



DISTRICT SURVEY REPORT **DIBRUGARH, ASSAM**

As per Sustainable Sand Mining Management Guidelines, 2016 and Enforcement & Monitoring Guidelines for Sand Mining, 2020, Ministry of Environment, Forest and Climate Change (MoEF & CC)

SEPTEMBER 2024

Prepared by:



RSP Green Development & Laboratories Pvt. Ltd

ACKNOWLEDGEMENT

Managing Director

Mr. Pinaki Roy

Directors

Smt. Mousumi Chakraborty

Smt. Saswati Roy

Mentor, Sr. Geologist

Mr. Subrata Kunar

General Manager & RS-GIS Specialist

Mrs. Piya Chowdhury

Project Manager & RS-GIS Specialist

Mr. Arpan Bhattacharjee

Senior Environmentalist & EIA coordinator

Mr. Amit Podder

Senior Environmentalist

Ms. Madhurima Bakshi

AutoCAD Specialist

Mrs. Iti Sutradhar

Mr. Subhendu Gayan

GIS Executive

Ms. Manisha Bhowmik

Mr. Soham Ghosh

Junior Environmentalist

Mrs. Paromita Chowdhury

Ms. Sreerupa Chatterjee

Ms. Madhumanti Bagh

Junior Geologist & Field Surveyor

Dr. Joyeeta Bhattacharjee

Mr. Debkanta Banerjee

Mr. Soumen Mondal

Mr. Bittu Biswas

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This District Survey Report (DSR) of Dibrugarh District has been prepared by RSP Green Development and Laboratories Pvt. Ltd., Howrah, West Bengal, India. The report covers diversified ranges of subject matters relevant to project objectives and survey based information/ data, therefore, this 'Confidentiality Clause' is a legally binding section that is anticipating that, any employee who are directly and/or indirectly involved in the project will not disclose any significant confidential information or any duplicate copies to any third parties without legalized written consent of 'No Objection' from company authority and Concerned department of Government of Assam, not even for the specific purpose for which the report has been prepared

Managing Director

Mr. Pinaki Roy
Mob: 9830808501/9830585501

Directors

Smt. Mousumi Chakraborty
Smt. Saswati Roy

LIABILITY CLAUSE

Limitation of Liability

RSP Green Development & Laboratories PVT.LTD undertakes the technical responsibility for the entire report. All the authenticated Secondary data included in the report has been obtained from the Various Government departments and all the report verifying by Sub-Divisional Committee

Managing Director

Mr. Pinaki Roy
Mob: 9830808501/9830585501

Directors

Smt. Mousumi Chakraborty
Smt. Saswati Roy



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RSP Green Development & Laboratories Pvt. Ltd.,

7F, Dinobandhu Mukherjee Lane, Howrah 711102, West Bengal

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Sr. Director, NABET
Dated: September 15, 2022

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June 18, 2024

RSP Green Development & Laboratories Pvt. Ltd.
7F Dinobandhu Mukherjee Lane
P.O.:Shibpir, Hawara, West Bengal

Sub.: Extension of Validity of Accreditation till September 17, 2024– regarding
Ref.. 1. Certificate no NABET/EIA/2124/SA 0176
2. Request mail June 15, 2024

Dear Sir/Madam

This has reference to the accreditation of your organization under QCI-NABET EIA Scheme, the validity **RSP Green Development & Laboratories Pvt. Ltd.** is hereby extended till September 17, 2024, or completion of the assessment process, whichever is earlier.

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

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

With best regards.

(A K Jha)
Sr. Director, NABET

NABET

Extension of the NABET Certificate of the respected Consultant

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ABBREVIATION

ABBREVIATIONS & SYMBOLS USED	:	FULL FORMS
%	:	Percent
'	:	Minute
"	:	Second
<	:	less than (strict inequality)
=	:	Equal to (strict equality)
>	:	greater than (strict inequality)
≈	:	approximately equal
°	:	Degree
°C	:	Degree Centigrade
°F	:	Degree Fahrenheit
ArcGIS	:	ArcGIS is a GIS for working with maps and geographic information maintained by the ESRI.
CD blocks	:	Community development blocks
cm	:	Centimeter
cum	:	Cubic meter
Dec	:	December
DEIAA	:	District Level Environment Impact Assessment Authority
DSR	:	District Survey Report
E	:	East
<i>e.g.,</i>	:	<i>'exempli gratia'</i> (Latin phrase) means 'for example'
EC	:	Environmental Clearance
<i>et.al.,</i>	:	<i>'et alia'</i> (Latin phrase) means 'and others'
G:2 stage	:	General Exploration (stage of exploration as per UNFC norms)
G:3 stage	:	Prospecting (stage of exploration as per UNFC norms)
GIS	:	Geographical Information System
Govt.	:	Government
GPS	:	Global Positioning System
Ha	:	Hectare
<i>i.e.,</i>	:	<i>'id est'</i> (Latin phrase) means 'that is'/'in other words'
ICAR	:	Indian Council of Agricultural Research

ABBREVIATIONS & SYMBOLS USED	:	FULL FORMS
Inch	:	inches
kg/ha	:	Kilogram per hectare
km	:	kilometer
km/ hour	:	Kilometer per hour
km²	:	kilometer square
LANDSAT	:	Land Satellite stands for Low Altitude Satellite
LULC	:	Land use and land cover
m	:	Meter
Mar	:	March
Max.	:	Maximum
mbgl	:	Meter Below Ground Level
Min.	:	Minimum
mm	:	Millimeter
MoEFCC	:	Ministry of Environment, Forest and Climate Change
N	:	North
NH	:	National Highways
No.(s)	:	Number(s)
RI value	:	River Index value
S	:	South
SEIAA	:	State Environment Impact Assessment Authority
Sept	:	September
sp.	:	species
sq.km	:	Square kilometer
Temp	:	Temperature
viz.,	:	Latin phrase ' <i>videre licet</i> ', and is used as a synonym for "namely",
W	:	West

CHAPTER 1: PREFACE

The need for District Survey Report (DSR) has been necessitated by MoEF & CC vide their Notification No. 125 (Extraordinary, Part II Section 3, and Sub-section ii), S.O. 141 (E), dated 15th January 2016. The notification was made to bring certain amendments with respect to the EIA notification 2006 and in order to have better control over the legislation, district level committees for introduction into the system. Preparation of District Survey Reports has been introduced as a part of the above notification. Subsequently, MOEF & CC has published Notification No. 3611 (E), dt. 25th July 2018 regarding the inclusion of the “Minerals Other than Sand” and specified the format of the DSR. Monitoring Guidelines for Sand Mining (EMGSM) January 2020, issued by the Ministry of Environment, Forest and Climate Change is prepared in consideration of various orders/directions issued by Hon’ble NGT in matters pertaining to illegal sand mining and based on the reports submitted by expert committees and investigation teams. This DSR has been prepared in conformity with the S O 141 (E), S O 3611 (E), and other sand mining guidelines published by MOEF & CC from time to time as well as the requirement specified in Assam Minor Mineral Concession rule 2013, (AMMCR), 2013.

The purpose of the District Survey Report (DSR) is to identify the areas of deposition where mining can be permitted and also, to identify the areas where mining will not be permitted due to proximity to infrastructural structures and installations and areas of erosion. The DSR would also help to calculate the total amount of replenishment.

Preparation of this DSR required both primary and secondary data generation. The primary data generation involved the site inspection, survey, ground truthing etc. while secondary data has been acquired through various authenticated sources and satellite imagery studies. The secondary data related to district profile, local geology, mineralization and other activities are available in rather a piecemeal fashion. The district survey report of Dibrugarh district also describes the general geographical profile of the district, distribution of natural resources, livelihood, climatic condition, inventory of minor minerals and revenue generation.

The state of Assam itself is very rich in mineral resources. Here “liquid gold” (fuel oil) and other natural resources are found. During the last 70 years, the mineral sector has grown considerably in Assam. In spite of this, the economic growth of this state has been slow. In order to expedite the development process, exploitation of available mineral resources by developing mines & establishment of mineral-based value- added industries has an imperative upshot. Developments achieved in the mining & mineral industries so far, availability of resources & existing trend would offer a glimpse of the future of the mineral sector in the state.

Minor minerals include building stones, gravel, ordinary clay, ordinary sand, limestone used for lime burning, boulders, kankar, morrum, brick earth, bentonite, road metals, slate marble, and stones used for making household utensils. But sand is used for stowing purposes. Coal is considered a major mineral. In the case of Assam, exploitation of minor minerals comes under Rule, 2013 52 (1) of the Assam Minor Minerals Concession Rule. Therefore, this District Survey Report (DSR) will give authentic field data sets and relevant information about the presence of riverbed sand deposits, ordinary earth & brick earth along with river bed boulder and/or fossilized channel deposits which in turn will bestow excellent guidance for systematic and scientific utilization of mineral resources, so that present and future generation may be benefitted at large.

DISTRICT SURVEY REPORT OF DIBRUGARH DISTRICT, ASSAM

It is also mentioned here that the procedure of preparation of this District Survey Report is as per notification guidelines issued by the Ministry of Environment, Forests and Climate Change (MoEFCC), SO No. 141(E), Dated 15.01.2016, and the format given by SO No. 3611(E), New Delhi, dated 25 July 2018 regarding the preparation of District survey report of mining and other minor minerals as specified in appendix 10 of the notification. The district Dibrugarh has an extremely remarkable value from the geological aspect. In mining, this district has been made to cover minor mineral mining locations, areas, and an overview of mining activity in the district with all its relevant features pertaining to geology & mineral wealth. From this point of view, minor minerals are slightly different from other districts of Assam. Far-reaching geological fieldwork and thorough study of different minerals along with inselbergs and geostatistical studies of different mineralogical attributes of different minerals, the mines, and their proprietors have been undertaken to find out the plausible causes for proper documentation of the geological history of the total Dibrugarh district. Some precious minerals that are found in Assam is Platinum (Pt), Gold (Au), etc. this report also contains details of the forest, drainage, land use & land cover, etc.

CHAPTER 2: INTRODUCTION

The District Survey Report of Dibrugarh District has been prepared as per the guideline of Ministry of Environment, Forests and Climate Change (MoEF& CC), Government of India vide Notification S.O.-1533(E) dated 14th Sept, 2006 and subsequent MoEF& CC Notification S.O. 141(E) dated 15th Jan, 2016. This report shall guide systematic and scientific utilization of natural resources, so that present and future generation may be benefitted at large. Further, MoEF& CC published a notification S.O. 3611(E) Dated 25th July, 2018 and recommended the format for District Survey Report.

The main objective of DSR is identification of areas of aggradations or deposition where mining can be allowed; and identification of areas of erosion and proximity to infrastructural structures and installations where mining should be prohibited and calculation of annual rate of replenishment and allowing time for replenishment after mining in that area. The DSR would also help to calculate the annual rate of replenishment wherever applicable and allow time for replenishment. Besides sand mining, the DSR also include the potential development scope of in-situ minor minerals.

The objectives of the District Survey Report are as follows:

1. To identify and quantify minor mineral resources for its optimal utilization.
2. To regulate sand and gravel mining, identification of site-specific end-use consumers and reduction in demand and supply gaps.
3. To facilitate use information technology (IT) for surveillance of the sand mining at each step.
4. To enable environmental clearance for cluster of sand and gravel mines.
5. To restrict illegal mining.
6. To reduce occurrences of flood in the area.
7. To maintain the aquatic habitats.
8. To protect ground water in the area by limiting extraction of material in riverbeds to an elevation above the base flow.
9. To maintain data records viz. details of mineral resource, potential area, lease, approved mining plan, co-ordinates of lease hold areas, and revenue generation.
10. To design a scientific mining plan and estimate ultimate pit limit.
11. To frame a comprehensive guideline for mining of sand and other minor minerals.

The District Survey Report (DSR) comprises secondary data on geology, mineral resources, climate, topography, land form, forest, rivers, soil, agriculture, road, transportation, and irrigation etc. of the district collected from various published and un-published literatures and reports as well as various websites. Data on lease and mining activities in the district, revenue etc. have been collected from the DL&LRO office of the district and from Government of Assam Mines & Minerals Directorate of Geology & Mining.

2.1 Statutory Framework:

Ministry of Environment, Forest, and Climate Change (MoEF& CC) has published several notifications time to time to formulate and implement the District Survey Report (DSR) for every district. Statutory Framework and its legal aspect with respect to DSR is tabulated in Table 01.

Table 01: Statutory Framework and guidelines on DSR with time scale

Year	Particulars
1957	Mines and Minerals (Development and Regulation) act, 1957 Act is the principal Act for regulation of mines and development of minerals.
1986	The environment (Protection) act, 1986 was enacted in 1986 by the Ministry of Environment and Forests with the objective of providing for the protection and improvement of the environment
1994	The Ministry of Environment, Forest & Climate Change (MoEF&CC) published Environmental Impact Assessment Notification 1994 which is only applicable for the Major Minerals more than 5 ha.
2006	In order to cover the minor minerals also into the purview of EIA, the MoEF & CC has issued EIA Notification SO 1533 (E), dated 14 th September 2006, made mandatory to obtain environmental clearance for both Major & Minor Mineral more than 5 Ha.
2012	Further, Hon'ble Supreme Court wide order dated the 27th February, 2012 in I.A. No.12- 13 of 2011 in Special Leave Petition (C) No.19628-19629 of 2009, in the matter of Deepak Kumar etc. Vs. State of Haryana and Others etc., ordered that "leases of minor minerals including their renewal for an area of less than five hectares be granted by the States/Union Territories only after getting environmental clearance from MoEF"; and Hon'ble National Green Tribunal, order dated the 13th January, 2015 in the matter regarding sand mining has directed for making a policy on environmental clearance for mining leases in cluster for minor Minerals.
2013	Assam Minor Mineral Concession rule 2013 recommended rules for regulating the grant of various forms of mineral concessions to prevent illegal mining in the district, The Rules detail restrictions on mining operations near villages, highways, and other structures, and the process for granting mining leases and contracts through competitive bidding or auctions and payments. It also covers General conditions to grant any mineral concession, regulation and control of mining operations, Restoration and Rehabilitation fund, illegal or un-authorized Mining and its consequences. It highlights the significance of scientific mining, detailed reporting, and adherence to environmental and safety regulations. Overall, the Rules aim to ensure responsible mineral extraction, prevent unauthorized activities, and promote sustainable mining practices in Assam, while providing a structured framework for granting and managing mineral concessions in the region.

DISTRICT SURVEY REPORT OF DIBRUGARH DISTRICT, ASSAM

March 2015	<p>The Mines and Minerals (Development and Regulation) Amendment Act,2015 is an act to amend the Mines and Minerals (Development and Regulation) Act, 1957 which enacted on March 26, 2015,and become effective from January 12, 2015,it introduced several key amendments, including the establishment of Special Courts for mining-related offenses, the requirement for prior approval from the Central Government for certain mining permits, and the extension of mining leases for captive purposes until March 31, 2030. It also revised provisions regarding the auctioning of expired leases and introduced new clauses related to the District Mineral Foundation payments. Additionally, the Act amended definitions and parameters related to mineral content and the powers of the Central Government in regulating mining activity</p>
September 2015	<p>Ministry of Mines notification on 17th September,2015 focuses on exercise of the powers conferred by sub-sections (5) and (6) of Section 9B of the Mines and Minerals (Development and Regulation) Act, 1957 (67 of 1957), the notification focused on specific rules made by Central Government specifying the amount to be paid by holder of a mining lease or a prospecting license-cum-mining lease, in addition to the royalty, to the District Mineral foundation of the district established by the concerned State Government through notification.</p>
2016	<p>The MoEF&CC in compliance of above Hon’ble Supreme Court’s and NGT’S order has prepared “Sustainable Sand Mining Guidelines (SSMG), 2016” in consultation with State governments, detailing the provisions on environmental clearance (EC) for cluster, creation of District Environment Impact Assessment Authority, preparation of District survey report and proper monitoring of minor mineral. There by issued Notification dated 15.01.2016 for making certain amendments in the EIA Notification, 2006, and made mandatory to obtain EC for all minor minerals. Provisions have been made for the preparation of District survey report (DSR) for River bed mining and other minor minerals.</p>
2018	<p>MoEF& CC published a notification S.O. 3611(E) Dated 25th July, 2018 and recommended the format for District Survey Report. The notification stated about the objective of DSR i.e. “Identification of areas of aggradations or deposition where mining can be allowed; and identification of areas of erosion and proximity to infrastructural structures and installations where mining should be prohibited and calculation of annual rate of replenishment and allowing time for replenishment after mining in that area.”</p>
2020	<p>Enforcement & Monitoring Guidelines for Sand Mining (EMGSM) 2020 has been published modifying Sustainable sand Mining Guidelines, 2016 by MoEF& CC for effective enforcement of regulatory provisions and their monitoring. The EMGSM 2020 directed the states to carry out river audits, put detailed survey reports of all mining areas online and in the public domain, conduct replenishment studies of river beds, constantly monitor mining with drones, aerial surveys, ground surveys and set up dedicated task forces at district levels. The guidelines also push for online sales and purchase of sand and other riverbed materials to make the process transparent. They propose night surveillance of mining activity through night-vision drones.</p>

DISTRICT SURVEY REPORT OF DIBRUGARH DISTRICT, ASSAM

October 2020	(In IA No 40/2020 41/2020, 46/2020, 47/2020) and vide order dated 14th October 2020 NGT also mandates that DSR/Replenishment Study should be prepared by a consultant having accreditation from NABET which further should be appraised by SEAC and approved by SEIAA. The consultant must follow procedure laid down under SSMMG-2016 and EMGSM-2020 during preparation of DSR.
February 2021	Government of Assam through Assam Minerals regulation and dealers' rule 2020 proposed rules to regulate the possession, storage, trading and transport of minerals and mineral products to check evasion of royalty or seigniorage fee, to stop illegal mining and transportation in the state of Assam. The rule is applicable to all Minerals Dealers and all industries/ factories connected with the sale, purchase, transportation, processing and consumption of minerals for commercial purpose in the state of assam.
October 2021	Assam Minor Mineral Concession (Amendment) Rules, 2021 notified on October 7 th , 2021, it focuses to reorganize the royalty payment process for minor minerals utilized by government departments and agencies. It establishes specific rates of royalties based on the project cost, excluding taxes, and mandates that these royalties be deducted at the time of payment to contractors or suppliers. Additionally, the rules introduce a structured collection process for urban local bodies, requiring royalties to be collected in installments throughout the construction phase, thereby ensuring compliance and proper financial management in the use of minor minerals.

Important statutory provisions of Assam Minor Mineral Concession rule:

Mining operation under mining a mineral concession.

- No person shall undertake any prospecting or mining operation activity in respect of any minerals in any part of the State, except under and in accordance with the terms and conditions of a permit or a prospecting licence or a mining lease or a mining contract or a permit, or a concession in any other form, as the case may be, granted:
- Provided that nothing in this sub-rule shall apply to any prospecting operation undertaken by the Geological Survey of India, the Indian Bureau of Mines, and the Atomic Minerals Directorate for Exploration and Research of the Central Government, the Directorate of Geology & Mining, Assam or the Mineral Exploration Corporation Limited.

Restriction on grant of mining lease/contract/ permit.

- (1) No mining lease/contract /permit shall be granted in respect of any land within a distance of: -
 - (i) Fifty metres from the outer periphery of the defined limits of any village habitation, National Highway, State Highway and other roads where such excavation does not required use of explosives.

(ii) Two hundred fifty metres for the outer periphery of the defined limits of any village habitation, National Highway, State Highway and other roads where use of explosives if required.

(iii) Five hundred metres from major structures like R.C.C. Bridge, Guide bund etc.

Provided that the Government may relax the above distance parameters, wherever required in the interest of working, mineral conservation or for any unforeseen reasons subject to such condition as may be imposed under the said relaxation.

(2) No mining lease/contract/permit or any other mineral concession shall be granted in respect of any such minor mineral or in respect of any specific or general area which the Government may notify.

Condition on which the Permit for mining/quarrying shall be granted

- I.** Any mining operation in the case of mining of brick earth or ordinary clay or alluvial deposit below a depth of 1.5 metre shall necessarily require formation of benches for safe mining. The benches would be formed in a manner that the width of the bench is not lesser than the height of the bench.
- II.** Any quarrying permit granted under these rules shall contain information with regard to the following:
- (i) Manner, mode and place of payment of rent, royalties, permit money, Rehabilitation and Restoration Fund amount and interest on delayed payments or any other dues as admissible under these rules.
 - (ii) Particulars of the receipt heads of the Government to which the payments are to be credited.
 - (iii) Grant, compensation of damage to the land owner for the land covered by the permit.
 - (iv) Felling the trees, pumping of ground water.
 - (v) Restriction of surface operations in any area provided by any authority.
 - (vi) Entering and working in any forest area.
 - (vii) Reporting all accidents, use of explosives.
 - (viii) Indemnity to the Government against claim of third parties.
 - (ix) Mineral to be stacked, measured and dispatched.
 - (x) Applicability of the provisions of all other statutes/rules framed by the Central and State Government.
 - (xi) Reclamation or restoration of the mining areas and security thereof.
 - (xii) Development and conservation of minerals and environment and ecology of the area.

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- (xiii) Extent of the area or land from where the minor mineral shall be extracted.
- (xiv) Period within which the minor mineral shall be extracted and removed and delivery of possession of land on the expiry of such period or on removal of the quantity of the minor mineral for which the permit is valid/granted.
- (xv) Release of security by the authority issuing permit after having satisfied that the permit holder has fulfilled all the conditions of the permit satisfactorily.
- (xvi) Any other condition, as may be found expedient by the competent authority to grant the permit, may be imposed in the interest of scientific mining, mineral conservation and mineral development.

III. In case of the permit holder is not able to remove the whole or any part of the mineral for which he obtained the permit within the permissible time for any reason, whatsoever, he shall not be entitled to claim the refund of permit amount/ royalty or any part thereof.

IV. The permit holders for the brick kilns shall furnish a solvent surety within fifteen days of the issue of the permit by submitting an undertaking of such surety that he would be responsible for deposit of all dues in case the permit holder fails to deposit the same.

Special conditions for river-bed

Following condition shall be application for excavation of minor mineral (s) from river beds in order to ensure safety of river-beds, structures and the adjoining areas:

- ❖ No mining would be permissible in a river-bed up to a distance of five times of the span of the bridge on up-stream side and ten times the span of such bridge on down-stream side, subject to minimum of 250 meters on the up-stream side and 500 meters on the down-stream side.
 - ❖ There shall be maintained an un-mined block of 50 meters width after every block of 1000 meters over which mining is undertaking or at such distance as may be directed by the competent authority.
 - ❖ The maximum depth of mining in the river-bed shall not exceed three meters measured from the un-mined bed level at any point of time with proper bench formation.
 - ❖ Mining shall be restricted within the central 3/4th width of the river/ rivulet.
 - ❖ No mining shall be permissible in an area up to a width specified by the competent authority from the action edges of embankments.
 - ❖ Any others condition as may be required by the competent authority in public interest.
- **Sustainable Sand Mining Management Guidelines (SSMMG), 2016 by MoEF & CC.**

The sustainable sand Mining Management Guidelines 2016 has been prepared after extensive consultation with the States and Stakeholders over a period of one year. The main objective of the Guideline is to ensure sustainable sand mining and environment friendly management practices in order to restore and maintain the ecology of river and other sand sources.

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1. Parts of the river reach that experience deposition or aggradation shall be identified first. The Lease holder/ Environmental Clearance holder may be allowed to extract the sand and gravel deposit in these locations to manage aggradation problem.
2. The distance between sites for sand and gravel mining shall depend on the replenishment rate of the river. Sediment rating curve for the potential sites shall be developed and checked against the extracted volumes of sand and gravel.
3. Sand and gravel may be extracted across the entire active channel during the dry season.
4. Abandoned stream channels on terrace and inactive flood plains be preferred rather than active channels and their deltas and flood plains. Stream should not be diverted to form inactive channel.
5. Layers of sand and gravel which could be removed from the river bed shall depend on the width of the river and replenishment rate of the river.
6. Sand and gravel shall not be allowed to be extracted where erosion may occur, such as at the concave bank.
7. Segments of braided river system should be used preferably falling within the lateral migration area of the river regime that enhances the feasibility of sediment replenishment.
8. Sand and gravel shall not be extracted within 200 to 500 meters from any crucial hydraulic structure such as pumping station, water intakes, and bridges. The exact distance should be ascertained by the local authorities based on local situation. The cross-section survey should cover a minimum distance of 1.0 km upstream and 1.0 km downstream of the potential reach for extraction. The sediment sampling should include the bed material and bed material load before, during and after extraction period. Develop a sediment rating curve at the upstream end of the potential reach using the surveyed cross- section. Using the historical or gauged flow rating curve, determine the suitable period of high flow that can replenish the extracted volume. Calculate the extraction volume based on the sediment rating curve and high flow period after determining the allowable mining depth.
9. Sand and gravel could be extracted from the downstream of the sand bar at river bends. Retaining the upstream one to two thirds of the bar and riparian vegetation is accepted as a method to promote channel stability.
10. Flood discharge capacity of the river could be maintained in areas where there are significant flood hazard to existing structures or infrastructure. Sand and gravel mining may be allowed to maintain the natural flow capacity based on surveyed cross- section history.
11. Alternatively, off-channel or floodplain extraction is recommended to allow rivers to replenish the quantity taken out during mining.
12. The Piedmont Zone (Bhabhar area) particularly in the Himalayan foothills, where riverbed material is mined, and this sandy-gravelly track constitutes excellent

conduits and holds the greater potential for ground water recharge. Mining in such areas should be preferred in locations selected away from the channel bank stretches.

13. Mining depth should be restricted to 3 meter and distance from the bank should be 3 meters or 10 percent of the river width whichever less.
14. The borrow area should preferably be located on the river side of the proposed embankment, because they get silted up in course of time. For low embankment less than 6 m in height, borrow area should not be selected within 25 m from the toe/heel of the embankment. In case of higher embankment, the distance should not be less than 50 m. In order to obviate development of flow parallel to embankment, cross bars of width eight times the depth of borrow pits spaced 50 to 60 meters centre-to-centre should be left in the borrow pits.
15. Demarcation of mining area with pillars and geo-referencing should be done prior to start of mining.

➤ **Enforcement & Monitoring Guidelines for sand Mining, 2020 (MoEF& CC)**

Ministry of Environment Forest & Climate Change formulated the Sustainable Sand Management Guidelines 2016 which focuses on the Management of Sand Mining in the Country. But in the recent past, it has been observed that apart from management and systematic mining practices there is an urgent need to have a guideline for effective enforcement of regulatory provision and their monitoring. Section 23 C of MMDR, Act 1957 empowered the State Government to make rules for preventing illegal mining, transportation and storage of minerals. But in the recent past, it has been observed that there was large number of illegal mining cases in the Country and in some cases, many of the officers lost their lives while executing their duties for curbing illegal mining incidence. The illegal and uncontrolled illegal mining leads to loss of revenue to the State and degradation of the environment.

1. Parts of the river reach that experience deposition or aggradation shall be identified. The Leaseholder/ Environmental Clearance holder may be allowed to extract the sand and gravel deposit in these locations to manage aggradation problem.
2. The distance between sites for sand and gravel mining shall depend on the replenishment rate of the river. Sediment rating curve for the potential sites shall be developed and checked against the extracted volumes of sand and gravel.
3. Sand and gravel may be extracted across the entire active channel during the dry season.
4. Abandoned stream channels on the terrace and inactive floodplains be preferred rather than active channels and their deltas and flood plains. The stream should not be diverted to form the inactive channel.
5. Layers of sand and gravel which could be removed from the river bed shall depend on the width of the river and replenishment rate of the river.
6. Sand and gravel shall not be allowed to be extracted where erosion may occur, such as at the concave bank.

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7. Segments of the braided river system should be used preferably falling within the lateral migration area of the river regime that enhances the feasibility of sediment replenishment.
8. Sand and gravel shall not be extracted up to a distance of 1 kilometre (1 km) from major bridges and highways on both sides, or five times (5x) of the span (x) of a bridge/public civil structure (including water intake points) on up-stream side and ten times (10x) the span of such bridge on down-stream side, subjected to a minimum of 250 meters on the upstream side and 500 meters on the downstream side.
9. The sediment sampling should include the bed material and bed material load before, during and after the extraction period. Develop a sediment rating curve at the upstream end of the potential reach using the surveyed cross-section. Using the historical or gauged flow rating curve, determine the suitable period of high flow that can replenish the extracted volume.
10. Calculate the extraction volume based on the sediment rating curve and high flow period after determining the allowable mining depth.
11. Sand and gravel could be extracted from the downstream of the sand bar at river bends. Retaining the upstream one to two-thirds of the bar and riparian vegetation is accepted as a method to promote channel stability.
12. The flood discharge capacity of the river could be maintained in areas where there is a significant flood hazard to existing structures or infrastructure. Sand and gravel mining may be allowed to maintain the natural flow capacity based on surveyed cross-section history. Alternatively, off-channel or floodplain extraction is recommended to allow rivers to replenish the quantity taken out during mining.
13. The Piedmont Zone (Bhabhar area) particularly in the Himalayan foothills, where riverbed material is mined, and this sandy-gravelly track constitutes excellent conduits and holds the greater potential for groundwater recharge. Mining in such areas should be preferred in locations selected away from the channel bank stretches.
14. Mining depth should be restricted to 3 meters and distance from the bank should be $\frac{1}{4}$ th or river width and should not be less than 7.5 meters.
15. The borrow area should preferably be located on the riverside of the proposed embankment because they get silted in the course of time. For low embankment, less than 6 m in height, borrow area should not be selected within 25 m from the toe/heel of the embankment. In the case of the higher embankment, the distance should not be less than 50 m. In order to obviate the development of flow parallels to the embankment, crossbars of width eight times the depth of borrow pits spaced 50-to-60-meter centre-to-centre should be left in the borrow pits.
16. Demarcation of mining area with pillars and geo-referencing should be done prior to the start of mining.
17. A buffer distance /un-mined block of 50 meters after every block of 1000 meter over which mining is undertaken or at such distance as may be the directed/prescribed by the regulatory authority shall be maintained.

18. A buffer distance /unmined block of 50 meters after every block of 1000 meters over which mining is undertaken or at such distance as may be the directed/prescribed by the regulatory authority shall be maintained.
19. River bed sand mining shall be restricted within the central 3/4th width of the river/rivulet or 7.5 meters (inward) from river banks but up to 10% of the width of the river, as the case may be and decided by regulatory authority while granting environmental clearance in consultation with irrigation department. Regulating authority while regulating the zone of river bed mining shall ensure that the objective to minimize the effects of riverbank erosion and consequential channel migration are achieved to the extent possible. In general, the area for removal of minerals shall not exceed 60% of the mine lease area, and any deviation or relaxation in this regard shall be adequately supported by the scientific report.
20. Mining Plan for the mining leases (non-government) on agricultural fields/Patta land shall only be approved if there is a possibility of replenishment of the mineral or when there is no riverbed mining possibility within 5 KM of the Patta land/Khatedari land. For government projects mining could be allowed on Patta land/Khatedari land but the mining should only be done by the Government agency and material should not be used for sale in the open market.

The minerals reserve for riverbed area is calculated on the basis of maximum depth of 3 meters and margins, width and other dimensions as mentioned in para (s) above. The area multiplied by depth gives the volume and volume multiplied with bulk density gives the quantity in Metric Ton. In case of riverbed, mineable material per hectare area available for actual mining shall not exceed the maximum quantity of 60,000 MT per annum.

➤ **Demand and Utilisation of Sand**

Sand is a multi-purpose topographical material. It is known as one of the three fundamental ingredients in concrete. The composition of sand is diverse. Mostly sand is made of silica which is a common element. It can also come from another source of minerals like quartz, limestone, or gypsum.

From beds to flood plains to coastlines- we can find the sand at almost everywhere. The robustness of sand has played a significant role in everyday life. We use sand practically every other day.

Sand extraction from river beds and brick earth mining for making raw bricks are the main mining activities in the district. With a spurt in construction of real estate sectors and various govt. sponsored projects, the demand for both sand and bricks has increased manifold. The extraction of sand is carried out either manually or through semi- mechanized system. The depth of mining for both river bed sand and brick earth is restricted due to statutory provision in the regulations pertaining to conservation and development of minor minerals.

River sand mining is a common practice as habitation concentrates along the rivers and the mining locations are preferred near the markets or along the transportation route, for reducing the transportation cost.

In the real world, there are a lot of situations where we can find uses of sand. Followings are the common sand uses.

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1. While binging metal, we can mix sand with clay binder for frameworks used in the foundries.
2. Sand can be used for cleaning up oil leak or any spill by dredging sand on that spill. The material will form clumps by soaking up, and we can quickly clean the mess.
3. Sand can be used as a road base which is a protective layer underneath all roads
4. Industrial sand is used to make glass, as foundry sand and as abrasive sand.
5. One creative usage of sand is serving as a candle holder. We can try putting some sand before pouring tea light or any candle in a glass. It holds the candle still and refrain the candle from rolling by giving it an excellent decoration.
6. Adds texture and aesthetic appeal to space.
7. Sand is mostly pure to handle, promptly available and economically wise.
8. We use sand in aquariums, fabricating artificial fringing reefs, and in human-made beaches
9. Sandy soils are ideal for growing crops, fruits and vegetables like watermelon, peaches, peanuts, etc.
10. Sand can light a path by filling mason jars with sand and tea light which is another inexpensive way to make a walkway glow.
11. Sand helps to improve resistance (and thus traffic safety) in icy or snowy conditions.
12. We need sand in the beaches where tides, storms or any form of preconceived changes to the shoreline crumble the first sand.
13. Sand containing silica is used for making glass in the automobile and food industry- even household products for the kitchen.
14. Sand is a strong strand which is used for plaster, mortar, concrete, and asphalt.
15. The usual bricks formulated of clay only are way weaker and lesser in weight than blocks made of clay mixed with sand.

2.2 Methodology of DSR Preparation

The steps followed during the preparation of District Survey Report are given in Figure 2.1. The individual steps are discussed in following paragraphs.

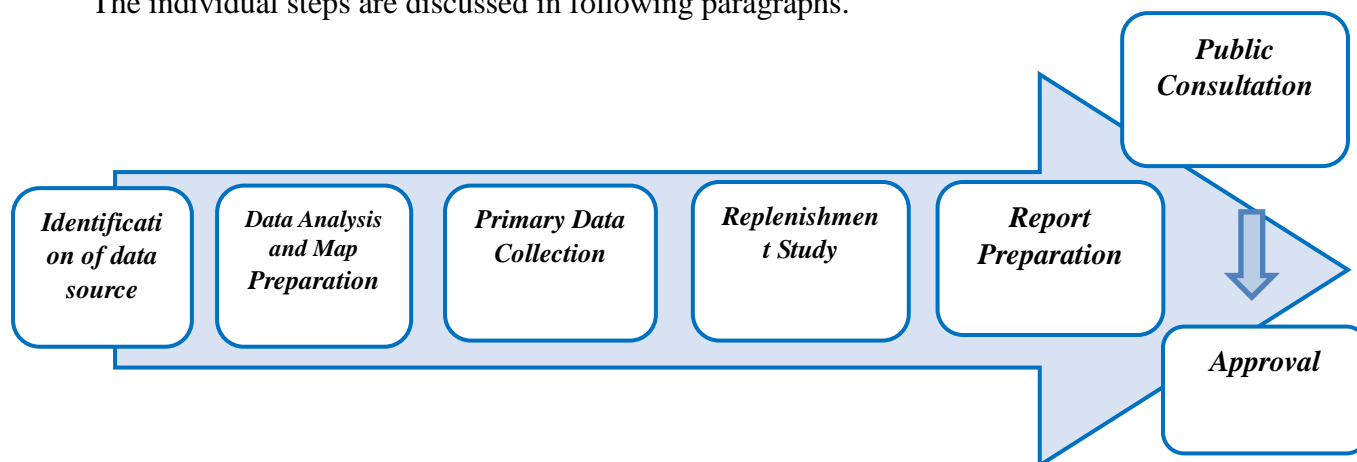


Figure 01: Steps followed in preparation of DSR

Data source Identification: District Survey Report has been prepared based on the primary data base and secondary data base collected and collated from different sources. It is very critical to identify authentic data sources before compiling the data set. The secondary data sources which are used in this DSR are mostly taken from public domain or from the published report in reputed journals. Information related to district profile has been taken from District Census Report, 2011 and District Statistical Handbook published by the Govt. of Assam. Potential mineral resources of the district have been described based on the published report of Geological Survey of India (GSI) or any other govt. agencies like MECL etc. List of mining lease, name of lease holder, lease/block area, resource in already allotted mining lease, revenue from minor mineral sector etc. have been collected from the concern DL & LRO offices of the district. Satellite images have been used for map preparation related to physiography and land use/land cover of the district.

Data Analysis and Map Preparation: To prepare the Maps of the district, we have collected the data set which are captured during the report preparation. They have gone through detail analysis work. District Survey Report involves the analytical implication of captured dataset to prepare relevant maps. Methodology adopted for preparation of relevant maps is explained below:

Land Use and Land Cover Map: Land Use and Land Cover classification is a complex process and requires consideration of many factors. The major steps of image classification include determination of a suitable classification system via Visual Image Interpretation, selection of training samples, Satellite image (FCC-False Color Composite) pre-processing, selection of suitable classification approaches, post classification processing, and accuracy assessment. Here LISS-III satellite imagery has been taken for supervised classification as supervised classification can be much more accurate than unsupervised classification, but depends heavily on the training sites, the skill of the individual processing the image, and the spectral distinctness of the classes in broader scale. According to the Visual Image Interpretation (Tone, Pattern, Texture, Shape, Color etc.) training set of the pixel has been taken. Pictorial descriptions of Land Use classification are explained in Figure 01.

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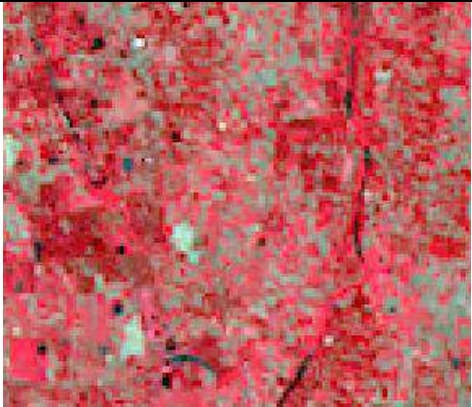
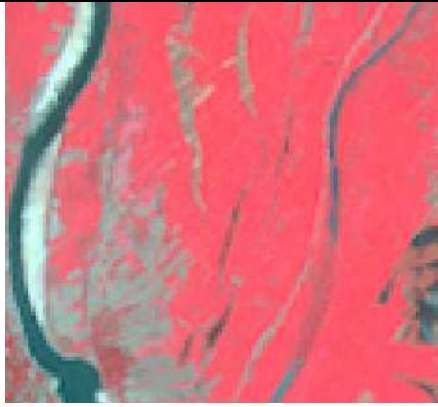
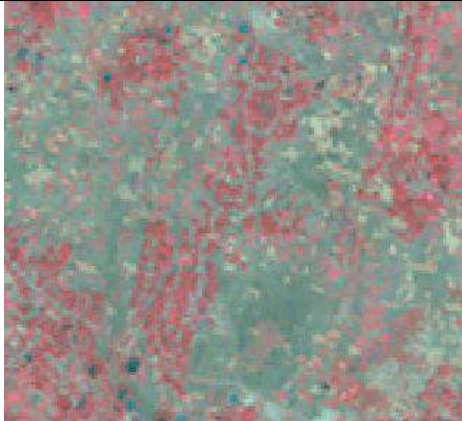



	
<p>Agricultural Land - Based on their Geometrical shape, Red and Pink color tone, Agricultural Land has been identified.</p>	<p>Vegetation Covered Area - Area with continuous Red color tone, Vegetation Covered Area has been classified.</p>
	
<p>Agricultural Fallow Land - Based on their Geometrical shape, Yellowish green color tone, Agricultural Fallow Land has been identified.</p>	<p>Badland Topography- Area with Non geometrical shape and Yellowish green color tone has been identified as Bad Land Topography.</p>
	
<p>Settlement – Area with some geometrical shape in a Linear Pattern including Light Cyan Color has been recognized as Settlement Area.</p>	<p>Water Bodies – Area with Blue color has been classified as Water Bodies.</p>

Figure 02: Pictorial description of Land Use Classification methods

Geomorphological Map: The major step of preparing Geomorphological Map is identifying features like – Alluvial Fan, Alluvial Plain, Hilly Region etc. from Satellite Imagery (FCC-False Colour Composite) via Visual Image Interpretation and then digitisation has been taken into the consideration to prepare map including all the Geomorphological features according to their location. Pictorial descriptions of Geomorphological unit’s classification are explained in Figure 03.

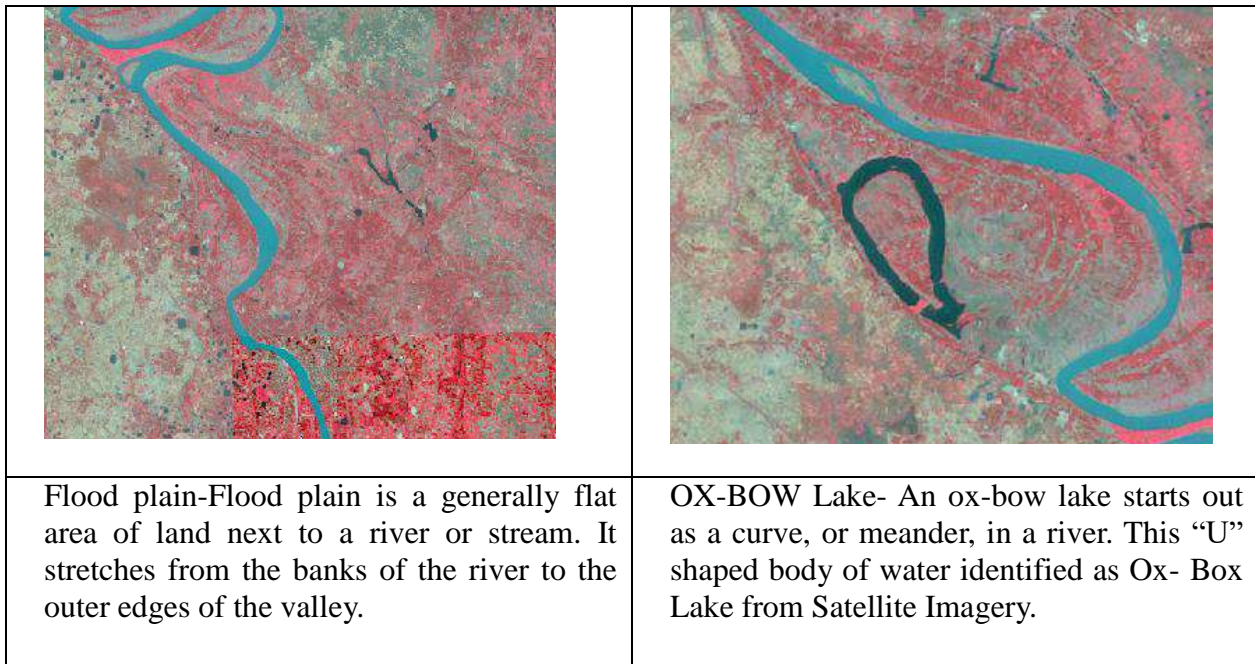


Figure 03: Pictorial description of Geomorphological Units Classification methods

Physiographical Map: The major step of preparing Physiographical Map is generating contour at a specific interval to show the elevation of the area using Cartosat DEM.

Block Map/Transportation Map/Drainage Map:

- Raw Data collected from National Informatics Centre (NIC Website) during May 2024.
- Data has been geo-referenced using GIS software.
- Digitization of block boundary, district boundary, state boundary, international boundary, and district headquarter, sub–district headquarter, places, road, railway, river, nala etc.
- Road name, River name, Railway name has been filled in attribute table of the Layers
- Final layout has been prepared by giving scale, legend, north arrow, etc.

Earthquake Map:

- Raw data collected from Ministry of Earth Science.

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- Data has been geo-referenced using GIS software.
- Digitization of Earthquake zone and superimposed it over Block Boundary.
- Zone name has been filled in attribute table of the Layers
- Final layout has been prepared by giving scale, legend, north arrow, etc.

Soil Map:

- Raw data collected from National Bureau of Soil Survey and Land Use Planning during May 2024.
- Data has been geo-referenced using GIS software.
- Digitization of Soil classification zone and superimposed it over District Boundary.
- Soil classification has been filled in attribute table of the Layers.
- Final layout has been prepared by giving scale, legend, north arrow, etc.

Wildlife Sanctuary and National Park location Map:

- Raw data obtained from ENVIS Centre on Wildlife & Protected Areas during August 2020.
- Data has been geo-referenced using GIS software.
- Digitization of Wildlife Sanctuary and National Park and superimposed it over Block Boundary.
- Wildlife Sanctuary & National Park name has been filled in attribute table of the Layers
Final layout has been prepared by giving scale, legend, north arrow, etc.

Primary Data Collection: To prepare DSR, primary data has been collected and field work has also been carried out for the district. Field study involves assessment of the mineral resources of the district by means of pitting / trenching in specific interval. This provides clear picture of mineral matters characterization and their distribution over the area.

Replenishment study: One of the principal causes of environmental impacts of river bed mining is the removal of more sediment than the system can replenish. Therefore, there is a need for replenishment study for riverbed sand in order to nullify the adverse impacts arising due to excess sand extraction. We have conducted Physical survey by the help of DGPS to define the topography, contours and offsets of the riverbed. The surveys clearly depict the important attributes of the stretch of the river and its nearby important civil and other feature of importance. This information will provide the eligible spatial area for mining. The annual rate of replenishment carried out on every river of the district to have proper assessment of the sand reserve for mining purposes. The surveys clearly depict the important attributes of the stretch of the river and its nearby important civil and other feature of importance. This information will provide the eligible spatial area for mining.

Report Preparation: The district survey report portrays general profile, geomorphology, land use pattern and geology of the district. The report then describes the availability and

distribution of riverbed sands and other minor minerals in the district. Apart from delineation the potential mining blocks, the report also includes Inventorisation of the minerals, recent trends of production of minor minerals and revenue generation there from. Annual replenishment of the riverbed sand has been estimated using field observation, satellite imagery and empirical formula. The road network connecting arterial road to potential mining blocks has been identified. Potential environmental impacts of mining of these minerals, their mitigation measures along with risk assessment and disaster management plan have also been discussed. Finally, the reclamation strategy for already mined out areas is also chalked out.

Public Consultation & Approval: In accordance with the Enforcement and Monitoring Guidelines for Sand Mining, the UT Government would look for public feedback on the list of mining zones that will be placed up for auction. The DSR, which includes the list of zones will be advertised in local and national newspapers as well as in district administration website. The public will have one month to provide their input or any comment which will then be considered by the district committee. Sand mining zones, including clusters and contiguous clusters, will be defined in the final DSR. The final list of sand mining areas, including riverbed, Patta land, Khatedari, desiltation locations and M-sand Plants will be defined in the final DSR, following the public hearing as per Annexure-V. Details regarding clusters and contiguous clusters will be provided in Annexure-VI and Annexure-VII. The process flow diagram is as follows:

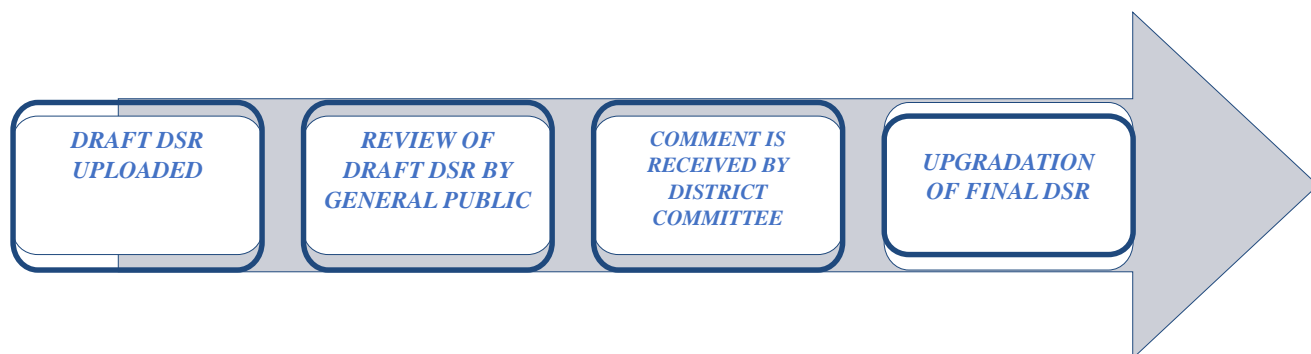


Figure 04: Schematic Representation of Public Consultation

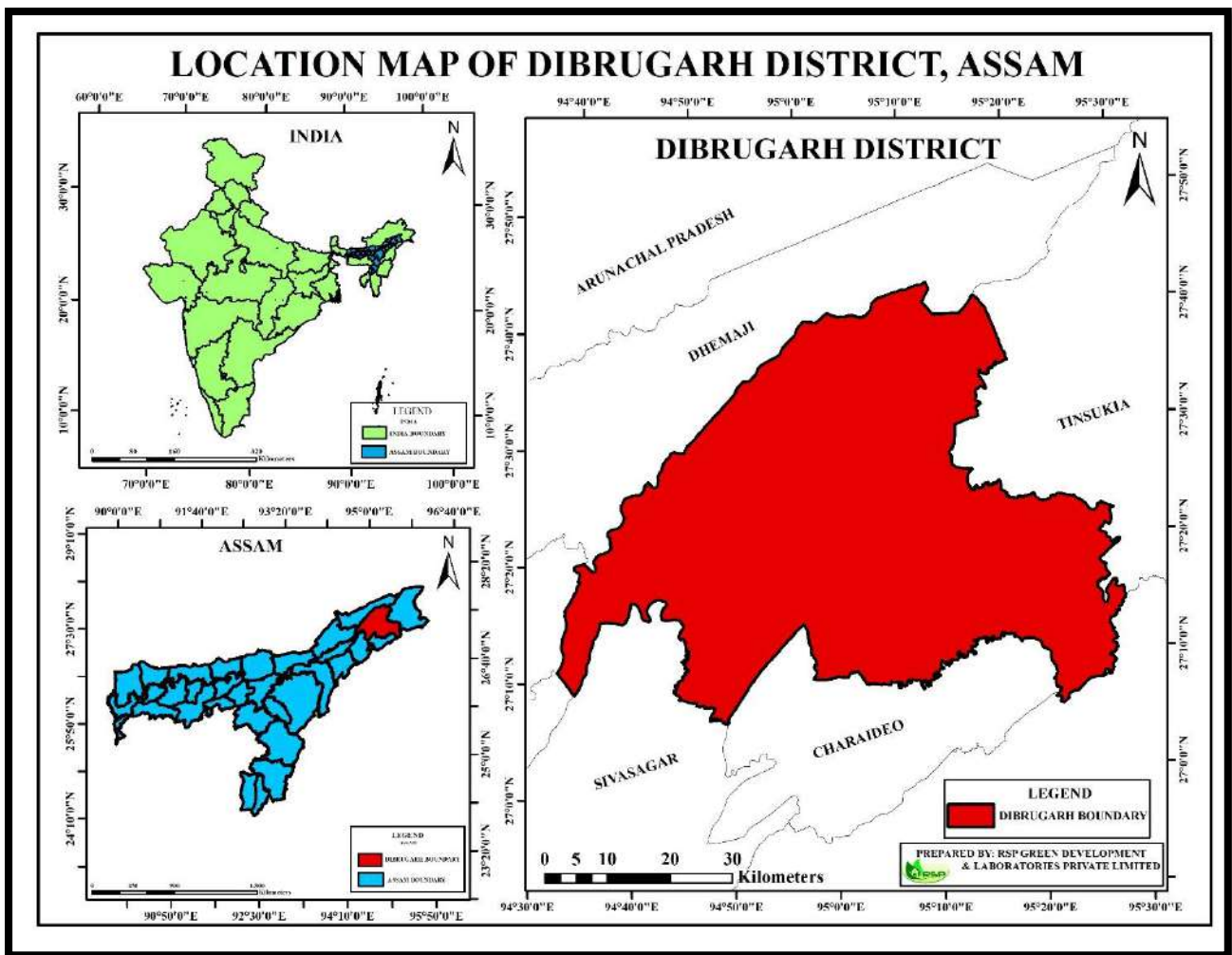
CHAPTER 3: GENERAL PROFILE OF THE DISTRICT

a) General Information

Dibrugarh is an industrial city in Upper Assam with sprawling tea gardens. Dibrugarh district occupies an area of 3,381 square kilometres. The district extends from 27° 5' 38" N to 27° 42' 30" N Latitude and 94°33'46"E to 95°29'8"E Longitude, it is bounded by Dhamaji District on the north, Tinsukia district on the east, Tirap district of Arunachal Pradesh on the south-east and Sibsagar district on the north and south-west. The area stretches from the north bank of the Brahmaputra, which flows for a length of 95 km through the northern margin of the district, to the Patkai foothills on the south. The Burhi Dihing, a major tributary of the Brahmaputra with its network of tributaries and wetlands flows through the district from east to west. There is a large tract of Tropical Rainforest in its eastern and southern regions, which is a part of the Dehing Patkai wildlife sanctuary.

Geographically, The Dibrugarh district in Assam, India is part of the Brahmaputra River basin and is drained by the river and its tributaries. The district is located in the north eastern corner of the Upper Brahmaputra valley south with an altitude ranging between 99 and 474 meters Some of the tributaries of the Brahmaputra River that drain the area include the Burhi Dihing, Disang, Dibru, Sessa, and Lekhijan.

Figure 05: Location Map of the District



The Administrative System is divided into:

- Village (1361)
- Block (7)
- Gaon Panchayats (93)
- Zilla Parishad (1)

In the lower-house (Lok Sabha) of the Indian Parliament, Dibrugarh is one constituency and represented by one elected Member of the Parliament.

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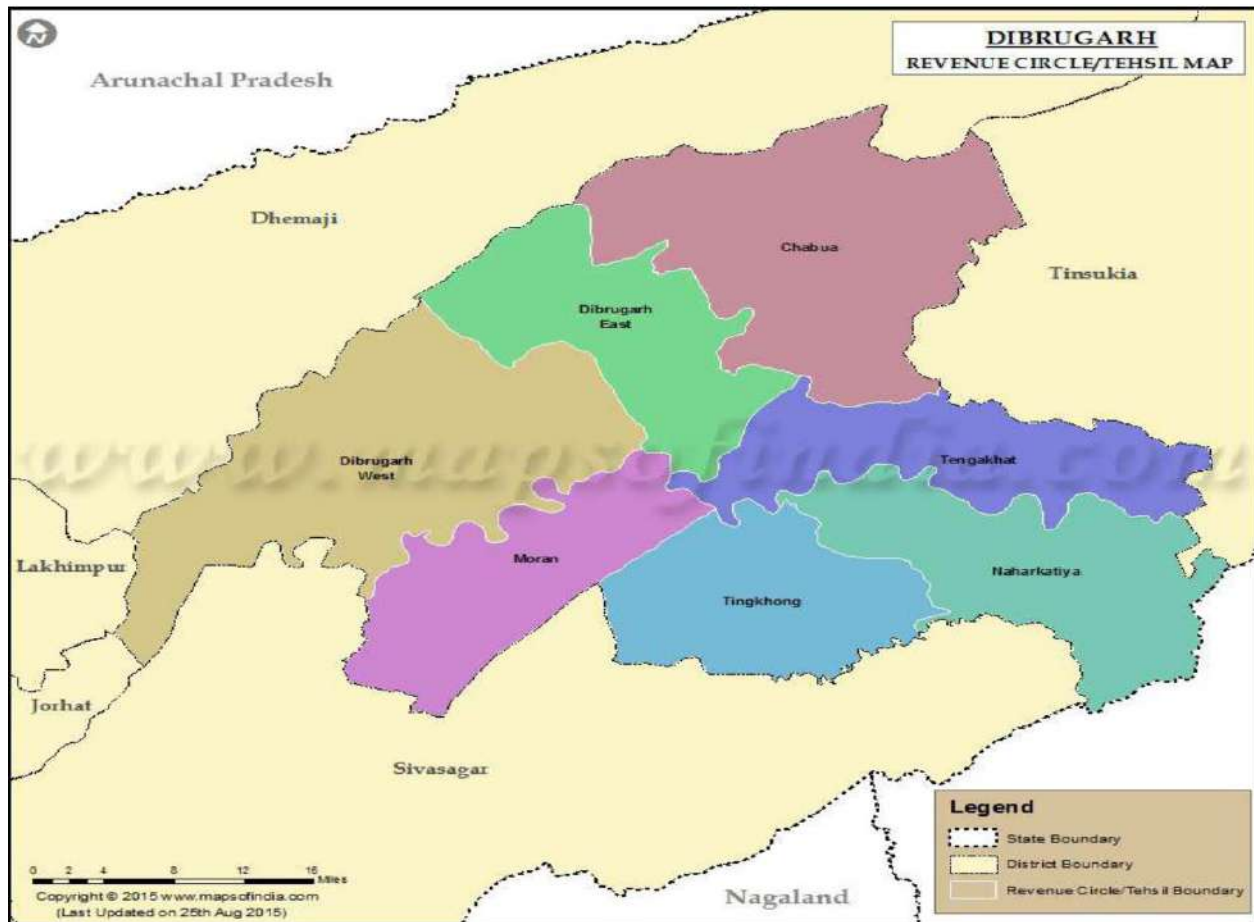
Table No 02: Town, village, Revenue circle and Police station of Dibrugarh District

Notable towns and villages	Revenue circles	Police stations
Chabua	Dibrugarh East	Borboruah (City) PS
Dibrugarh	Dibrugarh West	Chabua PS
Duliajan	Chabua	Dibrugarh Sadar Town (City)
Jamirah Patra Gaon	Tengakhata	Duliajan PS
Moran	Naharkatia	Joypur PS
Naharkatia	Tingkhong	Khowang PS
Namrup	Moran	Lahowal PS
		Moran PS
		Naharkatia PS
		Rajgarh PS
		Rohmoriam, Ghoramora PS
		Tengakhata PS
		Tingkhong PS

Table 3: Block distribution of Dibrugarh District

Development Blocks	Gaon Panchayat	Anchalik Panchayat	Village	Inhabited Village	Uninhabited Village	Forest Village
7	93	7	1362	1306	56	27

Figure 06: Block divisional map of Dibrugarh District



(Source: National Informatics Centre)

b) Climate Condition

Dibrugarh, Assam, India has a humid subtropical climate with hot summers and cool winters: According to District Meteorological Department, there are very minor variation of temperature, rainfall and relative humidity in all over the district viz. The climate of Dibrugarh is Subtropical, with pleasantly warm, dry winters from November to February and a long, hot and rainy period from April to mid-October. The monsoon runs from roughly from June to early or mid-October, but from March to May (and more rarely in February), showers occur, which gradually become more intense and frequent. The city is located in the extreme north-east of India, in the state of Assam, at 27 degrees north latitude. We are in the northernmost part of the Brahmaputra plain, closed between the Himalayas to the north and the mountains bordering Burma to the east. In the rainy season, the Great River, which flows on the northern edge of the city, often overflows.

Summer: Temperatures range from 28°C to 38°C, and the weather is breezy.

Monsoon: Temperatures range from 20°C to 28°C, and there is heavy rainfall that increases water pressure in the Brahmaputra River.

Winter: Temperatures drop to 7°C, and the city experiences chilly winds

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c) Rainfall

Precipitation amounts to 2610 millimeters (102.8 inches) per year: it is therefore very abundant. It ranges from 15 mm (0.6 in) in the driest month (December) to 525 mm (20.7 in) in the wettest one (July). Here is the average precipitation.

Table 04: Month-wise Rainfall Data

Dibrugarh - Average precipitation			
Month	Millimeters	Inches	Days
January	30	1.2	3
February	65	2.6	6
March	120	4.7	9
April	235	9.3	14
May	305	12	14
June	410	16.1	18
July	525	20.7	22
August	410	16.1	17
September	350	13.8	15
October	125	4.9	7
November	20	0.8	2
December	15	0.6	2
Total	2610	102.8	128

Source: Website of Indian Meteorological Department, Govt. of India

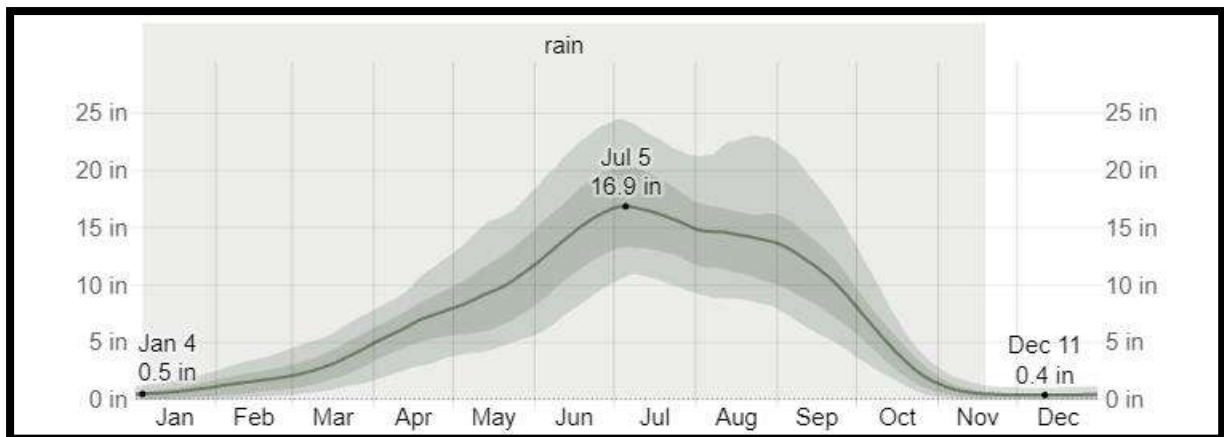


Figure 07: Graphical representation of Dibrugarh District rainfall

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- **Temperature**

Temperature along with other meteorological conditions of the district is more or less uniform. The hot season lasts for 5.3 months, from May 7 to October 17, with an average daily high temperature above 85°F. The hottest month of the year in Dibrugarh is August, with an average high of 88°F and low of 78°F.

The cool season lasts for 2.1 months, from December 12 to February 15, with an average daily high temperature below 75°F. The coldest month of the year in Dibrugarh is January, with an average low of 51°F and high of 72°F.

The average maximum and minimum temperature recorded in Dibrugarh is given in Table 05.

Table 05: Monthly mean temperature (in °C) distribution of Dibrugarh District

Dibrugarh - Average temperatures (1991-2020)						
Month	Min (°C)	Max (°C)	Mean (°C)	Min (°F)	Max (°F)	Mean (°F)
January	10.2	23.5	16.8	50	74	62.3
February	13	24.9	19	55	77	66.2
March	16.4	26.9	21.7	62	80	71
April	19.1	27.9	23.5	66	82	74.3
May	22	29.7	25.8	72	85	78.5
June	24.2	31	27.6	76	88	81.7
July	24.9	31.5	28.2	77	89	82.7
August	25.1	32	28.5	77	90	83.4
September	24.1	31.4	27.7	75	88	81.9
October	21.1	30.5	25.8	70	87	78.4
November	15.7	28	21.8	60	82	71.3
December	11.2	25	18.1	52	77	64.6
Year	18.9	28.5	23.7	66.1	83.4	74.5

- **Relative Humidity, Wind speed & Wind direction**

Humidity

We base the humidity comfort level on the dew point, as it determines whether perspiration will evaporate from the skin, thereby cooling the body. Lower dew points feel drier and higher dew points feel more humid. Unlike temperature, which typically varies significantly between night and day, dew point tends to change more slowly, so while the temperature may drop at night, a muggy day is typically followed by a muggy night. Dibrugarh experiences extreme seasonal variation in the perceived humidity.

The muggier period of the year lasts for 7.5 months, from March 28 to November 11, during which time the comfort level is muggy, oppressive, or miserable at least 25% of the time. The month with the fewest muggy days in Dibrugarh is January, with 0.0 days that are muggy or worse

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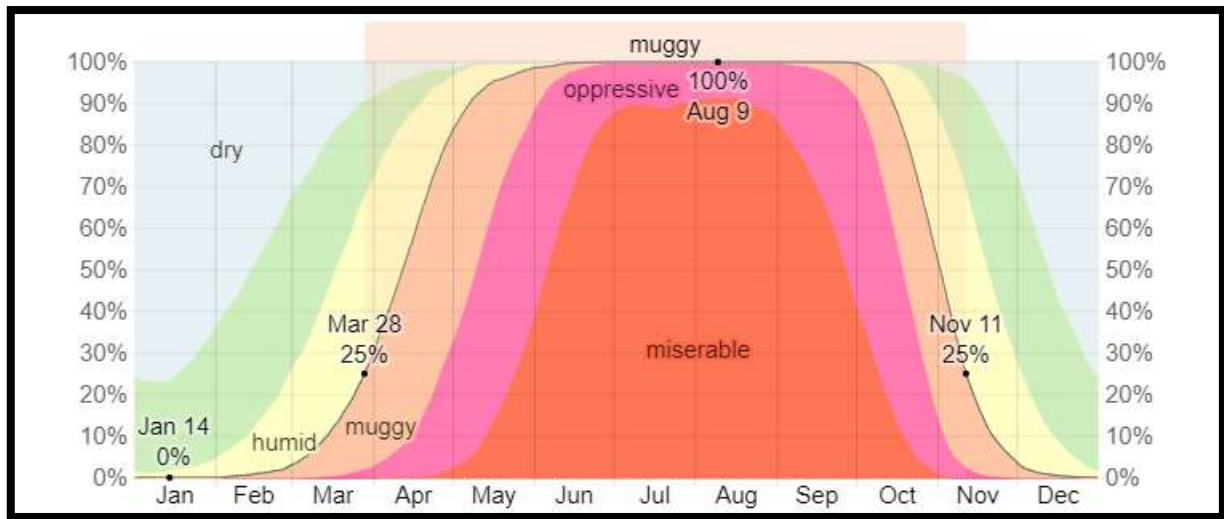


Figure 08: Graphical representation of Dibrugarh District

dry 55°F comfortable 60°F humid 65°F muggy 70°F oppressive 75°F miserable the percentage of time spent at various humidity comfort levels, categorized by dew point.

Wind

This section discusses the wide-area hourly average wind vector (speed and direction) at 10 meters above the ground. The wind experienced at any given location is highly dependent on local topography and other factors, and instantaneous wind speed and direction vary more widely than hourly averages.

The average hourly wind speed in Dibrugarh does not vary significantly over the course of the year, remaining within 0.3 miles per hour of 2.9 miles per hour throughout.

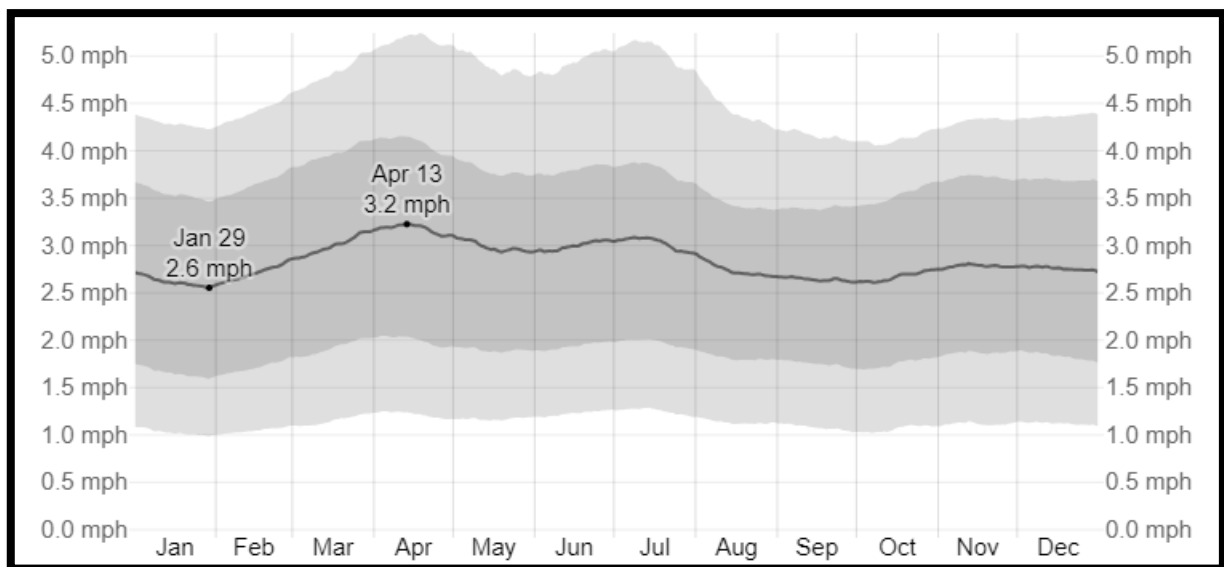
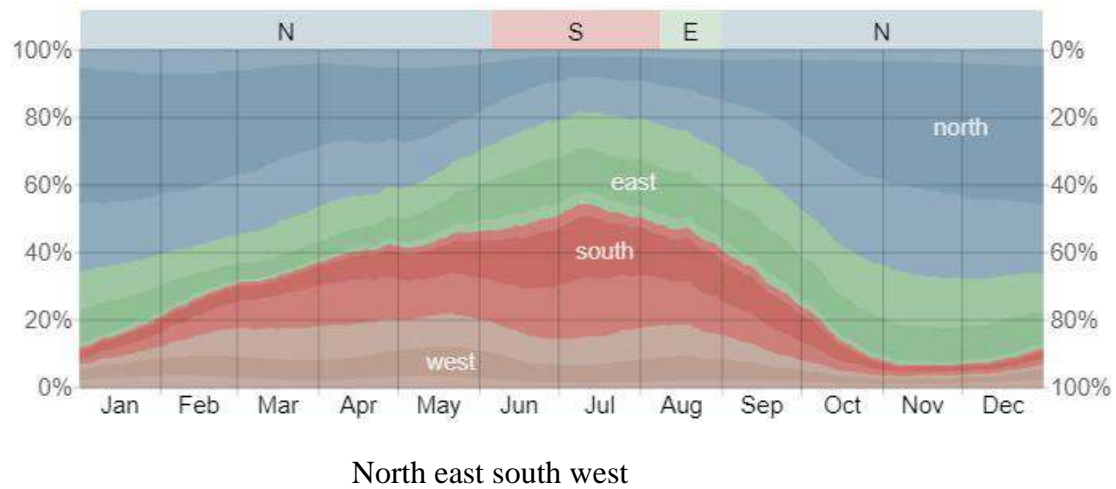


Figure 09: Average Wind Speed in Dibrugarh

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The average of mean hourly wind speeds (dark gray line), with 25th to 75th and 10th to 90th percentile band.

Figure 10: Wind Direction in Dibrugarh



The percentage of hours in which the mean wind direction is from each of the four cardinal wind directions, excluding hours in which the mean wind speed is less than 1.0 mph. The lightly tinted areas at the boundaries are the percentage of hours spent in the implied intermediate directions (northeast, southeast, southwest, and northwest)

d) Topography & Terrain

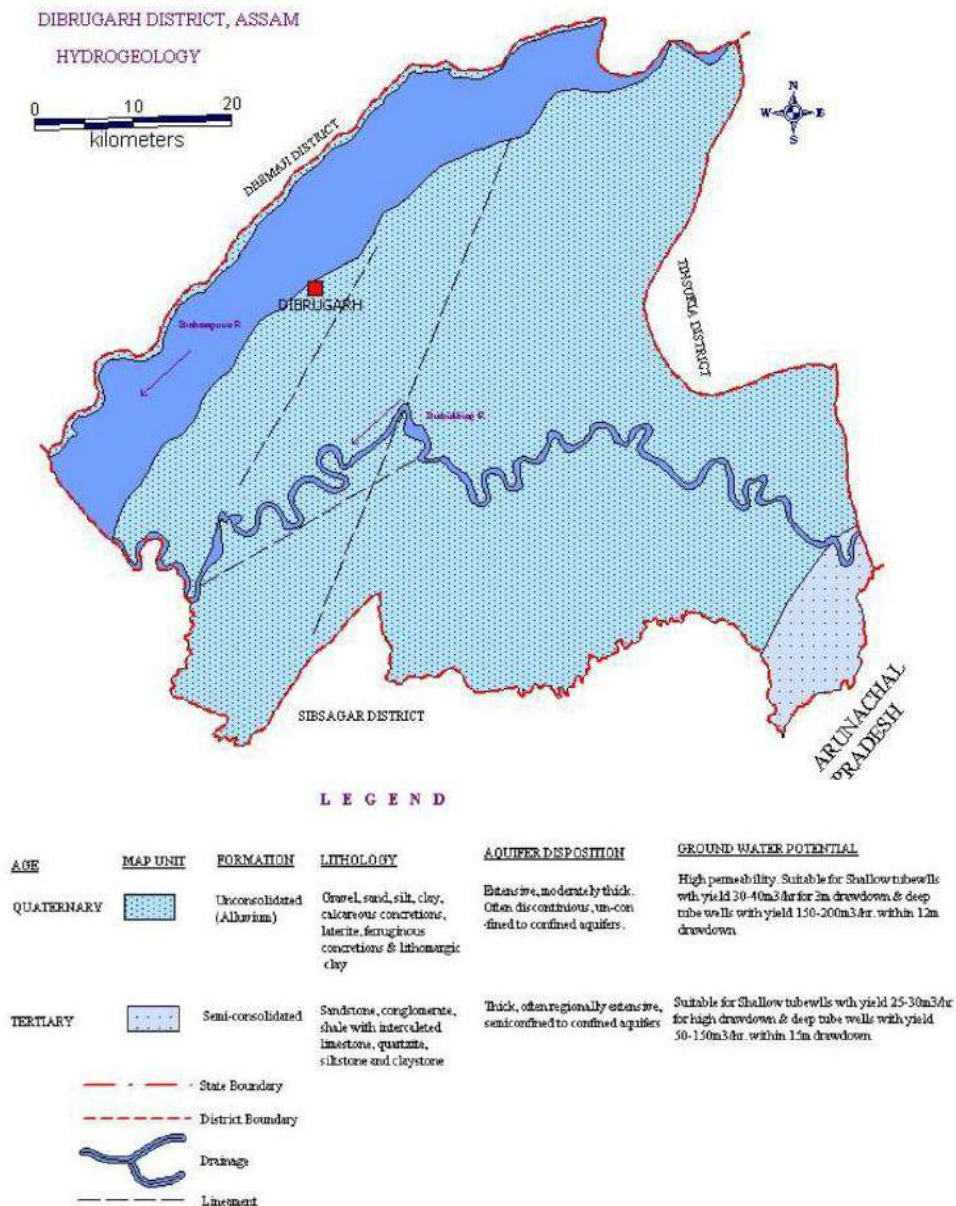
The topography and terrain of Dibrugarh, Assam, India includes:

- ❖ **Altitude:** The district ranges from 99 to 474 meters.
- ❖ **Gradient:** The area's gradient is from southeast to northwest.
- ❖ **Wetlands:** The district has many wetlands, including beels, marshes, and swamps.
- ❖ **Physiographic zones:** The area can be divided into three zones:
- ❖ **Active floodplain:** Includes the Brahmaputra's floodplain and charlands.
- ❖ **Middle plain:** Includes tributaries like the Dibru and Buri Dihing.
- ❖ **Vegetation:** The district mainly consists of wet evergreen forests, tropical moist deciduous forest, canebrakes and grasslands.
- ❖ **Rivers:** The Dihang River turns southwestward north of Dibrugarh, where it is joined by the Dibang and Luhit rivers. The Dibru River flows from NE to SW and meets with Brahmaputra River in the West

e) Water Course & Hydrology

Unconsolidated alluvial deposits of Quaternary Age cover major part of the district. Only about 4 % area of the district is underlain by semi consolidated formation of Tertiary Age belongs to Disang and Barail Groups of rock. A single system of aquifer (granular zone) below a thin clay cover on top is present mainly in the southern part of the district. In the northern part, this single aquifer system is separated into a multiple aquifer system by thick clay partings. Thickness of aquifer increases from east to west. Ground water in the shallow aquifer group exists in unconfined to semi confined condition. In general depth of tube wells varies from 35 to 45 m. The tube wells constructed down to a depth of 50 m yields 27 to 45 m³/hour. Hydrogeology of the district is depicted in Plate-II. Pre-monsoon depth to water level ranges from 0.16 to 4.23 m bgl. It is observed that Pre-monsoon depth to water level ranges from 2 to 4 m bgl in the southern part of the district i.e. Khowang, Joypur area and in a limited area in the northern part of the district i.e. parts of Lahoal, Borboruah and Tengakhat. But, in parts of Lahol and Panitola blocks, depth to water level goes upto 4 m bgl. Post-monsoon depth to water level ranges in this district from 0.14 to 5.693 m bgl.

Figure 11: Hydrogeological map of Dibrugarh District



f) Ground Water Development

As major part of the district is underlain by unconsolidated alluvial sediments, water level in 2-4 m bgl and as per exploration activity carried out by CGWB, state department as well as private party, whole district is feasible for construction of tube well for ground water development. As major part of the district covered by unconsolidated formation therefore, Rotary Rig is suitable for this area. In and around Namrup area covering Dillighat, Nagamati, Nagahat, Charaipung etc area bordering Dilli River/ Dilli R.F where boulder will encounter and therefore Percussion Rig is suitable. DTH rig with ODEX facility may be deployed but, this may restrict depth of drilling and therefore construction of shallow tube well is feasible in this area with such type of rig. As this area is acting as a recharge zone therefore, at least 25 to 30 m housing provision need to be kept during construction of well as expected drawdown will be high in this foot hill area. Depths of encountering boulder will vary from place to place. Beside Dilli River, bouldery formation starts almost from surface while boulders encounter approx. from 120 m bgl onwards as recorded at Dirialgaon at Joypur as per ground water exploration record of CGWB, NER. As major part of the district covered by loose formation the well assembly becomes essential to case the borehole with housing & slotted pipe. The range of slot size for the district varies from 1 to 1.5 mm. A shallow well assembly of 102 mm (4") diameter with 10 to 15 m slotted pipe is likely to yield upto 30 - 40 m³ /hr. for a drawdown of 3 to 4 m. This type of shallow tube well will command 3 to 4 ha land. In the southern part of the district i.e. in Khowang block, this type of well is likely to yield 15 to 30m³ / hour. The housing pipe for deep tube well drilled down to a depth of 100-150 m bgl and screening 30 to 50 m granular zone is likely to yield 90-120 m³ / hour for a drawdown of within 10 m. Pumping of shallow tube wells can be done by centrifugal pump. Only turbine or submersible pumps should be commissioned in deep tube wells because of higher lift involvement. The H.P. of prime movers for both shallow and deep tube wells is given in Table 3. Table 3. H.P. of Prime Movers Tubewell Discharge (lit/sec) Total head (m) Efficiency (y) H.P. Shallow 8.33 7.5 60 1.5 Deep 27.78 15.0 60 10

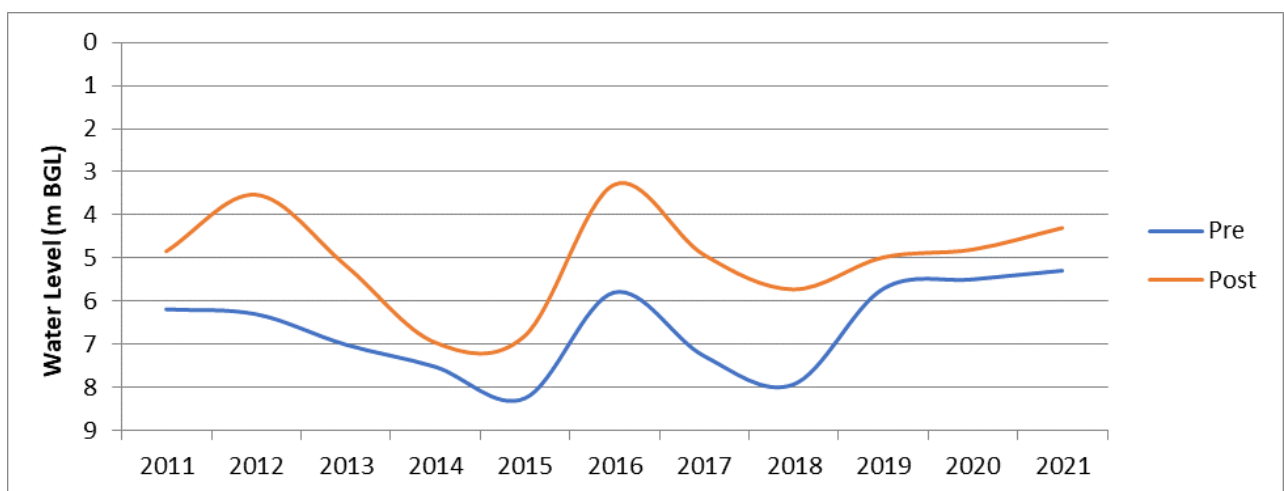


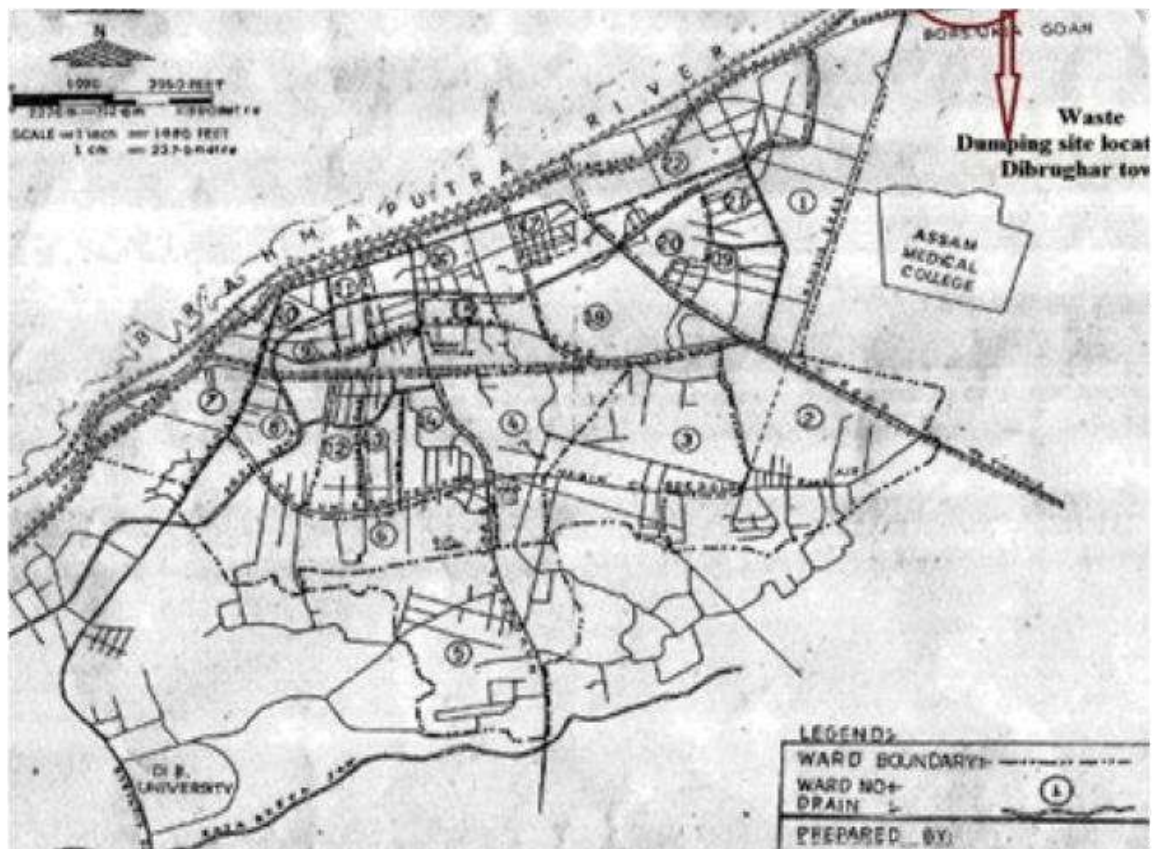
Figure 12: Graphical representation of pre-monsoon and post-monsoon water level data of Dibrugarh.

Over all stage of ground water development is 34% in the Birbhum district which implies safe stage (CGWB, 2017). Ground water resources estimation of 2013 (calculated using GEC 1997 Methodology) have been considered in case of Birbhum, West Bengal. However, the groundwater development status is not uniform throughout the district.

g) Drainage System

Dibrugarh, located on the south bank of river Dibru, a tributary of the river Brahmaputra, is vulnerable to recurrent flooding. Huge sediment load of Brahmaputra has resulted in continuous deposition of silt in the bed which has raised its level significantly. This has worsened the drainage system as water level of Brahmaputra has risen considerably. At present, the level of Dibrugarh town is 1.5m below the bed level of Brahmaputra the aquatic environment with its water quality is considered to be the main factor controlling the state of health and disease of aquatic organisms. The availability of water and its physico-chemical as well as biological composition determines the ability of aquatic environments to sustain healthy ecosystem. Deterioration occurs when a toxic product is added to the aquatic life that adversely affects its ability to dispose it off. In developing countries, only a small proportion of waste water produced by severed communities is treated. Therefore, the quality of water needs to be evaluated thoroughly to set up the baseline information for proper health of the inhabitants. Open sewage and poor drainage systems are a major threat to the human settlement around the globe. In our country, the majority of urban settlements still have no adequate facilities for disposing the wastes generated. There are several reasons to reconsider the present urban water and waste water policy including limitations of a conventional sanitary system, better understanding of nature and its principles gained during last decades, and the goal of society to achieve sustainable development [2]. Heavily populated areas are still facing increasing problem and carrying the risk of infectious diseases. There are several factors to consider when determining the opportunities for and constraints on the safe use, treatment and disposal of drainage water. Information and data desired at the site of drainage, water production include i) rate of drainage water production per unit area ii) concentration chemical constituents of health concern and iii) the rates of mass emission.

Figure 13: Drainage Map of Dibrugarh District



h) Demography

According to official Census 2011 detail of, a district of Assam has been released by Directorate of Census Operations in Assam. Enumeration of key persons was also done by census officials in Dibrugarh District of Assam. In 2011, Dibrugarh had population of 1,326,335 of which male and female were 676,434 and 649,901 respectively. In 2001 census, Dibrugarh had a population of 1,185,072 of which males were 613,555 and remaining 571,517 were females. Dibrugarh District population constituted 4.25 percent of total Maharashtra population. In 2001 census, this figure for Dibrugarh District was at 4.45 percent of Maharashtra population. There was change of 11.92 percent in the population compared to population as per 2001. In the previous census of India 2001, Dibrugarh District recorded increase of 13.68 percent to its population compared to 1991.

Out of total population, 50% of population lives in urban area and 60% lives in rural

Table: 06 Rural and urban data of Dibrugarh District

Description	Urban	Rural
Area(sq.km)	45.48	3335.52
Number of households	54453	222414
Total Population	243730	1082605
Population (%)	51.75%	49.17%
Male Population	126135	550299
Female Population	117595	532306
Sex Ratio	932	967
Literacy (%)	81.63%	63.33%

Table 07: Demographic distribution of Dibrugarh District Blockwise.

Taluk	Population	Area (km2)	Pop. Density	Sex-ratio
Dibrugarh East	270230	378.08	715	950
Tengakhat	220478	356.60	618	968
Naharkatiya	187408	465.88	402	959
Moran	169759	413.34	411	968
Chabua	159585	658.88	242	942
Dibrugarh West	159580	716.41	223	964
Tingkhong	159295	391.81	407	980

i) Cropping pattern

The cropping pattern in Dibrugarh, Assam, is characterized by a single cropping pattern due to the lack of a reliable irrigation system. The district's cropping intensity is categorized as follows:

Chabua: High intensity cropping (>140 percent) due to the presence of alluvial soil

Dibrugarh East, Moran, and Naharkatiya: Moderate intensity cropping (130-140 percent)

Dibrugarh West, Tengakhat, and Tingkhong: Low intensity cropping (<130 percent)

Some other factors that affect the cropping pattern in Dibrugarh include:

Rainfall

The district's climate is characterized by high humidity and seasonal rainfall and temperature patterns. Rainfall is the most important factor in the climate, with peak precipitation during the monsoon season (June–September) and little rainfall in the winter (December–February).

Soil

The soils in Assam are typically acidic, with a pH ranging from 4.2 to 5.8.

Irrigation

The lack of a reliable irrigation system is a major factor in the district's single cropping pattern. The predominant cropping systems in Dibrugarh is mainly rice mono-cropping, in few pockets rice- rice, rice-rapeseed (Toria), and rice-vegetables are followed.

j) Land Form and Seismicity

The landforms of Dibrugarh district in Assam, India include:

Flood plains: The majority of the district is covered by alluvial flood plains that are almost flat with gentle undulations.

Terrace deposits and denudational hills: These are located in the southeast part of the district and range in elevation from 115 to 350 meters above mean sea level (AMSL).

Brahmaputra River: This wide and braided river flows through the district.

Burhi Dihing River: This major tributary of the Brahmaputra flows through the district from east to west.

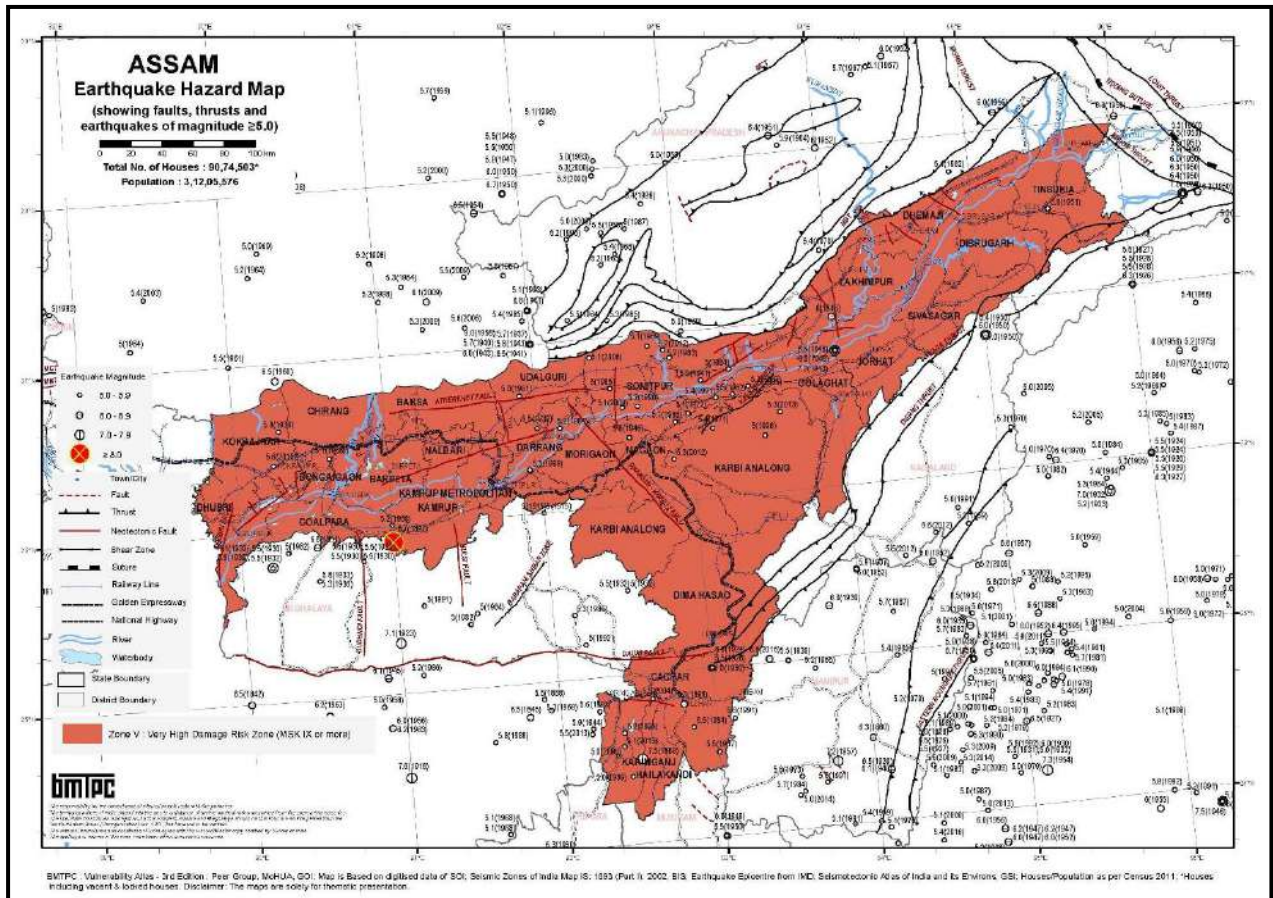
Tropical rainforest: A large tract of tropical rainforest is located in the eastern and southern regions of the district.

Southern foothills: These include isolated hillocks and plain embayments.

The district has a subtropical monsoon climate with warm, humid summers and mild winters. The annual rainfall ranges from 2,300 to 3,800 mm (91 to 150 in). The Dibrugarh district is a plain district of Assam. The entire is flat with gradual slope from the East Arunachal hills to the West. The soil of the district is mostly fertile Alluvial soil and this adjoining with the river Brahmaputra are composed sand and clay in varying proportion.

In Dibrugarh earthquake hazard is classified as medium according to the information that is currently available. This means that there is a 10% chance of potentially-damaging earthquake shaking in your project area in the next 50 years. Based on this information, the impact of earthquake should be considered in all phases of the project, in particular during design and construction. Project planning decisions, project design, and construction methods should take into account the level of earthquake hazard. Further detailed information should be obtained to adequately account for the level of hazard.

Figure 14: Earthquake zonation map of Assam



(Source: Vulnerability Atlas of India, Assam)

k) Flora

India is one of the 17 mega-biodiverse countries in the world, accounting for 7-8% of recorded species. The state of Assam is a component of the Eastern Himalayan Biodiversity Region. It is one of the two "hot spots" for biodiversity in the country. The climatic conditions and the diversity of physical features found in Assam have resulted in diverse ecosystems such as forests, grasslands, wetlands that inhabit and sustain a wide variety of floral and faunal diversity. (<https://assam.gov.in/>)

Table 08: Some citable flora of the district

Sl. No.	Local Name	Species Name
1	Chikamorolia	<i>Alangium chinense</i> (L) Harms.
2	Boga koroï	<i>Albizzia procera</i> Benth
3	Tang	<i>Aleurites fordii</i> Hemsl
4	Chotiona	<i>Alstonia scholaris</i> (L) R Br.
5	Jutulitenga	<i>Altingia excelsa</i> Bl.
6	Sasi	<i>Aquilaria malaccensis</i> Benth
7	Tolothapoka	<i>A. humilis</i> Vahl.
8	Cham kothal	<i>Artocarpus chaplasha</i> Roxb.
9	Leteku	<i>Baccaurea sapida</i> Muell. & Arg
10	Sahpat	<i>Camellia sinensis</i> (L) Kuntze.
11	Dhuna	<i>Canarium bengalense</i> Roxb
12	Hingori	<i>Castanopsis indica</i> A.Dc.
13	NogaDalchini	<i>Cinamomum obtusifolium</i> Nees
14	Gondhkoroï	<i>C. cicieodaphane</i> Meissn.
15	Kako Bah	<i>Dendrocalamus hamiltonii</i> Nees&Arn
16	KenduGach	<i>Diospyros lanceaefolia</i> Roxb.
17	Koliori	<i>D. variegata</i> Kurz.
18	Holong	<i>Dipterocarpus retusus</i> Bl
19	Amsia	<i>Drimycarpus recemosus</i> (Roxb) Hk.F
20	Bandardima	<i>Dysoxylum binectiferum</i> (Roxb.) Hook.
21	Gendheli Poma	<i>D. alliarium</i> (Buch-Hm.)Balakr
22	Lali amari	<i>D. Procerum</i> Hiern
23	Khokon	<i>Duabanga grandiflora</i> (Roxb.ex DC.)
24	Rudraksha	<i>Elaeocarpus ganitrus</i> Roxb
25	Thekera	<i>Garcinia cowa</i> Roxb
26	RupohiThekera	<i>G. lanceaefolia</i> (Roxb)
27	Teportenga	<i>G. xanthochymus</i> Hk.f
28	Kathbadam	<i>Juglans regia</i> Linn.
29	Ajar	<i>Lagerstroemia speciosa</i> (L) Pers.
30	Petarichua	<i>L. elongata</i> Benth and Hook.
31	Mezankori	<i>Litsea citrata</i> Bl.
32	Bonhualu	<i>L. laeta</i> Benth&Hook.f
33	Baghnola	<i>L. sabifera</i> .Pers.
34	Machpora	<i>Maesa indica</i> Wall.
35	Doloi Chopa	<i>Magnolia sphenocarpa</i> Hook.f. & Th
36	Moroliagach	<i>Mallotus alba</i> Muell & Arg.
37	Senduri Guti	<i>M.philippensis</i> (Lam) Muell&A
38	Aam	<i>Mangifera indica</i> L
39	Nahor	<i>Mesua ferrea</i> L.
40	Titachopa	<i>Michelia champaca</i> Linn
41	Borhmothuri	<i>Michelia hodgsonii</i> Hooker f. & T.
42	Kothalchopa	<i>M. manii</i> King
43	Ful chopa,	<i>M. oblonga</i> Wall ex H.Kf. Thomas.

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44	Bokol Bih	<i>Millettia cinerea Benth</i>
45	Bonsum	<i>Phoebe lanceolata Nees</i>
46	Titasachi	<i>Polyalthia jenkinsii Benth</i>
47	Gohora	<i>Premna bengalensis Clarke</i>
48	Bon bogori,	<i>P. lanceafolium Roxb</i>
49	Borkora	<i>Sapium baccatum Roxb.</i>
50	Mekai	<i>Shorea assamica Dyer.</i>
51	Hijol	<i>Sterculia balanghuas linn.</i>
52	Udal	<i>S.villosa Roxb.</i>
53	Borjamuk	<i>Syzigium cumini(L) Skeel.</i>
54	KutahiJamuk	<i>S.fruticosum Roxb DC.</i>
55	Khorokiachopa	<i>Talauma phelloocarpa King.</i>
56	Dolo Bah	<i>Teinostachyum dullooa Gamble.</i>
57	Bhumuraguti	<i>Terminalia belerica Roxb.</i>
58	Hilikha	<i>T.chebula Retz.</i>
59	Holokh	<i>T. Myriocarpa Heruk & Muell.</i>
60	Morsal.	<i>Vatica lanceafolia Blume.</i>
61	Bhaluka	<i>Bambusa balcooa</i>
62	Kotoha,Kotabanh	<i>Bambusa bambos</i>
63	Beti banh	<i>Bambusa mastersii.</i>
64	Deobanh,Jotia,	<i>Bambusa nutans</i>
65	Bijuli,Jowa,Makal.	<i>Bambusa pallida</i>
66	Bhaluki, paura	<i>Bambusa teres</i>
67	Jati, Nal banh.	<i>Bambusa tulda</i>
68	Karail, Jati	<i>Dendrocalamus strictus</i>
69	Worra	<i>Dendrocalamus giganteus.</i>
70	Kakoa,Kakeo banh	<i>Dendrocalamus hamiltonii.</i>
71	Madang	<i>Schizostachyum pergracile</i>
72	Behti banh	<i>Schizostachyum griffithii</i>
73	Dalu banh	<i>Schizostachyum dullooa</i>
74	Bajal banh, bajah banh.	<i>Schizostachyum polymorphum</i>
75	Jati Bet	<i>Calamus tennuis</i>
76	Raidang Bet	<i>Calamus flagellum</i>
77	Futkola	<i>Blastus cochinchinensis Lour</i>
78	Riha	<i>Boehmeria niivea(L) Gaud.</i>
79	Raidang bet	<i>Calamus jenkinsiana Griff.</i>
80	Jatibet	<i>Calamus tenuis</i>
81	Bonmola	<i>Calicarpa arborea Roxb.</i>
82	Tea	<i>Camellia sinensis (L)Kuntze.</i>
83	Bon kecheru	<i>Casearia veraca Roxb.</i>
84	Joratenga	<i>Citrus aurantium Linn.</i>
85	Nefafu	<i>Clerodendron colebrookianum</i>
86	RongaPhutukola	<i>Melastoma malabethricum Linn.</i>
87	Kauri kiat	<i>Mimosa himalayana Gamble.</i>
88	Akalbih	<i>Morinda angustifolia Roxb.</i>

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89	Korobi	<i>Nerium indicum</i> Mill.
90	Garo Iota	<i>Pericampylus incanus</i> (Colebr) Meirs.
91	Titaful	<i>P. curviflora</i> Nees.
92	Kola bahok	<i>Phyllanthus glauca</i> Wall.
93	Ram tamul	<i>Pinanga gracilis</i> (L) Blume.
94	Modhumola	<i>Roydsiasua violense</i> Roxb.
95	Bajal Banh	<i>Schizostachyum polymorphum</i> (Munro).
96	Borvekruri	<i>Solanum khasianum</i> C.B.C.
97	Jengoo pat	<i>Zallacca secunda</i> Griff.
98	Bon Bogori	<i>Zizyphus Rugosa</i> Lamk.
99	Araceae	<i>Alocasia forniculata</i> (Roxb) Scott.
100	Zingiberaceae	<i>Alpinea bracteata</i> Roxb.
101	Aracaceae	<i>Apostasia nuda</i> Br.
102	Poaceae	<i>Aristida fusca</i>
103	Poaceae	<i>Arundinella leptochloa</i> (Nees ex Steud.) Hook.f
104	Acanthaceae	<i>Barleria cristata</i> Lin.
105	Begoniaceae	<i>Begonia roxburghii</i> A Dc.
106	Gentianaceae	<i>Canscora andrographioides</i> Griff.
107	Chloranthaceae	<i>Chloranthus officinalis</i> Bl.
108	Acanthaceae	<i>Codonacanthus pauciflorus</i> Nees.
109	Araceae	<i>Colocasia affinis</i> Schott.
110	Commelinaceae	<i>Commelina obliqua</i> .Ham.
111	Zingiberaceae	<i>Costus speciosus</i> (Koen) Smith.
112	Hypoxidaceae	<i>Curculi goorchioides</i> Gaert.
113	Orchidaceae	<i>Cymbidium flexus</i> Nees.
114	Liliaceae	<i>Dracaena petiolata</i> Hk.f&T.
115	Acanthaceae	<i>Ebermaiema stacerogyne</i> Nees.
116	Ericaceae	<i>Elatostema acummatum</i> Brog.
117	Asteraceae	<i>Eupatorium wallichii</i> Dc.

1) Fauna

Table 09: Some citable Mammalian fauna of the district

Sl. No.	Vernacular Name	Scientific Name
Mammalian fauna		
1	Chinese Pangolin	<i>Manis pentadactyla</i>
2	Flying fox	<i>Pterocarpus giganteus</i>
3	Slow Loris	<i>Nycticebus bengalensis</i>
4	Stump-tailed Macaque	<i>Macaca arctoides</i>
5	Assamese Macaque	<i>Macaca assamensis</i>
6	Northern Pig-tailed Macaque	<i>Macaca leonina</i>
7	Pig tailed macaque	<i>M. nemestrina</i>

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8	Rhesus Macaque	<i>Macaca mulata</i>
9	Capped Langur	<i>Trachypithecus pileatus</i>
10	Western Hoolock Gibbon	<i>Hoolock hoolock</i>
11	Asiatic black bear	<i>Ursus thibetanus</i> (Schedule-1)
12	Malayan Sunbear Sloth Bear	<i>Melursus ursinus</i>
13	Indian Wild Dog (Dhole)	<i>Cuon alpinus</i>
14	Yellow throated marten	<i>Martes flavigula</i>
15	Hog Badger	<i>Arctonyx collaris</i>
16	Binturong	<i>Arctictis binturong</i>
17	Jackal	<i>Canis aureus</i>
18	Jungle Cat	<i>Felis chaus</i>
19	Fishing Cat	<i>Prionailurus viverrinus</i>
20	Golden Cat	<i>Catopuma temminckii</i>
21	Leopard Cat	<i>Prionailurus bengalensis</i>
22	Marble Cat	<i>Pardofelis marmorata</i>
23	Clouded Leopard	<i>Neofelis nebulosa</i>
24	Common Leopard	<i>Panthera pardus</i>
25	Royal Bengal Tiger	<i>Panthera tigris</i>
26	Asian Elephant	<i>Elephus maximus</i>
27	Wild Pig	<i>Sus scrofa</i>
28	Sambar	<i>Cervus unicolor</i>
29	Indian Muntjac	<i>Muntiacus muntjak</i>
30	Small Indian Civet	<i>Viverricula indica</i>
31	Large Indian Civet	<i>Viverra zibetha</i>
32	Common Palm Civet	<i>Paradoxurus jerdoni</i>
33	Masked Palm Civet	<i>Paguma larvata</i>
34	Crab Eating Mongoose	<i>Herpestes urva</i>
35	Grey Mongooses	<i>Herpestes edwardsii</i>
36	Small Asian Mongoose	<i>Herpestes javanicus</i>
37	Small Asian Clawed Otter	<i>Amblonyx cinereus</i>
38	Gaur (dung and tracks).	<i>Bos gaurus</i>
39	Serow	<i>Capricornis sumatraensis</i>
40	Malayan Giant Squirrel	<i>Ratufa bicolor</i>
41	Hoary-bellied Himalayan Squirrel	<i>Callosciurus pygerythrus</i>
42	Pallas' red-bellied squirrel	<i>Callosciurus erythraeus</i>

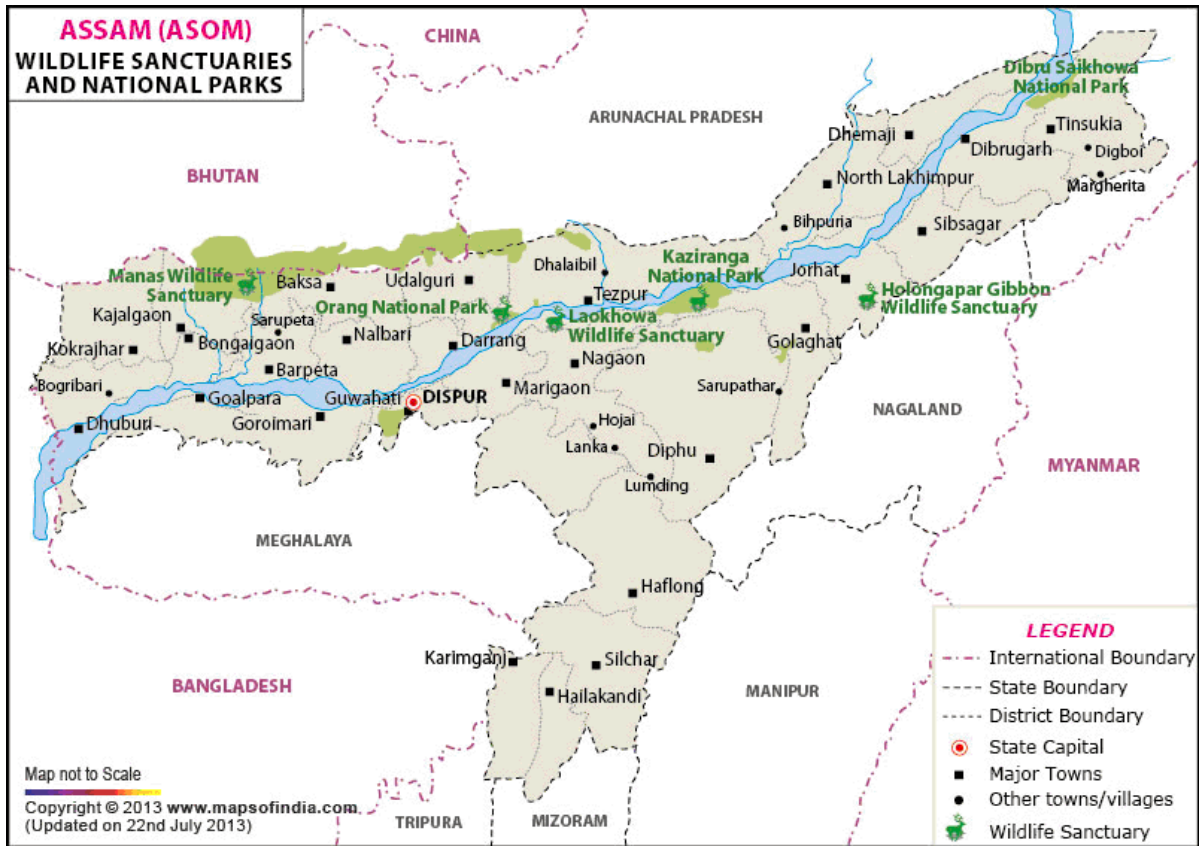
(Source: Forest division of Dibrugarh district)

Table 10: Some citable avian fauna of the district

Sl. No.	Vernacular Name	Scientific Name
Avian fauna		
1	Red Jungle Fowl	<i>Gallus gallus</i>
2	White-cheeked Partridge	<i>Arborophila atrogularis</i>
3	Rufous-throated Partridge	<i>Arborophila rufogularis</i>
4	Kaleej Pheasant	<i>Lophura leucomelanos</i>
5	Grey Peacock Pheasant	<i>Polyplectron bicalcaratum</i>
6	Barred Buttonquail	<i>Turnix suscitator</i>
7	Small Buttonquail	<i>Turnix sylvatica</i>
8	Blue-breasted Quail	<i>Coturnix chinensis</i>
9	Black Francolin	<i>Francolinus francolinus</i>
10	Swamp Francolin	<i>Francolinus gularis</i>
11	Ruddy Shelduck	<i>Tadorna ferruginea</i>
12	White-wing Wood Duck	<i>Cairina scutulata</i>
13	Lesser Whistling Teal	<i>Dendrocygna javanica</i>
14	Openbill stork	<i>Anastomus oscitans</i>
15	Lesser Adjutant Stork	<i>Leptoptilos javanicus</i>
16	Cattle Egret	<i>Bulbulcus ibis</i>
17	Little Egret	<i>Egretta arzetta</i>
18	Large Egret	<i>Casmerodius albus</i>
19	Little Heron	<i>Butorides striatus</i>
20	Indian Pond Heron	<i>Ardeola grayii</i>
21	Cinnamon Bittern	<i>Ixobrychus scinnamomeus</i>
22	Yellow Bittern	<i>Ixobrychus sinensis</i>

(Source: Forest division of Dibrugarh district)

Figure 15: District location with respect to Wild Life Sanctuary of Assam



CHAPTER 4: PHYSIOGRAPHY OF THE DISTRICT

4.1 General Landforms

Dibrugarh, a city in the state of Assam in India, is located in a valley along the Brahmaputra River. The general landforms of the Dibrugarh district include: Wet evergreen forests, Tropical moist deciduous forests, Canebrakes, and Grasslands. The Dibrugarh district is situated between 27° 5' 38" N to 27° 42' 30" N latitude and 94° 33' 46" E to 95° 29' 8" E longitude at an altitude between 99 and 474 metres. The Physiography of the district of Dibrugarh is constituted by a variety of elements such as flood plain, swamps and beels and occasional highlands

The state of Assam is divided into three geographical units:

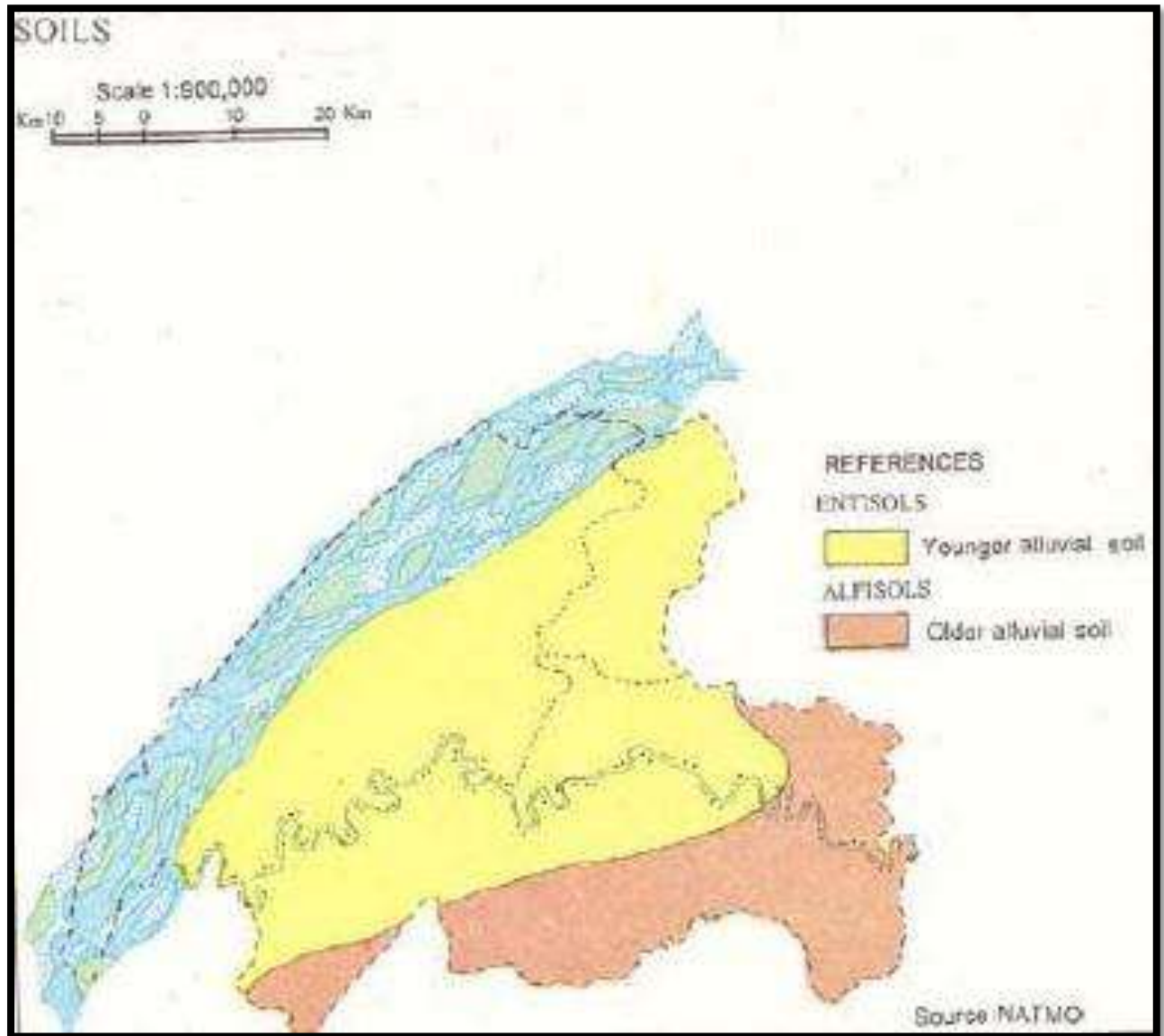
- The Brahmaputra valley in the north
- The Central Hilly Regions of Karbi-Anglong and North Cachar
- The Barak Valley in the south
- The region is flat with a gradual slope from the East Arunachal hills to the west.

4.2 Soil and rock pattern

The District is characterized by sedimentary rock formations of different ages, ranging between Eocene and Pleistocene and are exposed mainly along the foot hills bordering the southern boundary of this Division. The eastern part of the Division and the valley of the Brahmaputra River are covered by thick alluvial deposits belonging to sub-Recent and recent periods. The Brahmaputra valley in this district is of a nature of a "ramp valley" developed during the simultaneous upheavals of the Himalayas on the north and northeast and the Patkai ranges on the south and southeast. The thick sedimentary rocks of the Tertiary period have been buckled and over thrust due to the tectonic forces directed towards south from the Himalayas and to the northwest from the Shan-Burma Plateau region consequent on the upheavals. Eventually the tertiary rocks along the Patkai ranges were structurally disposed along several folded anticlines, often cut off by several parallel imbricating thrusts viz. Naga thrust, Haflong - Disang thrust and Margherita thrust. Naga thrust passes along the northern edge of the Jaipur-Tipam-Digboi range of hills bordering the alluvial plains of Brahmaputra on the north. The next important one is the Haflong Disang thrust which runs East North East (E.N.E.), along the northern base of the Namsang -Barduria hills, south of Jaipur and continue further eastward along the southern boundary of the Makum coal-field. In between the above two, there is another thrust known as the Margherita thrust running along the northern boundary of the Makum coalfield. The thrust finally merges with Disang thrust near Dirak towards the west. The region forming the Jaipur Digboi region consists of Upper Tertiary rocks with Tipam sand stone stage, which is characterized by oil deposits. Soils of the area are sandy to clayey loam type and grayish in color. They are acidic in reaction with PH ranges from 4.6 to 5.9. They are also characterized by low to medium phosphate and medium to high potash content. Based on pedogenic and pedological characters, soils of this area may be classified into following classes a) Recent riverine alluvial soils (Antisol) b) Old riverine alluvial soils (Inceptisol) c) Old Mountain valley alluvial soils (Alfisol). The soil formation in most of the tracts can be attributed to alluvial deposits brought down by the river Brahmaputra towards the north eastern portion and Buri Dihing River in the south western portion. The alluvial deposits of the Brahmaputra River are characterized by shallow surface layer of silty loam and grey colour with subsoil of coarse sand mixed with pebbles and boulders. The alluvial deposits of the Dihing River are characterized by its coarse nature reddish color and sandy clay.

The soil is of considerable depth. The soil of the Brahmaputra alluvial is acidic the pH value being 5.5

Figure 16 Soil Map of the District



The soil in Dibrugarh, Assam, India has the following characteristics:

- ❖ **Type:** The soil is sandy to clayey loam, and is grayish in color.
- ❖ **pH:** The soil is acidic, with a pH value ranging from 4.6 to 5.9.
- ❖ **Phosphorus:** The level of phosphorus in the soil varies from low to high.

Suitability for crops: The soil is suitable for a variety of crops and horticulture crops, including rice, wheat, maize, pulses, oilseeds, sugarcane, potato, jute, banana, coconut, areca nut, orange, and pineapple.

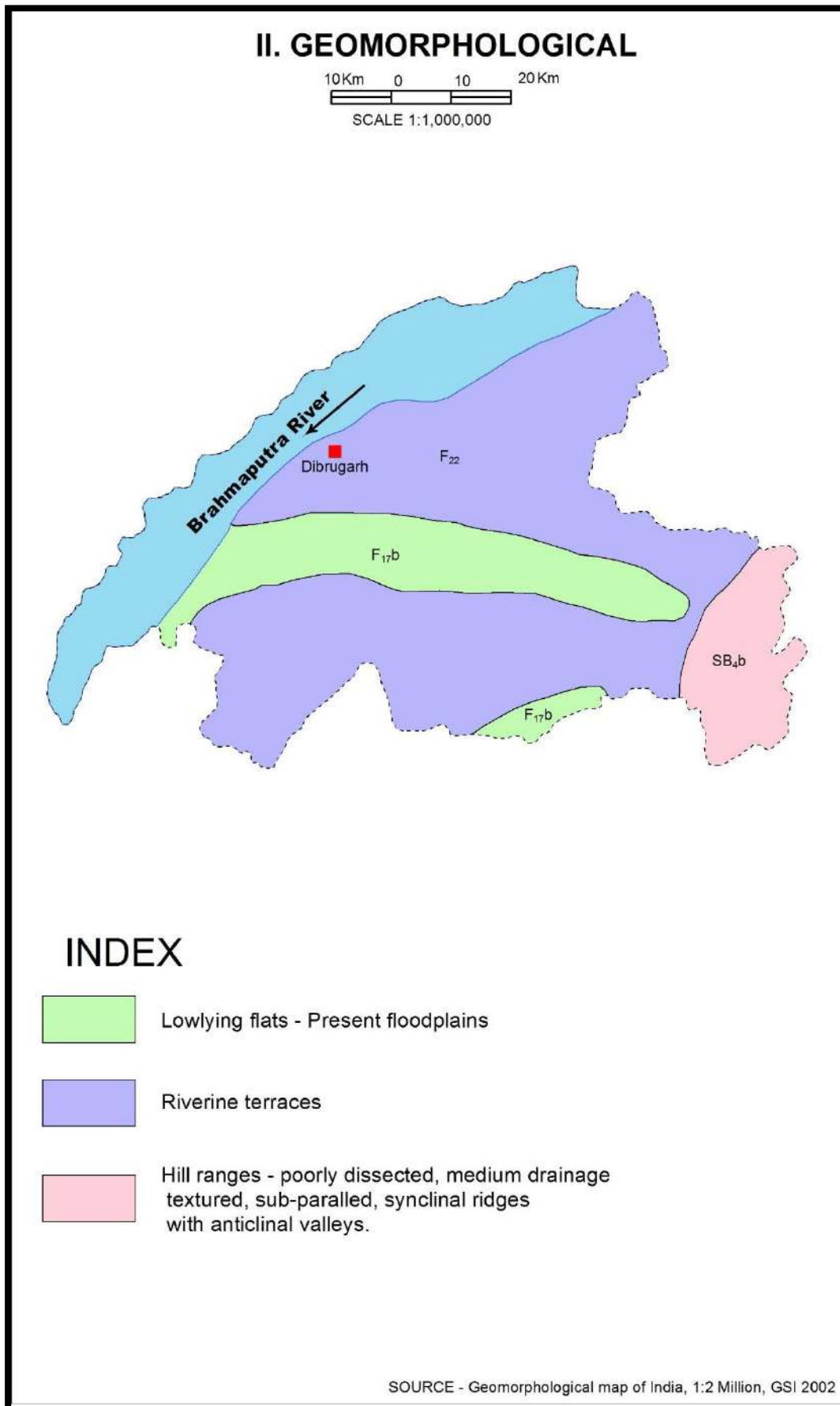
The soil in Dibrugarh is found in two different land forms: the flood plain of the Brahmaputra River and the terrace deposits and denudational hills in the southern part.

Soil organic carbon was medium to high. Nutrient index value for available nitrogen and phosphorus was low to medium range. Available potassium content was low and sulphur and zinc content was found medium in all the samples but available boron was in low to medium index level

4.3 Different geomorphologic units

The district is occupied with two different land forms namely- (1) Flood plain of Brahmaputra River and (2) the terrace deposits and denudational hills in the southern part. (1) Flood plains: The alluvial flood plains occupying the maximum part of the district is almost flat, except gentle undulations at places. Land elevation of the land ranges between 86.88 m and 152 m above msl. General slope is towards west and south west. (2) The terrace deposits and denudational hills: This present in the south eastern part of the district, range in elevation from 115 to 350m AMSL and rise upto 500m AMSL in Tikak Parbat area. The regional trend of the hills is NE-SW. Soils of the area are sandy to clayey loam type and grayish is color. They are acidic in reaction with PH ranges from 4.6 to 5.9. They are also characterized by low to medium phosphate and medium to high potash content. Based on pedogenic and pedological characters, soils of this area may be classified into following classes a) Recent riverine alluvial soils (Antisol) b) Old riverine alluvial soils (Inceptisol) c) Old Mountain valley alluvial soils (Alfisol)

Figure 17: Geomorphological Map of Dibrugarh district



CHAPTER 5: LAND USE PATTERN OF THE DISTRICT

The land use and land use change in forests was assessed and compared among two assessment base years of 2005-2006 and 2015-2016. The analysis of data reveals that the maximum Area are under Wetlands and natural inlands also show massive reduction in their total land area, when assessed with respect to their base year i.e. 2005-2006. Due to increase in grazing activities, the area under grasslands and grazing lands has also reduced significantly. Owing to increase in population, urbanization and industrialization, there is an ever increasing demand of land to cater to the requirements. As a result, significant area under forest has been transformed to build up areas for both rural and urban settlements. Due to increase in agricultural practices, the area along the forest fringe has also witnessed major shift. Due to anthropogenic pressure, the areas under forests have also significantly deteriorated. The total geographical area of the district is 3,33,036 Ha out of which 38.22% is cultivable, 8.5% is forest, 51.32% is under non-agricultural use and 2.12% is barren/waste land. Area under pasture is very negligible and marginally productive due to prevailing system of open grazing since long without adding any nutrient. This area is required to be given special attention for corrective treatment to enhance the productivity. The following table gives the block wise information on land use pattern.

Table 11: Land use pattern in Dibrugarh district

Name of Block	TGA	Area Under Agriculture				Area Area		
		GCA	NSA	AST	CI (%)	under Forest (Ha)	Area under Wasteland (Ha)	under other uses (Ha)
Barbaruah	43369	23560	17313	6247	136.08	10630	806	14620
Lahoal	70527	37674	22227	15447	169.50	980	1307	46013
Panitola	26950	13510	10140	3370	133.23	2929	1179	12702
Tengakhat	52912	33820	23413	10407	144.45	4472	928	24099
Khowang	42723	29179	19793	9386	147.42	3750	820	18360
Tingkhong	47727	21157	15326	5831	138.05	2840	946	28615
Joypur	48828	29792	19101	10691	155.97	2841	1098	25788
Total	333036	188692	127313	61379	148.21	28442	7084	170197

TGA- Total Geographical Area, GCA- Gross Cropped Area, NSA- Net Sown Area, AST- Area Sown more than once, CI- Cropping Intensity

DISTRICT SURVEY REPORT OF DIBRUGARH DISTRICT, ASSAM

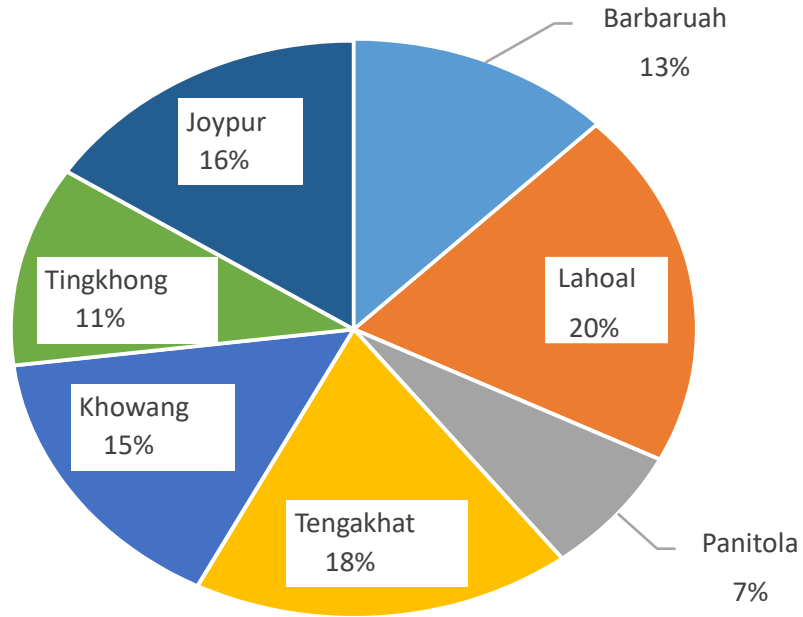


Figure 18: Block wise share of gross cropped area in Dibrugarh

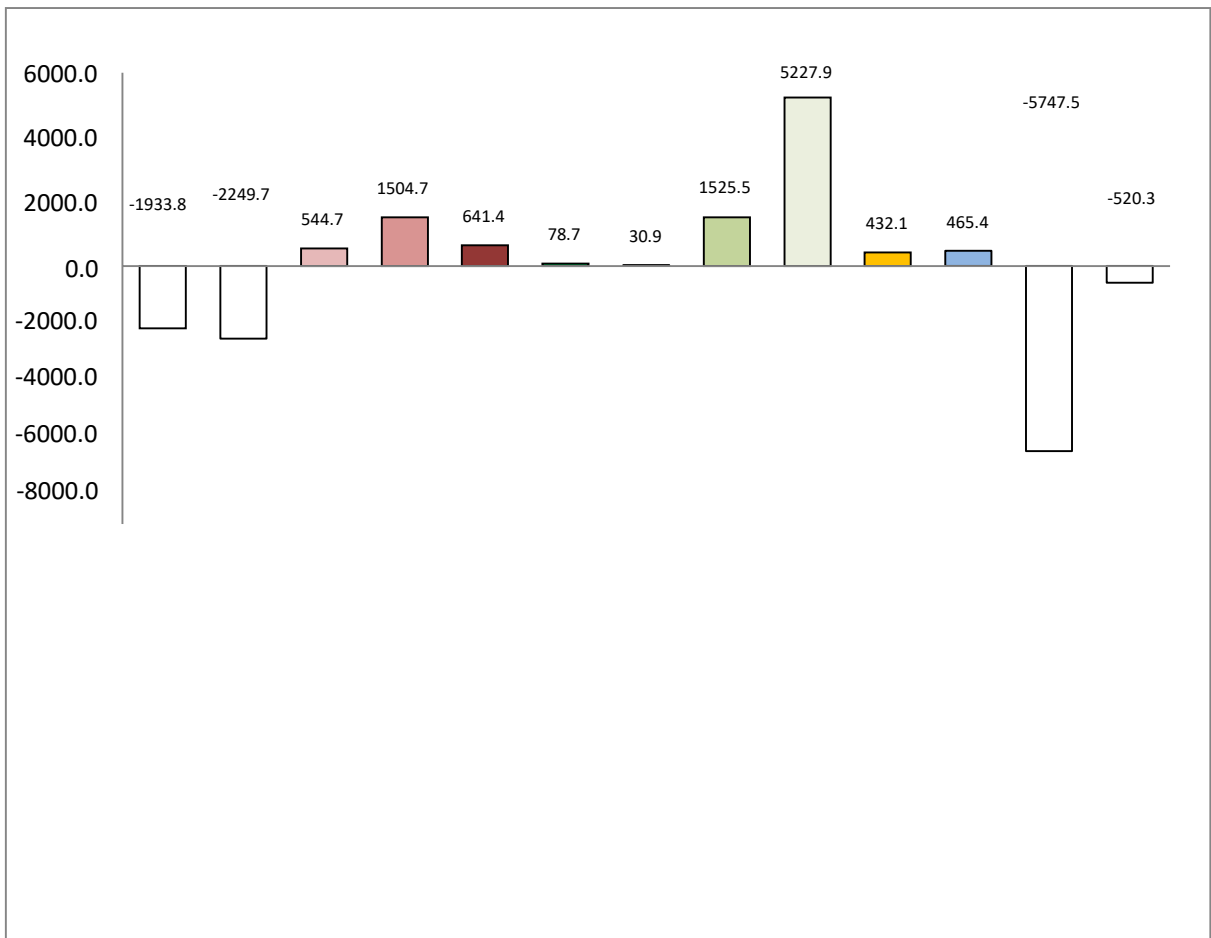


Figure 19: Graph showing extent of changes (Ha) in LULC detected between 2005-2006 and 2015-2016

Figure 20: Land Use Land Cover Map of Dibrugarh division in 2005-2006 and 2015-2016

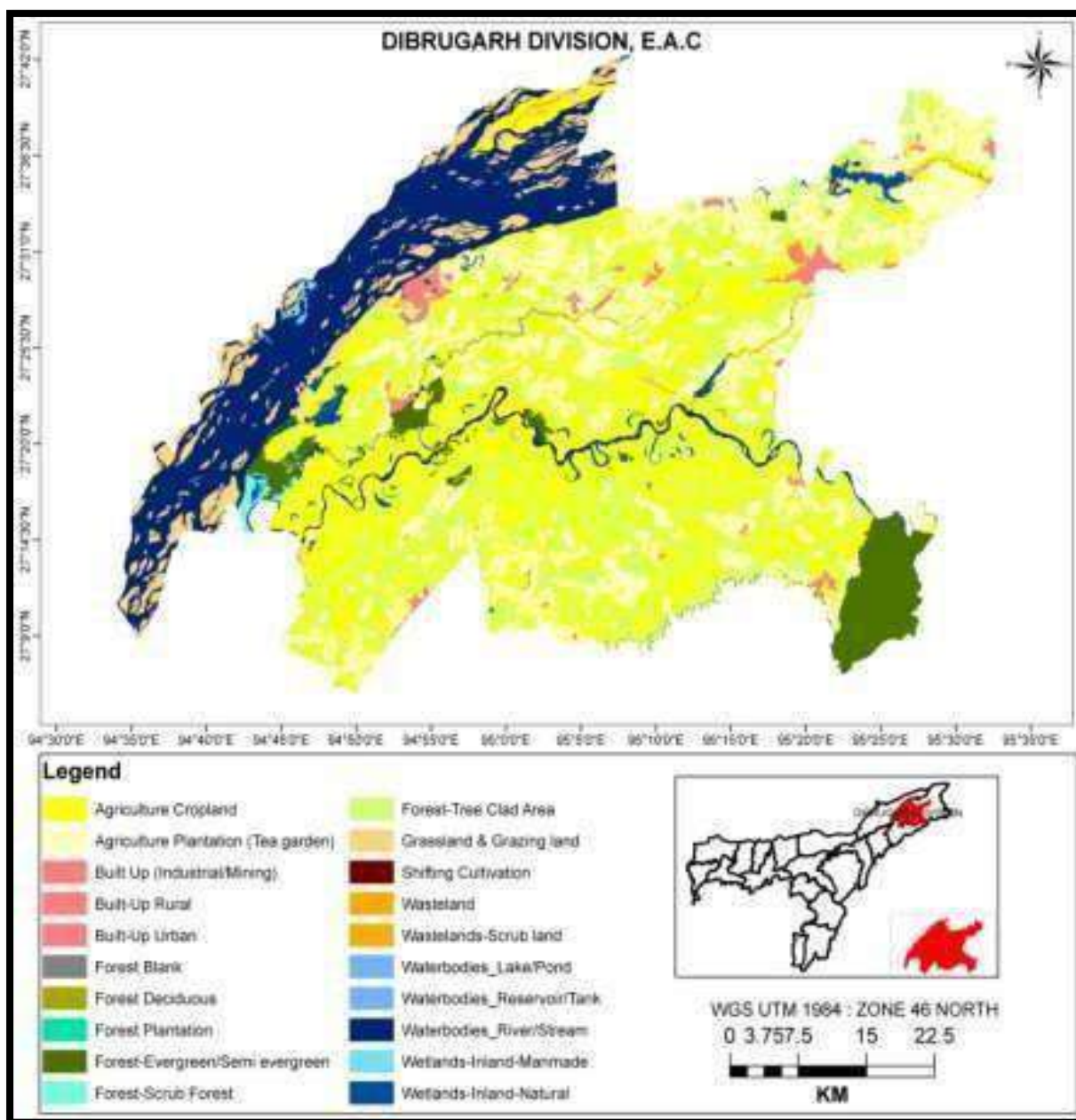


Table 08 shows the distribution of agricultural land, both irrigated and non-irrigated land in different blocks of Dibrugarh district. More than 30% of the district is cultivated, with homestead lands accounting for 19.6%, plantations for 15.76%, deciduous forests for 6.78%, and grasslands for 5.58%.

Forest -detail of the district

The Dibrugarh district of Assam, India is home to several forests, including national parks and wildlife sanctuaries

DISTRICT SURVEY REPORT OF DIBRUGARH DISTRICT, ASSAM

Area of forest under different legal classes: The Reserved Forests have been constituted under the relevant provisions of Assam Forest Regulation, 1891 and the Indian Forest Act, 1927. The total area under Reserved Forest of this Division, as per Working Plan survey, comprising five Reserved Forests and distribution of area into various Ranges along with the notification numbers and dates are presented in Table 2.1a

Table 12: Forests and distribution of area into various Ranges along with the notification numbers and dates

Sl. No.	Name of RFs	Govt. Notification No.	Notification Date	Area (Ha.)
1.	Dihingmukh RF	No. 22 dt.	31 st March 1887	5747.20
	1 st addition to Dihingmukh RF	No. 4146R	12 th July 1905	71.84
	2 nd addition to DihingmukhRF	No. FRS.257/83/3	26 th September 1983	60.00
2.	Jokai RF	No. 32	27 th May 1887	1848.01
3.	Joypur RF	No. 137	19 th October 1888	10,534.40
	1 st addition to Joypur RF	No. FOR SETT/277/57/28	24 th August 1959	198.20
	2 nd addition to Joypur RF	No. FOR/ SETT/372/66/6	5 th May 1969	144.00
4.	Namdang RF	No. 8010F	3 rd November 1919	1858.63
5.	Telpani RF	No. 3084R	30 th August 1921	1332.288
TOTAL				21,794.648

Padumani RF notified vide no. 929R dated 20th March 1916 and Bherjan RF notified vide No. 2984R dated 29th August 1916 has been declared as Wildlife Sanctuary vide Govt. No. FRW.17/99/46 dt. 30/10/1999. The compartment wise area perimeter under different RFs in Dibrugarh Division is shown in Annexure 1b

Diversions: Out of the total forestland of 21,794.648 hectare, an area of 110.272 hectare of forestland has been diverted under FRA 2006 and 63.4916 hectare has been diverted for non-forestry purposes. Details provide in table 2.1.1a and 2.1.1b.

2.1.1a Forest Rights Act: Forest Rights as per the Scheduled Tribes and Other Forest Dwellers (Recognition of Forest Rights) Act, 2006 has been implemented under this Division. A total of 11 numbers of Tribal Forest Villages were taken for consideration. FRCs were constituted for the said 11 numbers of Forest villages. Already titles were issued for 3 numbers of Forest Villages, namely, 1) 20 Ghoria Kachari F.V. in Jokai RF, 2) 12 Ghoria Missing Forest Village, and 3) Naharoni Forest Village in Dihingmukh RF. Claims for other Forest Villages are in progress.

Title issued (Claim accepted): a) Naharani Forest Village and 12 Ghoria Jokai Tangia 29 (individual) and 9 (community).

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Table 13: Status of forestland diverted under Forests Rights Act 2006 in Dibrugarh Division

Claim submitted				Claim accepted				Claim pending				Claim rejected
Individual		Community		Individual		Community		Individual		Community		
No.	Area (Ha)	No	Area(Ha)	No	Area(Ha)	No	Area (Ha)	No	Area(Ha)	No	Area (Ha)	
733	778.2833	29	6.4125	103	108.562	9	1.710	620	669.7213	14	4.7025	10

- Diversion of Forests to non-forest purposes: Forestland under this Division have been diverted to non-forest purposes. The status of diversion of forestland to non-forest purposes is shown

Table 14: Status of forestland diverted for non-forest purpose in Dibrugarh Division

Sl. No.	Location	Name of User Agency	Area (in Ha)	Purpose	CA Area (Ha) allotted	Remarks
1	Joypur R.F.	Assam Power Project Development Company Ltd. (APPDCL)	22.1072	Construction of IMW Desang Hydro Power Project on Dilli River in Joypur R.F. (2010)		The Regional Office, GoI. MoEF&CC, Shillong has taken decision to close the diversion proposal and delete from the pending list for non-furnishing of essential information by User Agency.
2		M/s B.K. Enterprise, Lakhtokia, Guwahati -1	2.5	Lease permission for a period of 10 years for collection of stone from Dilli River of Joypur R.F.		Area handed over to User Agency. (<i>period already expired</i>)
3		Assam Power Generation Corporation Ltd. Namrup	0.069	Construction of a New Raw Water Intake Pump House at Dilli River	1.00	Area handed over the User Agency
4	Dihingmukh R.F.	N.F. Railway, Dibrugarh	4.38	Construction of Dyke for Bogibeel Bridge at Dibrugarh	9.00	Area handed over to the User Agency
5		M/s Brahmaputra Cracker & Polymer Ltd. Lepetkatta, Dibrugarh	0.678	Implementing the Mega Assam Gas Cracker Project at Lepetkatta, Dibrugarh	1.50	Area handed over to the User Agency

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6		OIL, Duliajan	13.2574	Forest land required for Oil India Ltd. Drilling location DRB in Dehingmukh R.F.		Withdrawn by User Agency
7		Water Resource Division, Dibrugarh (WED Dibrugarh)	20.5	Extension of downstream Dyke on South Bank of Bogibeel Bridge, PH-IV from Chaulkhowa Gaon to Madhupur Deori Gaon at Bogibeel	20.50	Area handed over to the User Agency. An area of 20.5 Ha. are allotted for Compensatory Afforestation outside the Dehingmukh R.F. (Near Bogibeel Bridge)
		TOTAL	63.4916		32	

Forest area under different working circle: Forest area under different working circle covered under the purview of this working plan is shown in table 2.2. The compartment wise area allocated under different working circles is elaborated under the individual working circles chapters mentioned in Part II of the working plan. Figure 2.2 shows allocation of different working circles in the Division.

Percentage of forest with secured boundaries: The boundaries of the RFs are demarcated by artificial lines, roads, village paths and natural features like rivers, streams and edges of swamp area. The artificial lines are maintained by lines usually cleared of all shrub growth of width 8' to 12' and demarcated by earthen mounds or R.C.C. pillars. General state of artificial boundaries in the Division is not satisfactory in the case of some RFs surrounded by villages. The total length of the natural and artificial boundaries of the RF areas presented in Table.

Table 15: Total length of the natural and artificial boundaries of RFs in Dibrugarh Division

Sl. No.	Name of RF.	Artificial Boundaries (in Km)	Natural Boundaries (in Km)	Total Length (in Km)	Remarks
1.	Dehingmukh	03.04	27.20	30.24	
2.	Namdang	18.80	07.60	36.40	
3.	Telpani	12.62	10.40	23.02	
4.	Jokai	14.14	16.24	30.38	
5.	Jeypore	26.00	32.00	58.00	22 Km inner line
Total		74.60	93.44	168.04	

5.2 Agriculture and Irrigation

Agriculture in Dibrugarh, Assam, India, is characterized by a variety of crops and activities, including:

Tea: Dibrugarh is home to the world's largest area of tea gardens, with many gardens over 100 years old.

Rice: The district produces rice, but productivity is lower than the national average.

Pulses and oilseeds: The district produces pulses and oilseeds, but productivity is lower than the national average.

Horticulture: The district produces a variety of fruits, including bananas, pineapples, lemons, guavas, and papayas.

Fish farming: The district is involved in fish farming.

Research and extension: The ICAR - Krishi Vigyan Kendra in Dibrugarh conducts research and extension activities to increase production and productivity of crops and livestock.

Capacity development: The AAU-KVK in Dibrugarh provides training to farmers and extension personnel on modern agricultural technologies.

Marketing: The district has an agriculture marketing unit that monitors input supply and conducts market surveys.

The economy of Dibrugarh district is mainly agrarian with agriculture and allied activities including tea cultivation and providing livelihood support to about 70 per cent of the population of the district. However, the productivity of the major crops like rice, pulses, oilseeds and horticultural crops is still much lower in compared to the national average. The typical characteristic feature of Assam soils is its acidity (pH ranging from 4.2 to 5.8). High humidity and seasonal pattern of rainfall and temperature are important features of Dibrugarh climate with rainfall being the most important determinant factor for the climate. Rainfall distribution follows a typical monsoon pattern with peak precipitation during monsoon (June - September) and scanty rainfall in winter (December - February).

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Table 16: Basic Information of the district

1	Geographical Area	338100 Ha
2	Cultivable Area	143052 Ha
3	Net Cropped Area	127270 Ha
4	Area Miscellaneous Plantation	23744 Ha
5	Gross Cropped Area	187455 Ha
6	Cropping Intensity	147%
7	Irrigated Area	12444 Ha
8	Nos. of Blocks	7 Nos.
9	Nos. of Gaon Panchayat	93 Nos.
10	Total population (As per 2011 census)	1,326,335 Nos.
11	Total Agricultural Sub-Divisions	2 Nos.
12	Total nos. of ADO Circle	15
13	Total Nos. of AEA Elakas	94
14	Total nos. of Registered PPS	709 Nos.
15	Nos. of Farm Families	151342 Nos.

The irrigation potential in the district is developed both from the surface and ground water sources. The irrigation department is responsible for creation of major, medium and minor irrigation schemes. The agriculture department has also created irrigation potential in different cultivable area by way of installation of shallow tube well schemes.

Table 17: Irrigation based classification

Name of the Blocks	Gross Irrigated Area (in Ha)	Un-Irrigated or Totally Rainfed (in Ha)
Barbaruah	1293	22267
Lahoal	1012	36662
Panitola	414.5	13095.5
Tengakhat	1560	32260
Khowang	1090	28089
Tingkhong	446	20711
Joypur	1372	28420
Total	7187.5	181504.5

Source: C-DAP, Dibrugarh

Here are some types of irrigation used in Dibrugarh, Assam:

Deep tube well irrigation: A scheme that includes solar powered MDTWS at Dibrugarh Lac

Drip irrigation: A system that uses a network of lines to deliver water and nutrients directly to the root zone of plants

Shallow tube wells: A method used by resourceful farmers in the district

Irrigation is important in Assam because agriculture is the main occupation and rainfall is unevenly distributed. During the monsoon period, rainfall is concentrated over a period of 4-5 months, while dry spells can lead to crop failure

The following benefits are intended from the District Irrigation Plan.

- 1) A total of 127157.5 Hectares of Irrigation potential is proposed to be created under the four components of PMKSY. Thus, 80% of cultivable area would be brought under the command of assured irrigation. It would boost up the gross crop intensity significantly as the farmers would be able to go for multiple cropping sequences throughout the year.
- 2) Under the component AIBP, 4209 hectares of land is contemplated to be brought under irrigation with the total amount of Rs. 6070.20 lakh by Irrigation department.
- 3) Under the component „Har Khet Ko Pani“, 25765 hectares of land are contemplated to be brought under irrigation with the total amount of Rs. 52179 lakhs by Irrigation department.
- 4) Under Per Drop More Crop component, 35352.5 hectares of land are contemplated to be brought under irrigation with the total amount of Rs. 25372.8 lakh by Agriculture department.
- 5) Under Watershed component, 40491 hectares of land are contemplated to be brought under irrigation with the total amount of Rs. 5566.00 lakh by Soil Conservation and Agriculture department.
- 6) Under Convergence with MGNREGA component, 21340 hectares of land are contemplated to be brought under irrigation with the total amount of Rs. 21405 lakhs by Agriculture department.

Thus, the overall economy of the district would get better and better in the days to come after the contemplated projects get implemented and yield results in terms of enhanced crop production.

5.3 Horticulture

Horticulture is a major part of the agriculture sector in Dibrugarh, Assam, India:

Crops

The district produces a variety of fruits and vegetables, including bananas, pineapples, lemons, papayas, guavas, turmeric, potatoes, and onions.

Services

Horticulture development services in Dibrugarh provide farmers and horticulturists with tools and resources to improve crop quality and yields.

Climate

Dibrugarh's climate is characterized by high humidity, seasonal rainfall and temperature patterns, and peak precipitation during the monsoon season (June–September).

Soil

Assam soils are generally acidic, with a pH ranging from 4.2 to 5.8

5.4 Mining

There are several mining-related activities in Dibrugarh district, Assam, including:

❖ Illegal coal mining

In August 2022, the Dibrugarh district administration banned illegal coal mining at the Tarajan tea estate in the Naharkatia area. The ban was imposed under Section 144 of the Criminal Procedure Code (CrPC).

Sand mining

The district administration has prohibited sand mining in the Mohanaghat riverbed, DTP dyke, and Aithan dyke.

Brick earth quarry

The Tantipathar Gaon brick earth quarry district has a death mineable reserve of brick earth.

Directorate of Geology and Mining

The Directorate has an office in Dibrugarh that handles petroleum and coal-related revenue and other matters. It also has three permanent field camps at Umrangshu, Namrup, and Tezpur.

District Mineral Foundation Trust

The District Mineral Foundation Trust (DMFT) Dibrugarh is involved in sand mining activities.

CHAPTER 6: GEOLOGY AND MINERAL WEALTH

6.0 GEOLOGY

Regional Geology:

The overall geological set up of India is divided into three parts i.e., Extra-peninsula, Peninsula and Indo-Gangetic Plain. The Assam states is partially covered by Himalayan Mountain System as the thick sequence of marine rocks followed by freshwater rocks was deposited in Cenozoic times. Another part of this state is partially occupied by Indo-Gangetic plains.

The different types of rocks from different ages are found in Assam state belonging to

- a) Proterozoic Gneissic Complex;
- b) Meso-Palaeo Proterozoic Shillong Group;
- c) Neo-Proterozoic Lower Palaeozoic Granite Plutons;
- d) Permo-carboniferous Lower Gondwana sedimentary rocks.
- e) Alkali Complexes of Samchampi, Borpong and volcanic rocks represented by Sylhet Trap of Cretaceous age,
- f) Lower Tertiary (Paleocene-Eocene) shelf sediments of the Jaintia Group extending along the southern and eastern flanks of Mikir Hills and geo-synclinal sediments of the Disang Group in parts of the North Cachar Hills;
- g) Upper Tertiary (Oligocene to Pliocene) shelf and volcanic rocks represented by the Cretaceous Sylhet Trap and geo-synclinal sediments covering the southern flanks of Mikir Hills, the North Cachar Hills and the hills of the Cachar district in the Surma valley area exposed in the northern foothills of Naga-Patkai range covering the southern margin of Sibsagar, Jorhat and Dibrugarh districts. The northern part of Assam is comprised with southern foothills of Eastern Himalaya forming a narrow strip.
- h) The Quaternary deposits consisting of Older and Newer Alluvium present in flood plains and terraces of the Brahmaputra valley, Surma valley and other river basins of Assam.

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Major formation encountered in Dibrugarh district are Sylhet group (Eocene), Kopili (Late Eocene-Oligocene), Barail (Oligocene-Miocene), Tipam (Miocene), Girujan (Miocene), Namsang (Pliocene) and Siwalik/Dhekiajulu (Recent). Thickness of these formations varies in N-S direction whereas the thickness variations are less in NE-SW direction. The formations of Girujan, Tipam, and Barail are getting thicker in the south and southeast. These formations are situated on the northern side of the central basement high axis, dipping towards northward. These formations have better sand development in the north. Girujan Formation witnessed massive erosion in late Miocene period near central basement high. Tipam also had some erosion in several areas. The Namsang formation is thickening toward the east and north of the basin and has a "divergent" type depositional pattern.

During the deposition of all the formation Oligocene to Late Miocene (Kopili to Girujan), the basin got tilted towards south and south-east as a result of collision of Assam Shelf (of Indian Plate) with Indo- Sinian Plate. In this set up, the basin witnessed deposition of Kopili, Barail, Tipam and Girujan formation in shallow marine, deltaic, braided & meandering and waterlogged flood plain environment respectively. During the entire period, the sediment influx varied between north to south and northeast to southeast. Consequently, the beds are mainly south to southeast dipping.

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Table 18: Stratigraphic succession of Dibrugarh

AGE (APROXIMATE)	SERIES	STAGES AND LOCAL FACIES		
		GEOSYNCLINAL SEDIMENTS		LITHOLOGY
		SURMA VALLEY	UPPER ASSAM AND NAGA HILLS	
Recent and pleistocene		Alluvium and high-level terraces	Alluvium and high-level terraces	Alluvium and high-level terraces
		UNCONFORMITY		
Pliocene	DIHING	Not Subdivided 400	Not Subdivided 900	Dhekiajuli beds 1800
		UNCONFORMITY		
Mio-Pliocene	DUPI TILA	Upper Dupi Tila 2800 Lower Dupi Tila 500	Namsang Beds 800	Namsang Beds 600
		UNCONFORMITY		
Miocene	TIPAM	Girujan Clay 1500 Tipam Sandstone 1600	Girujan Clay 1800 Tipam Sandstone 2300	Girujan Clay 600 Tipam Sandstone 900
	SURMA	Boka Bil 1500 Bhuban 4000	Not subdivided 900	Not subdivided 200
		UNCONFORMITY		
Oligocene	BARAIL	Renji 1000 Jenam 1200 Laisong 2400	Tikak Parbat 600 Baragolai 3300 Naogaon 2200	Not subdivided 1200
Eocene	DISANG	Over 1500	Probably Over 3000	Kopili Alternations 500 Sylhet limestone 500 Therria 7100

Source: District Forest Office, Dibrugarh

Local Geology:

Dibrugarh district situated in between the Himalayan orogenic belt to the north and Indo-Burma orogenic belt to the south- east. The geology of Dibrugarh encompasses the history of disposition of different types of litho- units in foreland facies condition of dispositional history. Naga Patkai hills lie in south eastern part of the district. Hills are cover with a fairly thick group of sedimentary rock beds. These beds are belonged to the Barail & Tipam groups and are followed by Quaternary sediments. The Disang Formation consist of sandstone and a thick pile of dark grey splintery shales. Mainly shale, sandy shale and carbonaceous shale with streaks of coal are found in The Jenam formation. Sandstone with sub-ordinate of clay and shale characterized The Tipam formation. and thick pebble beds alternation with coarse sandstone, clay grit and occasional coal characterized The Dihing Group. In the district, the oldest Quaternary sediments are found in the Chapar, Sorbhong formation and newer alluvium formation are Hauli, Barpeta-I, and Barpeta-II formations. Pebbles, gravel, sand, silt, clayey matrix, unoxidized grey sand, silt, clay, pebbles, and carbonaceous materials are all present in these strata with to some variations.

The forces generated during the Tertiary period directed towards the south from the Himalayas and to the North West from the Shan-Burma plateau. As a result, the thick tertiary sediments have been buckled and overtuned. In the southern part of the district, several parallel imbricating thrusts, viz., the Naga thrust, pass along the northern edge of the Joypur-Tipam-Digboi range hills.

The district bears unconsolidated alluvial sediments, which have high cumulative permeability and low bearing capacity. It has poor foundational properties.

Following litho-units have been encountered from Dibrugarh

- Clay, Sand (Bimodal)
- Boulder, Cobble & Pebble intermingled with Silt & Clay
- Carbonaceous clays (of Barail), Sandstone

CHAPTER 7: MINERAL WEALTH

7.1 Overview of mineral resources:

There are accounts of minerals and metals being used before the early historic period, Assam's scientific mining and metallurgical industries only began after independence. Today, Assam is known as a "Mineral Paradise," with commercially exploitable major and minor minerals. Here, the mineral industry has expanded significantly during the past 70 years. Dismissing all geological congregations and concerns, it can be claimed that Assam's economic growth takes form of reversion. Establishing target-oriented and value-added enterprises as well as establishing mines with complete safety measures are essential to accelerating economic growth. Development achieved, without jeopardizing the environment, in the mining and mineral beneficiation industries so far, availability of resources and existing trend would offer a glimpse of future, eradicating all types of schism in mineral economy, of mineral sector in the state of Assam.

People won't be able to raise any more queries regarding Assam's mineral richness until systematic research, particularly surface and subsurface mining in all the mineral and ore-bearing prospective zones, is done. A strong foundation in case of mining especially in Dibrugarh of Assam must give perspective and confidence. In the case of mining, particularly in Dibrugarh, Assam, a solid foundation is necessary to provide perspective and assurance. It is important to emphasize that the Dibrugarh DSR preparedness is a remarkable initiative. As a result, maintaining sustainable management of mineral resources is crucial and becoming more so every year. To ensure that these resources endure for future generations, sustainable management of mineral resources necessitates a long-term view.

7.2 Details of Resources:

MAJOR MINERALS

- **Coal:** coal having 3.2-7.4% sulphur content occurs in Assam. Coal found in Dibrugarh district but it's a part of Joypore Colliery.

MINOR MINERALS

When it comes to river bed sand deposits, the global situation regarding reserves and production shows that while India is at the top, Assam is not the only exception. Dibrugarh district is amongst the last few in sand production. Sand production of Brahmaputra, Burhi Dihing, Sessa River, Lekhijan, Dibru River and Disang or Dilli River play a vital role.

- Riverbed sand and River bank sand deposits
- Ordinary earth and Brick earth material.
- Fireclay found in Dibrugarh.

Brahmaputra River

In Dibrugarh, the Brahmaputra is the most important river. The river rises to a height of 5300 meters in the Himalayan Kailash hills. It passes via Tibet before entering India through Arunachal Pradesh, then on through Assam and Bangladesh until entering the Bay of Bengal. It's an important Assamese canal that passes across the area from NNE to SSW. The Bhamputra is the main source of silt/ordinary clay. The river sand found in the plain/ bed of this river is not suitable for construction purpose. The river gives the local inhabitants essential supplies and facilitates transportation and agriculture.

Burhi Dihing River

Originating in the Mikir Hills, the Burhi Dihing River travels SE till it meets the Brahmaputra. Its meandering path and significant sediment carrying capacity are its defining features. The Burhi Dihing is essential to the region's agriculture, particularly the production of rice and tea. It also promotes biodiversity and has an impact on the dynamics of local floods.

Sessa River

The Sessa River rises in the the eastern foothills of the Arunachal Pradesh hills and flows through Dibrugarh District and goes southernly to join the Brahmaputra. Though smaller than the Brahmaputra and Burhi Dihing, this river is nevertheless very important to the hydrology of the area. It helps maintain Ecological balance in its basin and promotes regional agriculture.

Lekhijan River

A tributary of the Brahmaputra, the Lekhijan River flows through the Dibrugarh district in some places. The Lekhijan River originates in the foothills of the Naga Hills in Nagaland. It flows through the western part of Assam before merging with the Brahmaputra River. When measured against the larger rivers, such as the Brahmaputra and Burhi Dihing, it is comparatively smaller. It helps with drainage in the area. For local irrigation and agricultural assistance, the Lekhijan River is crucial. Additionally, it contributes to preserving the ecological equilibrium in the region.

Dibru River

The Dibru River falls into the Brahmaputra and is located in the Dibrugarh area. The Dibru River originates in the southeastern part of the Assam Valley. It flows through the Dibru-Saikhowa National Park before joining the Brahmaputra River. Although it is not as large as the Brahmaputra and Burhi Dihing, it nevertheless has a big effect on the local water system. The river supports the ecology of the region and is crucial for local irrigation. Its waters are essential to preserving the nearby agricultural activities.

Disang or Dilli River

The Disang, often called the Dilli River, is a tributary of the Brahmaputra that passes through the southeast of the Dibrugarh district. This river rises in the highlands to the northeastern part of Arunachal Pradesh and runs west until it meets the Brahmaputra. Before influence point, it shows meandering nature. So Gravel deposit found as point bar with few mid channel bars. It is distinguished by a varying flow regime that experiences notable seasonal variations. In addition to

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helping with local flood control and water management, the Disang River promotes agriculture, especially in the areas it flows through.

In general, sand extraction (mining) is possible at specific locations particularly where sand bars have been developed. Due to formation of sand bars, river courses are changing. Planning needed to be made for sand mining particularly at places where sand bars height is above the running water flow level during heavy rain. River bed sand mining also need to be carried to keep the river/ stream courses healthy. Care to be taken so that the original river bed should not be cut out. Manual/ semi-mechanised dredging is suggested for sand mining.

a) Drainage System with description of main rivers

Table 19: Drainage system with description of main rivers

Sl. No.	Name of the River	Area drained (sq.km.)	% Area drained in the district
1	Brahmaputra River	851	25.17
2	Burhi Dihing River	33.6	1
3	Sessa River	4.78	0.1413
4	Disang or Dilli river	4.23	0.125

b) Salient Features of important rivers and streams

Table 20: Salient Features of important rivers and streams

Sl. No.	Name of the River or Stream	Total Length in the District (in Km.)	Place of Origin	Altitude of Origin
1	Brahmaputra River	85.1	Himalayan Kailash hills	5300m
2	Burhi Dihing River	120	Mikir Hills	1057m
3	Sessa River	95.6	Eastern foothills of the Arunachal Pradesh hills	128m
4	Disang or Dilli river	70.5	Highlands to the northeastern part of Arunachal Pradesh	1200m

II. Annual deposition of riverbed minerals

Annual deposition of riverbed minerals is dependent on various factors which are explained below.

A) Geomorphological studies

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

i) Place of Origin

Details of origin of rivers of Dibrugarh District are furnished in Table.

Table 21: Place of Origin of important rivers and streams

Sl. No.	Name of the River or Stream	Place of Origin
1	Brahmaputra River	Himalayan Kailash hills
2	Burhi Dihing River	Mikir Hills
3	Sessa River	Eastern foothills of the Arunachal Pradesh hills
4	Disang or Dilli river	Highlands to the northeastern part of Arunachal Pradesh

ii) Catchment Area

The Dibrugarh district of Assam is mainly drained by the Brahmaputra and its tributaries are Burhi Dihing, Sessa River, Lekhijan, Dibru River and Disang or Dilli river which are forming the main catchment area. The catchment area of a river, also known as its drainage basin or watershed, is the region of land where precipitation collects and drains into the river and its tributaries. This area encompasses all the land that contributes to the river's flow, including all the streams, rivers, and other water bodies that feed into it. The land's elevation and slope can influence how water flows and accumulates. Mountains or highlands often define the boundaries of a catchment area. The amount and distribution of precipitation within the catchment area affect the river's flow. Areas with high rainfall contribute more water to the river. Soil type and vegetation cover impact how much water infiltrates into the ground versus how much runs off into the river. Forested or vegetated areas generally reduce runoff and increase groundwater recharge. Land use, such as agriculture, urban development, and deforestation, can alter the natural flow of water within a catchment area.

Table 22: Catchment areas of main rivers of Dibrugarh district, Assam

Sl. No.	Name of the River or Stream	Catchment Area (sq. km.)
1	Brahmaputra River	851
2	Burhi Dihing River	33.6
3	Sessa River	4.78
4	Disang or Dilli river	4.23

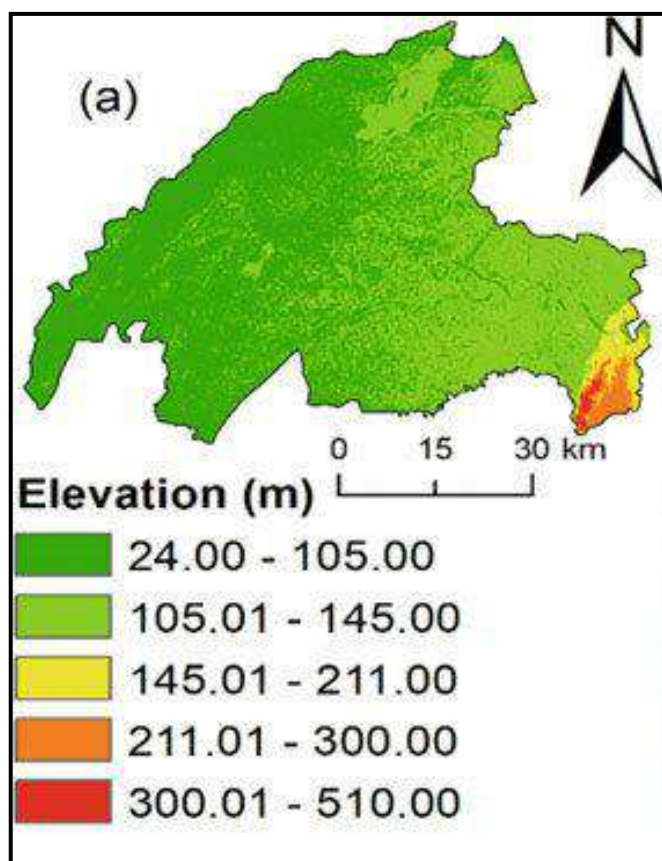
iii) General profile of river stream

If rivers are always straight i.e., if rivers follow straight course the meaning of slope becomes value less, but if the river is curvy and follows a sinusoidal pattern (as is usually the case, at least to some extent), then we have to measure the horizontal distance along the sinuous projection of the course of the river on a horizontal plane. The slope can be measured in feet per mile or some metric units like meters per kilometers. Recalling some trigonometry, we might recognize the tangent of a slope angle although measuring the slope of a river is not an easy matter. The slope of the rivers of the district, in this case, has been measured following the method of Digital Elevation Model (DEM).

To reach the targeted approach, here contour lines are digitized from topographic map using a scale of 1:8000; from this map few contours are also digitized in flat areas. Spot heights are also digitized. From this height data, contour interpolation is completed in ArcGIS approach. This slope map is exported to ERDAS for further processing. The slope map is classified to 0-15 degree or more than 15 degree.

The longitudinal profile and the cross-sectional profile of the streams or rivers is provided in **Annexure IX**.

Figure 22: Elevation of river Map of the Dibrugarh district, Assam



iv) Annual deposition Factor

Rivers are important geological agents for erosion, transportation and deposition. Deposition and erosion in river valleys can strongly modulate the downstream delivery of sediment (Fan and Cai, 2005; Malmon et al., 2005). A riverine sediment budget provides an effective conceptual framework within which to quantify sediment mobility, transport, deposition, and storage within a drain-age basin, as well as sediment output from the basin (Walling et al., 2002). It is therefore critical to understand this modulation effect (Walling and Horowitz, 2005). Annual deposition of riverbed materials depends on various factors which are as follows:

Geological erosion and soil erosion are the two basic terms used to describe erosion processes. Geological erosion refers to regular or natural erosion brought on by long-term geological processes that wear down mountains and produce floodplains, coastal plains, and other landforms to develop. Soil erosion happens gradually or at an alarming rate, but it is a continual process. It leads to various negative effects, including ongoing topsoil erosion, ecological harm, soil collapse, and many more.

The soil fragments are loosening or being washed away in the valleys, oceans, rivers, streams, or far-off regions throughout this process. Human activities like agriculture and deforestation have contributed to this situation getting worse.

Fluvial erosion is the direct removal of soil particles by moving water. The force of the flowing water and the resistance of the bank material to erosion both affect the pace of fluvial erosion.

1. Process of deposition

After erosion, the eroded materials get transported with running water. When the river loses its energy and velocity falls, the eroded material is deposited. A river can lose its energy when rainfall reduces, evaporation increases, friction close to river banks and when enters a shallow area (flood plain) or towards its mouth where it meets another body of water. Hjulström curve showing the relationship between particle size and the tendency to be eroded, transported or deposited at different current velocities.

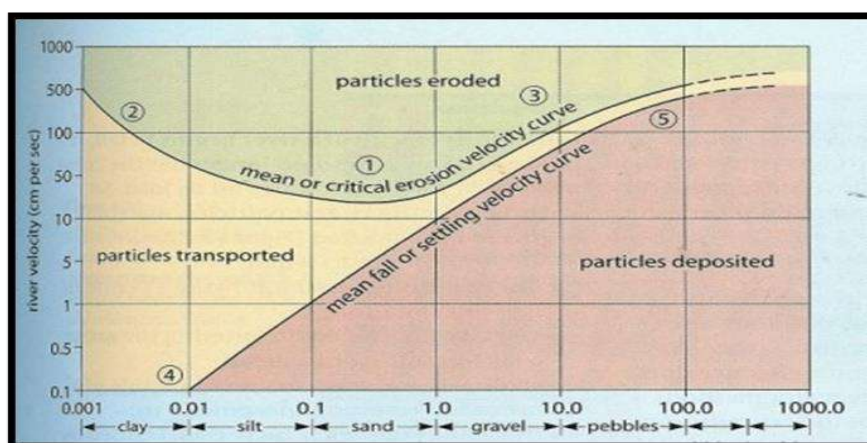


Figure 23: HJULSTRÖM CURVE

Source: Sediment Petrology, Pettijohn

In this diagram, X-axis indicates the grain size in mm and Y-axis indicates the flow velocity of the river in cm. s^{-1} . The lower line of the diagram shows the relationship between flow velocity and particles in motion, with pebbles at 20-30 cm. s^{-1} , medium sand grains at 2-3 cm. s^{-1} , and clay particles at 0 cm. s^{-1} . The grain size of particles can indicate the velocity at the time of sediment deposition. The upper line shows the flow velocity required to move a particle from rest, with smaller particles needing higher velocity to move them below coarse silt size due to the properties of clay minerals, which dominate the fine fraction in sediment. Clay minerals are cohesive and stick together, making it difficult to entrain them in a flow. The behavior of fine particles in a flow which has important consequences for deposition in natural depositional environments. Mud can accumulate in any setting where flow stops for long enough for clay particles to be deposited, and resumption of flow does not re-entrain the deposited clay unless the velocity is relatively high. Alterations of mud and sand deposition are seen in intermittent environments, such as tidal settings.

2. Mode of sediment transport in rivers

Sediment transport is the transportation of detrital particles via air, water, ice, or gravity. When transported by air and water (fluid transport), grains (which may be sand particles) travel as a bed

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load (by rolling, sliding, and saltation) or in suspension when the turbulence keeps the grains moving.

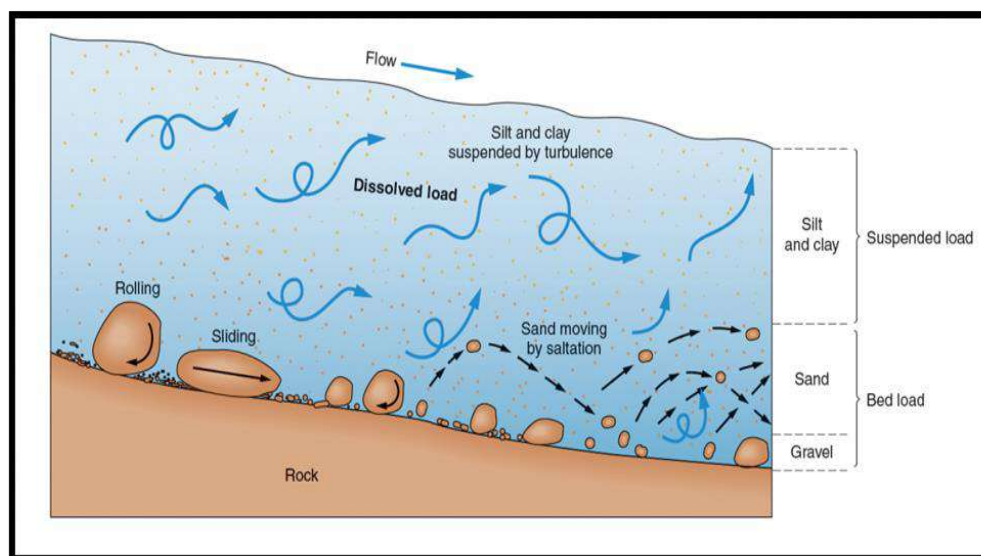
The amount and size of sediment moving through a river channel are determined by three fundamental controls: competence, capacity and sediment supply.

The sediment load of a river is transported in various ways although these distinctions are to some extent arbitrary and not always very practical in the sense that not all of the components can be separated in practice:

- i. Dissolved load
- ii. Suspended load
- iii. Saltation load
- iv. Wash load
- v. Bed load

- i. **DISSOLVED LOAD:** The amount of sediment carried in solution by a stream's total sediment load, particularly ions from chemical weathering, is known as the dissolved load. Along with suspended load and bed load, it makes up a significant portion of the overall number of debris removed from a river's drainage basin.
- ii. **SUSPENDED LOAD:** The term "suspended load" describes the portion of the total sediment transport that is kept suspended by turbulence in the flowing water for extended periods of time without contact with the stream bottom. Sometimes the particles may float on the surface of the water and thus become the part of the fluid mass. The duration of a particle's suspension is determined by the intensity of turbulence and velocity of the river-flow. It is nearly moving at the same speed as the flowing water.
- iii. **SALTATION LOAD:** The portion of the bed load that is moving, either directly or indirectly, as a result of the impact of bouncing, i.e., the intermittent jumping motion of the particles due to presence of eddies, along the stream bed. The smaller particles show higher lift and longer jump.
- iv. **WASH LOAD:** Particle sizes smaller than those found in substantial amounts in the bed material make up that portion of the suspended load. It is conveyed through the stream without deposition since it is in almost permanent suspension. The discharge of the wash load through a reach is determined solely by the rate at which these particles become available in the catchment area, not by the flow's transport capacity.
- v. **BED LOAD:** Particles that are too large to be carried as suspended load are bumped and pushed along the stream bed as bed load. The larger particles move close to the surface floor by rolling or sliding and occasional low leap. Bed load sediments do not move continuously. Streams with high velocity and steep gradients do a great deal of down cutting into the stream bed, which is primarily accomplished by movement of particles that make up the bed load.

Figure 24: Mode of Sediment Transport In Rivers



Source: [https://www.bgs.ac.uk/discovering-geology/geological-processes/deposition/#:~:text=Deposition%20is%20the%20laying%20down,sea%20shells\)%20or%20by%20evaporation.\(British Geological Survey\)](https://www.bgs.ac.uk/discovering-geology/geological-processes/deposition/#:~:text=Deposition%20is%20the%20laying%20down,sea%20shells)%20or%20by%20evaporation.(British%20Geological%20Survey)

3. Sediment Transport Rate

The rate at which sediment is moved past a cross section of the flow is called either the sediment transport rate or the sediment discharge. It is related to the sediment load, but it's different, just because different fractions of the sediment load are transported at different rates. It can be measured in mass per unit time, or in weight per unit time, or in volume per unit time. The sediment transport rate is commonly denoted by Q_s .

4. Estimation of Sedimentation

There are two approaches to obtaining values describing sediment loads in streams. One is based on direct measurement of the quantities of interest, and the other on relations developed between hydraulic parameters and sediment transport potential.

The total bed material load is equal to the sum of the bedload and the bed material part of the suspended load; in terms of volume transport per unit width, $q_t = q_b + q_s$. Here wash load, i.e. that part of the suspended load that is too fine to be contained in measurable quantities in the river bed, is excluded from q_s .

There are number of equations to compute the total sediment load. Most of these equations have some theoretical and empirical bases.

In 1973, Ackers and White developed a general theory for sediment transport which was calibrated against the flume-transport data then available. Their functions have been widely accepted as one of the best available procedures for estimating the total bed load over the full width of the flow section.

Dendy Bolton formula is often used to calculate the sedimentation yield. But use of these equations to predict sediment yield for a specific location would be unwise because of the wide variability caused by local factors not considered in the equations development. However, they may provide a quick, rough approximation of mean sediment yields on a regional basis. Computed sediment yields normally would be low for highly erosive areas and high for well stabilized drainage basins with high plant density because the equations are derived from average values. The equations express the general relationships between sediment yield, runoff, and drainage area.

5. Sediment Yield

The water that reaches a stream and its tributaries carries sediment eroded from the entire area drained by it. The total amount of erosional debris exported from such a drainage basin is its sediment load or sediment discharge and the sediment yield is the sediment discharge divided by the total drainage area of the river upstream of the cross section at which the sediment discharge is measured or estimated. Sediment yield is generally expressed as a volume or weight per unit area of drainage basin—e.g., as tons per square kilometre. Further, sediment yield is usually measured during a period of years, and the results are thus expressed as an annual average.

v) Replenishment Study (As per EMGSM guidelines, 2020):

Replenishment defines rejuvenation of riverbed sand deposition phenomena. The word replenishment is the fulcrum of riverbed sedimentation under different depositional environmental conditions especially during rainy seasons. The rate of gross or absolute silt production (erosion) in the watershed and the ability of the stream system to transport the eroded material in a river have a direct relation with the quantity of sediment delivered into a river. The rate of gross erosion is dependent upon many physical factors like climatic conditions, nature of soil, and slope of the area, topography and land use. Hydro-physical conditions of the watershed govern the capability of transporting the eroded material. It has been observed that the average rate of sediment production decreases as the size of drainage area increases. And also, larger the watershed, the lesser is the variation between the rates. The larger watershed presents more opportunity for deposition of silt during its traverse from the point of production. The watershed with maximum land use class of forest, generate very low rate of production unless the forests are degraded or open forest. The cultivated watersheds with unscientific farming produce very high rate of silt production. The total amount of eroded material, which reaches a particular hydraulic control point, is termed as sediment yield. The rotational mining is being adopted to facilitate the replenishment of the excavated pits during rainy season. Thus, the mineable area is to be divided in two blocks i.e., the upstream block and the downstream block. The mining of these blocks is suggested on rotation basis in such a way that pit of previous year mining will act as depository for the monsoon season. Sand is extracted from the said lot during one year; more than the extracted quantity of the same are automatically replenished by rainfall in the monsoon by the river/nallah itself on account of its flow and velocity.

For sustainability of river sand mining, it is necessary that the mine pits formed as a result of sand excavation are refilled with sand by natural process of replenishment in a reasonable period of time so that the area is again available for mining. The rate of excavation should be decided in accordance with the rate of replenishment which is the rate at which sand/gravel is deposited on the river flood plain by the river during monsoon season. However, determination of site- specific rate of replenishment is quite difficult as it is dependent on several factors such as geology and topography of the catchment area of the river, breadth of the flood plain, rainfall in that particular year (which is

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quite variable and not very much predictable much in advance) etc. Dandy-Bolton formula is generally used to calculate the sediment yield. But it is to be kept in mind that to prepare the mining plans of the mines, the factor of annual replenishment is to be taken into consideration while calculating the mineral reserves. It has also been observed that during flooding, all the pits replenish with sand. Hence, mined out areas in the pre- monsoon season will be completely replenished with sand during monsoon. Therefore, it has been assumed that the pits will be replenished after each monsoon.

Base Flow is influenced by incoming groundwater to aquifers and is closely related to watershed characteristics. Understanding baseflow characteristics is of great importance to river ecosystems and water management. Baseflow is the portion of stream flow that is delayed subsurface flow and generally maintained by groundwater discharge. Regardless of the specific climatic environment, its main features are tightly related to geological catchment properties. Understanding the baseflow process is important to deal with various water resource issues, such as water resources management strategies, low flow conditions assessment, hydrological modeling calibration, and water quality studies. However, no direct approach exists for continuously measuring the variability of streamflow recession under different conditions and the corresponding baseflow, because the baseflow is usually affected by diverse climatological and geological factors, with considerable variations in spatio-temporal watershed characteristics (e.g., geology, land use, soil type, etc.) and climatic conditions influence baseflow discharge to streams. Addressing such processes requires quantitative estimates of baseflow discharge across a gradient of watershed types. The development of quantitative methods for baseflow estimation is also necessary to understand water budgets (Stewart et al., 2007), estimate groundwater discharge (Arnold and Allen, 1999) and associated effects on stream temperature (Hill et al., 2013), and address questions of the vulnerability and response of the water cycle to natural and human-induced change in environmental conditions, such as stream vulnerability to legacy nutrients (Tesoriero et al., 2013). Given the importance of baseflow, many methods have been used to quantify the baseflow component of stream discharge beginning with Boussinesq (1877). Approaches for baseflow estimation can be grouped into two general categories: graphical hydrograph separation (GHS) methods, which rely on stream discharge data alone, and tracer mass balance (MB) methods, which rely on chemical constituents in the stream, stream discharge, and the streamflow end-member constituent concentrations (runoff and baseflow). Many different approaches for GHS exist, including recession curve methods and digital filter methods. Recession curve methods are generally considered more objective than digital filter methods because they provide an assumed integrated signal of basin hydrologic and geologic characteristics through identification of a linear recession constant based on the falling limb of the hydrograph (Barnes, 1939; Hall, 1968; Gardner et al., 2010).

However, in context of the rivers of district, the volume (weight) of the precipitated sand has been derived during Pre-monsoon and Post-monsoon period along with the thickness of the sand layers deposited in the respective periods. But, to erect hydrograph model which is essential for estimation of depth of base flow, data on daily discharge of water volume (weight) is required. Hence, it can be proposed that if these data are provided from the concerned authority of the state government (secondary data- already requested for providence), depth of base flow as well as the hydrograph model can be estimated. The quantitative estimation of the depth of base flow cannot be done due to absence of data. But a relative comparison between the mining depth and depth of baseflow has been done on the basis of collected data by making pit on the river bed.

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Usually, replenishment or sediment deposition / depletion quantities can be estimated in the following ways:

- Direct measurement of the sand bar upliftment;
- Monitoring of the new sand bars created in the monsoons within the channel;
- Elimination of sand bars during the monsoon etc.;

With systematic data acquisition over a period of several years, regression equations can be developed for modeling of the sediment yield and annual replenishment with variable components.

Several theoretical and empirical formulae can be used for the calculation of catchment runoff and sedimentation loads as thumb rules. Sedimentation in riverbeds depends on catchment areas / characteristics, peak flood of the river. Some of the common empirical formulae used for rough estimation of the Catchment runoffs, Peak Discharge, Bed load transportation and sediment yields for replenishment studies are as under:

➤ COMMON METHODS FOR REPLENISHMENT:

- ❖ List of instruments: DGPS, GPS and Hammer.
- ❖ List of software: ARC GIS, Google Earth, Microsoft and Google Maps.

➤ CATCHMENT YIELD CALCULATION

The total quantity of surface water that can be expected in a given period from a stream at the outlet of its catchment is known as yield of the catchment in that period. The annual yield from a catchment is the end product of various processes such as precipitation, infiltration and evapotranspiration operating on the catchment. Catchment Yield can be estimated using following formula:

$$\text{Catchment Yield (m3)} = \text{Catchment area (m2)} * \text{Runoff coefficient (\%)} * \text{Rainfall (mts/annum)}$$

The runoff generated from a watershed is estimated using Strange's Tables Method to get obtain approximate yield results. Runoff from a catchment is dependent upon annual rainfall as well as catchment area and characteristics such as soil types and the type of groundcover / land usage. Remote sensing is used for demarcation of catchment boundaries and computation of catchment area relevant to the drainage system. Strange's table is used to determine the Runoff coefficient of the catchment.

➤ PEAK FLOOD DISCHARGE CALCULATION

The term "peak discharge" stands for the highest concentration of runoff from the basin area. The accurate estimation of flood discharge remains one of the major challenges as it depends upon physical characteristics of the catchment area and the flood intensity, duration and distribution pattern. There have been many different approaches for determining the peak runoff from an area. As a result, many different models (equations) for peak discharge estimation have been developed. Formulae used for Peak Discharge calculation are as below:

i. As per Dicken's formula, $Q = CA^{3/4}$

Where: **Q** is Maximum flood discharge (m³/sec); **A** is Area of catchment in Sq. Km and **C** is Constant whose value varies widely between 2.8 to 5.6 for catchments in plains and 14 to 28 for catchments in hills

ii. As per Jarvis formula, $Q = CA^{1/2}$

Where: **Q** is Maximum flood discharge (m³/sec); **A** is Area of catchment in Sq. Km and **C** is Constant whose value varies between 1.77 as minimum and 177 as maximum. Limiting or 100 percent chance floods are given by the value of **C** of 177.

iii. As per Rational formula, $Q = CIA$

Where: **Q** is Maximum flood discharge (m³/sec); **A** is Area of catchment in Sq. Km and **C** is the Runoff coefficient (ratio of runoff to total rainfall) which depends on the characteristics of the catchment area.

I is Intensity of rainfall (in m/sec).

➤ **BED LOAD TRANSPORT CALCULATION**

The most difficult problem in river engineering is to accurately predict bed load transport rates in torrential floods flowing from mountainous streams. Three modes of transport namely; rolling, sliding and saltation may occur simultaneously in bed load transport. The different modes of transportation are closely related, and it is difficult, if not impossible, to separate them completely. There are a number of equations to compute the total sediment load. Most of these equations have some theoretical and empirical bases.

Ackers and White Equation:

Ackers and White (1973) used dimensional analysis based on flow power concept and their proposed formula is as follows.

$$C_t = C_s G_s (d_{50}/h) (V/U^*)^{n'} [(F_{gr}/A_1) - 1] m$$

The dimensionless particle d_{gr} is calculated by:

$$D_{gr} = d_{50} (g(G_s - 1)/v^2)^{1/3}$$

The particle mobility factor F_{gr} is calculated by:

$$F_{gr} = (U^* n' / (G_s - 1) g d_{50})^{1/2} * (V / (5.66 \log (10h / d_{50}))^{1-n'}$$

Where,

A_1 = Critical particle mobility factor

C_s = Concentration coefficient in the sediment transport function

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C_t = Total sediment concentration

d_{50} = Median grain size

d_{gr} = Dimensionless particle diameter

F_{gr} = Particle mobility parameter

g = Acceleration of gravity

D_s, S_g = Specific gravity

h = Water depth

m = Exponent in the sediment transport function

n' = Manning roughness coefficient

U = Shear velocity

V = Mean flow velocity

ν = Kinematic viscosity

ii. Meyer – Peter’s equation:

Meyer-Peter’s equation is based on experimental work carried out at Federal Institute of Technology, Zurich. Mayer-Peter gave a dimensionless equation based, for the first time, on rational laws. Mayer- Peter equations giving an empirical correlation of bed load transport rates in flumes and natural rivers. The simplified Meyer-Peter’s equation is given below:

$$gb = 0.417[\tau_0 (\eta' / \eta)^{1.5} - \tau_c]^{1.5}$$

Where,

gb = Rate of bed load transport (by weight) in N per m width of channel per second. η' = Manning’s coefficient pertaining to grain size on an unrippled bed and Strickler formula i.e., $\eta' = (1/24) \times d^{1/6}$ where d is the median size (d_{50}) of the bed sediment in m.

η = the actual observed value of the rugosity coefficient on rippled channels. Its value is generally taken as 0.020 for discharges of more than 11 cumecs, and 0.0225 for lower discharges.

τ_c = Critical shear stress required to move the grain in N/m² and given by equation $\tau_c = 0.687d_{50}$, where d_{50} mean or average size of the sediment in mm. This arithmetic average size is usually found to vary between d_{50} and d_{60} .

τ_0 = Unit tractive force produced by flowing water i.e., $\gamma_w R S$. Truly speaking, its value should be taken as the unit tractive force produced by the flowing water on bed = $0.97\gamma_w R S$. R is the hydraulic mean depth of the channel (depth of flow for wider channel) and S is the bed slope.

➤ **SEDIMENT YIELD ESTIMATION**

Sedimentation occurs as the stream velocity decreases thus reducing its ability to carry sediment. Coarse sediments deposit first, which may then interfere with the channel conveyance and may cause rivers to meander and form distributaries. As the area of the flowing water increases, the depth decreases, the velocity is reduced, and eventually even fine sediments begin to get deposited. As a result, deltas may be formed in the upper portion of reservoirs. The deposited material may later be moved to deeper portions of the reservoir by hydraulic processes within the water body.

There are many sediment transport equations which are suitable for use in the prediction of the rate of replenishment of rivers. Some of the common equations used to estimate sediment yields are:

- Dandy – Bolton Equation
- Modified Universal Soil Loss Equation (MUSLE) developed by Williams and Berndt (1977)

Dandy – Bolton Equation:

The formula uses catchment area and mean annual runoff as the key variables. It does not differentiate between the characteristics of basins and streams.

Dandy and Bolton equation estimates all types of sediment yield *i.e.*, through Sheet and rill Erosion, gully Erosion, Channel Bed and bank erosion and mass movement etc. Dandy- Bolton determined the combined influence of runoff and drainage area to compute the sediment yield. They developed two equations *i.e.*, for run off less than 2 inches and for run off more than 2 inches, which are given below:

For run off less than 2 inches:

$$(Q < 2 \text{ in}) S = 1289 * (Q)^{0.46} * [1.43 - 0.26 \text{ Log } (A)]$$

For run off more than 2 inches:

$$(Q > 2 \text{ in}): S = 1958 * (e^{-0.055 * Q}) * [1.43 - 0.26 \text{ Log } (A)]$$

Where: S = Sediment yield (tons/sq miles/yr) Q = Mean Annual runoff (inch) A = Net drainage area in sq mile

Modified Universal Soil Loss Equation (MUSLE):

Modified universal soil loss equation (MUSLE) for estimation of sediment yield is also used widely. MUSLE is a modification of the Universal Soil Loss Equation (USLE). USLE is an estimate of sheet and rill soil movement down a uniform slope using rain- fall energy as the erosive force acting on the soil (Wischmeier and Smith 1978). Depending on soil characteristics (texture, structure, organic matter, and permeability), some soils erode easily while others are inherently more resistant to the erosive action of rain- fall.

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MUSLE is similar to USLE except for the energy component. USLE depends strictly upon rainfall as the source of erosive energy. MUSLE uses storm-based runoff volumes (weight) and runoff peak flows to simulate erosion and sediment yield (Williams 1995). The use of runoff variables rather than rainfall erosivity as the driving force enables MUSLE to estimate sediment yields for individual storm events. The generalized formula of MUSLE is as below:

$$Y=11.8*(Q*qP).56 *K*Ls*C*P$$

Where,

Y = sediment yield of stream (t/yr/km²),

Q = average annual runoff (m³),

K = soil erodibility factor,

qP = Highest discharge recorded (m³/s),

Ls = gradient/slope length,

C = cover management factor,

P = erosion control practice.

A. REPLENISHMENT STUDY BASED ON SATELLITE IMAGERY

To delineate replenishment percentage in the river bed of the district, below mentioned steps have been followed.

➤ **Satellite imagery studies**

Satellite imagery study involves demarcation of sand/ RBM zones on riverbed of the district. Both pre and post monsoon images need to be analysed to established potential sand/ RBM zones.

➤ **Field data collation**

Field data collation was carried out during May- June for all the sand/ RBM zones on continuous basis for pre monsoon period and November – December for all the sand/ RBM zones on continuous basis for post monsoon period. In both the cases, relative elevation levels were captured through GPS/DGPS/ Electronic Total Station. Thickness of the sand/ RBM zones was measured through sectional profiles. The field survey for collect post-monsoon data has been conducted November-December time period in 2023 while preparing the District Survey Report of Dibrugarh district.

➤ **Selection of study profiles**

Study profiles are selected based on the occurrence of the sand / RBM zones in the channel profiles. Aerial extents of each of the profiles are mapped from satellite imageries. Frequency distribution did while selection of the ground truthing of the zones.

➤ **Data compilation:**

Following data were compiled for generation of this annual replenishment report:

- Elevation levels of the different sand/ RBM zones as measured at site.
- Extents of the sand/ RBM zones are measured from the pre monsoon satellite imageries.
- Sand/ RBM zones production data of the district.

All these data were compiled while estimation of the replenished sand/ RBM zones in the district.

➤ **Assessment of sediment load in the river:**

Assessment of sediment load in a river is subjective to study of the whole catchment area, weathering index of the various rock types which acts as a source of sediments in the specific river bed, rainfall data over a period not less than 20 years, and finally the detail monitoring of the river bed upliftment with time axis. Again, the sediment load estimation is not a dependent variable of the imaginary district boundary, but it largely depends upon the aerial extents of the catchment areas, which crossed the district and state boundaries.

➤ **METHODOLOGY FOR CALCULATING THE TOTAL POTENTIAL OF MINOR MINERAL IN THE RIVER BED ANNUAL DEPOSITION**

For estimating the reserve of River Bed Material [Sand/Gravel (Minor Mineral)], the following parameters were considered:

- a) The volumes of the reserves are calculated on the basis of the established width, thickness and length of the deposit as per actual field data.
- b) The tonnage of the reserve quantity is obtained by multiplying the above volume with the bulk density of mineral to arrive at tonnes per cum (as per lab report).
- c) The depth of the reserves has been estimated considering the available deposit thickness and the water level/red line.

The same procedure shall be followed for acquiring post monsoon data, its reserve estimation and then correlating between pre and post monsoon volumes as per table given below:

Table 23: Estimation of Sand/ RBM zones Reserves in Pre & Post Monsoon periods in sand/ RBM zones

Estimation of Sand Reserves in Pre & Post Monsoon periods in sand bars										
Sl. NO.	Deposit zone code	Area in Sq. m.	Ave. Thickness (m)	Quantity (CUM)	Sl. NO.	Deposit zone code	Area in Sq. m.	Ave. Thickness (m)	Quantity (CUM)	Difference (cum) 'YY'
PRE-MONSOON					POST-MONSOON					
1					1					
This table would be added after post-monsoon survey										
<i>Source: Field Survey and DGPS data</i>										

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Table 24: Sediment Load Comparison Pre & Post monsoon period for different rivers of Dibrugarh District

River Name	Pre-monsoon No of Ghats	Post-monsoon No of Ghats	Pre-monsoon Sediment Load (CUM)	Post-monsoon Sediment Load (CUM)	Difference (CUM) 'YY'	Percentage Variance (%) (Postmosoon - Premosoon / Postmonsoon *100)
Brahmaputra River						
Burhi Dihing River						
Sessa River						
Lekhijan River						
Dibru River						
Disang or Dilli river						
This table would be added after post-monsoon survey						
<i>Source: Field Survey and DGPS data</i>						

B. Geological studies

i) Lithology of the catchment area

- **Brahmaputra River:** Lithological units are Sand, Silt, and Clay with Carbonaceous matter.
- **Burhi Dihing River:** Sand, Silt, Clay with Occasionally Pebbles and Carbonaceous matter.
- **Sessa River:** Lithological Units are Sand, Silt, Clay with Occasionally Pebbles and cobbles.
- **Lekhijan River:** Sand, Silt, Clay with Occasionally Pebbles and cobbles.
- **Dibru River:** Sand, Silt, Clay with Occasionally Pebbles and cobbles.
- **Disang or Dilli River:** Sand, Silt, Clay with Occasionally Pebbles and cobbles.

ii) Tectonics and structural behavior of rocks

Dibrugarh is situated between the orogenic belts of Indo-Burma to the south-east and the Himalayan region to the north. The region is located barely 20 km to the north of the Himalayan foothills i.e. Arunachal Himalaya, where several ephemeral and perennial streams emerge in the plains and merge with the Brahmaputra River, which runs in the northeastern quadrant of the region in a NNE-SSW direction. The NE-SW Disang-Haflong Thrust in the east and the Naga Thrust in the west denote the active, thin, folded, and imbricate thrust slices known as the Schuppen belt, which is SW of Dibrugarh and comprises Paleogene rocks of the Disang and Barail Groups (Nandy, 2001). The NW-SE trending thrust/reverse fault belt Mishmi block is located 115 km northeast of Dibrugarh. The Po Chu fault in Mishmi block has formed the Great

Also, the Eastern Boundary Thrust, which spans the states of Mizoram, Manipur, and Nagaland in the south and north of Dibrugarh City, is located about 84.76 kilometers away. From the Bay of Bengal in the south, this belt stretches into the northeast and the Schuppen Belt in the southwest. Its shape is elongated and crescent. According to geological research conducted in Dibrugarh, the region is primarily covered with quaternary sediments that date from the Pleistocene to the Holocene and include the Sorbhog, Hauli, BARPETA-I, and BARPETA-II Formations.

C. Climate Factors

i) Intensity of rainfall

Rainfall and humidity are closely allied in terms of climatology. The district has a climate which is characterized by a highly humid atmosphere, abundant rain and general coolness. Therefore, heavy summer rainfall and high humidity affect the weather of Dibrugarh district. The area enjoys a sub-tropical climate with abundance of monsoonal rain. The rainfall is not uniform throughout the district. The average rainfall is about 2819 mm. Almost 64% to 68% of

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precipitation is received during June to September which is monsoon period and 22% to 26% of precipitation coming from March- May time i.e., pre-monsoon.

ii) Climate zone

The Dibrugarh district has sub-tropical tropical/ Equatorial climate as Assam lies in the regime of monsoon climate of the sub-tropical belt. So, people of Dibrugarh enjoy heavy summer rainfall, abundance of monsoonal rain, experiences winter drought, high humidity which is varies form 90%-95% in morning to 50-70% in the afternoon and relatively pleasant temperature throughout a year.

iii) Temperature variation

In Summer time district experiences hot, humid temperatures, maximum temperature of the district is around 35 °C. The winter months bring chilly, dry weather. The temperature ranges from 7 °C - 8°C degree in winter which begins from October and continues till February.

Annual Deposition:

Annual deposition of riverbed minerals has been calculated on post-monsoon sand volume. The pre-monsoon sand volume of the river is the depleted resources and is replenished by the monsoon rainfall.

➤ TOTAL POTENTIAL OF MINOR MINERAL IN THE RIVER BED ANNUAL DEPOSITION

According to Sustainable Sand Mining Guidelines, 2016 and Enforcement & Monitoring guidelines, for Sand Mining, 2020 mining depth of the mining zones are 1 meter for hilly area.

The annual deposition of riverbed minerals is shown in the Table given below.

Table 25: Annual deposition

River Name	Zone	Type of Material	Quantity in CUM (as per YY)	60% of quantity in CUM
BRAHMAPUTRA RIVER				
BURHI DIHING RIVER				
SESSA RIVER				
LEKHIJAN RIVER				
DIBRU RIVER				
DISANG OR DILLI RIVER				
This Table would be added after post-monsoon survey				

1. Riverbed minerals zone area recommended for mineral concession in the above table has been calculated as per the Enforcement & Monitoring Guidelines for Sand Mining (EMGSM) 2020.
2. As per guidelines, mining depth has been restricted to 3 meters depth and distance from the bank is $\frac{1}{4}$ th of river width and not be less than 7.5 meters.
3. Also, mining is prohibited up to a distance of 1 kilometer (1 km) from major bridges and highways on both sides, or five times (5x) of the span (x) of a bridge/public civil structure (including water intake points) on up-stream side and ten times (10x) the span of such bridge on down-stream side, subjected to a minimum of 250 meters on the upstream side and 500 meters on the downstream side.
4. Riverbed minerals zone deposits acting as potential sites for sand mining along with other aspects as mentioned above are illustrated in Satellite images in **Annexure VIII**.

III. Riverbed Mineral Potential

Process of disposition etc.:

Sand: Huge quantities of quality sands are found to occur in part of rivers. Smaller patches are also available locally in the other smaller rivers as well.

Table 26: Resources of Potential Riverbed Mineral

Boulder (Mcum)	Pebbles/Gravel (Mcum)	Sand/White sand (Mcum)	Total Mineable, Mineral Potential (Mcum)

DETAILS OF POTENTIAL SOURCES / SITES OF RIVER BED MATERIAL

Potential sensitive sites for mining near forests, protected areas, habitation, bridges etc., shall be avoided. For this, a sub-divisional committee may be formed which after the site visit shall decide its suitability for mining. The list of mining leases as per the recommendation of the Committee needs to be defined in the following format given in as **Annexure –V**.

The Sub-Divisional Committee shall make recommendations regarding the suitability of all potential mining sites and also record the reason for approving the specific mining leases on the basis of its field inspections. The details regarding cluster and contiguous cluster formation will be provided as in **Annexure-VI**.

No mining Zone

Mining of river bed materials is prohibited in some places on the river channel due to presence of notable landmarks like, sanctuary or national parks, forests, bridge/public civil structure or highways.

A definition of a protected area was established by IUCN in 1994, which is described as

“An area of land and /or sea especially dedicated to the protection and maintenance of biological diversity, and of natural and associated cultural resources, and managed through legal or other effective means.”

As per the Enforcement & Monitoring Guidelines for Sand Mining (EMGSM) 2020 the restricted zone for mining is a distance from the bank is ¼th of river width and not be less than 7.5 meters. Also, there is a no mining zone up to a distance of 1 kilometre (1 km) from major bridges and highways on both sides, or five times (5x) of the span (x) of a bridge/public civil structure (including water intake points) on upstream side and ten times (10x) the span of such bridge on down-stream side, subjected to a minimum of 250 meters on the upstream side and 500 meters on the downstream side.

No mining zone has been marked for an area up to a width of 100 meters from the active edge of embankments. Also, the concave side of the river is marked as no mining zone, as mining in this area will affect the course of river in future and will erode the river bank.

Mining has a range of environmental consequences for protected areas, whether operations are undertaken within them or nearby. The types of impact may be listed as follows:

- Direct land take and loss of vegetation cover in the mined area and other parts directly affected by associated activities such as deposition of tailings, or consequences such as subsidence;
- Pollution affects, especially on water supplies, aggravated by accidents (e.g., to tailing dams);
- Impacts due to access associated with mining (roads, railways, pipelines, power lines etc.), which permit illegal hunting, habitat fragmentation and alien invasions;
- Secondary effects of human immigration in association with real or perceived livelihood opportunities (e.g., on water supplies, illegal hunting, harvesting of vegetation, alien invasions, illegal land settlements);
- Impacts on other protected area values from noise and visual intrusion, arising from both mining and secondary activities, including transportation.

The 2020 guidelines for sand mining stress on protecting rivers and habitats of species including turtles and calls for such sensitive areas to be declared as no-mining zones. It also called for using the latest technology for surveillance of illegal mining as well as estimating minable reserves.

A United Nations Environment report has said that, led by China and India, the world is mining sand at unsustainable levels exceeding the replenishment rate and that can have far-reaching social and environmental implications. Unsustainable sand mining practices are rampant in India. Despite a set

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of guidelines in 2016 to curb the practice, illegal and unsustainable sand mining has continued to be common, spurring the Indian government to take another step toward enforcing rules. The environment ministry has now come out with, Enforcement & Monitoring Guidelines for Sand Mining 2020” to regulate sand mining and check illegal mining.

This comes four years after the Government’s Sustainable Sand Management Guidelines 2016, which was unsuccessful in putting an end to rampant illegal sand mining across the country. The latest guidelines suggest the use of technologies like drones with night vision for surveillance of sand mining sites, steps to identify sources of sand, procedures for replenishment of sand, post environmental clearance monitoring of sand mining sites, a procedure for environmental audit of such areas and steps to control the instances of illegal mining.

Among these, the focus on monitoring of sand mines after environment clearance is considerable given that so far it has been an area where the performance of authorities, central or state, is considered very poor.

The need for the latest version of the guidelines was felt after illegal and unsustainable sand mining continued despite the 2016 guidelines and many court cases. Since 2016, the National Green Tribunal, in many of the cases, stressed on the need of regulating sand mining and passed several orders. The court in some cases even expressed concern over the death of officials who tried to stop illegal mining and noted that on the ground level, illegal mining is still going on. The guidelines are thus a result of many such orders by the NGT wherein the tribunal passed directions to control it.

The new guidelines also laid special emphasis on the protection of rivers and species from sand mining as it called for surveys for identifying the stretches with freshwater turtles or turtle nesting zones. “Similarly, stretches shall be identified for other species of significant importance to the river ecosystem. Such stretches with adequate buffer distance shall be declared as no-mining zone and no mining shall be permitted,” the guidelines said.

It also called for a survey report in every district for identifying the sand bearing area but also the “mining and no mining zones” considering various environmental and social factors like the distance of the mining area from the protected area, forest, bridges, important structures and habitation. According to the Sand Mining Framework 2018 of the central Government’s Ministry of Mines, in India, there is a shortage of sand in the country, similar to the situation in other developed and developing countries. It estimated that the demand of sand in the country is around 700 million tons (in the financial year 2017) and it is increasing at the rate of 6-7 percent annually even as the quantity of natural generation of sand is static.

Due to uncertainties and inadequateness in supply, the selling rate of the material varies significantly leading to black marketing and illegal mining of the mineral. It noted that illegal and uncontrolled extraction of sand has an adverse environmental impact.

Protect the rivers from illegal sand mining

The main sources of sand in India are considered to be rivers (riverbed and flood plain), lakes and reservoirs, agricultural fields, coastal/marine sand and manufactured sand.

The guidelines focus on identifying sand mining sources, its quantification and feasibility for mining considering various environmental factors like proximity of protected area, wetlands, creeks, forest

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etc. and presence of important structures, places of archaeological importance, habitation, prohibited area etc.

To protect the rivers from illegal sand mining, the guidelines said that abandoned stream channels on the floodplains should be preferred rather than active channels and their deltas and floodplains.

CHAPTER 8: OVERVIEW OF THE MINING ACTIVITY IN THE DISTRICT

8.1 GENERAL OVERVIEW

To prepare the DSR of Dibrugarh district of Assam, geological studies along with structural studies in the quest from knowing more and more pertaining to tectonic set up of this regime, suitability for river bed sand mining and time of deposition of different types of minerals are also important. The common hydrological regime plays a pivotal role for deposition of sand and other minor minerals mainly pebbles and boulder. Assam, from climatological aspect gives a best fit result for economic sand deposits. Here brown sand is noticeable in the riverbed of Brahmaputra, Burhi Dihing, Sessa River, Lekhijan, Dibru River and Disang or Dilli river. The spatiality of rain is controlled here by the orientation of the axis of monsoon trough. River bed sand mining or sand mining adjacent to a river or stream has a direct impact on the physical characteristics of the stream such as channel geometry, bed elevation, substratum composition and stability, in-stream roughness of the bed, pro velocity, discharge capacity, sediment transport capacity, turbidity, temperature etc. Alteration or modification of the said attributes may cause hazardous impact on ecological equilibrium of riverine regime.

8.2 LIST OF THE EXISTING MINING LEASES OF THE DISTRICT (LOCATION, AREA, PERIOD FOR EACH MINOR MINERAL):

The existing Sand Mahals and stone quarries of the respective ranges in Dibrugarh District are attached in ANNEXURE II.

8.3 DETAILS OF PRODUCTION OF SAND AND OTHER MINERALS DURING LAST THREE YEARS:

- **Total Mineral production of Sand in the district during last three years:**

Table 27: Production of the District for the year 2020-21

Sl. No.	Name of the Mineral	Production (In m ³)
1	Sand	29750

Table 28: Production of the District for the year 2021-22

Sl. No.	Name of the Mineral	Production (In m ³)
1	Sand	36500

Table 29: Production of the District for the year 2022-23

Sl. No.	Name of the Mineral	Production (In m ³)
1	Sand	117950

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- **Total Mineral production of In-situ Minerals (Minerals other than sand) in the district during last three years:**

Table 30: Production of the District for the year 2020-21

Sl. No.	Name of the Mineral	Production (In m³)
1	Ordinary Clay	100250
2	Stone	1500
3	Brick Earth	3500

Table 31: Production of the District for the year 2021-22

Sl. No.	Name of the Mineral	Production (In m³)
1	Ordinary Clay	6500
2	Stone	9500
3	Brick Earth	3750

Table 32: Production of the District for the year 2023-24

Sl. No.	Name of the Mineral	Production (In m³)
1	Ordinary Clay	27500
2	Stone	11500
3	Brick Earth	70002

CHAPTER 9: DETAILS OF REVENUE GENERATED FROM MINERAL SECTOR DURING LAST THREE YEARS

9.1 REVENUE GENERATION FROM MINERAL SECTOR:

➤ Revenue generated in the district for Sand for during four years:

Table 33: Revenue Generated in the district for year 2020-21

Sl. No.	Name of the Mineral	Rate	Royalty (In Rs.)	Cess (Rs.)	Total Revenue
1	Sand	140	4165000		

Table 34: Revenue Generated in the district for year 2021-22

Sl. No.	Name of the Mineral	Rate	Royalty (In Rs.)	Cess (Rs.)	Total Revenue
1	Sand	140	5110000		

Table 35: Revenue Generated in the district for year 2022-23

Sl. No.	Name of the Mineral	Rate	Royalty (In Rs.)	Cess (Rs.)	Total Revenue
1	Sand	140	16513000		

Table 36: Revenue Generated in the district for year 2023-24

Sl. No.	Name of the Mineral	Rate	Royalty (In Rs.)	Cess (Rs.)	Total Revenue
1	Sand				

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- Revenue generated in the district for In-situ Mineral (Mineral other than Sand) during last three years:

Table 37: Revenue Generated in the district for year 2020-21

Sl. No.	Name of the Mineral	Rate	Royalty (In Rs.)
1	Stone		
2	Sand Gravel		

Table 38: Revenue Generated in the district for year 2021-22

Sl. No.	Name of the Mineral	Rate	Royalty (In Rs.)
1	Stone		
2	Sand Gravel		

Table 39: Revenue Generated in the district for year 2022-23

Sl. No.	Name of the Mineral	Rate	Royalty (In Rs.)
1	Stone		
2	Sand Gravel		

CHAPTER 10: TRANSPORT

A major road like the National Highway No. 37 runs from the center of the district. National Highway 37 passes through the district connecting Dibrugarh, the district Head Quarters, with Chabua, Chaulkhoa, Khowang. NH no.37 also connects with neighboring districts Tinsukia and Sibsagar. Twelve major district roads are present. Name of the Major District roads are M1-Jalan Bus terminus Amolapatti Road (Convoy Road) (Jalan Bus Terminali - Amolapatti(River Bank)), M2-Mancotta Saraighat Road (Mancotta - Bamunbari), M3 Chabua - Tengakhat Road (Tengakhat - Chabua), M4 Deohal tinali Madhuting Road (Madhuting Tinali - Bokuloni), M5-Tiwarigula Duliajan Road (Tiwarigula - Doliajan), M6-Madhabpur Tipling Tinali Road (Madhapur Tinali - Tipling Tinali), M7-Namrup Rangasowal Road (Namrup Sonari) (Namrup(Sunari Tinali) - Rangasowal), M8-Rajgarh Juktoli Road (Bhojo) (Rajgarh - Juktoli), M9-Pithaguti -Dessang Road (Pithaguti Sapekhati) (Pithaguti - Trans Arunachal Highway), M10-Naharkatia Tingkhong Road (Belbari Tinali - Mathauni Tinali) Part2, Naharkatia Tingkhong Road (Naharkatia(Nagaon Tinali) - Tingkhong) Part1, M11-Moran Gourisagar Road(Nitaiukhuri) (Moran Tea Hospital - Laukhua Bridge(District Boundary) and M12-Naoholia Tipam Road (Naoholia - Tipam(Dihing River Bank)). All roads length varying from 2 – 33 km. Roads are connected with each other. The government frequently invests in road infrastructure to enhance transportation efficiency and support economic growth. The region faces challenges such as maintenance issues, seasonal flooding, and infrastructural development needs. Addressing these challenges is crucial for improving road connectivity. Bus services, both state-run and private, operate in Dibrugarh, providing connectivity to various destinations within and outside the district.

Northeast Frontier Railway network passes through the district Head Quarter. Important railway lines are North Lakhimpur-Dibrugarh Line, Connects Dibrugarh to other major towns in Assam; Dibrugarh-Guwahati Line, This line links Dibrugarh with the state capital, Guwahati, providing access to other parts of India.; Dibrugarh-Silchar Line, This line extends to Silchar in the southern part of Assam. These include express trains that connect Dibrugarh with major cities like Delhi, Kolkata, and Mumbai. Examples include the Dibrugarh Rajdhani Express and the Dibrugarh-Howrah Kamrup Express. The station itself is equipped with various facilities to cater to passengers, including waiting rooms, ticket counters, and refreshment options. Ongoing improvements and expansions aim to enhance passenger experience and capacity.

Dibrugarh district in Assam has an airport named Dibrugarh Airport (IAF Code: DIB), also known as Mohanbari Airport. It is located at Mohanbari, which is situated 15 km east from the city centre. Airport is well-connected to major cities in India. Regular flights operate to and from cities like Kolkata, Guwahati, Delhi, and Mumbai. It also provides flights to other regional destinations within the northeastern states of India. The airport has basic amenities, including check-in counters, baggage claim, and passenger lounges. There are also facilities for refreshments and ground transportation options like taxis and rental cars. The airport plays a vital role in connecting Dibrugarh with other parts of Assam and the northeastern region. It also facilitates travel to international destinations, although direct international flights are limited.

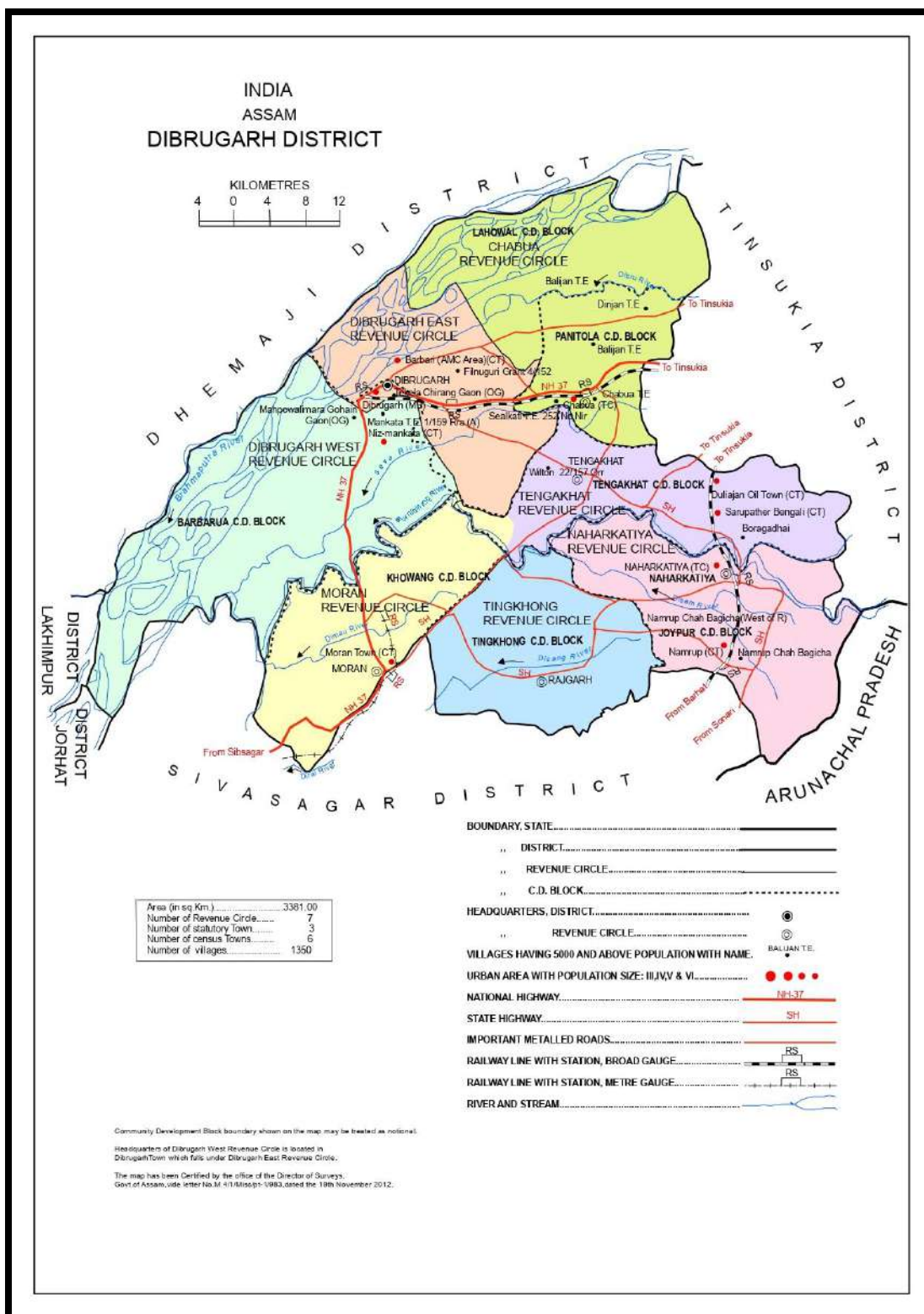
Existing sand mining areas of the district are connected with the state highways by blacktop or village/link roads. However, there is a scope for development of infrastructural structure. Mining of riverbed sand in the potential areas can generate considerable revenue and can be utilized for development of road network and infrastructure of the district.

A transportation map demarcating approach road to the potential sand blocks from the nearest National

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Highway/ Sate Highway has been prepared and presented in Figure 25.

Figure 25: Transport Map of the District



CHAPTER 11: IN-SITU MINERALS

11.1 MINERAL RESERVE

The sediments of Tertiary Age formed a treasury of few economic mineral deposits in Assam State. Dibrugarh District is no exception of these. Four distinct geological horizons belonging to Tikak Parbat Formation exist in this area where thicker seams of coal occur towards the bottom. About ten coal seams are located in the lower most horizon of Dibrugarh District in Assam is indeed significant for natural gas production. The region is part of the Upper Assam Basin, which is one of India's major natural gas-producing areas. Oil and Natural Gas Corporation Limited (ONGC) and Oil India Limited (OIL) are the key companies involved in the exploration and production of natural gas in this area. The natural gas extracted from Dibrugarh and surrounding regions is an important resource for the country's energy sector and has contributed to the development of infrastructure and industry in Assam. The gas fields in this district have been crucial in meeting regional energy needs and supporting industrial growth. Utilization of mineral is important, Thermal power station and a fertilizer factory situated at Namrup. Including Brick earth. That refers to the specific type of soil used for making bricks. It's generally a type of clay or loam that's rich in the minerals needed to form durable bricks when fired. The ideal brick earth has a good balance of clay, silt, and sand. It needs to be able to hold its shape when molded and withstand high temperatures during the firing process. In many areas, especially where brickmaking is a traditional industry, brick earth is often sourced from local deposits. This type of soil found in Rongrongia Gaon, Dehajan Gaon, Chakalia Gaon, etc. We have identified the potential area of brick earth material type of soil which included in **Anexure- v** (Source: *dgm.assam.gov.in*, Government of Assam Mines & Minerals Directorate of Geology & Mining.)

Mineral resources of the district are explained below.

Coal: Coal deposits of this state is mainly belonged to Tertiary coal deposits. The coal deposits found in Dilli Jeypore coalfield which is partly fall in to the Dibrugarh district. Here, thicker coal seams occur toward the bottom of four different geological layers that are part of the Tikak Parbat Formation. There are roughly ten coal seams in the lowestmost horizon, varying in thickness from 0.50 meters to 21 meters. The coal of this area is generally good in nature, low content of ash with high Moisture content varying from 3.7 to 6.7%, Fixed carbon content is varying from 32.6 to 46.5% and ash content is varying from 5.4-24.9%. Total reserve is Around 54 million tones and proved reserve is 32 million tones.

CHAPTER 12: REMEDIAL MEASURE TO MITIGATE THE IMPACT OF MINING

12.1 Environment Sensitivity

Dibrugarh district represents a unique geo-environmental setup. The district has a dense vegetation cover; almost 22.43% of total geographical area falls under forest. A significant part of Dibru-Saikhowa National Park and part of Dehing Patkai National Park falls under the district. Jokai Reserve Forest consists of Jokai Botanical Garden cum Germplasm Centre, it is one of the significant places for the migratory birds. Jeypore Rainforest is situated 60 km southeast of Dibrugarh in eastern Assam. It consists of very rich biodiversity including various rare and endangered flora and fauna. As human population increases, forests are being depleted for the extension of agricultural lands, introduction of new settlements, roadways etc. the Government of Assam has complied several legal frameworks to protect the reserve forests and other eco-sensitive zones from all sorts of forest degradation including encroachment, illegal felling, lopping, grazing, illegal collection of NTFP, illegal clearance of forests for coal mining, illegal removal of minor minerals etc.

Due to unprecedented growth of population during the last few decades, nature has started reacting sharply to the accumulated human guilt. Soil erosion and its conservation play an important role. The land use practices play the most important role in determining the stability factors in respect of landslide hazards.

12.2 Sand and Stone mining Impact

Another serious environmental problem around the globe in recent years is of sand and gravel mining. Sand mining is a process of extraction of sand from an open pit, river bed, sea beaches, ocean floor, river banks, deltas and island dunes. The extracted sand could be utilized for various types of manufacturing, such as concrete used in the construction of building and other structures. The sand can also be used as an abrasive. The demand for sand will increase with population growth and urbanization. The high demand of sand has led to unsustainable sand mining process resulting in illegal mining.

Although most jurisdictions have legal limit on the location and volume of sand that can be mined, illegal sand extraction is taking place in many parts of the country due to rapid urbanization and industrialization.

Removal or extraction of too much sand from rivers leads to erosion of river banks. Deltas can recede due to sand mining. These destructive effects of sand mining ultimately result in loss of fertile land and property. It also destabilizes the ground and causes failure of engineering structures.

In-stream mining directly alters the channel geometry and bed elevation. Removing sediment from the channel disrupts the pre-existing balance between sediment supply and transporting capacity, typically inducing incision upstream and downstream of the extraction site. The resultant incision alters the frequency of floodplain inundation along the river courses, lowers valley floor water table and frequently leads to destruction of bridges and channelization structures.

In Dibrugarh district while mining, all stone mahals and sand mahals should be geotagged. Sand, stone or any minor minerals mining operation would be done under strict supervision of forest

officer following all rules and regulations stipulated in Assam Minor Mineral Concession Rules to avoid any environmental and ecosystem degradation.

12.3 Remedial measure

12.3.1. Sustainable Mining Practices:

- The depth mining in riverbed shall not exceed 3 meter or base flow level whichever is less, provided that where the Joint Inspection Committee certifies about excessive deposit or over accumulation of mineral in certain reaches requiring channelization, it can go above 3 meters.
- Mining shall be done in layers of 1 meter depth to avoid ponding effect and after first layer is excavated, the process will be repeated for the next layers.
- No stream should be diverted for the purpose of sand mining. No natural water course and/ or water resources are obstructed due to mining operations.
- No blasting shall be resorted to in river mining and without permission at any other place.

12.3.2 Monitoring the Mining of Mineral and its Transportation:

- For each mining lease site, the access should be controlled in a way that vehicles carrying mineral from that area are tracked and accounted for.
- There should be regular monitoring of the mining activities in the State to ensure effective compliance of stipulated EC conditions and of the provisions under the Minor Mineral Concessions Rules framed by the State Government.

12.3.3 Noise Management:

- Noise arising out of mining and processing shall be abated and controlled at source to keep within permissible limit.
- Restricted sand mining operation has to be carried out between 6 am and 7 pm.

12.3.4 Air Pollution and Dust Management:

- The pollution due to transportation load on the environment will be effectively controlled and water sprinkling will also be done regularly.
- Air pollution due to dust, exhaust emission or fumes during mining and processing phase should be controlled and kept in permissible limits specified under environmental laws.
- The mineral transportation shall be carried out through covered trucks only and the vehicles carrying the mineral shall not be overloaded. Wheel washing facility should be installed and used.

12.3.5 Bio-Diversity Protection:

- Restoration of flora affected by mining should be done immediately. Five times the number of trees destroyed by mining to be planted preferably of indigenous species. Each

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EC holder shall have to undertake plantation of trees over at least 20% of the total area of lease in the same plot or plots utilised for such working.

- No mining lease shall be granted in the forest area without forest clearance in accordance with the provisions of the Forest Conservation Act, 1980 and the rules made there under.
- Protection of natural home of any wild animal shall have to be ensured.
- No felling of tree near quarry is allowed. For mining lease within 10km of the National Park / Sanctuary or in Eco-Sensitive Zone of the Protected Area, recommendation of Standing Committee of National Board of Wild Life (NBWL) has to be obtained as per the Hon'ble Supreme Court order in I.A. No. 460 of 2004.
- Spring sources should not be affected due to mining activities. Necessary protection measures are to be incorporated.

12.3.6. Management of Instability and Erosion:

- Removal, stacking and utilization of top soil should be ensured during mining. Where top soil cannot be used concurrently, it shall be stored separately for future use keeping in view that the bacterial organism should not die and should be spread nearby area.
- The EC should stipulate conditions for adequate steps to check soil erosion and control debris flow etc. by constructing engineering structures.
- Use of oversize material to control erosion and movement of sediments.
- No overhangs shall be allowed to be formed due to mining and mining shall not be allowed in area where subsidence of rocks is likely to occur due to steep angle of slope.
- No extraction of stone / boulder / sand in landslide prone areas.
- Controlled clearance of riparian vegetation to be undertaken.

12.3.7. Waste Management:

- Site clearance and tidiness is very much needed to have less visual impact of mining.
- Dumping of waste shall be done in earmarked places as approved in Mining Plan.
- Rubbish burial shall not be done in the rivers.

12.3.8. Pollution Prevention:

- Take all possible precautions for the protection of environment and control of pollution.
- Effluent discharge should be kept to the minimum and it should meet the standards prescribed.

12.3.9. Protection of Infrastructure:

- Mining activities shall not be done for mine lease where mining can cause danger to site of flood protection works, places of cultural, religious, historical, and archaeological importance.
- For carrying out mining in proximity to any bridge or embankment, appropriate safety zone should be worked out on case-to-case basis, taking into account the structural parameters, location aspects and flow rate, and no mining should be carried out in the safety zone so worked out.

Mining shall not be undertaken in a mining lease located in 300-500 meter of bridge, 300 meter upstream and downstream of water supply / irrigation scheme, 100 meters from the edge of National Highway and railway line, 50 meters from a reservoir, canal or building, 25 meters from the edge of State Highway and 10 meters from the edge of other roads except on special exemption by the Sub-Divisional level Joint Inspection Committee.

CHAPTER 13: SUGGESTED RECLAMATION PLAN FOR ALREADY MINED OUT AREAS

As per statute all mines/quarries are to be properly reclaimed before final closure of the mine. Reclamation plans should include:

1. Baseline survey of river cross section. The study of cross section is basis for delineating channel form. Cross-sections must be surveyed between two monumented endpoints set on the river banks, and elevations should be referenced based on benchmark set in the area;
2. The proposed mining cross-section data should be plotted over the baseline data to illustrate the vertical extent of the proposed excavation;
3. The cross-section of the replenished bar should be the same as the baseline data. This illustrates that the bar elevation after the bar is replenished will be the same as the bar before extraction;
4. A planimetric map showing the aerial extent of the excavation and extent of the riparian buffers;
5. Planting plan developed by a plant ecologist familiar with the flora of the river for any areas such as roads that need to be restored;
6. Each EC holder shall have to undertake plantation of trees over at least 20% of the total area of the plot or plots of land as subject to such working in accordance with a plan approved by the concerned Divisional Forest Officer holding jurisdiction, provided further the competent authority i.e., The Divisional Forest Officer may fix up norms for plantation of trees in a particular area regarding choice of species, spacing, nos of trees and maintenance etc.
7. A monitoring plan has to establish.

CHAPTER 14: RISK ASSESSMENT & DISASTER MANAGEMENT PLAN

Risk analysis is the systematic study of risks encountered during various stages of mining operation. Risk analysis seek to identify the risks involved in mining operations, to understand how and when they arise, and estimate the impact (financial or otherwise) of adverse outcomes. The sand mining operation in the district is mainly done manually.

14.1. Identification of risk due to river sand mining

There is no land degradation due to mining activities as mining is done only on river bed dry surface. There will be no OB or waste generation as the sand is exposed in the river bed and is completely saleable. There will be neither any stacking of soil nor creation of OB dumps. The mining activity will be carried out up to a maximum depth of 3m below the surface level. So, there is no chance of slope failure, bench failure in the mines. However, there are some identified risks in the mining activity which are as follows:

1. Accident during sand loading and transportation
2. Inundation/ Flooding
3. Quick Sand Condition

14.2. Mitigation measures

14.2.1. Measures to prevent accidents during loading and transportation:

- ❖ During the loading, trucks should be brought to a lower level so that the loading operation suits the ergonomic condition of the workers.
- ❖ The workers will be provided with gloves and safety shoes during loading.
- ❖ Opening of the side covers of the truck should be done carefully and with warning to prevent injury to the loaders.
- ❖ Mining operations will be done during daylight only.
- ❖ The truck will be covered with tarpaulin and maintained to prevent any spillage.
- ❖ To avoid danger while reversing the trackless vehicles especially at the embankment and tipping points, all areas for reversing of lorries should be made man free as far as possible.
- ❖ All transportation within the main working will be carried out directly under the supervision and control of the management.
- ❖ Overloading should not be permitted and the maximum permissible speed limit should be ensured.

- ❖ There will be regular maintenance of the trucks and the drivers will have valid driving license

14.2.2. Measures to prevent incidents during Inundation/ Flooding:

- ❖ To minimize the risk of flooding/ inundation following measures should be under taken:
- ❖ Mining will be completely closed during the monsoon months.
- ❖ Proper weather information, particularly on rain should be kept during the operational period of mines so that precautionary measures will be undertaken.

14.2.3. Measures for mitigation to quick sand condition:

- ❖ Quicksand zone and deep-water zone will be clearly demarcated and all the mine workers will be made aware of the location.
- ❖ Mining will be done strictly as per the approved mining plan.

14.3. Disaster Management Plan

As the depth of mining will be maximum of 3m below the surface level considering local condition, the risk related to mining activity is much less. The mining operation will be carried out under the supervision 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 law applicable to mine will strictly be complied. During heavy rainfall and during the monsoon season the mining activities will be closed. Proper coordination with Irrigation Department should be maintained so that at the time of releasing water, if any, from the dam suitable warning/information is given in advance. Special attention and requisite precautions shall be taken while working in areas of geological weakness like existence of slip, fault etc. The mining site will be supplied with first aid facilities and the entire mines worker will have access to that.

CHAPTER 15: CONCLUSION & RECOMMENDATIONS

15.1 CONCLUSION

Sand mining or River Bed Minerals mining (used here as a generic term that includes mining of any riverine aggregates regardless of particle size) is a global activity that is receiving increasing media attention due to perceived negative environmental and social impacts. As calls grow for stronger regulation of mining, there is a need to understand the scientific evidence to support effective management. This paper summarizes the results of a structured literature review addressing the question, the review found that most investigations have focused on temperate rivers where sand or river bed mineral mining occurred historically but has now ceased. Channel incision was the most common physical impact identified; other physical responses, including habitat disturbance, alteration of riparian zones, and changes to downstream sediment transport, were highly variable and dependent on river characteristics. Ecosystem attributes affected included macro invertebrate drift, fish movements, species abundance and community structures, and food web dynamics. Studies often inferred impacts on populations, but supporting data were scarce. Limited evidence suggests that rivers can sustain extraction if volumes (weight) are within the natural sediment load variability. Significantly, the countries and rivers for which there is science-based evidence related to sand or river bed mineral mining are not those where extensive sand mining or gravel, pebbles, boulder extraction is currently reported. The lack of scientific and systematic studies of mining in these countries prevents accurate quantification of mined volumes (weight) or the type, extent, and magnitude of any impacts. Additional research into how river bed mining is affecting ecosystem services, impacting biodiversity and particularly threatened species, and how mining impacts interact with other activities or threats is urgently required.

The rapid rise in urbanization and construction of large-scale infrastructure projects are driving increasing demands for construction materials globally. United Nations Environment Programme (UNEP; 2014) estimated that between 32 and 50 billion tonnes of sand and gravel are extracted globally each year with demand increasing, especially in developing countries (Schandl et al., 2016). Rivers are a major source of sand and gravel for numerous reasons: cities tend to be located near rivers so transport costs are low; river energy grinds rocks into gravels and sands, thus eliminating the cost of mining, grinding, and sorting rocks; and the material produced by rivers tends to consist of resilient minerals of angular shape that are preferred for construction (whereas wind-blown deposits in deserts are rounder and less suitable). Sand mining or river bed minerals mining activities are one of many recognized pressures affecting riverine ecosystems, where biodiversity is already in rapid decline (World Wildlife Fund, 2018). Increasingly, there are media reports about the negative environmental and social impacts of river bed mining, and as calls grow for stronger regulation of mining (Schandl et al., 2016), there is a need to understand the scientific evidence of mining impacts to underpin management.

Impacts of sand mining or river bed mineral mining on rivers may be two types such as direct or indirect. Direct impacts are those in which the extraction of material is directly responsible for the ecosystem impact, such as due to the removal of flood plains habitat. Indirect impacts are related to ecosystem changes that are propagated through the system due to physical changes in the river system resulting from sand extraction. For example, the removal of material from a river can alter the channel, river hydraulics, or sediment budget which in turn can alter the distribution of habitats and ecosystem functioning. These types of impacts can be difficult to attribute to river bed mining, as they may require long time frames to emerge, and other interventions can result in similar changes. The situation is further complicated by the

existence of geomorphic thresholds in river systems (Schumm, 1979). Alterations linked to removal of sand, gravel, pebbles, boulder from rivers may not be gradual and/or linear, and only limited changes may be observed for an extended period, but once a threshold is reached, change may become rapid and irreversible. Whether the impacts of sand or river bed mineral mining are positive, neutral, or negative depends on the situation and perceptions of different stakeholders.

During the preparation of the present report prominent rivers/ streams has been studied in detail. These mineral concessions shall also reduce demand load and will be helpful to minimize illegal extraction of minerals, failure of which may result in to illegal mining at odd hours and shall be haphazard and more detrimental to the local ecology. Irrespective of it following geo-scientific considerations are also suggested to be taken into account during the river bed mining in a particular area:

1. Abandoned stream channels or terrace and inactive floodplains may be preferred rather than active channels and their deltas and floodplains.
2. Stream should not be diverted to form inactive channel.
3. Mining below subterranean water level should be avoided as a safeguard against environmental contamination and over exploitation of resources.
4. Mining area should be demarcated on the ground with Pucca pillars so as to avoid illegal unscientific mining.

15.2 Recommendation:

1. The mining lease distribution for the district must be carried out by involving a district level committee constituted with inter-disciplinary members of various departments including irrigation and waterways, DL&LRO, forest, biodiversity, wetland management, SWID or any other relevant department which the district authority may find suitable to include.
2. While recommending for Mining Leases, the District Level Committee should ensure the protection of Biodiversity Zones as recorded by relevant Government Agencies from time to time.
3. It is recommended to have a periodical review along with primary data collection during pre- and post-monsoon periods to record the seasonal variance of the sedimentation rate on annual basis and update replenishment rate of the district.
4. Efforts should be given to restrict distribution of mining leases along the confluence zone of the rivers where rich aquatic habitats are reported.

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ANNEXURE – I

- **Details of Sand / M – Sand Source**
 - a) **Rivers,**
 - b) **De-siltation location: (Lakes/Ponds/Dams etc.)**
 - c) **Patta Lands/khatedari Land**
 - d) **M-Sand Plants**

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a) Rivers:

Sl. No	River Name / M-Sand plant	Total stretch of River (in Km)	Type Of River
1	Buridehing	120	Perennial
2	Brahmaputra	85.1	Perennial
3	Disang	70.5	Perennial

b) List of De-siltation location (Lake, Pond, Dams, River)

Name	Maintain/Controlled by State Govt./PSU etc.	Location	District	Lake/Pond/Dams/River/Canal	Tehsil	Village	Size (Ha)	Existing /Proposed
NA								

c) List of Patta Lands / Khatedari land

Owner	Area Kanal / Nala / Tilla	GPS Coordinates	Material / Forest Produce/ Mineral	District	Tehsil	Village	Agricultural Land (Yes / No)
NA							

d) M-Sand plants with location:

Sl. No.	Plant Name	Owner	District	Tehsil	Village	Geolocation		Quantity (Tonnes /Annum)
						Latitude	Longitude	
NA								

ANNEXURE – II

- **List of Potential Mining Leases (existing)**
 - **Rivers**
 - **Patta Lands/Khatedari Land:** (existing)
 - **De-Siltation Location:** (Lakes/Ponds/Dams etc.) (existing)
 - **M-Sand Plants:** (existing)

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➤ **List of existing mining zones of the district with location, area, period for each minor mineral (River Bed)**

Sl. No.	River Details	Name of the mines or Desilting sites	Area (Ha)	Geo-location		Distance in (km) from PA/BR/WC	Distance from Forest Area (in km)	Mining Leases within 500 meters (if yes cluster area)	Production as per EC (cum)	Mineral to be mined (Sand/ Bajri/R BM etc)	Existing /Proposed
				Latitude	Longitude						
01	Burid ehing	DBR/49/Burid ehing/Bahdhari/ Sand MCA	4.97	27°19'22.49"N 27°19'25.62"N 27°19'27.19"N 27°19'25.97"N	95°19'25.2"E 95°19' 25.8"E 95°19'7.42"E 95°19' 7.42"E	No PA/BR/WC available in 500m	No forest available in 500m	No	12000 P/A	SAND	Existing
02	Burid ehing	DBR/22/Burid ehing/ Jagunghat/Sand MCA	4.94	27°18'52.42"N 27°18'52.86"N 27°19'2.69"N 27°19' 2.38"N	95°19'55.3"E 95°20'1.37"E 95°19'56.92"E 95°19'51.41"E	No PA/BR/WC available in 500m	No forest available in 500m	No	15000 P/A	SAND	Existing
03	Burid ehing	DBR/31/Burid ehing/ Kenduguri/Sand MPA	2.22	27°18'58.46"N 27°18'52.65"N 27°18'54.63"N 27°19'0.5"N	95°4'26.64"E 95°4'20.8"E 95°4'18.39"E 95°4'24.15"E	No PA/BR/WC available in 500m	No forest available in 500m	No	10000 P/A	SAND	Existing
04	Burid ehing	DBR/30/Burid ehing/Horeghat/ Bharalibari/Sand MCA	4.53	27°21'34.3"N 27°21'36.72"N 27°21'25.47"N 27°21'23.6"N	94°59'12.33"E 94°59'9.86"E 94°58'57.38"E 94°58'59.78"E	No PA/BR/WC available in 500m	No forest available in 500m	No	12000 P/A	SAND	Existing
05	Burid ehing	DBR/23/Burid ehing/ Charaihabi/Sand MCA	4.97	27°20'3.14"N 27°19'59.89"N 27°19'52.42"N 27°19'50.19" N	94°56'30.68"E 94°56'33.94"E 94°56'21.22"E 94°56'24.32"E	No PA/BR/WC available in 500m	No forest available in 500m	No	22059 P/A	SAND	Existing

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06	Burid ehing	DBR/52/Buride hing/Deorighat/ Sand MCA of 2022 - 29	4.94	27°19'12.01"N 27°19'14"N 27°19'0.02"N 27°18'58.26"N	94°54'12.37"E 94°54'14.32"E 94°54'32.35"E 94°54'29.55"E	No PA/BR/WC available in 500m	No forest available in 500m	No	19400 P/A	SAND	Existing
07	Burid ehing	DBR/32/Buride hing/Khamtigh at/Sand MCA of 2022-29	4.94	27°20'18.17"N 27°20'13.71"N 27°20'7.77" N 27°20'12.36"N	94°57'13.92"E 94°57'18.27"E 94°57'10.26"E 94°57'10.26"E	No PA/BR/WC available in 500m	No forest available in 500m	No	36500 P/A	SAND	Existing
08	Burid ehing	DBR/16/Buride hing/Gamon/Sand/MCA	4.98	27°18'25.62"N 27°18'21.93" N 27°18'14.68"N 27°18'16.68"N	94°52'43.69"E 94°52'49.21"E 94°52'42.67"E 94°52'37.98"E	No PA/BR/WC available in 500m	No forest available in 500m	No	17500 P/A	SAND	Existing
09	Burid ehing	DBR/53/Buride hing/Kolakhowa Bahbari/Sand MCA	4.32	27°16'9.52"N 27°15'53.57"N 27°15'55.19"N 27°16'7.24"N	94°48'6.07"E 94°47'59.62"E 94°48'4.37"E 94°48'8.31"E	No PA/BR/WC available in 500m	No forest available in 500m	No	25565 P/A	SAND	Existing
10	Burid ehing	DBR/24/Buride hing. Bantona/Sand MCA	4.25	27°20'10.4"N 27°20'17.38"N 27°20'14.02"N 27°20'7.52"N	95°10'47.9"E 95°10'59.59"E 95°10'1.55"E 95°10'50.07"E	No PA/BR/WC available in 500m	No forest available in 500m	No	18863 P/A	SAND	Existing
11	Burid ehing	DBR/12/Buride hing/ Gamonghat/Sand MCA	4.15	27°18'51.48"N 27°18'47.51"N 27°18'53.73"N 27°18'56.27"N	94°53'1.13"E 94°53'7.53"E 94°53'12.97"E 94°53'10.2"E	No PA/BR/WC available in 500m	No forest available in 500m	No	-	SAND	Existing
12	Burid ehing	DBR/15/Buride hing/ Gamon Bhogamur/ Sand MCA	4.95	27°17'41.99"N 27°17'39.12"N 27°17'39.92"N 27°17'45.02"N	94°52'2.78"E 94°52'2.41"E 94°51'48.18"E 94°51'47.62"E	No PA/BR/WC available in 500m	No forest available in 500m	No	-	SAND	Existing

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13	Buridehing	DBR/26/Buridehing/Silputa/Sand MCA	4.00	27°14'52.72"N 27°14'55.84"N 27°15'0.03"N 27°14'57.13"N	94°46'49.29"E 94°46'48.45"E 94°46'59.51"E 94°47'3.16"E	No PA/BR/WC available in 500m	No forest available in 500m	No	-	SAND	Existing
14	Buridehing	DBR/54/Buridehing/Disam Kulagora/Sand MCA	4.98	27°19'37.16"N 27°19'40.99"N 27°19'40.99"N 27°19'30.82"N	95°7'17.1"E 95°7'15.6"E 95°7'2.68"E 95°7'5.15"E	No PA/BR/WC available in 500m	No forest available in 500m	No	-	SAND	Existing
15	Buridehing	DBR/55/Buridehing/Jagunghat /Sand MCA	4.9	27°18'47.29"N 27°18'48.36"N 27°18'40.12"N 27°18'35.67"N	95°19'56.88"E 95°20'2.86"E 95°20'1.85"E 95°19'55.59"E	No PA/BR/WC available in 500m	No forest available in 500m	No	21748 P/A	SAND	Existing
16	Buridehing	DBR/56/Buridehing/Mohmari/Sand MCA	4.78	27°18'56.09"N 27°18'58.15"N 27°18'43.87"N 27°18'42.65"N	95°18'31.58"E 95°18'27.46"E 95°18'24.24"E 95°18'27.35"E	No PA/BR/WC available in 500m	No forest available in 500m	No	21215 P/A	SAND	Existing
17	Buridehing	DBR/57/Buridehing/Nepali Ganon/Sand MCA	4.98	27°21'17.29"N 27°21'11.57"N 27°21'7.83"N 27°21'13.53"N	95°12'31.99"E 95°12'44.07"E 95°12'41.79"E 95°12'29.63"E	No PA/BR/WC available in 500m	No forest available in 500m	No	-	SAND	Existing
18	Buridehing	DBR/18/Buridehing/Bhekulajan/Sand MCA	4.87	27°21'29.68"N 27°21'34.94"N 27°21'31.45"N 27°21'25.51"N	95°12'1.84"E 95°12'5.69"E 95°12'13.34"E 95°12'10.54"E	No PA/BR/WC available in 500m	No forest available in 500m	No	-	SAND	Existing
19	Buridehing	DBR/58/Buridehing/Dighaliah ulla/Sand/MCA	4.1	27°15'25.68"N 27°15'31.62"N 27°15'36.65"N 27°15'42.41"N 27°15'39.26"N 27°15'35.2"N 27°15'30.56"N 27°15'25.55"N	94°47'55.82"E 94°47'55.91"E 94°47'56.92"E 94°47'57.57"E 94°47'55.24"E 94°47'52.03"E 94°47'52.49"E 94°47'53.7"E	No PA/BR/WC available in 500m	No forest available in 500m	No	-	SAND	Existing

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20	Burid ehing	DBR/59/Buride hing/Dhoriatoli Gaon/Sand MCA	4.66	27°22'45.35"N 27°22'48.92"N 27°22'36.66"N 27°22'39.8"N	95°0'4.32"E 95°0'6.34"E 95°0'14.51"E 95°0'17.1"E	No PA/BR/WC available in 500m	No forest available in 500m	No	-	SAND	Existing
21	Burid ehing	DBR/48/Buride hing/ Kulagora/Sand	-	27°19'37.03"N 27°19'35.15"N 27°19'33.17"N 27°19'36.34"N	95°6'41.27"E 95°6'40.48"E 95°6'47.62"E 95°6'47.74"E	No PA/BR/WC available in 500m	No forest available in 500m	No	-	SAND	Existing
22	Burid ehing	DBR/25/Buride hing/ Horeghat/Sand	-	27°21'0.82"N 27°20'53.1"N 27°21'6.16"N 27°21'0.22"N	94°58'14.76"E 94°58'13.2"E 94°58'22.81"E 94°58'25.05"E	No PA/BR/WC available in 500m	No forest available in 500m	No	-	SAND	Existing
23	Burid ehing	DBR/42/Buride hing/ Napam Thangaon/Sand MPA	-	27°19' 17"N 27°19'18"N 27°19'30"N 27°19'29.4"N	94°56'5.4"E 94°56'4"E 94°56'14"E 94°56'14.1"E	No PA/BR/WC available in 500m	No forest available in 500m	No	-	SAND	Existing
24	Burid ehing	DBR/14/Buride hing/ Kotoha/ Sand MPA	3.00	27°17'59.6"N 27°17'58.11"N 27°17'48.16"N 27°17'50.3"N	94°52'30"E 94°52'31.93"E 94°52'24.9"E 94°52'22.2"E	No PA/BR/WC available in 500m	No forest available in 500m	No	-	SAND	Existing
25	Dilli	DBR/02/Dilliriver/Stone MCA	4.32	27°9'16.8"N 27°9'15.87"N 27°9'23.53"N 27°9'32.24"N 27°9'46.9"N 27°9'47.43"N 27°9'31.99"N 27°9'24.78"N	95°21'35.1"E 95°21'33.88"E 95°21'28.28"E 95°21'25.99"E 95°21'30.5"E 95°21'32.1"E 95°21'27.69"E 95°21'29.47"E	No PA/BR/WC available in 500m	No forest available in 500m	No	-	RBM	Existing

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26	Dilli	DBR/04/Dilliriver/Stone MCA	4.67	27°10'31.89"N 27°10'31.52"N 27°10'44.27"N 27°10'53.45"N 27°10'54.21"N 27°10'41.39"N	95°20'45.33"E 95°20'43.32"E 95°20'41.23"E 95°20'37.61"E 95°20'38.52"E 95°20'45.38"E	No PA/BR/WC available in 500m	No forest availabl e in 500m	No	-	RBM	Existing
27	Dilli	DBR/01/Dillighhat/Dilliriver/Stone/MCA	4.49	27°8'47.93"N 27°8'54.5"N 27°9'1.97"N 27°9'7.1"N 27°9'13.97"N 27°9'12.8"N 27°9'6.4"N 27°8'0.71"N 27°8'53.14"N 27°8'46.82"N	95°21'56.15"E 95°21'51.31"E 95°21'48.9"E 95°21'45.76"E 95°21'38.75"E 95°21'37.36"E 95°21'44.19"E 95°21'47.7"E 95°21'50.48"E 95°21'54.2"E	No PA/BR/WC available in 500m	No forest availabl e in 500m	No	-	RBM	Existing
28	Buridhing	DBR/47/Buridhing/Gamon/Sand MPA	3.49	27°19'4.86"N 27°19'9.15"N 27°19'12.95"N 27°19'7.06"N	94°53'50.88"E 94°54'2.92"E 94°54'2.75"E 94°54'49.67"E	No PA/BR/WC available in 500m	No forest availabl e in 500m	No	-	SAND	Existing
29	Dilli	DBR/5/Dilli River Stone Mining Permit Area	2.40	27°10'57.65"N 27°11'10.23"N 27°11'11.67"N 27°11'11.23"N 27°11'9.83"N 27°10'57.24" N	95°20'35.55"E 95°20'24.63"E 95°20'14.74"E 95°20'15.04"E 95°20'24.08"E 95°20'35.12"E	No PA/BR/WC available in 500m	No forest availabl e in 500m	No	-	RBM	Existing
30	Dilli	DBR/03/Dilli River Stone Mining Permit Area	1.5	27°10'1.4"N 27°10'1.47"N 27°10'14.03"N 27°10'11.9"N 27°10'21.19"N 27°10'20.25"N	95°21'28.94"E 95°21'30.45"E 95°21'21.27"E 95°21'22.38"E 95°20'57.83"E 95°20'57.06"E	No PA/BR/WC available in 500m	No forest availabl e in 500m	No	-	RBM	Existing
31	Buridhing	DIG/T (Old Dig - 15 - A)	4.7	27°19'34.8"N 27°19'37.16" N 27°19'32.97"N 27°19'31.02"N	95°19'20.24"E 95°19'6.38"E 95°19'6.28"E 95°19'19.44"E	No PA/BR/WC available in 500m	No forest availabl e in 500m	No	171615	SAND	Existing

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32	Burid ehing	DIG/U (Old Dig - 15 C)	4.18	27°19'26.36"N 27°19'22.97"N 27°19'13.76"N 27°19'15.52"N	95°19'39.65"E 95°19'36.79"E 95°19'48.3"E 95°19'50.81"E	No PA/BR/WC available in 500m	No forest available in 500m	No	154600	SAND	Existing
33	Burid ehing	DIG/W (Old Dig - 15 - B)	3.75	27°19'33.64"N 27°19'29.79"N 27°19'27.16"N 27°19'24.96"N	95°19'24.24"E 95°19'23.03"E 95°19'36.38"E 95°19'34.59"E	No PA/BR/WC available in 500m	No forest available in 500m	No	104020	SAND	Existing
34	Brahmaputra	Old Bogibeel Ghat Ordinary Clay Mining Permit Area	4.63	27°23'52.35"N 27°24'6.6"N 27°24'47.65"N 27°25'27.67"N 27°25'14.3"N 27°24'24.89"N	94°47'18.47"E 94°47'48.5"E 94°48'24.21"E 94°48'48.85"E 94°47'38.43"E 94°46'45.02"E	No PA/BR/WC available in 500m	No forest available in 500m	No	32500 P/A	Ordinary Clay (Silt)	Existing
35	Brahmaputra	North Balijan Bajarghat Ordinary Clay Mining Permit Area	4.8	27°33'15.99"N 27°33'23.42"N 27°33'25"N 27°33'20.44"N	95°9'46.45"E 95°9'43.56"E 95°9'50.9"E 95°9'54.64"E	No PA/BR/WC available in 500m	No forest available in 500m	No	35506 P/A	Ordinary Clay (Silt)	Existing
36	Brahmaputra	Brahmaputra River Ordinary Clay (Silt) Mining Permit Area, Ranighat	4.93	27°34'0.47"N 27°34'4.86"N 27°34'1.87"N 27°35'57.6"N	95°16'18.14"E 95°16'16.31"E 95°16'4.17"E 95°16'5.93"E	No PA/BR/WC available in 500m	No forest available in 500m	No	36465 P/A	Ordinary Clay (Silt)	Existing
37	Burid ehing	Aghunibari (Kenduguri) Area Ordinary Clay Mining Permit Area	4.92	27°18'47.2"N 27°18'44.93"N 27°18'36.55"N 27°18'38.35"N	95°4'11.97"E 95°4'17.04"E 95°4'15.01"E 95°4'8"E	No PA/BR/WC available in 500m	No forest available in 500m	No	44014 P/A	Ordinary Clay (Silt)	Existing
38	Brahmaputra	Brahmaputra River Ordinary Clay (Silt) Mining Permit Area "Old Bogibeel Ghat"	4.1	27°23'56.71"N 27°23'52.28"N 27°23'49.73"N 27°23'50.57"N	95°47'6.3"E 95°47'13.37"E 95°47'9"E 95°46'59.92"E	No PA/BR/WC available in 500m	No forest available in 500m	No	30329	Ordinary Clay (Silt)	Existing

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39	Buridehing	Buridehing River Ordinary Clay (Silt) Mining Permit Area "Gamon Area"	1.52	27°18'14.87"N 27°18'13.42"N 27°18'7.95"N 27°18'9.16"N	94°52'37.27"E 94°52'40.39"E 94°52'36.62"E 94°52'34.83"E	No PA/BR/WC available in 500m	No forest available in 500m	No	11244 P/A	Ordinary Clay (Silt)	Existing
40	Brahmaputra	Brahmaputra River Ordinary Clay (Silt) Mining Permit Area "Old Bogibeel Ghat"	4.91	27°24'7.93"N 27°24'4.96"N 27°24'10.9"N 27°24'14.53"N	94°47'2.3"E 94°46'55.07"E 94°46'51.63"E 94°46'59.71"E	No PA/BR/WC available in 500m	No forest available in 500m	No	36321 P/A	Ordinary Clay (Silt)	Existing
41	Buridehing	Charaihabhi Ordinary Clay (Silt) Mining Permit Area "Buridehing River"	4.9	27°19'49.54"N 27°19'47.11"N 27°19'30.31"N 27°19'30.84"N	94°56'19.15"E 94°56'22.53"E 94°56'21.19"E 94°56'18.17"E	No PA/BR/WC available in 500m	No forest available in 500m	No	72493 P/A	Ordinary Clay (Silt)	Existing
42	Buridehing	Buridehing River Sand Mining Permit Area "Khamtighat"	4.18	27°20'21.39"N 27°20'15.71"N 27°20'23.4"N 27°20'28.17"N	94°57'13.98"E 94°57'19.13"E 94°57'22.13"E 94°57'21.01"E	No PA/BR/WC available in 500m	No forest available in 500m	No	46381 P/A	SAND	Existing
43	Buridehing	Buridehing River Ordinary Clay (Silt) Mining Permit Area "Horeghat"	4.3	27°20'59.4"N 27°20'55.05"N 27°20'58.57"N 27°21'3.24"N	94°58'17.61"E 94°58'4.47"E 94°58'4.04"E 94°58'15.48"E	No PA/BR/WC available in 500m	No forest available in 500m	No	30329 P/A	Ordinary Clay (Silt)	Existing
44	Buridehing	Dehing River Ordinary Clay (Silt) Mining Permit Area "Thangon Parghat"	2.67	27°14'45.24"N 27°14'45.46"N 27°14'40.83"N 27°14'37.09"N	94°45'58.61"E 94°46'2.95"E 94°46'8.48"E 94°46'7.42"E	No PA/BR/WC available in 500m	No forest available in 500m	No	19751 P/A	Ordinary Clay (Silt)	Existing

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45	Buridehing	Naharkatia Sasoni Mohmari Gaon Mining Permit Area	2.65	27°18'24.83"N 27°18'20.42"N 27°18'23.77"N 27°18'27.59"N	95°18'2.35"E 95°17'52.22"E 95°17'51.15"E 95°18'0.32"E	No PA/BR/WC available in 500m	No forest available in 500m	No	--	SAND & Ordinary Clay (Silt)	Existing
46	Buridehing	Nahorkatia Sasoni Balipora Gaon Mining Permit Area	3.46	27°18'27.34"N 27°18'35.14"N 27°18'36.96"N 27°18'29.34"N	95°16'16.4"E 95°16'27.66"E 95°16'30.64"E 95°16'39.12"E	No PA/BR/WC available in 500m	No forest available in 500m	No	--	SAND	Existing
47	Buridehing	Extraction of Sand from Buridehing River Bed at Gajpuria Near Gabharu Bridge of Sasoni Area	0.75	27°19'27.77"N 27°19'29.25"N 27°19'31.48"N 27°19'30"N	95°15'52.39"E 95°15'53.58"E 95°15'49.32"E 95°15'48.21"E	No PA/BR/WC available in 500m	No forest available in 500m	No	--	SAND	Existing
48	Buridehing	Buridehing River Sand Mining Permit Area Dighaliahulla, Khowang	1.97	27°15'26.66"N 27°15'26.73"N 27°15'39.22"N 27°15'39.15"N	94°47'54.5"E 94°47'53.44"E 94°47'53.58"E 94°47'56.23"E	No PA/BR/WC available in 500m	No forest available in 500m	No	--	SAND	Existing
49	Dilli River	DBR/6/Dilli River Stone Mining Permit Area	4.90	27°11'7.98"N 27°11'5.92"N 27°11'5.76"N 27°11'7.53"N	95°20'2.22"N 95°18'42.8"N 95°18'42.63"E 95°20'1.87"E	No PA/BR/WC available in 500m	No forest available in 500m	No	--	RBM	Existing
50	Buridehing	DBR/60/Buridehing/Bolai/Sand MCA	4.85	27°18'29"N 27°18'32.3"N 27°18'44.8"N 27°18'44.2"N	94°54'37.6"E 94°54'40.6"E 94°54'32.9"E 94°54'30"E	No PA/BR/WC available in 500m	No forest available in 500m	No	--	SAND	Existing

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➤ **List of existing mining zones of the district with location, area, period for each minor mineral (In-Situ)**

SL. No.	Name of Mineral	Name of Lease	Area (HA)	Geo-coordinates		Quantity As per EC (CUM)	Lease Execution date	Lease Expiry Date
				Latitude	Longitude			
1	Ordinary Earth	Naojan Habigaon Ordinary Earth Mining Permit Area	3.93	27°18'44.21"N 27°18'44.26"N 27°18'49.67"N 27°18'49.5"N 27°18'56.2"N 27°18'56"N 27°18'2.6"N 27°18'3.8"N 27°18'53"N 27°18'47.4"N 27°18'47.73"N 27°18'53.5" N	94°53'25.11"E 94°53'28.07"E 94°53'28.54"E 94°53'25.3"E 94°54'2.3"E 94°54'4.3"E 94°54'5.1"E 94°54'1.7"E 94°54'3"E 94°54'5.6"E 94°54'6.68"E 94°54'5"E	21480 P/A	--	--
2	Stone	Chaikya Gaon PP Land Stone Mining Permit Area	0.93	27°9'59.6"N 27°9'58"N 27°10'4.4"N 27°10'4.8"N	95°21'52.4"E 95°21'50.7"E 95°21'47.9"E 95°21'48.7"E	4538 P/A	--	--
3	Ordinary Earth	Kachuwani Gaon Ordinary Earth Mining Permit Area	4.0	27°31'57.42"N 27°31'55.05"N 27°31'55.05"N 27°31'52.36"N 27°31'55.05"N 27°31'52.36"N 27°31'48.88"N 27°31'49.21"N 27°31'49.34"N 27°31'51.06"N 27°31'52.63"N 27°31'57.61"N	95°3'28.08"E 95°3'28.54"E 95°3'30.51"E 95°3'31.1"E 95°3'30.51"E 95°3'31.1"E 95°3'29.75"E 95°3'31.24"E 95°3'37.35"E 95°3'36.27"E 95°3'34.91"E 95°3'33.44" E	19521	--	--

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b) List of Patta Lands / Khatedari land

Owner	Area Kanal / Nala/Tilla	GPS Coordinates	Material/ Forest Produce/ Mineral	Total Mineral to be Mined (in m3)	District	Tehsil	Village	Agricultural Land (Yes / No)
NA								

c) List of De-siltation location (Lake, Pond, Dams, River)

Name	Maintain/Controlled by State Govt./PSU etc.	Location	District	Lake/Pond/Dams/River/Canal	Tehsil	Village	Size (Ha)	Existing/Proposed
NA								

d) M-Sand plants with location

Sl. No.	Plant Name	Owner	District	Tehsil	Village	Geolocation		Quantity (Tonnes/Annum)
						Latitude	Longitude	
NA								

ANNEXURE – III

- **list of Cluster and Contiguous Clusters**
 - **Clusters:**
 - **Contiguous Clusters:**

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• **Cluster details**

River Name	Cluster No.	Lease No.	Location (Riverbed/Patta Land)	Village	Area (in Ha)	Total Excavation (Ton)	Total Mineral Excavation (Ton)
NA							

• **Contiguous Cluster details**

River Name	Contiguous Cluster No.	Cluster No.	Number of leases in the cluster	Location (Riverbed/Patta Land)	Distance between clusters	Village	Area of Cluster (Ha)	Total Mineral Excavation (Ton)
NA								

ANNEXURE – IV

- **Transportation Routes for Individual leases and leases in Cluster**

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➤ **Transportation Routes for individual leases details:**

Lease No.	Transportation Route No.	Number of tippers /days of lease	Number of tippers /days of all the lease on route	Length of the Route in Km	Type of Road (black Topped/ unpaved)	Recommendation for road (Black Topped/ unpaved)	The road will be constructed by Govt. / Lease Owner	Route Map & Location
NA								

➤ **Transportation Routes for leases in Cluster details:**

Cluster No.	Transportation Route No.	Number of tippers / days of cluster	Number of tippers / days of all the clusters on route	Length of Route in km	Type of Road (Black Topped / unpaved)	Recommendation for road (Black Topped / unpaved)	The road will be Constructed by Govt. / Lease Owner	Route Map & Location
NA								

ANNEXURE – V

- **Final list of Potential Mining Zones :** (Proposed)
- **Final list of Patta land:** (Proposed)
- **De-siltation Location:** (Lakes/Ponds/Dams etc.)(Proposed)
- **Final list of Sand/M – Sand Source:** (Proposed)

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➤ **Final List of potential Mining zones: (River Bed)**

Sl. No.	Lease Details (Zone Code)	River Details	Area (In Ha)	Latitude	Longitude	Depth	Distance (In Km) From PA/BR/WC	Distance From Forest Area (In Km)	Mining Leases Within 500 meters (if Yes cluster area In Ha)	Total Excavation in (CUM/Yr) (Mine Depth max as 3m)	Mineable Reserve (cum)	Mineral to be mined (Sand/Bajri/RBM etc.)	Existing / Proposed
1	DBGH_PRO_01	DILLI RIVER	14.6	27° 9'52.49"N 27° 9'46.26"N 27° 8'47.97"N 27° 8'46.34"N	95°21'32.27"E 95°21'32.16"E 95°21'56.18"E 95°21'52.08"E	2	No PA/BR/WC available in 500m	No forest available in 500m	No	292000	175200	RBM	Proposed
2	DBGH_PRO_02	DILLI RIVER	8.1	27°10'20.07"N 27°10'21.23"N 27°10'1.64"N 27°10'1.25"N	95°20'56.89"E 95°20'57.83"E 95°21'31.02"E 95°21'28.83"E	2	No PA/BR/WC available in 500m	No forest available in 500m	No	162000	97200	RBM	Proposed
3	DBGH_PRO_03	DILLI RIVER	7.5	27°10'53.12"N 27°10'54.20"N 27°10'29.38"N 27°10'29.43"N	95°20'37.26"E 95°20'38.59"E 95°20'45.57"E 95°20'42.85"E	2	No PA/BR/WC available in 500m	No forest available in 500m	No	150000	90000	RBM	Proposed
4	DBGH_PRO_04	DILLI RIVER	2	27°11'8.41"N 27°11'7.38"N 27°11'8.24"N 27°11'8.76"N	95°20'8.69"E 95°20'9.73"E 95°20'25.07"E 95°20'26.29"E	2	No PA/BR/WC available in 500m	No forest available in 500m	No	40000	24000	RBM	Proposed
5	DBGH_PRO_05	DILLI RIVER	17	27°11'5.84"N 27°11'6.40"N 27°11'5.95"N 27°11'7.59"N	95°18'41.73"E 95°18'42.77"E 95°20'5.85"E 95°20'5.36"E	2	No PA/BR/WC available	No forest available in	No	340000	204000	RBM	Proposed

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							in 500m	500m					
6	DBGH_PRO_06	Buridehing River	21.2	27°19'7.97"N 27°19'9.61"N 27°18'43.38"N 27°18'34.84"N	95°19'46.01"E 95°19'53.06"E 95°20'4.23"E 95°19'54.92"E	2.25	No PA/BR/WC available in 500m	No forest available in 500m	No	477000	286200	Sand	Proposed
7	DBGH_PRO_06A	Buridehing River	16.2	27°18'39.81"N 27°18'30.40"N 27°17'58.75"N 27°18'6.47"N	95°20'8.20"E 95°20'6.55"E 95°19'51.71"E 95°19'49.85"E	2.25	No PA/BR/WC available in 500m	No forest available in 500m	No	364500	218700	Sand	Proposed
8	DBGH_PRO_06B	Buridehing River	13.5	27°17'46.58"N 27°17'41.66"N 27°17'52.01"N 27°17'57.21"N	95°20'3.67"E 95°20'9.42"E 95°20'27.88"E 95°20'22.59"E	2.25	No PA/BR/WC available in 500m	No forest available in 500m	No	303750	182250	Sand	Proposed
9	DBGH_PRO_07	Buridehing River	28.6	27°19'39.49"N 27°19'32.41"N 27°19'13.02"N 27°19'15.51"N	95°19'4.41"E 95°19'4.63"E 95°19'48.08"E 95°19'52.02"E	2.25	No PA/BR/WC available in 500m	No forest available in 500m	No	643500	386100	Sand	Proposed
10	DBGH_PRO_08	Buridehing River	8.17	27°19'28.63"N 27°19'23.87"N 27°19'20.57"N 27°19'25.76"N	95°19'6.15"E 95°19'5.35"E 95°19'26.34"E 95°19'27.27"E	2.25	No PA/BR/WC available in 500m	No forest available in 500m	No	183825	110295	Sand	Proposed
11	DBGH_PRO_09	Buridehing River	8.3	27°18'59.43"N 27°18'57.41"N 27°18'38.26"N 27°18'40.12"N	95°18'26.45"E 95°18'32.35"E 95°18'24.18"E 95°18'22.10"E	2.25	No PA/BR/WC available in 500m	No forest available in 500m	No	186750	112050	Sand	Proposed
12	DBGH_PRO_10	Buridehing River	9.1	27°18'31.42"N 27°18'28.82"N 27°18'19.08"N 27°18'26.38"N	95°18'6.79"E 95°18'8.91"E 95°17'51.09"E 95°17'52.14"E	2.25	No PA/BR/WC available in 500m	No forest available in 500m	No	204750	122850	Sand	Proposed

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13	DBGH_PRO_10A	Buridehing River	13	27°18'14.17"N 27°18'7.67"N 27°18'3.55"N 27°18'15.63"N	95°17'0.56"E 95°17'3.37"E 95°17'15.85"E 95°17'30.64"E	2.25	No PA/BR/WC available in 500m	No forest available in 500m	No	292500	175500	Sand	Proposed
14	DBGH_PRO_11	Buridehing River	6.43	27°18'36.09"N 27°18'38.32"N 27°18'27.54"N 27°18'25.89"N	95°16'25.17"E 95°16'30.84"E 95°16'41.09"E 95°16'36.91"E	2.25	No PA/BR/WC available in 500m	No forest available in 500m	No	144675	86805	Sand	Proposed
15	DBGH_PRO_12	Buridehing River	2.42	27°19'30.57"N 27°19'33.14"N 27°19'26.95"N 27°19'29.94"N	95°15'46.05"E 95°15'48.99"E 95°15'53.27"E 95°15'55.61"E	2.25	No PA/BR/WC available in 500m	No forest available in 500m	No	54450	32670	Sand	Proposed
16	DBGH_PRO_12A	Buridehing River	14.1	27°20'1.67"N 27°20'0.85"N 27°19'53.27"N 27°19'46.15"N	95°14'32.48"E 95°14'40.93"E 95°14'58.57"E 95°15'6.07"E	2.25	No PA/BR/WC available in 500m	No forest available in 500m	No	317250	190350	Sand	Proposed
17	DBGH_PRO_12B	Buridehing River	6.8	27°19'53.13"N 27°19'48.53"N 27°19'42.55"N 27°19'48.48"N	95°15'21.24"E 95°15'19.77"E 95°15'40.13"E 95°15'32.24"E	2.25	No PA/BR/WC available in 500m	No forest available in 500m	No	153000	91800	Sand	Proposed
18	DBGH_PRO_12C	Buridehing River	5.54	27°19'40.58"N 27°19'38.67"N 27°19'32.69"N 27°19'33.55"N	95°15'38.59"E 95°15'39.32"E 95°15'57.32"E 95°15'58.12"E	2.25	No PA/BR/WC available in 500m	No forest available in 500m	No	124650	74790	Sand	Proposed
19	DBGH_PRO_13	Buridehing River	18.2	27°21'9.72"N 27°21'17.40"N 27°21'10.09"N 27°21'4.40"N	95°12'22.78"E 95°12'25.64"E 95°12'49.21"E 95°12'43.74"E	2.25	No PA/BR/WC available in 500m	No forest available in 500m	No	409500	245700	Sand	Proposed

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20	DBGH_PRO_14	Buridehing River	13.2	27°21'31.90"N 27°21'36.39"N 27°21'37.23"N 27°21'26.60"N	95°11'50.59"E 95°11'52.75"E 95°12'6.60"E 95°12'16.23"E	2.25	No PA/BR/WC available in 500m	No forest available in 500m	No	297000	178200	Sand	Proposed
21	DBGH_PRO_15	Buridehing River	8.52	27°20'10.56"N 27°20'6.06"N 27°20'14.91"N 27°20'17.90"N	95°10'45.44"E 95°10'49.49"E 95°11'5.33"E 95°10'59.33"E	2.25	No PA/BR/WC available in 500m	No forest available in 500m	No	191700	115020	Sand	Proposed
22	DBGH_PRO_15A	Buridehing River	14.7	27°20'43.78"N 27°20'40.13"N 27°20'44.18"N 27°20'47.92"N	95°9'16.39"E 95°9'22.94"E 95°9'42.43"E 95°9'43.57"E	2.25	No PA/BR/WC available in 500m	No forest available in 500m	No	330750	198450	Sand	Proposed
23	DBGH_PRO_16	Buridehing River	11.3	27°19'32.39"N 27°19'28.04"N 27°19'36.78"N 27°19'38.59"N	95°6'55.80"E 95°6'59.34"E 95°7'20.41"E 95°7'23.57"E	2.25	No PA/BR/WC available in 500m	No forest available in 500m	No	254250	152550	Sand	Proposed
24	DBGH_PRO_17	Buridehing River	16.5	27°19'31.14"N 27°19'38.55"N 27°19'35.73"N 27°19'25.25"N	95°6'24.15"E 95°6'32.46"E 95°6'47.14"E 95°6'45.48"E	2.25	No PA/BR/WC available in 500m	No forest available in 500m	No	371250	222750	Sand	Proposed
25	DBGH_PRO_17A	Buridehing River	15.6	27°19'11.71"N 27°19'4.87"N 27°19'10.86"N 27°19'17.87"N	95°4'46.70"E 95°4'57.67"E 95°5'16.06"E 95°5'21.06"E	2.25	No PA/BR/WC available in 500m	No forest available in 500m	No	351000	210600	Sand	Proposed
26	DBGH_PRO_17	Buridehing River	23	27°18'18.10"N 27°18'19.99"N 27°19'5.28"N 27°19'5.89"N	95°4'0.24"E 95°4'4.18"E 95°4'39.72"E 95°4'31.86"E	2.25	No PA/BR/WC available in 500m	No forest available in 500m	No	517500	310500	Sand	Proposed

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27	DBGH_PRO_18A	Buridehing River	5.63	27°18'26.35"N 27°18'23.63"N 27°18'23.56"N 27°18'30.97"N	95° 3'46.13"E 95° 3'45.61"E 95° 3'55.30"E 95° 3'59.92"E	2.25	No PA/BR/WC available in 500m	No forest available in 500m	No	126675	76005	Sand	Proposed
28	DBGH_PRO_18B	Buridehing River	12.7	27°19'32.61"N 27°19'37.64"N 27°19'39.05"N 27°19'32.95"N	95° 2'36.15"E 95° 2'41.35"E 95° 3'0.18"E 95° 3'7.32"E	2.25	No PA/BR/WC available in 500m	No forest available in 500m	No	285750	171450	Sand	Proposed
29	DBGH_PRO_18C	Buridehing River	16.6	27°19'58.25"N 27°20'2.90"N 27°19'34.56"N 27°19'32.52"N	95° 2'6.52"E 95° 2'13.29"E 95° 2'21.16"E 95° 2'14.00"E	2.25	No PA/BR/WC available in 500m	No forest available in 500m	No	373500	224100	Sand	Proposed
30	DBGH_PRO_18D	Buridehing River	20.5	27°20'31.53"N 27°20'31.50"N 27°20'17.55"N 27°20'26.10"N	95° 1'37.22"E 95° 1'44.99"E 95° 2'19.19"E 95° 2'23.41"E	2.25	No PA/BR/WC available in 500m	No forest available in 500m	No	461250	276750	Sand	Proposed
31	DBGH_PRO_18E	Buridehing River	19.5	27°21'0.84"N 27°21'6.55"N 27°20'37.96"N 27°20'35.28"N	95° 1'22.46"E 95° 1'27.03"E 95° 1'41.07"E 95° 1'27.91"E	2.25	No PA/BR/WC available in 500m	No forest available in 500m	No	438750	263250	Sand	Proposed
32	DBGH_PRO_18F	Buridehing River	17.3	27°21'11.86"N 27°21'16.60"N 27°21'25.68"N 27°21'23.28"N	95° 0'29.84"E 95° 0'31.11"E 95° 1'8.01"E 95° 1'12.47"E	2.25	No PA/BR/WC available in 500m	No forest available in 500m	No	389250	233550	Sand	Proposed
33	DBGH_PRO_19	Buridehing River	25.2	27°22'38.27"N 27°22'43.54"N 27°22'30.17"N 27°22'27.30"N	94°59'42.45"E 94°59'45.08"E 95° 0'17.21"E 95° 0'12.68"E	2.25	No PA/BR/WC available in 500m	No forest available in 500m	No	567000	340200	Sand	Proposed

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34	DBGH_PRO_19A	Buridehing River	6.92	27°22'26.02"N 27°22'18.91"N 27°22'7.88"N 27°22'19.67"N	95° 0'22.12"E 95° 0'22.38"E 95° 0'4.19"E 95° 0'14.23"E	2.25	No PA/BR/WC available in 500m	No forest available in 500m	No	155700	93420	Sand	Proposed
35	DBGH_PRO_19B	Buridehing River	13.4	27°21'0.73"N 27°20'59.72"N 27°21'12.88"N 27°21'34.78"N 27°21'12.01"N	95° 0'0.21"E 94°59'42.31"E 94°59'31.99"E 94°59'35.54"E 94°59'35.72"E	2.25	No PA/BR/WC available in 500m	No forest available in 500m	No	301500	180900	Sand	Proposed
36	DBGH_PRO_20	Buridehing River	13.5	27°21'25.68"N 27°21'22.90"N 27°21'40.38"N 27°21'40.68"N	94°58'53.96"E 94°59'0.77"E 94°59'16.82"E 94°59'11.04"E	2.25	No PA/BR/WC available in 500m	No forest available in 500m	No	303750	182250	Sand	Proposed
37	DBGH_PRO_20A	Buridehing River	12.9	27°21'53.43"N 27°21'46.84"N 27°22'13.06"N 27°22'15.58"N	94°59'14.16"E 94°59'14.83"E 94°59'26.82"E 94°59'25.42"E	2.25	No PA/BR/WC available in 500m	No forest available in 500m	No	290250	174150	Sand	Proposed
38	DBGH_PRO_21	Buridehing River	18.7	27°20'58.08"N 27°20'53.23"N 27°20'59.32"N 27°21'7.44"N	94°57'59.02"E 94°58'1.89"E 94°58'26.53"E 94°58'23.02"E	2.25	No PA/BR/WC available in 500m	No forest available in 500m	No	420750	252450	Sand	Proposed
39	DBGH_PRO_22	Buridehing River	16	27°20'29.96"N 27°20'23.73"N 27°20'6.07"N 27°20'11.83"N	94°57'22.25"E 94°57'22.86"E 94°57'10.08"E 94°57'4.32"E	2.25	No PA/BR/WC available in 500m	No forest available in 500m	No	360000	216000	Sand	Proposed
40	DBGH_PRO_23	Buridehing River	30	27°20'5.20"N 27°20'1.48"N 27°19'15.26"N 27°19'18.99"N	94°56'31.11"E 94°56'38.37"E 94°56'5.94"E 94°56'1.16"E	2.25	No PA/BR/WC available in 500m	No forest available in 500m	No	675000	405000	Sand	Proposed

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41	DBGH_PRO_24	Buridehing River	8.85	27°18'45.36"N 27°18'45.08"N 27°18'34.44"N 27°18'34.07"N 27°18'28.04"N	94°54'31.29"E 94°54'32.85"E 94°54'36.59"E 94°54'54.07"E 94°54'45.90"E	2.25	No PA/BR/WC available in 500m	No forest available in 500m	No	199125	119475	Sand	Proposed
42	DBGH_PRO_25	Buridehing River	30.7	27°19'7.81"N 27°19'4.01"N 27°18'53.75"N 27°18'55.63"N	94°53'45.99"E 94°53'49.13"E 94°54'30.58"E 94°54'35.59"E	2.25	No PA/BR/WC available in 500m	No forest available in 500m	No	690750	414450	Sand	Proposed
43	DBGH_PRO_23A	Buridehing River	8.85	27°18'45.32"N 27°18'45.08"N 27°18'33.99"N 27°18'29.71"N	94°54'31.29"E 94°54'32.80"E 94°54'53.96"E 94°54'50.08"E	2.25	No PA/BR/WC available in 500m	No forest available in 500m	No	199125	119475	Sand	Proposed
44	DBGH_PRO_26	Buridehing River	6.46	27°18'57.29"N 27°18'56.40"N 27°18'47.25"N 27°18'51.87"N	94°53'10.06"E 94°53'17.24"E 94°53'7.60"E 94°53'0.19"E	2.25	No PA/BR/WC available in 500m	No forest available in 500m	No	145350	87210	Sand	Proposed
45	DBGH_PRO_27	Buridehing River	9.65	27°18'7.80"N 27°18'6.86"N 27°18'23.15"N 27°18'26.36"N	94°52'34.30"E 94°52'37.41"E 94°52'51.12"E 94°52'43.72"E	2.25	No PA/BR/WC available in 500m	No forest available in 500m	No	217125	130275	Sand	Proposed
46	DBGH_PRO_28	Buridehing River	6.4	27°18'1.54"N 27°17'58.76"N 27°17'46.95"N 27°17'48.67"N	94°52'30.91"E 94°52'33.24"E 94°52'25.13"E 94°52'19.63"E	2.25	No PA/BR/WC available in 500m	No forest available in 500m	No	144000	86400	Sand	Proposed
47	DBGH_PRO_29	Buridehing River	8.25	27°17'46.57"N 27°17'39.54"N 27°17'38.54"N 27°17'42.90"N	94°51'46.07"E 94°51'46.60"E 94°52'3.23"E 94°52'6.54"E	2.25	No PA/BR/WC available in 500m	No forest available in 500m	No	185625	111375	Sand	Proposed
48	DBGH_PRO_30	Buridehing	8.12	27°16'10.41"N	94°48'5.84"E	2.25	No	No	No	182700	109620	Sand	Proposed

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		g River		27°16'8.46"N 27°15'54.22"N 27°15'51.20"N	94°48'9.69"E 94°48'4.76"E 94°47'57.26"E		PA/BR/ WC available in 500m	forest availabl e in 500m					d
49	DBGH_PRO_30A	Buridehin g River	7.41	27°17'18.95"N 27°17'19.09"N 27°17'3.46"N 27°17'3.89"N	94°48'29.10"E 94°48'30.95"E 94°48'48.43"E 94°48'43.66"E	2.25	No PA/BR/ WC available in 500m	No forest availabl e in 500m	No	166725	100035	Sand	Propose d
50	DBGH_PRO_30B	Buridehin g River	13.8	27°16'56.54"N 27°16'55.63"N 27°16'36.18"N 27°16'43.24"N	94°48'51.76"E 94°49'4.26"E 94°49'28.78"E 94°49'15.82"E	2.25	No PA/BR/ WC available in 500m	No forest availabl e in 500m	No	310500	186300	Sand	Propose d
51	DBGH_PRO_30C	Buridehin g River	5.91	27°16'35.98"N 27°16'37.17"N 27°16'43.01"N 27°16'39.87"N	94°50'15.49"E 94°50'15.69"E 94°50'30.93"E 94°50'31.18"E	2.25	No PA/BR/ WC available in 500m	No forest availabl e in 500m	No	132975	79785	Sand	Propose d
52	DBGH_PRO_31	Buridehin g River	8.54	27°15'36.39"N 27°15'44.04"N 27°15'20.05"N 27°15'26.89"N	94°47'50.72"E 94°47'58.17"E 94°47'55.20"E 94°47'51.63"E	2.25	No PA/BR/ WC available in 500m	No forest availabl e in 500m	No	192150	115290	Sand	Propose d
53	DBGH_PRO_32	Buridehin g River	5.53	27°14'56.07"N 27°14'48.99"N 27°14'55.84"N 27°15'0.39"N	94°46'47.95"E 94°46'46.45"E 94°47'6.85"E 94°46'59.36"E	2.25	No PA/BR/ WC available in 500m	No forest availabl e in 500m	No	124425	74655	Sand	Propose d
54	DBGH_PRO_32A	Buridehin g River	6.99	27°15'2.36"N 27°15'3.07"N 27°14'58.61"N 27°14'56.84"N	94°46'59.79"E 94°47'0.86"E 94°47'35.25"E 94°47'32.49"E	2.25	No PA/BR/ WC available in 500m	No forest availabl e in 500m	No	157275	94365	Sand	Propose d
55	DBGH_PRO_33	Buridehin g River	4.55	27°14'46.36"N 27°14'47.39"N	94°45'55.56"E 94°45'59.14"E	2.25	No PA/BR/	No forest	No	102375	61425	Sand	Propose d

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				27°14'37.49"N 27°14'35.12"N	94°46'10.67"E 94°46'8.06"E		WC available in 500m	availabl e in 500m					
56	DBGH_PRO_34	Brahmap utra River	15.3	27°34'13.26"N 27°34'1.07"N 27°33'59.77"N 27°34'10.45"N	95°16'3.94"E 95°16'1.91"E 95°16'19.80"E 95°16'17.18"E	3	No PA/BR/ WC available in 500m	No forest availabl e in 500m	No	459000	275400	Ordinar y Clay (Silt)	Propose d
57	DBGH_PRO_35	Brahmap utra River	25.5	27°33'21.81"N 27°33'10.56"N 27°33'26.19"N 27°33'31.50"N	95° 9'35.68"E 95° 9'40.06"E 95°10'3.91"E 95° 9'50.30"E	3	No PA/BR/ WC available in 500m	No forest availabl e in 500m	No	765000	459000	Ordinar y Clay (Silt)	Propose d
58	DBGH_PRO_36	Brahmap utra River	24	27°24'11.67"N 27°24'1.54"N 27°24'10.39"N 27°24'21.49"N	94°46'45.40"E 94°46'52.13"E 94°47'12.21"E 94°47'6.17"E	3	No PA/BR/ WC available in 500m	No forest availabl e in 500m	No	720000	432000	Ordinar y Clay (Silt)	Propose d
59	DBGH_PRO_37	Brahmap utra River	21.8	27°23'58.89"N 27°23'50.62"N 27°23'58.96"N 27°24'8.09"N	94°47'8.10"E 94°47'12.87"E 94°47'35.26"E 94°47'31.22"E	3	No PA/BR/ WC available in 500m	No forest availabl e in 500m	No	654000	392400	Ordinar y Clay (Silt)	Propose d
TOTAL			779.04							18054900	10832940		

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➤ **Final List of potential Mining zones: (Earth Mining)**

SL. No.	Lease Details (Zone Code)	Name of the Mineral	Area of Mineralization (Ha)	Depth of Mineralization (in Meter)	Geological Reserve (cum)	Mineable Reserve (cum)	Latitude	Longitude
1	DBGH_PRO_IS_01	ORDINARY EARTH	73.3	3	2199000	1319400	27°13'39.66"N 27°13'43.77"N 27°13'29.67"N 27°13'12.46"N 27°13'9.45"N	94°48'51.04"E 94°49'20.70"E 94°49'26.00"E 94°49'5.89"E 94°48'53.64"E
2	DBGH_PRO_IS_02	ORDINARY EARTH	84.7	3	2541000	1524600	27°10'5.94"N 27° 9'48.43"N 27° 9'41.68"N 27° 9'30.26"N 27° 9'45.08"N 27° 9'59.83"N	94°51'33.46"E 94°51'54.86"E 94°51'50.97"E 94°51'22.83"E 94°51'11.04"E 94°51'16.08"E
3	DBGH_PRO_IS_03	ORDINARY EARTH	57.2	3	1716000	1029600	27°10'10.46"N 27°10'13.91"N 27°10'1.85"N 27° 9'51.04"N 27° 9'52.02"N	94°49'26.88"E 94°49'53.99"E 94°50'1.27"E 94°49'55.39"E 94°49'25.80"E
4	DBGH_PRO_IS_04	ORDINARY EARTH	107	3	3210000	1926000	27°15'35.35"N 27°15'57.59"N 27°15'39.23"N 27°15'24.99"N 27°15'24.54"N	94°48'47.26"E 94°49'0.71"E 94°49'51.05"E 94°49'51.59"E 94°49'11.56"E
5	DBGH_PRO_IS_05	ORDINARY EARTH	76.3	3	2289000	1373400	27°16'28.87"N 27°16'14.71"N 27°16'23.91"N 27°16'28.50"N 27°16'40.09"N 27°16'36.71"N	95° 2'35.27"E 95° 2'48.91"E 95° 3'6.74"E 95° 3'44.79"E 95° 3'38.25"E 95° 2'51.53"E

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6	DBGH_PRO_IS_06	ORDINARY EARTH	86.7	3	2601000	1560600	27°21'40.99"N 27°21'57.64"N 27°21'44.21"N 27°21'32.72"N 27°21'22.60"N	94°59'49.59"E 95° 0'15.92"E 95° 0'38.58"E 95° 0'40.13"E 95° 0'20.96"E
7	DBGH_PRO_IS_07	ORDINARY EARTH	106	3	3180000	1908000	27°20'15.27"N 27°20'23.73"N 27°20'6.33"N 27°19'52.81"N 27°19'40.75"N 27°19'49.40"N	94°54'47.34"E 94°55'7.13"E 94°55'29.25"E 94°55'32.51"E 94°55'11.17"E 94°54'55.73"E
8	DBGH_PRO_IS_08	ORDINARY EARTH	79.6	3	2388000	1432800	27°11'18.19"N 27°11'20.32"N 27°11'44.22"N 27°11'57.17"N 27°11'31.95"N	95°10'56.76"E 95°11'14.09"E 95°11'40.64"E 95°11'23.35"E 95°10'59.18"E
9	DBGH_PRO_IS_09	ORDINARY EARTH	71.5	3	2145000	1287000	27°11'24.73"N 27°11'32.81"N 27°11'9.51"N 27°11'3.00"N 27°10'57.42"N	95°11'56.53"E 95°12'8.65"E 95°12'44.92"E 95°12'44.49"E 95°12'35.83"E
10	DBGH_PRO_IS_10	ORDINARY EARTH	86.5	3	2595000	1557000	27°14'46.61"N 27°14'32.64"N 27°14'0.77"N 27°14'7.69"N 27°14'36.48"N	95°13'18.69"E 95°13'46.71"E 95°14'7.07"E 95°13'43.99"E 95°13'12.59"E
11	DBGH_PRO_IS_11	ORDINARY EARTH	94.3	3	2829000	1697400	27°18'33.83"N 27°18'22.92"N 27°17'56.96"N 27°18'1.41"N	95° 7'28.84"E 95° 7'20.34"E 95° 7'26.29"E 95° 8'12.32"E

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12	DBGH_PRO_IS_12	ORDINARY EARTH	84.2	3	2526000	1515600	27°22'33.20"N 27°22'13.21"N 27°21'58.97"N 27°22'19.02"N	95° 8'49.98"E 95° 9'17.13"E 95° 8'39.74"E 95° 8'27.93"E
13	DBGH_PRO_IS_13	ORDINARY EARTH	99.6	3	2988000	1792800	27°14'28.48"N 27°14'18.34"N 27°13'59.44"N 27°13'54.54"N 27°14'16.33"N	95°19'0.02"E 95°19'27.93"E 95°19'25.30"E 95°18'57.48"E 95°18'45.90"E
14	DBGH_PRO_IS_14	ORDINARY EARTH	69.9	3	2097000	1258200	27°22'30.40"N 27°22'15.97"N 27°22'5.99"N 27°22'6.34"N 27°22'11.32"N	95°10'35.70"E 95°11'18.18"E 95°11'15.45"E 95°10'39.32"E 95°10'32.22"E
15	DBGH_PRO_IS_15	ORDINARY EARTH	30	3	900000	540000	27°26'40.97"N 27°26'30.83"N 27°26'22.18"N 27°26'36.29"N 27°26'41.32"N	95°12'20.13"E 95°12'19.48"E 95°12'47.38"E 95°12'51.66"E 95°12'38.45"E
16	DBGH_PRO_IS_16	ORDINARY EARTH	53.6	3	1608000	964800	27°30'21.66"N 27°30'14.22"N 27°29'58.39"N 27°29'55.48"N 27°30'10.28"N	95° 9'20.49"E 95° 9'47.70"E 95° 9'30.84"E 95° 9'17.04"E 95° 9'6.68"E
17	DBGH_PRO_IS_17	ORDINARY EARTH	35.7	3	1071000	642600	27°31'28.31"N 27°31'42.43"N 27°31'35.47"N 27°31'29.21"N 27°31'19.58"N 27°31'21.34"N	95° 7'35.13"E 95° 7'53.75"E 95° 8'5.71"E 95° 8'5.99"E 95° 7'47.09"E 95° 7'39.61"E

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18	DBGH_PRO_IS_18	ORDINARY EARTH	89.2	3	2676000	1605600	27°23'46.77"N 27°23'30.99"N 27°23'6.43"N 27°23'20.75"N	94°51'21.24"E 94°51'43.26"E 94°50'49.10"E 94°50'40.07"E
19	DBGH_PRO_IS_19	ORDINARY EARTH	45.6	3	1368000	820800	27°26'28.40"N 27°26'16.82"N 27°26'9.16"N 27°26'20.44"N 27°26'29.82"N	95° 2'58.36"E 95° 2'55.22"E 95° 3'30.83"E 95° 3'33.85"E 95° 3'13.47"E
20	DBGH_PRO_IS_20	ORDINARY EARTH	63.6	3	1908000	1144800	27°11'48.19"N 27°12'7.89"N 27°12'2.06"N 27°11'47.56"N 27°11'45.40"N 27°11'38.51"N	95° 0'45.42"E 95° 1'3.22"E 95° 1'25.33"E 95° 1'24.60"E 95° 1'6.39"E 95° 0'49.38"E
21	DBGH_PRO_IS_21	ORDINARY EARTH	63.6	3	1908000	1144800	27°15'54.65"N 27°16'8.82"N 27°15'40.14"N 27°15'34.34"N	94°52'47.99"E 94°53'20.97"E 94°53'18.13"E 94°53'1.00"E
22	DBGH_PRO_IS_22	ORDINARY EARTH	46.6	3	1398000	838800	27°26'23.53"N 27°26'22.20"N 27°26'14.67"N 27°26'5.61"N 27°26'9.31"N	94°52'33.18"E 94°53'7.38"E 94°53'11.22"E 94°52'40.64"E 94°52'34.25"E

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23	DBGH_PRO_IS_23	ORDINARY EARTH	68	3	2040000	1224000	27°20'12.35"N 27°20'22.58"N 27°20'14.82"N 27°20'2.79"N 27°19'49.23"N	95°25'56.92"E 95°26'17.34"E 95°26'31.50"E 95°26'39.03"E 95°26'15.87"E
24	DBGH_PRO_IS_24	ORDINARY EARTH	102	3	3060000	1836000	27° 8'26.29"N 27° 8'30.03"N 27° 8'57.40"N 27° 9'7.81"N 27° 8'59.16"N	95° 6'30.18"E 95° 6'48.54"E 95° 6'40.72"E 95° 6'23.29"E 95° 6'5.12"E
25	DBGH_PRO_IS_25	ORDINARY EARTH	71.7	3	2151000	1290600	27°15'35.88"N 27°15'26.50"N 27°15'22.21"N 27°15'14.79"N 27°15'33.75"N 27°15'40.40"N	95° 0'47.93"E 95° 0'47.96"E 95° 0'54.83"E 95° 1'32.74"E 95° 1'31.01"E 95° 1'22.24"E
26	DBGH_PRO_IS_26	ORDINARY EARTH	28.2	3	846000	507600	27°22'29.81"N 27°22'38.46"N 27°22'29.82"N 27°22'16.70"N	95°16'36.16"E 95°16'48.65"E 95°17'3.33"E 95°17'4.03"E
TOTAL			1874.6		56238000	33742800		

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➤ **Final List of proposed Patta Lands/Khatedari land**

Owner	Sl. No.	Area (hectare)	Latitude	Longitude	District	Tehsil	Village	Khasra No	Type of Material	Total Reserve (CUM)	Total Mineral to be mined (CUM)	Existing/ Proposed
NA												

➤ **Final List of Proposed De-siltation location (Lake, Pond, Dams, River):**

Name	Maintain/Controlled by Sate Govt./PSU etc.	Location	Khasra No.	District	Tehsil	Village	Size (Ha)	Quantity (CUM/Year)	Existing / Proposed
NA									

➤ **Final List of Proposed M-Sand Plants:**

Sl. No.	Plant Name	Owner	District	Tehsil	Village	Geolocation		Quantity / Capacity (Tonnes/Annum)	Existing / proposed
						Latitude	Longitude		
NA									

ANNEXURE – VI

- **Final list of Cluster and Contiguous Clusters**

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➤ **Cluster details (Riverbed)**

River Name	Cluster No.	Lease No.	Location (Riverbed/Patta Land)	Tehsil	Area (in Ha)	Total Excavation (CUM)	Total Mineable Mineral Excavation (CUM)
NA							

➤ **Contiguous Cluster details**

River Name	Contiguous Cluster No.	Cluster No.	Number of leases in the cluster	Location (Riverbed/Patta Land)	Distance between clusters	Tehsil	Area of Cluster (Ha)	Total Mineral Excavation (Ton)
NA								

- **Note: The final Cluster details shall be as per the approved mine plan and as per the environment clearance granted by the competent authority.**

ANNEXURE – VII

- **Final Transportation Routes for individual Zones and Zones in Cluster(s): (Proposed)**

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➤ **Transportation Routes for individual leases details (Riverbed)**

Lease No.	Transportation Route No.	Number of tippers /days of lease	Number of tippers /days of all the lease on route	Length of the Route in Km	Type of Road (black Topped/unpaved)	Recommendation for road (Black Topped/unpaved)	The road will be constructed by Govt. / Lease Owner	Route Map & Location
NA								

➤ **Transportation Routes for leases in Cluster details (Riverbed)**

Cluster No.	Transportation Route No.	Number of tippers / days of cluster	Number of tippers / days of all the clusters on route	Length of Route in km	Type of Road (Black Topped / unpaved)	Recommendation for road (Black Topped / unpaved)	The road will be Constructed by Govt. / Lease Owner	Route Map & Location
NA								

- **Note: The final transportation routes shall be as per the approved mine plan and as per the environment clearance granted by the competent authority.**