DISTRICT SURVEY REPORT
OF
DAKSHIN DINAJPUR

(For mining of minor minerals)
As per Notification No. S.O.141 (E) New Delhi Dated 15th of January 2016 and S.O.3611 (E) New Delhi Dated 25th of July 2018 and Enforcement & Monitoring Guidelines for Sand Mining (EMGSM) January 2020, Issued by Ministry of Environment, Forest and Climate Change (MoEF& CC)

SEIAA Approval Date:

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PREPARED BY
Department of Industry, Commerce & Enterprises
Government of West Bengal

GOVERNMENT OF WEST BENGAL
DIRECTORATE OF MINES & MINERALS
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No. 1333 MD

Kolkata, 6th January, 2022.

TO WHOM IT MAY CONCERN

This is to certify that DSRs of concerned districts of West Bengal have been duly validated by respective district authorities and their suggestions/inputs, if any, have been duly incorporated in the DSRs. The DSRs have been finally scrutinised and accepted by the scrutiny committee of DMM, WB and the same have been forwarded to the Dept. of Industry, Commerce and Enterprises along with respective scrutiny reports for onward transmission to SEAC for necessary action.

Director of Mines and Minerals

Govt. of West Bengal

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Abbreviations

% DEP – Departures

° C – Degree Centigrade

BGL – Below Ground Level

CD - Community Development

Cft- Cubic Feet

CGWB - Central Ground water Board

CRIS - Customized Rainfall Information System

Cum - Cubic meter

DGMS - Directorate General of Mines Safety

DGPS - Differential Global Positioning system.

DL&LRO - District Land & Land Reform officer

DSR - District Survey Report

EC – Environmental Clearance

EIA- Environment Impact Assessment

EMGSM - Enforcement and Monitoring Guideline for Sand Mining

ENVIS - Environmental Information System

ft – Feet

GBF – Ganges Bangal Fault

GIS - Geographical Information System

GMEC - Global Management and Engineering Consultant

GSI - Geological Survey of India

Ha – Hectare

hr - Hour

IMD – Indian Meteorological Department

ISRO - The Indian Space Research Organisation

KM - Kilometre

LISS - Linear Imaging Self-Scanning Sensor

LOI - Letter of Intent

LULC - Land Use Land Cover

m^2 - Square meter

Mcum – Million Cubic Meter

MKF – Malda Kisahangang Fault

MMDR - Mines & Minerals (Development and Regulation) Act

MMR - Metalliferous Mines Regulation

MOEF & CC - Ministry of Environment, forest & Climate Change

Mph- miles per hour

M-Sand - Mineral Sand

MSME - Micro, Small & Medium Enterprises

Mt - Metric Ton

MT – Million Tons

NGT - National Green Tribunal

NH – National Highway

NIC - National Informatics Center

OC - Officer In Charge

OGL - Original Ground level

PSU - Public Sector Unit

R/F – Rain Fall

SSMG - Sustainable Sand Mining Guidelines

WBMDTCL- West Bengal Mineral Development and Trading Corporation Limited

The WBMMCR, 2016 – The West Bengal Minor Mineral Concession Rules, 2016

Definitions

Riverbed: A riverbed is the area between two banks of river where sediment deposited. During the normal flow period, river water is contained in and flows along the riverbed. However, during a flood, the river overflows the riverbed and flows onto the floodplain.

Sandbars: The sandbar is the ridge of sand or coarse sediment that is built over a period of time.

Pre monsoon Sandbars: Sandbars which are identified from satellite imagery of pre monsoon period.

Post monsoon Sandbars: Sandbars which are identified from satellite imagery of post monsoon period.

Restricted Area: Sandbars or part of sandbars which are falling within restricted area. 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 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. No mining zone has been marked for an area up to a width of 100 meters from the active edge of embankments.

Potential Zone: Sandbars which are falling within the central $3/4^{th}$ part of the riverbed and which are not falling within the restricted area.

Potential Block: Each individual sand bars of potential zone is Potential Block.

River bed occurrence: River bed occurrence means sand, stone, boulder, pebbles, gravel accumulated in the river bed by natural phenomenon.

Replenishment: Restoration of sediment to a former level or condition.

Aggradations: Aggradation (or alluviation) is the term used in geology for the increase in land elevation, typically in a river system, due to the deposition of sediment. Aggradation occurs in areas in which the supply of sediment is greater than the amount of material that the system is able to transport.

Act: It means the Mines and Minerals (Development and Regulation) Act, 1957(67 of 1957), as subsequently amended.

Mineral: It means minor minerals as defined in clause (e) of section 3 of the Act.

Sand: A natural resource, is a minor mineral as defined under S 3(e) of the Mines and Minerals (Development and Regulation) Act, 1957 (" MMDR Act").

Lease: It means a mining lease granted under West Bengal Minor Mineral Concession Rules, 2016.

Mining: Excavation of mineral by manual method or using machineries.

EXECUTIVE SUMMARY

Formation of Dakshin Dinajpur district taken place on 1st April, 1992 by the division of erstwhile West Dinajpur district. Geographically this district lies between latitudes 24°20'N and 25°35'N and longitudes 88°20'E and 89°30'E. The district is bounded by the river Karatoya to the east, the Mahananda in the west, and the northern bank of the river Ganges in the South. This district is having two sub-divisions namely, Balurghat and Gangarampur. The district has an area of 2219 sq.km and a population of around 1667276.

The district is generally flat, slightly southward sloping. The average elevation of the district from ranges around 15 m AMSL. The region appears to be a continuation of 'Barind' land- a Geological formation of Older Alluvium. Physiographycally this region is divided in three units; Recent Alluvial Fan, Barind Pleistocene and Recent Flood Plain.The main three rivers of this district are Atrai, Punarbhava and Tangaon, another river Ichamati is also flowing in this district. Due to the slope of landmass, the general flow of these rivers is from North to South direction.

Neo-tectonic activities have been reported in vast quaternary plains of Malda, South Dinajpur, and North Dinajpur district, which may be attributed to the presence of the causative fault resource. Number of sub-surface fault like Ganges-Bengal fault (GBF), Malda-Kishanganj fault (MKF), Jangipur-Gaibandha fault, Teesta fault etc has been deciphered through geophysical studies in North Bengal plains. Further micro earth quake studies followed by Geodetic survey over north Bengal plains reveals that the area located in the Buffer Zone of causative earthquake source are Seismo-techtonically vulnerable. This warrants proper planning and policy implementation ensure seismic proof design of civil structure to minimize damage and destruction in case of an impending earthquake.

Ground water occurs under semi-confined to Confined condition below a blanket of about 60m thick Clay bed. Saturated granular zone of discontinuous nature generally occurs in depth span of 65m-100m, which is capable of yielding up to 50m3 /hrs the availability of ground water more or less limited to unconsolidated Alluvium formation of Quaternary age.

Due to very fertile nature of the soil and paucity of natural mineral resources, people of this district are mainly depending upon the agriculture.

Social forestry has received a lot of attention and it is becoming very popular in this district. Uses of plants by different tribal community for treatment of various ailments also have been documented in this district. Large amounts of common wildlife are found in the forest along with some species of migratory bird seen near low land and marshy area during winter season.

The varied soil conditions of the region offer scope and opportunity for horticulture in this district. Occurrences of major minerals are not established so far; onlymining of river sand is the mining potentiality of this district.

As per the data received from OC, Mines, DL&LRO office, Dakshin Dinajpur, total 65 leases have been allotted for mining of river sand in the district. Out of which 41 leases are allotted in Atrai River, 13 leases are allotted in Punarbhava River and 11 leases are in TangaonRiver. Revenue generated in the

district of Dakshin Dinajpur from Minor minerals during the period of April 2018 to March 2021 is Rs. 2.62 Crores. Potential riverbed sand blocks of the district where lease not allotted yet are also identified and discussed in the current DSR.

The district has a potential for development of Riverbed sand. The occurrence has been reported by Directorate of Mines and Minerals, Government of West Bengal and others in previous instances. It requires further systematic and scientific approach to quantify the resource along with their grade assessment. The occurrences are mostly observed in the river Atrai, Punarbhava and Tangaon.

1 Preface:

The need for District Survey Report (DSR) have been necessitated by Ministry of Environment, Forest and Climate Change (MoEF& CC) vide there Notification No. 125 (Extraordinary, Part II Section 3, Sub-section ii), S.O. 141 (E), dated 15th January 2016. The notification was addressed to bring certain amendments with respect to the EIA notification 2006 and in order to have a better control over the legislation, district level committee's for introduced in the system. As a part of this notification, preparation of District Survey Reports has been introduced. Subsequently, MOEF& CC has published Notification No. 3611 (E), dt. 25th July, 2018 regarding inclusion of the "Minerals Other than Sand" and format for preparation of the DSR has been specified. Enforcement &Monitoring Guidelines for Sand Mining (EMGSM) January 2020, Issued by MoEF& CC is prepared in consideration of various orders/directions issued by Hon'ble NGT in matters pertaining to illegal sand mining and also 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 time to time as well as the requirement specified in West Bengal Minor Mineral Concession Rules (WBMMCR), 2016.

The purpose of DSR is to identify the mineral potential areas where mining can be allowed; and also, to distinguish areas where mining will not be allowed due to proximity to infrastructural structures and installations, areas of erosion. The DSR would also help to estimate the annual rate of replenishment wherever applicable.

Preparation of this DSR involved 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 DSR of Dakshin Dinajpur district describes the general geographical profile of the district, distribution of natural resources, livelihood, climatic condition, inventory of minor minerals and revenue generation.

2 Introduction:

The District Survey Report of Dakshin Dinajpur has been prepared as per Ministry of Environment, Forests & Climate Change (MoEF& CC), Government of India 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. Beside the sand mining, the DSR also include the potential development scope of in-situ minor minerals.

The objectives of the District Survey Report are as following:

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, 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 West Bengal Mineral Development Corporation Limited.

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 thedistrict. 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.

1. While bunging 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 is way weaker and lesser in weight than blocks made of clay mixed with sand.

2.1 Statutory Framework

The below table has mentioned the requirement of District survey report and its year wise modification;

Table 2.1: Requirement of District Survey Report & its year wise modification of Guidelines

Year	Particulars
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 preview of EIA, the MoEF&CC issued EIA Notification SO 1533 (E), dated 14th 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.
2016	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) of River bed mining and other minor minerals.
2016	West Bengal Minor Minerals Concession Rules,2016 amended the Mines and Minerals (Developmentand Regulation) Act, 1957 (Act 67 of 1957), to make the rules regulating the grant of mining licenses, prospecting license-cum-mining leases and mining leases in respect of minor minerals by auction process.The rule also incorporates EIA 2016 also includes SSMG 2016 for minor mineral mining.
2018	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 DSRi.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".
2020	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.TheEMGSM 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.

Details statutory Guidelines for sand or gravel mining

- **The West Bengal Minor Minerals Concession Rules, 2016**

(1) (a) No person shall undertake mining operation in any area prohibited by the 'State Government in the public interest by notification in the *Official Gazette*.

Provided that nothing in the sub-rule shall affect any mining operation undertaken in any area in accordance with the terms and conditions of a mining lease or mineral concession already granted.

(b) No person shall transport or store or cause to be transported or stored any mineral otherwise than in accordance with the provisions of these rules and the West Bengal Minerals (Prevention of Illegal Mining, Transportation and Storage) Rules, 2002.

(2) No minor mineral coming out in course of digging of wells or excavation of tanks shall be disposed of by the person digging or excavating without informing the District Authority as well as the Executive Officer of the *Panchayat Samiti*orthe Executive Officer of the Municipality concerned, as the case may be, about such occurrence.

Provided that disposal of such minor mineral may be allowed on pre-payment of prices of such minor mineral at the prevailing market rate as determined on the basis of the rates published by the Public Works Department /concerned department of the State Government for the concerned area from time to time.

(3) No mining of river bed occurrences shall be allowed within 300 meters, upstream and downstream, measured from the centrelineof any bridge, regulator or similar hydraulic structure and from the end point of bank protection works.

(4) No river bed mining shall be allowed beneath 3 meters of the river bed or ground water Ievel, whichever is less.

(S) No mining operation in case of river bed occurrence shall be done within a distance of three (3) kilometers of a barrage axis or dam on a river unless otherwise permitted by the concerned Executive

Engineer or Revenue Officer or authorized officer and such distance shall be reckoned across an imaginary line parallel to the 'barrage, or dam axis, as the case maybe.

(6) No extraction of river bed occurrence shall 'be allowed beyond the central one third of the river bed, or keeping a distance of 100 meter from the existing bank line whichever is less, unless otherwise permitted by the concerned Executive Engineer or Revenue Officer.

(7) No extraction of minerals other than river bed occurrence shall be allowed within fifty (50) metersfromany road, public structure, embankment, railway line, bridge canal, road and other public works or buildings.

(8) No mining lease shall be granted without proof of existence of mineral contents in the area for which the applicationfor a mining lease has been made in accordance with such parameters as may be prescribed by the Government fromtime to time.

N.B- The aforesaid application for mining lease shall succeed the competitive bidding for mining lease for a specified mineral(s).

- **Sustainable Sand Mining Management Guidelines, 2016(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.

a) Parts of the river reach that experience deposition or aggradations 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 aggradations problem.

b) 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.

c) Sand and gravel may be extracted across the entire active channel during the dry season.

d) 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.

e) 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.

f) Sand and gravel shall not be allowed to be extracted where erosion may occur, such as at the concave bank.

g) 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.

h) Sand and gravel shall not be extracted within 200 to 500 meter 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.

i) 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.

J) 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.

k) Alternatively, off-channel or floodplain extraction is recommended to allow rivers to replenish the quantity taken out during mining.

l) The Piedmont Zone (Bhabhar area) particularly in the Himalayan foothills, where riverbed material is mined, 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.

m) Mining depth should be restricted to 3 meter and distance from the bank should be 3 meter or 10 percent of the river width whichever less.

n) 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.

o) 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)**

The 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.

a) Parts of the river reach that experience deposition or aggradations shall be identified. The Leaseholder/ Environmental Clearance holder may be allowed to extract the sand and gravel deposit in these locations to manage aggradations problem.
b) 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.
c) Sand and gravel may be extracted across the entire active channel during the dry season.
d) 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.
e) 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.
f) Sand and gravel shall not be allowed to be extracted where erosion may occur, such as at the concave bank.
g) 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.
h) Sand and gravel shall not be extracted 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.
i) 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. Calculate the extraction volume based on the sediment rating curve and high flow period after determining the allowable mining depth.
j) 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.
k) 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.
l) The Piedmont Zone (Bhabhar area) particularly in the Himalayan foothills, where riverbed material is mined, 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.
m) Mining depth should be restricted to 3 meters and distance from the bank should be ¼th or river width and should not be less than 7.5 meters.
n) 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 center-to-center should be left in the borrow pits.

o) Demarcation of mining area with pillars and geo-referencing should be done prior to the start of mining.

p) A buffer distance /un-mined 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.

q) 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.

r) 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.

s) 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 river bed 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 river bed, mineable material per hectare area available for actual mining shall not exceed the maximum quantity of 60,000 MT per annum.

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.

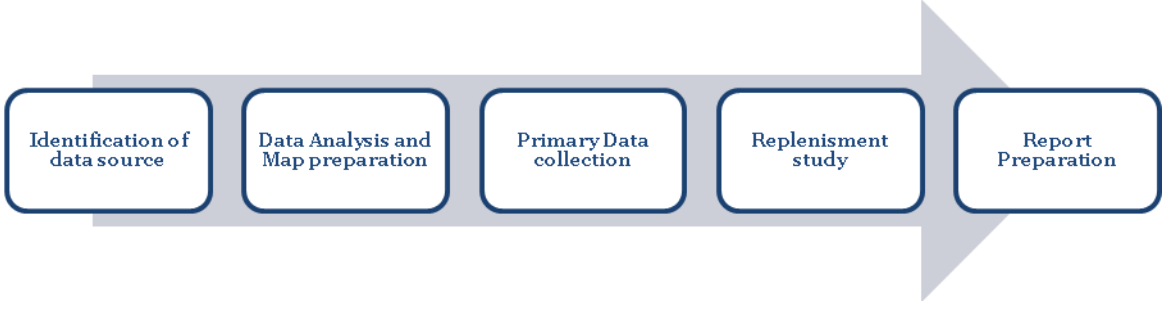


Figure 2.1: Steps followed in preparation of DSR

Data source Identification: District Survey Report has been prepared based on the Primary data base and secondary data base collated from different sources. This is very critical to identify authentic data sources before collating the data set. The secondary data sources which are used in DSR are mostly government published data based or the published report in reputed journal. District profile has been prepared based on the District Statistical handbook published by West Bengal Government as well as District Census 2011. Potential mineral resources have been described based on GSI or any other govt. agencies work done. Mining lease details and the revenue generated from minor minerals has been prepared based on available data from DL&LRO offices of the district. Satellite image has been used for map preparation related to physiography and land utilization pattern of the district.

Data Analysis and Map preparation: Dataset which are captured during the report preparation, are gone through detail analysis work. District Survey Report involves the analytical implication of captured dataset to prepare relevant maps. Methodology obtain for map preparation 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 may include determination of a suitable classification system via Visual Image Interpretation, selection of training samples, Satellite image (FCC-False Colour 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, Texture, Color etc.) training set of the pixel has been taken. Pictorial descriptions of Land Use classification are explained in Figure 2.2.

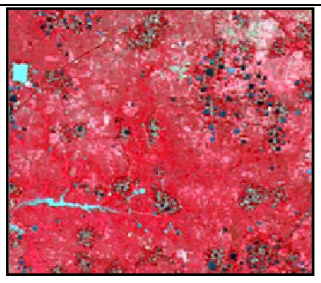
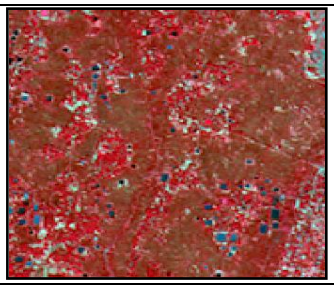
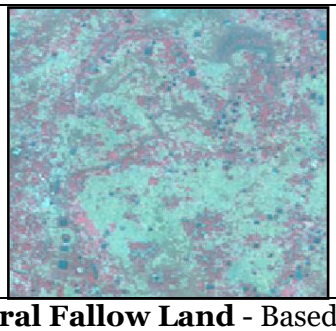
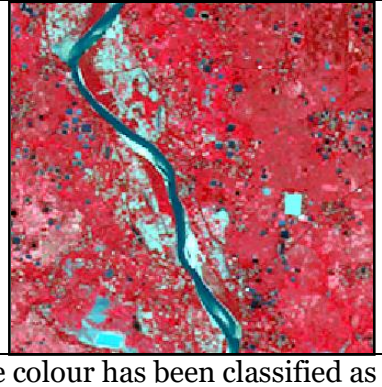
	
Agricultural Land - Based on their Geometrical shape, Red and Pink colour tone, Agricultural Land has been identified.	**Vegetation Covered Area** - Based on their continuous Red colour tone, Vegetation Covered Area has been identified.
	
Agricultural Fallow Land - Based on their Geometrical shape, Light and dark cyan with light pink colour tone, Agricultural Land has been identified.	**Settlement** – Area with Cyan Colour including geometrical shape has been recognised as Settlement Area.
	
Water Bodies – Area with blue colour has been classified as Water Bodies.	

Figure 2.2: Pictorial Descriptions of Physiography

Geomorphological Map: The major steps 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 Interpretationand 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 2.3.

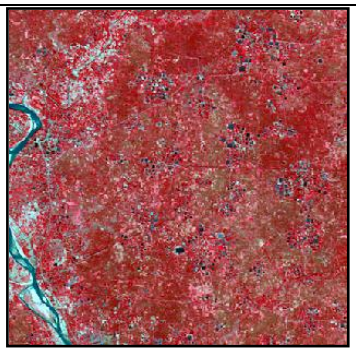
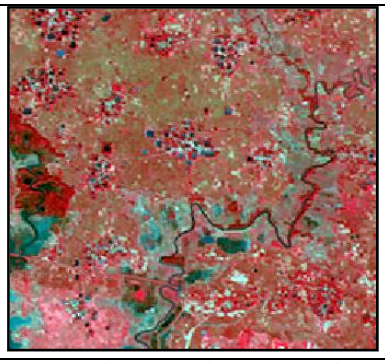
	
Alluvial Plain – Alluvial plain is a largely flat landform created by the deposition of sediment over a long period. In satellite Imagery the whole flat landhas been identified as Alluvial Plain.	**Marshy Land** –Marshes can often be found at the edges of lakes and streams, where they form a transition between the aquatic and terrestrial ecosystem. Area with blue with mixed cyan has been classified as Marshy Land.

Figure 2.3: Pictorial Description of Geomorphic Features

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:

- Raw Data collected from **National Informatics Centre (NIC Website).**
- 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.

Transportation Map:

- Raw Data collected from **National Informatics Centre (NIC Website) during Sept 2020.**
- 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.

Drainage Map:

- Raw Data collected from **National Informatics Centre (NIC Website) during Sept 2020**.
- 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.**
- 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 Sept 2020.**
- 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 collected from **ENVIS Centre on Wildlife & Protected Areas during August 2020.**
- Data has been geo-referenced using GIS software.
- Digitization of Wildlife Sanctuary& 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, capturing primary data or field data has also been carried out in 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 from in-stream mining is the removal of more sediment than the system can replenish. It is therefore need for replenishment study for river bed sand in order to nullify the adverse impacts arising due to excess sand extraction. The annual rate of replenishment carried out on every river of the district to have proper assessment of the sand reserve for mining purposes. Physical survey has been carried out by DGPS/ Total Station 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.

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 inventorization 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.

3 General Profile of the district

3.1 General Information

Dakshin Dinajpur is the District in North Bengal in the IndianState of West Bengal, India. It was created on 1 April 1992 by the division of the erstwhile West Dinajpur District. The Headquarter (Sadar) of the district is at Balurghat. It comprises two subdivisions: Balurghat and Gangarampur at Buniadpur . According to the 2011 population, it is the third least populous District of West Bengal. Geographically this unit lies roughly between latitudes 24°20'N and 25°35'N and longitudes 88°20'E and 89°30'E. This physiographic unit is bounded by the river Karatoya to the east, the Mahananda to the west, and the northern bank of the river Ganges to the South. Most part of this Barind Tract now belongs to Bangladesh and in Indian portion it is located only in the district of Dakshin Dinajpur and eastern part of adjoining district of Malda. The location Map of this district has mentioned below Figure 3.1; (Source: https://en.wikipedia.org/wiki/Dakshin_Dinajpur_district)

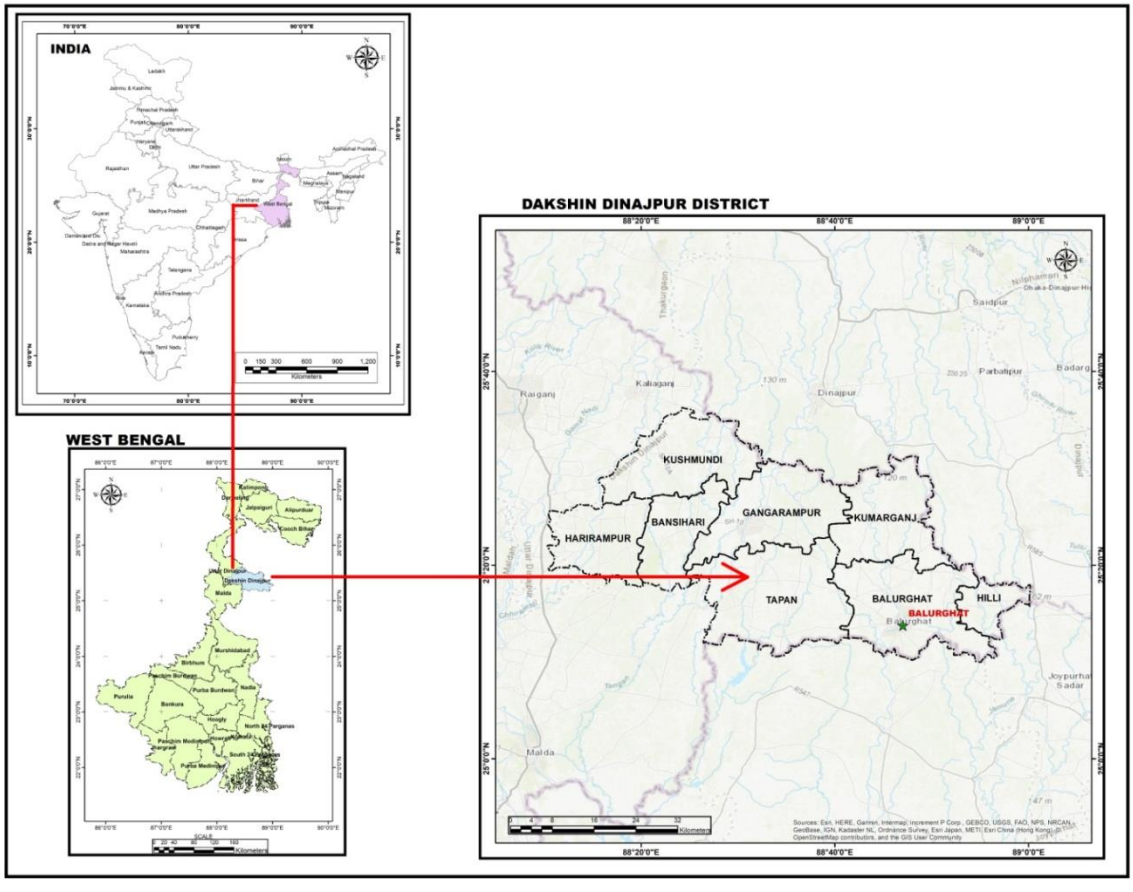


Figure 3.1: Location Map of Dakshin Dinajpur

(Source: National Informatics Centre and ESRI Base Map)

The erstwhile Dinajpur District, at the time of the partition of India, was split up into West Dinajpur district and East Dinajpur. The East Dinajpur district, now called Dinajpur, became part of East Pakistan (now Bangladesh). The West Dinajpur district was enlarged in 1956, when States Reorganisation Act recommendations were implemented, with the addition of some areas of Bihar. The district was bifurcated into Uttar Dinajpur and Dakshin Dinajpur on 1 April 1992. (Source: https://ddinajpur.nic.in/history/)

The district comprises two subdivisions: Balurghat and Gangarampurpur at Buniadpur. Balurghat subdivision consists of Balurghat municipality and four community development blocks: Hili, Balurghat, Kumarganj and Tapan. Gangarampur subdivision consists of Gangarampur, Buniadpur municipalities and four community development blocks: Gangarampur, Bansihari, Harirampur and Kushmandi. Balurghat is the district headquarters. There are eight police stations, eight development blocks, three municipalities, 64 gram panchayatsand 2317 villages in this district. The below mentioned table has illustrate the area and population of the district in block wise;

Table 3.1: Sub-division of block Area and Population wise in Dakshin Dinajpur

Sub-Division	Headquarter	CD Block	Block HQ	Distance from Main HQ (km)	No. of Gram Panchyat	Area (Sq. Km.)-2001
Gangarampur Sub-Division	Buniadpur	Kushmandi	Kushmandi	17.3	**8**	310.63
		Banshihari	Buniadpur	1	**5**	196.52
		Harirampur	Harirampur	13.2	**6**	214.94
		Gangarampur(M)	Gangarampur	15.8		10.29
		Gangarampur			**11**	315.52
Balurghat Sub- Division	Balurghat	Kumarganj	Kumarganj	23.6	**8**	286.62
		Tapan	Tapan	25.6	**11**	445.63
		Balurghat(M)	Balurghat	2.3		10.46
		Balurghat			**11**	369.39
		Hili	Hili	24.9	**5**	90.78
District Total					**65**	**2219.78**

Source: Census of India, 2001 & 2011

Dakshin Dinajpur spreads across 2219.78 Sq. Km of land. It lies cushioned between Bangladesh on its east and south and Uttar Dinajpur on its north. To its west lie Uttar Dinajpur district and a part of its southern border lies adjacent to Malda district. The block map has mentioned below in Figure 3.2; (Source: https://en.wikipedia.org/wiki/Dakshin_Dinajpur_district)

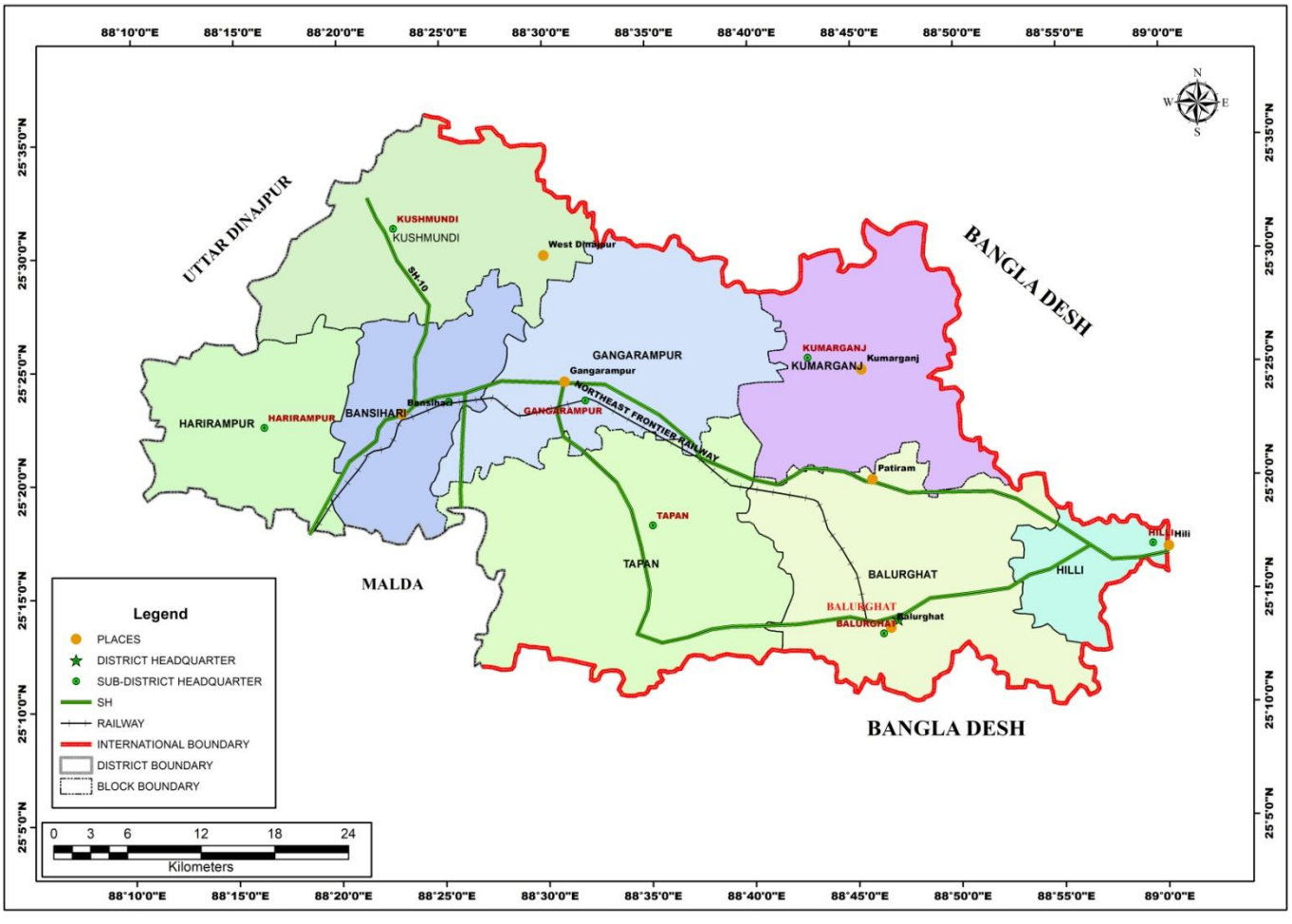


Figure 3.2: Block Map of Dakshin Dinajpur

(Source: National Informatics Centre)

3.2 Climate Condition

As this district is a constituent of North Bengal and is in close proximity to the Darjeeling or for that matter the Himalayan region, the climate is generally cool and comfortable through the major part of the year. The minimum temperature of the district lies within the range of 11° and 22° Celsius in the month of January and August respectively and maximum temperature lies within 25° and 38° in the month of December and May respectively. Meteorological condition of Dakshin Dinajpur is same as those of other districts of West Bengal during the winter season. Rainfall is associated with the passage of western disturbances traveling eastwards and consequent incursion of moisture from the Bay of Bengal, but they reach almost in a dissolving condition when they come over to this district. On the average 10 to 30 mm. rainfall occurs during whole winter season. North-west generally passes over the district in the month of

March and April. During March to April occurrences of squalls, cyclonic storm coupled with thunderstorms are regular feature with some rain. *(Source: https://en.climate-data.org)*

Normally pre-monsoon shower starts from late April, continues up to May, and places the district with congenial conditions for sowing of Jute and Aus paddy. Monsoon generally sets in late May and continues up to October. Usually monsoon withdraws by 10th October. Annual average day-night temperature varies from 17.5° Celsius to 33.4° Celsius. During the hot summer months, maximum temperature rises up to 39° Celsius and during the peak winter season, minimum temperature falls to as low as 3.5° Celsius.

3.2.1 Temperature

This district lies in near Himalayan foothills. So the climate is not to much hot. The minimum temperature of the district lies within the range of 11° and 22° Celsius in the month of January and August respectively and maximum temperature lies within 25° and 38° in the month of December and May respectively. Below table mentioned the temperature variation throughout the year;

Table 3.2: Monthly average temperature distribution of Dakshin Dinajpur District:

Months	Jan	Feb	March	April	May	June	July	Aug	Sept	Oct	Nov	Dec
Avg. Temperature (°c)	18.1°C	21.0°C	25.9°C	30.3°C	30.7° C	30.1°C	28.4 °C	28.1° C	28.2°C	27.0°C	23.3°C	19.0°C
Max. Temperature (°c)	25.9°C	28.9°C	34.3°C	38.4°C	37.5° C	35.5°C	32.7 °C	32.5° C	32.9°C	33.0°C	30.5°C	27.0°C
Min. Temperature (°c)	10.2°C	13.2°C	17.4°C	22.3°C	23.9° C	24.7°C	24.1° C	23.7° C	23.6°C	21.0°C	16.0°C	11.1°C

(Source: Climate-Data.Org)

3.3 Rainfall and Humidity

The average annual rainfall is 1022.24 mm from year 2016 – 2020. The maximum rainfall in the area as per IMD data was recorded in the month of June followed by August and September (Refer table no. 3-3 and Figure 3-3). (Source: https://wanderlog.com/weather)

Table 3.3: Rainfall Data of Dakshin Dinajpur from 2106-20

Month	Unit	2016	2017	2018	2019	2020	Avg. Rainfall
JAN	mm.	0	1.6	0	0	5.2	1.36
FEB	mm.	0	0	8	16.7	22.4	9.42
MAR	mm.	5.2	40.9	9.4	4.3	34.3	18.82
APR	mm.	12.3	91.5	30.9	71.4	108.3	62.88
MAY	mm.	50.1	68.5	138.8	112.9	349.4	143.94
JUN	mm.	86.8	150.3	131	139.8	294.3	160.44
JUL	mm.	310.1	161.2	230.8	373.6	430.9	301.32
AUG	mm.	62.8	522	108.3	136.6	120.8	190.10

Month	Unit	2016	2017	2018	2019	2020	Avg. Rainfall
SEPT	mm.	244.6	133.4	103.2	314.9	418.6	242.94
OCT	mm.	78.9	75.7	17.7	166.6	66.5	81.08
NOV	mm.	0	0	0	0	0	0.00
DEC	mm.	0	0	7.8	3.2	0	2.20

Source: India Meteorological Department, Ministry of Earth Sciences

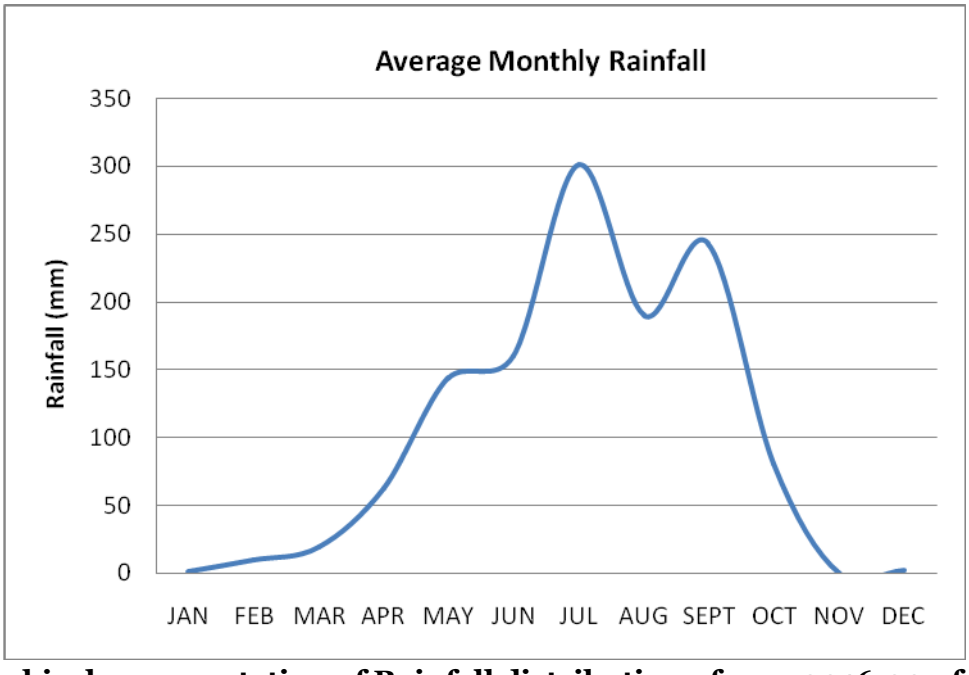


Figure 3.3: Graphical representation of Rainfall distribution of year 2016-20 of Dakshin Dinajpur District

3.3.1 Relative Humidity, Wind speed & Wind direction

The entire District experiences a high relative humidity that is spread uniformly. Generally, the humidity ranging from 85 - 99% during the monsoons and the relative humidity generally decreases in drier months of March and April are less humid with the relative humidity ranging between 45% - 60%.

The winds over the district are high during Monsoon, the average wind speed in monsoon seasons varies from 14.4 mph to 18.5 mph, and occasionally this wind speed goes over the 22-mph due to depression. The wind direction in the monsoon season is South- West wind.

3.4 Topography & Terrain

The district is generally flat, slightly sloping southwards. The region appears to be a continuation of 'Barind' tract – a geographical formation of old alluvium. The surface ground is undulating though there is no existence of hill. The elevation of the district from mean sea level is 15 metres. The highest elevation

shows in the northern part of this district and the elevation is very low in the southern part of this district. So it has clearly seen that the slope is varying from north to south direction.

The district can be divided into 2 sub-micro regions. The northern part of the district, may be referred as Sudhani-Mahananda-Gamari Plain, has few clusters of trees found generally in tropical and moist type of climate. Marshes are found in plenty. The south-eastern part of the district may be referred as Balurghat Plain is the bed of rivers for its flat alluvial plain. Rivers like the Tangon, the Punarbhaba, the ATRAI and the Ichhamati flow through this region.

Physiographically this region is divided into three units. These are Recent Alluvial Fan, Barind Pleistocene, and Recent Floodplain. These morphologicunits are separated by long, narrow bands of recent alluvium. The floodplain ofthe river Mahananda flanks the west side while the Karatoya delineates the eastern margin. The rivers Punarbhaba, Atrai and old Jamuna have cut across the Pleistocene and their floodplains separate the units. The Barind Tract, which is the largest Pleistocene Terrace of the country, is made up of the Pleistocene alluvium, also known as older alluvium. ***(Census, 2011)***

The Physiographic Map has mentioned below in Figure 3.4;

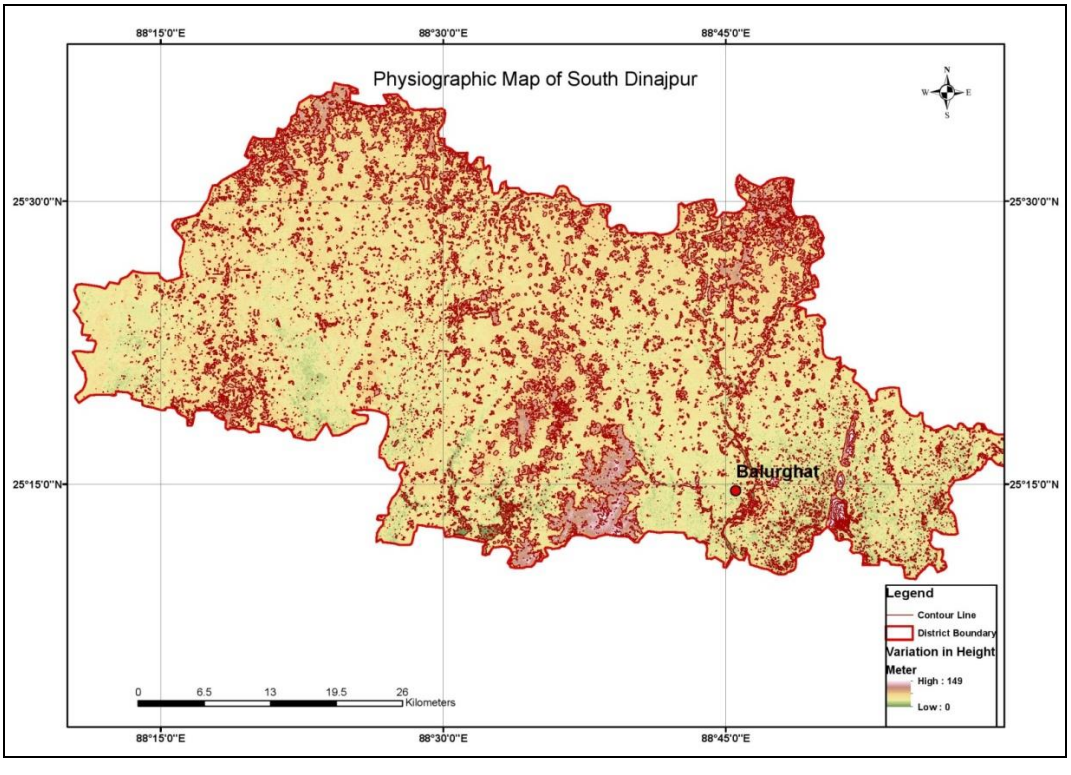


Figure 3.4: Physiography Map of Dakshin Dinajpur
(Source: Cartosat-1, Bhuvan India)

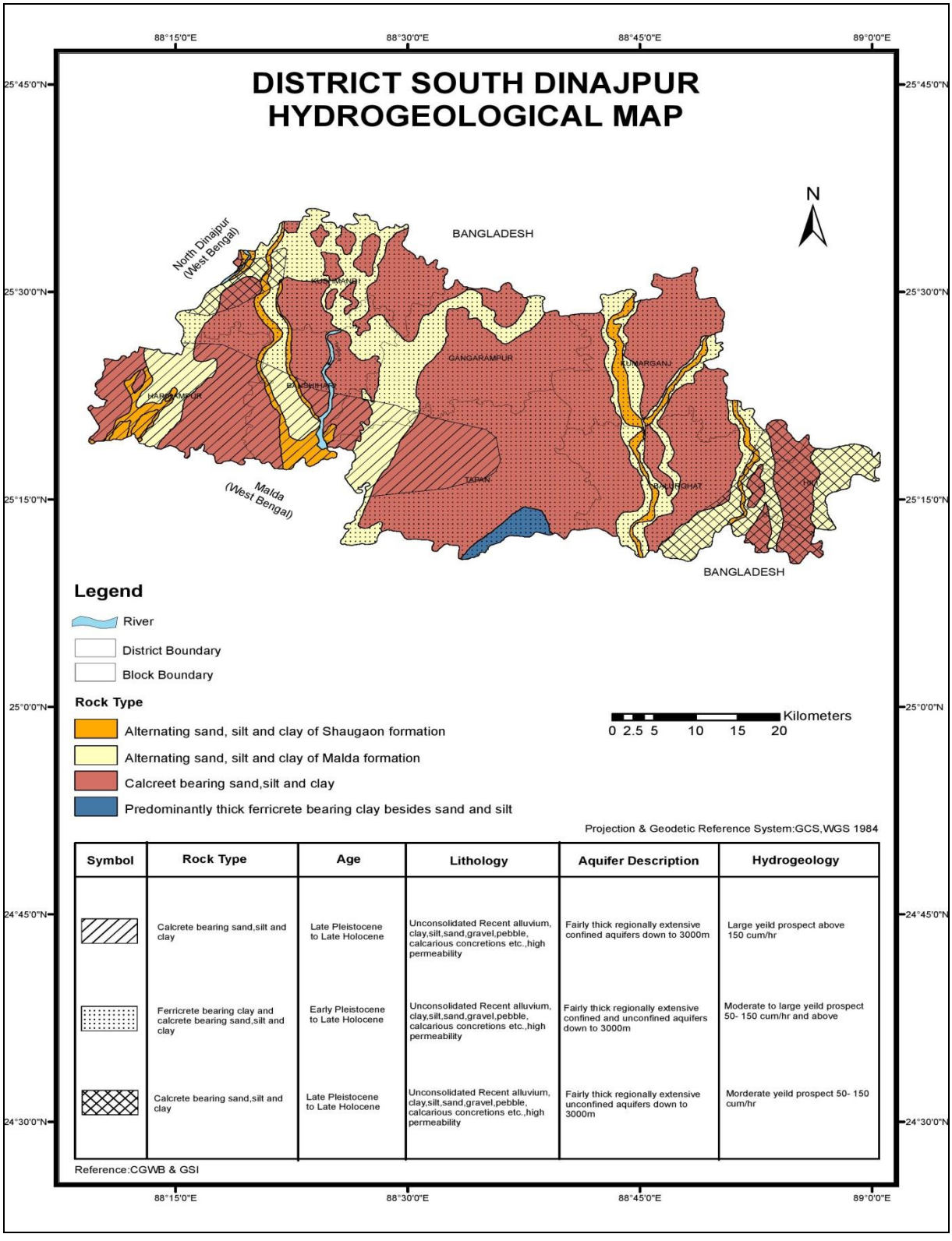
3.5 Water courses and Hydrology

Ground water occurs under semi-confined to confined condition below a blanket of about 60 m thick clay bed. Saturated granular zone of discontinuous nature generally occurs in the depth span of 65-110 m, which is capable of yielding up to 50 m^3/hrs (CGWB, 2016).

Older alluvium, deposits of discontinuous aquifers andrecent alluvium of regional extensive aquifers. Ground water occurs under unconfined condition in a thick zone of saturation within the alluvial sediments. Several promising saturated granular zones are present in the depth range of 17 to 184 meter below ground level. It can be observed that the general predominance of sand over clay in the alluvial formation, the discontinuous nature of clay horizons and commonly the silty characters of the clay layers apparently indicates that the ground water is predominantly under unconfined condition and locally it is under semi-confined condition in the district.

In the northern part of the district, the aquifers are depicted as multilayered fashion. Predominance of clay over sand occurs in Barind tract which is restricted in the south western parts i.e. in Bansihari, Tapan&Buniadpur blocks and the yield potentiality of aquifers is not so promising with a maximum draw down. The maximum thickness of porous formation is restricted within 50 m only. However ground water also occurs under semi-confined to confined condition below a blanket of 15-20 m thick clay bed in the Barind Tract available in Bansihari- Tapan-Gangarampursector.The lithology of this area is unconsolidated recent alluvium, clay, silt, sand, gravel, pebble, calcarious concretions etc., and high permeability. The aquifer is fairly thick regionally extensive confined aquifers down to 3000m and has large yield prospect above 150 cum / hr. The south east part of this block i.e. in Hilli and surrounding area has fairly thick regionally extensive confined and unconfined aquifers down to 3000m with almost similar lithology with Bansihari and the yielding prospect is moderate to large 50-150 cum/hr. and above. The Balurghat and Kumarganj these two important locations of this district has similar type of lithology like Hili but the thick regionally extensive unconfined aquifers down to 3000m with moderate yielding prospect 50-150 cum/hr. (Source: http://wbwridd.gov.in/swid/mapimages/SOUTH%20DINAJPUR.pdf)

Below mentioned Figure3.5 has shown the hydrological map of Dakshin Dinajpur;



Symbol	Rock Type	Age	Lithology	Aquifer Description	Hydrogeology
	Calcrete bearing sand,silt and clay	Late Pleistocene to Late Holocene	Unconsolidated Recent alluvium, clay,silt,sand,gravel,pebble, calcarious concretions etc.,high permeability	Fairly thick regionally extensive confined aquifers down to 3000m	Large yeild prospect above 150 cum/hr
	Ferricrete bearing clay and calcrete bearing sand,silt and clay	Early Pleistocene to Late Holocene	Unconsolidated Recent alluvium, clay,silt,sand,gravel,pebble, calcarious concretions etc.,high permeability	Fairly thick regionally extensive confined and unconfined aquifers down to 3000m	Moderate to large yeild prospect 50- 150 cum/hr and above
	Calcrete bearing sand,silt and clay	Late Pleistocene to Late Holocene	Unconsolidated Recent alluvium, clay,silt,sand,gravel,pebble, calcarious concretions etc.,high permeability	Fairly thick regionally extensive unconfined aquifers down to 3000m	Morderate yeild prospect 50- 150 cum/hr

Figure 3.5: Hydrogeological Map of Dakshin Dinajpur

(Source: wbwridd.gov.in)

3.6 Ground Water Development

The ground water occurs under semi confined to confined condition under a clay horizon in Recent Alluvial Plain available as a patchy occurrence in the eastern part of Balurghat, Hilli and northern part of Kumarganj. Course to fine sand, gravel deposits in the Recent Alluvium are the main repository of ground water having large yield potentiality. Lateral facies variation in the sediments in general leads to variations in thickness of aquifers in the occurrence, movement and availability of ground water in different parts of the district (Gayen, 2015).

The below mentioned table has illustrated the last 19 years Ground water level (2000-2018) of Pre-Monsoon and Post-Monsoon of this district;

(Source: https://indiawris.gov.in/wris/#/groundWater%20(CGWB%20website%20for%20Ground%20water%20data)

Table 3.4: Comparison of Pre-Monsoon and Post Monsoon data from year 2000-2018

Year	Avg Pre-Monsoon	Avg Post Monsoon
2000	4.3	4.29
2001	7.07	3.45
2002	5.07	1.06
2003	3.17	2.53
2004	4.18	2.99
2005	6.07	3.01
2006	5.36	0.76
2007	7.74	3.98
2008	5.99	3.02
2009	6.57	3.28
2010	5.61	2.76
2011	4.78	0
2012	0	4.36
2013	5.1	2.03
2014	5.14	2.56
2015	5.38	3.53
2016	2.61	1.56
2017	3.06	2.22
2018	1.55	0

Source: Water Resources Information System of India

Also, the Figure 3.6, the graphical representation of this data comparison has given below;

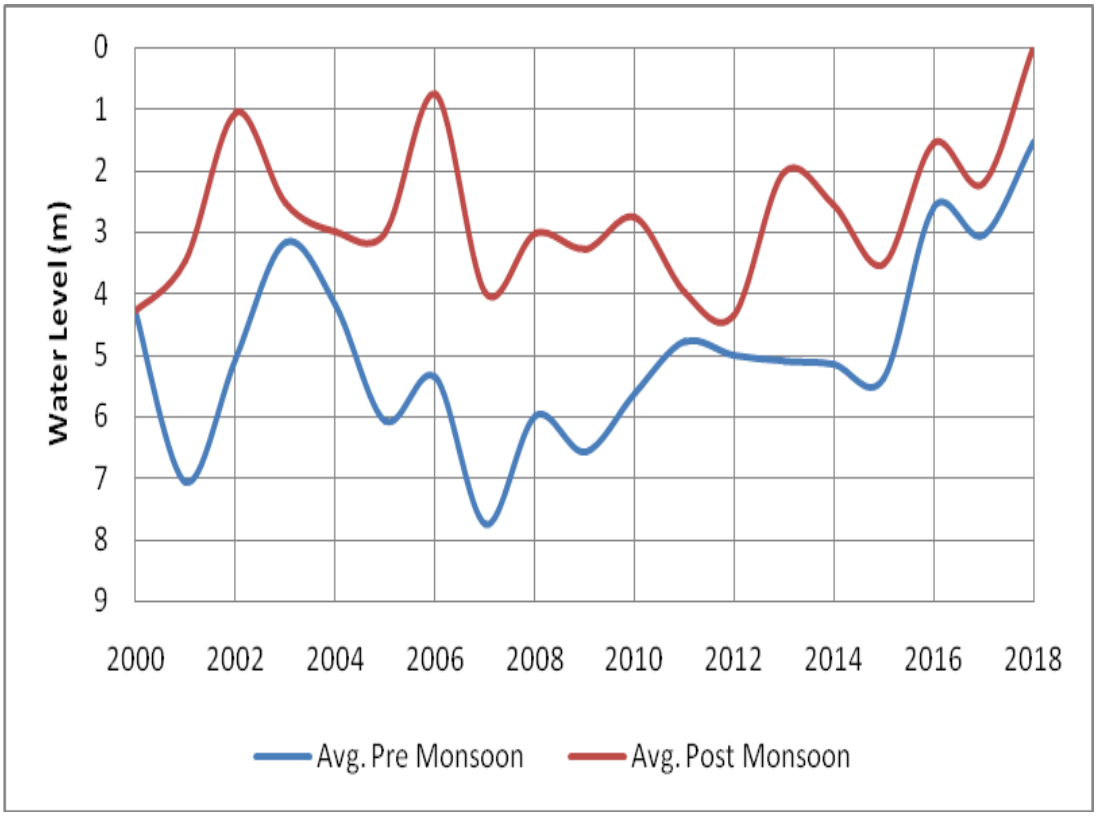
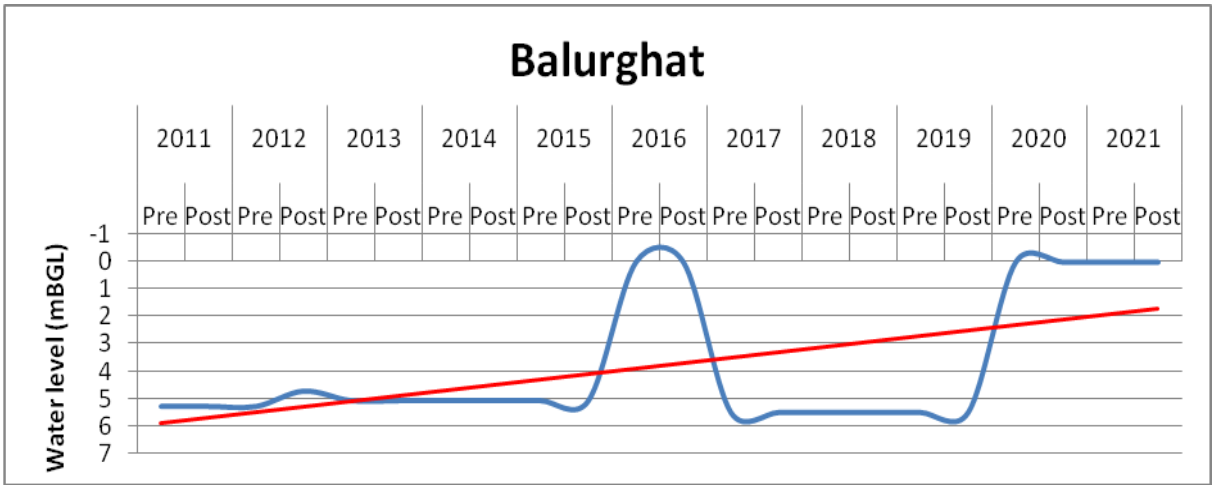
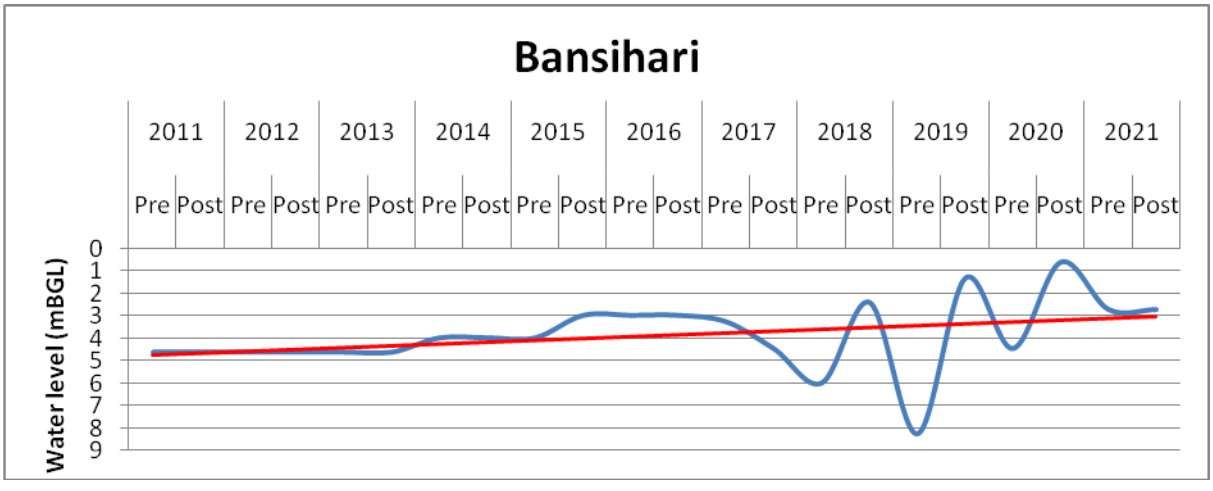
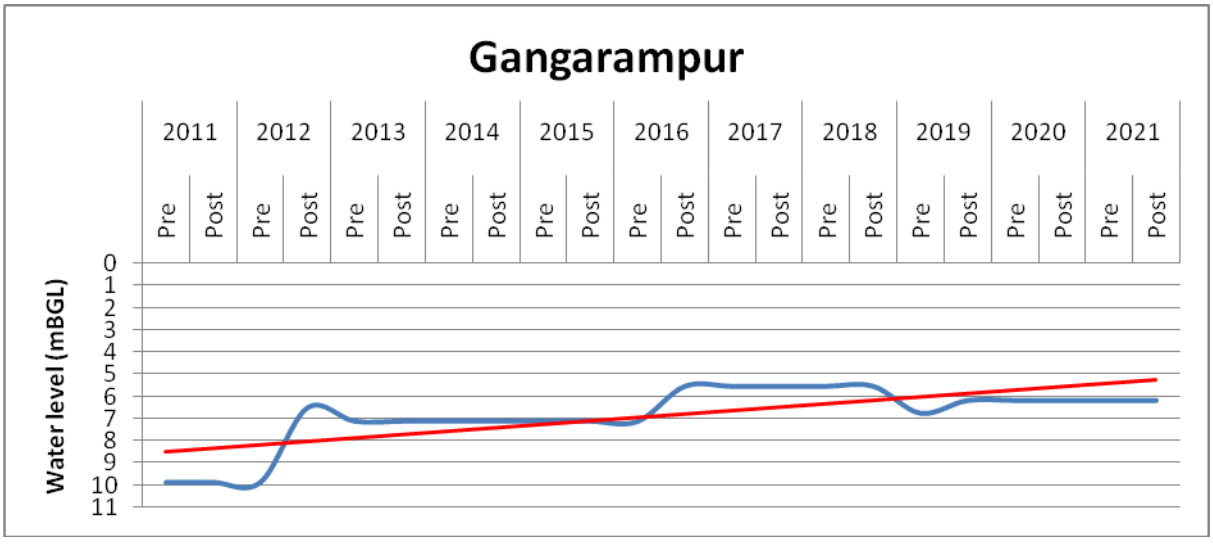


Figure 3.6: Graphical Representation of Ground water data

Hydrographs showing variation in water level observed in between 2011 to 2021 in the district is given below.




Bansihari
2011
2012
2013
2014
2015
2016
2017
2018
2019
2020
2021
Pre
Post
Water level (mBGL)
0
1
2
3
4
5
6
7
8
9


Gangarampur
2011
2012
2013
2014
2015
2016
2017
2018
2019
2020
2021
Pre
Post
Water level (mBGL)
0
1
2
3
4
5
6
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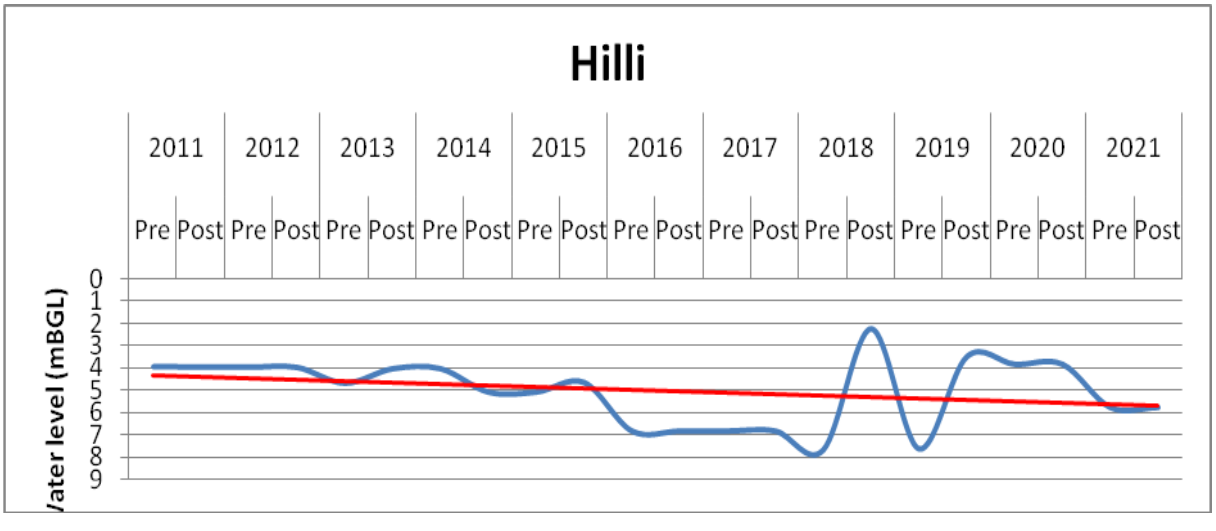
10
11


Hilli
2011
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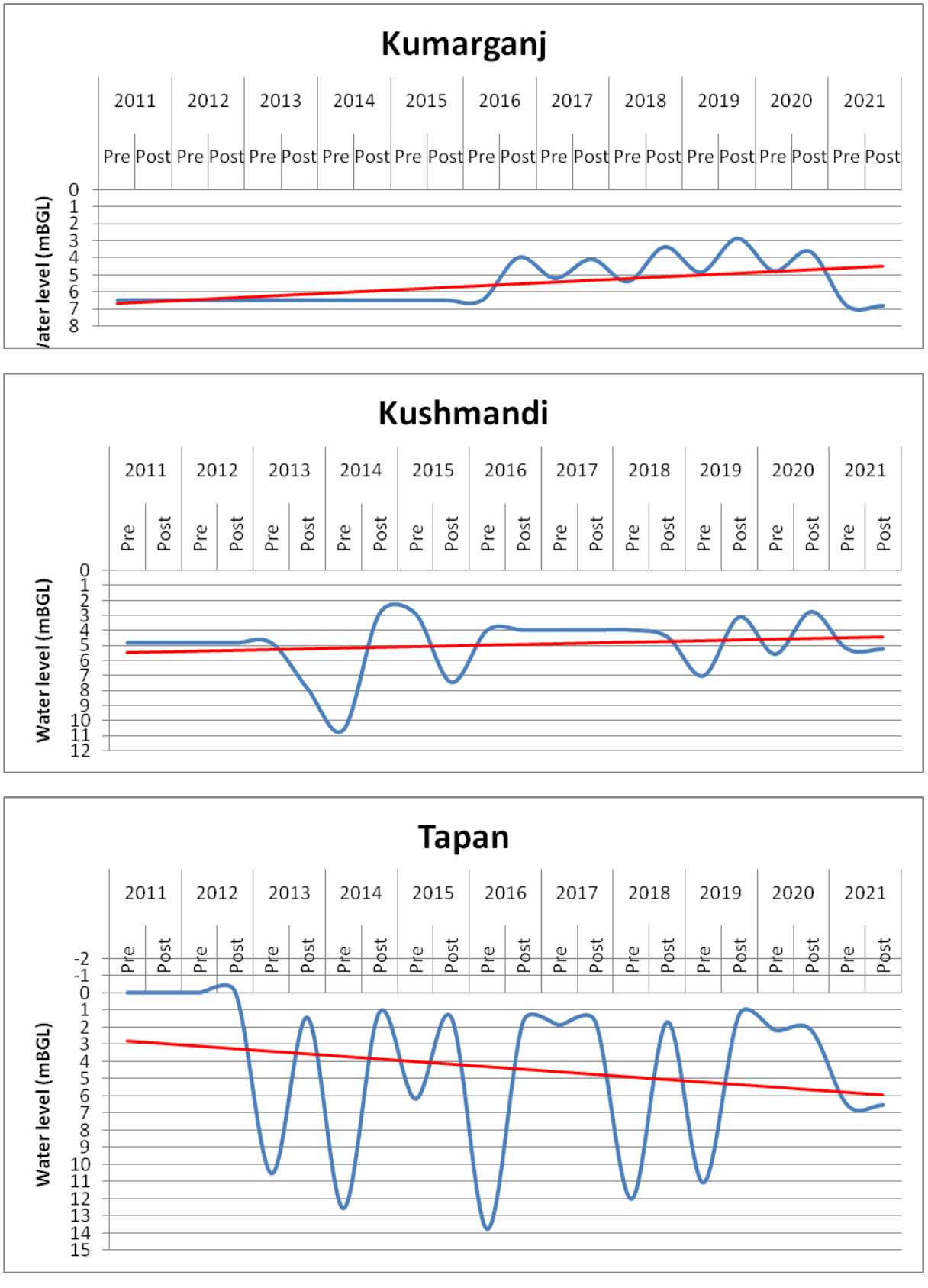


Figure 3.6.1: Block wise Hydrograph showing variation of waterlevel during 2011 to 2021

3.7 Drainage System

The main three river of the district are ATRAI, Punarbhaba and Tangaon. Along these three main rivers; another important river, Ichamoti is also flowing in this district. There is another small river named Jamuna in theHilli block. Flood in rainy season is a common phenomenon with in this district due to over flowing of water. All these riversare being silted and depths are reducing. Accordingto the slope of the land mass, the general flow of all the rivers are from North to South (Details of Drainage system discussed on 7.2.1 chapter).

A Drainage map of the district is furnished as Figure 3.7, as well as in Plate 1.

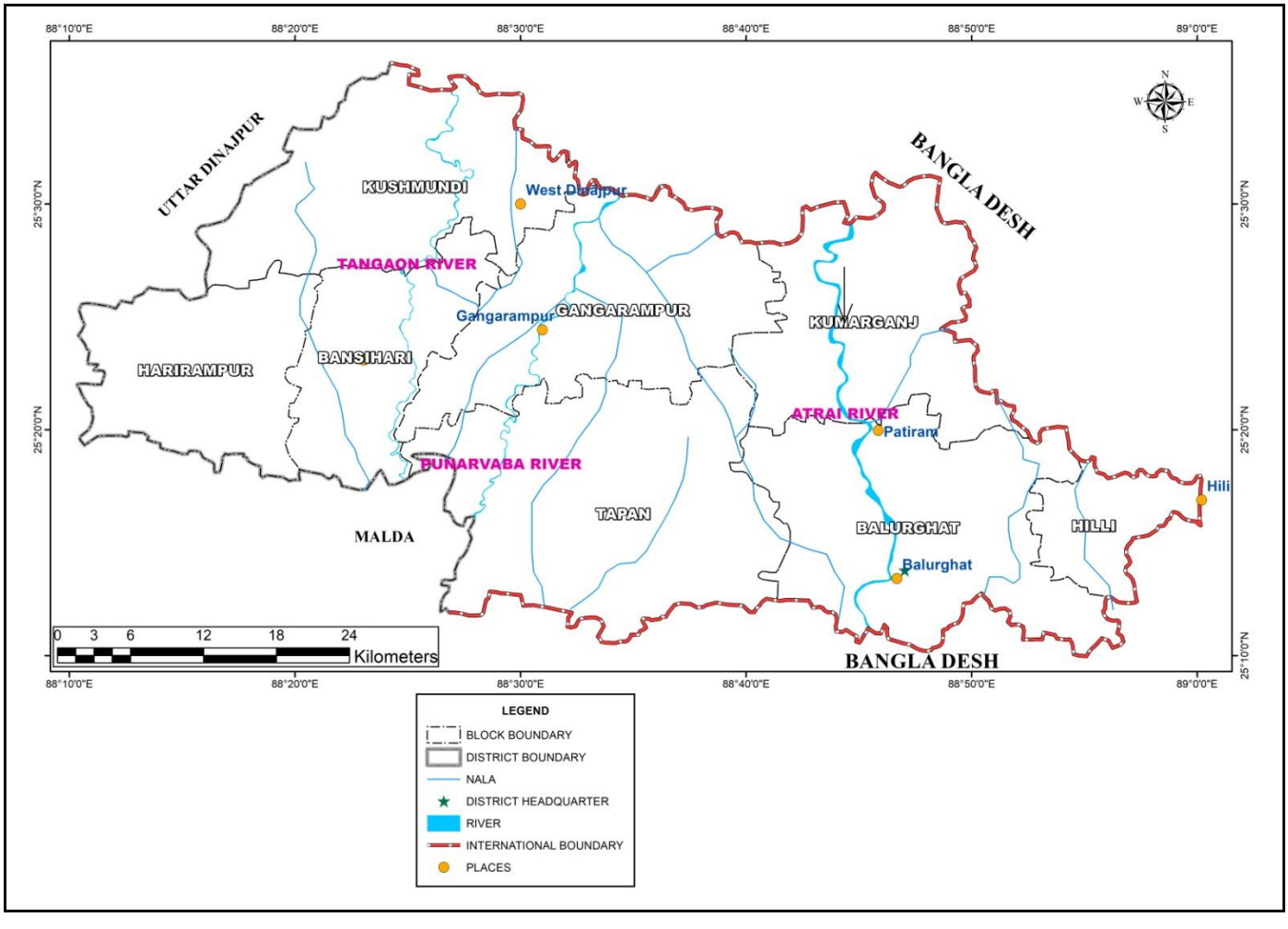


Figure 3.7: Drainage Map of Dakshin Dinajpur

(Source: National Informatics Centre)

3.8 Demography

According to 2011 census, the district encompasses a geographical area of 2219 sq km and has a population of 16,76,276 (persons) including 8,57,199 (males) and 8,19,077 (females). The district has a sex ratio of 92 females for every 100 males. The major religions in the district are Hindu (74.01%) and Muslim (24.02%) of the total population respectively. The literacy rate in the district is 72.82%. (***Census, 2011***)

Below mentioned table show the Demography of this district block wise;

Table 3.5: Demographic distribution of Dakshin Dinajpur District

Sub-Division / C.D.Block / M	Area (Sq. Km.) (2001)	Total Population			Literacy Rate %	Illiterate %	Percent of population to district population
		Male	Female	Total			
Gangarampur Sub-Div.	**1047.90**	**393572**	**377164**	**770736**	**69.24**	**30.76**	**45.98**
Kushmandi	310.63	100317	98435	198752	65.43	34.57	11.86
Banshihari	196.52	72161	69125	141286	68.79	31.21	8.43
Harirampur	214.94	69058	67795	136853	64.78	35.22	8.16
Gangarampur(M)	10.29	29095	27122	56217	84.59	15.41	3.35
Gangarampur	315.52	122941	114687	237628	71.45	28.55	14.18
Balurghat Sub-Div.	**1202.88**	**463627**	**441913**	**905540**	**75.78**	**24.22**	**54.02**
Kumarganj	286.62	87098	82004	169102	74.57	25.43	10.09
Tapan	445.63	128500	122004	250504	68.62	31.38	14.94
Balurghat(M)	10.46	75794	75622	151416	91.18	8.82	9.03
Balurghat	369.39	129254	121510	250764	73.96	26.04	14.96
Hili	90.78	42981	40773	83754	76.04	23.96	5.00
District Total	**2219.00**	**857199**	**819077**	**1676276**	**72.82**	**27.18**	**100**

(Source: Census, 2011)

The below mentioned figure 3-8 has illustrated the Population of Dakshin Dinajpur with respect to Male and female counts at all the blocks;

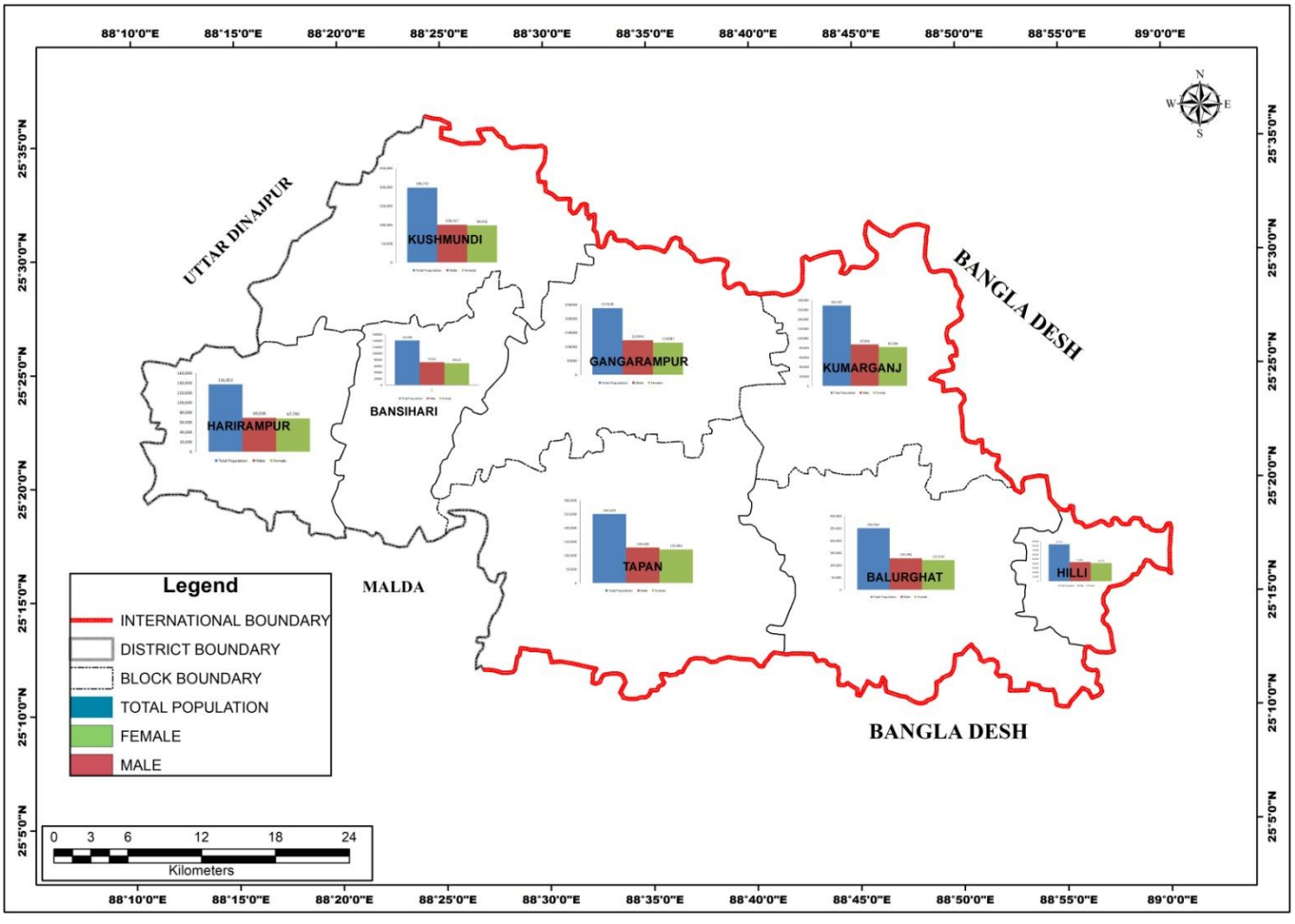


Figure 3.8: Block-wise population distribution in Dakshin Dinajpur District

(Source: Census, 2011)

The blow mentioned Figure 3.9 has illustrated the literacy rate of Dakshin Dinajpur at all the blocks;

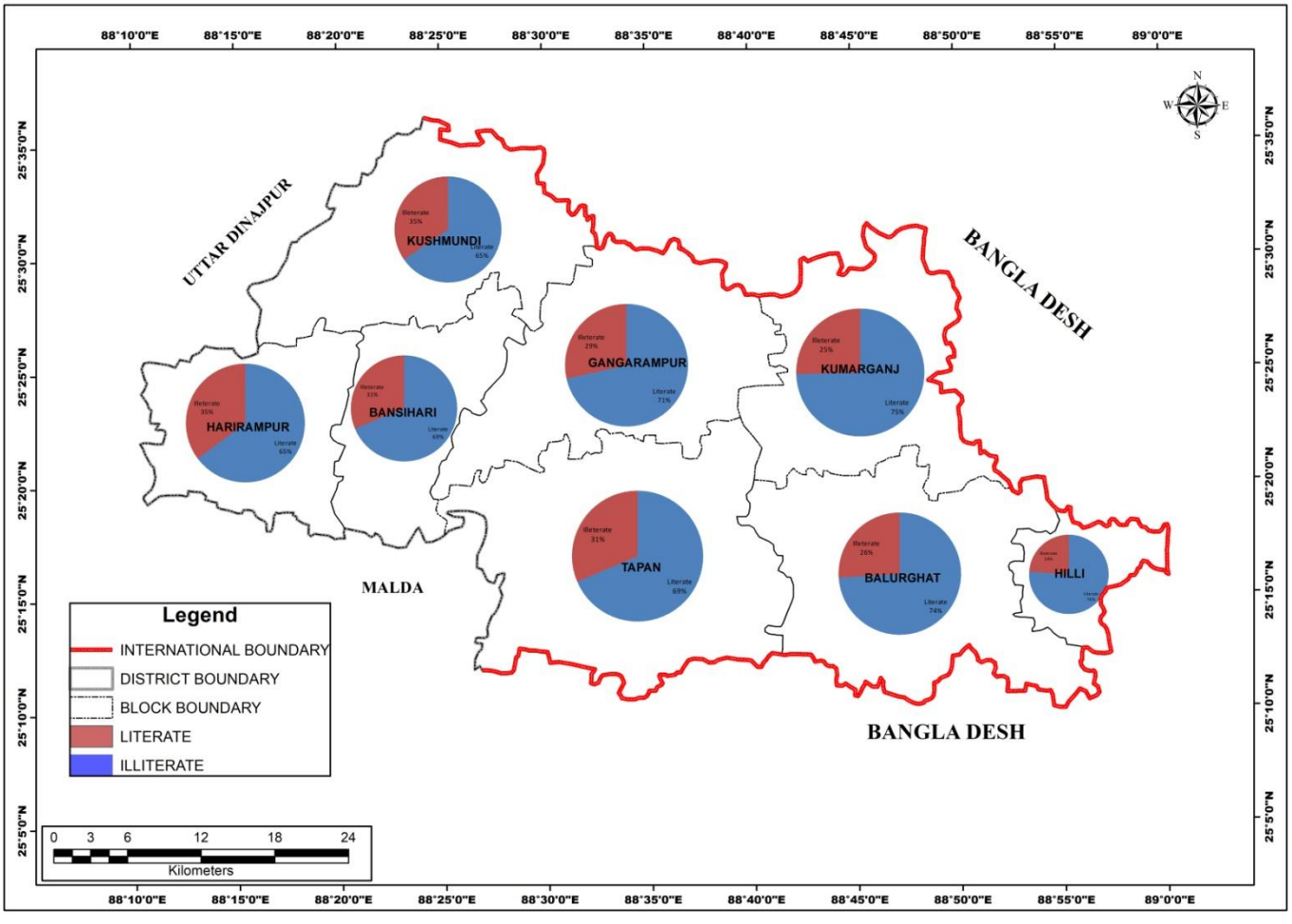


Figure 3.9: Demographic map showing Block-wise Literacy rate of Dakshin Dinajpur District

(Source: Census, 2011)

3.9 Cropping Pattern

Due to the very fertile nature of soil and devoid of natural mineral resource, Dakshin Dinajpur people are mainly depending upon agriculture. A variety of crops are cultivated which contributes greatly to the economy of the district. Considering the production, paddy and wheat are unparalleled among the food crops. Many important crops like vegetables, cereals, fruits, spices, fibres, flowers are also widely cultivated to satisfy the needs of the growing population. The major crops are:

a) Paddy- Paddy is the most important food crop of Dakshin Dinajpur. It is produced in over 2 lakhs hectare agricultural land. Kharif paddy is cultivated in most lands. The production of kharif paddy is over six lakh eighty thousand tons. But the productivity of boro paddy is slightly more than kharif paddy. Paddy is cultivated most in Gangarampur followed by Kushmandi and Kumarganj.

b) Wheat- Wheat is most important winter crop of Dakshin Dinajpur. It is sown in the beginning of winter (November-December) and harvested in the beginning of summer (March-April).It is grown in 32,300 hectares agricultural land. It is cultivated in Balurghat, Banshihari and Harirampur.

c) Potato-Amongst the vegetables of Dakshin Dinajpur potato is most extensively cultivated. Potato grows in well-drained, loose and loamy soil. It is grown in Balurghat, Kushmandi and Tapan.

d) Mustard- Mustard is cultivated in 27,900 hectares area and its production is 24,800 tons. It is cultivated all over the district, especially in Balurghat, Kumarganj and Hili.

e) Jute- Jute is one of the most important natural fiber cash crops of DakshinDinajpur. It is sown in February and harvested after 102- 110 days. It is cultivated in 14,085 hectares agricultural land of the district. The major areas where Jute is produced are Balurghat and Tapan.

f) Mesta- Mesta is another natural fiber cultivated in Dakshin Dinajpur. It is largely cultivated in TapanblockAlso Remunerative crops like Turmeric, Banana, Areca nut, are grown. Homestead crops of Mango, Guava, Coconut and Papaya are also grown in this district.

These Cropping pattern also divided some broad group like;

(1) Subsistence Farming — Paddy, maize, wheat, barley, etc.
(2) Cash Crop Raising — Potato, Sugarcane (very less), Jute, Ginger, Mango etc.
(3) Plantation Agriculture — Pineapples, Chilies, etc
(4) Miscellaneous categories — Horticulture, floriculture, orchid culture, sericulture

(Source: http://ddkvk.in/progress.html)

Table 3.6 mentioned major farming system with compare to land situation;

Table 3.6: Major farming system with compare to Land situation

S. No	Land situation	Farming system
1.	Medium to Up land	Jute / Mesta – Rice – Mustard/Wheat, Fishery, Livestock, Poultry
2.	Medium to Low land	Fallow – Rice – Rice, Fishery
3.	Medium land	Jute – Rice – Vegetable / Potato, Fishery
4.	Upland	Vegetable – Vegetable – Vegetable, Fishery, Livestock, Poultry
5.	Lowland	Fallow – Rice – Fallow, Fishery
6.	River bed	Cucurbits (Rabi-Pre-kharif)

Source: Dakshin Dinajpur Krishi Vigyan Kendra Annual Report, 2018-19

3.10 Land Form and Seismicity

The state of West Bengal is almost entirely covered by Indo-Gangetic Alluvium, crystalline rocks and Pre- Quaternary sediments occupy small part on the west and north. The flat lying, undisturbed and thickly developed alluvial expanse of West Bengal constitute the western half of N-S trending Ganga – Padma valley (Bengal Basin) and its delta compels.

The alluvium – filled depression occur its origin to recurrent movement along extensive basement faults that are active beneath alluvial cover of Bengal Basin. Notable among large scale fault generated structures in Bengal basement is the Eocene hinge zone, which originates in Bay of Bengal and passes into Bangladesh through West Bengal. Kolkata and Bongaon are situated above the hinge zone.

Unlike the E-W trending Himalayan foothill belts which is a recognized source of instrumentally recorded great earthquake, there are no instrumentally recorded earthquakes from N-S trending Bengal basin. There are some recorded earthquake in Bengal Basin are;

1. The largest instrumentally recorded earthquake in Bengal Basin originates on the east of Indo-Bangladesh border near Murshidabad (1935 Pabna Earth Quake).
2. On 15th April, 1964, for this purpose of seismic hazard assessment of faults in South Bengal, it remains a significant event.
3. On June 20, 2002, movement along NNW-SSE Tista fault caused a comparable event and was widely felt in North Bengal especially in border areas of Jalpaiguri District.
4. In 2006 and 2011 Sikkim earthquake and even 2015 Gorkha earthquake was widely felt in the northern district of W.B.

Southern part of North Bengal and the western part of the Darjeeling Himalaya along with foothills come within Zone IV of seismic zoning Map of India, where as west, central and North-East part lying in the Zone III.

The brief Description of Seismic zoning;

Zone - V

Zone 5 covers the areas with the highest risks zone that suffers earthquakes of intensity MSK IX or greater. The IS code assigns zone factor of 0.36 for Zone 5. Structural designers use this factor for earthquake resistant design of structures in Zone V. The zone factor of 0.36 is indicative of effective (zero periods) level earthquake in this zone. It is referred to as the Very High Damage Risk Zone. The region of Kashmir, the Western and Central Himalayas, North and Middle Bihar, the North-East Indian region, the Rann of Kutch and the Andaman and Nicobar group of islands fall in this zone.

Generally, the areas having trap rock or basaltic rock are prone to earthquakes.

Zone - IV

This zone is called the High Damage Risk Zone and covers areas liable to MSK VIII. The IS code assigns zone factor of 0.24 for Zone 4 Jammu and Kashmir, Ladakh, Himachal Pradesh, Uttarakhand, Sikkim, the parts of Indo-Gangetic plains (North Punjab, Chandigarh, Western Uttar Pradesh, Terai, North Bengal, Sundarbans) and the capital of the country Delhi fall in Zone 4.

In Maharashtra, the Patan area (Koynanagar) is also in zone no-IV. In Bihar the northern part of the state like Raxaul, near the border of India and Nepal, is also in zone no-IV.

Zone - III

This zone Comprises of Kerala, Goa, Lakshadweep islands, remaining parts of Uttar Pradesh, Gujarat and West Bengal, parts of Punjab, Rajasthan, Madhya Pradesh, Bihar, Jharkhand, Chhattisgarh, Maharashtra, Odisha, Andhra Pradesh, Tamil Nadu and Karnataka.

Zone – II

This region is liable to MSK VI or less and is classified as the Low Damage Risk Zone. The IS code assigns zone factor of 0.10 (maximum horizontal acceleration that can be experienced by a structure in this zone is 10% of gravitational acceleration) for Zone II.

Zone – I

Since the current division of India into earthquake hazard zones does not use Zone 1, no area of India is classed as Zone I.

The below table mentioned the seismic zone sustain on comprising to earthquake intensity;

Table 3.7: Seismic zone with intensity of earthquake

Seismic Zone	Intensity on M.M Scale
Zone-II (Low-Intensity Zone)	6 (or less)
Zone-III (Moderate Intensity Zone)	7
Zone-IV (Severe Intensity Zone)	8
Zone-V (Very Severe Intensity Zone)	9 (and above)

This district belongs to seismic zone IV because early mentioned that this area has faced some serious earthquake. So based on that matter Dakshin Dinajpur has categorized in seismic zone IV. Below mentioned Figure 3.10 has described the Earth quake map of the study district;

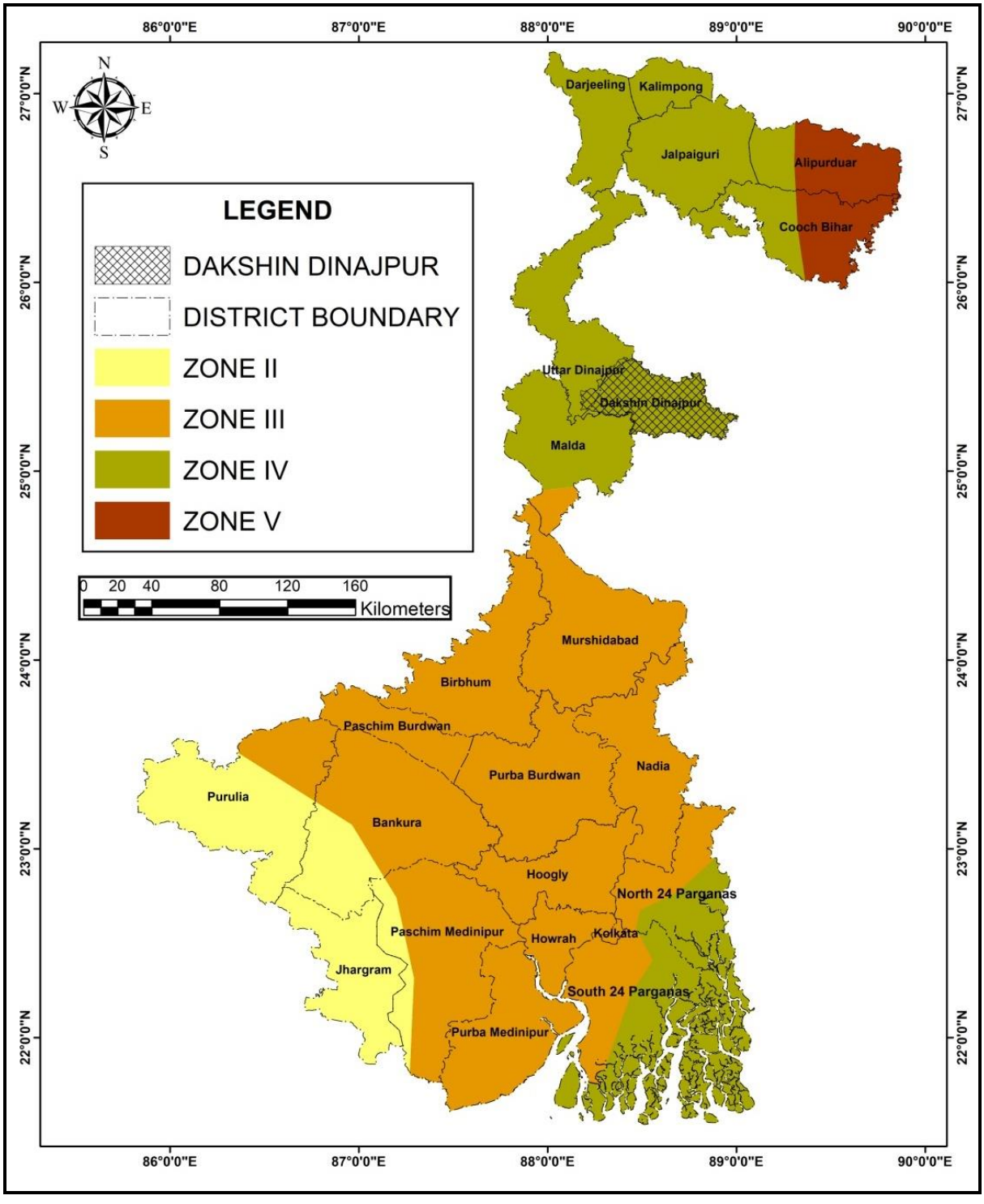


Figure 3.10: Earthquake zonation map of West Bengal highliting the Dakshin Dinajpur district position

(Source: http://wiienvis.nic.in/)

3.11 Flora

Mango, jackfruits, custard apple, Khejur, Tal, peach and coconut are available in numbers. The presence of jungle trees like Babool, wild palm, Pepul, Banyan, Neem, tamarisk, Sishu, bamboo, Simul are noteworthy. Many species of grasses and reeds such as Nagarmutha, Nal, Khaskhas and sola are also found.

Use of plants by different ethnic tribal communities for treatment of various ailments in Hilli C.D. Block of Dakshin Dinajpur district has been documented. As many as 62 plant species belonging to 34 families (61 Angiosperms and one fern), used by Santhal, Oraon, Munda and other communities (Polia, Sabar, Lodha) for medicinal purposes were identified.

In very recent timessocial forestry has received a lot of attention and it is becoming very popular in this area. Plantation of trees like Teak, Sal, Eucalyptus, Sishu, Garam, Arjun etc.arevery common along the roads, railway lines, rivers, and canal banks in the district.

The present study reveals the use of 132 plant species belonging to 120 genera and 65 families by different tribal and non-tribal communities of this district. Some of the plant specie has mentioned below table;

Table 3.8: Enumeration of the plants used by the tribal and non-tribal people of Dakshin Dinajpur district

Scientific name	Vernacular Name	Family	Parts used
Abroma augustum(L.)L. f.	Ulatkambol	Sterculiaceae	Petiole
*Abrusprecatorius*L.	Kanch	Papilionaceae	Root
*Acacia nilotica*L.	Babla	Mimosaceae	Stem bark
Achyranthes aspera L.	Apang/ Chatchota	Amaranthaceae	Root
Acmella oleracea (L.)	Rasun sag	Asteraceae	Whole plant
Acorus calamus L.	Bach	Acoraceae	Rhizome
Aegle marmelos(L.) Corr.	Bel	Rutaceae	Fruit
Alocasia macrorrhiza Schott.	Man-kachu	Araceae	Petiole
Alstoniascholaris(L.)	Chatim/ Chatan	Apocyanaceae	Stem
Amaranthus spinosusL.	KantaKhuria	Amaranthaceae	Root
Ampelocissus latifolia(Roxb.) Planch.	Goalilata	Vitaceae	Root
Andrographis paniculata(Burm. f.) Wall. Ex Nees	Kalmegh	Acanthaceae	Leaf

Scientific name	Vernacular Name	Family	Parts used
*Argemone mexicana*L.	Siyalkanta	Papaveraceae	Root
Aristolochia indica L.	Iswarmul	Aristolochiacea e	Root
*Artemisia vulgaris*L.	Nagdona	Asteraceae	Leaf
Averrhoa carambola	Kamranga	Oxalidaceae	Fruit
Azadirachta indica A. Juss.	Neem	Meliaceae	Stem bark
*Bambusatulda*L.	Bansh	Poaceae	Stem
Basella alba L.	Pui	Basellaceae	Stem
Bauhinia acuminata L.	Swet	Caesalpiniaceae	Flower
Blumealacera(Burm. f.) DC.	Kukurmuta	Asteraceae	Root
*Boerhaviadiffusa*L.	Punarnaba	Nyctaginaceae	Whole plant
Bombax ceiba L.	Shimul	Bombacaceae	Root
Borassus flabellifer L.	Tal	Palmae	Root
Butea monosperma(L	Palash	Papilionaceae	Leaf
Cajanus cajan(L.)	Arhar	Papilionaceae	Leaf
Calotropis gigantea(L.) W. T. Aiton	Akanda	Asclepiadaceae	Leaf
Canna indica L.	Kalabati	Cannaceae	Root
Cassia fistula L.	Sona gach	Caesalpiniaceae	Leaf
*Cassia sophera*L.	Chekenda / Kalkasunda	Caesalpiniaceae	Root
Centella asiatica (L.) Urb.	Thankuni / Dholamoni	Apiaceae	Leaf
Chromolaena odorata	Assam Lata	Asteraceae	Leaf
Cissus quadrangularis	Harjora	Vitaceae	Whole plant
Clerodendrum indicum (L.) Kuntze	Bhamot	Verbenaceae	Stem
Clerodendrumviscosum Vent.	Ghentu / Bhant	Verbenaceae	Leaf
Coccinia grandis (L.) Voigt.	Telakucha	Cucurbitaceae	Leaf

Source: International Research Journal of Biological Sciences, Vol. 3(5), 67-79, May (2014)

3.12 Fauna

A huge amount of common wild lives like moles, squirrels, fox, jackals, tortoise, wild cat, and so many other mammals are found in the forest. This areais rich in avariety of birds including owls, ducks, cranes, cuckoos, bulbuls, mynas, pigeons, parakeets, doves, owls, and others. Recently, some species of migratory birds have been seen near the low-land or areas marshy areas during the winter season. There are alsofound different types of snakes in thejungle. The nearest wildlife sanctuary is Raiganj Wildlife sanctuary and the distance from this district is 17.07 km.

The below mentioned figure 3-11 has illustrated the map of wildlife of Dakshin Dinajpur;

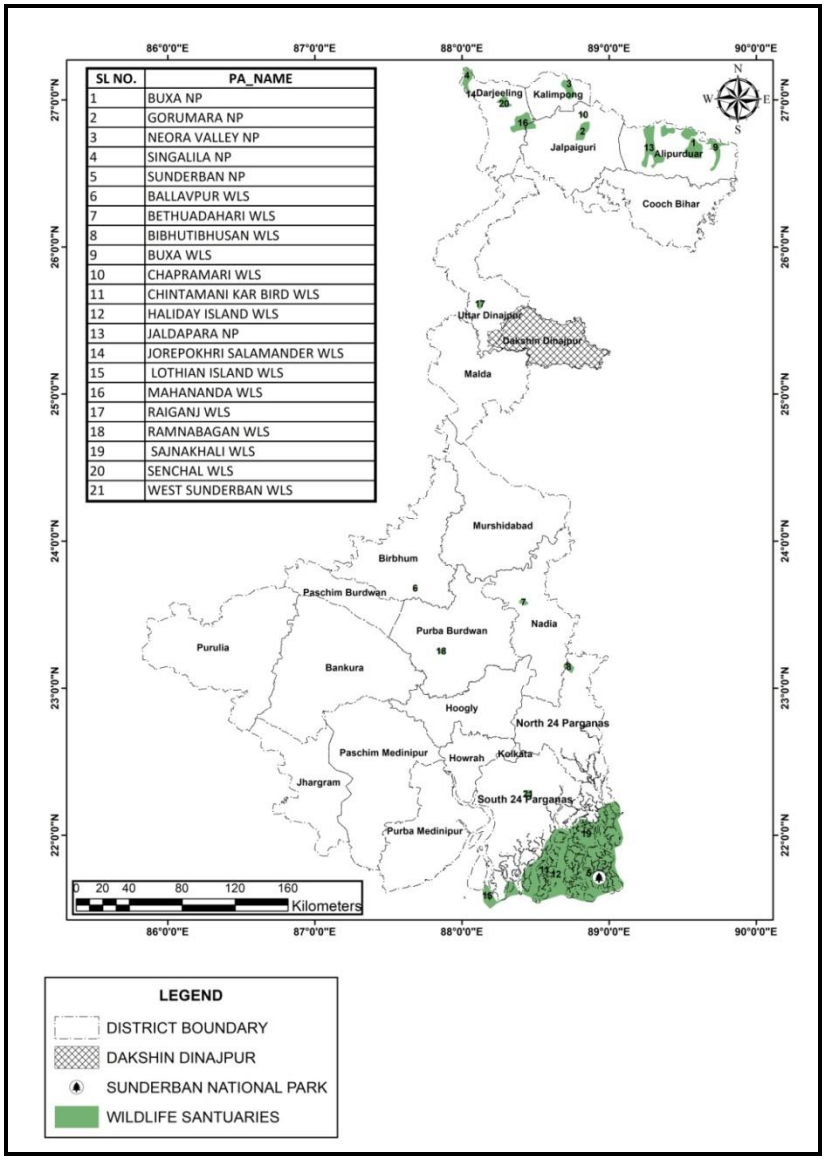


Figure 3.11: District location with respect to Wild Life Sanctuary of West Bengal

(Source: ENVIS Centre on Wildlife and Protected Areas)

4 Geomorphology

4.1 General Landforms

Geomorphological point of view the district occurs at theterminal end of the Mahananda-Tista conjugate fan where it passes into the flood plain regime. Levees, back swamps, channel bars, point bars and meander scrolls characterize both the active present day and inactive Shaugaon and Malda floodplain. The BaikunthapurFormation is observed as a part of an uplifted piedmont fan in the northwest and as a flood basin in the rest of the area, particularly east of the Tangaon river. Part of this flood basin constitutes the barind uplands. The oldest deposits in the area, namely, the BarindFormation also forms part of Barind uplands.

Few of them may active during the time of flood or heavy monsoonal rain. The topography ofthis area is level plain and gently sloping towards southwarddirection. The general slope of the whole area is not greater than angle 10◦. The average height ofthisarea is about 25 meters above the mean sea level. Although it is observed that the plainischaracterizedby occasional undulating terrain, interspersed with some depressions. Thus, considering relief and slope variations, the region can be divided into the fourzones which are given below and the

- Recent AlluviumZone
- OlderAlluviumZone
- Undulating UplandZone and
- Low Lands and Depressions Zone

Older Alluvium zone

The whole area is a part of the lower Ganga Plainof West Bengal. It is a largely flat land-form, created by the deposition of sediments over a long period of time by one or more rivers. Geomorphologically, itmay be pointed out that this plainof the whole field is characterized by Quaternary Alluvial Formation.It is evident that this alluvial plain occupies the largest portion ofthisregion (Refer figure 4.1). However, few riversquitefrequentlychange their courses, owing to heavy deposition of clay, silt in the stream-courses. Although the height of this geomorphic unit varies from 20 to 30mabove meansea level.

Recent AlluviumZone

The younger low plain lies on both side ofthebanks of the major rivers like ATRAI, Punarbhava, and the Tangon in thisregion. This geomorphic unit can be divided into three well-definedtracts by the ATRAI, Punarbhava, and the Tangaonrivers.But there is also found a patch of recent alluvial plain on the earlier Tangaonriver basin that is known as nowtheMaraTangaon River. It consists of grey colored fresh alluvial sand and silt. This unit is so dominated by the alternate sequence of sand, silt and clay formation. This topographic surface istermed as the Recent Alluvium Zone.

Undulating UplandsZone

The raised undulating upland zone lies betweenthe east bank of the flood plains of the river Tangaonand the west bank of the flood plains of the Punarbhava River. This centrally raised upland unit is characterized slightly by rolled topography and dominated with sediments like alternate sand, silt and clay with calcretesand also ferricrete. According to the Geological Formationthis unit is dominated by theBarindFormation under the tentative age of earlier Holocene.The relief of this unit ranges from 20 to 40m approximately above the mean sea level.

Low Lands and DepressionsZone

There are also a large number of swamps and marshes (Refer Figure-5.1), scatter located over the whole plain region. Locally the marshy areas are known as 'Bils'. The most remarkable among those is a chain of six large bilsonthe block of Gangarampur. It includes the important bils, like Karan bil, Nandanbil, Barbil, KoraBil, Baharam Bil and KainkanaBil which together extend over this study-region. Besides these, there are so many low-lying depression formed.

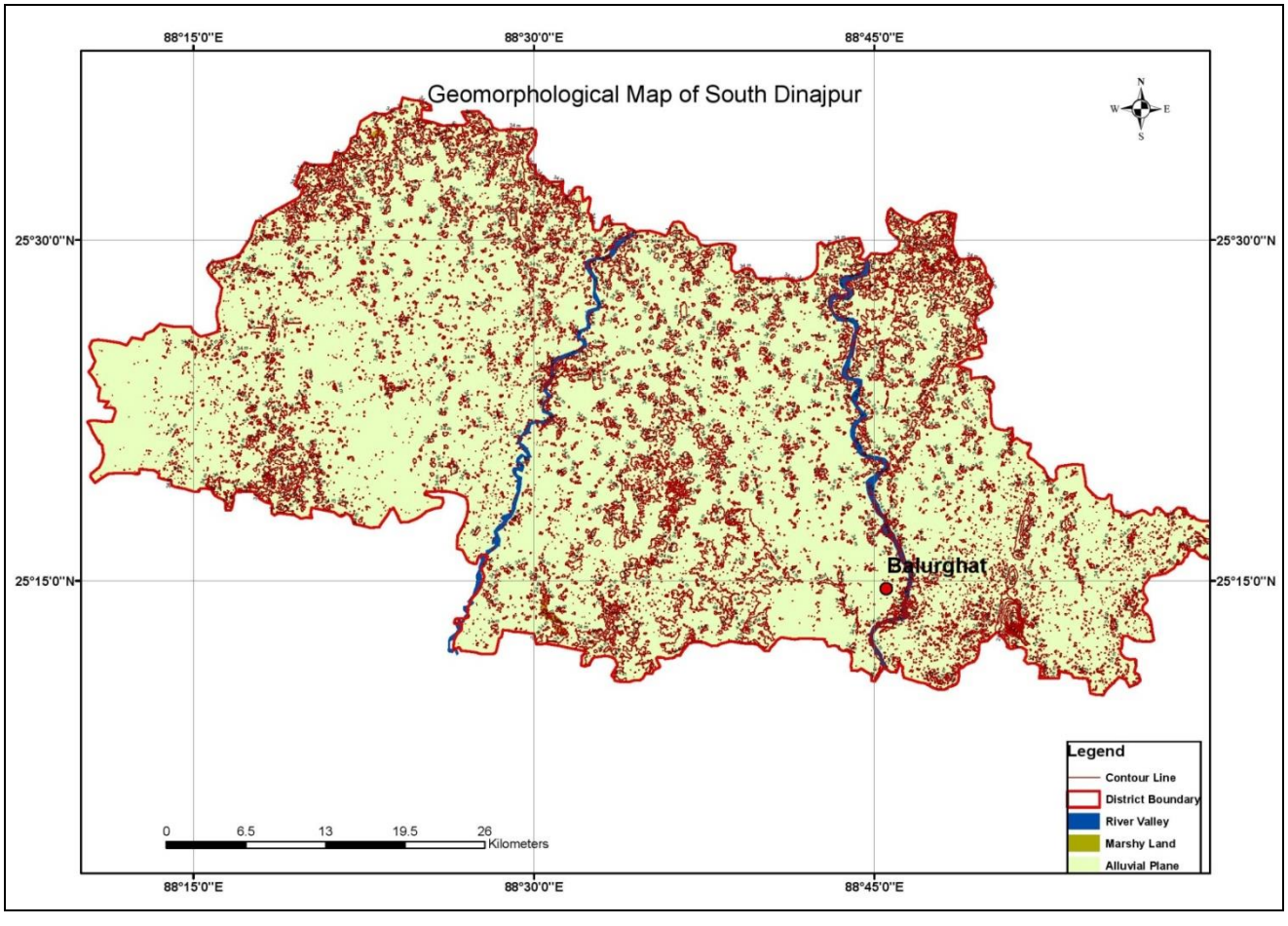


Figure 4.1: Geomorphological Map of Dakshin Dinajpur

(Source: Resourcesat-1&2 – Liss-3, Bhuvan India)

4.2 Soil and Rock Pattern

Physiographically the whole area of the district is a featureless plain land covered by alluvium soil, devoid of any rocky terrain. Genetically two types of soil as recent alluvium and older alluvium occur in the district. So far as the soil taxonomy is concerned six bi-series cover the entire district of Dakshin Dinajpur.

Table 4.1: Soil series of Dakshin Dinajpur district

Lithology	Soil Series (Bi-Series)
Recent Alluvium	Fine Loamy TypeUstocrepts with Course Loamy Type Ustorthents
	Fine Loamy AericHaplaquepts with Fine Loamy Fluventic Ustocrepts
	Fine Loamy TypeUstocrepts with Fine Loamy Type Ustorthents
Older Alluvium	Fine Loamy Type Ustocrepts with Fine Loamy Type Ustorthents
	Fine Loamy TypeUstocrepts with Fine Loamy TypeUstifluvent
	Fine Loamy TypeUstocrepts with Fine Loamy Fluventic Ustocrepts

Source: Prepared based on information adopted from Nayak, D.C et al. (2001).

Three soil series have been developed over recent alluvium while remaining three series are of sub-recent category of Bengal Basin developed over older alluvium.

Fine loamy type ustochrepts in association with course loamy type ustorthents are very deep, imperfectly drained, fine loamy soils of sub-recent origin occurring on level to nearly level recent alluvial plain with loamy surface and moderately flooding and associated with very deep, imperfectly drained coarse loamy soils of most recent origin. Fine loamy type ustochrepts in association with fine loamy type ustorthents are very deep imperfectly drained fine loamy soils of sub-recent origin occurring on level to nearly level recent alluvial plain with loamy surface associated with very deep, imperfectly drained, fine loamy soils of most recent origin.

Fine, aerichaplaquepts in association with fine loamy, fluvial ustochrepts are very deep, poorly drained, fine soils of sub-recent origin occurring on level to nearly level recent alluvial plain with clayey surface and moderate flooding associated with very deep imperfectly drained, fine loamy soils sub-recent origin. Fine loamy type ustochrepts in association with loamy type ustorthents are very deep, imperfectly drained, fine loamy soils of sub-recent origin occurring on very gently sloping old alluvial plain with loamy surface associated with very deep, imperfectly drained, fine loamy soils of most recent origin.

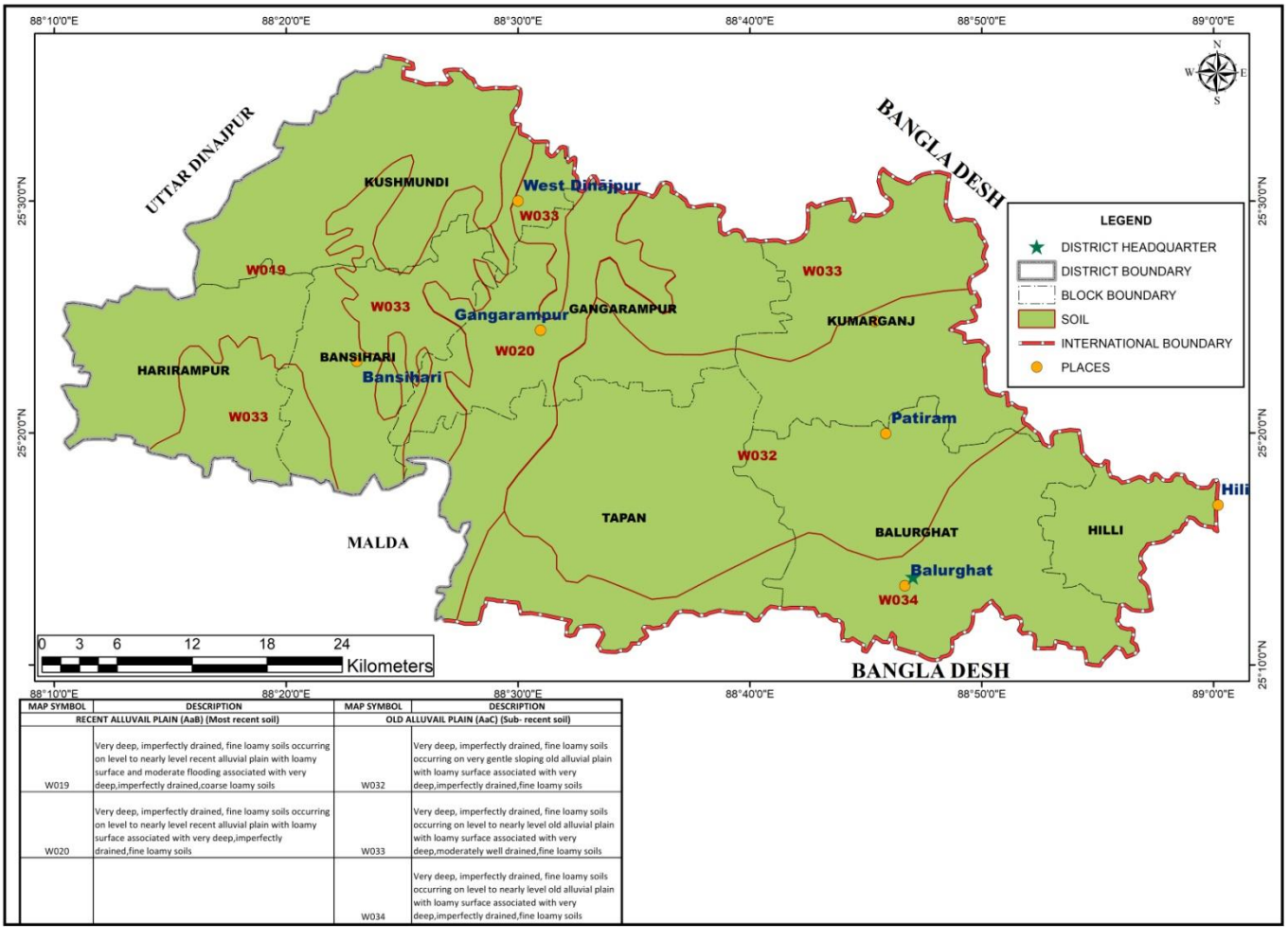
Fine loamy type ustochrepts in association with fine loamy type ustifluvents are very deep, imperfectly drained fine loamy soils of sub-recent origin occurring on level to nearly level old alluvial plain with loamy surface associated with very deep, moderately well drained, fine loamy soils of most recent origin.

Fine loamy type ustochrepts in association with fine loamy fluventic ustochrepts are very deep, imperfectly drained, fine loamy soils of sub-recent origin occurring on level to nearly level old alluvial plain with loamy surface associated with very deep, imperfectly drained, fine loamy soils of sub-recent origin (Table. 4.2)

Table 4.2: Descrption of District soil typeof Dakshin Dinajpur

MAP SYMBOL	DESCRIPTION	AREA (in Ha.)
RECENT ALLUVIAL PLAIN (Most recent soil)		
W019	Very deep, imperfectly drained, fine loamy soils occurring on level to nearly level recent alluvial plain with loamy surface and moderate flooding associated with very deep, imperfectly drained, coarse loamy soils	49170
W020	Very deep, imperfectly drained, fine loamy soils occurring on level to nearly level recent alluvial plain with loamy surface associated with very deep, imperfectly drained, fine loamy soils	24020
OLD ALLUVIAL PLAIN (Sub- recent soil)		
W032	Very deep, imperfectly drained, fine loamy soils occurring on very gentle sloping old alluvial plain with loamy surface associated with very deep, imperfectly drained, fine loamy soils	60760
W033	Very deep, imperfectly drained, fine loamy soils occurring on level to nearly level old alluvial plain with loamy surface associated with very deep, moderately well drained, fine loamy soils	44725
W034	Very deep, imperfectly drained, fine loamy soils occurring on level to nearly level old alluvial plain with loamy surface associated with very deep, imperfectly drained, fine loamy soils	43225
TOTAL AREA		221900

The below mentioned figure 4-2 has described the soilmap in Dakshin Dinajpur;



MAP SYMBOL	DESCRIPTION	MAP SYMBOL	DESCRIPTION
RECENT ALLUVAIL PLAIN (AaB) (Most recent soil)		OLD ALLUVAIL PLAIN (AaC) (Sub- recent soil)	
W019	Very deep, imperfectly drained, fine loamy soils occurring on level to nearly level recent alluvial plain with loamy surface and moderate flooding associated with very deep,imperfectly drained,coarse loamy soils	W032	Very deep, imperfectly drained, fine loamy soils occurring on very gentle sloping old alluvial plain with loamy surface associated with very deep,imperfectly drained,fine loamy soils
W020	Very deep, imperfectly drained, fine loamy soils occurring on level to nearly level recent alluvial plain with loamy surface associated with very deep,imperfectly drained,fine loamy soils	W033	Very deep, imperfectly drained, fine loamy soils occurring on level to nearly level old alluvial plain with loamy surface associated with very deep,moderately well drained,fine loamy soils
		W034	Very deep, imperfectly drained, fine loamy soils occurring on level to nearly level old alluvial plain with loamy surface associated with very deep,imperfectly drained,fine loamy soils

Figure 4.2: Soil Map of Dakshin Dinajpur

(Source: *https://esdac.jrc.ec.europa.eu/content/west-bengal-soils-sheet-2**)***

4.3 Different geomorphologic units

Geomorphologically this region is divided into three units. These are Recent Alluvial Fan, Barind Pleistocene, and Recent Floodplain. These morphologic units are separated by long, narrow bands of recent alluvium. The floodplain of the river Mahananda flanks the west side while the Karatoya delineates the eastern margin. The rivers Punarbhaba, ATRAI and old Jamuna have cut across the Pleistocene and their floodplains separate the units.

5 Land use pattern of the district

Dakshin Dinajpur district is situated on a plain land. The soil texture of the district can be broadly divided into 2 main groups (i) alluvium and (ii) laterite. The C.D. Blocks of Balurghat, Hili and Kumarganj predominantly have alluvium soil while Tapan C.D. Block is characterized mainly by the laterite soil type. The rich alluvium soil has enabled double cropping and even multiple cropping in the district. As the rivers overflow their banks every year, the soil is further enriched, which allows the farmers to reap a bumper harvest. The district is nearly flat with a gentle slope from north to south. The land is formed with alluvial & soil, generated from the different rivers in this district. The land is fertile for agricultural production.

The supply of landmass is fixed for all practical purpose. At the same time, the demand for land for various competing purposes is continuously increasing with the increase in human population and economic growth. Land use pattern at any given time is determined by several factors including size of human and livestock population, the demand pattern, the technology in use, the cultural traditions, the location and capability of land, institutional factors like ownership pattern and rights and state regulation. The land use pattern besides having economic implications has also important ecological dimensions, which if ignored can have disastrous consequences.

The below mentioned Table 5.1 is describes the classification of land utilization of this district;

Table 5.1: Classification of Land Utilization Statistics in the district of Dakshin Dinajpur

Year	2009-10	2010-11	2011-12	2012-13	2013-14
Reporting Area (In Thousand Hectors)	221.91	221.91	221.91	221.91	221.91
Forest Area	0.93	0.93	0.93	0.93	0.93
Area under Non-agricultural use	32.38	34.17	26.06	32.56	32.64
Barren &uncultur-able land	0.09	0.01	0.01	0.01	0.01
Permanent pastures & other grazing land	0.04	-	-	-	-
Land under misc. tree groves not included in 'Net area sown'	1.03	1.16	2.05	1.83	1.69
Culturable waste land	0.07	0.03	0.03	0.02	-

Year	2009-10	2010-11	2011-12	2012-13	2013-14
Fallow land other than current fallow	0.19	0.41	0.03	0.01	0.01
Current fallow	1.47	1.59	0.02	0.01	0.04
Net area sown	185.71	183.61	192.78	186.54	186.60

(Unit in Thousand hectares)

Source: *http://wbpspm.gov.in/publications/District%20Statistical%20Handbook*

Below mentioned figure 5-1 has describes the Land use map of Dakshin Dinajpur;

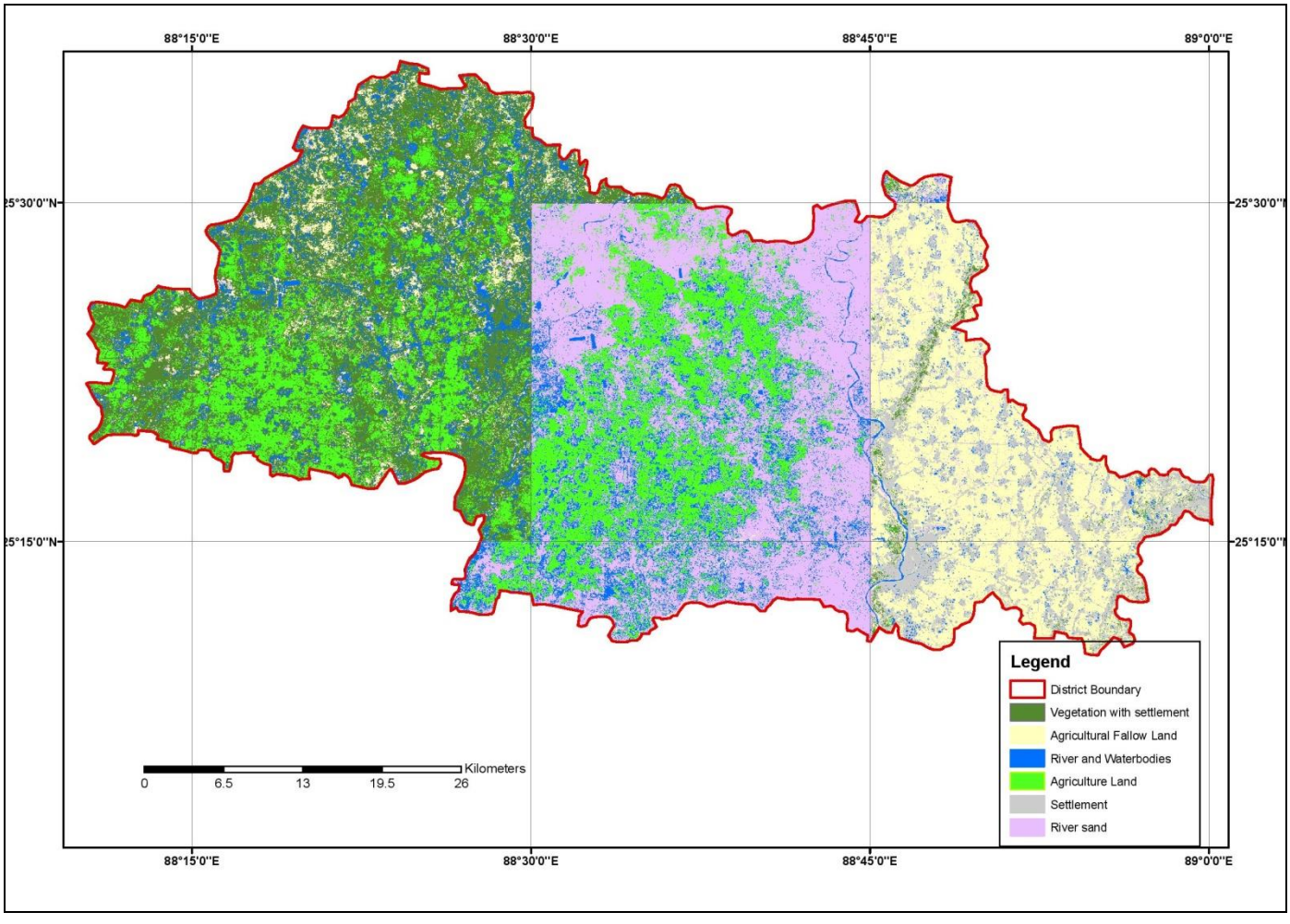


Figure 5.1: Landuse and Landcover Map of Dakshin Dinajpur

(Source: Resourcesat-1&2 – Liss-3, Bhuvan India)

5.1 Forest Details

The Concentration of forests in the district of Dakshin Dinajpur is mostly along the eastern and southern borders which the district shares with Bangladesh. The major forest produce which has a significant contribution in the district's annual revenue earned account are timber and fuel. Social forestry has also received a lot of attention and plantations of Eucalyptus, Babla, Sishu, Garan, Simul, Sirish etc. are encouraged (DCH, Dakshin Dinajpur, 2011, Series: 20, Part-XII-A). Table 5.2 shows classification of forest with outturn of forest produce and revenue and expenditure of forest department.

.

Table 5.2: Classification of Forest Area

Item	Unit	2009-10	2010-11	2011-12	2012-13	2013-14
(1)	(2)	(3)	(4)	(5)	(6)	(7)
1. Area by Class of forest :	-		-	-	-	-
Reserved forest	Hectare	987.79	987.79	987.79	987.79	987.79
Protected forest	"	402.41	402.41	402.41	402.41	402.41
Unclassed state forest	"	73.59	73.59	73.59	73.59	73.59
Khas forest	"	-	-	-	-	-
Vested waste land	"	-	-	-	-	-
Forest owned by corporate bodies	"	-	-	-	-	-
Forest owned by private individuals	"	-	-	-	-	-
Forest owned by civil authorities	"	-	-	-	-	-
Total		**1463.79**	**1463.79**	**1463.79**	**1463.79**	**1463.79**

Source: *http://wbpspm.gov.in/publications/District%20Statistical%20Handbook*

Table 5.3: Forest Area, Out-turn of Forest Produce, Revenue and Expenditure of Forest Department from 2009-10 to 2013-14

Item	Unit	2009-10	2010-11	2011-12	2012-13	2013-14
(1)	(2)	(3)	(4)	(5)	(6)	(7)
Forest Produce :	-	-	-	-	-	-
Timber	Thousand cu. meter	..	..	392.84	78.93	292.54

Item	Unit	2009-10	2010-11	2011-12	2012-13	2013-14
Fuel	"	..	..	..	..	..
Pole	Number	-	-	565	2500	..
Revenue & Expenditure :	-					
Revenue	Rs. in thousand	345.44	610.10	4665.68	909.77	6238.87
Expenditure	"	13834.41	15107.02	13368.75	3951.82	6294.34

Source: Divisional Forest Officer, RaiganjSocial Forestry Division

5.2 Agriculture & Irrigation

5.2.1 Agriculture

Throughout the human history, agriculture has played an important role in the economy of the society. The growth and development of the activity of such economy are older in this district. The district is situated in old-agro climatic zone of the northern part of West Bengal. It is agriculturally rich. Agriculture is most dominant sector of the economy of this area. The livelihood profile of this area has evolved in association with agricultural practices. More than 70 percent oftotal rural population draws livelihoods from agriculture and its related occupations. However, rapid growth of urbanization has accelerated the growth of tertiary economic activity based on trade, commerce, services intowns or urban centersof the district. Despite suchrapid growth of urban life, the economy of the entire rural life still remains entirelyagricultural. The agricultural patterns are closely controlled by the existing physical factors of the region. Infact, terrain, topography, slope, climate, soils, surface drainage, and underground water table are quite vital controlling factorsof agricultural activities and cropping patterns (Hussain, 1999).

Table 5.4: Production of Principal Crops (Thousand Tonnes) in the district of Dakshin Dinajpur

Crops		2009-10	2010-11	2011-12	2012-13	2013-14
(1)		(2)	(3)	(4)	(5)	(6)
Foodgrains :						
1.	**Rice**	**463.8**	**560.7**	**469.5**	**510.7**	**514.7**
	Aus	8.7	7.7	4.5	1.7	1.6
	Aman	360.6	447.7	374.2	440.3	442.9
	Boro	94.5	105.3	90.8	68.7	70.2
2.	Wheat	35.3	38.2	39.4	41.0	38.3

Crops		2009-10	2010-11	2011-12	2012-13	2013-14
(1)		(2)	(3)	(4)	(5)	(6)
3.	Barley	-	-	-	-	-
4.	Maize	2.3	1.6	1.6	2.3	10.8
5.	Other Cereals	-	-	-	-	-
	Total Cereals	**501.4**	**600.5**	**510.5**	**554.0**	**563.8**
6.	Gram	-	-	-	(b)	-
7.	Tur	-	-	-	-	-
8.	Other Pulses	0.4	0.3	0.3	0.6	0.9
	Total Pulses	**0.4**	**0.3**	**0.3**	**0.6**	**0.9**
	Total Foodgrains	**501.8**	**600.8**	**510.8**	**554.6**	**564.7**
Oil Seeds :						
1.	Rapeseed & Mustard	17.5	21.4	19.5	29.2	26.5
2.	Linseed	(b)	(b)	0.1	0.1	0.1
3.	Other Oil seeds	0.4	0.6	(b)	(b)	(b)
	Total Oil seeds	**17.9**	**22.0**	**19.6**	**29.3**	**26.6**
Fibres :*						
1.	Jute	234.2	247.1	294.0	272.8	300.0
2.	Mesta	46.7	53.7	35.1	42.0	77.2
3.	Other Fibres	-	-	-	-	-
	Total Fibres	**280.9**	**300.8**	**329.1**	**314.8**	**377.2**
Miscellaneous crops :						
1.	Sugarcane	-	-	0.6	-	-
2.	Potato	151.1	169.6	154.9	163.0	130.0
3.	Tobacco	-	-	-	-	-
4.	Tea	-	-	-	-	-
5.	Chillies (dry)	3.4	3.4	3.4	3.4	3.3
6.	Ginger	0.3	0.3	0.3	0.3	0.3
Total Miscellaneous crops		**154.8**	**173.3**	**159.2**	**166.7**	**133.6**

Unit: Thousand Tonnes

Source: *http://wbpspm.gov.in/publications/District%20Statistical%20Handbook*

5.2.2 Irrigation

As the rivers of the district carries water during monsoon season only, the irrigation of the district largely depends upon different categories of tube wells and dug wells. In 2000-2001, 48,240 hectares of land in the district was under irrigation. Still due to lack of natural water resource, the irrigation picture of the district during preceding five years has remained almost unchanged. About 27.8% of the total cropped area has been brought under irrigation facility which is the main driving force for extensive cultivation during dry season. Increasing dependency on groundwater based irrigation causes the depletion of groundwater reserves which exacerbates water scarcity in the district. Following tables and plates show the irrigation and agricultural scenario of Dakshin Dinajpur district in particular and overall economic scenario in general.

The details of irrigation in the district of Dakshin Dinajpur for the period 2009-010 to 2013-14, is shown hereunder table.

5.3 Horticulture

The varied soil conditions of the region offeranother scope for cultivation of fruits and flowers. The total area accounts for 4441ha and undersuchcultivationof major fruits like Mango, Banana, Watermelon, Jackfruit, Litchi, Papaya, Guava, Pineapple etc. The total production is 33532 MT. This accountfor approximately 35% of the vegetables isover produced. So, thishas a scope ofthe potentialities of trade. Now-a-daysfloriculture is widening its markets. Flowers like Rose, Tuberose, Marigold, Gladiolus, Jasmine, etc. are cultivated. The district has also good potential for establishmentof plantation crops like Coconut, Cashewnut, and spice like Large Cardamom, Coriander, Turmeric, etc. Hence commercially, the allied agricultural sectors of the district areyet to be raised for the development of food processing unitsgenerating additional employment fortherisinggrowthof population day by day. Holding in perspective with this agro-climatic condition the area have the opportunity for the international trade or market potential.

The major fruits and vegetable grown in the district of Dakshin Dinajpur for the period 2009-10 to 2013-14, is shown hereunder table;

Table 5.5: Area and Production of Fruits in the district of Dakshin Dinajpur

Name of Fruits		Area (Thousand hectares)					Production (Thousand tonnes)				
		2009-10	2010-11	2011-12	2012-13	2013-14	2009-10	2010-11	2011-12	2012-13	2013-14
(1)		(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
A.	**Fruits** :										
	Mango	1.11	1.12	1.14	1.16	1.17	6.82	7.42	7.52	7.81	3.65
	Banana	0.90	0.91	0.96	0.97	0.91	10.91	11.91	11.97	11.17	10.16
	Pineapple	0.04	0.04	0.03	0.04	0.04	0.95	0.95	0.79	0.90	0.89

	Papaya	0.33	0.34	0.37	0.38	0.37	11.10	11.18	11.50	10.60	9.80
	Guava	0.22	0.23	0.28	0.27	0.26	3.56	3.95	3.97	3.67	3.50
	Jackfruit	0.39	0.39	0.40	0.40	0.40	5.53	5.53	5.16	5.65	5.60
	Litchi	0.30	0.30	0.30	0.31	0.31	2.70	2.70	2.91	2.82	2.82
	Mandarin Orange	-	-	-	-	-	-	-	-	-	-
	Other Citrus	0.12	0.12	0.13	0.14	0.14	1.21	1.21	1.31	1.35	1.36
	Sapota	0.03	0.03	0.03	0.03	0.03	0.05	0.05	0.06	0.26	0.26
	Others	0.85	0.84	0.90	0.90	0.90	6.04	6.11	6.05	6.15	6.01
	Total	**4.29**	**4.32**	**4.54**	**4.60**	**4.53**	**48.87**	**51.01**	**51.23**	**50.38**	**44.05**

Source: *http://wbpspm.gov.in/publications/District%20Statistical%20Handbook*

Table 5.6: Area and Production of Vegetables in the district of Dakshin Dinajpur

Name of Vegetables	Area (Thousand hectares)					Production (Thousand tonnes)				
	2009-10	2010-11	2011-12	2012-13	2013-14	2009-10	2010-11	2011-12	2012-13	2013-14
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
B. Vegetables :										
Tomato	2.01	2.03	2.03	2.04	2.00	36.01	36.48	36.48	36.02	35.02
Cabbage	4.11	4.17	4.17	4.18	4.11	110.60	112.15	112.16	107.60	106.00
Cauliflower	2.11	2.14	2.14	2.14	2.11	56.85	57.60	57.60	55.85	52.85
Peas	0.47	0.48	0.47	0.47	0.47	2.15	2.21	2.15	2.16	1.94
Brinjal	6.62	5.47	6.69	6.72	6.72	110.35	93.83	114.40	108.24	108.44
Onion	0.69	0.70	0.69	0.69	0.71	9.05	9.30	8.20	7.50	7.60
Cucurbits	9.50	9.64	9.27	9.15	9.17	112.43	116.60	118.65	116.28	116.44
Ladies Finger	2.17	2.20	2.21	2.20	2.16	23.45	24.08	23.98	23.05	22.88
Radish	2.82	0.58	2.81	2.29	1.80	28.02	5.74	29.12	24.02	18.02
Others	15.46	23.28	15.90	15.32	15.02	69.82	114.36	74.98	66.17	63.62
Total	**45.96**	**50.69**	**46.38**	**45.20**	**44.27**	**558.73**	**572.35**	**577.72**	**546.89**	**532.81**

Source: Directorate of Food Processing Industries and Horticulture, Govt. of W.B.

Table 5.7: Area and Production of Flowers in the district of Dakshin Dinajpur

Name of Flowers	Area						Production					
	Unit	2009-10	2010-11	2011-12	2012-13	2013-14	Unit	2009-10	2010-11	2011-12	2012-13	2013-14
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
Rose	'000 hectares	0.001	0.001	0.002	0.005	0.005	Crore Cut Flower	0.010	0.010	0.020	0.045	0.046
Chrysanthemum	"	0.001	0.001	0.001	0.001	0.001	"	0.010	0.010	0.010	0.010	0.011
Gladiolus	"	0.003	0.003	0.003	0.003	0.003	"	0.020	0.020	0.020	0.021	0.023
Tuberose	"	0.001	0.001	0.001	0.005	0.005	"	0.010	0.010	0.022	0.053	0.054
Marigold	"	0.007	0.008	0.018	0.019	0.020	'000 MT	0.055	0.063	0.144	0.122	0.124
Jasmine	"	-	-	-	-	-	"	-	-	-	-	-
Seasonal Flower	"	0.001	0.001	0.001	0.001	0.001	"	0.001	0.001	0.001	0.001	0.001
Misc.Flower	"	0.001	0.001	0.001	0.001	0.002	"	0.001	0.001	0.001	0.001	0.002

Source: Directorate of Food Processing Industries and Horticulture, Govt. of W.B.

5.4 Mining

This area is comprises with thick sequence of alluvial fan and river valley deposits. This area is absolutely free from any types of major minerals. So in this area, underground as well as open cast mining activities has not been studied. Due to large number of rivers are flowing in this area, the sand mine activities has studied in this region.

6 Geology of the district

As per the District Resource Map, Dakshin Dinajpur, West Bengal published in 2009 under the direction of the Director General, Geological Survey of India, Kolkata five geological Formations occur in the study area. These are as follows: Present day deposits, Shaugaon Formation, Malda Formation, Baikunthapur Formation and Barind Formation.

As per the explanatory note given in the map as mentioned above the present day deposits is the youngest fluvial deposits in the district. It constitutes the active channel deposits consisting of unconsolidated sand, silt and clay.

The Barind Formation comprises the oldest quaternary deposits. It is restricted to the uplands in the southeastern part of the district. Its pedogenic horizon consists of 1 to 3 m thick ferricrete-bearing brownish red sticky clayey soil (latosol) overlying thick clay and sand horizons. Its highly oxidized soil is comparable in age to the Middle Pleistocene latosols of the Lalgarh Formation of the Rarh region in the South Bengal, which has itself been dated as Lower Pleistocene on the basis of vertebrate fossil assemblage.

The Baikunthapur Formation is the dominant flood plain deposit in the area. It is made up of repeated cycles of sand, silt and clay and has a characteristic soil having a grey black surface horizon underlain by a mottled grey horizon. The substratum is yellowish green coloredsilty clay with calcareous nodules. It is this substratum which is generally east of Tangaon River. It represents an arid phase possibly coeval with the global aridity between 16 Ka and 22 Ka. To the northwest this soil type diminishes as the sediments merge in to the fan facies. Coeval to this deposit is also the reworked/re-deposited material of the Barind Formation that covers most of the uplands.

The Malda Formation also consists of sand, silt and clay deposits. It constitutes most of the visible palaeo-channels dissecting the Baikunthpur deposits. It has a large spread in the western part of the district where they engulf the older deposits. To the east, they flank the Karatoa and ATRAI rivers. It has developed an incipient soil.

The Shaugaon Formation occurs flanking the active rivers and some abandoned channels. It is a deposit of sand, silt and clay and has not developed a soil cover and occurs mainly near the western margin of the district.

Table 6.1: Detailed geological succession of the Dinajpur (N & S) Districts

Lithostratigraphic Unit		Subunit	Depositional Environment	Surficial lithology	Age
NEWER ALLUVIUM GROUP	**Shaogaon Formation**	a) Present day flood plain deposits	Active Alluvial valley	Sand, silt & clay	Present day - Late Holocene
		b) Older flood plain deposits / Terrace	Older valleys	Silty sand	
	Baikunthapur Formation	**Upper:** Meander belt deposits	Channel-interchannel of Fan	Sand &silty sand	Late – Middle Holocene
		Upper: Flood Basin Deposit		Clay &silty clay	
		Lower: Meander belt deposits		Medium sand with occasional pebble zone	
		Lower: Flood plain deposits		Silty sand and silt	
OLDER ALLUVIUM GROUP	**Barind Formation**	Older fan deposits	Delta flank fan	Ferruginous Clay with Minor Sand	Early Holocene – Late Pleistocene

Table 6.2: Geological formations occurring in Dakshin Dinajpur District

Geological Formation	Lithological Unit	Age
Present Day Deposits	Sand, silt & clay	-
Shaugaon Formation	Alternating sand, silt & clay	Late Holocene
Malda Formation	-do-	Middle to Late Holocene
Baikunthapur Formation	Calcrete bearing sand, silt & clay	Late Pleistocene to early Holocene
Barind Formation	Predominantly thick ferricrete bearing clay beside sand & silt	Early to late Pleistocene

Source: District Resource Map, South Dinajpur, GSI, 2009

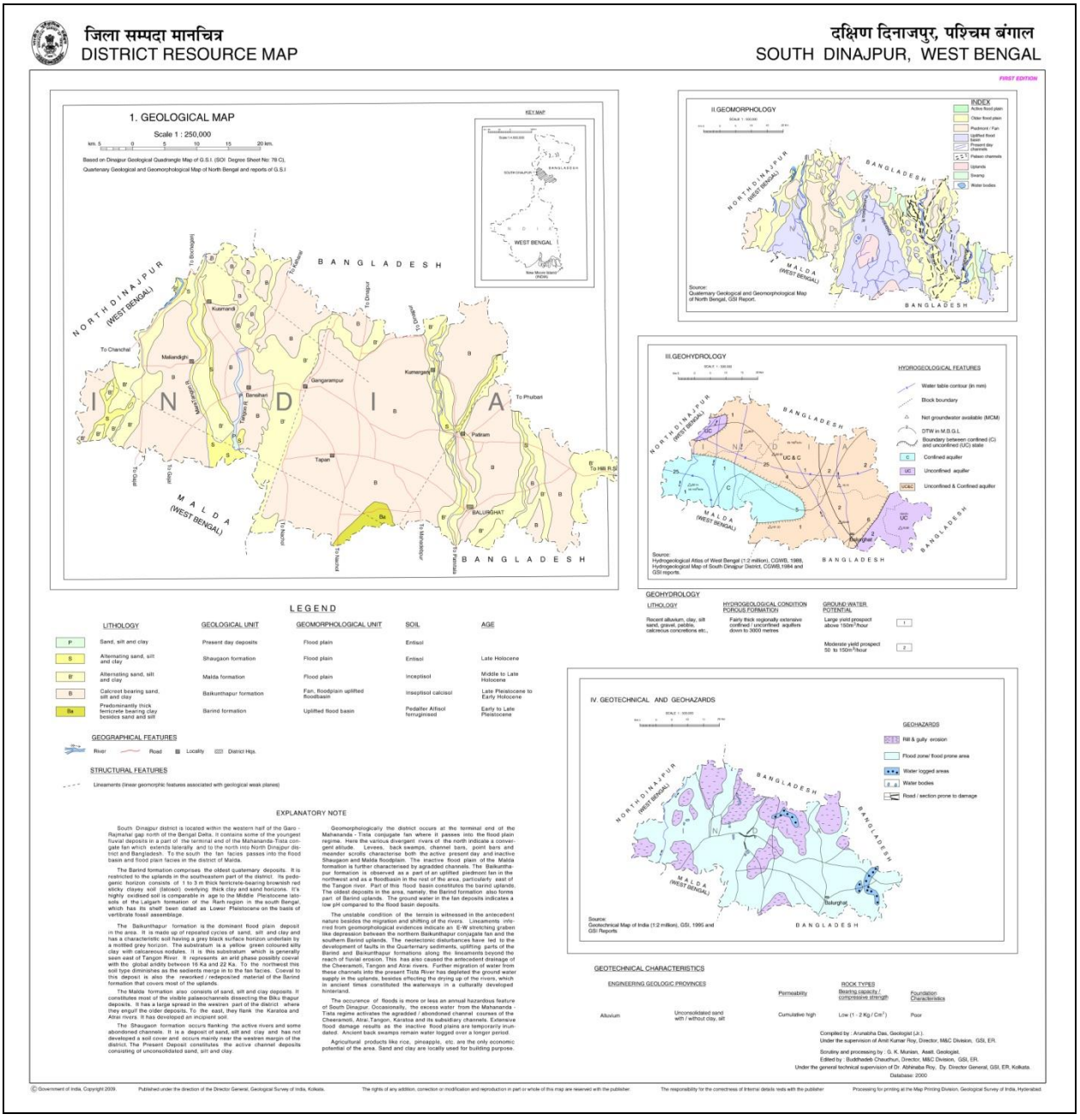


Figure 6.1: Geological Map of Dakshin Dinajpur

7 Mineral Wealth

7.1 Overview of mineral resources

The district is free from any major mineral deposits. The geological formation of Dakshin Dinajpur district indicates the presence of quite a number of minor minerals such brick and sand.

7.2 Details of Resource

7.2.1 Sand and other River bed minerals (Minor Mineral)

I. Drainage System

There is good reason to suppose that the drainage system of this area has played a predominant role in the evolution of human settlements and their distributions with different patterns since the historic times. Ingeneral,this drainage feature refers to all kinds of water bodies,whether small or large such as rivers, streams, canals, tanks, ponds, lakes,etc. The district is crisscrossed by a number of rivers streamsand huge water reservoirs. Although there are many rivers, traverse the district,but these don'tact as boundaries of any natural divisions. There are four principal rivers – ATRAI, Punarbhava, Yamuna and Tangaon.All these rivers and their tributaries form the drainage system of the area. Allthese rivers flow from north to south and most of them originate from Bangladesh. There are some small rivers-Ichhamati, Brahmani, Tulaietc flow through the district. There are somany water reservoirs like bil, dighi, ponds etc. liesoverscatterlyin the district. Most of them are able to maintain their flow even in the months of dryseason.

The Atrai River

The Atrai River is one of the international river sand constitutes one of the most significant river basins in North Bengal and Sub-Himalayan Barind Tract of West Bengal in India. The Atrai, the once mighty river finds a mention in the Mahabharata in ancient times. It was one of the major distributaries channels of the river Tista of North Bengal. Tista discharged its water by Atrai into the Ganga.The historical record reveals that the rivers ATRAI carry enough water throughout the year to act as a main transport way. Tista shifted further east and reached Permekhligunje -Jaldhaka of present Bangladesh. On the other hand due to the tectonic activities or disturbances coupled with highintensive rainfall induced flash flood massive shifting of the river. This caused to split off Atrai from its mother river Tista. Atrai has changed its course and is now flowing through the western portion of the present day Balurghat town which is on the left bank of it. Atrai is leaving its formeroriginal course in the middle and eastern part of this town locally known as 'Khari'. The old basin of river Atrai flows near 20km from north eastofsouthwestinBalurghat block while the total length of this river flowing intothe district is about 58km.Thus the shifting courses have their significant impact largely on the

human occupancyof this region. The Atrai originates in West Bengal and then after flowing through Dinajpurdistrict in Bangladesh it re-entersIndia again. It passes through Kumarganjblock and Balurghat block (Passing 51km in length) in Dakshin Dinajpur district, the river again re-enters Bangladesh. Itis passing through Rajshaiand continues on its southerly course which ultimately joins a branch of the Ganga called 'Baral' in the Pabna district in Bangladesh. There is good reason to suppose that Atrai River is gradually becoming shallower through silting up. It is very much apt to overflow its channel and inundate large areas adjoining its banks during the monsoons in this district. During raining season, it is navigablefor large boats throughout its course however during the rest of the year it is fordable. The river serves as a perennial source of fishing in the district and its adjoining areas in West Bengal.It is rich with floral diversity as well as inhabitants of indigenous Santhal and Munda tribes. During its course through the district Dakshin Dinajpur, the Atrai is joined by several small streams. Among these, the old Atrai and Ichamoti on its eastern bank are most significant. Both of these rivers enter the district to the east of Khansama.

The Punarbhava River

According old records the river Punarbhava has been derived from its original name Apurarbhava, meaning that a bath in it has not to endure the ordeal of re-birth**.** This river is a river of Bangladesh and West Bengal in India. It originates from the lowlands of the Takurgaon district of Bangladesh. The river Punarbhava enters the district Dakshin Dinajpur across the northern boundary of the police station Gangarampur and Tapan. After flowing to the south most, the river meets with DhepaRiver in Bangladesh. The Punarbhava flows about 42 km in a straight-line lower down in the district Dakshin Dinajpur. Due to high siltation along the course of Punarbhava the water level goes as low as knee-deep in some places in dry season.

The Tangaon River

The other important river Tangaon flows for about 51km along the western portion of the territory**.** The name 'Tangaon' was named after Tankonath, Zamindar of Ranisankhali in Takurgaon district of Bangladesh. It originates in the region of Jalpaiguri district, which now forms a part of Bangladesh. After originating it passes through Pirgonj, Panchagarh, Bochaganj in Bangladesh and Kaliaganj in Uttar Dinajpur, it enters into the Dakshin Dinajpur district. It passes through Kusumandi and Banshihari block in this district and then comes in the next district Malda. The river merges with Punarbhaba River at Tapan block at this district and then meets with river Mahananda at Malda district. However, the water level in the Tangon goes as low as knee-deep in some places in dry season. The rate of the siltation along the channel of this stream is quite high.

The Yamuna River

The river Yamuna enters the district from north at the eastern extremity of Hili police station in Dakshin Dinajpur district. After flowing through Hili block it enters Bangladesh. The Yamuna River flows approximately 4.91km along the easterly boundary of the territory. It is also apt to spill over its channel and its adjoining bank areas during the monsoon.

The Brahmani River

The Brahmani River one of the small rivers, having a source in district follows a line nearly parallel to those of Tangaon and Punarbhaba. It flows near about 7km through Gangarampur and Tapan Blocks in the district Dakshin Dinajpur. It finally joins in the river Punarbhava in Malda district.

The Ichchamati River

Itis also a small river originates from Bangladesh and enters this district flowing through Kumargang Block. It hangs approximately 28.10 km and it meets with river ATRAI near Patiram.It is a thin flowingstreamin dry season. But during monsoon, it flooded with water.

The Tulai River

Tulai River is one of the tributaries of TangonRiver. It is also avery small stream and originates from Bangladesh.It enters the Kumarganjblock and flows nearly parallel to that of TangaonRiver in Kumarganj. Finally, it joins with Tangaon.

Table 7.1: Drainage system with description of Main Rivers

S.No.	Name of the River	Area drained (Sq.km)	% Area drained in the district
1	ATRAI RIVER	10.88	0.49
2	TANGAON RIVER	3.88	0.17
3	PUNARBHAVA RIVER	4.08	0.18

Table 7.2: Salient Features of important rivers and streams

S.No.	Name of the River or Stream	Total Length in the District (in Km)	Place of origin	Altitude at Origin (msl mt)
1	ATRAI RIVER	43.37	Siliguri, Baikanthapur Forest	165
2	TANGAON RIVER	48.57	At Jalpaiguri which is now part of Bangladesh	89
3	PUNARBHAVA RIVER	38.98	Takurgaon, Bangladesh	60

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

Table 7.3: Place of origin of rivers of Dakshin Dinajpur district

Name of the River or Stream	Place of origin
ATRAI River	Siliguri, Baikanthapur Forest
Tangaon River	Jalpaiguri
Punarbhava River	Takurgaon, Bangladsh

ii) Catchment Area

The Dakshin Dinajpur district is mainly drained by four principal rivers – ATRAI, Punarbhava, Yamuna, and Tangaon. All these rivers and their tributaries form the drainage system of the area. All these rivers flow from north to south. The rivers of the districts Dakshin Dinajpur originating at Bangladesh passes through the districts and then joins the Ganga-Padma at downstream of Farakka in Bangladesh.

iii) General profile of river stream

River profile has been studied along the cross-section lines which was chosen based on the drastic variation of the river widths, proximity of the operating sand ghats and the position of the sand bars. Relative disposition of rivers in the district along with the distribution of the section lines are shown in Figure 7.1.

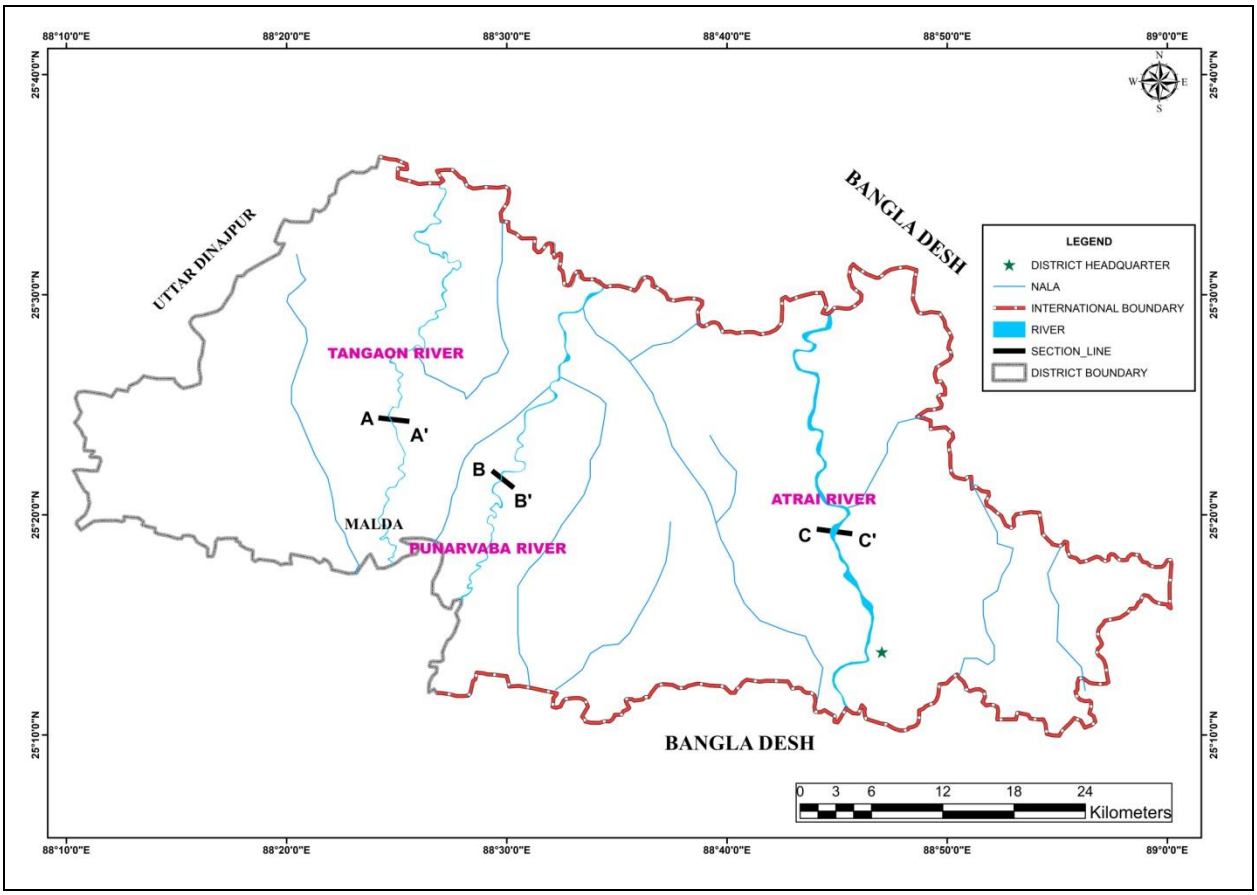


Figure 7.1: Plan showing the major rivers along with the distribution of Section Lines, Dakshin Dinajpur District

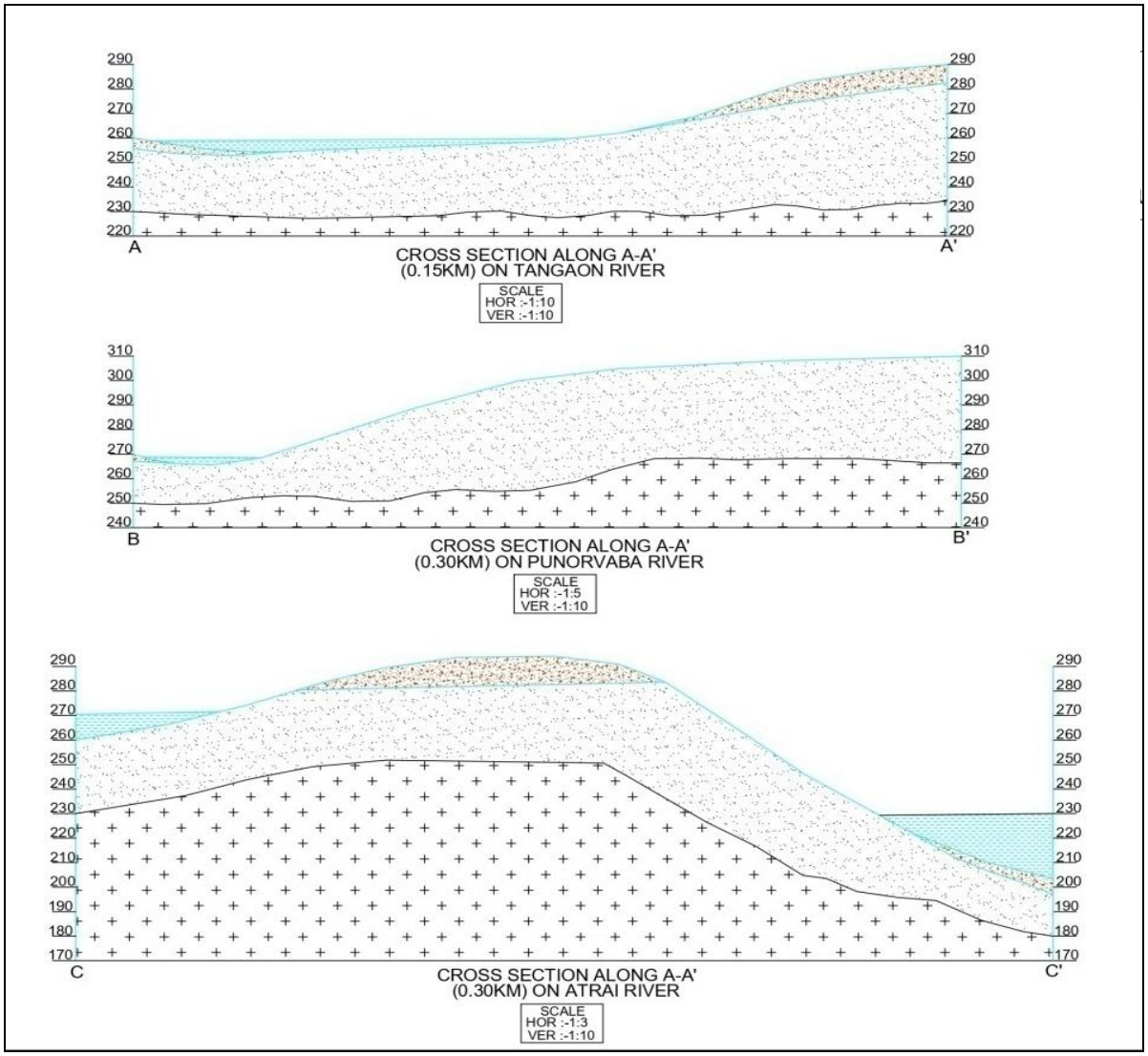


Figure 7.2: River cross section during pre-monsoon period

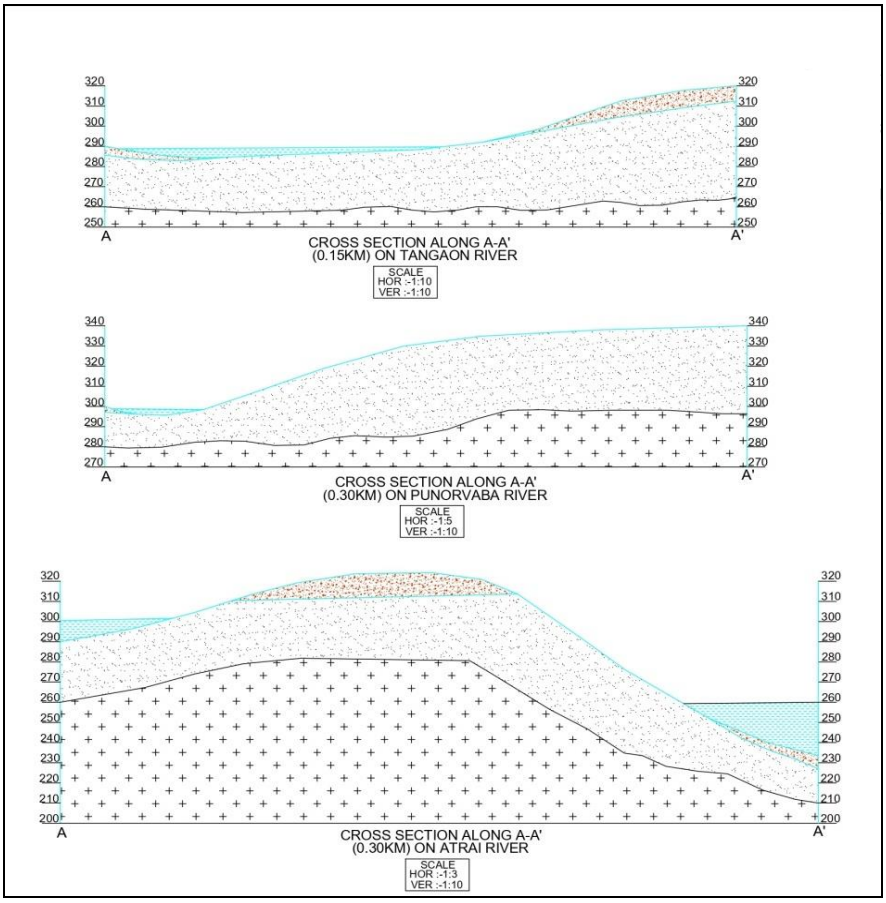


Figure 7.3: River cross section during post-monsoon period

iv) Annual deposition factor

Annual deposition of riverbed materials depends on various factors, such as process of deposition, mode of sediment transport, sediment transport rate, and sediment yield of the river.

1. Process of deposition

Deposition is the processes where material being transported by a river is deposited. Deposition occurs when the forces responsible for sediment transportation are no longer sufficient to overcome the forces of gravity and friction, creating a resistance to motion; this is known as the null-point hypothesis. This can be when a river enters a shallow area or towards its mouth where it meets another body of water.

The principle underlying the null point theory is due to the gravitational force; finer sediments remain in the water column for longer durations allowing transportation outside the surf zone to deposit under calmer conditions. The gravitational effect or settling velocity

determines the location of deposition for finer sediments, whereas a grain's internal angle of friction determines the deposition of larger grains on a shore profile.

Deposition of non-cohesive sediments: Large-grain sediments transported by either bedload or suspended load. In case of bedload, when there is insufficient bed shear stress and fluid turbulence are insufficient to keep the sediment moving, the grain cease horizontal movement and rapidly come to rest. In case of suspended load the grain settle longer distance vertically through the fluid before coming to rest.

Deposition of cohesive sediments: The cohesion of sediment occurs with the small grain sizes associated with silts and clays, or particles smaller than 4Φ or 62.5 μm. If these fine particles remain dispersed in the water column, Stokes law applies to the settling velocity of the individual grains. The face of a clay platelet has a slight negative charge where the edge has a slight positive charge when two platelets come into close proximity with each other the face of one particle and the edge of the other are electrostatically attracted, and then have a higher combined mass which leads to quicker deposition through a higher fall velocity.

2. Mode of sediment transport in rivers

Sediment transport in rivers provides a dynamic linkage between flow and channel form. Mainly there are three processes by which sediment load is transported and these are (i) rolling or traction, in which the particle moves along a sedimentary bed but is too heavy to be lifted from it; (ii) saltation; and (iii) suspension, in which particles remain permanently above the bed, sustained there by the turbulent flow of the water.

Another name for sediment transport is sediment load. The total load includes all particles moving as bedload, suspended load, and wash load.

Bed load: Bedload is the portion of sediment transport that rolls, slides or bounces along the bottom of a waterway. This sediment is not truly suspended, as it sustains intermittent contact with the streambed, and the movement is neither uniform nor continuous. Bedload occurs when the force of the water flow is strong enough to overcome the weight and cohesion of the sediment. While the particles are pushed along, they typically do not move as fast as the water around them, as the flow rate is not great enough to fully suspend them. Bedload transport can occur during low flows (smaller particles) or at high flows (for larger particles). Approximately 5-20% of total sediment transport is bedload. In situations where the flow rate is strong enough, some of the smaller bedload particles can be pushed up into the water column and become suspended.

Suspended load: While there is often overlap, the suspended load and suspended sediment are not the same thing. Suspended sediment are any particles found in the water column, whether the water is flowing or not. The suspended load, on the other hand, is the amount of sediment carried downstream within the water column by the water flow. Suspended loads require moving water, as the water flow creates small upward currents (turbulence) that

keep the particles above the bed. The size of the particles that can be carried as suspended load is dependent on the flow rate. Larger particles are more likely to fall through the upward currents to the bottom, unless the flow rate increases, increasing the turbulence at the streambed. In addition, suspended sediment will not necessarily remain suspended if the flow rate slows.

Wash load: The wash load is a subset of the suspended load. This load is comprised of the finest suspended sediment (typically less than 0.00195 mm in diameter). The wash load is differentiated from the suspended load because it will not settle to the bottom of a waterway during a low or no flow period. Instead, these particles remain in permanent suspension as they are small enough to bounce off water molecules and stay afloat. However, during flow periods, the wash load and suspended load are indistinguishable.

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‘s 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 Qs.

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, qt = qb + qs. 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 qs.

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 over the full width of the flow section.

Dendy Bolton formula is often used to calculate the Sediment 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

All of 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 study for a river solely depends on estimation of sediment load for any river system and the estimation is a time consuming and should be done over a period. The process in general is very slow and hardly measurable on season to season basis except otherwise the effect of flood is induced which is again a cyclic phenomenon. Usually replenishment or sediment deposition quantities can be estimated in the following ways as given below:

A. Replenishment study based on satellite imagery involves demarcation of sand bars potential for riverbed mining. Both pre and post monsoon images need to be analysed to established potential sand bars. Volume estimation of sand is done by multiplying Depth and Area of the sand bar. The sand bars are interpreted with the help of satellite imagery. Ground truthing has been done for 100% of the total identified sand bars. During ground truthing, width and length of each segment were physically measured. It has also been observed that in few cases, sand bars have attained more than 3 meters height from the average top level of the river beds. Considerations of sand resources have been restricted within 3 meters from the average top surface of the river bed.
B. Direct field measurement of the existing leases involving estimation of the volume diference of sand during pre and post-monsoon period. With systematic data acquisition, a model has developed for calculation of sediment yield and annual replenishment with variable components.
C. The replenishment estimation based on a theoretical empirical formula with the estimation of bed-load transport comprising of analytical models to calculate the replenishment estimation.

A. Replenishment estimation based on field base study:

Sedimentation in any river is dependent on sediment yield and sediment yield depends on soil erosion in river's catchment area. Catchment yield is computed using Strange's Monsoon runoff tables for runoff coefficient against rainfall return period. Peak flood discharge calculated by using Dickens, Jarvis and Rational formula at 25, 50 and 100 years return period. The estimation of bed load transport using Ackers and White Equation.

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

1. Field data collation:

Field data collations were done during June 2020 for pre monsoon period and during December 2020 for post monsoon period for the river ghats on continuous basis. However, the nonoperational areas were covered through traverses. In both the cases, relative elevation levels were captured through GPS/DGPS/ Electronic Total Station. Thickness of the sand bars was measured through sectional profiles. In few instances, sieve analysis of the sands was carried out to assess their particle size distribution.

Figure 7.4: Site View of River Atrai

2. Selection of Study profiles:

Study profiles are selected based on the occurrence of the sand bars in the channel profiles. Aerial extents of each of the profiles are mapped from satellite imagery.

3. Data Compilation:

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

- Elevation levels of the different sand ghats and sand bars as measured at site.
- Extents of the sand bars are measured from the pre monsoon satellite imagery.
- Sand production data of the district.

All these data were compiled while estimation of the replenished sand in the Dakshin Dinajpur district.

4. 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 district boundary, but it largely depends upon the aerial extents of the catchment areas, which crossed the district and state boundaries.

The major sand producing river of the Dakshin Dinajpur district is Atrai, Tangaon and Punarbhava Rivers. Planning has been done for systematic sand mining in the rivers.

From the satellite imagery and ground investigation in the pre monsoon period, altogether 72 sand bars are identified in Dakshin Dinajpur district of which 15 are falling in Tangaon River, 19 are falling in Punarbhava River, 38 are falling in Atrai River.

In the post monsoon period for the year 2019, altogether 75 sand bars are identified in Dakshin Dinajpur district of 18 are falling in Tangaon River, 19 are falling in Punarbhava River, 38 are falling in Atrai River.

While, calculation of the areas of sand bar; a classification system has been adopted with three categories of land identified within the channel areas. The class which followed for classification is as follows:

a. The untapped Sand Bars.

b. The Sand bars worked in the pre-monsoon period.

c. Main channel course within the channel.

A summary of sediment load comparison between pre- and post-monsoon period for different rivers of Dakshin Dinajpur district is given in Table 7.4 and details of each sand bars along with their sand resources in pre monsoon and post monsoon periods are provided in

Annexure 2. Maps showing distribution of sand bars on rivers of the Dakshin Dinajpur district during pre- and post-monsoon period are depicted in Plate 2A and Plate 2B respectively.

Table 7.4: Sediment Load comparison between Pre & Post Monsoon periods for different rivers of Dakshin Dinajpur district

River Name	Pre-Monsoon no of Bars	Post-Monsoon no of Bars	Pre-Monsoon Sediment Load (Mcum)	Post Monsoon Sediment Load (Mcum)	Volume Difference (Mcum)	Variation %
Tangaon	15	19	0.54	0.61	0.07	12.96
Punarbhava	19	19	1.28	1.66	0.38	29.69
ATRAI	38	38	7.57	9.13	1.56	20.61
Total =	**72**	**76**	**9.39**	**11.4**	**2.01**	**21.41**

Thus, in Dakshin Dinajpur district, about 2.01 million cum of sand has been found as an incremental volume increase when compared between pre and post monsoon sand reserve data. Therefore, a replenishment and aggradationsrate for the year comes to about 121%.

Long-term Satellite imagery study has also been carried out for sand producing rivers of Dakshin Dinajpur district to analyse the changes in river course. A representative map, showing long-term (from 1985-2010-to 2022) erosion-accretion areas on both the banks of Adri River has been prepared and furnished as Plate No. 5B. The map shows changes in river channel cross-section throgh erosion and accretion of river bank. River channel is showing narrowing natureas compare between 1985 and 2022.

B. Replenishment estimation based on field investigation

The study was carried out on existing mining leases. In order to assess the annual replenishment rate, an approach of direct measurement methodology has been adopted. The depth and area of the mining leases are measured through DGPS/Total station just before the closure of the mines in pre-monsoon period and the same areas are resurveyed in the post-monsoon period. The difference between the depth of the surveyed areas are accounted for the volumetric measurement of the replenished sand.

Table 7.5 represents field measurement of replenishment rate estimated for major rivers.

Table 7.5: Replenishment rate of Dakshin Dinajpur District

Location	River Name	Area	Surface RL	Thickness	Volume	After mining floor RL	Surface RL	Thickness	Volume	Difference in RL	Replenishment Rate
		m2	m	m	cum	m	m	m	cum	m	%
Kumarganj	ATRAI	47800.00	31.00	2.90	138620.00	28.10	30.88	2.78	132936.58	0.12	95.90%
Patiram	ATRAI	49000.00	26.00	2.80	137200.00	23.20	25.91	2.71	132809.60	0.09	96.80%
Gangasagar	ATRAI	4046.00	17.00	3.00	12138.00	14.00	16.91	2.91	11786.00	0.09	97.10%
Debipur	Punarbhava	36500.00	28.00	2.90	105850.00	25.10	27.90	2.80	102145.25	0.10	96.50%
Sukdebpur	Punarbhava	13700.00	26.00	3.00	41100.00	23.00	25.91	2.91	39867.00	0.09	97.00%
Basuria	Punarbhaba	9800.00	26.00	2.90	28420.00	23.10	25.93	2.83	27709.50	0.07	97.50%
Balaspur	Tangaon	5400.00	32.00	3.00	16200.00	29.00	31.90	2.90	15649.20	0.10	96.60%
Rasulpur	Tangaon	12140.00	27.00	2.90	35206.00	24.10	26.91	2.81	34079.41	0.09	96.80%
MahurKismat	Tangaon	3900.00	26.00	3.00	11700.00	23.00	25.91	2.91	11349.00	0.09	97.00%
Average Replenishment Rate											96.80%

The average replenishment rate for the year 2020 comes to about 96.80%.

C. Replenishment estimation based on an empirical formula:

The river reaches with sand provide the resource and thus it is necessary to ascertain the rate of replenishment of the mineral. Regular replenishment study needs to be carried out to keep a balance between deposition and extraction.

Sediment load deposition in a river is dependent on catchment area, weathering index of the various rock types of the catchment area, land-use pattern of the area, rainfall data and grain size distribution of the sediments. Again, the sediment load estimation is not a dependent variable of the district boundary, but it largely depends upon the aerial extents of the catchment areas, which crosses the district and state boundaries.

i. Methodology of the study:

The replenishment estimation is based on a theoretical empirical formula with the estimation of bedload transport comprising of analytical models to calculate the replenishment estimation. Sedimentation in riverbed depends on catchment yield, peak flood discharge due to rainfall, bed load transport rates and sediment yield characteristic of the river. Some of the common methods used for replenishment study are explained below.

a. 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.

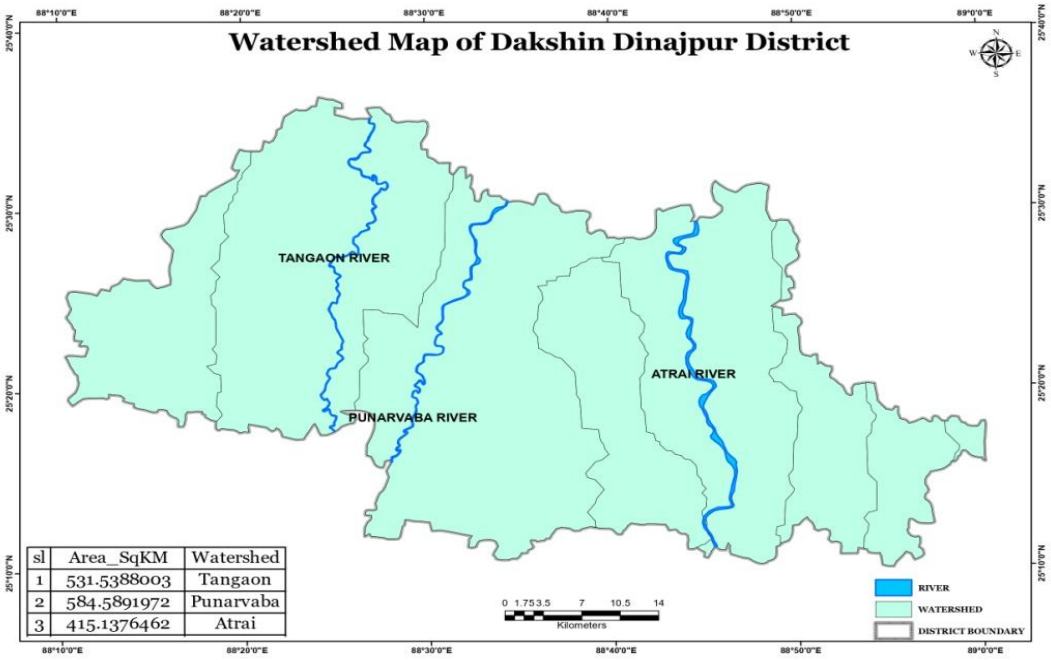


Figure 7.5: Watershed map of Dakshin Dinajpur District

Catchment Yield can be estimated using following formula:

Catchment Yield (m^3) =Catchment area (m^2) × Runoff coefficient (%)×Rainfall (m)

The runoff generated from the watershed is analyzed using Strange's Tables to get the reliable yield results. Runoff from a catchment is dependent upon annual rainfall as well as catchment characteristics such as soil types and the type of groundcover / land usage. Remote sensing was used for demarcation of catchment area relevant to the drainage system. Runoff coefficient of the catchment has been established based on Strange's Table.

Strange (1892) studied the available rainfall and runoff and obtained yield ratios as functions of indicators representing catchment characleris1ics. Catchments are classified as good, average and bad according to the relative magnitudes of yield of sediment. For example, catchment with good forest cover and having soils of high permeability would be classified as bad, while catchment having soils of low permeability and having little or no vegetal cover is termed good. Based on the study, Strange established runoff coefficient table is given in Table 7.6:

Table 7.6: Runoff coefficient of the catchment based on Strange's table

Total monsoon rainfall (mm)	Runoff coefficient (%)			Total monsoon rainfall (mm)	Runoff coefficient (%)		
	Good catchment	Average catchment	Bad catchment		Good catchment	Average catchment	Bad catchment
25.4	0.1	0.1	0.1	787.4	27.4	20.5	13.7
50.8	0.2	0.2	0.1	812.8	28.5	21.3	14.2

Total monsoon rainfall (mm)	Runoff coefficient (%)			Total monsoon rainfall (mm)	Runoff coefficient (%)		
	Good catchment	Average catchment	Bad catchment		Good catchment	Average catchment	Bad catchment
76.2	0.4	0.3	0.2	838.2	29.6	22.2	14.8
101.6	0.7	0.5	0.3	863.6	30.8	23.1	15.4
127	1	0.7	0.5	889	31.9	23.9	15.9
152.4	1.5	1.1	0.7	914.4	33	24.7	16.5
177.8	2.1	1.5	1	939.8	34.1	25.5	17
203.2	2.8	2.1	1.4	965.2	35.3	26.4	17.6
228.6	3.5	2.6	1.7	990.6	36.4	27.3	18.2
254	4.3	3.2	2.1	1016	37.5	28.1	18.7
279.4	5.2	3.9	2.6	1041.4	38.6	28.9	19.3
304.8	6.2	4.6	3.1	1066.8	39.8	29.8	19.9
330.2	7.2	5.4	3.6	1092.2	40.9	30.6	20.4
355.6	8.3	6.2	4.1	1117.6	42	31.5	21
381	9.4	7	4.7	1143	43.1	32.3	21.5
406.4	10.5	7.8	5.2	1168.4	44.3	33.2	22.1
431.8	11.6	8.7	5.8	1193.8	45.4	34	22.7
457.2	12.8	9.6	6.4	1219.2	46.5	34.8	23.2
482.6	13.9	10.4	6.9	1244.6	47.6	35.7	23.8
508	15	11.3	7.5	1270	48.8	36.6	24.4
533.4	16.1	12	8	1295.4	49.9	37.4	24.9
558.8	17.3	12.9	8.6	1320.8	51	38.2	25.5
584.2	18.4	13.8	9.2	1346.2	52.1	39	26
609.6	19.5	14.6	9.7	1371.6	53.3	39.9	26.6
635	20.6	15.4	10.3	1397	54.4	40.8	27.2
660.4	21.8	16.3	10.9	1422.4	55.5	41.6	27.7
685.8	22.9	17.1	11.4	1447.8	56.6	42.4	28.3
711.2	24	18	12	1473.2	57.8	43.3	28.9
736.6	25.1	18.8	12.5	1498.6	58.9	44.4	29.4
762	26.3	19.7	13.1	1524	60	45	30

Rainfall returns period for 25, 50 and 100 years calculated as below:

As per Weibull's Formula (Subramanya, 2008),

Return period/Recurrence interval = (n+1)/m

Where: n number of years on record;

m is the rank of observed occurrences when arranged in descending order.

b. 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 characteristic 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. Formulas used for Peak Discharge calculation areas below:

As per Dicken's formula (Subramanya, 2008),

$$Q = CA^{3/4}$$

Where: Q is Maximum flood discharge (m^3/sec) in a river
A is Area of catchment in Sq. Km
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

As per Jarvis formula (Subramanya, 2008),

$$Q = CA^{1/2}$$

Where: Q is Maximum flood discharge (m^3/sec) in a river
A is Area of catchment in Sq. Km

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

As per Rational formula (Subramanya, 2008),

$$Q = CIA$$

Where: Q is Maximum flood discharge (m^3/sec) in a river
A is Area of catchment in Sq. Km

C is Runoff coefficient which depends on the characteristics of the catchment area. It is a ratio of runoff: rainfall

I is Intensity of rainfall (in m/sec)

c. Bed Load Transport Calculation:

The most important problems in river engineering are to predict bed load transport rates in torrential floods flowingfrom mountainous streams. Three modes of transport namely; rolling, sliding and saltationmay 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 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 proposedformulais 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:

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

Where,

A_1 = **Critical particle mobilityfactor**
C_s = **Concentration coefficient in the sediment transportfunction**
C_t = **Total sediment concentration**
d_{50} = **Median grainsize**
d_{gr} = **Dimensionless particle diameter**
F_{gr} = **Particle mobilityparameter**
g = **Acceleration ofgravity**
D_s, S_g = **Specific gravity**
h = **Waterdepth**
m = **Exponent in the sediment transportfunction**
n' = **Manning roughnesscoefficient**
U_* = **Shear velocity**
V = **Mean flowvelocity**
ν = **Kinematic viscosity**

Meyer – Peter's equation (Ponce, 1989**):**

Meyer-Peter's equation (Ponce, 1989) is based on experimental work carried out at the Federal Institute of Technology, Zurich. Mayer-Peter gave a dimensionless equation based on rational laws. Mayer- Peter equation gave an empirical formula of bed load transport rates in flumes and natural rivers. The simplified Meyer-Peter's equation is given below:

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

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. η' = (1/24) x d1/6 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 11cumecs, and 0.0225 for lower discharges.

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

τ0= Unit tractive force produced by flowing water i.e. γwRS. Truly speaking, its value should be taken as the unit tractive force produced by the flowing water on bed = 0.97γwRS. R is the hydraulic mean depth of the channel (depth of flow for wider channel) and S is the bed slope.

d. Sediment Yield Estimation:

Sedimentation occurr as the velocity decreases along with its abilityto carry sediment. Coarse sediments deposit first, then interfere with the channel conveyance,and may cause additional river meanders and distributaries. The area of the flowing waterexpands, the depth decreases, the velocity is reduced, and eventually even fine sediments beginto deposit. As a result, deltas may be formed in the upper portion of reservoirs. The depositedmaterial may later be moved to deeper portions of the reservoir by hyraulic processes withinthe water body.

There are many sediment transport equations which are suitable for use in the prediction of the rate of replenishment of river. Some of the famous sediment transport equations are:

1. Dendy – Bolton Equation

2. Yang Equations

3. Engelund-Hansen Equation

4. Modified Universal Soil Loss Equation (MUSLE) developed by Williams and Berndt (1977)

Dendy – Bolton Equation:

Dendy – Bolton formula (Dendy and Bolton 1976) is often used to calculate the Sediment Yield because:-

- The formula uses catchment area and mean annual runoff as key determinants.
- It does not differentiate in basin wide smaller streams and their characteristics.
- Dendy and Bolton equation calculates all types of sediment yield i.e. sheet and rill erosion sediments, gully erosion sediments, channel bed and bank erosion sediments and mass movement etc.

Dendy-Bolton determined the combined influence of runoff and drainage area on sediment yield to compute the sediment yield. They developed two equations i.e. for run off less than 2 inch and for run off more than 2 inch, which are given below:

For run off less than 2 inch:

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

For run off more than 2 inches:

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

Where: S = Sediment yield (tons/sq miles/yr)

Q = Mean Annual runoff (inch)

A = Net drainage are in sq mile

Dendy Bolton formula is often used to calculate the sediment yield. But use of theseequations to predict sediment yield for a specific location would be unwise because ofthe wide variability caused by local factors not considered in the equation's development. However, they may provide a quick, rough approximation of mean sediment yields ona regional basis for preliminary watershed planning. Computed sediment yieldsnormally would be low for highly erosive areas and high for well stabilized drainagebasins with high vegetation density because the equations are derived from average values. The equations express the general relationships between sediment yield, runoff, anddrainage area. Many variables influence sediment yield from a drainage basin. Theyinclude climate, drainage area, soils, geology, topography, vegetation and land use. The effect of any of these variables may vary greatly from one geographic location toanother, and the relative importance of controlling factors often varies within a given landresource area. Studies revealed that sediment yield per unit area generally decreases asdrainage area increases. As drainage area increases, average land slopes usually decrease; andthere is less probability of an intense rainstorm over the entire basin. Both phenomena tendto decrease sediment yield per unit area.

Modified Universal Soil Loss Equation (MUSLE):

Modified universal soil loss equation (MUSLE) for estimation of sediment yield is also widely used. MUSLE is a modification of the Universal Soil Loss Equation (USLE). USLE is anestimate of sheet and rill soil movement down a uniform slope using rain- fall energyas 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 moreresistant to the erosive action of rain- fall.

MUSLE is similar to USLE except for the energy component. USLE depends strictly uponrainfall as the source of erosive energy. MUSLE uses storm-based runoff volumes andrunoff peak flows to simulate erosion and sediment yield (Williams 1995). The use ofrunoff

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:

$$\mathbf{Y=11.8 \times (Q \times qP).56 \times K \times Ls \times C \times P}$$

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

ii. Estimation of Replenishment:

Topography ofthe district is generally flat, slightly sloping towards south. The region appears to be a continuation of 'Barind' tract – a geographical formation of old alluvium. The surface ground is undulating though there is no existence of hill. The elevation of the district from mean sea level is 15 metres. The highest elevation shows in the northern part of this district and the elevation is very low in the southern part of this district.

The major sand producing river of the Dakshin Dinajpur district is Atrai, Tangaon and PunarbhavaRivers. These rivers and its tributary rivers are forming the main catchment area.

For replenishment study, following assumption/calculation taken in to consideration:

- Catchment area (Watershed area) against each river has been calculated based on remote sensing data.
- Rainfall runoff coefficient as per Strange's table for the catchment area is consider 45%, as the rainfall in the district is more than 1524mm and the characteristic of the catchment of the district is average in nature.
- Peak flood discharge of the river of the district calculated based on Dicken's formula which is more applicable to north Indian and central Indian catchment. Here Dicken constant C is taken as 12 in present study as per published literature by Saha (2002).
- Bed load transport has not been computed in the regional aspect of the district, as the values are highly dependent on local factors such as particle mobility factor, roughness coefficient, Shear velocity, Mean flow velocity, Kinematic viscosity etc.
- Sediment Yield calculated as per Dendy-Bolton formula as the equations express the general relationships between sediment yield, runoff, and drainage area.
- Computed sediment yields by Dendy-Bolton formula 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.

- Dendy -Boltan formula also says that actual sediments yield from individual drainage basins may vary 10-fold or even 100 fold from computed yields. Since the district river basin comprises of sedimentary rocks with good average rainfall therefore the estimated replenishment considered as 50 fold of computed results sediment yield.

The data estimated for each river in the district are given in Table 7.7.

Table 7.7: Replenishment parameter estimated for each river in the district

Estimation parameter	Tangaon	Punarbhava	ATRAI
Catchment Area (m^2)	531540000	584589200	415140000
Annual Rainfall (m) (in 2020)	1.851	1.851	1.851
Strange Runoff coefficient (%)	45%	45%	45%
Annual Run-off (m) (in 2020)	0.40722	0.40722	0.40722
Catchment Yield (m^3)	442746243	486933574.1	345790863
Peak Flood Discharge (m^3/sec)	42008116.54	45114831.21	34900141.02
Flow depth d (m)	0.5	0.5	0.6
Channel width b (m)	9.34	26.56	89.48
Mean velocity v (m/s)	0.06	0.05	0.05
Channel slope S_o (m/m)	0.01	0.01	0.01
Sediment Yield (Tons/year)	5511.13	5982.6	4449.21
Estimated Annual Replenishment (in million m3)	0.10320	0.11203	0.08332

Specific gravity of sand = 2.76tonne per m^3

Sedimentation rate of a river is dependent on the annual rainfall of the district. Year-wise sedimentation rate for last 5 years in each river is presented in Table 7.8 and Figure 7.6.

Table 7.8: Year-wise sedimentation rate for last 5 years of each river

Year	Tangaon	Punarbhava	ATRAI
2016	90.43	89.25	93.47
2017	38.51	38.01	39.81
2018	104.07	102.72	107.57
2019	31.35	30.94	32.41
2020	10.37	10.23	10.72

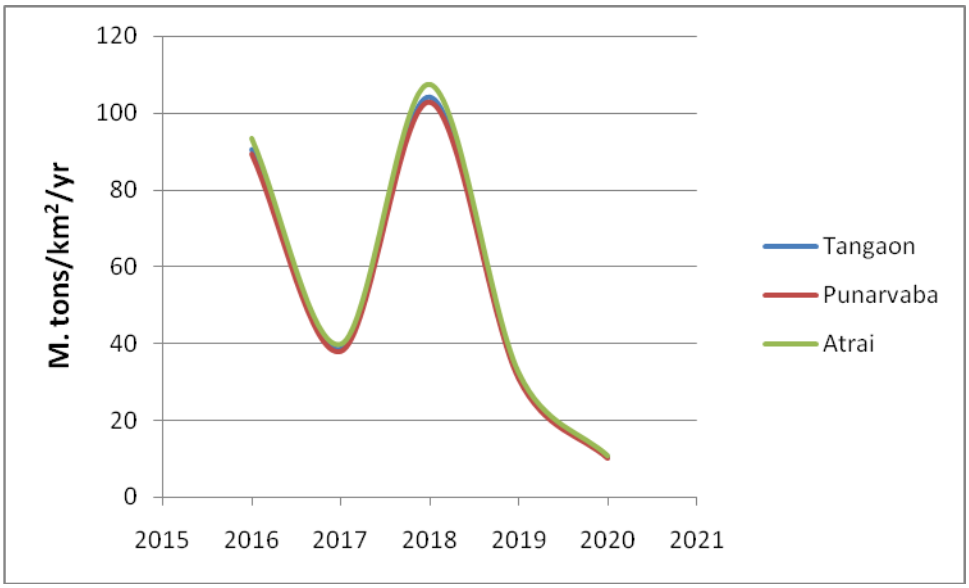


Figure 7.6: Graphical representation of year-wise sedimentation rate

The estimation of sedimentation based on empirical formula need critical analysis of different factors related to the LULC property of the catchment area, slope geometry, sediment erosion factor of catchment litho-type. This will help to assess replenishment rate more precisely.

Replenishment studies based on empirical formula for existing mining leases have also been conducted and are given in Table 7.9.

Table 7.9: River wise replenishment rate estimation based on empirical formula

Location	River Name	Lease Area	Surface RL Before mining	Mine out Thickness	Mine out Volume	Annual Rainfall-2020	Estimated Replenished Volume as per Dendy-Bolton	Replenishment Rate
		m2	m	m	cum	m	cum	%
Kumarganj	ATRAI	47800.00	31.00	2.90	138620.00	1.85	99806.40	72.00%
Patiram	ATRAI	49000.00	26.00	2.80	137200.00		102625.60	74.80%
Gangasagar	ATRAI	4046.00	17.00	3.00	12138.00		9103.50	75.00%
Debipur	Punarbhava	36500.00	28.00	2.90	105850.00		76212.00	72.00%
Sukdebpur	Punarbhava	13700.00	26.00	3.00	41100.00		31071.60	75.60%
Basuria	Punarbhaba	9800.00	26.00	2.90	28420.00		21599.20	76.00%
Balaspur	Tangaon	5400.00	32.00	3.00	16200.00		12069.00	74.50%
Rasulpur	Tangaon	12140.00	27.00	2.90	35206.00		26404.50	75.00%
MahurKismat	Tangaon	3900.00	26.00	3.00	11700.00		8892.00	76.00%
Average replenishment rate								74.27%

Theoretical Replenishment study based on mining lease shows variation from 72% to 76% with an average of 74.27% of replenishment rate in the district.

Illustration of Replenishment Estimation is given in Table 7.10.

Table 7.10: Illustration of replenishment rate calculation based on 3 methods

Based on Satellite imageries		Based on field investigation		Based on empirical formula	
Particulars	Estimation	Particulars	Estimation	Particulars	Estimation
		River Name	Tangaon	River Name	Tangaon
River	Tangaon	Location	Rasulpur	Location	Rasulpur
Total Pre-monsoon Sand Bar Area	358386 (sq.m)	Mining Area	12140 (Sq.m)	Lease Area	12140 (Sq.m)
Average Pre monsoon Thickness	1.5 (m)	Pre monsoon RL	27 (m)	Surface RL Before mining	27 (m)
Total Sand Volume	.54 (Mcum)	Sand Thickness	2.90 (m)	Mine out Thickness	2.90 (m)
Total Post-monsoon Sand Bar Area	278587 (sq.m)	Volume excavated (Cum)	35206.00	Mine out Volume (Cum)	35206.00
Average Post-monsoon Thickness	2 (m)	Post monsoon RL	26.91 (m)	Drainage area for lease block	0.31 (Sq.km)
Total Sand Volume	0.62 (M.cum)	Thickness	2.81 (m)	Monsoon Rainfall-2020	1.85 (m)
Pre and Post monsoon Volume Difference	0.08 (M.cum)	Volume deposited (Cum)	34079.41	Estimated Volume as per Dendy- Bolton (S = 1280 Q0.46[1.43 - 0.26 log(A)]) Where, Q is runoff, A is drainage area)	26404.0 (Cum)
Replenishment and Agrredation %	112%	Replenishment Rate	96.80%	Replenishment Rate	75.0%

Replenishment studies have been carried out in the district based on three different methodologies as illustrated in Table 7.10. Table 7.11 explained comparison of the outcome of these three methodologies adopted for the district.

Table 7.11: Comparison of replenishment study

Replenishment Study Method	Tangaon	Punarbhava	ATRAI
Estimated Annual Replenishment based on Sattelite imegaries **(*)**	112.96%	129.69	120.61%
Estimated Annual Replenishment based on field investigation	96.80%	97.00%	96.60%
Estimated Annual Replenishment based on empirical formula	75.17	74.53%	73.93%

(*)Replenishment study based on satellite imagery involves estimation of replenish volume along with aggredation volume.

vi) Total potential of minor mineral in the river bed

The major sand producing rivers of the district are ATRAI, Tangaon and Punarbhava Rivers. The total potential of minor mineral in the riverbed is 6.549mcum.

B. Geological studies

i) Lithology of the catchment area

The district occurs at the terminal end of the Mahananda-Tista conjugate fan where it passes into the flood plain regime. The district is dominated by recent alluvium and older alluvium deposits.

There are five geological formations occur in the district. These are Shaugaon formation, Malda formation, Baikunthapur formation and Barind formation.The Barind formation comprises the oldest quaternary deposits. It is restricted to the uplands in the southeastern part of the district. The Baikunthapur formation is the dominant flood plain deposit, made up of repeated cycles of sand, silt and clay, generally noted at the east of Tangaon River. The Malda formation consists of sand, silt and clay deposits spread large part in the western part of the district and to the east, flank the Karatoa and Atrai rivers.

ii) Tectonics and structural behavior of rocks

Dakshin Dinajpur has categorized in seismic zone IV which is the High Damage Risk Zone and covers areas liable to MSK VIII. The IS code assigns zone factor of 0.24 for Zone 4. The district is almost entirely covered by Indo-Gangetic Alluvium deposits. The alluvium – filled depression occur its origin to recurrent movement along extensive basement faults that are active beneath alluvial cover of Bengal Basin.

C. Climate Factors

i) Intensity of rainfall

Dakshin Dinajpur gets about 1022.24 mm rainfall annually. The precipitation during the southwest monsoon constitutes about 80 percent of the rainfall.The maximum rainfall in the area as per IMD data was recorded in the month of June followed by August and September in the district.

ii) Climate zone

As this district is a constituent of North Bengal and is in close proximity to the Darjeeling or for that matter the Himalayan region, the climate is generally cool and comfortable through the major part of the year. The minimum temperature of the district lies within the range of 11° and 22° Celsius in the month of January and August respectively and maximum temperature lies within 25° and 38° in the month of December and May respectively.

iii) Temperature variation

This district lies in near Himalayan foothills. So the climate is not to much hot. The minimum temperature of the district lies within the range of 11° and 22° Celsius in the month of January and August respectively and maximum temperature lies within 25° and 38° in the month of December and May respectively.

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.

Sand bar area recommended for mineral concession in the table is calculated as per the Enforcement and Monitoring Guidelines for Sand Mining (EMGSM) 2020. As per guidelines, mining depth restricted to 3 meters depth and distance from the bank is ¼th of river width and not less than 7.5 meters. Also mining is prohibitated 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.

For the purpose of estimating mineable mineral potential, the thickness of the sand bar considered extractable based on base flow level. The annual minable mineral potential is given in Table 7.12.

Table 7.12: Annual deposition of Riverbed minerals

S.No.	River or Stream	Portion of the river stream recommended for mineral concession	Length of area recommended for mineral concession (in meter)	Average width of area recommended for mineral concession (in meters)	Area recommended for mineral concession (in sq.m)	Thickness (m)	Mineable mineral potential (in million cubic meter) (60% of total mineral potential
1	Atrai River	27.32%	33,215.37	89.48	29,71,995.47	3	5.350
2	Punarbhava River	18.31%	28,118.64	26.56	7,56,880.23	2	0.908
3	Tangaon River	5.21%	21,648.58	9.34	2,11,155.25	2.5	0.317
Total for the District			**82982.59**	**125.37**	**3940030.95**		**6.575**

III. Riverbed Mineral Potential

Sand: Huge quantity of quality sands are found to occur in part of Damodar, Kansavati, Silavati, Dwarakeswar, Atrai, Punarbhava, Tangaon, Mahananda, Mayurakshi, Ajay etc. rivers. Smaller patches are also available locally in the other smaller rivers as well. Sand mining can be developed on cluster approach with restricted usage of Machinery's for lifting of sands. The rivers in the north Bengal are filled by gravels & boulders. Development of river bed material with huge boulders also requires usage of machinery's to increase more production in turn revenue.

Table 7.13: Resources of Potential Riverbed Mineral

Boulder (million Cubic meter)	Pebbles/Gravel (million Cubic meter)	Sand/White sand (million Cubic meter)	Total Mineable, Mineral Potential (million Cubic meter)
0.327	**0.393**	**5.855**	**6.575**

Table 7.14: Potential Zone of Riverbed Mineral

Sr. No	River name	Zone	Block name	Area (sqm)	Mouza name	Jl no	Coordinate		Area within prohibited zone as per rule 3 of wbmmc rules, 2016 (sq.m)
							Latitude	Longitude	
1	Atari River	Zone 1	Kumar ganj	17,24,886.45	Uttar ramkrishnapur, kanura, buribar, aichara, brahmapur, par sahazadpur	011 ,014 , 044, 045 , 046, 049,	25°29'3.754"n - 25°22'49.075"n	88°44'38.617"e-88°44'11.077"e	327239.2984
		Zone 2	Kumar ganj	1,58,998.63	Prasadpur	171	25°22'20.34"n-25°20'48.604"n	88°44'28.653"e-88°44'19.957"e	24855.18069
		Zone 3	Balurghat	7,38,523.38	Par patiram,dhulatair,chakmanipur,rajapur,pollapara,chandipur,madanganj, parbatipur	028, 179	25°20'13.691"n - 25°16'31.735"n	88°45'21.768"e-88°46'5.856"e	41465.74144
		Zone 4	Balurghat	3,49,587.00	Dakra	105,	25°16'27.283"n - 25°14'9.203"n	88°46'4.85"e-88°46'24.416"e	42531.73737
2	Punarbhava River	Zone 5	Gangarampur	5,49,365.40	Hamzapur,dauiatpur,champatali,khozapur,kasba,naodapara,debipur	033, 035, 027, 024, 028, 006	25°30'5.483"n - 25°25'15.426"n	88°34'8.08"e - 88°32'9.502"e	80198.12148
		Zone 6	Gangarampur	64,835.13	Hamzapur	6	25°21'58.746"n - 25°20'45.411"n	88°30'6.349"e - 88°29'38.945"e	15922.38325
		Zone 7	Tapan	1,42,679.70	Sautail,kasbabatair,jamalpur, naogon,katabari,shukdebpur	018, 019, 022, 024 , 029, 031	25°20'32.256"n -25°16'6.101"n	88°29'47.111"e-88°27'58.767"e	27360.14437
3	Tangaon River	Zone 8	Kushmundi	1,55,644.71	Balaspur,chausa,dhakdhol,kandaha,balarampur,mahishakuri,joypur,rampur,rasalpur, mnlgalpur,punat	157, 164, 165, 170,	25°35'2.822"n - 25°28'54.256"n	88°27'0.854"e-88°26'41.015"e	26934.79998
		Zone 8A	Kushmandi	9016.61	Tikul	215	25°28’29.433”n-25°28’24.144”n	88°26'4.496”e-88°26'2.201”e	0

Sr. No	River name	Zone	Block name	Area (sqm)	Mouza name	Jl no	Coordinate		Area within prohibited zone as per rule 3 of wbmmc rules, 2016 (sq.m)
							Latitude	Longitude	
		Zone 9	Bansihari	18,026.96	Chandipur	231	25°27'0.495"n - 25°26'53.906"n	88°24'43.001"e- 88°24'48.608"e	2700.634006
		Zone 10	Bansihari	28467.58321	Bagduar	281	25°19'2.922"n - 25°17'55.36"n	88°24'27.39"e- 88°24'41.746"e	3586.798715

NO MINING ZONE:

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 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.

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 rive is marked as no mining zone, as mining is this area will affect the course of river in future and will erode the river bank. A representative map of no mining zone shown on River Tangaon of Dakshin Dinajpur district is given below.

Table 7.15: No mining zone in the district

Sl. No	River name	Zone	Block name	No mining area (in Sq.m.)
1	Atari river	Zone 1	Kumarganj	327239.2984
		Zone 2	Kumarganj	24855.18069
		Zone 3	Balurghat	41465.74144
		Zone 4	Balurghat	42531.73737
2	Punarbhava river	Zone 5	Gangarampur	80198.12148
		Zone 6	Gangarampur	15922.38325
		Zone 7	Tapan	27360.14437
3	Tangaon river	Zone 8	Kushmundi	26934.79998
		Zone 8A	Kushmundi	0.00
		Zone 9	Bansihari	2700.634006
		Zone 10	Bansihari	3586.798715

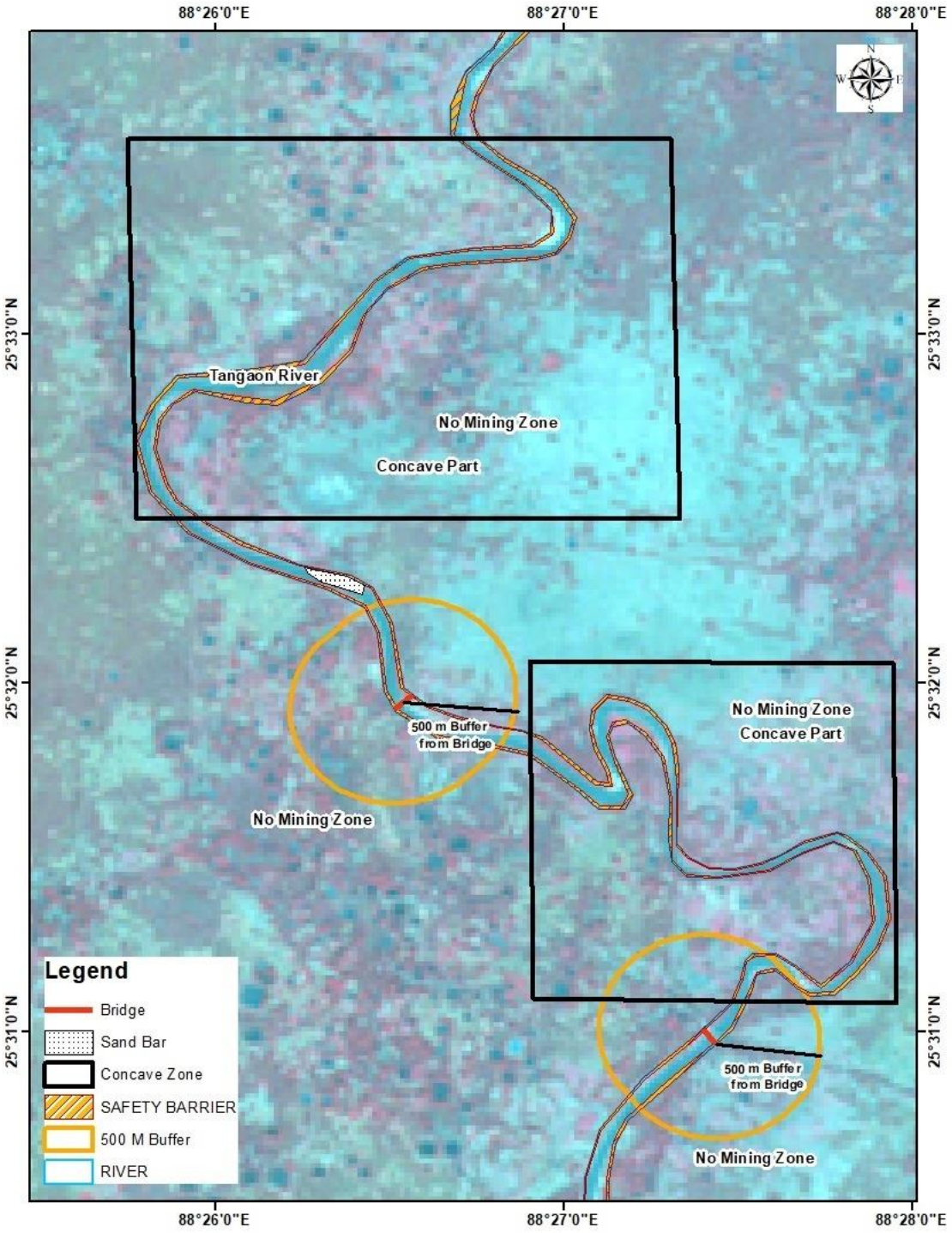


Figure No. 7.7: A representative map showing no-mining zone demarcated on Tangaon River

7.2.2 In-situ Minerals

I. Mineral Reserve

Mineral resources of the district are still not well established, the district does not have reserve of any major mineral deposits.

II. Mineral Potential

Sand is the important riverbed mineral found to be potential for mining. Considerable quantity of quality sands are found to occur in the riverbed of the district.

Table 7.16: In-situ Minerals Occurrences

Name of mineral	Name of associated minerals, if any	Host rock of mineralization	Area of mineralization	Depth of mineralization	Whether virgin or partially excavated	Name of land (whether free for mining/forest/agricultural	Mineral reserve (approximate) mentioning grade	Location of potential mineralized zones				Area within prohibited zone as per rule 3(7) of WBMMC Rules, 2016	Infrastructure available near the mineralized zone
								Administrative Block	Mouza	Plot No.s	Co-ordinates		
1	2	3	4	5	6	7	8	9				10	11
Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil				Nil	Nil

7.3 Mineral Development Prospect of the district with respect to Minor Mineral

Dakshin Dinajpur district is not very rich in mineral resources and there are no mines in the district. However, collection of sand, stone and gravels from the river-bed of the river terrain are the minor mineral sources. In this district some of big rivers are flowing like ATRAI, Punarbhava, Tangonetc, so in this region it has seen that the different geomorphic features like Alluvium Plain, Alluvial Fan etc, which are create by river deposition activity. So in this region there is huge deposition of sand, clay and gravel has found, so the sand mining or the sand industry should the very useful for this district.

7.4 Exploration Requirement of the district

In this district the sand industry might be very much useful so here need more scientific sand mining procedure.

8 Overview of mining activity in the district

8.1 General overview

The district is not very rich in mineral resources and there are no large mines in the district. However, collection of sand, Bricks, from the river-bed is the minor mineral sources. These materials are primarily utilized for construction purpose.

8.2 List of existing mining leases of the districts (location, area, period for each minor mineral)

Details of List of existing mining leases of the districts are furnished in Table 8.1

Table 8.1: Details of mining leases of the districts

ID	Block	Mouza	JL No	River	Road	Plot No	Area in Hectares	Latitude	Longitude	Bidder Name	Date of Issuance of Environmental Clearance (E.C.)	Date of Execution of Lease Deed	Lease Agreement Start Date (date of effect)	Lease Agreement Expiry Date	Quantum of Sand Extraction permissible as per Mining Plan (tonnes)	Reasons for non-execution of lease deed
249/SB2021	KUSHMANDI	UTTARPARA	166	Tangon	Kachha Road	31	0.75			Chhanabur Rahaman	26-02-2018	28-02-2018	28-02-2018	27-Feb-23	138165.78	
174/SB2021	BALURGHAT	Mahinagar	150	Atrai	Kachha Road	249	2.13			Sovan Pahan	22-12-2016	27-12-2016	27-12-2016	26-Dec-21	172523.624	
194/SB2021	KUMARGANJ	Bramhapur	46	Atrai	Kachha Road	01	0.83			Ahed Ali Molla	26-02-2018	28-02-2018	28-02-2018	27-Feb-23	77144.266	
245/SB2021	KUSHMANDI	Balashpur	104	Tangon	Kachha Road	472/621	0.54			Chhanabur Rahaman	20-03-2017	24-05-2017	24-05-2017	23-May-22	129484.862	
262/SB2021	BALURGHAT	Fulghara	62	Atrai	Kachha Road	577	0.65			Kuntal Mondal	22-12-2016	27-12-2016	27-12-2016	26-Dec-21	31584.633	
289/SB2021	BALURGHAT	Parbatipur	60	Atrai	Kachha Road	563	0			Mintu Das	26-02-2018	28-02-2018	28-02-2018	27-Feb-23	287080.046	
296/SB2021	BALURGHAT	Fulghara	62	Atrai	Kachha Road	579	0			Malay Mahanta	15-12-2016	27-12-2016	27-12-2016	26-Dec-21	240534.174	
332/SB2021	BALURGHAT	Gangasagar	93	Atrai	Kachha Road	339	0.4			Bhagirath Barman	26-02-2018	28-02-2018	28-02-2018	27-Feb-23	66058.349	

ID	Block	Mouza	JL No	River	Road	Plot No	Area in Hectares	Latitude	Longitude	Bidder Name	Date of Issuance of Environmental Clearance (E.C.)	Date of Execution of Lease Deed	Lease Agreement Start Date (date of effect)	Lease Agreement Expiry Date	Quantum of Sand Extraction permissible as per Mining Plan (tonnes)	Reasons for non-execution of lease deed
379/SB2021	KUMARGANJ	Safanagar	47	Atrai	Kachha Road	6592	0.25			Ashim Das	15-12-2016	27-12-2016	27-12-2016	26-Dec-21	39520.183	
396/SB2021	KUMARGANJ	Balupara	99	Atrai	Kachha Road	471	0.26			Gautam Saha	26-02-2018	28-02-2018	28-02-2018	27-Feb-23	46735.55	
399/SB2021	Gangarampore (M)	Rajibpur	84	Punarbhaba	Kachha Road	01	0.64			Nilratan Ghosh	26-02-2018	28-02-2018	28-02-2018	27-Feb-23	118369.495	
655/SB2021	KUSHMANDI	Joypur	164	Tangon	Kachha Road	141	0.12			Rakash Roy	22-12-2016	24-05-2017	24-05-2017	23-May-22	10408.349	
422/SB2021	KUSHMANDI	Ujil	106	Tangon	Kachha Road	2042	0.41			Babul Islam	15-12-2016	27-12-2016	27-12-2016	26-Dec-21	29116.193	
391/SB2021	KUMARGANJ	Chak Gangaprasad	107	Atrai	Kachha Road	132	4.9			Pintu Sarkar	22-12-2016	09-08-2017	09-08-2017	08-Aug-17	952519.541	
411/SB2021	TAPAN	Basuria	33	Punarbhaba	Kachha Road	522, 524	1.37			Ramkrishna Basak	22-12-2016	24-05-2017	24-05-2017	23-May-22	187782.431	
412/SB2021	KUSHMANDI	Rasulpur	157	Tangon	Kachha Road	828	1.21			Babul Islam	21-06-2017	09-08-2017	09-08-2017	08-Aug-17	198207.661	
429/SB2021	BANSIHRI	Tikul	222	Tangon	Kachha Road	115/705	0.38			Babul Islam	15-12-2016	27-12-	27-12-2016	26-Dec-	24830.367	

ID	Block	Mouza	JL No	River	Road	Plot No	Area in Hectares	Latitude	Longitude	Bidder Name	Date of Issuance of Environmental Clearance (E.C.)	Date of Execution of Lease Deed	Lease Agreement Start Date (date of effect)	Lease Agreement Expiry Date	Quantum of Sand Extraction permissible as per Mining Plan (tonnes)	Reasons for non-execution of lease deed
												2016		21		
453/SB2021	KUMARGANJ	Kuraha	149	Atrai	Kachha Road	152/653	4.9			Utpal Nandi	15-12-2016	27-12-2016	27-12-2016	26-Dec-21	266706.239	
179/SB2021	BALURGHAT	Madanganj	51	Atrai	Kachha Road	139, 140, 141, 142, 143, 144	2.23			Sujit Choudhury	15-12-2016	27-12-2016	27-12-2016	26-Dec-21	108359.633	
185/SB2021	KUMARGANJ	Daudpur	15	Atrai	Kachha Road	162	1.75			Uday Roy	15-12-2016	27-12-2016	27-12-2016	26-Dec-21	11338.073	
180/SB2021	KUMARGANJ	Tara	05	Atrai	Kachha Road	1371, 1372	4.2			Pradip Roy	15-12-2016	27-12-2016	27-12-2016	26-Dec-21	27668.44	
183/SB2021	KUMARGANJ	Daudpur	15	Atrai	Kachha Road	6/493, 6/494	4.78			Uday Roy	15-12-2016	27-12-2016	27-12-2016	26-Dec-21	30969.128	
203/SB2021	BALURGHAT	Patiram	187	Atrai	Kachha Road	02	1.61			Amit Prosad	15-12-2016	27-12-2016	27-12-2016	26-Dec-21	78232.569	
216/SB2021	BALURGHAT	Patiram	187	Atrai	No Approach Road	549	4.85			Pinaki Das	15-12-2016	27-12-2016	27-12-2016	26-Dec-21	235675	
225/SB2021	BALURGHAT	Paschim Kalikapur	63	Atrai	Kachha Road	481	4.9			Sujit Kumar Sarkar	15-12-2016	27-12-2016	27-12-2016	26-Dec-21	238104.587	

ID	Block	Mouza	JL No	River	Road	Plot No	Area in Hectares	Latitude	Longitude	Bidder Name	Date of Issuance of Environmental Clearance (E.C.)	Date of Execution of Lease Deed	Lease Agreement Start Date (date of effect)	Lease Agreement Expiry Date	Quantum of Sand Extraction permissible as per Mining Plan (tonnes)	Reasons for non-execution of lease deed
515/SB2021	BALURGHAT	Bedaipur	78	Atrai	Kachha Road	35	4.86			Adyamaa Tradeling Private Limited	22-12-2016	02-01-2017	02-01-2017	01-Jan-22	235675	
535/SB2021	KUMARGANJ	Kumarganj	100	Atrai	Kachha Road	365	1.6			Bikalpa Traders Private Limited	20-02-2017	24-05-2017	24-05-2017	23-May-22	62197.431	
539/SB2021	KUMARGANJ	Beltara	184	Atrai	Kachha Road	1484	4.35			ADYAMA TRADELINK PVT LTD	15-12-2016	02-01-2017	02-01-2017	01-Jan-17	1057356.33	
552/SB2021	KUMARGANJ	Kulahari	10	Atrai	Kachha Road	1206	4.35			ADYAMA TRADELINK PVT LTD	15-12-2016	02-01-2017	02-01-2017	01-Jan-17	211625.138	
1544/SB2021	KUMARGANJ	Sahajadpur	48	Atrai	Kachha Road	589	7.69								0	EC Awaiting
1333/SB2021	Gangarampore (M)	Rajibpur	84	Punarbhaba	Kachha Road	2501	0.68			Gobinda Halder	26-02-2018	28-02-2018	28-02-2018	27-Feb-23	126532.89	
745/SB2021	TAPAN	Baturiaya	198	Punarbhaba	Kachha Road	42	0.98			Ujjal Kumar Guha					0	EC Awaiting
757/SB2021	TAPAN	Naoga	22	Punarbhaba	Kachha Road	2051	1.42			Ujjal Kumar Guha	22-12-2016	27-12-2016	27-12-2016	26-Dec-21	9264.908	
766/SB20	TAPAN	Naoga	22	Punarb	Kachha	2156	1.35			Ujjal Kumar Guha	22-12-2016	27-12-	27-12-2016	26-Dec-	8761.239	

ID	Block	Mouza	JL No	River	Road	Plot No	Area in Hectares	Latitude	Longitude	Bidder Name	Date of Issuance of Environmental Clearance (E.C.)	Date of Execution of Lease Deed	Lease Agreement Start Date (date of effect)	Lease Agreement Expiry Date	Quantum of Sand Extraction permissible as per Mining Plan (tonnes)	Reasons for non-execution of lease deed
21				haba	Road							2016		21		
772/SB2021	TAPAN	Sukdebpur	24	Punarbhaba	Kachha Road	667, 668	2.04			Ujjal Kumar Guha	15-12-2016	27-12-2016	27-12-2016	26-Dec-16	13218.67	
775/SB2021	TAPAN	Sukdebpur	24	Punarbhaba	Kachha Road	561	1.14			Ujjal Kumar Guha	15-12-2016	27-12-2016	27-12-2016	26-Dec-21	7386.927	
780/SB2021	TAPAN	Sukdebpur	24	Punarbhaba	Kachha Road	705	1.37			Ujjal Kumar Guha	15-12-2016	27-12-2016	27-12-2016	26-Dec-21	8877.248	
784/SB2021	TAPAN	Jamalpur	31	Punarbhaba	Kachha Road	337	1.56			Ujjal Kumar Guha	20-03-2017	24-05-2017	24-05-2017	23-May-22	254730.963	
806/SB2021	GANGARAMPUR	Mahurkismat	118	Punarbhaba	Kachha Road	1524	0.39			Bimal Chnadra Sarkar	26-02-2018	28-02-2018	28-02-2018	27-Feb-23	714298.624	
141/SB2021	BALURGHAT	Madanganj	51	Atrai	Kachha Road	71, 72, 73, 74	4.71			Parimal Chandra Sarkar	15-12-2016	27-12-2016	27-12-2016	26-Dec-21	45773.394	
156/SB2021	BALURGHAT	Pollapara	179	Atrai	Kachha Road	01	4.9			Sukamal Mondal	15-12-2016	27-12-2016	27-12-2016	26-Dec-21	238104.587	
826/SB2021	BALURGHAT	Paschim Kalikapur	63	Atrai	Kachha Road	482	1.87			Achhalal Choudhury	15-02-2016	27-12-2016	27-12-2016	26-Dec-21	90868.578	

ID	Block	Mouza	JL No	River	Road	Plot No	Area in Hectares	Latitude	Longitude	Bidder Name	Date of Issuance of Environmental Clearance (E.C.)	Date of Execution of Lease Deed	Lease Agreement Start Date (date of effect)	Lease Agreement Expiry Date	Quantum of Sand Extraction permissible as per Mining Plan (tonnes)	Reasons for non-execution of lease deed
1178/SB2021	Gangarampore (M)	Rajibpur	84	Punarbhaba	Kachha Road	1, 2	3.66			Ratan Ghosh	26-02-2018	28-02-2018	28-02-2018	27-Feb-23	350905.275	
326/SB2021	Balurghat (M)	CHAKVRIGU	90	Atrai	Kachha Road	704	0.4			Amitava Chakraborty	21-06-2017	24-05-2017	24-05-2017	23-May-22	77756.927	
1165/SB2021	Balurghat (M)	Dakra	105	Atrai	Kachha Road	2436	0.4			Raju Misir					0	EC Awaiting
449/SB2021	KUSHMANDI	Narayanpur	146	Tangon	Kachha Road	1035	2.66			Binoy Kumar Roy					0	EC Awaiting
462/SB2021	KUMARGANJ	Kulahari	10	Atrai	Kachha Road	1402	1.86			Binoy Chandra Roy					0	EC Awaiting
1545/SB2021	KUMARGANJ	Chalk Gangaprasad	107	Atrai	Kachha Road	132	4.05								0	EC Awaiting
832/SB2021	KUSHMANDI	Laxmijal	162	Tangon	Kachha Road	197/198	0.44			Gopal Kirtaniya	15-12-2016	27-12-2016	27-12-2016	26-Dec-21	39415.688	
1289/SB2021	BALURGHAT	Paschim Kalikapur	63	Atrai	Kachha Road	483	0.72			Achhalal Choudhury					0	EC Awaiting
1574/SB202	BALURGHAT	Madangaanj	59	Atrai	Kachha Road	140	3.98								0	EC Await

ID	Block	Mouza	JL No	River	Road	Plot No	Area in Hectares	Latitude	Longitude	Bidder Name	Date of Issuance of Environmental Clearance (E.C.)	Date of Execution of Lease Deed	Lease Agreement Start Date (date of effect)	Lease Agreement Expiry Date	Quantum of Sand Extraction permissible as per Mining Plan (tonnes)	Reasons for non-execution of lease deed
1																ing
1547/SB2021	KUMARGANJ	Narayanpur	117	Atrai	Kachha Road	755	3.24								0	EC Awaiting
1542/SB2021	KUMARGANJ	Dhadolpara	118	Atrai	Kachha Road	1023	2.02								0	EC Awaiting
1541/SB2021	KUMARGANJ	Dhadolpara	118	Atrai	Kachha Road	756	2.02								0	EC Awaiting
1548/SB2021	KUMARGANJ	Radhanagar	181	Atrai	Kachha Road	550	0.4								0	EC Awaiting
1551/SB2021	KUMARGANJ	Parial	179	Atrai	Kachha Road	1	4.05								0	EC Awaiting
1295/SB2021	BALURGHAT	Dakra	105	Atrai	Kachha Road	1138	1.49			Dhirendra Nath Ghosh	15-12-2016	27-12-2016	27-12-2016	26-Dec-21	72401.835	
1571/SB2021	BALURGHAT	Fatepur	83	Atrai	Kachha Road	119/246	1.66								0	EC Awaiting
1651/SB2021	GANGARAMPUR	Kathalhathossenpur	28	Punarbhaba	Kachha Road	3459, 3498	0.43								0	EC Awaiting

ID	Block	Mouza	JL No	River	Road	Plot No	Area in Hectares	Latitude	Longitude	Bidder Name	Date of Issuance of Environmental Clearance (E.C.)	Date of Execution of Lease Deed	Lease Agreement Start Date (date of effect)	Lease Agreement Expiry Date	Quantum of Sand Extraction permissible as per Mining Plan (tonnes)	Reasons for non-execution of lease deed
175/SB2021	KUMARGANJ	Buribar	44	Atrai	Kachha Road	230	2			Pradip Roy	20-02-2017	24-05-2017	24-05-2017	23-May-22	38873.945	
209/SB2021	KUMARGANJ	Uttar Ramkrishnapur	11	Atrai	Kachha Road	02	0.24			Mintu Roy	15-12-2016	27-12-2016	27-12-2016	26-Dec-21	11705.734	
221/SB2021	BALURGHAT	Dakra	105	Atrai	Kachha Road	1108	2.28			Mithun Karmakar	15-12-2016	27-12-2016	27-12-2016	26-Dec-21	110788.991	
229/SB2021	BALURGHAT	Patiram	187	Atrai	Kachha Road	2098	4.9			Pintu Choudhury	15-12-2016	27-12-2016	27-12-2016	26-Dec-21	238104.587	
252/SB2021	KUSHMANDI	Dhakdhol	115	Tangon	Kachha Road	1735/1775	1.04			Chhanabur Rahaman	22-12-2016	24-05-2017	24-05-2017	23-May-22	40201.56	
258/SB2021	BALURGHAT	Patiram	187	Atrai	Kachha Road	592	4.95			Utpal Shil	26-02-2018	28-02-2018	28-02-2018	27-Feb-23	555160.688	
295/SB2021	Balurghat (M)	Dakra	105	Atrai	Kachha Road	1114, 1115, 1116	4.47			Shyamal Kumar Das	15-12-2016	27-12-2016	27-12-2016	26-Dec-21	217205.046	
347/SB2021	KUMARGANJ	Tara	05	Atrai	Kachha Road	1166/1457	0.95			Prafulla Nandi	15-12-2016	27-12-2016	27-12-2016	26-Dec-21	6155.734	
355/SB2021	KUMARGANJ	Safanagar	47	Atrai	Kachha Road	6597	0.37			Ashim Das	15-12-2016	27-12-	27-12-2016	26-Dec-	23975	

ID	Block	Mouza	JL No	River	Road	Plot No	Area in Hectares	Latitude	Longitude	Bidder Name	Date of Issuance of Environmental Clearance (E.C.)	Date of Execution of Lease Deed	Lease Agreement Start Date (date of effect)	Lease Agreement Expiry Date	Quantum of Sand Extraction permissible as per Mining Plan (tonnes)	Reasons for non-execution of lease deed
												2016		21		
438/SB2021	KUSHMANDI	Jagannathpur	217	Tangon	Kachha Road	102	0.32			Nikhil Sarkar	20-03-2017	24-05-2017	24-05-2017	23-May-22	24587.431	
524/SB2021	BALURGHAT	Chak Kashi	92	Atrai	Kachha Road	157	2			Bikalpa Traders Private Limited	26-02-2018	28-02-2018	28-02-2018	27-Feb-18	326389.587	
547/SB2021	KUMARGANJ	Beltara	184	Atrai	Kachha Road	01	4.98			ADYAMA TRADELINK PVT LTD	21-06-2017	09-08-2017	09-08-2017	08-Aug-22	812684.083	
556/SB2021	TAPAN	Basuria	33	Punarbhaba	Kachha Road	169, 170	2.23			ADYAMA TRADELINK PVT LTD	22-12-2016	24-05-2017	24-05-2017	23-May-22	364134.633	
584/SB2021	KUMARGANJ	Chandpur	148	Atrai	Kachha Road	597	0.29			Munchur Ali Mondal	26-02-2018	28-02-2018	28-02-2018	27-Feb-18	47347.798	
587/SB2021	KUMARGANJ	Chakbehater	185	Atrai	Kachha Road	280	0.21			Munchur Ali Mondal	26-02-2018	28-02-2018	28-02-2018	27-Feb-23	37347.615	
596/SB2021	GANGARAMPUR	Debipur	35	Punarbhaba	Kachha Road	1757, 1758	0.62			Muktar Ali	26-02-2018	28-02-2018	28-02-2018	27-Feb-23	185879.633	
799/SB2021	GANGARAMPUR	Khairbaon	34	Punarbhaba	No Approach Road	243	1.05			Bimal Chnadra Sarkar	26-02-2018	28-02-2018	28-02-2018	27-Feb-23	84219.22	

ID	Block	Mouza	JL No	River	Road	Plot No	Area in Hectares	Latitude	Longitude	Bidder Name	Date of Issuance of Environmental Clearance (E.C.)	Date of Execution of Lease Deed	Lease Agreement Start Date (date of effect)	Lease Agreement Expiry Date	Quantum of Sand Extraction permissible as per Mining Plan (tonnes)	Reasons for non-execution of lease deed
1145/SB2021	BALURGHAT	CHAKVRIGU	90	Atrai	Kachha Road	713	0.4			Jagabandhu Paul	26-02-2018	28-02-2018	28-02-2018	27-Feb-23	66058.349	
1191/SB2021	BALURGHAT	Paschim Kalikapur	63	Atrai	Kachha Road	465	0.93			Sujan Rajbhar	26-02-2018	28-02-2018	28-02-2018	27-Feb-23	132655.459	
1543/SB2021	KUMARGANJ	Prasadpur	171	Atrai	Kachha Road	14, 31, 22, 144	1.21								0	EC Awaiting
1546/SB2021	KUMARGANJ	Tajpur	186	Atrai	Kachha Road	55	1.21								0	EC Awaiting
1552/SB2021	KUMARGANJ	Chakbaram	180	Atrai	Kachha Road	415	1.21								0	EC Awaiting
1555/SB2021	KUMARGANJ	Chalkbaram	118	Atrai	Kachha Road	814	0.81								0	EC Awaiting
1572/SB2021	BALURGHAT	Rajapur	39	Atrai	Kachha Road	77	3.12								0	EC Awaiting

8.3 Detail of production of sand and other minerals during last three years

As this district is less abundance of mejor minerals the main productive mineral is river bedded minerals that is Sand.

Table 8.2: Details of production of sand as per mine plan in Dakshin Dinajpur district

Sl. No.	Year	Total Production in cft
1	2018-2019	6813013
2	2019-2020	4804800
3	2020-2021	3332000

9 Details of revenue generated from mineral sector during last three years

Details of revenue generated from mineral sector during last 3 years are furnished in Table 9.1.

Table 9.1: District revenue generation from Mineral sector

Sl. No.	Year	Total revenue in Rs.
1	2018-2019	11944039
2	2019-2020	8397975
3	2020-2021	5831500

10 Transport (Railway, road)

Emphasize on local transport infrastructure from mineral transport point of view Dakshin Dinajpur district is well connected with other cities and towns of West Bengal and neighborhood states by road and rail transport.

10.1 Rail Transport

The main railway station is Balurghat in Dakshin Dinajpur district. Balurghat railway station is on Eklakhi-Balurghat branch line and is located in Dakshin Dinajpur district in the Indian state of West Bengal. It serves Balurghat city and the surrounding areas. One express train Tebhaga Express is available for reaching Kolkata and a link superfast express. Siliguri-Balurghat Intercity Express train is the only direct train for North Bengal Communication. Also Tebhaga Express also joined the nearest district Birbhum.

10.2 Road Transport

Dakshin Dinajpur is well connected with the rest of the State through National Highways; State Highways. There is one State Highway with only 3 KM of National Highway no. 34 falling within the district. Balurghat is 434 km from State capital Kolkata (Calcutta). The distance from Malda and Siligiri to Raiganj is 105 km and 283 km respectively. Transport system mainly depends on Govt. Bus Service & Private Bus service. The town is well connected to major towns like - Kolkata, Durgapur, Asansol, Sainthia, Burdwan, Rampurhat, English Bazar, Jalpaiguri, Siliguri, Katwa, etc. through roadway.

The transport map has given below in Figure 10.1. A transportation map demarcating approach road to the potential sand blocks from the nearest National Highway/ Sate Highway has been prepared and presented in Figure 10.2.

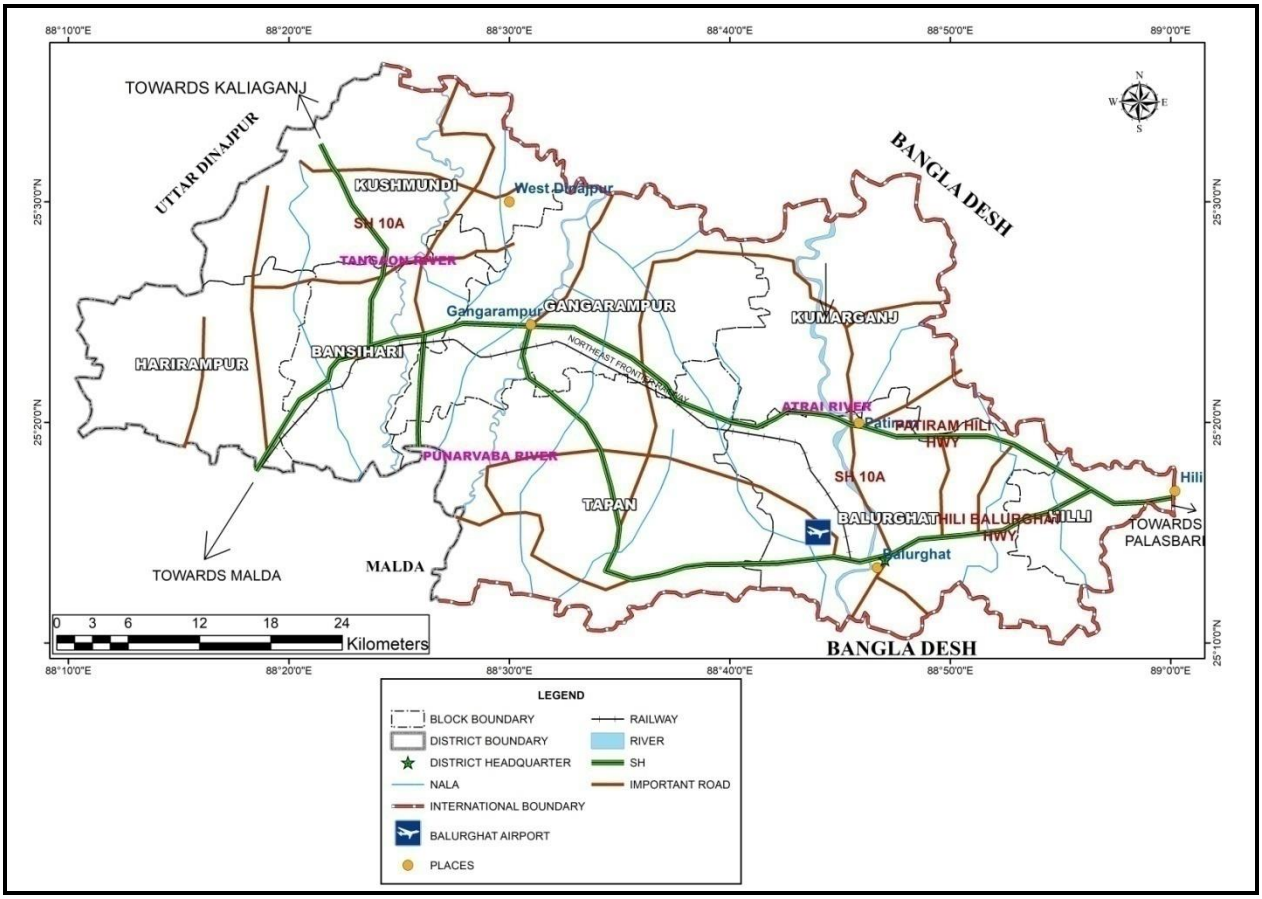


Figure 10.1: Transportation Map of Dakshin Dinajpur

(Source: National Informatics Centre)

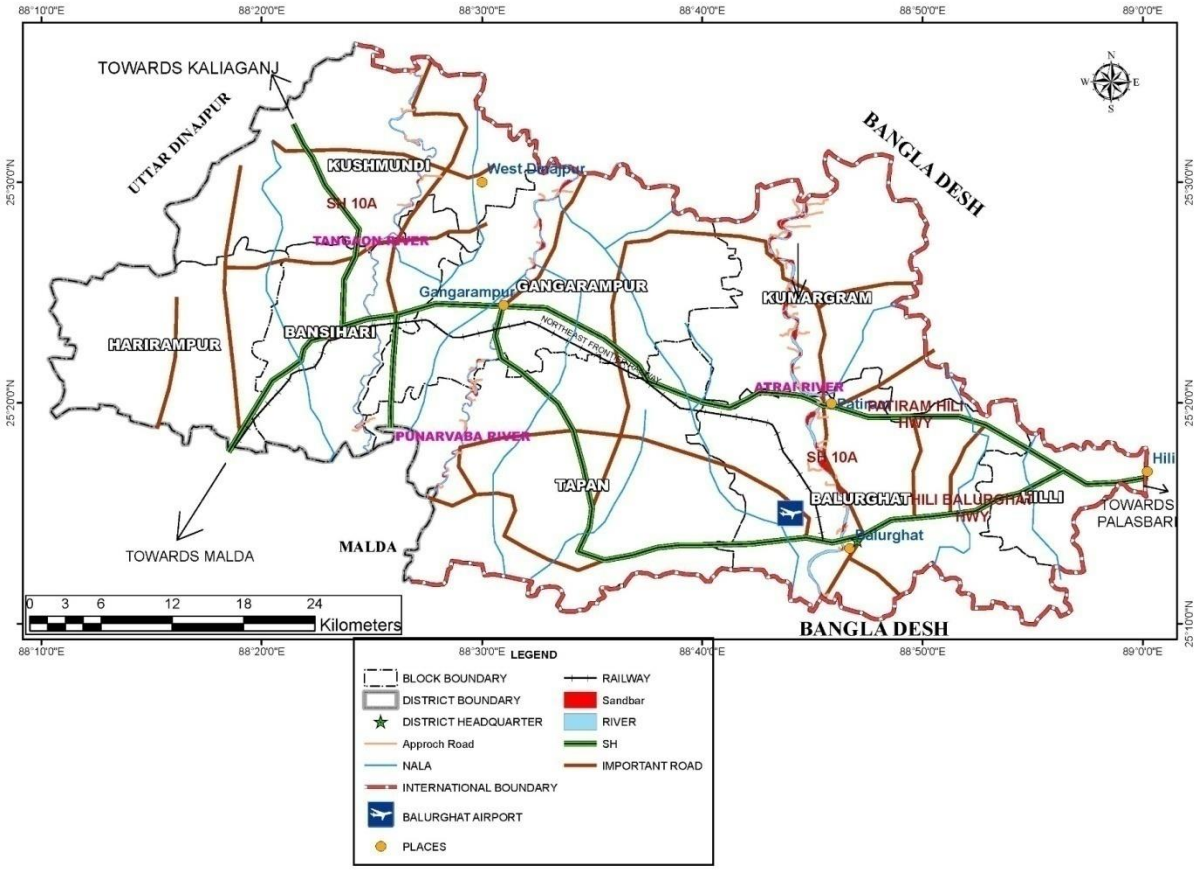


Figure 10.2: Map showing approach road to potential sand bars

11 Remedial measure to mitigate the impact of Mining

11.1 Sand mining Impact

Sand and gravel mining has been a serious environmental problem around the globe in recent years. In-stream mining directly alters the channel geometry and bed elevation. By removing sediment from the channel, in-stream material extraction disrupts the preexisting 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 tables and frequently leads to destruction of bridges and channelization structures.

Sand in mining is a process of extraction of sand from an open pit, river bed, sea beaches, ocean floor, river banks, deltas and island occurs. The extracted sand could be utilised for various types of manufacturing, such as concreted used in the construction of building and other structures. The sand can also be used as an abrasive. The demand for sand increase as population grows also urbanization on with time. The high level of demands have offer led to the use of unsustainable sand mining process for speedy urbanization resulted in illegal mining.

All though most jurisdictions have legal limit on the location and volume of sand that can be mined, illegal sand extraction is flowing in many parts of the country due to rapid urbanization and industries. This illegal mining activity has a negative impact on the surrounding ecosystem.

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 results in loss of fertile land and property. It also destabilizes the ground and causes failure of engineering structures.

Sand Mining in beaches disturbs the ecosystem of different fauna of the beaches. Even the aquatic ecosystem within the ocean is disturbed due sand mining of the beach.

The sand mining from natural barriers made up of sand causes flooding of the natural habitat. The sand mining activity destroys the aesthetic beauty o beaches and river bank and makes the ecosystem unstable. If these are popular tourist destination, tourism potential of such areas will e lost.

It can be concluded that there has been little in depth research on the environmental, social and political effects of land use practices and calls for urgent attention by the competent authority.

11.2 Remedial measure

11.2.1 Sustainable Mining Practices:

- The depth of 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.

11.2.2 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.

11.2.3 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 to 7 pm.

11.2.4 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.

11.2.5 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 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) have 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.

11.2.6 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.

11.2.7 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.

11.2.8 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.

11.2.9 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 archeological 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 200-500 meter of bridge, 200 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 meter 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.

12 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:

a) A 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;

b) The proposed mining cross-section data should be plotted over the baseline data to illustrate the vertical extent of the proposed excavation;

c) 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;

d) A planimetric map showing the aerial extent of the excavation and extent of the riparian buffers;

e) A 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;

f) 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 l.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.;

g) A monitoring plan has to establish.

13 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.

13.1 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 selable. There will be neither any stacking of soil nor creation of OB dumps. The mining activity will carry 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

13.2 Mitigation measures

13.2.1 Measures to prevent accidents during loading and transportation:

- During the loading truck should be brought to a lower level so that the loading operation suits to 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 liscence.

13.2.2 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.

13.2.3 Measures for mitigation to quick sand condition:

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

13.3 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 laws 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.

14 Conclusion and Recomendation

The District Survey Report for Dakshin Dinajpur district has been prepared as per Ministry of Environment, Forests and Climate Change (MoEF& CC) guidelines. The Guideline of WBMMCR, 2016 is also taken into consideration while preparation of this report.

This report will guide the systematic and scientific mining of major and minor mineral of the district. Report highlighted the district profile with respect to its geographical position, its area of extent, soil characteristic, land use pattern, physiography of the district and mineral potentiality.

As per the study conducted, the district is generally flat, slightly sloping southwards. The average elevation of the district from mean sea level is only 15m. The slope is varying from north to south directions. The region appears to be a continuation of 'Barind' land- a Geological formation of Older Alluvium. Physiographycally this region is divided in three units; Recent Alluvial Fan, Barind Pleistocene and Recent Flood Plain. The main three rivers of this district are ATRAI, Punarbhava and Tangaon, another river Ichamati is also flowing in this district. Due to the slope of landmass, the general flow of these rivers is from North to South direction.

Due to very fertile nature of the soil and paucity of natural mineral resources, people of this district are mainly depending upon the agriculture. Social forestry has received a lot of attention and it is becoming very popular in this district.

The Dakshin Dinajpur District is holding mineral potentiality with respect to minor mineral. Minor minerals are mining actively in the state, mainly sand, bricks and gravel from riverbeds. As per the data received from DL&LRO office, Dakshin Dinajpur, total 65leases have been allotted for mining of river sand in the district. Out of which 41 leases are allotted in ATRAIRiver, 13 leases are allotted in Punarbhava river and 11 leases are in Tangaonriver. Revenue generated in the district of Dakshin Dinajpur from Minor minerals during the period of April 2018 to March 2021 is Rs. 2.62 Crores. Potential riverbed sand blocks of the district where lease not allotted yet are also identified and discussed in the current DSR. Incremental volume of sand is estimated in this DSR and found as around 1.98 million cu.m. when compared between pre and post monsoon sand reserve data. So, the district is potential for scientific and systematic sand mining.

The district has an upside potential for development of Riverbed sand. The occurrence has been reported by Directorate of Mines and Minerals, Government of West Bengal and others in previous instances. However, it requires further systematic and scientific approach to quantify the resource along with their grade assessment. The occurrences are mostly observed in the riverATRAI, Punarbhava and Tangaon. This report also recommends undertaking detail exploration (G1 & G2 level) program to assess the mineral occurrences in the major rivers of the district and should have a proper development and production plan for the specified minerals.

14.1 Conclusion

I. Most of the potential sand blocks are restricted on River Atrai only. Other river bed deposits are not very promising for large scale mining.

II. The replenishment study has been carried out during four consecutive seasons for the preparation of this DSR. Both field-based surveys coupled with satellite imagery study and empirical studies were carried out to determine the rate of replenishment in each river of the district.

III. The determined values of various methods as adopted for replenishment study gives a comparable value and in all cases the values are found to be more as compared to the capping limit (60%) as suggested in the Enforcement & Monitoring Guidelines for Sand Mining (EMGSM) January 2020, Issued by Ministry of Environment, Forest and Climate Change (MoEF&CC) 2020.

IV. Field base study shows variation of replenishment from 95.9 to 97.0% in the district and for theoretical replenishment study shows variations from 72% to 76% with an average of 74.27% of replenishment rate in the district.

V. The total potential river bed deposit for the district comes to about 6.575 mcum.

14.2 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 Agenesis from time to time.
3. During finalization of mining leases for the district, strict adherence of Supreme Court orders No 1501 dated 03/06/2022 should be followed.
4. Efforts should be given to restrict distribution of mining leases along the confluence zone of the rivers where rich aquatic habitats are reported.
5. Since the state of West Bengal has royalty system in volumetric measurement, specific gravity for sand and gravel has not been determined during this study. However, during the finalization of mining lease if it is found necessary to conduct such test may be initiated by the state government on case-to-case basis.
6. 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.

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PLATE 1

DRAINAGE MAP OF THE DISTRICT

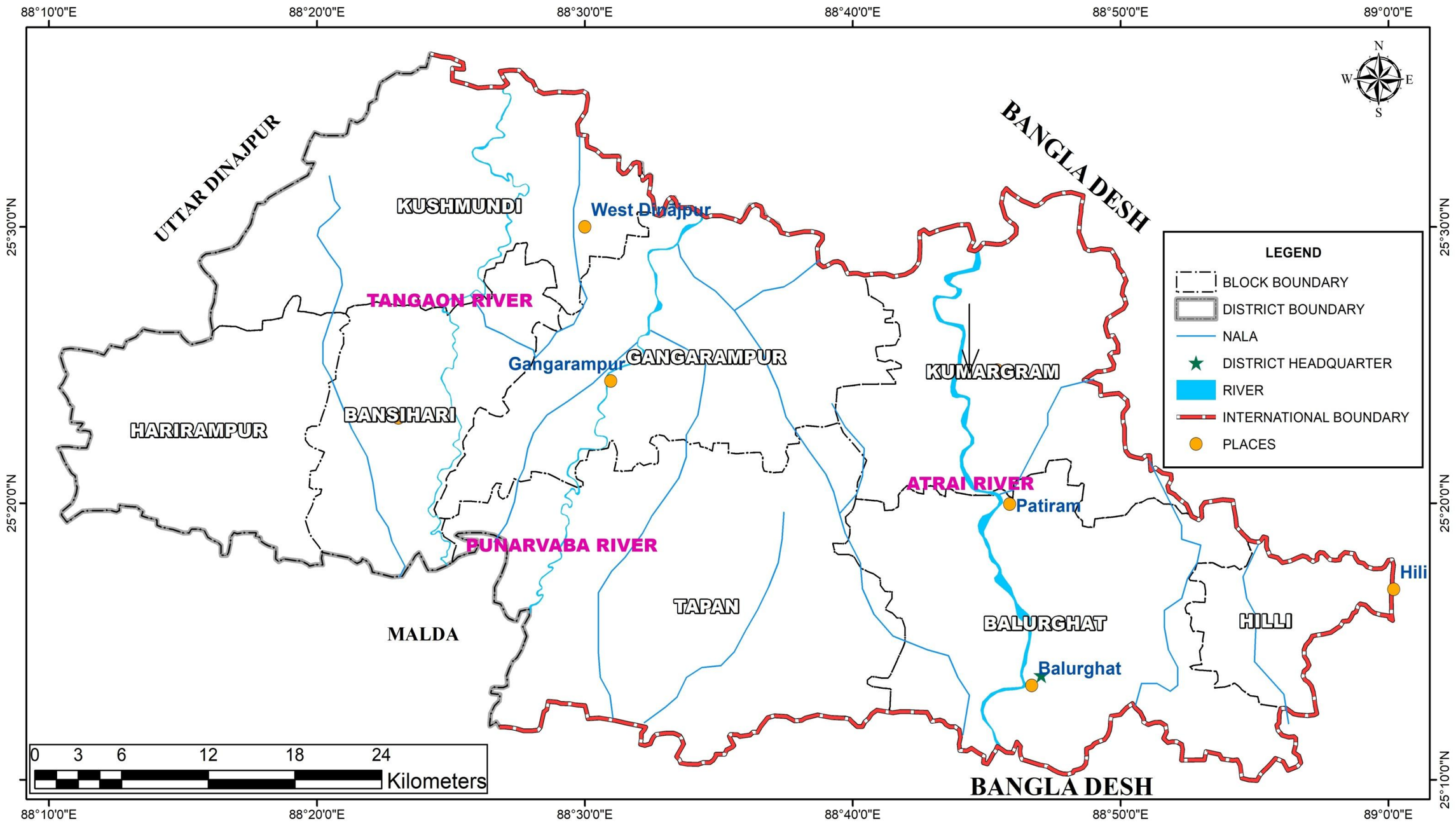
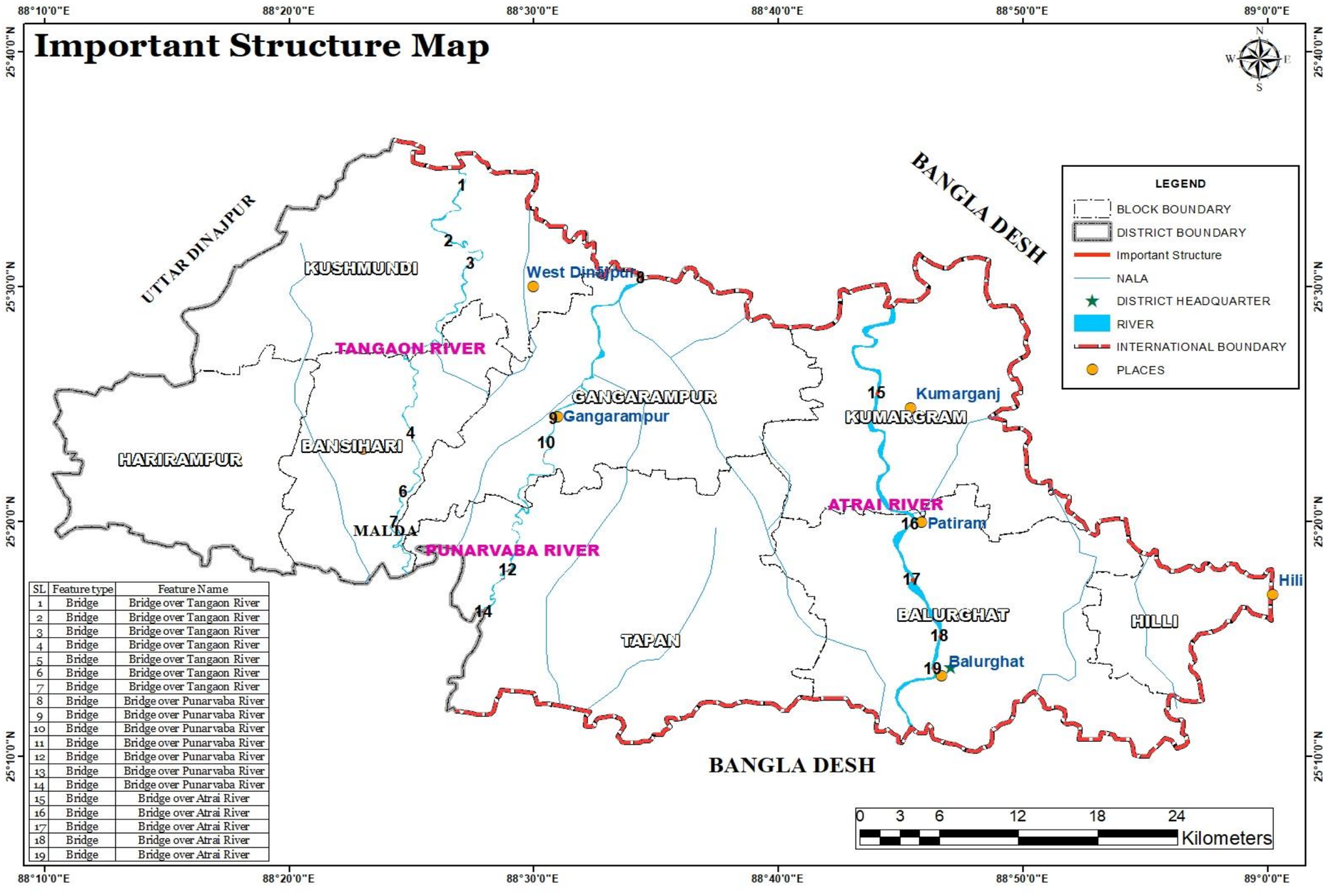


Plate 1A: Drainage Map of the District *(Source: National Informatics Centre -NIC Website, Sept 2020)*



SL	Feature type	Feature Name
1	Bridge	Bridge over Tangaon River
2	Bridge	Bridge over Tangaon River
3	Bridge	Bridge over Tangaon River
4	Bridge	Bridge over Tangaon River
5	Bridge	Bridge over Tangaon River
6	Bridge	Bridge over Tangaon River
7	Bridge	Bridge over Tangaon River
8	Bridge	Bridge over Punarvaba River
9	Bridge	Bridge over Punarvaba River
10	Bridge	Bridge over Punarvaba River
11	Bridge	Bridge over Punarvaba River
12	Bridge	Bridge over Punarvaba River
13	Bridge	Bridge over Punarvaba River
14	Bridge	Bridge over Punarvaba River
15	Bridge	Bridge over Atrai River
16	Bridge	Bridge over Atrai River
17	Bridge	Bridge over Atrai River
18	Bridge	Bridge over Atrai River
19	Bridge	Bridge over Atrai River

Plate No 1B: Location Map of dams, barrages, bridge showing on drainage system of the district *(Source: National Informatics Centre -NIC Website, Sept 2020)*

PLATE 2A

DISTRIBUTION MAP OF SAND BARS ON RIVERS DURING PRE-MONSOON PERIOD OF DAKSHIN DINAJPUR DISTRICT

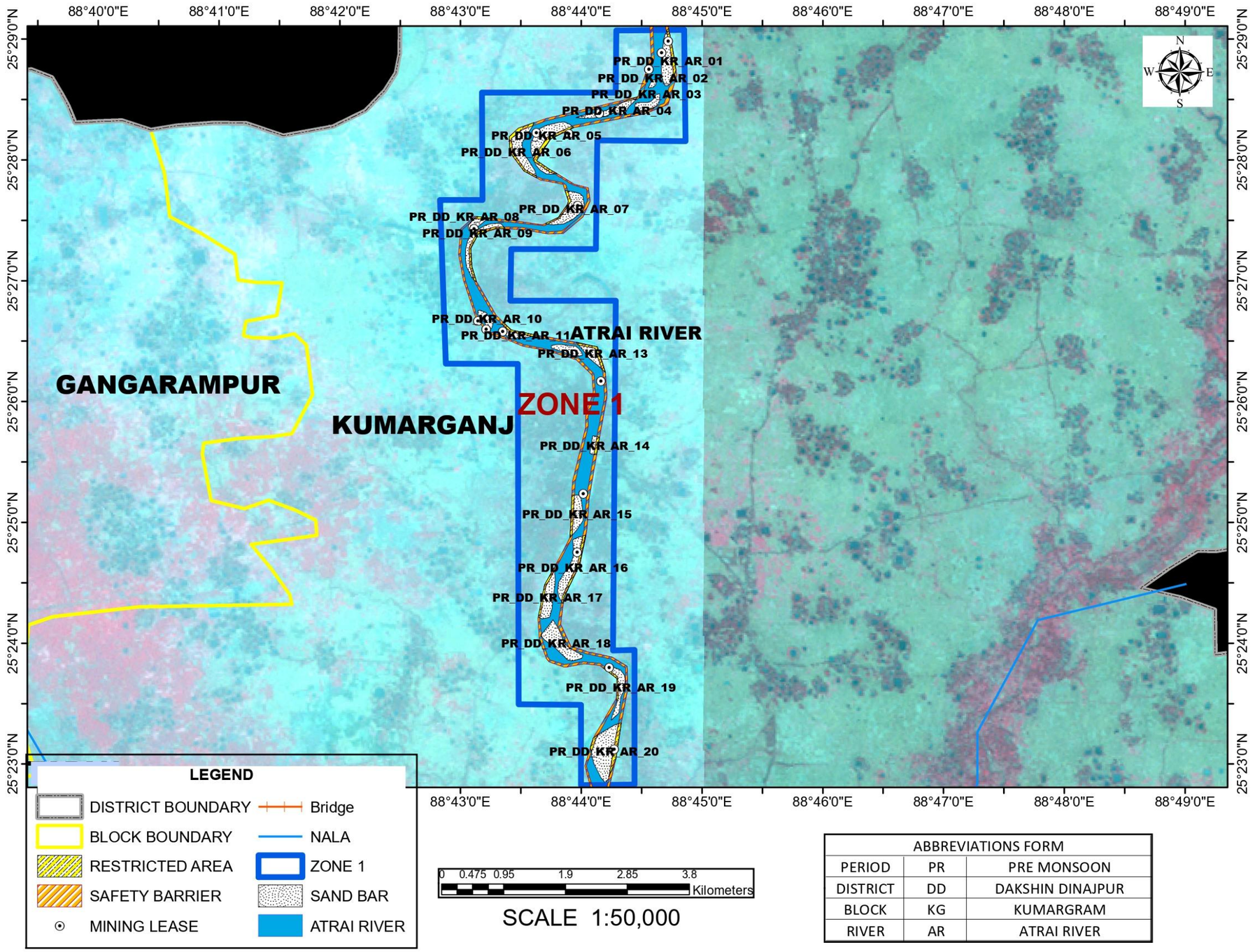


Plate 2A1: Distribution Map of Sand Bars on Rivers During Pre-Monsoon Period of Dakshin Dinajpur District*(Source: ISRO RESOURCE Sat 2 LISS III Sensor, March 2020)*

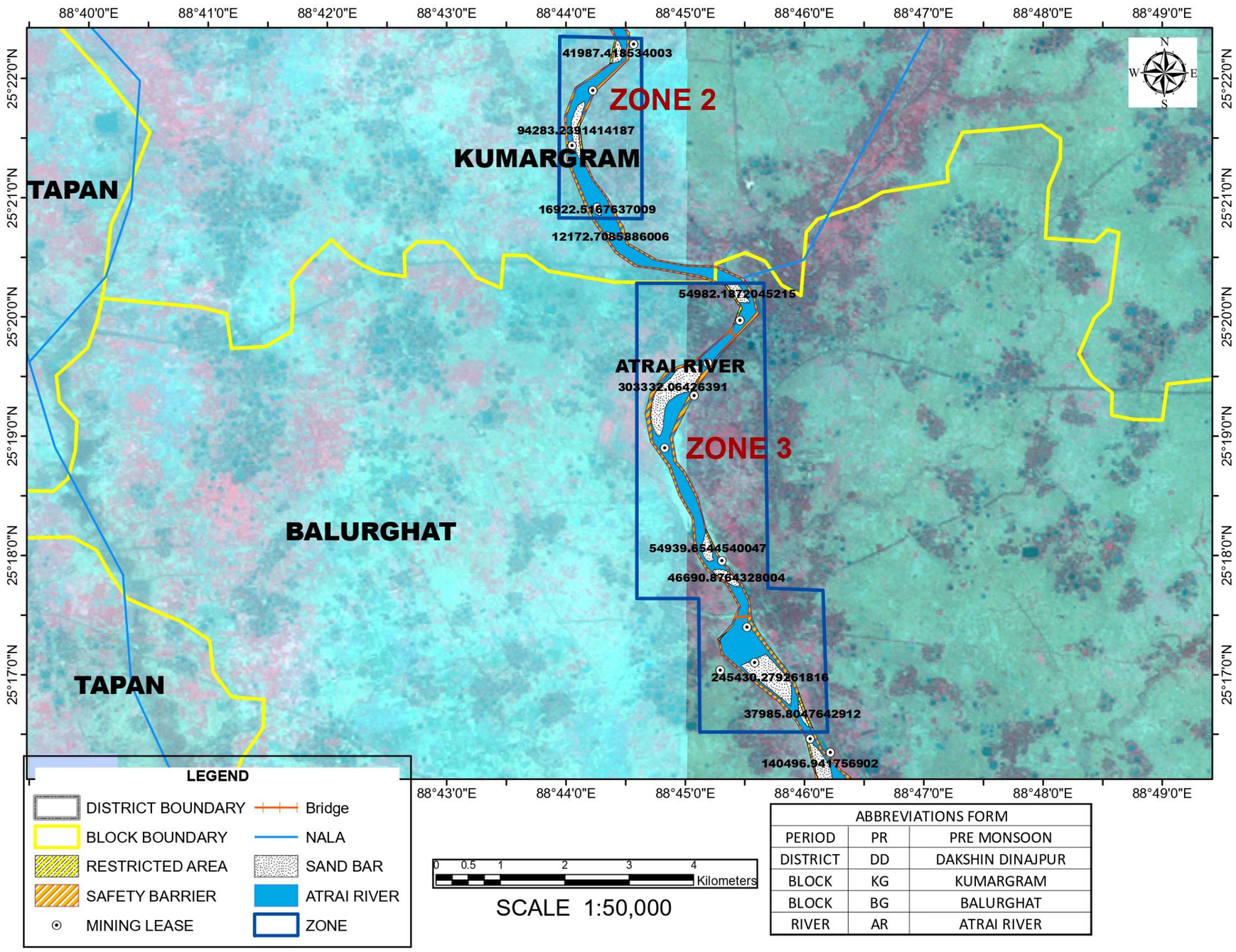


Plate 2A2: Distribution Map of Sand Bars on Rivers During Pre-Monsoon Period of Dakshin Dinajpur District*(Source: ISRO RESOURCE Sat 2 LISS III Sensor, March 2020)*

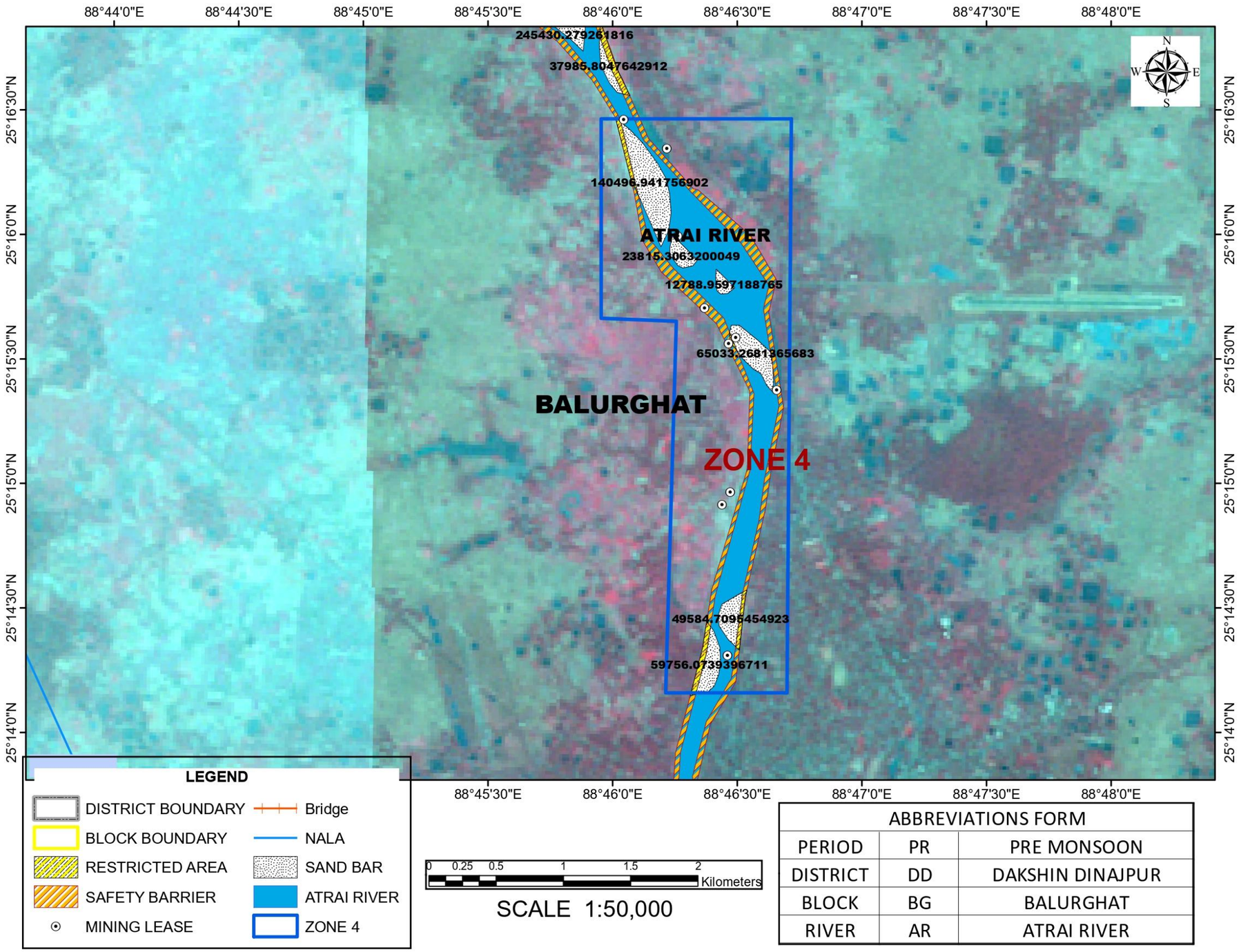


Plate 2A3: Distribution Map of Sand Bars on Rivers During Pre-Monsoon Period of Dakshin Dinajpur District*(Source: ISRO RESOURCE Sat 2 LISS III Sensor, March 2020)*

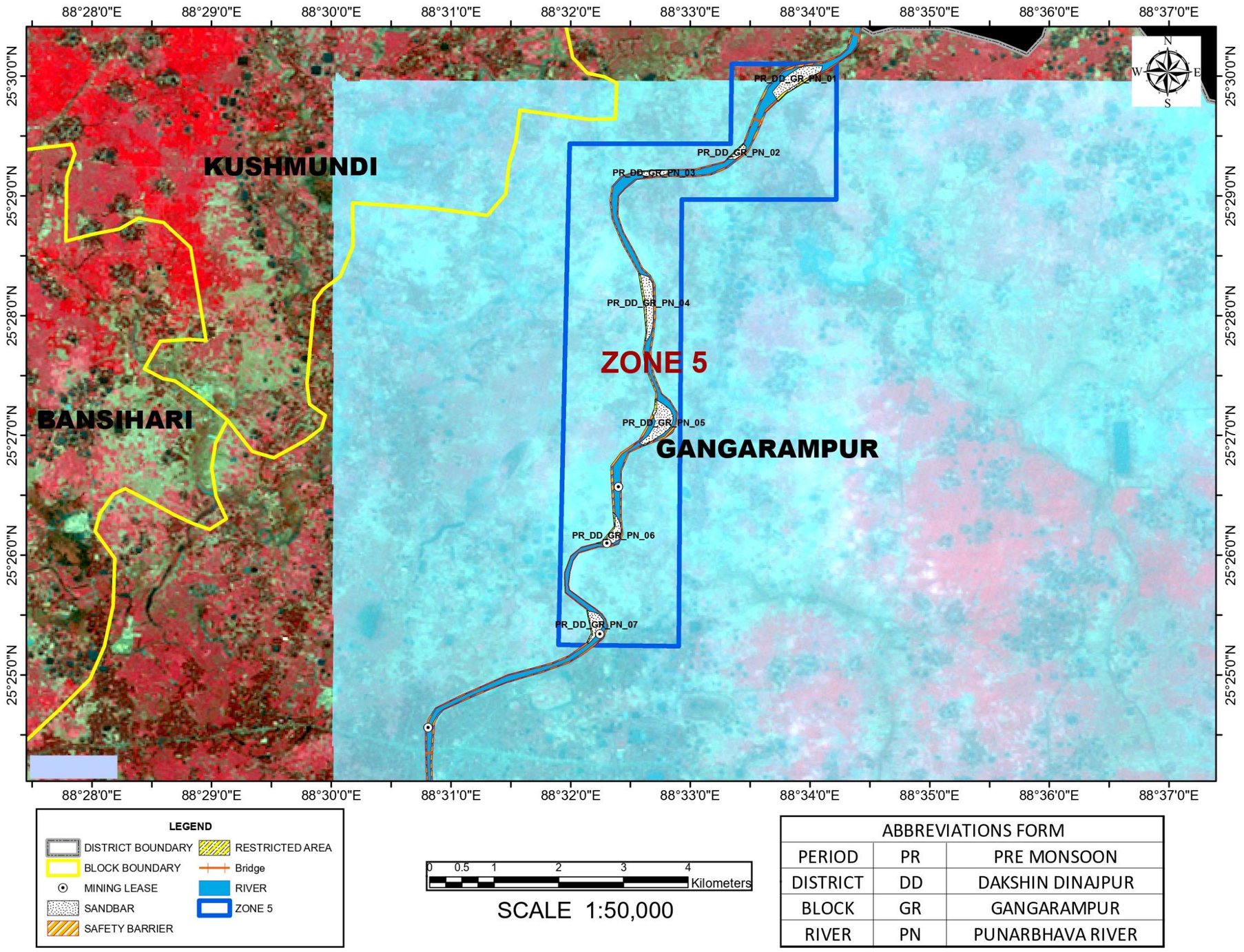


Plate 2A4: Distribution Map of Sand Bars on Rivers During Pre-Monsoon Period of Dakshin Dinajpur District*(Source: ISRO RESOURCE Sat 2 LISS III Sensor, March 2020)*

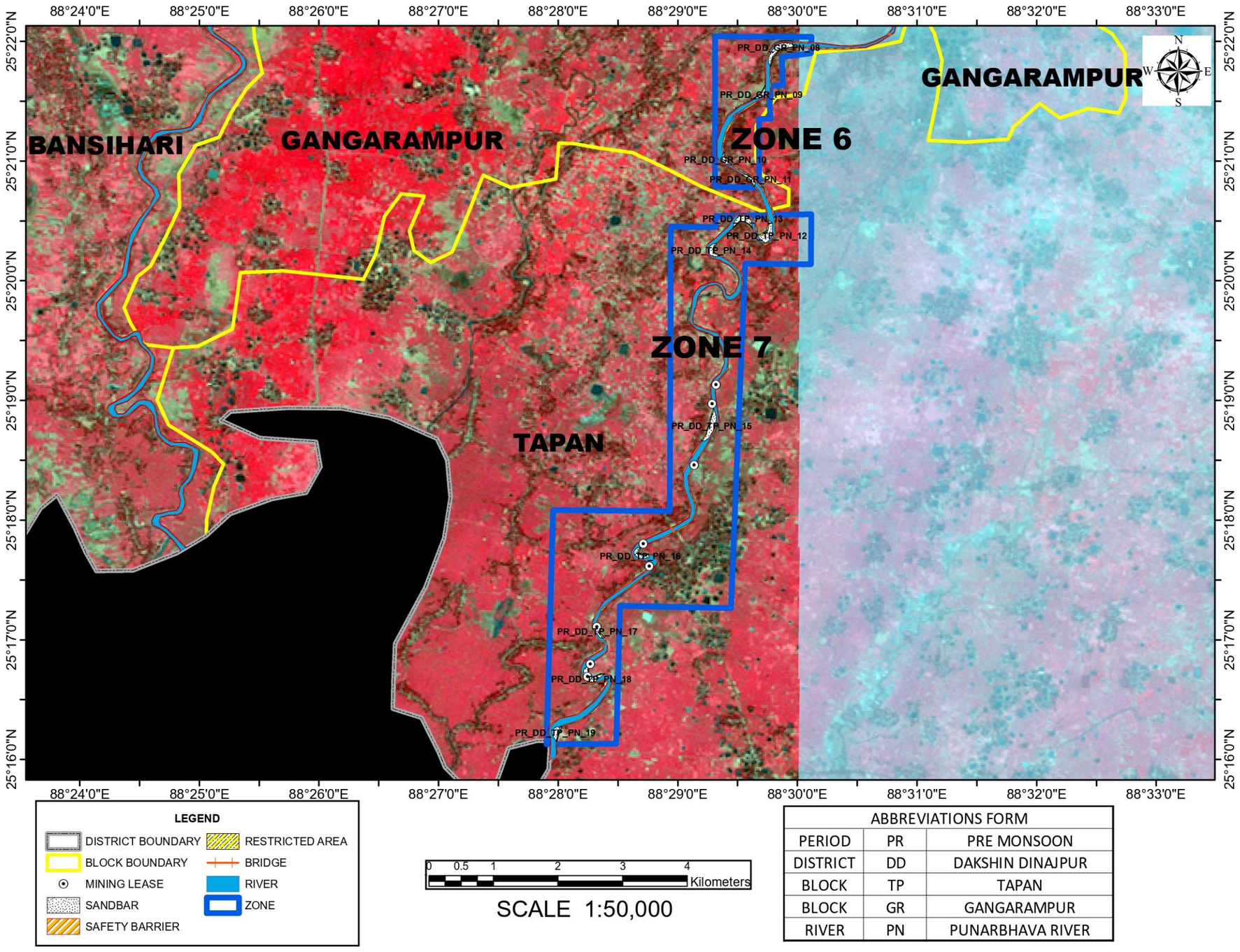


Plate 2A5: Distribution Map of Sand Bars on Rivers During Pre-Monsoon Period of Dakshin Dinajpur District*(Source: ISRO RESOURCE Sat 2 LISS III Sensor, March 2020)*

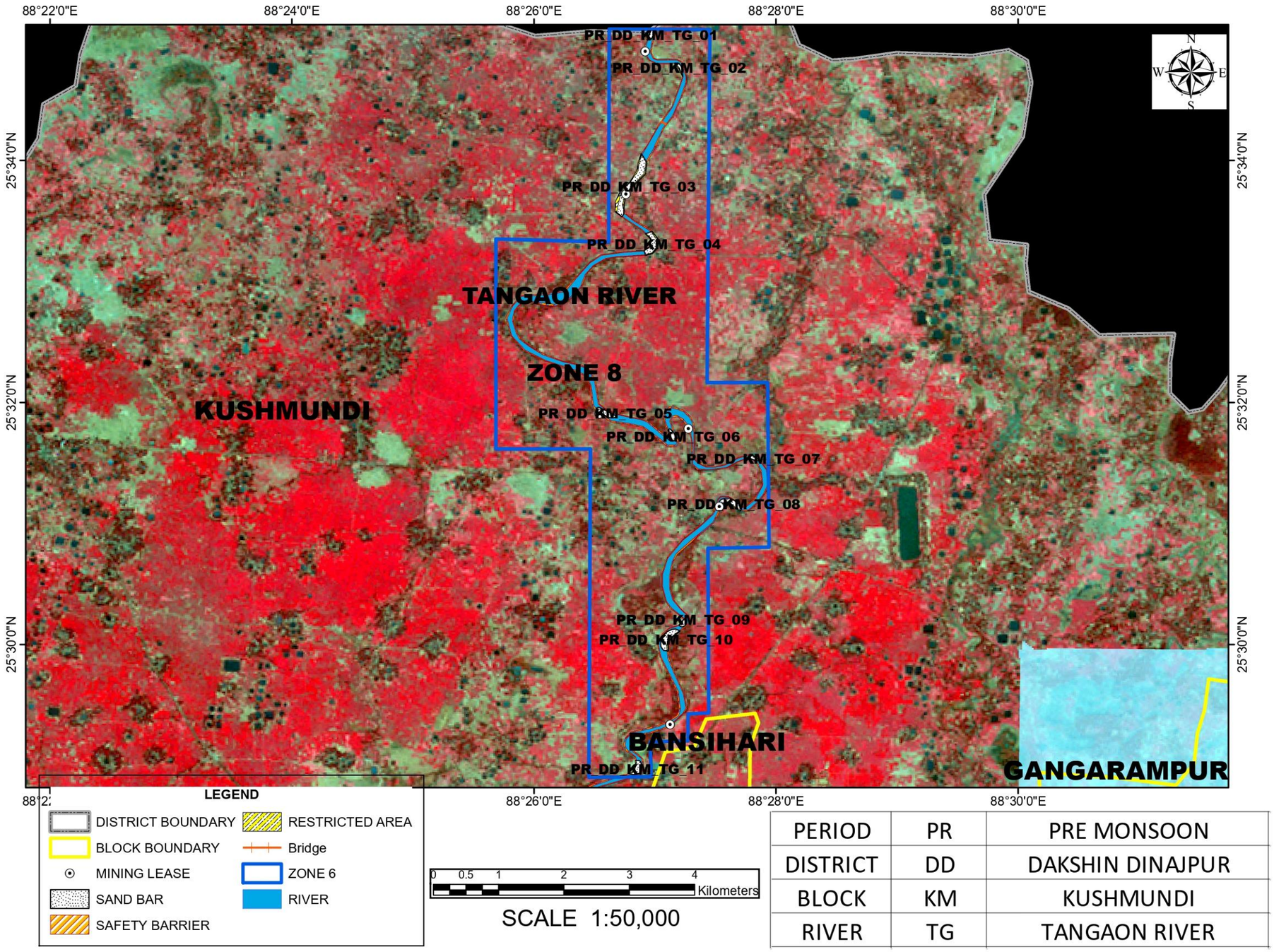


Plate 2A6: Distribution Map of Sand Bars on Rivers During Pre-Monsoon Period of Dakshin Dinajpur District*(Source: ISRO RESOURCE Sat 2 LISS III Sensor, March 2020)*

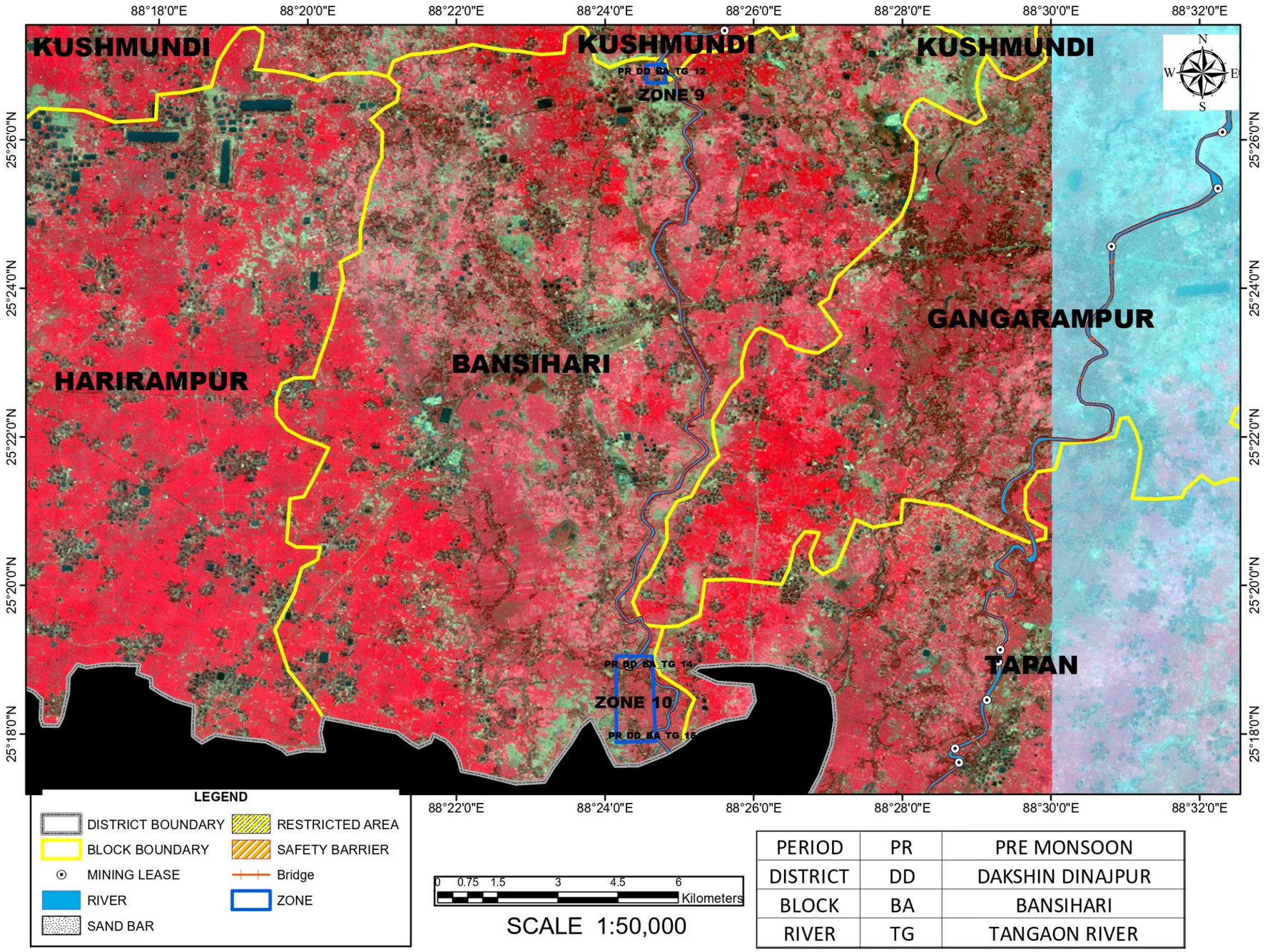


Plate 2A7: Distribution Map of Sand Bars on Rivers During Pre-Monsoon Period of Dakshin Dinajpur District*(Source: ISRO RESOURCE Sat 2 LISS III Sensor, March 2020)*

PLATE2B

DISTRIBUTION MAP OF SAND BARS ON RIVERS DURING POST-MONSOON PERIOD OF DAKSHIN DINAJPURDISTRICT

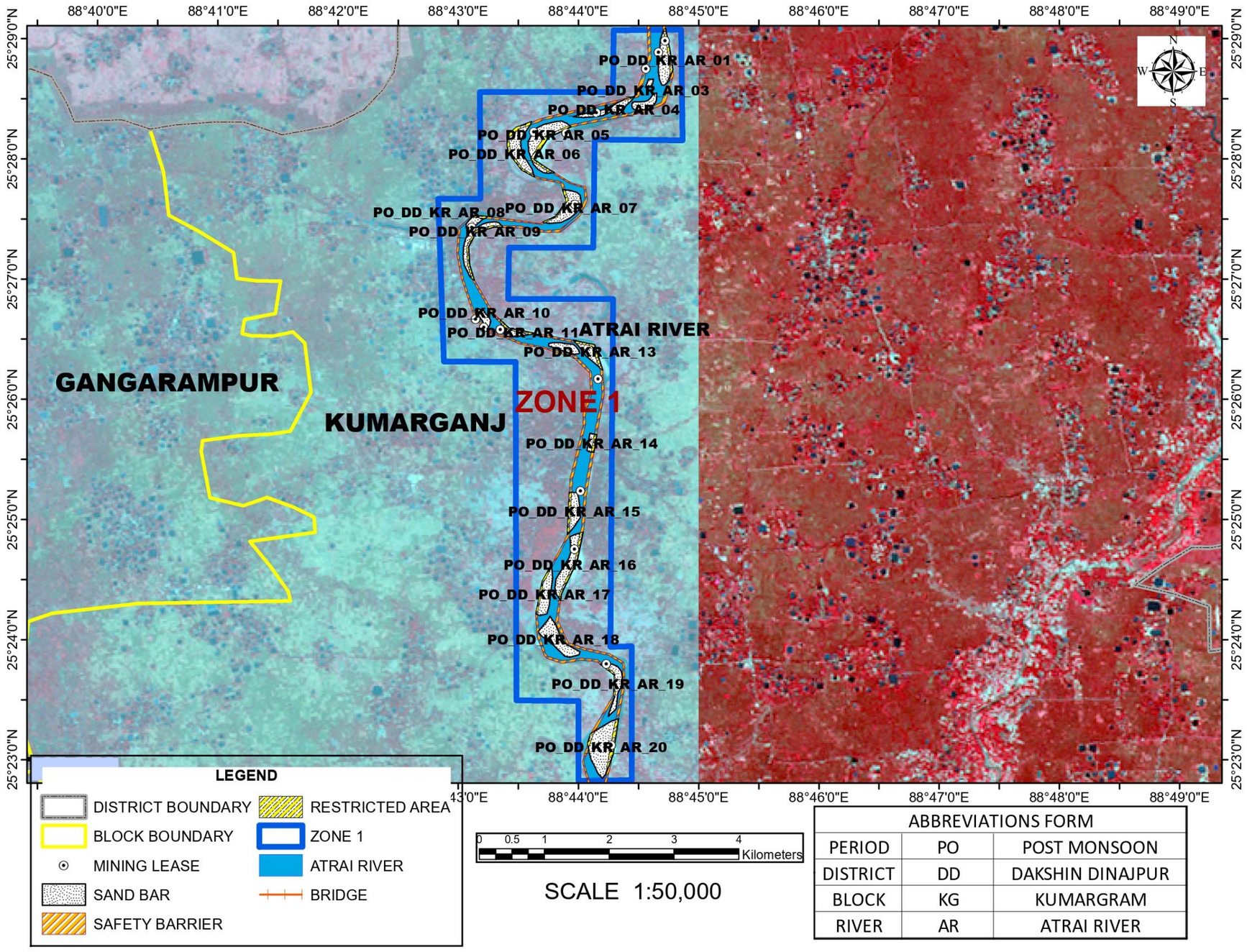


Plate 2B1: Distribution Map of Sand Bars on Rivers During Post-Monsoon Period of Dakshin Dinajpur District*(Source: ISRO RESOURCE Sat 2 LISS III Sensor, November 2020)*

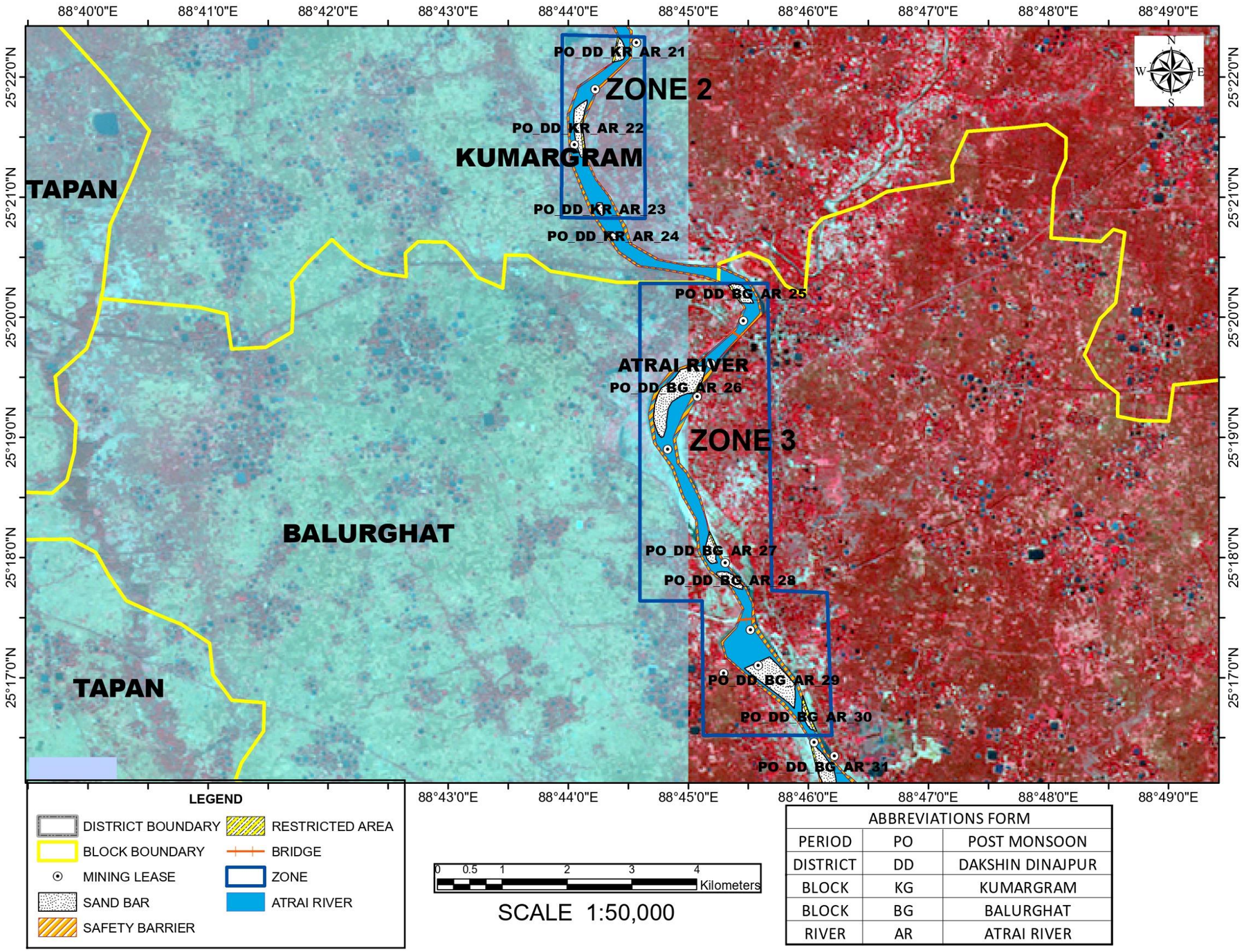


Plate 2B2: Distribution Map of Sand Bars on Rivers During Post-Monsoon Period of Dakshin Dinajpur District*(Source: ISRO RESOURCE Sat 2 LISS III Sensor, November 2020)*

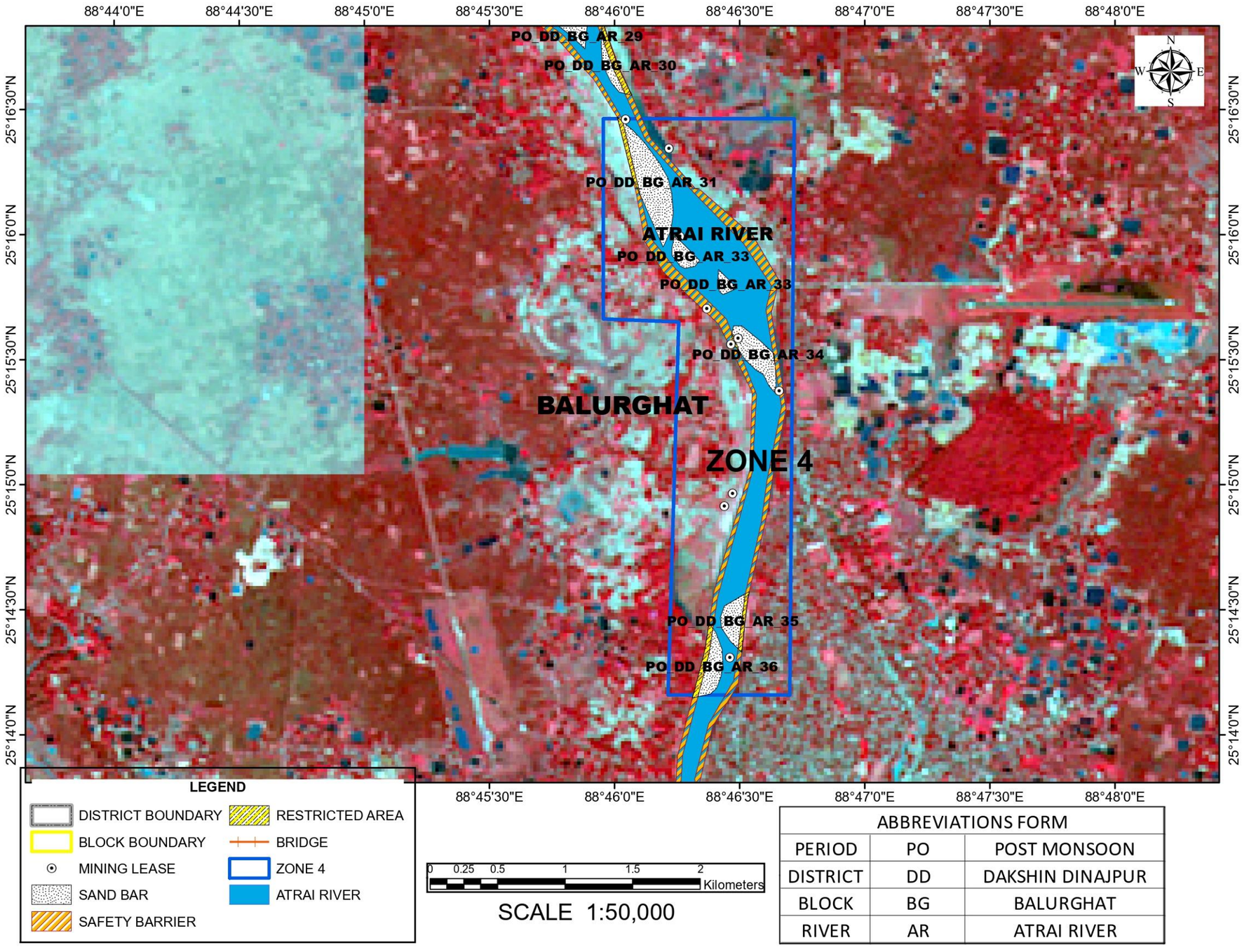


Plate 2B3: Distribution Map of Sand Bars on Rivers During Post-Monsoon Period of Dakshin Dinajpur District*(Source: ISRO RESOURCE Sat 2 LISS III Sensor, November 2020)*

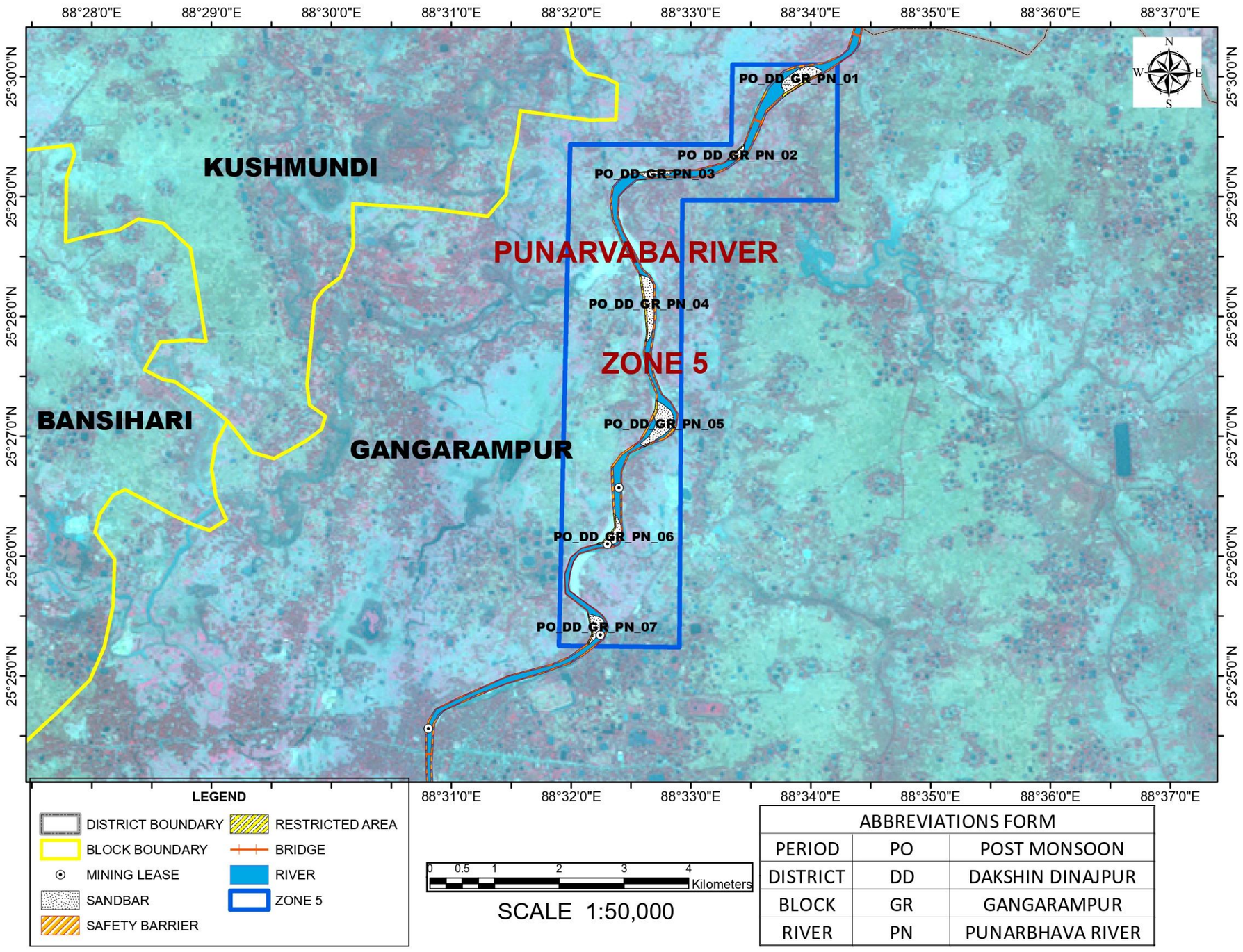


Plate 2B4: Distribution Map of Sand Bars on Rivers During Post-Monsoon Period of Dakshin Dinajpur District*(Source: ISRO RESOURCE Sat 2 LISS III Sensor, November 2020)*

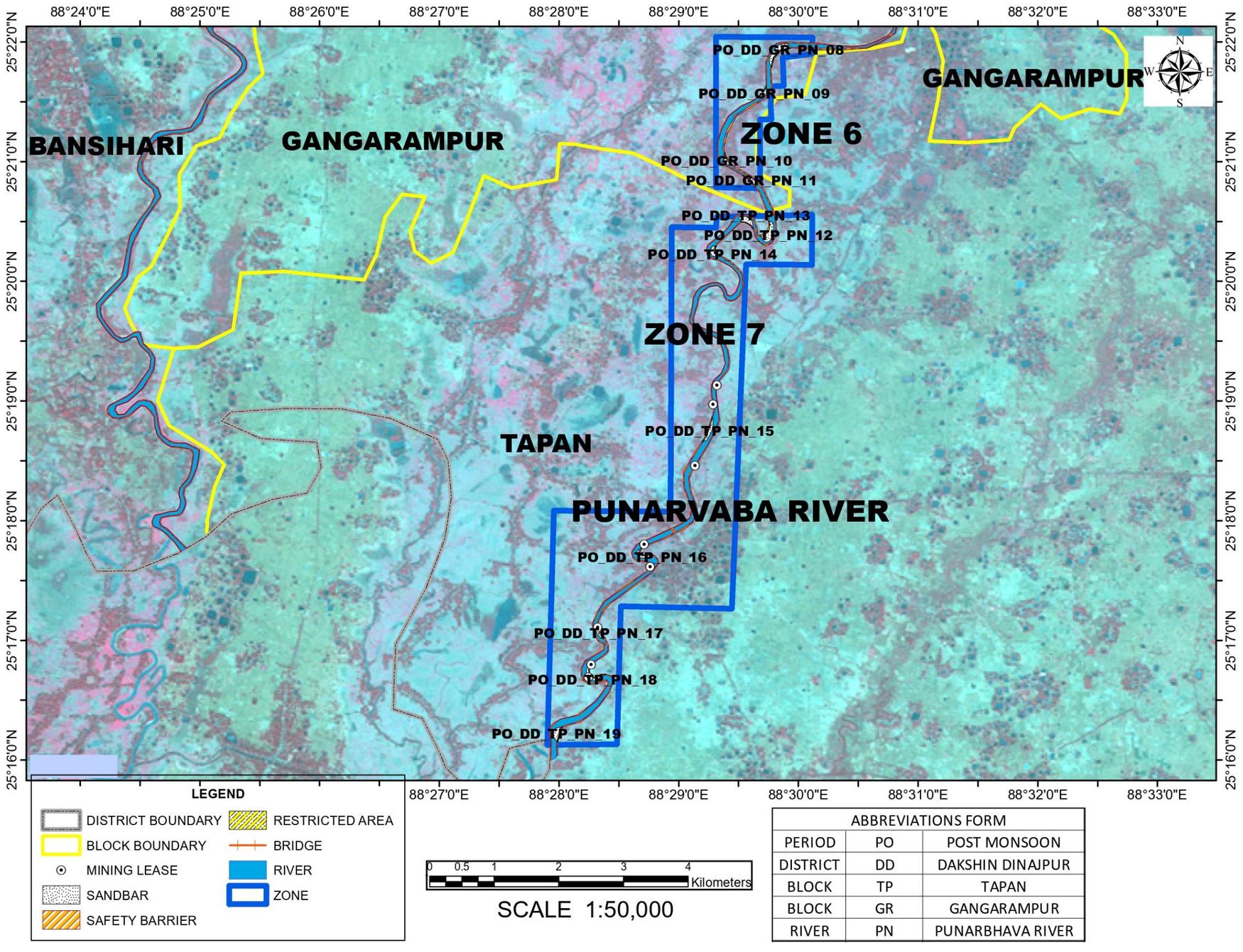


Plate 2B5: Distribution Map of Sand Bars on Rivers During Post-Monsoon Period of Dakshin Dinajpur District*(Source: ISRO RESOURCE Sat 2 LISS III Sensor, November 2020)*

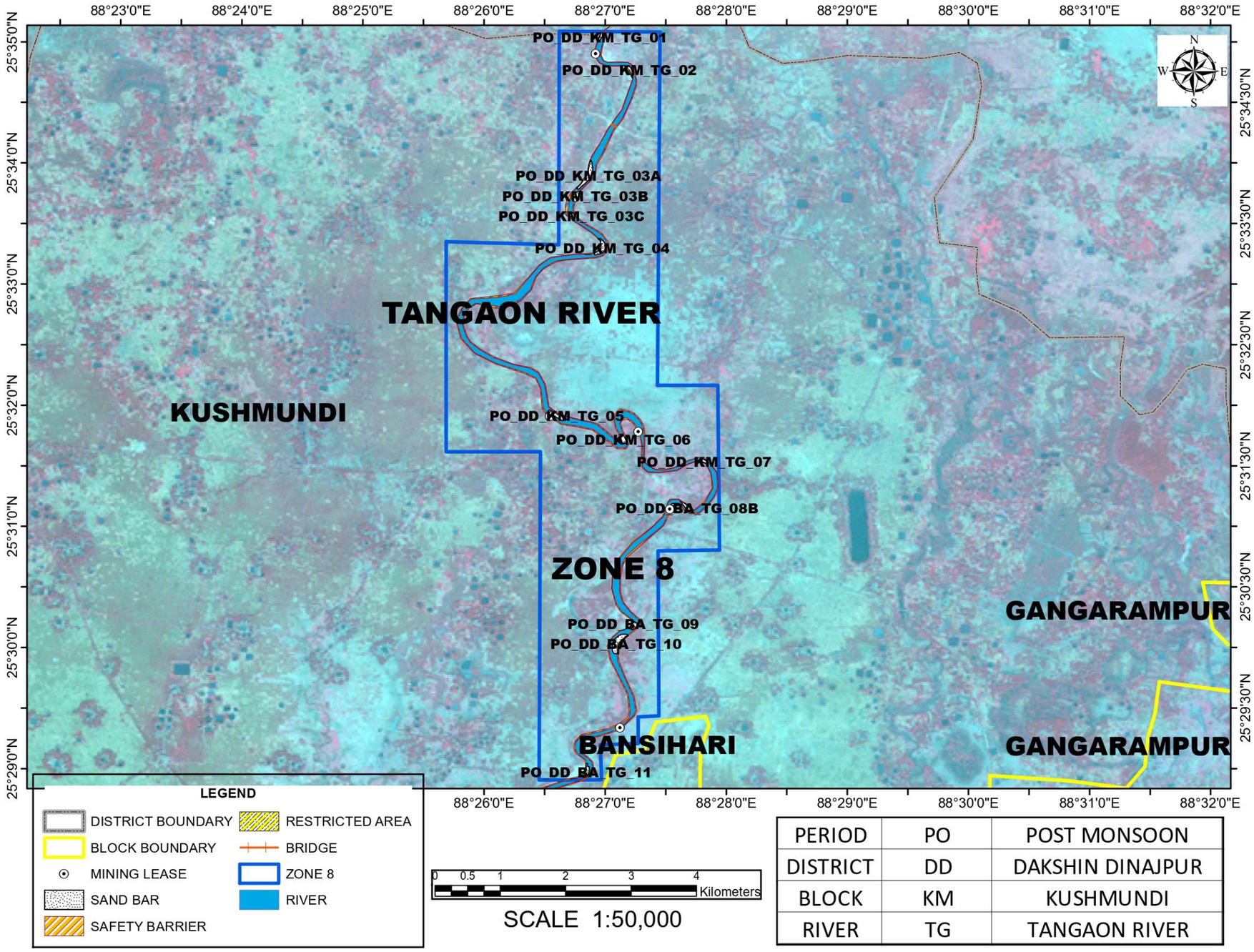
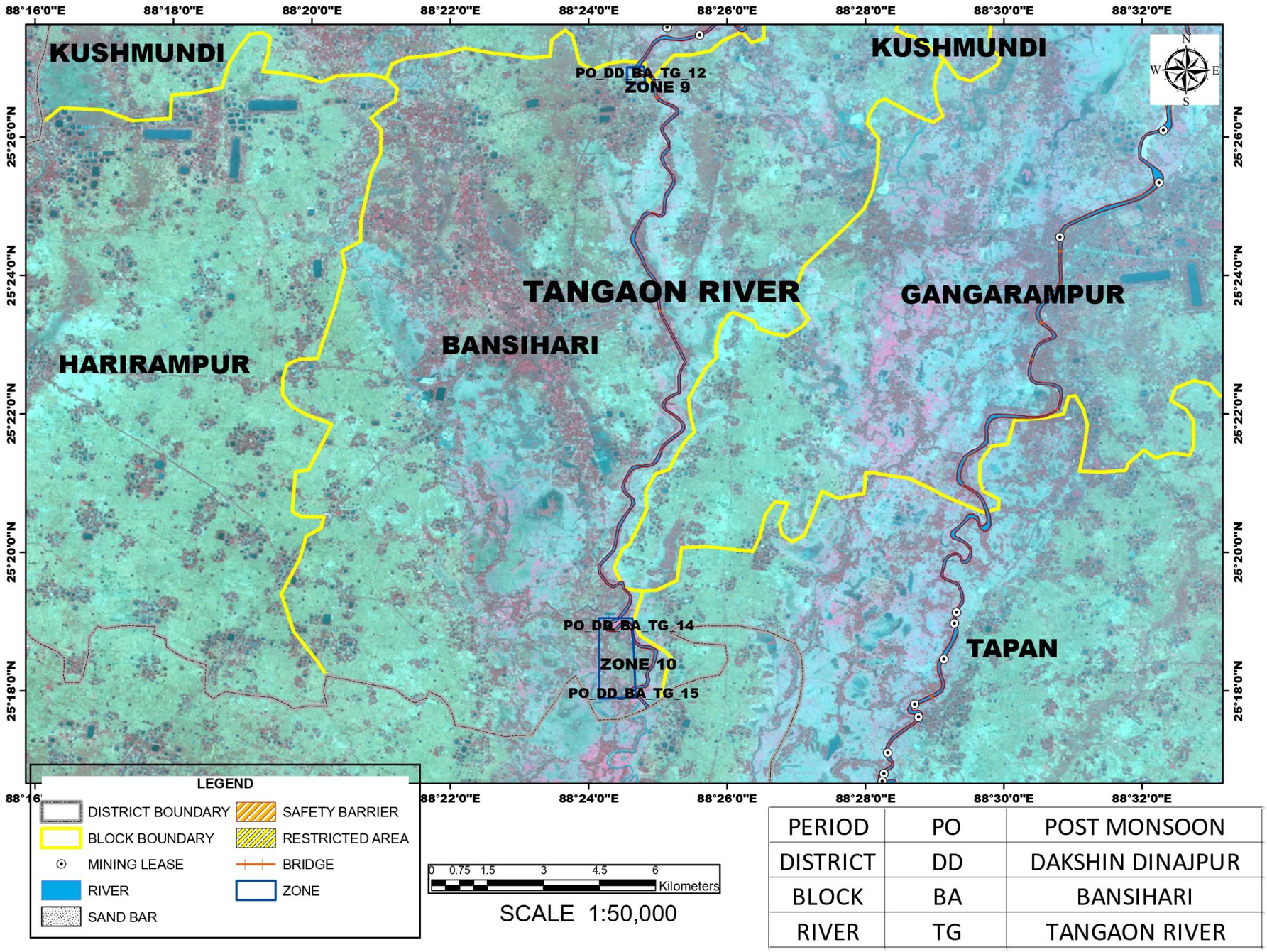


Plate 2B6: Distribution Map of Sand Bars on Rivers During Post-Monsoon Period of Dakshin Dinajpur District*(Source: ISRO RESOURCE Sat 2 LISS III Sensor, November 2020)*



PERIOD	PO	POST MONSOON
DISTRICT	DD	DAKSHIN DINAJPUR
BLOCK	BA	BANSIHARI
RIVER	TG	TANGAON RIVER

Plate 2B7: Distribution Map of Sand Bars on Rivers During Post-Monsoon Period of Dakshin Dinajpur District*(Source: ISRO RESOURCE Sat 2 LISS III Sensor, November 2020)*

PLATE3

WATERSHED MAP OF DAKSHIN DINAJPUR DISTRICT

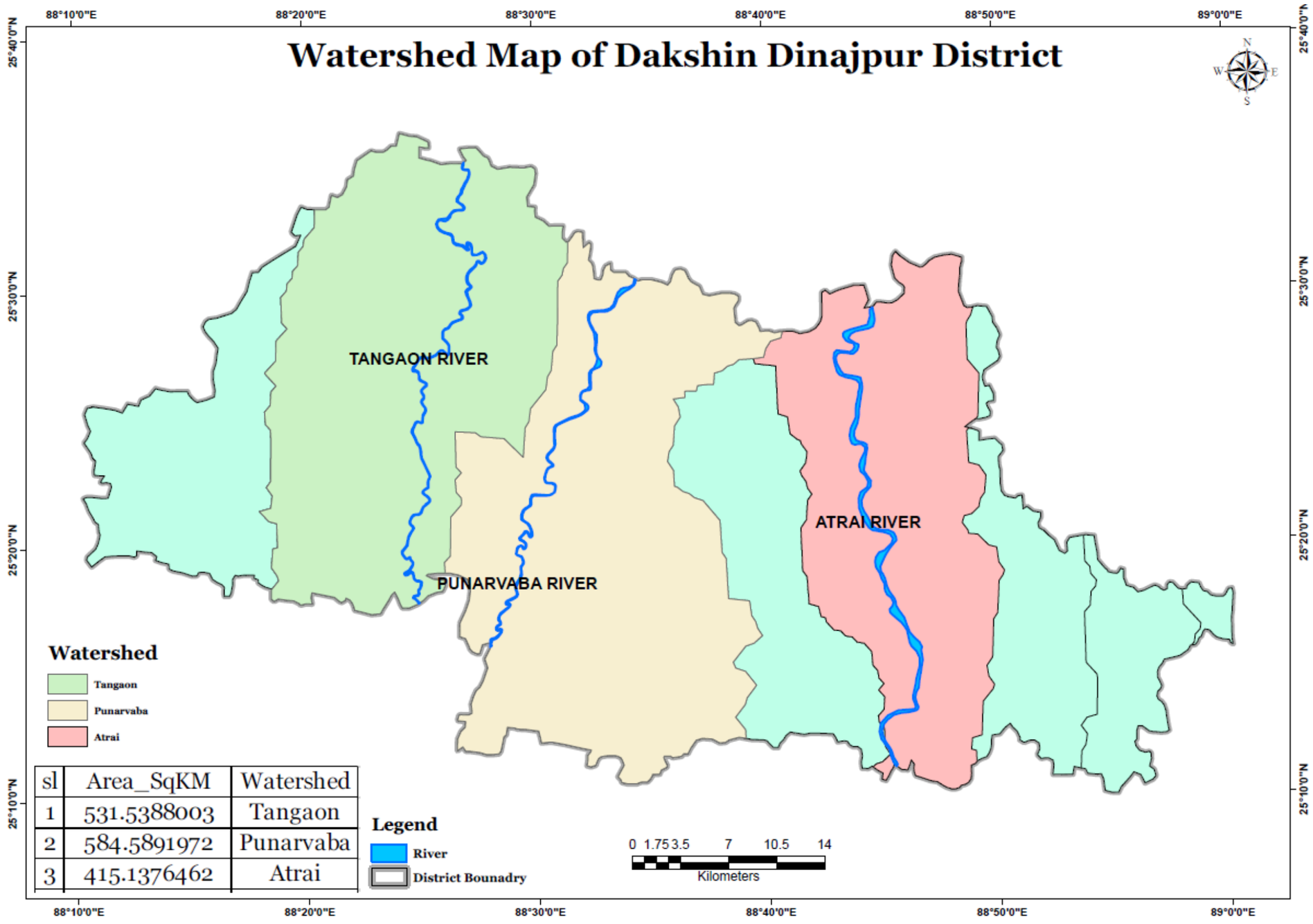
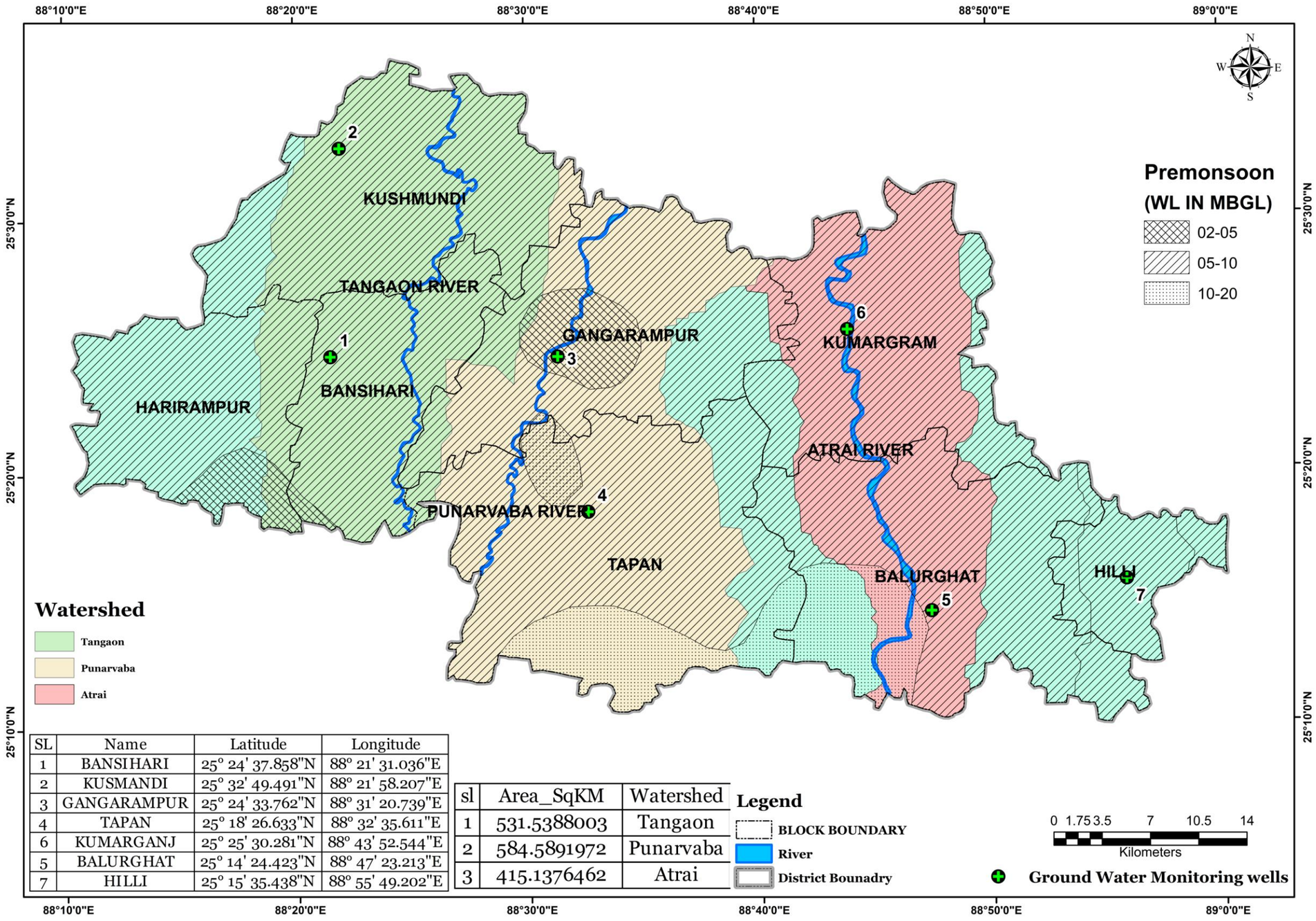


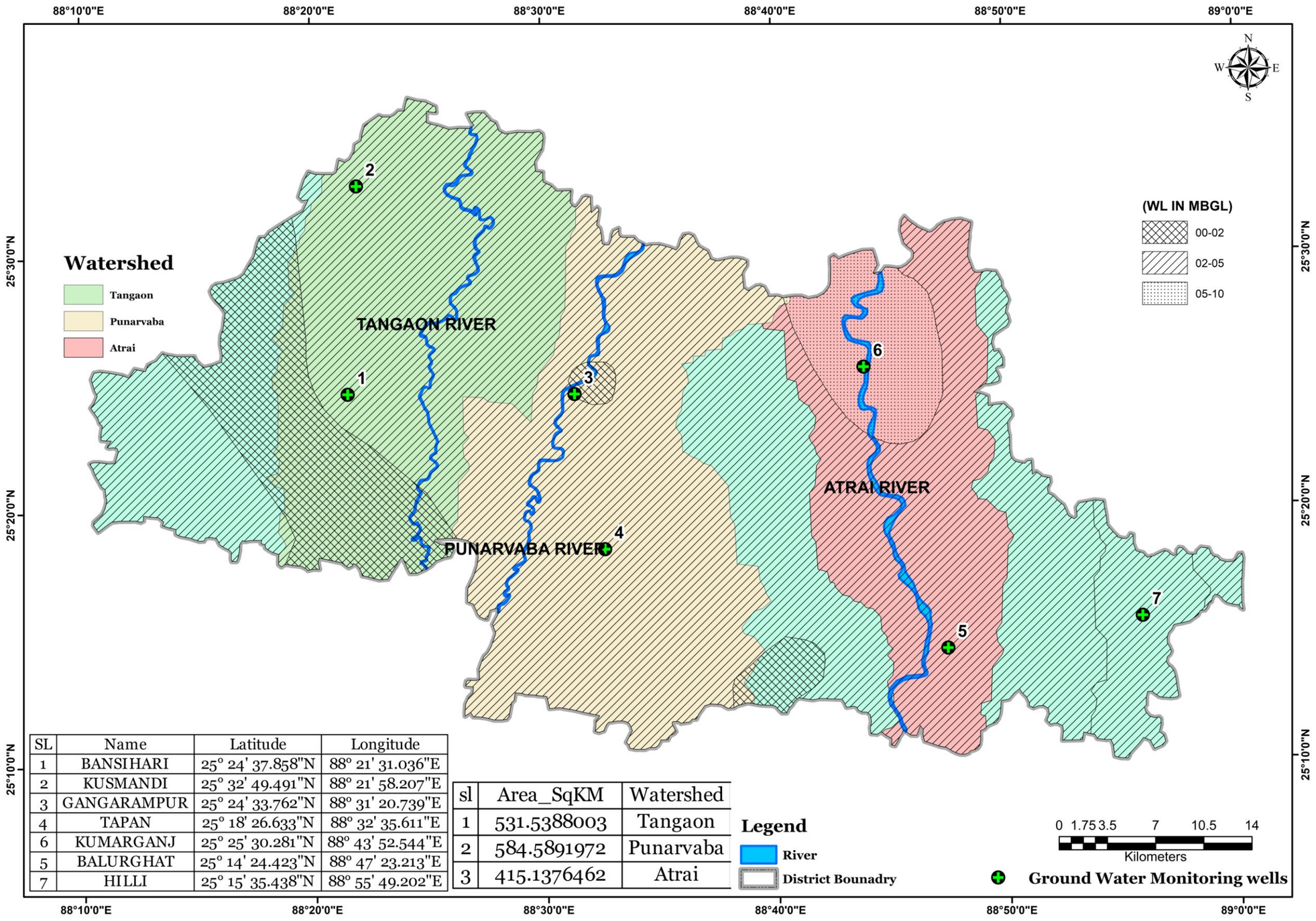
Plate 3A: Watershed map of Dakshin Dinajpur District *(Source: World Wild Fund for Nature, Sept, 2020)*



SL	Name	Latitude	Longitude
1	BANSIHARI	25° 24' 37.858"N	88° 21' 31.036"E
2	KUSMANDI	25° 32' 49.491"N	88° 21' 58.207"E
3	GANGARAMPUR	25° 24' 33.762"N	88° 31' 20.739"E
4	TAPAN	25° 18' 26.633"N	88° 32' 35.611"E
6	KUMARGANJ	25° 25' 30.281"N	88° 43' 52.544"E
5	BALURGHAT	25° 14' 24.423"N	88° 47' 23.213"E
7	HILLI	25° 15' 35.438"N	88° 55' 49.202"E

sl	Area_SqKM	Watershed
1	531.5388003	Tangaon
2	584.5891972	Punarvaba
3	415.1376462	Atrai

Plate 3B: District Watershed map showing ground water level during Pre-monsoon period *(Source: World Wild Fund for Nature, Sept 2020)*



SL	Name	Latitude	Longitude
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7	HILLI	25° 15' 35.438"N	88° 55' 49.202"E

sl	Area_SqKM	Watershed
1	531.5388003	Tangaon
2	584.5891972	Punarvaba
3	415.1376462	Atrai

Plate 3C: District Watershed map showing ground water level during Pre-monsoon period *(Source: World Wild Fund for Nature, Sept 2020)*

PLATE 4

FIELD SURVEY PHOTOGRAPHS

Picture of Riverbed deposit of Punarbhava River (Date: 28/12/2020, Lat: 25.4299° N Long: 88.5328° E

Picture of Riverbed deposit of Atrai River (Date: 28/12/2020, Lat: 25.3595° N Long: 88.7342° E

Picture of Riverbed deposit of Tangaon River (Date: 29/12/2020, Lat: 25.4393° N Long: 88.4213° E

PLATE 5

LONG TERM EROSION-ACCRETION MAP OF RIVER BANK

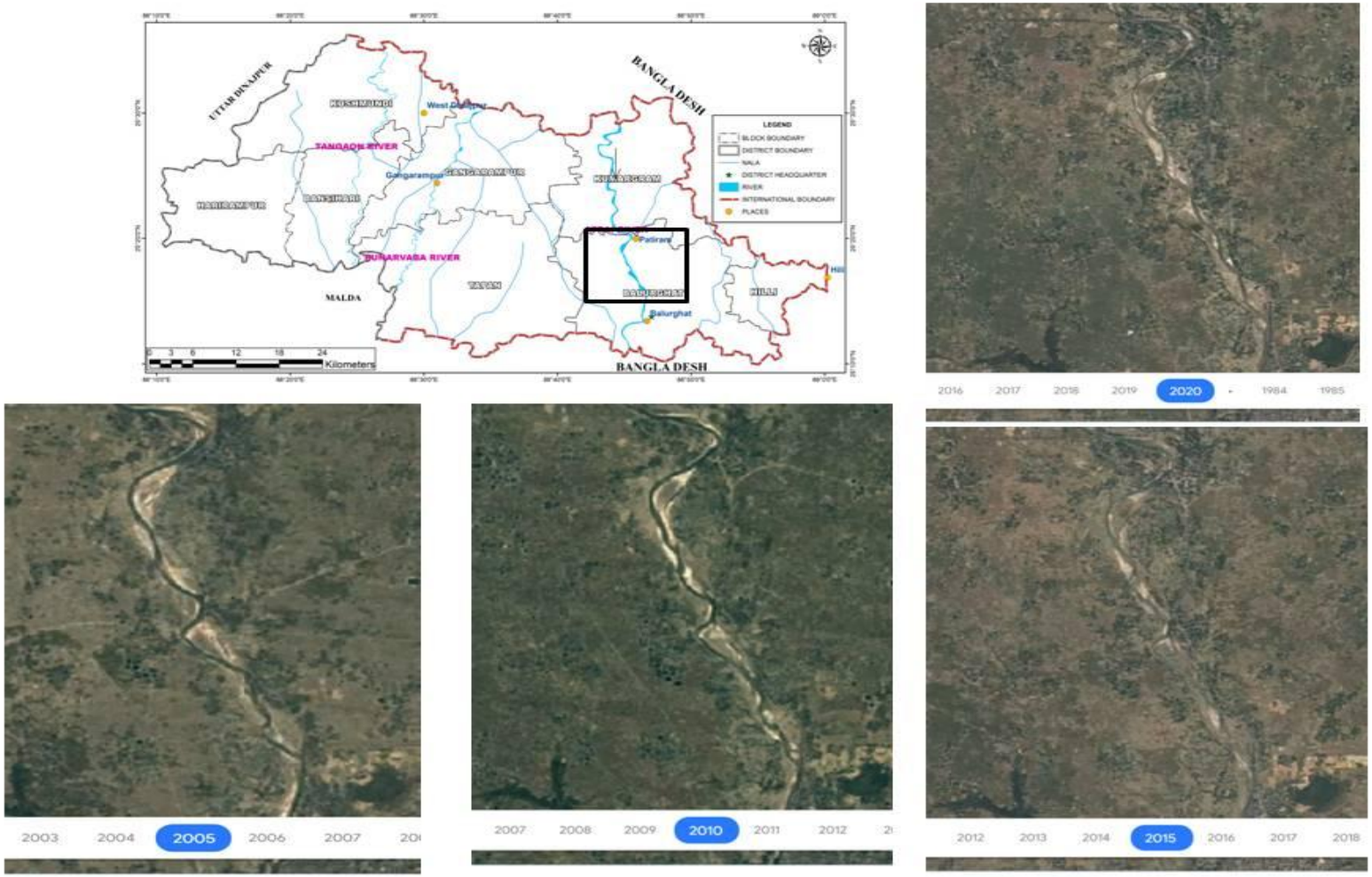


Plate 5A: Long term river course map showing very less erosion/ accretion along its banks
(Source: ISRO RESOURCE Sat 2 LISS III Sensor)

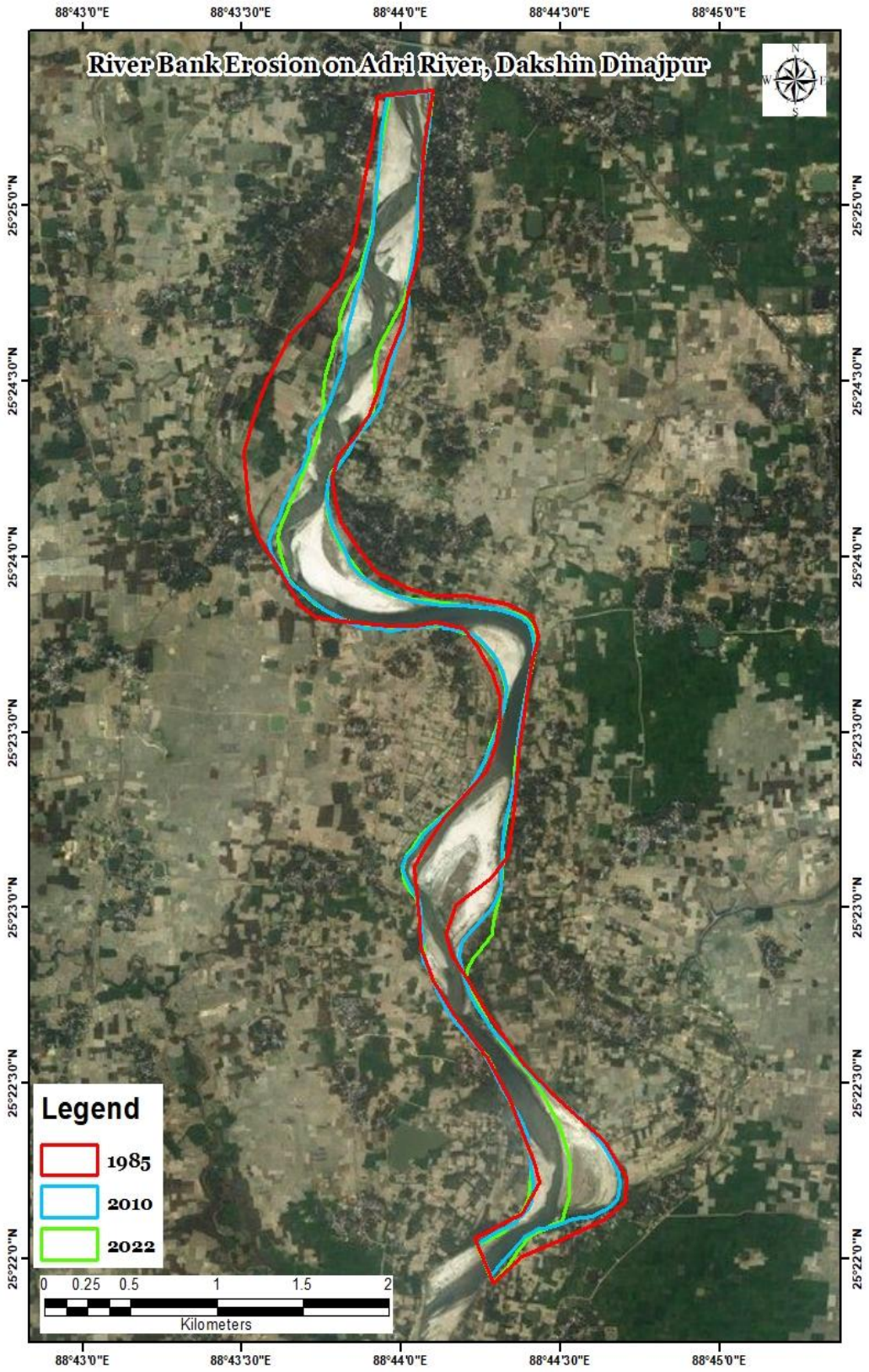


Plate 5B: Map showing long-term (10-year or more) erosion-accretion areas on both the banks of Adri River, Dakshin Dinajpur *(Source: ISRO RESOURCE Sat 2 LISS III Sensor)*

Annexure 1
Compliance as per Enforcement & Monitoring Guidelines for sand Mining, 2020 (MoEF& CC) for preparation of District Survey Report

Sl. No.	Particulars	Status
1	District Survey Report for sand mining shall be prepared before the auction/e-auction/grant of the mining lease/Letter of Intent (LoI) by Mining department or department dealing the mining activity in respective states.	Noted.
2	In order to make the inventory of River Bed Material, a detailed survey of the district needs to be carried out, to identify the source of River Bed Material and alternative source of sand (M-Sand). The source will include rivers, de-siltation of reservoir/dams, Patta lands/Khatedari Land, M-sand etc.	Complied with and explained in Chapter 7 pg no 56 to 86.
3	District Survey Report is to be prepared in such a way that it not only identifies the mineral-bearing area but also define the mining and no mining zones considering various environmental and social factors.	Complied with and furnished in pg no 84-85.
4	Identification of the source of Sand & M-Sand. The sources may be from Rivers, Lakes, Ponds, Dams, De-silting locations, Patta land/Khtedari lands. The details in case of Rivers such as [name, length of river, type (Perennial or Non-Perennial), Villages, Tehsil, District], in case of Lakes, Ponds, Dams, De-silting locations [Name, owned/maintained by (State Govt./PSU), area, Villages, Tehsil, District] in case of Patta land/Khtedari lands [Owner Name, Sy No, Area, Agricultural/Non-Agricultural, Villages, Tehsil, District], in case of M-Sand Plant [Owner Name, Sy No, Area, Quantity/Annum, Villages, Tehsil, District], needs to be recorded .	Complied with and given in table 7.3 pg 68-69.
5	Defining the sources of Sand/M-Sand in the district is the next step for identification of the potential area of deposition/aggradation wherein mining lease could be granted. Detailed survey needs to be carried out for quantification of minerals. The purpose of mining in the river bed is for channelization of rivers so as to avoid the possibility of flooding and to maintain the flow of the rivers. For this, the entire river stretch needs to be surveyed and original ground level (OGL) to be recorded and area of aggradation/deposition needs to be ascertained by comparing the level difference between the outside riverbed OGL and water level. Once the area of aggradation/deposition is identified, then the quantity of River Bed Material available needs to be calculated. The next step is channelization of the river bed and for this central ¾th part of the river, width needs to be identified on a map. Out of the ¾th part area, where there is a deposition/aggradation of the material needs to be identified. The remaining ¼th area needs to be kept as no mining zone for the protection of banks. The specific gravity of the material also needs to be ascertained by analyzing the sample from a NABL accredited lab. Thus, the quantity of material available in metric ton needs to be calculated for mining and no mining zone.	Complied with and given in table 7.11 pg 82 to 84.

Sl. No.	Particulars	Status
6	The permanent boundary pillars need to be erected after identification of an area of aggradation and deposition outside the bank of the river at a safe location for future surveying. The distance between boundary pillars on each side of the bank shall not be more than 100 meters.	Benchmark Pillars are established in strategic locations while boundary pillars will be fixed while fixation of the mining lease boundary subsequent to district level verification.
7	Identifying the mining and no mining zone shall follow with defining the area of sensitivity by ascertaining the distance of the mining area from the protected area, forest, bridges, important structures, habitation etc. and based on the sensitivity the area needs to be defined in sensitive and non-sensitive area.	Complied with and furnished in pg no 84 to 85.
8	Demand and supply of the Riverbed Material through market survey needs to be carried out. In addition to this future demand for the next 5 years also needs to be considered.	Complied with and given in pg no 5.
9	It is suggested that as far as possible the sensitive areas should be avoided for mining, unless local safety condition arises. Such deviation shall be temporary & shall not be a permanent feature.	Complied with and furnished in pg no 84 to 85.
10	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.	Noted. The DSR is compose of all the potential sand zones for defining the resources. In a subsequent phase blocking of potential zones shall be done in due consultation with the district level committee. The areas mentioned in the observation points shall be excluded while blocking of sand mining leases which are part of these potential zones marked in this DSR.
11	The final area selected for the mining should be then divided into mining lease as per the requirement of State Government. It is suggested the mining lease area should be so selected as to cover the entire deposition area. Dividing a large area of deposition/aggradation into smaller mining leases should be avoided as it leads to loss of mineral and indirectly promote illegal mining.	Shall be Complied with.
12	Cluster situation shall be examined. A cluster is formed when one mining lease of homogenous mineral is within 500 meters of the other mining lease. In order to reduce the cluster formation mining lease size should be defined in such a way that distance between any two clusters preferably should not be less than 2.5 Km. Mining lease should be defined in such a way that the total area of the mining leases in a cluster should not be more than 10 Ha.	Noted. Due care will be taken while distribution of mining leases either to prevent cluster situation or keeping the prescribed distance in between two mining clusters.
13	The number of a contiguous cluster needs to be ascertained. Contiguous cluster is formed when one cluster is at a distance of 2.5 Km from the other cluster.	Noted and shall be complied with.

Sl. No.	Particulars	Status
14	The mining outside the riverbed on Patta land/Khatedari land be granted when there is possibility of replenishment of material. In case, there is no replenishment then mining lease shall only be granted 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. Cluster situation as mentioned in para k above is also applicable for the mining in Patta land/Khatedari land.	Noted.
15	The State Government should define the transportation route from the mining lease considering the maximum production from the mines as at this stage the size of mining leases, their location, the quantity of mineral that can be mined safely etc. is available with the State Government. It is suggested that the transportation route should be selected in such a way that the movement of trucks/tippers/tractors from the villages having habitation should be avoided. The transportation route so selected should be verified by the State Government for its carrying capacity.	Noted and final transport route will be submitted during preparation of mine plan.
16	Potential site for mining having its impact on the forest, protected area, 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.	Shall be Complied with.
17	Public consultation-The Comments of the various stakeholders may be sought on the list of mining lease to be auctioned. The State Government shall give an advertisement in the local and national newspaper for seeking comments of the general public on the list of mining lease included in the DSR. The DSR should be placed in the public domain for at least one month from the date of publication of the advertisement for obtaining comments of the general public. The comments so received shall be placed before the sub-divisional committee for active consideration. The final list of sand mining areas [leases to be granted on riverbed &Patta land/Khatedari land, de-siltation location (ponds/lakes/dams), M-Sand Plants (alternate source of sand)] after the public hearing needs to be defined in the final DSR.	After publication of the West Bengal Sand Mining Policy, 2021, it is now eminent that State owned The West Bengal Mineral Development and Trading Corporation Limited (WBMDTCL) shall be responsible for mining of sand/ gravel/ river bed materials in whole state of West Bengal. However, the existing mining leases which were in effect before hand of this Gazzate notification July 2021 will be in operation till the year 2027-28. In order to have the rational distribution of mining leases as per the prevailing norms and guidelines grant of mining leases in the state of West Bengal shall be carried out in phases till all the blocks are under the ambit of WBMDTCL. This DSR thus consist of the identified potential sand deposite areas within which the existing and future mining leases shall occur. The details of the mining leases as and when granted shall follow the procedure described in EMGSM 2020 and prevailing norms.
18	The LOI should not be granted for mining area falling on both riverbed and outside riverbed. Therefore, in the same lease, both types of area should not be included.	Shall be Complied with.

Annexure 2
Estimation of Sand Resources based on sediment load comparison between Pre and Post Monsoon period of Dakshin Dinajpur District

Abbreviation used in the table as below

Particulars	Code	Details	Particulars	Code	Details
PERIOD	PO	POST MONSOON	BLOCK	TP	TAPAN
PERIOD	PR	PRE MONSOON	BLOCK	KM	KUSHMUNDI
DISTRICT	DD	DAKSHIN DINAJPUR	BLOCK	BA	BANSIHARI
BLOCK	KG	KUMARGRAM	RIVER	AR	ATRAI RIVER
BLOCK	BG	BALURGHAT	RIVER	PN	PUNARBHAVA RIVER
BLOCK	GR	GANGARAMPUR	RIVER	TG	TANGAON RIVER

SL No	Sand Bar_Code	RL (m)	Area in Sq. m	Sand Thickness in m.	Sand Volume in M. Cum	SL No	Sand Bar_Code	RL (m)	Area in Sq.m	Sand Thickness in m.	Sand Volume in M. Cum
Pre monsoon						Post monsoon					
Estimation of Sand Resources in Pre monsoon period & Post monsoon period in sand bar regions of Tangaon River											
1	PR_DD_KM_TG_01	28	8406	1.5	0.01	1	PO_DD_KM_TG_01	29	10826	2.5	0.03
2	PR_DD_KM_TG_02	28	7217	1.5	0.01	2	PO_DD_KM_TG_02	29	7123	2.5	0.02
3	PR_DD_KM_TG_03	28	100400	1.5	0.15	3	PO_DD_KM_TG_03A	29	25310	2.5	0.06
						4	PO_DD_KM_TG_03B	28	9048	2.5	0.02
						5	PO_DD_KM_TG_03C	28	4191	2.5	0.01
4	PR_DD_KM_TG_04	27	39470	1.5	0.06	6	PO_DD_KM_TG_04	28	16200	2.5	0.04
5	PR_DD_KM_TG_05	26	18570	1.5	0.03	7	PO_DD_KM_TG_05	27	12790	2.5	0.03
6	PR_DD_KM_TG_06	26	13690	1.5	0.02	8	PO_DD_KM_TG_06	27	12120	2.5	0.03
7	PR_DD_KM_TG_07	26	6572	1.5	0.01	9	PO_DD_KM_TG_07	27	13355	2.5	0.03
8	PR_DD_KM_TG_08	24.5	23880	1.5	0.04	10	PO_DD_BA_TG_08A	25	14303	2	0.03
						11	PO_DD_BA_TG_08B	25	18914	2	0.04
9	PR_DD_KM_TG_10	24.5	39970	1.5	0.06	12	PO_DD_BA_TG_09	25	17511	2	0.04
10	PR_DD_KM_TG_09	24.5	7511	1.5	0.01	13	PO_DD_BA_TG_10	25	29280	2	0.06
11	PR_DD_KM_TG_11	24.5	19260	1.5	0.03	14	PO_DD_BA_TG_11	25	11670	2	0.02
						15	PO_DD_BA_TG_11A	25	9016	2	0.02
12	PR_DD_BA_TG_12	24.5	26280	1.5	0.04	16	PO_DD_BA_TG_12	25	19460	2	0.04
13	PR_DD_BA_TG_13	24.5	14020	1.5	0.02	17	PO_DD_BA_TG_13	25	9983	2	0.02
14	PR_DD_BA_TG_14	24.5	16060	1.5	0.02	18	PO_DD_BA_TG_14	25	18140	2	0.04
15	PR_DD_BA_TG_15	24.5	17080	1.5	0.03	19	PO_DD_BA_TG_15	25	19347	2	0.04
Estimation of Sand Resources in Pre monsoon period & Post monsoon period in sand bar regions of Punarbhava River											
1	PR_DD_GR_PN_01	27.5	148700	1.5	0.22	1	PR_DD_GR_PN_01	28	119500	2	0.24
2	PR_DD_GR_PN_02	27.5	27420	1.5	0.04	2	PR_DD_GR_PN_02	28	21910	2	0.04
3	PR_DD_GR_PN_03	26.5	34520	1.5	0.05	3	PR_DD_GR_PN_03	27	28710	2	0.06
4	PR_DD_GR_PN_04	26.5	124600	1.5	0.19	4	PR_DD_GR_PN_04	27	124600	2	0.25
5	PR_DD_GR_PN_05	26.5	135900	1.5	0.2	5	PR_DD_GR_PN_05	27	135900	2	0.27
6	PR_DD_GR_PN_06	25.5	60060	1.5	0.09	6	PR_DD_GR_PN_06	26	60060	2	0.12

SL No	Sand Bar_Code	RL (m)	Area in Sq. m	Sand Thickness in m.	Sand Volume in M. Cum	SL No	Sand Bar_Code	RL (m)	Area in Sq.m	Sand Thickness in m.	Sand Volume in M. Cum
7	PR_DD_GR_PN_07	24.5	64810	1.5	0.1	7	PR_DD_GR_PN_07	25	88750	2	0.18
8	PR_DD_GR_PN_08	23.5	38570	1.5	0.06	8	PR_DD_GR_PN_08	24	34190	2	0.07
9	PR_DD_GR_PN_09	23.5	10400	1.5	0.02	9	PR_DD_GR_PN_09	24	17998	2	0.04
10	PR_DD_GR_PN_10	23.5	10860	1.5	0.02	10	PR_DD_GR_PN_10	24	10860	2	0.02
11	PR_DD_GR_PN_11	23.5	11780	1.5	0.02	11	PR_DD_GR_PN_11	24	16780	2	0.03
12	PR_DD_TP_PN_12	23.5	33710	1.5	0.05	12	PR_DD_TP_PN_12	24	29770	2	0.06
13	PR_DD_TP_PN_13	23.5	24270	1.5	0.04	13	PR_DD_TP_PN_13	24	36830	2	0.07
14	PR_DD_TP_PN_14	23.5	17430	1.5	0.03	14	PR_DD_TP_PN_14	24	12510	2	0.03
15	PR_DD_TP_PN_15	23.5	35300	1.5	0.05	15	PR_DD_TP_PN_15	24	15280	2	0.03
16	PR_DD_TP_PN_16	23.5	17610	1.5	0.03	16	PR_DD_TP_PN_16	24	11670	2	0.02
17	PR_DD_TP_PN_17	23.5	11890	1.5	0.02	17	PR_DD_TP_PN_17	24	10820	2	0.02
18	PR_DD_TP_PN_18	23.5	28280	1.5	0.04	18	PR_DD_TP_PN_18	24	28241	2	0.06
19	PR_DD_TP_PN_19	23.5	17550	1.5	0.03	19	PR_DD_TP_PN_19	24	27550	2	0.06
Estimation of Sand Resources in Pre monsoon period & Post monsoon period in sand bar regions of Atrayee River											
1	PR_DD_KR_AR_01	27.5	116400	2.5	0.29	1	PO_DD_KR_AR_01	28	116400	3	0.35
2	PR_DD_KR_AR_02	26.5	8705	2.5	0.02	2	PO_DD_KR_AR_02	27	8705	3	0.03
3	PR_DD_KR_AR_03	26.5	45090	2.5	0.11	3	PO_DD_KR_AR_03	27	45090	3	0.14
4	PR_DD_KR_AR_04	26.5	71210	2.5	0.18	4	PO_DD_KR_AR_04	27	71210	3	0.21
5	PR_DD_KR_AR_05	24.5	165000	2.5	0.41	5	PO_DD_KR_AR_05	25	165000	3	0.5
6	PR_DD_KR_AR_06	24.5	131000	2.5	0.33	6	PO_DD_KR_AR_06	25	135500	3	0.41
7	PR_DD_KR_AR_07	24.5	117500	2.5	0.29	7	PO_DD_KR_AR_07	25	117500	3	0.35
8	PR_DD_KR_AR_08	24.5	30500	2.5	0.08	8	PO_DD_KR_AR_08	25	30500	3	0.09
9	PR_DD_KR_AR_09	24.5	89060	2.5	0.22	9	PO_DD_KR_AR_09	25	89060	3	0.27
10	PR_DD_KR_AR_10	24.5	29950	2.5	0.07	10	PO_DD_KR_AR_10	25	29950	3	0.09
11	PR_DD_KR_AR_11	24.5	41680	2.5	0.1	11	PO_DD_KR_AR_11	25	41680	3	0.13
12	PR_DD_KR_AR_12	24.5	45360	2.5	0.11	12	PO_DD_KR_AR_12	25	45360	3	0.14
13	PR_DD_KR_AR_13	24.5	62060	2.5	0.16	13	PO_DD_KR_AR_13	25	62060	3	0.19
14	PR_DD_KR_AR_14	24.5	26900	2.5	0.07	14	PO_DD_KR_AR_14	25	26900	3	0.08
15	PR_DD_KR_AR_15	24.5	80080	2.5	0.2	15	PO_DD_KR_AR_15	25	80080	3	0.24
16	PR_DD_KR_AR_16	23.5	135300	2.5	0.34	16	PO_DD_KR_AR_16	24	135300	3	0.41
17	PR_DD_KR_AR_17	23.5	96620	2.5	0.24	17	PO_DD_KR_AR_17	24	96620	3	0.29
18	PR_DD_KR_AR_18	23.5	123300	2.5	0.31	18	PO_DD_KR_AR_18	24	123300	3	0.37
19	PR_DD_KR_AR_19	23.5	75340	2.5	0.19	19	PO_DD_KR_AR_19	24	75340	3	0.23
20	PR_DD_KR_AR_20	22.5	229500	2.5	0.57	20	PO_DD_KR_AR_20	23	229500	3	0.69
21	PR_DD_KR_AR_21	22.5	41990	2.5	0.1	21	PO_DD_KR_AR_21	23	41990	3	0.13
22	PR_DD_KR_AR_22	22.5	94280	2.5	0.24	22	PO_DD_KR_AR_22	23	100100	3	0.3
23	PR_DD_KR_AR_23	22.5	16920	2.5	0.04	23	PO_DD_KR_AR_23	23	16920	3	0.05
24	PR_DD_KR_AR_24	22.5	12170	2.5	0.03	24	PO_DD_KR_AR_24	23	12170	3	0.04
25	PR_DD_BG_AR_25	22.5	54980	2.5	0.14	25	PO_DD_BG_AR_25	23	54940	3	0.16
26	PR_DD_KR_AR_26	22.5	303300	2.5	0.76	26	PO_DD_BG_AR_26	23	303300	3	0.91

SL No	Sand Bar_Code	RL (m)	Area in Sq. m	Sand Thickness in m.	Sand Volume in M. Cum	SL No	Sand Bar_Code	RL (m)	Area in Sq.m	Sand Thickness in m.	Sand Volume in M. Cum
27	PR_DD_BG_AR_27	20.5	54940	2.5	0.14	27	PO_DD_BG_AR_27	21	54940	3	0.16
28	PR_DD_BG_AR_28	20.5	46690	2.5	0.12	28	PO_DD_BG_AR_28	21	46690	3	0.14
29	PR_DD_BG_AR_29	19.5	245400	2.5	0.61	29	PO_DD_BG_AR_29	20	240600	3	0.72
30	PR_DD_BG_AR_30	19.5	37990	2.5	0.09	30	PO_DD_BG_AR_30	20	37990	3	0.11
31	PR_DD_BG_AR_31	19.5	140500	2.5	0.35	31	PO_DD_BG_AR_31	20	140500	3	0.42
32	PR_DD_BG_AR_32	19.5	23820	2.5	0.06	32	PO_DD_BG_AR_32	20	23820	3	0.07
33	PR_DD_BG_AR_33	19.5	12790	2.5	0.03	33	PO_DD_BG_AR_33	20	11850	3	0.04
34	PR_DD_BG_AR_34	19.5	65030	2.5	0.16	34	PO_DD_BG_AR_34	20	65030	3	0.2
35	PR_DD_BG_AR_35	17.5	49580	2.5	0.12	35	PO_DD_BG_AR_35	18	49580	3	0.15
36	PR_DD_BG_AR_36	17.5	59760	2.5	0.15	36	PO_DD_BG_AR_36	18	59760	3	0.18
37	PR_DD_BG_AR_37	17.5	19350	2.5	0.05	37	PO_DD_BG_AR_37	18	18840	3	0.06
38	PR_DD_BG_AR_38	17.5	28020	2.5	0.07	38	PO_DD_BG_AR_38	18	40590	3	0.12

Annexure 3
Boundary Coordinates of Potential Blocks of Dakshin Dinajpur District

Abbreviation used in the table as below

Particulars	Code	Details	Particulars	Code	Details
DISTRICT	DD	DAKSHIN DINAJPUR	BLOCK	KM	KUSHMUNDI
BLOCK	KR	KUMARGRAM	BLOCK	BA	BANSIHARI
BLOCK	BG	BALURGHAT	RIVER	AR	ATRAI RIVER
BLOCK	GR	GANGARAMPUR	RIVER	PN	PUNARBHAVA RIVER
BLOCK	TP	TAPAN	RIVER	TG	TANGAON RIVER

DD_KR_AR_01		
POINT NO	**LATITUDE**	**LONGITUDE**
1	25° 28' 36.902" N	88° 44' 42.757" E
2	25° 28' 36.902" N	88° 44' 41.601" E
3	25° 28' 39.729" N	88° 44' 40.316" E
4	25° 28' 43.326" N	88° 44' 39.802" E
5	25° 28' 46.153" N	88° 44' 39.802" E
6	25° 28' 54.309" N	88° 44' 40.467" E
7	25° 28' 59.706" N	88° 44' 40.724" E
8	25° 29' 3.646" N	88° 44' 42.094" E
9	25° 29' 3.976" N	88° 44' 42.377" E
10	25° 28' 55.695" N	88° 44' 44.212" E
11	25° 28' 43.179" N	88° 44' 45.840" E
12	25° 28' 38.302" N	88° 44' 44.357" E
13	25° 28' 36.902" N	88° 44' 42.757" E

DD_KR_AR_02		
POINT NO	**LATITUDE**	**LONGITUDE**
1	25° 28' 39.808" N	88° 44' 34.826" E
2	25° 28' 39.783" N	88° 44' 36.497" E
3	25° 28' 39.823" N	88° 44' 37.343" E
4	25° 28' 37.356" N	88° 44' 36.864" E
5	25° 28' 36.054" N	88° 44' 35.493" E
6	25° 28' 35.780" N	88° 44' 33.369" E
7	25° 28' 35.883" N	88° 44' 33.380" E
8	25° 28' 37.921" N	88° 44' 34.165" E
9	25° 28' 39.808" N	88° 44' 34.826" E

DD_KR_AR_03		
POINT NO	**LATITUDE**	**LONGITUDE**
1	25° 28' 24.519" N	88° 44' 32.249" E
2	25° 28' 24.404" N	88° 44' 29.685" E
3	25° 28' 24.610" N	88° 44' 27.784" E
4	25° 28' 25.586" N	88° 44' 26.704" E
5	25° 28' 26.974" N	88° 44' 26.499" E
6	25° 28' 28.310" N	88° 44' 26.961" E
7	25° 28' 28.464" N	88° 44' 28.041" E
8	25° 28' 28.516" N	88° 44' 30.148" E
9	25° 28' 28.567" N	88° 44' 32.923" E
10	25° 28' 29.132" N	88° 44' 34.516" E
11	25° 28' 30.520" N	88° 44' 36.007" E
12	25° 28' 32.576" N	88° 44' 37.138" E
13	25° 28' 32.884" N	88° 44' 38.988" E
14	25° 28' 29.235" N	88° 44' 38.834" E
15	25° 28' 27.950" N	88° 44' 38.320" E
16	25° 28' 26.149" N	88° 44' 36.390" E
17	25° 28' 24.519" N	88° 44' 32.249" E

DD_KR_AR_04		
POINT NO	**LATITUDE**	**LONGITUDE**
1	25° 28' 24.539" N	88° 44' 22.524" E
2	25° 28' 22.689" N	88° 44' 20.468" E
3	25° 28' 22.072" N	88° 44' 18.892" E
4	25° 28' 23.374" N	88° 44' 18.207" E
5	25° 28' 23.237" N	88° 44' 15.534" E
6	25° 28' 21.661" N	88° 44' 11.902" E
7	25° 28' 21.113" N	88° 44' 8.339" E
8	25° 28' 20.633" N	88° 44' 2.514" E
9	25° 28' 21.113" N	88° 43' 57.305" E
10	25° 28' 22.003" N	88° 44' 0.184" E
11	25° 28' 24.587" N	88° 44' 12.433" E
12	25° 28' 28.740" N	88° 44' 20.990" E
13	25° 28' 30.234" N	88° 44' 27.134" E
14	25° 28' 29.062" N	88° 44' 26.156" E
15	25° 28' 26.458" N	88° 44' 23.415" E
16	25° 28' 24.539" N	88° 44' 22.524" E

DD_KR_AR_05		
POINT NO	**LATITUDE**	**LONGITUDE**
1	25° 28' 11.252" N	88° 43' 43.016" E
2	25° 28' 0.368" N	88° 43' 36.220" E
3	25° 28' 3.909" N	88° 43' 34.916" E
4	25° 28' 8.706" N	88° 43' 34.779" E
5	25° 28' 12.364" N	88° 43' 36.706" E
6	25° 28' 15.447" N	88° 43' 39.104" E
7	25° 28' 17.289" N	88° 43' 42.616" E
8	25° 28' 18.617" N	88° 43' 48.484" E
9	25° 28' 18.831" N	88° 43' 51.525" E
10	25° 28' 17.589" N	88° 43' 54.223" E
11	25° 28' 16.686" N	88° 43' 55.376" E
12	25° 27' 53.090" N	88° 43' 46.603" E
13	25° 27' 52.894" N	88° 43' 45.173" E
14	25° 27' 53.108" N	88° 43' 42.496" E
15	25° 27' 54.822" N	88° 43' 39.820" E
16	25° 27' 57.284" N	88° 43' 37.357" E
17	25° 27' 59.112" N	88° 43' 36.683" E
18	25° 27' 53.844" N	88° 43' 44.733" E

DD_KR_AR_06		
POINT NO	**LATITUDE**	**LONGITUDE**
1	25° 27' 54.917" N	88° 43' 36.718" E
2	25° 27' 52.048" N	88° 43' 37.545" E
3	25° 27' 54.860" N	88° 43' 32.389" E
4	25° 28' 3.277" N	88° 43' 26.214" E
5	25° 28' 10.698" N	88° 43' 25.209" E
6	25° 28' 15.034" N	88° 43' 30.824" E
7	25° 28' 16.857" N	88° 43' 35.717" E
8	25° 28' 11.299" N	88° 43' 32.114" E
9	25° 28' 8.408" N	88° 43' 31.043" E
10	25° 28' 3.804" N	88° 43' 31.472" E
11	25° 28' 0.056" N	88° 43' 33.506" E
12	25° 27' 54.917" N	88° 43' 36.718" E

DD_KR_AR_07		
POINT NO	**LATITUDE**	**LONGITUDE**

1	25° 27' 28.267" N	88° 43' 51.284" E
2	25° 27' 27.731" N	88° 43' 45.288" E
3	25° 27' 28.166" N	88° 43' 43.322" E
4	25° 27' 31.066" N	88° 43' 49.287" E
5	25° 27' 39.573" N	88° 43' 54.928" E
6	25° 27' 44.578" N	88° 43' 53.360" E
7	25° 27' 44.221" N	88° 43' 56.102" E
8	25° 27' 43.257" N	88° 43' 59.207" E
9	25° 27' 41.865" N	88° 44' 0.706" E
10	25° 27' 37.689" N	88° 44' 1.456" E
11	25° 27' 35.655" N	88° 44' 1.028" E
12	25° 27' 32.764" N	88° 43' 58.565" E
13	25° 27' 30.301" N	88° 43' 55.460" E
14	25° 27' 28.267" N	88° 43' 51.284" E

DD_KR_AR_08		
POINT NO	**LATITUDE**	**LONGITUDE**
1	25° 27' 24.835" N	88° 43' 5.768" E
2	25° 27' 24.784" N	88° 43' 4.740" E
3	25° 27' 24.938" N	88° 43' 4.226" E
4	25° 27' 25.760" N	88° 43' 3.866" E
5	25° 27' 27.611" N	88° 43' 3.866" E
6	25° 27' 28.768" N	88° 43' 4.784" E
7	25° 27' 30.891" N	88° 43' 7.223" E
8	25° 27' 30.288" N	88° 43' 13.058" E
9	25° 27' 29.615" N	88° 43' 11.884" E
10	25° 27' 28.125" N	88° 43' 10.137" E
11	25° 27' 26.583" N	88° 43' 8.081" E
12	25° 27' 24.835" N	88° 43' 5.768" E

DD_KR_AR_09		
POINT NO	**LATITUDE**	**LONGITUDE**
1	25° 27' 28.315" N	88° 43' 20.023" E
2	25° 27' 26.610" N	88° 43' 21.554" E
3	25° 27' 26.688" N	88° 43' 16.933" E
4	25° 27' 24.359" N	88° 43' 8.538" E
5	25° 27' 16.431" N	88° 43' 4.207" E
6	25° 27' 7.138" N	88° 43' 4.681" E
7	25° 27' 0.395" N	88° 43' 6.727" E

8	25° 27' 1.332" N	88° 43' 5.568" E
9	25° 27' 7.114" N	88° 43' 2.891" E
10	25° 27' 11.075" N	88° 43' 2.356" E
11	25° 27' 15.680" N	88° 43' 2.463" E
12	25° 27' 19.427" N	88° 43' 3.319" E
13	25° 27' 22.854" N	88° 43' 4.818" E
14	25° 27' 25.745" N	88° 43' 8.887" E
15	25° 27' 27.672" N	88° 43' 12.421" E
16	25° 27' 28.315" N	88° 43' 14.883" E
17	25° 27' 28.636" N	88° 43' 17.989" E
18	25° 27' 28.315" N	88° 43' 20.023" E

DD_KR_AR_10		
POINT NO	**LATITUDE**	**LONGITUDE**
1	25° 26' 43.023" N	88° 43' 8.655" E
2	25° 26' 44.950" N	88° 43' 8.441" E
3	25° 26' 45.378" N	88° 43' 9.404" E
4	25° 26' 43.986" N	88° 43' 12.831" E
5	25° 26' 42.809" N	88° 43' 13.473" E
6	25° 26' 40.679" N	88° 43' 15.340" E
7	25° 26' 39.103" N	88° 43' 16.231" E
8	25° 26' 36.293" N	88° 43' 15.409" E
9	25° 26' 35.882" N	88° 43' 13.970" E
10	25° 26' 37.047" N	88° 43' 12.668" E
11	25° 26' 38.966" N	88° 43' 12.119" E
12	25° 26' 41.524" N	88° 43' 10.154" E
13	25° 26' 43.023" N	88° 43' 8.655" E

DD_KR_AR_11		
POINT NO	**LATITUDE**	**LONGITUDE**
1	25° 26' 31.780" N	88° 43' 32.961" E
2	25° 26' 31.244" N	88° 43' 27.821" E
3	25° 26' 31.459" N	88° 43' 23.860" E
4	25° 26' 32.851" N	88° 43' 22.575" E
5	25° 26' 35.527" N	88° 43' 21.718" E
6	25° 26' 37.961" N	88° 43' 21.237" E
7	25° 26' 34.773" N	88° 43' 24.658" E
8	25° 26' 32.381" N	88° 43' 35.704" E
9	25° 26' 31.780" N	88° 43' 32.961" E

DD_KR_AR_12		
POINT NO	**LATITUDE**	**LONGITUDE**
1	25° 26' 24.137" N	88° 44' 0.316" E
2	25° 26' 22.959" N	88° 44' 0.423" E
3	25° 26' 22.317" N	88° 43' 58.175" E
4	25° 26' 23.066" N	88° 43' 55.712" E
5	25° 26' 25.101" N	88° 43' 49.288" E
6	25° 26' 26.600" N	88° 43' 45.005" E
7	25° 26' 27.885" N	88° 43' 45.112" E
8	25° 26' 28.313" N	88° 43' 47.360" E
9	25° 26' 28.313" N	88° 43' 50.572" E
10	25° 26' 27.670" N	88° 43' 54.748" E
11	25° 26' 27.456" N	88° 43' 57.318" E
12	25° 26' 26.385" N	88° 43' 58.496" E
13	25° 26' 24.137" N	88° 44' 0.316" E

DD_KR_AR_13		
POINT NO	**LATITUDE**	**LONGITUDE**
1	25° 26' 26.422" N	88° 44' 6.703" E
2	25° 26' 16.009" N	88° 44' 10.276" E
3	25° 26' 18.258" N	88° 44' 7.671" E
4	25° 26' 21.470" N	88° 44' 3.944" E
5	25° 26' 25.197" N	88° 44' 0.989" E
6	25° 26' 28.053" N	88° 43' 58.625" E
7	25° 26' 26.422" N	88° 44' 6.703" E

DD_KR_AR_14		
POINT NO	**LATITUDE**	**LONGITUDE**
1	25° 25' 42.601" N	88° 44' 7.832" E
2	25° 25' 33.666" N	88° 44' 6.307" E
3	25° 25' 33.812" N	88° 44' 5.144" E
4	25° 25' 34.454" N	88° 44' 4.180" E
5	25° 25' 40.986" N	88° 44' 5.251" E
6	25° 25' 42.980" N	88° 44' 5.607" E
7	25° 25' 42.601" N	88° 44' 7.832" E

DD_KR_AR_15		
POINT NO	**LATITUDE**	**LONGITUDE**
1	25° 24' 56.228" N	88° 43' 57.721" E
2	25° 24' 53.753" N	88° 43' 55.500" E
3	25° 25' 13.498" N	88° 43' 56.628" E
4	25° 25' 13.410" N	88° 43' 59.071" E
5	25° 25' 11.225" N	88° 43' 59.842" E
6	25° 25' 5.829" N	88° 44' 0.613" E
7	25° 25' 0.982" N	88° 44' 0.805" E
8	25° 24' 56.228" N	88° 43' 57.721" E

DD_KR_AR_16		
POINT NO	**LATITUDE**	**LONGITUDE**
1	25° 24' 23.311" N	88° 43' 50.695" E
2	25° 24' 20.582" N	88° 43' 50.280" E
3	25° 24' 22.473" N	88° 43' 48.898" E
4	25° 24' 25.813" N	88° 43' 48.127" E
5	25° 24' 30.182" N	88° 43' 48.641" E
6	25° 24' 34.422" N	88° 43' 51.083" E
7	25° 24' 37.763" N	88° 43' 53.395" E
8	25° 24' 41.104" N	88° 43' 55.194" E
9	25° 24' 43.545" N	88° 43' 56.094" E
10	25° 24' 47.271" N	88° 43' 55.965" E
11	25° 24' 51.383" N	88° 43' 55.708" E
12	25° 24' 52.584" N	88° 43' 58.445" E
13	25° 24' 53.237" N	88° 44' 0.903" E
14	25° 24' 39.475" N	88° 43' 58.254" E
15	25° 24' 23.311" N	88° 43' 50.695" E

DD_KR_AR_17		
POINT NO	**LATITUDE**	**LONGITUDE**
1	25° 24' 12.900" N	88° 43' 44.144" E
2	25° 24' 12.043" N	88° 43' 40.396" E
3	25° 24' 12.497" N	88° 43' 39.456" E
4	25° 24' 28.335" N	88° 43' 42.500" E
5	25° 24' 35.941" N	88° 43' 46.615" E
6	25° 24' 30.460" N	88° 43' 47.035" E
7	25° 24' 26.606" N	88° 43' 46.500" E

8	25° 24' 22.109" N	88° 43' 45.750" E
9	25° 24' 17.183" N	88° 43' 45.322" E
10	25° 24' 12.900" N	88° 43' 44.144" E

DD_KR_AR_18		
POINT NO	**LATITUDE**	**LONGITUDE**
1	25° 23' 52.427" N	88° 44' 0.184" E
2	25° 23' 51.142" N	88° 43' 55.473" E
3	25° 23' 51.678" N	88° 43' 53.117" E
4	25° 23' 57.353" N	88° 43' 47.335" E
5	25° 24' 1.743" N	88° 43' 41.553" E
6	25° 24' 3.164" N	88° 43' 40.402" E
7	25° 24' 4.586" N	88° 43' 40.234" E
8	25° 24' 9.452" N	88° 43' 44.337" E
9	25° 24' 11.594" N	88° 43' 45.729" E
10	25° 24' 7.632" N	88° 43' 48.406" E
11	25° 24' 3.349" N	88° 43' 50.226" E
12	25° 24' 0.565" N	88° 43' 51.190" E
13	25° 23' 57.888" N	88° 43' 53.652" E
14	25° 23' 57.554" N	88° 43' 54.199" E
15	25° 23' 57.172" N	88° 43' 54.403" E
16	25° 23' 56.942" N	88° 43' 55.200" E
17	25° 23' 55.532" N	88° 43' 57.507" E
18	25° 23' 53.926" N	88° 44' 0.719" E
19	25° 23' 52.427" N	88° 44' 0.184" E

DD_KR_AR_19		
POINT NO	**LATITUDE**	**LONGITUDE**
1	25° 23' 25.463" N	88° 44' 18.624" E
2	25° 23' 21.715" N	88° 44' 14.876" E
3	25° 23' 23.825" N	88° 44' 15.186" E
4	25° 23' 31.192" N	88° 44' 17.808" E
5	25° 23' 31.382" N	88° 44' 17.782" E
6	25° 23' 32.638" N	88° 44' 18.476" E
7	25° 23' 43.429" N	88° 44' 18.125" E
8	25° 23' 47.940" N	88° 44' 11.985" E
9	25° 23' 47.991" N	88° 44' 12.392" E
10	25° 23' 48.077" N	88° 44' 14.705" E
11	25° 23' 47.734" N	88° 44' 16.675" E

12	25° 23' 46.621" N	88° 44' 19.416" E
13	25° 23' 44.137" N	88° 44' 21.301" E
14	25° 23' 42.166" N	88° 44' 21.643" E
15	25° 23' 38.140" N	88° 44' 21.729" E
16	25° 23' 35.913" N	88° 44' 21.044" E
17	25° 23' 33.515" N	88° 44' 19.588" E
18	25° 23' 28.568" N	88° 44' 19.159" E
19	25° 23' 25.463" N	88° 44' 18.624" E

DD_KR_AR_20		
POINT NO	**LATITUDE**	**LONGITUDE**
1	25° 22' 52.764" N	88° 44' 13.456" E
2	25° 22' 50.708" N	88° 44' 11.828" E
3	25° 22' 53.220" N	88° 44' 9.698" E
4	25° 22' 56.968" N	88° 44' 7.878" E
5	25° 23' 0.073" N	88° 44' 6.164" E
6	25° 23' 4.142" N	88° 44' 5.094" E
7	25° 23' 5.654" N	88° 44' 4.932" E
8	25° 23' 12.740" N	88° 44' 7.481" E
9	25° 23' 14.593" N	88° 44' 8.505" E
10	25° 23' 15.278" N	88° 44' 9.484" E
11	25° 23' 19.346" N	88° 44' 16.444" E
12	25° 23' 20.031" N	88° 44' 18.538" E
13	25° 23' 12.627" N	88° 44' 17.077" E
14	25° 23' 3.666" N	88° 44' 15.468" E
15	25° 22' 53.474" N	88° 44' 13.725" E
16	25° 22' 52.764" N	88° 44' 13.456" E

DD_KR_AR_21		
POINT NO	**LATITUDE**	**LONGITUDE**
1	25° 22' 8.372" N	88° 44' 26.162" E
2	25° 22' 7.693" N	88° 44' 23.270" E
3	25° 22' 19.429" N	88° 44' 25.427" E
4	25° 22' 18.480" N	88° 44' 26.505" E
5	25° 22' 16.424" N	88° 44' 27.618" E
6	25° 22' 14.197" N	88° 44' 28.218" E
7	25° 22' 11.285" N	88° 44' 28.646" E
8	25° 22' 8.886" N	88° 44' 27.533" E
9	25° 22' 8.372" N	88° 44' 26.162" E

DD_KR_AR_22		
POINT NO	**LATITUDE**	**LONGITUDE**
1	25° 21' 20.117" N	88° 44' 7.855" E
2	25° 21' 19.814" N	88° 44' 6.340" E
3	25° 21' 22.277" N	88° 44' 5.269" E
4	25° 21' 27.845" N	88° 44' 3.663" E
5	25° 21' 32.128" N	88° 44' 3.021" E
6	25° 21' 37.910" N	88° 44' 2.592" E
7	25° 21' 44.013" N	88° 44' 3.021" E
8	25° 21' 46.476" N	88° 44' 5.805" E
9	25° 21' 48.618" N	88° 44' 9.231" E
10	25° 21' 46.784" N	88° 44' 9.438" E
11	25° 21' 43.443" N	88° 44' 8.239" E
12	25° 21' 40.351" N	88° 44' 7.704" E
13	25° 21' 36.495" N	88° 44' 5.968" E
14	25° 21' 20.250" N	88° 44' 7.790" E
15	25° 21' 20.117" N	88° 44' 7.855" E

DD_KR_AR_23		
POINT NO	**LATITUDE**	**LONGITUDE**
1	25° 20' 57.407" N	88° 44' 15.034" E
2	25° 20' 57.133" N	88° 44' 16.953" E
3	25° 20' 53.396" N	88° 44' 17.733" E
4	25° 20' 51.148" N	88° 44' 17.626" E
5	25° 20' 50.934" N	88° 44' 16.555" E
6	25° 20' 51.790" N	88° 44' 14.842" E
7	25° 20' 53.433" N	88° 44' 14.143" E
8	25° 20' 55.420" N	88° 44' 13.732" E
9	25° 20' 56.859" N	88° 44' 14.075" E
10	25° 20' 57.407" N	88° 44' 15.034" E

DD_KR_AR_24		
POINT NO	**LATITUDE**	**LONGITUDE**
1	25° 20' 38.839" N	88° 44' 24.768" E
2	25° 20' 38.633" N	88° 44' 23.329" E
3	25° 20' 39.182" N	88° 44' 21.753" E
4	25° 20' 40.117" N	88° 44' 20.642" E

5	25° 20' 41.543" N	88° 44' 19.681" E
6	25° 20' 42.801" N	88° 44' 19.855" E
7	25° 20' 42.468" N	88° 44' 21.844" E
8	25° 20' 41.440" N	88° 44' 24.071" E
9	25° 20' 40.621" N	88° 44' 24.837" E
10	25° 20' 38.839" N	88° 44' 24.768" E

DD_BG_AR_25		
POINT NO	**LATITUDE**	**LONGITUDE**
1	25° 20' 9.017" N	88° 45' 31.631" E
2	25° 20' 6.989" N	88° 45' 32.588" E
3	25° 20' 7.064" N	88° 45' 30.570" E
4	25° 20' 8.687" N	88° 45' 26.076" E
5	25° 20' 15.848" N	88° 45' 21.449" E
6	25° 20' 16.158" N	88° 45' 20.631" E
7	25° 20' 16.326" N	88° 45' 20.852" E
8	25° 20' 16.755" N	88° 45' 22.394" E
9	25° 20' 16.069" N	88° 45' 26.677" E
10	25° 20' 14.699" N	88° 45' 28.048" E
11	25° 20' 12.557" N	88° 45' 29.247" E
12	25° 20' 10.758" N	88° 45' 30.446" E

DD_BG_AR_26		
POINT NO	**LATITUDE**	**LONGITUDE**
1	25° 19' 0.452" N	88° 44' 47.528" E
2	25° 18' 59.938" N	88° 44' 46.372" E
3	25° 19' 1.737" N	88° 44' 44.830" E
4	25° 19' 5.335" N	88° 44' 43.545" E
5	25° 19' 7.923" N	88° 44' 42.722" E
6	25° 19' 8.532" N	88° 44' 42.658" E
7	25° 19' 11.888" N	88° 44' 42.774" E
8	25° 19' 16.513" N	88° 44' 43.160" E
9	25° 19' 21.268" N	88° 44' 44.573" E
10	25° 19' 22.432" N	88° 44' 45.177" E
11	25° 19' 25.316" N	88° 44' 47.407" E
12	25° 19' 26.536" N	88° 44' 49.584" E
13	25° 19' 29.877" N	88° 44' 53.182" E
14	25° 19' 33.547" N	88° 44' 55.787" E
15	25° 19' 34.229" N	88° 44' 57.407" E

16	25° 19' 35.659" N	88° 45' 2.819" E
17	25° 19' 35.659" N	88° 45' 8.858" E
18	25° 19' 30.000" N	88° 45' 7.443" E
19	25° 19' 28.022" N	88° 45' 5.797" E
20	25° 19' 22.443" N	88° 45' 2.913" E
21	25° 19' 21.910" N	88° 44' 59.606" E
22	25° 19' 20.882" N	88° 44' 56.394" E
23	25° 19' 17.670" N	88° 44' 51.640" E
24	25° 19' 14.201" N	88° 44' 49.841" E
25	25° 19' 8.162" N	88° 44' 49.070" E
26	25° 19' 4.821" N	88° 44' 48.942" E

DD_BG_AR_27		
POINT NO	**LATITUDE**	**LONGITUDE**
1	25° 17' 57.431" N	88° 45' 14.361" E
2	25° 17' 57.003" N	88° 45' 11.256" E
3	25° 17' 59.251" N	88° 45' 9.222" E
4	25° 18' 1.393" N	88° 45' 8.579" E
5	25° 18' 4.391" N	88° 45' 8.151" E
6	25° 18' 10.494" N	88° 45' 9.864" E
7	25° 18' 12.053" N	88° 45' 10.317" E
8	25° 18' 3.028" N	88° 45' 14.243" E
9	25° 18' 2.249" N	88° 45' 13.826" E
10	25° 17' 59.680" N	88° 45' 13.612" E
11	25° 17' 57.431" N	88° 45' 14.361" E

DD_BG_AR_28		
POINT NO	**LATITUDE**	**LONGITUDE**
1	25° 17' 45.557" N	88° 45' 27.316" E
2	25° 17' 45.295" N	88° 45' 27.248" E
3	25° 17' 45.010" N	88° 45' 23.810" E
4	25° 17' 45.557" N	88° 45' 22.519" E
5	25° 17' 47.789" N	88° 45' 18.862" E
6	25° 17' 51.615" N	88° 45' 13.829" E
7	25° 17' 52.753" N	88° 45' 14.364" E
8	25° 17' 52.958" N	88° 45' 16.694" E
9	25° 17' 52.684" N	88° 45' 19.572" E
10	25° 17' 51.519" N	88° 45' 21.902" E
11	25° 17' 49.874" N	88° 45' 23.753" E

12	25° 17' 47.682" N	88° 45' 25.672" E

DD_BG_AR_29		
POINT NO	**LATITUDE**	**LONGITUDE**
1	25° 16' 50.209" N	88° 45' 53.401" E
2	25° 16' 44.534" N	88° 45' 52.866" E
3	25° 16' 47.532" N	88° 45' 49.761" E
4	25° 16' 53.421" N	88° 45' 42.158" E
5	25° 17' 1.238" N	88° 45' 31.772" E
6	25° 17' 4.544" N	88° 45' 27.976" E
7	25° 17' 10.311" N	88° 45' 40.576" E
8	25° 17' 5.949" N	88° 45' 45.156" E
9	25° 16' 56.808" N	88° 45' 53.128" E

DD_BG_AR_30		
POINT NO	**LATITUDE**	**LONGITUDE**
1	25° 16' 36.871" N	88° 46' 1.159" E
2	25° 16' 33.786" N	88° 46' 2.535" E
3	25° 16' 34.147" N	88° 46' 1.132" E
4	25° 16' 36.289" N	88° 45' 59.312" E
5	25° 16' 40.786" N	88° 45' 57.063" E
6	25° 16' 45.605" N	88° 45' 56.742" E
7	25° 16' 47.649" N	88° 45' 56.902" E
8	25° 16' 39.208" N	88° 45' 59.963" E
9	25° 16' 36.871" N	88° 46' 1.159" E

DD_BG_AR_31		
POINT NO	**LATITUDE**	**LONGITUDE**
1	25° 16' 0.954" N	88° 46' 13.446" E
2	25° 15' 56.992" N	88° 46' 11.626" E
3	25° 16' 9.291" N	88° 46' 6.239" E
4	25° 16' 27.024" N	88° 46' 2.045" E
5	25° 16' 25.046" N	88° 46' 4.344" E
6	25° 16' 22.048" N	88° 46' 7.128" E
7	25° 16' 16.908" N	88° 46' 10.876" E
8	25° 16' 13.482" N	88° 46' 12.803" E
9	25° 16' 10.055" N	88° 46' 13.660" E
10	25° 16' 5.237" N	88° 46' 14.088" E

11	25° 16' 0.954" N	88° 46' 13.446" E

DD_BG_AR_32		
POINT NO	**LATITUDE**	**LONGITUDE**
1	25° 15' 59.776" N	88° 46' 14.410" E
2	25° 15' 56.992" N	88° 46' 17.194" E
3	25° 15' 53.780" N	88° 46' 20.406" E
4	25° 15' 52.388" N	88° 46' 19.228" E
5	25° 15' 51.852" N	88° 46' 16.872" E
6	25° 15' 52.495" N	88° 46' 15.694" E
7	25° 15' 54.958" N	88° 46' 13.767" E
8	25° 15' 56.992" N	88° 46' 13.767" E
9	25° 15' 59.776" N	88° 46' 14.410" E

DD_BG_AR_33		
POINT NO	**LATITUDE**	**LONGITUDE**
1	25° 15' 51.638" N	88° 46' 24.903" E
2	25° 15' 47.141" N	88° 46' 29.400" E
3	25° 15' 46.247" N	88° 46' 27.363" E
4	25° 15' 45.642" N	88° 46' 25.974" E
5	25° 15' 46.392" N	88° 46' 25.117" E
6	25° 15' 49.497" N	88° 46' 24.796" E
7	25° 15' 51.638" N	88° 46' 24.903" E

DD_BG_AR_34		
POINT NO	**LATITUDE**	**LONGITUDE**
1	25° 15' 23.906" N	88° 46' 38.710" E
2	25° 15' 22.278" N	88° 46' 38.282" E
3	25° 15' 23.735" N	88° 46' 36.997" E
4	25° 15' 26.390" N	88° 46' 35.712" E
5	25° 15' 27.589" N	88° 46' 33.827" E
6	25° 15' 30.074" N	88° 46' 31.258" E
7	25° 15' 31.777" N	88° 46' 30.051" E
8	25° 15' 36.418" N	88° 46' 28.191" E
9	25° 15' 38.126" N	88° 46' 28.516" E
10	25° 15' 38.040" N	88° 46' 30.487" E
11	25° 15' 34.528" N	88° 46' 34.941" E
12	25° 15' 31.638" N	88° 46' 38.065" E

13	25° 15' 29.137" N	88° 46' 38.469" E
14	25° 15' 23.906" N	88° 46' 38.710" E

DD_BG_AR_35		
POINT NO	**LATITUDE**	**LONGITUDE**
1	25° 14' 33.270" N	88° 46' 31.269" E
2	25° 14' 20.682" N	88° 46' 29.635" E
3	25° 14' 22.409" N	88° 46' 27.798" E
4	25° 14' 25.621" N	88° 46' 25.656" E
5	25° 14' 28.177" N	88° 46' 25.382" E
6	25° 14' 30.849" N	88° 46' 26.307" E
7	25° 14' 32.108" N	88° 46' 28.415" E
8	25° 14' 33.327" N	88° 46' 30.351" E
9	25° 14' 33.855" N	88° 46' 31.401" E
10	25° 14' 33.270" N	88° 46' 31.269" E

DD_BG_AR_36		
POINT NO	**LATITUDE**	**LONGITUDE**
1	25° 14' 9.847" N	88° 46' 23.027" E
2	25° 14' 9.184" N	88° 46' 20.033" E
3	25° 14' 19.274" N	88° 46' 22.667" E
4	25° 14' 25.497" N	88° 46' 23.599" E
5	25° 14' 24.536" N	88° 46' 24.276" E
6	25° 14' 20.574" N	88° 46' 25.775" E
7	25° 14' 16.768" N	88° 46' 25.973" E
8	25° 14' 13.959" N	88° 46' 25.494" E
9	25° 14' 11.217" N	88° 46' 24.466" E
10	25° 14' 9.847" N	88° 46' 23.027" E

DD_BG_AR_37		
POINT NO	**LATITUDE**	**LONGITUDE**
1	25° 13' 21.148" N	88° 46' 22.560" E
2	25° 13' 20.206" N	88° 46' 20.161" E
3	25° 13' 20.292" N	88° 46' 18.020" E
4	25° 13' 20.549" N	88° 46' 16.649" E
5	25° 13' 21.155" N	88° 46' 16.313" E
6	25° 13' 21.312" N	88° 46' 18.345" E
7	25° 13' 24.568" N	88° 46' 20.949" E

8	25° 13' 25.260" N	88° 46' 23.416" E
9	25° 13' 23.033" N	88° 46' 23.245" E
10	25° 13' 21.148" N	88° 46' 22.560" E

DD_BG_AR_38		
POINT NO	**LATITUDE**	**LONGITUDE**
1	25° 11' 16.437" N	88° 45' 29.182" E
2	25° 11' 13.444" N	88° 45' 30.530" E
3	25° 11' 14.542" N	88° 45' 27.831" E
4	25° 11' 16.983" N	88° 45' 24.619" E
5	25° 11' 20.453" N	88° 45' 22.948" E
6	25° 11' 24.179" N	88° 45' 22.306" E
7	25° 11' 26.186" N	88° 45' 22.667" E
8	25° 11' 16.437" N	88° 45' 29.182" E

DD_GR_PN_01		
POINT NO	**LATITUDE**	**LONGITUDE**
1	25° 29' 51.623" N	88° 33' 46.672" E
2	25° 29' 50.766" N	88° 33' 45.750" E
3	25° 29' 50.813" N	88° 33' 45.728" E
4	25° 29' 52.969" N	88° 33' 46.779" E
5	25° 29' 54.479" N	88° 33' 45.491" E
6	25° 29' 56.698" N	88° 33' 45.520" E
7	25° 29' 58.792" N	88° 33' 46.643" E
8	25° 30' 0.613" N	88° 33' 48.892" E
9	25° 30' 2.219" N	88° 33' 51.354" E
10	25° 30' 4.146" N	88° 33' 54.245" E
11	25° 30' 5.217" N	88° 33' 57.779" E
12	25° 30' 5.110" N	88° 34' 1.527" E
13	25° 30' 4.066" N	88° 34' 3.538" E
14	25° 30' 3.075" N	88° 34' 5.703" E
15	25° 30' 1.606" N	88° 34' 4.338" E
16	25° 29' 58.718" N	88° 33' 57.846" E

DD_GR_PN_02		
POINT NO	**LATITUDE**	**LONGITUDE**
1	25° 29' 18.478" N	88° 33' 22.534" E
2	25° 29' 18.341" N	88° 33' 20.341" E

3	25° 29' 18.576" N	88° 33' 18.874" E
4	25° 29' 23.783" N	88° 33' 24.586" E
5	25° 29' 23.071" N	88° 33' 26.343" E
6	25° 29' 22.707" N	88° 33' 26.292" E
7	25° 29' 21.212" N	88° 33' 25.325" E
8	25° 29' 19.645" N	88° 33' 24.381" E

DD_GR_PN_03		
POINT NO	**LATITUDE**	**LONGITUDE**
1	25° 29' 12.790" N	88° 32' 51.320" E
2	25° 29' 11.283" N	88° 32' 49.023" E
3	25° 29' 11.487" N	88° 32' 46.761" E
4	25° 29' 11.183" N	88° 32' 42.967" E
5	25° 29' 9.775" N	88° 32' 40.115" E
6	25° 29' 10.049" N	88° 32' 37.168" E
7	25° 29' 11.146" N	88° 32' 34.427" E
8	25° 29' 11.792" N	88° 32' 33.650" E
9	25° 29' 12.536" N	88° 32' 42.021" E

DD_GR_PN_04		
POINT NO	**LATITUDE**	**LONGITUDE**
1	25° 27' 47.638" N	88° 32' 38.419" E
2	25° 27' 47.568" N	88° 32' 37.683" E
3	25° 27' 51.753" N	88° 32' 38.316" E
4	25° 28' 4.357" N	88° 32' 37.751" E
5	25° 28' 20.305" N	88° 32' 35.060" E
6	25° 28' 20.802" N	88° 32' 34.787" E
7	25° 28' 19.546" N	88° 32' 38.954" E
8	25° 28' 16.120" N	88° 32' 40.989" E
9	25° 28' 8.839" N	88° 32' 41.417" E
10	25° 28' 1.772" N	88° 32' 41.524" E
11	25° 27' 54.812" N	88° 32' 41.096" E
12	25° 27' 50.208" N	88° 32' 39.918" E

DD_GR_PN_05		
POINT NO	**LATITUDE**	**LONGITUDE**
1	25° 26' 57.013" N	88° 32' 40.444" E

2	25° 26' 55.314" N	88° 32' 36.064" E
3	25° 26' 56.177" N	88° 32' 34.350" E
4	25° 26' 59.925" N	88° 32' 38.740" E
5	25° 27' 4.101" N	88° 32' 41.524" E
6	25° 27' 6.778" N	88° 32' 42.273" E
7	25° 27' 9.185" N	88° 32' 41.535" E
8	25° 27' 12.159" N	88° 32' 43.187" E
9	25° 27' 17.567" N	88° 32' 43.319" E
10	25° 27' 15.772" N	88° 32' 46.235" E
11	25° 27' 13.095" N	88° 32' 49.769" E
12	25° 27' 9.990" N	88° 32' 51.268" E
13	25° 27' 6.992" N	88° 32' 51.161" E
14	25° 27' 3.887" N	88° 32' 49.876" E
15	25° 27' 0.674" N	88° 32' 46.235" E

DD_GR_PN_06		
POINT NO	**LATITUDE**	**LONGITUDE**
1	25° 26' 5.745" N	88° 32' 20.890" E
2	25° 26' 5.488" N	88° 32' 17.164" E
3	25° 26' 5.932" N	88° 32' 14.139" E
4	25° 26' 6.387" N	88° 32' 15.982" E
5	25° 26' 11.929" N	88° 32' 20.695" E
6	25° 26' 14.291" N	88° 32' 22.517" E
7	25° 26' 20.502" N	88° 32' 22.154" E
8	25° 26' 19.365" N	88° 32' 23.203" E
9	25° 26' 14.956" N	88° 32' 25.110" E
10	25° 26' 14.021" N	88° 32' 25.240" E
11	25° 26' 10.627" N	88° 32' 25.131" E
12	25° 26' 7.929" N	88° 32' 24.360" E

DD_GR_PN_07		
POINT NO	**LATITUDE**	**LONGITUDE**
1	25° 25' 17.812" N	88° 32' 11.091" E
2	25° 25' 15.756" N	88° 32' 9.035" E
3	25° 25' 15.834" N	88° 32' 8.817" E
4	25° 25' 20.569" N	88° 32' 11.142" E
5	25° 25' 31.018" N	88° 32' 8.737" E
6	25° 25' 30.057" N	88° 32' 12.203" E

7	25° 25' 29.159" N	88° 32' 15.103" E
8	25° 25' 27.577" N	88° 32' 16.487" E
9	25° 25' 24.750" N	88° 32' 16.359" E
10	25° 25' 21.538" N	88° 32' 14.175" E

DD_GR_PN_08		
POINT NO	**LATITUDE**	**LONGITUDE**
1	25° 21' 52.186" N	88° 29' 47.373" E
2	25° 21' 47.863" N	88° 29' 46.289" E
3	25° 21' 49.399" N	88° 29' 45.545" E
4	25° 21' 52.076" N	88° 29' 45.545" E
5	25° 21' 54.967" N	88° 29' 46.830" E
6	25° 21' 56.894" N	88° 29' 48.222" E
7	25° 21' 58.286" N	88° 29' 50.042" E
8	25° 21' 59.250" N	88° 29' 52.291" E
9	25° 21' 59.195" N	88° 29' 53.881" E
10	25° 21' 58.928" N	88° 29' 54.911" E
11	25° 21' 58.054" N	88° 29' 55.836" E
12	25° 21' 56.983" N	88° 29' 56.281" E
13	25° 21' 56.023" N	88° 29' 50.918" E

DD_GR_PN_09		
POINT NO	**LATITUDE**	**LONGITUDE**
1	25° 21' 32.113" N	88° 29' 42.120" E
2	25° 21' 32.113" N	88° 29' 40.556" E
3	25° 21' 32.486" N	88° 29' 40.171" E
4	25° 21' 33.894" N	88° 29' 42.048" E
5	25° 21' 37.078" N	88° 29' 43.815" E
6	25° 21' 34.794" N	88° 29' 43.832" E
7	25° 21' 33.594" N	88° 29' 43.660" E

DD_GR_PN_10		
POINT NO	**LATITUDE**	**LONGITUDE**
1	25° 21' 2.678" N	88° 29' 23.092" E
2	25° 20' 58.142" N	88° 29' 25.905" E
3	25° 20' 58.171" N	88° 29' 25.218" E
4	25° 20' 58.599" N	88° 29' 23.933" E

5	25° 20' 59.970" N	88° 29' 22.648" E
6	25° 21' 1.512" N	88° 29' 22.134" E
7	25° 21' 3.225" N	88° 29' 22.391" E
8	25° 21' 3.754" N	88° 29' 22.808" E

DD_GR_PN_11		
POINT NO	**LATITUDE**	**LONGITUDE**
1	25° 20' 48.520" N	88° 29' 38.828" E
2	25° 20' 47.739" N	88° 29' 38.476" E
3	25° 20' 51.136" N	88° 29' 35.699" E
4	25° 20' 53.079" N	88° 29' 32.595" E
5	25° 20' 53.249" N	88° 29' 32.797" E
6	25° 20' 53.352" N	88° 29' 33.620" E
7	25° 20' 53.258" N	88° 29' 34.293" E
8	25° 20' 51.536" N	88° 29' 37.252" E
9	25° 20' 50.476" N	88° 29' 38.212" E
10	25° 20' 49.343" N	88° 29' 38.828" E

DD_TP_PN_12		
POINT NO	**LATITUDE**	**LONGITUDE**
1	25° 20' 23.298" N	88° 29' 47.151" E
2	25° 20' 22.013" N	88° 29' 46.740" E
3	25° 20' 20.522" N	88° 29' 45.918" E
4	25° 20' 19.923" N	88° 29' 44.975" E
5	25° 20' 19.623" N	88° 29' 43.861" E
6	25° 20' 20.094" N	88° 29' 42.748" E
7	25° 20' 21.550" N	88° 29' 41.677" E
8	25° 20' 22.475" N	88° 29' 41.055" E
9	25° 20' 22.384" N	88° 29' 41.611" E
10	25° 20' 24.670" N	88° 29' 45.079" E
11	25° 20' 28.223" N	88° 29' 45.861" E
12	25° 20' 29.860" N	88° 29' 45.544" E
13	25° 20' 29.825" N	88° 29' 46.432" E
14	25° 20' 29.054" N	88° 29' 47.254" E
15	25° 20' 27.872" N	88° 29' 47.460" E
16	25° 20' 26.176" N	88° 29' 47.460" E
17	25° 20' 24.840" N	88° 29' 47.460" E

DD_TP_PN_13		
POINT NO	**LATITUDE**	**LONGITUDE**
1	25° 20' 30.459" N	88° 29' 36.529" E
2	25° 20' 29.534" N	88° 29' 36.906" E
3	25° 20' 26.978" N	88° 29' 37.171" E
4	25° 20' 28.262" N	88° 29' 36.193" E
5	25° 20' 29.698" N	88° 29' 33.750" E
6	25° 20' 30.105" N	88° 29' 31.079" E
7	25° 20' 30.082" N	88° 29' 31.056" E
8	25° 20' 30.659" N	88° 29' 30.653" E
9	25° 20' 31.207" N	88° 29' 30.345" E
10	25° 20' 31.966" N	88° 29' 30.122" E
11	25° 20' 32.343" N	88° 29' 30.739" E
12	25° 20' 32.515" N	88° 29' 32.143" E
13	25° 20' 32.412" N	88° 29' 33.857" E
14	25° 20' 31.727" N	88° 29' 34.987" E

DD_TP_PN_14		
POINT NO	**LATITUDE**	**LONGITUDE**
1	25° 20' 12.507" N	88° 29' 20.710" E
2	25° 20' 12.191" N	88° 29' 19.414" E
3	25° 20' 12.333" N	88° 29' 17.321" E
4	25° 20' 12.919" N	88° 29' 16.673" E
5	25° 20' 13.775" N	88° 29' 16.117" E
6	25° 20' 14.932" N	88° 29' 15.774" E
7	25° 20' 16.217" N	88° 29' 15.817" E
8	25° 20' 17.116" N	88° 29' 16.545" E
9	25° 20' 17.844" N	88° 29' 17.487" E
10	25° 20' 17.753" N	88° 29' 18.453" E
11	25° 20' 15.600" N	88° 29' 17.543" E
12	25° 20' 13.792" N	88° 29' 18.216" E

DD_TP_PN_15		
POINT NO	**LATITUDE**	**LONGITUDE**
1	25° 18' 40.204" N	88° 29' 13.826" E
2	25° 18' 39.793" N	88° 29' 12.356" E
3	25° 18' 42.361" N	88° 29' 14.067" E

4	25° 18' 51.503" N	88° 29' 16.995" E
5	25° 18' 50.954" N	88° 29' 17.210" E
6	25° 18' 49.027" N	88° 29' 17.081" E
7	25° 18' 47.314" N	88° 29' 17.081" E
8	25° 18' 45.344" N	88° 29' 16.610" E
9	25° 18' 43.416" N	88° 29' 15.711" E

DD_TP_PN_16		
POINT NO	**LATITUDE**	**LONGITUDE**
1	25° 17' 42.816" N	88° 28' 40.218" E
2	25° 17' 42.377" N	88° 28' 42.487" E
3	25° 17' 42.725" N	88° 28' 45.443" E
4	25° 17' 42.717" N	88° 28' 45.499" E
5	25° 17' 41.631" N	88° 28' 45.435" E
6	25° 17' 41.220" N	88° 28' 43.533" E
7	25° 17' 41.220" N	88° 28' 41.169" E
8	25° 17' 41.939" N	88° 28' 39.678" E
9	25° 17' 42.967" N	88° 28' 39.062" E
10	25° 17' 44.149" N	88° 28' 38.856" E
11	25° 17' 45.229" N	88° 28' 39.473" E
12	25° 17' 45.640" N	88° 28' 40.295" E
13	25° 17' 45.794" N	88° 28' 40.772" E
14	25° 17' 44.123" N	88° 28' 39.822" E

DD_TP_PN_17		
POINT NO	**LATITUDE**	**LONGITUDE**
1	25° 17' 3.447" N	88° 28' 20.248" E
2	25° 17' 0.761" N	88° 28' 22.524" E
3	25° 17' 0.812" N	88° 28' 21.548" E
4	25° 17' 1.223" N	88° 28' 20.623" E
5	25° 17' 1.274" N	88° 28' 20.584" E
6	25° 17' 2.250" N	88° 28' 19.852" E
7	25° 17' 2.939" N	88° 28' 19.336" E
8	25° 17' 3.690" N	88° 28' 18.772" E
9	25° 17' 5.129" N	88° 28' 18.464" E
10	25° 17' 6.414" N	88° 28' 18.515" E
11	25° 17' 6.602" N	88° 28' 19.193" E
12	25° 17' 7.014" N	88° 28' 19.311" E

13	25° 17' 7.485" N	88° 28' 19.362" E

DD_TP_PN_18		
POINT NO	**LATITUDE**	**LONGITUDE**
1	25° 16' 41.456" N	88° 28' 15.222" E
2	25° 16' 41.026" N	88° 28' 17.369" E
3	25° 16' 42.586" N	88° 28' 20.939" E
4	25° 16' 42.692" N	88° 28' 22.873" E
5	25° 16' 41.302" N	88° 28' 21.214" E
6	25° 16' 41.024" N	88° 28' 20.850" E
7	25° 16' 40.728" N	88° 28' 19.830" E
8	25° 16' 39.344" N	88° 28' 18.432" E
9	25° 16' 38.702" N	88° 28' 14.985" E
10	25° 16' 39.012" N	88° 28' 14.439" E
11	25° 16' 41.424" N	88° 28' 12.233" E
12	25° 16' 45.004" N	88° 28' 12.610" E
13	25° 16' 46.099" N	88° 28' 14.104" E
14	25° 16' 46.229" N	88° 28' 15.143" E
15	25° 16' 45.831" N	88° 28' 14.957" E

DD_TP_PN_19		
POINT NO	**LATITUDE**	**LONGITUDE**
1	25° 16' 16.458" N	88° 28' 1.143" E
2	25° 16' 9.233" N	88° 27' 58.934" E
3	25° 16' 10.379" N	88° 27' 58.037" E
4	25° 16' 11.543" N	88° 27' 57.352" E
5	25° 16' 13.051" N	88° 27' 56.941" E
6	25° 16' 14.422" N	88° 27' 56.941" E
7	25° 16' 15.655" N	88° 27' 57.969" E
8	25° 16' 16.203" N	88° 27' 58.997" E

DD_KM_TG_01		
POINT NO	**LATITUDE**	**LONGITUDE**
1	25° 35' 0.499" N	88° 26' 57.359" E
2	25° 35' 0.009" N	88° 26' 56.568" E
3	25° 35' 4.651" N	88° 26' 58.221" E
4	25° 35' 4.829" N	88° 26' 58.455" E

5	25° 35' 4.097" N	88° 26' 58.541" E
6	25° 35' 2.401" N	88° 26' 58.490" E
7	25° 35' 2.016" N	88° 26' 57.925" E

DD_KM_TG_02		
POINT NO	**LATITUDE**	**LONGITUDE**
1	25° 34' 48.134" N	88° 27' 10.010" E
2	25° 34' 48.117" N	88° 27' 10.417" E
3	25° 34' 48.117" N	88° 27' 11.496" E
4	25° 34' 47.243" N	88° 27' 12.576" E
5	25° 34' 46.009" N	88° 27' 13.141" E
6	25° 34' 44.519" N	88° 27' 13.552" E
7	25° 34' 43.440" N	88° 27' 13.706" E
8	25° 34' 42.154" N	88° 27' 13.689" E
9	25° 34' 45.736" N	88° 27' 12.243" E
10	25° 34' 47.179" N	88° 27' 10.941" E

DD_KM_TG_03A		
POINT NO	**LATITUDE**	**LONGITUDE**
1	25° 33' 49.477" N	88° 26' 49.493" E
2	25° 33' 46.874" N	88° 26' 46.618" E
3	25° 33' 47.307" N	88° 26' 45.966" E
4	25° 33' 49.043" N	88° 26' 47.721" E
5	25° 33' 54.765" N	88° 26' 51.661" E
6	25° 33' 58.821" N	88° 26' 52.152" E
7	25° 34' 1.047" N	88° 26' 52.928" E
8	25° 33' 59.964" N	88° 26' 53.431" E
9	25° 33' 57.587" N	88° 26' 53.744" E
10	25° 33' 55.317" N	88° 26' 53.773" E
11	25° 33' 52.132" N	88° 26' 52.313" E

DD_KM_TG_03B		
POINT NO	**LATITUDE**	**LONGITUDE**
1	25° 33' 41.318" N	88° 26' 44.825" E
2	25° 33' 40.858" N	88° 26' 44.700" E
3	25° 33' 41.061" N	88° 26' 43.808" E
4	25° 33' 42.849" N	88° 26' 43.905" E

5	25° 33' 44.357" N	88° 26' 44.378" E
6	25° 33' 45.751" N	88° 26' 46.102" E
7	25° 33' 46.203" N	88° 26' 47.662" E

DD_KM_TG_03C		
POINT NO	**LATITUDE**	**LONGITUDE**
1	25° 33' 34.867" N	88° 26' 44.563" E
2	25° 33' 33.269" N	88° 26' 44.402" E
3	25° 33' 32.906" N	88° 26' 44.143" E
4	25° 33' 33.762" N	88° 26' 42.317" E
5	25° 33' 35.247" N	88° 26' 41.766" E
6	25° 33' 35.575" N	88° 26' 43.363" E

DD_KM_TG_04		
POINT NO	**LATITUDE**	**LONGITUDE**
1	25° 33' 15.045" N	88° 26' 57.925" E
2	25° 33' 14.351" N	88° 26' 54.764" E
3	25° 33' 15.099" N	88° 26' 54.599" E
4	25° 33' 15.103" N	88° 26' 54.671" E
5	25° 33' 17.220" N	88° 26' 58.038" E
6	25° 33' 17.670" N	88° 26' 58.099" E
7	25° 33' 21.632" N	88° 26' 57.845" E
8	25° 33' 22.484" N	88° 26' 56.930" E
9	25° 33' 22.566" N	88° 26' 57.529" E
10	25° 33' 21.410" N	88° 26' 59.028" E
11	25° 33' 19.953" N	88° 27' 0.013" E
12	25° 33' 17.212" N	88° 26' 59.884" E
13	25° 33' 16.202" N	88° 26' 59.210" E

DD_KM_TG_05		
POINT NO	**LATITUDE**	**LONGITUDE**
1	25° 31' 52.822" N	88° 26' 40.895" E
2	25° 31' 52.308" N	88° 26' 39.045" E
3	25° 31' 53.758" N	88° 26' 35.985" E
4	25° 31' 55.907" N	88° 26' 32.598" E
5	25° 31' 56.845" N	88° 26' 31.643" E
6	25° 31' 57.704" N	88° 26' 32.209" E

7	25° 31' 55.221" N	88° 26' 37.060" E
8	25° 31' 53.233" N	88° 26' 40.638" E

DD_KM_TG_06		
POINT NO	**LATITUDE**	**LONGITUDE**
1	25° 31' 44.903" N	88° 27' 9.267" E
2	25° 31' 41.823" N	88° 27' 10.593" E
3	25° 31' 41.266" N	88° 27' 10.301" E
4	25° 31' 41.009" N	88° 27' 7.371" E
5	25° 31' 41.883" N	88° 27' 6.343" E
6	25° 31' 42.457" N	88° 27' 5.999" E
7	25° 31' 42.279" N	88° 27' 8.282" E
8	25° 31' 45.149" N	88° 27' 7.605" E
9	25° 31' 45.626" N	88° 27' 7.336" E
10	25° 31' 45.703" N	88° 27' 8.567" E
11	25° 31' 45.172" N	88° 27' 9.067" E

DD_KM_TG_07		
POINT NO	**LATITUDE**	**LONGITUDE**
1	25° 31' 31.946" N	88° 27' 50.539" E
2	25° 31' 31.045" N	88° 27' 50.930" E
3	25° 31' 31.145" N	88° 27' 50.233" E
4	25° 31' 32.063" N	88° 27' 48.006" E
5	25° 31' 33.174" N	88° 27' 48.095" E
6	25° 31' 33.182" N	88° 27' 48.870" E

DD_KM_TG_08A		
POINT NO	**LATITUDE**	**LONGITUDE**
1	25° 31' 11.277" N	88° 27' 36.618" E
2	25° 31' 10.868" N	88° 27' 36.566" E
3	25° 31' 10.888" N	88° 27' 36.543" E
4	25° 31' 10.875" N	88° 27' 36.000" E
5	25° 31' 10.286" N	88° 27' 33.104" E
6	25° 31' 9.384" N	88° 27' 32.736" E
7	25° 31' 10.426" N	88° 27' 32.216" E
8	25° 31' 11.235" N	88° 27' 33.063" E
9	25° 31' 11.373" N	88° 27' 34.771" E

DD_KM_TG_08B		
POINT NO	**LATITUDE**	**LONGITUDE**
1	25° 31' 7.073" N	88° 27' 42.734" E
2	25° 31' 7.053" N	88° 27' 41.570" E
3	25° 31' 7.636" N	88° 27' 40.419" E
4	25° 31' 9.287" N	88° 27' 39.579" E
5	25° 31' 10.847" N	88° 27' 38.347" E
6	25° 31' 12.487" N	88° 27' 37.114" E
7	25° 31' 11.693" N	88° 27' 38.802" E
8	25° 31' 11.011" N	88° 27' 39.919" E
9	25° 31' 11.011" N	88° 27' 39.919" E
10	25° 31' 9.637" N	88° 27' 41.590" E
11	25° 31' 8.170" N	88° 27' 42.802" E

DD_KM_TG_09		
POINT NO	**LATITUDE**	**LONGITUDE**
1	25° 30' 9.553" N	88° 27' 14.910" E
2	25° 30' 8.834" N	88° 27' 13.831" E
3	25° 30' 8.936" N	88° 27' 12.906" E
4	25° 30' 9.296" N	88° 27' 12.186" E
5	25° 30' 9.549" N	88° 27' 12.054" E
6	25° 30' 12.616" N	88° 27' 14.540" E
7	25° 30' 11.917" N	88° 27' 15.733" E
8	25° 30' 10.838" N	88° 27' 15.681" E

DD_KM_TG_10		
POINT NO	**LATITUDE**	**LONGITUDE**
1	25° 29' 58.408" N	88° 27' 5.927" E
2	25° 29' 56.827" N	88° 27' 6.044" E
3	25° 29' 57.167" N	88° 27' 4.117" E
4	25° 29' 58.929" N	88° 27' 3.382" E
5	25° 30' 1.944" N	88° 27' 3.451" E
6	25° 30' 3.931" N	88° 27' 4.479" E
7	25° 30' 5.987" N	88° 27' 6.946" E
8	25° 30' 6.604" N	88° 27' 8.591" E
9	25° 30' 6.398" N	88° 27' 10.646" E

10	25° 30' 6.189" N	88° 27' 11.172" E
11	25° 30' 4.252" N	88° 27' 8.770" E
12	25° 30' 1.733" N	88° 27' 6.223" E

DD_KM_TG_11		
POINT NO	**LATITUDE**	**LONGITUDE**
1	25° 28' 55.774" N	88° 26' 50.497" E
2	25° 28' 55.517" N	88° 26' 49.041" E
3	25° 28' 55.802" N	88° 26' 48.187" E
4	25° 28' 57.482" N	88° 26' 49.841" E
5	25° 29' 0.808" N	88° 26' 50.942" E
6	25° 29' 2.455" N	88° 26' 50.709" E
7	25° 29' 2.455" N	88° 26' 51.300" E
8	25° 29' 1.082" N	88° 26' 51.300" E
9	25° 29' 0.782" N	88° 26' 52.114" E
10	25° 28' 59.240" N	88° 26' 52.071" E
11	25° 28' 57.099" N	88° 26' 51.643" E

DD_KM_TG_11A		
POINT NO	**LATITUDE**	**LONGITUDE**
1	25° 28' 25.446" N	88° 26' 3.527" E
2	25° 28' 24.037" N	88° 26' 2.903" E
3	25° 28' 24.259" N	88° 26' 1.447" E
4	25° 28' 25.150" N	88° 26' 1.241" E
5	25° 28' 27.378" N	88° 26' 2.029" E
6	25° 28' 28.851" N	88° 26' 3.108" E
7	25° 28' 29.433" N	88° 26' 4.496" E
8	25° 28' 28.830" N	88° 26' 4.929" E
9	25° 28' 28.747" N	88° 26' 4.913" E
10	25° 28' 28.517" N	88° 26' 4.868" E
11	25° 28' 28.011" N	88° 26' 4.651" E
12	25° 28' 27.615" N	88° 26' 4.481" E
13	25° 28' 27.077" N	88° 26' 4.250" E
14	25° 28' 27.052" N	88° 26' 4.239" E
15	25° 28' 26.277" N	88° 26' 3.896" E
16	25° 28' 25.909" N	88° 26' 3.732" E

DD_BA_TG_12		
POINT NO	**LATITUDE**	**LONGITUDE**
1	25° 26' 54.494" N	88° 24' 49.338" E
2	25° 26' 54.418" N	88° 24' 47.038" E
3	25° 26' 54.525" N	88° 24' 44.861" E
4	25° 26' 55.226" N	88° 24' 43.543" E
5	25° 26' 56.207" N	88° 24' 42.485" E
6	25° 26' 58.335" N	88° 24' 41.629" E
7	25° 26' 59.449" N	88° 24' 41.972" E
8	25° 26' 59.601" N	88° 24' 42.975" E
9	25° 26' 58.927" N	88° 24' 42.512" E
10	25° 26' 58.483" N	88° 24' 42.979" E
11	25° 26' 56.878" N	88° 24' 46.381" E
12	25° 26' 56.086" N	88° 24' 49.503" E

DD_BA_TG_13		
POINT NO	**LATITUDE**	**LONGITUDE**
1	25° 18' 55.368" N	88° 24' 17.237" E
2	25° 18' 53.048" N	88° 24' 18.799" E
3	25° 18' 53.216" N	88° 24' 21.905" E
4	25° 18' 53.227" N	88° 24' 22.160" E
5	25° 18' 52.435" N	88° 24' 21.905" E
6	25° 18' 52.474" N	88° 24' 19.936" E
7	25° 18' 52.440" N	88° 24' 18.531" E
8	25° 18' 53.022" N	88° 24' 17.332" E
9	25° 18' 54.324" N	88° 24' 16.338" E
10	25° 18' 55.324" N	88° 24' 15.449" E
11	25° 18' 56.420" N	88° 24' 16.203" E
12	25° 18' 57.174" N	88° 24' 17.026" E
13	25° 18' 57.334" N	88° 24' 17.705" E
14	25° 18' 57.239" N	88° 24' 17.667" E

DD_BA_TG_14		
POINT NO	**LATITUDE**	**LONGITUDE**
1	25° 18' 52.775" N	88° 24' 37.666" E
2	25° 18' 52.004" N	88° 24' 37.614" E
3	25° 18' 52.091" N	88° 24' 37.303" E
4	25° 18' 53.061" N	88° 24' 36.718" E

5	25° 18' 54.633" N	88° 24' 36.285" E
6	25° 18' 57.305" N	88° 24' 33.642" E
7	25° 18' 57.375" N	88° 24' 32.815" E
8	25° 18' 57.597" N	88° 24' 32.564" E
9	25° 18' 57.762" N	88° 24' 30.907" E
10	25° 18' 58.429" N	88° 24' 31.652" E
11	25° 18' 58.789" N	88° 24' 32.629" E
12	25° 18' 59.046" N	88° 24' 33.605" E
13	25° 18' 58.532" N	88° 24' 35.199" E
14	25° 18' 57.041" N	88° 24' 36.535" E
15	25° 18' 55.602" N	88° 24' 37.254" E
16	25° 18' 54.420" N	88° 24' 37.511" E

DD_BA_TG_15		
POINT NO	**LATITUDE**	**LONGITUDE**
1	25° 17' 57.398" N	88° 24' 40.591" E
2	25° 17' 56.443" N	88° 24' 40.163" E
3	25° 17' 57.530" N	88° 24' 37.618" E
4	25° 17' 59.550" N	88° 24' 37.736" E
5	25° 17' 59.840" N	88° 24' 38.828" E
6	25° 17' 59.546" N	88° 24' 39.666" E
7	25° 17' 59.543" N	88° 24' 39.665" E
8	25° 17' 57.637" N	88° 24' 40.192" E

Annexure 4
Map showing of Potential Blocks of Dakshin Dinajpur District

POTENTIAL BLOCK DD_KR_AR_01 OF ATRAI RIVER

88°44'30"E

88°45'0"E

25°29'0"N

25°29'0"N

N

W

E

S

9

8

7

10

6

11

5

4

3

12

2

1

ATRAI RIVER

LEGEND

- COORDINATE
- POTENTIAL BLOCK
- SAFETY BARRIER
- RIVER
- ADMINISTRATIVE BLOCK BOUNDARY
- DISTRICT BOUNDARY

DD_KR_AR_01		
POINT NO	LATITUDE	LONGITUDE
1	25° 28' 36.902" N	88° 44' 42.757" E
2	25° 28' 36.902" N	88° 44' 41.601" E
3	25° 28' 39.729" N	88° 44' 40.316" E
4	25° 28' 43.326" N	88° 44' 39.802" E
5	25° 28' 46.153" N	88° 44' 39.802" E
6	25° 28' 54.309" N	88° 44' 40.467" E
7	25° 28' 59.706" N	88° 44' 40.724" E
8	25° 29' 3.646" N	88° 44' 42.094" E
9	25° 29' 3.976" N	88° 44' 42.377" E
10	25° 28' 55.695" N	88° 44' 44.212" E
11	25° 28' 43.179" N	88° 44' 45.840" E
12	25° 28' 38.302" N	88° 44' 44.357" E

ABBREVIATION FORM		
DISTRICT	DD	DAKSHIN DINAJPUR
BLOCK	KR	KUMARGRAM
RIVER	AR	ATRAI RIVER

0 0.075 0.15 0.3 0.45

Kilometers

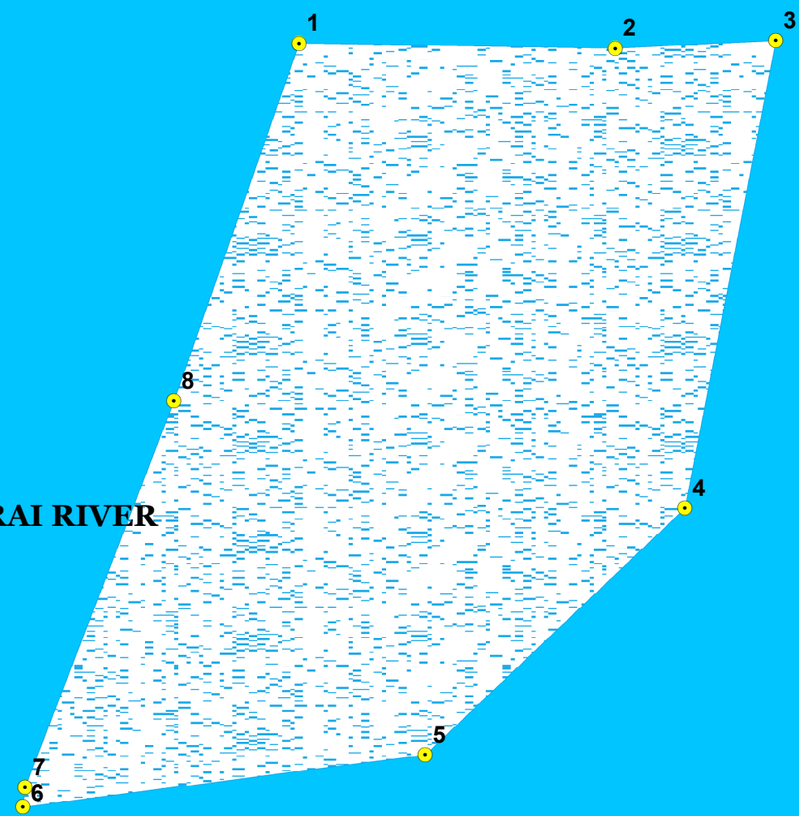
88°44'30"E

88°45'0"E

88°44'30"E

POTENTIAL BLOCK DD_KR_AR_02 OF ATRAI RIVER

N
W E
S



LEGEND

- COORDINATE
- POTENTIAL BLOCK
- SAFETY BARRIER
- RIVER
- ADMINISTRATIVE BLOCK BOUNDARY
- DISTRICT BOUNDARY

DD_KR_AR_02		
POINT NO	**LATITUDE**	**LONGITUDE**
1	25° 28' 39.808" N	88° 44' 34.826" E
2	25° 28' 39.783" N	88° 44' 36.497" E
3	25° 28' 39.823" N	88° 44' 37.343" E
4	25° 28' 37.356" N	88° 44' 36.864" E
5	25° 28' 36.054" N	88° 44' 35.493" E
6	25° 28' 35.780" N	88° 44' 33.369" E
7	25° 28' 35.883" N	88° 44' 33.380" E
8	25° 28' 37.921" N	88° 44' 34.165" E

ABBREVIATION FORM		
DISTRICT	**DD**	**DAKSHIN DINAJPUR**
BLOCK	**KR**	**KUMARGRAM**
RIVER	**AR**	**ATRAI RIVER**

0 0.025 0.05 0.1 0.15

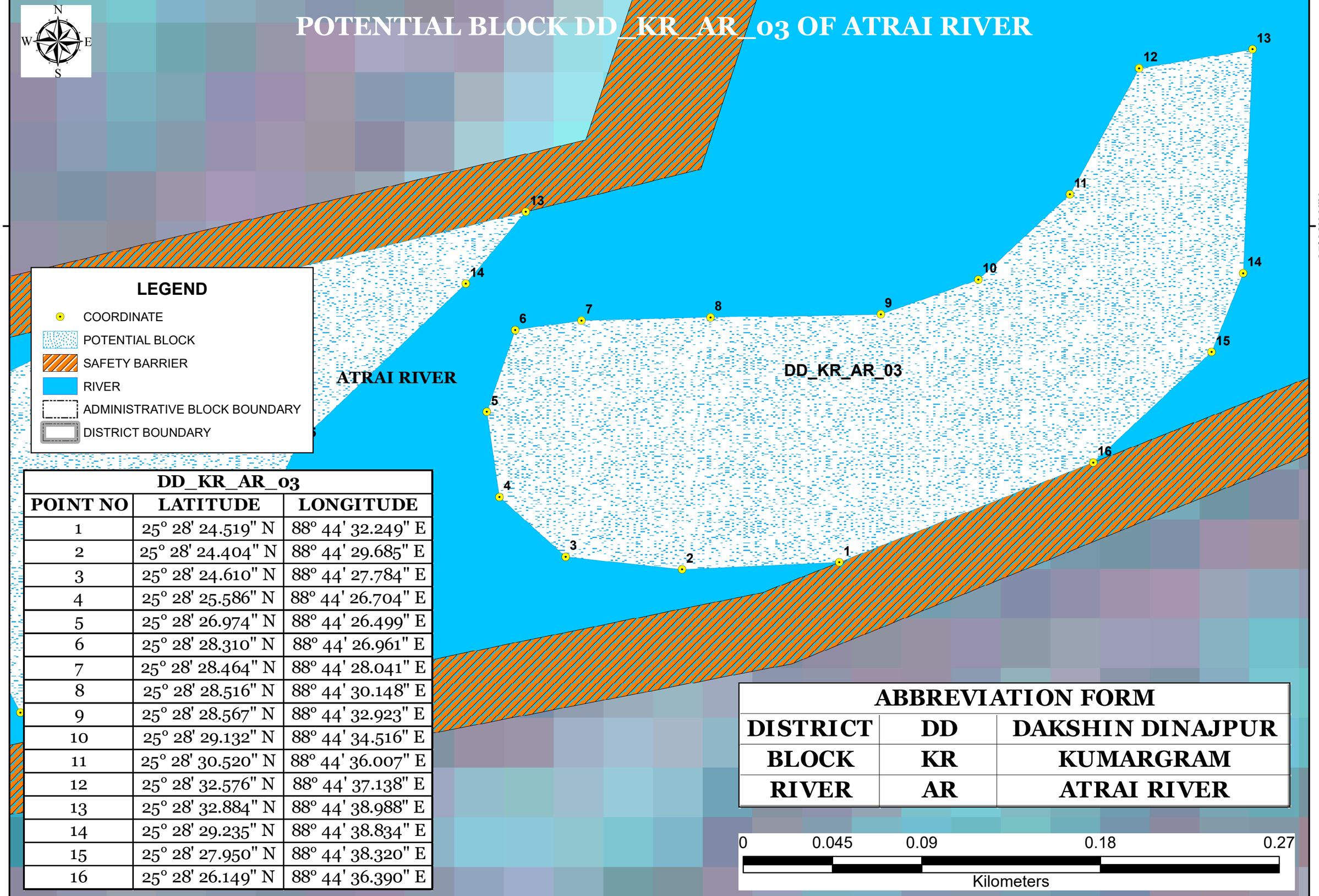
Kilometers

88°44'30"E

POTENTIAL BLOCK DD_KR_AR_03 OF ATRAI RIVER

88°44'30"E

25°28'30"N



DD_KR_AR_03		
POINT NO	LATITUDE	LONGITUDE
1	25° 28' 24.519" N	88° 44' 32.249" E
2	25° 28' 24.404" N	88° 44' 29.685" E
3	25° 28' 24.610" N	88° 44' 27.784" E
4	25° 28' 25.586" N	88° 44' 26.704" E
5	25° 28' 26.974" N	88° 44' 26.499" E
6	25° 28' 28.310" N	88° 44' 26.961" E
7	25° 28' 28.464" N	88° 44' 28.041" E
8	25° 28' 28.516" N	88° 44' 30.148" E
9	25° 28' 28.567" N	88° 44' 32.923" E
10	25° 28' 29.132" N	88° 44' 34.516" E
11	25° 28' 30.520" N	88° 44' 36.007" E
12	25° 28' 32.576" N	88° 44' 37.138" E
13	25° 28' 32.884" N	88° 44' 38.988" E
14	25° 28' 29.235" N	88° 44' 38.834" E
15	25° 28' 27.950" N	88° 44' 38.320" E
16	25° 28' 26.149" N	88° 44' 36.390" E

ABBREVIATION FORM		
DISTRICT	DD	DAKSHIN DINAJPUR
BLOCK	KR	KUMARGRAM
RIVER	AR	ATRAI RIVER

88°44'30"E

POTENTIAL BLOCK DD_KR_AR_04 OF ATRAI RIVER

88°44'0"E

25°28'30"N

25°28'30"N

88°44'0"E

ATRAI RIVER

DD_KR_AR_04

DD_KR_AR_04		
POINT NO	LATITUDE	LONGITUDE
1	25° 28' 24.539" N	88° 44' 22.524" E
2	25° 28' 22.689" N	88° 44' 20.468" E
3	25° 28' 22.072" N	88° 44' 18.892" E
4	25° 28' 23.374" N	88° 44' 18.207" E
5	25° 28' 23.237" N	88° 44' 15.534" E
6	25° 28' 21.661" N	88° 44' 11.902" E
7	25° 28' 21.113" N	88° 44' 8.339" E
8	25° 28' 20.633" N	88° 44' 2.514" E
9	25° 28' 21.113" N	88° 43' 57.305" E
10	25° 28' 22.003" N	88° 44' 0.184" E
11	25° 28' 24.587" N	88° 44' 12.433" E
12	25° 28' 28.740" N	88° 44' 20.990" E
13	25° 28' 30.234" N	88° 44' 27.134" E
14	25° 28' 29.062" N	88° 44' 26.156" E
15	25° 28' 26.458" N	88° 44' 23.415" E

LEGEND

- COORDINATE
- POTENTIAL BLOCK
- SAFETY BARRIER
- RIVER
- ADMINISTRATIVE BLOCK BOUNDARY
- DISTRICT BOUNDARY

ABBREVIATION FORM		
DISTRICT	DD	DAKSHIN DINAJPUR
BLOCK	KR	KUMARGRAM
RIVER	AR	ATRAI RIVER

0 0.075 0.15 0.3 0.45

Kilometers

POTENTIAL BLOCK DD_KR_AR_05 OF ATRAI RIVER

88°44'0"E

25°28'0"N

ATRAI RIVER

DD_KR_AR_05

LEGEND

- COORDINATE
- POTENTIAL BLOCK
- SAFETY BARRIER
- RIVER
- ADMINISTRATIVE BLOCK BOUNDARY
- DISTRICT BOUNDARY

DD_KR_AR_05		
POINT NO	LATITUDE	LONGITUDE
1	25° 28' 11.252" N	88° 43' 43.016" E
2	25° 28' 0.368" N	88° 43' 36.220" E
3	25° 28' 3.909" N	88° 43' 34.916" E
4	25° 28' 8.706" N	88° 43' 34.779" E
5	25° 28' 12.364" N	88° 43' 36.706" E
6	25° 28' 15.447" N	88° 43' 39.104" E
7	25° 28' 17.289" N	88° 43' 42.616" E
8	25° 28' 18.617" N	88° 43' 48.484" E
9	25° 28' 18.831" N	88° 43' 51.525" E
10	25° 28' 17.589" N	88° 43' 54.223" E
11	25° 28' 16.686" N	88° 43' 55.376" E
12	25° 27' 53.090" N	88° 43' 46.603" E
13	25° 27' 52.894" N	88° 43' 45.173" E
14	25° 27' 53.108" N	88° 43' 42.496" E
15	25° 27' 54.822" N	88° 43' 39.820" E
16	25° 27' 57.284" N	88° 43' 37.357" E
17	25° 27' 59.112" N	88° 43' 36.683" E
18	25° 27' 53.844" N	88° 43' 44.733" E

ABBREVIATION FORM		
DISTRICT	DD	DAKSHIN DINAJPUR
BLOCK	KR	KUMARGRAM
RIVER	AR	ATRAI RIVER

0 0.1 0.2 0.4 0.6

Kilometers

88°43'30"E

POTENTIAL BLOCK DD_KR_AR_06 OF ATRAI RIVER

DD_KR_AR_06		
POINT NO	LATITUDE	LONGITUDE
1	25° 27' 54.917" N	88° 43' 36.718" E
2	25° 27' 52.048" N	88° 43' 37.545" E
3	25° 27' 54.860" N	88° 43' 32.389" E
4	25° 28' 3.277" N	88° 43' 26.214" E
5	25° 28' 10.698" N	88° 43' 25.209" E
6	25° 28' 15.034" N	88° 43' 30.824" E
7	25° 28' 16.857" N	88° 43' 35.717" E
8	25° 28' 11.299" N	88° 43' 32.114" E
9	25° 28' 8.408" N	88° 43' 31.043" E
10	25° 28' 3.804" N	88° 43' 31.472" E
11	25° 28' 0.056" N	88° 43' 33.506" E

DD_KR_AR_06

ATRAI RIVER

25°28'0"N

LEGEND

- COORDINATE
- POTENTIAL BLOCK
- SAFETY BARRIER
- RIVER
- ADMINISTRATIVE BLOCK BOUNDARY
- DISTRICT BOUNDARY

ABBREVIATION FORM		
DISTRICT	DD	DAKSHIN DINAJPUR
BLOCK	KR	KUMARGRAM
RIVER	AR	ATRAI RIVER

0 0.075 0.15 0.3 0.45

Kilometers

88°43'30"E

88°43'30"E

88°44'0"E

POTENTIAL BLOCK DD_KR_AR_07 OF ATRAI RIVER

N

W E

S

6 7 8 9 5 10 11 12 4 13 3 2 1

ATRAI RIVER

25°27'30"N

25°27'30"N

LEGEND

- COORDINATE
- POTENTIAL BLOCK
- SAFETY BARRIER
- RIVER
- ADMINISTRATIVE BLOCK BOUNDARY
- DISTRICT BOUNDARY

DD_KR_AR_07		
POINT NO	LATITUDE	LONGITUDE
1	25° 27' 28.267" N	88° 43' 51.284" E
2	25° 27' 27.731" N	88° 43' 45.288" E
3	25° 27' 28.166" N	88° 43' 43.322" E
4	25° 27' 31.066" N	88° 43' 49.287" E
5	25° 27' 39.573" N	88° 43' 54.928" E
6	25° 27' 44.578" N	88° 43' 53.360" E
7	25° 27' 44.221" N	88° 43' 56.102" E
8	25° 27' 43.257" N	88° 43' 59.207" E
9	25° 27' 41.865" N	88° 44' 0.706" E
10	25° 27' 37.689" N	88° 44' 1.456" E
11	25° 27' 35.655" N	88° 44' 1.028" E
12	25° 27' 32.764" N	88° 43' 58.565" E
13	25° 27' 30.301" N	88° 43' 55.460" E

ABBREVIATION FORM		
DISTRICT	DD	DAKSHIN DINAJPUR
BLOCK	KR	KUMARGRAM
RIVER	AR	ATRAI RIVER

0 0.1 0.2 0.4 0.6

Kilometers

88°43'30"E

88°44'0"E

88°43'0"E

25°27'30"N

POTENTIAL BLOCK DD_KR_AR_08 OF ATRAI RIVER

N W E S

DD_KR_AR_08

ATRAI RIVER

LEGEND

- COORDINATE
- POTENTIAL BLOCK
- SAFETY BARRIER
- RIVER
- ADMINISTRATIVE BLOCK BOUNDARY
- DISTRICT BOUNDARY

ABBREVIATION FORM		
DISTRICT	DD	DAKSHIN DINAJPUR
BLOCK	KR	KUMARGRAM
RIVER	AR	ATRAI RIVER

0 0.04 0.08 0.16 0.24

Kilometers

88°43'0"E

DD_KR_AR_08		
POINT NO	LATITUDE	LONGITUDE
1	25° 27' 24.835" N	88° 43' 5.768" E
2	25° 27' 24.784" N	88° 43' 4.740" E
3	25° 27' 24.938" N	88° 43' 4.226" E
4	25° 27' 25.760" N	88° 43' 3.866" E
5	25° 27' 27.611" N	88° 43' 3.866" E
6	25° 27' 28.768" N	88° 43' 4.784" E
7	25° 27' 30.891" N	88° 43' 7.223" E
8	25° 27' 30.288" N	88° 43' 13.058" E
9	25° 27' 29.615" N	88° 43' 11.884" E
10	25° 27' 28.125" N	88° 43' 10.137" E
11	25° 27' 26.583" N	88° 43' 8.081" E

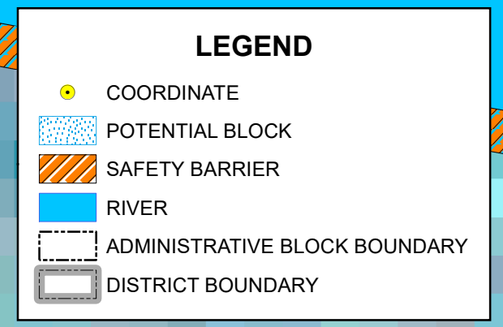
POTENTIAL BLOCK DD_KR_AR_09 OF ATRAI RIVER

88°43'0"E 88°43'30"E

25°27'30"N 25°27'0"N

ATRAI RIVER

DD_KR_AR_09

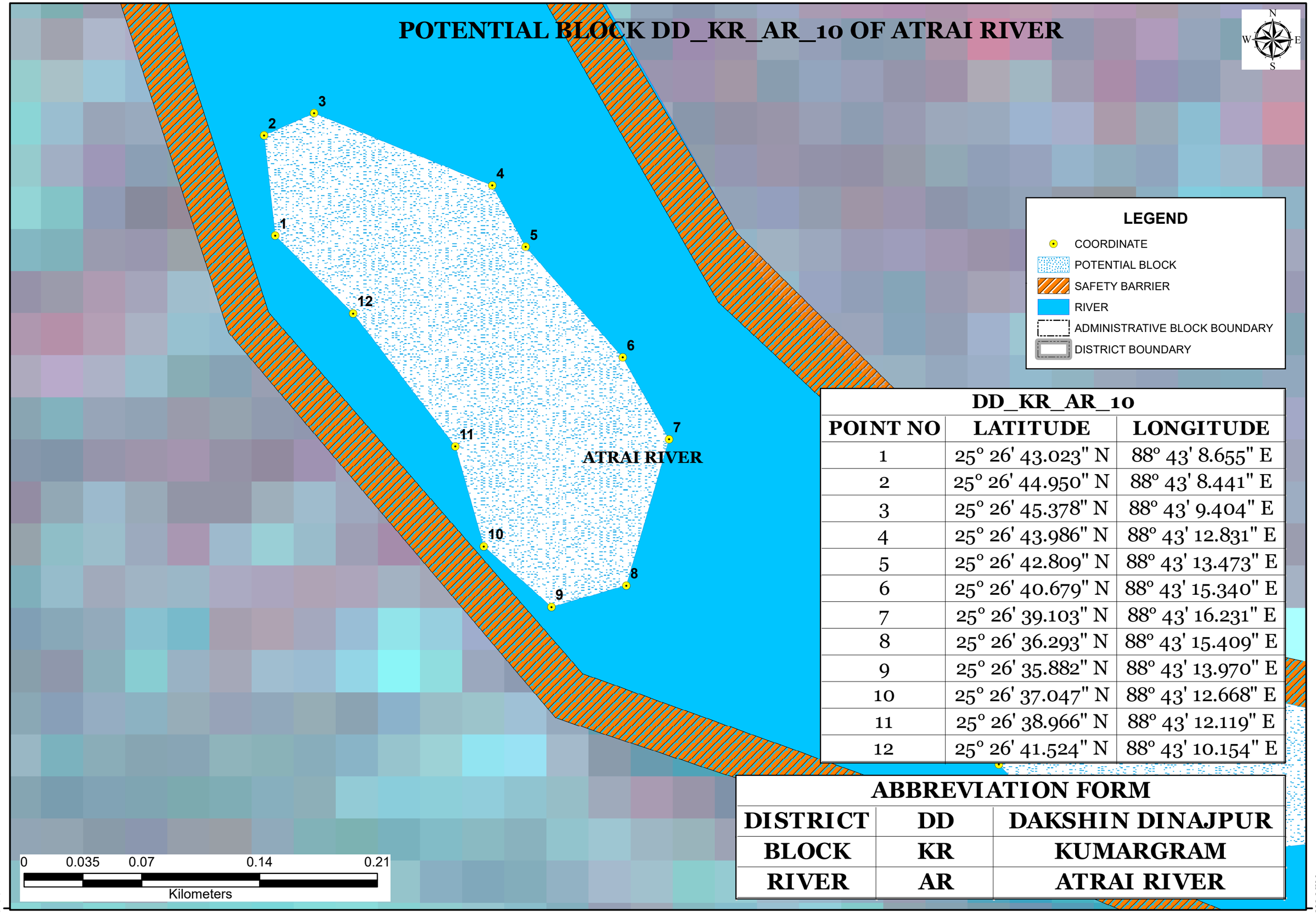


DD_KR_AR_09		
POINT NO	LATITUDE	LONGITUDE
1	25° 27' 28.315" N	88° 43' 20.023" E
2	25° 27' 26.610" N	88° 43' 21.554" E
3	25° 27' 26.688" N	88° 43' 16.933" E
4	25° 27' 24.359" N	88° 43' 8.538" E
5	25° 27' 16.431" N	88° 43' 4.207" E
6	25° 27' 7.138" N	88° 43' 4.681" E
7	25° 27' 0.395" N	88° 43' 6.727" E
8	25° 27' 1.332" N	88° 43' 5.568" E
9	25° 27' 7.114" N	88° 43' 2.891" E
10	25° 27' 11.075" N	88° 43' 2.356" E
11	25° 27' 15.680" N	88° 43' 2.463" E
12	25° 27' 19.427" N	88° 43' 3.319" E
13	25° 27' 22.854" N	88° 43' 4.818" E
14	25° 27' 25.745" N	88° 43' 8.887" E
15	25° 27' 27.672" N	88° 43' 12.421" E
16	25° 27' 28.315" N	88° 43' 14.883" E
17	25° 27' 28.636" N	88° 43' 17.989" E

ABBREVIATION FORM		
DISTRICT	DD	DAKSHIN DINAJPUR
BLOCK	KR	KUMARGRAM
RIVER	AR	ATRAI RIVER

0 0.05 0.1 0.2 0.3
Kilometers

POTENTIAL BLOCK DD_KR_AR_10 OF ATRAI RIVER



DD_KR_AR_10		
POINT NO	**LATITUDE**	**LONGITUDE**
1	25° 26' 43.023" N	88° 43' 8.655" E
2	25° 26' 44.950" N	88° 43' 8.441" E
3	25° 26' 45.378" N	88° 43' 9.404" E
4	25° 26' 43.986" N	88° 43' 12.831" E
5	25° 26' 42.809" N	88° 43' 13.473" E
6	25° 26' 40.679" N	88° 43' 15.340" E
7	25° 26' 39.103" N	88° 43' 16.231" E
8	25° 26' 36.293" N	88° 43' 15.409" E
9	25° 26' 35.882" N	88° 43' 13.970" E
10	25° 26' 37.047" N	88° 43' 12.668" E
11	25° 26' 38.966" N	88° 43' 12.119" E
12	25° 26' 41.524" N	88° 43' 10.154" E

ABBREVIATION FORM		
DISTRICT	**DD**	**DAKSHIN DINAJPUR**
BLOCK	**KR**	**KUMARGRAM**
RIVER	**AR**	**ATRAI RIVER**

88°43'30"E

POTENTIAL BLOCK DD_KR_AR_11 OF ATRAI RIVER

N
W E
S

DD_KR_AR_11		
POINT NO	LATITUDE	LONGITUDE
1	25° 26' 31.780" N	88° 43' 32.961" E
2	25° 26' 31.244" N	88° 43' 27.821" E
3	25° 26' 31.459" N	88° 43' 23.860" E
4	25° 26' 32.851" N	88° 43' 22.575" E
5	25° 26' 35.527" N	88° 43' 21.718" E
6	25° 26' 37.961" N	88° 43' 21.237" E
7	25° 26' 34.773" N	88° 43' 24.658" E
8	25° 26' 32.381" N	88° 43' 35.704" E

6
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4
3
2
1
8

ATRAI RIVER

25°26'30"N

25°26'30"N

LEGEND

- COORDINATE
- POTENTIAL BLOCK
- SAFETY BARRIER
- RIVER
- ADMINISTRATIVE BLOCK BOUNDARY
- DISTRICT BOUNDARY

ABBREVIATION FORM		
DISTRICT	DD	DAKSHIN DINAJPUR
BLOCK	KR	KUMARGRAM
RIVER	AR	ATRAI RIVER

0 0.04 0.08 0.16 0.24

Kilometers

88°43'30"E

POTENTIAL BLOCK DD_KR_AR_12 OF ATRAI RIVER

88°44'0"E

25°26'30"N

ATRAI RIVER

DD_KR_AR_12

DD_KR_AR_12		
POINT NO	LATITUDE	LONGITUDE
1	25° 26' 24.137" N	88° 44' 0.316" E
2	25° 26' 22.959" N	88° 44' 0.423" E
3	25° 26' 22.317" N	88° 43' 58.175" E
4	25° 26' 23.066" N	88° 43' 55.712" E
5	25° 26' 25.101" N	88° 43' 49.288" E
6	25° 26' 26.600" N	88° 43' 45.005" E
7	25° 26' 27.885" N	88° 43' 45.112" E
8	25° 26' 28.313" N	88° 43' 47.360" E
9	25° 26' 28.313" N	88° 43' 50.572" E
10	25° 26' 27.670" N	88° 43' 54.748" E
11	25° 26' 27.456" N	88° 43' 57.318" E
12	25° 26' 26.385" N	88° 43' 58.496" E

0 0.04 0.08 0.16 0.24

Kilometers

LEGEND

- COORDINATE
- POTENTIAL BLOCK
- SAFETY BARRIER
- RIVER
- ADMINISTRATIVE BLOCK BOUNDARY
- DISTRICT BOUNDARY

ABBREVIATION FORM		
DISTRICT	DD	DAKSHIN DINAJPUR
BLOCK	KR	KUMARGRAM
RIVER	AR	ATRAI RIVER

88°44'0"E

POTENTIAL BLOCK DD_KR_AR_13 OF ATRAI RIVER

88°44'0"E

25°26'30"N

N
W
E
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DD_KR_AR_13

ATRAI RIVER

LEGEND

- COORDINATE
- POTENTIAL BLOCK
- SAFETY BARRIER
- RIVER
- ADMINISTRATIVE BLOCK BOUNDARY
- DISTRICT BOUNDARY

DD_KR_AR_13		
POINT NO	LATITUDE	LONGITUDE
1	25° 26' 26.422" N	88° 44' 6.703" E
2	25° 26' 16.009" N	88° 44' 10.276" E
3	25° 26' 18.258" N	88° 44' 7.671" E
4	25° 26' 21.470" N	88° 44' 3.944" E
5	25° 26' 25.197" N	88° 44' 0.989" E
6	25° 26' 28.053" N	88° 43' 58.625" E

ABBREVIATION FORM		
DISTRICT	DD	DAKSHIN DINAJPUR
BLOCK	KR	KUMARGRAM
RIVER	AR	ATRAI RIVER

0 0.04 0.08 0.16 0.24

Kilometers

88°44'0"E

88°44'0"E

POTENTIAL BLOCK DD_KR_AR_14 OF ATRAI RIVER

LEGEND

- COORDINATE
- POTENTIAL BLOCK
- SAFETY BARRIER
- RIVER
- ADMINISTRATIVE BLOCK BOUNDARY
- DISTRICT BOUNDARY

DD_KR_AR_14		
POINT NO	LATITUDE	LONGITUDE
1	25° 25' 42.601" N	88° 44' 7.832" E
2	25° 25' 33.666" N	88° 44' 6.307" E
3	25° 25' 33.812" N	88° 44' 5.144" E
4	25° 25' 34.454" N	88° 44' 4.180" E
5	25° 25' 40.986" N	88° 44' 5.251" E
6	25° 25' 42.980" N	88° 44' 5.607" E

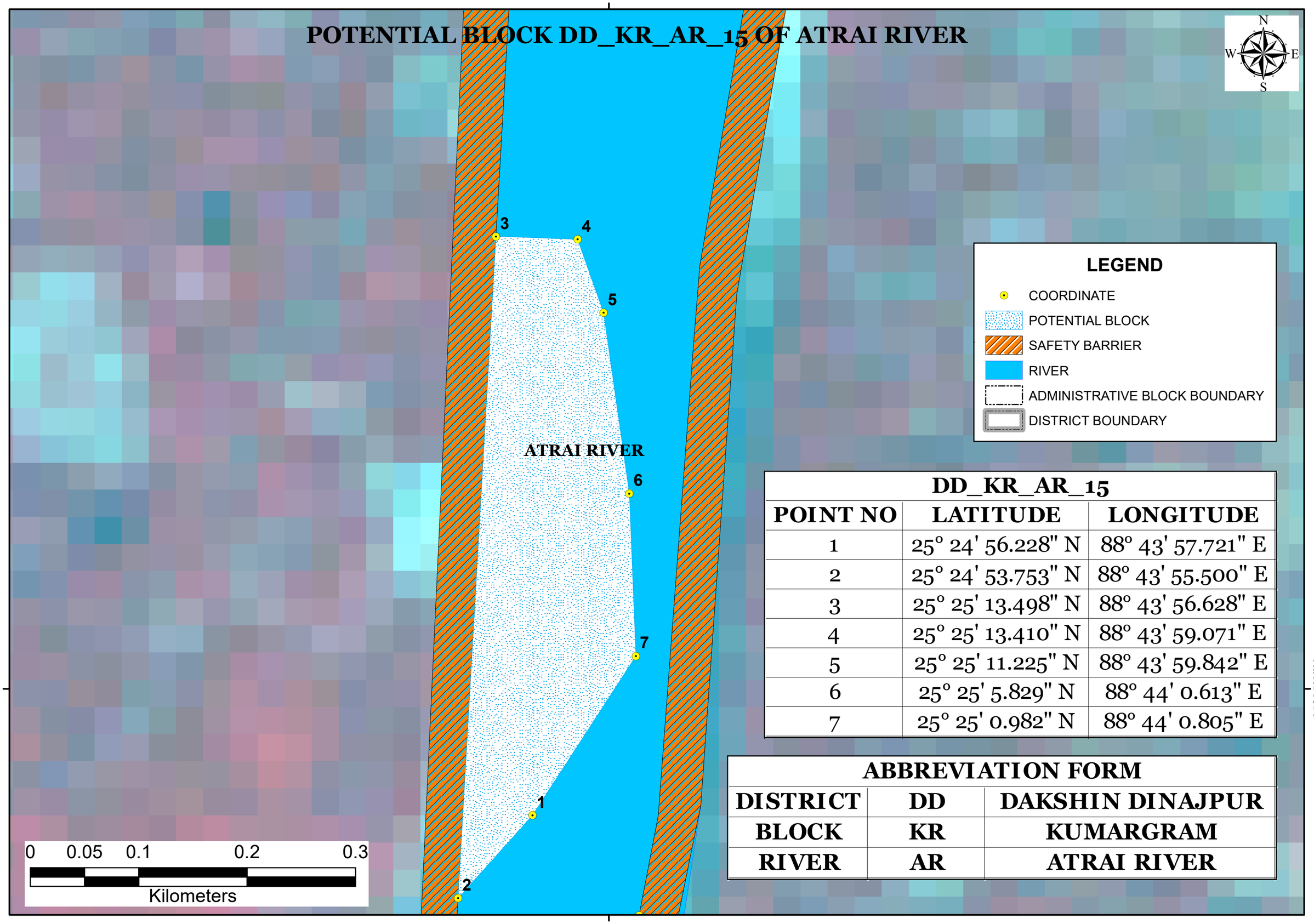
ABBREVIATION FORM		
DISTRICT	DD	DAKSHIN DINAJPUR
BLOCK	KR	KUMARGRAM
RIVER	AR	ATRAI RIVER

88°44'0"E

POTENTIAL BLOCK DD_KR_AR_15 OF ATRAI RIVER

88°44'0"E

25°25'0"N



DD_KR_AR_15		
POINT NO	LATITUDE	LONGITUDE
1	25° 24' 56.228" N	88° 43' 57.721" E
2	25° 24' 53.753" N	88° 43' 55.500" E
3	25° 25' 13.498" N	88° 43' 56.628" E
4	25° 25' 13.410" N	88° 43' 59.071" E
5	25° 25' 11.225" N	88° 43' 59.842" E
6	25° 25' 5.829" N	88° 44' 0.613" E
7	25° 25' 0.982" N	88° 44' 0.805" E

ABBREVIATION FORM		
DISTRICT	DD	DAKSHIN DINAJPUR
BLOCK	KR	KUMARGRAM
RIVER	AR	ATRAI RIVER

88°44'0"E

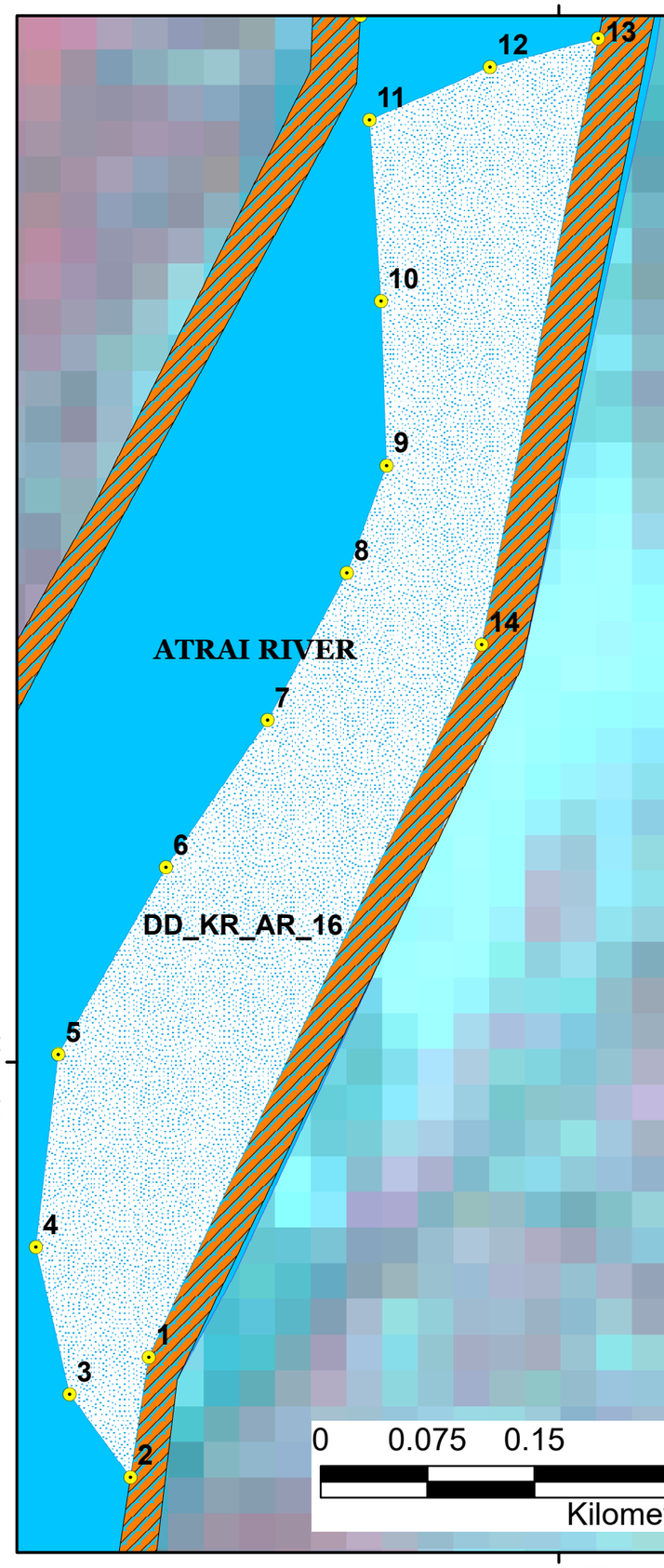
25°25'0"N

POTENTIAL BLOCK DD_KR_AR_16 OF ATRAI RIVER

88°44'0"E

88°44'30"E

25°24'30"N



LEGEND

- COORDINATE
- POTENTIAL BLOCK
- SAFETY BARRIER
- RIVER
- ADMINISTRATIVE BLOCK BOUNDARY
- DISTRICT BOUNDARY

DD_KR_AR_16		
POINT NO	LATITUDE	LONGITUDE
1	25° 24' 23.311" N	88° 43' 50.695" E
2	25° 24' 20.582" N	88° 43' 50.280" E
3	25° 24' 22.473" N	88° 43' 48.898" E
4	25° 24' 25.813" N	88° 43' 48.127" E
5	25° 24' 30.182" N	88° 43' 48.641" E
6	25° 24' 34.422" N	88° 43' 51.083" E
7	25° 24' 37.763" N	88° 43' 53.395" E
8	25° 24' 41.104" N	88° 43' 55.194" E
9	25° 24' 43.545" N	88° 43' 56.094" E
10	25° 24' 47.271" N	88° 43' 55.965" E
11	25° 24' 51.383" N	88° 43' 55.708" E
12	25° 24' 52.584" N	88° 43' 58.445" E
13	25° 24' 53.237" N	88° 44' 0.903" E
14	25° 24' 39.475" N	88° 43' 58.254" E

ABBREVIATION FORM		
DISTRICT	DD	DAKSHIN DINAJPUR
BLOCK	KR	KUMARGRAM
RIVER	AR	ATRAI RIVER

88°43'30"E

POTENTIAL BLOCK DD_KR_AR_17 OF ATRAI RIVER

25°24'30"N

25°24'30"N

LEGEND

- COORDINATE
- POTENTIAL BLOCK
- SAFETY BARRIER
- RIVER
- ADMINISTRATIVE BLOCK BOUNDARY
- DISTRICT BOUNDARY

DD_KR_AR_17		
POINT NO	LATITUDE	LONGITUDE
1	25° 24' 12.900" N	88° 43' 44.144" E
2	25° 24' 12.043" N	88° 43' 40.396" E
3	25° 24' 12.497" N	88° 43' 39.456" E
4	25° 24' 28.335" N	88° 43' 42.500" E
5	25° 24' 35.941" N	88° 43' 46.615" E
6	25° 24' 30.460" N	88° 43' 47.035" E
7	25° 24' 26.606" N	88° 43' 46.500" E
8	25° 24' 22.109" N	88° 43' 45.750" E
9	25° 24' 17.183" N	88° 43' 45.322" E

0 0.075 0.15 0.3 0.45

Kilometers

ATRAI RIVER

DD_KR_AR_17

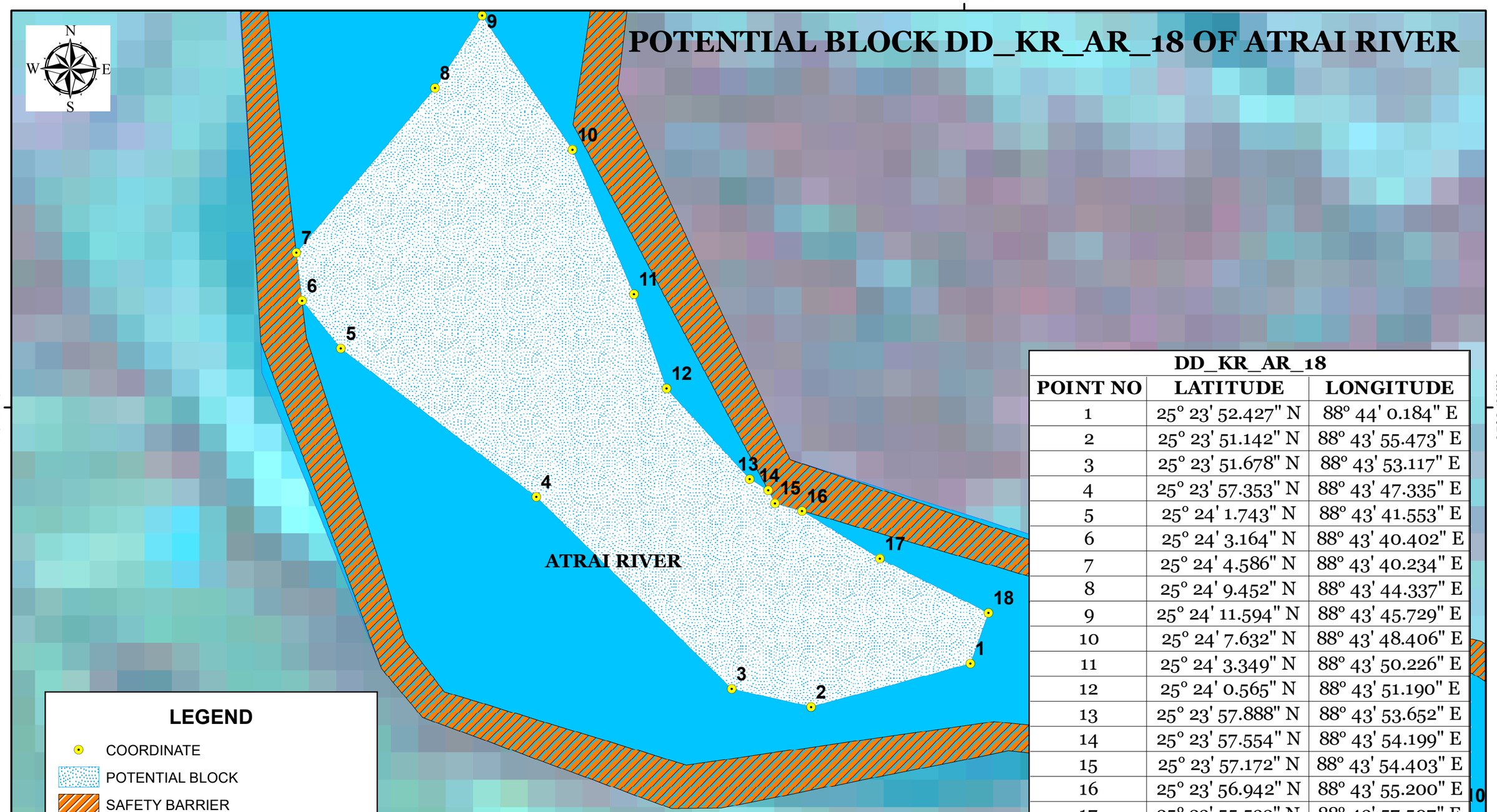
ABBREVIATION FORM		
DISTRICT	DD	DAKSHIN DINAJPUR
BLOCK	KR	KUMARGRAM
RIVER	AR	ATRAI RIVER

88°43'30"E

POTENTIAL BLOCK DD_KR_AR_18 OF ATRAI RIVER

88°44'0"E

25°24'0"N



DD_KR_AR_18		
POINT NO	LATITUDE	LONGITUDE
1	25° 23' 52.427" N	88° 44' 0.184" E
2	25° 23' 51.142" N	88° 43' 55.473" E
3	25° 23' 51.678" N	88° 43' 53.117" E
4	25° 23' 57.353" N	88° 43' 47.335" E
5	25° 24' 1.743" N	88° 43' 41.553" E
6	25° 24' 3.164" N	88° 43' 40.402" E
7	25° 24' 4.586" N	88° 43' 40.234" E
8	25° 24' 9.452" N	88° 43' 44.337" E
9	25° 24' 11.594" N	88° 43' 45.729" E
10	25° 24' 7.632" N	88° 43' 48.406" E
11	25° 24' 3.349" N	88° 43' 50.226" E
12	25° 24' 0.565" N	88° 43' 51.190" E
13	25° 23' 57.888" N	88° 43' 53.652" E
14	25° 23' 57.554" N	88° 43' 54.199" E
15	25° 23' 57.172" N	88° 43' 54.403" E
16	25° 23' 56.942" N	88° 43' 55.200" E
17	25° 23' 55.532" N	88° 43' 57.507" E
18	25° 23' 53.926" N	88° 44' 0.719" E

LEGEND

- COORDINATE
- POTENTIAL BLOCK
- SAFETY BARRIER
- RIVER
- ADMINISTRATIVE BLOCK BOUNDARY
- DISTRICT BOUNDARY

0 0.075 0.15 0.3 0.45

Kilometers

ABBREVIATION FORM		
DISTRICT	DD	DAKSHIN DINAJPUR
BLOCK	KR	KUMARGRAM
RIVER	AR	ATRAI RIVER

88°44'0"E

POTENTIAL BLOCK DD_KR_AR_19 OF ATRAI RIVER

88°44'0"E

88°44'30"E

25°23'30"N

ATRAI RIVER

DD_KR_AR_19		
POINT NO	LATITUDE	LONGITUDE
1	25° 23' 25.463" N	88° 44' 18.624" E
2	25° 23' 21.715" N	88° 44' 14.876" E
3	25° 23' 23.825" N	88° 44' 15.186" E
4	25° 23' 31.192" N	88° 44' 17.808" E
5	25° 23' 31.382" N	88° 44' 17.782" E
6	25° 23' 32.638" N	88° 44' 18.476" E
7	25° 23' 43.429" N	88° 44' 18.125" E
8	25° 23' 47.940" N	88° 44' 11.985" E
9	25° 23' 47.991" N	88° 44' 12.392" E
10	25° 23' 48.077" N	88° 44' 14.705" E
11	25° 23' 47.734" N	88° 44' 16.675" E
12	25° 23' 46.621" N	88° 44' 19.416" E
13	25° 23' 44.137" N	88° 44' 21.301" E
14	25° 23' 42.166" N	88° 44' 21.643" E
15	25° 23' 38.140" N	88° 44' 21.729" E
16	25° 23' 35.913" N	88° 44' 21.044" E
17	25° 23' 33.515" N	88° 44' 19.588" E
18	25° 23' 28.568" N	88° 44' 19.159" E

LEGEND

- COORDINATE
- POTENTIAL BLOCK
- SAFETY BARRIER
- RIVER
- ADMINISTRATIVE BLOCK BOUNDARY
- DISTRICT BOUNDARY

0 0.075 0.15 0.3 0.45

Kilometers

ABBREVIATION FORM		
DISTRICT	DD	DAKSHIN DINAJPUR
BLOCK	KR	KUMARGRAM
RIVER	AR	ATRAI RIVER

POTENTIAL BLOCK DD_KR_AR_20 OF ATRAI RIVER

88°44'0"E

88°44'30"E

25°23'0"N

N
W
E
S

ATRAI RIVER

DD_KR_AR_20		
POINT NO	LATITUDE	LONGITUDE
1	25° 22' 52.764" N	88° 44' 13.456" E
2	25° 22' 50.708" N	88° 44' 11.828" E
3	25° 22' 53.220" N	88° 44' 9.698" E
4	25° 22' 56.968" N	88° 44' 7.878" E
5	25° 23' 0.073" N	88° 44' 6.164" E
6	25° 23' 4.142" N	88° 44' 5.094" E
7	25° 23' 5.654" N	88° 44' 4.932" E
8	25° 23' 12.740" N	88° 44' 7.481" E
9	25° 23' 14.593" N	88° 44' 8.505" E
10	25° 23' 15.278" N	88° 44' 9.484" E
11	25° 23' 19.346" N	88° 44' 16.444" E
12	25° 23' 20.031" N	88° 44' 18.538" E
13	25° 23' 12.627" N	88° 44' 17.077" E
14	25° 23' 3.666" N	88° 44' 15.468" E
15	25° 22' 53.474" N	88° 44' 13.725" E

LEGEND

- COORDINATE
- POTENTIAL BLOCK
- SAFETY BARRIER
- RIVER
- ADMINISTRATIVE BLOCK BOUNDARY
- DISTRICT BOUNDARY

0 0.075 0.15 0.3 0.45

Kilometers

ABBREVIATION FORM		
DISTRICT	DD	DAKSHIN DINAJPUR
BLOCK	KR	KUMARGRAM
RIVER	AR	ATRAI RIVER

POTENTIAL BLOCK DD_KR_AR_21 OF ATRAI RIVER

88°44'30"E

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ATRAI RIVER

LEGEND

- COORDINATE
- POTENTIAL BLOCK
- SAFETY BARRIER
- RIVER
- ADMINISTRATIVE BLOCK BOUNDARY
- DISTRICT BOUNDARY

DD_KR_AR_21		
POINT NO	LATITUDE	LONGITUDE
1	25° 22' 8.372" N	88° 44' 26.162" E
2	25° 22' 7.693" N	88° 44' 23.270" E
3	25° 22' 19.429" N	88° 44' 25.427" E
4	25° 22' 18.480" N	88° 44' 26.505" E
5	25° 22' 16.424" N	88° 44' 27.618" E
6	25° 22' 14.197" N	88° 44' 28.218" E
7	25° 22' 11.285" N	88° 44' 28.646" E
8	25° 22' 8.886" N	88° 44' 27.533" E

ABBREVIATION FORM		
DISTRICT	DD	DAKSHIN DINAJPUR
BLOCK	KR	KUMARGRAM
RIVER	AR	ATRAI RIVER

0 0.05 0.1 0.2 0.3
Kilometers

25°22'0"N

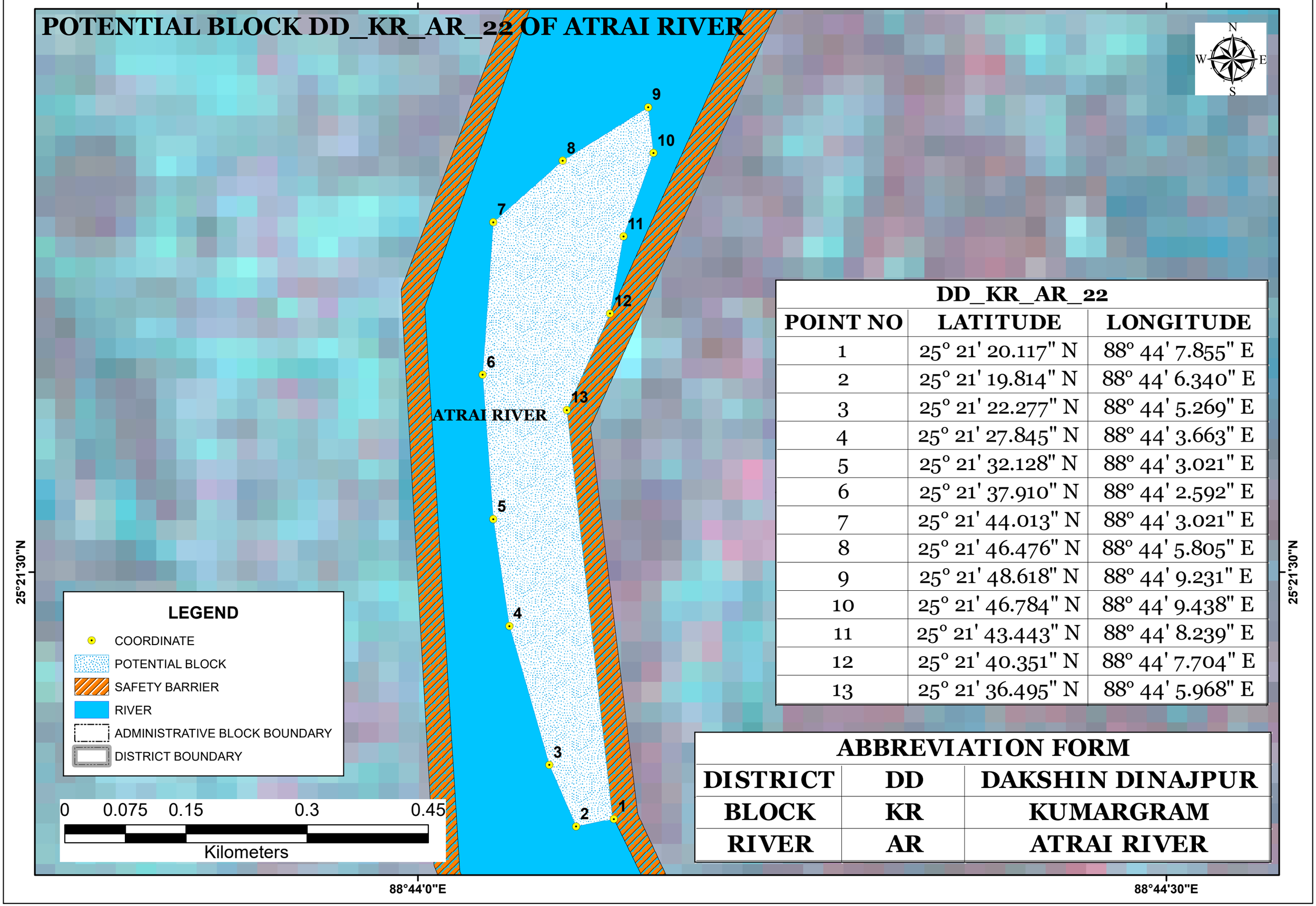
88°44'30"E

POTENTIAL BLOCK DD_KR_AR_22 OF ATRAI RIVER

88°44'0"E

88°44'30"E

25°21'30"N



LEGEND

- COORDINATE
- POTENTIAL BLOCK
- SAFETY BARRIER
- RIVER
- ADMINISTRATIVE BLOCK BOUNDARY
- DISTRICT BOUNDARY

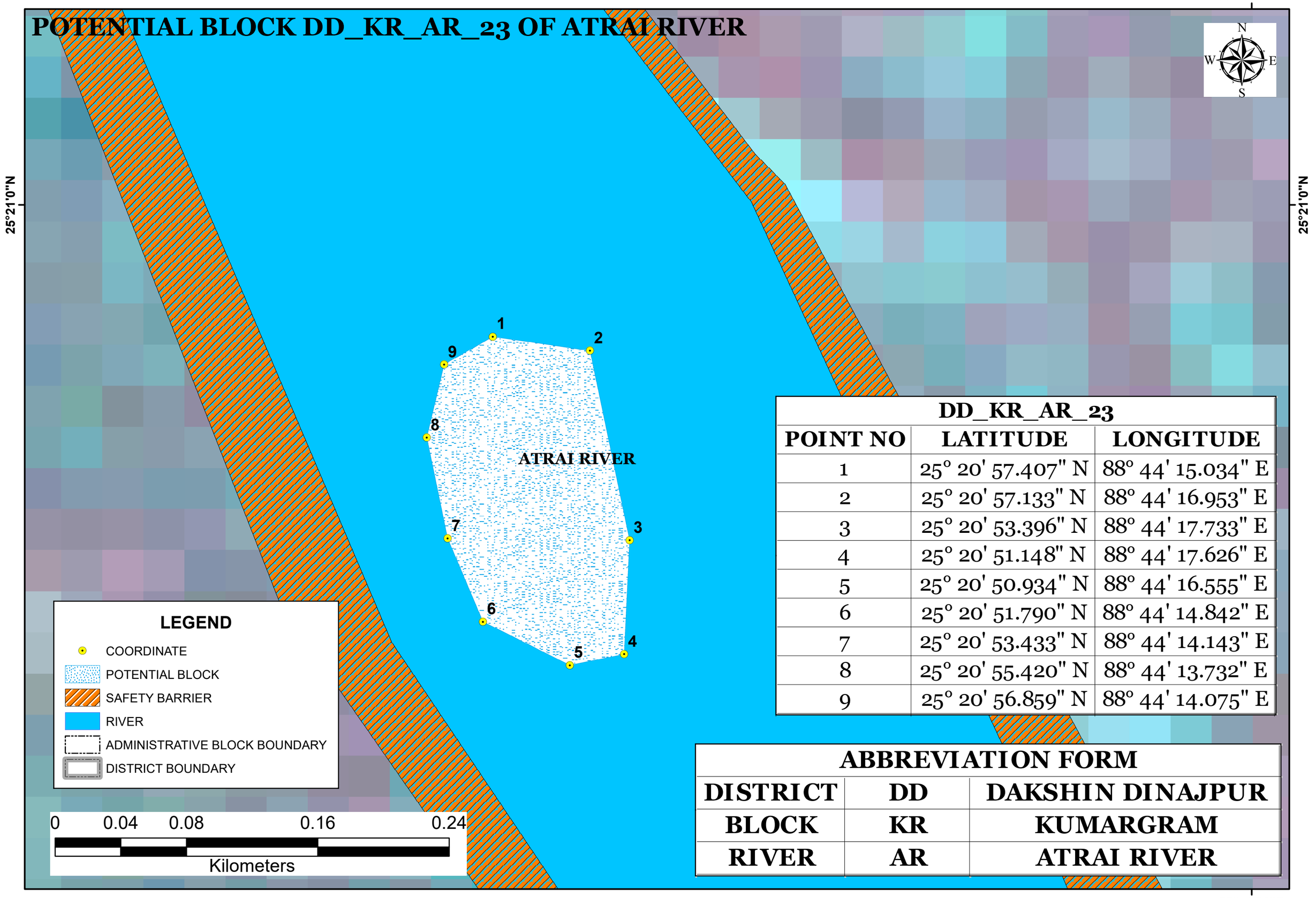
DD_KR_AR_22		
POINT NO	LATITUDE	LONGITUDE
1	25° 21' 20.117" N	88° 44' 7.855" E
2	25° 21' 19.814" N	88° 44' 6.340" E
3	25° 21' 22.277" N	88° 44' 5.269" E
4	25° 21' 27.845" N	88° 44' 3.663" E
5	25° 21' 32.128" N	88° 44' 3.021" E
6	25° 21' 37.910" N	88° 44' 2.592" E
7	25° 21' 44.013" N	88° 44' 3.021" E
8	25° 21' 46.476" N	88° 44' 5.805" E
9	25° 21' 48.618" N	88° 44' 9.231" E
10	25° 21' 46.784" N	88° 44' 9.438" E
11	25° 21' 43.443" N	88° 44' 8.239" E
12	25° 21' 40.351" N	88° 44' 7.704" E
13	25° 21' 36.495" N	88° 44' 5.968" E

ABBREVIATION FORM		
DISTRICT	DD	DAKSHIN DINAJPUR
BLOCK	KR	KUMARGRAM
RIVER	AR	ATRAI RIVER

POTENTIAL BLOCK DD_KR_AR_23 OF ATRAI RIVER

88°44'30"E

25°21'0"N



DD_KR_AR_23		
POINT NO	LATITUDE	LONGITUDE
1	25° 20' 57.407" N	88° 44' 15.034" E
2	25° 20' 57.133" N	88° 44' 16.953" E
3	25° 20' 53.396" N	88° 44' 17.733" E
4	25° 20' 51.148" N	88° 44' 17.626" E
5	25° 20' 50.934" N	88° 44' 16.555" E
6	25° 20' 51.790" N	88° 44' 14.842" E
7	25° 20' 53.433" N	88° 44' 14.143" E
8	25° 20' 55.420" N	88° 44' 13.732" E
9	25° 20' 56.859" N	88° 44' 14.075" E

ABBREVIATION FORM		
DISTRICT	DD	DAKSHIN DINAJPUR
BLOCK	KR	KUMARGRAM
RIVER	AR	ATRAI RIVER

88°44'30"E

POTENTIAL BLOCK DD_KR_AR_24 OF ATRAI RIVER

88°44'30"E

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4
ATRAI RIVER
3
1
2

DD_KR_AR_24		
POINT NO	LATITUDE	LONGITUDE
1	25° 20' 38.839" N	88° 44' 24.768" E
2	25° 20' 38.633" N	88° 44' 23.329" E
3	25° 20' 39.182" N	88° 44' 21.753" E
4	25° 20' 40.117" N	88° 44' 20.642" E
5	25° 20' 41.543" N	88° 44' 19.681" E
6	25° 20' 42.801" N	88° 44' 19.855" E
7	25° 20' 42.468" N	88° 44' 21.844" E
8	25° 20' 41.440" N	88° 44' 24.071" E
9	25° 20' 40.621" N	88° 44' 24.837" E

LEGEND

- COORDINATE
- POTENTIAL BLOCK
- SAFETY BARRIER
- RIVER
- ADMINISTRATIVE BLOCK BOUNDARY
- DISTRICT BOUNDARY

0 0.03 0.06 0.12 0.18

Kilometers

ABBREVIATION FORM		
DISTRICT	DD	DAKSHIN DINAJPUR
BLOCK	KR	KUMARGRAM
RIVER	AR	ATRAI RIVER

88°44'30"E

POTENTIAL BLOCK DD_BG_AR_25 OF ATRAI RIVER

88°45'30"E

N
W E
S

LEGEND

- COORDINATE
- POTENTIAL BLOCK
- SAFETY BARRIER
- RIVER
- ADMINISTRATIVE BLOCK BOUNDARY
- DISTRICT BOUNDARY

ATRAI RIVER

DD_BG_AR_25		
POINT NO	LATITUDE	LONGITUDE
1	25° 20' 9.017" N	88° 45' 31.631" E
2	25° 20' 6.989" N	88° 45' 32.588" E
3	25° 20' 7.064" N	88° 45' 30.570" E
4	25° 20' 8.687" N	88° 45' 26.076" E
5	25° 20' 15.848" N	88° 45' 21.449" E
6	25° 20' 16.158" N	88° 45' 20.631" E
7	25° 20' 16.326" N	88° 45' 20.852" E
8	25° 20' 16.755" N	88° 45' 22.394" E
9	25° 20' 16.069" N	88° 45' 26.677" E
10	25° 20' 14.699" N	88° 45' 28.048" E
11	25° 20' 12.557" N	88° 45' 29.247" E
12	25° 20' 10.758" N	88° 45' 30.446" E

0 0.04 0.08 0.16 0.24

Kilometers

ABBREVIATION FORM		
DISTRICT	DD	DAKSHIN DINAJPUR
BLOCK	BG	BALURGHAT
RIVER	AR	ATRAI RIVER

88°45'30"E

POTENTIAL BLOCK DD_BG_AR_26 OF ATRAI RIVER

88°44'0"E 88°44'30"E 88°45'0"E

25°19'30"N

25°19'0"N

LEGEND

- COORDINATE
- POTENTIAL BLOCK
- SAFETY BARRIER
- RIVER
- ADMINISTRATIVE BLOCK BOUNDARY
- DISTRICT BOUNDARY

0 0.125 0.25 0.5 0.75

Kilometers

N W E S

ATRAI RIVER

ABBREVIATION FORM

DISTRICT	DD	DAKSHIN DINAJPUR
BLOCK	BG	BALURGHAT
RIVER	AR	ATRAI RIVER

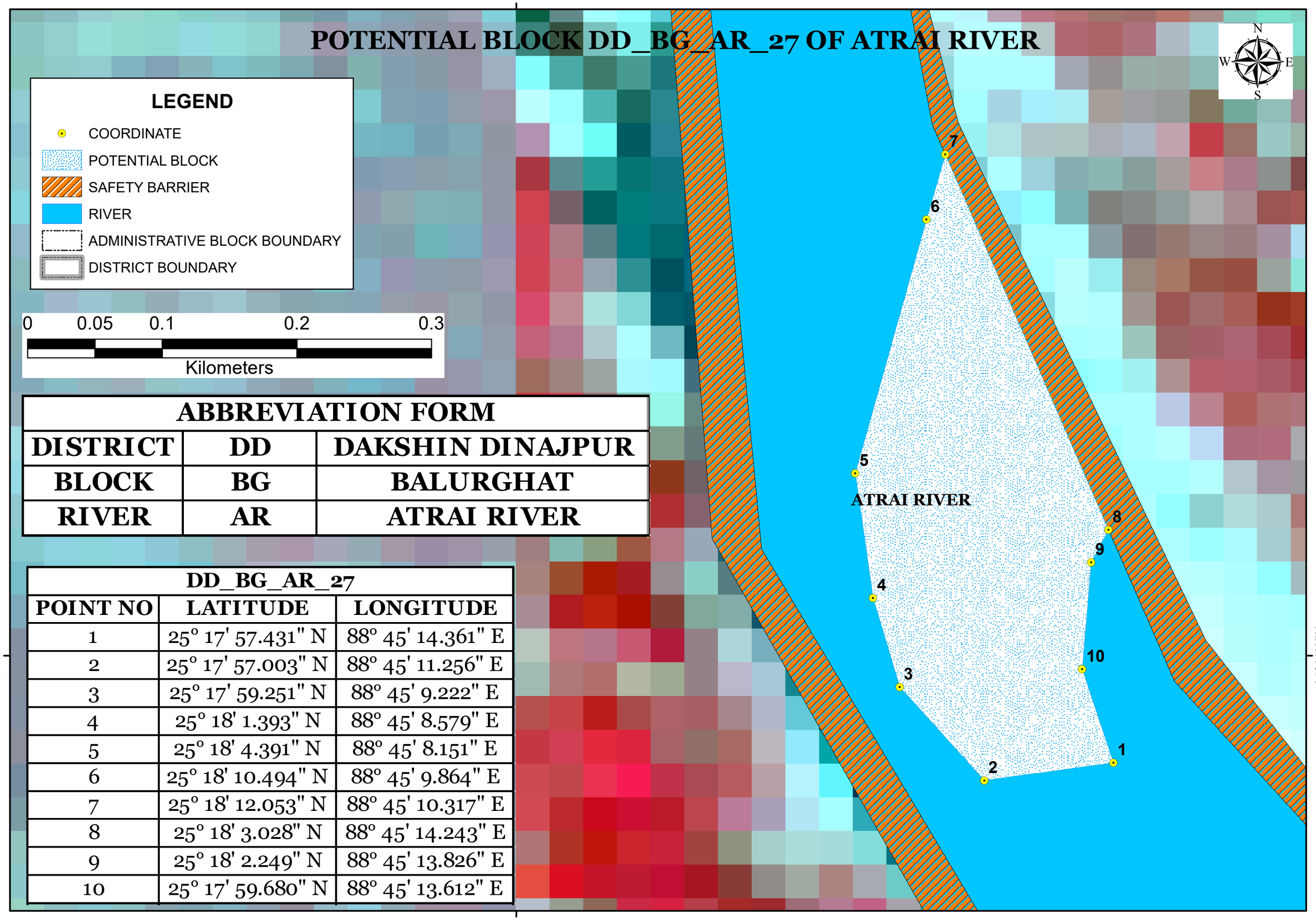
DD_BG_AR_26

POINT NO	LATITUDE	LONGITUDE	POINT NO	LATITUDE	LONGITUDE
1	25° 19' 0.452" N	88° 44' 47.528" E	14	25° 19' 33.547" N	88° 44' 55.787" E
2	25° 18' 59.938" N	88° 44' 46.372" E	15	25° 19' 34.229" N	88° 44' 57.407" E
3	25° 19' 1.737" N	88° 44' 44.830" E	16	25° 19' 35.659" N	88° 45' 2.819" E
4	25° 19' 5.335" N	88° 44' 43.545" E	17	25° 19' 35.659" N	88° 45' 8.858" E
5	25° 19' 7.923" N	88° 44' 42.722" E	18	25° 19' 30.000" N	88° 45' 7.443" E
6	25° 19' 8.532" N	88° 44' 42.658" E	19	25° 19' 28.022" N	88° 45' 5.797" E
7	25° 19' 11.888" N	88° 44' 42.774" E	20	25° 19' 22.443" N	88° 45' 2.913" E
8	25° 19' 16.513" N	88° 44' 43.160" E	21	25° 19' 21.910" N	88° 44' 59.606" E
9	25° 19' 21.268" N	88° 44' 44.573" E	22	25° 19' 20.882" N	88° 44' 56.394" E
10	25° 19' 22.432" N	88° 44' 45.177" E	23	25° 19' 17.670" N	88° 44' 51.640" E
11	25° 19' 25.316" N	88° 44' 47.407" E	24	25° 19' 14.201" N	88° 44' 49.841" E
12	25° 19' 26.536" N	88° 44' 49.584" E	25	25° 19' 8.162" N	88° 44' 49.070" E
13	25° 19' 29.877" N	88° 44' 53.182" E	26	25° 19' 4.821" N	88° 44' 48.942" E

POTENTIAL BLOCK DD_BG_AR_27 OF ATRAI RIVER

88°45'0"E

25°18'0"N



ABBREVIATION FORM		
DISTRICT	DD	DAKSHIN DINAJPUR
BLOCK	BG	BALURGHAT
RIVER	AR	ATRAI RIVER

DD_BG_AR_27		
POINT NO	LATITUDE	LONGITUDE
1	25° 17' 57.431" N	88° 45' 14.361" E
2	25° 17' 57.003" N	88° 45' 11.256" E
3	25° 17' 59.251" N	88° 45' 9.222" E
4	25° 18' 1.393" N	88° 45' 8.579" E
5	25° 18' 4.391" N	88° 45' 8.151" E
6	25° 18' 10.494" N	88° 45' 9.864" E
7	25° 18' 12.053" N	88° 45' 10.317" E
8	25° 18' 3.028" N	88° 45' 14.243" E
9	25° 18' 2.249" N	88° 45' 13.826" E
10	25° 17' 59.680" N	88° 45' 13.612" E

88°45'0"E

88°45'0"E

88°45'30"E

POTENTIAL BLOCK DD_BG_AR_28 OF ATRAI RIVER

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LEGEND

- COORDINATE
- POTENTIAL BLOCK
- SAFETY BARRIER
- RIVER
- ADMINISTRATIVE BLOCK BOUNDARY
- DISTRICT BOUNDARY

ABBREVIATION FORM		
DISTRICT	DD	DAKSHIN DINAJPUR
BLOCK	BG	BALURGHAT
RIVER	AR	ATRAI RIVER

0 0.05 0.1 0.2 0.3

Kilometers

ATRAI RIVER

DD_BG_AR_28		
POINT NO	LATITUDE	LONGITUDE
1	25° 17' 45.557" N	88° 45' 27.316" E
2	25° 17' 45.295" N	88° 45' 27.248" E
3	25° 17' 45.010" N	88° 45' 23.810" E
4	25° 17' 45.557" N	88° 45' 22.519" E
5	25° 17' 47.789" N	88° 45' 18.862" E
6	25° 17' 51.615" N	88° 45' 13.829" E
7	25° 17' 52.753" N	88° 45' 14.364" E
8	25° 17' 52.958" N	88° 45' 16.694" E
9	25° 17' 52.684" N	88° 45' 19.572" E
10	25° 17' 51.519" N	88° 45' 21.902" E
11	25° 17' 49.874" N	88° 45' 23.753" E
12	25° 17' 47.682" N	88° 45' 25.672" E

88°45'0"E

88°45'30"E

POTENTIAL BLOCK DD_BG_AR_28 OF ATRAI RIVER

88°45'30"E

25°17'0"N

N
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LEGEND

- COORDINATE
- POTENTIAL BLOCK
- SAFETY BARRIER
- RIVER
- ADMINISTRATIVE BLOCK BOUNDARY
- DISTRICT BOUNDARY

ABBREVIATION FORM		
DISTRICT	DD	DAKSHIN DINAJPUR
BLOCK	BG	BALURGHAT
RIVER	AR	ATRAI RIVER

0 0.075 0.15 0.3 0.45

Kilometers

DD_BG_AR_29		
POINT NO	LATITUDE	LONGITUDE
1	25° 16' 50.209" N	88° 45' 53.401" E
2	25° 16' 44.534" N	88° 45' 52.866" E
3	25° 16' 47.532" N	88° 45' 49.761" E
4	25° 16' 53.421" N	88° 45' 42.158" E
5	25° 17' 1.238" N	88° 45' 31.772" E
6	25° 17' 4.544" N	88° 45' 27.976" E
7	25° 17' 10.311" N	88° 45' 40.576" E
8	25° 17' 5.949" N	88° 45' 45.156" E
9	25° 16' 56.808" N	88° 45' 53.128" E

ATRAI RIVER

88°45'30"E

POTENTIAL BLOCK DD_BG_AR_30 OF ATRAI RIVER

88°46'0"E

25°16'40"N

N
W E
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LEGEND

- COORDINATE
- POTENTIAL BLOCK
- SAFETY BARRIER
- RIVER
- ADMINISTRATIVE BLOCK BOUNDARY
- DISTRICT BOUNDARY

ABBREVIATION FORM

DISTRICT	DD	DAKSHIN DINAJPUR
BLOCK	BG	BALURGHAT
RIVER	AR	ATRAI RIVER

ATRAI RIVER

0 0.04 0.08 0.16 0.24

Kilometers

DD_BG_AR_30

POINT NO	LATITUDE	LONGITUDE
1	25° 16' 36.871" N	88° 46' 1.159" E
2	25° 16' 33.786" N	88° 46' 2.535" E
3	25° 16' 34.147" N	88° 46' 1.132" E
4	25° 16' 36.289" N	88° 45' 59.312" E
5	25° 16' 40.786" N	88° 45' 57.063" E
6	25° 16' 45.605" N	88° 45' 56.742" E
7	25° 16' 47.649" N	88° 45' 56.902" E
8	25° 16' 39.208" N	88° 45' 59.963" E

POTENTIAL BLOCK DD_BG_AR_31 OF ATRAI RIVER

88°46'0"E

88°46'40"E

25°16'0"N

N

W E

S

LEGEND

- COORDINATE
- POTENTIAL BLOCK
- SAFETY BARRIER
- RIVER
- ADMINISTRATIVE BLOCK BOUNDARY
- DISTRICT BOUNDARY

ABBREVIATION FORM		
DISTRICT	DD	DAKSHIN DINAJPUR
BLOCK	BG	BALURGHAT
RIVER	AR	ATRAI RIVER

0 0.075 0.15 0.3 0.45

Kilometers

DD_BG_AR_31

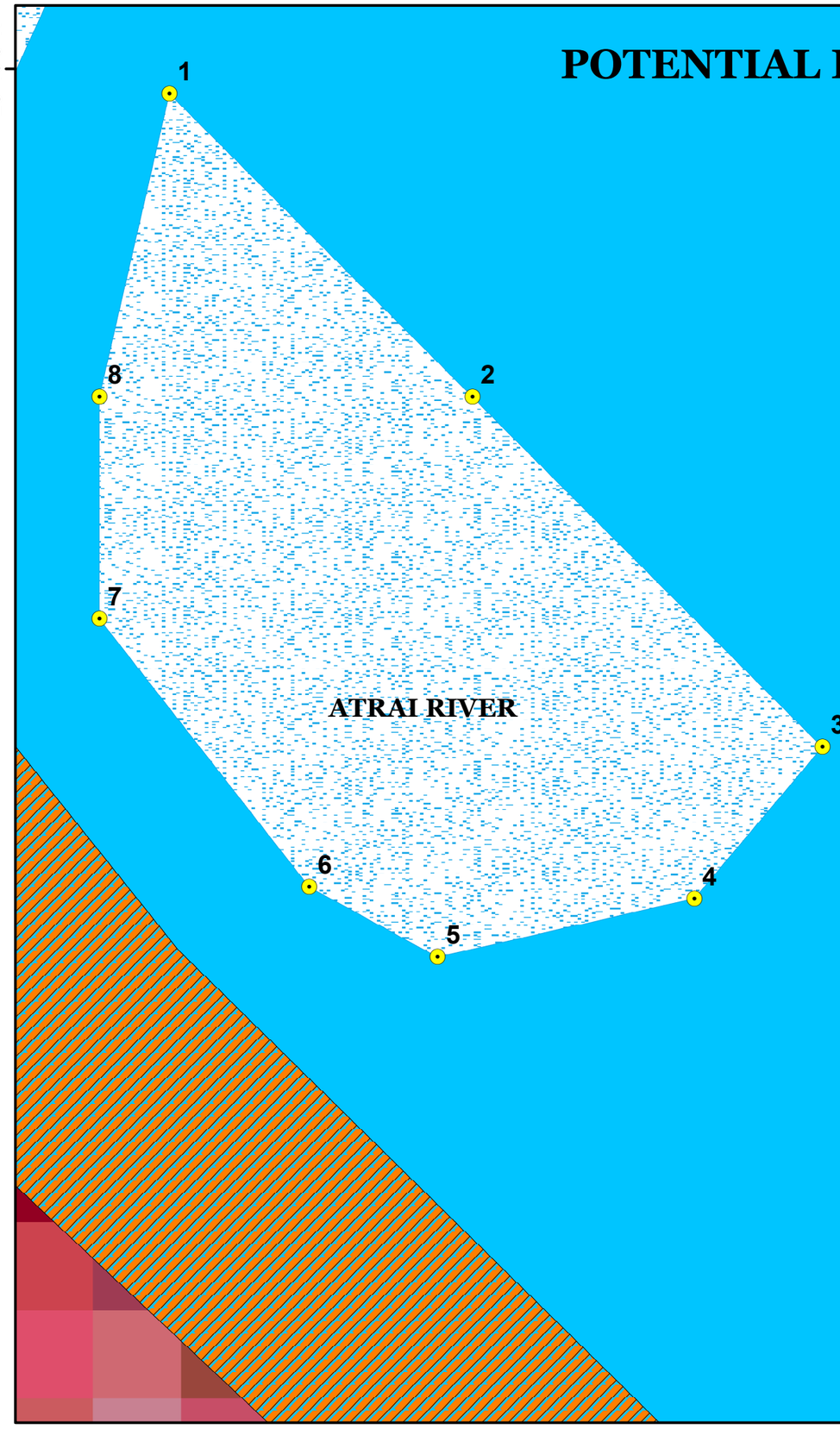
ATRAI RIVER

DD_BG_AR_31		
POINT NO	LATITUDE	LONGITUDE
1	25° 16' 0.954" N	88° 46' 13.446" E
2	25° 15' 56.992" N	88° 46' 11.626" E
3	25° 16' 9.291" N	88° 46' 6.239" E
4	25° 16' 27.024" N	88° 46' 2.045" E
5	25° 16' 25.046" N	88° 46' 4.344" E
6	25° 16' 22.048" N	88° 46' 7.128" E
7	25° 16' 16.908" N	88° 46' 10.876" E
8	25° 16' 13.482" N	88° 46' 12.803" E
9	25° 16' 10.055" N	88° 46' 13.660" E
10	25° 16' 5.237" N	88° 46' 14.088" E

POTENTIAL BLOCK DD_BG_AR_32 OF ATRAI RIVER

25°16'0"N

25°16'0"N



LEGEND

- COORDINATE
- POTENTIAL BLOCK
- SAFETY BARRIER
- RIVER
- ADMINISTRATIVE BLOCK BOUNDARY
- DISTRICT BOUNDARY

ABBREVIATION FORM		
DISTRICT	DD	DAKSHIN DINAJPUR
BLOCK	BG	BALURGHAT
RIVER	AR	ATRAI RIVER

0 0.03 0.06 0.12 0.18

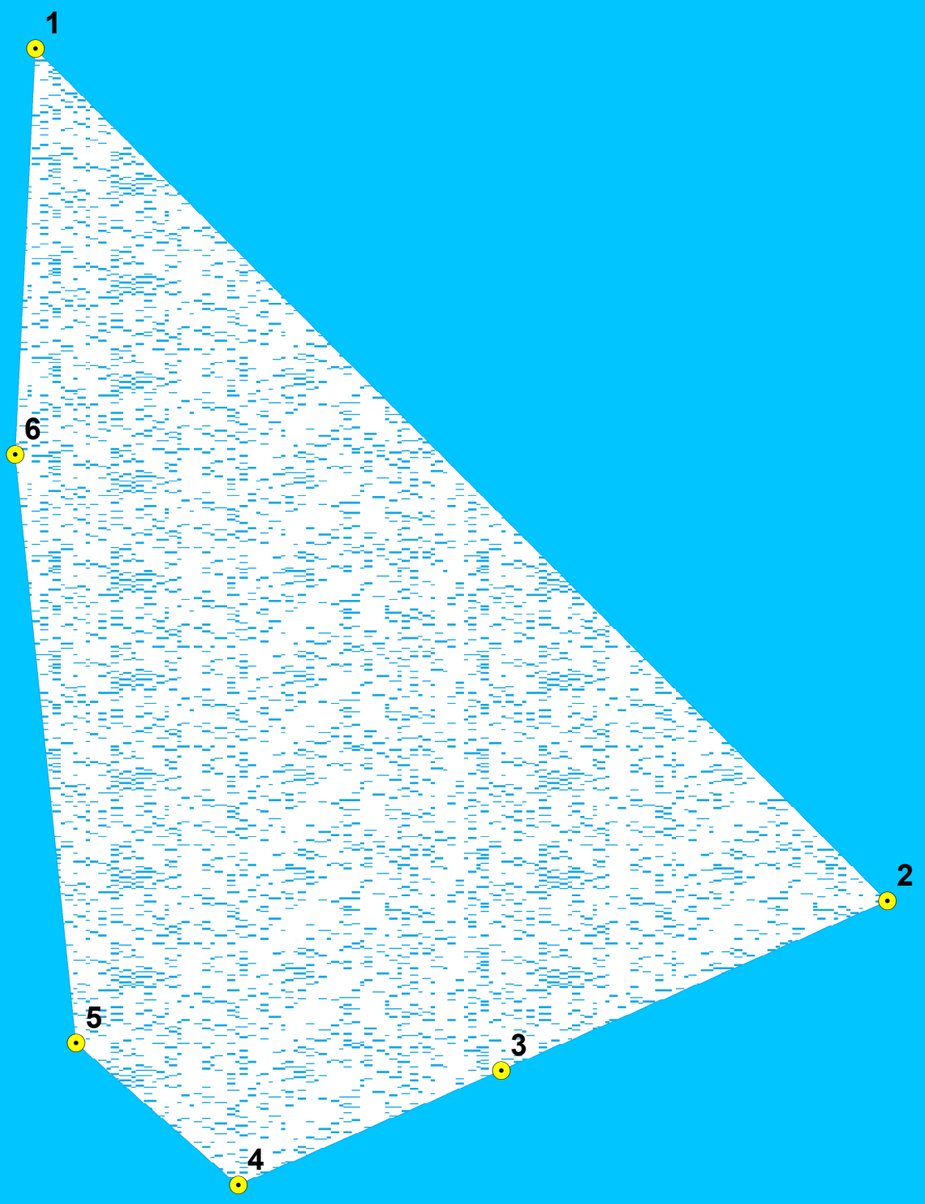
Kilometers

DD_BG_AR_32		
POINT NO	LATITUDE	LONGITUDE
1	25° 15' 59.776" N	88° 46' 14.410" E
2	25° 15' 56.992" N	88° 46' 17.194" E
3	25° 15' 53.780" N	88° 46' 20.406" E
4	25° 15' 52.388" N	88° 46' 19.228" E
5	25° 15' 51.852" N	88° 46' 16.872" E
6	25° 15' 52.495" N	88° 46' 15.694" E
7	25° 15' 54.958" N	88° 46' 13.767" E
8	25° 15' 56.992" N	88° 46' 13.767" E

POTENTIAL BLOCK DD_BG_AR_33 OF ATRAI RIVER

88°46'30"E

25°15'50"N



ATRAI RIVER

LEGEND

- COORDINATE
- POTENTIAL BLOCK
- SAFETY BARRIER
- RIVER
- ADMINISTRATIVE BLOCK BOUNDARY
- DISTRICT BOUNDARY

ABBREVIATION FORM		
DISTRICT	DD	DAKSHIN DINAJPUR
BLOCK	BG	BALURGHAT
RIVER	AR	ATRAI RIVER

0 0.02 0.04 0.08 0.12

Kilometers

DD_BG_AR_33		
POINT NO	LATITUDE	LONGITUDE
1	25° 15' 51.638" N	88° 46' 24.903" E
2	25° 15' 47.141" N	88° 46' 29.400" E
3	25° 15' 46.247" N	88° 46' 27.363" E
4	25° 15' 45.642" N	88° 46' 25.974" E
5	25° 15' 46.392" N	88° 46' 25.117" E
6	25° 15' 49.497" N	88° 46' 24.796" E

88°46'30"E

POTENTIAL BLOCK DD_BG_AR_34 OF ATRAI RIVER

88°46'30"E 88°46'40"E 88°46'50"E 88°47'0"E

25°15'40"N 25°15'30"N 25°15'20"N

N W E S

LEGEND

- COORDINATE
- POTENTIAL BLOCK
- SAFETY BARRIER
- RIVER
- ADMINISTRATIVE BLOCK BOUNDARY
- DISTRICT BOUNDARY

ATRAI RIVER

0 0.05 0.1 0.2 0.3

Kilometers

ABBREVIATION FORM		
DISTRICT	DD	DAKSHIN DINAJPUR
BLOCK	BG	BALURGHAT
RIVER	AR	ATRAI RIVER

DD_BG_AR_34		
POINT NO	LATITUDE	LONGITUDE
1	25° 15' 23.906" N	88° 46' 38.710" E
2	25° 15' 22.278" N	88° 46' 38.282" E
3	25° 15' 23.735" N	88° 46' 36.997" E
4	25° 15' 26.390" N	88° 46' 35.712" E
5	25° 15' 27.589" N	88° 46' 33.827" E
6	25° 15' 30.074" N	88° 46' 31.258" E
7	25° 15' 31.777" N	88° 46' 30.051" E
8	25° 15' 36.418" N	88° 46' 28.191" E
9	25° 15' 38.126" N	88° 46' 28.516" E
10	25° 15' 38.040" N	88° 46' 30.487" E
11	25° 15' 34.528" N	88° 46' 34.941" E
12	25° 15' 31.638" N	88° 46' 38.065" E
13	25° 15' 29.137" N	88° 46' 38.469" E

POTENTIAL BLOCK DD_BG_AR_35 OF ATRAI RIVER

88°46'30"E

88°46'40"E

25°14'30"N

25°14'20"N

ATRAI RIVER

LEGEND

- COORDINATE
- POTENTIAL BLOCK
- SAFETY BARRIER
- RIVER
- ADMINISTRATIVE BLOCK BOUNDARY
- DISTRICT BOUNDARY

ABBREVIATION FORM

DISTRICT	DD	DAKSHIN DINAJPUR
BLOCK	BG	BALURGHAT
RIVER	AR	ATRAI RIVER

DD_BG_AR_35

POINT NO	LATITUDE	LONGITUDE
1	25° 14' 33.270" N	88° 46' 31.269" E
2	25° 14' 20.682" N	88° 46' 29.635" E
3	25° 14' 22.409" N	88° 46' 27.798" E
4	25° 14' 25.621" N	88° 46' 25.656" E
5	25° 14' 28.177" N	88° 46' 25.382" E
6	25° 14' 30.849" N	88° 46' 26.307" E
7	25° 14' 32.108" N	88° 46' 28.415" E
8	25° 14' 33.327" N	88° 46' 30.351" E
9	25° 14' 33.855" N	88° 46' 31.401" E

0 0.04 0.08 0.16 0.24

Kilometers

POTENTIAL BLOCK DD_BG_AR_36 OF ATRAI RIVER

88°46'0"E 88°46'10"E 88°46'20"E

25°14'20"N

25°14'10"N

LEGEND

- COORDINATE
- POTENTIAL BLOCK
- SAFETY BARRIER
- RIVER
- ADMINISTRATIVE BLOCK BOUNDARY
- DISTRICT BOUNDARY

DD_BG_AR_36		
POINT NO	LATITUDE	LONGITUDE
1	25° 14' 9.847" N	88° 46' 23.027" E
2	25° 14' 9.184" N	88° 46' 20.033" E
3	25° 14' 19.274" N	88° 46' 22.667" E
4	25° 14' 25.497" N	88° 46' 23.599" E
5	25° 14' 24.536" N	88° 46' 24.276" E
6	25° 14' 20.574" N	88° 46' 25.775" E
7	25° 14' 16.768" N	88° 46' 25.973" E
8	25° 14' 13.959" N	88° 46' 25.494" E
9	25° 14' 11.217" N	88° 46' 24.466" E

ABBREVIATION FORM		
DISTRICT	DD	DAKSHIN DINAJPUR
BLOCK	BG	BALURGHAT
RIVER	AR	ATRAI RIVER

0 0.0475 0.095 0.19 0.285

Kilometers

N W E S

ATRAI RIVER

POTENTIAL BLOCK DD_BG_AR_37 OF ATRAI RIVER

88°46'10"E

88°46'20"E

25°13'20"N

ATRAI RIVER

ABBREVIATION FORM		
DISTRICT	DD	DAKSHIN DINAJPUR
BLOCK	BG	BALURGHAT
RIVER	AR	ATRAI RIVER

LEGEND

- COORDINATE
- POTENTIAL BLOCK
- SAFETY BARRIER
- RIVER
- ADMINISTRATIVE BLOCK BOUNDARY
- DISTRICT BOUNDARY

0 0.03 0.06 0.12 0.18

Kilometers

DD_BG_AR_37		
POINT NO	LATITUDE	LONGITUDE
1	25° 13' 21.148" N	88° 46' 22.560" E
2	25° 13' 20.206" N	88° 46' 20.161" E
3	25° 13' 20.292" N	88° 46' 18.020" E
4	25° 13' 20.549" N	88° 46' 16.649" E
5	25° 13' 21.155" N	88° 46' 16.313" E
6	25° 13' 21.312" N	88° 46' 18.345" E
7	25° 13' 24.568" N	88° 46' 20.949" E
8	25° 13' 25.260" N	88° 46' 23.416" E
9	25° 13' 23.033" N	88° 46' 23.245" E

POTENTIAL BLOCK DD_BG_AR_38 OF ATRAI RIVER

88°45'10"E 88°45'20"E 88°45'30"E

25°11'20"N

N W E S

LEGEND

- COORDINATE
- POTENTIAL BLOCK
- SAFETY BARRIER
- RIVER
- ADMINISTRATIVE BLOCK BOUNDARY
- DISTRICT BOUNDARY

ABBREVIATION FORM		
DISTRICT	DD	DAKSHIN DINAJPUR
BLOCK	BG	BALURGHAT
RIVER	AR	ATRAI RIVER

DD_BG_AR_38		
POINT NO	LATITUDE	LONGITUDE
1	25° 11' 16.437" N	88° 45' 29.182" E
2	25° 11' 13.444" N	88° 45' 30.530" E
3	25° 11' 14.542" N	88° 45' 27.831" E
4	25° 11' 16.983" N	88° 45' 24.619" E
5	25° 11' 20.453" N	88° 45' 22.948" E
6	25° 11' 24.179" N	88° 45' 22.306" E
7	25° 11' 26.186" N	88° 45' 22.667" E

0 0.04 0.08 0.16 0.24

Kilometers

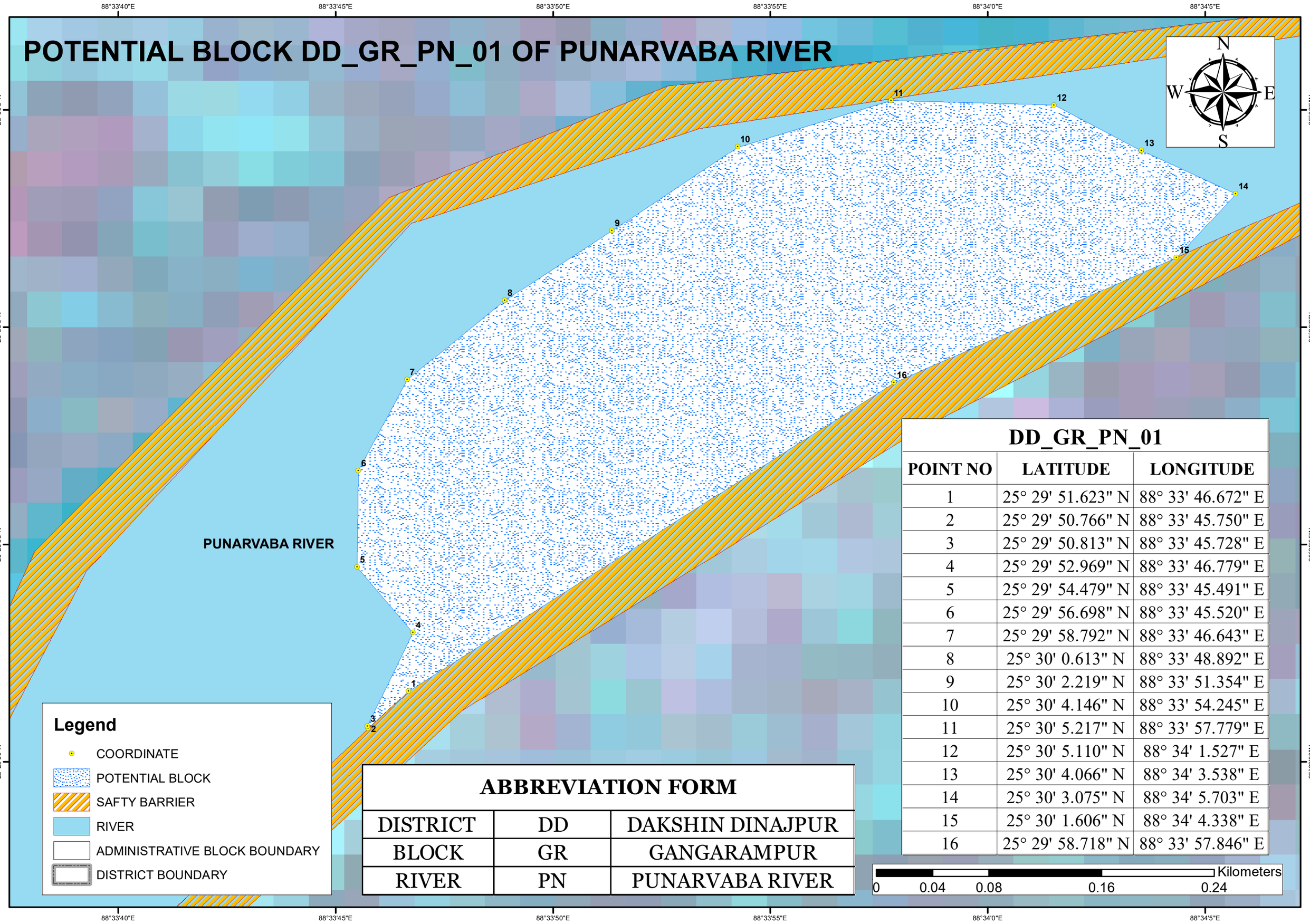
ATRAI RIVER

7 6 5 4 1 3 2

25°11'20"N

88°45'10"E 88°45'20"E 88°45'30"E

POTENTIAL BLOCK DD_GR_PN_01 OF PUNARVABA RIVER

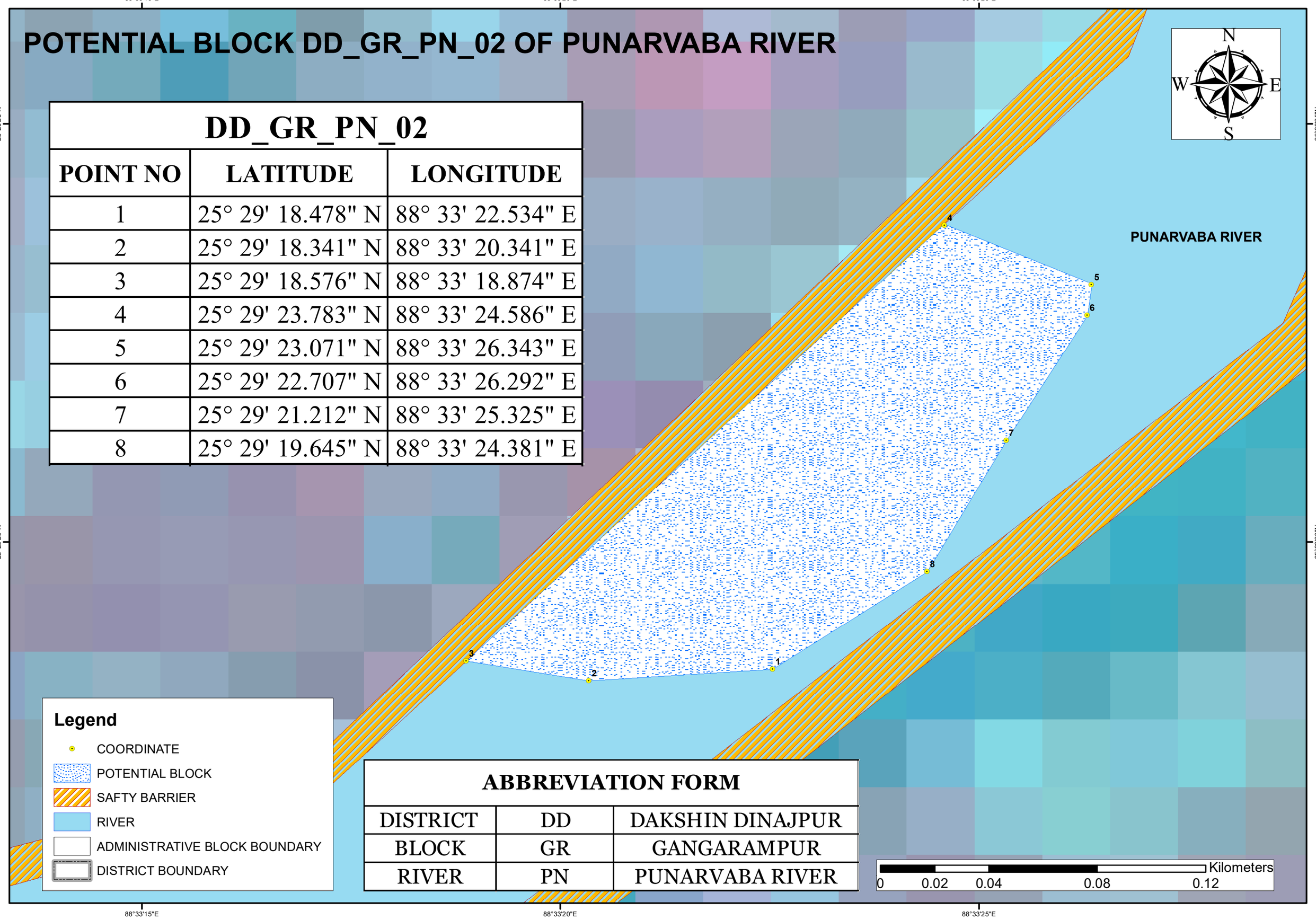


DD_GR_PN_01		
POINT NO	**LATITUDE**	**LONGITUDE**
1	25° 29' 51.623" N	88° 33' 46.672" E
2	25° 29' 50.766" N	88° 33' 45.750" E
3	25° 29' 50.813" N	88° 33' 45.728" E
4	25° 29' 52.969" N	88° 33' 46.779" E
5	25° 29' 54.479" N	88° 33' 45.491" E
6	25° 29' 56.698" N	88° 33' 45.520" E
7	25° 29' 58.792" N	88° 33' 46.643" E
8	25° 30' 0.613" N	88° 33' 48.892" E
9	25° 30' 2.219" N	88° 33' 51.354" E
10	25° 30' 4.146" N	88° 33' 54.245" E
11	25° 30' 5.217" N	88° 33' 57.779" E
12	25° 30' 5.110" N	88° 34' 1.527" E
13	25° 30' 4.066" N	88° 34' 3.538" E
14	25° 30' 3.075" N	88° 34' 5.703" E
15	25° 30' 1.606" N	88° 34' 4.338" E
16	25° 29' 58.718" N	88° 33' 57.846" E

ABBREVIATION FORM		
DISTRICT	DD	DAKSHIN DINAJPUR
BLOCK	GR	GANGARAMPUR
RIVER	PN	PUNARVABA RIVER

POTENTIAL BLOCK DD_GR_PN_02 OF PUNARVABA RIVER

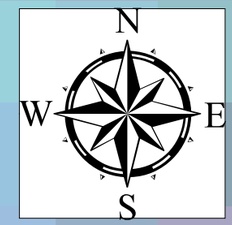
DD_GR_PN_02		
POINT NO	**LATITUDE**	**LONGITUDE**
1	25° 29' 18.478" N	88° 33' 22.534" E
2	25° 29' 18.341" N	88° 33' 20.341" E
3	25° 29' 18.576" N	88° 33' 18.874" E
4	25° 29' 23.783" N	88° 33' 24.586" E
5	25° 29' 23.071" N	88° 33' 26.343" E
6	25° 29' 22.707" N	88° 33' 26.292" E
7	25° 29' 21.212" N	88° 33' 25.325" E
8	25° 29' 19.645" N	88° 33' 24.381" E



ABBREVIATION FORM		
DISTRICT	DD	DAKSHIN DINAJPUR
BLOCK	GR	GANGARAMPUR
RIVER	PN	PUNARVABA RIVER

POTENTIAL BLOCK DD_GR_PN_03 OF PUNARVABA RIVER

DD_GR_PN_03		
POINT NO	**LATITUDE**	**LONGITUDE**
1	25° 29' 12.790" N	88° 32' 51.320" E
2	25° 29' 11.283" N	88° 32' 49.023" E
3	25° 29' 11.487" N	88° 32' 46.761" E
4	25° 29' 11.183" N	88° 32' 42.967" E
5	25° 29' 9.775" N	88° 32' 40.115" E
6	25° 29' 10.049" N	88° 32' 37.168" E
7	25° 29' 11.146" N	88° 32' 34.427" E
8	25° 29' 11.792" N	88° 32' 33.650" E
9	25° 29' 12.536" N	88° 32' 42.021" E



88°32'35"E 88°32'40"E 88°32'45"E 88°32'50"E

25°29'15"N

25°29'10"N

PUNARVABA RIVER

Legend

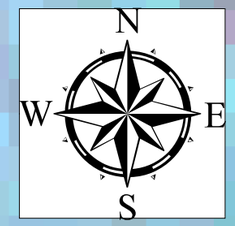
- COORDINATE
- POTENTIAL BLOCK
- SAFTY BARRIER
- RIVER
- ADMINISTRATIVE BLOCK BOUNDARY
- DISTRICT BOUNDARY

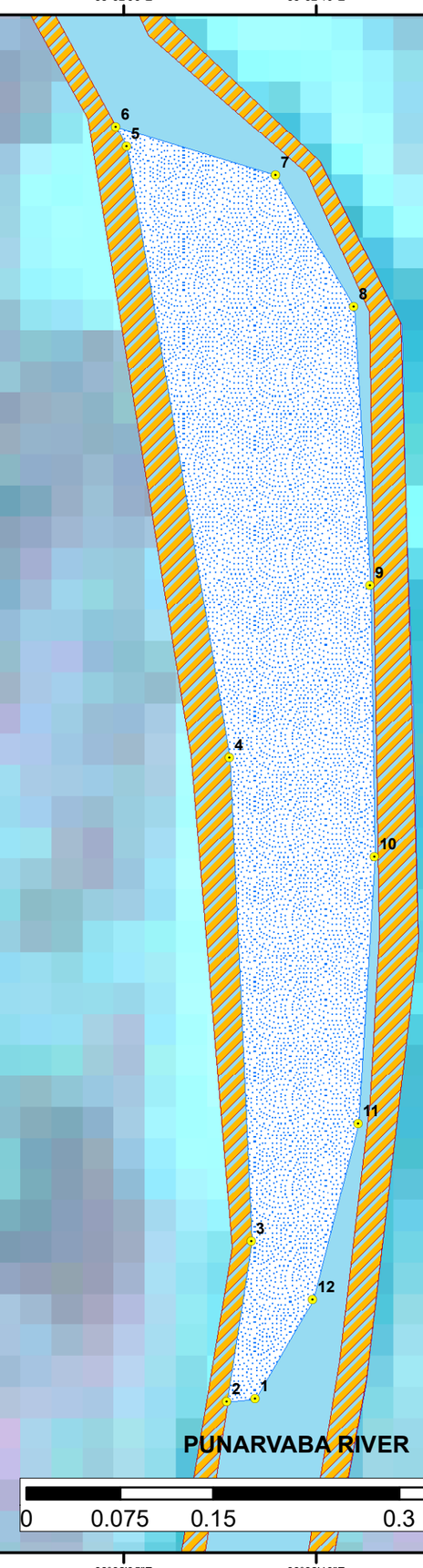
ABBREVIATION FORM		
DISTRICT	DD	DAKSHIN DINAJPUR
BLOCK	GR	GANGARAMPUR
RIVER	PN	PUNARVABA RIVER

0 0.025 0.05 0.1 0.15 Kilometers

POTENTIAL BLOCK DD_GR_PN_04 OF PUNARVABA RIVER

DD_GR_PN_04		
POINT NO	**LATITUDE**	**LONGITUDE**
1	25° 27' 47.638" N	88° 32' 38.419" E
2	25° 27' 47.568" N	88° 32' 37.683" E
3	25° 27' 51.753" N	88° 32' 38.316" E
4	25° 28' 4.357" N	88° 32' 37.751" E
5	25° 28' 20.305" N	88° 32' 35.060" E
6	25° 28' 20.802" N	88° 32' 34.787" E
7	25° 28' 19.546" N	88° 32' 38.954" E
8	25° 28' 16.120" N	88° 32' 40.989" E
9	25° 28' 8.839" N	88° 32' 41.417" E
10	25° 28' 1.772" N	88° 32' 41.524" E
11	25° 27' 54.812" N	88° 32' 41.096" E
12	25° 27' 50.208" N	88° 32' 39.918" E





Legend

- COORDINATE
- POTENTIAL BLOCK
- SAFTY BARRIER
- RIVER
- ADMINISTRATIVE BLOCK BOUNDARY
- DISTRICT BOUNDARY

ABBREVIATION FORM		
DISTRICT	DD	DAKSHIN DINAJPUR
BLOCK	GR	GANGARAMPUR
RIVER	PN	PUNARVABA RIVER

Kilometers
0 0.075 0.15 0.3 0.45

88°31'55"E 88°32'0"E 88°32'5"E 88°32'10"E 88°32'15"E 88°32'20"E 88°32'25"E 88°32'30"E 88°32'35"E 88°32'40"E 88°32'45"E 88°32'50"E

25°28'20"N 25°28'15"N 25°28'10"N 25°28'5"N 25°28'0"N 25°27'55"N 25°27'50"N 25°27'45"N

POTENTIAL BLOCK DD_GR_PN_05 OF PUNARVABA RIVER

DD_GR_PN_05		
POINT NO	LATITUDE	LONGITUDE
1	25° 26' 57.013" N	88° 32' 40.444" E
2	25° 26' 55.314" N	88° 32' 36.064" E
3	25° 26' 56.177" N	88° 32' 34.350" E
4	25° 26' 59.925" N	88° 32' 38.740" E
5	25° 27' 4.101" N	88° 32' 41.524" E
6	25° 27' 6.778" N	88° 32' 42.273" E
7	25° 27' 9.185" N	88° 32' 41.535" E
8	25° 27' 12.159" N	88° 32' 43.187" E
9	25° 27' 17.567" N	88° 32' 43.319" E
10	25° 27' 15.772" N	88° 32' 46.235" E
11	25° 27' 13.095" N	88° 32' 49.769" E
12	25° 27' 9.990" N	88° 32' 51.268" E
13	25° 27' 6.992" N	88° 32' 51.161" E
14	25° 27' 3.887" N	88° 32' 49.876" E
15	25° 27' 0.674" N	88° 32' 46.235" E

PUNARVABA RIVER

N
W
E
S

88°32'20"E 88°32'25"E 88°32'30"E 88°32'35"E 88°32'40"E 88°32'45"E 88°32'50"E 88°32'55"E

25°27'15"N 25°27'10"N 25°27'5"N 25°27'0"N 25°26'55"N 25°26'50"N

Legend

- COORDINATE
- POTENTIAL BLOCK
- SAFTY BARRIER
- RIVER
- ADMINISTRATIVE BLOCK BOUNDARY
- DISTRICT BOUNDARY

ABBREVIATION FORM		
DISTRICT	DD	DAKSHIN DINAJPUR
BLOCK	GR	GANGARAMPUR
RIVER	PN	PUNARVABA RIVER

0 0.05 0.1 0.2 0.3 Kilometers

POTENTIAL BLOCK DD_GR_PN_06 OF PUNARVABA RIVER

DD_GR_PN_06		
POINT NO	LATITUDE	LONGITUDE
1	25° 26' 5.745" N	88° 32' 20.890" E
2	25° 26' 5.488" N	88° 32' 17.164" E
3	25° 26' 5.932" N	88° 32' 14.139" E
4	25° 26' 6.387" N	88° 32' 15.982" E
5	25° 26' 11.929" N	88° 32' 20.695" E
6	25° 26' 14.291" N	88° 32' 22.517" E
7	25° 26' 20.502" N	88° 32' 22.154" E
8	25° 26' 19.365" N	88° 32' 23.203" E
9	25° 26' 14.956" N	88° 32' 25.110" E
10	25° 26' 14.021" N	88° 32' 25.240" E
11	25° 26' 10.627" N	88° 32' 25.131" E
12	25° 26' 7.929" N	88° 32' 24.360" E

88°32'0"E 88°32'5"E 88°32'10"E 88°32'15"E 88°32'20"E 88°32'25"E 88°32'30"E

25°26'20"N 25°26'15"N 25°26'10"N 25°26'5"N

N W E S

PUNARVABA RIVER

Legend

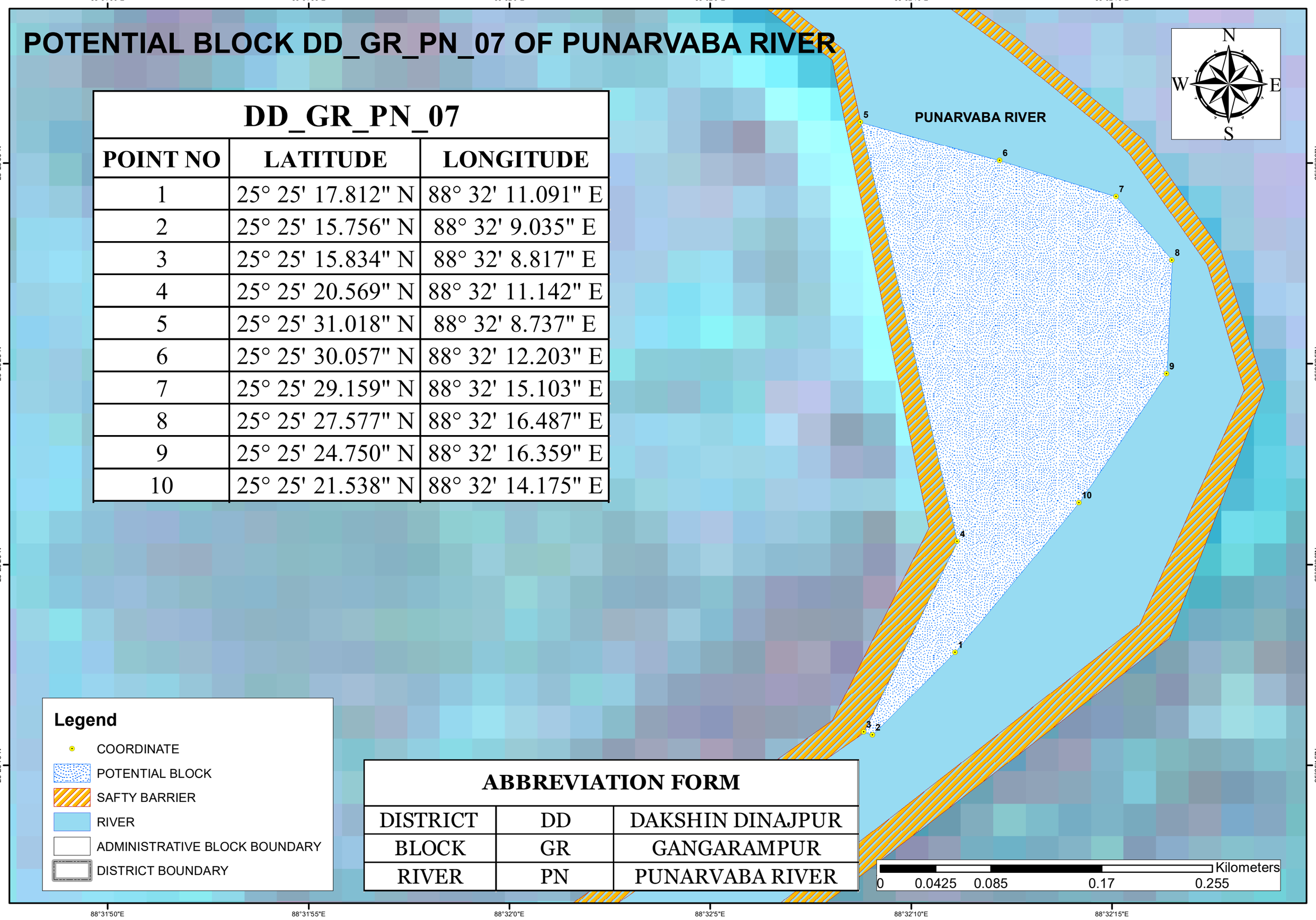
- COORDINATE
- POTENTIAL BLOCK
- SAFTY BARRIER
- RIVER
- ADMINISTRATIVE BLOCK BOUNDARY
- DISTRICT BOUNDARY

ABBREVIATION FORM		
DISTRICT	DD	DAKSHIN DINAJPUR
BLOCK	GR	GANGARAMPUR
RIVER	PN	PUNARVABA RIVER

Kilometers
0 0.0425 0.085 0.17 0.255

POTENTIAL BLOCK DD_GR_PN_07 OF PUNARVABA RIVER

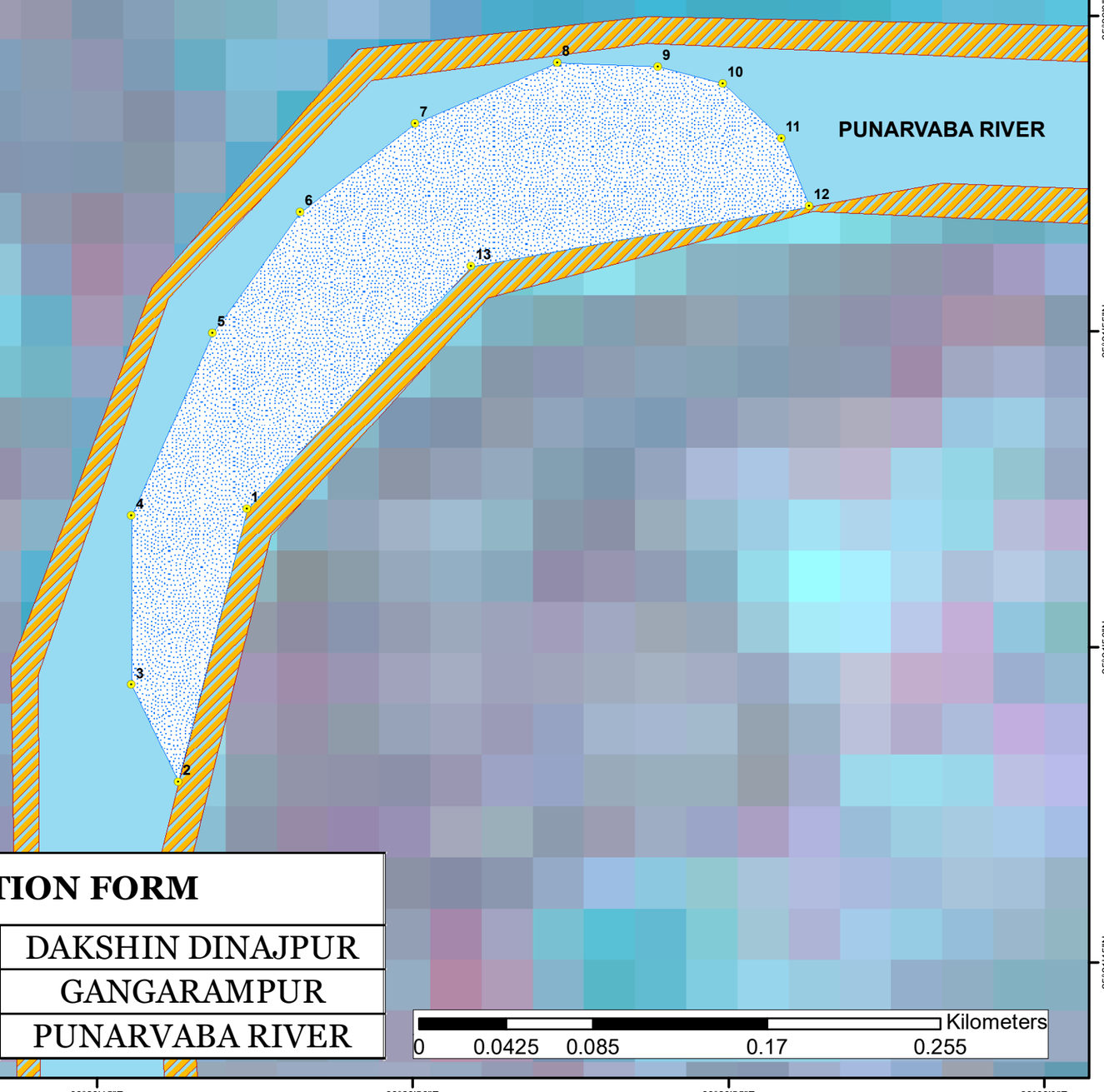
DD_GR_PN_07		
POINT NO	**LATITUDE**	**LONGITUDE**
1	25° 25' 17.812" N	88° 32' 11.091" E
2	25° 25' 15.756" N	88° 32' 9.035" E
3	25° 25' 15.834" N	88° 32' 8.817" E
4	25° 25' 20.569" N	88° 32' 11.142" E
5	25° 25' 31.018" N	88° 32' 8.737" E
6	25° 25' 30.057" N	88° 32' 12.203" E
7	25° 25' 29.159" N	88° 32' 15.103" E
8	25° 25' 27.577" N	88° 32' 16.487" E
9	25° 25' 24.750" N	88° 32' 16.359" E
10	25° 25' 21.538" N	88° 32' 14.175" E

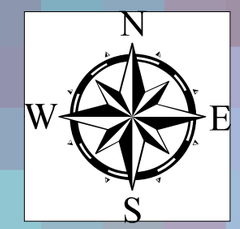


ABBREVIATION FORM		
DISTRICT	DD	DAKSHIN DINAJPUR
BLOCK	GR	GANGARAMPUR
RIVER	PN	PUNARVABA RIVER

POTENTIAL BLOCK DD_GR_PN_08 OF PUNARVABA RIVER

DD_GR_PN_08		
POINT NO	**LATITUDE**	**LONGITUDE**
1	25° 21' 52.186" N	88° 29' 47.373" E
2	25° 21' 47.863" N	88° 29' 46.289" E
3	25° 21' 49.399" N	88° 29' 45.545" E
4	25° 21' 52.076" N	88° 29' 45.545" E
5	25° 21' 54.967" N	88° 29' 46.830" E
6	25° 21' 56.894" N	88° 29' 48.222" E
7	25° 21' 58.286" N	88° 29' 50.042" E
8	25° 21' 59.250" N	88° 29' 52.291" E
9	25° 21' 59.195" N	88° 29' 53.881" E
10	25° 21' 58.928" N	88° 29' 54.911" E
11	25° 21' 58.054" N	88° 29' 55.836" E
12	25° 21' 56.983" N	88° 29' 56.281" E
13	25° 21' 56.023" N	88° 29' 50.918" E





Legend

- COORDINATE
- POTENTIAL BLOCK
- SAFTY BARRIER
- RIVER
- ADMINISTRATIVE BLOCK BOUNDARY
- DISTRICT BOUNDARY

ABBREVIATION FORM		
DISTRICT	DD	DAKSHIN DINAJPUR
BLOCK	GR	GANGARAMPUR
RIVER	PN	PUNARVABA RIVER

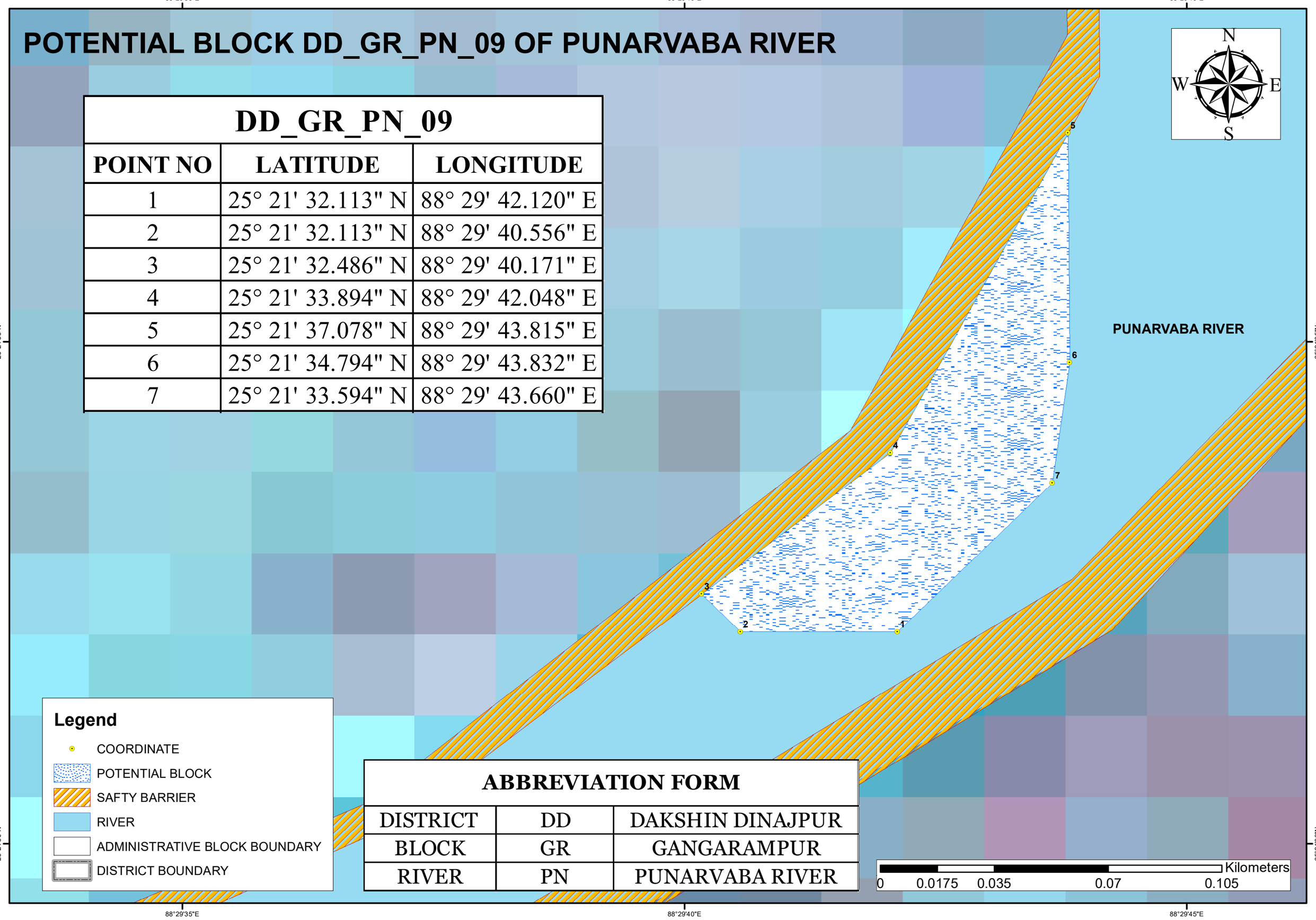
Kilometers
0 0.0425 0.085 0.17 0.255

88°29'30"E 88°29'35"E 88°29'40"E 88°29'45"E 88°29'50"E 88°29'55"E 88°30'0"E

25°22'5"N 25°22'0"N 25°21'55"N 25°21'50"N 25°21'45"N

POTENTIAL BLOCK DD_GR_PN_09 OF PUNARVABA RIVER

DD_GR_PN_09		
POINT NO	**LATITUDE**	**LONGITUDE**
1	25° 21' 32.113" N	88° 29' 42.120" E
2	25° 21' 32.113" N	88° 29' 40.556" E
3	25° 21' 32.486" N	88° 29' 40.171" E
4	25° 21' 33.894" N	88° 29' 42.048" E
5	25° 21' 37.078" N	88° 29' 43.815" E
6	25° 21' 34.794" N	88° 29' 43.832" E
7	25° 21' 33.594" N	88° 29' 43.660" E



ABBREVIATION FORM		
DISTRICT	DD	DAKSHIN DINAJPUR
BLOCK	GR	GANGARAMPUR
RIVER	PN	PUNARVABA RIVER

POTENTIAL BLOCK DD_GR_PN_10 OF PUNARVABA RIVER

88°29'20"E 88°29'25"E

25°21'5"N 25°21'0"N

PUNARVABA RIVER

DD_GR_PN_10		
POINT NO	LATITUDE	LONGITUDE
1	25° 21' 2.678" N	88° 29' 23.092" E
2	25° 20' 58.142" N	88° 29' 25.905" E
3	25° 20' 58.171" N	88° 29' 25.218" E
4	25° 20' 58.599" N	88° 29' 23.933" E
5	25° 20' 59.970" N	88° 29' 22.648" E
6	25° 21' 1.512" N	88° 29' 22.134" E
7	25° 21' 3.225" N	88° 29' 22.391" E
8	25° 21' 3.754" N	88° 29' 22.808" E

Legend

- COORDINATE
- POTENTIAL BLOCK
- SAFTY BARRIER
- RIVER
- ADMINISTRATIVE BLOCK BOUNDARY
- DISTRICT BOUNDARY

ABBREVIATION FORM		
DISTRICT	DD	DAKSHIN DINAJPUR
BLOCK	GR	GANGARAMPUR
RIVER	PN	PUNARVABA RIVER

Kilometers
0 0.0175 0.035 0.07 0.105

POTENTIAL BLOCK DD_GR_PN_11 OF PUNARVABA RIVER

88°29'30"E 88°29'35"E 88°29'40"E

25°20'55"N 25°20'50"N

N W E S

DD_GR_PN_11		
POINT NO	LATITUDE	LONGITUDE
1	25° 20' 48.520" N	88° 29' 38.828" E
2	25° 20' 47.739" N	88° 29' 38.476" E
3	25° 20' 51.136" N	88° 29' 35.699" E
4	25° 20' 53.079" N	88° 29' 32.595" E
5	25° 20' 53.249" N	88° 29' 32.797" E
6	25° 20' 53.352" N	88° 29' 33.620" E
7	25° 20' 53.258" N	88° 29' 34.293" E
8	25° 20' 51.536" N	88° 29' 37.252" E
9	25° 20' 50.476" N	88° 29' 38.212" E
10	25° 20' 49.343" N	88° 29' 38.828" E

Legend

- COORDINATE
- POTENTIAL BLOCK
- SAFTY BARRIER
- RIVER
- ADMINISTRATIVE BLOCK BOUNDARY
- DISTRICT BOUNDARY

ABBREVIATION FORM		
DISTRICT	DD	DAKSHIN DINAJPUR
BLOCK	GR	GANGARAMPUR
RIVER	PN	PUNARVABA RIVER

PUNARVABA RIVER

Kilometers
0 0.0175 0.035 0.07 0.105

POTENTIAL BLOCK DD_TP_PN_12 OF PUNARVABA RIVER

DD_TP_PN_12		
POINT NO	LATITUDE	LONGITUDE
1	25° 20' 23.298" N	88° 29' 47.151" E
2	25° 20' 22.013" N	88° 29' 46.740" E
3	25° 20' 20.522" N	88° 29' 45.918" E
4	25° 20' 19.923" N	88° 29' 44.975" E
5	25° 20' 19.623" N	88° 29' 43.861" E
6	25° 20' 20.094" N	88° 29' 42.748" E
7	25° 20' 21.550" N	88° 29' 41.677" E
8	25° 20' 22.475" N	88° 29' 41.055" E
9	25° 20' 22.384" N	88° 29' 41.611" E
10	25° 20' 24.670" N	88° 29' 45.079" E
11	25° 20' 28.223" N	88° 29' 45.861" E
12	25° 20' 29.860" N	88° 29' 45.544" E
13	25° 20' 29.825" N	88° 29' 46.432" E
14	25° 20' 29.054" N	88° 29' 47.254" E
15	25° 20' 27.872" N	88° 29' 47.460" E
16	25° 20' 26.176" N	88° 29' 47.460" E
17	25° 20' 24.840" N	88° 29' 47.460" E

88°29'35"E 88°29'40"E 88°29'45"E 88°29'50"E

25°20'30"N 25°20'25"N 25°20'20"N

N W E S

PUNARVABA RIVER

Legend

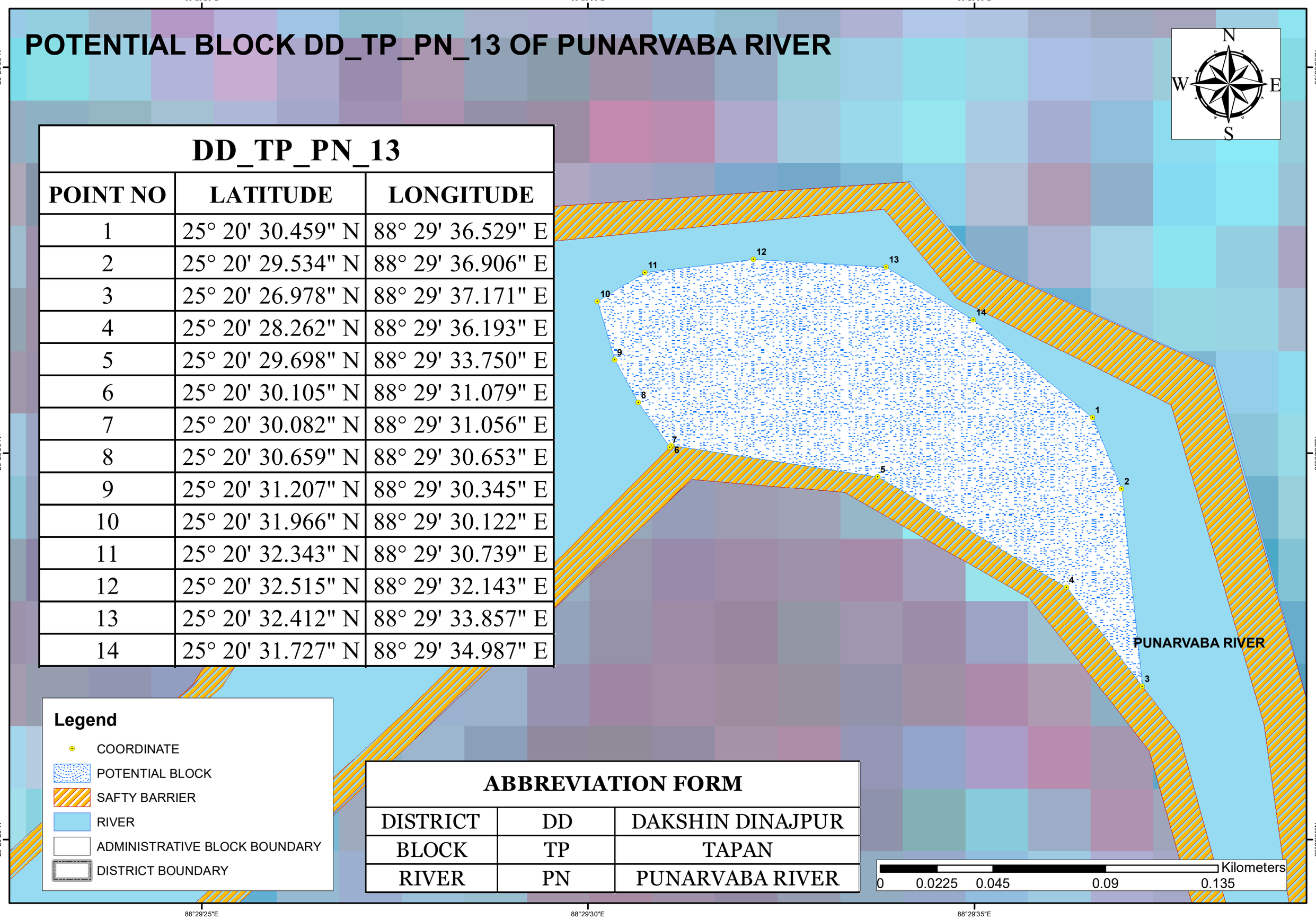
- COORDINATE
- POTENTIAL BLOCK
- SAFTY BARRIER
- RIVER
- ADMINISTRATIVE BLOCK BOUNDARY
- DISTRICT BOUNDARY

ABBREVIATION FORM		
DISTRICT	DD	DAKSHIN DINAJPUR
BLOCK	TP	TAPAN
RIVER	PN	PUNARVABA RIVER

0 0.025 0.05 0.1 0.15 Kilometers

POTENTIAL BLOCK DD_TP_PN_13 OF PUNARVABA RIVER

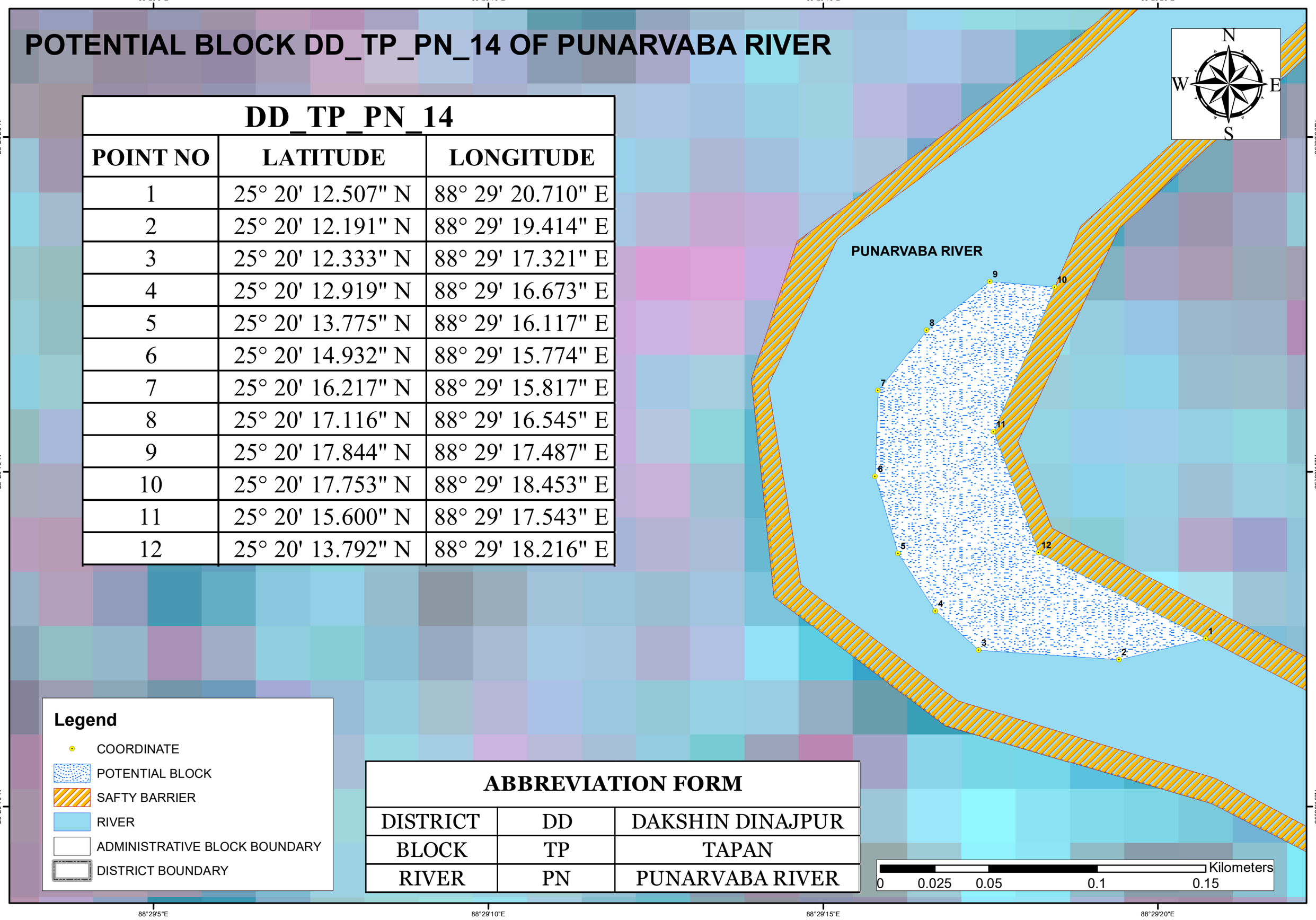
DD_TP_PN_13		
POINT NO	**LATITUDE**	**LONGITUDE**
1	25° 20' 30.459" N	88° 29' 36.529" E
2	25° 20' 29.534" N	88° 29' 36.906" E
3	25° 20' 26.978" N	88° 29' 37.171" E
4	25° 20' 28.262" N	88° 29' 36.193" E
5	25° 20' 29.698" N	88° 29' 33.750" E
6	25° 20' 30.105" N	88° 29' 31.079" E
7	25° 20' 30.082" N	88° 29' 31.056" E
8	25° 20' 30.659" N	88° 29' 30.653" E
9	25° 20' 31.207" N	88° 29' 30.345" E
10	25° 20' 31.966" N	88° 29' 30.122" E
11	25° 20' 32.343" N	88° 29' 30.739" E
12	25° 20' 32.515" N	88° 29' 32.143" E
13	25° 20' 32.412" N	88° 29' 33.857" E
14	25° 20' 31.727" N	88° 29' 34.987" E



ABBREVIATION FORM		
DISTRICT	DD	DAKSHIN DINAJPUR
BLOCK	TP	TAPAN
RIVER	PN	PUNARVABA RIVER

POTENTIAL BLOCK DD_TP_PN_14 OF PUNARVABA RIVER

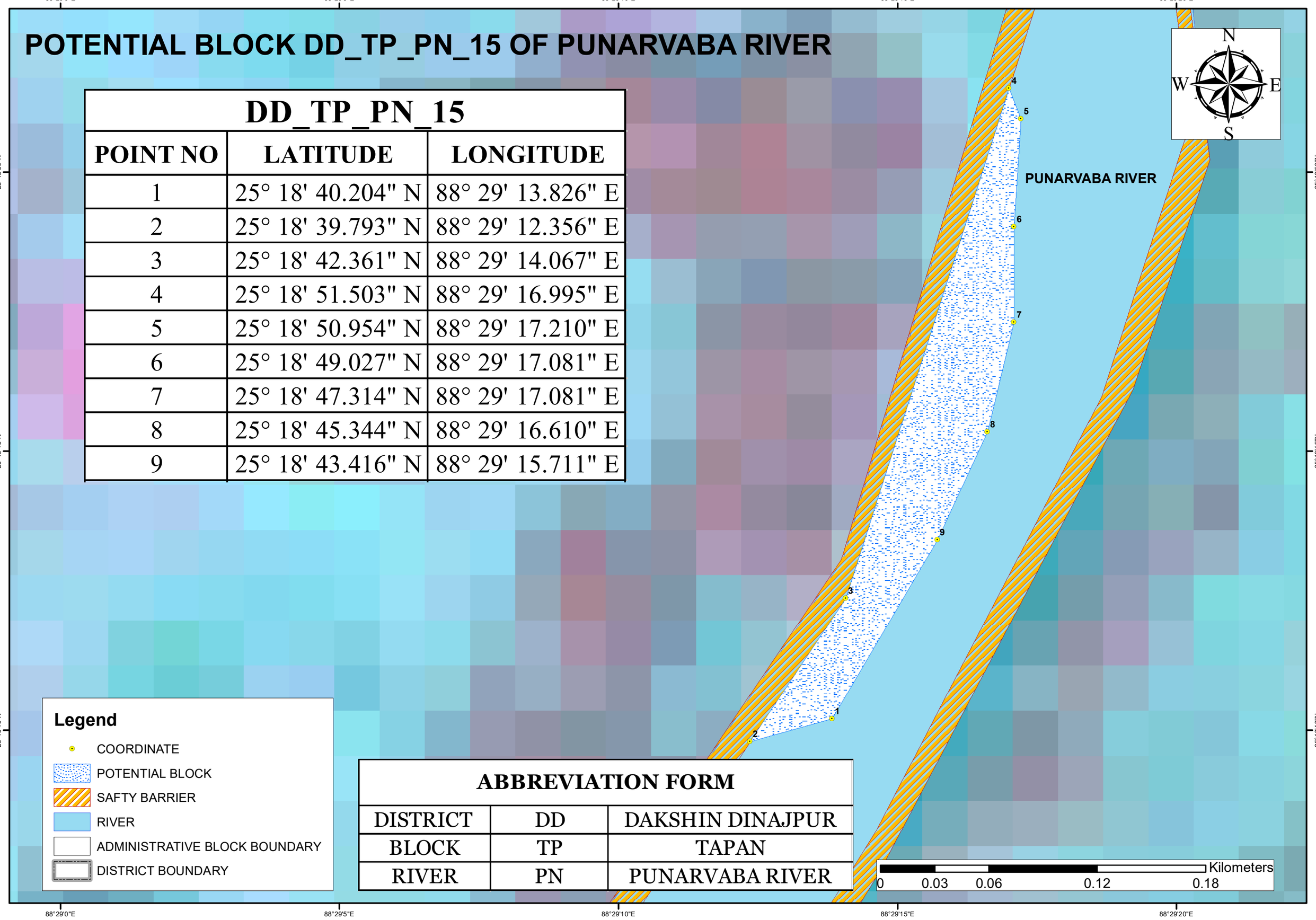
DD_TP_PN_14		
POINT NO	**LATITUDE**	**LONGITUDE**
1	25° 20' 12.507" N	88° 29' 20.710" E
2	25° 20' 12.191" N	88° 29' 19.414" E
3	25° 20' 12.333" N	88° 29' 17.321" E
4	25° 20' 12.919" N	88° 29' 16.673" E
5	25° 20' 13.775" N	88° 29' 16.117" E
6	25° 20' 14.932" N	88° 29' 15.774" E
7	25° 20' 16.217" N	88° 29' 15.817" E
8	25° 20' 17.116" N	88° 29' 16.545" E
9	25° 20' 17.844" N	88° 29' 17.487" E
10	25° 20' 17.753" N	88° 29' 18.453" E
11	25° 20' 15.600" N	88° 29' 17.543" E
12	25° 20' 13.792" N	88° 29' 18.216" E



ABBREVIATION FORM		
DISTRICT	DD	DAKSHIN DINAJPUR
BLOCK	TP	TAPAN
RIVER	PN	PUNARVABA RIVER

POTENTIAL BLOCK DD_TP_PN_15 OF PUNARVABA RIVER

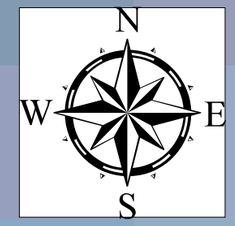
DD_TP_PN_15		
POINT NO	LATITUDE	LONGITUDE
1	25° 18' 40.204" N	88° 29' 13.826" E
2	25° 18' 39.793" N	88° 29' 12.356" E
3	25° 18' 42.361" N	88° 29' 14.067" E
4	25° 18' 51.503" N	88° 29' 16.995" E
5	25° 18' 50.954" N	88° 29' 17.210" E
6	25° 18' 49.027" N	88° 29' 17.081" E
7	25° 18' 47.314" N	88° 29' 17.081" E
8	25° 18' 45.344" N	88° 29' 16.610" E
9	25° 18' 43.416" N	88° 29' 15.711" E

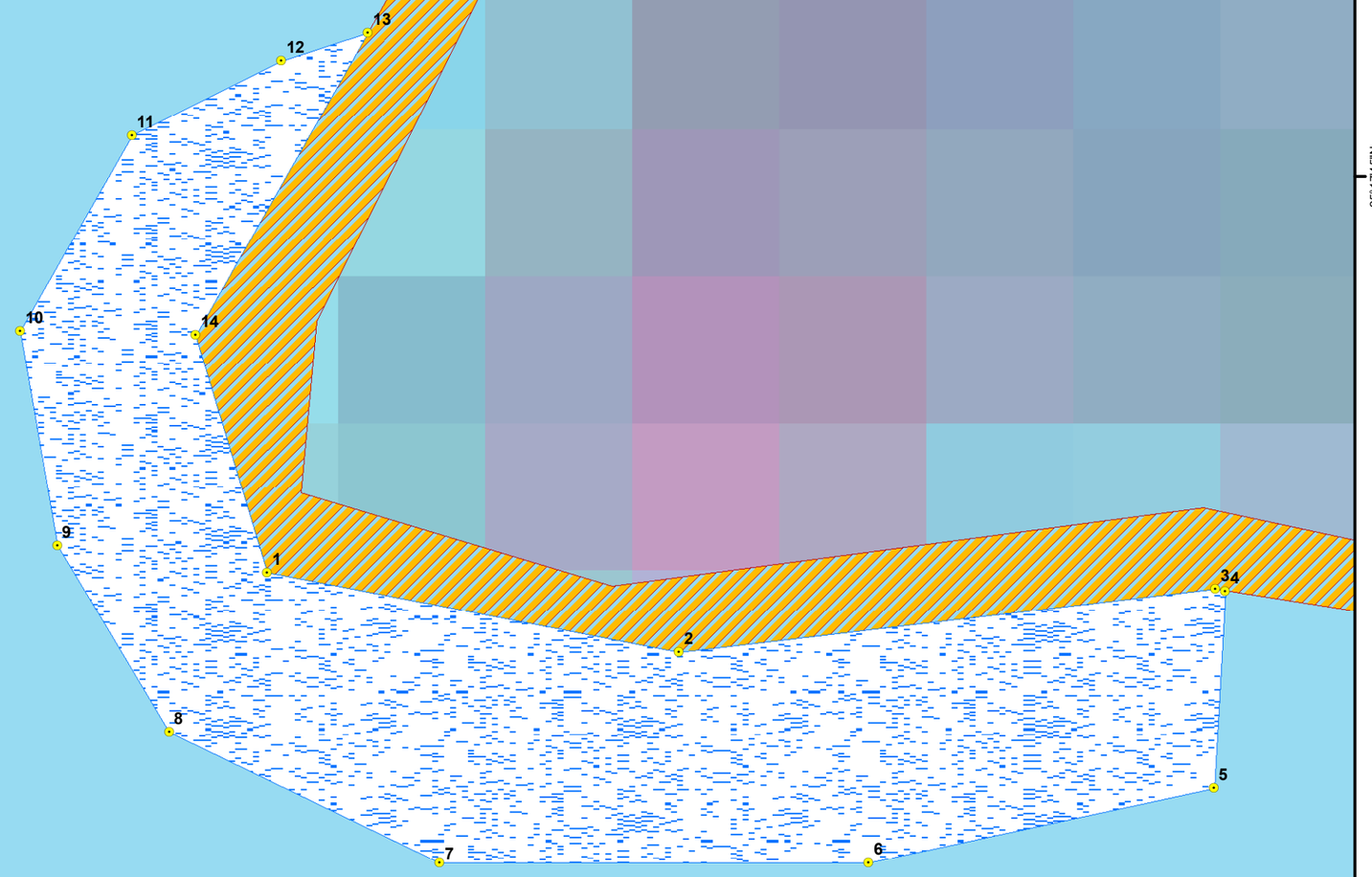


ABBREVIATION FORM		
DISTRICT	DD	DAKSHIN DINAJPUR
BLOCK	TP	TAPAN
RIVER	PN	PUNARVABA RIVER

POTENTIAL BLOCK DD_TP_PN_16 OF PUNARVABA RIVER

DD_TP_PN_16		
POINT NO	**LATITUDE**	**LONGITUDE**
1	25° 17' 42.816" N	88° 28' 40.218" E
2	25° 17' 42.377" N	88° 28' 42.487" E
3	25° 17' 42.725" N	88° 28' 45.443" E
4	25° 17' 42.717" N	88° 28' 45.499" E
5	25° 17' 41.631" N	88° 28' 45.435" E
6	25° 17' 41.220" N	88° 28' 43.533" E
7	25° 17' 41.220" N	88° 28' 41.169" E
8	25° 17' 41.939" N	88° 28' 39.678" E
9	25° 17' 42.967" N	88° 28' 39.062" E
10	25° 17' 44.149" N	88° 28' 38.856" E
11	25° 17' 45.229" N	88° 28' 39.473" E
12	25° 17' 45.640" N	88° 28' 40.295" E
13	25° 17' 45.794" N	88° 28' 40.772" E
14	25° 17' 44.123" N	88° 28' 39.822" E





88°28'35"E
88°28'40"E
88°28'45"E
25°17'45"N
25°17'40"N

Legend

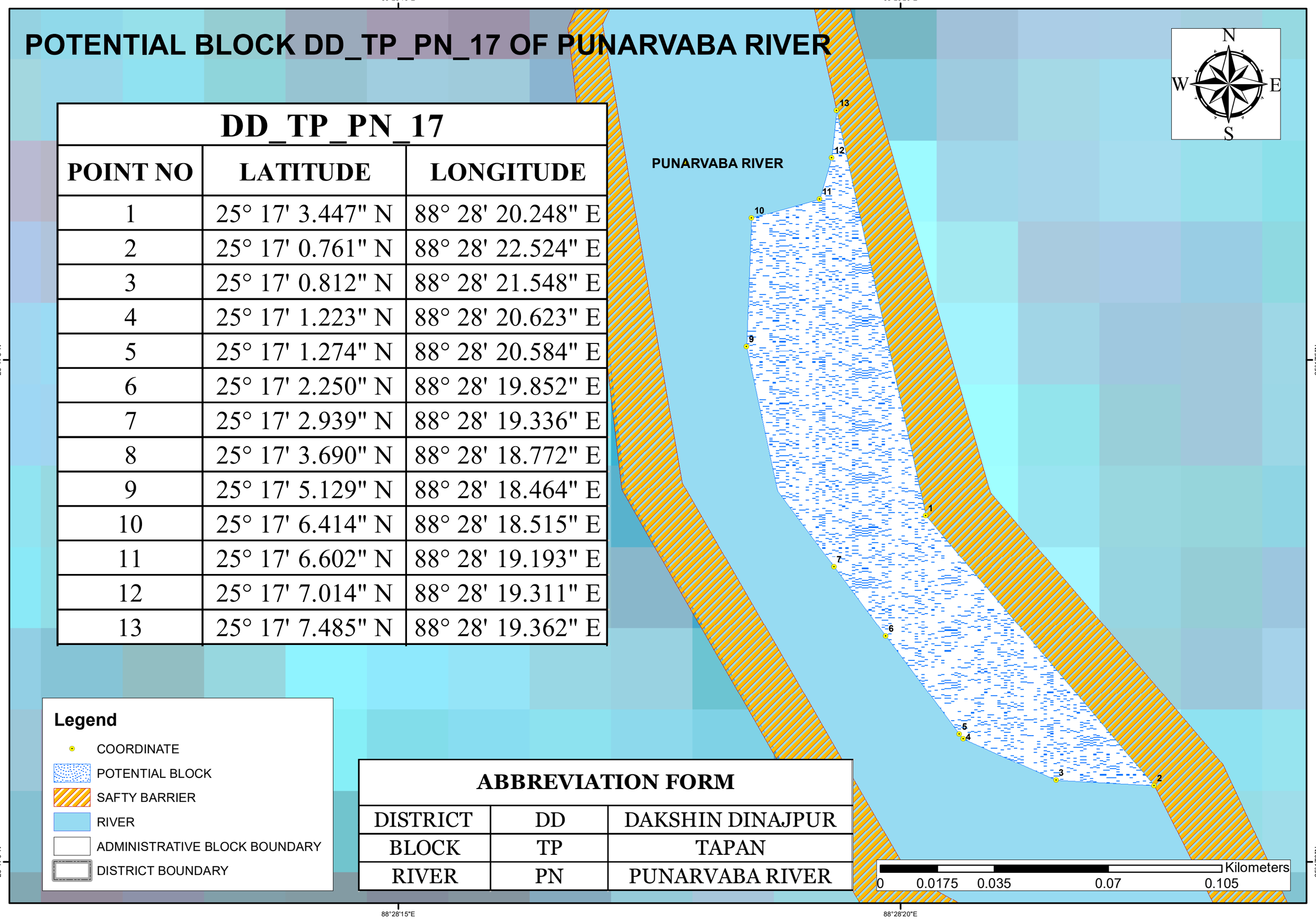
- COORDINATE
- POTENTIAL BLOCK
- SAFTY BARRIER
- RIVER
- ADMINISTRATIVE BLOCK BOUNDARY
- DISTRICT BOUNDARY

ABBREVIATION FORM		
DISTRICT	DD	DAKSHIN DINAJPUR
BLOCK	TP	TAPAN
RIVER	PN	PUNARVABA RIVER

Kilometers
0 0.0175 0.035 0.07 0.105

POTENTIAL BLOCK DD_TP_PN_17 OF PUNARVABA RIVER

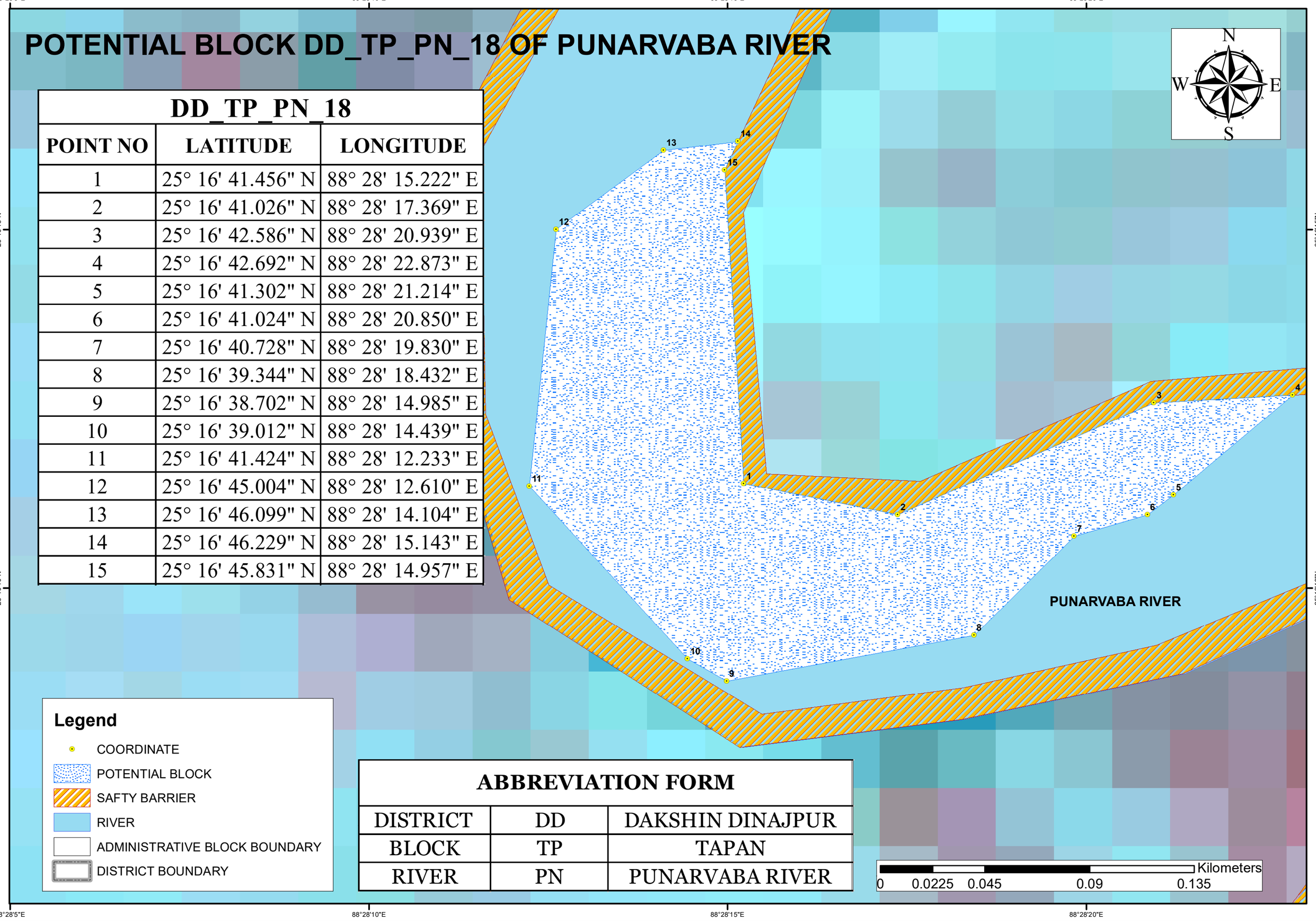
DD_TP_PN_17		
POINT NO	LATITUDE	LONGITUDE
1	25° 17' 3.447" N	88° 28' 20.248" E
2	25° 17' 0.761" N	88° 28' 22.524" E
3	25° 17' 0.812" N	88° 28' 21.548" E
4	25° 17' 1.223" N	88° 28' 20.623" E
5	25° 17' 1.274" N	88° 28' 20.584" E
6	25° 17' 2.250" N	88° 28' 19.852" E
7	25° 17' 2.939" N	88° 28' 19.336" E
8	25° 17' 3.690" N	88° 28' 18.772" E
9	25° 17' 5.129" N	88° 28' 18.464" E
10	25° 17' 6.414" N	88° 28' 18.515" E
11	25° 17' 6.602" N	88° 28' 19.193" E
12	25° 17' 7.014" N	88° 28' 19.311" E
13	25° 17' 7.485" N	88° 28' 19.362" E



ABBREVIATION FORM		
DISTRICT	DD	DAKSHIN DINAJPUR
BLOCK	TP	TAPAN
RIVER	PN	PUNARVABA RIVER

POTENTIAL BLOCK DD_TP_PN_18 OF PUNARVABA RIVER

DD_TP_PN_18		
POINT NO	LATITUDE	LONGITUDE
1	25° 16' 41.456" N	88° 28' 15.222" E
2	25° 16' 41.026" N	88° 28' 17.369" E
3	25° 16' 42.586" N	88° 28' 20.939" E
4	25° 16' 42.692" N	88° 28' 22.873" E
5	25° 16' 41.302" N	88° 28' 21.214" E
6	25° 16' 41.024" N	88° 28' 20.850" E
7	25° 16' 40.728" N	88° 28' 19.830" E
8	25° 16' 39.344" N	88° 28' 18.432" E
9	25° 16' 38.702" N	88° 28' 14.985" E
10	25° 16' 39.012" N	88° 28' 14.439" E
11	25° 16' 41.424" N	88° 28' 12.233" E
12	25° 16' 45.004" N	88° 28' 12.610" E
13	25° 16' 46.099" N	88° 28' 14.104" E
14	25° 16' 46.229" N	88° 28' 15.143" E
15	25° 16' 45.831" N	88° 28' 14.957" E



ABBREVIATION FORM		
DISTRICT	DD	DAKSHIN DINAJPUR
BLOCK	TP	TAPAN
RIVER	PN	PUNARVABA RIVER

POTENTIAL BLOCK DD_TP_PN_19 OF PUNARVABA RIVER

88°27'50"E 88°27'55"E 88°28'0"E

25°16'15"N 25°16'10"N

PUNARVABA RIVER

N W E S

DD_TP_PN_19		
POINT NO	LATITUDE	LONGITUDE
1	25° 16' 16.458" N	88° 28' 1.143" E
2	25° 16' 9.233" N	88° 27' 58.934" E
3	25° 16' 10.379" N	88° 27' 58.037" E
4	25° 16' 11.543" N	88° 27' 57.352" E
5	25° 16' 13.051" N	88° 27' 56.941" E
6	25° 16' 14.422" N	88° 27' 56.941" E
7	25° 16' 15.655" N	88° 27' 57.969" E
8	25° 16' 16.203" N	88° 27' 58.997" E

Legend

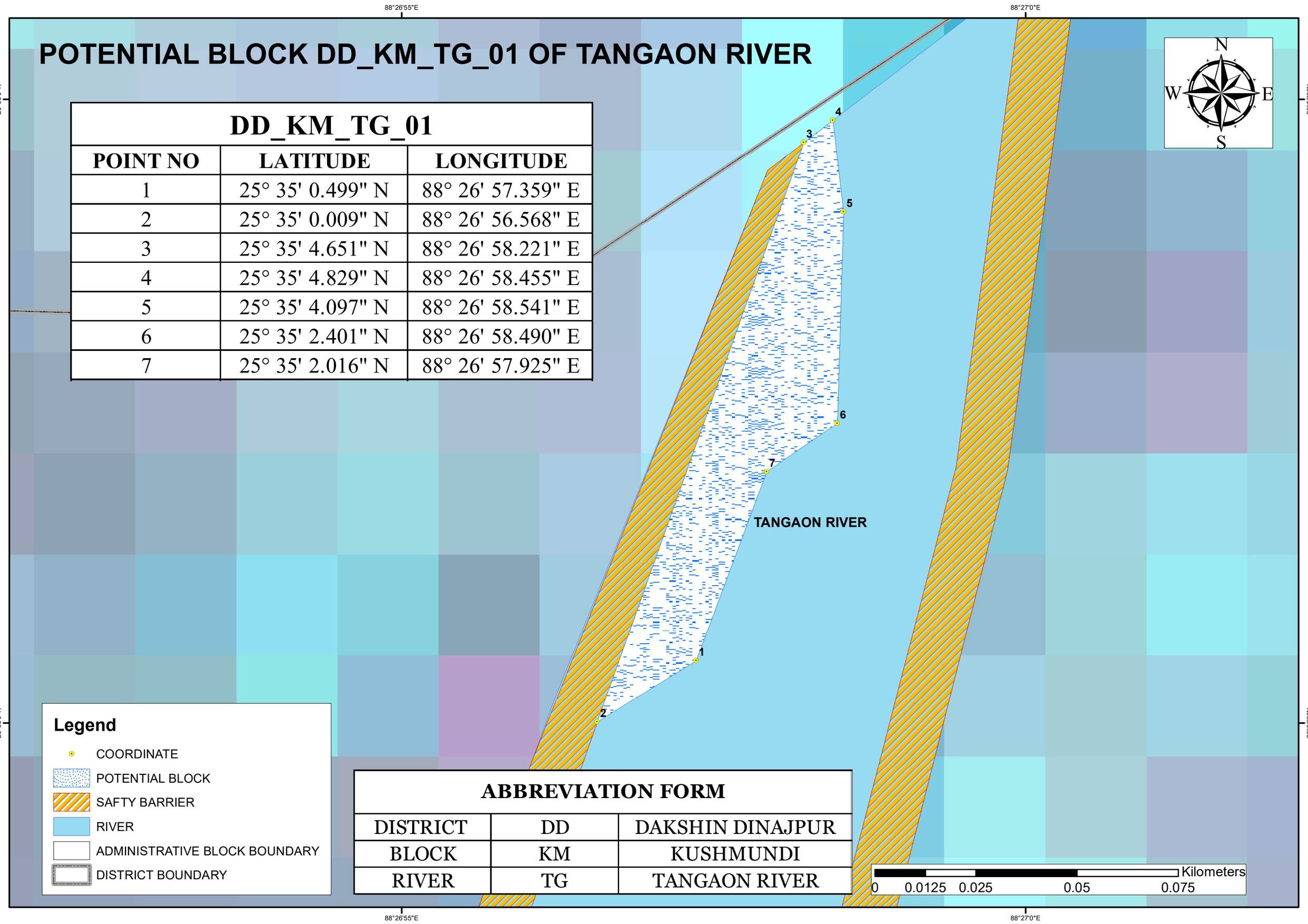
- COORDINATE
- POTENTIAL BLOCK
- SAFTY BARRIER
- RIVER
- ADMINISTRATIVE BLOCK BOUNDARY
- DISTRICT BOUNDARY

ABBREVIATION FORM		
DISTRICT	DD	DAKSHIN DINAJPUR
BLOCK	TP	TAPAN
RIVER	PN	PUNARVABA RIVER

0 0.02 0.04 0.08 0.12 Kilometers

POTENTIAL BLOCK DD_KM_TG_01 OF TANGAON RIVER

DD_KM_TG_01		
POINT NO	**LATITUDE**	**LONGITUDE**
1	25° 35' 0.499" N	88° 26' 57.359" E
2	25° 35' 0.009" N	88° 26' 56.568" E
3	25° 35' 4.651" N	88° 26' 58.221" E
4	25° 35' 4.829" N	88° 26' 58.455" E
5	25° 35' 4.097" N	88° 26' 58.541" E
6	25° 35' 2.401" N	88° 26' 58.490" E
7	25° 35' 2.016" N	88° 26' 57.925" E



ABBREVIATION FORM		
DISTRICT	DD	DAKSHIN DINAJPUR
BLOCK	KM	KUSHMUNDI
RIVER	TG	TANGAON RIVER

POTENTIAL BLOCK DD_KM_TG_02 OF TANGAON RIVER

88°27'5"E 88°27'10"E 88°27'15"E

25°34'45"N

TANGAON RIVER

N W E S

DD_KM_TG_02		
POINT NO	LATITUDE	LONGITUDE
1	25° 34' 48.134" N	88° 27' 10.010" E
2	25° 34' 48.117" N	88° 27' 10.417" E
3	25° 34' 48.117" N	88° 27' 11.496" E
4	25° 34' 47.243" N	88° 27' 12.576" E
5	25° 34' 46.009" N	88° 27' 13.141" E
6	25° 34' 44.519" N	88° 27' 13.552" E
7	25° 34' 43.440" N	88° 27' 13.706" E
8	25° 34' 42.154" N	88° 27' 13.689" E
9	25° 34' 45.736" N	88° 27' 12.243" E
10	25° 34' 47.179" N	88° 27' 10.941" E

1 2 3 4 5 6 7 8 9 10

Legend

- COORDINATE
- POTENTIAL BLOCK
- SAFTY BARRIER
- RIVER
- ADMINISTRATIVE BLOCK BOUNDARY
- DISTRICT BOUNDARY

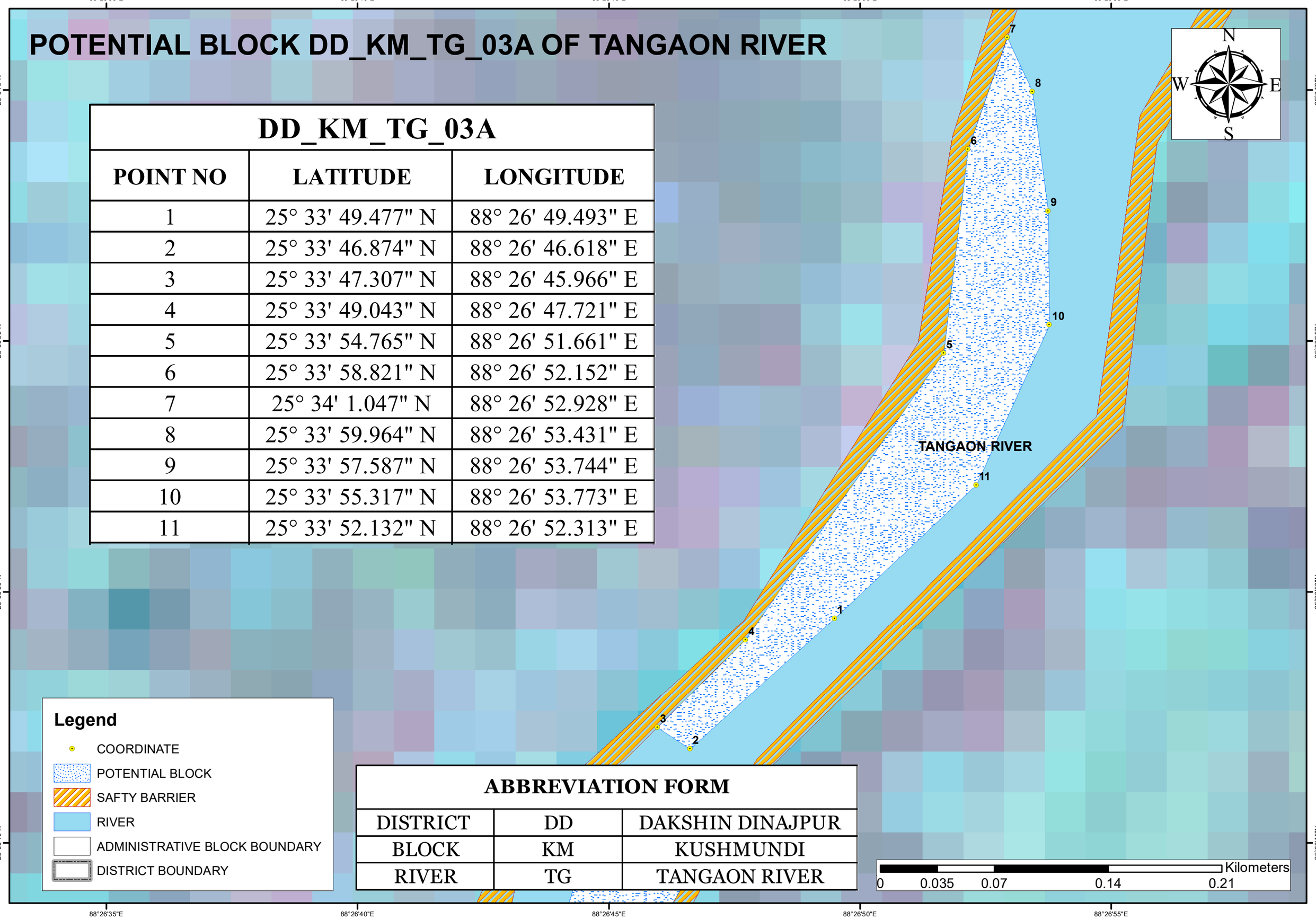
ABBREVIATION FORM		
DISTRICT	DD	DAKSHIN DINAJPUR
BLOCK	KM	KUSHMUNDI
RIVER	TG	TANGAON RIVER

Kilometers
0 0.0175 0.035 0.07 0.105

88°27'5"E 88°27'10"E 88°27'15"E

POTENTIAL BLOCK DD_KM_TG_03A OF TANGAON RIVER

DD_KM_TG_03A		
POINT NO	**LATITUDE**	**LONGITUDE**
1	25° 33' 49.477" N	88° 26' 49.493" E
2	25° 33' 46.874" N	88° 26' 46.618" E
3	25° 33' 47.307" N	88° 26' 45.966" E
4	25° 33' 49.043" N	88° 26' 47.721" E
5	25° 33' 54.765" N	88° 26' 51.661" E
6	25° 33' 58.821" N	88° 26' 52.152" E
7	25° 34' 1.047" N	88° 26' 52.928" E
8	25° 33' 59.964" N	88° 26' 53.431" E
9	25° 33' 57.587" N	88° 26' 53.744" E
10	25° 33' 55.317" N	88° 26' 53.773" E
11	25° 33' 52.132" N	88° 26' 52.313" E



Legend

- COORDINATE
- POTENTIAL BLOCK
- SAFTY BARRIER
- RIVER
- ADMINISTRATIVE BLOCK BOUNDARY
- DISTRICT BOUNDARY

ABBREVIATION FORM		
DISTRICT	DD	DAKSHIN DINAJPUR
BLOCK	KM	KUSHMUNDI
RIVER	TG	TANGAON RIVER

Kilometers
0 0.035 0.07 0.14 0.21

POTENTIAL BLOCK DD_KM_TG_03B OF TANGAON RIVER

88°26'40"E

88°26'45"E

25°33'45"N

25°33'40"N

N

W

E

S

DD_KM_TG_03B		
POINT NO	LATITUDE	LONGITUDE
1	25° 33' 41.318" N	88° 26' 44.825" E
2	25° 33' 40.858" N	88° 26' 44.700" E
3	25° 33' 41.061" N	88° 26' 43.808" E
4	25° 33' 42.849" N	88° 26' 43.905" E
5	25° 33' 44.357" N	88° 26' 44.378" E
6	25° 33' 45.751" N	88° 26' 46.102" E
7	25° 33' 46.203" N	88° 26' 47.662" E

TANGAON RIVER

Legend

- COORDINATE
- POTENTIAL BLOCK
- SAFTY BARRIER
- RIVER
- ADMINISTRATIVE BLOCK BOUNDARY
- DISTRICT BOUNDARY

ABBREVIATION FORM		
DISTRICT	DD	DAKSHIN DINAJPUR
BLOCK	KM	KUSHMUNDI
RIVER	TG	TANGAON RIVER

Kilometers

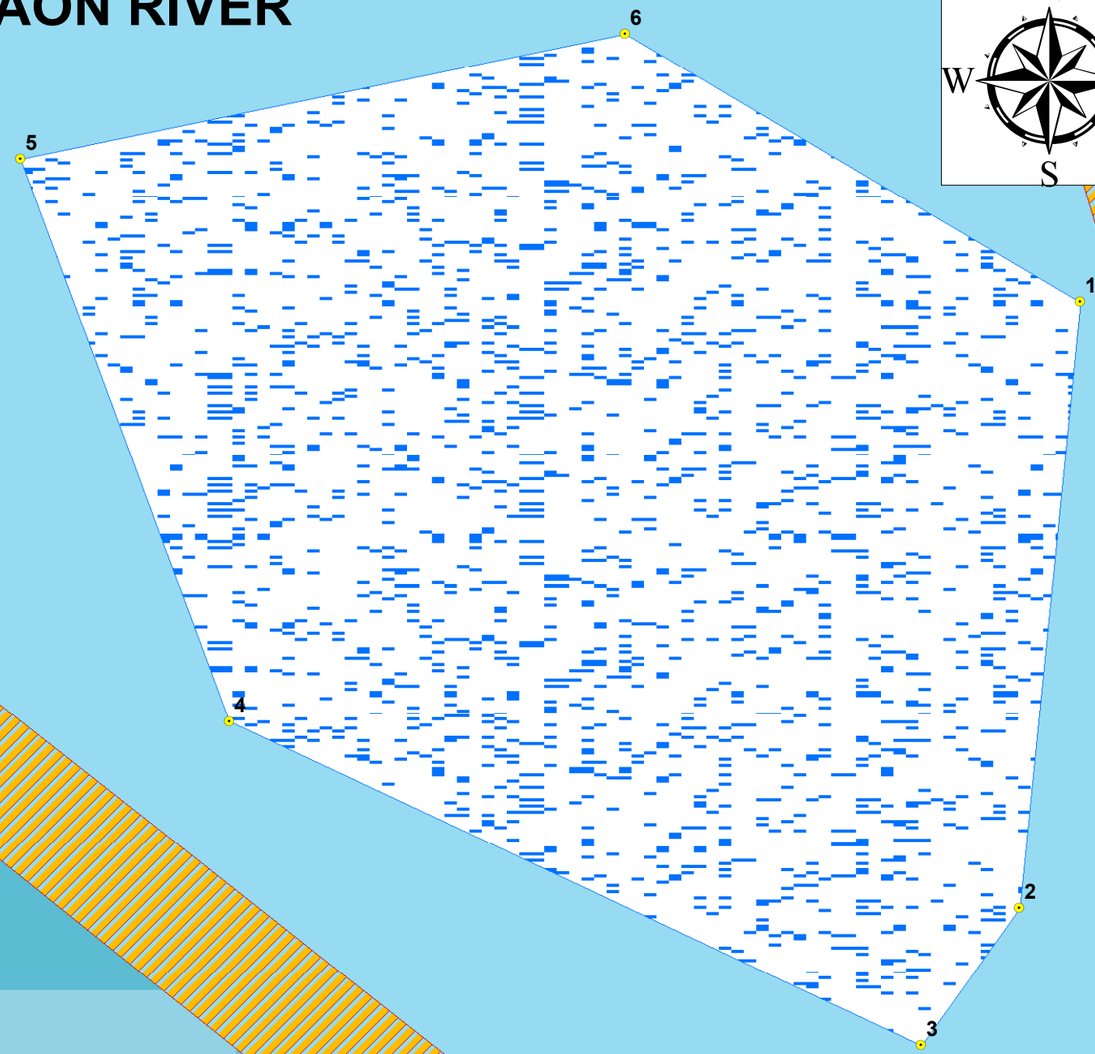
0 0.015 0.03 0.06 0.09

POTENTIAL BLOCK DD_KM_TG_03C OF TANGAON RIVER

88°26'40"E

25°33'35"N

DD_KM_TG_03C		
POINT NO	**LATITUDE**	**LONGITUDE**
1	25° 33' 34.867" N	88° 26' 44.563" E
2	25° 33' 33.269" N	88° 26' 44.402" E
3	25° 33' 32.906" N	88° 26' 44.143" E
4	25° 33' 33.762" N	88° 26' 42.317" E
5	25° 33' 35.247" N	88° 26' 41.766" E
6	25° 33' 35.575" N	88° 26' 43.363" E



TANGAON RIVER

Legend

- COORDINATE
- POTENTIAL BLOCK
- SAFTY BARRIER
- RIVER
- ADMINISTRATIVE BLOCK BOUNDARY
- DISTRICT BOUNDARY

ABBREVIATION FORM		
DISTRICT	DD	DAKSHIN DINAJPUR
BLOCK	KM	KUSHMUNDI
RIVER	TG	TANGAON RIVER

0 0.0075 0.015 0.03 0.045 Kilometers

88°26'40"E

POTENTIAL BLOCK DD_KM_TG_04 OF TANGAON RIVER

DD_KM_TG_04		
POINT NO	**LATITUDE**	**LONGITUDE**
1	25° 33' 15.045" N	88° 26' 57.925" E
2	25° 33' 14.351" N	88° 26' 54.764" E
3	25° 33' 15.099" N	88° 26' 54.599" E
4	25° 33' 15.103" N	88° 26' 54.671" E
5	25° 33' 17.220" N	88° 26' 58.038" E
6	25° 33' 17.670" N	88° 26' 58.099" E
7	25° 33' 21.632" N	88° 26' 57.845" E
8	25° 33' 22.484" N	88° 26' 56.930" E
9	25° 33' 22.566" N	88° 26' 57.529" E
10	25° 33' 21.410" N	88° 26' 59.028" E
11	25° 33' 19.953" N	88° 27' 0.013" E
12	25° 33' 17.212" N	88° 26' 59.884" E
13	25° 33' 16.202" N	88° 26' 59.210" E

88°26'50"E 88°26'55"E 88°27'0"E

25°33'20"N 25°33'15"N

N W E S

TANGAON RIVER

Legend

- COORDINATE
- POTENTIAL BLOCK
- SAFTY BARRIER
- RIVER
- ADMINISTRATIVE BLOCK BOUNDARY
- DISTRICT BOUNDARY

ABBREVIATION FORM		
DISTRICT	DD	DAKSHIN DINAJPUR
BLOCK	KM	KUSHMUNDI
RIVER	TG	TANGAON RIVER

0 0.02 0.04 0.08 0.12 Kilometers

POTENTIAL BLOCK DD_KM_TG_05 OF TANGAON RIVER

DD_KM_TG_05		
POINT NO	**LATITUDE**	**LONGITUDE**
1	25° 31' 52.822" N	88° 26' 40.895" E
2	25° 31' 52.308" N	88° 26' 39.045" E
3	25° 31' 53.758" N	88° 26' 35.985" E
4	25° 31' 55.907" N	88° 26' 32.598" E
5	25° 31' 56.845" N	88° 26' 31.643" E
6	25° 31' 57.704" N	88° 26' 32.209" E
7	25° 31' 55.221" N	88° 26' 37.060" E
8	25° 31' 53.233" N	88° 26' 40.638" E

88°26'25"E 88°26'30"E 88°26'35"E 88°26'40"E

25°32'0"N 25°31'55"N 25°31'50"N

N W E S

6 5 4 7 3 8 1 2

TANGAON RIVER

Legend

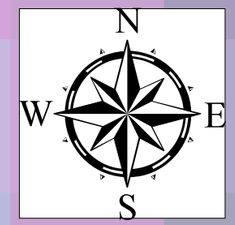
- COORDINATE
- POTENTIAL BLOCK
- SAFTY BARRIER
- RIVER
- ADMINISTRATIVE BLOCK BOUNDARY
- DISTRICT BOUNDARY

ABBREVIATION FORM		
DISTRICT	DD	DAKSHIN DINAJPUR
BLOCK	KM	KUSHMUNDI
RIVER	TG	TANGAON RIVER

Kilometers
0 0.025 0.05 0.1 0.15

POTENTIAL BLOCK DD_KM_TG_06 OF TANGAON RIVER

DD_KM_TG_06		
POINT NO	**LATITUDE**	**LONGITUDE**
1	25° 31' 44.903" N	88° 27' 9.267" E
2	25° 31' 41.823" N	88° 27' 10.593" E
3	25° 31' 41.266" N	88° 27' 10.301" E
4	25° 31' 41.009" N	88° 27' 7.371" E
5	25° 31' 41.883" N	88° 27' 6.343" E
6	25° 31' 42.457" N	88° 27' 5.999" E
7	25° 31' 42.279" N	88° 27' 8.282" E
8	25° 31' 45.149" N	88° 27' 7.605" E
9	25° 31' 45.626" N	88° 27' 7.336" E
10	25° 31' 45.703" N	88° 27' 8.567" E
11	25° 31' 45.172" N	88° 27' 9.067" E



Legend

- COORDINATE
- POTENTIAL BLOCK
- SAFTY BARRIER
- RIVER
- ADMINISTRATIVE BLOCK BOUNDARY
- DISTRICT BOUNDARY

ABBREVIATION FORM		
DISTRICT	DD	DAKSHIN DINAJPUR
BLOCK	KM	KUSHMUNDI
RIVER	TG	TANGAON RIVER

Kilometers
0 0.0175 0.035 0.07 0.105

88°27'50"E

POTENTIAL BLOCK DD_KM_TG_07 OF TANGAON RIVER

N
W E
S

DD_KM_TG_07		
POINT NO	LATITUDE	LONGITUDE
1	25° 31' 31.946" N	88° 27' 50.539" E
2	25° 31' 31.045" N	88° 27' 50.930" E
3	25° 31' 31.145" N	88° 27' 50.233" E
4	25° 31' 32.063" N	88° 27' 48.006" E
5	25° 31' 33.174" N	88° 27' 48.095" E
6	25° 31' 33.182" N	88° 27' 48.870" E

5
6
4
1
3
2

TANGAON RIVER

Legend

- COORDINATE
- POTENTIAL BLOCK
- SAFTY BARRIER
- RIVER
- ADMINISTRATIVE BLOCK BOUNDARY
- DISTRICT BOUNDARY

ABBREVIATION FORM		
DISTRICT	DD	DAKSHIN DINAJPUR
BLOCK	KM	KUSHMUNDI
RIVER	TG	TANGAON RIVER

0 0.0075 0.015 0.03 0.045 Kilometers

25°31'30"N

88°27'50"E

25°31'30"N

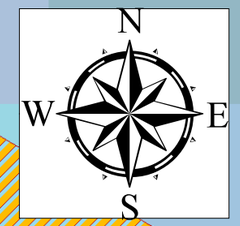
POTENTIAL BLOCK DD_KM_TG_08A OF TANGAON RIVER

88°27'35"E

25°31'10"N

TANGAON RIVER

DD_KM_TG_08A



DD_KM_TG_08A		
POINT NO	LATITUDE	LONGITUDE
1	25° 31' 11.277" N	88° 27' 36.618" E
2	25° 31' 10.868" N	88° 27' 36.566" E
3	25° 31' 10.888" N	88° 27' 36.543" E
4	25° 31' 10.875" N	88° 27' 36.000" E
5	25° 31' 10.286" N	88° 27' 33.104" E
6	25° 31' 9.384" N	88° 27' 32.736" E
7	25° 31' 10.426" N	88° 27' 32.216" E
8	25° 31' 11.235" N	88° 27' 33.063" E
9	25° 31' 11.373" N	88° 27' 34.771" E

Legend

- COORDINATE
- POTENTIAL BLOCK
- SAFTY BARRIER
- RIVER
- ADMINISTRATIVE BLOCK BOUNDARY
- DISTRICT BOUNDARY

ABBREVIATION FORM		
DISTRICT	DD	DAKSHIN DINAJPUR
BLOCK	KM	KUSHMUNDI
RIVER	TG	TANGAON RIVER

0 0.01 0.02 0.04 0.06 Kilometers

88°27'35"E

POTENTIAL BLOCK DD_KM_TG_08B OF TANGAON RIVER

88°27'40"E

88°27'45"E

25°31'10"N

N

W

E

S

DD_KM_TG_08B		
POINT NO	LATITUDE	LONGITUDE
1	25° 31' 7.073" N	88° 27' 42.734" E
2	25° 31' 7.053" N	88° 27' 41.570" E
3	25° 31' 7.636" N	88° 27' 40.419" E
4	25° 31' 9.287" N	88° 27' 39.579" E
5	25° 31' 10.847" N	88° 27' 38.347" E
6	25° 31' 12.487" N	88° 27' 37.114" E
7	25° 31' 11.693" N	88° 27' 38.802" E
8	25° 31' 11.011" N	88° 27' 39.919" E
9	25° 31' 11.011" N	88° 27' 39.919" E
10	25° 31' 9.637" N	88° 27' 41.590" E
11	25° 31' 8.170" N	88° 27' 42.802" E

DD_KM_TG_08B

TANGAON RIVER

Legend

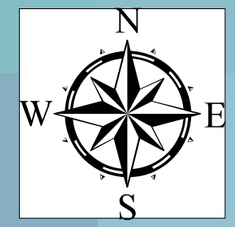
- COORDINATE
- POTENTIAL BLOCK
- SAFTY BARRIER
- RIVER
- ADMINISTRATIVE BLOCK BOUNDARY
- DISTRICT BOUNDARY

ABBREVIATION FORM		
DISTRICT	DD	DAKSHIN DINAJPUR
BLOCK	KM	KUSHMUNDI
RIVER	TG	TANGAON RIVER

Kilometers

0 0.0125 0.025 0.05 0.075

POTENTIAL BLOCK DD_KM_TG_09 OF TANGAON RIVER



TANGAON RIVER

DD_KM_TG_09		
POINT NO	LATITUDE	LONGITUDE
1	25° 30' 9.553" N	88° 27' 14.910" E
2	25° 30' 8.834" N	88° 27' 13.831" E
3	25° 30' 8.936" N	88° 27' 12.906" E
4	25° 30' 9.296" N	88° 27' 12.186" E
5	25° 30' 9.549" N	88° 27' 12.054" E
6	25° 30' 12.616" N	88° 27' 14.540" E
7	25° 30' 11.917" N	88° 27' 15.733" E
8	25° 30' 10.838" N	88° 27' 15.681" E

88°27'10"E 88°27'15"E 88°27'20"E

25°30'10"N

Legend

- COORDINATE
- POTENTIAL BLOCK
- SAFTY BARRIER
- RIVER
- ADMINISTRATIVE BLOCK BOUNDARY
- DISTRICT BOUNDARY

ABBREVIATION FORM		
DISTRICT	DD	DAKSHIN DINAJPUR
BLOCK	KM	KUSHMUNDI
RIVER	TG	TANGAON RIVER

0 0.0125 0.025 0.05 0.075 Kilometers

POTENTIAL BLOCK DD_KM_TG_10 OF TANGAON RIVER

88°27'0"E 88°27'5"E 88°27'10"E 88°27'15"E

25°30'5"N 25°30'0"N 25°29'55"N

N W E S

DD_KM_TG_10		
POINT NO	**LATITUDE**	**LONGITUDE**
1	25° 29' 58.408" N	88° 27' 5.927" E
2	25° 29' 56.827" N	88° 27' 6.044" E
3	25° 29' 57.167" N	88° 27' 4.117" E
4	25° 29' 58.929" N	88° 27' 3.382" E
5	25° 30' 1.944" N	88° 27' 3.451" E
6	25° 30' 3.931" N	88° 27' 4.479" E
7	25° 30' 5.987" N	88° 27' 6.946" E
8	25° 30' 6.604" N	88° 27' 8.591" E
9	25° 30' 6.398" N	88° 27' 10.646" E
10	25° 30' 6.189" N	88° 27' 11.172" E
11	25° 30' 4.252" N	88° 27' 8.770" E
12	25° 30' 1.733" N	88° 27' 6.223" E

TANGAON RIVER

Legend

- COORDINATE
- POTENTIAL BLOCK
- SAFTY BARRIER
- RIVER
- ADMINISTRATIVE BLOCK BOUNDARY
- DISTRICT BOUNDARY

ABBREVIATION FORM		
DISTRICT	DD	DAKSHIN DINAJPUR
BLOCK	KM	KUSHMUNDI
RIVER	TG	TANGAON RIVER

0 0.025 0.05 0.1 0.15 Kilometers

POTENTIAL BLOCK DD_KM_TG_11 OF TANGAON RIVER

88°26'45"E 88°26'50"E 88°26'55"E 88°27'0"E

25°29'0"N

25°28'55"N

TANGAON RIVER

DD_KM_TG_11		
POINT NO	LATITUDE	LONGITUDE
1	25° 28' 55.774" N	88° 26' 50.497" E
2	25° 28' 55.517" N	88° 26' 49.041" E
3	25° 28' 55.802" N	88° 26' 48.187" E
4	25° 28' 57.482" N	88° 26' 49.841" E
5	25° 29' 0.808" N	88° 26' 50.942" E
6	25° 29' 2.455" N	88° 26' 50.709" E
7	25° 29' 2.455" N	88° 26' 51.300" E
8	25° 29' 1.082" N	88° 26' 51.300" E
9	25° 29' 0.782" N	88° 26' 52.114" E
10	25° 28' 59.240" N	88° 26' 52.071" E
11	25° 28' 57.099" N	88° 26' 51.643" E

Legend

- COORDINATE
- POTENTIAL BLOCK
- SAFTY BARRIER
- RIVER
- ADMINISTRATIVE BLOCK BOUNDARY
- DISTRICT BOUNDARY

ABBREVIATION FORM		
DISTRICT	DD	DAKSHIN DINAJPUR
BLOCK	KM	KUSHMUNDI
RIVER	TG	TANGAON RIVER

0 0.02 0.04 0.08 0.12 Kilometers

POTENTIAL BLOCK DD_KM_TG_11A OF TANGAON RIVER

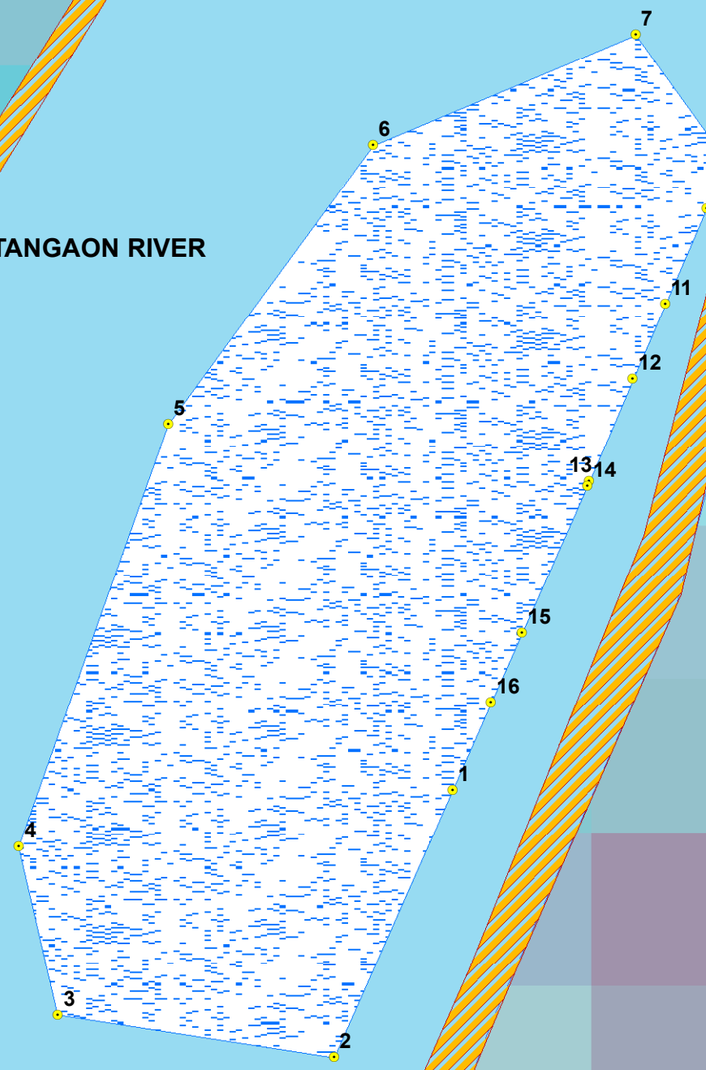
88°26'5"E

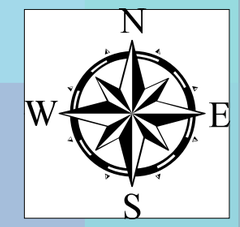
88°26'10"E

25°28'30"N

25°28'25"N

TANGAON RIVER





DD_KM_TG_11A		
POINT NO	LATITUDE	LONGITUDE
1	25° 28' 25.446" N	88° 26' 3.527" E
2	25° 28' 24.037" N	88° 26' 2.903" E
3	25° 28' 24.259" N	88° 26' 1.447" E
4	25° 28' 25.150" N	88° 26' 1.241" E
5	25° 28' 27.378" N	88° 26' 2.029" E
6	25° 28' 28.851" N	88° 26' 3.108" E
7	25° 28' 29.433" N	88° 26' 4.496" E
8	25° 28' 28.830" N	88° 26' 4.929" E
9	25° 28' 28.747" N	88° 26' 4.913" E
10	25° 28' 28.517" N	88° 26' 4.868" E
11	25° 28' 28.011" N	88° 26' 4.651" E
12	25° 28' 27.615" N	88° 26' 4.481" E
13	25° 28' 27.077" N	88° 26' 4.250" E
14	25° 28' 27.052" N	88° 26' 4.239" E
15	25° 28' 26.277" N	88° 26' 3.896" E
16	25° 28' 25.909" N	88° 26' 3.732" E

Legend

- COORDINATE
- POTENTIAL BLOCK
- SAFTY BARRIER
- RIVER
- ADMINISTRATIVE BLOCK BOUNDARY
- DISTRICT BOUNDARY

ABBREVIATION FORM		
DISTRICT	DD	DAKSHIN DINAJPUR
BLOCK	KM	KUSHMUNDI
RIVER	TG	TANGAON RIVER

Kilometers

0 0.0175 0.035 0.07 0.105

POTENTIAL BLOCK DD_BA_TG_12 OF TANGAON RIVER

88°24'45"E 88°24'50"E

25°27'0"N 25°26'55"N

N W E S

DD_BA_TG_12		
POINT NO	**LATITUDE**	**LONGITUDE**
1	25° 26' 54.494" N	88° 24' 49.338" E
2	25° 26' 54.418" N	88° 24' 47.038" E
3	25° 26' 54.525" N	88° 24' 44.861" E
4	25° 26' 55.226" N	88° 24' 43.543" E
5	25° 26' 56.207" N	88° 24' 42.485" E
6	25° 26' 58.335" N	88° 24' 41.629" E
7	25° 26' 59.449" N	88° 24' 41.972" E
8	25° 26' 59.601" N	88° 24' 42.975" E
9	25° 26' 58.927" N	88° 24' 42.512" E
10	25° 26' 58.483" N	88° 24' 42.979" E
11	25° 26' 56.878" N	88° 24' 46.381" E
12	25° 26' 56.086" N	88° 24' 49.503" E

TANGAON RIVER

Legend

- COORDINATE
- POTENTIAL BLOCK
- SAFTY BARRIER
- RIVER
- ADMINISTRATIVE BLOCK BOUNDARY
- DISTRICT BOUNDARY

ABBREVIATION FORM		
DISTRICT	DD	DAKSHIN DINAJPUR
BLOCK	BA	BANSIHARI
RIVER	TG	TANGAON RIVER

0 0.0175 0.035 0.07 0.105 Kilometers

POTENTIAL BLOCK DD_BA_TG_13 OF TANGAON RIVER

88°24'15"E 88°24'20"E 88°24'25"E

25°18'55"N 25°18'50"N

N W E S

DD_BA_TG_13		
POINT NO	**LATITUDE**	**LONGITUDE**
1	25° 18' 55.368" N	88° 24' 17.237" E
2	25° 18' 53.048" N	88° 24' 18.799" E
3	25° 18' 53.216" N	88° 24' 21.905" E
4	25° 18' 53.227" N	88° 24' 22.160" E
5	25° 18' 52.435" N	88° 24' 21.905" E
6	25° 18' 52.474" N	88° 24' 19.936" E
7	25° 18' 52.440" N	88° 24' 18.531" E
8	25° 18' 53.022" N	88° 24' 17.332" E
9	25° 18' 54.324" N	88° 24' 16.338" E
10	25° 18' 55.324" N	88° 24' 15.449" E
11	25° 18' 56.420" N	88° 24' 16.203" E
12	25° 18' 57.174" N	88° 24' 17.026" E
13	25° 18' 57.334" N	88° 24' 17.705" E
14	25° 18' 57.239" N	88° 24' 17.667" E

TANGAON RIVER

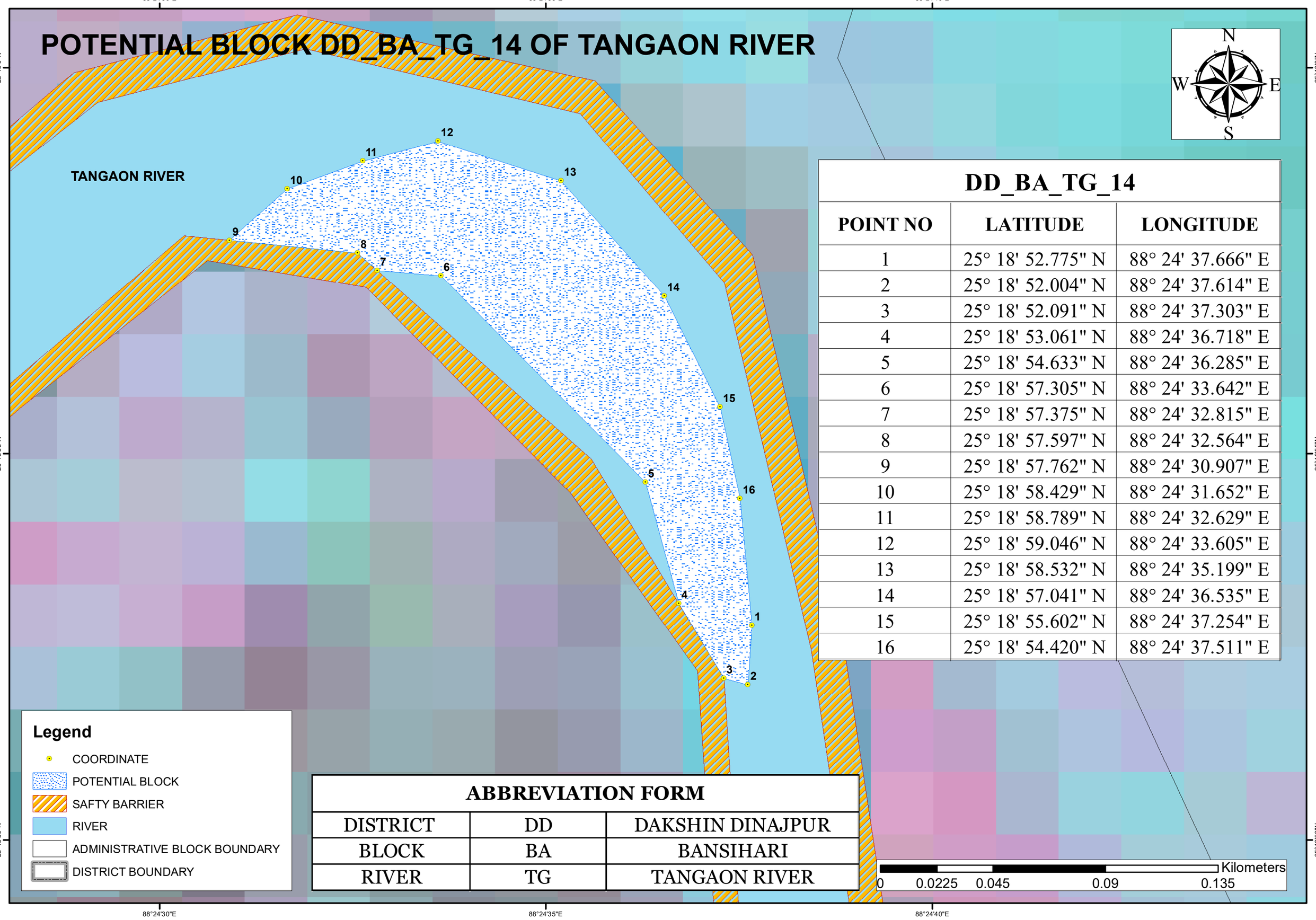
Legend

- COORDINATE
- POTENTIAL BLOCK
- SAFTY BARRIER
- RIVER
- ADMINISTRATIVE BLOCK BOUNDARY
- DISTRICT BOUNDARY

ABBREVIATION FORM		
DISTRICT	DD	DAKSHIN DINAJPUR
BLOCK	BA	BANSIHARI
RIVER	TG	TANGAON RIVER

0 0.0175 0.035 0.07 0.105 Kilometers

POTENTIAL BLOCK DD_BA_TG_14 OF TANGAON RIVER



DD_BA_TG_14		
POINT NO	**LATITUDE**	**LONGITUDE**
1	25° 18' 52.775" N	88° 24' 37.666" E
2	25° 18' 52.004" N	88° 24' 37.614" E
3	25° 18' 52.091" N	88° 24' 37.303" E
4	25° 18' 53.061" N	88° 24' 36.718" E
5	25° 18' 54.633" N	88° 24' 36.285" E
6	25° 18' 57.305" N	88° 24' 33.642" E
7	25° 18' 57.375" N	88° 24' 32.815" E
8	25° 18' 57.597" N	88° 24' 32.564" E
9	25° 18' 57.762" N	88° 24' 30.907" E
10	25° 18' 58.429" N	88° 24' 31.652" E
11	25° 18' 58.789" N	88° 24' 32.629" E
12	25° 18' 59.046" N	88° 24' 33.605" E
13	25° 18' 58.532" N	88° 24' 35.199" E
14	25° 18' 57.041" N	88° 24' 36.535" E
15	25° 18' 55.602" N	88° 24' 37.254" E
16	25° 18' 54.420" N	88° 24' 37.511" E

ABBREVIATION FORM		
DISTRICT	DD	DAKSHIN DINAJPUR
BLOCK	BA	BANSIHARI
RIVER	TG	TANGAON RIVER

POTENTIAL BLOCK DD_BA_TG_15 OF TANGAON RIVER

88°24'40"E

25°18'0"N

N

W E

S

DD_BA_TG_15		
POINT NO	**LATITUDE**	**LONGITUDE**
1	25° 17' 57.398" N	88° 24' 40.591" E
2	25° 17' 56.443" N	88° 24' 40.163" E
3	25° 17' 57.530" N	88° 24' 37.618" E
4	25° 17' 59.550" N	88° 24' 37.736" E
5	25° 17' 59.840" N	88° 24' 38.828" E
6	25° 17' 59.546" N	88° 24' 39.666" E
7	25° 17' 59.543" N	88° 24' 39.665" E
8	25° 17' 57.637" N	88° 24' 40.192" E

TANGAON RIVER

Legend

- COORDINATE
- POTENTIAL BLOCK
- SAFTY BARRIER
- RIVER
- ADMINISTRATIVE BLOCK BOUNDARY
- DISTRICT BOUNDARY

ABBREVIATION FORM		
DISTRICT	DD	DAKSHIN DINAJPUR
BLOCK	BA	BANSIHARI
RIVER	TG	TANGAON RIVER

0 0.0075 0.015 0.03 0.045 Kilometers

88°24'40"E

ANNEXURE 5.1

Compliance to the Observations
Government of West Bengal
Office of the District Land & Land Reforms Officer,
Balurghat, Dakshin Dinajpur
Memo No. 3019/L&LR/MM, dated 17.11.2021

Ref No.	Page of DSR	Matter involved	SL. No.	Comments		Status
1	76 of 98	**Sand Block**	6	Lease Area (-----)	1.87HA	Complied with. Please refer Table No. 8.1, page no 83 to 92
2			7	River Name, Lease Area, LAT & LONG (---)	ATRAI, 0.92HA, 25°15'36.31"N. 88°46'26.27" E	
3	77 of 98		11	Lease area (---)	4.85 HA	
4	78 of 98		16	River name, Lease area, LAT & LONG (---)	ATRAI, 0.40 HA, 25°13'52.92"N. 25°13'52.85"N, 25°13'52.82", 25°13'50.8892"N, 88°46'18.59" E, 88°46'20.75" E, 88°46'20.53" E, 88°46'18.31" E	
5			19	Lease area (---)	4.95 HA	
6	79 of 98		27	Lease area (---)	0.95 HA	
7			31	Lease area (---)	1.6 HA	
8			32	Lease area (---)	4.9815 HA	
9			34	Lease area (---)	1.75 HA	
10			36	Lease area (---)	4.9 HA	
11	81 of 98		41	Lease area (---)	0.29 HA	
12	83 of 98		52	Lease area (---)	1.56 HA	
13	84 of 98		63	Whether EC Grented. River Name. Lease Area, LAT && LONG (---)	NO PUNARVABA, 3.14 HA, Mining plan not submitted	
14	85 of 98		65	Plot No. 142, River Name. Lease Area, LAT & LONG (---)	1&2, PUNARVABA, 3.66HA, 25°24' 43.53" N. 88°31'3.87"E	
15	85 of 98		70	Police Station, Mouza, Plot No., Whether EC Grented, River Name. Lease Area, LAT & LONG (---)	Balurghat, Fatepur. 119/246, NO, ATRAI, 1.66 HA, 25°19'81.89"N, 88°75'06.73" E	
16			71	Police Station, Mouza, Plot No., Whether EC Grented, River Name. Lease Area, LAT & LONG (---)	Balurghat, Madanganj, 140, NO ATRAI, 3.97 HA, 25°29'01.07"N, 88°75'64.61"E	
17			72	Police Station, Mouza, Plot No., Whether EC Grented, River Name. Lease Area, LAT & LONG (---)	Balurghat, Rajapur, 77, NO, ATRAI, 3.11 HA, 25°30'74.36"N, 88°75'82.07"E	
18			73	Police Station, Mouza, Plot No., Whether EC Grented, River Name. Lease Area, LAT & LONG (---)	Kumarganj, Dhadolpara, 756, NO. ATRAI, 2.02HA. 25°39'85.26"N, 88°73'10.29"E	
19			74	Police Station, Mouza, Plot No., Whether EC Grented, River Name. Lease Area, LAT & LONG (---)	Kumarganj. Dhadolpara, 1023, NO. ATRAI, 2.02HA, 25°39' 85.26"N. 88°73'10.29"E	

Ref No.	Page of DSR	Matter involved	SL. No.	Comments		Status
20			75	Police Station, Mouza, Plot No., Whether EC Grented, River Name. Lease Area, LAT & LONG (---)	Kumarganj, Prasadpur, 14, 31, 22,144, NO, ATRAI. 1 .21HA 25°36'99.26"N, 88°74 04.67"E	The coordinates have been checked and they are not lying within the potential area, therefore the coordinates need to be reviewed.
21			76	Police Station, Mouza, Plot No., Whether EC Grented, River Name. Lease Area, LAT & LONG (---)	Kumarganj, Sahajadpur, 589, NO. ATRAI 7.68HA. 25°44'04.14"N. 88°73'21.24"E	
22			77	Police Station, Mouza, Plot No., Whether EC Grented, River Name. Lease Area, LAT & LONG (---)	Kumarganj, Chak Ganga Prasad. 132. NO. ATRAI. 4.04HA. 25°40'53.71"N, 88°72'92.44"E	
23			78	Police Station, Mouza, Plot No., Whether EC Grented, River Name. Lease Area, LAT & LONG (---)	Kumarganj. Taipur. 55. NO, ATRAI. 1.21HA. 25°38' 04.11"N 88° 73'64.58"E	
24			79	Police Station, Mouza, Plot No., Whether EC Grented, River Name. Lease Area, LAT & LONG (---)	Kumarganj. Narayanpur, 755, NO, ATRAI, 08.00HA 25°40'00.07"N, 88°72'70.74"E	
25			80	Police Station, Mouza, Plot No., Whether EC Grented, River Name. Lease Area, LAT & LONG (---)	Kumarganj, Radhanagar, 550, NO, ATRAI, 3.23HA. 25°33'99.84"N, 88°75'49.79"E	
26			81	Police Station, Mouza, Plot No., Whether EC Grented, River Name. Lease Area, LAT & LONG (---)	Kumargani. Parial, 01, NO ATRAI, 4.04HA, 25°34' 36.23"N, 88° 73'93.98"E	
27			82	Police Station, Mouza, Plot No., Whether EC Grented, River Name. Lease Area, LAT & LONG (---)	Kumarganj, Chakbalaram, 08, 14, 415, NO. ATRAI, 1.61HA 25°34'40.10"N. 88°74'08.84"E	
28	03 of 07	Brick Earth	21	LR Plot Nos. 165/182	166/182	List of Bricks Earth Mines in Dakshin Dinajpur District has been removed.
29	05 of 07		40	Area in acre	4.05	
30	07 of 07		42	Mouza Habell	Habeli	
31			43	Mouza Habell& Area in acre	Habeli, 3.84	
32			64	Sl. No., Name of the Mineral, Name of the Block, Name of Brick field, Mouza, JL No., LR, Plot Nos., Area in acre, Consent to operate valid upto& Whether E.C. is there	Brick Earth, Balurghat, Mondal Brick, Katna, 99, 88,89,90, 3.45, 31.12.2025, Pending	

ANNEXURE 5.2

Compliance to the Minutes of the twenty-eighth meeting of the reconstituted State Level Expert Appraisal Committee, West Bengal held on 08.01.2022 at 10:30 a.m. at the Conference Room, Paribesh Bhawan, Kolkata

Sl. No.	Observations	Compliance
1	In the drainage map watersheds and micro-watersheds should be marked	The watershed level up to 3rd order streams are marked in the drainage map and is depicted in Plate No. 3A.
2	Hydrographs at key intersections along the entire stretch of the river falling in the particular district along with a discussion on the runoff of the river in the upstream and downstream within the district.	Given in section 3.6 page no 30 to 32. Depth of mining has been selected in accordance with the depth to water level depicting from the Hydrographs.
3	A separate map showing locations of dams, barrages, bridge, river bed tube wells, river bed collector wells and infiltration galleries.	Given as Plate no 1B. All major bridges, Barrages, river bed wells, and other hydraulic structures are marked in the drainage map of the district and also labeled.
4	Depth to base flow in the riverbed sand mining areas, present and proposed, in pre-monsoon and post-monsoon periods.	Depth of the base flow is below proposed mining depth as observed from the field study. During study period, no mining activity commenced.
5	Field photographs showing activities of replenishment study.	Representative Photographs of Survey of the River bed profile used for replenishment and aggradation measurement study is being furnished in Plate no 4.
6	A map showing long-term (10-year or more) erosion-accretion areas on both the banks of the rivers which would help to identify no-mining zone on the river bed along with a discussion.	Given in Plate no 5A & 5B. Though all the rivers of the district doesn't shows much difference when studied the image archives from 1985 to 2022, however, a stretch of Adri River shows narrowing nature is being furnished as one of the representative image detection study.
7	In each proposed block, the RL of the sand surface (pre and post Monsoon) will be useful and the suggested mining depth corresponds to a particular RL of the deepest layer mined (not depth on absolute terms in case replenished quantity is different)	Elevation levels for each potential zone are furnished as Annexure-2. However, DGPS survey of each block shall be carried while preparation of the Mining Plans and final adjustment of depth parameters shall be done accordingly. In no circumstances, mining depth shall be increased beyond the depth suggested for each potential zones in this DSR.
8	Depth of mining considered for calculation of potential reserve. It presumes that base flow depth is more than the mining depth in pre-monsoon period. That needs to be substantiated with data for each block.	Depths of Mining Considered for each potential zone are furnished on the basis of average and are given in Table no 7.9, Page no 91. However, after finalization of the sand Blocks, each block shall be surveyed again during the course of Mining Plan preparation and final depths shall be suggested accordingly.
9	Ground water level pre and post monsoon in the watershed (of district) may be put in a map.	Complied with. The same has been furnished as Plate no 3B and 3C

Sl. No.	Observations	Compliance
10	It was also suggested to show in maps the approach roads (accessibility plan complying with guidelines) for the blocks.	The major transport networks for the district are depicted in Figure no 10.2, Page no 102. The accessibility from each block shall be detailed in the Mining Plan.
11	Sand mining in designated upstream blocks may affect the replenishment in blocks downstream and this consideration may be relevant for estimating the percentage of replenishment. What should be the percentage for minable reserve with respect to potential reserve of sand?	This study shall be undertaken by the Mines Branch, Dep. Of Industry, Commerce & Enterprise, GoWB in subsequent years and annual reports shall be generated covering these points. However, as per the EMGSM, 2020, not more than 60% of the area will be covered under extraction plan.
12	Data on river flow on all seasons and the sediment load data (especially during seasons of replenishment) will constitute a baseline condition to judge any effect of increased mining on the river flow characteristics.	This study shall be undertaken by the Mines Branch, Dep. Of Industry, Commerce & Enterprise, GoWB in subsequent years and annual reports shall be generated covering these points.
13	Stowing sand excavation blocks have not been shown in river map.	Not applicable for this district.
14	Existing mining leases may be shown on river map along with potential blocks	Existing Mining Leases having Environmental Clearance as on 31st January, 2022 are furnished inPlate no 2A and 2B
15	On the river map, potential new blocks and existing blocks may also be designated by serial or code number so that it matches with the tables.	Given in Plate no 2A and 2B
16	It will be appropriate if the methodology adopted (not only the available theory) for annual replenishment estimation is clearly and objectively narrated with applicable data and sample calculations.	Change detection through satellite imagery study, Field evidences and empirical formulae are utilized for replenishment study. Detail discussions are done in section 7 of this report.
17	Representative satellite and/or drone photography, if used for surveying, may also be produced in DSR.	All the plates are satellite imagery based and are furnished in Plate no 2A and 2B
18	The suggested mining depth should be indicated for each block in the table (not done for PurbaBardhaman).	Complied with. Suggested mining depths are furnished as Annexure-2.
19	A table showing all general compliances in DSR as per the Mining Rules may be furnished.	Complied with. Given in Table no 1.1, Page no 3-5
20	For existing mines (sand and other minerals), minable reserve has not been mentioned.	Details of the mining leases given in Table no 8.1, Page no 96-97.
21	All the documents leave much to be desired in respect of reserve assessment and replenishments estimations.	Given in section 7.2/v, page no 72-90
22	Reserve assessment has been rudimentary and the replenishment estimation needs to be carried out using accepted methods and models available for the purpose.	No attempt has been done for mineable reserve assessment in this DSR. Efforts have been restricted to define the potential sand resources in each rivers of the district. Mineable reserve estimation shall be done once the Blocks are demarcated as per West Bengal Minor Mineral

Sl. No.	Observations	Compliance
		Concession Rules, 2016 and based on EMGSM 2020.
23	Rivers are one of the main sources to supply sand for construction projects. Depending on river morphology and hydraulic characteristics, its sediment transport capacity, and mining operation method, the extraction of river bed materials may affect its ecosystem through bank and bed erosion. This needs to be incorporated in the DSR.	Mining impact given in Chapter 11, page no 103-106
24	To advance the mechanisms of river pit infilling, the effects of various parameters (i.e., the distance between pits, the pit plan shape, the pit depth, sediment size, and approaching flow velocity) needs to be investigated.	This study shall be undertaken by the Mines Branch, Dep. Of Industry, Commerce & Enterprise, GoWB in subsequent years and annual reports shall be generated covering these points.
25	Monitoring should provide data to evaluate the upstream and downstream effects of sand and gravel extraction activities, and long-term changes. A brief report summarizing the annual results of the physical and biological monitoring should document the evolution of the sites over time, and the cumulative effects of sand and gravel extraction. The summary should also recommend any maintenance or modification of extraction rates needed to minimize impacts of extraction.	This study shall be undertaken by the Mines Branch, Dep. Of Industry, Commerce & Enterprise, GoWB in subsequent years and annual reports shall be generated covering these points.
26	Sand Replenishment, Geomorphology and Hydrology Physical monitoring requirements of sand and gravel extraction activities should include surveyed channel cross-sections, longitudinal profiles, bed material measurements, geomorphic maps, and discharge and sediment transport measurements. The physical data will illustrate bar replenishment and any changes in channel morphology, bank erosion, or particle size.	Explained in detailed in Chapter no 7, Page no 63 to 94
27	With reference to (point no 4.1.1 g) of enforcement guidelines 2020 read with Standard environmental conditions for sand mining (point no 8 page 73) of SSMMG-2016, all DSRs so prepared, should contain a chapter on NO MINING ZONE with name of mouza, dag no and geo references along with areas of sensitivity. Appraisal of the DSRs should NOT be taken for consideration without the chapter on NO MINING ZONE and AREAS of SENSITIVITY.	Section on No mining zone is given in Page no 93
28	The areas of sensitivity should contain those NON-FOREST AREAS which are in excellent line of habitat for wild animals, birds, turtles, dolphins and other aquatic life, which need be excluded from the list of mining areas on ecological and environmental grounds. This is utmost necessary and has to be done to avoid conflict about wetland use in near future.	ENVIS centre on Wildlife and Protection areas map as published in August 2020, does not show any wildlife habitat in the potential sand mining areas.
29	For example, low lying swamps by the side of river Ajay in Paschim Midnapur and Ahiran lake, pathanbeel, Bishnupur beel area in Murshidabad District provide an excellent nitche for migratory birds in the winter. Part of river Damodar and the confluence of Damodar and Hooghly in East Barddhaman District house one of the last surviving habitats	Part of comment 30.

Sl. No.	Observations	Compliance
	of endangered gangetic dolphin (Platinista gangeticus), should be identified in consultation with the concerned forest circles of the Department of Forests and to be excluded from the list of mining areas.	
30	Though all the DSRs so prepared, have not followed the same format yet it is felt that necessary remedial measures to mitigate the effect of mining and a reclamation plan in mined out areas should be included, especially in those DSRs which have not yet mentioned the same.	DSR Format Compliance under Notification S. O. 3611 (E), Dated 25th July 2018, Appendix-X (I).
31	Data, satellite imageries and allied information in respect of flora, fauna and their habitat biological environment, if collected from ENVIScentre may be included in the DSRs for ready reference.	Source of all the secondary figures and tables included in the DSR.
32	DSR comprises of secondary data which are required to be endorsed by concerned Departments.	References for secondary data are furnished in the DSR under references.
33	Revision should be done every year and actual survey should be done.	This study shall be undertaken by the Mines Branch, Dep. Of Industry, Commerce & Enterprise, GoWB in subsequent years and annual reports shall be generated covering these points.
34	It is to be clearly mentioned that there are no other minerals than sand in this district.	Noted
35	Dates of NIC database and other data should be provided	Noted and given in page no 13-14
36	Outcome / response to the public consultation should be mentioned	Given as compliance statements in the DSR
37	No-Mining-Zone should be clearly mentioned with special mention to the ecologically and otherwise sensitive zones. Bridges and river-bed tubewells should also be clearly demarcated. Wildlife should also be considered	Restricted zone given as Plate no 2A and 2B. Location of bridges, dam given in 1B
38	Hydrographs of the rivers and volume of rain should be studied to correlate with the minable sand reserve	Incorporated in the Replenishment study section 7.2/v, page no 72-90
39	Text parts (as in Chapter 6) should be provided with proper reference and citation of authentic books. Sources of Tables and figures should be mentioned. Some are very old data – those should be replaced by latest data	Source of all the secondary figures and tables included in the DSR
40	Depth of mining and distance from banks should be clearly mentioned and highlighted	Given as Annexure-2
41	Secondary (Collected) data/ map from other departments should be certified from the respective departments (e.g., Forest and wildlife data, demography, aquifer, transportation route to the blocks)	References used from Public Domain/ Websites are furnished in the Reference section in this DSR.
42	Evidence (like dated photographs) of surveying, collection of primary data to be provided	Field photographs are furnished in Plate 4.
43	Sample calculation and methodology for calculation for minable resource and replenishment data to be provided with proper units	Given in Table no 7.5 and Table no 7.10.
44	If any predictive model is used, its validity should be established	Predictive Model has been carried out based on EMGSM 2020. The

Sl. No.	Observations	Compliance
		validity checking requires consecutive study which needs to be undertaken by the concerned department.
45	Evidence for 4 times physical survey to be provided	Field photographs are furnished in Plate 4. Field registers are available at office and can be furnished on demand.
46	Land utilization and forests data are upto 2013/2014 – should be updated	Latest available data incorporated in the DSR

ANNEXURE 5.3

Compliance to the SEAC members' comments received through mail on 25th March 2022

Sr. No.	Observations	Compliance
1	Inclusion executive summary at the beginning	Executive summary included in page no 2 to 3.
2	Compliance table of the DM/SEAC members' observations may be placed at the end. Instead, a table of compliance with the guidelines to be placed at the beginning indicating the page number	Complied with and given as separate document.
3	DSR specific observation should not be included in all in the compliance table of all theDSR.	Complied with.
4	DSR compliance table should come just after the executive summary	Complied with and given as Annexure-1.
5	Need to mention page number in the DSR compliance table.	Modified table furnished as Annexure-1.
6	Should include Brick Earth and its mining regulations.	Not Applicable
7	Legend should be given for sand bar coding	Complied with and furnished as abbreviation in page no 70.
8	Citation of reference should be given for Empirical formula by which Replenishment calculated.	Complied with and given in page no 74 to 77.
9	Map Source to be given for each map such as Watershed, Transport, Location, Drainage etc.	Complied with and given in Plate no 1 and 3.
10	Mention conclusion and Recommendation instead Summary	Complied with and given in page no 110-113.
11	Reference should be in a standard referencing format	Complied with and given in page no 114-115.
12	Source and date of collecting data for satellite imagery should be given.	Complied with and given in Plate no 2.

ANNEXURE 5.4
Compliance to the Minutes of the 61st meeting of the SEIAA, West Bengal held on 23.05.2022 at Kolkata

Sl. No.	Observations	Compliance
1	List of definitions of technical terms used in the DSR to be included.	Complied with.
2	Each potential zone should have a unique code no. and area bearing all the coordinates of all the points defining the boundary.	Complied with. Please refer Annexure 3.
3	A map showing the potential zone with the legend, mentioning all the coordinates of the polygon, defining the zone to be attached as annexure in the DSR.	Complied with. Please refer Annexure 4.
4	Dept. of Industry, Commerce & Enterprises will issue unique code with reference to the original coding of potential zones to each lessee. This unique code issued to lessee should be reflected in the LoI.	Shall be complied with.
5	Dept. of Industry, Commerce & Enterprises will upload the updated map showing the location of the LoI issued against the area and sand mining lease areas in different colour coding.	Shall be complied with.
6	Date of approval should be mentioned in all the pages of the annexures of DSRs.	Noted.
7	The consultant is further requested to refer the DSRs prepared by other states in order to confirm that no relevant point is missed out in any of our DSRs.	Complied with.
8	The consultant may also refer to the baseline data available with Irrigation Dept.	At present Replenishment Study is being conducted for all the sand producing Districts of West Bengal. This will be covered in the relevant reports.

ANNEXURE 5.5

Compliance to the Minutes of the 66th meeting of the SEIAA, West Bengal held on 06.07.2022 at Kolkata

Sl. No.	Observations	Compliance
1	The format of all the DSRs should be uniform.	Complied with.
2	The corrections required to be done regarding Annexure-3.	Complied with. Please refer Annexure 3.
3	List of existing lease is attached with the documents in Chapter 8.2. The list should contain the date of issue and validity.	Complied with. The details of the existing leases updated as per the data provided from concern department.
4	Sequence of meetings and observation given by SEAC and SEIAA should be mentioned in chronological order and be a part of the whole document.	Complied with. Please refer Annexure-5.

Annexure 6
SEIAA 69th Meeting (10nd August, 2022) Minutes of Meeting

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State Environment Impact Assessment Authority
Pranisampad Bhawan, 5th Floor, Sector-III, Salt Lake, Kolkata - 700106
(West Bengal)
Minutes of SEIAA Meeting

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Subject:- 69th meeting of SEIAA

Venue:- Conference Room of Environment Department, Prani Sampad Bhavan, 5th Floor, LB Block, Sector III, Salt Lake, Kolkata 700106.

From :- 10 Aug 2022

To :- 10 Aug 2022

1. Proposal No. :- **SIA/WB/IND3/72391/2020** File No- **EN/T-II-1/021/2020** Proposed Synthetic Resin Production Plant (UF Resin, PF Resin & MF Resin) for Laminate Manufacturing Unit at Dag No. 674, 680, 681, J.L No. 144, L.R KH-3068 Uluberia–Amta Road, Vill – Sherpur, P. O. – Panpur, P. S. – Amta, Mouza - Serpur, Block - Amta–I, Dist- Howrah, PIN – 711401, West Bengal by **M/s. Intim Laminates Pvt. Ltd.**	Type- **EC**

INTRODUCTION

The proponent made online application vide proposal no. **SIA/WB/IND3/72391/2020** dated **17 Mar 2022** along with copies of EIA/EMP seeking environment clearance under the provisions of the EIA Notification, 2006 for the above mentioned project. The proposed project activity is listed at SL.No. **5(f) Synthetic organic chemicals industry (dyes & dye intermediates; bulk drugs and intermediates excluding drug formulations; synthetic rubbers; basic organic chemicals, other synthetic organic chemicals and chemical intermediates)**, under Category "**B1**" of EIA Notification 2006 and the proposal is appraised at State level.

The **Proposed Synthetic Resin Production Plant (UF Resin, PF Resin & MF Resin) for Laminate Manufacturing Unit of M/s Intim Laminates Pvt. Ltd.** of M/s **M/S INTIM LAMINATES PVT. LTD.** located in Dag No. 674, 680, 681, J.L No. 144, L.R KH-3068 Uluberia–Amta Road, Vill – Sherpur, P. O. – Panpur, P. S. – Amta, Mouza - Serpur, Block - Amta–I, Dist- Howrah, PIN – 71140, **West Bengal** was initially received in the SEIAA on **09 Sep 2020** for obtaining Terms of Reference (ToR) as per EIA Notification,2006. The Project was appraised by the State Expert Appraisal Committee (Industrial Projects - 3) [SEAC] during its 8 th meeting held between **22 Dec 2020** to **22 Dec 2020** and prescribed ToRs to the project for undertaking detailed EIA study for obtaining Environmental Clearance. Accordingly, the SEIAA had prescribed ToRs to the project on **03 Feb 2021.**

The project was placed in the 65th meeting of SEIAA held on 23.06.2022 and it was observed that some documents required to be uploaded in the PARIVESH Portal. The project proponent uploaded documents on 14.07.2022.

PROJECT DETAILS

The project of **M/S INTIM LAMINATES PVT. LTD.** located in as follows :

State of the project				
S. No.	**State**	**District**	**Tehsil**	**Village**
(1.)	West Bengal	Howrah	Amta - I	Serpur

The production details / project configuration is as follows :

Project configuration/product details						
S. No.	Project configuration/product details	Quantity	Unit	Other Unit	Mode of Transport/Transmission of Product	Other Mode of Transport
(1.)	Decorative Laminates	300000	9	Sheets/M	Road	
(2.)	PF Resin	500	9	MT/Month	Road	
(3.)	MF Resin	300	9	MT/Month	Road	
(4.)	UF Resin	100	9	MT/Month	Road	

Raw Material Requirement is as follows :

Raw Material Requirement details								
S. No.	Item	Quantity per annum	Unit	Other Unit	Source	Mode of Transport/Transmission of Product	Other Mode of Transport	Distance of Source from Project Site(Kilometers)
(1.)	Melamine	1395.72	1		Local	Road		1
(2.)	Phenol	2715.84	1		Local	Road		1
(3.)	Acetic acid	27	1		Local	Road		1
(4.)	Caustic soda	286.2	1		Local	Road		1
(5.)	Paper	5400	1		Local	Road		1
(6.)	Formaldehyde	6445.32	1		Local	Road		1
(7.)	Industrial Urea	336	1		Local	Road		1

DELIBERATION IN SEIAA

SEIAA considered the submission made by the project proponent (PP) vide their letter No. NIL dated 14.07.2022 uploaded on 14.07.2022 and accepted the same.

RECOMMENDATIONS OF SEIAA

The application for EC is approved.

Conclusion

Recommended

S.No	Conditions
(1)	I **Statutory compliance** i. The project proponent shall obtain forest clearance under the provisions of Forest (Conservation) Act, 1986, in case of the diversion of forest land for non-forest purpose involved in the project. ii. The project proponent shall obtain clearance from the National Board for Wildlife, if applicable. iii. The project proponent shall prepare a Site-Specific Conservation Plan & Wildlife Management Plan and approved by the Chief Wildlife Warden. The recommendations of the approved Site-Specific Conservation Plan / Wildlife Management Plan shall be implemented in consultation with the State Forest Department. The implementation report shall be furnished along with the six-monthly compliance report. (in case of the presence of schedule- I species in the study area) iv. The project proponent shall obtain Consent to Establish / Operate under the provisions of Air (Prevention & Control of Pollution) Act, 1981 and the Water (Prevention & Control of Pollution) Act, 1974 from the concerned State pollution Control Board / Committee. v. The project proponent shall obtain authorization under the Hazardous and other Waste Management Rules, 2016 as amended from time to time. vi. The Company shall strictly comply with the rules and guidelines under Manufacture, Storage and Import of Hazardous Chemicals (MSIHC) Rules, 1989 as amended time to time. All transportation of Hazardous Chemicals shall be as per the Motor Vehicle Act (MVA), 1989. **II. Air quality monitoring and preservation** i. The project proponent shall install 24x7 continuous emission monitoring system at process stacks to monitor stack emission with respect to standards prescribed in Environment (Protection) Rules 1986 and connected to SPCB and CPCB online servers and calibrate these system from time to time according to equipment supplier specification through labs recognized under Environment (Protection) Act, 1986 or NABL accredited laboratories. ii. The project proponent shall monitor fugitive emissions in the plant premises at least once in every quarter through labs recognized under Environment (Protection) Act, 1986. iii. The project proponent shall install system to carryout Ambient Air Quality monitoring for common / criterion parameters relevant to the main pollutants released (e.g. PM_{10} and $PM_{2.5}$ in reference to PM emission, and SO_2 and NOx in reference to SO_2 and NOx emissions) within and outside the plant area at least at four locations (one within and three outside the plant area at an angle of 120^0 each), covering upwind and downwind directions. iv. To control source and the fugitive emissions, suitable pollution control devices shall be installed to meet the prescribed norms and / or the NAAQS. Sulphur content should not exceed 0.5% in the coal for use in coal fired boilers to control particulate emissions within permissible limits (as applicable). The gaseous emissions shall be dispersed through stack of adequate height as per CPCB / SPCB guidelines. v. Storage of raw materials, coal etc. shall be either stored in silos or in covered areas to prevent dust pollution and other fugitive emissions. vi. National Emission Standards for Organic Chemicals Manufacturing Industry issued by the Ministry vide G.S.R.608(E) dated 21st July, 2010 and amended from time to time shall be followed. vii. The National Ambient Air Quality Emission Standards issued by the Ministry vide G.S.R.No.826(E) dated 16th November, 2009 shall be complied with. **III. Water quality monitoring and preservation** i. The project proponent shall provide online continuous monitoring of effluent, the unit shall install web camera with night vision capability and flow meters in the channel / drain carrying effluent within the premises (applicable in case of the projects achieving ZLD). ii. As already committed by the project proponent, Zero Liquid Discharge shall be ensured and no waste / treated water shall be discharged outside the premises (applicable in case of the projects achieving the ZLD).

iii. The effluent discharge shall conform to the standards prescribed under the Environment (Protection) Rules, 1986, or as specified by the State Pollution Control Board while granting Consent under the Air / Water Act, whichever is more stringent.

iv. Total fresh water requirement shall not exceed the proposed quantity or as specified by the Committee. Prior permission shall be obtained from the concerned regulatory authority / CGWA in this regard.

v. Process effluent / any wastewater shall not be allowed to mix with storm water. The storm water from the premises shall be collected and discharged through a separate conveyance system.

vi. The Company shall harvest rainwater from the roof tops of the buildings and storm water drains to recharge the ground water and utilize the same for different industrial operations within the plant.

vii. The DG sets shall be equipped with suitable pollution control devices and the adequate stack height so that the emissions are in conformity with the extant regulations and the guidelines in this regard.

IV. Noise monitoring and prevention

i. Acoustic enclosure shall be provided to DG set for controlling the noise pollution.

ii. The overall noise levels in and around the plant area shall be kept well within the standards by providing noise control measures including acoustic hoods, silencers; enclosures etc. on all sources of noise generation.

iii. The ambient noise levels should conform to the standards prescribed under E(P)A Rules, 1986 viz. 75 dB(A) during day time and 70 dB(A) during night time.

V. Energy Conservation measures

i. The energy sources for lighting purposes shall preferably be LED based.

VI. Waste management

i. Hazardous chemicals shall be stored in tanks, tank farms, drums, carboys etc. Flame arresters shall be provided on tank farm and the solvent transfer through pumps.

ii. Process organic residue and spent carbon, if any, shall be sent to cement industries. ETP sludge, process inorganic & evaporation salt shall be disposed off to the TSDF.

iii. The company shall undertake waste minimization measures as below:-

a. Metering and control of quantities of active ingredients to minimize waste.

b. Reuse of by-products from the process as raw materials or as raw material substitutes in other processes.

c. Use of automated filling to minimize spillage.

d. Use of Close Feed system into batch reactors.

e. Venting equipment through vapour recovery system.

f. Use of high pressure hoses for equipment clearing to reduce wastewater generation.

VII. Green Belt

i. The green belt of 5-10 m. width shall be developed in more than 33% of the total project area, mainly along the plant periphery, in downward wind direction, and along road sides etc. Selection of plant species shall be as per the CPCB guidelines in consultation with the State Forest Department. The project proponent should follow plantation plan as approved by Forest Range Officer, Howrah Urban S. F. Range on 14.03.2022.

VIII. Safety, Public hearing and Human health issues

i. Emergency preparedness plan based on the Hazard Identification and Risk Assessment (HIRA) and Disaster Management Plan shall be implemented.

ii. The unit shall make the arrangement for protection of possible tire hazards during manufacturing process in material handling. Fire fighting system shall be as per the norms.

iii. The PP shall provide Personal Protection Equipment (PPE) as per the norms of Factory Act.

iv. Training shall be imparted to all employees on safety and health aspects of chemicals handling. Pre-employment and routine periodical medical examinations for all employees shall be undertaken on regular basis. Training to all employees on handling of chemicals shall be imparted.

v. Provision shall be made for the housing of construction labour within the site with all necessary infrastructure and facilities such as fuel for cooking, mobile toilets, mobile STP, safe drinking water, medical health care, creche etc. The housing may be in the form of temporary structures to be removed after the completion of the project.

vi. Occupational health surveillance of the workers shall be done on a regular basis and records maintained as per the Factories Act.

vii. There shall be adequate space inside the plant premises earmarked for parking of vehicles for raw materials and finished products, and no parking to be allowed outside on public places

IX. Environment Management Plan (EMP)

i. The project proponent should submit the proposed EMP on a six monthly basis. The Office Memorandum issued by the MoEF & CC vide F. No. 22-65/2017-IA.III dated 30.09.2020 should be strictly followed.

ii. Need based activities for local people is part of the EMP. Details of such activities submitted by the project proponent is given in Annexure-1.

iii. The company shall have a well laid down environmental policy duly approve by the Board of Directors. The environmental policy should prescribe for standard operating procedures to have proper checks and balances and to bring into focus any infringements / deviation / violation of the environmental / forest / wildlife norms / conditions. The company shall have defined system of reporting infringements / deviation / violation of the environmental / forest / wildlife norms / conditions and / or shareholders / stake holders. The copy of the board resolution in this regard shall be submitted to the MoEF&CC as a part of six-monthly report.

iv. A separate Environmental Cell both at the project and company head quarter level, with qualified personnel shall be set up under the control of senior Executive, who will directly to the head of the organization.

v. Action plan for implementing EMP and environmental conditions along with responsibility matrix of the company shall be prepared and shall be duly approved by competent authority. The year wise funds earmarked for environmental protection measures shall be kept in separate account and not to be diverted for any other purpose. Year wise progress of implementation of action plan shall be reported to the Ministry / Regional Office along with the Six Monthly Compliance Report.

vi. Self environmental audit shall be conducted annually. Every three years third party environmental audit shall be carried out.

X. Additional condition

1. An appropriate display board may be erected at a conspicuous location. The board may display the status of relevant environmental parameters and should provide the names of the institutions/ organisations benefitted by the schemes mentioned in the CER. It would be the proponent's (or their successors) responsibility to ensure that the board is maintained during the operation phase of the project.

XI. Miscellaneous

a) The environmental clearance accorded shall be valid for a period of 10 years for the proposed project.

b) The project proponent shall make public the environmental clearance granted for their project along with the environmental conditions and safeguards at their cost by prominently advertising it at least in two local newspapers of the District or State, of which one shall be in the vernacular language within seven days and in addition this shall also be displayed in the project proponent's website permanently.

c) The copies of the environmental clearance shall be submitted by the project proponents to the Heads of local bodies, Panchayats and Municipal Bodies in addition to the relevant offices of the Government who in turn has to display the same for 30 days from the date of receipt.

d) The project proponent shall upload the status of compliance of the stipulated environment clearance conditions, including results of monitored data on their website and update the same on half-yearly basis.

e) The project proponent shall monitor the criteria pollutants level namely; PM_{10}, SO_2, NOx (ambient levels as well as stack emissions) or critical sectoral parameters, indicated for the projects and display the same at a convenient location for disclosure to the public and put on the website of the company.

f) The project proponent shall submit six-monthly reports on the status of the compliance of the stipulated environmental conditions on the website of the ministry of Environment, Forest and Climate Change at environment clearance portal.

g) The project proponent shall submit the environmental statement for each financial year in Form-V to the concerned State Pollution Control Board as prescribed. under the Environment (Protection) Rules, 1986, as amended subsequently and put on the website of the company.

h) The project proponent shall inform the Regional Office as well as the Ministry, the date of financial closure and final approval of the project by the concerned authorities, commencing the land development work and start of production operation by the project.

i) The project authorities must strictly adhere to the stipulations made by the State Pollution Control Board and the State Government.

j) The project proponent shall abide by all the commitments and recommendations made in the EIA / EMP report, commitment made during Public Hearing and also that during their presentation to the Expert Appraisal Committee.

k) No further expansion or modifications in the plant shall be carried out without prior approval of the Ministry of Environment, Forests and Climate Change (MoEF&CC).

l) Concealing factual data or submission of false / fabricated data may result in revocation of this environmental clearance and attract action under the provisions of Environment (Protection) Act, 1986.

m) The Ministry may revoke or suspend the clearance, if implementation of any of the above conditions is not satisfactory.

n) The Ministry reserves the right to stipulate additional conditions if found necessary. The Company in a time bound manner shall implement these conditions.

o) The Regional Office of this Ministry shall monitor compliance of the stipulated conditions. The project authorities should extend full cooperation to the officer(s) of the Regional Office by furnishing the requisite data / information / monitoring reports.

p) The above conditions shall be enforced, inter-alia under the provisions of the Water (Prevention & Control of Pollution) Act, 1974, the Air (Prevention & Control of Pollution) Act, 1981, the Environment (Protection) Act, 1986, Hazardous and Other Wastes (Management and Transboundary Movement) Rules, 2016 and the Public Liability Insurance Act, 1991 along with their amendments and Rules and any other orders passed by the Hon'ble Supreme Court of India / High Courts and any other Court of Law relating to the subject matter.

q) Any appeal against this EC shall lie with the National Green Tribunal, if preferred, within a period of 30 days as prescribed under Section 16 of the National Green Tribunal Act, 2010.

Annexure-1

NEED BASED ACTIVITIES FOR LOCAL PEOPLE

Sl No	Proposed Activity (Heads may vary as per Recommendation of SEAC)	Investment (In Lacs)			Total	Collaborating Responsible Body
		1st Year	2nd Year	3rd Year		
1	Providing fund for items like Hand Washing Station at Sherpur Village (1st year), Gajipur Village (2nd year) and Majukhetra Village (3rd Year) under Bhandargachha Gram Panchayat	2.0	2.0	2.0	6.0	Panchayat Pradhan, Bhandargachha Gram Panchayat

2	Provision for sufficient service water supply and treatment of drinking water at Sherpur Village (1st year), Gajipur Village (2nd year) and Majukhetra Village (3rd Year) under Bhandargachha Gram Panchayat	1.5	1.5	1.5	4.5	Panchayat Pradhan, Bhandargachha Gram Panchayat
3	Donation to nearby Schools for construction & maintenance of toilets with running water, infrastructural support and training on environmental awareness including MSW segregation at Badogram Prathamik Vidyalaya (1st Year), Bhandargachha Balika Vidyalaya (2nd year) and Sashikant High School (3rd Year)	2.0	2.0	2.0	6.0	Head Master / Mistress / School authority of respective school
4	Providing fund for Sanitary napkin vending machine & incinerator for used napkins for nearby girls' schools like Aadarsh High School (1st Year), Bhandargachha Balika Vidyalaya (2nd year) and Sashikant High School (3rd Year)	4.5	4.5	4.5	13.5	Head Master / Mistress / School authority of respective school
	Total	**10**	**10**	**10.5**	**30.0**	

2. Proposal No. :- **SIA/WB/MIS/75122/2022** File No- **EN/T-II-1/034/2022**
Proposed development of an industrial complex 'Hosiery Park' at Mouza Jagadishpur, J.L. No 2, Mouza – Baigachhi, P.S. – Liluah, Dist. – Howrah, West Bengal by **M/s. West Bengal Hosiery Park Infrastructure Ltd.** (VIOLATION CASE) | Type- **TOR**

INTRODUCTION

This has reference to your online application vide proposal no. **SIA/WB/MIS/75122/2022** dated **19 May 2022** along with the copies of EIA/EMP seeking Terms of reference (TOR) under the provisions of the EIA Notification, 2006 for the above mentioned proposed project. The proposed project activity is listed at S.No **8(a) Building and Construction projects** under Category **B** of EIA Notification, 2006 and the proposal is appraised at state level.

SEAC recommended the proposal for Terms of Reference under violation category.

PROJECT DETAILS

The project of M/s **WEST BENGAL HOSIERY PARK INFRASTRUCTURE LIMITED** located in as follows :

State of the project			
S. No.	**State**	**District**	**Tehsil**
(1.)	West Bengal	Howrah	Bally Jagachha

Town/Village : **Jagadishpur**

The salient features of the project submitted by the project proponent is available at Report under online proposal no. **SIA/WB/MIS/75122/2022**

DELIBERATION IN SEIAA

SEIAA considered the recommendation of SEAC and accepted the same.

RECOMMENDATIONS OF SEIAA

SEIAA approved the proposal for ToR under violation category.

Conclusion

Recommended

S.No	Conditions
(1)	SEIAA grants Terms of Reference (ToR) for undertaking Environment Impact Assessment (EIA) and preparation of Environment Management Plan (EMP) and specific ToR for the assessment of ecological damage, remediation plan and natural and community resource augmentation plan as enumerated in **Annexure-2** along with the following additional ToR for proposed industrial complex project 'Hosiery Park' having G + 3 Storied buildings at Mouza Jagadishpur, J.L. No 2, Mouza – Baigachhi, P.S. – Liluah, Dist. – Howrah, West Bengal with the following conditions:- 1) The unit should abide by The West Bengal Trees (Protection and Conservation in Non-Forest Areas) Act, 2006 and subsequent rules. The proponent should undertake plantation of trees over at least 20% of the total area. DFO approved plantation plan should be submitted. 2) The project proponent should submit a compliance report of the Notifications issued by SEIAA, WB vide No. 3435/EN/T-II-1/011/2018 dated 30.10.2018 and No. 2495/EN/T-II-1/011/2018 dated 17.12.2019. 3) Notary Affidavit as per the enclosed format given in **Annexure – 3**. 4) Related documents mentioned in **Annexure – 4**. 5) Comparative statement of the salient features of the project **Annexure – 5**. 6) Sanction plans and other documents as mentioned in Notification issued by SEIAA vide No. 2495/EN/T-II-1/011/2018 dated 17.12.2019. 7) Damage assessment plan. 8) Remediation Plan. 9) Community Augmentation Plan. 10) Present status of construction of the project along with a few recent photographs. 11) Developers Agreement and Power of Attorney in the name of the project proponent. 12) Authenticated documents for the total project cost compared to the cost incurred till the date of submission of the EC application along with EIA/EMP. 13) Gross turn-over till the date of submission of EC application to be certified by Chartered Accountant. 14) Complete land documents along with mutation and conversion in the name of project proponent. Summary of the land schedule to be submitted. 15) Permission from the competent authority regarding water supply for the entire water requirement. 16) Concurrence for waste water discharge, storm water discharge, solid waste etc. from the competent authority. 17) EMP as per Office Memorandum of MoEF & CC vide F. No. 22-65/2017.IA.III dated 30.09.2020 needs to be submitted. Items like hand washing station, toilet facility with running

water, school infrastructure including incinerator for used sanitary napkins in case of girls' schools, provision for sufficient service water supply and treatment of drinking water, training on environmental awareness including MSW segregation etc. in nearby schools may be considered. Computer literacy training for the local youth may also be considered. Evidence of collecting data on the need of the locality should be submitted.

18) Onsite sanitation and safe drinking water facility during construction phase.
19) DFO approved tree plantation plan in 1:100 scale mentioning spacing of the trees and their names and numbers.
20) Details of STP along with scaled up drawings and flow diagrams. Report on influent analysis at the inlet to equalisation tank and effluent analyses from each individual process / unit operations to be submitted. Complete water balance in this regard should also be provided.
21) Drainage network at the site. Permission of discharge water with quantity specified.
22) While preparing the land use plan for the project area, the details (exact width and other dimensions) of the underground service lines including fire, electricity, sewerage and drainage may be depicted using different colours; it must be ensured that the area earmarked for exclusive tree plantation does not overlap with these underground service lines. The plan so prepared, may be certified by the project architect.
23) Mouza map showing all the dag nos.
24) All mandatory documents i.e. all sanction plans, Building Permits, NOC from WBF&ES, AAI Clearance etc. to be uploaded in the PARIVESH portal.
25) The provision of water meter with totaliser at freshwater inlets, ETP discharge and recycling lines.
26) Number of rainwater recharge wells should be as per standard guidelines. The wells should be only under the green area – no chemicals should be used in the green area so that the recharge water is not contaminated.
27) Plan for installation of digital display board for showing environmental parameters and EMP data.
28) Subsurface hydro-geological study of the area.
29) Arsenic monitoring in wells at different depths.
30) Detailed plan of solar power plant including PV array should be submitted. Area of rooftop to be provided.
31) Fuel requirement for DG sets.
32) Power requirement and connected load (process and non-process).
33) Car parking and truck parking area in the land use diagram.
34) Distance between the borewell and pumping schedule of the wells.
35) Accreditation of the consultant along with names of functional area expert and EIA coordinator should be uploaded in the PARIVESH portal.
36) Display board for environmental information during operation stage shall be installed. The following information shall be provided: -

    a. Daily consumption and quality of drinking water.
    b. Quality & quantity of inlet & outlet effluent from STP.
    c. Data from ambient air quality monitoring station.
    d. Data from ambient noise monitoring station.

All the data and information uploaded should conform to the provisions of the NBC, 2016.

The above-mentioned documents should be uploaded in the PARIVESH portal during application of EC.

The ToRs are valid for a period of one year, which can be extended for a maximum period of three years provided an application in this regard is submitted by the project proponent, well before expiry of the

validity period. EIA/EMP to be submitted before the expiry of the ToR for consideration of EC application or otherwise.

Annexure – 2

Terms of Reference for EIA and preparation of Environment Management Plan (EMP)

- Project description, its importance and the benefits.
- Project site details (location on toposheet of the study area of 10m, coordinates. google Map, layout map land use geological features and geo-hydrological status of the study area, drainage),
- Land use as per the approved Master Plan of the area. Permission/approvals required from the land owning agencies. Development Authorities, Local Body, Water Supply & Sewerage Board. Etc.,
- Land acquisition status and R&R details.
- Forest and Wildlife and eco-sensitive zones. if any in the study area of 10 km - Clearances require under the Forest (Conservation) Act. 1980, the Wildlife (Protection) Act, 1972 and/or the Environment (Protection) Act, 1986.
- Baseline environmental study for ambient air (PM10, PM2.5, S02, NOx CO), water (both surface and ground) noise and soil for one month (except monsoon period) as per MoEF&CC/CPCB guidelines at minimum 5 locations in the study area of 10 km.
- Details on flora and fauna and socio-economic aspects in the study area.
- Likely Impact of the project on the environmental parameters (ambient air, surface and ground water, land, flora and fauna and socio-economic etc).
- Source of water for different identified purposes with the permissions required from the concerned authorities, both for surface water and the ground water (by CGWA) as the case may be. Rain water harvesting, etc.
- Waste water management (treatment, reuse and disposal) for the project and also the study area.
- Management of solid waste and the construction & demolition wasta for the project vis-à-vis the Solid Waste Management Rules, 2016 and the Construction Demolition Rules, 2016.
- Energy efficient measures (LED lights, solar power, etc.) during construction as well as during operational phase of the project.
- Assessment of ecological damage with respect to air, water, land and other environmental attributes. The collection and analysis of data shall be done by an environmental laboratory duly notified under the Environment (Protection) Act 1986. or an environmental laboratory accredited by NABL. or a laboratory of a Council of Scientific and Industrial Research (CSIR) institution working in the field of environment.
- Preparation of EMP comprising remediation plan and natural and community resource augmentation plan corresponding to the ecological damage assessed and economic benefits derived due to Violation.
- The remediation plan and the natural and community resource augmentation plan to be prepared as an independent chapter in the EIA report by the accredited consultants.

Annexure – 3

UNDERTAKING for Building projects
(To be done on Non-Judicial Stamp Paper of valuation Rs.10/- and duly notarized)

I, son of _____(Father's Name)_____, resident _____(Address)_____ presently working ____(Designation)_____ of M/s. _____(Organization Name)_____ am authorized person of the above named organization, do hereby solemnly declare and state as follows :

1) THAT M/s._____ are the project proponent in respect of the _____(Prc

Name)_____.

2. THAT M/s._____ has constructed _____ sq.mt. built-up area at prem No._____.

3. THAT in terms of EIA Notification 2006 and amendments thereof, our project falls within the purv of environment clearance.

4. THAT M/s._____ has failed to get prior environmental clearance as per statu provisions of EIA Notification due to the reasons mentioned below: (please mentioned the reasons) –

i.
ii.
iii.
iv.

5. THAT M/s._____ has submitted the application form for obtaining necessary Te of Reference / Environmental Clearance as per EIA Notification, 2006 and its amendments issued by the Mini of Environment, Forest & Climate Change & Standard Operating Procedure (SoP) issued by MoEF&CC vid OM dated 07.07.2021 which was upheld by hon'ble Supreme Court vide its order dated 09.12.2021 (MoEF& O.M. No.22-21/2020-IA.III[E 138949] dated 28.01.2022).

6. Now I, on behalf of the Project Proponent undertake the followings :-

a) To comply with all statutory requirements/norms, for obtaining Environmental Clearance;
b) To take all necessary permissions/licences/clearances from the concerned Government Departments an submit compliance before the State Level Appraisal Committee, West Bengal;
c) To take all measures for the protection of the environment as may be prescribed by the Central Governn or the State Government from time to time at the expenses of the project proponent.

7. THAT the project proponent also undertakes not to repeat such violation in future, in case of violat the ToR/EC shall be liable to be terminated.

The above-mentioned statements are true to the best of my knowledge and belief.

DEPONENT

Annexure – 4

1. Compliance report of the Notification issued by SEIAA, WB vide No. 3435/EN/T-II-1/011/2018 dated 30.10.2018.
2. NABET Accredited Certificate
3. Project Cost (detailed breakup including present value of land cost to be submitted)
4. Details of Court Cases, if any
5. Land Documents
   - Porcha
   - Local body mutation
   - Land Conversion
6. Sanctioned plan
7. Building Configuration
   - As per Stipulation
   - As per Sanctioned Plan
   - Present Status and Configuration

8. Land use distribution plan showing % of land use as per sanctioned plan.
9. Services (STP, Rainwater Harvesting, Composter, Solar Power etc.) layout plan and its status of configuration.
10. Whether the services are adequate enough with respect to the status of occupancy.
11. All statutory clearance from competent authority as applicable.
    - Sources of water supply and its permission
    - Tree felling permission
    - Relocation of water body
    - PCCF clearance
    - Clearance from WBF&ES
    - Airport Authority clearance
    - DFO certified plantation plan.
12. Concurrence from competent authority regarding water supply, disposal of solid waste and liquid waste.
13. Drainage Pattern (both inside and outside)
14. Final place of discharge for the treated waste water and recipient water body.

Annexure – 5

Land Area	
Block details	
Nos. of flats	
Expected Population (as per NBC, 2016)	
Total Water requirement (as per NBC, 2016)	
Fresh Water requirement	
Wastewater generated	
Wastewater recycled	
Wastewater discharged	
Solid waste generation & disposal (as per NBC, 2016)	
Total Built-up Area	
Complete Area Statement along with percentage of the total land area adding upto 100%	
1. Ground Coverage with percentage of the total land area	
2. Service Area with percentage of the total land area	
3. Waterbody Area (if any), with percentage of the total land area	
4. Exclusive Tree Plantation Area with percentage of the total land area	
5. Other Green Area with percentage of the total land area	
6. Total Paved Area with percentage of the total land area	
7. Area for services	
8. Other area, if any.	
Peak power demand load for the project	
Solar power plant generation in KW & % of the connected load	
No. of Parking spaces proposed	
No. of Trees proposed	

Backup Power	
Project Cost (Rs.)	

MISCELLANEOUS

(1) Reasoned order in compliance with the directives of Hon'ble Calcutta High Court in W.P.A. 11523 of 2022 dated 30.06.2022.

In view of the decisions taken by the Dept. of Environment against filing of the appeal, the directives issued by the Hon'ble Calcutta High Court in W.P.A. 11523 of 2022 dated 30.06.2022 is duly noted.

(2) Acceptance of project proposals from the project proponents engaging the Environmental Consultant Organizations which are listed as 'ACOs' cases sub judice NABET accreditation.

As per the letter vide No. QCI/NABET/ENV/SEIAA/22/2416 dated 07.07.2022 from National Accreditation Board for Education and Training (NABET), it is found that some of the Environmental Consultant Organizations either do not have NABET Accreditation or their cases for accreditation are sub-judice in different courts of law. However, they have been allowed to act as consultants in view of stay orders given by the Hon'ble Calcutta High Court in the past. Recently the Hon'ble Supreme Court of India has ruled that a stay granted by any court in the country automatically expires in six months unless extended.

Accordingly, an opinion from the Law Cell of the Env. Dept. was obtained. It was opined that '*Hon'ble High Court at Calcutta vide its order dated 14.05.2015 disposed of the case stating in an identical case Gujarat High Court vide its order dated 24.01.2013 imposed a stay on the operation of the impugned. As per status shown in the Gujarat High Court website, it is still pending. Meanwhile, Hon'ble Supreme Court in its order dated 15.10.2020 passed in connection with criminal appeal no. 1375 of 2013 ordered "whatever stay has been granted by any court including the High Court automatically expires within a period of six months and unless exemption is granted for good reason". Under such circumstances, in light of direction of Hon'ble Supreme Court, the stay granted by Gujarat High Court should expire long ago*'. Accordingly, based on the legal opinion obtained from the Env. Dept., SEIAA in its 15th meeting held on 29.01.2021 decided that henceforth environmental consultant without NABET accreditation shall not be allowed to act as consultant for any project being submitted for EC.

It is also observed that in the portal of NABET vide http://eia.nabet.qci.org.in/ACOs_Case_Sub_Judice.aspx as accessed on 10.08.2022, a list of Environmental Consultant Organizations (ECO) is mentioned as 'ACOs cases sub-judice'. As per EIA Notification, 2006 as amended from time to time, only NABET accredited ACOs are eligible to prepare / submit EIA – EMP reports. However, there are some applications where the ACOs names are not found in the NABET portal as accredited consultants. These consultants make an appeal to SEIAA to consider their cases which are listed as 'ACOs cases sub-judice'. Though a decision was taken on 29.01.2021, similar cases are still being received by SEIAA. SEIAA needs clarification from MoEF&CC and NABET regarding dealing with such ACOs which are shown sub-judice in the NABET website.

MS, SEIAA vide his letter no. 1206/EN/T-II-1/077/2012(Part-I) dated 27.06.2022 (copy enclosed) had requested the MoEF&CC for a clarification in the matter regarding acceptability of ACOs which are shown as sub-judice in the NABET website. Further to this MS, SEIAA vide his letter no. 1316/EN/T-II-1/077/2012(Part-I) dated 11.07.2022 had requested the directives from MoEF&CC on this subject in view of the order of Hon'ble Calcutta High Court dated 30.06.2022 in W.P.A. No. 11523 of 2022 wherein the decision taken by SEIAA, WB regarding non-acceptance of the environmental consultant organizations without having NABET accreditation was quashed.

MS, SEIAA is once again requested to obtain clarification from MoEF&CC in the matter <u>urgently</u> in order to avoid further legal complications.

(3) Discussion on draft DSRs of Dakshin Dinajpur and Alipurduar.

The DSRs of Dakshin Dinajpur and Alipurduar are approved.

(4) ToR application for the proposed Modification of "Aerotropolis Township" at Andal, Vill. – Tamla, Dhokinkhanda, Mahira, Khandra, Amloka, Banguli, Durgapur Taluk, District: Paschim Bardhhaman, West Bengal by **M/s. Bengal Aerotroplis project Limited. Proposal No. SIA/WB/MIS/80933/2022.**

Background
Earlier M/s. Bengal Aerotroplis project Limited had obtained EC from SEIAA, WB vide No. EN/2041/T-II-1/025/2009 dated 11.08.2011 for Greenfield Aerotropolis Township (Phase I) at Andal, Vill. – Tamla, Dhokinkhanda, Mahira, Khandra, Amloka, Banguli, Durgapur Taluk, District: Burdwan, West Bengal.

Now the PP has applied for modification of "Aerotropolis Township" at Andal, Vill. – Tamla, Dhokinkhanda, Mahira, Khandra, Amloka, Banguli, Durgapur Taluk, District: Paschim Bardhhaman, West Bengal.

Since the location of the proposed project area appears to be close to Durgapur Municipal Corporation area, which is declared as a 'Severely Polluted Area', the project proponent is requested to mention the exact distance of the project area from the municipal limits of Durgapur and also submit Google earth image showing the Lat-Long of the proposed project area along with the municipal limits of Durgapur.

(5) Order of Hon'ble NGT dated 22.07.2022 in O.A. No. 86/2022/EZ

DSRs of four districts (Murshidabad, Uttar Dinajpur, Dakshin Dinajpur and Alipurduar) have already been approved by SEIAA. Another five DSRs are in the final stages of approval.

In view of the directives issued by the Hon'ble NGT in O.A. referred above, MS, SEIAA may please inform the Dept. of Industry, Commerce & Enterprise, Mines Branch for compliance of the order.

In absence of approved DSRs, all application including this particular application for mining of minor minerals were delisted as per the directives of the MoEF&CC. This case falls in the district of Purba Bardhaman where the DSR is yet to be placed for approval. The project proponent is requested to relist his application in the PARIVESH portal once the DSR for the district is approved.

(6) Order of Hon'ble NGT dated 22.07.2022 in O.A. No. 85/2022/EZ

DSRs of four districts (Murshidabad, Uttar Dinajpur, Dakshin Dinajpur and Alipurduar) have already been approved by SEIAA. Another five DSRs are in the final stages of approval.

In view of the directives issued by the Hon'ble NGT in O.A. referred above, MS, SEIAA may please inform the Dept. of Industry, Commerce & Enterprise, Mines Branch for compliance of the order.

In absence of approved DSRs, all application including this particular application for mining of minor minerals were delisted as per the directives of the MoEF&CC. This case falls in the district of Purba Bardhaman where the DSR is yet to be placed for approval. The project proponent is requested to relist his application in the PARIVESH portal once the DSR for the district is approved.

(7) Order of Hon'ble NGT dated 22.07.2022 in O.A. No. 87/2022/EZ

The order of Hon'ble NGT in the aforesaid case is noted.