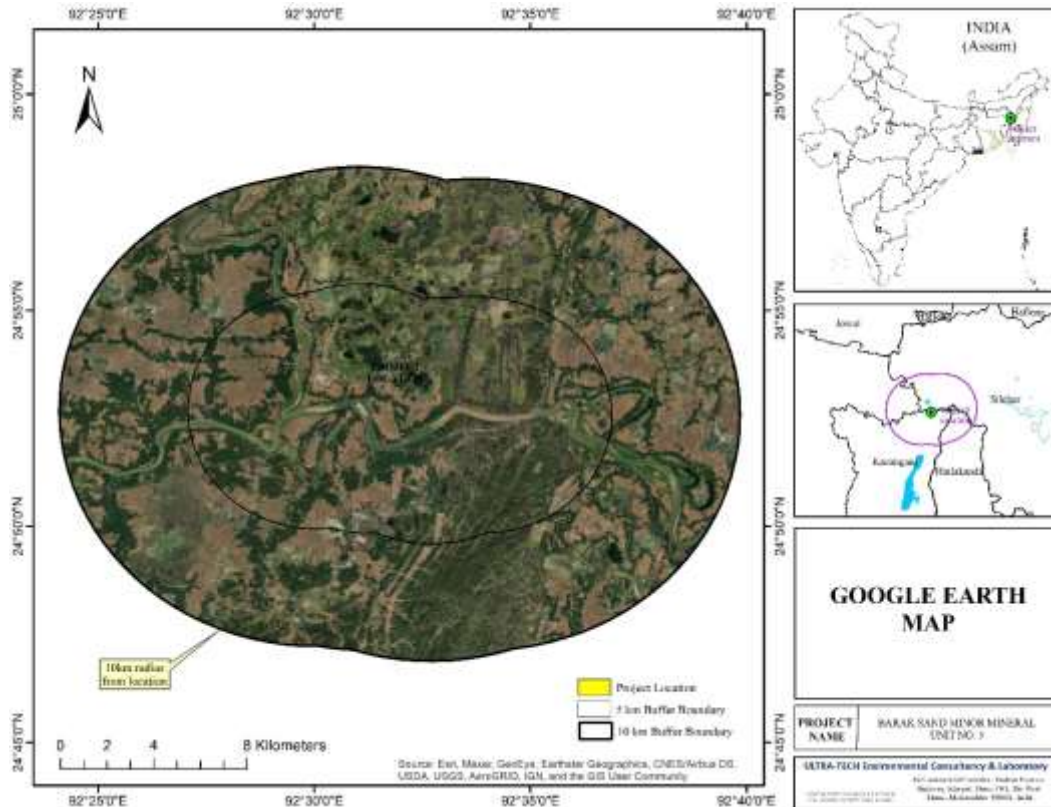
Figure 3.3 Project site on Google Earth Image

3.3.2.2 Satellite image:

Satellite data or satellite image has been downloaded to the framework and a land-use map has been created from the website of the European Space Agency https://scihub.copernicus.eu, information provided in Table 3.1. The first move was the establishment of the FCC standard (using Sentinel 2 bands B2, B3, B4, and B8) and the implementation of the LULC Classification Map of the test site around the site for the project (Figure 3). Sentinel-2 data from the above source have been downloaded to cover the whole area. Sentinel-2 has a total of 13 bands in it. Both bands vary in their spatial resolution. Radiometric and atmospheric corrections have been used to generate the reflectance file. For Sentinel-2, bands 2, 3, 4, and 8 were selected to prepare the RGB to achieve improved classification accuracy. The RGB of the sample region is prepared using the boundary form file to clip the data. Area of significance to all the adjacent scenes. Mosaicking was carried out to minimize the disparity between the various sensing dates and the impact of color issues

The following are the specifics of the satellite image used in this study :

Entity ID	S2B MSIL1C 20240220T041559 N0509
Acquisition date	20/02/2024
Tile Number	T46RDN
Agency	ESA
Platform	SENTINEL-2A
Orbit Number	90
Orbit Direction	Descending Orbit
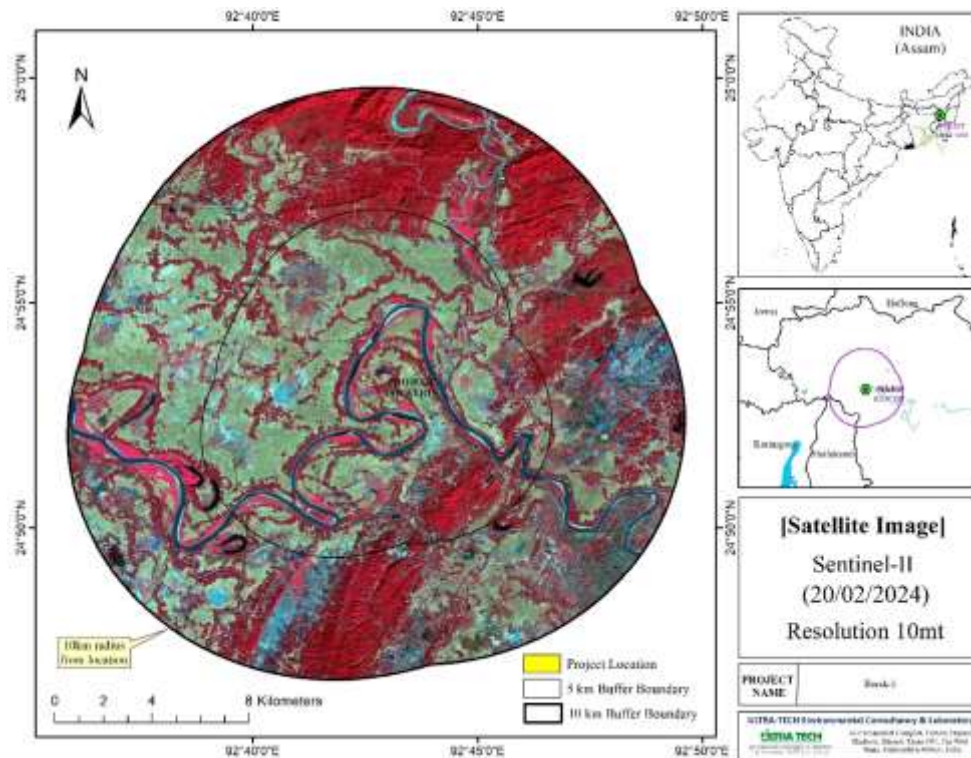
Figure 3.4: Satellite Image Map Covering the Project Location And Its Surroundings

3.3.4 Processing/Analysis of data

3.3.4.1 Restoration of image Data

Data errors, noise, and geometric distortions are added during scanning, transmitting, and recording operations, and restoration processes are designed to detect and compensate for them. The aim is to make the image resemble the original scenario as closely as possible. Since each band's pixels are stored independently, image restoration is relatively simple. Picture restoration attempts to restore image data that has been blurred or corrupted in order to provide a more precise depiction of the original scene. This usually includes the initial analysis of raw image images to correct geometric distortions and calibrate the data radiometrically. Image correction and restoration procedures are often referred to since retrieval operations since they normally precede the editing and review of image data in order to extract relevant data and information.

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3.3.4.2 Radiometric corrections

To calibrate pixel values or fix value errors, radiometric correction is used. The method improves the readability and precision of remote sensing data. When comparing various data sets over time, radiometric calibration and correction are especially important. The difference between the energy emitted or reflected from the surface to the earth as measured by aircraft or satellite instruments and the true energy emitted or reflected from the surface to the earth. This is due to the sun's azimuth, as well as elevation and ambient conditions, which can modify the sensor's capacity. In order to obtain actual or true ground radiance or reflectance values, radiometric errors must also be taken into account.

3.3.4.3 Geometric corrections

Geometric correction is an integral step in the pre-processing of the image since the orientation of the images is calculated. However, the geometric adjustment also requires pixel values in their original location in order to change the original values. Raw digital images usually contain such extreme geometric inconsistencies that they cannot be used as diagrams. The cause of these distortions varies between altitude variance and the velocity of the sensor platform, including panoramic distortion, Earth curve and atmosphere.

3.3.4.3 Ground Truthing

A study of identification was carried out in order to gain a broad understanding of the field of analysis. In order to assess the accessibility of the region as well as the pattern and distribution of vegetation and its composition, it was necessary to have knowledge of current field conditions. Land validation means the formation of a connection between objects and objects observed, labeled, marked, and satellite imagery. In satellite imaging for identification, the appearance of a few species of plants on the field was associated with its tonality.

3.3.5 Final Outputs

3.3.5.1 Classifications of land use:

The land use classification of Hybrid Level-2 was carried out using the Supervised Classification System. Bands 2, 3, 4, 8 are the most appropriate ones. At the end of the study, 9 classes were derived and the picture was ranked. The pattern for graded land use is seen in Table 3.1 and seen in Figure 3.6. The False Color Composite for the area as seen in Figure 3.5**.**
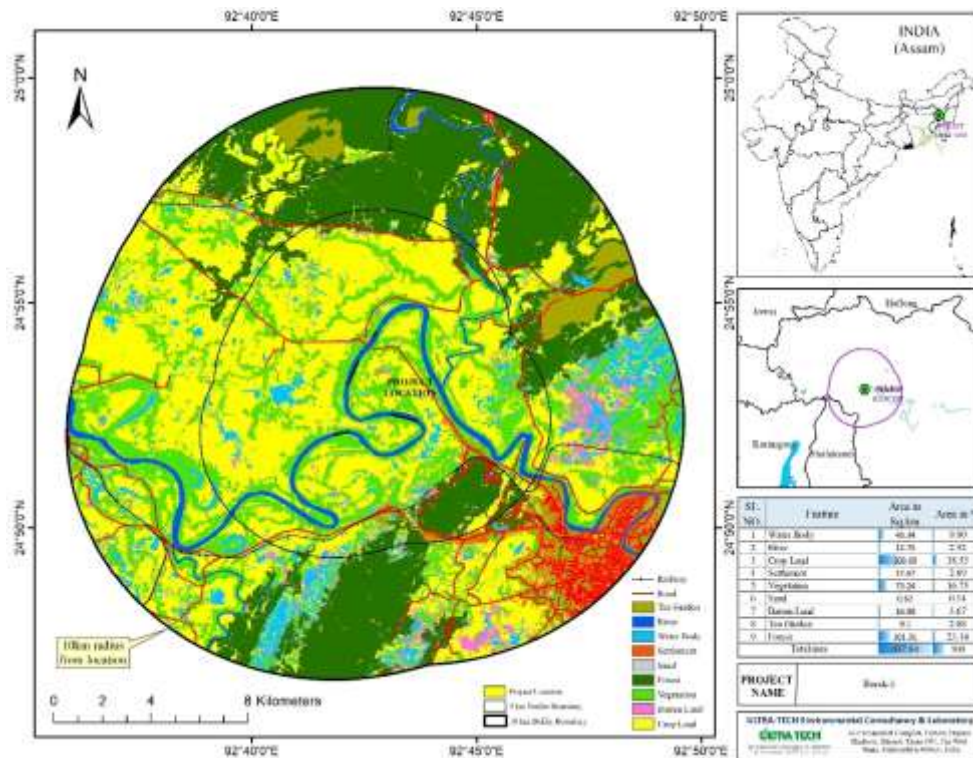
Figure 3.5: Map of LULC Classification (10 Km. Buffer)

Table 3.1: Land-use Classification – Area (10 Km. Buffer)

Sl. No.	Feature	Area in Sq.km	Area in %
1	Water Body	43.34	9.90
2	River	12.79	2.92
3	Crop Land	168.69	38.53
4	Settlement	12.67	2.89
5	Vegetation	73.24	16.73
6	Sand	0.62	0.14
7	Barren Land	16.08	3.67
8	Tea Garden	9.1	2.08
9	Forest	101.31	23.14
	Total area	437.84	100
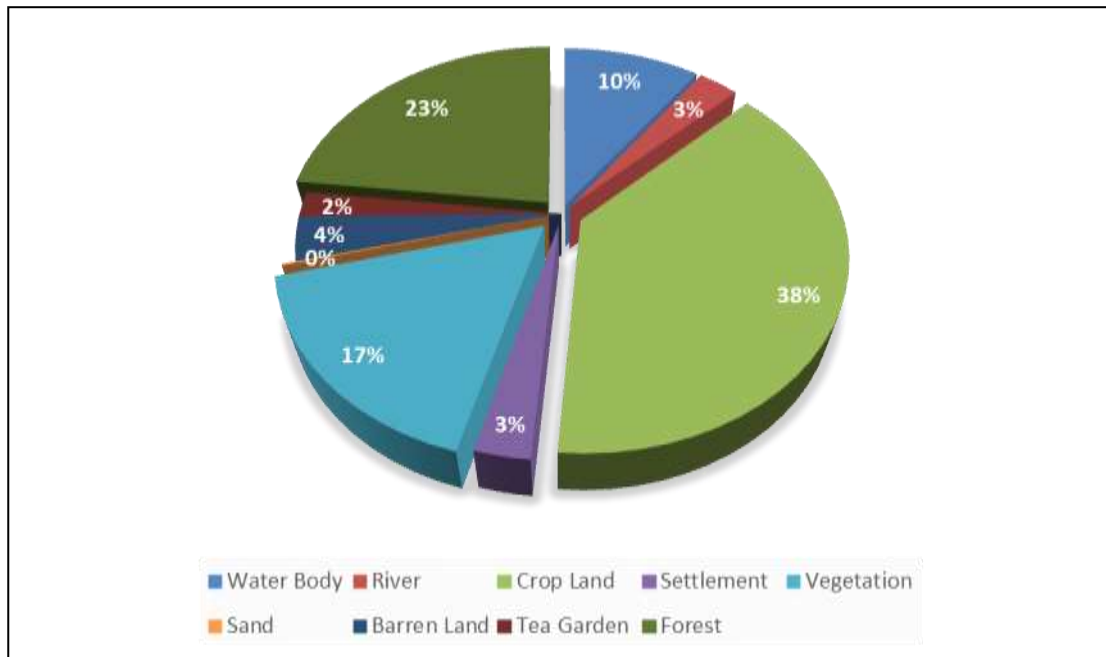
Figure 3.6: LULC Classification (10 Km. Buffer)

3.3.5.2 Interpretation of the classes of land use:

The site of the Bhangarpar village in Borkhola Tehsil of Cachar district in Assam. The area of the village falls on the Survey of India topo sheet 83D/9, and 83D/13 of SOI (Survey of India), as shown in figure 3.2. Figure 3.5 shows the land use map and the land cover map of the study area covering a distance of 10 Km. The LULC map in Figure 3.5 shows that the analysis consists of 9 areal classes water body, River, Barren Land, Crop Land, Settlement, Vegetation, Forest, Tea garden, Sand. Table 3.1 shows that between the regions, cropland is the main patches that cover a large part of the study area.

Water Bodies:

This category includes surface water regions such as lakes, lakes, rivers, and so on. The major body of water, as well as a few scattered bodies of water, are located in the region surrounding the project site. Depending on the temperature of the water, they appear in blue to dark blue or cyan on the satellite picture. These locations have been identified and mapped as significant water bodies; this unit is spread throughout a 56.13 sq.km region, accounting for 12.8 percent of the whole project area.

Settlement:

Built-up Land: A human ecosystem formed as a result of the non-agricultural activity. Built-up land located south-east portion of the study area, including villages, cities, panchayats, and income settlements, as well as structures and industry, factories, roads, communications, water,

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and vegetation amenities. The built-up land community covers 12.67 sq.km of the total area covered by the settlement and commercial sectors, accounting for 2.89% of the overall project, mainly in a linear pattern. This class includes the region surrounding the sand mining project's location.

Barren Land

Land resources serve as the foundation for a variety of development activities on the planet. Due to the ever-increasing population strain on land to fulfill the growing need for food, fuel, and fiber, a large amount of previously barren, fallow, and marginal lands and forests in the country has been converted to agriculture. In the study area 16.08 sq.km i.e. 3.68% of the study area, which makes this portion the area suitable for the project activity.

Cropland

The project area in Badarpur in Cachar District, is basically agrarian in nature with about 80% of the population dependent on agriculture. The main crop is paddy. Oilseeds, legumes, cash crops like jute, vegetables, and so forth are other significant crops. The district's agro-climatic characteristics are favourable for a variety of agricultural operations. Agriculture in the area is distinguished by its reliance on rainfall, the dominance of seasonal crops, and the use of traditional agricultural methods. The croplands span an area of 168.69 square kilometres, or 38.53% of the project area. For the research region, they are listed as linear land use and land cover categories (Figure 3.5).

Vegetation

The project area in Badarpur in Cachar District, where the flora is mainly Tropical evergreen as well as there are huge tracts of the Rainforests within northern as well as southern parts in the district. The forest covers a majority of 52.8 sq.km, i.e., 11.75 % of the project area. Then the dispersed vegetation patches are covering 73.24 sq.km, i.e., 16.73 % within the project area.

Mining Area

Sand deposits are usually most extensive in the lower part of a river's course, forming floodplains and deltas, but they may form at any point where the river overflows its banks or where the flow of a river is checked. They yield very fertile soils, across the plains of Brahmaputra. They occupy 0.62 square kilometres (0.14 % of the study area).

3.4   Meteorological Data

The meteorological parameters play a vital role in transport and dispersion of pollutants in the atmosphere. The collection and analysis of meteorological data, therefore, is an essential component of environmental impact assessment studies. The long term and short-term impact assessment could be made through utilization and interpretation of meteorological data collected over long and short periods.

Since, the meteorological parameters exhibit significant variation in time and space, meaningful interpretation can only be done through a careful analysis of reliable data collected very close to the site.

Table 3.2: Meteorological Monitoring At study area

S.N.	Parameter	Instrument	Frequency
1	Wind Speed	Automatic Weather station (Envirotech WM 251)	Continuous Automatic 1 hourly Average
2	Wind Direction		
3	Ambient Temperature		
4	Max. & Min Temperature	Wet & Dry Bulb Thermometer	Daily at 08:30 and 17:30 IST
5	Relative Humidity	Hygrometer	Daily at 08:30 and 17:30 IST
6	Rainfall	Rain Gauge	Daily

The aforesaid meteorological parameters were being observed in the field during monitoring period. The analysis of the field observations is given in **Table 3.3**. The wind rose during the study period is presented in **Figure 3.7.**

Table 3.3: Meteorological Data Recorded at study area

Period	Wind Speed (m/s)		Temperature (°C)		Relative Humidity (%)		Rainfall (mm)
	Max	**Min**	**Max**	**Min**	**Max**	**Min**	
Oct-23	4.56	0.09	32.94	17.33	99	50.12	319.39
Nov-23	6.43	0.05	29.51	14.2	98.31	50.81	66.11
Dec-23	3.89	0.03	28.57	9.72	100	42.25	48.51

Figure 3.7: Wind rose (October 2023- December 2023) for of the project site

3.5   Ambient Air Quality

The ambient air quality monitoring is carried out at 8 locations within the 10 km radius around the site of project to know the existing background ambient air quality. The purpose of the estimation of background pollutant concentration is to assess the impact of the project on the ambient air quality within the region based on the activities of the project. The parameters chosen for assessment of air quality were PM_{10}, $PM_{2.5}$, Sulphur Dioxide (SO_2), Nitrogen Dioxide (NO_2) andCarbon Monoxide (CO).Their quality monitoring was conducted as per NAAQ standards 2009 amendments.

3.5.1   Methodology Adopted for the Study

PM_{10}, $PM_{2.5}$, Sulphur dioxide (SO_2), Nitrogen Dioxide (NO_2) andCarbon Monoxide (CO) are the major pollutants associated with project. The baseline status of the ambient air quality has been established through field monitoring data on PM_{10}, $PM_{2.5}$, Sulphur dioxide (SO_2), Nitrogen Dioxide (NO_2) andCarbon Monoxide (CO) at 6 locations within the study area. The locations for air quality monitoring are scientifically selected based on the following considerations using climatologically data.

• Meteorological conditions on synoptic scale;

- The methodology for conducting the baseline environmental survey and selection of sampling locations considered the guidelines given in the EIA manual of the MoEF&CC;
- Topography of the study area;
- Representative of the regional background air quality for obtaining baseline status;
- Representative of likely impact areas.

Ambient air quality monitoring was carried out on 24-hour basis with a frequency of twice a week at a station during the study period for 8 locations.

3.5.2 *Sampling and Analytical Techniques*

Respirable Dust Samplers PEM-RDS of Poltech instruments are used for monitoring Respirable fraction (<10 microns) and gaseous pollutants like SO_2, NO_2, CO. Fine Particulate Air sampler PEM-ADS 2.5/10 of Poltech instruments are used for monitoring fine particles i.e PM2.5 in the ambient air. **Table 3.4** shows the techniques for sampling and analysis for these parameters.

Table 3.4: Techniques Used for Ambient Air Quality Monitoring

Parameters	Technique	Technical Protocol	Détectable Limit,($\mu g/m3$)
PM10	Respirable Dust Sampler (Gravimetric method)	Gravimetric	10.0
PM2.5	FRM method/ Low volume sampling (Gravimetric)	Gravimetric	5.0
Sulphur Dioxide	West and Gaeke	IS-5182 (Part-II)	5.0
Nitrogen Oxide	Jacob &Hochheiser	IS-5182 (Part-VI)	5.0
Carbone Monoxide	Non- Dispersive Infrared Absorbtion Method	IS-5182 (Part 10)	0.01 mg/m 3

Ambient air at the monitoring location is sucked through a cyclone. Coarse and non-respirable dust is separated from the air stream by centrifugal forces acting on the solid particles and these particles fall through the cyclone's conical hopper and get collected in the sampling cap placed at the bottom. The fine dust (<10 microns) forming the PM_{10} passes the cyclone and is retained on the filter paper. A tapping is provided on the suction side of the blower to provide suction for sampling air through a set of impingers for containing absorbing solutions for SO_2 and NO_2. Samples of gases are drawn at a flow rate of 0.2 liters per minute.

PM_{10} has been estimated by gravimetric method. Modified West and Gaeke method (IS-5182 part-II, 1969) has been adopted for estimation of SO_2 and Jacobs-Hochheiser method (IS-5182 part-VI, 1975) has been adopted for the estimation of NO_2. Non- Dispersive Infrared Absorbtion Method is used for measurement of CO. Calibration charts have been prepared for all gaseous pollutants.

Duration of Sampling

The duration of sampling of PM_{10}, $PM_{2.5}$, SO_2, and NOx was each twenty-four hourly continuous sampling per day and CO was sampled for 8 hours continuous thrice in 24 hour duration monitoring. The monitoring was conducted for two days in a week for three months. This is to

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allow a comparison with the present revised standards mentioned in the latest Gazette Notification of the Central Pollution Control Board (CPCB) (16th November 2009).

The location of the monitoring stations with reference to the project site is given in **Table 3.5** & **Figure 3.7(A).**

Table 3.5: Details of Ambient Air Quality Monitoring Locations

Station Code	Location	Latitude	Longitude	Distance and Direction
AAQ-1	Near Project Location (Near Block A)	24°54'14.35"N	92°42'33.90"E	0.18 km, West
AAQ-2	Near Project Location (Near Block B)	24°53'25.45"N	92°42'4.40"E	0.25 km, West
AAQ-3	Near Project Location (Near Block C)	24°52'21.29"N	92°43'15.29"E	0.21 km,South
AAQ-4	Near Project Location (Near Block D)	24°52'11.56"N	92°42'7.75"E	0.10 km,North
AAQ-5	Near Dudpur Footbal Ground	24°52'39.56"N	92°40'38.64"E	2.68 km, SW
AAQ-6	Hatirhar part II	24°50'26.72"N	92°42'17.35"E	4.07 km, SSW
AAQ-7	Badarpur part II	24°53'33.75"N	92°45'0.58"E	3.25 km, NE
AAQ-8	Ujangram	24°55'36.25"N	92°43'44.16"E	2.78 km, NE
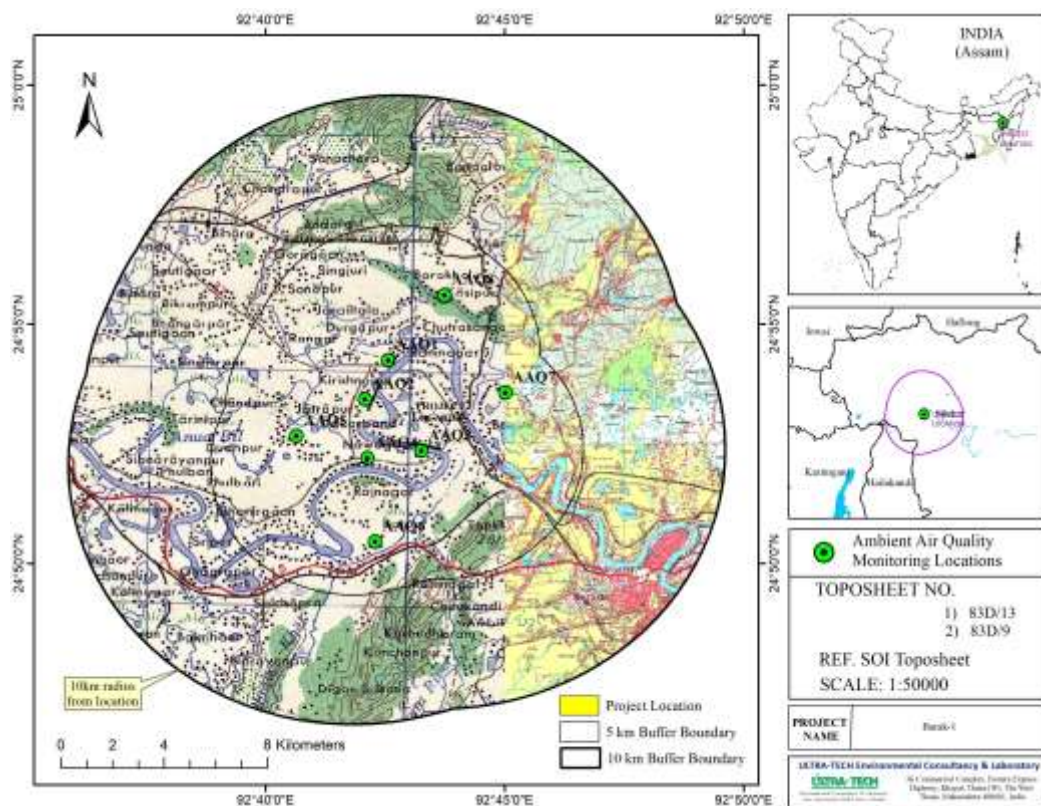
Figure 3.7(A): Map Showing Ambient Air Quality Monitoring Locations

The ambient air quality results are as summarized in **Table 3.6.**

Table 3.6: Summary of Ambient Air Quality Monitoring Results

PM_{10} ($\mu g/m^3$)										
	A1	**A2**	**A3**	**A4**	**A5**	**A6**	**A7**	**A8**
Min	78	75	78	81	68	66	68	64
Max	88	89	91	89	86	74	75	86
98 Percentile	87	87	89	89	86	74	75	86
Standard	100	100	100	100	100	100	100	100
$PM_{2.5}$ ($\mu g/m^3$)								
	A1	**A2**	**A3**	**A4**	**A5**	**A6**	**A7**	**A8**
Min	35	31	35	31	26	26	31	25
Max	43	36	38	37	36	39	37	34
98 Percentile	42	36	38	37	36	37	37	34
Standard	60	60	60	60	60	60	60	60
SO_2 ($\mu g/m^3$)								
	A1	**A2**	**A3**	**A4**	**A5**	**A6**	**A7**	**A8**
Min	8	5	6	5	5	5	7	5
Max	14	8	11	9	7	7	10	7
98 Percentile	14	8	11	9	7	7	10	7
Standard	80	80	80	80	80	80	80	80
NO_2 ($\mu g/m^3$)								
	A1	**A2**	**A3**	**A4**	**A5**	**A6**	**A7**	**A8**
Min	15	10	12	11	11	10	11	10
Max	21	14	18	15	15	13	15	17
98 Percentile	21	14	17	15	15	13	15	17
Standard	80	80	80	80	80	80	80	80
CO (mg/m^3)								
	A1	**A2**	**A3**	**A4**	**A5**	**A6**	**A7**	**A8**
Min	1.5	1.2	1.2	0.9	0.8	0.6	0.8	0.6
Max	2.0	1.4	1.5	1.4	1.0	0.9	1.2	0.9
98 Percentile	2.0	1.4	1.5	1.4	1.0	0.9	1.2	0.9
Standard	4	4	4	4	4	4	4	4

Observations of Primary Data

The results of the monitored data indicate that the ambient air quality of the region in general is in conformity with respect to rural/residential norms of the National Ambient Air Quality Standards of CPCB, with present level of activities.

PM_{10}: The maximum value for PM_{10} is **91 $\mu g/m^3$** observed at AAQ3, Near Project Location (Near Block C) while the minimum value is **64 $\mu g/m^3$** observed at AAQ8, Ujangram during the study period.

$PM_{2.5}$: The maximum value for $PM_{2.5}$ is 43 **$\mu g/m^3$** observed at AAQ1, Near Project Location (Near Block A) with the minimum value is **25 $\mu g/m^3$** observed at AAQ8, Ujangram during the study period.

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SO$_2$: The maximum value for SO$_2$ is **14 µg/m^3** observed at AAQ1, Near Project Location (Near Block A) with the minimum value is **5 µg/m^3** observed at AAQ2, Near Project Location (Near Block B); AAQ4, Near Project Location (Near Block D); AAQ5, Near Dudpur Footbal Ground; AAQ6, Hatirhar part II and AAQ8, Ujangram during the study period.

NO$_2$: The maximum value for NO$_2$ is **21 µg/m^3** observed at AAQ1, Near Project Location (Near Block A) with the minimum value is **10 µg/m^3** observed at AAQ2, Near Project Location (Near Block B); AAQ6, Hatirhar part II and AAQ8, Ujangram during the study period.

CO: The maximum value for CO is **2.0 mg/m^3** observed at AAQ1, Near Project Location (Near Block A) with the minimum value is **0.6 mg/m^3** observed at AAQ6, Hatirhar part II and AAQ8, Ujangram during the study period.

3.6   Noise

Noise in general is sound, which is composed of many frequency components of various loudness distributed over the audible frequency range. The most common and universally accepted scale is the A weighted scale which is measured as dB (A). This is more suitable for audible range of 20 to 20,000 Hz and has been designed to weigh various components of noise according to the response of a human ear. The environmental assessment of noise from the industrial activity, construction activity and vehicular traffic can be undertaken by taking into consideration various factors like potential damage to hearing, physiological responses, and annoyance and general community responses.

3.6.1   Objective

The main objective of monitoring of ambient noise levels was to establish the baseline noise levels in different zones. i. e. Residential, Industrial, Commercial and Silence zones, in the surrounding areas and to assess the total noise level in the environment of the study area.

3.6.2   Methodology

- **Identification of Sampling Locations**

A preliminary reconnaissance survey was undertaken to identify the major noise sources in the area. The sampling location in the area was identified considering location of commercial shopping complex activities, residential areas with various traffic activity and sensitive areas like hospital, court, temple and schools also near the railway track for railway noise. The noise monitoring was conducted at 8 locations in the study area during monitoring period.

- *Equivalent sound pressure level (Leq)*

The sound from noise source often fluctuates widely during a given period of time. Leq is the equivalent continuous sound level, which is equivalent to the same sound energy as the actual fluctuating sound measured in the same time period.

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- **Instrument used for Monitoring**

Noise levels were measured using an Integrating sound level meter manufactured by Cygnet (Model No. 2031). It had an indicating mode of Lp and Leq. Keeping the mode in Lp for few minutes and setting the corresponding range and the weighting network in "A" weighing set the sound level meter was run for one hour time and Leq was measured at all locations. There are different types of fields for measuring the ambient noise level, e categorized as free field, near field and far field.

- **Free Field**

The free field is defined as a region where sound wave propagates without obstruction from source to the receiver. In such case, the inverse square law can be applied so that the sound pressure level decreases by 6 dB (A) as the distance is doubled.

- **Near Field**

The near field is defined as that region close to the source where the inverse square law does not apply. Usually this region is located within a few wavelengths from the source.

- **Far Field**

The far field is defined as that region which is at a distance of more than 1-meter from the source. The location of the monitoring stations with reference to the project site is given in **Table 3.7&Figure 3.7(B)**.

Table 3.7: Noise Level Monitoring Stations in the Study Area

Station Code	Location	Latitude	Longitude
ANQ-1	Near Project Location (Near Block A)	24°54'18.87"N	92°42'42.49"E
ANQ-2	Near Project Location (Near Block B)	24°53'35.36"N	92°42'10.82"E
ANQ-3	Near Project Location (Near Block C)	24°52'20.11"N	92°43'32.48"E
ANQ-4	Near Project Location (Near Block D)	24°52'10.78"N	92°42'12.25"E
ANQ-5	Near Dudpur Footbal Ground	24°52'45.55"N	92°40'48.55"E
ANQ-6	Hatirhar part II	24°50'24.93"N	92°42'13.39"E
ANQ-7	Badarpur part II	24°53'32.01"N	92°45'1.92"E
ANQ-8	Ujangram	24°55'35.26"N	92°43'41.49"E
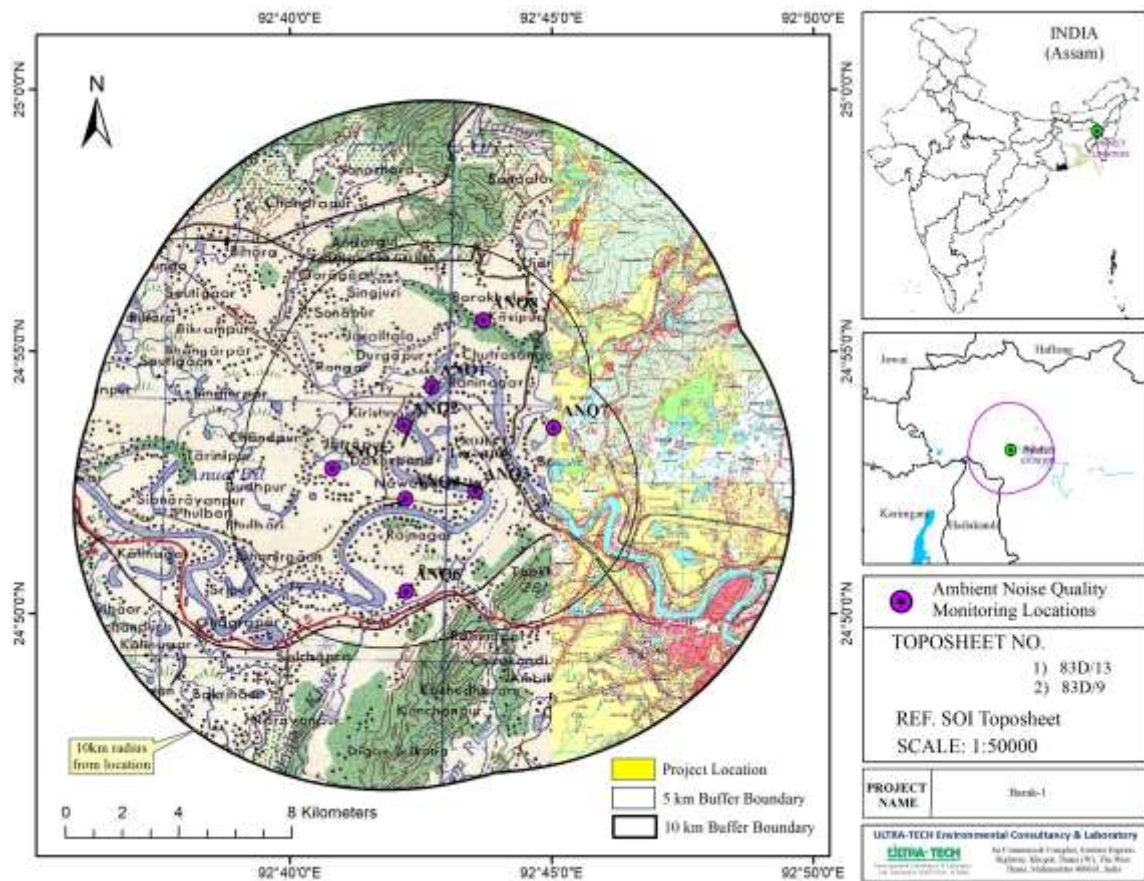
Figure 3.7(B): Map Showing Ambient Noise Quality Monitoirng Locations

3.6.3   Method of Monitoring and Parameters Measured

Noise monitoring was carried out continuously for 24-hours with one-hour interval. During each hour parameters like L_{10}, L_{50}, L_{90} and Leq were directly computed by the instrument based on the sound pressure levels. Monitoring was carried out at 'A' weighting and in fast response mode.

The important parameters to be measured are L_{eq}, L_{day}, and $L_{night.}$

L_{eq}: Latest noise monitoring equipments have the facility for measurement of L_{eq} directly. However, L_{eq}can also be calculated using the following equation:

$L_{eq\,(hrly)} = L_{50} + (L_{10} - L_{90})^2 / 60$

Where,

L_{10} (Ten Percentile Exceeding Level) is the level of sound exceeding 10% of the total time of measurement.

L_{50} (Fifty Percentile Exceeding Level) is the level of sound exceeding 50% of the total time of measurement.

L_{90} (Ninety Percentile Exceeding Level) is the level of sound exceeding 90% of the total time of measurement.

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L_{day}: This represents L_{eq} of daytime. L_{day} is calculated as Logarithmic average using the hourly L_{eq}'s for day time hours from 6.00a.m to 10.00p.m

L_{night}: This represents L_{eq} of night time. L_{night} is calculated as Logarithmic average using the hourly L_{eq}'s for night-time hours from 10.00p.m to 6.00a.m.

3.6.4   Noise Results

The values of noise level parameters like Leq (day), and Leq (night), were monitored during study period and are presented in **Table 3.8.**

Table 3.8: Ambient Noise Monitoring Results

Station Code	Location	Category	Leq dB (A) Day Time	Leq dB (A) Night Time
ANQ-1	Near Project Location (Near Block A)	Industrial Area	64.2	54.7
ANQ-2	Near Project Location (Near Block B)	Industrial Area	64.7	55.2
ANQ-3	Near Project Location (Near Block C)	Industrial Area	64.8	55.3
ANQ-4	Near Project Location (Near Block D)	Industrial Area	65.4	55.9
ANQ-5	Near Dudpur Footbal Ground	Commercial Area	56.7	46.9
ANQ-6	Hatirhar part II	Residential Area	54.4	43.8
ANQ-7	Badarpur part II	Residential Area	53.2	44.1
ANQ-8	Ujangram	Residential Area	53.7	43.7

- **Noise Standards**

Ambient air quality standard in respect of noise have been stipulated by Govt. of India vide Gazette notification dated. 14.2.2000. **Table 3.9** describes ambient noise standards.

In Respect of Noise*

Table 3.9: Ambient Noise Standards

Area Code	Category of Area	Limits in dB(A), L_{eq}	
		** Day time	#Night time
A	Industrial Area	75	70
B	Commercial Area	65	55
C	Residential Area	55	45
D	Silence Zone @	50	40

*   As per Environment protection act.

** Day Time: 6.00a.m to 10.00p.m.

Night Time: 10.00p.m to 6.00a.m.

@ Silence zone is defined as an area upto 100 meters around such premises ashospitals, educational institutions and courts. The silence zones are to be declared by the competent authority; Use of horns, loudspeakers and bursting of crackers shall be banned in these zones.

The noise data compiled on noise levels is given in **Table 3.8.** Noise level of the study area varied from 53.2 to 64.8 dB (A) in day time and from 43.7 to 55.9 dB (A) in the night time.

3.7   Water Environment

Selected water quality parameters of ground water and surface water resources within the study area have been studied for assessing the hydrological environment to evaluate anticipated impact of the proposed project. Understanding the water quality is essential in the preparation of Environmental Impact Assessment. It also assists to identify critical issues in a view to suggest appropriate mitigation measures for implementation to curb the deterioration of various hydrological sources in the vicinity of the project.

The purpose of this study is to:

- Assess the water quality characteristics for critical parameters;
- Evaluate the impacts on agricultural productivity, habitat conditions, recreational resources and aesthetics in the vicinity; and
- Predict the likely impacts on water quality due to the project and related activities.

3.7.1 Methodology

8 surface water and 8 ground water samples were examined for physico-chemical, heavy metals and bacteriological parameters in order to assess the effect of industrial and other activities on surface and ground water. The samples were analyzed as per the procedures specified in 'Standard Methods for the Examination of Water and Wastewater' published by American Public Health Association (APHA).Samples for chemical analysis were collected in polyethylene carboys. Samples collected for metal content were acidified with 1 ml HNO_3. Samples for bacteriological analysis were collected in sterilized glass bottles. Selected physic-chemical and bacteriological parameters have been analyzed for projecting the existing water quality status in the study area. Parameters like Dissolved Oxygen (DO) and pH were analyzed.

3.7.2 Water Sampling Locations

Ground water sample was analyzed for various parameters to compare with the standards for drinking water as per IS: 10500. The water sampling locations are listed below in **Table 3.10** and **Figure 3.7.**

Table 3.10A: Surface Water Quality Sampling Locations

Station Code	Location	Latitude	Longitude
SW-1	Barak River US	24°54'20.91"N	92°42'44.24"E
SW-2	Barak River DS	24°52'2.15"N	92°41'49.75"E
SW-3	Katakal River	24°53'35.64"E	92°38'13.96"E
SW-4	Dolasor River	24°51'28.62"N	92°36'19.14"E
SW-5	Jatinga River	24°53'22.06"N	92°44'19.33"E
SW-6	Gangrai Bill, Raipur	24°53'24.10"N	92°42'42.13"E
SW-7	Anua Bill, Ramnagar	24°49'56.00"N	92°45'36.87"E
SW-8	Pa Dhowar Bill, Bhangarpar	24°54'16.28"N	92°38'54.20"E
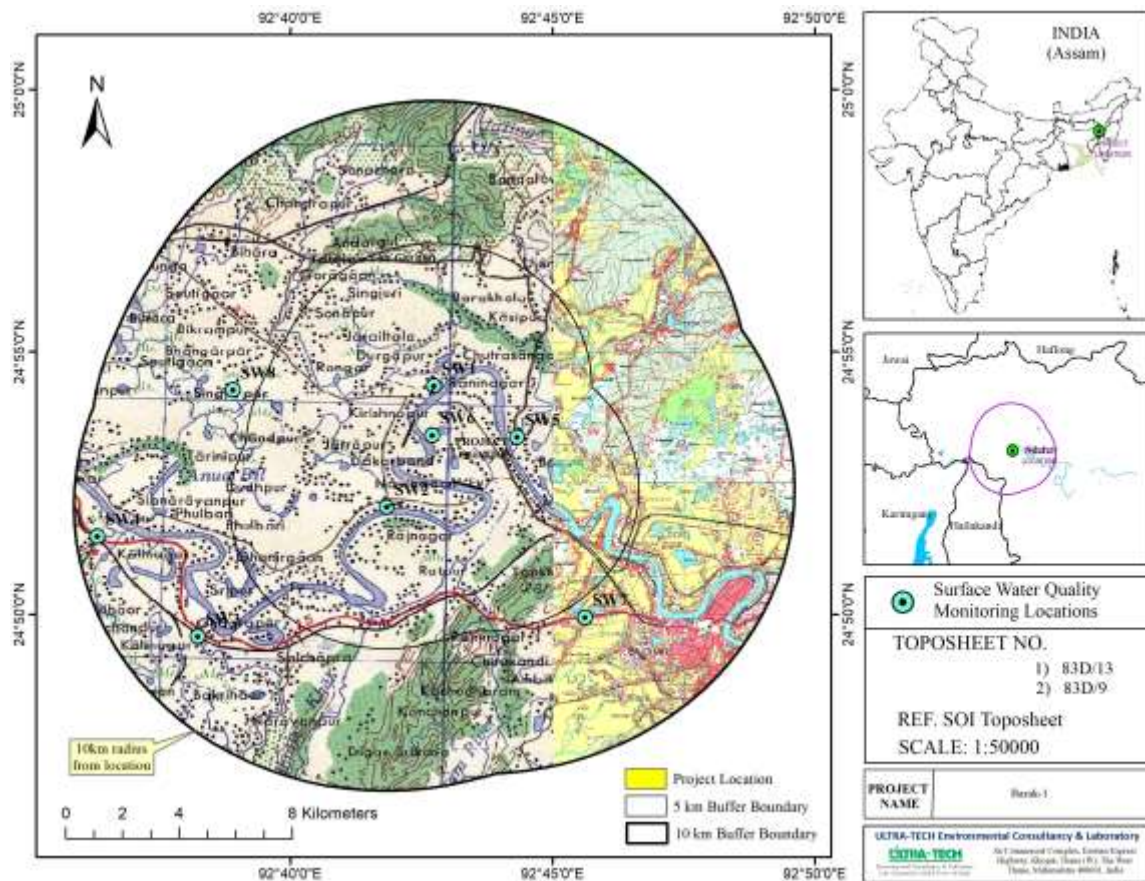
Figure 3.7(C) : Map Ground Water Quality Sampling Locations

Table 3.10B: Groundwater Quality Sampling Locations

Station Code	Location	Latitude	Longitude
GW-1	Public ME School, Durgapur	24°54'49.56"N	92°42'40.61"E
GW-2	Yasin High school, Ganirgram 4	24°52'44.80"N	92°41'44.30"E
GW-3	331 no Rakhal khaler par LPS, Rakhal Khaler par Pt 1	24°51'41.26"N	92°43'28.46"E
GW-4	Rajnagar M.E. School, Patheri Gram	24°51'29.22"N	24°51'29.22"N
GW-5	Fulbari PHC, sripur Pt I	24°51'21.73"N	92°39'7.57"E
GW-6	Behera GP Office	24°54'46.96"N	92°37'41.53"E
GW-7	New Model Degree COLLAGE , Sunapur Pt II	24°57'0.20"N	92°41'21.95"E
GW-8	Kharilpar M.E school, Kalinagar Pt I	24°53'27.60"N	92°45'37.44"E
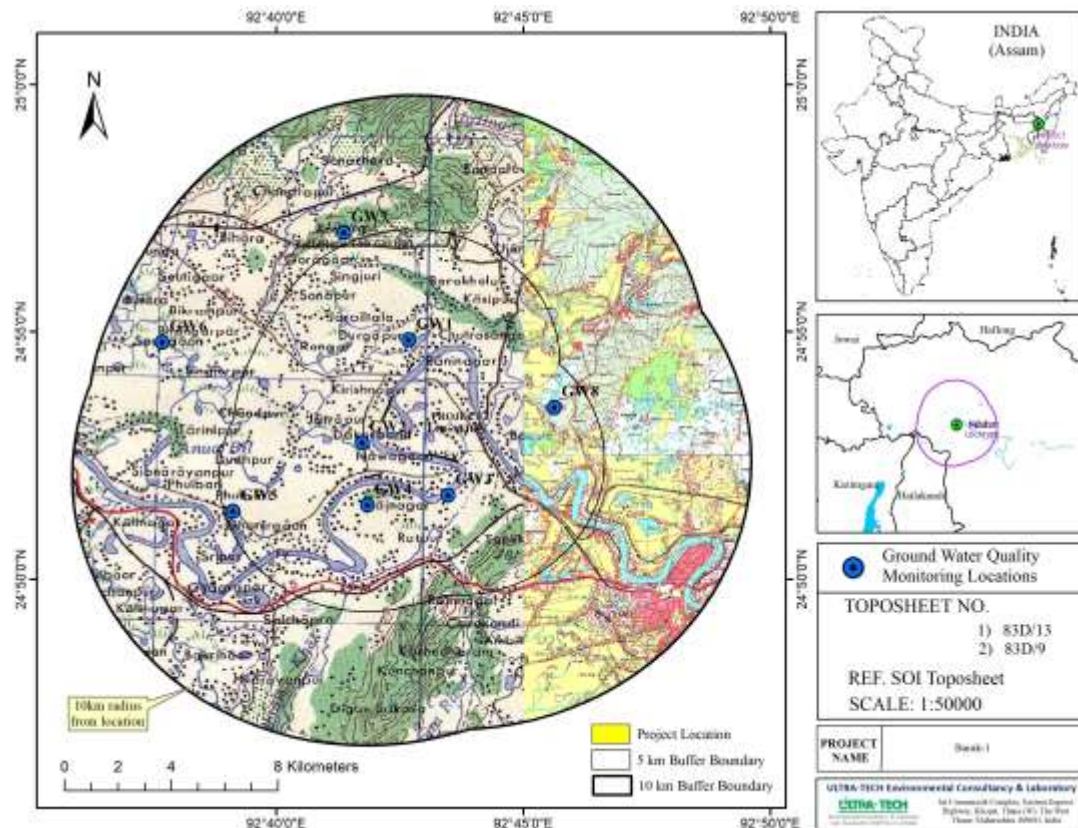
Figure 3.7(D) : Map Showing Ground Water Sampling Locations

3.7.3   Ground and Surface Water Quality Results

8 ground water and 8 surface water samples representing water environment have been considered around the existing plant within the periphery of 10 km taking in to account the various uses. The results of ground water and surface water quality are presented in **Table 3.11**and **Table 3.12.** The physico-chemical characteristics of Ground water are confirming to permissible limits of drinking water standards, prescribed in IS: 10500 (Test Characteristics for Drinking Water) and suitable for consumption.

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Table 3.11: Ground Water Characteristics

SN	Test Parameter	GW-1	GW-2	GW-3	GW-4	GW-5	GW-6	GW-7	GW-8	Unit
1	Color	BDL[DL=1]	BDL[DL=1]	BDL[DL=1]	BDL[DL=1]	BDL[DL=1]	BDL[DL=1]	BDL[DL=1]	BDL[DL=1]	Hazen
2	Odor*	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable	-
3	Temperature	26.7	25.8	26.8	25.6	25.4	25.8	25.4	26.1	^{0}C
4	Turbidity	1	0.5	0.7	0.5	0.4	0.6	0.5	0.9	NTU
5	pH	7.8	7.5	7.5	7.4	7.3	7.3	7.5	7.3	-
6	Electrical Conductivity	985	689	689	745	568	805	498	765	µS/cm
7	Total Dissolved Solids	646	454	450	486	382	534	304	478	mg/L
8	Total Suspended Solids	4	3	4	5	6	3	5	3	mg/L
9	Total Hardness as $CaCO_3$	284	208	300	276	256	332	264	288	mg/L
10	Ammonical Nitrogen as NH_3-N	BDL[DL=0.1]	BDL[DL=0.1]	BDL[DL=0.1]	BDL[DL=0.1]	BDL[DL=0.1]	BDL[DL=0.1]	BDL[DL=0.1]	BDL[DL=0.1]	mg/L
11	Nitrates as NO_3^--N	1.7	1	1.2	0.8	0.5	0.7	0.8	1.6	mg/L
12	Nitrite as NO_2^--N	0.014	0.008	0.016	0.02	0.006	0.01	0.007	0.018	mg/L
13	Phosphates as PO_4^{3-}	BDL[DL=0.01]	BDL[DL=0.01]	BDL[DL=0.01]	BDL[DL=0.01]	BDL[DL=0.01]	BDL[DL=0.01]	BDL[DL=0.01]	BDL[DL=0.01]	mg/L
14	Potassium as K	2.7	1.6	2.6	2.3	1.4	1.9	3.5	2.3	mg/L
15	Sodium as Na	45	38	42	45	44	44	33	44	mg/L
16	Calcium as Ca	58	51	72	66	55	69	53	63	mg/L
17	Magnesium as Mg	34	19	29	27	29	39	32	32	mg/L
18	Carbonates (CO_3^{-2}) as $CaCO_3$*	BDL[DL=1]	BDL[DL=1]	BDL[DL=1]	BDL[DL=1]	BDL[DL=1]	BDL[DL=1]	BDL[DL=1]	BDL[DL=1]	mg/L
19	Bicarbonates as (HCO_3^-) as $CaCO_3$*	268	232	252	264	280	324	240	244	mg/L
20	Chlorides as Cl^-	75	63	71	76	73	74	55	71	mg/L
21	Sulphates as SO_4^{2-}	67	62	72	68	76	67	59	65	smg/L
22	Fluoride as F^-	0.8	0.6	0.8	0.9	0.7	0.6	0.4	0.7	fmg/L
23	Boron as B	0.5	0.4	0.5	0.4	0.3	0.4	0.3	0.6	bmg/L
24	Iron as Fe	BDL[DL=0.06]	BDL[DL=0.06]	BDL[DL=0.06]	BDL[DL=0.06]	BDL[DL=0.06]	BDL[DL=0.06]	BDL[DL=0.06]	BDL[DL=0.06]	mg/L
25	Zinc as Zn	BDL[DL=0.02]	BDL[DL=0.02]	BDL[DL=0.02]	BDL[DL=0.02]	BDL[DL=0.02]	BDL[DL=0.02]	BDL[DL=0.02]	BDL[DL=0.02]	zmg/L
26	Mercury as Hg	BDL[DL=0.006]	BDL[DL=0.006]	BDL[DL=0.006]	BDL[DL=0.006]	BDL[DL=0.006]	BDL[DL=0.006]	BDL[DL=0.006]	BDL[DL=0.006]	mg/L
27	Total Coliform Bacteria*	50	12	24	18	20	22	8	4	MPN/100 ml
28	*Fecal coliform*	BDL[DL=2]	BDL[DL=2]	BDL[DL=2]	BDL[DL=2]	BDL[DL=2]	BDL[DL=2]	BDL[DL=2]	BDL[DL=2]	MPN/100 ml
29	*E. Coli*	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	-

Table 3.12: Surface Water Characteristics

SN	Test Parameter	SW-1	SW-2	SW-3	SW-4	SW-5	SW-6	SW-7	SW-8	Unit
1	Color	BDL[DL=1]	BDL[DL=1]	BDL[DL=1]	BDL[DL=1]	BDL[DL=1]	BDL[DL=1]	BDL[DL=1]	BDL[DL=1]	Hazen
2	Odor*	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable	-
3	Temperature	27.5	27.3	28.1	27.6	28.4	27.4	27.8	28.1	^{0}C
4	Turbidity	3.1	4.5	2.6	2.3	1.2	2.9	3.6	3.4	NTU
5	pH	7.1	7.2	7.4	7.2	7.5	7.6	7.6	7.8	-
6	Electrical Conductivity	321	453	389	469	428	489	542	502	µS/cm
7	Total Dissolved Solids	198	282	224	316	274	296	336	338	mg/L
8	Total suspended solids	3	4	2	5	3	4	5	4	mg/L
9	Total Hardness as CaCO3	108	154	130	138	114	124	146	152	mg/L
10	Ammonical Nitrogen as NH3-N	BDL[DL=0.1]	BDL[DL=0.1]	BDL[DL=0.1]	BDL[DL=0.1]	BDL[DL=0.1]	BDL[DL=0.1]	BDL[DL=0.1]	BDL[DL=0.1]	mg/L
11	Nitrates as NO3- -N	0.4	0.7	0.7	1.6	0.6	1.3	1.4	0.8	mg/L
12	Nitrite as NO2- -N	0.008	0.018	0.014	0.02	0.013	0.018	0.026	0.018	mg/L
13	Phosphates as PO4^{3-}	0.07	0.08	0.07	0.08	0.08	0.07	0.08	0.05	mg/L
14	Biochemical Oxygen Demand (270C, 3Days)	2.1	2.5	2.0	2.3	2.0	3.2	2.5	2.7	mg/L
15	Chemical Oxygen Demand	12	20	24	16	20	18	21	12	mg/L
16	Dissolved Oxygen	6.3	5.9	7.1	6.5	7.1	5.7	5.6	5.9	mg/L
17	Potassium as K	2.2	2.6	2.1	2.3	2	1.8	2.6	2.2	mg/L
18	Sodium as Na	25	25	26	28	32	35	42	48	mg/L
19	Calcium as Ca	26	34	26	30	26	24	33	30	mg/L
20	Magnesium as Mg	11	17	16	15	12	16	16	19	mg/L
21	Carbonates (CO3-2) as CaCO3*	BDL[DL=1]	BDL[DL=1]	BDL[DL=1]	BDL[DL=1]	BDL[DL=1]	BDL[DL=1]	BDL[DL=1]	BDL[DL=1]	mg/L
22	Bicarbonates as (HCO3-) as CaCO3*	130	144	116	130	106	112	134	138	mg/L
23	Chlorides as Cl-	41	42	42	43	49	57	55	53	mg/L
24	Sulphates as SO4^{2-}	30	30	32	34	26	35	30	33	mg/L
25	Fluoride as F-	0.6	0.6	0.5	0.5	0.5	0.7	0.6	0.6	mg/L

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SN	Test Parameter	SW-1	SW-2	SW-3	SW-4	SW-5	SW-6	SW-7	SW-8	Unit
26	Boron as B	0.4	0.4	0.4	0.6	0.2	0.4	0.4	0.5	mg/L
27	Iron as Fe	BDL[DL=0.06]	BDL[DL=0.06]	BDL[DL=0.06]	BDL[DL=0.06]	BDL[DL=0.06]	BDL[DL=0.06]	BDL[DL=0.06]	BDL[DL=0.06]	mg/L
28	Zinc as Zn	BDL[DL=0.02]	BDL[DL=0.02]	BDL[DL=0.02]	BDL[DL=0.02]	BDL[DL=0.02]	BDL[DL=0.02]	BDL[DL=0.02]	BDL[DL=0.02]	mg/L
29	Total Coliform Bacteria*	500	900	500	900	1600	900	500	990	MPN/100 ml
30	Fecal coliform*	110	116	80	110	150	120	221	128	MPN/100 ml
31	E. Coli*	Present	Present	Present	Present	Present	Present	Present	Present	

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3.7.4 Observations

Ground Water Quality

- The analysis results indicate that the pH ranges in between 7.3 to 7.8. The minimum pH of 7.3 was observed at GW5, Fulbari PHC, sripur Pt I ; GW6, Behera GP Office and GW8, Kharilpar M.E school, Kalinagar Pt I; the maximum pH of 7.8 was observed at GW1, Public ME School, Durgapur.
- Total hardness was observed to be ranging from 208 to 332 mg/l. The minimum hardness (208 mg/l) was recorded at GW2, Yasin High school, Ganirgram 4 and the maximum (332 mg/l) was recorded at GW6, Behera GP Office.
- Chlorides were found to be in the range of 55 to 76 mg/l, the minimum concentration of chlorides 55 mg/l was observed at GW7, New Model Degree COLLAGE , Sunapur Pt II whereas the maximum value of 76 mg/l was observed at GW4, Rajnagar M.E. School, Patheri Gram.
- Sulphates were found to be in the range of 59 to 76 mg/l. The minimum value observed at GW7, New Model Degree COLLAGE , Sunapur Pt II (59 mg/l) whereas the maximum value observed at GW5, Fulbari PHC, sripur Pt I (76 mg/l).
- The Total Dissolved Solids (TDS) concentrations were found to be ranging in between 304 to 646 mg/l, the minimum TDS observed at GW7, New Model Degree COLLAGE , Sunapur Pt II (304 mg/l) and maximum concentration of TDS observed at GW1, Public ME School, Durgapur (646 mg/l).
- Iron & Zinc found below detectable limit.

Surface Water Quality

- The analysis results indicate that the pH values in the range of 7.1 to 7.8, the minimum value was observed at SW1, Barak river (US) and maximum value was observed at SW8, Pa Dhowar Bill, Bhangarpar.
- DO was observed to be in the range of 5.6 to 7.1 mg/l. The minimum DO value was observed at SW7, Anua Bill, Ramnagar and maximum DO was observed at SW3, Katakal River and SW5, Jatinga River .
- The TDS was observed in the range of 198 to 338 mg/l, the minimum TDS value was observed at SW1, Barak river (Upstream) and where as maximum value was observed at SW8, Pa Dhowar Bill, Bhangarpar.
- The chlorides and Sulphates were found to be in the range of 41 to 57 mg/l and 26 to 35 mg/l, respectively.
- Total hardness expressed as $CaCO_3$ ranges between 108 to 154 mg/l.
- The calcium & magnesium were found to be in the range of 24 to 34 mg/l and 11 to 19 mg/l, respectively. Zinc is found below detectable limit.

According to the surface water quality criteria set by the CPCB, the Surface water sample 1,2 and 3 falls under class B. Surface Water Sample 6 falls under Class D and rest of the water samples falls under Class C

pH value is in the range of 6.5 to 8.5 on the pH scale indicates normal water in the samples of water collected from ground and surface. Hardness of water indicates that very hards water in the ground water sample (208 – 332 mg /l) i.e. veryhard (>180 mg/l); surface water is moderate to hard water (108 to 154 mg/l) as per the presence of $CaCO_3$ in water sample.

3.8   Soil

Soil is generally differentiated into two horizons of minerals and organic constituents of variable depth, which differ from the parent material below in morphology, physical properties, constituents, chemical properties, and composition and biological characteristics. The physico- chemical characteristics of soil have been determined at 8 locations during the monitoring period with respect to colour, texture, cation exchange capacity, pH, N, P, and K etc. The sampling locations have been selected to represent the study area.

3.8.1   Selection of sampling Locations
The sampling locations have been identified with the following objectives:

- To determine the baseline soil characteristics of the study area;
- To determine the impact of existing plant on soil characteristics; and
- To determine the impact on soils more importantly from agricultural productivity point of view.

Eight locations within 10 km radius around the project site were selected for soil sampling. The details of the sampling locations are given in **Table 3.13** and **Figure 3.7(E)**. The soil samples have been analyzed for physico-chemical parameters and heavy metals in accordance with the USEPA and Soil Science Society of America (SSSA) standard test methods. The analysis results of all the locations are presented in **Table 3.14 (A).** The results are compared with standard classification given in **Table 3.14 (B).**

Table 3.13: Soil Sampling Stations in the Study Area

Station Code	Location	Latitude	Longitude
S-1	Near Project Location (Near Block A)	24°54'14.81"N	92°42'38.14"E
S-2	Near Project Location (Near Block B)	24°53'25.79"N	92°42'5.54"E
S-3	Near Project Location (Near Block C)	24°52'19.19"N	92°43'16.21"E
S-4	Near Project Location (Near Block D)	24°52'14.62"N	92°42'7.12"E
S-5	Near Dudpur Footbal Ground	24°52'40.83"N	92°40'39.91"E
S-6	Hatirhar part II	24°50'26.49"N	92°42'16.95"E
S-7	Badarpur part II	24°53'33.15"N	92°45'0.17"E
S-8	Ujangram	24°55'36.24"N	92°43'44.68"E
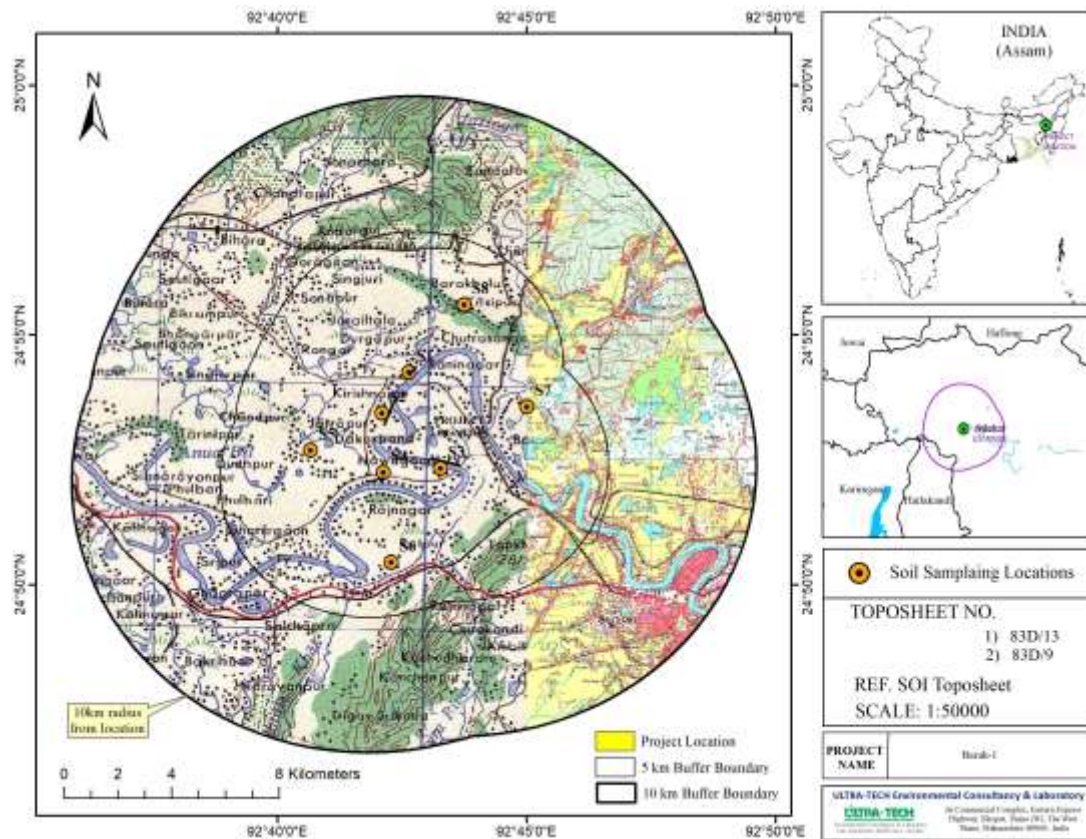
Figure 3.7(E): Map showing Soil Sampling Locations

3.8.2 Methodology

The soil samples were collected during monitoring period. The samples collected from the all locations are homogeneous representative of each location. At random 8 sub locations were identified at each location and soil was dug from 30 cm below the surface. It was uniformly mixed before homogenizing the soil samples. The samples were filled in polythene bags, labelled in the field with number and site name and sent to laboratory for analysis.

3.8.3 Soil Results

The detailed soil results of all the monitoring locations are as shown in **Table 3.14(A)**.

Table 3.14(A): Soil Analysis Result

SN	Test Parameter	Test Result								Unit
		S-1	S-2	S-3	S-4	S-5	S-6	S-7	S-8	
1.	Color*	Brown	Brown	Brown	Brown	Brown	Brown	Brown	Brown	-
2.	pH(1:2.5 Soil: Water)	7.7	7.1	7.8	7.3	7.3	7.9	6.8	7.7	-
3.	Electrical Conductivity (1:2 Soil: Water Extract)	447	316	378	564	469	352	525	488	uS/cm
4.	Bulk Density	1126	1142	1089	1137	1084	1175	1156	1148	kg/m^3
5.	Porosity	53.7	51.9	51.1	52.3	53.5	54.2	50.9	49.5	%
6.	Organic Matter	2	1.6	1.9	2.4	2.2	1.8	2.3	2.2	%
7.	Total Organic Carbon	1.2	1.0	1.1	1.4	1.3	1.1	1.3	1.3	%
8.	Moisture Content	6.2	6.8	5.2	5.6	6.7	6.3	6.1	6.4	%
9.	Water Holding Capacity	55.4	58.6	55.7	57.6	51.5	58.2	57.7	56.6	%
10.	Sodium Adsorption Ratio	1.2	1.2	1.2	1.1	1.2	1.2	1.2	1.1	$(meq/kg)^{1/2}$
11.	Cation Exchange Capacity	27.9	26.1	27.5	30.1	28.5	27.1	29.3	28.9	meq/100g
12.	Sodium as Na (Exchangeable)	1.3	1.3	1.3	1.4	1.3	1.3	1.3	1.3	meq/100g
13.	Potassium as K (Exchangeable)	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	meq/100g
14.	Calcium as Ca (Exchangeable)	14.1	13.1	14.1	17.2	15.2	14.1	16.2	16.2	meq/100g
15.	Magnesium as Mg (Exchangeable)	11.2	11.2	11.2	11.2	11.1	11.2	11.2	11.2	meq/100g
16.	Sodium as Na (water Extractable)	54	52	52	56	54	53	55	54	mg/kg
17.	Potassium as K (water Extractable)	34	34	34	36	35	34	36	35	mg/kg
18.	Calcium as Ca (water Extractable)	129	121	129	145	137	129	137	137	mg/kg
19.	Magnesium as Mg (water Extractable)	59	49	54	59	54	49	64	59	mg/kg

SN	Test Parameter	S-1	S-2	S-3	S-4	S-5	S-6	S-7	S-8	Unit
					Test Result					
20.	Chloride as Cl- (water Extractable)	117	88	108	147	127	98	137	137	mg/kg
21.	Sulfate as SO4--(water Extractable)	123	110	120	131	124	114	128	127	mg/kg
22.	Available Phosphorus as P2O5	72	90	75	76	78	63	87	67	kg/ha
23	Available Potassium as K2O	251	231	234	278	248	246	272	266	kg/ha
24	Available Nitrogen as N	123	132	124	132	125	154	144	125	kg/ha
					TCLP Metals					
1.	Cadmium as Cd	BDL[DL=0.018]	BDL[DL=0.018]	BDL[DL=0.018]	BDL[DL=0.018]	BDL[DL=0.018]	BDL[DL=0.018]	BDL[DL=0.018]	BDL[DL=0.018]	mg/L
2.	Total Chromium as Cr	BDL[DL=0.06]	BDL[DL=0.06]	BDL[DL=0.06]	BDL[DL=0.06]	BDL[DL=0.06]	BDL[DL=0.06]	BDL[DL=0.06]	BDL[DL=0.06]	mg/L
3.	Cobalt as Co	BDL[DL=0.06]	BDL[DL=0.06]	BDL[DL=0.06]	BDL[DL=0.06]	BDL[DL=0.06]	BDL[DL=0.06]	BDL[DL=0.06]	BDL[DL=0.06]	mg/L
4.	Copper as Cu	BDL[DL=0.06]	BDL[DL=0.06]	BDL[DL=0.06]	BDL[DL=0.06]	BDL[DL=0.06]	BDL[DL=0.06]	BDL[DL=0.06]	BDL[DL=0.06]	mg/L
5.	Iron as Fe	BDL[DL=0.09]	BDL[DL=0.09]	BDL[DL=0.09]	BDL[DL=0.09]	BDL[DL=0.09]	BDL[DL=0.09]	BDL[DL=0.09]	BDL[DL=0.09]	mg/L
6.	Lead as Pb	BDL[DL=0.06]	BDL[DL=0.06]	BDL[DL=0.06]	BDL[DL=0.06]	BDL[DL=0.06]	BDL[DL=0.06]	BDL[DL=0.06]	BDL[DL=0.06]	mg/L
7.	Manganese as Mn	BDL[DL=0.12]	BDL[DL=0.12]	BDL[DL=0.12]	BDL[DL=0.12]	BDL[DL=0.12]	BDL[DL=0.12]	BDL[DL=0.12]	BDL[DL=0.12]	mg/L
8.	Nickel as Ni	BDL[DL=0.06]	BDL[DL=0.06]	BDL[DL=0.06]	BDL[DL=0.06]	BDL[DL=0.06]	BDL[DL=0.06]	BDL[DL=0.06]	BDL[DL=0.06]	mg/L
9.	Zinc as Zn	BDL[DL=0.018]	BDL[DL=0.018]	BDL[DL=0.018]	BDL[DL=0.018]	BDL[DL=0.018]	BDL[DL=0.018]	BDL[DL=0.018]	BDL[DL=0.018]	mg/L

Table 3.14(B): Standard Classification of Soil

S. No.	Soil Test	Classification
1.	pH	<4.5 Extremely acidic 4.51- 5.50 Very strongly acidic 5.51-6.0 moderately acidic 6.01-6.50 slightly acidic 6.51-7.30 Neutral 7.31-7.80 slightly alkaline 7.81-8.50 moderately alkaline 8.51-9.0 strongly alkaline 9.01 very strongly alkaline
2	Salinity Electrical Conductivity (mmhos/cm) (1 ppm = 640 mmho/cm)	Upto 1.00 Average 1.01-2.00 harmful to germination 2.01-3.00 harmful to crops (sensitive to salts)
3	Organic Carbon	Upto 0.2: very less 0.21-0.4: less 0.41-0.5 medium, 0.51-0.8: on an average sufficient 0.81-1.00: sufficient >1.0 more than sufficient
4	Nitrogen (Kg/ha)	Upto 50 very less 51-100 less 101-150 good 151-300 Better >300 sufficient

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

Baseline Soil Status

- It has been observed that the pH of the soil in the study area varied from 6.8 to 7.9. The maximum pH value of 6.8 was observed at S7, Badarpur part II where as the minimum value of 7.9 was observed at S6, Hatirhar part II.
- The electrical conductivity was observed to range from 316 to 564 µs/cm, with the maximum observed at S2, Near Project Location (Near Block B) with the minimum observed in S4, Near Project Location (Near Block D).
- The available Nitrogen value varies from 123 to 154 kg/ha.
- The available Phosphorus value varies from 63 to 90 kg/ha.
- The available Potassium value varies from 231 to 278 kg/ha.

3.9 Biological Environment

3.9.1 Introduction

Study of biological environment is one of the most important aspects for Environmental Impact Assessment. In view of the need for conservation of environmental quality and biodiversity study, biological environment is one of the most important aspects for Environmental Impact Assessment. Ecological systems show complex inter-relationships between biotic and abiotic

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components including dependence, competition and mutualism. Biotic components comprise of both plant and animal communities, which interact not only within and between them but also with the abiotic components viz. physical and chemical components of the environment. Generally, biological communities are the indicators of climatic and edaphic factors. The biological environment includes mainly terrestrial ecosystem and aquatic ecosystem. The mining activities are one such external influence, which might affect the ecology of an area, if proper management measures are not taken.

3.9.2 Objectives of Ecological studies:

- To assess the nature and distribution of vegetation in and around Core Zone and buffer Zone.
- To enlist the major agricultural crops, plantations and cultivated species.
- To evaluate the distribution of animal life spectra, including avifauna and butterflies, available in this area.
- To document the major fauna both invertebrate and vertebrate occurring in the selected 10 km study area.

3.9.3 Study Area

As per guidelines of MoEF & CC for Environmental Impact Assessment, the study area was restricted up to 10 km radius from the project site. The study area is divided into two parts as core zone and buffer zone. Sand Mining Project is located near Kalain , P. O & P.S: Kalain, District: Cachar, under Kalain Range of Karimganj Forest Division, , Assam. The data was generated with reference to topography, land use, vegetation pattern, animals etc. Core zone has been considered within the cluster area and buffer zone has been considered outside the cluster area up to 10 km from Project boundary. All observations were generated in **December 2023**.Vegatation in the study area is given in **(Figure 3.8).**
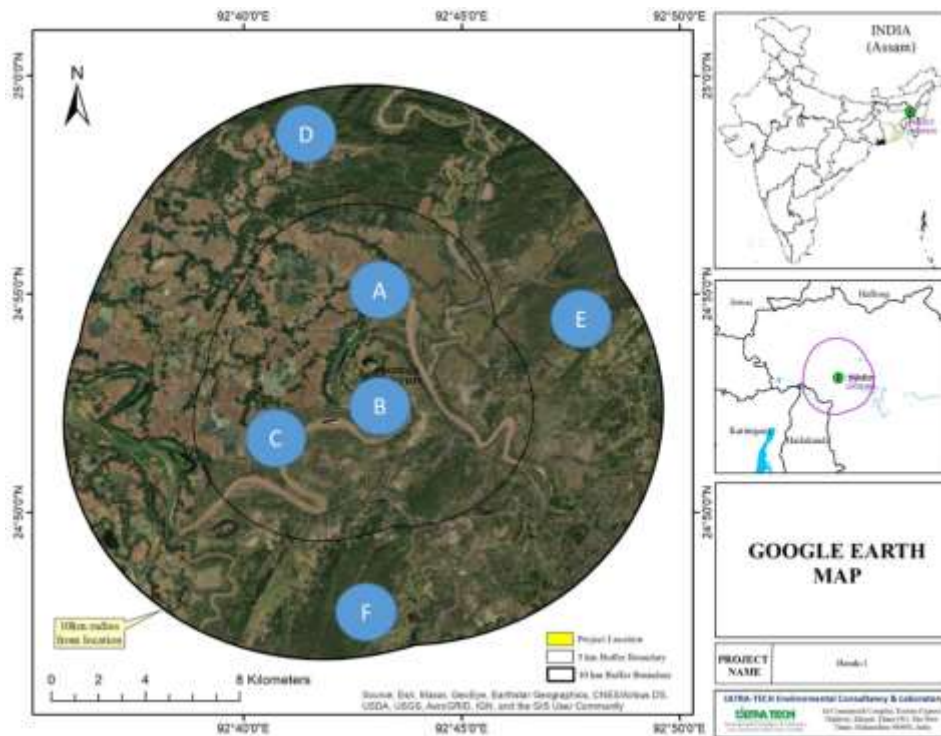
Figure 3.8: Study area for Biological Environment

3.9.4 Methodology

An ecological survey of the study area was conducted, as per following steps, with reference to listing of species, assessment of the existing baseline ecological conditions and predicting impacts with suggestive mitigation measures. Studies were undertaken in core zone & buffer zone various types of Flora; viz. trees, shrubs, herbs palms including grasses were enumerated in **(Table 3.15)**. Fauna like mammals, birds, reptiles, amphibians & butterflies. Were surveyed and enlisted. With reference to avifauna diversity, birds were studied through direct evidence, in the form of visual sightings, and indirect evidence such as calls, nests, burrows, droppings, scats, tracks etc. All available types of habitats at the site were evaluated and marked.

Identified vegetation patches through GIS map and physically surveyed representative sites

- Different types of animals, including avifauna, available in this area, have been recorded,
- Secondary data, pertaining to flora and fauna within 10 Km boundary from the project site have been collected from literature, forest department, and discussions with local people & NGOs.
- Probable impact, if any, of project activity on biota and mitigation measures have been delineated

View of Project Site

Plate 3.9:   Vegetation in core zone

7.9.5   Biodiversity

A) Core Zone

I) Terrestrial Ecology:

 Flora:

Core area Project site (A, B &C) includes very less vegetation within the cluster area (core zone) along the riverbank. Tree species commonly seen in this zone include *Bambusa pallida* (Lakhooti bah). Shrubs such as *Ageratum conyzoides* (Billygoat weed), *Lantana camara* (Gubon Gu-phu), and *Calotropis gigantea* (Akon) are prevalent. The dominant herbs in the study area are *Ageratum conyzoides and Tephrosia purpurea* (wild indigo). During the survey, no endangered or endemic flora or fauna were found near the study area.

Fauna: Mammals like *Funambulus pennantii* (Squirrel) & *Semnopithecus entellus (*Common langur), In avifauna commonly observed local bird species as *Coracias benghalensis*(Indian roller*), Bubulcus ibis* (Cattle egret), *Corvus splendens* (House crow), *Acridotheres tristis* (Myna*), Dicrurus macrocercus* (Black Drongo*)* and   *Merops orientalis (*Bee eater*)* etc. were also found in the core zone.

B) Buffer Zone

 In Buffer zone there are water bodies like Canal, Rivers Lake, Fallow Land, Crop Land, Settlement, Shrub Land, and Vegetation. Cropland is the major patch that covers a substantial portion of the project area **Table 3.15**.

II) Terrestrial Ecology

Flora

Four locations viz,   Towards north west side (D), Towards north east side (E), Towards south side (F) **(Figure 3.9)** Based on field survey primary data were generated by preparing a general checklist of the plants encountered in this area. The study showed overall 75   trees from 62 genera and 40 families **(Table 3.15).** The floristic survey reveals that the study area is having dominance of tree species like *Saccharum spontaneum* (Kush),   *Bambusa pallida* (Lakhooti bah)*, Bauhinia sp.,(Kanchan), Areca catechu (*Supari*), Ficus. Benghalensis* (Bar), *Emblica officinalis* (Amblica),   *Michelia champa* (*Champa), Dalbergia sissoo* (Sissoo), *Dendrocalamus sp.* etc. are dominant in study area. **(Table 3.15**).

Table 3.15: Presence of vegetation within core zone and Buffer zone

SN	Scientific Name	Local name	Family	IUCN Conservation Status	Core Zone	Buffer Zone
Trees						
1	*Acacia auriculiformis*	Australian acacia	Leguminosae	Not assessed		+
2	*Acacia catechu*	Khair	Fabaceae	Not assessed		+
3	*Acacia nilotica*	Babool	Fabaceae	Not assessed		+
4	*Aegle marmelos*	Bel	Rutaceae	-		+
5	*Albizia lebbeck*	lebbek tree	Fabaceae	Least Concern		+
6	*Ailanthus excelsa*	Maharukh	Simaroubaceae	Least Concern		+
7	*Adina cordifolia*	Haldu	Rubiaceae	Not assessed		
8	*Albizia procera*	Siris	Fabaceae	Least Concern		+
9	*Alstonia scholaris*	Chhatpan	Apocynaceae	Least Concern		+
10	*Bauhinia purpurea*	Kurial	Fabaceae	Least Concern		+
11	*Bauhinia racemosa*	Kanchan	Fabaceae	Least Concern		+
12	*Bombax ceiba*	Simul	Malvaceae	Not assessed		+
13	*Butea monosperma*	Palas	Fabaceae	Not assessed		+
14	*Dalbergia sisoo*	sisoo	Caesalpiniaceae	Not assessed		+
15	*Emblica officinalis*	Amlakhi	Phyllanthaceae	Least Concern		+
16	*Ficus religiosa*	Ahot	Moraceae	Not assessed		+
17	*Ficus glomerata*	Umer	Moraceae	Not assessed		+
18	*Ficus benghalensis*	Bar	Moraceae	Not assessed		+
19	*Gmelina arborea*	Gomari	Lamiaceae	Least Concern		+
20	*Ficus recemosa*	Dimoru	Moraceae	Not assessed		+
21	*Kydia calycina*	Pisela	Malvaceae	Not assessed		+
22	*Lagerstroemia speciosa*	Ajar	Lythraceae	Not assessed		+
23	*Leucaena leucocephala*	Subabul	Fabaceae	Not assessed		+
24	*Lannea coromandelica*	Ruhimala	Anacardiaceae	Not assessed		
25	*Mangifera indica*	Aam	Anacardiaceae	Not assessed		+
26	*Moringa oleifera*	Sojina	Moringaceae	Not assessed		+
27	*Millettia pinnata*	Karas	Fabaceae	Least Concern		+

SN	Scientific Name	Local name	Family	IUCN Conservation Status	Core Zone	Buffer Zone
28	*Michelia champa*	Champa	Magnoliaceae	Least Concern		+
29	*Semecarpus anacardium*	Bhela	Anacardiaceae	Least Concern		+
30	*Shorea robusta*	Sal	Dipterocarpaceae	Least Concern		+
31	*Semecarpus anacardium*	Bhilwa	Anacanrdiaceae	Not assessed		+
32	*Shorea robusta*	Sal	Dipterocarpaceae	Not assessed		+
33	*Syzygium cumini*	Jamu	Myrtaceae	Least Concern		
34	*Thespesia populnea*	Indian tulip tree	Malvaceae	Least Concern		
35	*Terminalia arjuna*	Arjun	Combretaceae	Not assessed		+
37	*Terminalia belerica*	Bohera	Combretaceae	Not assessed		+
38	*Terminalia tomentosa*	Ain	Combretaceae	Not assessed		+
39	*Tamarindus indica*	Tetali	Fabaceae	Least Concern		+
40	*Tectona grandis*	saag	Lamiaceae	-		+
41	*Zizyphus rugosa*	Ber	Rhamnaceae	Not assessed		
42	*Ziziphus mauritiana*	Ber	Rhamnaceae	Not assessed		+
Shrubs						
1	*Argemone mexicana*	Sial kanta	Asteraceae	Not assessed	+	+
2	*Bougainvillea spectabilis*	Kagaj-phul	Nyctaginaceae	Not assessed		+
3	*Calotropis-gigantea*	Akon	Asclepiadaceae	Not assessed		+
4	*Cassia tora*	Soru-medelua	Apocynaceae	Not assessed	+	+
5	*Carica papaya*	Amita	Caricaceae	Not assessed	+	+
6	*Lantana camera*	Gubon Gu-phul	Verbenaceae	Not assessed		+
7	*Datura metel*	Dhatura	Solanaceae	Not assessed		+
8	*Solanum incanum*	Titta Baingna	Solanaceae	Least Concern		+
9	*Nerium indicum*	Korobi	Apocynaceae	Not assessed		+
10	*Ricinus communis*	Era-gos	Euphorbiaceae	Not assessed		+
11	*Musa × paradisiaca*	kol	Musaceae	Not assessed		+
Herbs						
1	*Ageratum conyzoides*	Gondhoa-bon	Asteraceae	Not assessed	+	+
2	*Desmodium trifolium*	Kodalia	Leguminosae	Not assessed	+	+
3	*Tribulus terrestris*	Goksharu	Zygophyllaceae	Not assessed	+	+
4	*Ocimum basilicum*	Tulsi	Lamiaceae	Not assessed		
5	*Tephrosia purpurea*	Wild indigo	Leguminosae	Not assessed	+	+
Palms						
1	*Areca catechu*	Tamul	Arecaceae	Not assessed		+
2	*Cocos nucifera*	Narikol	Arecaceae	Not assessed		+
3	*Caryota urens*	Elephant	Arecaceae	Least concern		+

SN	Scientific Name	Local name	Family	IUCN Conservation Status	Core Zone	Buffer Zone
		palm				
Grasses						
1.	*Erianthus ravennae*	Ekra	Poaceae	Not assessed		+
2.	*Saccharum spontaneum*	Kush	Poaceae	Not assessed		+
3.	*Phragmitis karka*	Nal	Poaceae	Not assessed		+
4.	*Pollinia ciiliata*	Sau	Poaceae	Not assessed		+
5.	*Bamboosa pallida*	Bakhal	Poaceae	Not assessed	+	
6	*Teinostachyum dulloca*	Dolu bah	Poaceae	Not assessed	+	+
7	*Bamboosa sp.*	-	Poaceae	Not assessed	+	+
8	*Dendrocalamus sp.*	Banh	Poaceae	Not assessed	+	
Climbers						
1.	*Cucurbita maxima*	Kolu	Cucurbitaceae	Not assessed		+
2.	*Cucumis sativus*	Giant Pumpkin	Cucurbitaceae	Not assessed		+
3.	*Ipomoea sp.*	Water Morning	Convolvulaceae	Not assessed	+	+
4.	*Smilax pacis*	-	Smilacaceae	-	+	+
5.	*Dioscorea species*	Kath-alu	Dioscoraceae	-	+	+
6.	*Luffa cylindrica*	Sponge gourd	Cucurbitaceae	Not assessed	+	+

Source: Primary data generation by Ultra-Tech team + Observed in core zone & Buffer Zone +: Observed in Core Zone & Buffer Zone & Secondary data collected from forest department and local people

Note: IUCN: International Union for Conservation of Nature and Natural Resources

B) Buffer Zone

b) Fauna

Methodology

Field observations of fauna were carried out. The commonly available mammals, amphibians, reptiles, butterflies, with 10km surroundings were enumerated. The method followed for avifauna survey has been outlined in respective section. To prepare a detailed report on the status of faunal diversity within study area, field studies were conducted. Both direct (sighting) and indirect (evidences) observations methods were used to survey the faunal species around the study area. Further, information towards faunal diversity from secondary sources was collected on interaction with the local people and Forest Dept. officials.

Observation

I) Vertebrates

Mammals:

No wild mammalian species was directly sighted during the field survey **Table 3.16** The survey revealed that 7 species of common mammals were recorded Dialogue with local villagers located within the study area also could not confirm presence of any wild animal in that area. Common Langur, Indian Hare, Five striped squirrel   common mongoose except   mongoose no one species belong   to (Schedule I) were observed during primary survey as per Wildlife (Protection) act 1972 & as per amendment (conservation plan is attached as an Annexure-VI).

II) Reptiles & Amphibians:

On the basis observations during site visits & secondary data 8 species of Reptiles & Amphibians   were found in the study area **(Table 3.16)**.

Reptiles:

Five species of reptiles, None of these sp. except Indian Cobra & Indian rat snake   belong   to (Schedule I) as per Wildlife (Protection) act 1972 & as per amendment (conservation plan is attached as an Annexure-VI)

III) Avifauna:

Birds were studied by direct observation with the help of ''Olympus 10 x 50 DPS I'' binocular and were identified by adopting available literature (Grimmett et al. 1998).During the survey a total of 35 species of avifauna were identified and recorded. The dominant birds were Indian roller cattle egret, House sparrow, Common Koel, Indian cuckoo, Cattle egret, Green bea eater, Indian Myna, Asian koel , Magpie Robin, Crow Pheasant, White breasted Kingfisher, Indian roller, Black Drongo etc . Plate 3.10(A)   It   has been observed that the majority of birds were insectivorous in habit preferring insects, worms and arachnids.

None of these birds are endangered (Schedule I) as per Wildlife (Protection) amendment Act, 1972 & as per amendments.

| *Haleyon smyrensis* (White breasted Kingfisher) | *Dicrurus macrocercus* (Black Drongo) |

Plate 3.10(A): Common Birds Observed in study area
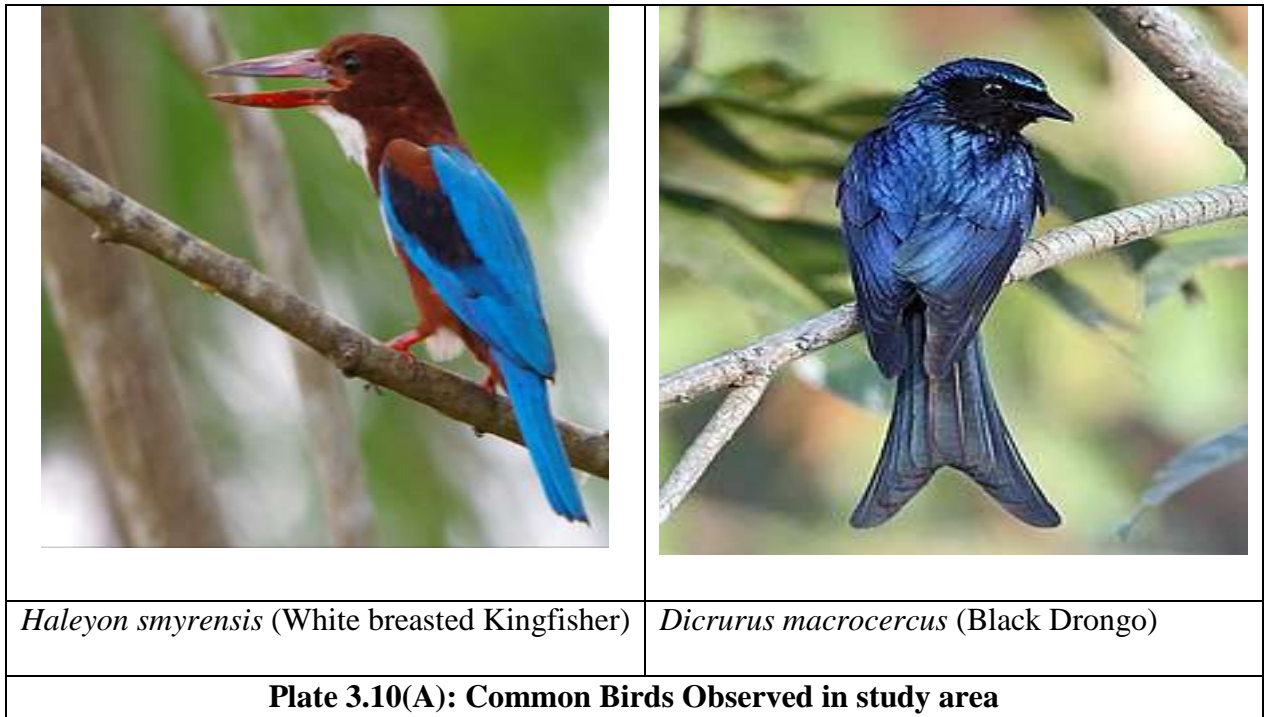
2) Invertebrates

Butterflies

Study area comprises of 8 species of butterflies, dominated by *Junonia lemonias, Danaus chrysippus & Junonia atlites* **Plate 3.10(B)** Butterflies diversity and community composition are dependent on plants, as their caterpillars are highly specific to host plants on which they feed and metamorphose into the adults. Fairly good butterfly diversity in this area is conspicuous due to presence of wide varieties of flowering trees. Therefore, richness of host plant diversity contributes to butterflies diversity.

| Plain tiger (*Danaus chrysippus*) | *Gray pansy* (*Junonia atlites*) |

Plate 3.10 (B): Butterflies in the Study Area
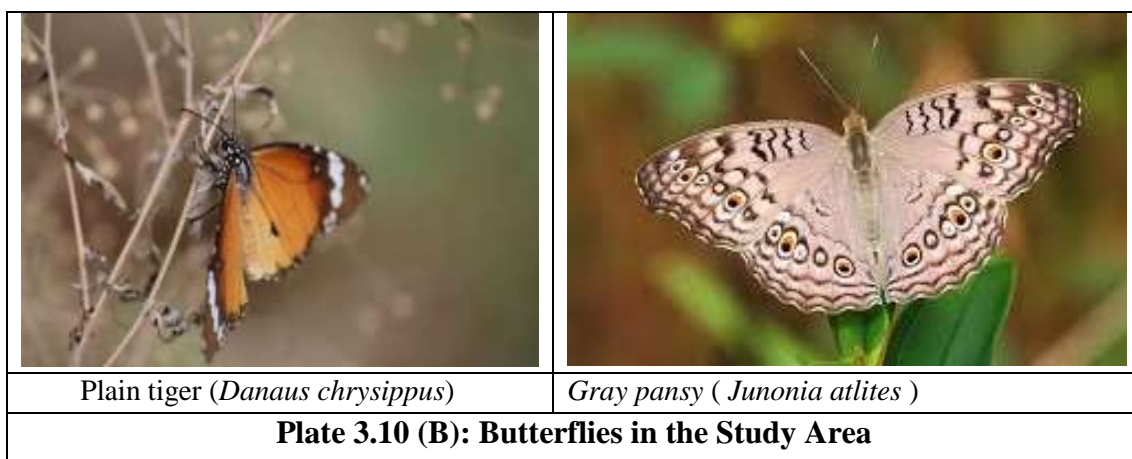
Table 3.16 (A): List of Fauna &Avifauna Recorded in Core zone &Buffer zone

SN	Scientific name	English Name	Schedule of Wildlife Protection	Status as per IUCN Red Data List	Core Zone	Buffer Zone
Mammals						
1.	*Common Langur	*Semnopithecus*	II	Least concern	+	+
2.	*Squirrel	*Funambulus*	-	Least concern	+	+
3.	Mongoose	*Herpestes*	Sch -I	Least concern		+
4.	Hare	*Lepus nigricollis*		Least concern		+
5.	Indian Flying fox	*Pteropus giganteus*	-	Least concern		
6.	House rat	*Rattus rattus*	-	Least concern		
7.	Wild boar	*Sus scrofa*	Sch – II	Least concern		
Reptiles						
1.	Rat Snake	*Ptyas mucosus*	Sch -I	Least concern		+
2.	Spectacled Cobra	*Naja Naja*	Sch -I	Least concern		+
3.	Geckos	*Lepidodactylus*	-	Least concern		+
4.	Common garden	*Calotes*	Not enlisted	Not assessed		+
5.	House lizard	*Hemidactylus*	Not enlisted	Not assessed		+
Amphibians						
1	Common Indian	*Bufo*	Not enlisted	Least		+
2	Indian bull frog	*Rana tigrina*	Not enlisted	Least		+
Birds						
1	*Alcedo atthis*	Common	Sch – II	Least		+
2	*Coracias*	Indian roller	Sch – II	Least		
3	*Acridotheres*	Common Myna	Sch – II	Least	+	+
4	*Corvus splendens*	House Common crow	Sch – II	Least Concern	+	+
5	*Bubulcus ibis*	Cattle egret	Sch – II	Least	+	+
6	*Ardeola grayii*	Indian Pond-Heron	Sch – II	Least Concern		
7	*Eudynamys scolopaceus*	Asian koel	Sch – II	Least Concern		
8	*Saxicoloides*	Magpie	Sch – II	Least		+
9	*Egretta garzetta*	Little Egret	Sch – II	Least Concern		+
10	*Psittacula krameri*	Rose ringed	Sch – II	Least		+
11	*Haleyon smyrensis*	White breasted kingfisher	Sch – II	Least concern	+	+

SN	Scientific name	English Name	Schedule of Wildlife Protection	Status as per IUCN Red Data List	Core Zone	Buffer Zone
12	*Corvus*	Jungle Crow	Sch – II	Least concern		+
13	*Dandrocitta*	Tree pie	Sch – II	Least concern		+
14	*Passer domesticus*	House sparrow	Sch – II	Least concern		+
15	*Motacilla alba*	Wagtail	Sch – II	Least concern		+
16	*Dinopium benghalense*	Golden backed	Sch – II	Least concern		+
17	*Apus affinis*		Sch – II	Least concern		+
18	*Vanellus indicus*	Red wattled lapwing	Sch – II	Least concern		+
19	*Caryle rudis*	Pied king fisher	Sch – II	Least concern		+
20	*Upupa epops*	Hoopoe	Sch – II	Least concern		+
21	*Bubo bubo*	Great horned	Sch – II	Least concern		+
22	*Athene brama*	Spotted owlet	Sch – II	Least concern		+
23	*Amauvornis phoonicurus*	White breasted water hen	Sch – II	Least concern		+
24	*Prophvno*	Purple	Sch – II	Least concern		+
25	*Phalacrocorax fuscicollis*	Indian Cormorant	Sch – II	Least Concern		+
26	*Hirundo rustica*	Common	Sch – II	Least		+
27	**Merops orientalis*	Green bee eater	Sch – II	Least Concern	+	+
28	*Columba livia*	Rock Pigeon	Sch – II	Least	+	+
29	*Vanellus indicus*	Red-wattled	Sch – II	Least		+
30	*Saxicoloides*	Indian Robin	Sch – II	Least		+
31	*Centropus sinensis*	Crow-Pheasant	Sch – II	Least	+	
32	*Sturnus pagodarum*	Brahminy	Sch – II	Least Concern		+
33	**Dicrurus*	Black Drongo	Sch – II	Least Concern	+	-
34	*Nectarinia asiatica*	Purple sunbird	Sch – II	Least Concern		+
35	*Turdoides caudatus*	Babblers	Sch – II	Least Concern		+
Butterflies						
1	*Pantoporia perius*	Common sergeant	-	Not assessed	-	+
2	*Papilio demoleus*	Lime butterfly	-	Not assessed	+	+
3	*Danaus chrysippus*	Plain Tiger	-	Not assessed	+	+
4	*Junonia orithya*	Blue Pansy	-	Not assessed	-	+
5	*Papilio polytes*	Common Mormon	-	Not assessed	-	+

SN	Scientific name	English Name	Schedule of Wildlife Protection	Status as per IUCN Red Data List	Core Zone	Buffer Zone
6	*Junonia lemonias*	Lemon Pansy	-	Not assessed	+	+
7	*Phalanta phalantha*	Common Leopard	-	Not assessed	+	+
8	*Euploea* core	Common Indian Crow	-	-	+	

Source: Primary data generation by Ultra-Tech +: Observed in Core Zone & Buffer Zone &Secondary data collected from forest department & Local people

Note: IUCN: International Union for Conservation of Nature and Natural Resources.

- *Agriculture & Horticulture*

The farming system of Cachar and district is mainly agriculture and agri-based allied activities. Rice is the main cereal crop of the district. Rice is grown as a double crop. Rice is the main cereal crop of the Assam district. Rice is grown as a double crop, in sequence with vegetables, Pigeon pea, Potato, French bean, Pigeon pea, black gram and pea are the main pulse crops. Different vegetables are grown particularly on river interacts. Pineapple, Arecanut, coconut, banana, jackfruit and Papaya are the important horticultural crops. Pineapple is specialty of zone for its sweetness and is grown on a commercial scale in certain regions of the district. Crops Grown in the Study area **Table 3.16(B).**

Table: 3.16(B) Agriculture Crops Grown in the Study area

Sr. No.	Botanical Name	Local/English Name	Family
Food grain			
1	*Oryza sativa*	Rice	Poaceae
2	*Zea mays*	Maize	Fabaceae
3	*Saccharum officinarum*	Sugarcane	Poaceae
4	*Pisum sativum*	Pea	Solanaceae
Horticulture			
1	*Mangifera indica*	Aam	Anacardiaceae
2	*Ananas comosus*	Pineapple	Bromeliaceae
3	*Citrus limon*	Assam Nimbu	Rutaceae
4	*Artocarpus heterophyllus*	Jackfruit	Moraceae
	Psidium guajava	Guava	Myrtaceae
5	*Musa × paradisiaca*	Banana	Musaceae
6	*Carica papaya*	Papaya	Caricaceae
Plantation crops			
1	*Areca catechu*	Areca nut	Arecaceae
2	*Camellia sinensis*	Tea Plantation	Theaceae

Source: **field survey & discussion with local people &** https://agricoop.nic.in/sites/default/files/ASSAM11-CACHAR-26.7.2012.pdf

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3.9.6 National Park and Wildlife Santuary

There is no National Park but Barail wild life sanctuary is present is present at a distance of 7.43 km from the project Site

Borail wild life sanctuary:
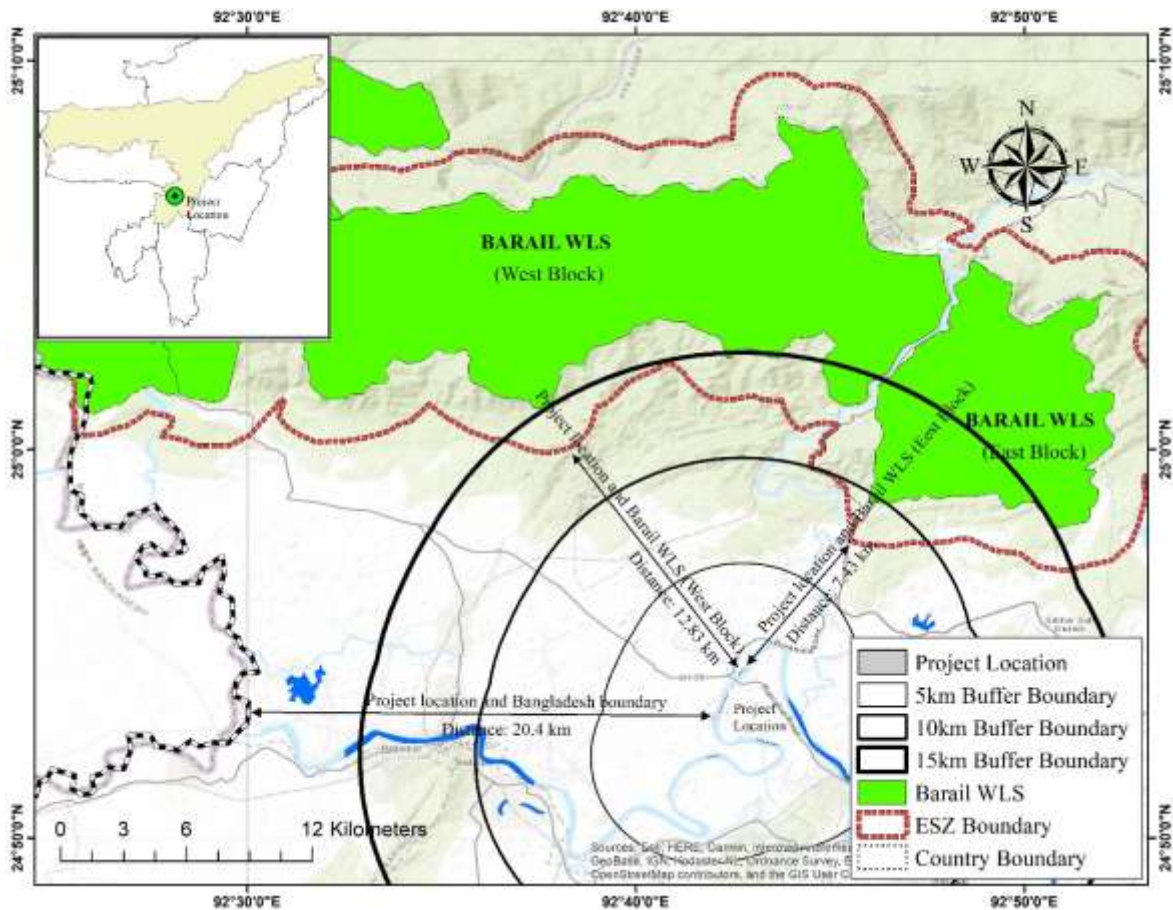
ESZ boundary of Borail wildlife sanctuary

Flora: Trees and lianas were inventoried in Borail Wildlife Sanctuary which revealed the occurrence of 112 and 23 species of trees and lianas respectively. Apart from animals and birds the sanctuary is also rich in vegetation. Borail Wildlife Sanctuary comprises of Tropical Moist Evergreen and semi Evergreen Forest. Thick bamboo forest and grassland are alsoseen in this sanctuary. Due to the ideal climate condition and suitable geographical location, different species of orchids are commonly seen in this forest. Tree, shrub and lianas species form a thick vegetation of the sanctuary. Forest floor is enriched by many herbaceous species. The main secondary landscape elements are cultivated flatland, extensive bamboo brakes, tree plantations(Teak and Sal), secondary and disturbed forest (betel-vine plantation), and village gardens including Areca nut plantations.The sanctuary also harbors a vast amount of floristic diversity e.g. *Ornithochilus cacharensis*- an epiphytic orchid species, Larsenianthus assamensis a terrestrial zingiber species, Diospyros cacharensis- a small deciduous tree belonging to family Ebenaceae and Alseodaphne keenanii- a large tree belonging to family Lauraceae. These all are endemic to north-east India.

Fauna

Borail Wildlife Sanctuary houses a variety of animals and birds. It serves asan ideal place for both mammals and reptiles. The sanctuary houses theworld's most venomous snake, King Cobra. Other common reptile speciest hat are found here are Rock python, Red snake, Green Pit viper etc. Two endangered species of tortoise - Brown hill tortoise, Monitor Lizard and Asian Leaf turtle are also found here.

The Borail Wildlife Sanctuary provides shelter to mammals like Flying fox,Slow Loris, Golden cat, Jungle wild dog, Barking Deer, Giant squirrel,Porcupine, Clouded leopard, Leopard, Hoolock Gibbon, Hog-badger,Himalayan Black Dear, Capped Langur, Sambar, Fishing cat, Yellow-throated marten, Capped langur, Wild pig, Serow, Pigtailed Macaque, Stump-tailed macaque, Assamese macaque,Rhesus macaque etc.

Borail Wildlife Sanctuary is a house of various species of birds too like Lesser Adjutant Stork, White-backed Vulture, Slender-billed Vulture, White cheeked Hill Partridge, Mountain Bamboo partridge, Khaleej Pheasant, Grey Peacock-Pheasant, Rufus necked Hornbill, Wreathed Hornbill, Great Pied Hornbill etc.

Source: https://www.indianetzone.com/57/borail_wildlife_sanctuary.htm

Forest

Based on land use map & topo sheet Barail of Reserve forest is present at a distance of 9.55 m from study area

3.9.7   Aquatic Ecology

Preamble

Plankton is an important component of ecosystem, which responds to ecosystem alterations rather rapidly. They are passive drifters with the currents. Phytoplankton can grow rapidly and form massive blooms that can be regulated by environmental factors such as nutrients, availability of light and biotic interaction with grazers.

Zooplankton, also a very important group in the aquatic ecosystem, act as the primary consumer and ultimately serve as the natural food source for many aquatic organisms, including fishes. Zooplankton show considerable varieties comprising of members of various groups from protozoa to chordate. Depending on seasons and environmental conditions, the plankton community shows pronounced variation in its character and composition.

Methodology

Sampling

Water samples within 10 km periphery of project site were collected from Barak river   during December 2023 for phytoplankton and zooplankton analyses.

To enumerate phytoplankton, unfiltered surface waters were collected from above water bodies Phytoplankton samples were immediately fixed in Lugols iodine solution so as to prevent adverse effects of light and temperature which might cause rapid decay of organisms (APHA 2005). Phytoplankton were identified up to genera level using standard taxonomic keys. For zooplankton, desired volume of water was filtered through plankton net having mesh size of 75µ to 200 µ to represent all the available groups. The samples were fixed immediately with 5 % buffered formalin and subsequently analysed under microscope in the laboratory with the help of Sedgwick rafter cell.

Observation

a) Phytoplankton

Phytoplankton counts, were recorded are presented in **Table 3.17(A)**Total algal population varied between 524 No/ml to 670 No/ml Altogether 17 genera of phytoplankton were recorded **Table 3.17(B)** Amongst 4 groups, Cyanophyceae is Dominant followed by chlorophyaceae Bacillario-phyceae & Euglenophyaceae.

Table 3.17 (A): Enumeration of Phytoplankton at Barak River

SN	Name of sampling locations	Phyto plankton Density (No/ml)	Percent composition of algal groups				SWI
			Cyano-phyceae	Chloro-phyceae	Bacillario-phyceae	Eugleno-phyceae	
1	Jatinga River Upstream	524	46	30	14	10	2
2	Jatinga River Downstream	670	38	32	24	6	1.6

Table 3.17 (B): Phytoplankton genera observed at Barak River

SN	Bacillariophyceae	Cyanophyceae	Chlorophyceae	Euglenophyceae
1.	*Navicula sp.*	*Anabaena sp.*	*Actinastrum sp.*	*Euglena sp.*
2.	*Nitzschia sp*	*Oscillatoria sp.*	*Closterium sp.*	*Phacus sp.*
3.	*Cymbella sp.*	*Spirulina sp.*	*Cosmerium sp.*	_
4.	*Pinnularia sp.*	*Lyngbya sp.*	*Pediastrum sp.*	-
5.	-	*Merismopedia sp.*	*Scenedesmus sp.*	-
6	-	*Microcystis sp.*	-	-

b) Zooplankton

Density of zooplankton varied between 580 No/m^3 to 692 No/m^3 **Table 3.17(C).** Total three groups of zooplankton were recorded. Altogether 7 genera of zooplankton were recorded **Table 3.17 (D)** *Rotifera* was dominant followed by Copapoda & cladocera in river.

Table 3.17 (C): Enumeration of Zooplankton at Barak River

SN	Sampling locations	Zooplankton (No/m^3)	Percent composition of zooplankton in groups			SWI
			Rotifera	Cladocera	Copepoda	
1	Jatinga River Upstream	580	40	20	40	2.1
2	Jatinga River Downstream	692	42	22	36	2

Table 3.17 (D): Zooplankton Genera at Barak River

SN	Rotifera	Cladocera	Copepoda
1.	*Brachionus sp.*	*Alonella sp.*	*Microcyclops sp.*
2.	*Keratella sp.*	*Daphnia sp*	*Diaptomus sp.*
3	*Asplanchna sp.*	-	-

The Values of SWI for Plankton (phytoplankton& Zooplankton) indicate medium productive water.

Fish Fauna:

Fish farming is the second important source of livelihood of Cachar district. Some species like rohu, common carp, grass carp, silver carp, big head carp, singorah, arii, Tilapia, magur, Java Puti etc. are cultivated commercially in Cachar. List of the common fishes are given in **Table 3.18.**

Table 3.18: Fishes recorded in Study area

Sr. No.	Scientific Name	Local Name	English Name
1	*Catla catla*	Katal / Catla	Katla
2	*Labeo rohita*	Rui	Rohu
3	*Labeo calbasu*	Baush kalibaush	Calbasu / Black rohita
4	*Labeo gonius*	Goinya	Goania
5	*Cirrhinus mrigala*	Mrigal / mikra	Mrigal
6	*Labeo bata*	Bata	Bata
7	*Cirrhinus reba*	Bhagna	Reba
8	*Hilsa ilisha*	Ilish	Indian shad
9	*Rhinomugil corsula*	Corsula / Nadir bata	Corsula mullet
10	*Hypophthalmichthys molitrix*	Silver carp	Silver carp
11	*Hypophthalmichthys nobilis*	Big head	Big head
12	*Ctenopharyngodon idellus*	Grass carp	Grass carp

Sr. No.	Scientific Name	Local Name	English Name
13	*Cyprinus carpio var communis*	Carpio / Japani rui	Common carp / Scale carp.
14	*Puntius javanicus*	Japani Puti	Java Puti
15	*Oreochromis mossambica*	Tilapia	Tilapia / Mozambique cichlid

**Source: Local people &
https://bioinfopublication.org/files/articles/7_9_9_IJAS.pdf**

3.10   Socio-Economic Environment

3.10.1 Introduction

Socioeconomics has been recognized as a component that focuses primarily on the social and economic effects likely to occur due to the construction and operation of the proposed development. 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. Studying these parameters helps identify, predict, and evaluate the likely impacts of project activity in the surrounding region. Any developmental activity exerts direct, indirect, positive, and negative impacts on the socioeconomic environment of the region.

Objectives

The following are the socioeconomic study priorities:

- To investigate the demographic and facility structure available in the field of study.
- Identification and evaluation of the effects on the socioeconomic status of the study area.
- Consider any potential negative and positive social consequences of the initiative.
- We are recommending action to minimize the adverse effects of the project.
- To check that environmental and industrial standards have been complied with.
- To advise the adoption of cost-effective steps to mitigate the expected consequences.

The field of socioeconomic evaluation study was formed within a 10 kilometer radius. The Ministry of Environment and Forestry has designated the main radius of 10 km from the project data site radius. The radius of the project location. The EIA Guiding Handbook is used to classify the effect zone. For the socioeconomic study, both primary and secondary data are used.

3.10.2 Data Collection

The word "data collection" refers to a method of processing and obtaining data. Systematic data compilation from various sources for a particular project, which has been frequently monitored, documented, and coordinated. Data are critical inputs to every phase of the project's decision-making process.

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Primary Data Collection

The term "primary data" refers to data that was collected specifically for this reason. Data collected in the field with the investigator's assistance and supervision. This type of Information is often new and collected for the first time. It is beneficial for both present and future research. The following strategies are used to collect primary data in the research sector.

1. Form of observation
2. Focus group discussion (FGD)
3. Questionnaires and Surveys

Secondary Data Collection

Secondary data is acquired and registered by someone else before and with a reason other than the present one. Secondary Information is collected from a variety of other offices such as: Census offices (2011 Indian Census), Statistical, Health Offices, Department of Land and Revenue, Zilla Parishad and Non-Governmental Organizations.

3.10.3 Concept & Definitions

- **Study area:** The study area, also known as the impact area, has been established as the whole core region plus a buffer region 10 kilometres from the core perimeter. The study area includes both natural and man-made features.
- **Quality of Life (QoL):** Quality of Life refers to how much a person may appreciate his or her life's favourable resources. The 'possibilities' that each individual has in his or her life, which represent the combination of personal and environmental variables, are derived from opportunities and limits. Leisure consists of two parts: the sensation of pleasure and the possession or attainment of such attributes.
- **Household:** A household is a group of people who usually live together and dine in shared kitchens. People in the household might be related, unconnected, or a combination of the two. However, if a group of similar or unrelated persons reside in the same house but do not share a kitchen, they do not belong to a shared home. Each individual is regarded as if they were a member of a distinct family. Households might include one man, two, or more people.
- **Sex ratio**: The percentage of women and males in a particular population is referred to as the sex ratio. It is stated the term "number of women per 1000 males."
- **Literate:** Anyone above the age of seven who can read and write in any language is called literate. There is no formal schooling or minimum educational credentials required for an individual to be considered literate. Blind persons who can read Braille are now considered academics.
- **Literacy rate:** The literacy rate is defined as the percentage of the Population aged 7 and older who are literate.
- **Labor force:** the number of employees in a geographical unit is equal to the number of jobs and unemployed persons. The workforce is defined as the number of persons who work and those who are jobless. An individual who is not an employee must be characterized as being actively engaged in work. Those between the ages of 14 and 16 make up the majority of the country's labour force, as do those beyond the retirement age (about 65) who are either

employers or job searchers. Students, seniors, home visitors, inmates, persons with permanent impairments, and incentives are not counted as part of the labour force.

- **Work:** Work is defined as participation in any economically advantageous action, with or without compensation, wages, or revenue. Such involvement might be emotional or physical in character. Jobs need not only actual work, but also close supervision and instruction. Jobs on a farm, in a family business, or in another type of business might be part-time or full-time.

- **Worker:** All personnel are classed as workers. People who produce or prepare milk are typically regarded as employees, even if only for personal consumption.

- **Main workers:** Individuals who worked the majority of the time (6 months or more for a year of the comparative period) are referred to as Main Workers.

- **Marginalized workers:** These are people who have not served for the majority of their time (i.e., for less than 6 months).

- **The rate of participation in work**: the rate of participation is the ratio of workers to the total size of the cohort (national population of the same age range). The labour participation rate is defined in this study as the total (main and marginal) share of the work force.

3.10.4 Project Introduction

The proposed project area is located in Cachar district, Assam state, India. Left bank of our projected area is Pratapi Para, Buribali Pt-1, Buribali Pt –II, Rakhal Khaler Par Pt -1, Ganigram 4; Right bank of our projected area is Krishna Para, Buribali Pt II, Rakhal Khaler Par Pt-II, Hatirhar Pt II. Silchar Airport is the nearest airport from our study area.
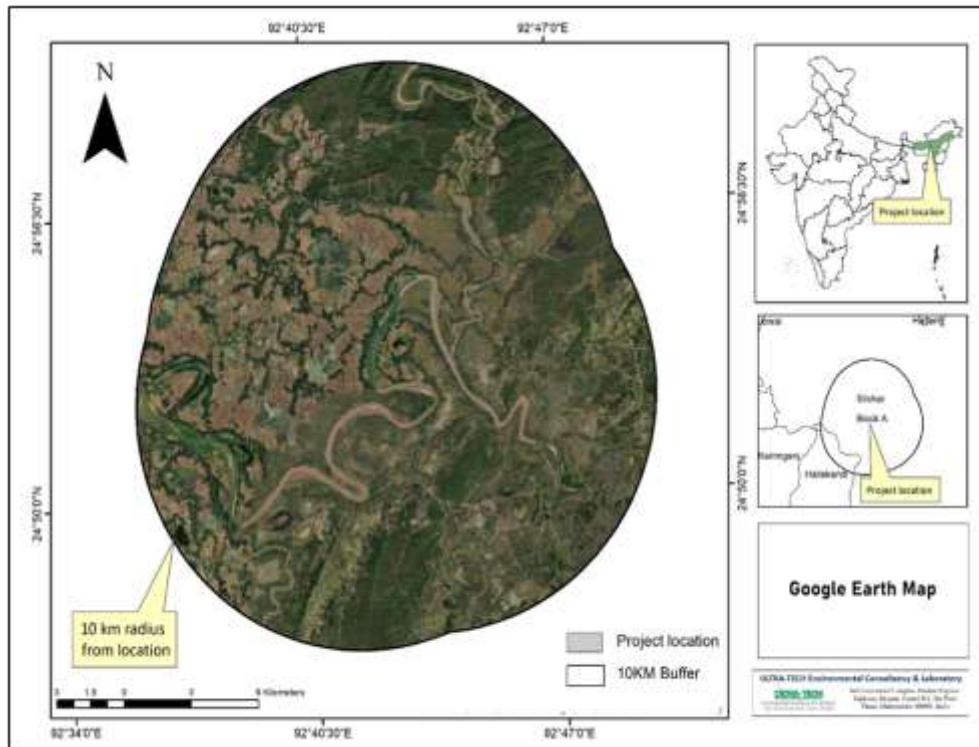
Figure 3.11: Projectsite and Study area

In the 10 km radius area, settlements are under study during the discussion of the basic socio-economic environment scenario. Various tables and graphs give detailed descriptions of these settlements.
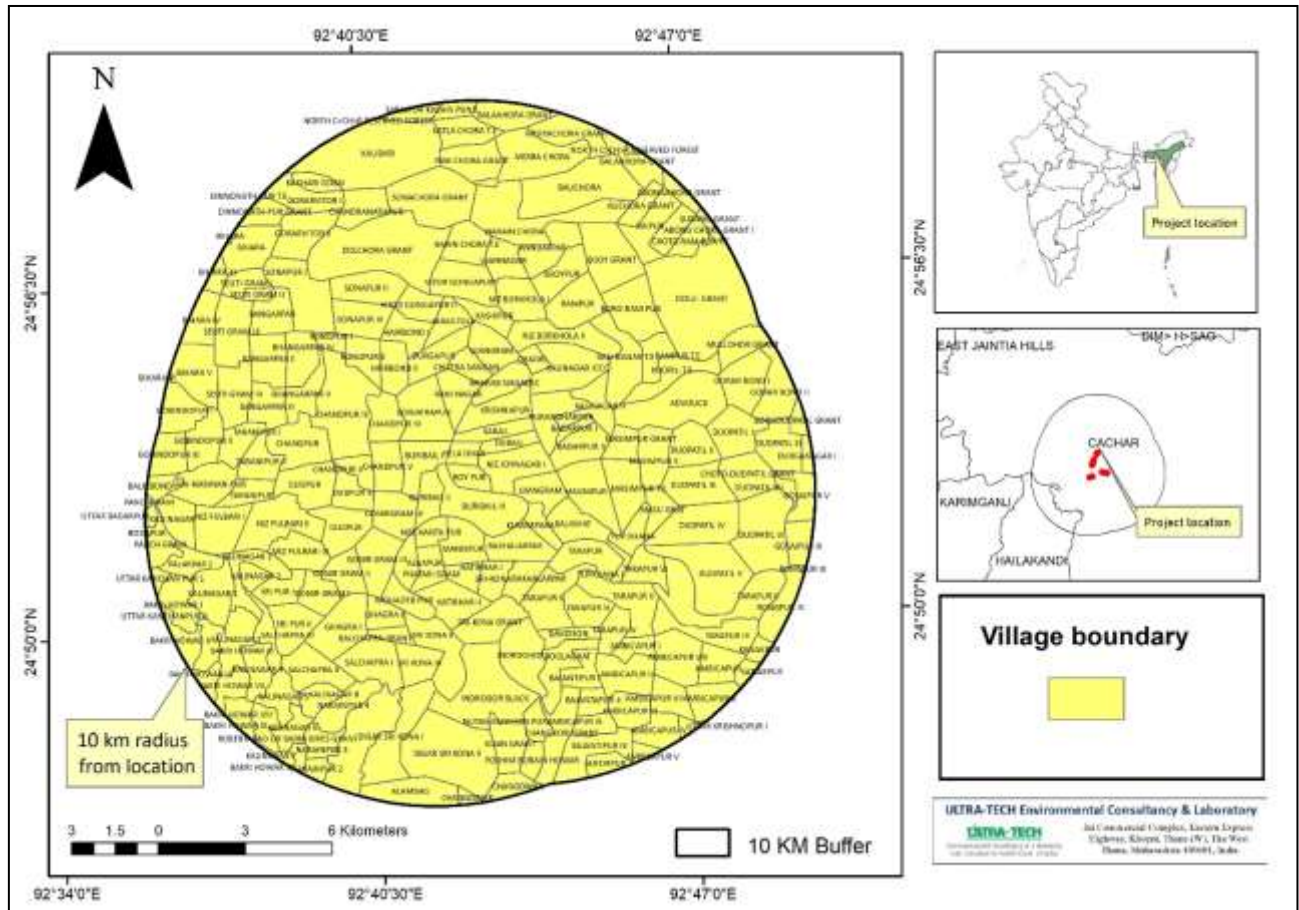
Figure 3.12: Villages within 10 Km. Radius Area from Project Site

Table 3.19: List of Villages within 10 Km. Radius Area from Project Site and Demographic details

Sl No:	Name	No. of House holds	Total Pop.		0-6 age pop	SC Pop.		ST Pop.		Literate Pop.		Illiterate Pop.		Working Pop.		Non-Working Pop	
			Male	Female		Male	Female	Male	Female	Male	Female	Male	Female	Main	Marginal	Male	Female
1	Abongchara Grant Pt I	122	260	216	61	0	0	0	0	169	88	91	128	130	148	114	84
2	Abongchara Grant Pt II	67	132	133	54	0	0	0	1	47	10	85	123	127	7	39	92
3	Alambag	725	1648	1526	458	377	345	55	48	992	772	656	754	815	179	812	1368
4	Algapur	358	660	647	116	53	44	0	0	594	572	66	75	285	55	345	622
5	Ambicapur Pt I	390	850	812	156	324	312	2	0	757	659	93	153	467	148	396	651
6	Ambicapur Pt II	313	742	742	150	0	0	0	0	626	601	116	141	403	308	289	484
7	Ambicapur Pt III	32	77	85	18	0	0	0	0	71	64	6	21	45	39	36	42
8	Ambicapur Pt IV	368	867	858	196	588	566	0	0	715	652	152	206	443	18	443	821
9	Ambicapur Pt V	182	448	451	119	151	145	0	0	353	298	95	153	216	45	206	432
10	Ambicapur Pt VI (CT)	1641	4070	3901	1168	460	427	0	1	3132	2628	938	1273	2125	229	1935	3682
11	Ambicapur Pt VII	394	1061	1005	202	455	421	0	0	903	822	158	183	495	156	492	923
12	Ambicapur Pt VIII (CT)	2336	5866	5825	1610	3028	3087	79	69	4052	3497	1814	2328	3578	294	2683	5136
13	Ambicapur Pt XI	642	1399	1379	280	267	273	8	6	1222	1142	177	237	896	70	658	1154
14	Ambikapur Pt. X (CT)	3169	7309	6974	1571	952	886	4	4	6115	5392	1194	1582	4248	301	3421	6313
15	Anwarpur	64	156	168	77	0	0	0	0	103	99	53	69	62	21	81	160
16	Badarpur Pt I	462	1068	1034	333	75	74	0	0	819	749	249	285	494	238	531	839
17	Badarpur Pt II	355	928	875	331	24	14	0	0	640	556	288	319	373	149	469	812
18	Bajantipur Pt I	229	614	577	107	0	0	0	0	524	456	90	121	276	35	341	539
19	Bajantipur Pt II	201	432	378	88	0	0	0	0	333	283	99	95	179	44	231	356
20	Bajantipur Pt III	170	400	348	102	197	171	0	0	307	243	93	105	322	86	179	161
21	Balighat	618	1391	1374	354	144	115	0	0	1115	951	276	423	766	63	638	1298
22	Balirbond	66	157	147	61	45	37	1	1	98	65	59	82	76	7	83	138

			**Total Pop.**		**SC Pop.**		**ST Pop.**		colspan=2 **Literate Pop.**		**Illiterate Pop.**		**Working Pop.**		**Non-Working Pop**	

Sl No:	**Name**	**No. of House holds**	**Total Pop.** Male	Female	**0-6 age pop**	**SC Pop.** Male	Female	**ST Pop.** Male	Female	**Literate Pop.** Male	Female	**Illiterate Pop.** Male	Female	**Working Pop.** Main	Marginal	**Non-Working Pop** Male	Female
23	Behara Pt I (Bihara Pt I)	271	632	600	113	78	73	1	0	562	518	70	82	268	93	297	574
24	Behara Pt II	374	789	795	140	212	202	0	0	697	697	92	98	510	27	339	708
25	Behara Pt III	841	2141	2020	708	64	71	2	4	1684	1427	457	593	996	228	1031	1906
26	Behara Pt IV	851	2240	2045	874	0	0	0	0	1546	1330	694	715	962	243	1196	1884
27	Behara Pt V	696	1855	1721	737	0	0	1	1	972	709	883	1012	475	464	1044	1593
28	Behara Pt VI	491	1291	1200	569	0	0	0	0	900	733	391	467	391	278	663	1159
29	Bijoypur	238	593	566	206	14	14	88	84	365	322	228	244	302	25	289	543
30	Bijoypur Grant	160	323	300	88	2	1	0	0	155	96	168	204	265	19	150	189
31	Buribali Pt I	449	932	853	272	71	69	0	0	739	633	193	220	445	163	423	754
32	Buribali Pt II	495	1143	1086	297	15	20	0	0	917	770	226	316	344	248	569	1068
33	Buribali Pt III	320	799	757	235	0	0	0	1	630	554	169	203	384	24	405	743
34	Chandpur Pt I	398	917	899	398	124	131	0	0	550	518	367	381	294	275	498	749
35	Chandpur Pt II	306	615	627	191	380	400	0	0	445	445	170	182	283	88	273	598
36	Chandpur Pt III	456	967	920	346	40	37	0	0	736	647	231	273	379	175	455	878
37	Chandpur Pt IV	431	932	848	266	0	0	0	0	730	583	202	265	418	103	462	797
38	Chandpur Pt V	201	439	386	137	4	3	0	0	351	281	88	105	83	142	236	364
39	Chandranath Pur	705	1402	1379	366	55	50	13	12	863	664	539	715	828	326	619	1008
40	Chengduar Pt I	130	335	313	122	28	31	0	1	219	158	116	155	125	35	179	309
41	Chenglorie Grant	678	1534	1479	443	485	421	0	0	1108	934	426	545	911	94	779	1229
42	Chotorampur Grant	68	151	140	45	7	6	0	0	86	31	65	109	72	78	61	80
43	Chutra Sangan	74	165	165	53	159	161	0	0	125	124	40	41	94	3	75	158
44	Dalu Grant	1872	3995	3960	1120	55	69	11	8	2286	1706	1709	2254	2131	1737	1880	2207
45	David Sonapur	4	16	11	4	0	0	0	0	14	5	2	6	11	1	7	8
46	Digorsrikona Pt I	193	480	458	157	378	366	8	10	320	285	160	173	313	21	234	370

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			Male	Female		Male	Female	Male	Female	Male	Female	Male	Female	Main	Marginal	Male	Female
47	Digorsrikona Pt II	741	1855	1754	582	1081	1019	13	12	1053	797	802	957	945	489	902	1273
48	Dinanath Pur Grant	1043	2393	2269	615	887	802	14	10	1786	1622	607	647	1089	813	914	1846
49	Dubag	228	491	452	153	0	0	0	0	375	329	116	123	261	28	249	405
50	Dudhpatil Pt I	193	482	447	161	474	434	0	0	360	287	122	160	246	0	239	444
51	Dudhpatil Pt II	49	95	84	28	31	26	0	0	78	63	17	21	30	27	43	79
52	Dudhpatil Pt III	119	259	268	88	219	216	0	0	214	186	45	82	126	17	123	261
53	Dudhpatil Pt IV	701	1381	1336	349	282	259	0	0	1112	958	269	378	784	262	622	1049
54	Dudhpatil Pt V (CT)	919	2092	2029	449	2	1	0	0	1778	1663	314	366	1047	251	985	1838
55	Dudhpatil Pt VI (CT)	1215	2573	2510	824	91	81	0	0	1886	1675	687	835	1281	178	1269	2355
56	Dudhpatil Pt VII	309	658	643	173	469	435	0	0	530	490	128	153	411	3	275	612
57	Dudpur Pt I	584	1207	1175	460	0	0	0	0	753	733	454	442	490	72	680	1140
58	Durganagar Pt I	189	511	457	177	32	23	0	0	367	267	144	190	187	123	224	434
59	Durgapur	450	1064	974	292	0	0	0	0	790	647	274	327	333	451	497	757
60	Elgin Grant	114	271	245	75	31	30	1	0	134	76	137	169	70	122	110	214
61	Ganirgram Pt I	256	582	515	175	29	30	0	0	444	362	138	153	238	86	280	493
62	Ganirgram Pt II	310	564	529	179	0	2	0	0	434	339	130	190	317	82	222	472
63	Ganirgram Pt III	383	890	817	288	41	39	0	0	695	591	195	226	429	34	442	802
64	Ganirgram Pt IV	502	1154	1050	297	72	65	0	0	935	739	219	311	485	229	531	959
65	Gobindapur Pt I	106	280	220	116	79	66	0	0	179	130	101	90	94	45	149	212
66	Gobindapur Pt II	483	1252	1214	362	0	0	0	0	990	852	262	362	653	135	599	1079
67	Gobindapur Pt III	738	1785	1607	466	716	647	0	0	1422	1160	363	447	626	613	732	1421
68	Gorer Vitor Pt I	205	447	430	120	101	84	224	215	378	345	69	85	68	194	214	401
69	Gorer Vitor Pt II	236	569	519	147	198	183	6	2	448	378	121	141	21	329	308	430
70	Gorer Bond Pt I	327	655	678	240	610	633	37	38	299	280	356	398	320	145	321	547

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			Male	Female		Male	Female	Male	Female	Male	Female	Male	Female	Main	Marginal	Male	Female
71	Gorer Bond Pt II	381	914	814	247	406	337	15	20	625	475	289	339	432	92	481	723
72	Gossaipur Pt III	538	1307	1279	422	94	84	0	0	1022	925	285	354	620	174	669	1123
73	Gossaipur Pt V	383	725	685	182	17	24	0	0	468	430	257	255	429	51	296	634
74	Hatirhar Pt I(Matirhar Pt I)	206	453	397	105	199	191	0	0	376	307	77	90	238	14	214	384
75	Hatirhar Pt II	235	538	526	134	0	0	0	0	462	412	76	114	247	15	309	493
76	Heirbond Pt I	197	439	417	122	389	366	0	0	338	307	101	110	153	128	199	376
77	Heirbond Pt II	146	375	371	141	137	110	0	0	228	225	147	146	25	231	209	281
78	Indragarh Block	133	299	286	91	142	133	15	19	216	179	83	107	129	95	121	240
79	Indragarhgrant	97	224	217	54	94	98	0	0	162	130	62	87	158	9	81	193
80	Jaifarpur	546	1321	1199	331	391	374	19	12	1078	883	243	316	746	72	580	1122
81	Jarailtala	464	1111	1046	328	0	0	0	0	895	755	216	291	441	462	471	783
82	Kachari Gaon	148	295	285	116	0	0	50	53	190	135	105	150	160	14	138	268
83	Kalinagar	308	645	640	221	173	144	0	0	482	394	163	246	310	52	303	620
84	Kalinagar Garden	216	411	401	138	6	3	0	0	165	83	246	318	370	41	168	233
85	Kalinagar Pt I	364	783	771	176	381	355	0	0	648	587	135	184	476	178	315	585
86	Kalinagar Pt II	131	333	293	85	269	240	0	0	260	215	73	78	130	83	136	277
87	Kanakpur I (CT)	1282	3191	3028	749	106	88	0	0	2494	2101	697	927	1715	250	1474	2780
88	Kanakpur Pt III	837	2044	2001	659	123	106	57	61	1357	1075	687	926	1039	589	1011	1406
89	Kanakpur Pt. II (CT)	2078	4817	4702	1121	866	839	4	1	3916	3554	901	1148	2992	212	2020	4295
90	Kashipur	206	483	481	136	91	88	0	0	393	367	90	114	290	51	247	376
91	Katlichara Grant Bagicha)	241	477	408	122	0	0	0	0	184	79	293	329	314	2	293	276
92	Krishna Pur	604	1247	1182	371	0	0	0	0	990	883	257	299	605	107	697	1020
93	Manikpur	502	1095	1031	328	261	223	0	0	882	767	213	264	461	192	532	941

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			Male	Female		Male	Female	Male	Female	Male	Female	Male	Female	Main	Marginal	Male	Female
94	Masimpur Grant	317	1193	578	212	27	20	12	7	1012	368	181	210	872	166	267	466
95	Masimpur Pt I Maohimpur)	558	1697	1176	478	286	253	1	0	1313	714	384	462	1063	125	603	1082
96	Masimpur Pt II	460	1450	914	287	36	34	0	0	1263	630	187	284	1000	142	414	808
97	Masughat	408	862	872	178	373	339	0	0	764	721	98	151	420	22	455	837
98	Mulidahar Grant	259	609	548	166	217	221	7	10	406	267	203	281	314	287	274	282
99	Narainchara Grant	243	559	559	221	25	29	5	3	309	271	250	288	446	81	253	338
100	Narsingpur Pt II	386	750	787	157	45	51	0	0	663	685	87	102	238	118	454	727
101	Narsingpur Pt III	441	941	944	199	47	54	0	0	798	761	143	183	466	86	492	841
102	Narsingpur Pt IV	132	228	238	58	0	0	0	0	198	210	30	28	134	7	107	218
103	Nischintapur	292	712	680	193	0	0	0	0	550	482	162	198	359	14	360	659
104	Niz-Borkhola Pt I	767	1641	1593	373	349	318	0	0	1369	1240	272	353	843	249	757	1385
105	Niz-Borkhola Pt II	553	1364	1304	407	106	107	3	1	1111	1013	253	291	733	122	688	1125
106	Niz-Fulbari Pt I	629	1477	1300	429	476	414	0	0	1092	843	385	457	567	242	697	1271
107	Niz-Fulbari Pt II	117	259	249	96	0	0	0	0	214	179	45	70	50	84	128	246
108	Niz-Joynagar	571	1364	1307	394	279	267	4	0	1011	901	353	406	539	330	639	1163
109	Noon Nagar (Nurnagar)	478	1177	1107	371	5	6	0	0	894	774	283	333	600	63	557	1064
110	Nutan Kanchanpur	836	1633	1728	735	0	0	0	0	1117	956	516	772	526	327	923	1585
111	Pachim Biroinhowar	163	487	469	139	371	339	0	1	294	227	193	242	225	6	271	454
112	Panch Gram	93	260	277	109	19	31	0	0	125	117	135	160	84	171	135	147
113	Raipur	193	455	377	125	0	0	0	0	373	263	82	114	215	81	210	326
114	Rakhal Khaler Par Pt I	597	1404	1278	319	533	488	0	0	1198	1026	206	252	691	112	717	1162
115	Rakhalkhalerpar Pt II	274	700	667	236	0	0	0	0	530	442	170	225	286	184	340	557
116	Rampur	183	443	438	123	243	245	13	13	290	295	153	143	167	95	197	422
117	Rampur Garden	143	256	277	73	10	11	0	0	158	123	98	154	246	62	91	134

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			Male	Female		Male	Female	Male	Female	Male	Female	Male	Female	Main	Marginal	Male	Female
118	Rangar Pt I	293	762	737	250	82	79	0	0	515	429	247	308	342	78	420	659
119	Rongpur Pt I	558	1359	1384	398	113	96	0	1	1027	909	332	475	754	238	646	1105
120	Rongpur Pt II	455	1071	1074	242	25	26	0	0	897	804	174	270	630	172	445	898
121	Rongpur Pt IV	592	1520	1442	433	374	342	6	7	1154	986	366	456	765	137	721	1339
122	Sabajpur Bagicha	178	359	338	102	0	0	0	0	218	124	141	214	202	254	103	138
123	Salchapra Pt I	401	889	925	233	316	318	3	5	710	672	179	253	480	34	418	882
124	Salchapra Pt II	296	715	669	204	201	190	0	0	580	494	135	175	329	22	377	656
125	Salchapra Pt III	253	564	573	109	87	128	0	0	470	419	94	154	270	37	289	541
126	Sarail	243	516	477	150	0	0	0	0	410	350	106	127	280	9	254	450
127	Sewti Pt I (Santi Pt I)	522	1384	1358	488	331	332	0	0	1022	892	362	466	372	433	692	1245
128	Sewti Pt II	285	594	594	132	39	36	0	0	502	465	92	129	150	208	304	526
129	Sewti Pt III	239	495	489	105	50	56	0	0	451	398	44	91	214	14	296	460
130	Sewti Pt IV	283	718	721	263	0	0	0	0	522	462	196	259	273	84	389	693
131	Sonachera Grant	184	383	388	109	27	27	0	1	221	168	162	220	249	71	176	275
132	Sonachera Pt I	156	268	261	68	104	100	0	0	213	182	55	79	186	13	97	233
133	Sonachera Pt II	77	176	143	48	4	1	0	0	127	77	49	66	107	2	79	131
134	Sonachera Pt III	29	53	52	24	0	0	0	0	38	17	15	35	35	0	22	48
135	Srikona Grant	1389	3274	3155	982	1681	1565	17	36	2349	1965	925	1190	1746	446	1538	2699
136	Srikona Pt II	760	1751	1678	624	0	0	0	0	1265	1015	486	663	594	991	803	1041
137		111	283	264	120	51	44	1	6	173	111	110	153	138	166	129	114
138	Sripur Pt I	344	844	773	257	337	307	0	0	628	485	216	288	383	25	468	741
139	Sripur Pt II	373	908	834	307	247	242	0	0	612	505	296	329	477	19	435	811
140	Subang Garden	570	1194	1113	398	8	12	0	0	470	271	724	842	861	139	535	772
141	Tarapur Pt I	11	26	26	5	0	1	0	0	19	19	7	7	11	11	10	20

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			Male	Female		Male	Female	Male	Female	Male	Female	Male	Female	Main	Marginal	Male	Female
142	Tarapur Pt II	298	735	699	132	87	84	0	2	637	602	98	97	335	72	398	629
143	Tarapur Pt III	366	858	896	193	7	6	0	0	742	728	116	168	411	94	445	804
144	Tarapur Pt IV	932	2240	2109	692	153	153	0	0	1659	1411	581	698	1083	242	1121	1903
145	Tarapur Pt V	216	556	531	142	0	0	0	0	447	387	109	144	269	23	301	494
146	Tarapur Pt VI (CT)	1862	4392	4361	1059	846	845	8	3	3426	3149	966	1212	2523	210	2115	3905
147	Tarinipur Pt I	353	890	845	355	21	27	0	0	572	428	318	417	355	102	486	792
148	Tarinipur Pt II	73	203	199	97	0	0	0	0	88	86	115	113	96	19	108	179
149	Tarinipur Pt III	622	1397	1413	535	0	0	0	0	969	762	428	651	636	81	772	1321
150	Tupkhana Pt I (CT)	989	2369	2271	617	52	61	5	4	1897	1594	472	677	1143	112	1245	2140
151	Tupkhana Pt II	383	835	831	156	82	91	0	0	707	651	128	180	382	67	434	783
152	Ujan Nagar	325	746	697	261	34	19	35	40	511	425	235	272	241	313	324	565
153	Ujangram	567	1161	1180	370	12	18	0	0	927	851	234	329	520	112	574	1135
154	Uttar Krishnapur Pt II	917	2383	2163	694	110	82	0	0	1769	1426	614	737	991	280	1296	1979
155	Uttar Krishnapur Pt. I (CT)	1485	3549	3411	892	179	173	3	6	2800	2429	749	982	1867	378	1678	3037

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Data Source: https://data.gov.in/resources/villagetown-wise-primary-census-abstract-2011

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			Male	**Female**		**Male**	**Female**	**Male**	**Female**	**Male**	**Female**	**Male**	**Female**	**Main**	**Marginal**	**Male**	**Female**
1	Bakori Hawar Pt I	452	1151	1158	407	468	457	0	0	827	743	324	415	402	299	558	1050
2	Bakri Howar Pt II	292	718	687	248	503	466	3	4	477	373	241	314	194	194	401	616
3	Bakri Howar Pt VI	107	250	260	110	0	0	0	0	129	97	121	163	124	0	133	253
4	Bakri Howar Pt VII	311	736	736	283	275	296	0	0	489	467	247	269	342	9	403	718
5	Bakri Howar Pt VIII	357	857	837	345	0	7	0	0	568	390	289	447	294	174	458	768
6	Bakri Howar Pt XI	112	238	233	94	0	0	0	0	147	113	91	120	91	53	123	204
7	Kalinagar Pt II	333	803	738	226	152	136	0	0	612	511	191	227	299	121	417	704
8	Kalinagar Pt III	904	1975	1908	479	555	505	0	0	1555	1406	420	502	929	238	1005	1711
9	Kalinagar Pt IV	187	412	421	121	27	25	0	0	323	285	89	136	109	75	243	406
10	Kalinagar Pt V	299	763	718	311	0	0	0	0	536	396	227	322	244	102	424	711
11	Kalinagar Pt VI	239	553	497	220	128	106	0	0	351	255	202	242	153	72	357	468
12	Kalinagar Pt VII	137	322	300	124	8	5	0	0	237	157	85	143	160	6	166	290

CENSUS DATA 2011 OF HALIKANDI DISTRICT , ASSAM

			CENSUS DATA 2011 OF HALIKANDI DISTRICT , ASSAM															
Sl No:	Name	No. of House holds	Total Pop.		0-6 age pop	SC Pop.		ST Pop.		Literate Pop.		Illiterate Pop.		Working Pop.		Non-Working Pop	
			Male	Female		Male	Female	Male	Female	Male	Female	Male	Female	Main	Marginal	Male	Female
13	Kalinagar Pt VIII	298	717	737	289	0	0	0	0	399	329	318	408	165	165	401	723
14	Narainpur Pt II	314	699	658	222	43	29	0	0	532	390	167	268	317	56	364	620
15	Narainpur Pt III	289	644	575	230	90	88	0	0	485	370	159	205	321	22	329	547
16	Narainpur Pt IV	295	644	574	134	406	362	0	0	539	417	105	157	264	94	306	554
17	Panchgram	817	1951	1817	531	701	633	5	5	1498	1280	453	537	918	165	1031	1654
18	Uttar Kanchanpur Pt I	209	553	556	153	82	81	0	0	399	325	154	231	233	55	299	522

Data Source: https://data.gov.in/resources/villagetown-wise-primary-census-abstract-2011

3.10.5 Male and Female Population

According to recent census (2011), Total Population of the study area is 352401 (within a 10 Km radius of the project site). The male population is 180585, and the female population is171816. The highest population in the study area is Ambikapur Pt. X (CT), Cachar (14283). 51% of our study area is dominant by male population and 49% is dominant by female population. There are 77284 households in the study area, and the average size of household is 5 members per household**.**
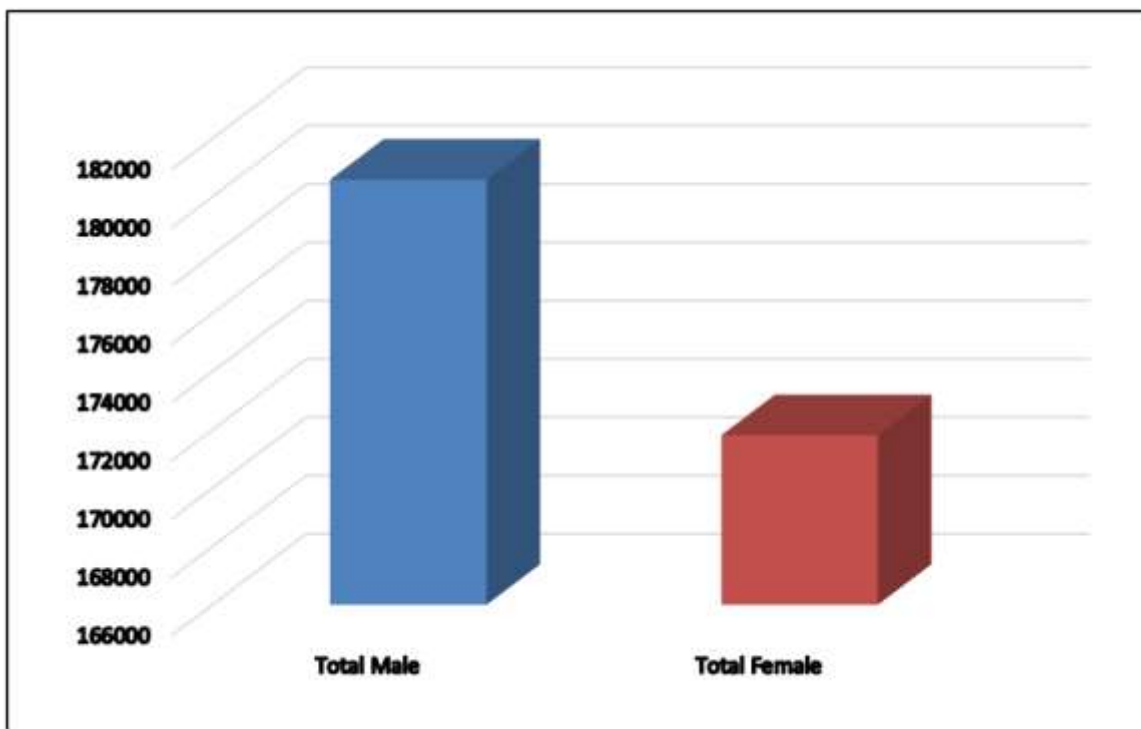
Figure 3.13 : Male-Female Population Distribution

3.10.6 SC &ST Population

According to the 2011 census, the total population of Scheduled Caste population in our study area is 61250 and the total population of Scheduled Tribe is 1708. Compared to the SC and ST pop, Scheduled Caste population is higher than Scheduled Tribe population in the study area to the total population is. Scheduled Caste population consist 97% of the total population and Scheduled Tribe population 3%. Ambicapur Pt VIII (CT) dominant by Scheduled Caste population (6115) and Gorer Vitor Pt I is dominant by Scheduled Tribe (439).

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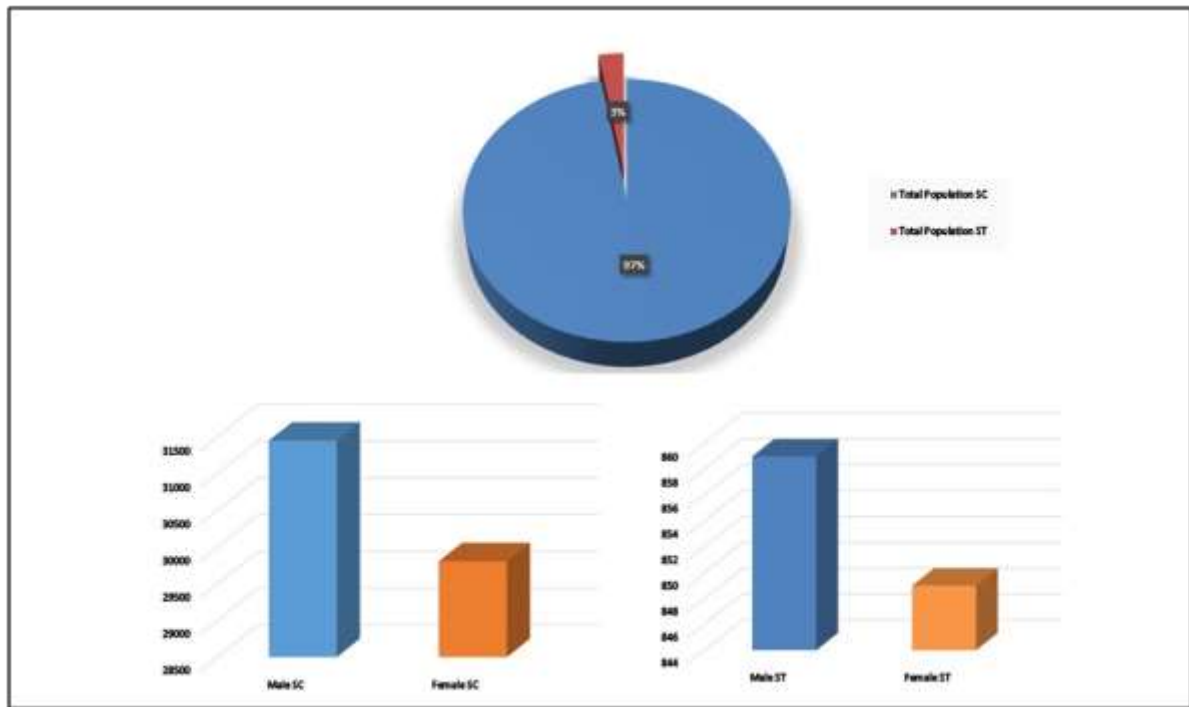
Figure 3.14: SC and ST Population Distribution

3.10.7 Religion

Hindu, is a majority religion in the study area 59.83 %. of the population being followers. Muslim is the second-most-popular religion in the area with 37.71 %, followed by Christian 2.17 %. Sikh 0.02 %.

People of different religion worship their religious beliefs in Temple, Churches, Masjids, Gurudwaras, Jain temples and other religious places that is located in the study area. There are many religious places area noted, some are:

Hindu temple: Abijit Dey House (Sitali bhari), Laxmi-Narayan Temple, Polarpar Kali Mandir, Shri Shri sarbojanik Jugal Milan Kali bari(Temple), Arunachal Ashram(Silchor), Sri Sri Chaitanya Mahaprabhu Mandir, Masughat.

Mosque: Mazumdar bazar Masjid and Dewar Mukam, Shilakuti Jama Masjid (Kadamtala)Cachar Assam, Tupkhana Pakka Masjid, Cachar Title Madrassa (Masjid E Qu tub), Ujangram boro masjid.

Church: Panicherra Presbyterian Church, BSF Church.

Gurudwara: BSF Sikh Gurudwara, Nasim – Gurudwara.

Table 3.19: Religion Distribution Percentage

Religion	Percentage
Hindu	59.83 %
Muslims	37.71 %
Christian	2.17 %
Sikh	0.02 %
Buddhist	0.02 %
Jain	0.10 %
Others	0.01 %

3.10.8 Educational Status

According to census 2011; in the study area among the total literate population is 248823; the male literate population is 134857 and female literate population is 113966 in the study area. Hence the female literacy rate is lower compared to the male literacy in the study area, which is a pan Indian phenomena. The education status has been mentioned in the figure. Also, in our study area the total illiterate population is 103578; the male illiterate population is 45728 and female illiterate population is 57850.

There are many primary, Secondary and higher-secondary schools are available in study area. The secondary and higher education in study area is conducted by three educational boards- the W.B, I.C.S.E., CBSC. Study area has a wide range of colleges and universities that cater to diverse streams such as commerce, arts, science, engineering, applied science and law. Following schools are noted in study area are: Holy Crown School, Zilkadar Ali H.S School, Al Hilal Islamic Academy – School, Sonapur Public M E School, Spring Dales Academy: Bhangarpar - School, Kendriya Vidyalaya Dholchera - CBSE School, Government Model College, Borkhola, West Silchar College (Barjatrapur) – College, Sarada Charan Dey College.
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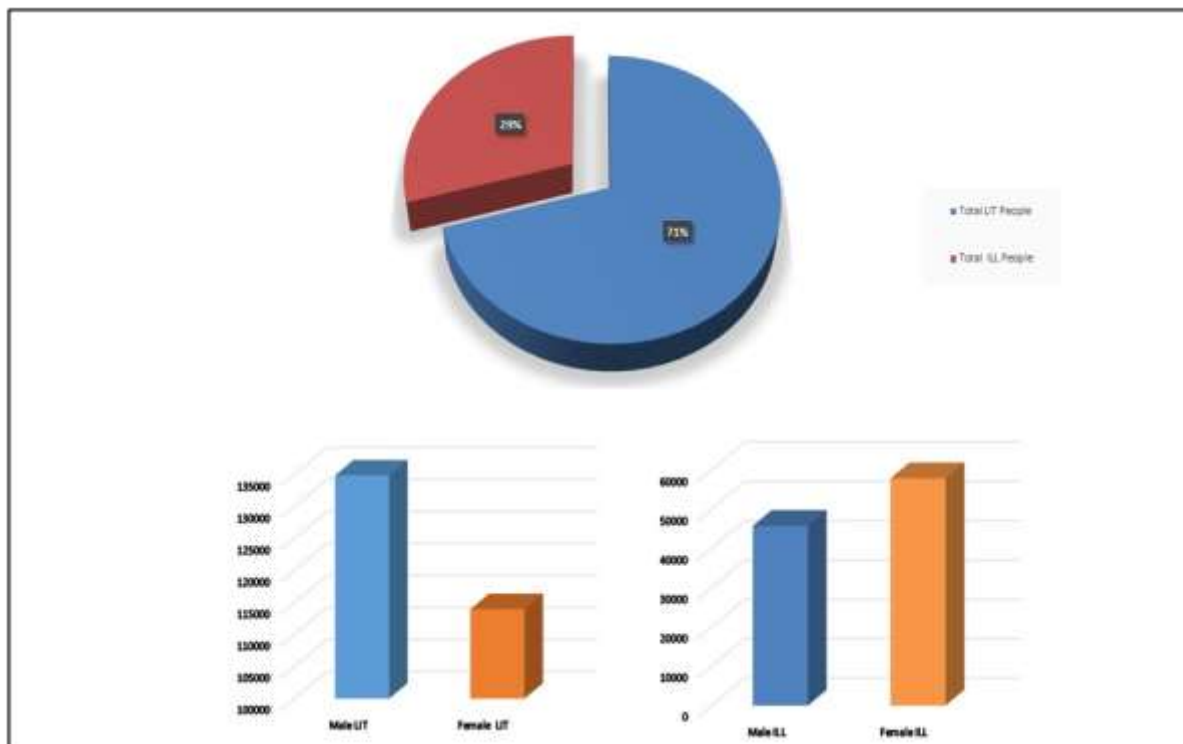
Figure 3.15: Literates and Illiterate Population distribution

3.10.9 Economy

The occupation of agriculture is the backbone of the study area. Considering agricultural production, most farmers still practice traditional cultivation methods, resulting in low growth rates and productivity. The farmers must be made aware of modern technologies suitable to their holdings. Providing adequate knowledge to the farmers is essential to implement the agricultural development plans better and improve productivity. Considering this and a very limited irrigated area, the productivity of rice and other crops is low. Hence, the farmers are unable to obtain economic benefits from agriculture, and it has remained subsistence agriculture till now.

Within study area total working population is 67% and non-working population is 33%. In our study area there is 77% main workers and 23% marginal workers. We can see from our figure; total main working population constitute with 17% main cultivator population person, 5% main agricultural laborers population, 2% main household industries population person, 76% main other working population person and we can see from our figure; total marginal working population constitute with 5% marginal cultivator population person, 7% marginal agricultural laborers population, 3% marginal household industries population person, 85% marginal other working population person. In our study area Ambikapur Pt. X (CT) has highest main working population, which is 4248 and Dalu Grant has highest marginal working population which is 1737.
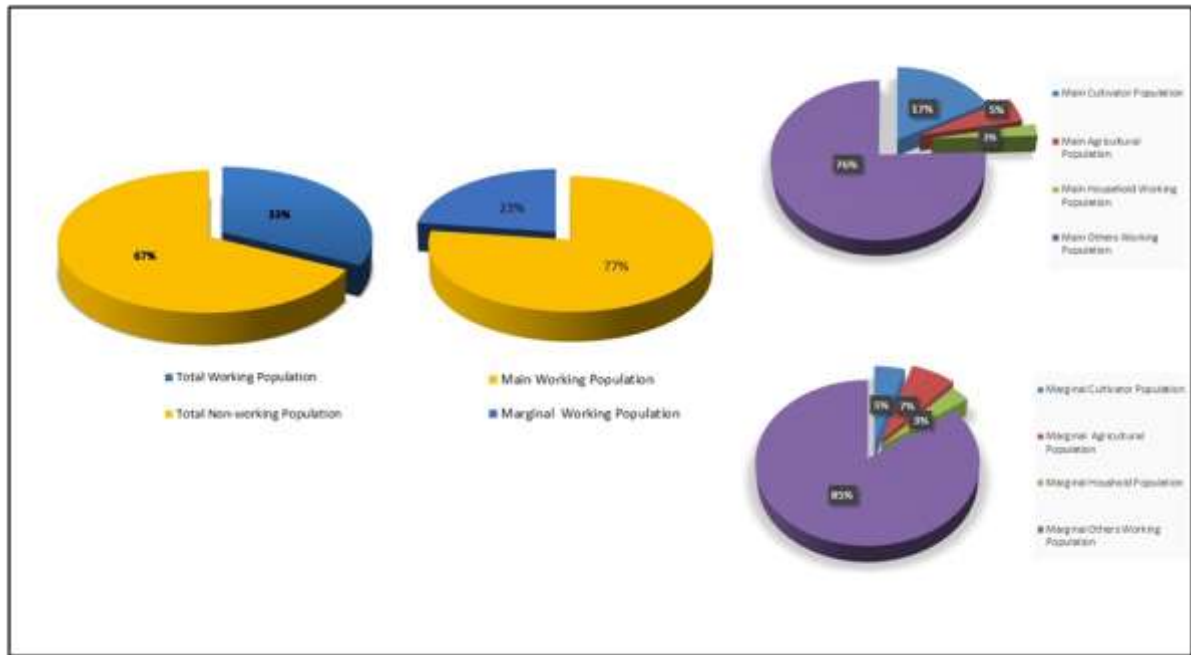
Figure 3.16: Distribution of working population

3.10.10 People, Tradition , Heritage and Culture

The majority of people in this district speak Bengali, which is the official language, and Sylheti, a dialect of Bengali. In addition to Bengali, the district also speaks Hindi, Assamese, Meitei Manipuri, Bishnupuriya Manipuri, Dimasa, Rongmei-Naga, and Hmar, among other languages.

Festivals:

The people of the study area celebrate several religious and cultural festivals that transgress the time-honored communal divide. Some common festivals are:

- Bihu Dance Festival

- Elephant Festival

- Brahmaputra Beach Fair and Festival

- Dehing Tea Patkai Festival

- Tea Fair and Festival

- Rongali Utsav

- Ambubachi Mela

People and culture:

The Assamese wear extremely basic garments that are primarily hand-loomed. The women dress in elaborately patterned Mekhela Chador or Riha-Mekhela. The men cover their "suria" or "dhoti" with a chadar called "Seleng." In Assam, gamucha is an essential component of practically all socio-religious rituals.

Art and Craft:

Assam is well-known for its fine silks and its bamboo and cane goods, but it also produces a variety of other crafts.

i. Canne and Bamboo

 In Assam, cane and bamboo continue to be essential components of daily existence. Grown in large quantities here, cane and bamboo make up the majority of household items in Assamese homes. They also happen to be the most widely utilized items in daily life, being used in everything from furniture to weaving accessories to musical instruments to household tools to dwelling building construction.

ii. Metals Crafts

The two metals that Assamese artisans have employed the most frequently are brass and bell-metal. Every Assamese home has elegant pieces made by these artisans as well as traditional kitchenware. For ages, the Xorai and bota have been used to greet esteemed guests with betel nut and paan.

iii. Wooden Craft

Assam has historically been one of the states with the greatest amount of forest cover in the nation, and the diversity of wood and timber that is available here has influenced the people's way of life and culture.

iv. Masks

Masks play a significant role in the people's cultural activities since tribal art and folk elements are the foundation of Assamese culture. Masks made of terracotta, pith, metal, bamboo, and wood have been used extensively in folk theatres and bhaonas.

3.10.11 Infrastructure, Transport and Communication

This section analyses the infrastructure facilities like water supply, roads, markets, banks, post offices, schools and electrification in the study area.

*Air***:** The nearest airport is **Silchar Airport**, Kumbhirgram, Assam 788031

, India which is away from 26.43 km to the project area.

Rail: The nearest railway **station** is **Karimganj Railway Station (Junction)** from study area, which is away from 33.11 km.

Road: **Maradona road, Dudhpatil Part-V, Silchar, Cachar, Assam**, near our project location.
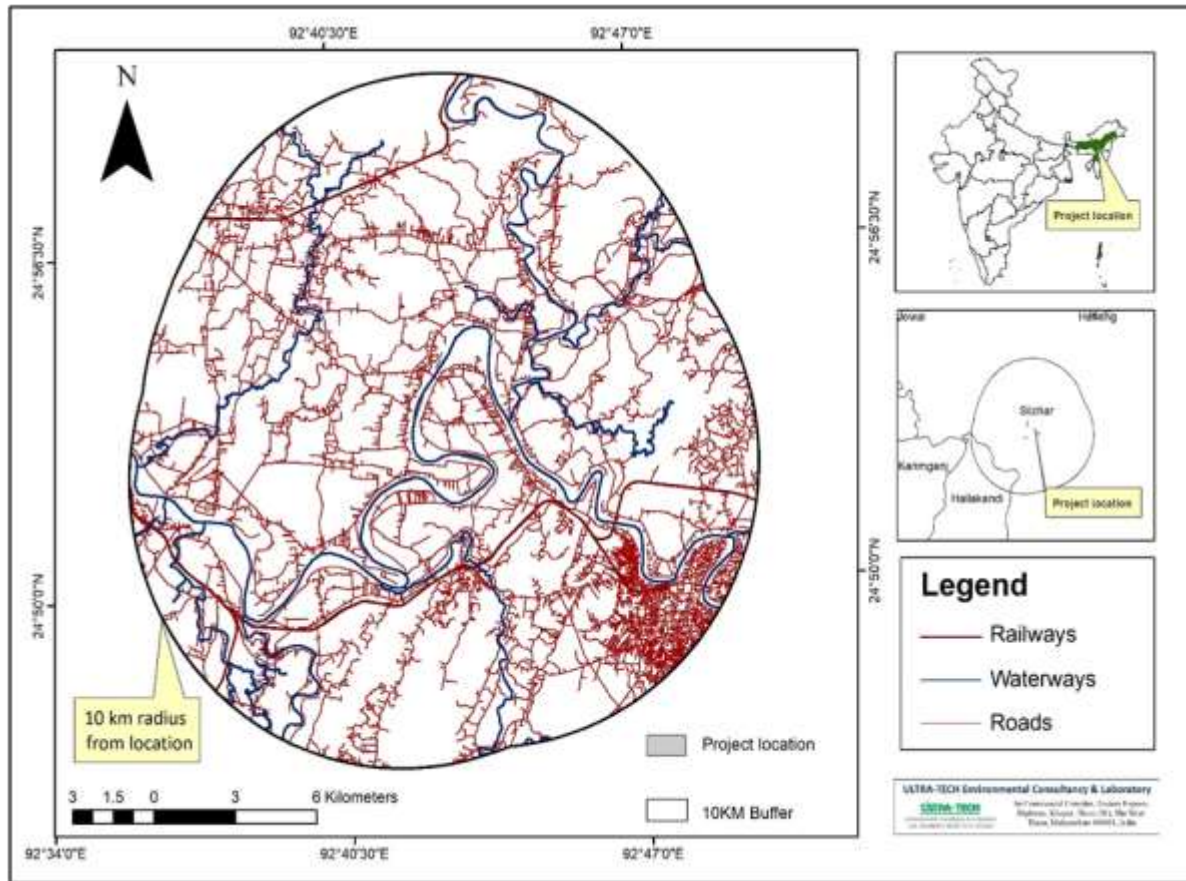
Figure 3.17: Transport and Communication Map of the study area

➢ **Amenities**

Sl. No.	Amenities	Name/ Type	Aerial distance from project (km)
1	Airport	Silchar Airport	26.43 km
2	Railway Station	Karimganj Railway Station (Junction)	33.11 km
		Salchapra - Train station	5.79 km
3	Bus Stop	Irongmara Irongmara Bus Stand - Bus stop	10.87 km
4	ATM	Axis bank ATM	9.20 km

Sl. No.	Amenities	Name/ Type	Aerial distance from project (km)
5	Bank	SBI Silchar Branch- Bank	9.12 km
		HDFC Bank	9.28 km
6	Police Station	Silchar Sadar Police Station	9.74 km
		SP Office, Cachar	8.66 km
7	Post Office	Silchar post office - Post office	2.79 km
8	School	1320 No. Jaykali L P School	6.98 km
		Abdul Musabbir M.E School	2.08 km
		Spring Dales Academy: Bhangarpar – School	8.95 km
		Kandigram L.P School – School	8.23 km
		Bhangarpar Part-2 New L. P School – School	5.97 km
		Sri Sri Gnan Mandir High School - Elementary school	6.99 km
9	College	Sarada Charan Dey College - College	7.49 km
		Didarul home - College	6.58 km
10	Hospital	Kalinagar Primary Health Centre(Hospital) - Hospital	7.66 km
11	Medical Store	Shamima Medical Hall - Pharmacy	4.68 km

➢ **Banks**

Bank	Address
Assam Gramin Vikash Bank	Santipur-Silchar Kalain Rd

Bank	Address
	Dudpur Pt III, Sridharpur, Assam 788025
Central Bank of India - Jarailtola Bazar Branch	P.O, DIST Jarailtola Bazar, Assam 788127
Punjab National Bank	P.O. Dalu Chotorampur Grant, Boro Rampur, Assam 788111

➢ **Education Institutions**

School Type	School Name	Address
Primary school	Panighat LP School - Primary school	Panichar Grant, Narainchara Grant, Assam 788110
School	Kalinagar kumartila lp school Cachar Assam – School	Kharil Bagicha, Assam 788111
	Kendriya Vidyalaya Dholchera - CBSE School	Dholchera P.O Jarailtola Bazar, Assam 788127
	Saraswati Shishu Niketan, Dalu - School	Silchar, Assam 788111
High School	Hazi Maskandar Ali Laskar High School Salchapra –School	Srikona Pt III, Assam 788026
	Panchgram Town High School - School	Panchgram, Assam 788802
College/ University Training Centre	Borkhola College -College	Ujangram-Dholcherra Rd Chesri,Niz-Borkhola Pt II, Borkhola Bazaar, Assam 788110
	Rayan Learning Center - Education center	Sibnarain Pur, Niz-Fulbari Pt I, Assam 788802

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Basic amenities like Drinking Water, Sanitation, communication, etc. Providing municipal council in urban areas and Gram panchayat in rural area

3.11 Traffic Survey

The traffic survey was conducted on the junction of SH 38 connecting road i.e. Borkhola Road to mining site of Barak Riverbed (node 1) to ascertain the traffic density in the study area in prior to the project execution and in operation phase of project. The composition of Traffic includes two wheelers, four-wheeler (Passenger Cars) and four wheeler like heavy vehicles like Trucks, Lorries, and Bus etc. Another road is being proposed to be constructed near the project site.

The recommended PCU Factors for various types of vehicles on Urban Roads has been adopted from IRC 106-1990 guidelines as shown in **Table 3.20**.

Table 3.20: Recommended PCU Factors on Urban Roads

Types of Vehicles	Passenger Car Equivalency (PCE)
Motor Cycle or Scooter (2-Wheeled)	0.75
Passenger Car, Pick-up van	1
Auto-rickshaw (3-Wheeled)	2.0
Light Commercial Vehicle	2.0
Truck or Bus	3.7
Bicycle	0.5

Thus, volume of vehicles was estimated as: PCU unit = No of vehicles* x PCE of those particular.

Figure 3.18: Location of the Node 1 for Traffic Survey

Traffic study was carried out at node - 1 at the junction of SH 38 and connecting road i.e. Borkhola Road to mining site of Barak Riverbed as shown in **Figure 3.18**.

Node-1

Data was collected by physically counting the number of vehicles plying in both directions at Node 1. The hourly counts were carried out for the different type/category of vehicles. The variation in the traffic flow at the given road along with the number of vehicles during peak hour & lean hour is presented in the **Table 3.21** and **Figure 3.19.**

Table 3.21: Traffic Survey on Node I

	During Lean Hrs.	**During Lean Hrs. Vehicles in PCU's**	**During Peak Hrs.**	**During Peak Hrs. Vehicles in PCU's**
Two Wheelers	81	60.75	111	83.25
Three Wheelers	18	36	30	60
Cars/Jeeps	62	62	98	98
Bus	18	66.6	28	103.6
Trucks/Lorries	18	66.6	11	40.7
Total	**197**	**291.95**	**278**	**385.55**

Lean Hrs: Before 8.00 hrs (morning), 13.00 to 17.00 hrs afternoon & after 21.00 hrs (evening)
Peak Hrs: Between 8.00 to 13.00 hrs & 17.00 to 21.00 hrs in the evening
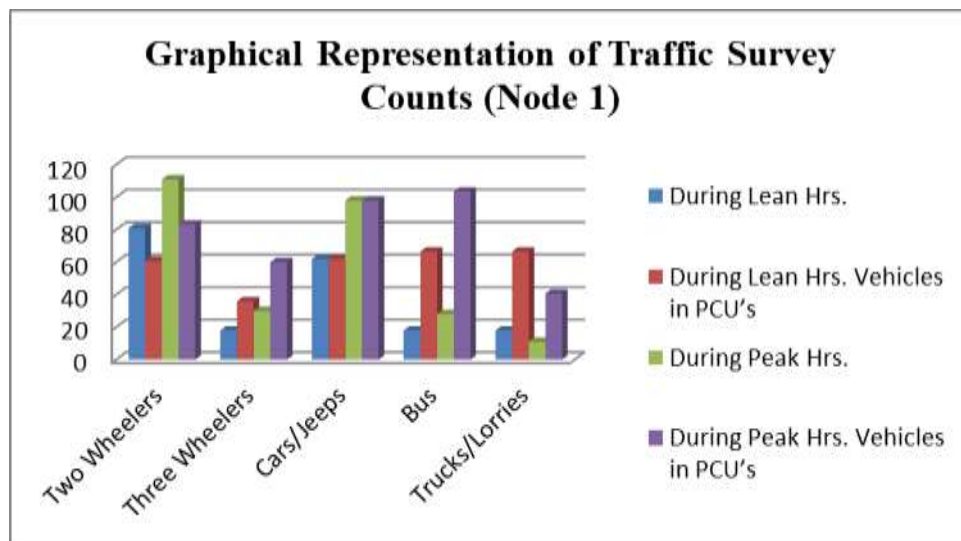
Figure 3.19: No's of vehicles during peak hour & lean hour

3.11.1 Existing Traffic Scenario & Level of Service

Node-1

Capacity of road as per IRC = 1200 PCU's/hr
Total Volume in PCUs during Peak Hours = 385.55
Existing Volume/Capacity ratio = 385.55/1200= 0.32
The level of service is **"B"** that is VERY GOOD**.**

Table 3.22: Level of Service

Sl. No.	Existing Volume/Capacity	Level of Services
1	0.0 to 0.2	"A" (Excellent)
2	0.2 to 0.4	"B" (Very Good)
3	0.4 to 0.6	"C" (Good)
4	0.6 to 0.8	"D" (Fair)
5	0.8 to 1.0	"E" (Poor)

During the proposed project an addition of ~90 trips per day (i.e. 45 trucks per day to and fro) of trucks is envisaged. To understand that impact due this addition the following modified scenarios on the access roads is discussed. The Node I is shown in the figure.

3.11.2 Modified Traffic Scenario & Level of Service

45 additional trucks *i.e.* 90 trips assume to enter and exit during peak hrs for the proposed project (worst case scenario).

45 trucks of 90 additional volume in PCU will be 3.7x90/9 = 37 per hour during peak hours.

Traffic Flow at **Node I**

Total volume during peak hours in PCUs after completion of the project (V)

$= 385.55 + 37 = 422.55$

Capacity of Road as per IRC (C) = 1200 PCU's/hr

Modified Existing Volume/Capacity ratio will be (V/C) = 422.55/1200 = 0.35. The level of service of the road will continue to be **"B"** after the proposed project that is **"VERY GOOD".**

The above results indicated that the post project scenarios will contribute to addition in existing traffic, the level of service will continue to be **VERY GOOD** in Node 1. Traffic will continue to run smoothly without congestion and no widening of road is anticipated.

CHAPTER 4: ANTICIPATED ENVIRONMENTAL IMPACTS AND MITIGATION MEASURES

This chapter deals with the expected impacts and the respective mitigation measures of the project on the environment during its lifetime. Project has two phases one is the construction phase and other one is operation phase of the project. There is no significant impact on the environment during constrction phase of river bed project. In the operation phase. environmental paramters such as Ambient Air, Water, Soil, Noise, Flora and Fauna and Socio-economy etc. are affeceted.

4.1   Introduction

Identification of impacts and mitigation measures of the same in EIA study helps in quantification and evaluation of impacts. During baseline study several impacts can be identified but it is necessary to identify the critical impacts both positive and negative on various components of the environment that are likely due to the proposed sand mining project.

The environmental impacts can be categorized as either primary or secondary. Primary impacts are the ones that are caused directly due to the project activity on environmental attributes, whereas secondary impacts are indirectly induced. The construction and operation phase of the project activity comprises various activities, each of which may have either positive or negative impact on some or other environmental attributes. The proposed project activities would impart impact on the environment in two distinct phases:

- During construction phase - Temporary or short -term impact

- During operation phase - May have long term impact

The construction and operation phase of the project comprises of various activities, each of which will have an impact on some or other environmental parameters. Various impacts during the construction and operation phase on the environmental parameters have been studied to estimate the impact on environment. The details on impact of the project activity on each of the above environmental attributes are discussed in the following sections.

4.2   Environmental Impact Assessment

4.2.1   Impact Assessment during the Construction Phase

Since the project is sand mining activity, no major construction activities are involved or proposed. Therefore, there will not be any environmental impact during the construction phase.

4.2.2   Impact Assessment during the Operation Phase

The following activities related to the operational phase will have varying impacts on the environment and are considered for impact assessment:

Some of the impacts identified in various phases of operation are insignificant and do not warrant much attention whereas some others are important especially with respect to the present context. Therefore, objective is to identify those impacts, which are significant and require a detailed analysis for decision making or formulating adequate management measures. This section deals with an assessment of impact of various mining activities on the existing environmental conditions. The methodology of assessment is based upon identification and description of the existing project activities as well as environmental components followed by evaluating the impact of mining and associated activities on the environment. The environmental components that are likely to be influenced or modified by the continuation of project activities are:

- Land Environment
- Water Environment
- Air Environment
- NoiseEnvironment
- BiologicalEnvironment
- Socio-EconomicEnvironment

Land Environment

Identified impacts

The mining area does not consist of any forest land. It does not consist of any human habitations. The most of the land of this lease area is in the riverbed and the entire excavated land will get replenished every year hence there will be no impact on the land use. It is an eco-friendly mining project. Every year the sediments in the riverbed accumulated, if these are not removed/ excavated then riverbed level may be increased and the river may change its course which may cause heavy losses to the life of nearby villagers and habitants.

Mitigation measures

Adopting suitable, site-specific mitigation measures can reduce the degree of impact of mining on land & soil. Some of the land & soil related mitigation measures are as follows:

- Present land use pattern of the lease area is riverbed and at the conceptual stage the land use pattern will remain the same, hence will not bechanged.

- There will be no mining near the banks. This is to protect the bank erosion and river migration
- There is no generation of waste material in case of River Bed mining. No back filling is proposed as river Bed will be replenished by sediments during rainy season.
- Minimum number of haul roads to river bed for which cutting of river banks will be avoided.
- Mining is avoided during the monsoon season and at the time of floods.
- Vegetation development is proposed along the road sides of the haul roads, to arrest soil erosion. While selecting the plant species, preference will be given for planting native species of the area.

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❖ **Water Environment**

Identified impacts

The mining process will not divert and utilize the surface & ground water. Quantity of water will remain the same. The existing background level of water quality as indicated by the baseline data revealed that impact on water environment will be insignificant in this project.

Because of the semi-mechanization method in the mining activity, the impact of mining operations on water quality is also expected to be insignificant. There would be no impact on the quality/quantity of ground water as existing ground water level in study area is deep. Surface water does also not diverted or disturbed. Therefore, there would not be any impact on surface water and ground water quality. There is only one river (Barak river) existing in the core and adjoining to the lease area zone. The lease area is almost flat where only direct precipitation flows down the slope during rains. During rains the rainwater flow on natural slope of the surface, which flows during rains only in south direction.

Since the mining process is totally dry, no effluent will be generated hence no adverse impact on water is anticipated.

Mitigation measures

Ground water table will not be intersected during the mining activity. During the entire lease period, the deposit will be worked from the top surface up to 3 m bgl or above ground water table, whichever comes first.

No diversion of surface water is proposed. There will not be any adverse impact on flow pattern, surface hydrology and ground water regime.

❖ **Air Environment**

Anticipated Impacts

Sand mine deposit will be carried out by opencast manual mining method, where Particulate Matter (PM_{10} & $PM_{2.5}$) will be the main pollutants generated in mining activities. The emissions of Sulphur dioxide (SO_2), Oxides of nitrogen (NO_x as NO_2) and Carbon Monoxide (CO) contributed by diesel operated equipment and vehicles movement are considered marginal as properly maintained vehicles with PUC certificate will be operated on the haul road of mining areas. Sri Abdul Munim Barbhuiya was issued mine lease area of 12.7 Hectares , Capacity – 45094 cum annually (No. of working days-200 days/year as per approved mining plan) in riverbed of Barak River in Kalain area in the District – Cachar Assam. I lies under the Jurisdiction of Kalain range of Karimganj Forest Division, Assam (**Left bank**: Pratapi Para, Buribali Pt – 1, Buribali Pt –II, Rakhal Khaler Par Pt –I, Ganigram 4, **Right bank:** Krishna Pur, buribali Pt III, Rakhal Khaler Par Pt –II, Hatirhar Pt II). It is a new mining lease that lies in toposheet of 83D/9 of zone 46. Mine lease is granted on 26/05/2023, Letter NoKJ(T0/ 40 9D0/ Sand/ Barak-1/ 3504 for a period of 7 years by the Office of the Divisional Forest Officer,

Karimganj Forest Division, Govt of Assam. Mine plan is prepared by registered RQP Mr. Prabal Kumar Goswami of Directorate of Geology and Mining, Govt. of Assam

Prediction of impacts on air environment is carried out taking into consideration the proposed production and net increase in all air pollutant's emission. This air quality prediction has been carried out at all AAQMS (Ambient Air Quality Monitoring Stations) located within 10 km radius of the study area.

Air pollution sources in the project are identified from following mining activities of

- ✓ Area sources due to loading, unloading activities
- ✓ Line sources to calculate Emission from Haul Road
- ✓ Wind erosion of the exposed area
- ✓ Movement of vehicles for transportation of sand mine
  A. Loading, unloading in mining area has been considered as area sources.
  B. Transportation of sand from mining by trucks moving on the haul road at the outer boundary of mining area, which are covered with tarpaulin considered by line sources.

Water tankers with spraying arrangement of sprinklers with high efficiency (>50%) will be used for regular water sprinkling on the haul roads to ensure effective dust suppression. In order to assess the impact due to sand deposit of 45094 cum/year on air environment due to various mining activities, impact is predicted over a radial distance of 10,000 m at grid interval 200 m and 5,000 m at grid interval 100 m around the site with Pit No-1 as center to predict GLC around the proposed site and at various sampling locations as per layout of the mining lease area. GLC is calculated at every grid point over the study area in all directions to predict combined impact of loading & unloading of minerals and movement of trucks on the haul road in the mining lease area in Cartesian coordinates (X, Y) to have better prediction of model results at various receptor locations representing project site, human settlements, commercial area and sensitive areas. Wind rose diagram of the present meteorological conditions representing the post-monsoon season is shown is shown in **Figure 4.1.**.

4.2 Emissions Details

Loading - unloading and transportation of minerals will be the main polluting source in the proposed mining activities releasing Particulate Matter (PM_{10} and $PM_{2.5}$) affecting Ambient Air of the area. Emission during Loading and Unloading are calculated by the area sources. Transportation of the sand deposit by 9 (nos.) tucks/hour or 18nos. of trips with capacity-83.746 MTPH on the haul road is calculated by the area source with each truck loaded with minerals transported over the haul road of the mining area 12.7 Ha. It is assumed that truck will carry 10 Tons of mineral. Details of emission during loading/unloading and transportation on the haul road are discussed. Since, impact of wind erosion of the exposed area and road maintenance are small compare to other potential polluting sources. So, they are not considered. Drilling and blasting are not applied for the proposed river bed mining project. They are not considered in prediction of impact.

Loading - US EPA, 2008, revision of emission factor for AP-42 is used to calculate emission of particulate matter released into the atmosphere during loading and unloading separately. Emission of PM_{10} and $PM_{2.5}$ during loading is found same as during unloading. Emission of PM_{10} and $PM_{2.5}$ during loading is calculated and found to be 23.44 **x 10^{-2}** and 14.06 **x 10^{-2}** g/s based on moisture content 10-20 % in sand. It is assumed that moisture content in sand deposit is 7 % and further moisture content will be increased to 10-20% to reduce fugitive emission of PM_{10} during loading/unloading.

Unloading - Emission value of PM_{10} and $PM_{2.5}$ during unloading was 23.44 **x 10^{-2}** and 14.06 **x 10^{-2}** g/s based on moisture content 10-20 % in sand and average wind speed 6.33 km/h (1.76 m/s) as observed with site data with calm conditions 3.76 % as shown in wind rose and discussion of local meteorology of the area.

Haul Road - US EPA, 2006, revision of emission factor for **AP-42** is used to calculate emission of particulate matter PM_{10} and $PM_{2.5}$ released into the atmosphere during transportation of sand by 9 trucks operated per hour on haul road. Emission of PM_{10} and $PM_{2.5}$ due to transportation of minerals on haul road is 37.90 **x10^{-2}** and 22.74 x 10^{-2} **g/s** based on assumption that slit content spread on road surface was 5%, and efficiency of PM_{10} emission control 50%. Truck will be fully covered with tarpaulin material and emission of PM_{10} and $PM_{2.5}$ during on the haul road will be insignificant.

Total emission of PM10 will be 84.78 x10^{-2} and 50.86 x 10^{-2} g/s, if all the activities such as loading & unloading, movement of vehicle on the haul road will occur simultaneously. Total emission of PM_{10} and $PM_{2.5}$ and 1 – h meteorological data are used as input of ISCST3 Dispersion model developed by USEPA and approved by CPCB/MoEF and various SPCBs. Emission value in each case is discussed as above is given in **Table 4.1**.

Table 4.1: Emission of PM_{10} and $PM_{2.5}$ in g/s in various mining activities

S.No.	Source type	Pollutants	Emission (g/s)	Pollutants	Emission (g/s)
1	Loading		23.44×10^{-2}		14.06×10^{-2}
2	Unloading	PM_{10}	23.44×10^{-2}	$PM_{2.5}$	14.06×10^{-2}
3	Haul Road		37.90×10^{-2}		22.74×10^{-2}
Total Emission from all activities			84.78×10^{-2}		50.86×10^{-2}

4.3 Meteorological data

The meteorological data recorded at hourly interval during post-monsoon season -2023 on wind speed, wind direction, dry & wet bulb temperature, humidity, cloud cover and rainfall are processed to extract hourly mean meteorological data as per the guidelines of CPCB/MoEF for

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prediction of impacts from the area source. Stability has been computed by Turner's method and mixing height is obtained from publication of IMD "Atlas of Hourly Mixing Height in India, 2008.

Data recorded from authorized source/Govt. agency are used as meteorological input for Dispersion Model which is stored in the computer for further analysis and interpretation to study the local meteorology of the study area. It is observed that northeasterly is dominant wind during post-monsoon as shown in wind rose (**Figure 4.1**). South and South-east may be worst affected quadrant due to dominant wind in post-monsoon season.
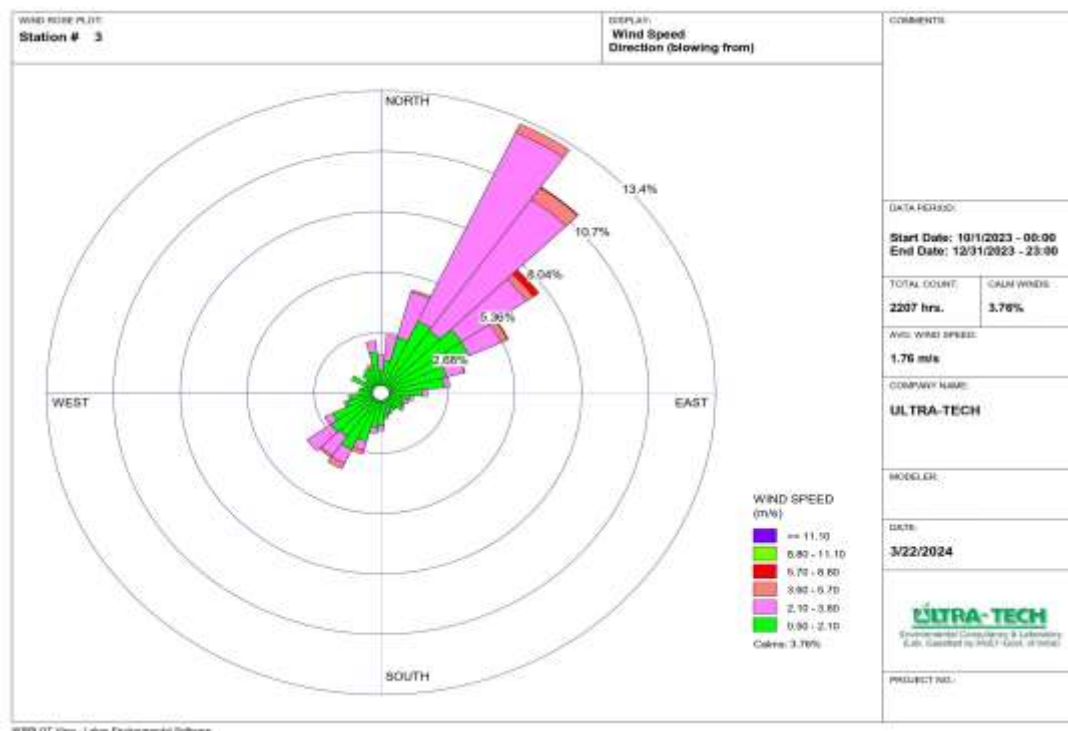
Figure 4.1: Windrose: Post-monsoon (Octobet 2023 to December 2023)

Moderate to low wind speed and   high calm condition are observed during study period at site. Impact of the pollutants is anticipated in the south-east under influence of north-easterly winds. Ambient air quality locations are selected based on the long- term wind meteorological data of the area.

4.4 Base-line data

Eight (8) ambient air quality sampling locations are finalized to study the baseline status around the proposed site and impacts have been predicted at various locations.

Table 4.2: 24-hrly Baseline GLC (µg/m3) of Particulate Matter - PM_{10} and $PM_{2.5}$

Location	Minimum	Maximum	Average	98 Percentile
AAQ-1: Project site	78(35)	88(43)	84 (38)	87.08 (*42.54*)

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Location	Minimum	Maximum	Average	98 Percentile
(near block -A) 0.18 km, West				
AAQ-2: Project site (near block -B) 0.25 km, South	75 (31)	89 (36)	81 (34)	87.2 (36.00)
AAQ-3: Project site (near block -C) 0.21 km, South	78 (35)	91 (38)	83 (36)	88.7 (38.00)
AAQ-4: Project site (near block -D) 0.10 km, North	81 (36)	89 (37)	86 (35)	*89* (37.00)
AAQ-5: Near Dudpur Football ground 2.68 km, Southwest	68(26)	86 (36)	76 (32)	85.54 (36.00)
AAQ-6: Hatirhar Part- II 4.07 km, South-southwest	66 (26)	74 (39)	69 (31)	74 (37.16)
AAQ-7: Badarpur Part- II 3.25 km, North-east	68 (31)	75 (37)	72 (35)	75 (36.54)
AAQ-8:Ujangram, 2.78 km, North-east	64 (25)	86 (34)	77 (29)	85.54 (33.54)

4.5 Frame work of Computation& Model details

By using the above-mentioned inputs, ground level concentrations due to the mining activities have been estimated to know the incremental rise in ambient air quality and impact in the study area. Local meteorology of the area influences pollutants released in the atmosphere. Air quality modeling is an important tool for prediction, planning and evaluation of Air Pollution Control (APC) through APC equipment and emission control to meet the regulatory standards and to apply mitigation measures to reduce impact caused by mining activities. 24-h maximum impact of PM_{10} and $PM_{2.5}$ is envisaged due to low to moderate wind speed at southwest of the site. Stable atmospheric condition E & F dominates in early morning and night hours and B, C & D in day hours are observed. Pollutants are dispersed from the proposed source under influence of local meteorology and dispersed on the ground in downwind direction close to the source under influence of moderate to low wind speed. Moderate temperature and low humidity are observed at site with high temperature in day hours and comparatively low during night. There is no significant rain fall received and sky was clear of clouds in most of the days.

PM_{10} and $PM_{2.5}$ are the major pollutant occurred during mining activities. Impact of area source emission is considered and prediction of impact is made on various monitoring locations in the study area due to i) loading ii) unloading and iii) transportation on the haul road in the mining area. Impact is predicted in the worst - case scenario due to combined impact of loading and unloading and emission due to transportation of mineral on haul road of mining area will occur simultaneously. Combined emission of PM_{10} and $PM_{2.5}$ due to all mining activities discussed above is 84.78 x 10^{-2} and 50.86 x 10^{-2} g/s (**Table 4.1**) which is along with 1-hour meteorological data is used as input of the dispersion model – ISCST3.

Impact is predicted over the distance of 10,000 m and 5,000 m around the source in grids of 200m & 100 m respectively in Cartesian coordinates (X,Y) to assess the impact at each receptor separately at the various locations and maximum incremental GLC value at the project site. Maximum impact of PM_{10} and $PM_{2.5}$ is observed close to the source in south-west of proposed

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site due to low to moderate wind speeds. Incremental value of PM_{10} and $PM_{2.5}$ is superimposed on the base line data monitored value at the proposed site to predict total GLC of PM_{10} and $PM_{2.5}$ due to combined impacts.

4.6 Model Results

The Air Quality Impact Prediction has been done by using "Industrial Source Complex Short Term version 3 (ISCST3), of USEPA". The main sources of air pollution with regard to the proposed project for the purpose of estimation of increase in PM_{10} and $PM_{2.5}$ are identified due to –

(i) Loading/unloading of minor mineral
(ii) Transportation of ore by trucks on the Haul roads from mining benches.

Combined impact of PM_{10} and $PM_{2.5}$ is considered due to mining activities occurred simultaneously on various sampling locations is given in **Table 4.3**.

Table - 4.3   Impact in µg/m³of PM_{10} and $PM_{2.5}$ due to combined impact of i) Loading iii) unloading iv) Transportation over the haul road of the mining lease area of 12.7 Ha

Locations	Maximum Background value in 98 Percentile	Incremental	Total Predicted	AQI & AQI Category for PM_{10} & $PM_{2.5}$
AAQ-1: Project site (near block -A) 0.18 km, West	87.08 (*42.54*)	9.38 (5.62)	96.46 (48.16)	71 – Moderate (132-Unhealthy for Sensitive Group)
AAQ-2: Project site (near block -B) 0.25 km, South	87.2 (36.00)	3.40 (2.04)	90.60 (38.04)	68-Moderate (107-Unhealthy for Sensitive Group)
AAQ-3: Project site (near block -C) 0.21 km, South	88.7 (38.00)	3.94 (2.36)	92.64 (40.36)	69-Moderate (113-Unhealthy for Sensitive Group)
AAQ-4: Project site (near block -D) 0.10 km, North	*89* (37.00)	2.57 (1.54)	91.57 (38.54)	69-Moderate (108-Unhealthy for Sensitive Group)
AAQ-5: Near Dudpur Football ground 2.68 km, Southwest	85.54 (36.00)	2.37 (1.42)	87.91 (37.42)	67-Moderate (106-Unhealthy for Sensitive Group)
AAQ-6: Hatirhar Part- II 4.07 km, South-southwest	74 (37.16)	0.03 (0.02)	74.03 (37.18)	60-Moderate (105-Unhealthy for Sensitive Group)
AAQ-7:BadarpurPart- II 3.25 km, North-east	75 (36.54)	0.10 (0.06)	75.10 (36.60)	61-Moderate (104-Unhealthy for Sensitive Group)
AAQ-8:Ujangram, 2.78 km, North-east	85.54 (33.54)	<0.01 (<0.01)	85.54 (33.54)	66-Moderate (96-Moderate)

Locations	Maximum Background value in 98 Percentile	Incremental	Total Predicted	AQI & AQI Category for PM_{10} & $PM_{2.5}$
Worst case scenario	89 (*42.54*)	9.44 (5.66)	98.44 (48.20)	72-Moderate (132-Unhealthy for Sensitive Group)
Ambient Air Quality Standards			100 (60)	

Note – 24-h average incremental value of PM_{10} and $PM_{2.5}$ due to project was 9.38 **and 5.62 µg/m^3** occurred at the site. **Total predicted GLC of PM10 is 96.46 and 48.16 µg/m^3 with max. base-line (87.08 and 42.54 µg/m^3)** as in Table 4.3 at the project site. The total predicted values of PM_{10} and $PM_{2.5}$ under the worst - case scenario based on max. base line 89 and 42.54 µg/m^3 measured over all locations superimposed over the max. incremental 9.44 and 5.66 µg/m^3 is 98.44 and 48.20 µg/m^3.

4.7   Discussion of Results and Conclusion

ISCST3 - Model is used for prediction of impact of PM_{10} during conditions   i) Loading ii) unloading and ii) transportation of minerals by trucks on Haul roads by using area source model to predict GLC of PM_{10} and $PM_{2.5}$ during these conditions. Prediction is made with emission values due to loading / unloading and   transportation of ore   by trucks on haul road over the length as discussed in **Table 4.1.** Total predicted 24-h maximum GLC of PM_{10} and $PM_{2.5}$ is 96.46 and 48.16 **µg/m^3** occurred at   the project site after superposition of incremental values (9.38 and 5.62 **µg/m^3**) over the base-line value 87.08 and 42.54 **µg/m^3** due to combined impact of loading, unloading and transportation over the haul road. Under the worst- case scenario, the max. incremental values of PM_{10} (9.44 µg/m^3) and $PM_{2.5}$ (5.66 µg/m^3) occurred at the project site is super imposed on 24-h average max. base-line values of PM_{10} (89.0 µg/m^3) and $PM_{2.5}$ (42.54 µg/m^3). The total predicted maximum GLC of PM_{10} and $PM_{2.5}$ is 98.44 and 48.20µg/m^3 with 24-h max. base line and max. incremental values of PM_{10} and $PM_{2.5}$ as discussed in the text. Iso-concentrations lines are drawn for PM_{10} and $PM_{2.5}$ and shown below in Figures 4.2 & 4.3.

Figure – 4.2   Iso-plot shows max. incremental GLC of PM10 is 9.44 µg/m3 at the (-0.2m, -0.2m) from the project site under   i) loading and unloading and ii) transportation of minerals over the haul road of mining area occur simultaneously at the site.
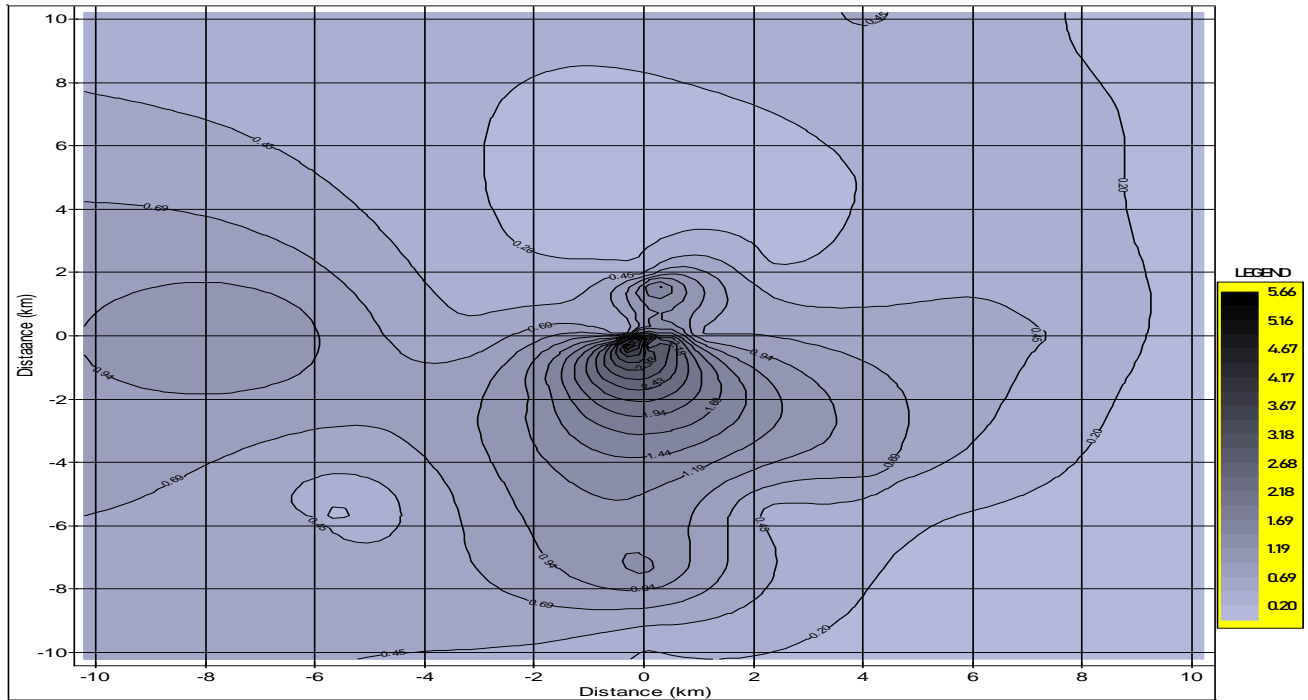

Figure – 4.3   Iso-plot shows max. incremental GLC of PM2.5 is 5.66 µg/m3 at a the (-0.2m, -0.2m) from the project site under   i) loading and unloading and ii) transportation of minerals over the haul road of mining area occur simultaneously at the site.
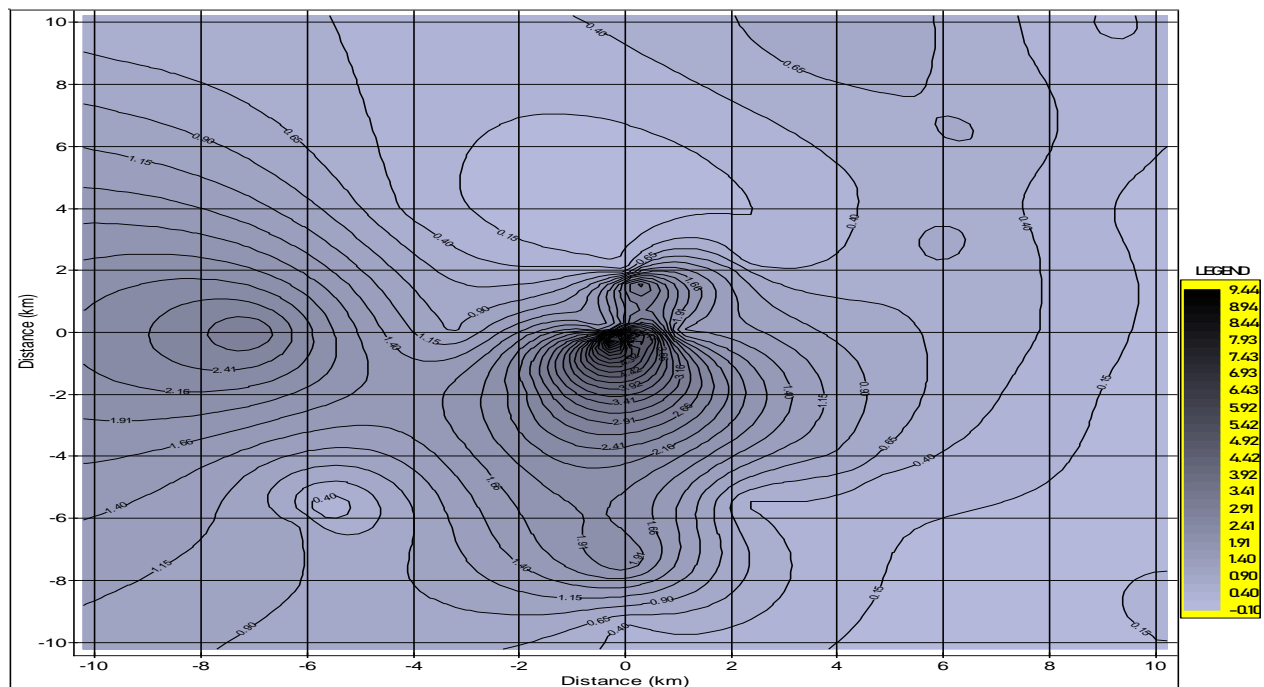
It was observed that GLG of PM_{10} beyond 1000 m had very low values due to low wind speed as shown in isopleths. It was observed that maximum total GLC of PM_{10} due to combined impact of all major polluting sources is low compare to the stipulated standards of CPCB/MoEF **(Table 4.2)** applicable for PM_{10} and $PM_{2.5}$ as the mining activities are continued and will impact Ambient Air Quality of the base-line data. The total predicted GLCs are within the National Ambient Air Quality of the areas as MoEF Notification – 2009.

✓ **Management Plan**

The model predicted average concentrations with baseline BAU or uncontrolled scenario atthe project will be much above the standards. Environment Management Plan will look after site specific most desirable control measures and the same are listed here under;

- Air & Dust monitoring should be conducted at every activity stages. Monitors should be stationed 25m away from site boundary during excavation, and at post occupancy stage with the help of MoEF&CC approved laboratory.
- Dust covers should be provided on trucks used for transportation of materials prone to fugitive dust emissions;
- Watering the areas exposed to wind erosion, avoiding material transportation on un-watered haul roads instead use conveyers, generating barriers to wind circulation around piles and processing units, increasing moisture content of excavate material and overburden, etc.
- Total area exposed to wind action, minimizing route lengths and reducing uncovered areas used as dumps and pits through re-forestation.
- Emission control efficiency by water spraying program (intensity of the applications and average time between spray applications)
- Water availability being a measure concern during dry days, innovative technologies based on water additives which reduce water evaporation and particulate matter agglomerated over unpaved roads.

❖ **Noise Environment**

Identified impacts

The proposed project represents calm surroundings. There is no heavy traffic, industry or noisy habitation in the area. As the project is proposed for open cast semi-mechanized mining method there will be no blasting or drillingactivities.

- The source of Noise pollution will be the vehicularmovements.
- Noise will be generated by the digging of mine area using shovels, crowbars etc.

Mitigation measures

- No noise pollution work shall be carried out in the night hours.
- Provision of personal Protective Equipments (PPE's) for the workers.
- Green belt will reduce noise and pollution level.
- Proper maintenance of all transportation vehicles will be carried out which help in reducing

noise during operations.

- Regular maintenance and proper management of deployed machinery will be ascertained and entire mining operation will be carried out in day timeonly.
- Awareness will be imparted to the workers about the permissible noise levels & maximum exposure to those levels.

❖ **Biological Environment**

Identified impacts

Flora

The project will be carried out inside the river bed, so there is no forest area diversion required for the project. No plant will be cut during operational phase of the mine. Transportation of mined sand will also cause dust deposition on the agricultural fields and vegetation along the transportation routes.

Fauna

The project site is essentially riverbed of River Barak. The river in the project stretch is not identified as a drinking water source to wild animals. Hence, very few animals are spotted in the project site.

- As it is a forest area, chances of vehicle collisions with wildlife attempting to cross roads are possible.
- Loud sounds generated by human activities and transportation may have an adverse impact on terrestrial fauna and avifauna.

Mitigation measures

Flora

- Plantation proposed along haul roads and other areas in the vicinity will improve the vegetation cover of the study area over a period of time.
- Native plant species which are stress and pollution tolerant and comparatively well acclimatized should be grown along roadsides.
- The trucks carrying sand shall be covered with tarpaulin to avoid dust generation during transportation.

Fauna

- ❖ All workers and drivers involved in the project will be trained. They will not harm/disturb any animal roaming in the forest area. No mining activity shall be carried out at night.
- ❖ No night time mining will be allowed which may disturb wildlife.
- ❖ Workers will be made aware of the importance of the wildlife and signage will be displayed at the sensitive areas to caution the workers & other passerby.
- ❖ Access roads will not encroach into the riparian zones.

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Wild Life Conservation

Wildlife conservation is the practice of protecting wild species (plant and animal) and their habitats in order to ensure that the wildlife is preserved and prevented from becoming extinct. The conservation of wildlife is necessary for prevention of drought, new deserts, fires as well as flood. Also, this conservation ensures that the upcoming generations of human and wildlife will be surrounded by nature thereby loving it and understanding the significance of wildlife. The Wildlife Protection Act of 1972 is a law that was enacted to safeguard wild animals, birds, and plants in order to ensure India's ecological and environmental security.

The project area has nearby forest area and an amout of Rs, 50,000/- will be allocated towards plantation, social awareness and for different wild life conservation measures.

❖ **Socio-Economic Environment**

Identified impacts

- The area is considered as industrially backward. There is no industry. Agriculture is seasona and only source of income.The population in general does not have opportunities of earning from employment.
- In the absence of any other source of employment potential , the people are economically backward.

Mitigation measures

- The implementation of the sand mining project will generate both direct and indirect employment.
- Mining in this lease will give job opportunities to the local people. Thus, mining will create beneficial effect on local people.
- The various indirect employment opportunities will also be generated. Several persons ofthe Neighbouring villages will be benefited with contract works, employment through contractors, running of jeeps, trucks, tractors water tankers and bullock carts on hire, and transport related business avenues.
- There will be some people who are engaged in trading of sand. Therefore due to mining of sand, there is possibility of the per capita income improvement.

❖ **Waste Generation**

Identified impacts

This river bed mining project does not produce waste Thus, no waste dump sites are needed for the project. However, there will be about 30 workers on site. No labour camps will be constructed as the workers will be local people from neighbouring villages, some food wastes are expected to be generated which if not disposed appropriately will render the site dirty. During rains, the same shall find their way into the river and pollute the river surface water.

Mitigation measures

- The river bed mining process will not lead to any waste generation. The amount of solid wastes generated from the workers such as waste paper, food residues etc. will be handeled under Municipal Solid Waste and Handling (MSW) Rule - 2016.
- Temporary bio-toilet will be constructed for the workers.

Other Mitigation measures

- **Haul Road: -**The long life WBM (Water Bound Macadam) haul roads will be constructed and maintained for traffic movement.

- **Transport:** - The speed of dumpers/ trucks on haul road will be controlled as increased speed increases dust emissions. Overloading of transport vehicles will be avoided. The trucks/ tippers will have sufficient free board. Spillage of ore on public roads will be cleared immediately and vehicles will play in safe speed.

- **Green Belt:** - 33% of the total allotted area i.e 4.2 Ha will be allotted for compensatory greenbelt development as per the suggestion of Divisional Forest Officer, to prevent the generation of dust due to movement of dumpers/trucks.

- **Other Mitigation Measures**

  - ❖ **Traffic Management Mitigation**

- Haul roads will be repaired regularly and maintained in good coditions.
- Hauls roads will be sprinkled with water to keep the dust suppressed.
- A supervisor will be appointed to regulate the traffic movement near the site.
- Speed breakers will be constructed near accident prone areas to calm the traffic and its speed.
- Proper Sign boards will be placed at sensitive and precautious places to provide information to road users.

  - ❖ **Air Impact Mitigation**

- Checking of vehicles and machinery to ensure compliance to Indian Emission Standards Transportation vehicles and machinery to be properly and timely maintained and serviced regularly to control the emission of air pollutants in order to maintain the emissions of NOx and SOx within the limits established by CPCB
- Dust suppression by water sprinkiling in and around the project mining lease area
- Minimize idling time for vehicles and adequate parking provision and proper traffic arrangement for smooth traffic flow
- Appropriate spill control measures and labeling / handling procedures shall be maintained
- Vehicles with valid PUC shall be used for transporting the minerals to avoid the exhaust emission.

- A 33% compensatory greenbelt development plan will be prepared with local species as per the suggestion of Divisional Forest Officer. The greenbelt will reduce the dust and noise levels.
- Regular monitoring of the air quality as per the monitoring plan detailed in Chapter 6 of this EIA report, shall be adopted during the operation phase, to ensure that, the air quality is within the desired limits prescribed by CPCB.

❖ Water Impact Mitigation

- The total water requirement for sand mining is estimated to be 3KLD.
- Mining in the area will be done well above the water table. Therefore, impact on water regime is not anticipated.
- River bed mining will be done up to depth of 3m from the surface as per approved mining plan.
- No ordinary sand mining shall be done within 1Km distance from any irrigation dams (check dams), French wells, erosion structure and bridge on national Highway.
- Mining will be stopped in the area where water line is encountered
- All hazardous wastes such as the spent oil/lube oil shall be securely stored, under a shed for eventual transportation and disposal to the authorized hazardous waste dealers.

CHAPTER 5: ANALYSIS OF ALTERNATIVE SITES ANDTECHNOLOGY

5.1   Analysis of Alternative Sites

No other site is considered for the proposed project. The location of the quarry site as has been recommended by the Office of the Divisional Forest Officer, Karimganj Forest Division, and Government of Assam to issue the Mining Contract is in the river bed of River Barak, for collection of sand. The mining sites being open river courses free from any human habitation, vegetation, infrastructural construction including those which do not fall within any restricted areas as notified in the guideline, coupled with natural replenishment of mining materials through fluvial deposition during rainy season, offers negligible impact on the environment.

5.2   Alternative Technology

The proposed technology was approved by the Department of Geology & Mining, Government of Assam. Technology will not change during mining activities. This project is proposed for the excavation of sand from the bed of river Barak. It is an opencast semi-mechanized mining project to excavate sand in its existing form for direct usage as a construction material. Sand excavation will be carried out up to a depth of 3 m.

CHAPTER 6: ENVIRONMENTAL MONITORING PROGRAMME

6.1   Introduction

Environmental Management is nothing but resource management and environmental planning is just the same as development planning. They are just the other side of the same coin. The resource management and development planning look at the issue from narrow micro-economical point of view while environmental management views the issue from the broader perspective of long term sustained development option, which ensures that the environment is not desecrated.

For the effective and consistent functioning of the project, proper environmental monitoring programme shall be continued to be carried out at the proposed mining site.

The programme includes the following:

- Environmental Monitoring
- Personnel Training
- Regular Environmental audits and Correction measures
- Documentation–standards operation procedures Environmental Management Plan and other records

6.2   Environmental Monitoring

The environmental monitoring is an important part in terms of assessing the implementation of pollution controlequipment is installed in the industry to abate and reduce the pollution level at site. The sampling and analysis of the environmental attributes will be as per the guidelines framed by Central Pollution Control Board (CPCB) / Assam State Pollution Control Board (ASPCB).

Work of monitoring shall be carried out at the locations to assess the environmental health in the post period. A post study monitoring program is important as it provides useful information on the following aspects.

- It helps to verify the predictions on environmental impacts presented in this study.
- It helps to indicate warnings of the development of any alarming environmental situations, and thus, provides opportunities for adopting appropriate control measures in advance.

The monitoring program in different areas of environment, outlined in the next few sections, have been based on the findings of the impact assessment studies described in Chapter 4. Post study monitoring program have been summed up in **Table 6.1.**

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Table 6.1: Environmental Monitoring Program during Project Operation

SNo.	Potential Impact	Action to be Followed	Parameters for Monitoring	Frequency of Monitoring
1	Air Emissions	All equipment's are operated within specified design parameters	Random checks of equipment logs/ manuals	Periodic during mining activities
		Vehicle trips to be optimized to the extent possible	Vehicle logs	Periodic during site clearance
		Ambient air quality within the premises of the proposed unit to be monitored	The ambient air quality shall conform to the standards for PM_{10}, $PM_{2.5}$, SO_2, NO_x, and CO	As per CPCB / ASPCB requirement or on monthly basis whichever is earlier
2	Noise	List of all noise generating machinery onsite along with age to be prepared. Equipment to be maintained in good working order	Equipment logs, noise reading	Regular during mining activities
		Generation of vehicular noise.	Maintenance of records of vehicles	Daily records
		Noise to be monitored in ambient air within the plant premises.	Spot noise recording	As per CPCB/ ASPCB requirement or on quarterly basis whichever is earlier
3	Wastewater Discharge	No discharge to be made to surface water, groundwater or soil.	No discharge hoses shall be in vicinity of watercourses.	Periodic during mining activities
4	Soil Erosion	Protect topsoil stockpile where possible at edge of site.	Effective cover in place.	Periodic during mining activities
5	Health	Employees and migrant labour health check ups	All relevant parameters including HIV	Regular check ups
6	Loss of flora and fauna	Re-vegetation as per Forest guidelines	No. of plants, species	During site clearance

6.2.1 Ambient Air Quality

Monitoring of ambient air quality at the proposed Mining site shall be continued to be carried out on a regular basis to ascertain the levels of PM_{10}, $PM_{2.5}$, SO_2 & NO_X in the atmosphere; ambient air quality shall be monitored as per **Table 6.1**.

6.2.2 Surface Water Quality

Water quality constitutes another important area in the post study monitoring programme. The nearest waterbody is Barak River. Contamination of surface water in the vicinity of the proposed mining area during the operation is not possible as there will not be any discharge of waste water from the project.

6.2.3 Noise Level

Ambient noise levels will be monitored at the mining site during operation.

CHAPTER 7: ADDITIONAL STUDIES

This Chapter briefly encompasses the additional aspects (reply of comments of public hearing, environmental risk assessment and risk mitigation plan and company environmental policy) that were also dealt upon while conducting EIA study for the proposed river bed project to be sited at Barak River near Kalain area of Karimganj Area district – Cachar Assam under Kalain Range of Karimganj Fotrest Division, Assam.

7.1 Environmental Risk Assessment

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

Risk assessments will help mine operators to identify high, medium and low risk levels. This is a requirement of the Occupational Health and Safety Act 2000. Risk assessments will help to priorities the risks and provide information on the need to safely control the risks. In this way, mine owners and operators will be able to implement safety improvements. The following natural/industrial problem may be encountered during the mining operation. The different steps of risk assessment procedure are as given below:

Step I: Hazard Identification

The purpose of hazard identification is to identify and develop a list of hazards for each job in the organization that are reasonably likely to expose people to injury, illness or disease if not effectively controlled. Workers can then be informed of these hazards and controls put in place to protect workers prior to them being exposed to the actual hazard.

Step II: Risk Assessment

Risk assessment is the process used to determinethe likelihood that people exposed to injury, illness or disease in the workplace arising from any situation identified during the hazard identification process prior to consideration or implementation of control measures. Risk occurs when a person is exposed to a hazard. Risk is the likelihood that exposure to a hazard will lead to injury or health issues. It is a measure of probability and potential severity of harm or loss.

Step III: Risk Control

Risk control is the process used to identify, develop, implement and continually review all practicable measures for eliminating or reducing the likelihood of an injury, illness or diseases in the workplace.

Step IV: Implementation of risk controls

All hazards that have been assessed should be dealt in order of priority in one or more of the following hierarchy of controls.

The most effective methods of control are:

i. Elimination of hazards
ii. Substitute something safer
iii. Use engineering/design controls
iv. Use administrative controls such as safe work procedures
v. Protect the workers i.e., by ensuring competence through supervision and training, etc.

Each measure must have a designated person assigned for the implementation of controls. This ensures that all required safety measures will be completed.

Step V: Monitor and Review

Hazard identification, risk assessment and control are an on-going process. Therefore, regularly review the effectiveness of your hazard assessment and control measures. Make sure that you undertake a hazard and risk assessment when there is change to the work place including when work systems, tools, machinery or equipment changes. Provide additional supervision when the new employees with reduced skill levels or knowledge are introduced to the workplace.

RISK ANALYSIS

The risk assessment portion of the process involves three levels of site evaluation:

a) Initial Site Evaluation,
b) Detailed Site Evaluation,
c) Priority Site Investigations and Recommendations.

The risk assessment criteria used for all levels of site evaluation take into account two basic factors:

- The existing site conditions
- The level of the travelling public's exposure to those conditions

The Initial Site Evaluation and Detailed Site Evaluation both apply weighted criteria to the existing information and information obtained from one site visit. The Initial Site Evaluation Sub divides the initial inventory listing of sites into 5 risk assessment site groups. The Detailed Site Evaluation risk assessment is then performed on each of the three highest risk site groups in order of the group priority level of risk. The result of the Detailed Site Evaluation process is a prioritized listing of the sites within each of the three highest risk site Groups.

Risk analysis is done for:

- Forecasting any unwanted situation
- Estimating damage potential of such situation
- Decision making to control such situation

- Evaluating effectiveness of control measures

Table 7.1: Risk Likelihood Table for Guidance

Step 1: Assess the Likelihood			Step 2: Assess the Consequences		
L1	Happens every time we operate	Almost Certain	Common or repeating occurrence	C1	Fatality	Catastrophic
L2	Happens regularly (often)	Likely	Known to have occurred "has happened"	C2	Permanent disability	Major
L3	Has happened (occasionally)	Possible	Could occur or "heard of it happening"	C3	Medical/hospital or lost time	Moderate
L4	Happens irregularly (almost never)	Unlikely	Not likely to occur	C4	First aid or no lost time	Minor
L5	Improbable (never)	Rare	Practically impossible	C5	No injury	Insignificant

A logical systematic process is usually followed during a qualitative risk assessment to identify the key risk events and to assess the consequences of the events occurring and the likelihood of their occurrence.

Risk Rank Likelihoods Consequence	L1 Almost certain	L2 Likely	L3 Possible	L4 Unlikely	L5 Rare
C1 - Catastrophic	1	2	4	7	11
C2 - Major	3	5	8	12	16
C3 - Moderate	6	9	13	17	20
C4 - Minor	10	14	18	21	23
C5 - Insignificant	15	19	22	24	25

There are various factors, which can create unsafe working conditions/hazards in mining of Minor minerals from river bed.

The key risk (hazard x probability) event rating associated with river bed mining and to assess its consequences of such events occurring and the likelihood based on above table are as the Risk rating of such hazards is as follows:

Inundation/Flooding

The risk rating assigned to this activity is assigned as '4' i.e., it is possible and will have catastrophic with major consequences, if work started without assessment of the river be condition especially during monsoon season. Inundation or flooding is expected and beneficial for these mines as during this time only the mineral reserve gets replenished.

Measures to prevent consequences of Inundation/Flooding

Inundation of flooding is expected and beneficial for these mines as during this time only the mineral reserve gets replenished.

1. During monsoon months and heavy rains, the mining operations areceased.
2. There should be mechanism/warning system of heavy rains and discharges fromthe Upstream dams

Accident due to vehicular movement

The risk rating assigned to this activity is assigned as '13' i.e., it is possible event with moderate consequences as frequency of this operation is more but the predicted/assumed intensity is less like minor cuts, bodily injury. The possibilities of road accidents are due to reckless or untrained driver or overloading of trucks or in case pathway is not compacted suitably, etc.

Measures to Prevent Accidents during Transportation

1. All transportation within the main working should be carried out directly under the supervision and control of the management.
2. The Vehicles will be maintained/ repaired and checked thoroughly by the competent person.
3. A statutory provision of constant education, training etc. will go a long way in reducing the incidents of such accidents.
4. Over loading will not be permitted and will be covered with tarpaulin.
5. The maximum permissible speed limit willbe ensured.
6. The truck drivers will have valid driving license.

Drowning

The risk rating assigned to this activity is assigned as '16' i.e., it is a rare accident but will have major consequences, if occurred. This may occur due to flash floods etc due to which the workers at the site may get seriously injured or drowned.

Measure to Prevent Drowning

1. The mining will be done under strict supervision and only in the dry part of the river.
2. Mining will be completely stopped in monsoon season to avoid such accidents.
3. Deep water areas will be identified and 'No Go Zones' will be clearly marked and made aware to the mine workers.

Accident during Material Handling & Loading

The risk rating assigned to this activity is assigned as '18' i.e. it is possible event with minor consequences", as frequency of this operation is more but the predicted/assumed intensity is less like minor cuts, abrasion, etc. may be due to river bank collapse, over thrown Boulders/pebbles, injuries due to carelessness use of hand tools, etc.

Measures to Prevent Accidents during material handling & loading

1. The truck should be brought to a lower level so that the loading operation suits to the

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ergonomic condition of the workers.

2. The loading should be done from one side of the truck only to avoid over throw of materials.
3. The workers should be provided with gloves and safety shoes during loading.

All the activities will be done under strict supervision/control to avoid anticipated accidents so that the risk is reduced to a level considered As Low As Reasonably Practicable (ALARP) Conditions which are adequately safe and healthy.

7.2 Disaster Management Plan

This should deal with action plan for high risk accidents like Landslides, Earthquakes, subsidence, Avalanches & Snow Blizzards, Drought, Wind Strom, Cloud burst, flood, inundation, fire, seismic activities, tailing dam failures etc. and emergency plan proposed for quick evacuation, ameliorative measures to be taken etc. The capability of lessee to meet such event ualities and the assistance to be required from the local authorities should be described.

The shallow depth of activities in river bed mining will not involve any high-risk accident due to side falls/ collapse.

The complete mining operation will be carried out under the Management and control of experienced and qualified Mines Manager having Certificate of Competency to manage the mines granted by DGMS.

- All the provisions of Mines Act 1952, MMR 1961 and Mines Rules 1955 and other laws applicable to mine will strictly be complied with.
- During heavy rain fall 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 of releasing water, if any, from the dam suitable warning /information is given in advance.
- Disaster Warning System" as developed will be strictly implemented.

Natural disasters& management

- **Floods:** The area is prone to floods. However, bank protection has been taken care by the govt. by constructing of flood embankments/retaining walls/check dams, etc. Precautionary measures will be taken to avoid the effects on the workers at the site if the disaster occurs.
- **Earth quake:** The lease area falls in seismic zone- V which is high intensity zone. However, there will be no impact as there is no built-in structure at the site.

Opencast mining method involves dust generation by excavation, loading and transportation of mineral. At site, during excavation and loading activity, dust is main pollutant which affects the health of workers in mining activities whereas environmental and climatic conditions also generate the health problems.

Addressing the occupational health hazard means gaining an understanding of the source (its location and magnitude or concentration), identifying an exposure pathway (e.g., a means to get it in contact with someone), and determination of likely a receptor (someone receiving the stuff that is migrating).

Occupational Health hazards & management

- **Safe Working Environment:** The project proponent shall ensure health and safety of all the employees at work. Efforts will be made to provide and maintain a safe work environment and ensure that the machinery and equipment in use is safe for employees. Further, it will be ensured that working arrangements are not hazardous to employees.
- **Provision of First Aid:** The first aid treatment reflects the hazards associated with the mining of sand. The first-aiders will be well trained in handling patients working in the above Mining Project.
- **Regular Health Examination:** For all mine workers regular health examination will be made compulsory. Treatment for respiratory diseases or asthma, skin diseases, lung function test (pre and post ventolin), Audiograms, Chest X- ray etc., as required will be given.
- **No work for Temporal Disabilities:** The workers having temporary disability will be asked to stop doing the job till he/she recovers from disabilities.
- **Health Education:** Adequate health education and information related to the job will be provided to the workers. Baseline health information will be recorded for future references.
- **Tie-up with the Nearest Hospital for Medical Assistance:** To meet the medical needs of the mine workers tie-up with nearest hospitals will be made. Efforts will be made to reserve few beds in the above hospitals for the workers of the mining project. This will ensure timely medical aid to the affected persons.
- **Supply of Mask and Gloves:** The workers in the project are subject to respiratory diseases. For protection from dust, it will be made compulsory for all workers to wear masks and gloves, while working in the mine.
- **Special Telephone Number:** A special telephone number will be made available to the workers in case of emergency so that they can dial the same for–medical assistances. Further, efforts will be made to provide vehicles to the patients in short duration for shifting to a hospital.

7.3 Environmental Policy

The proponent company has well established environmental policy which is discussed as below:

Policy states that

1. Company complies Environmental Conditions as directed in EC, CTE and CTO letters and directions given by statutory bodies' time- to- time under Environmental Protection Act 1986 and its amendments.

2. General Manager (Project – Management) is Head of Environment Management. He will be responsible for Environmental issues, Compliance of EC conditions, implementation of EMP, EHS & CER yearly till the project continues. He will report to management of the company.

3. Violation/ non-compliance of environmental norms/conditions is reported to the management (owner / CMD) of the company, which will be strictly handled by management may lead to termination of employee.

4. Implementation of Environmental monitoring, EMP, CER and EHS is as per schedule discussed in EIA report and report will be provided to the office of statutory bodies.

5. Company has policy for health checkup prior to employment in the company and will be facilitated routine health checkup under EHS policy of company.

6. On-site shelter, crutch at site and first aid and tie up with District Hospital for ambulance and other medical facilities (if requires) as per company policy.

CHAPTER 8: PROJECT BENEFITS

8.1   Project Benefits

The demand of river bed material has been rising in the state as a result of rising infrastructure demand. The proposed project aims to fulfil the supply of river bed material. Hence, the fine quality of mineral will be used further for 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 lies on the river bed of Barak. The river bed material is used mainly in the construction activities like buildings, bridges 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 demand in domestic market is increasing with infrastructure growth; hence new areas for river bed material reserves are approached and made operational.

8.2   Improvements in Physical Infrastructure

This project will provide various improvements in the physical infrastructure of adjoining area such as: -

- The proposed mine area lies in the flood plain; hence the removal of extracted material will minimize the chances of flood disaster in the area.
- Improved road communication system in villages in adjoining area.
- Strengthening of existing community facilities through the existing Community Development Program.
- Outside river bed area green belt will be developed.
- Awareness program and community activities, like health camps, medical aids, family welfare programs, immunization camp sports & cultural activities, plantation etc.

8.3   Improvements in Social Infrastructure

The proposed project is expected to provide employment to local people in different activities such as mining, sizing, transportation and plantation activities. The project activity will not have any major impact on the environment. At post mining stage of proposed project, the existing waste land shall be converted to water harvesting bodies and greenbelts. Also, the project proponent has survey-based activities that will have a positive impact on socio economic fabric of the region.

8.4   Employment Potential

The local labor shall be engaged for the purpose of mining of mineral, loading & unloading of mineral besides, watch and ward and plantation activity with proper maintenance. The total manpower required formining works will be 30. This will help in the improvement of financial condition of the area.

8.5   Tangible social benefits

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

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and health facilities.

8.6   Health

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

8.7   Budgetary Allocation

The proposed mining project is aware of the obligations towards the society and to fulfill the social obligations unit will employ semi-skilled and unskilled labor from the nearby villages for the proposed project as far as possible. Unit will also try to generate maximum indirect employment in the nearby villages by appointing local contractors during construction phase as well as during operation phase. The Project Proponent will contribute reasonably as part of their initiative-based activities will carry out various activities in nearby villages. The total estimated cost of the project is 2 Crores. The project Proponent will allot 2% of the project cost i.e., around 4 Lacs towards the Need Basedactivity. The proposed activities are shown in **Table 8.1**, although the heads can be changed on the basis of local demand analysis at the time of Public Hearing.

Table 8.1: Proposed Cost of Environmental Management Plan

S.No.	Particulars	Capital Cost (Rs)	Recurring Cost (Rs)
1.	Sprinkling on haulage route for dust suppression through Tankers,	2,00,000	1,00,000
2.	Compensatory Greenbelt development	7,56,000	1,50,000
3.	Environmental Monitoring & Management twice in a year (summer & winter season)	-	3,00,000
4.	Budget for Conservation Plan	90,000	90,000
5.	Solar lights in the nearby villages and approach road to the mining site, Installation of RO plant and free health checkup camp & Supply of Medicine to villagers under Socio- economic Development.	4,00,000	--
Total		**14,46,000**	**6,40,000**

8.8   Direct Revenue Earning to the National and State Exchequer

This project will contribute additional revenue to the Central and State exchequer in the form of excise duty, income tax, state sales tax or GST, tax for interstate movement, corporate taxes etc. Indirect contribution to the Central and State exchequer will be there due to Income by way of registration of trucks, payment of road tax, income tax from individual as well as taxes from associated units. Thus, the proposed project will help the Government by paying different taxes from time to time, which is a part of revenue and thus, will help in developing the area.

CHAPTER 9: ENVIRONMENTAL COST BENEFIT ANALYSIS

Not recommended at the Scoping stage

CHAPTER 10: ENVIRONMENT MANAGEMENT PLAN

EMP (Environmental Management Plan) is a site-specific plan which is designed to ensure that the project is being implemented in an environmentally sustainable manner. The details of the EMP are briefed in this chapter.

10.1 Introduction

The Environmental Management Plan (EMP) provides an essential link between predicted impacts and mitigation measures during implementation and operational activities. EMP outlines the mitigation, monitoring and institutional measures to be taken during project implementation and operation to avoid or mitigate adverse environmental impacts, and the actions needed to implement these measures.

The likely impacts on various components of environment due to the project during developmental activities have been identified and measures for their mitigation are suggested.

The EMP lists all the requirements to ensure effective mitigation of every potential biophysical and socio-economic impact identified in the EIA. For each attribute, or operation, which could otherwise give rise to impact, the following information is presented:

- A comprehensive listing of the mitigation measures
- Parameters that will be monitored to ensure effective implementation of the action
- Timing for implementation of the action to ensure that the objectives of mitigation are fully met

The EMP comprises a series of components covering direct mitigation and environmental monitoring, an outline waste management plan and a project site restoration plan. Therefore, environmental management plan has been prepared for each of the above developmental activities.

10.2 Objectives of Environmental Management Plan:

- Overall conservation of environment.
- Minimization of waste generation and pollution.
- Judicious use of natural resources and water.
- Safety, welfare and good health of the work force and populace.
- Ensure effective operation of all control measures.
- Vigilance against probable disasters and accidents.
- Monitoring of cumulative and long-term impacts.
- Ensure effective operation of all control measures.

10.3 Environmental Management Cell (Emc)

It is imperative to establish an effective organization to implement, maintain, monitor and control the environmental management system. A separate Environmental Management Cell (EMC) will be formed to look after the environment related matter of the mine. The structure of EMC is as follows:
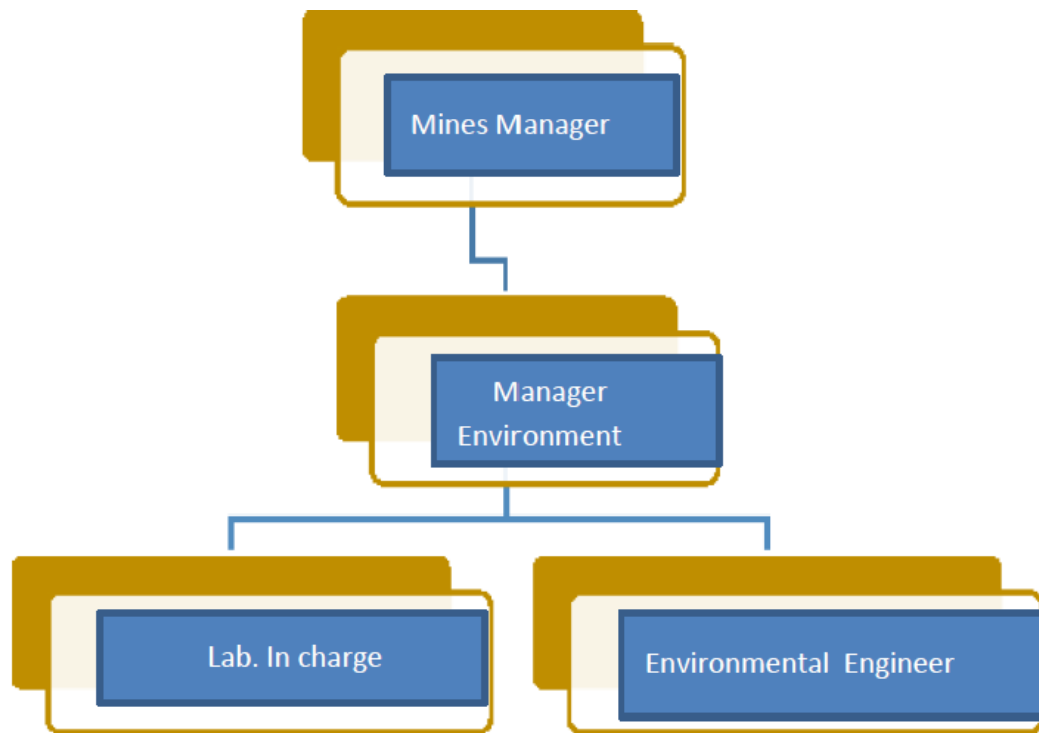
Figure 10.1: Hierarchy of Environmental Management Cell (Emc)

10.4 Duties of EMC

- EMC will oversee that environmental control measures are implemented as per the plan.
- EMC will ensure ambient Field monitoring like air monitoring, meteorological monitoring and noise monitoring in coordination with outside agencies.
- Reporting the status report to the statutory authorities.
- Systematically document and record keeping w.r.t. environmental issues.
- Plantation and their maintenance
- Collection statistics of health of workers and population of surrounding villages.ent
- Environmental Compliance to the regulatory authority.
- Communication with the concerned department on the environmental issue.
- Monitoring the progress of implementation of environmental management programme.

10.5   Environmental Management Plan during the Construction Phase

This is a Sand mining project in riverbed. There will be no construction stage associated with this project.

10.6   Environmental Management Plan during the Operation Phase

In order to mitigate the impacts due to the proposed project on various environmental components, the following environmental management measures are recommended:

10.6.1 Air Environment

In order to minimize impacts of mining on air quality and to maintain it within the prescribed limits of CPCB/SPCB, an Environment Management Plan (EMP) has been prepared. This will help in mitigating the impacts likely to happen to air environment due to mining in the area. During the course of mining no toxic substances will be released into the atmosphere and as such there seems to be no potential threat to health of human beings.

In river bed mining activities, the only source of gaseous emission is the fugitive dust generation during mining and from the engines of vehicles transporting the mined materials. The following mitigation measures are suggested to control the fugitive dust generation during mining and transportation:

- Proper mitigation measures like water sprinkling on haul roads will be adopted to control fugitive dust emission.
- Plantation will be carried out on approach roads and nearby vicinity of riverbank.
- To control the emissions regular preventive maintenances of vehicles will be done and all transportation vehicles will carry a valid PUC certificate.

10.6.2 Noise Environment

- Regular monitoring of the noise levels as per the monitoring plan detailed in Chapter 6 of this EIA report shall be adopted during the operation phase, to ensure that, the noise levels are within the desired limits prescribed by CPCB.

- The following environmental management measures are recommended to mitigate adverse impacts on noise levels during operation phase:
  - ➢ The barricades which act as the dust and noise barriers will be provided along the mining activity areas.
  - ➢ No noise polluting work shall be carried out in the night hours
  - ➢ All the vehicles for the transporation of minerals should have valid PUC certificate
  - ➢ Vehicles and generator set to be serviced regularly and maintained properly to avoid any unwanted generation of noise or vibration from them
  - ➢ Green belt and garden trees reduce noise, traffic related pollution and heat island effect
  - ➢ Proper lubrication, muffling and modernization of equipment shall be used to reduce the noise during operation phase

10.6.3 Water Environment

- Regular moniroring of the water quality is detailed in chapter 6 of the EIA report.
- The total water requirement for sand mining is estimated to be 3KLD.
- Sufficiebnt and appropriate sanitary facilities (temporary toilets) shall be provided in order to maintain hygienic condition at the project site.

- Mining in the area will be done well above the water table. Therefore, impact on water regime is not anticipated.
- River bed mining will be done up to depth of 3m from the surface as per approved mining plan.

10.6.4 Land Environment

Deviation from planned mining procedure can lead to bank erosion/cutting and there by river channel shifting and degradation of land, causing loss of properties. Thus for environment friendly river bed mining the following control/abatement measures will be followed:

- The extraction of sand will be restricted within the central $3/4^{th}$ width of the river. Here, in Barak Sand MMU No. (C), the average minerable width of the permit area is to be kept 128.25 meters out of the average width of the river being 171 meters as per ruloe 39(iv) of AMMCR, 2013.

- The sand extracted and stacked by the Mining Contract Holder will not exceed twice the average monthly production.

- The proposed river bed mining is unlikely to change any characteristic of the river bed as the permitted mining volume is based upon annual replenishment as has been calculated.

- The depth of the river bed mining will not in any way exceed 3 meters at any point in the permit area from the top of the unmined river bed as per rule 39 (iii) of AMMCR 2013.

10.6.5 Solid/Hazardous Waste Management

- Solid waste that will be generated during mining activities as spillage will be utilized for filling of the mine voids. Apart from this, no other solid wastes will be generated from the said mining operations.
- There is no toxic element present in the mineral which may contaminate the soil.

10.6.6 Biological Environment

The mining activity will have insignificant effect on the existing flora and fauna. The project area is surrounded by reserved forests on the banks. The purpose of the project itself is to save the flora around the project area from river widening, excessive erosion and floods. It was found that the sand mining activity will not have any significant impact on the biological environment of the region. There is a requirement to establish a stable ecosystem with both ecological and economic returns. Minimization of soil erosion and dust pollution enhances the beauty of the core and the buffer zone. To achieve this it planned to increase plantation activities. The objectives of plantations are as follows:-

- Improvement of Soil quality
- Quick vegetative cover to check soil erosion

- Improvement in river bank stability
- Conservation of biological diversity

10.6.7 Health and Safety

- The health of workers will be checked for general illness; first time upon employment and thereafter at periodic intervals, as per the local laws and regulations.

- Safety training shall be provided to all workers on operation of equipment. Security will also be extended during non-working hours to ensure there is controlled access to the machinery and equipment.

10.6.8 Socio-economic Environment

The environmental management plan has been developed with a view to bring down the levels of impacts within limits. In each of the areas of impact, measures have to be taken to reduce potentially significant adverse impacts and where these are beneficial in nature, such impacts are to be enhanced /augmented that the overall adverse impacts are reduced to as low level as possible. For improving the socio-economic environment, proper need-based activities will be taken up in vicinity to uplift the condition of people.

10.7 Green Belt Development

- Compensatory afforestation on degraded forest land, forest protection / conservation and river training measures will be carried out.
- This activity will promote the emergence of the primary succession species; hence it will be extremely important for maintaining ecology and environment of the area.
- Compensatory Green belt will be developed on 33% area (4.2 ha) of the total allotted mining area (12.7 Ha) in consultation with divisional forest officer. Total 6300 trees will be planted @ 1500 trees per Hectare. The species selected for greenbelt development is mentioned in **Table 10.1**.

Table 10.1: List of big trees for proposed plantation

SL.No.	Common name	Scientific name	Tree Number	Family
1	Garjan	*Dipterocarpus turbinatus*	2000	Dipterocarpaceae
2	Defol	*Garcinia nervosa*	2000	Clusiaceae
3	Bakul	*Mimoups elengi*	209	Sapotaceae
4	Agor	*Aquillaria malaccensis*	209	Thymelaeaceae
5	Amloki	*Phyllanthus emblica*	209	Phyllanthaceae
6	Hilikha	*Terminalia chebula*	209	Combretaceae

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SL.No.	Common name	Scientific name	Tree Number	Family
7	Asoca	*Saraca asoca*	218	Fabaceae
8	Bel	*Aegle marmelos*	209	Rutaceae
9	Bokphul	*Sesbania grandiflora*	200	Fabaceae
10	Mohaneem	*Azediracta indica*	209	Meliaceae
11	Jamun	*Syzygium cuminii*	200	Myrtaceae
12	kordoi	*Averrhoa carambola*	209	Oxalidaceae
13.	Arjun	*Terminalia arjuna*	219	Combretaceae
		Total No of Trees	6300	

Table 10.2: Estimated Budgetary Expenditure for Plantation

Estimate for block plantation				
Total area: 4.2 Ha. No. of plants to be planted: 6300 plants		**Estimated Expenditure**		
Sr. No.	Particulars of work	Magnitude	Rate (Rs.) per unit	Amount (Rs.)
1	Purchase of plants (Large growing trees)	6300	100	6,30,000
2	Transportation cost (transportation of plants to project site including loading & unloading) &plantation pits		26,000	26,000
3	Purchase of soil & fertilizers		80,000	80,000
4	Bordering/Fencing development for green belt		20,000	20,000
Total				**7,56,000**

Table 10.3: Capital &Recurring Cost for Green Belt

Estimated expenditure for green belt			
Sr. No.	Particular of work	Capital Cost (Rs)	Recurring/Annum cost (Rs.)
1	Development of green belt (as detailed above)	7,56,000	-
3	Caretaker 1 No. for 12 month @ 1x10,000/month	-	1,20,000
4	Miscellaneous expenditures (soil, manure/fertilizer etc.)	-	30,000.00
Total		**7,56,000**	**1,50,000**

10.8 Budgetary Allocation for Environmental Management Plan

An initial budget of Rs.14.46 Lacs to be made on the following heads as included in the project cost in the proposed project. The recurring cost is estimated to be around Rs. 6.4 lakhs per annum.

Table 10.4: Cost of Environmental Management Plan

S.No.	Particulars	Capital Cost (Rs)	Recurring Cost (Rs)
1.	Sprinkling on haulage route for dust suppression through Tankers,	2,00,000	1,00,000
2.	Compensatory Greenbelt development	7,56,000	1,50,000
3.	Environmental Monitoring & Management twice in a year (summer & winter season)	-	3,00,000
4.	Budget for Conservation Plan	90,000	90,000
5.	Solar lights in the nearby villages and approach road to the mining site, Installation of RO plant and free health checkup camp & Supply of Medicine to villagers under Socio- economic Development.	4,00,000	--
	Total	**14,46,000**	**6,40,000**

10.9 Need based activity and Socio-Economic Development

The proposed mining project is aware of the obligations towards the society and to fulfill the social obligations unit will employ semi-skilled and unskilled labor from the nearby villages for the proposed project as far as possible. Unit will also try to generate maximum indirect employment in the nearby villages by appointing local contractors during construction phaseas well as during operation phase. The Project Proponents will contribute reasonably as part of their various need-based activities in nearby villages.

The total estimated cost of the project is 2 Crores. The project Proponent will allot 2% of the project cost i.e., around 4 Lacs towards the Need based activity

The proposed need-based activities are shown in **Table 10.5**.

Table 10.5: Proposed Need Based Activities by the proposed mining project

Proposed Programme	Amount (Rs. In Lacs)			
	1st year	2nd year	3rd year	Total
Installation of Solar lights in the nearby villages and approach road to the mining site	0.7	0.8	0.9	2.4
Installation of RO plant and maintenance	0.12	0.13	0.15	0.4
Free Health Camp & Supply of Medicine to villagers snd the daily workers involved	0.4	0.4	0.4	1.2
Total	**1.22**	**1.33**	**1.45**	**4.0**

10.10 Occupational Hazards and Safety

Occupational safety and health are related to productivity and good employer-employee relationship. Employee good health reflects in good product & production. The factors of occupational health in mining of sand mining project are mainly dust and land degradation. Safety of employees during operation and maintenance etc. shall be as per Mines rules and regulations.

Occupational hazards involved in mines are related to dust pollution, noise pollution and injuries from equipments and fall from high places. DGMS has given necessary guidelines for safety against these occupational hazards. The management will strictly follow these guidelines.

All necessary first aid and medical facilities will be provided to the workers. Mines will be well equipped with proper fire protection and firefighting equipment. All operators and mechanics will be trained to handle fire-fighting equipments. Further all the necessary protective equipments such as helmets, safety goggles, earplugs, earmuffs, etc. will be provided to persons working in mines.

Initial medical examination will be carried out prior to employment of every person and periodical medical examination will be carried out of persons employed in the mine once in three years. Provided that in case any dust related disease needs to be confirmed, the pertaining tests may be conducted more frequently to identify the impact of project in health status of workers working for the project.

To avoid any adverse effect on the health of workers due to various pollutants, sufficient measures relating to safety and health will also be practiced.

- All safety measures like use of safety appliances, such as dust masks, helmets, shoes, non breakable goggles, knee pads, as the case may be, shall be ensured. Safety awareness programs, awards, posters, slogans related to safety etc. will be encouraged
- Regular maintenance and testing of all equipment as per manufacturers' guidelines
- Close surveillance of the factors in working environment and work practices which may affect environment and worker's health
- Working of mine as per approved mining plans and environmental plans
- Provision of rest shelters for mine workers with amenities like drinking water, portable toilets etc
- Training of employees for use of safety appliances and first aid in vocational training center
- Periodical Medical Examination of all workers by a Medical Officer
- First Aid facility will be provided at the mine site.
- Provision of ambulance and empanelment of hospital in case of emergency.

CHAPTER 11: SUMMARY & CONCLUSION

1. For seeking Environmental Clearance (EC) for the proposed River-bed project on Barak River (Barak Sand Minor Mineral Unit No.1) over an area of 12.7 Hectare, was granted in favour of Sri Abdul Munim Barbhuiya for collection of riverbed sand against their developmental work for a period of 7 (seven) years, as recommended by the Divisonal Forest Officer, Government of Assam, the EIA/EMP report has been prepared in line with TOR conditions recommended by SEIAA, Assam. As per Environmental Impact Assessment Notification dated 14th September 2006, the proposed project comes under Item No. 1(a) of Category 'B1' for which Environmental Clearance (EC) from SEIAA is necessary.

2. The detail of the ToR is furnished as below:

Date of application	Consideration	Details	Date of accord	ToR Validity
04/12/2023	Proposal Appraised by SEAC, Assam and TOR approved.	Terms of Reference (TOR) accorded vide letter no. SEIAA. 3632/2023/TOR/110, Date: 04/04/2024	04/04/2024	03/04/2027

3. The riverbed sand mining project of Barak Sand Minor Mineral Unit No. 1 is located near Kalain at Cachar district of Assam under Kalain Range of Karimganj Forest Division, Assam. The production capacity is 45,094 Cu. M per year.

4. Environmental site settings:

S. No.	Particulars	Details				Remarks
i.	Total land	12.7 ha				Landuse: Riverbed
ii.	Land acquisition Details	LOI Office order No. KJ(T)/40(D)/Sand/ Barak -1/3504 dated 26/05/2023				LOI Holder: Sri Abdul Munim Barbhuiya
iii.	Existence of habitation & involvement of R&R, if any.	**Project site:** No R&R involved **Left bank**: Pratapi Para, Buribali Pt – 1, Buribali Pt –II, Rakhal Khaler Par Pt –I, Ganigram 4**;** **Right bank:** Krishna Pur, buribali Pt III, Rakhal Khaler Par Pt –II, Hatirhar Pt II				Not Applicable
iv.	Latitude and Longitude of the project site	**BLOCK**	**POINT**	**LATITUDE**	**LONGITUDE**	
		BLOCK A	1.	24°54'21.31"N	92°42'46.23"E	
			2.	24°54'21.90"N	92°42'45.38"E	
			3.	24°54'11.03"N	92°42'39.27"E	
			4.	24°54'11.46"N	92°42'38.61"E	
		BLOCK B	1.	24°53'41.84"N	92°42'22.09"E	
			2.	24°53'43.35"N	92°42'21.51"E	
			3.	24°53'11.63"N	92°42'9.35"E	
			4.	24°53'12.22"N	92°42'7.38"E	
		BLOCK	1.	24°52'30.63"N	92°43'6.20"E	

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S. No.	Particulars	Details				Remarks
		C	2.	24°52'32.32"N	92°43'5.68"E	
			3.	24°52'23.39"N	92°43'40.19"	
			4.	24°52'22.52"N	92°43'39.18"E	
		BLOCK D	1.	24°52'8.45"N	92°42'8.94"E	
			2.	24°52'7.58"N	92°42'8.64"E	
			3.	24°52'2.91"N	92°41'49.20"E	
			4.	24°52'3.91"N	92°41'48.63"E	
v.	Involvement of Forest land if any.	No forest land involved				Not Applicable
vi.	Waterbody exists within the project site as well as studyarea	1. **Barak River** –Project Site itself 2. Jatinga River- 3.53 km, East (From Block B) 3. Katakal River – 7.62 Km, South West (From Block D) 4. Dolasor River – 8.75 km, West, (From Block D) 5. Dalu River – 4.5 km, North (From Block A)				--
vii.	Existence of ESZ/ESA/ nationalpark/ wildlife sanctuary/ biosphere reserve/ tiger reserve/ elephant reserve etc. if any within the study area	Barail WLS (East Block) - 7.43 km, North East Barail WLS (West Block) - 12.83 km, North West				--

5. The unit configuration and capacity of proposed project is given as below:

Name of unit/facilities	Production Capacity (Cu. m / Year)
Barak Sand Minor Mineral Unit No 1	45,094 Cu. M per year

6. The procedure to be adopted for open cast mining is elaborately described below:

- The entire boundary of the Mining Contract area will be marked with boundary lines and pillars in all the corner points. The boundary pillars are to be numbered and marked with GPS coordinate there on. Extraction of ordinary sand is to be carried out with a bench height of 0.5 metre to 1.0 metre for the whole area. Use of explosives for mining is not required.

- The river bed deposits to be extracted and stacked by the Mining Contract Holder will not exceed twice the average monthly production.

- No mining would be permissible in a river bed up to a distance of five times of the span of a bridge on upstream side and ten times the span of such bridge on downstream side, subject to minimum of 250M on upstream and 500M on the downstream side. (Rule 39(i) of

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AMMCR, 2013)

- There shall be maintained an un-mined block of 50M width after every block of 1000M over which mining is undertaken or at such distance as may be directed by the competent authority. (Rule 39(ii) of AMMCR, 2013)

- Depth of the river bed mining will not in any way exceed 3 metres at any point in the Permit area from the top of the un-mined river bed as per rule 39 (iii) of AMMCR 2013.

- The extraction of sand will be restricted within the central 3/4th width of the river. Here, in Barak Sand MMU No.3, the average mineable width of the Permit area is to be kept 128.25 meters out of the average width of the river being 171 meters as per rule 39(iv) of AMMCR, 2013 and amendments.

7. The total water requirement shall be 3 KLD for domestic and sprinkling purpose, which will be sourced from Ground / surface water. The proposed site has high rainfall due to south-west monsoon and retreating monsoon seasons.

- Dust suppression – 2KLD
- Green Belt – 0.5KLD
- Domestic – 0.5 KLD

8. There is no power demand in the project. Work will be carried out in day time only.

9. The mining activity shall generate employment opportunity of 30 nos. from nearby villages and business opportunity for others.

S.No.	Category	No. of persons
1	Mine Manager	2
2	Mining Supervisor	4
4	Office Staff	13
5	Security Personnel	11
Total		**30**

10. Baseline Environmental Studies

Period	October 2023 to December 2023.
AAQ parameters at 8 locations	PM2.5 = 25 to 43 μg/m^3
	PM10 = 64 to 91 μg/m^3
	SO2 = 5 to 14 μg/m^3
	NOX = 10 to 21 μg/m^3
	CO = 0.6 to 2.0 mg/m^3
AAQ modelling (IncrementalGLC)	PM_{10} = 9.44 μg/m^3, $PM_{2.5}$ = 5.66 μg/m^3, (Worst Case scenario)

Ground waterquality at 8locations	pH: 7.3 to 7.8 Total Hardness: 208 to 332 mg/l Chlorides: 55 to 76 mg/l Sulphate: 59 to 76 mg/l TDS: 304 to 646 mg/l
Surface waterquality at 8 locations	pH: 7.1 to 7.8 DO: 5.6 to 7.1 mg/l BOD: 2.0 to 3.2 mg/l. COD: 12 to 24 mg/l Zinc: <0.02 mg/l Boron: 0.2 to 0.6 mg/l
Noiselevels	53.2 to 64.8 dB (A) in day time and from 43.7 to 55.9 dB (A) in the night time.
Traffic assessment study findings	Traffic study has been conducted on the junction of SH 38 and the connecting Borkhola road to mining site of Barak River bed.. • Transportation of riverbed sand will be done 100% by road. • Existing PCU is 385.55 PCU/hr on SH 38 and existing level of service (LOS) is: "B" (Very Good)

Road	V (Volume in PCU/hr)	C (Capacity in PCU/hr)	Existing V/C Ratio	LOS
SH 38	385.55	1200	0.32	"B" (Very Good)

• PCU load for SH 38 after proposed project will be 385.55 (Existing) + 37 (Additional) = 422.55 PCU/hr and level of service (LOS) will be: "B" (Very Good)

Road	V (Volume in PCU/hr)	C (Capacity in PCU/hr)	Existing V/C Ratio	LOS
SH 38	422.55	1200	0.35	"B" (Very Good)

Note: Capacity as per IRC-106-1990 Guide line for capacity for roads.
Conclusion: The level of service will be "B – Very Good" after including additional traffic due to proposed project.

Flora and fauna	No Schedule - I species were found during the study. There is no endangered fauna reported with in study area.

11. The river bed mining process will not lead to any waste generation. The amount of solid wastes generated from the workers such as waste paper, food residues etc. will be handled under Municipal Solid Waste and Handling (MSW) Rule – 2016

12. The capital cost of the project is Rs 2.0 Crores and the capital cost for environmental management plan is proposed as Rs 14.46 Lakhs. The annual recurring cost towards the environmental management plan are proposed as Rs 6.4 Lakhs.. The details of cost for environmental management plan as below:

S.No.	Particulars	Capital Cost (Rs)	Recurring Cost (Rs)
1.	Sprinkling on haulage route for dust suppression through Tankers,	2,00,000	1,00,000
2.	Compensatory Greenbelt development	7,56,000	1,50,000
3.	Environmental Monitoring & Management twice in a year (summer & winter season)	-	3,00,000
4.	Budget for Conservation Plan	90,000	90,000
5.	Solar lights in the nearby villages and approach road to the mining site, Installation of RO plant and free health checkup camp & Supply of Medicine to villagers under Socio- economic Development.	4,00,000	--
Total		**14,46,000**	**6,40,000**

13. Greenbelt will be developed in 4.2 ha which is about 33% of the total project area. Local and native species will be planted with a density of 1500 tree species per hectare. Total no. of 6300 saplings will be planted and nurtured.

14. There is no violation under EIA Notification, 2006/court case/show cause/direction related to the project under consideration.

15. Name of the EIA consultant: M/s ULTRA TECH (Environmental Consultancy and Laboratory) [NABET Certificate no: NABET/EIA/2023/RA 0194_Rev 01 Validity Upto 18/10/2024].

CHAPTER 12: DISCLOSURE OF CONSULTANTS ENGAGED

12.1   Introduction

ULTRA TECH (UTC) is a prominent and widely recognized environmental consultancy and service provider headquartered at Thane (Maharashtra, India). It was formed by a first-generation entrepreneur in the year 1986.

With a dedicated team of over 200 environmental professionals, UTC has earned a formidable reputation with our stakeholders by delivering comprehensive high-quality services in Environmental Consulting and Clearance Services which include the following:

- Environmental Impact Assessment and Environmental Clearance Services
- Coastal Regulatory Zone (CRZ) Clearances
- Clearance from the National Board for Wildlife
- Forest Clearance
- Environment Management Plan
- Environmental Due Diligence
- Ecological Due Diligence
- Environmental and Social Audit
- Social Impact Assessment
- No Objection Certificates for CFE, CFO and Renewals
- Quantitative Risk Assessment
- Disaster Management Plan
- Environmental Legal Advisory Services/ Consultancy
- Environmental Status Reports
- Project Consultancy/ Engineering/ O&M for Effluent Treatment Plants (ETP), Sewage Treatment Plants (STP), Water Treatment Plants (WTP) projects.

UTC provides economically viable and feasible environmental solutions for projects across more than 20 States in India with its PAN India network of operations. We have provided consultancy services for CRZ Clearance in all coastal states of India. Currently, UTC has ongoing projects in more than 10 States. UTC has worked with most of the Public Sector Undertakings and Major Ports of India. The details of the various offices of UTC are given in Table 0.1.

Table 0.1: Details of Offices of ULTRA TECH

Offices	Address	Contact Details
Head Office, Thane	Unit No.: 206, 224-225, Jai Commercial Complex, Eastern Express Highway, Opposite Cadbury Factory, Khopat, Thane West – 400 601, Maharashtra State, India	Mr. Niranjan Tamhane +91 9920947770 Ms. Rekha Margam +91 8149500506 Ms. Dipti Rathod +91 8692900073
Pune Branch Office	C-1, 202, Saudamini Commercial Complex, Bhusari colony, Paud Road, Kothrud Pune – 411038, Maharashtra, India	Mr. Vikrant Kulkarni +91 9004666814
Kolkata Branch Office	BD-009, 1st Ave Rd, BD Block, Sector 1, Salt Lake, Bidhannagar, Kolkata - 700064 West Bengal, India	Mr. Debasish Sengupta +91 9674488198
Kochi BranchOffice	No. 199, First Floor, Door No: 55/1308-B, Club Road, Girinagar, Kadavanthra, Kochi - 682020 Kerala, India	Ms. Ananthitha A. +91 9895200526
Gandhinagar Branch Office	Plot No. 305/2, Nr. GH-1 New Gandhinagar - 382006 Gujarat, India	Mr. Roshan +91 9558117469
Laboratory at Thane	Survey No. 93/A, Conformity Hissa No. 2, G. V. Brothers Building, Bata Compound, Khopat, Thane (W) - 400 601 Maharashtra, India	Mr. Meghan Patil +91 8291140013 Mr. Shailesh Salvi +91 7039076680

UTC has been operating its own MoEF&CC approved and NABL accredited (TC-5600, valid up to 03.08.2024) environmental laboratory at Thane, Maharashtra. The laboratory monitors and analyses various environmental parameters, including air quality, water quality, soil quality, groundwater quality, surface water quality, noise levels, and meteorological data. These services are available to clients not only in India but also internationally. The UTC laboratory is serving as the backbone of all its core business services.

Consultant's Accreditation and Sectors (ACO)

UTC is accredited by QCI – NABET (Accreditation No.: NABET/EIA/21-24/SA 0217 valid till 18th October 2024) for 12 sectors. Our top Functional Area Experts (FAE)s have eminent experience ranging upto 30+ years in their respective fields. The NABET accreditation details of UTC are given in Table 0.2.

Table 0.2: NABET Approved Sectors

S. No.	Description	NABET Sector	MoEF&CC Sector	Category
1.	Mining of minerals – opencast only	1	1(a) (i)	B
2.	River valley projects – Irrigation Only	3	1(c)	A
3.	Thermal Power Plants	4	1(d)	B
4.	Metallurgical Industries	8	3(a)	B
5.	Cement Plants	9	3(b)	A
6.	Synthetic Organic Chemical Industry	21	5(f)	B
7.	Distilleries	22	5(g)	A
8.	Oil & Gas Transportation Pipeline	27	6(a)	A
9.	Ports, harbours, breakwaters and dredging	33	7(e)	A
10.	Highways	34	7(f)	A
11.	Building & Construction Projects	38	8(a)	B
12.	Townships and Area Development Projects	39	8(b)	B

EIA Team Members

Table 12.3 List of Team Members

S.No.	Name of Expert	Role	Involvement	Under the Approved Expert
1.	Debasish Sengupta	➢ Preparation of EIA report under guidance of EIA Coordinator. ➢ Interpretation of baseline data w.r.t CPCB standards under guidance of approved expert. ➢ Identification of sources of pollution and its inventorization under guidance of approved expert. ➢ Preparation of Management plan with budgetary provision for all the sources of pollution. ➢ Suggestion of Operational monitoring program to verify and keep the levels well within the norms from time to time under guidance of approved expert.	April 2024 to July 2024	--
2.	Pamela Chowdhury			Debasish Sengupta

Environmental Laboratory Engaged

One season baseline monitoring and analysis has been done by ULTRA-TECH Environmental Consultancy & Laboratory TC-5600 valid till 03/08/2024 which is renewed by NABL for chemical testing (vide letter dated 04/08/2022) with issue date 04/08/2022 and valid till 03/08/2024.