DISTRICT SURVEY REPORT
OF
UTTAR DINAJPUR DISTRICT

(For mining of minor minerals)
As per Notification No.S.O.141 (E) New Delhi Dated 15th of January 2016, 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)

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Department of Industry, Commerce & Enterprises
Government of West Bengal

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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 Bengal 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 - Kilometer

LISS - Linear Imaging Self-Scanning Sensor

LOI - Letter of Intent

LULC - Land Use Land Cover

m2 - Square meter

MKF - Malda Kishanganj Fault

Mcum – Million Cubic Meters

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 Centre

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 3/4th 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: Quantum of sand deposited in a mined out void during monsoon period.

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

Uttar Dinajpur is located between 25°11' N to 26°49' N latitude and 87°49' N to 90°00' E longitude in the state of West Bengal. The district covers an area of 3,140 sq.km surrounded in the east by Bangladesh, on the west by Bihar, on the north by Darjeeling and Jalpaiguri and on the south by Malda district. The district is divided by two subdivisions: Raiganj and Islampur with Raiganj being the district Head Quarters. According to 2011 census, the district encompasses a geographical area of 3140 sq. km. and has a population of 30,07,134 (persons) including 15,51,066 (males) and 14,56,068 (females). The district has a sex ratio of 93.9 females for every 100 males.

This district is representing almost a flat topography with gentle sloping towards south. The landscape of the district is more or less a plain area which is a fertile tract suitable for growing rice and jute. The average elevation is 15 m above mean sea level. The main river is Mahananda.

Drainage system of the district is mostly controlled by the topography. A large number of rivers are flowing over the district in southerly direction. The main rivers are Mahananda, Nagar, Sui, Gamari, Kulik, Chirramati and Tangon. The water level of the river generally rises during rainy season. Due to uneven distribution of rainfall over time and space, floods or flood like situation cannot be ruled out. The area is an undulating plain intersecting with ravines. They are locally called Kharis.

In the vast quaternary plains of Malda, South Dinajpur and Uttar Dinajpur districts, neotectonics activities are common and may be attributed to the presence of causative fault zones. Number of sub-surface faults like Ganges Bengal Fault (GBF), Malda Kishanganj Fault (MKF), Jangipur-Gaibanda Fault, Tista fault etc. has been delineated through geophysical study in North Bengal plain. The micro earthquake studies followed by geodatic survey over North Bengal plain reveals that the area is located in the buffer zone of causative earthquake sources and are seismo-tectonically vulnerable. This warrants proper planning and policy implementation to ensure seismic proof design of civil constructions to minimize damage and destruction in case of an impending earthquake.

Geologically Uttar Dinajpur is rather a featureless plain comprising entirely of alluvium. The area forms part of great Barind of Pleistocene (older/alluvium), which is the largest of the alluvial unit of Bengal Basin. At the surface this unit is covered by flood plains of various rivers flowing south. Some of the rivers have deposited a broad piedmont alluvial plain, which overlap barind in north. The older alluvial group consists of Barind formation of Early Holocene to Late Pleistocene age. Baikunthapur Formation of Late–Middle Holocene age overlies the Barind Formation. The newer alluvium, Shaogaon Formation, present day to Late Holocene age overlies Baikunthapur Formation.

Uttar Dinajpur district is drained by Mahananda, Tangon, Dahuk, Bairang, and Nagri etc rivers. It has been noticed that different geomorphic features like Alluvium Plain, Alluvial Fan etc. which are deposited by the active rivers. So, in this region there is huge deposition of sand,

clay and gravel occurred. So, the sand mining and sand industry should be the very useful for this district.

As per the data received from Department of Mines and Minerals, Siliguri, total 16 blocks have been allotted for mining of river sand in the district. Total allotted river-bed block area for 16 blocks is 52.88 Ha and estimated reserve is around 3908204.95 Cu.M area allotted and for sand & stone area allotted is 4.55 Ha and estimated reserve is 306600 Cu.M. Revenue generated in the district of Uttar Dinajpur from Minor minerals during the period of April 2017 to Sept 2021 is Rs. 12.92 Crores.

The occurrence of riverbed sand in the district has been established 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 of riverbed are mostly observed in the river Mahananda, Tangon, Dahuk, Bairang, and Nagri. This report also recommends to undertake 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.

1 Preface

The need for District Survey Report (DSR) have been necessitated by Ministry of Environment, Forest and Climate Change (MoEF& CC) vide 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 have been 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 District Survey Report (DSR) has been specified. Enforcement &Monitoring Guidelines for Sand Mining (EMGSM) January 2020, Issued by Ministry of Environment, Forest and Climate Change is prepared in consideration of various orders/directions issued by Hon'ble NGT in matters pertaining to illegal sand mining and 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, 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 Uttar 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 Uttar Dinajpur district has been prepared as per the guide line of Ministry of Environment, Forests & Climate Change (MoEF& CC), Government of India vide Notification S.O.-1533(E) dated 14th Sept, 2006 and subsequent MoEF& CC Notification S.O. 141(E) dated 15th Jan, 2016. This report shall guide systematic and scientific utilization of natural resources, so that present and future generation may be benefitted at large. Further, MoEF& CC published a notification S.O. 3611(E) Dated 25th July, 2018 and recommended the format for District Survey Report.

The main objective of DSR is Identification of areas of aggradations or deposition where mining can be allowed; and identification of areas of erosion and proximity to infrastructural structures and installations where mining should be prohibited and calculation of annual rate of replenishment and allowing time for replenishment after mining in that area. The DSR would also help to calculate the annual rate of replenishment wherever applicable and allow time for replenishment.

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.

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 (Development and 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 DSR i.e. "Identification of areas of aggradations or deposition where mining can be allowed; and identification of areas of erosion and proximity to infrastructural structures and installations where mining should be prohibited and calculation of annual rate of replenishment and allowing time for replenishment after mining in that area".
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.The EMGSM 2020 directed the states to carry out river audits, put detailed survey reports of all mining areas online and in the public domain, conduct replenishment studies of river beds, constantly monitor mining with drones, aerial surveys, ground surveys and set up dedicated task forces at district levels.The guidelines also push for online sales and purchase of sand and other riverbed materials to make the process transparent. They propose night surveillance of mining activity through night-vision drones.

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* or the 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 centre line of 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 level, whichever is less.

(5) 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) meters from any 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 application for a mining lease has been made in accordance with such parameters as may be prescribed by the Government from time 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 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.
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 riverbed area is calculated on the basis of maximum depth of 3 meters and margins, width and other dimensions as mentioned in para (s) above. The area multiplied by depth gives the volume and volume multiplied with bulk density gives the quantity in Metric Ton. In case of riverbed, mineable material per hectare area available for actual mining shall not exceed the maximum quantity of 60,000 MT per annum.

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.

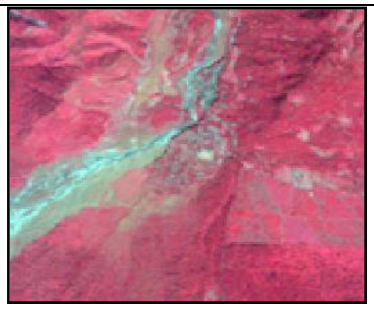
	
Agricultural Land - Based on their Geometrical shape, Red and Pink colour tone, Agricultural Land has been identified.	**Vegetation Covered Area** - Based on their continuous Red colour tone, Vegetation Covered Area has been identified.
	
Agricultural Fallow Land - Based on their Geometrical shape, Light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

Figure 2.2: Pictorial description of Land Use Classification methods

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 Interpretation and then digitization 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.

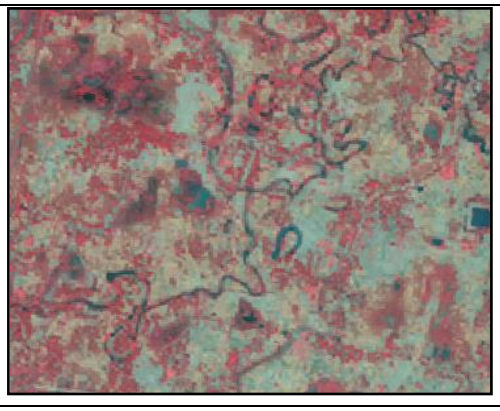
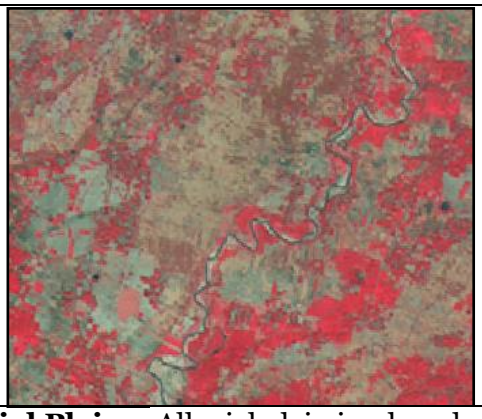
	
OX-BOW LAKE& MARSHY LAND -An ox-bow lake starts out as a curve, or meander, in a river. This "U" shaped body of water identified as Ow-Box Lake from Satellite Imagery. Marshes can often be found at the edges of lakes and streams, where they form a transition between the aquatic and terrestrial ecosystem. Area with blue with mixed cyan has been classified as Marshy Land.	**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 land has been identified as Alluvial Plain.

Figure 2.3: Pictorial description of Geomorphological Units Classification methods

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

Block Map:

- 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.

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 and National Park and superimposed it over Block Boundary.
- Wildlife Sanctuary & National Park name has been filled in attribute table of the Layers Final layout has been prepared by giving scale, legend, north arrow, etc.

Primary Data Collection: To prepare DSR, 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. Therefore, there is a 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.

Four times 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: District Survey Report has been prepared to fulfill the purpose of identification of mining area both major and minor mineral and their impact on environment. Report provides details of the major and mineral potential zones. Assessing mining prospect with respect to minor minerals has covered. Replenishment study details includes in the report. Report also provides the socio environmental study for establishing minor minerals in the district.

Demand and Utilisation of Sand

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

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

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

River sand mining is a common practice as habitation concentrates along the rivers and the mining locations are preferred near the markets or along the transportation route, for reducing the transportation cost.In the real world, there are a lot of situations where we can find uses of sand. Followings are the common sand uses.

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.

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.

3 General Profile of the district

3.1 General Information

Uttar Dinajpur is one of the twenty-three districts of West Bengal and somewhat arc in shape. The district located between 25°11' North latitude to 26°49' North latitude and 87°49' East longitude to 90°00' East longitude. This district covers an area of 3,140 Sq. Km, surrounded on the east by Bangladesh, on the west by Bihar, on the North by Darjeeling &Jalpaiguri and on the south by Malda District. (Source: http://uttardinajpur.nic.in/)

The location Map of this district has mentioned below figure 3-1;

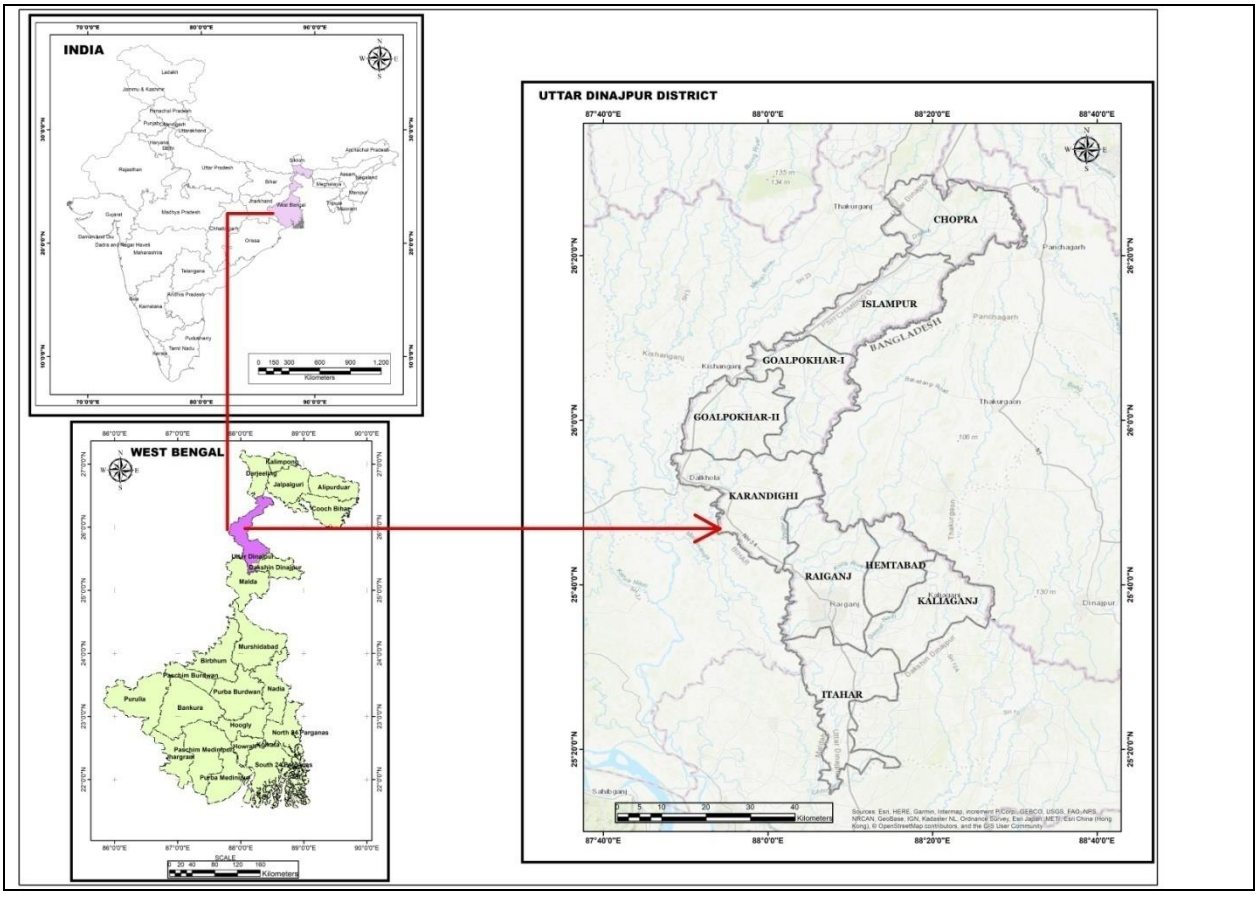


Figure 3.1: Location Map of Uttar Dinajpur

(Source: National Informatics Centre and ESRI Base Map)

This district divided by two subdivisions: Raiganj and Islampur with Raiganj being the District Head Quarters. 9 police station are coming under these two sub-divisions. (1) Chopra, 2) Islampur, 3) Goalpokhar-I,4) Goalpokhar-II, 5) Karandighi, 6) Raiganj, 7) Hemtabad, 8) Kaliaganj, and 9) Itahar). (Source: https://en.wikipedia.org/wiki/Uttar_Dinajpur_district)

The below mentioned table has illustrate the area of the district in block wise;

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

Sub-Division	Headquarter	Police Station	CD Block	Block HQ	Distance from Main HQ (km)	No. of Gram Panchyat	Area (Sq. Km.)-2001
Islampur Sub-Div.	**Islampur**	Chopra	Chopra	Chopra	18.9	8	380.82
		Islampur	Islampur(M)	Islampur	1	-	329.44
			Islampur			13	13.99
		Goalpokhar	Goalpokhar-I	Goalpokhar	24.1	14	355.11
		Chakulia	Goalpokhar-II	Chakulia	41.9	11	298.69
		Karandighi	Dalkhola(M)	Karandighi	73.4	-	390.52
			Karandighi			13	
Raiganj Sub-Div.	**Raiganj**	Raiganj	Raiganj(M)	Raiganj	6.8	-	472.13
			Raiganj			14	10.64
		Hemtabad	Hemtabad	Hemtabad	7.8	5	191.82
		Kaliaganj	Kaliaganj(M)	Kaliaganj	20.8	-	301.90
			Kaliaganj			8	11.67
		Itahar	Itahar	Itahar	25.9	12	362.40
District Total 2011		**9**	**13**	**9**		**98**	**3140**

Source: Census, 2001 & 2011

Uttar Dinajpur spreads across 3149 Sq. Km of land, enclosed by Bangladesh on the East, Bihar on theWest, Darjeeling & Jalpaiguri District on the North and Malda District on the South. The block map has mentioned below in figure3.2;

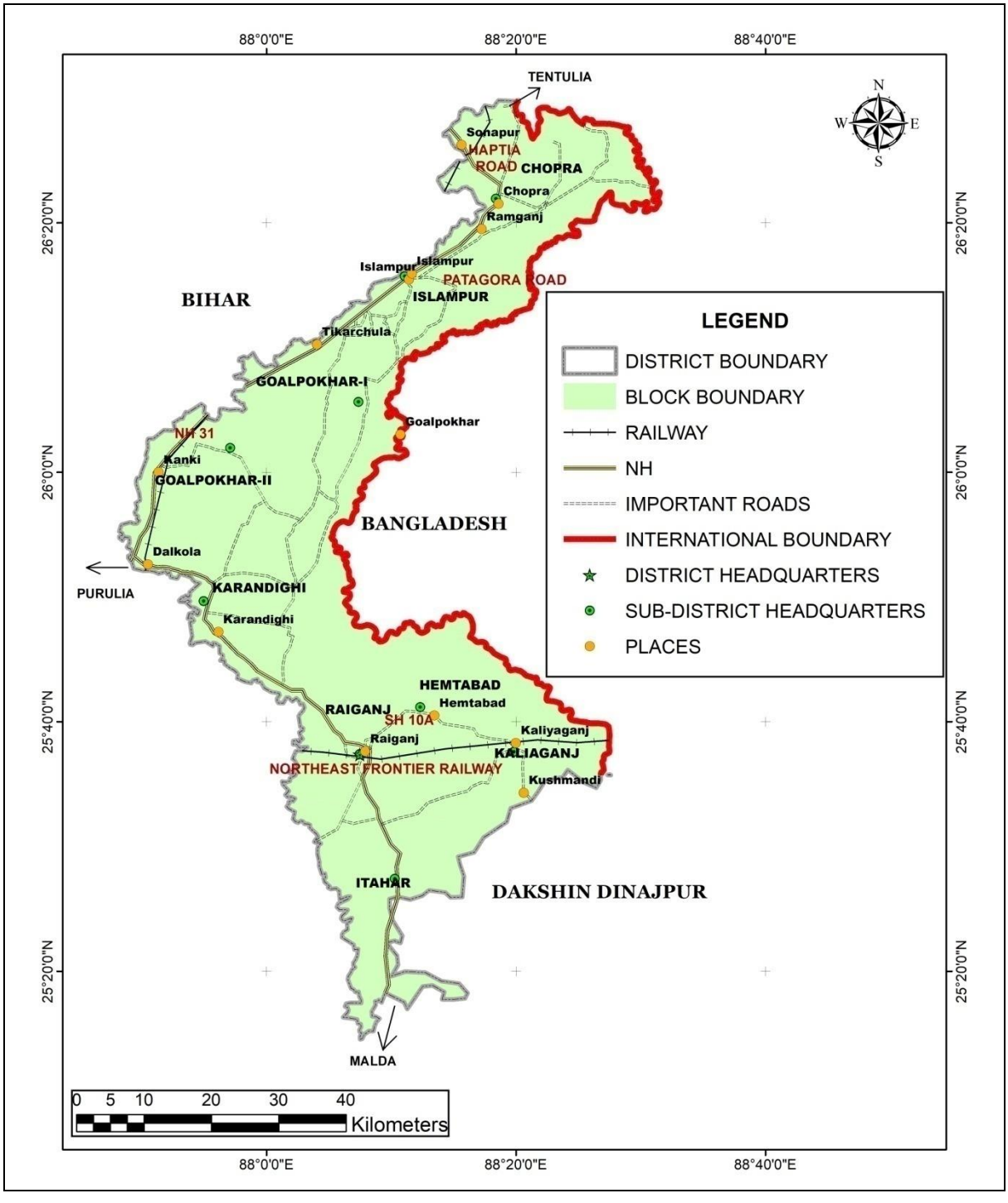


Figure 3.2: Block Map of Uttar Dinajpur

(Source: National Informatics Centre)

3.2 Climate Condition

Of all the physical factors, Climate is quite significant that determines the land use and agricultural patterns of a region. The climate of West Bengal is generally tropical, hot and humid, Monsoon type, except in the northern mountains where the altitude becomes the controlling factor. The physiographic and climatic variations in the state are closely associated with each other and consequently the boundaries of the sub-regions (mentioned under physiographic divisions) broadly coincide with each other.

The Uttar Dinajpur falls under the group of North Bengal Plain region. Climatically it may be called as Tropical per Humid Zone. The climate of the area is tropical per humid with mean annual temperature of 24.4° C and mean annual rainfall of 851mm. The most important characteristic is that the annual rainfall amount decreases from north to south in the subdivision. Hot summer, profuse rains and humid atmosphere all through the year characterize the climate. The hot weather begins with strong westerly winds. Practically from March and continues till the middle of June. May is the hottest month of the year and is the harvesting season for most of the fruits locally produced. This is also the time when the area experiences scarcity of moisture and farmers are forced to irrigate their crops. The humidity is higher in the northern part than the southern part. The hot summer ends when there are occasional thundershowers accompanied by high-speed wind coming from west, hot and interrupted by squalls. Rains and often by hails of great magnitude, which are known as Kalbaisakhi's. The rainy season generally sets in by the middle of June when the monsoon commences. The heaviest rain usually falls in July and August, sometimes even as early as the middle of June. This season may be called as productive season as far as agricultural is concerned: otherwise, the weather becomes damp and unhealthy in this season. The heat is tempered by easterly winds, which spring up towards sunset and lower the temperature during the night. This is also the most productive season for the tea cultivation.

As the monsoon withdraws in October, day and night temperatures decrease steadily. From the middle of October, the nights become appreciably cooler though the days remain hot. The cold weather may be said to be actually setting in early in November and continues up to the end of February. January is the coldest month in the region. In general, the cold weather of winter months is the most comfortable period in the area but less productive as far as tea plantation is concerned. This is designated as the pruning months in the tea plantation. Days are bright and sunny and the sky remains crisp and clear. During the cold season the subdivision experiences a very little rainfall with the exception of light showers towards the end of December and a thundershower or two in February. Occasional appearance of fog is also experienced in winter.

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 1st week of October. Annual average day-night temperature varies from 8.5° Celsius to 35.5° Celsius. During the hot summer months, maximum temperature rises up to 41.5° Celsius and during the peak winter

season, minimum temperature falls to as low as 4° Celsius. (Source: https://www.imdpune.gov.in/library/public/Climate%20of%20WestBengal.pdf)

3.2.1 Temperature

This district lies in near Himalayan foothills. So the climate is not too much hot. The minimum temperature of the district lies within the range of 12° and 29° Celsius in the month of January and August respectively and maximum temperature lies within 23° and 37° in the month of January and June respectively. Below table mentioned the temperature variation throughout the year;

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

Months	Jan	Feb	March	April	May	June	July	Aug	Sept	Oct	Nov	Dec
Avg. Temperature (°c)	17.1° C	23.0° C	28.6°C	29.3° C	30.7° C	32.1° C	31.4 °C	30.1° C	30.1° C	29.0° C	27.3° C	23.0° C
Max. Temperature (°c)	23.1° C	29.9° C	35.3°C	36.4° C	34.5° C	36.5° C	34.7 °C	34.5 °C	34.9° C	32.0° C	31.3° C	27.0° C
Min. Temperature (°c)	12.1° C	17.6° C	22.1°C	24.2° C	25.3° C	29.7° C	28.1 °C	29.7 °C	27.2° C	23.0° C	21.0° C	18.1° C

(Source: World Weather Online)

3.3 Rainfall and Humidity

The average annual rainfall is 1592.32 mm from year 2016 – 2020. The maximum rainfall in the area as per IMD data was recorded in the month of June and July followed by August (Refer table no. 3-2 and Figure 3-3).

Table 3.3: Rainfall Data of Uttar Dinajpur from 2016-20

YEAR	Unit	2016	2017	2018	2019	2020	Avg. Rainfall
JAN	mm	0	3.4	0	0	3.1	1.63
FEB	mm	0	0	0	24.2	24.4	12.15
MAR	mm	0	35.5	13.5	2.8	26.7	19.63
APR	mm	0	143.5	71.2	78.5	129.9	105.78
MAY	mm	0	121.4	180.5	85.6	171	139.63
JUN	mm	266.6	169.1	145.3	215.3	350.2	229.30
JUL	mm	433	395.8	277.5	362.5	503	394.36
AUG	mm	124.8	605.3	293.9	159.5	219.1	280.52
SEPT	mm	364.6	128.3	184.3	373	509.5	311.94
OCT	mm	90.9	257.2	16.3	66.4	50	96.16
NOV	mm	0	0	0	0	0	0.00
DEC	mm	0	0	6.1	0	0	1.22

Source: India Meteorological Department, Ministry of Earth Sciences

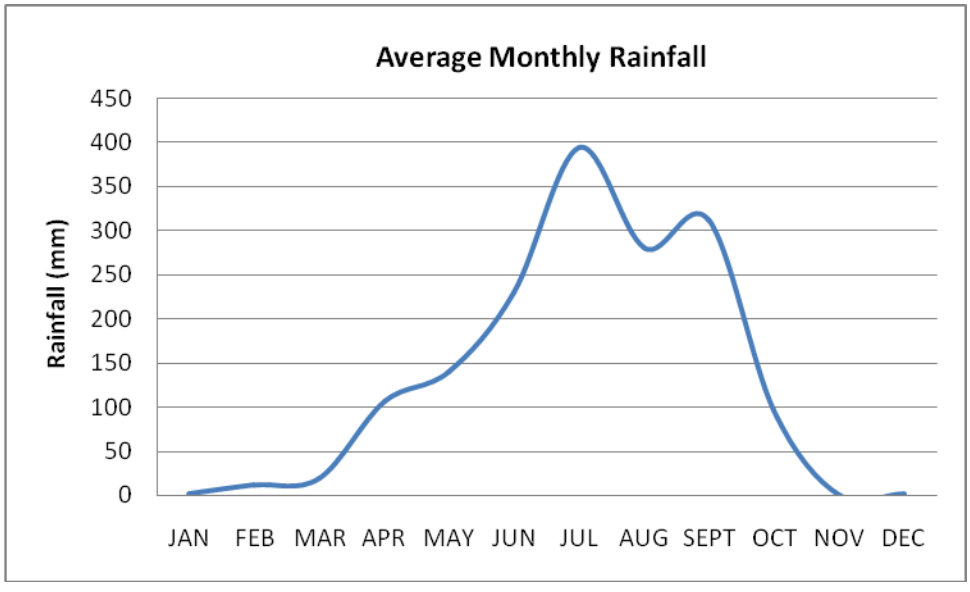


Figure 3.3: Graphical Representation of Rainfall data of year 2016-20

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 69 - 75% 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 31% - 55%. (Source: https://en.climate-data.org/)

The winds over the district are high during Monsoon, the average wind speed in monsoon seasons varies from 13.1 mph to 14.5 mph, and occasionally this wind speed goes over the 18 mph due to depression and local storm. The wind direction in the monsoon season is South- West wind.

3.4 Topography & Terrain

This district is representing almost flat topography with gentle sloping towards south. The district divided into 2 sub-micro-regions i.e. (a) Islampur-Goalpokhar Plain (b) Sudhani-Mahananda-Gamari Plain. There is no hill in the district and the highest elevation doesn't exceed 30 meters. The landscape of the district is more or less a plain area which is a fertile tract suitable for growing rice and jute. The average elevation is 15 meters above mean sea level. The slope of the land is from north to south by less than 10 meters per square kilometers, shown by the trend of the river. It is a flat alluvial plain of the Gangetic delta. The deeper depressions bear a resemblance to old river beds sometimes containing water. In the north western side of the region there are small hillocks. The southern portion of the land resemblances the characteristics of Barind land geologically classed as old alluvium. The average elevation of southern portion is lesser than the northern part. The average elevation of southern portion is

10 to 15 meters, where lowest elevation has marked near Raiganj is 9 meters. The elevation of the land is highest (80-108 meters) in the northern part of the district. The land gradually slopes downward and in the southern portion, a large part of the land has an elevation of 30-40 meters. The northern portion is termed as Mahananda plain. It slopes from north to south. The main river is Mahananda. The district is characterized by an undulating topography intersected with ravines. The ridges are commonly covered with scrub jungle.

The Physiographic Map has mentioned below in figure 3-4;

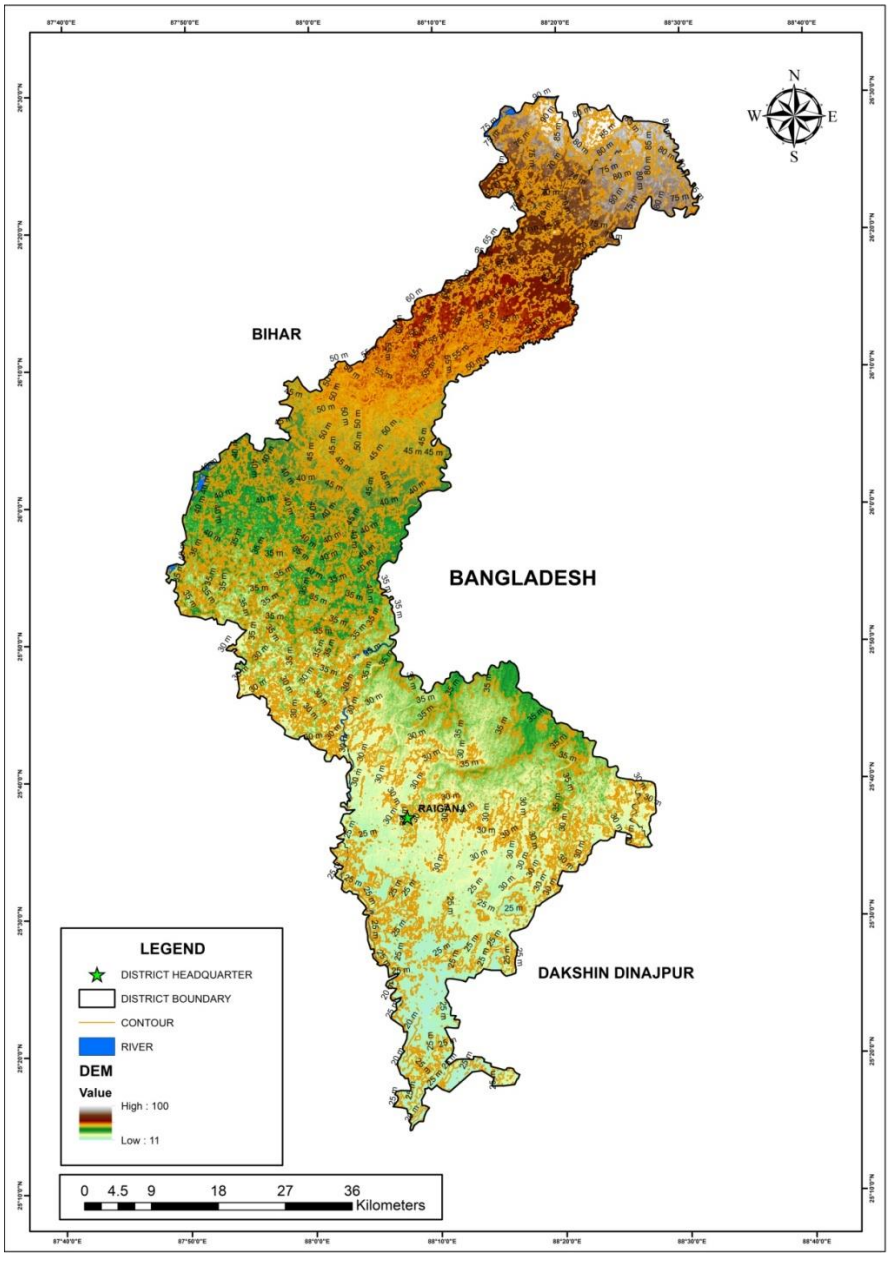


Figure 3.4: Physiography Map of Uttar Dinajpur
Source: Cartosat-1, Bhuvan India)

3.5 Water courses and Hydrology

Hydrological units are basically the landform units of ground water potentials in different hydrological input/output zones. Understanding of landforms, morpho facies, surficial lithology, topography, etc, help facilitate recognition of recharge/infiltration, surface run-off and accumulation/storage/discharge zones in proper and identification of landform units of ground water prospects in specific. Study of geological and Geomorphological maps prepared for the area together with field data on surficial lithology of Mahananda and Raiganj surfaces proved to be the potential zones for good to excellent ground water prospects within a depth of 50 ft even during summer period. Hydro-geomorphic units in Barind surface show moderate ground water prospects only beyond 70-ft depth. (Source: http://wbwridd.gov.in/swid/mapimages/UTTAR%20DINAJPORE.pdf)

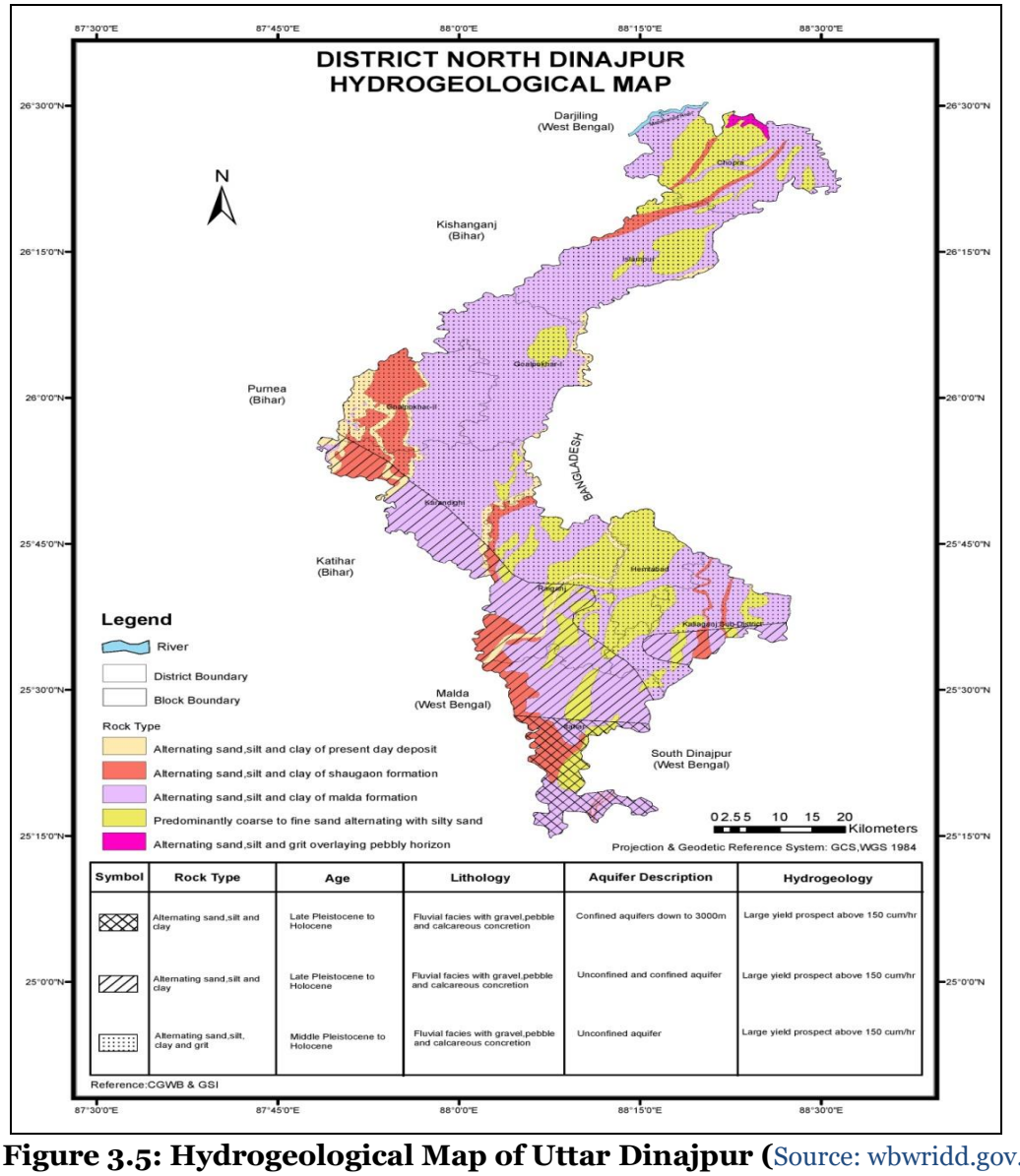


Figure 3.5: Hydrogeological Map of Uttar Dinajpur (Source: wbwridd.gov.in)

The litho units of Uttar Dinajpur has been deposited or formed during late Pleistocene to Holocene period. The lithology includes mostly gravel, pebble, and calcareous concretion. The southernmost part of the district, around Itahar, the confined aquifers are found at a depth of 3000mt having large yield prospect above 150 cum/hours. In the southwestern part of the district, around Raiganj and Karandighi area, unconfined and confined aquifers are found with yield of above 150 cum/hrs. The whole central and northern part of the district, around Hemtabad, Goalpokhar I & II, Islampur up to Chopra, alternate sand, soil, clay and grit constitute unconfined aquifer having large yield prospect above 150 cum/hrs.

3.6 Ground Water Development

Ground water occurs in the condition in the shallow aquifers and under unconfined to semi-confined condition in deeper aquifers, the latter being particularly common in Kaliaganj, Raiganj, and Hemtabad and Karandighi blocks. Dug wells, shallow tube wells and deep tube wells are the ground water structures in this district. Dug wells tapping the unconfined aquifer are mainly the depth range 5-10 mbgl. Deep tube wells tapping the unconfined to semi-confined aquifers are not plenty in this district and the depth range varies from 50-307 mbgl. Thin clay beds have separated the unconfined aquifer to semi confined aquifer.

In northern part of the district mainly Chopra, Islampur and Goalpokhar I &II blocks a single unconfined highly potential aquifers exists within 100 $m^{3/}$ or more under a thin soil cover. Shallow tube wells which were constructed within 50mbgl tapping unconfined aquifers. The depth of heavy-duty tube-wells yielding upto 200 m^3 /hr, are in the range of 50-100 mbgl. The specific capacity of the tube wells is maximum in Raiganj, Karandighi, Hemtabad and Goalpokhar I & II, which decreases towards north and south.

Generally, it is observed that depth to water level is within 2 – 5 mbgl in the entire district except in the southern part of the Itahar block, where depth to water level varies Between 5 – 10 mbgl. (Source: https://indiawris.gov.in/wris/#/groundWater%20(CGWB%20website%20for%20Ground%20water%20data)

In the Uttar Dinajpur district the thickness of alluvium increases gradually from south to north. The development of ground water may be done through different ground water abstraction structures considering the occurrence of the potential and potable ground water aquifers and stage of ground water development.

Maximum ground water exploration has been done through open wells and shallow tube-wells. The depth of the open wells varies from 4-10 mbgl, where as the shallow tube wells are generally constructed down to the depth of 40 mbgl. A few deep tube wells of depth ranges between 50-300 mbgl have been constructed for irrigation purpose. The depth of the tube wells may be restricted down to the depth of 150-200 mbgl tapping the aquifers. Deep tube wells are suitable for in the southern sector while shallow ground water structures including dug wells are particularly suitable for northern blocks for effective utilization of ground water for irrigation purpose.

The below mentioned table has illustrated the last 23 years Ground water level (1996-2018) of pre-monsoon and post-monsoon of this district;

Table 3.4: Comparison of Pre-Monsoon and Post Monsoon data from year 1996-2018

Year	Avg. Pre Monsoon	Avg. Post Monsoon
1996	4.98	4.02
1997	4.96	2.95
1998	4.17	2.22
1999	4.56	1.93
2000	3.54	2.50
2001	4.30	1.98
2002	3.94	1.97
2003	3.99	1.50
2004	4.29	2.03
2005	4.60	1.77
2006	4.07	2.67
2007	4.89	2.70
2008	4.20	2.29
2009	4.26	2.56
2010	3.99	2.34
2011	3.88	2.61
2012	4.44	2.98
2013	5.02	2.30
2014	5.30	2.69
2015	4.54	3.22
2016	5.61	3.22
2017	3.83	3.03
2018	4.30	0

Source: Water Resources Information System of India

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

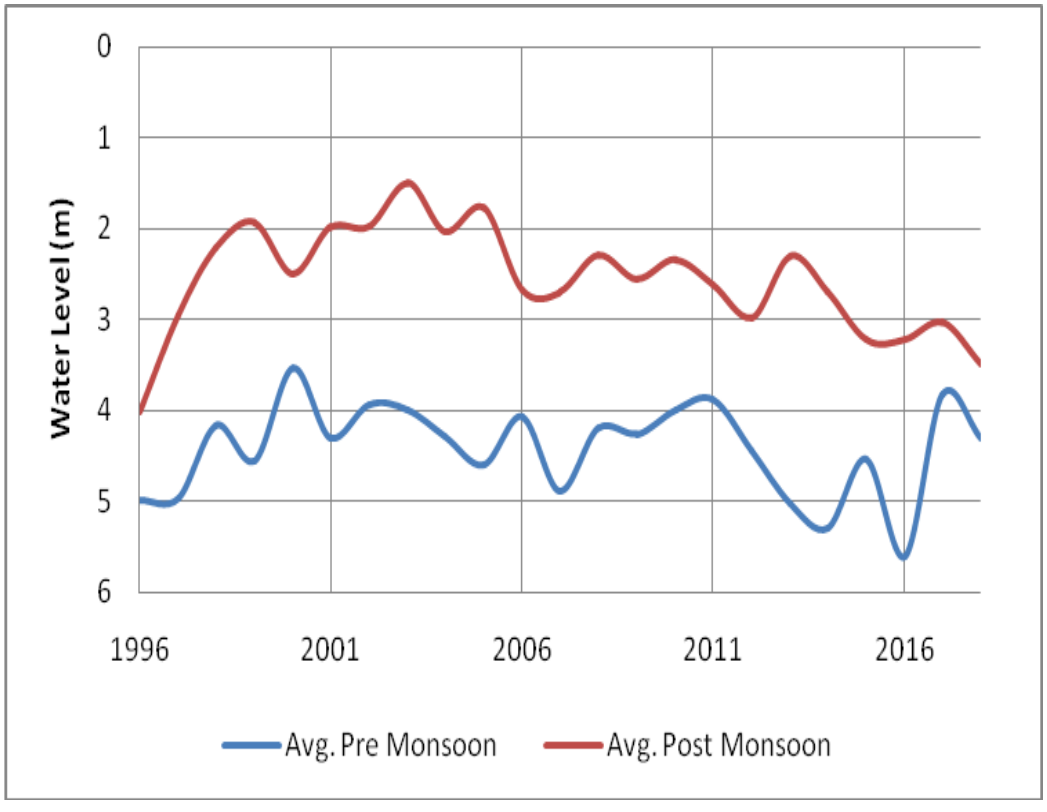
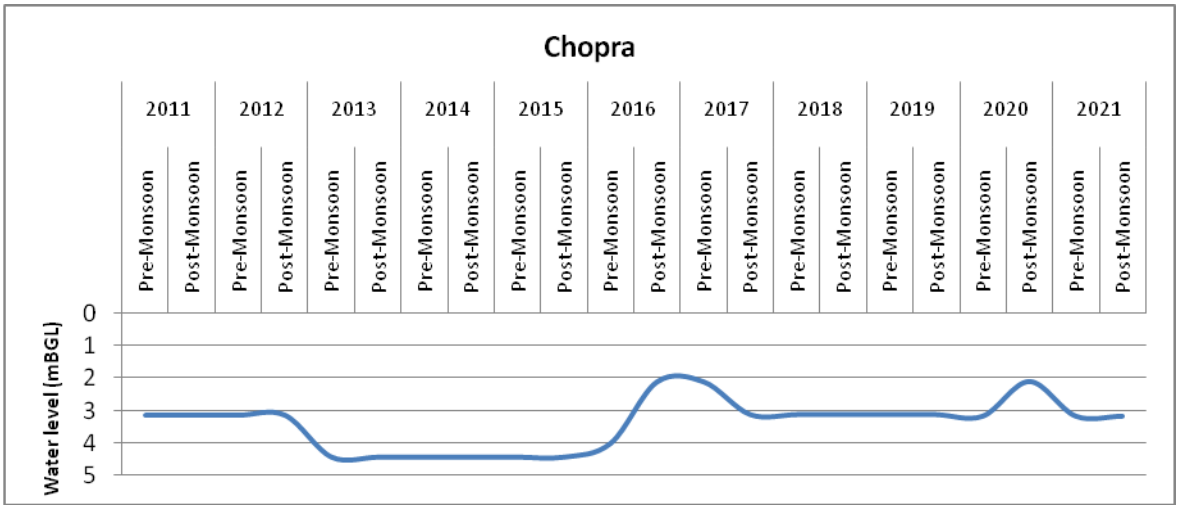
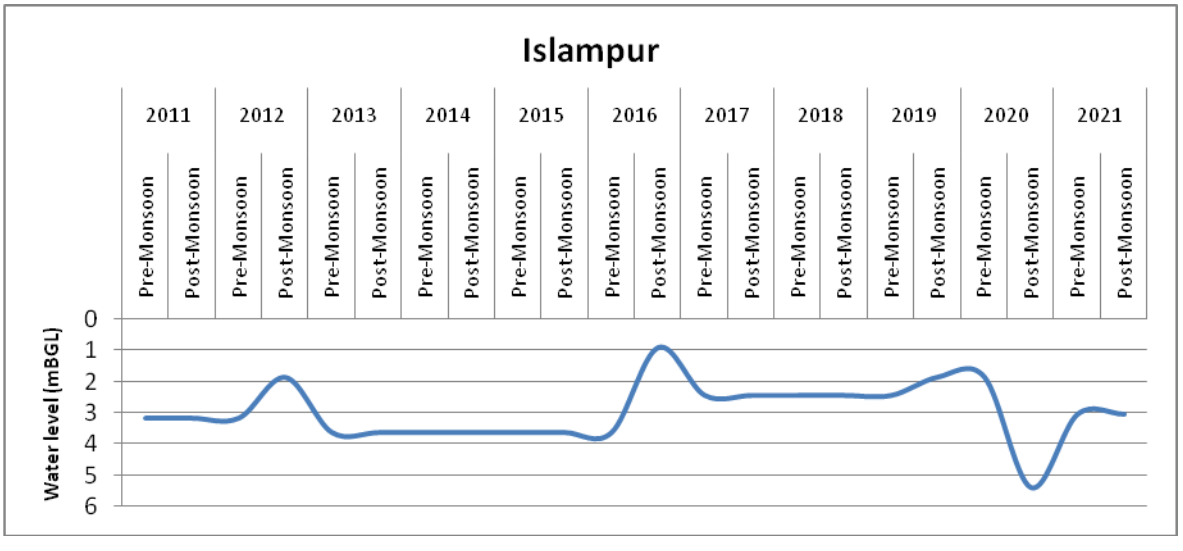


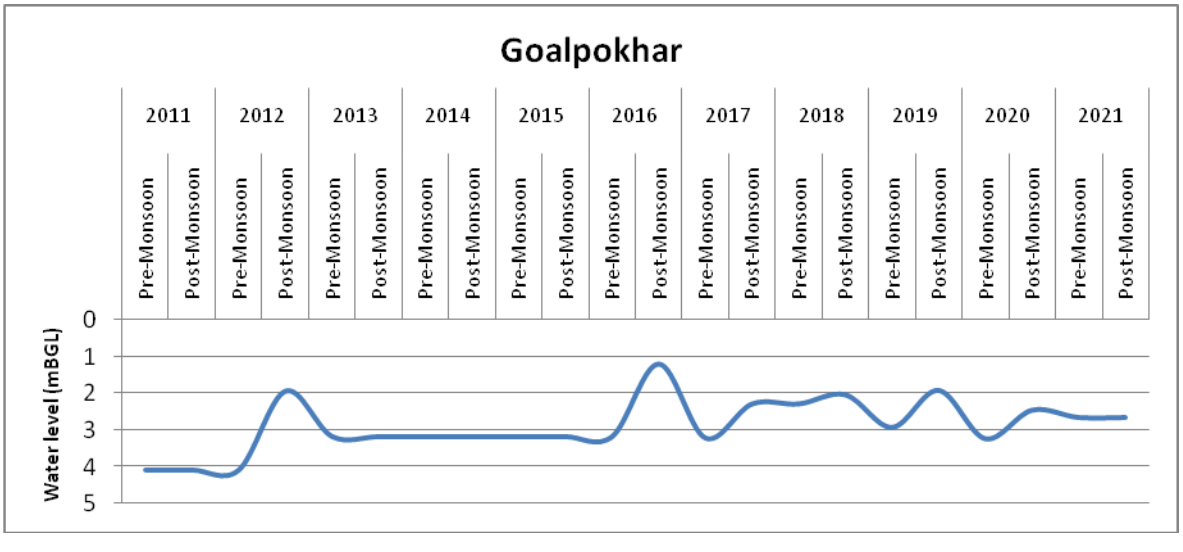
Figure 3.6: Graphical Representation of Depth to water level data for Uttar Dinajpur District for the period of 1996 to 2018

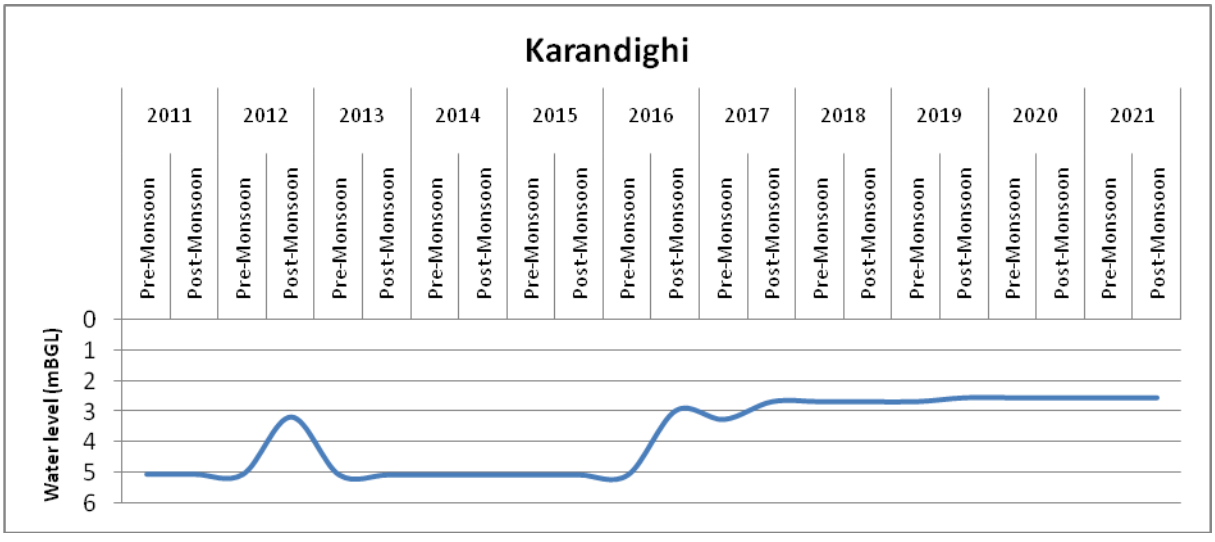
Central Ground Water Board has established several water level monitoring stations for the study of water level behavior in the district. National Hydrograph Stations (NHS) for the study of behavior of the water level and their fluctuation for each block of the district have been represented by below figures. Water levels in the blocks are mostly varying between 2.5 to 5m below ground level. Water level depends upon the storage of ground water development and variation in rainfall over a long period. CGWB have measured water level data four times in a year which covers the pre-monsoon and post-monsoon period.

Hydrographs showing variation in depth to water level observed in between 2011 to 2021 in various blocks of Uttar Dinajpur district is furnished below.


Chopra
2011
2012
2013
2014
2015
2016
2017
2018
2019
2020
2021
Pre-Monsoon
Post-Monsoon
Water level (mBGL)
0
1
2
3
4
5


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


Goalpokhar
2011
2012
2013
2014
2015
2016
2017
2018
2019
2020
2021
Pre-Monsoon
Post-Monsoon
Water level (mBGL)
0
1
2
3
4
5


Karandighi
2011
2012
2013
2014
2015
2016
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2020
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Pre-Monsoon
Post-Monsoon
Water level (mBGL)
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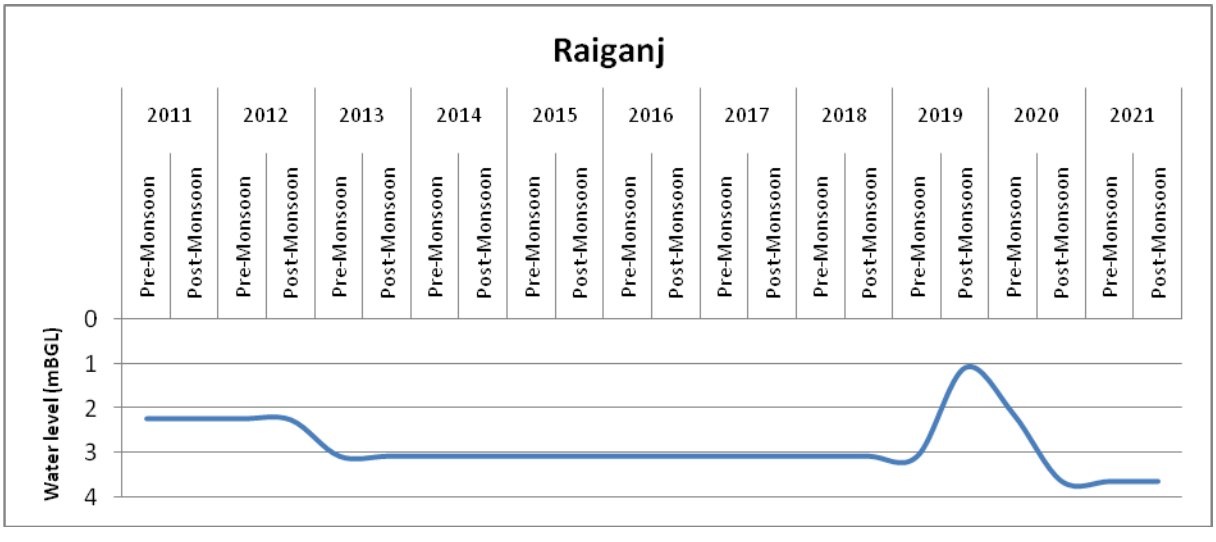
Raiganj
2011
2012
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Pre-Monsoon
Post-Monsoon
Water level (mBGL)
0
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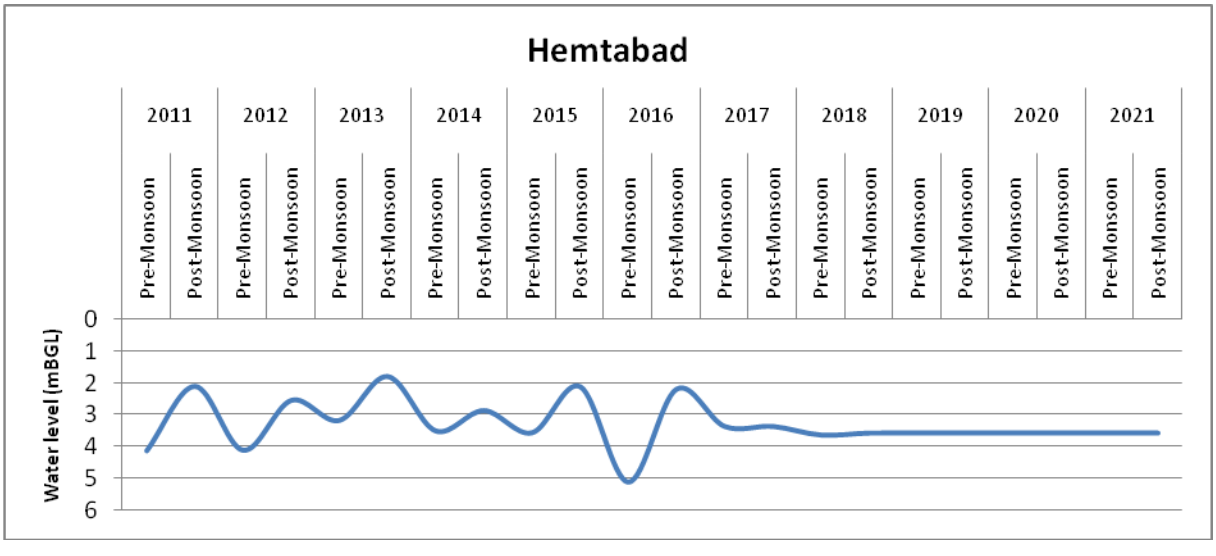
Hemtabad
2011
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2013
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2015
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2021
Pre-Monsoon
Post-Monsoon
Water level (mBGL)
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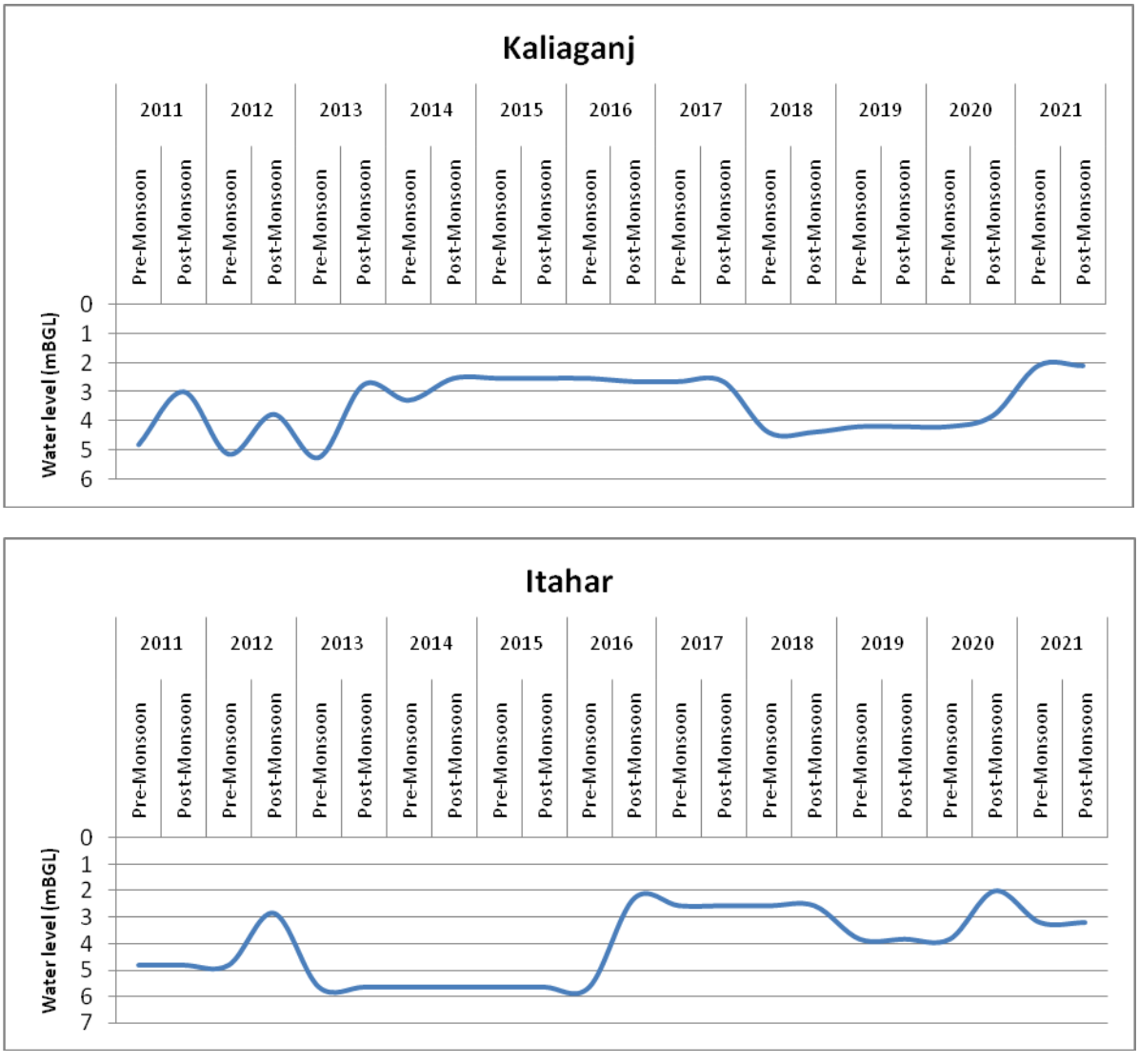


Figure 3.7: Block wise Hydrograph showing variation of water level during 2011 to 2021

3.7 Drainage System

A large number of rivers are flowing over the districts in a southerly direction. The main rivers are Mahananda, Nagar, Sui, Gamari, Kulik, Chirramati and Tangan. The water level of the rivers generally rises during rainy season. Due to uneven distribution of rainfall over time and area, floods or flood like situation cannot be ruled out. The area is an undulating plain intersected with ravines. They are locally called kharis. Tanks form a striking feature of the district which varies from large tanks to insignificant ponds. There are also a number of marshes or bills, formed by the overflowing rivers. As the district is narrow in shape, length of the rivers flowing through this region is very short (Details of Drainage system discussed on 7.2.1 chapter).

A Drainage map of Uttar District is furnished as Figure 3.8 as well as in Plate-1.

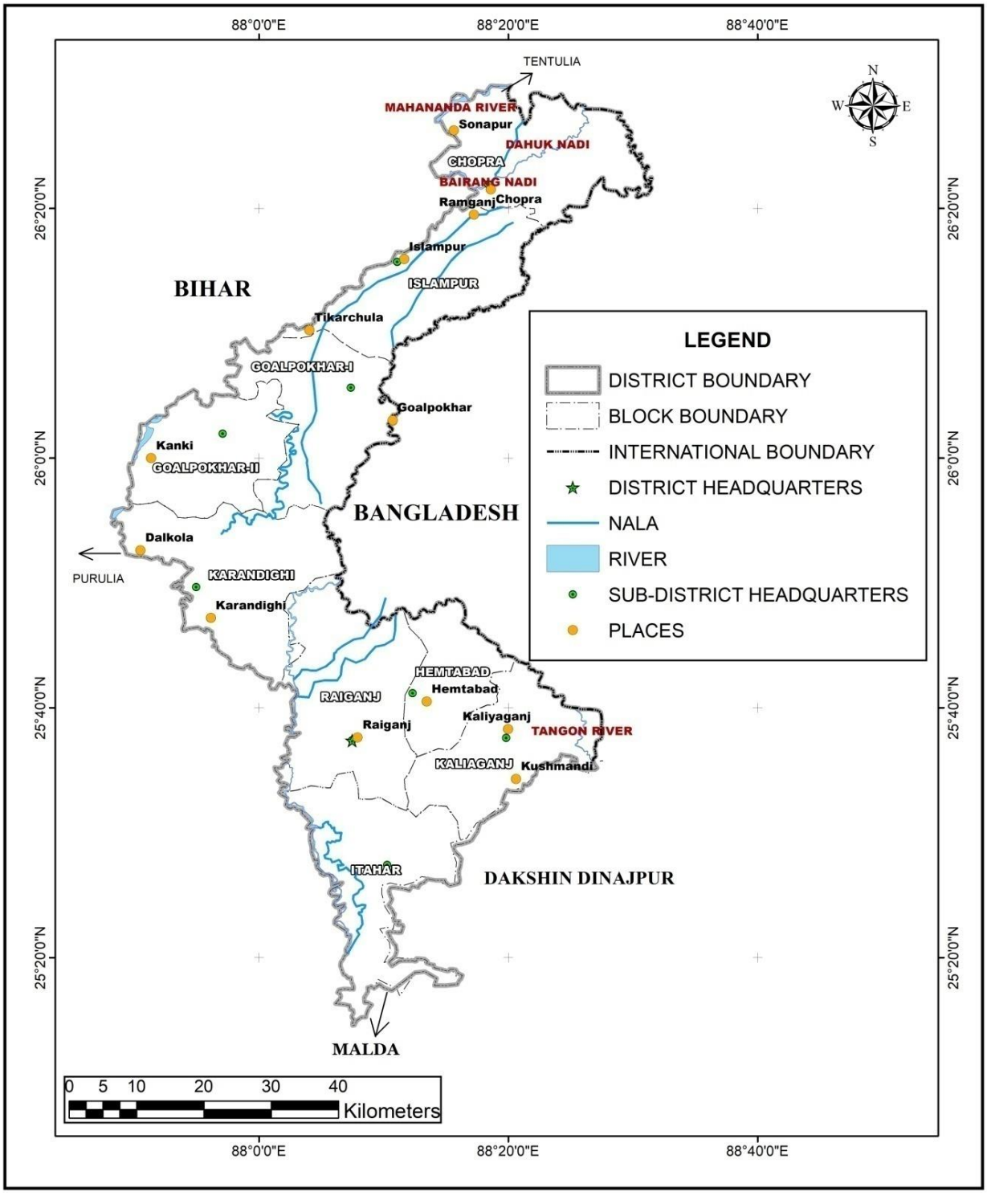


Figure 3.8: Drainage Map of Uttar Dinajpur

(Source: National Informatics Centre)

3.8 Demography

According to 2011 census, the district encompasses a geographical area of 3140 sq km and has a population of 30, 07,134(persons) including 15, 51,066(males) and 14, 56,068(females). The district has a sex ratio of 93.9 females for every 100 males. The major religions in the district (according to census 2001) are Hindu (51.73%) and Muslim (47.36%) of the total population respectively.

The initial provisional data released by Census 2011, shows that density of Uttar Dinajpur district for 2011 is 958 people per sq. km. In 2001, Uttar Dinajpur district density was at 778 people per sq. km. Uttar Dinajpur district administers 3,140 square kilometers of areas.

With regards to Sex Ratio in Uttar Dinajpur, it stood at 939 per 1000 male compared to 2001 census figure of 938. The average national sex ratio in India is 940 as per latest reports of Census 2011.

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

Table 3.5: Demographic distribution of Uttar Dinajpur District

Sub-Division / C.D. Block / M	Area (Sq. Km.) (2001)	Total Population			Literacy Rate %	Percent of population to district population
		Male	Female	Total		
Islampur Sub- Division	**1768.57**	**862114**	**807781**	**1669895**	**52.40**	**55.53**
Chopra	380.82	147073	137330	284403	59.90	9.46
Islampur	329.44	158933	149585	308518	53.53	10.26
Islampur(M)	13.99	28227	26113	54340	80.70	1.81
Goalpokhar-I	355.11	169954	156166	326120	42.26	10.84
Goalpokhar-II	298.69	150125	141127	291252	46.07	9.69
Dalkhola(M)	390.52	19230	17700	36930	67.67	1.23
Karandighi		188572	179760	368332	53.42	12.25
Raiganj Sub- Division	**1350.56**	**688952**	**648287**	**1337239**	**66.94**	**44.47**
Raiganj	472.13	221738	208483	430221	63.52	14.31
Raiganj(M)	10.64	96388	87224	183612	81.70	6.11
Hemtabad	191.82	72624	69432	142056	67.88	4.72
Kaliaganj	301.90	115104	109038	224142	66.50	7.45
Kaliaganj(M)	11.67	27321	26209	53530	85.95	1.78
Itahar	362.40	155777	147901	303678	58.95	10.10
District Total	**3140.00**	**1551066**	**1456068**	**3007134**	**59.07**	**100**

(Source: Census, 2011)

The below mentioned Figure 3-9 has illustrated the Population of Uttar Dinajpur with respect to Male and female counts at all the blocks;

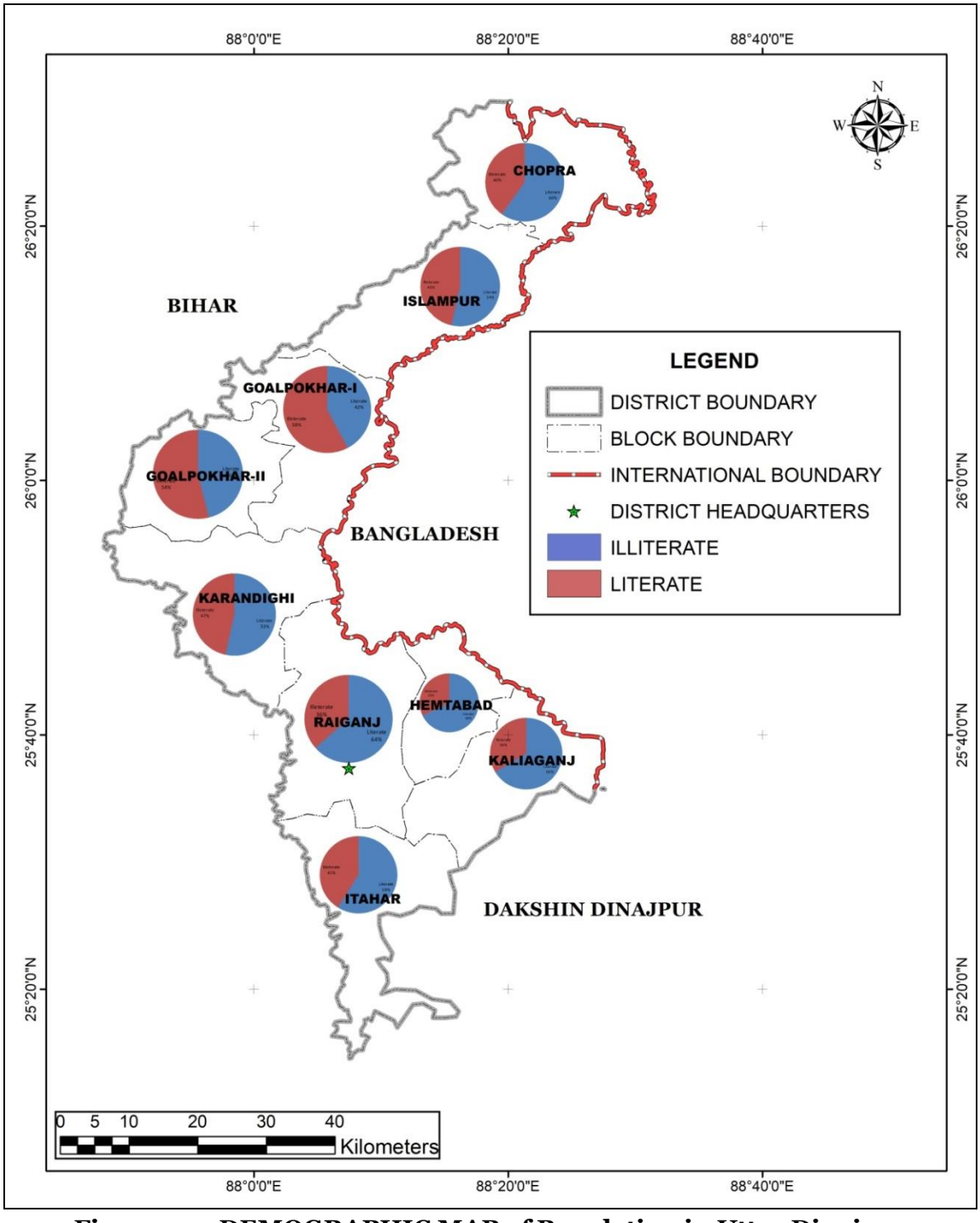


Figure 3.9: DEMOGRAPHIC MAP of Population in Uttar Dinajpur

(Source: Census, 2011)

The blow mentioned Figure 3-10 has illustrated the literacy rate of Uttar Dinajpur at all the blocks;

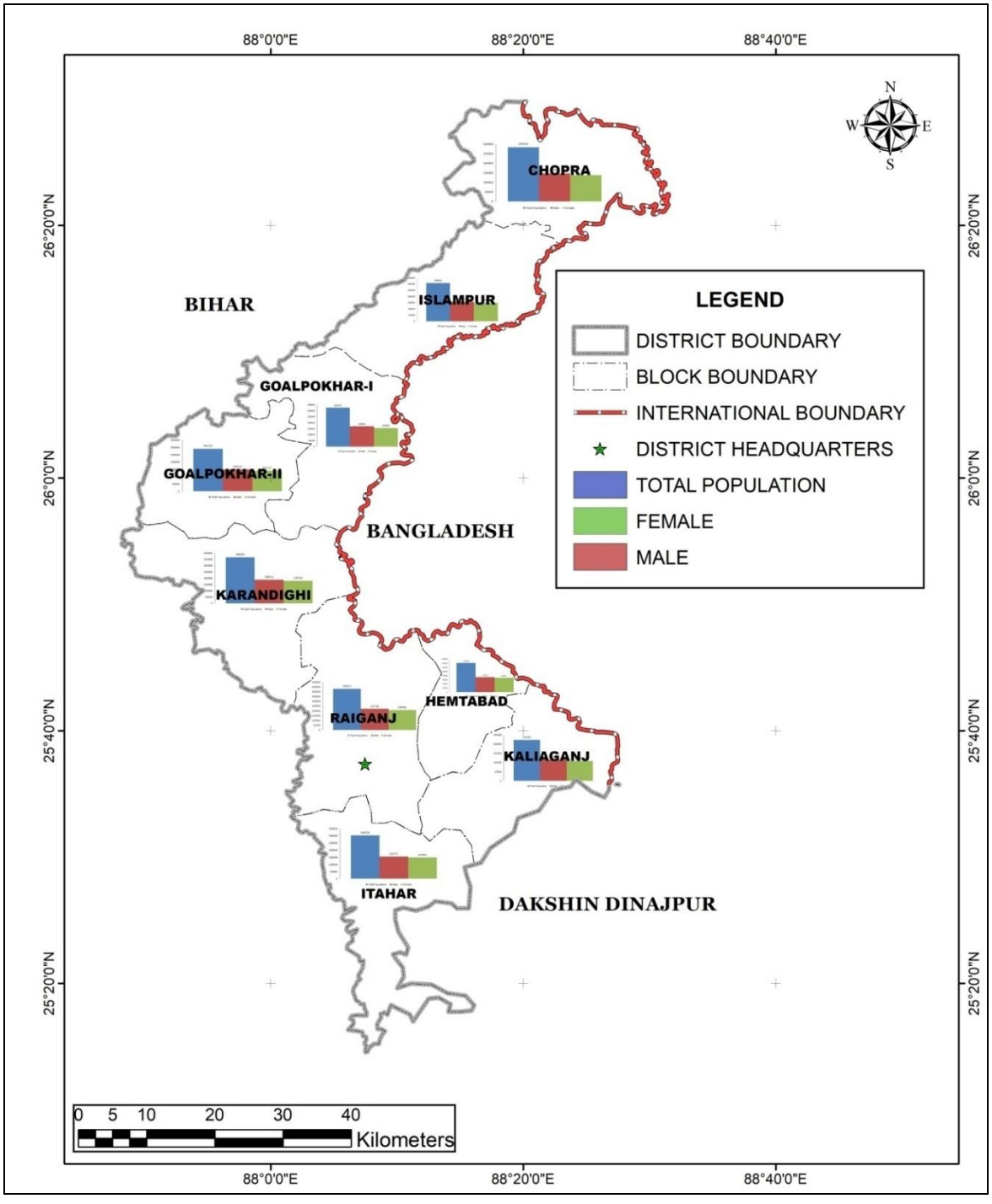


Figure 3.10: Demographic Map of Literacy Rate in Uttar Dinajpur

(Source: Census, 2011)

3.9 Cropping Pattern

Uttar Dinajpur is mainly agriculture in nature but still many farmers follow the subsistence farming due to large population dependent on the agriculture land, small holding of the land and less money for agricultural input. But inadequate implementation of effective management practices, low crop diversification and improper crop planning together with inadequate irrigation and drainage systems has led to stagnation. Non optimum use of ground water, presence of acidic soils and non availability of water during non monsoon periods had led to low crop production. To overcome all the problems like soil and water conservation, drainage and irrigation. Application of bio-fertilizers, diversification of crops and distribution of agricultural implementation are undertaken.

The main crops of this area are paddy, jute, pulses and mustard. Jute is the main cash crop of the district. There has been a reducing trend in the last few years towards use of land for crop production. It is also observed that slowly but steadily tea plantation is creasing in the district which may affect agricultural lands at a great extent in future. Islampur, Goalpokhar-I and Chopra C.D blocks area has immense tea plantation and have big and small tea gardens. The district has ranked 2nd in terms of production of Maize. Raiganj is well known for its Tulaipanji rice. Here the major Tulaipanji (paddy) growing areas are- Raiganj, Kaliyaganj, Hemtabad, and Itahar. Pineapple is the major fruit in this district. Major pineapple growing areas are - Chopra, Hemtabad, and Karandighi. Aman rice is grown on a much wider scale across an aggregate area of 1.96 lakh ha spanning the entire district, boro rice cultivation is more localized in the central and southern blocks of Karandighi, Itahar, Raiganj and Goalpokhar-I. Through the remainder of the district gross rice outputs fall mainly because of the limited availability of irrigation and the consequently restricted scale of boro operations in the concerned blocks. The main areas where jute cultivated are Chopra, Islampur, Raiganj and Itahar. Potatoes are only cultivated on a wide scale in Raiganj and Chopra. Oilseeds are winter crop and grown on a wider scale over a cumulative area of 0.42 lakh hectors. The large scale shift to boro cultivation has been made at the cost of dry crops like pulses and oilseeds. The switchover to less agro-climatically suitable crops in this water scarce region has in fact reduced the total area under pulses and oilseeds, both of which are now in deficit in the district.

Changes in Cropping Pattern: Last few years in net sown area was affected on changing cropping pattern in Uttar Dinajpur district. The proportion of area under total food grains decreases from 27.91% to 27.50%. Total oilseeds areas increase from 3.92 % to 4.26 % and total pulses areas decreases from 0.40% to 0.38%. The large scale shift of boro cultivation is the main reason for that. Total fruit areas increased from 0.82% to 0.85% but vegetables areas decrease slightly. The district is rich in horticulture product but due to lack of marketing and storage facility the same is not being used properly. Total cereals areas decrease from 27.51% to 27.13%. Among cereals production of Maize increased rapidly. In Maize production, this district ranked 2nd in state.

Cropping Intensity: Cropping intensity is the number of times a crop is planted per year in a given agricultural area. It is the ratio of effective crop area harvested to the physical

area. The cropping intensity is not same in all the blocks. The increase in cropping intensity will increase the agricultural production also. In 2000-01 the cropping intensity found higher (183%) but it decreases in 2010-11 and 2014-15 (175% and 180%). The net cropped area increased year by year. Where the gross cropped area is high, intensity of cropping is high (2000-1 and 2014-15) but where gross cropped area is found low, the cropping intensity is also low. Now a day's many schemes taken in this district to improve the irrigation facilities. That is the reason for increasing trend in cropping intensity. The percentage of irrigated area is high in Hemtabad district; here the percentage of gross cropped areas records low compared to the other blocks shows a positive relationship between the irrigated area and cropping intensity. The annual rainfall amount is not same all over the blocks, Hemtabad gets minimum rainfall, so the percentage irrigated area is high in Hemtabad but the cropping intensity shows low. But in Chopra block the annual rainfall is very high, percentage of irrigated area are moderate but cropping intensity shows very high here.

Below table mentioned major farming system with compare to land situation;

Table 3.6: Cropping Intensity of Uttar Dinajpur

Year	Gross cropped area(thousand Ha)	Net cropped area(thousand Ha)	Cropping Intensity (%)
2000-01	501.04	273.41	183
2010-11	479.84	274.77	175
2013-14	496.26	275.66	180

Source: State statistical Handbook-2015

3.10 Land Form and Seismicity

General Information of Earthquake: The state of West Bengal in general and North Bengal in particular encompasses a plethora of unique geological domains and comprises both quaternary alluvium and rocks of Eastern Himalaya fore-deep basin. GSI has carried out systematic mapping on Quaternary deposits of North Bengal since early eighties and A. Das (2005-2006) had established six discrete stratigraphic units in the areas of Jalpaiguri, Darjeeling and N. Dinajpur districts of West Bengal which were classified as Shaugaon Formation, Jalpaiguri Formation, Baikunthapur Formation, Chalsa Formation, Matiali Formation and Samsing Formation. Along the Himalayan fore-deep, existence of regional transverse faults striking NE-SW and NW-SE have been documented by several workers (Dasgupta et al, 1987). In the eastern Himalayas, the MFT is not clearly demarcated and in general expressed as blind ramping thrusts and anticlines which bear the signatures of relatively short and discontinuous E-W running scarps that cut the Quaternary fluvial terraces and alluvial

fans (Nakata, 1989, Guha et al 2007). Thrust planes namely MCT, MBT and MFT along with major transverse lineaments like Teesta, GBF, Jaldhaka, Balason etc. are found to be active through geodetic studies, which bear the testimony that these transverse structures are having tectonic contacts with major thrusts of Himalayas. The foot hills of the North Bengal were severely affected due to the 18th September 2011 Sikkim earthquake (Mw-6.9).

Neotectonic activities have been reported in other areas apart from eastern Himalayan fore-deep in vast quaternary plains of Malda, South Dinajpur and Uttar Dinajpur districts which may be attributed to the presence of causative fault sources. The Number of subsurface faults like Ganges Bengal Fault (GBF), MaldaKishenganj Fault (MKF), Jangipur-Gaibandha Fault, Tista Fault and Katihar-Nailphamari Fault, Debagram Bogra Fault etc has been delineated through geophysical studies in North Bengal plains. In the eastern most part, the conspicuous tectonic discontinuity is the N-S trending Dhubri Fault, which has a considerable down throw towards west may also be considered as a causative source of earthquake. The Surface manifestation of neotectonism in the form of escarpment and unpaired terraces of rivers draining across these plains signifies the effect of active tectonism. Recent work on GPS measurements in frontal parts of Eastern Himalayas in North Bengal (Mullick et al. 2009) by eight GPS points has shown that both extensional and thrust faults are active in the Quaternary piedmont zone. S. Bardhan, S Dasgupta and S Basir (2003-2004) had indicated neotectonic disturbances of the Quarternary sediments of Gaursing-Boghajot-Jhoragachi falling in parts of the Himalayan Foreland Basin region. They have demarcated roughly NE-SW trending escarpment running for nearly 4 km with an average height of 20-18 25 m in the south of Naxalbari town forming over Matiali formation.

Recently (2017-18), GSI through a comprehensive deformation study within the fore-deep sediments of Eastern Himalayas within the vicinity of two transverse features the Ganges Bengal Fault (GBF) and the Malda Kishanganj Fault (MKF) have observed signs of active tetonism and reported soft sedimentary deformation structures like convolute laminations, pinch and swell, clay balls and sand injections are observed within the area. Indirect evidences of neo-tectonism through morphometric studies also corroborates with the fact that the vicinity of afore said transverse structures are active.

Further, Micro earthquake studies followed by geodetic survey over various sectors of North Bengal have also shown that the area located in the buffer zones of causative earthquake sources are seismo-tectonically vulnerable. This warrants proper planning and policy implementation to ensure seismic proof design of civil structures to minimize damage and destruction in case of an impending earthquake.

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 earthquakes 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 Uttar Dinajpur has categorized in seismic zone IV. Below mentioned Figure 3-11 has described the Earth quake map of the study district;

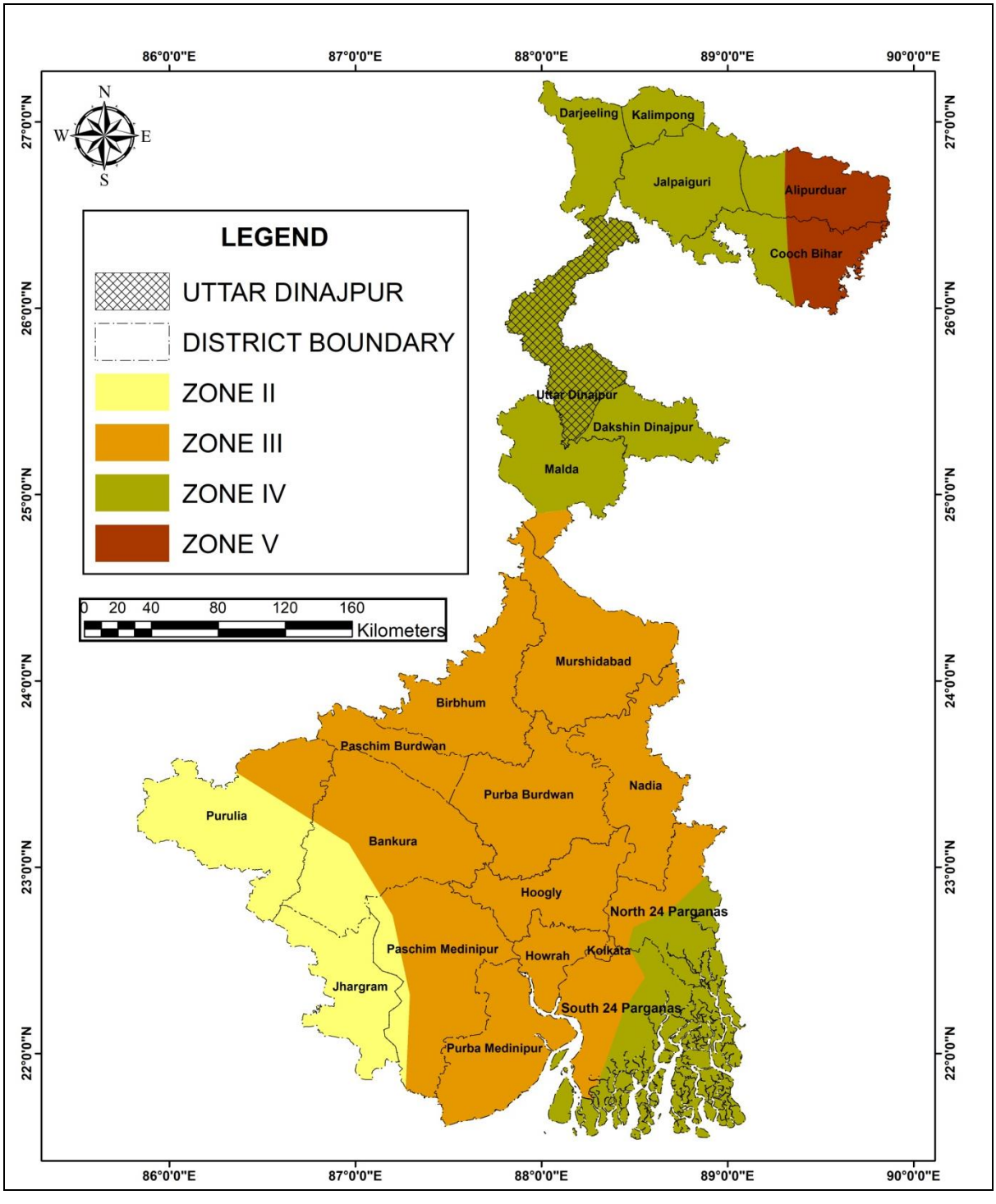


Figure 3.11: Earthquake zonation map of West Bengal highliting the Uttar Dinajpur district position

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

3.11 Flora

This district is not deficient in vegetation. Here khejur, jackfruits, mango, custard apple, Tal and coconuts are available. Tropical type of forest is found in this region but very few in numbers. In the forest sal, sisu, segun, bamboo, hijal and palash trees are grown. The plantation of teak trees has also been undertaken in the region. Paddy and jute are the principal cash crops. Jute is mostly grown in the Islampur and Chopra C.D Block area. Some tea gardens are also found in the Islampur sub-division of the district.

Here vegetation is mixed deciduous type with some plantation sites. Species of economic types are Cocos nucifera, Artocarpus heterophyllus, Olea sp., Dalbergia sissoo, Gmelina arborea, Anthocephaluscadamba, Terminalia chebula, Albizia lebbeck, Samanea saman, Flagship species found here are Ficus benghalensis, F. hispida, F. glomerata, F. cunea etc. Weeds of exotic types in aquatic bodies are species like Tillanthera and Eichhornia sp. along with Salvinia and Azolla sp., whereas in the bundh or semi-aquatic bodies the most promising species are Veteveriazizanoides and Impereta cylindrica. Weeds of fallow land are Jussia sp., Ludwigia sp., Mimosa sp., Eupatorium sp., Alysicarpus sp., Evolvulus sp., Tephrosia sp., Sonchus sp., Spilanthes sp., Achyranthes sp., Spermacoce sp., Oldenlandia sp., Phylla sp., etc. In waste land the species like Hibiscus vitifolius, Leonotisnepetifolia, Anisomeles indica, Hyptissuaveolens, Daemia extensa, Sida acuta, Sida cordata, Melochiacorchorifolia, Clerodendrum sp., Parthenium are common along with Solanum sp. Other species found here are Cuscuta sp., Dendropthoae sp., as plant parasite. Some orchids of epiphytic kind are also available here. Trees found here are Terminalia bellerica, T. chebula, T. catappa, Bombax ceiba, Holarrhenaantidysenterica, Cassia fistula, Lagerstroimeia indica, Aegle marmelos, Semecarpus anacardium, Butea frondosa etc. Woody climbers found here are Tiliocoraracemosa, Hemidesmus indicus, Ichnocarpuspubescens, Bauhinia vahlii, Spatholobusroxburghii, Aganosmadichotoma, Cephalendra indica, Trichosanthespametta, Jasminum dispermum, J. sambac, Dalbergia stipulacea. Species producing wood of commerce are Samania saman, Albizzia lebbeck. Other species found are Cereus hexagonus, Opuntia sp., which found in dry and open land habitats. Aristolochia indica, Curculigoorchioides, Diospyros tomentosa, D. sylvatica, Clerodendrum indicum etc. are medicinal plants. Dillenia indica, Mangifera indica, Ficus religiosa, F. benghalensis, F. hispida, Geloniummultiflorum, Glochidionlanceolarium, Annona squamosa, A. reticulate, Zizyphus rugosa, Flacourtiaramaontchii, Pterospermumacerifolium, Tectona grandis, Borassus flabellifer, Phoenix sylvestris, Cassia ocidentalis, Calotropis procera, C. gigantean, Leonotisnepetifolia, Martynia annua, Tribulus terrestris, etc are common available here and there. Plantation sites include species like Eucalyptus, Acacia, Anacardium, Simarouba, Disoxylum, Anthocephalus, Phyllanthus, Couripitaguanensis, Mesua sp. etc. along with a lot of Bamboos. Ornamentals available here are Caesalpinia sp., Delonix sp., Alamanda sp., Thunbergia sp., Ixora sp., Gardenia sp., Musa sp., Ravenala sp., Heliconia sp., Cammelia sp., Hibiscus sp., Salvia sp., Croton sp, Jasminum sp., Polyanthes sp., Rosa sp., Tagetes sp., Dahlia sp., Chrysanthemum sp. Etc

The area has also good potential of medicinal plants. These are species like Cassia fistula, Cissus quadrangularis, Pongamia pinnata, Achyranthes aspera, Acorus calamus, Allium sativum, Andrographis paniculata, Vitex negundo, Tinospora cordifolia, Withaniasomnifera, Rauvolfia serpentina, Rauvolfiatetraphylla, Morindacitrifolia, Mimosa pudica, Kalanchoe

pinnata, Hemidesmus indicus, Tylophoraasthmatica, Gymnemasylvestre, Euphorbia nerifolia, Datura metel, Ocimum sanctum, Ocimumgratisimum, Calotropis procera, C. gigantean, Azadirachta indica, Solanum indicum, Amorphophalusbulbifera, Streblus asper, Alstoniascholaris, Aristolochia indica, Stephania hernandifolia, Cissus adnata, Curculigoorchioides, Polygala crotalarioides, Zizyphus jujuba, Z. rugosa, Zornia diphylla, Adhatodavasica, Mollugo pentaphylla, Enhydra fluctuens, Wedeliacalandulacea, Vernonia cinerera, Solanum trilobatum, Solanum nigrum, Solanum xanthocarpum, Ipomoea carnea, I. aquatic, Glenuslotoides, Moringa oleifera, Morindacitrifolia, Agave Americana, Spondias dulcis, Scoparia dulcis, Averhoeea carambola, Meyna spinosa etc.

3.12 Fauna

As the forest is under social forestry so, numbers of local kinds of wild animals are available here less in number, maximum are residential from other side as they posses temporal stay. The good example is Storks and Cormorants. So, other faunal members are Porcupine, Snakes, Lizards, Butterflies, Insects, Ants, Spider, monitor and common birds. Birds available here are Sparrow, kingfisher, Crane, Crow, Raven, Dove, Parrot and Parakeet, Mayna, white breasted water hen etc. Pigeon and Drongos are available here in the area where cultivated crops are common. One of the famous attractions in this district is Raniganj Wildlife Sanctuary. The brief of this sanctuary has given below;

It is claimed by some to be the largest bird sanctuary in Asia. The area of the sanctuary is around 1.30 km2. The core area is about 0.14 km^2 and the rest is buffer area. The river flows around part of the sanctuary and acts as the boundary in its eastern and southern parts. The shape of the sanctuary is that of the English alphabet "U". The sanctuary has a network of artificial canals connected with the river Kulik. During monsoon the river water enters the sanctuary, which supports a wide variety of food for the birds, particularly for the Asian openbill, whose main diet is apple snail. The sanctuary is home to 164 species of birds.

Several types of migratory birds arrive here each year from South Asian countries and coastal regions. They start arriving from June. The migratory species includes open-bill storks, egrets, night herons and cormorants. The resident birds are kites, flycatchers, owls, kingfishers, woodpeckers, drongoes, etc. According to a 2002 census, 77,012 birds visited the sanctuary that year. Some 90,000 to 100,000 migratory birds visit the sanctuary every year.

Description of Heronry; Global population of the Asian open bills is estimated to be 130,000 by Wetland International, and around half of them live in Asia. The species is known to breed in a colony, called heronry, but there are very few heronries in India, particularly those that are well protected against human greed. Ornithologically, Raiganj Wildlife Sanctuary is a very important heronry. As per the breeding population data of Asian open bills, the sanctuary reveals that it regularly supports 32 - 40 percent of the existing population of Asian open bills of South Asia. A heronry, which supports such a high percentage of Asian open bills, is not only a nationally important heronry but also an internationally important heronry.

Birds at the heronry

The **Asian open bill** or **Asian open bill stork** (*Anastomusoscitans*) is a large wading bird in the stork family Ciconiidae. This distinctive stork is found mainly in the Indian subcontinent and Southeast Asia. It is grayish or white with glossy black wings and tail and the adults have a gap between the arched upper mandible and recurved lower mandible. Young birds are born without this gap which is thought to be an adaptation that aids in the handling of snails, their main prey. Although resident within their range, they make long distance movements in response to weather and food availability.

The **little egret (Egrettagarzetta)**is a species of small heron in the family Ardeidae. The genus name comes from the Provençal French Aigrette, "egret", a diminutive of Aigron," heron". The species epithet garzetta is from the Italian name for this bird, garzetta or sgarzetta. It is a white bird with a slender black beak, long black legs and, in the western race, yellow feet. As an aquatic bird, it feeds in shallow water and on land, consuming a variety of small creatures. It breeds colonially, often with other species of water birds, making a platform nest of sticks in a tree, bush or reed bed. A clutch of three to five bluish-green eggs is laid and incubated by both parents for about three weeks. The young fledge at about six weeks of age.

The **little cormorant** (*Microcarboniger*) is a member of the cormorant family of seabirds. Slightly smaller than the Indian cormorant it lacks a peaked head and has a shorter beak. It is widely distributed across the Indian Subcontinent and extends east to Java, where it is sometimes called the **Javanese cormorant**. It forages singly or sometimes in loose groups in lowland freshwater bodies, including small ponds, large lakes, streams and sometimes coastal estuaries. Like other cormorants, it is often found perched on a waterside rock with its wings spread out after coming out of the water. The entire body is black in the breeding season but the plumage is brownish, and the throat has a small whitish patch in the non-breeding season. These birds breed gregariously in trees, often joining other waterbirds at heronries.

Pond herons (***Ardeola***) are herons, typically 40–50 cm (16–20 in) long with an 80–100 cm (31–39 in) wingspan. Most breed in the tropical Old World, but the migratory squaccoheron occurs in southern Europe and the Middle East and winters in Africa. The scientific name comes from Latin *ardeola*, a small heron (*ardea*). These pond herons are stocky species with a short neck, short thick bill, typically buff or brownish back, and coloured or streaked fore neck and breast. In summer, adults may have long neck feathers. *Ardeola* herons are transformed in flight, looking very white due to the brilliant white wings.

The below mentioned Figure 3.12 has illustrated the map of wildlife of Uttar Dinajpur;

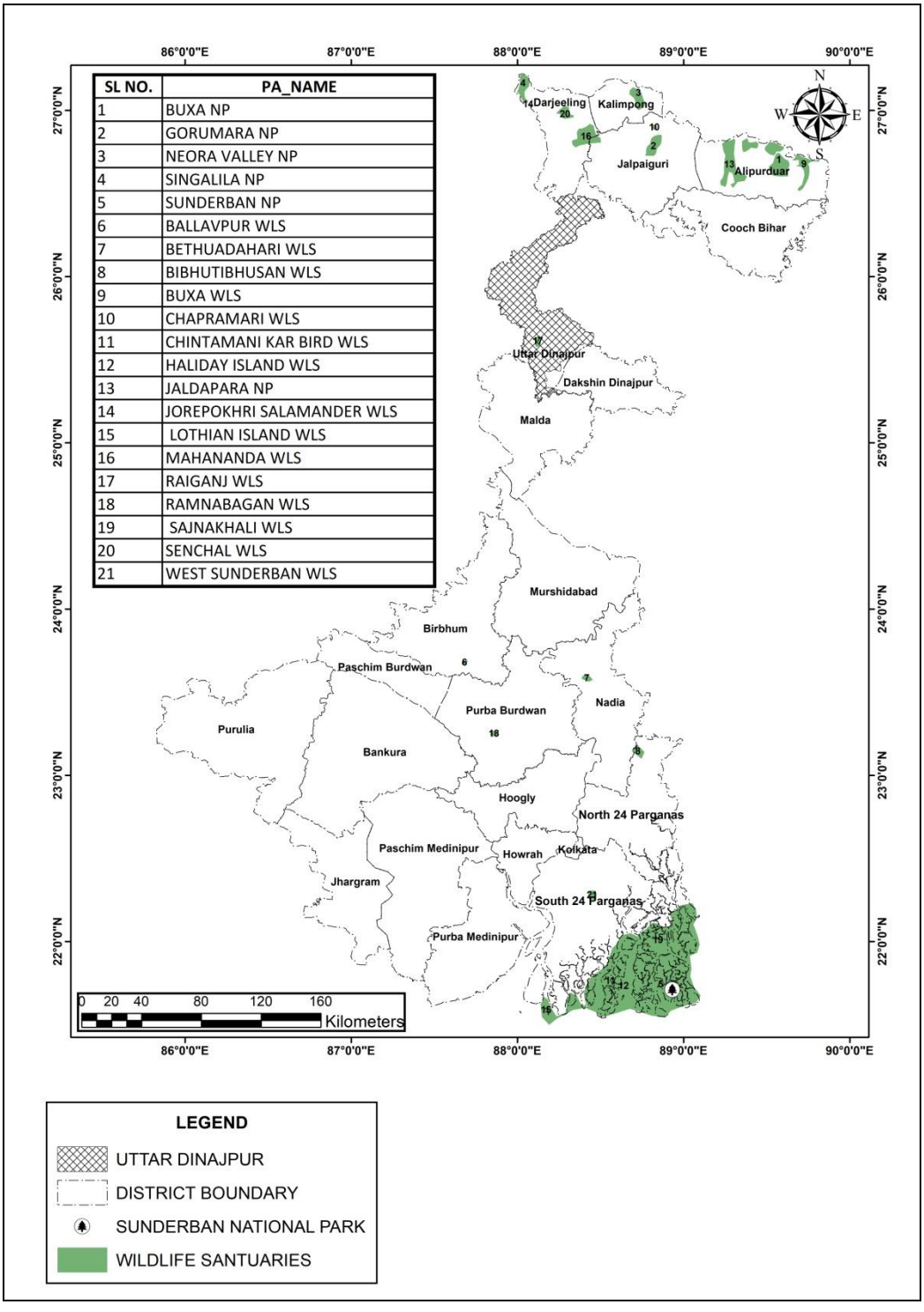


Figure 3.12: District location with respect to Wild Life Sanctuary of West Bengal

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

4 Geomorphology

4.1 General Landforms

The district covers an area of 3139.807 sq.km. The landscape of the district is more or less a plain area which is a fertile tract suitable for growing rice and jute. The average elevation is 15 m above mean sea level. The slope of the land is from north to south by less than 10 m/ sq.km., shown by the trend of the river. It is a flat alluvial plain of the Gangetic delta. The deeper depressions bear a resemblance to old river beds sometimes containing water. In the north western side of the region there are small hillocks.

The southern portion of the land resemblances the characteristics of Barind land geologically classed as old alluvium.

The elevation of the land is highest (80-100 m) in the northern part of the district. The land gradually slopes downward and in the southern portion, a large part of the land has an elevation of 30-40 m.

The northern portion is termed as Mahananda plain. It slopes from north to south. The main river is Mahananda.

4.2 Soil and Rock Pattern

Uttar Dinajpur district is a featureless plain consisting entirely of alluvium. The district is devoid of any rocky exposure.

In the southern half of Uttar Dinajpur district the soil consists of an ash colored clayey silt, locally called khiar. This, a soft sticky loam in the rainy season, hardens almost to the consistency of cement in the dry weather, when it is not suitable for the growth of vegetation. In the northern half of the district and on the banks of some of the principal rivers in the south, the soil consists of a sandy loam mixed with gravel, the local name of which is Pali.

The lower portion of the land of the district is formed with Mahananda alluvium and the upper portion of the land of the district is formed with clay soils. Some portions of the police station areas of Karandighi, Raiganj, Hemtabad and Itahar are formed with the clay soils of the river Ganga and other rivers of the district. The surface soil of the district is divided into three types of soils like Bele- Doash, Doash and Loamy. In the north, the large tract of land of the Islampur Sub-Division is formed with the clay of river Tista. The region belongs to the old riverine delta of Ganga River. Alluvial loamy soils are mainly found throughout the district. The gray colored loamy soil is capable of high water holding capacity. In most parts of the district, the soil is mainly comprised of old alluvium and alkaline soil underlain by new alluvium during floods. Mainly Entisols and Inceptisols type of soils are found throughout the district. Fluvaquents, Ustifluvents and Ustorthents are grouped under the Entisols type of soil. These types of soil are found in the northern part of the district. In the southern half of the district,

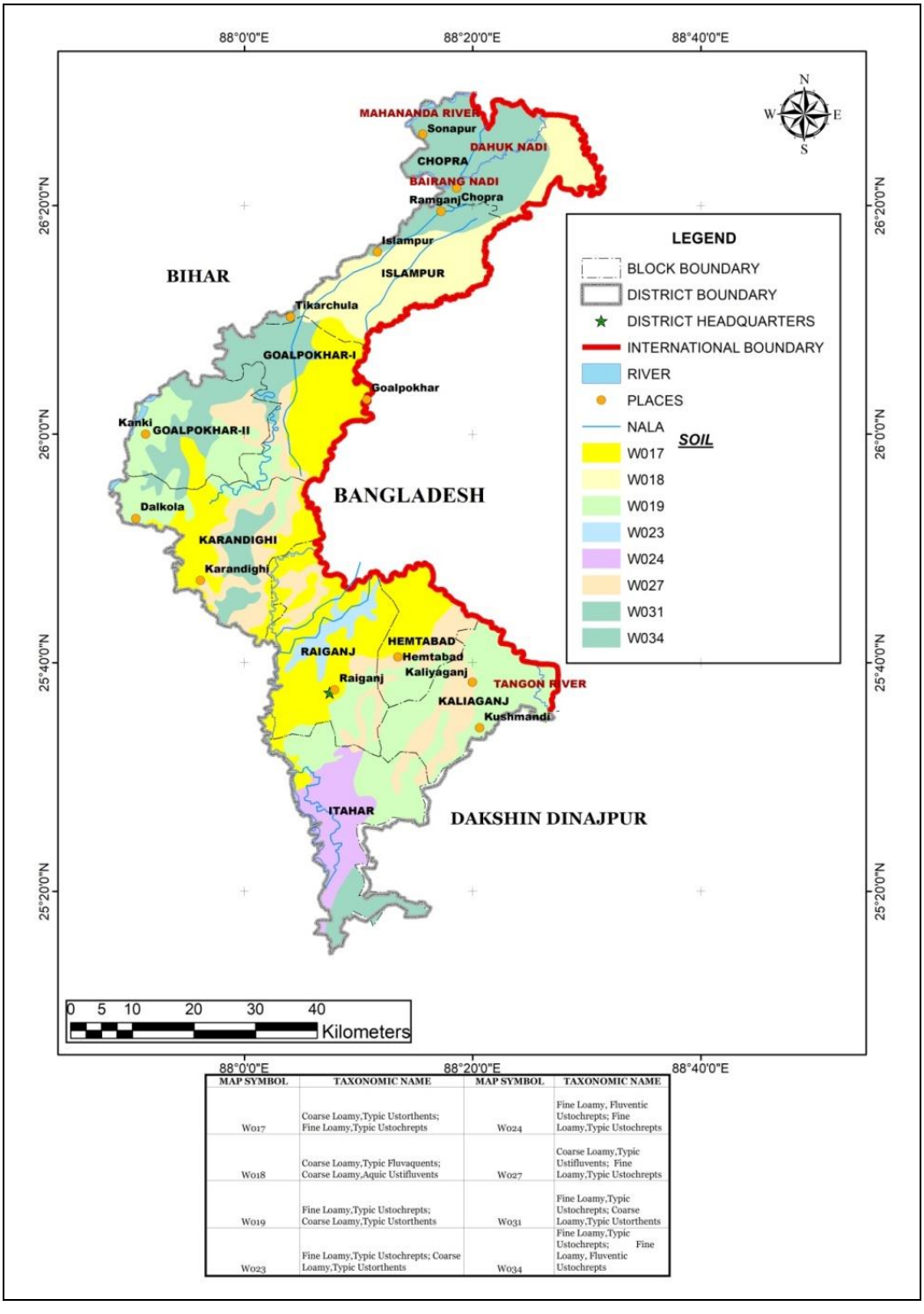
Ustochrepts type of soil is found extensively. Ustifluvents cover some parts of Hemtabad and Kaliaganj blocks.

The Table no. 4-1 has illustrated the soil description in this district;

Table 4.1: Description of District soil type of Uttar Dinajpur

MAP SYMBOL	DESCRIPTION	AREA (in Ha.)
RECENT ALLUVIUM PLAIN (Most recent soil)		
W017	Very deep, well drained, coarse loamy soils occurring on level to nearly level recent alluvial plain with loamy surface associated with very deep, imperfectly drained, fine loamy soils	76202.5
W018	Very deep, poorly drained, coarse loamy soils occurring on level to nearly level recent alluvial plain with loamy surface associated with very deep, imperfectly drained, coarse loamy soils	32110.43185
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	71320.31433
W023	Very deep, moderately well drained, fine loamy soils occurring on level to nearly level recent alluvial plain with loamy surface associated with very deep, well drained, coarse loamy soils	5206.749494
W024	Very deep, imperfectly drained, fine loamy soils occurring on very gently sloping recent alluvial plain with loamy surface and moderate erosion associated with very deep, imperfectly drained, fine loamy soils	12823.11157
W027	Very deep, moderately well 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	41929.29656
W031	Very deep, imperfectly drained, fine loamy soils occurring on level to nearly level recent alluvial plain with loamy surface associated with very deep, moderately well drained, coarse loamy soils	68011.79881
OLD ALLUVIUM PLAIN (Sub- recent soil)		
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	6395.797373
	TOTAL AREA	**314000**

The below mentioned Figure 4-1 has described the soil map in Uttar Dinajpur;



MAP SYMBOL	TAXONOMIC NAME	MAP SYMBOL	TAXONOMIC NAME
W017	Coarse Loamy,Typic Ustorthents; Fine Loamy,Typic Ustochrepts	W024	Fine Loamy, Fluventic Ustochrepts; Fine Loamy,Typic Ustochrepts
W018	Coarse Loamy,Typic Fluvaquents; Coarse Loamy,Aquic Ustifluvents	W027	Coarse Loamy,Typic Ustifluvents; Fine Loamy,Typic Ustochrepts
W019	Fine Loamy,Typic Ustochrepts; Coarse Loamy,Typic Ustorthents	W031	Fine Loamy,Typic Ustochrepts; Coarse Loamy,Typic Ustorthents
W023	Fine Loamy,Typic Ustochrepts; Coarse Loamy,Typic Ustorthents	W034	Fine Loamy,Typic Ustochrepts; Fine Loamy, Fluventic Ustochrepts

Figure 4.1: Soil Map of Uttar Dinajpur

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

4.3 Different Geomorphologic units:

Geomorphological set-up of the area shows three pronounced relief surfaces of various landform assemblages namely, the low lying Mahananda surface of active flood plain, the intermediate Raiganj surface of younger alluvial fan, and the elevated Barind surface of older alluvial deposits. Of the three surfaces, the Barind and Raiganj surfaces represent older fan terraces and valley fills. The younger Mahananda surface represents part of its flood plains within the inter fan alluvial valleys.

The Barind surface characterized by aggraded channel segments and meander cut-offs of varying length and dimension occupy relatively higher elevation than the surroundings and show gentle surface undulation only to the southeastern part. The surface is experienced deep drainage dissection that resulted in development of entrenched meander belts along the constricted river valleys. Alluvial architectures in the Raiganj surface clearly show development of four landform units in two height levels. In both the height levels landform units are identified as paleo aggraded meander belts and paleo flood basin subunits. In the higher relief zone, relatively narrow interconnected paleo aggraded meander belts with intervening areas of paleo flood basin remnants have fashioned the landscape. Major alluvial ridges with meander scroll ridges and swales are among the common morphofacies characterizing aggraded upper subunit. Paleo flood basin morphofacies belonging to upper subunit supports formation of number of shallow un-drained swamps. Partially aggraded meander cut-off, ox-bow lakes and meander scroll ridges and swells are the characteristic features of the lower subunit. The upper subunit is mostly developed in the northern part of the Uttar Dinajpur district, while the lower subunit occupies the entire southern part. The active rivers and streams flowing across the upper Raiganj and Barind surfaces show deep entrenchment of river valley with development of erosional terraces.

The below mentioned Figure no. 4.2 has illustrated the Geomorphology Map of Uttar Dinajpur;

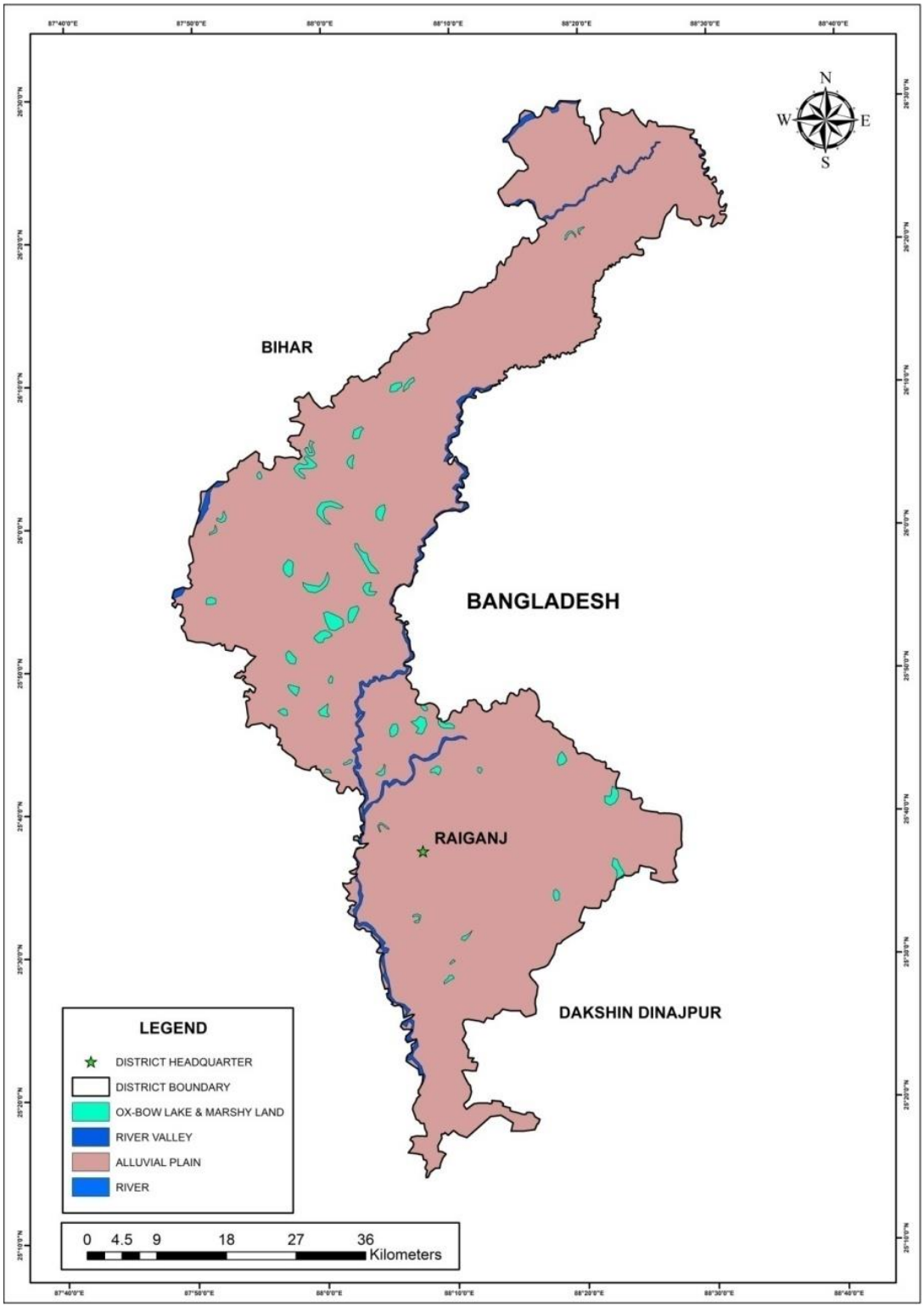


Figure 4.2: Geomorphological Map of Uttar Dinajpur

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

5 Land use pattern of the district

Uttar Dinajpur is situated mainly on plain lands. The land is formed with alluvial soil generated from the different rivers in the district. The crop production depends largely on monsoon. This district is flood prone, which occurs almost every year.

Vast fertile agricultural tract of Uttar Dinajpur district attracts the population from ancient time. Due to excessive population pressure, the natural vegetation of this district is diminishing very rapidly. A small patch of forest land is found in Raiganj block. In the forest area Sal, Segun, Hijal, Sishu and Palash trees are available. The forest is not so dense and it is mainly important for tourist spots. Local people often collect various forest products like honey, fuel wood seasonally Orchards having pineapple, Mango, Jackfruit, Litchi, Guava are found in the remote rural areas. Banana is also cultivated in vast fields. These fruits are mainly sold in the local markets. Bush and grassy fields are found in a scattered manner. There is a small patch of jungle in police station Goalpokhar on the two sides of the National Highway, and another in police station Chopra, but in the rest of the district, forest or jungle is scarce. Grassy fields are mainly used for animal rearing by the villagers. Jute is mainly cultivated in the Islampur Sub division, while jute and rice get equal importance in Raiganj. Chili is grown abundantly in Kaliaganj police Station. Large tract of grassy fields are found in Hemtabad, Balarampur, Fatepur, Dalkhola and Chakulia.

This district is predominantly agro based and agriculture is the mainstay. The Majority of the rural population is engaged in agriculture and multiple cropping. But inadequate implementation of effective management practices, low crop diversification, and improper crop planning together with inadequate irrigation and drainage systems hasled to stagnation. The farmers are more or less dependent on surface water than the groundwater. Non optimum use of ground water through proper irrigation methods, presence of acidic soils and non availability of water during non monsoon periods had led to low crop production. To overcome all the above obstacles, through implementation like, soil and water conservation, land reclamation & improvement, drainage and irrigation, promotion of organic farming, application of bio fertilizers, distribution of hybrid seeds, diversification of crops and distribution of agricultural implements are undertaken. According to the below sources the majority area of the district is used for cultivation. About 248 thousand hectares land among 313 thousand hectare of total land is used for cultivation purposes. This district is preliminarily agricultural in nature.

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 Uttar Dinajpur

Year	2008-09	2009-10	2010-11	2011-12	2012-13
Reporting Area (In Thousand Hectares)	312.47	312.47	312.47	312.47	312.47
Forest Area	0.58	0.58	0.58	0.58	0.58
Area under Non-agricultural use	32.56	32.67	33.43	31.12	31.30
Barren & unculturable land	0.19	0.06	0.27	0.10	0.05
Permanent pastures & other grazing land	0.02	0.03	0.13	0.06	0.04
Land under misc. tree groves not included in Net area sown	1.82	2.09	1.51	3.73	3.47

Year	2008-09	2009-10	2010-11	2011-12	2012-13
Culturable waste land	0.07	0.09	0.12	0.08	0.05
Fallow land other than Current fallow	0.04	0.05	0.16	0.14	0.10
Current fallow	0.20	1.39	1.50	0.20	0.15
Net area sown	276.99	275.51	274.77	276.46	276.73

(Unit in Thousand hectares)

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

Below mentioned Figure 5.1 has describes the Land use and Land Cover map of Uttar Dinajpur;

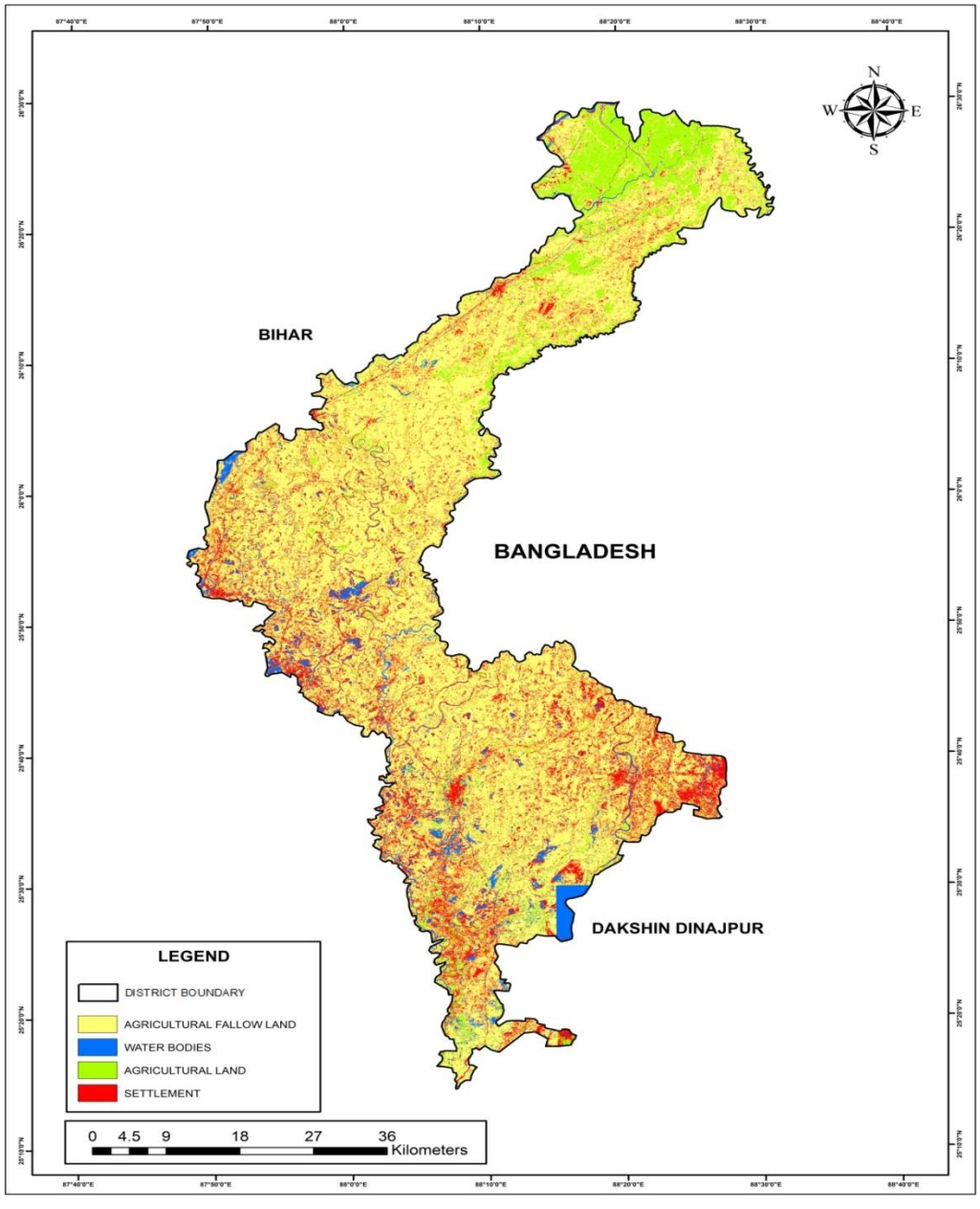


Figure 5.1: Land use and land cover map of Uttar Dinajpur
(Source: Resourcesat-1&2 – Liss-3, Bhuvan India)

5.1 Forest Details

The Concentration of forests in the district of Uttar 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	2008-09	2009-10	2010-11	2011-12	2012-13
(1)	(2)	(3)	(4)	(5)	(6)	(7)
Area by Class of forest						
Reserved forest	Ha	207.49	207.49	512.71	512.71	512.71
Protected forest	"	126.38	126.38	312.29	312.29	312.29
Unclassed state forest	"	207.50	207.50	668.42	668.42	668.42
Khas forest	"	-	-	-	-	-
Vested waste land	"	-	-	-	-	-
Forest owned by corporate bodies	"	-	-	-	-	-
Forest owned by private individuals	"	-	-	-	-	-
Total		**541.37**	**541.37**	**1493.42**	**1493.42**	**1493.42**

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	2008-09	2009-10	2010-11	2011-12	2012-13
Forest Produce						
Timber	Thousand cu.metre	0.32	..	..	39.54	66.39
Fuel	"	0.08	..	..	..	-
Pole	Number	..	..	..	368	150
Revenue & Expenditure						

Item	Unit	2008-09	2009-10	2010-11	2011-12	2012-13
Revenue	Rs. in thousand	273	545	650	5703**	1365
Expenditure	"	180*	18000	21147	18462	5928

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

5.2 Agriculture & Irrigation

5.2.1 Agriculture

People of Uttar Dinajpur are primarily dependent on agriculture as the land is very much fertile. The main crops of the land of this area are paddy, jute, pulses and mustard. Jute is the main cash crop of the district. There has been a reducing trend in the last few years towards use of land for crop production. It is also observed that slowly but steadily tea plantation is increasing in the district which may affect agricultural lands at a great extent in future.

The region is predominated with rice cultivation with a variety of aus, aman and boro. Apart from rice the district has the experience of wheat, jute and sugarcane cultivation. Here, due to its diverse and surplus production of various crops like Tea, Jute, Potato, Ginger, Spices and Pineapple etc. the district has a strong base for agro based and horticulture- based industry. Periodic markets in rural areas have the potentiality to carryon marketing transaction of agricultural and horticultural produce which give the impetus for more production to farmers. So it is imperative to highlight the large agricultural potentials of the district and data regarding the area which is occupied under different principle crops has been given below. As some periodic markets operating in the region operate as a cattle market along with general commodities so it is also urgent to show the livestock status of the region. Nowadays the periodic markets of the district are the only source of variety of agricultural and horticultural produce. Mustatard are cultivated in winter season and largely disposed at periodic markets. So, it seems that periodic markets are the glimpse of agricultural and horticultural product of the district.

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

Crops		2008-09	2009-10	2010-11	2011-12	2012-13
Foodgrains:						
1.	**Rice**	**660.0**	**559.0**	**655.5**	**635.9**	**573.8**
	Aus	3.2	0.4	0.6	0.5	0.4
	Aman	404.1	375.6	467.3	446.6	436.7
	Boro	252.7	183.0	187.6	188.8	136.7

Crops		2008-09	2009-10	2010-11	2011-12	2012-13
2.	Wheat	75.6	92.6	98.3	89.2	89.3
3.	Barley	0.1	(b)	(b)	(b)	(b)
4.	Maize	153.9	193.8	157.5	166.9	224.7
5.	Other Cereals	1.8	0.1	0.2	0.1	0.2
	Total Cereals	**891.4**	**845.5**	**911.5**	**892.1**	**888.0**
6.	Gram	0.4	0.5	0.4	0.1	(b)
7.	Tur	(b)	-	(b)	(b)	-
8.	Other Pulses	2.8	3.6	2.9	1.3	2.7
	Total Pulses	**3.2**	**4.1**	**3.3**	**1.4**	**2.7**
Total Foodgrains		**894.6**	**849.6**	**914.8**	**893.5**	**890.7**
Oil Seeds :						
1.	Rapeseed & Mustard	22.4	41.4	35.0	33.7	41.7
2.	Linseed	0.3	0.3	0.2	0.3	0.2
3.	Other Oil seeds	0.9	1.1	1.3	0.9	1.1
Total Oil seeds :		**23.6**	**42.8**	**36.5**	**34.9**	**43.0**
Fibres :*						
1.	Jute	566.5	546.5	564.3	604.7	578.1
2.	Mesta	23.9	8.2	7.6	7.0	6.8
3.	Other Fibres	-	-	-	-	-
Total Fibres		**590.4**	**554.7**	**571.9**	**611.7**	**584.9**
Miscellaneous crops :						
1.	Sugarcane	48.8	-	95.6	112.4	100.2
2.	Potato	166.5	282.0	338.8	315.0	357.7
3.	Tobacco	-	-	-	-	-
4.	Tea	0.6	0.7(P)	0.7(P)	0.7(P)	..
5.	Chillies (dry)	6.6	6.6	6.6	6.9	7.4
6.	Ginger	2.6	2.6	2.6	2.7	2.7
Total Miscellaneous crops		**225.1**	**291.9**	**444.3**	**437.7**	**468.0**

*** In 1000 bales of 180 kgs each**
(b) Less than 50 tonnes

Sources: ***1) Directorate of Agriculture, Govt. of W.B.***
2) B.A.E.& S., Govt. of W.B.
3) Tea Board of India

The Yield rate of the principal crops in this district is given below;

Table 5.5: Yield rate of the principal crops in this district of Uttar Dinajpur from 2008-09 to 2012-13

Crops		2008-09	2009-10	2010-11	2011-12	2012-13
Foodgrains:						
1.	**Rice**	**2320**	**2180**	**2627**	**2699**	**2530**
	Aus	1554	1621	1872	1863	1782
	Aman	2147	2066	2631	2577	2467
	Boro	2682	2459	2620	3043	2758
2.	Wheat	2486	2696	2731	2414	2383
3.	Barley	1919	1129	1358	2010	2000
4.	Maize	5633	6030	5801	5593	5218
5.	Other Cereals	940	1100	1030	900	867
	Total Cereals	**2589**	**2617**	**2914**	**2949**	**2887**
6.	Gram	865	1457	875	1089	1400
7.	Tur	793	-	1094	448	-
8.	Other Pulses	677	835	693	554	760
	Total Pulses	**694**	**886**	**713**	**565**	**761**
Total Foodgrains		**2564**	**2593**	**2882**	**2929**	**2863**
Oil Seeds:						
1.	Rapeseed & Mustard	579	950	826	780	862
2.	Linseed	294	257	336	539	644
3.	Other Oil seeds	697	755	808	794	686
Total Oil seeds:		**576**	**928**	**818**	**778**	**855**
Fibres*:						
1.	Jute	12.4	12.5	13.0	13.4	13.0
2.	Mesta	9.5	10.3	9.1	7.7	8.7
3.	Other Fibres	-	-	-	-	-
Total Fibres		**12.2**	**12.5**	**12.9**	**13.3**	**12.9**
Miscellaneous crops :						
1.	Sugarcane	106087	-	98925	116395	104567
2.	Potato	18392	29097	29967	29452	30592
3.	Tobacco	-	-	-	-	-
4.	Tea	2019	1960	2003	2233	2532(E)**
5.	Chillies (dry)	963	965	967	980	1053
6.	Ginger	2197	2196	2196	2216	2219
Total Miscellaneous crops		**12575**	**16217**	**21464**	**21668**	**22373#**

Sources : ***1) Directorate of Agriculture, Govt. of W.B.***

**** In bales / hectare***

***** Figure of 'Terai' for calendar year 2013***

 # excluding figure of Tea

2) B.A.E.& S., Govt. of W.B.

3) Tea Board of India

From the upper mentioned tale it clear that the main revenue generate coming in this district is from the Agriculture. The principal crops are Rice, Wheat, Gram, Jute, Mastered, Potato, Maize, and Sugarcane. These all-agricultural crops are the revenue generated crops in Uttar Dinajpur. Maximum families in this district are depending upon the agriculture.

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.

Uttar Dinajpur district is one of the backward district of West Bengal whose economy mainly based on Agriculture. This district has 761 nos. backwards mouzas and total cultivable area is 2,60,947.00 ha. Strong Minor Irrigation activities have lifted the Irrigation status to a great extent during last decades.

In 2011-2012, 121.26 thousand 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 43.2% 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 Uttar Dinajpur district in particular and overall economic scenario in general.

The details of irrigation in the district of Uttar Dinajpur for the period 2008-09 to 2012-12, is shown hereunder table;

Table 5.6: Area (Thousand Hectors) Irrigated by different sources in the district of Uttar Dinajpur

Year	Area irrigated by									
	Govt.Canal	Tank	HDTW	MDTW	LDTW	STW	RLI	ODW	Others	Total
2008-09	8.47	2.70	3.53	0.79	0.10	72.97	3.61	-	6.98	99.15
2009-10	0.75	2.88	3.55	0.16	1.12	98.88	2.37	-	..	109.71
2010-11	0.04*	2.39	1.29	0.06	0.45	115.86	1.38	-	..	121.47
2011-12	1.70	2.47	1.29	0.06	0.45	113.96	1.33	-	..	121.26
2012-13	1.70	..	4.33	0.14	..	0.07**	1.46	-	..	7.70 (I)

** Irrigation suffered due to severe drought situation, ** Figure of only Own & Operated sources of irrigation*

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

Table 5.7: Sources of Irrigation in the district of Uttar Dinajpur (Number)

Year	Tank	HDTW	MDTW	LDTW	STW	RLI	ODW	Others
2008-09	3468	120	152	32	33234	86	-	54
2009-10	5013	153	7	48	39641	114	-	..
2010-11	3378	135	7	47	42175	110	-	..
2011-12	3403	135	7	47	41700	98	-	..
2012-13	..	106	7	..	12*	99	-	..

** Figure of only Own & Operated sources of irrigation*

N.B.: Figures are based on available information

Sources: 1) Irrigation & Waterways Directorate, Govt. of W.B.
2) Asstt. Engr.,(Agri. Mech.) & (Agri. Irri.), Uttar Dinajpur
3) W.B.S.M.I.C. Ltd.
4) A.D. A., All Blocks, Uttar Dinajpur

Note:HDTW = High capacity Deep Tubewell

MDTW =Middle capacity Deep Tubewell

LDTW = Low capacity Deep Tubewell

STW =Shallow Tubewell

RLI =River Lift Irrigation

ODW =Open Dug Well

5.3 Horticulture

Horticulture crops, fruits and vegetables are an important food supplement to the human diet as they provide the essential vitamins and mineral fibers required for maintaining health. Uttar Dinajpur district is ideally suited to a wide variety of soil conditions for growing a large variety of fruit and vegetable production in the district. Pineapple is the major crop in the district. Most of the fruit and vegetable are seasonal crops and are perishable in nature. In a favorable season there is a good market for chilly, ginger, different fruits and other seasonal vegetables. The surplus cannot is stored for the sale in the off season because insufficient cold storage can't store such large amount of perishable items. Thus the cultivation does not get the best price for their produce and have to sell their produce on the available rate, which they get from the local middle man in the district. The sale is further hampered because the marketing channel is not proper. At times there is complete loss to the farmers growing fruit and vegetables.

The major fruits and vegetable grown in the district of Uttar Dinajpur for the period 2008-09 to 2012-13, is shown hereunder table;

Table 5.8: Area and Production of Fruits in the district of Uttar Dinajpur

Name of Fruits	Area (Thousand hectares)					Production (Thousand tonnes)				
	2008-09	2009-10	2010-11	2011-12	2012-13	2008-09	2009-10	2010-11	2011-12	2012-13
Fruits :										
Mango	1.63	1.63	1.64	1.7	1.8	7.92	8.92	9.92	10.44	10.91
Banana	1.02	1.02	1.02	1.12	1.14	14.59	14.59	15.59	17.07	16.97
Pineapple	2.6	2.63	2.67	2.8	2.95	70.63	79.63	80.93	84.94	85.08
Papaya	0.55	0.55	0.56	0.57	0.59	11.85	11.85	11.93	12.88	14.18
Guava	0.53	0.53	0.53	0.57	0.58	5.53	6.53	6.82	6.95	6.95
Jackfruit	0.62	0.62	0.62	0.62	0.62	8.83	8.83	8.83	8.85	9.35
Litchi	0.6	0.6	0.6	0.64	0.65	4.78	4.78	4.78	5.62	5.72
Mandarin Orange	-	-	-	-	-	-	-	-	-	-
Other Citrus	0.14	0.14	0.14	0.15	0.16	1.31	1.32	1.32	1.65	1.67
Sapota	0.1	0.1	0.1	0.11	0.12	1.15	1.15	1.15	1.17	1.27
Others	1.01	1.01	1.02	1.05	1.07	5.07	5.16	5.23	5.21	6.6
Total	**8.8**	**8.83**	**8.9**	**9.33**	**9.68**	**131.66**	**142.76**	**146.5**	**154.78**	**158.7**

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

Table 5.9: Area and Production of Vegetables in the district of Uttar Dinajpur

Name of Vegetables	Area (Thousand hectares)					Production (Thousand tonnes)				
	2008-09	2009-10	2010-11	2011-12	2012-13	2008-09	2009-10	2010-11	2011-12	2012-13
Vegetables:										
Tomato	2.23	2.35	2.38	2.48	2.46	27.93	30.93	31.33	32.6	33.5
Cabbage	3.68	3.68	3.73	3.75	3.81	69.31	89.31	90.56	91.56	95.14
Cauliflower	3.11	3.11	3.15	3.25	3.33	48.4	68.4	69.31	71.51	80.15
Peas	0.63	0.63	0.64	0.65	0.66	3.28	3.28	3.38	3.18	3.18
Brinjal	9.19	9.19	6.72	9.38	9.59	145	145	119.33	155.51	159.23
Onion	0.63	1.17	1.19	0.64	0.65	6.63	14.31	14.69	7	7.5
Cucurbits	3.09	3.19	3.24	4.33	4.38	29.85	41.85	43.42	45.92	46.38
Ladies Finger	1.17	0.63	0.63	1.19	1.33	16.31	6.63	6.82	14.69	16.43
Radish	2.02	2.02	0.42	2.1	2.27	20.69	20.69	4.37	22.37	24.15
Others	7.9	7.78	16.17	7.98	8.07	45.28	34.28	81.73	37.82	40.06
Total	**33.65**	**33.75**	**38.27**	**35.75**	**36.55**	**412.68**	**454.68**	**464.94**	**482.16**	**505.72**

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

Table 5.10: Area and Production of Flowers in the district of Uttar Dinajpur

Name of Flowers	Area (Thousand Hectares)					Production (Crore Cut Flower/" 000 MT				
	2008-09	2009-10	2010-11	2011-12	2012-13	2008-09	2009-10	2010-11	2011-12	2012-13
Rose	0.023	0.023	0.023	0.024	0.025	0.300	0.300	0.300	0.324	0.326
Chrysanthemum	-	-	-	-	-	-	-	-	-	-
Gladiolus	0.025	0.025	0.025	0.028	0.048	0.135	0.135	0.135	0.150	0.350
Tuberose	0.017	0.017	0.018	0.020	0.030	0.293	0.293	0.313	0.493	0.543
Marigold	0.078	0.078	0.078	0.089	0.094	0.553	0.553	0.553	0.697	0.722
Jasmine	-	-	-	-	-	-	-	-	-	-
Seasonal Flower	0.002	0.002	0.003	0.003	0.006	0.003	0.003	0.004	0.005	0.010
Misc. Flower	0.020	0.020	0.020	0.026	0.030	0.030	0.030	0.030	0.040	0.045

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

5.4 Mining

This area is comprising 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 have studied in this region.

6 Geology of the district

The Uttar Dinajpur district is a narrow central part of the north Bengal plains. Geomorphologically the central and western part of the district cover an area of instanced fluvial activity and the area is drained by the Mahananda River with its tributaries and distributaries. Numerous large water bodies that are remnants of back swamps or abundant streams are locally known as 'Bils'. These are very much conspicuous in the central part of the district. Isolated remnants of the dissected piedmont fans are recorded in the north and along the eastern part of the district. Topographically they occupy higher level and are not flood prone. In the northern part the area is well above the region is a fluvial activity and is well drained, utilized for tea and pineapple plantation.

The inactive flood plains constitute the higher terrace levels that are normally not inundated by flood waters. Paleo channels, meander scrolls, levees, back swamps and marsh land are the characteristic features of this plain which is inundated during high flood. Active flood plains are normally inundated during floods.

Geomorphologically the terrain consists of five stratigraphic units, of which the Chalsa formation is the oldest. Overlapping the Chalsa formation to the south is the older Baikunthapur formation. To the south in the adjoined south Dinajpur district this sandy horizon passes into silty and clay horizon of Barind upland. The Shaugaon formation of the Teesta - Mahananda fan to the north continues as a low-level terrace flanking the Mahananda River. The terrace is presently occurring in an active flood plain.

Neo-tectonic movements are manifested in various land forms through a wide spectrum of signature. Many of these have laid to environmental hazards in the past as witnessed by the changes in the course during the historical period. The effects of Neo-tectonism also include selective terracing and gully erosion. Antecedent drainage is observed in all the stream courses.

Geologically Uttar Dinajpur district is rather a featureless plain consisting entirely of alluvium. The area forms part of the great barind or Pleistocene (older) alluvium, which is the largest of the alluvial units of the Bengal Basin. At the surface, this older alluvium is covered by the flood plains of the various rivers, which flow towards the south across the district. Some of these rivers with headwaters in the Himalayan foothills have deposited a broad piedmont alluvial plain, which overlap the Barind in the north. These rivers flow over the barind and they have generally developed entrenched meanders.

The barind consists of well-oxidized, massive reddish colored argillaceous formations at the surface. Kankar and ferruginous concretions are commonly found in these formations. The thickness of these alluvial formations is not clearly known. It is generally agreed that the area of which this district forms a part, lays a gap between the Garo and Rajmahal hills filled up by alluvium in comparatively late geological times. Due to the great earthquake on the 12th June, 1897, with its epicenter at the Shillong plateau, the area cracks up to a mile in length and up to a few feet in width opened all over low lying lands.

The alluvium can be divided into two groups- khadar and bhangar. The newer alluvium is termed as khadar. It is fertile in nature and suitable for growing various types of crops. It is washed by river water during flood so the water holding capacity is very high. Bhangar is found far away from the river course normally at higher elevation. This older alluvium is not so much fertile like khadar. The proportion of soil pore spaces is negligible.

The area comprises a thick sequence of alluvial fan and river valley deposits of Holocene age. Litho-stratigraphic classifications of Late Quaternary sediments have been made taking mostly morphological criteria to establish different morpho-stratigraphic units. Based on degree of oxidation and grain size variation, the delineated morpho-stratigraphic units are correlated to three broad units namely Barind, Baikunthapur, and Shaugaon Formations. Barind Formation, the oldest litho-unit representing Older Alluvium of late Pleistocene-early Holocene occupies entire South Dinajpur district and small part of adjoining Uttar Dinajpur district. The litho-unit consists predominantly of clay deposit intercalated with fine discrete lenses of sand beds. The clay deposit grades from pale brownish to reddish grey in color and is deeply oxidized to form both calcrete and ferricrete. The former occurs mostly along the peripheral part of the unit, while the latter is confined mostly in the elevated central part around Balurghat.

The younger Baikunthapur Formation representing Newer Alluvium comprises an extensive fan deposit of mid-late Holocene that covers mostly the entire Uttar Dinajpur district. Image interpretation, supported by ground observations led to the identification of two members of Baikunthapur Formation in the area. The lower Baikunthapur Member represents predominantly micaceous medium sand with pebble horizons of older meander belt and flood basin deposits in the north and sand-silt dominated upper Baikunthapur Member represents younger stabilized meander belt-flood basin and major valley fills deposits in the south.

The Shaugaon Formation represents recent flood plain deposits of major channels. The formation, however, comprises older flood plain and terrace deposits of silty sand as lower Shaugaon Member, and younger flood plain deposits of sand silt and clay as upper Shaugaon Member. Two sets of prominent lineaments were depicted based on tonal differences caused by linear arrangement of distinct relief and drainage features. Of the two sets, ENE-WSW lineament is predominant and found mostly in Baikunthapur Formation. The other NW-SE set is less frequent and found both in Baikunthapur as well as in Barind Formations.

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

Litho-stratigraphic 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

Litho-stratigraphic Unit		Subunit	Depositional Environment	Surficial lithology	Age
		b) Older flood plain deposits / Terrace	Older valleys	Silty sand	
	Baikunthapur Formation	**Upper:** Meander belt deposits	Channel-inter-channel 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

Source: Geological Survey of India, CHQ.

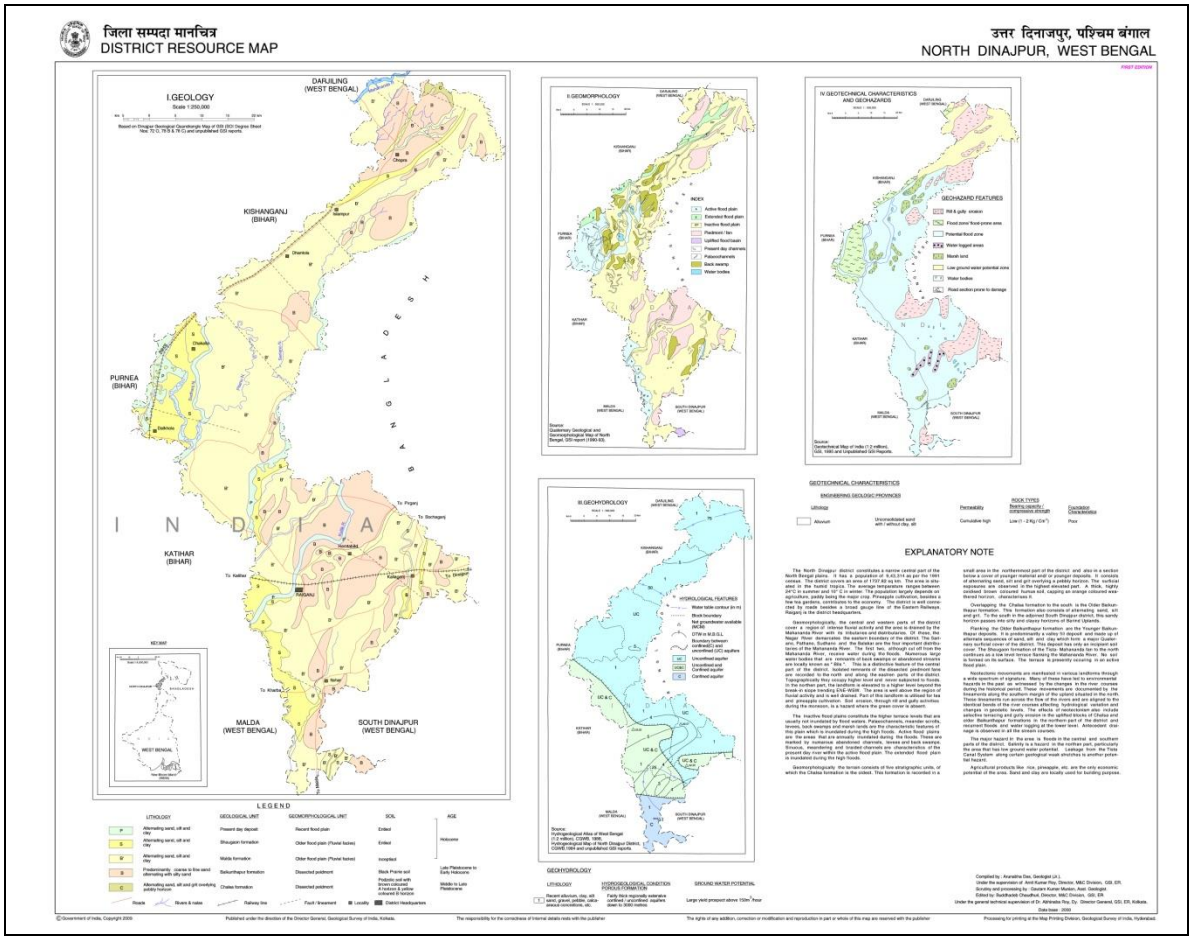


Figure 6.1: Geological Map of Uttar Dinajpur

7 Mineral Wealth

7.1 Overview of mineral resources

The district is free from any underground deposits of minerals or mining product. This area is comprising with thick sequence of alluvial fan and river valley deposits.

7.2 Details of Resource

7.2.1 Sand and other River bed minerals (Minor Mineral)

I. Drainage System

A large number of rivers are flowing over the districts in a southerly direction. The main rivers are Mahananda, Nagar, Sui, Gamari, Kulik, Chirramati and Tangon. The water level of the rivers generally rises during rainy season. Due to uneven distribution of rainfall over time and area, floods or flood like situation cannot be ruled out. The area is an undulating plain intersected with ravines. They are locally called kharis. Tanks form a striking feature of the district which vary from large tanks to insignificant ponds. There are also a number of marshes or bills, formed by the overflowing rivers. As the district is narrow in shape, length of the rivers flowing through this region is very short.

RIVER MAHANANDA

The river Mahananda forms the northern boundary of the district for a few kilometres along its course. After this, it bends to the south-westerly direction. It then leaves the district and after flowing through the district of Purnea, it again is joined by river Nagar at a place called Mukundapur situated in police station Itahar. From this point, the combined stream of the Nagar and the Mahananda forms the south-western boundary of Raiganj and Itahar blocks, and enters Maldah district. The total length of the river in this district is 40-45 kilometres. During the greater part of the year, the water flows only along a very narrow channel leaving most of the bed dry. During rainy season, the entire channel is full of water. Occasionally during heavy rainfall parts of the Itahar police station, become inundated by the overflowing of the Mahananda water. The direction of flow of the river as a whole is generally from north to south, but the direction changes at a few points on account of the meandering course of the river.

RIVER NAGRI

Nagri is another important river of the district. It originated in the northern part of Dinajpur district in Bangladesh. It flows through the district forming the boundary between the police stations of Karandighi and Raiganj. It joins with the Mahananda River near Mukundapur police station of the Itahar block. During flood, high flood level of river Nagar rises up to 31.08 meters, against the danger level of 32.00 m in Karandighi block. The river bed is wide enough,

but the water is confined in a narrow channel throughout the year. The principal tributaries of river Nagar flowing through the district are the Nona or the Gandhar and the Kulik. River Kulik joins river Nagar at a point which is about 11 kilometres in the south West of Raiganj town and it flows through Hemtabad and Raiganj police station.

RIVER SUI

River Sui is a branch of the principal river Nagar. Nagar joins the Mahananda, in police station Itahar. It maintains a parallel flow with the Mahananda River. This river plays a vital role on the irrigational practices throughout the region. High flood level of river Sui was 29.08 meters, while danger level was 27.3 meters in Itahar block. Generally, Itahar is the worst affected block of the district during the flood time. The width of the river bed stretches from 24 to 30 meters and variations in the water level between dry and rainy seasons are between 0 and 5 meters.

GAMARI RIVER

Gamari River originates from Radhaniparabil areas in police station Kaliaganj and flowing through a meandering course, meets the river Sui near Barot in Itahar police station. The width of the river bed is about 24 metres and the water level varies between 1 and 3 meters. Small boats ply during the monsoons in both the rivers Sui and Gamari.

RIVER CHHIRAMATI

The Chhiramati, called Shrimati in the lower reaches gets its water from some marshes in the south western part of the police station Kaliaganj. After flowing through about 5 kilometers in Itahar police station, the river enters the district of Malda. It is a sluggish stream of less importance.

Tanks are quite prevalent in the district especially in the south. They vary in size from splendid stretches of water, which might be called lakes to small and insignificant ponds. There are also a number of marshes or bills, formed by the overflowing rivers. These tanks provide water for daily uses, pisciculture and also for irrigation. Water of some tanks may be used for the purpose of drinking but it is likely, with the installation of numerous tube wells that the water of tank has ceased to be a major source of supply of drinking water. The silted up portions are also being brought under cultivation by the local cultivators. The water is full of weeds and reeds. All the rivers become furious during floods. Due to siltation, capacity of holding excess water of the rivers has been awfully reduced. Height of the present existing embankment is not sufficient enough to hold the excess flood water.

RIVER TANGON

Rising from Bangladesh, Tangon enters the district of Uttar Dinajpur at the bi-junction point of Bangladesh and Kaliaganj. Flowing through Kaliaganj for some distance it soon enters Dakshin Dinajpur. It is a fairly large river and navigable by boats throughout the year.

RIVER KULIK

River Kulik enters district Uttar Dinajpur in a North- South flow from Bangladesh creating the natural boundary between C. D. Blocks Raiganj and Hemtabad. The river meeting with another small stream passes beside the Raiganj Town. The famous Raiganj Bird Sanctuary with its lush green vegetation is situated on the bank of river Kulik.

RIVER DAHUK

Dahuk River has originated from Bangladesh enters India towardsNorth-eastern side of Uttar Athakhai village. It flows to the Uttar Dinajpur district in direction of north-eastto south-west and declined in Mahananda River at Bihar.

RIVER BAIRANG

Bairang River has originated in Raiganj, West Bengal. It is very Small River with compare to other rivers flowing in district.

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	MAHANANDA RIVER	8.78	0.28
2	NAGRI RIVER	10.2	0.32
3	BAIRANGNADI	0.934957	0.03
4	TANGON RIVER	1.181008	0.04
5	DAHUKNADI	2.34	0.07

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
1	MAHANANDA RIVER	17.65	Paglajhora Falls on Mahaldiram Hill	2100 m
2	NAGRI RIVER	72.51	Bogra District, Bangladesh	20 m
3	BAIRANGNADI	11.36	West Bengal	40 m
4	TANGON RIVER	12.21	Jalpaiguri, West Bengal	89 m
5	DAHUKNADI	24.13	Panchagarh District, Bangladesh	46 m

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 Uttar Dinajpur district

Name of the River or Stream	Place of origin
Mahananda River	Paglajhora Falls on Mahaldiram Hill
Nagri River	Bogra District, Bangladesh
BairangNadi	West Bengal
Tangon River	Jalpaiguri, West Bengal
Dahuk Nadi	Panchagarh District, Bangladesh

ii) Catchment Area

Uttar Dinajpur district has a flat topography and slopes gently from north to south. All rivers flow in that direction, except for the eastern fringes of Chopra CD Block. The district of

Uttar Dinajpur is located entirely within the catchment of the Mahananda River, which occupies a low entrenched valley between the major alluvial fans of the Kosi and the Tista over much of its course. The main rivers are: Nagar, Mahananda, Kulik, Gamari, Chhiramati (Srimati) and Tangon. The rivers have little water in the dry season but with heavy rains, during monsoon, overflow the banks. The Nagar River flows along the international border with Bangladesh on the east of Islampur CD Block. The Sanauna, Dalaucha and Raba rivers flow through Islampur CD Block Approximately 134.4 km of the India-Bangladesh border.

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 Uttar Dinajpur district along with the distribution of the section lines are shown in Figure 7.1.

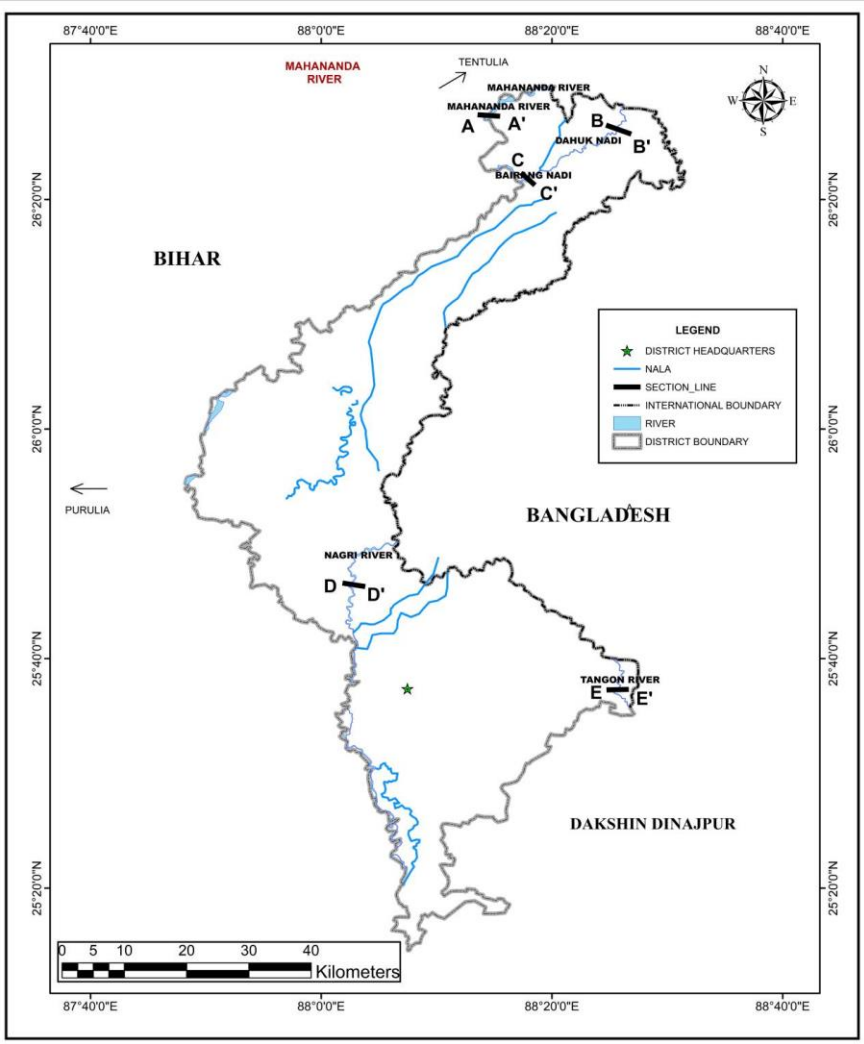


Figure 7.1: Plan showing the major rivers along with the distribution of Section Lines

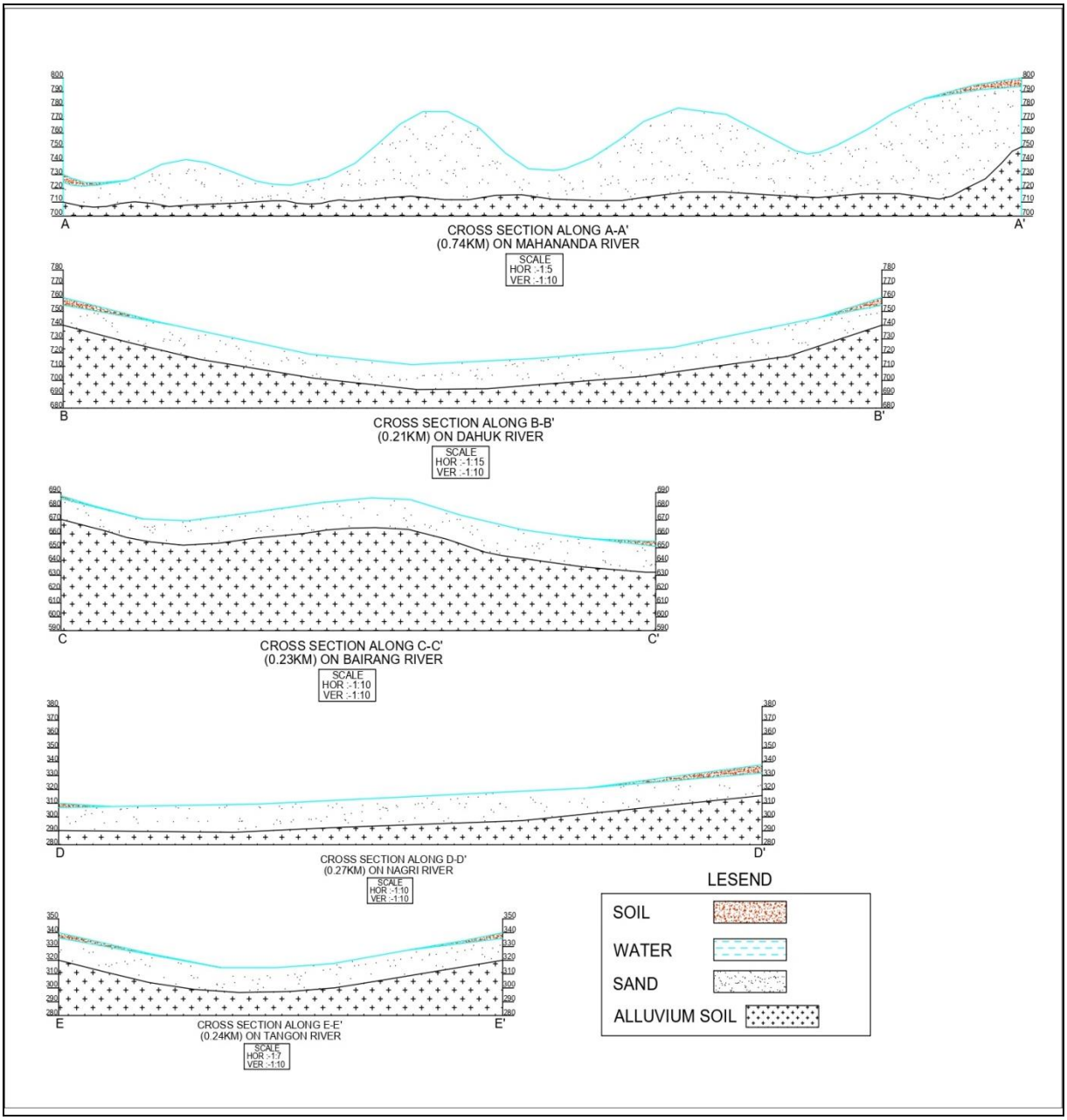


Figure 7.2: River cross section during pre monsoon period

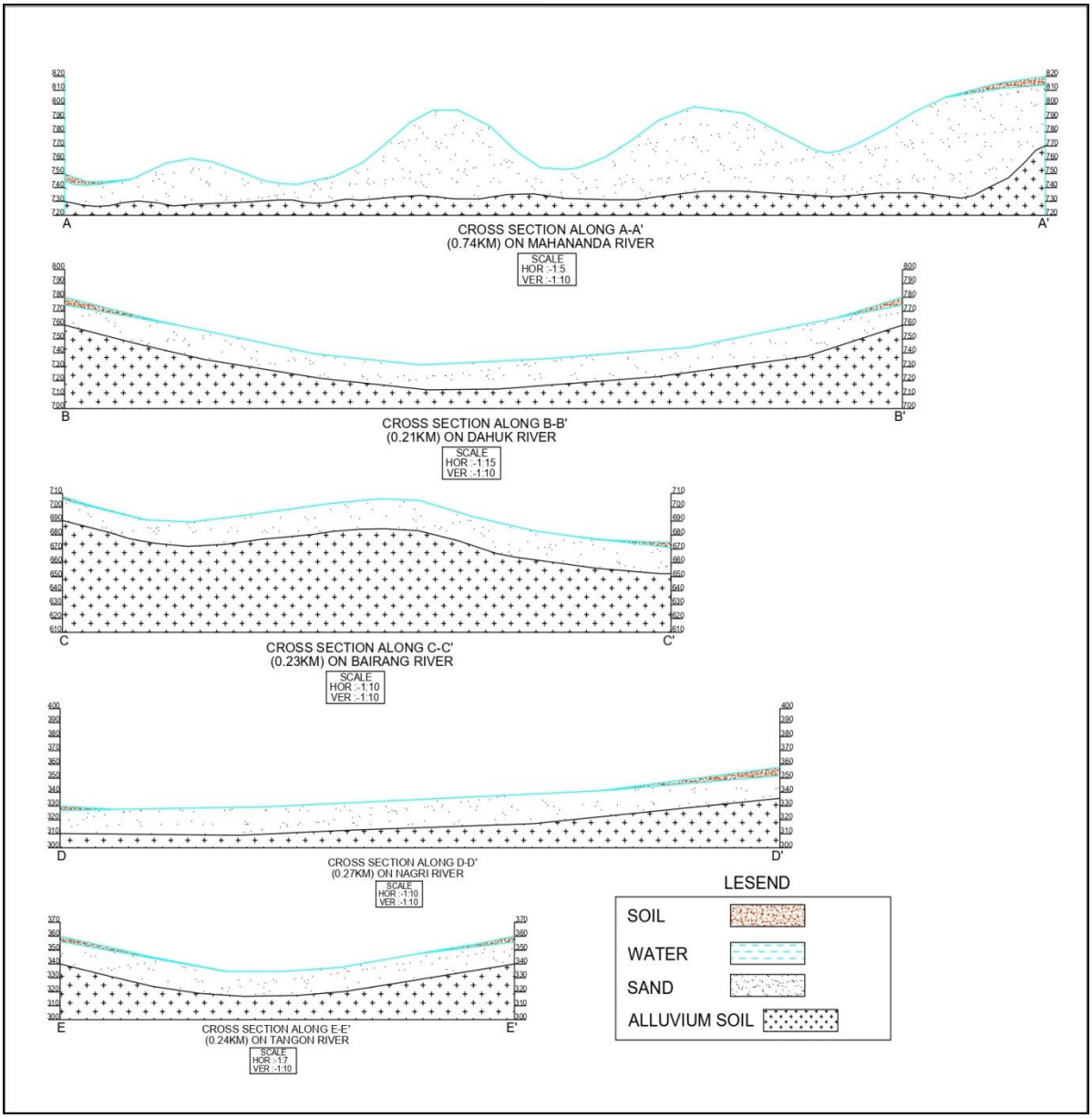


Figure 7.3: River cross section during post monsoon period

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

5. Sediment Yield

The water that reaches a stream and its tributaries carries sediment eroded from the entire area drained by it. The total amount of erosional debris exported from such a drainage basin is its sediment load or sediment discharge and the sediment yield is the sediment discharge divided by the total drainage area of the river upstream of the cross section at which the sediment discharge is measured or estimated. Sediment yield is generally expressed as a volume or weight per unit area of drainage basin—e.g., as tons per square kilometer. 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. 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 difference 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 investigation

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 collation was carried out during May- June 2020 for all the river Ghats on continuous basis for pre monsoon period and October- November 2020 for all the river Ghats on continuous basis for post monsoon period. 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 derive the size frequency analysis.

Figure 7.4: Site View of River Mahananda

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 Uttar 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 rivers of the Uttar Dinajpur district are Mahananda, Tangon, Dahuk, Bairang, and Nagri. Planning has been done for systematic sand mining in the rivers.

From the satellite imagery as well as ground survey during pre monsoon period, altogether 74sand bars are identified in Uttar Dinajpur district. Whereas during post monsoon period, altogether 75 sand bars are identified in Uttar Dinajpur district.

While calculation of the areas of sand bar, a classification system has been adopted with three categories of land identified within the channel areas which 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 Uttar 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 Uttar 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 and Post Monsoon period for different rivers of Uttar Dinajpur district

River Name	Pre-Monsoon no of ghats	Post-Monsoon no of ghats	Pre-Monsoon Sediment Load (Mcum)	Post Monsoon Sediment Load (Mcum)	Variance (Mcum)	Variance (%)
Mahananda	11	11	1.67	1.69	0.02	1.21
Dahuk	11	11	0.44	0.50	0.06	13.67
Tangon	6	6	0.14	0.15	0.01	7.14
Fulhar	6	7	4.57	5.42	0.85	18.52
Nagri	40	40	4.04	3.88	-0.16	-3.96
Total =	74	75	10.86	11.64	0.78	7.15

Thus in Uttar Dinajpur district, about 0.78 Million cum of sand has been found as an incremental volume when compared between pre and post monsoon sand reserve data. Therefore, replenishment and aggradation rate for the year comes to about 107.15% for the year.

Long-term satellite imagery study has also been carried out for sand producing rivers of Murshidabad 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 Nagri River,

Uttar Dinajpur has been prepared and furnished as Plate No. 5B. Map shows changes in river channel through erosion and accretion of river bank and in the process of generating Ox-bow Lake as compare between 1985 and 2022 river courses.

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 the 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	%
Paschim Dangapara	Mahananda	60500.00	91.00	2.80	169400.00	88.20	90.83	2.63	159236.00	0.17	94.00%
Chittalghata	Mahananda	38900.00	78.00	2.80	108920.00	75.20	77.85	2.65	103038.32	0.15	94.60%
Gulandhar	Mahananda	2500.00	29.00	2.90	7250.00	26.10	28.86	2.76	6894.75	0.14	95.10%
Dakshin Ariagaon	Dahuk	18000.00	71.00	2.90	52200.00	68.10	70.83	2.73	49068.00	0.17	94.00%
Chopra	Dahuk	45000.00	68.00	3.00	135000.00	65.00	67.84	2.84	127980.00	0.16	94.80%
Bogdura	Tangon	20300.00	33.00	2.90	58870.00	30.10	32.85	2.75	55808.76	0.15	94.80%
Faridpur	Tangon	2600.00	31.00	3.00	7800.00	28.00	30.84	2.84	7378.80	0.16	94.60%
Average rate of replenishment											94.56

Therefore, replenishment rate for the year comes to about 94.56% for the year.

C. Replenishment estimation based on a 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 depend 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 evapo-transpiration operating on the catchment.

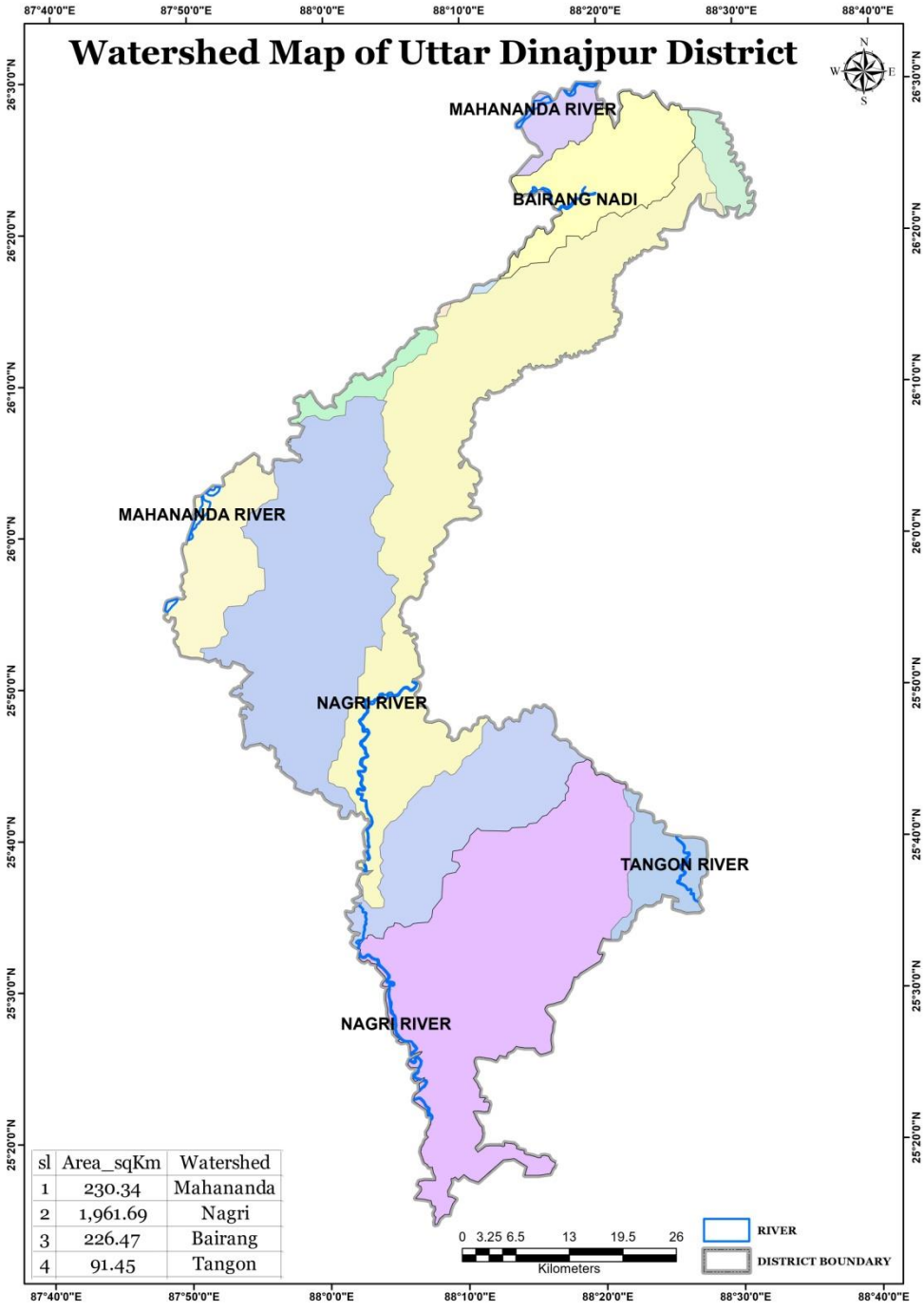


Figure 7.5: Watershed map of Uttar Dinajpur District

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 characteristics. 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 as given below:

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
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

Total monsoon rainfall (mm)	Runoff coefficient (%)			Total monsoon rainfall (mm)	Runoff coefficient (%)		
	Good catchment	Average catchment	Bad catchment		Good catchment	Average catchment	Bad catchment
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,

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

Ackers and White Equation:

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

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

The dimensionless particle d_{gr} is calculated by:

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

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

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

Where,

A_1 = **Critical particle mobility factor**

C_s = Concentration coefficient in the sediment transport function
C_t = Total sediment concentration
d_{50} = Median grain size
d_{gr} = Dimensionless particle diameter
F_{gr} = Particle mobility parameter
g = Acceleration of gravity
D_s, S_g = Specific gravity
h = Water depth
m = Exponent in the sediment transport function
n' = Manning roughness coefficient
U_* = Shear velocity
V = Mean flow velocity
ν = Kinematic viscosity

Meyer – Peter's equation:

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

$$g_b = 0.417[\tau 0\ (\eta'/\ \eta)^{1.5} - \tau c]^{1.5}$$

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 11 cumecs, and 0.0225 for lower discharges.

τc = Critical shear stress required to move the grain in N/m2 and given by equation τc = 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 = 0.97 γwRS. 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 occurred as the velocity decreases along with its ability to 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 water expands, the depth decreases, the velocity is reduced, and eventually even fine sediments begin to deposit. As a result, deltas may be formed in the upper portion of reservoirs. The deposited material may later be moved to deeper portions of the reservoir by hydraulic processes within the water body.

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

1. Dendy – Bolton Equation
2. Yang Equations
3. Engelund-Hansen Equation
4. Modified Universal Soil Loss Equation (MUSLE)

Dendy – Bolton Equation (Source: Hydrologic Engineering Center):

Dendy – Bolton formula is often used to calculate the sedimentation 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:

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

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 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 for preliminary watershed planning. Computed sediment yields normally would be low for highly erosive areas and high for well stabilized drainage basins with high vegetation density because the equations are derived from average values. The equations express the general relationships between sediment yield, runoff, and drainage area. Many variables influence sediment yield from a drainage basin. They include climate, drainage area, soils, geology, topography, vegetation and land use. The effect of any of these variables may vary greatly from one geographic location to another, and the relative importance of controlling factors often varies within a given land resource area. Studies revealed that sediment yield per unit area generally decreases as drainage area increases. As drainage area increases, average land slopes usually decrease; and there is less probability of an intense rainstorm over the entire basin. Both phenomena tend to 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 an estimate of sheet and rill soil movement down a uniform slope using rain- fall energy as the erosive force acting on the soil (Wischmeier and Smith 1978). Depending on soil characteristics (texture, structure, organic matter, and permeability), some soils erode easily while others are inherently more resistant to the erosive action of rainfall.

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

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

Where,

Y = sediment yield of stream (t/yr/km^2),

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:

Geomorphologically the Uttar Dinajpur district is more or less a plain land which is a fertile tract suitable for growing rice and jute. The average elevation is 15 m above mean sea level. The slope of the land is from north to south by less than 10 m/sq. km., shown by the trend of the river. It is a flat alluvial plain of the Gangetic delta.

The major sand producing rivers of the Uttar Dinajpur district are Mahananda, Tangon, Dahuk, Bairang, and Nagri. 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 1524 mm 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.
- Sedimentation 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 tabulated below.

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

Estimation parameter	Mahananda	Nagri	Bairang	Tangon
Catchment Area (m^2)	230340000	1961690000	226470000	91450000
Annual Rainfall (m) (in 2020)	1.987	1.987	1.987	1.987
Strange Runoff coefficient (%)	45%	45%	45%	45%
Annual Run-off (m) (in 2020)	0.43714	0.43714	0.43714	0.43714

Estimation parameter	Mahananda	Nagri	Bairang	Tangon
Catchment Yield (m³)	205958511	1754045114	202498150.5	81770017.5
Peak Flood Discharge (m³/sec)	22436663.16	111854646.52	22153342.20	11221968.06
Flow depth d (m)	1	0.5	0.5	0.6
Channel width b (m)	112.75	66.47	5.13	9.56
Mean velocity v (m/s)	0.1	0.06	0.06	0.07
Channel slope S_o (m/m)	0.01	0.01	0.01	0.01
Sediment Yield (Tons/year)	1981.7	12455.49	1952.44	875.67
Estimated Annual Replenishment (in million m3)	0.03711	0.23325	0.03656	0.01640

Sedimentation rate of a river is dependent on the annual rainfall of the district. Year-wise sedimentation rate for last 4 years in each river has been calculated as below.

Table 7.8: Year-wise sedimentation rate for last 4 years of each river

Year	Mahananda	Nagri	Bairang	Tangon
2017	11.33	8.36	11.35	12.61
2018	47.49	35.05	47.59	52.86
2019	32.87	24.26	32.94	36.58
2020	8.6	6.35	8.62	9.58

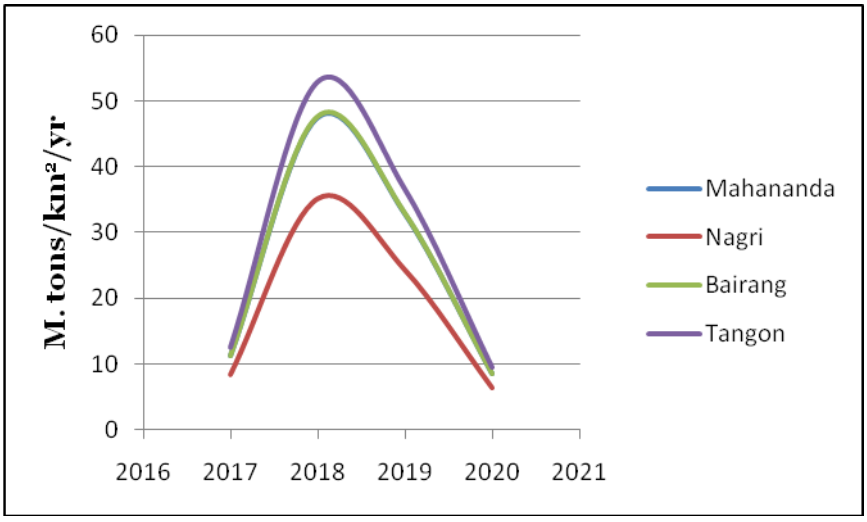


Figure 7.6: Graphical representation of year-wise sedimentation rate

The estimation of sedimentation rate 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	%
Paschim Dangapara	Mahananda	60500.00	91.00	2.80	169400.00	1.99	123662.00	73.00%
Chittalghata	Mahananda	38900.00	78.00	2.80	108920.00		81690.00	75.00%
Gulandhar	Mahananda	2500.00	29.00	2.90	7250.00		5510.00	76.00%
Dakshin Ariagaon	Dahuk	18000.00	71.00	2.90	52200.00		37584.00	72.00%
Chopra	Dahuk	45000.00	68.00	3.00	135000.00		102600.00	76.00%
Bogdura	Tangon	20300.00	33.00	2.90	58870.00		43563.80	74.00%
Faridpur	Tangon	2600.00	31.00	3.00	7800.00		6084.00	78.00%

Theoretical Replenishment study based on mining lease shows variations from 72% to 78% with an average of 74.8% 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	Tangon	River Name	Tangon
River	Tangon	Location	Bogdura	Location	Bogdura
Total Pre-monsoon Sand Bar Area	100462 (sq.m)	Mining Area	20300 (Sq.m)	Lease Area	20300 (Sq.m)
Average Pre monsoon Thickness	1.4 (m)	Pre monsoon RL	33 (m)	Surface RL Before mining	33 (m)
Total Sand Volume	.14 (Mcum)	Sand Thickness	2.90 (m)	Mine out Thickness	2.90 (m)
Total Post-monsoon	100462 (sq.m)	Volume	58870.00	Mine out Volume (Cum)	58870.00

Based on Satellite imageries		Based on field investigation		Based on empirical formula	
Sand Bar Area		excavated (Cum)			
Average Post-monsoon Thickness	1.5 (m)	Post monsoon RL	32.85 (m)	Drainage area for lease block	0.220 (Sq.km)
Total Sand Volume	0.15 (M.cum)	Thickness	2.75 (m)	Monsoon Rainfall-2020	1.99 (m)
Pre and Post monsoon Volume Difference	0.02 (M.cum)	Volume deposited (Cum)	55808.76	Estimated Volume as per Dendy- Bolton (S = 1280 Q0.46[1.43 - 0.26 log(A)]) Where, Q is runoff, A is drainage area)	43563.80 (Cum)
Replenishment and Agrredation %	107%	Replenishment Rate	94.80%	Replenishment Rate	74.0%

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	Mahananda	Dahuk	Tangon
Estimated Annual Replenishment based on Satellite imagery **(*)**	101.21%	113.67%	107.14%
Estimated Annual Replenishment based on field investigation	94.57%	94.40%	94.70%
Estimated Annual Replenishment based on empirical formula	74.67%	74.0%	76.0%

(*) 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 Uttar Dinajpur district are Mahananda, Tangon, Dahuk, Bairang, and Nagri.

B. Geological studies

i) Lithology of the catchment area

The Uttar Dinajpur district is a narrow central part of the north Bengal plains. Geologically Uttar Dinajpur district is rather a featureless plain consisting entirely of alluvium. The area forms part of the great barind or Pleistocene (older) alluvium, which is the largest of the alluvial units of the Bengal Basin. At the surface, this older alluvium is covered by the flood plains of the various rivers.

ii) Tectonics and structural behavior of rocks

The district falls under the Seismic Zone IV (in a scale of I to V in ascending order of propensity f Seismic Activity), making it very prone to the earthquakes (Source: Census, 2011). Neotectonic activities have been reported in other areas apart from eastern Himalayan fore-deep in vast quaternary plains of Malda, South Dinajpur and Uttar Dinajpur districts which may be attributed to the presence of causative fault sources. The Number of subsurface faults like Ganges Bengal Fault (GBF), Malda Kishenganj Fault (MKF), Jangipur-Gaibandha Fault, Tista Fault and Katihar-Nailphamari Fault, Debagram Bogra Fault etc has been delineated through geophysical studies in North Bengal plains.

The geological formations of the district show the predominance of several tectonic units. Two sets of prominent lineaments were depicted based on tonal differences caused by linear arrangement of distinct relief and drainage features. Of the two sets, ENE-WSW lineament is predominant and found mostly in Baikunthapur Formation. The other NW-SE set is less frequent.

C. Climate Factors

i) Intensity of rainfall

Uttar Dinajpur gets about 1592 mm rainfall annually between 2016 to 2020. The maximum rainfall in the area as per IMD data was recorded in the month of June and July followed by August. 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. The intensity of rainfall due to depressions sometimes becomes very great and may cause enhanced soil erosion in the district

ii) Climate zone

The Uttar Dinajpur falls under the group of North Bengal Plain region. Climatically it may be called as Tropical per Humid Zone. The climate of the area is tropical per humid with mean annual temperature of 24.4° C and mean annual rainfall of 851mm.

iii) Temperature variation

This district lies in near Himalayan foothills. So the climate is not too much hot. The minimum temperature of the district lies within the range of 12°C and 29°C in the month of January and August respectively and maximum temperature lies within 23°C and 37°C in the month of January and June 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 prohibited 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

Sl. 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 meter)	Area recommended for mineral concession (in Sq.m)	Mineable mineral potential (in Mcum) (60% of total mineral potential)	Considered Thickness (m)
1	MAHANANDA RIVER	31.10	9979.00	112.75	1125107.00	1.01	1.50
2	DAHUK RIVER	7.41	23772.00	9.54	226810.00	0.34	2.50
3	FULHAR RIVER	1.70	9125.00	237.41	2166386.00	3.25	2.50
4	NAGRI RIVER	18.83	29203.00	66.47	1941158.00	1.75	1.50
5	TANGON RIVER	4.50	10506.00	9.56	100462.00	0.09	1.50

III. Riverbed Mineral Potential

Good quantities of quality sands are found to occur in part of Mahananda, Nagri, Tangon, Dahuk, Bairangetc Rivers. Smaller patches are also available locally in the other smaller rivers as well.

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)
NA	NA	6.44	6.44

Based on satellite imagery study and field investigation, potential zones for riverbed deposits for each river of the district have been identified and the details of the zones are provided in Table 7.14.

Table 7.14: Potential Zone of Riverbed Mineral

Sl. No	Rivers or Streams	Location of potential zones					Area within prohibited zone as per rule 3 of WBMMC Rules, 2016 (in Sq.m.)
		Administrative Block	Mouza &JL No	ZONE	Co-ordinates		
					LATITUDE	LONGITUDE	
1	MAHANANDA RIVER	CHOPRA	PURBADANGAPARA(011), PASCHIM DANGAPARA(010), BOROBILA(009), CHITALGHATA(001)	ZONE 1	26°29'46.606"N	88°19'52.806"E	235615
					26°26'57.456"N	88°14'15.504"E	
2	DAHUK RIVER	CHOPRA	UTTAR JAYPURA(057), PASCHIM JIBHAKATA(058), LALITGACHH(070), DAKSHIN BESARBARI(068), NARAYANPUR(034), DALUA(027)	ZONE 2	26°26'45.526"N	88°26'3.474"E	32634
					26°21'30.809"N	88°17'10.842"E	
3	FULHAR RIVER	GOALPOKHAR-II	PURLA BARI, MANJHOK, LALBARI, FASHIADIATION	ZONE 3	26°03'22.09"N	87°52'17.785"E	197558
					25°55'21.905"N	87°48'14.666"E	
4	NAGRI RIVER	RAIGANJ	BARDAHI, BADKOL(006), KHARIBADKOL(005), KHLIARA ANANTAPUR, JOTILAMAT, KACHANBARI(019)	ZONE 4	25°50'19.945"N	88°06'32.505"E	164957
					25°45'56.384"N	88°02'18.195"E	
5		RAIGANJ	PASCHIM GOBINDAPUR(021), MAKDAMPUR(061), SHITALPUR(062), BILASPUR, PAIKPARA	ZONE 5	25°45'49.737"N	88°03'03.951"E	109279
					25°42'08.09"N	88°02'03.346"E	

Sl. No	Rivers or Streams	Location of potential zones					Area within prohibited zone as per rule 3 of WBMMC Rules, 2016 (in Sq.m.)
		Administrative Block	Mouza &JL No	ZONE	Co-ordinates		
					LATITUDE	LONGITUDE	
6		RAIGANJ	MAHIGRAM(070), MERAN(072), SHIALTOR(074), AULABARI(075)	ZONE 6	25°40'01.458"N	88°03'00.323"E	13358
					25°37'56.564"N	88°2'34.283"E	
7	TANGON RIVER	KALIAGANJ	BAGDUAR(046), RAMGANJ(062), BAGCHA(066), CHAKBHABANIPUR(074), KHILTOR(069)	ZONE 7	25°40'00.747"N	88°25'16.578"E	12029
					25°36'12.958"N	88°26'22.982"E	

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 river 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 Dahuk of Uttar Dinajpur district is given below.

Table 7.15: No mining zone in the district

Sl. No.	Rivers or Streams	Administrative Block	No mining area (in Sq.m.)
1	MAHANANDA RIVER	CHOPRA	235615
2	DAHUK RIVER	CHOPRA	32634
3	FULHAR RIVER	GOALPOKHAR-II	197558
4	NAGRI RIVER	RAIGANJ	287594
5	TANGON RIVER	KALIAGANJ	12029

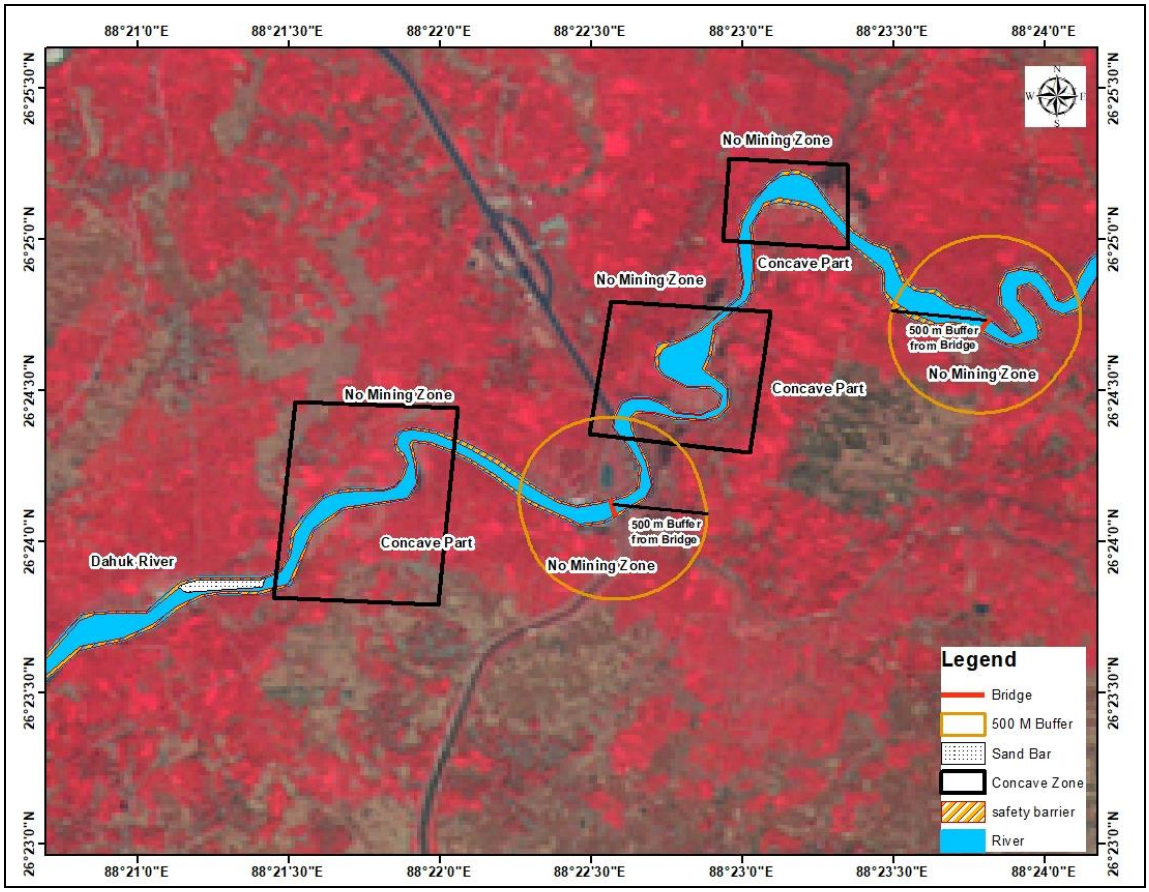


Figure 7.7: A representative map showing no-mining zone demarcated on Dahuk River

7.2.2 In-situ Minerals

I. Mineral Reserve

The district does not have any major mineral deposits recorded by GSI. The riverbed sand deposits are the only potential mineral deposits recorded in the district.

II. Mineral Potential

The mineral potential of this district is not established.

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

Uttar Dinajpur district is not rich in major 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 Mahanada, Tangan, Sui, Kulliketc, 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. So, the scope of sand Exploration in this district is very high.

8 Overview of mining activity in the district

8.1 General overview

Uttar Dinajpur district is not having any large mines. Collection of sand, stone from the river-bed and Brick-earth are the minor mineral sources of the district. 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)

As per the data received from Department of Mines and Minerals, Siliguri, total 16 blocks have been allotted for mining of river sand in the district. Total allotted river-bed block area for 16 blocks is 52.88 Ha and estimated reserve is around 3908204.95 Cu.M and for sand & stone area allotted is 4.55 Ha and estimated reserve is 306600 Cu.M. Revenue generated in the district of Uttar Dinajpur from Minor minerals during the period of April 2017 to Sept 2021 is Rs. 12.92 Crores.

Table No. 8.1A: Details of mining leases of the districts

Name of Applicants	ID	Subdivision	Block/Municipality	GP/Ward	PS	Mouza	JL No	River	Plot No	Area in Hectares
Debabrata Kar	1288/SB2021	RAIGANJ SUBDIVISION	KALIAGANJ	RADHIKAPUR	Kaliaganj	Uttar Krishnapur	55	Tangon	234P	0.99
Krishna Gopal Agarwal & Sons	1299/SB2021	ISLAMPUR SUBDIVISION	CHOPRA	SONAPUR	Chopra	Chitalghata	01	Mahananda	604,606,607,610,612,613,619,620,622,624,625,626,627,630	4.55
Adyamaatradelink Pvt. Ltd.	1195/SB2021	ISLAMPUR SUBDIVISION	CHOPRA	SONAPUR	Chopra	Chitalghata	01	Mahananda	24P,25,81P	3.65
Md. Sefiul	1248/SB2021	ISLAMPUR SUBDIVISION	CHOPRA	SONAPUR	Chopra	Chitalghata	01	Mahananda	123,124,125,126,127,128P,129,130,131,132,133,134P, 137P, 8401P,8404	7.8
Mrinal Roy	1296/SB2021	RAIGANJ SUBDIVISION	KALIAGANJ	RADHIKAPUR	Kaliaganj	Bogduar	49	Tangon	517	2.03
Md. Naimul Haque	1245/SB2021	ISLAMPUR SUBDIVISION	CHOPRA	MAJHIALI	Chopra	Dakshin Ariagaon	35	Dahuk	2181P, 2928, 2929	1.80
Md. HasibulRahaman	1239/SB2021	ISLAMPUR SUBDIVISION	CHOPRA	SONAPUR	Chopra	Paschim Ariagaon	39	Berang	2542P, 2545P, 2553P,2554P, 2555P	4.44
AbaidurRahaman	1273/SB2021	RAIGANJ SUBDIVISION	ITAHAR	JOYHAT	Itahar	Joyhat	233	Mahananda	101,103	0.22
Ambey Niwas Pvt. Ltd.	1281/SB2021	ISLAMPUR SUBDIVISION	CHOPRA	CHOPRA	Chopra	Chopra	24	Mahananda	127P,623P,624P,587P, 588P,625	4.5
Ramdebpur Sand Company (MahbubAlam)	1304/SB2021	RAIGANJ SUBDIVISION	ITAHAR	GULANDAR-II	Itahar	Gulandar	155	Mahananda	1888P	0.25
-	1306/SB2021	RAIGANJ SUBDIVISION	KALIAGANJ	RADHIKAPUR	Kaliaganj	Bagcha	66	Tangon	1410	0.1
-	1309/SB2021	ISLAMPUR SUBDIVISION	CHOPRA	HAPTIAGACHH	Chopra	Barabilla	09	Mahananda	1128	7.25
-	1312/SB2021	ISLAMPUR SUBDIVISION	CHOPRA	SONAPUR	Chopra	Chitalghata	01	Mahananda	81P,83,84,85,86,87,88,89,90,91,92,95P,96P,99P,100P,101,134,135P,136P,140P,141,142,143,146,147	7.4
Sudipta Bose	1184/SB2021	ISLAMPUR SUBDIVISION	CHOPRA	HAPTIAGACHH	Chopra	Paschim Dangapara	10	Mahananda	36P	6.05
Md. Islam Uddin	1228/SB2021	ISLAMPUR SUBDIVISION	CHOPRA	SONAPUR	Chopra	Chitalghata	01	Mahananda	81P	3.89
Ambey Niwas Pvt. Ltd.	1277/SB2021	ISLAMPUR SUBDIVISION	CHOPRA	SONAPUR	Chopra	Chitalghata	01	Mahananda	8401P,8401/9792P	2.59
Mrinal Roy	1291/SB2021	RAIGANJ SUBDIVISION	KALIAGANJ	RADHIKAPUR	Kaliaganj	Faridpur	70	Tangon	10	0.26

Table No. 8.1B: Details of mining leases of the districts

Name of Applicants	ID	Mouza	River	Area in Hectares	Latitude	Longitude	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 (ton)	Quantum of sand extraction permissible as per Environmental Clearance (E.C.)(ton)
Debabrata Kar	1288/SB2021	Uttar Krishnapur	Tangon	0.99	25.6492694	88.4353472	EC awaiting				0	0
Krishna Gopal Agarwal & Sons	1299/SB2021	Chitalghata	Mahananda	4.55	26.48525	88.2841667	EC awaiting				0	0
Adyamaatradelink Pvt. Ltd.	1195/SB2021	Chitalghata	Mahananda	3.65	26.4726167	88.2617583	31/03/2017	31/10/2017	31/10/2017	30-10-2022	591276.376	443949.083
Md. Sefiul	1248/SB2021	Chitalghata	Mahananda	7.8	26.4666556	88.2523194	20/12/2017	02/02/2018	02/02/2018	01-02-2023	1465173.165	948540.596
Mrinal Roy	1296/SB2021	Bogduar	Tangon	2.03	25.6615694	88.4255306	EC awaiting				0	0
Md. Naimul Haque	1245/SB2021	Dakshin Ariagaon	Dahuk	1.8	26.3979167	88.3523861	21/02/2017	16/03/2017	16/03/2017	15-03-2022	209945.872	145543.119
Md. HasibulRahaman	1239/SB2021	Paschim Ariagaon	Berang	4.44	26.4322611	88.3441917	21/02/2017	05/04/2017	05/04/2017	04-04-2022	583176.835	252102.982
AbaidurRahaman	1273/SB2021	Joyhat	Mahananda	0.22	25.2951222	88.1083111	EC awaiting				0	0
Ambey Niwas Pvt. Ltd.	1281/SB2021	Chopra	Mahananda	4.5	26.3695472	88.3062611	EC awaiting				0	0
Ramdebpur Sand Company (MahbubAlam)	1304/SB2021	Gulandar	Mahananda	0.25	25.4651028	88.0789417	EC awaiting				0	0
-	1306/SB2021	Bagcha	Tangon	0.1	25.6135833	88.429025	EC awaiting				0	0
-	1309/SB2021	Barabilla	Mahananda	7.25	26.48815	88.3079833	EC awaiting				0	0
-	1312/SB2021	Chitalghata	Mahananda	7.4	26.4674333	88.25525	EC awaiting				0	0
Sudipta Bose	1184/SB2021	Paschim Dangapara	Mahananda	6.05	26.4957444	88.3108833	20/12/2017	02/02/2018	02/02/2018	01-02-2023	736067.661	736056.881
Md. Islam Uddin	1228/SB2021	Chitalghata	Mahananda	3.89	26.4706528	88.2596556	21/02/2017	10/03/2017	10/03/2017	09-03-2022	473474.771	473474.771
Ambey Niwas Pvt. Ltd.	1277/SB2021	Chitalghata	Mahananda	2.59	26.4540944	88.2410111	31/03/2017	15/03/2018	15/03/2018	14-03-2023	422924.541	315731.422
Mrinal Roy	1291/SB2021	Faridpur	Tangon	0.26	25.6134	88.4296833					0	0

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

Table 8.1: Details of production of sand as per mine plan in Uttar Dinajpur District

Sl. No.	Year	Name of mineral	Total Production (in cft)
1	2017-2018	Sand	4907000
2	2018-2019	Sand	9042000
3	2019-2020	Sand	16832200
4	2020-2021	Sand	47491300
5	2021-2022 (up to 30.09.21)	Sand	7850000

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

Table 9.1: District Revenue generation from Mineral sector

Year	Total Royalty Collected (in Rs.)
2017-2018	7360500
2018-2019	13563000
2019-2020	25248300
2020-2021	71236950
2021-2022 (up to 30.09.21)	11775000

10 Transport (Railway, road)

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

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

1. Rail Transport

The main railway station is Raiganj in Uttar Dinajpur district. Raiganj railway station is on the Barsoi-Radhikapur branch line, another main station is Dalkhola railway station which is stoppage of maximum express train. One express train Radhikapur Express is available for reaching Kolkata and a link superfast express train Radhikapur-Anandvihar Express is available for going to New Delhi. Radhikapur-Kolkata (RDP-KOAA) Express train is the only direct train for Raiganj to South Bengal Communication. Although the (RDP-SGUJ) DEMU is the only direct train for Raiganj to North Bengal Communication.

2. Road Transport

Uttar Dinajpur is well connected with the rest of the State through National Highways, State Highways and Railways. NH-31 and NH-34 passes through the heart of the district. Raiganj is 397 km from State capital Kolkata (Calcutta) by National Highway No. 12. The distance from Malda and Siligiri to Raiganj is 72 km and 156 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, English Bazar, Jalpaiguri, Siliguri, Katwa, etc. through roadway.

The general transport map has given below in Figure 10.1 and potential block accessibility map given in figure no 10.2;

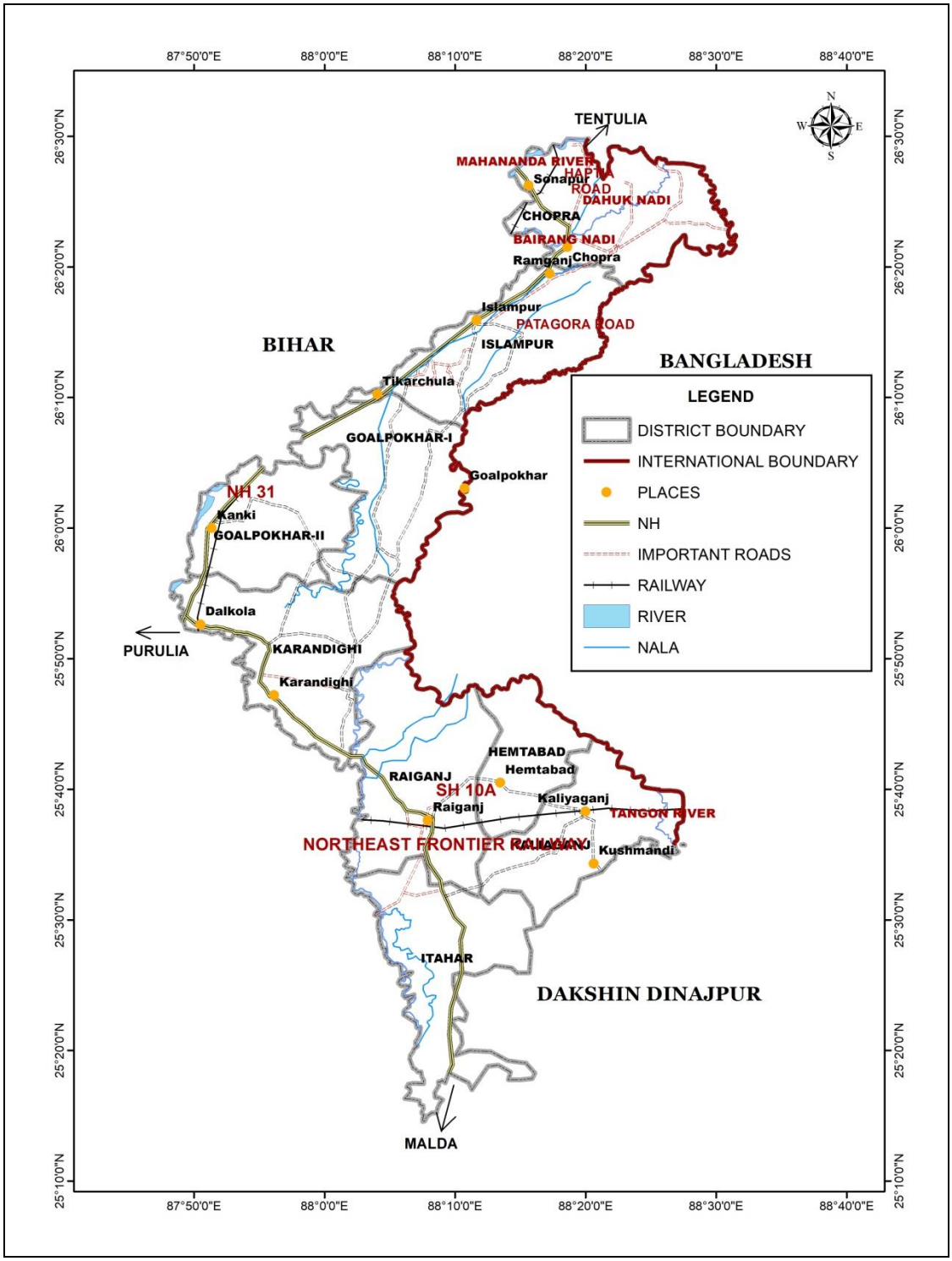


Figure 10.1: Transportation Map of Uttar Dinajpur

(Source: National Informatics Centre)

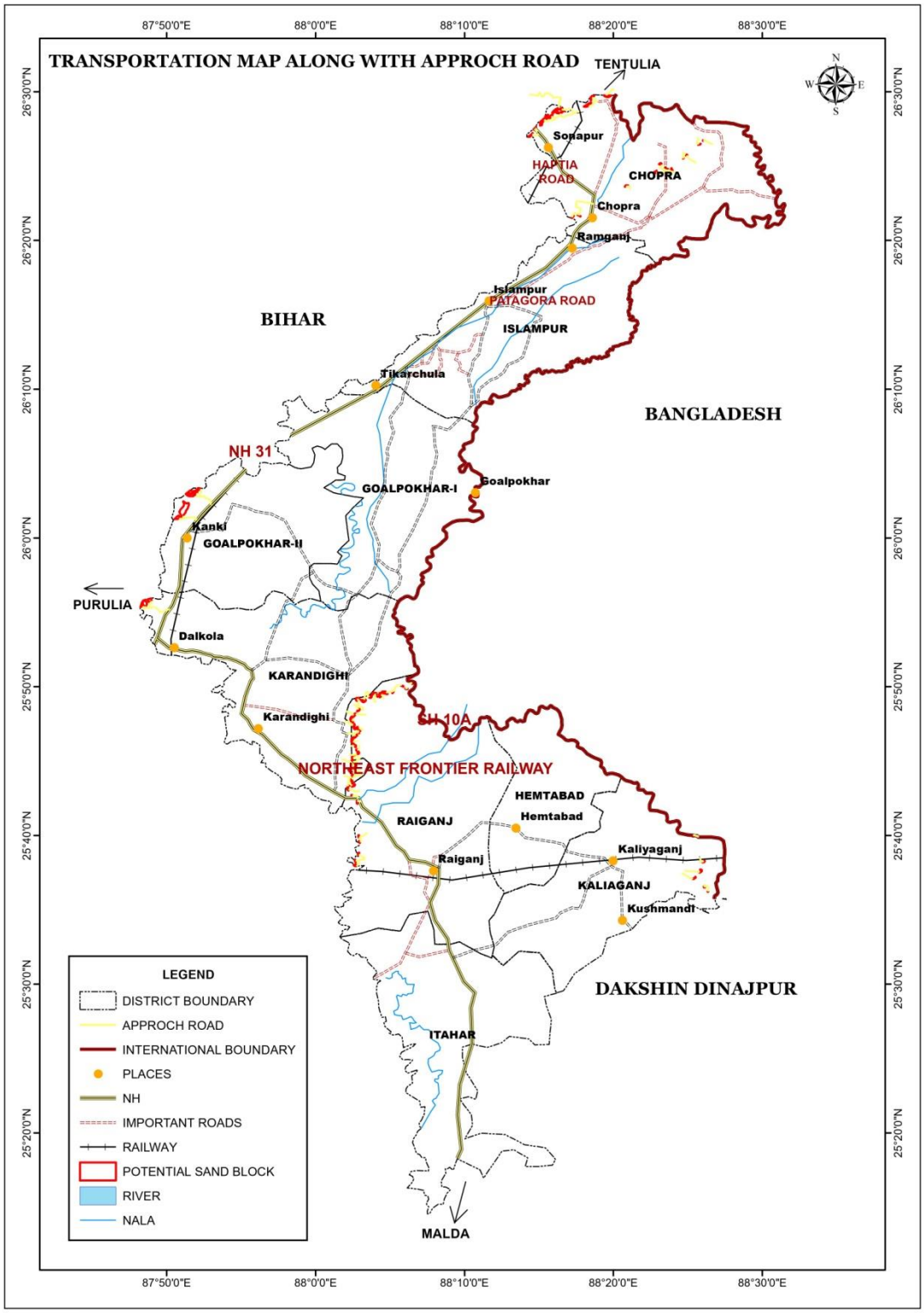


Figure 10.2: Map showing approach road to potential sand bars

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 occur. The extracted sand could be utilized 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 has 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 shrinking of river banks. Deltas can recede due to sand mining. These destructive effects of sand mining ultimately result in loss of fertile land and property. It also destabilized the ground and causes the failure of engineering structures for civilization.

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 lose.

It could be concluding that there has been little in-depth research in to the environmental and social also political effect of sand mining and calls for urgent redressed 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 saleable. There will be neither any stacking of soil nor creation of OB dumps. The mining activity will be carried out up to a maximum depth of 3m below the surface level. So, there is no chance of slope failure, bench failure in the mines. However, there are some identified risks in the mining activity which are as follows:

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

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 Recommendation

The District Survey Report of Uttar 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. Although, as reported by the earlier workers, the district is absolutely devoid of any type of major mineral.

Salient features like length of the major rivers in the district, place of origin, altitude at several levels, drained area of the rivers, depositional characteristic of the rivers etc. are discussed in this District Survey Report. Geological cross sections of major rivers for pre and post monsoon season are also prepared to assess the sediment load and sand resources of the district.

In Uttar Dinajpur district, some of big rivers are flowing like Mahananda, Tangon, Sui, Kulik etc. So, in this region, different geomorphic features like Alluvium Plain, Alluvial Fan etc. are developed by the active rivers which resulted huge deposition of sand, clay and gravel. Hence, the sand mining and sand industry is looking promising for this district.As per the data received from DL&LRO office, Uttar Dinajpur, total 16 leases have been allotted for mining of river sand in the district. Revenue generated in the district of Uttar Dinajpur from Minor minerals during the period of April 2017 to Sept 2021 is Rs. 12.92 crores. Potential riverbed sand blocks of the district where lease not allotted yet are also identified and discussed in the current DSR.

However, the high demands have often led to the use of unsustainable sand mining processes and for speedy urbanization resulted illegal mining. This illegal mining activity has a negative impact on the surrounding ecosystem. Removal or mining of too much of sand from rivers leads to erosion and shrinking of riverbanks which destabilizes the ground and causes the failure of engineering structures.

Considering the high concentration of riverbed material deposition every year in the river Mahananda, Tangon, Sui, Kulik etc., scientific study shall be carried out in detail to evaluate the quantum of sediment load deposited in the major rivers in last 20 years, possibility of mining beyond 3 meter depth to regenerate the fluvial channel to the extent possible, to find the ways and means to increase the carrying capacity of the rivers, to identify the potential mineral deposits within the riverbed material such as Dolomite, Quartz etc.

This report also recommends undertaking detail Geological exploration 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

1. The river beds of the district are enriched with sand which is highly potential for mining.
2. The replenishment study has been carried out during the preparation of this DSR after analysing datasets of consecutive calendar years. 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.
3. 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 much 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.
4. Field base study shows variation of replenishment from 94.0 to 95.1% in the district and theoretical replenishment shows variation from 72% to 78% with an average of 74.86% of replenishment rate in the district.
5. The total potential river bed deposit for the district comes to about 6.44 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

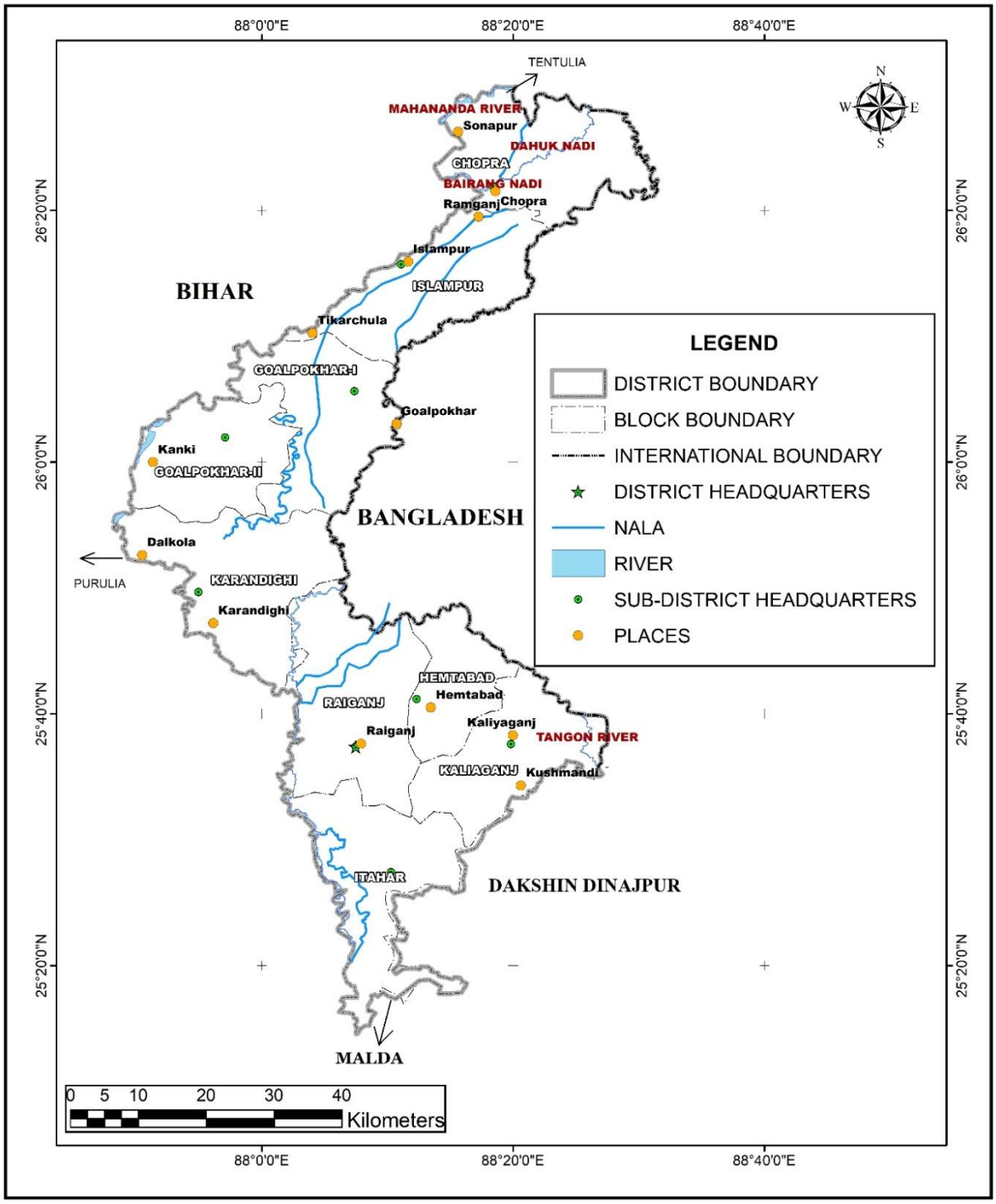


Plate 1A: Drainage Map of the District

(Source: National Informatics Centre -NIC Website, Sept 2020)

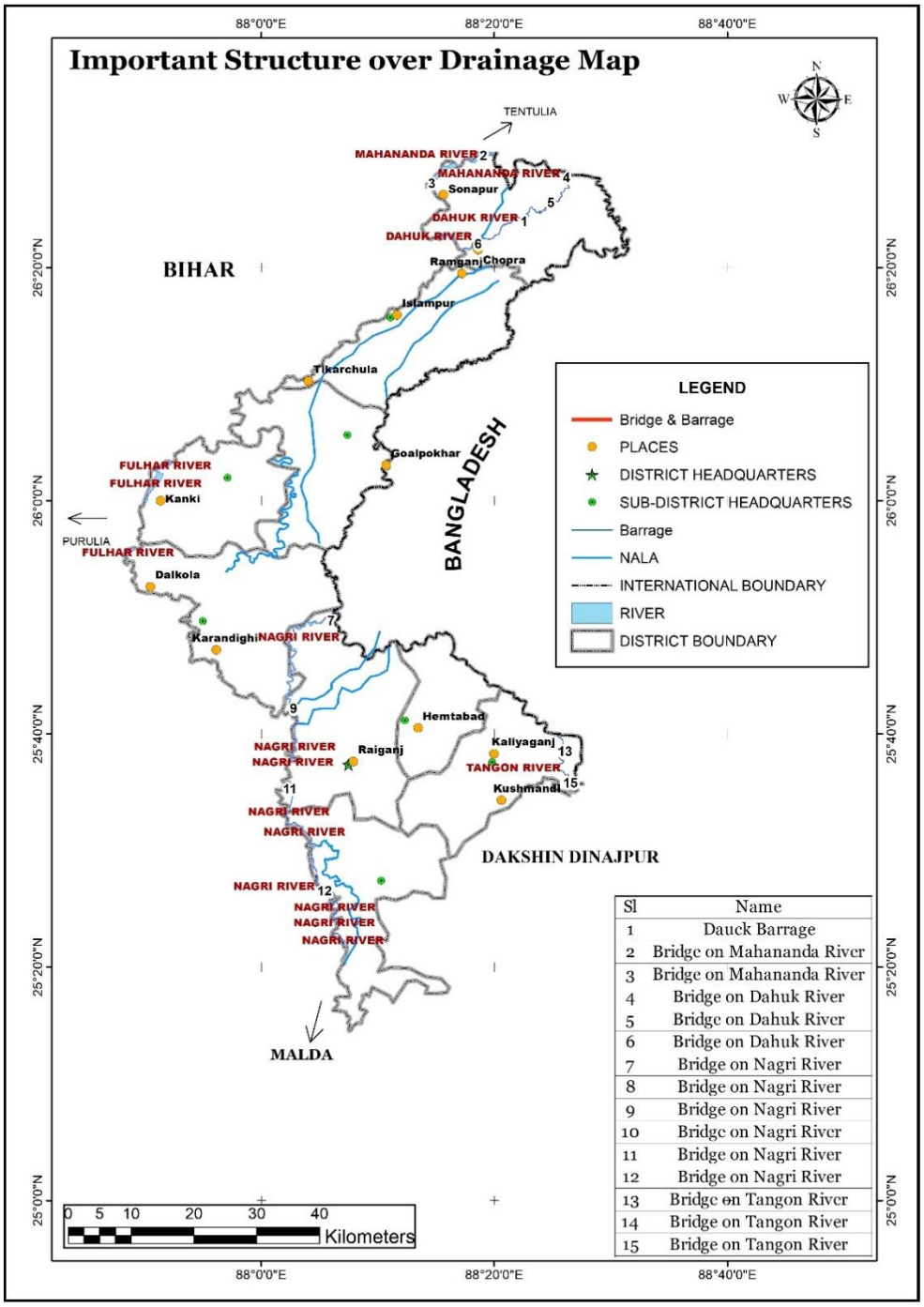
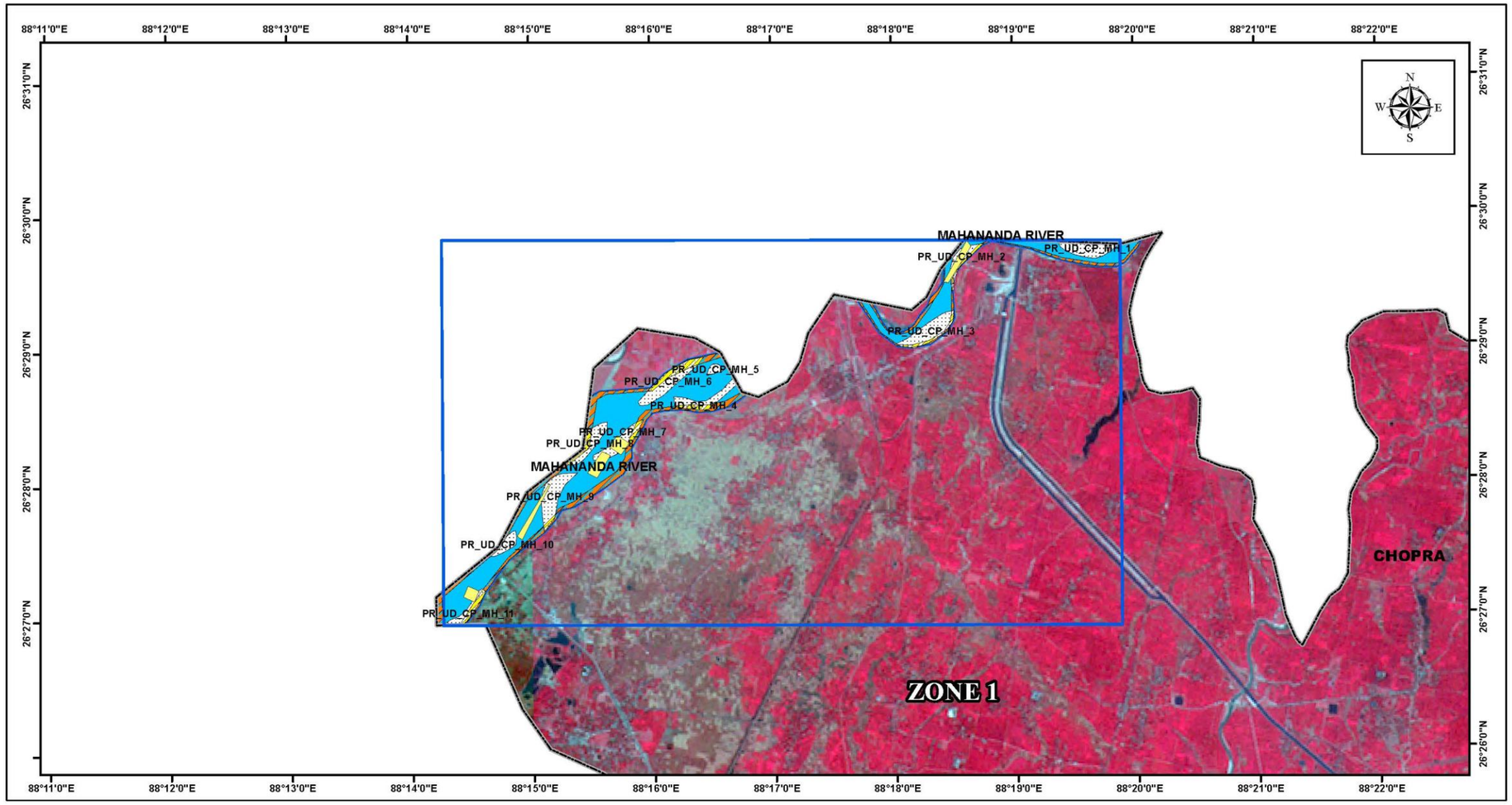


Plate 1B: Location Map of dams, barrages, bridge showing on drainage system of the district

(Source: National Informatics Centre -NIC Website, Sept 2020)

PLATE2A

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



Legend

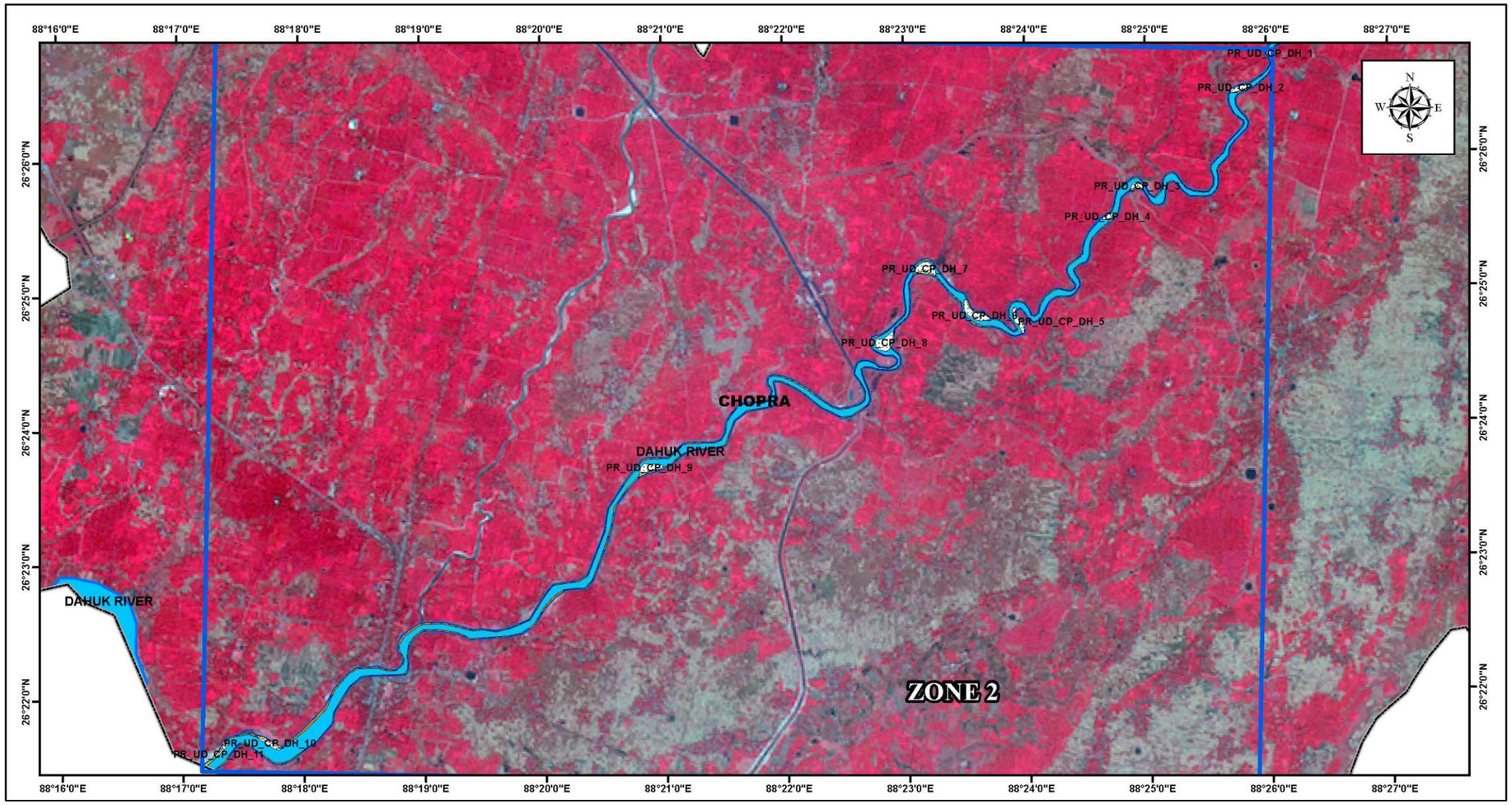
- Zone 1
- BLOCK BOUNDARY
- DISTRICT BOUNDARY
- Mining Lease Area
- Restricted Area
- Pr_Sand Bar
- safety barrier
- River

SCALE 1:50,000

Kilometers 0 0.5 1 2 3 4

ABBREVIATION FORM					
PERIOD	PR	PREMONSOON	BLOCK	HB	HEMTABAD
DISTRICT	UD	UTTAR DINAJPUR	BLOCK	KD	KARANDIGHI
BLOCK	CP	CHOPRA	BLOCK	IH	ITAHAR
BLOCK	IP	ISLAMPUR	RIVER	MH	MAHANANDA RIVER
BLOCK	GP1	GOPALPOKHAR-I	RIVER	DH	DAHUK RIVER
BLOCK	GP2	GOPALPOKHAR-II	RIVER	FH	FULHAR RIVER
BLOCK	RG	RAIGANJ	RIVER	NG	NAGRI RIVER
BLOCK	KG	KALIAGANJ	RIVER	TG	TANGON RIVER

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



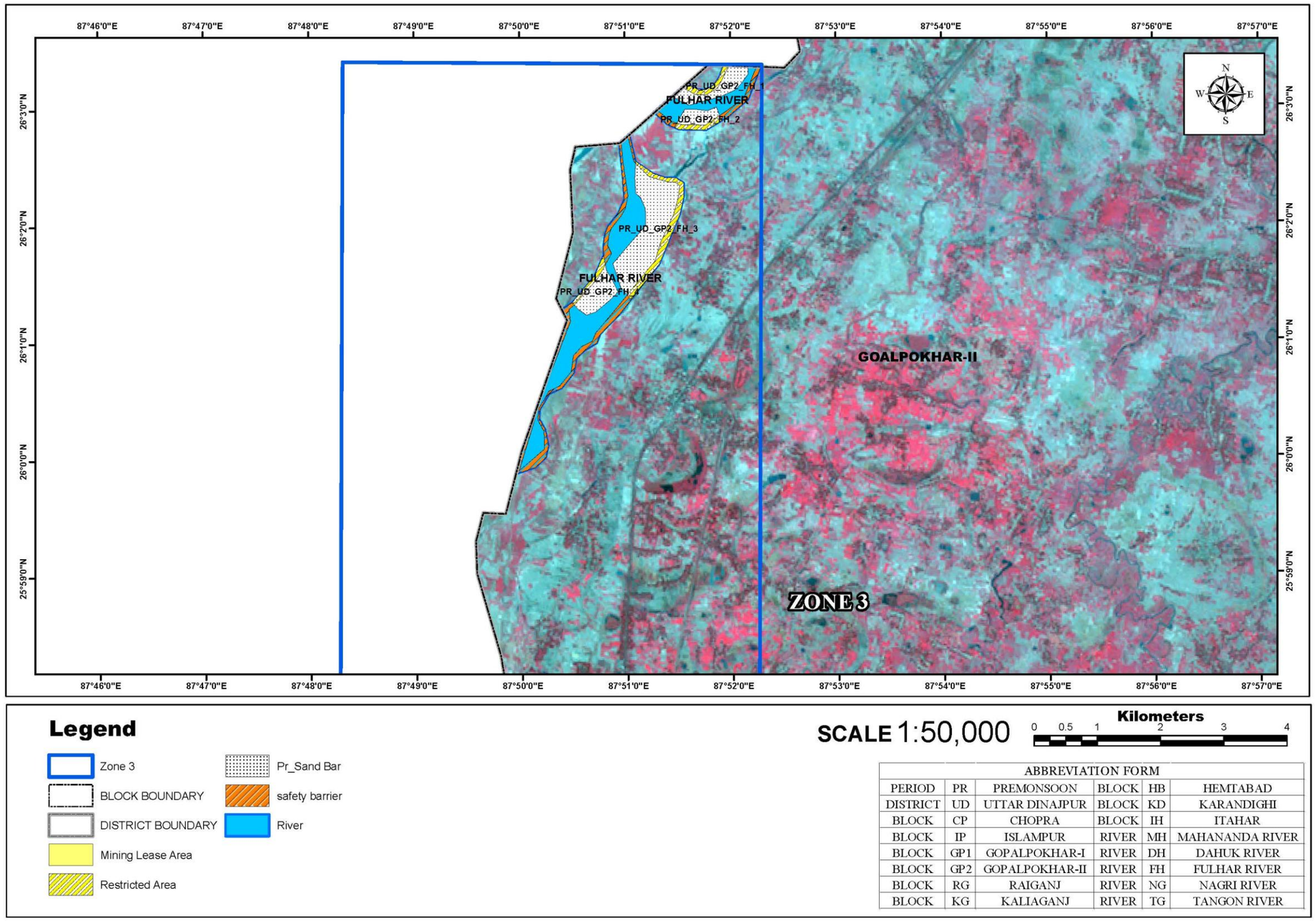
Legend

- Zone 2
- BLOCK BOUNDARY
- DISTRICT BOUNDARY
- Mining Lease Area
- Restricted Area
- Pr_Sand Bar
- safety barrier
- River

SCALE 1:50,000 Kilometers 0 0.5 1 2 3 4

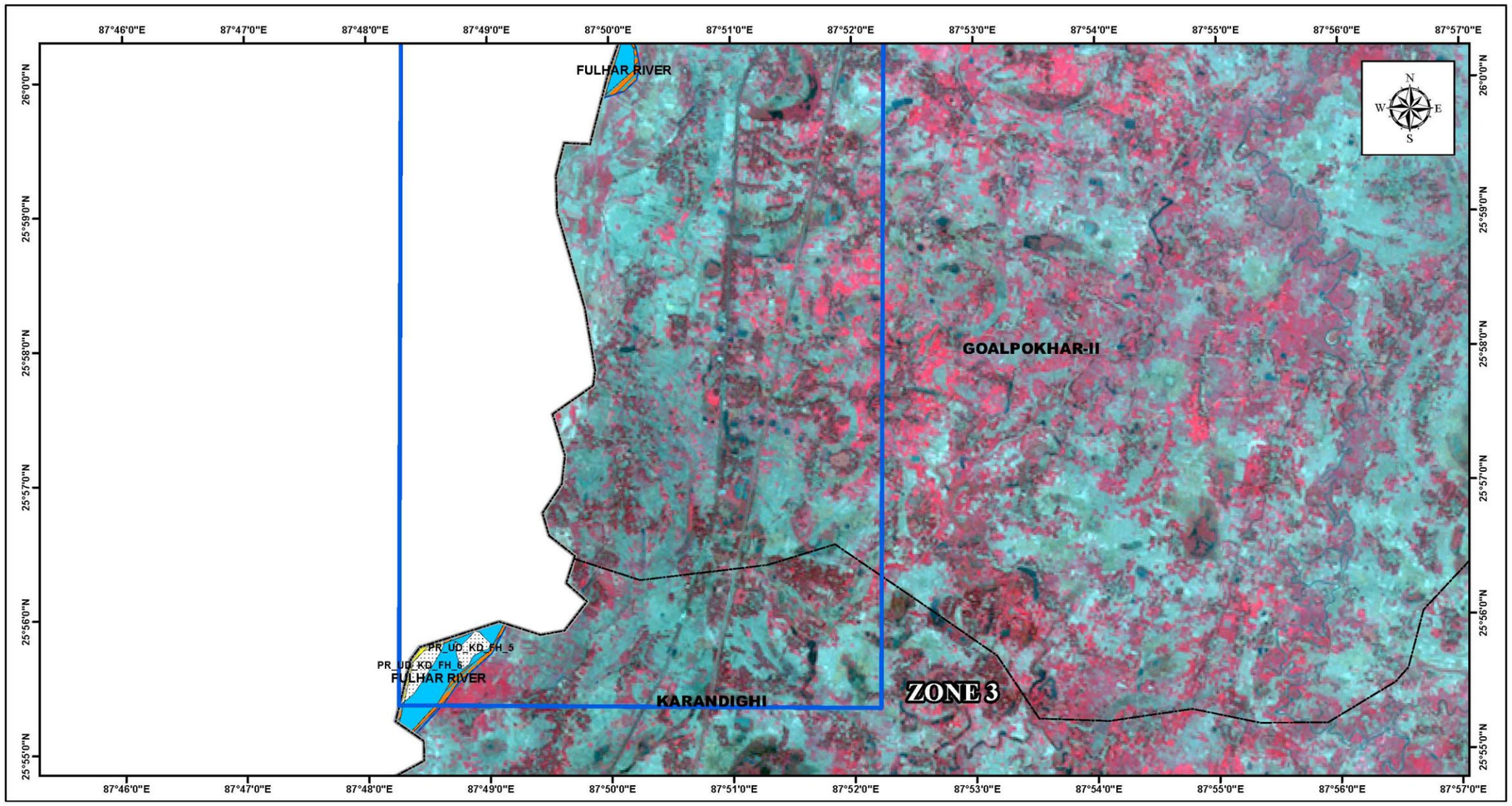
ABBREVIATION FORM					
PERIOD	PR	PREMONSOON	BLOCK	HB	HEMTABAD
DISTRICT	UD	UTTAR DINAJPUR	BLOCK	KD	KARANDIGHI
BLOCK	CP	CHOPRA	BLOCK	IH	ITAHAR
BLOCK	IP	ISLAMPUR	RIVER	MH	MAHANANDA RIVER
BLOCK	GP1	GOPALPOKHAR-I	RIVER	DH	DAHUK RIVER
BLOCK	GP2	GOPALPOKHAR-II	RIVER	FH	FULHAR RIVER
BLOCK	RG	RAIGANJ	RIVER	NG	NAGRI RIVER
BLOCK	KG	KALIAGANJ	RIVER	TG	TANGON RIVER

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



ABBREVIATION FORM					
PERIOD	PR	PREMONSOON	BLOCK	HB	HEMTABAD
DISTRICT	UD	UTTAR DINAJPUR	BLOCK	KD	KARANDIGHI
BLOCK	CP	CHOPRA	BLOCK	IH	ITAHAR
BLOCK	IP	ISLAMPUR	RIVER	MH	MAHANANDA RIVER
BLOCK	GP1	GOPALPOKHAR-I	RIVER	DH	DAHUK RIVER
BLOCK	GP2	GOPALPOKHAR-II	RIVER	FH	FULHAR RIVER
BLOCK	RG	RAIGANJ	RIVER	NG	NAGRI RIVER
BLOCK	KG	KALIAGANJ	RIVER	TG	TANGON RIVER

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



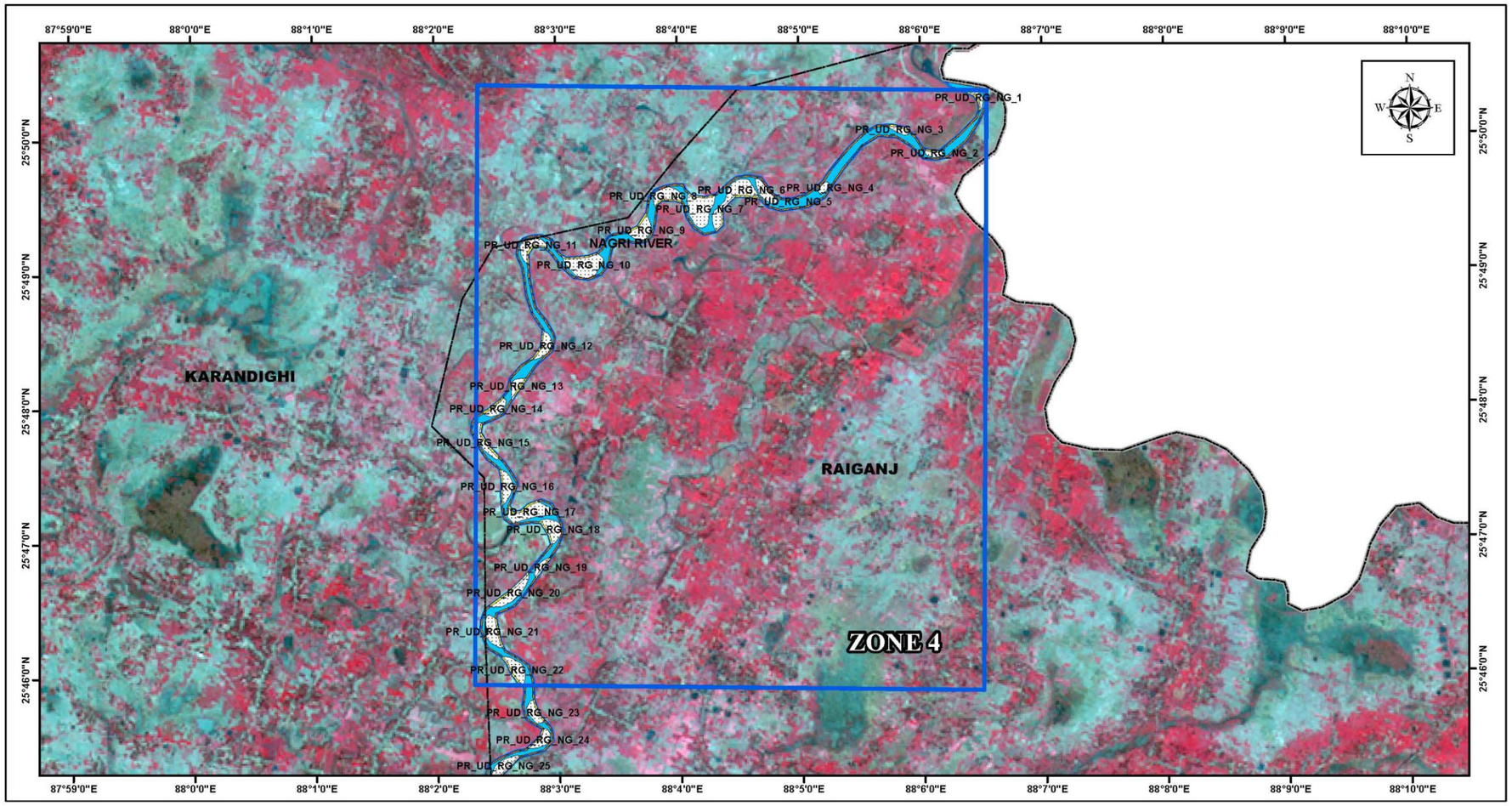
Legend

- Zone 3
- BLOCK BOUNDARY
- DISTRICT BOUNDARY
- Mining Lease Area
- Restricted Area
- Pr_Sand Bar
- safety barrier
- River

SCALE 1:50,000 Kilometers 0 0.5 1 2 3 4

ABBREVIATION FORM					
PERIOD	PR	PREMONSOON	BLOCK	HB	HEMTABAD
DISTRICT	UD	UTTAR DINAJPUR	BLOCK	KD	KARANDIGHI
BLOCK	CP	CHOPRA	BLOCK	IH	ITAHAR
BLOCK	IP	ISLAMPUR	RIVER	MH	MAHANANDA RIVER
BLOCK	GP1	GOPALPOKHAR-I	RIVER	DH	DAHUK RIVER
BLOCK	GP2	GOPALPOKHAR-II	RIVER	FH	FULHAR RIVER
BLOCK	RG	RAIGANJ	RIVER	NG	NAGRI RIVER
BLOCK	KG	KALIAGANJ	RIVER	TG	TANGON RIVER

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



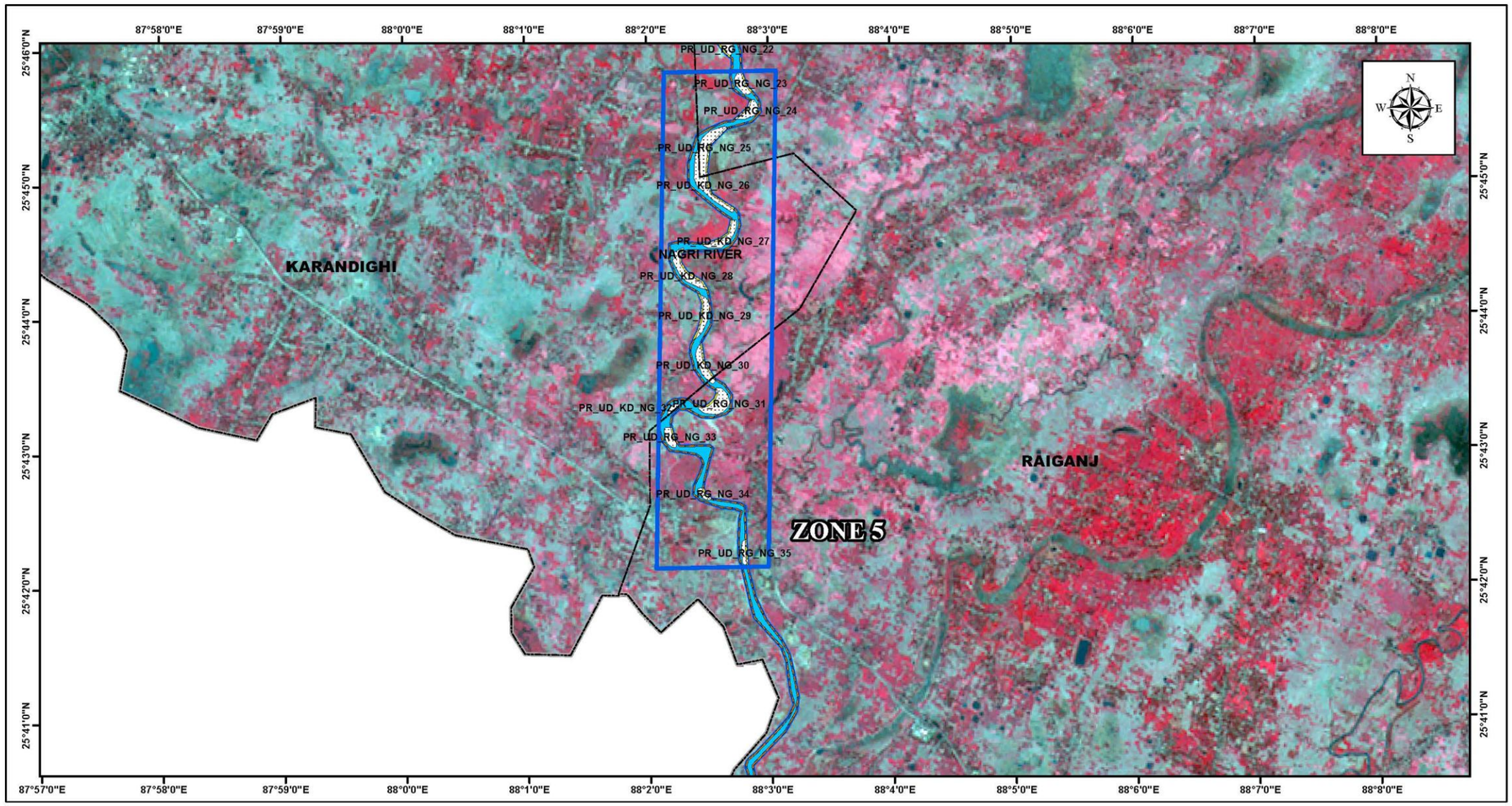
Legend

- Zone 4
- BLOCK BOUNDARY
- DISTRICT BOUNDARY
- Mining Lease Area
- Restricted Area
- Pr_Sand Bar
- safety barrier
- River

SCALE 1:50,000 Kilometers 0 0.5 1 2 3 4

ABBREVIATION FORM					
PERIOD	PR	PREMONSOON	BLOCK	HB	HEMTABAD
DISTRICT	UD	UTTAR DINAJPUR	BLOCK	KD	KARANDIGHI
BLOCK	CP	CHOPRA	BLOCK	IH	ITAHAR
BLOCK	IP	ISLAMPUR	RIVER	MH	MAHANANDA RIVER
BLOCK	GP1	GOPALPOKHAR-I	RIVER	DH	DAHUK RIVER
BLOCK	GP2	GOPALPOKHAR-II	RIVER	FH	FULHAR RIVER
BLOCK	RG	RAIGANJ	RIVER	NG	NAGRI RIVER
BLOCK	KG	KALIAGANJ	RIVER	TG	TANGON RIVER

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



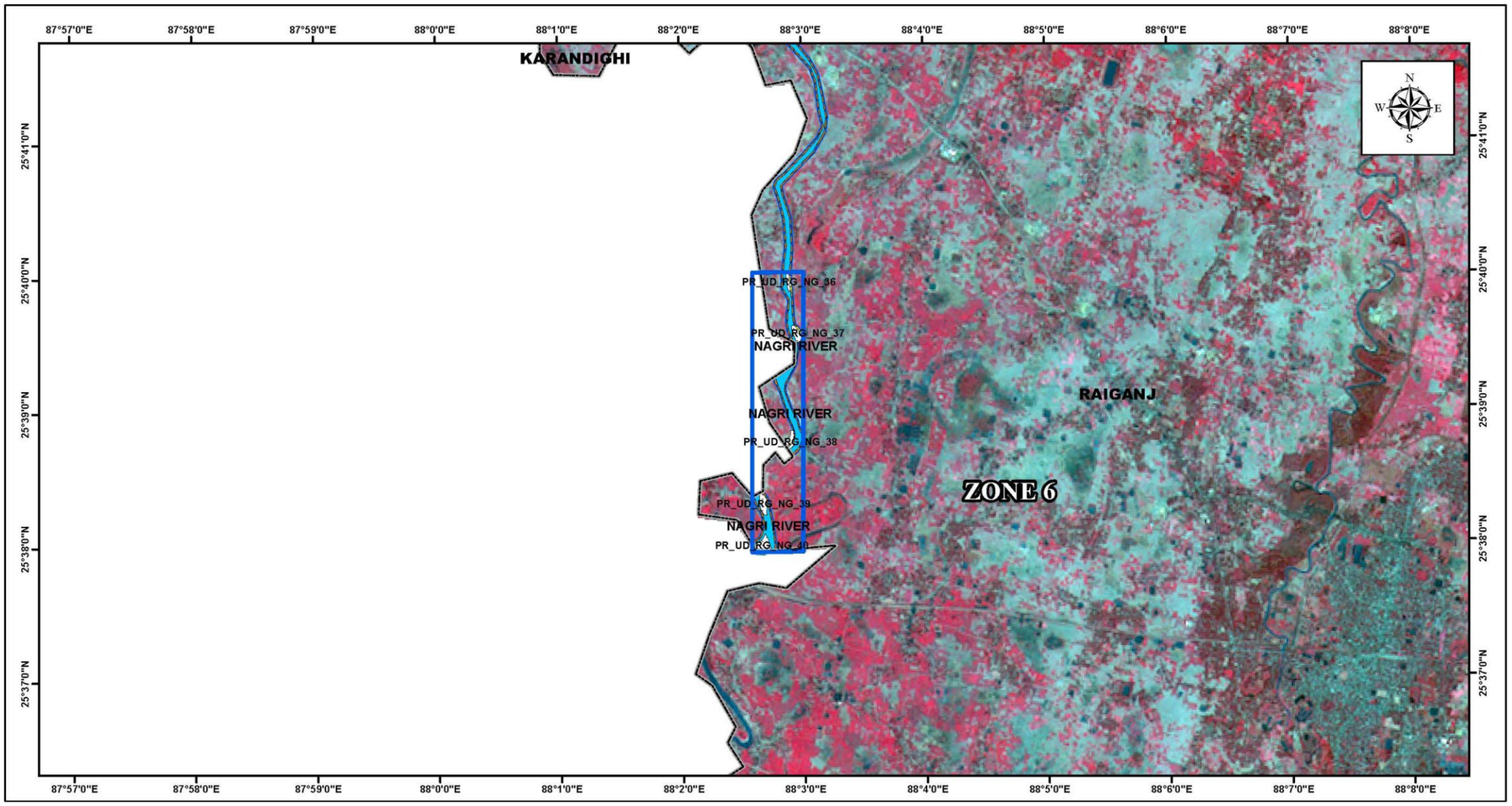
Legend

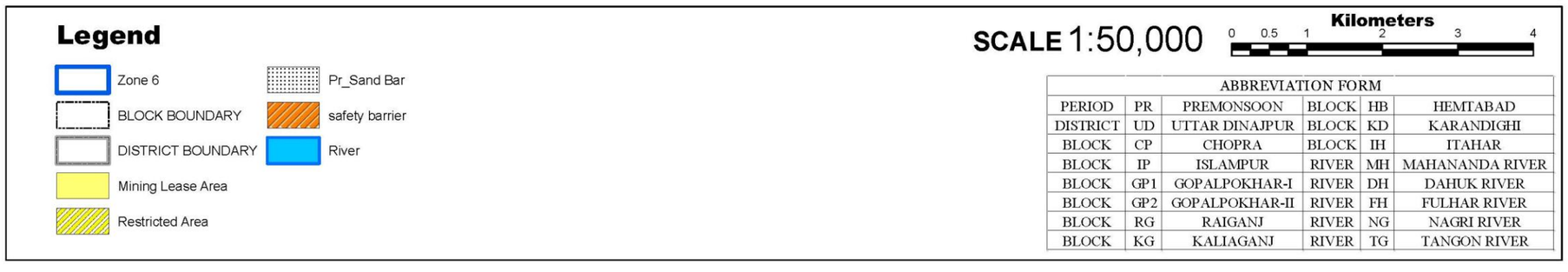
- Zone 5
- BLOCK BOUNDARY
- DISTRICT BOUNDARY
- Mining Lease Area
- Restricted Area
- Pr_Sand Bar
- safety barrier
- River

SCALE 1:50,000 Kilometers 0 0.5 1 2 3 4

ABBREVIATION FORM					
PERIOD	PR	PREMONSOON	BLOCK	HB	HEMTABAD
DISTRICT	UD	UTTAR DINAJPUR	BLOCK	KD	KARANDIGHI
BLOCK	CP	CHOPRA	BLOCK	IH	ITAHAR
BLOCK	IP	ISLAMPUR	RIVER	MH	MAHANANDA RIVER
BLOCK	GP1	GOPALPOKHAR-I	RIVER	DH	DAHUK RIVER
BLOCK	GP2	GOPALPOKHAR-II	RIVER	FH	FULHAR RIVER
BLOCK	RG	RAIGANJ	RIVER	NG	NAGRI RIVER
BLOCK	KG	KALIAGANJ	RIVER	TG	TANGON RIVER

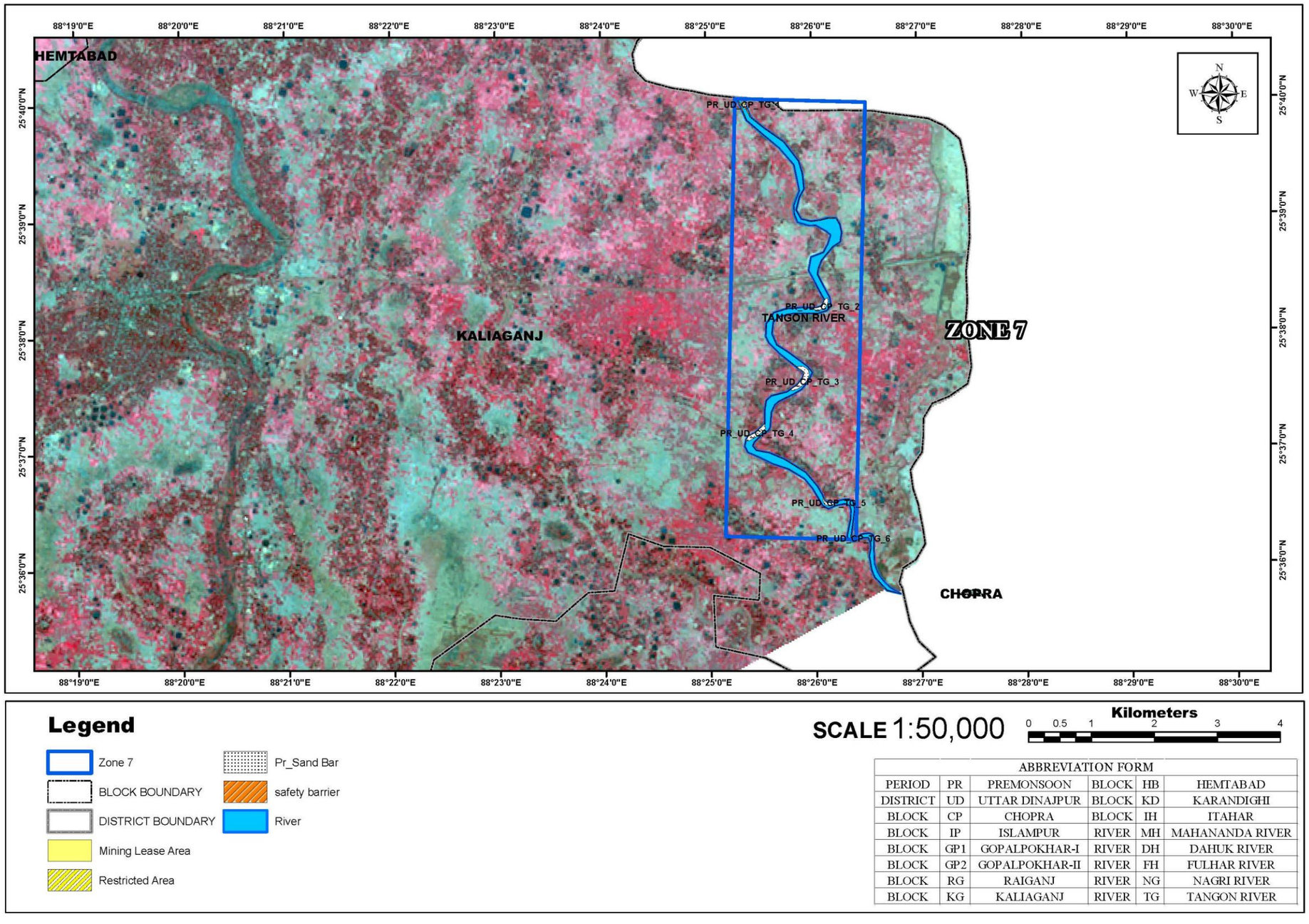
Plate 2A6: Distribution Map of Sand Bars on Rivers During Pre-Monsoon Period of Uttar Dinajpur District*(Source: ISRO RESOURCE Sat 2 LISS III Sensor, March 2020)*





ABBREVIATION FORM					
PERIOD	PR	PREMONSOON	BLOCK	HB	HEMTABAD
DISTRICT	UD	UTTAR DINAJPUR	BLOCK	KD	KARANDIGHI
BLOCK	CP	CHOPRA	BLOCK	IH	ITAHAR
BLOCK	IP	ISLAMPUR	RIVER	MH	MAHANANDA RIVER
BLOCK	GP1	GOPALPOKHAR-I	RIVER	DH	DAHUK RIVER
BLOCK	GP2	GOPALPOKHAR-II	RIVER	FH	FULHAR RIVER
BLOCK	RG	RAIGANJ	RIVER	NG	NAGRI RIVER
BLOCK	KG	KALIAGANJ	RIVER	TG	TANGON RIVER

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

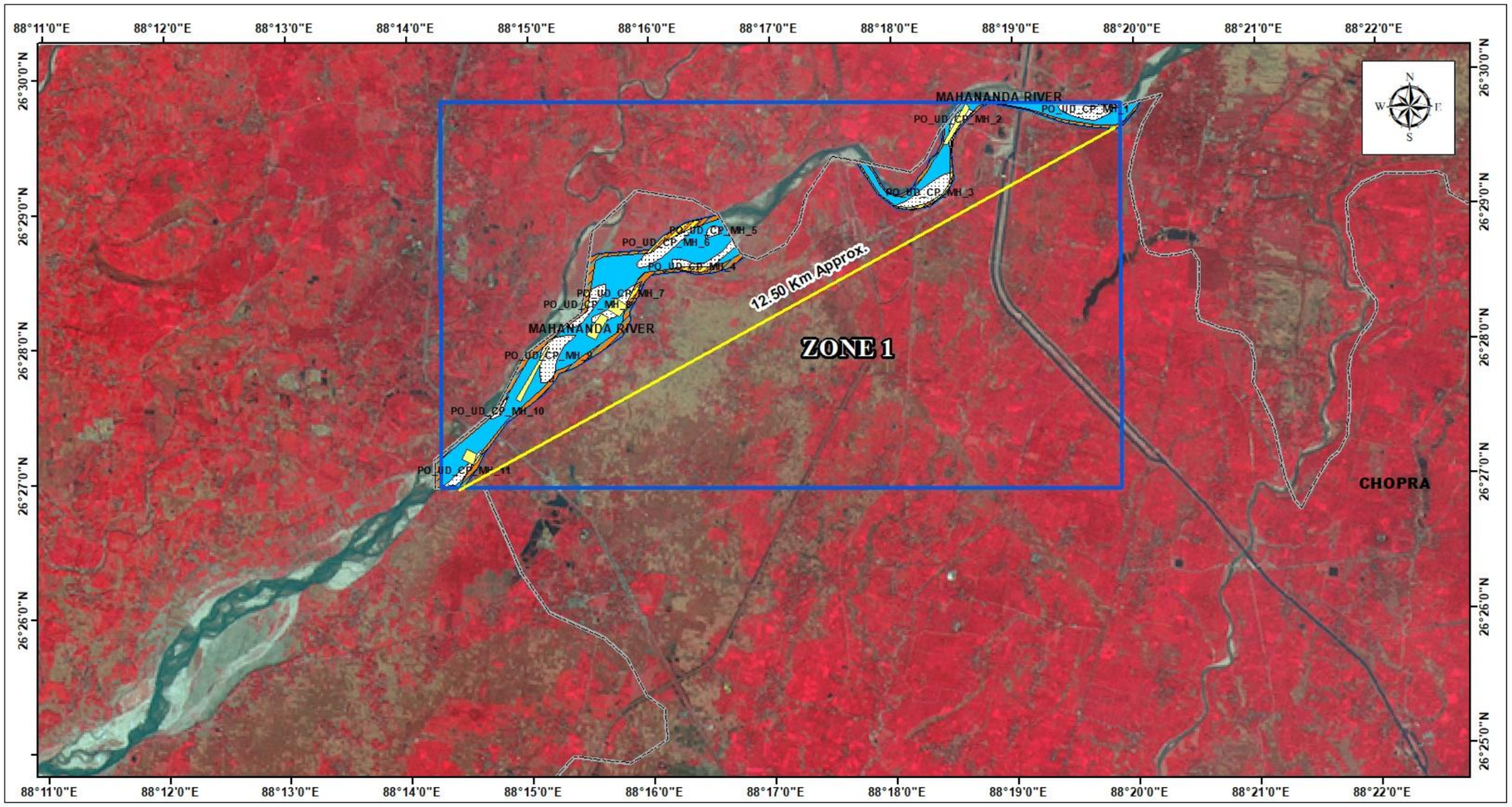


ABBREVIATION FORM					
PERIOD	PR	PREMONSOON	BLOCK	HB	HEMTABAD
DISTRICT	UD	UTTAR DINAJPUR	BLOCK	KD	KARANDIGHI
BLOCK	CP	CHOPRA	BLOCK	IH	ITAHAR
BLOCK	IP	ISLAMPUR	RIVER	MH	MAHANANDA RIVER
BLOCK	GP1	GOPALPOKHAR-I	RIVER	DH	DAHUK RIVER
BLOCK	GP2	GOPALPOKHAR-II	RIVER	FH	FULHAR RIVER
BLOCK	RG	RAIGANJ	RIVER	NG	NAGRI RIVER
BLOCK	KG	KALIAGANJ	RIVER	TG	TANGON RIVER

Plate 2A8: Distribution Map of Sand Bars on Rivers During Pre-Monsoon Period of Uttar Dinajpur District*(Source: ISRO RESOURCE Sat 2 LISS III Sensor, March 2020)*

ANNEXURE 2B

DISTRIBUTION MAP OF SAND BARS ON RIVERS DURING POST-MONSOON PERIOD OF UTTAR DINAJPUR DISTRICT



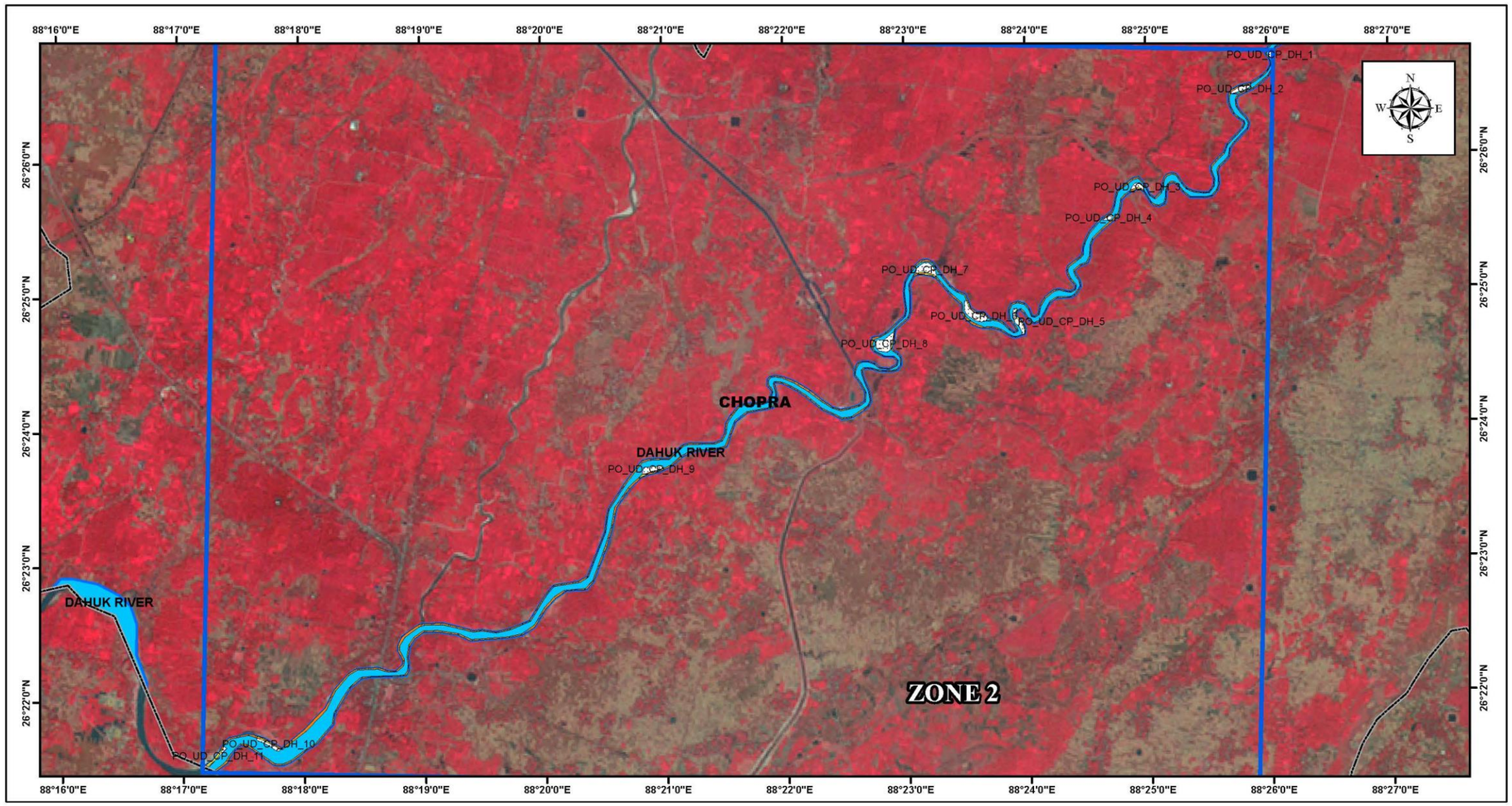
Legend

- Zone 1
- DISTRICT BOUNDARY
- BLOCK BOUNDARY
- DISTRICT BOUNDARY
- Mining Lease Area
- Restricted Area
- safety barrier
- Po_Sand Bar
- River

SCALE 1:50,000 Kilometers 0 0.5 1 2 3 4

ABBREVIATION FORM					
PERIOD	PO	POSTMONSOON	BLOCK	HB	HEMTABAD
DISTRICT	UD	UTTAR DINAJPUR	BLOCK	KD	KARANDIGHI
BLOCK	CP	CHOPRA	BLOCK	IH	ITAHAR
BLOCK	IP	ISLAMPUR	RIVER	MH	MAHANANDA RIVER
BLOCK	GP1	GOPALPOKHAR-I	RIVER	DH	DAHUK RIVER
BLOCK	GP2	GOPALPOKHAR-II	RIVER	FH	FULHAR RIVER
BLOCK	RG	RAIGANJ	RIVER	NG	NAGRI RIVER
BLOCK	KG	KALIAGANJ	RIVER	TG	TANGON RIVER

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



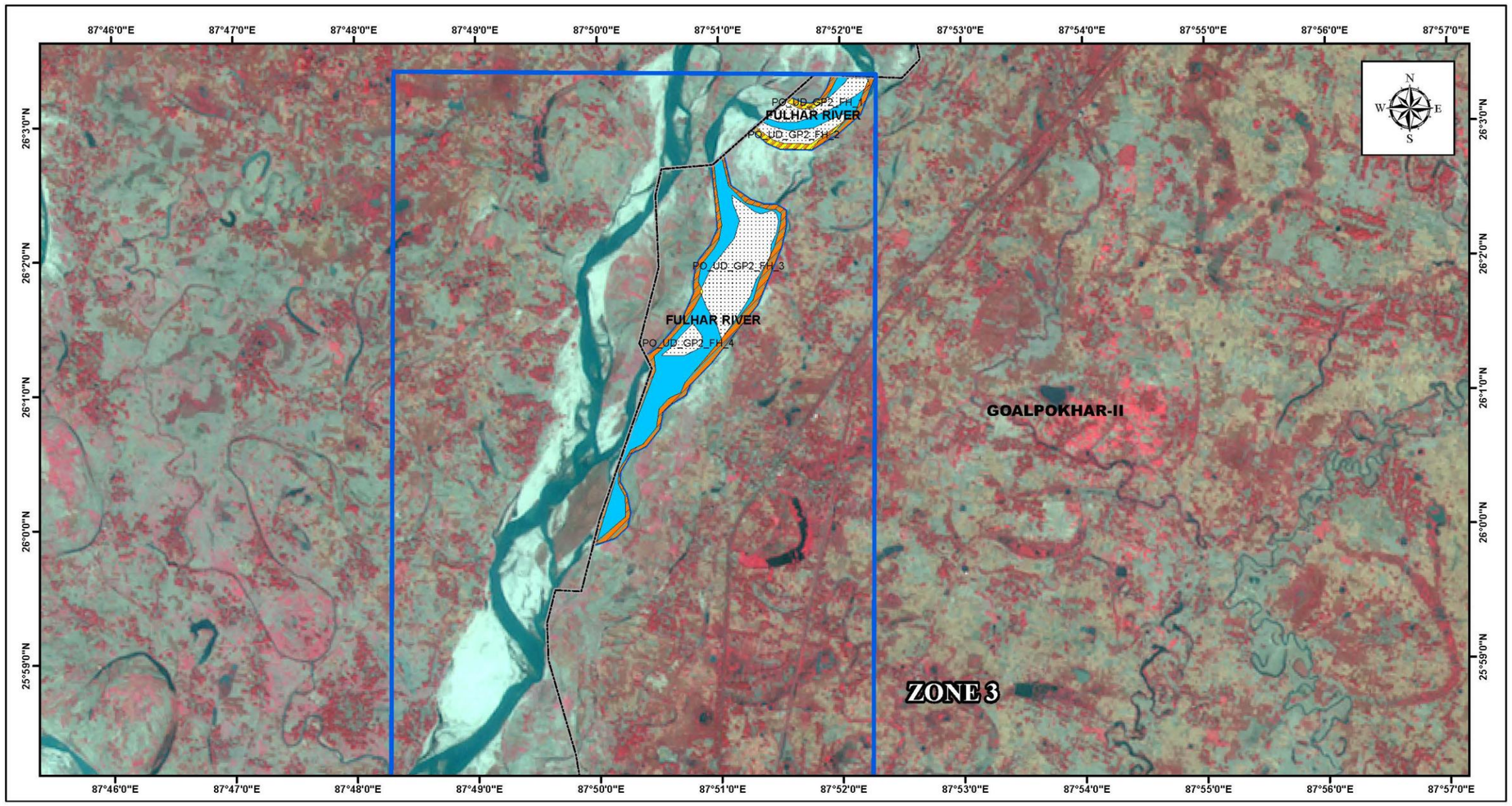
Legend

- Zone 2
- BLOCK BOUNDARY
- DISTRICT BOUNDARY
- Mining Lease Area
- Restricted Area
- safety barrier
- Po_Sand Bar
- River

SCALE 1:50,000 Kilometers 0 0.5 1 2 3 4

ABBREVIATION FORM					
PERIOD	PO	POSTMONSOON	BLOCK	HB	HEMTABAD
DISTRICT	UD	UTTAR DINAJPUR	BLOCK	KD	KARANDIGHI
BLOCK	CP	CHOPRA	BLOCK	IH	ITAHAR
BLOCK	IP	ISLAMPUR	RIVER	MH	MAHANANDA RIVER
BLOCK	GP1	GOPALPOKHAR-I	RIVER	DH	DAHUK RIVER
BLOCK	GP2	GOPALPOKHAR-II	RIVER	FH	FULHAR RIVER
BLOCK	RG	RAIGANJ	RIVER	NG	NAGRI RIVER
BLOCK	KG	KALIAGANJ	RIVER	TG	TANGON RIVER

Plate 2B2: Distribution Map of Sand Bars on Rivers During Post-Monsoon Period of Uttar Dinajpur District*(Source: ISRO RESOURCE Sat 2 LISS III Sensor, Nov2020)*



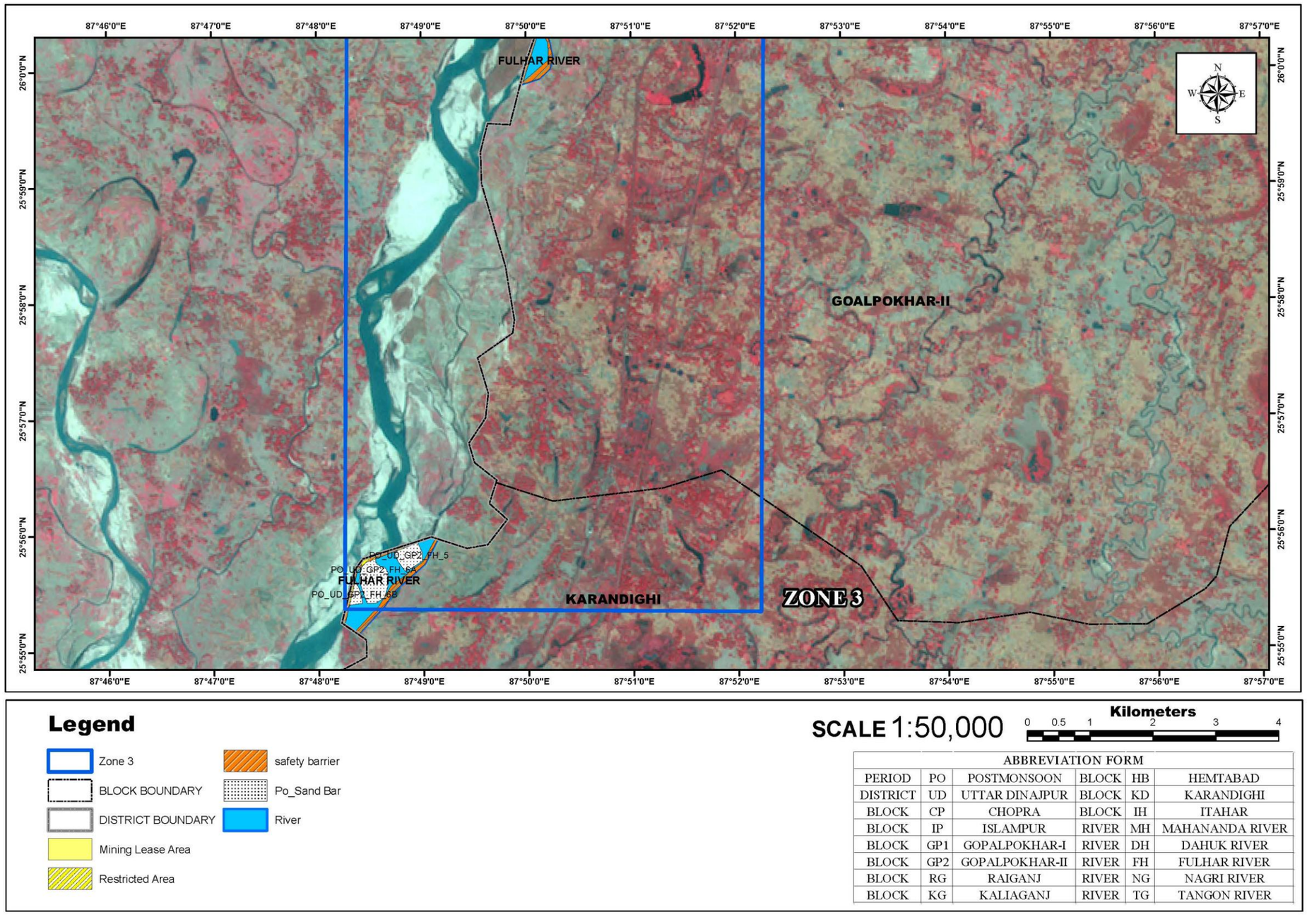
Legend

- Zone 3
- BLOCK BOUNDARY
- DISTRICT BOUNDARY
- Mining Lease Area
- Restricted Area
- safety barrier
- Po_Sand Bar
- River

SCALE 1:50,000 Kilometers 0 0.5 1 2 3 4

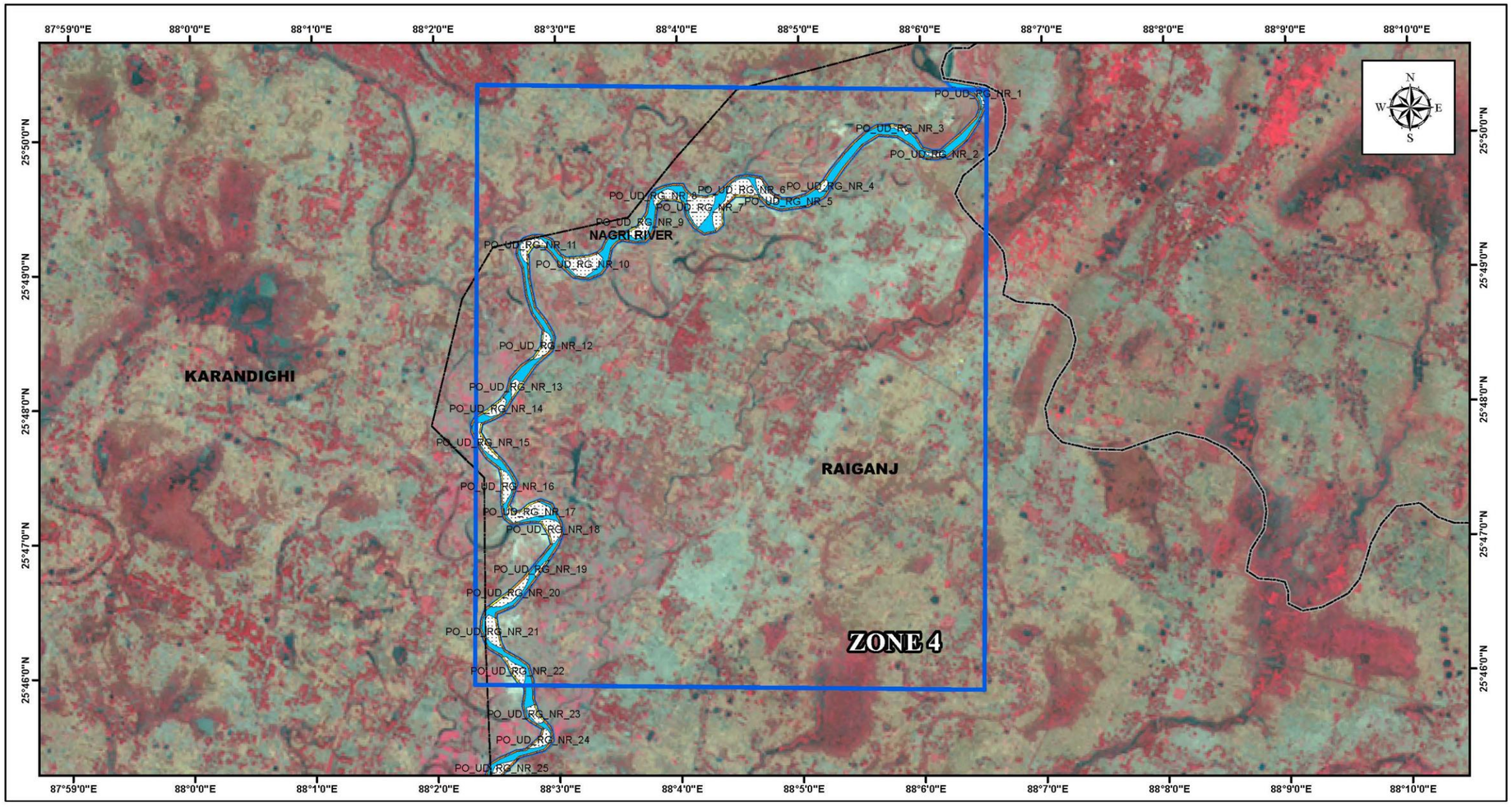
ABBREVIATION FORM					
PERIOD	PO	POSTMONSOON	BLOCK	HB	HEMTABAD
DISTRICT	UD	UTTAR DINAJPUR	BLOCK	KD	KARANDIGHI
BLOCK	CP	CHOPRA	BLOCK	IH	ITAHAR
BLOCK	IP	ISLAMPUR	RIVER	MH	MAHANANDA RIVER
BLOCK	GP1	GOPALPOKHAR-I	RIVER	DH	DAHUK RIVER
BLOCK	GP2	GOPALPOKHAR-II	RIVER	FH	FULHAR RIVER
BLOCK	RG	RAIGANJ	RIVER	NG	NAGRI RIVER
BLOCK	KG	KALIAGANJ	RIVER	TG	TANGON RIVER

Plate 2B3: Distribution Map of Sand Bars on Rivers During Post-Monsoon Period of Uttar Dinajpur District*(Source: ISRO RESOURCE Sat 2 LISS III Sensor, Nov2020)*



ABBREVIATION FORM					
PERIOD	PO	POSTMONSOON	BLOCK	HB	HEMTABAD
DISTRICT	UD	UTTAR DINAJPUR	BLOCK	KD	KARANDIGHI
BLOCK	CP	CHOPRA	BLOCK	IH	ITAHAR
BLOCK	IP	ISLAMPUR	RIVER	MH	MAHANANDA RIVER
BLOCK	GP1	GOPALPOKHAR-I	RIVER	DH	DAHUK RIVER
BLOCK	GP2	GOPALPOKHAR-II	RIVER	FH	FULHAR RIVER
BLOCK	RG	RAIGANJ	RIVER	NG	NAGRI RIVER
BLOCK	KG	KALIAGANJ	RIVER	TG	TANGON RIVER

Plate 2B4: Distribution Map of Sand Bars on Rivers During Post-Monsoon Period of Uttar Dinajpur District*(Source: ISRO RESOURCE Sat 2 LISS III Sensor, Nov2020)*



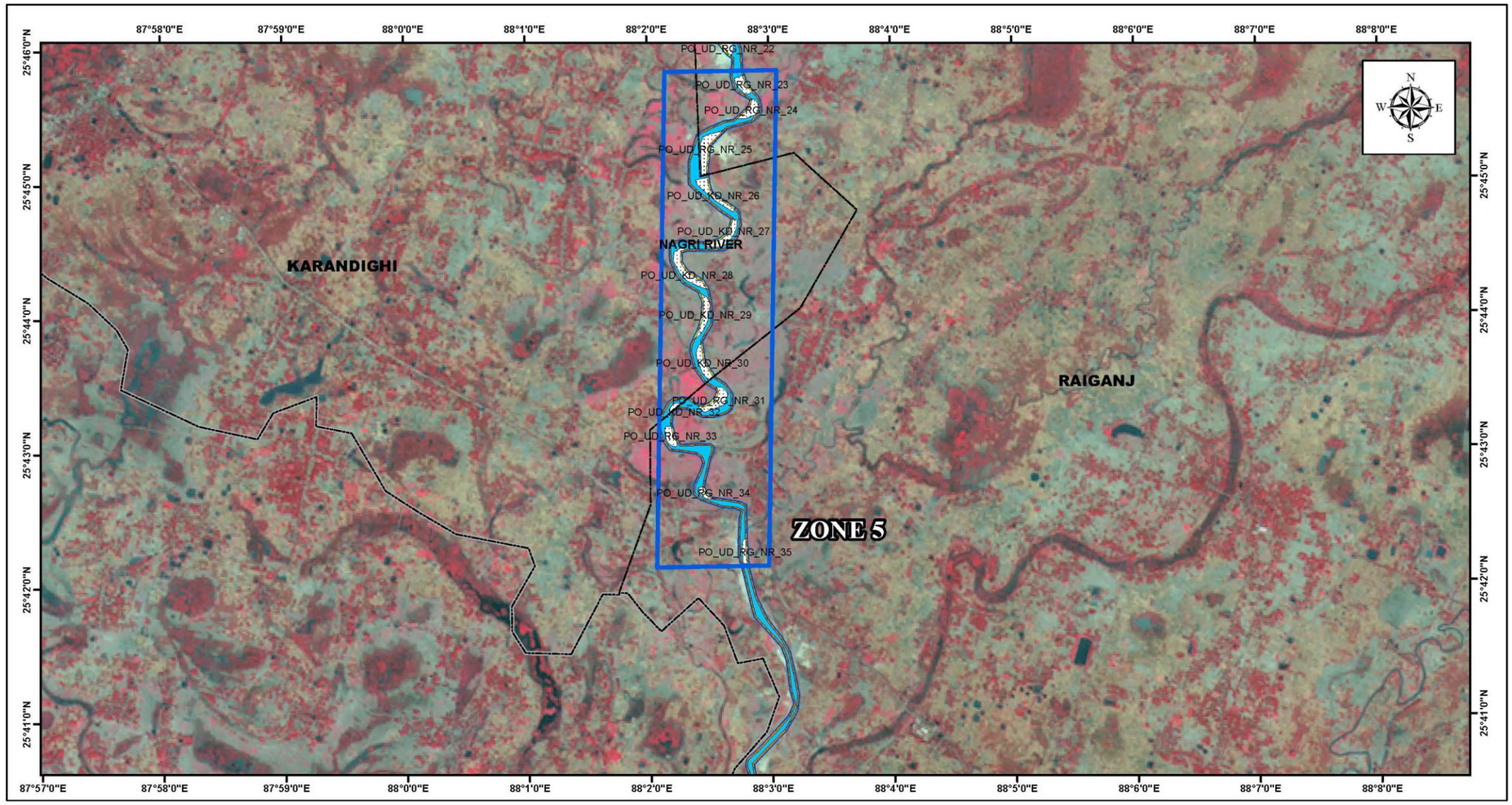
Legend

- Zone 4
- BLOCK BOUNDARY
- DISTRICT BOUNDARY
- Mining Lease Area
- Restricted Area
- safety barrier
- Po_Sand Bar
- River

SCALE 1:50,000 Kilometers 0 0.5 1 2 3 4

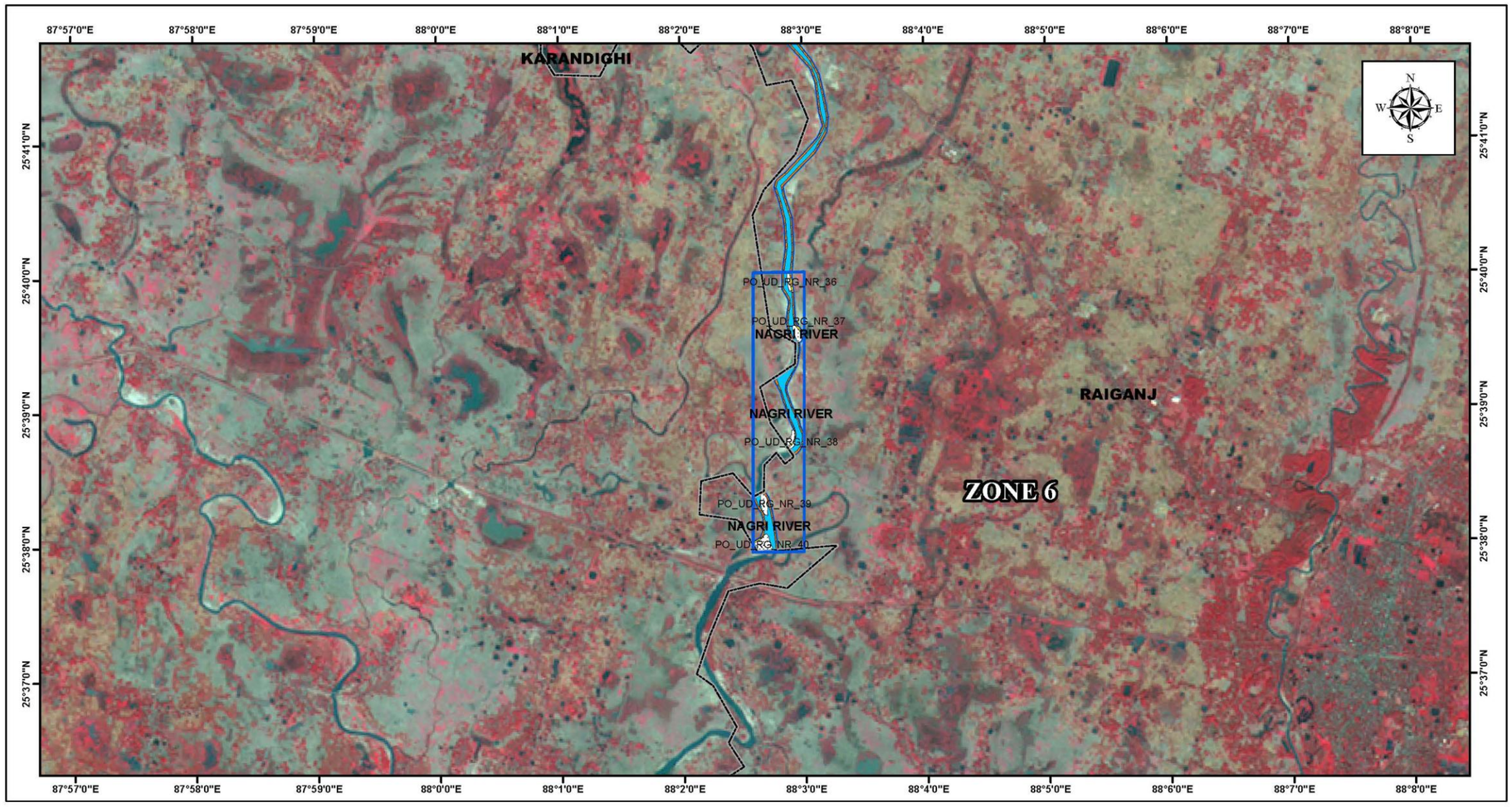
ABBREVIATION FORM					
PERIOD	PO	POSTMONSOON	BLOCK	HB	HEMTABAD
DISTRICT	UD	UTTAR DINAJPUR	BLOCK	KD	KARANDIGHI
BLOCK	CP	CHOPRA	BLOCK	IH	ITAHAR
BLOCK	IP	ISLAMPUR	RIVER	MH	MAHANANDA RIVER
BLOCK	GP1	GOPALPOKHAR-I	RIVER	DH	DAHUK RIVER
BLOCK	GP2	GOPALPOKHAR-II	RIVER	FH	FULHAR RIVER
BLOCK	RG	RAIGANJ	RIVER	NG	NAGRI RIVER
BLOCK	KG	KALIAGANJ	RIVER	TG	TANGON RIVER

Plate 2B5: Distribution Map of Sand Bars on Rivers During Post-Monsoon Period of Uttar Dinajpur District*(Source: ISRO RESOURCE Sat 2 LISS III Sensor, Nov2020)*



ABBREVIATION FORM					
PERIOD	PO	POSTMONSOON	BLOCK	HB	HEMTABAD
DISTRICT	UD	UTTAR DINAJPUR	BLOCK	KD	KARANDIGHI
BLOCK	CP	CHOPRA	BLOCK	IH	ITAHAR
BLOCK	IP	ISLAMPUR	RIVER	MH	MAHANANDA RIVER
BLOCK	GP1	GOPALPOKHAR-I	RIVER	DH	DAHUK RIVER
BLOCK	GP2	GOPALPOKHAR-II	RIVER	FH	FULHAR RIVER
BLOCK	RG	RAIGANJ	RIVER	NG	NAGRI RIVER
BLOCK	KG	KALIAGANJ	RIVER	TG	TANGON RIVER

Plate 2B6: Distribution Map of Sand Bars on Rivers During Post-Monsoon Period of Uttar Dinajpur District*(Source: ISRO RESOURCE Sat 2 LISS III Sensor, Nov2020)*



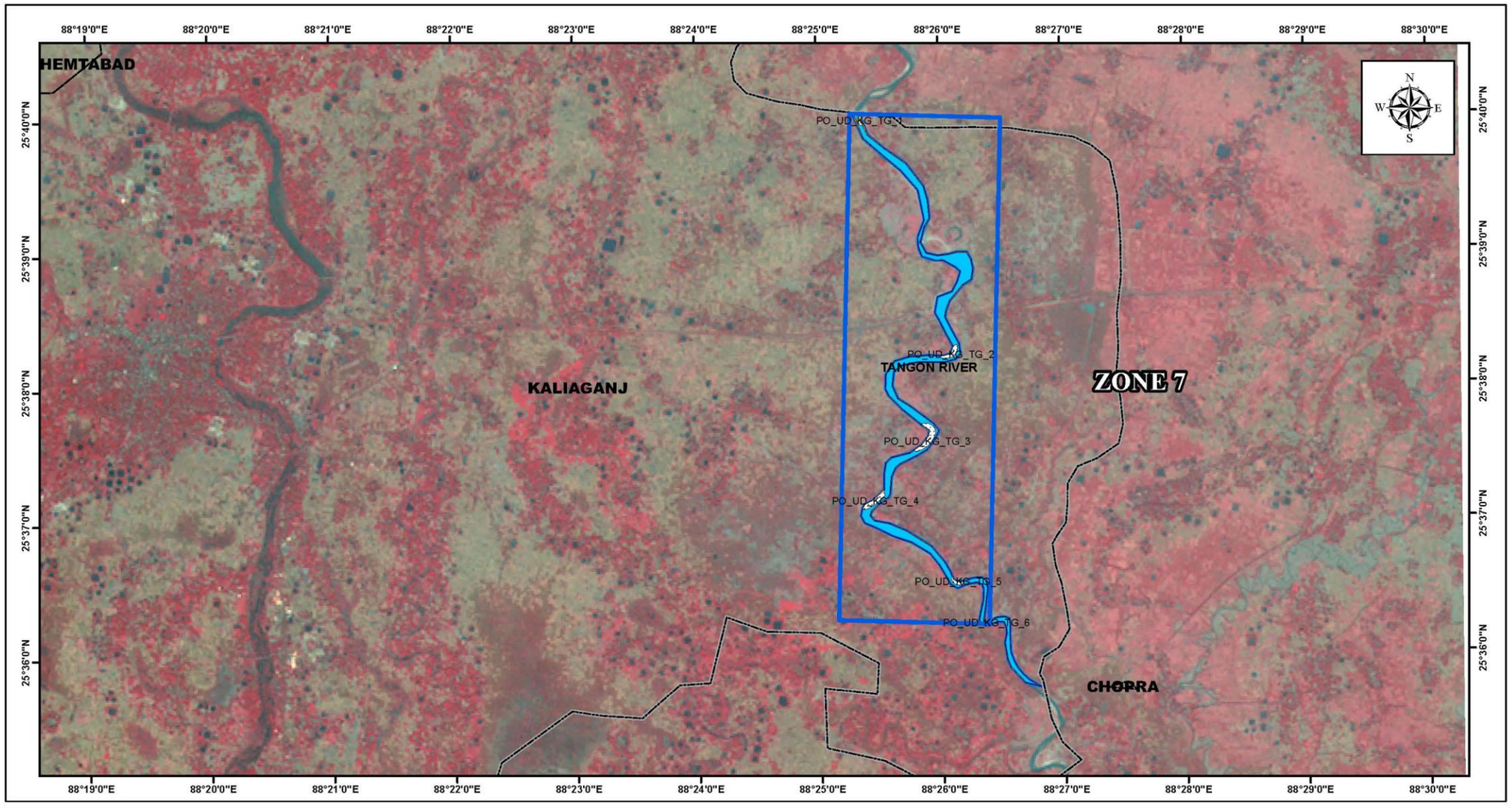
Legend

- Zone 6
- BLOCK BOUNDARY
- DISTRICT BOUNDARY
- Mining Lease Area
- Restricted Area
- safety barrier
- Po_Sand Bar
- River

SCALE 1:50,000 Kilometers 0 0.5 1 2 3 4

ABBREVIATION FORM					
PERIOD	PO	POSTMONSOON	BLOCK	HB	HEMTABAD
DISTRICT	UD	UTTAR DINAJPUR	BLOCK	KD	KARANDIGHI
BLOCK	CP	CHOPRA	BLOCK	IH	ITAHAR
BLOCK	IP	ISLAMPUR	RIVER	MH	MAHANANDA RIVER
BLOCK	GP1	GOPALPOKHAR-I	RIVER	DH	DAHUK RIVER
BLOCK	GP2	GOPALPOKHAR-II	RIVER	FH	FULHAR RIVER
BLOCK	RG	RAIGANJ	RIVER	NG	NAGRI RIVER
BLOCK	KG	KALIAGANJ	RIVER	TG	TANGON RIVER

Plate 2B7: Distribution Map of Sand Bars on Rivers During Post-Monsoon Period of Uttar Dinajpur District*(Source: ISRO RESOURCE Sat 2 LISS III Sensor, Nov2020)*



Legend

- Zone 7
- BLOCK BOUNDARY
- DISTRICT BOUNDARY
- Mining Lease Area
- Restricted Area
- safety barrier
- Po_Sand Bar
- River

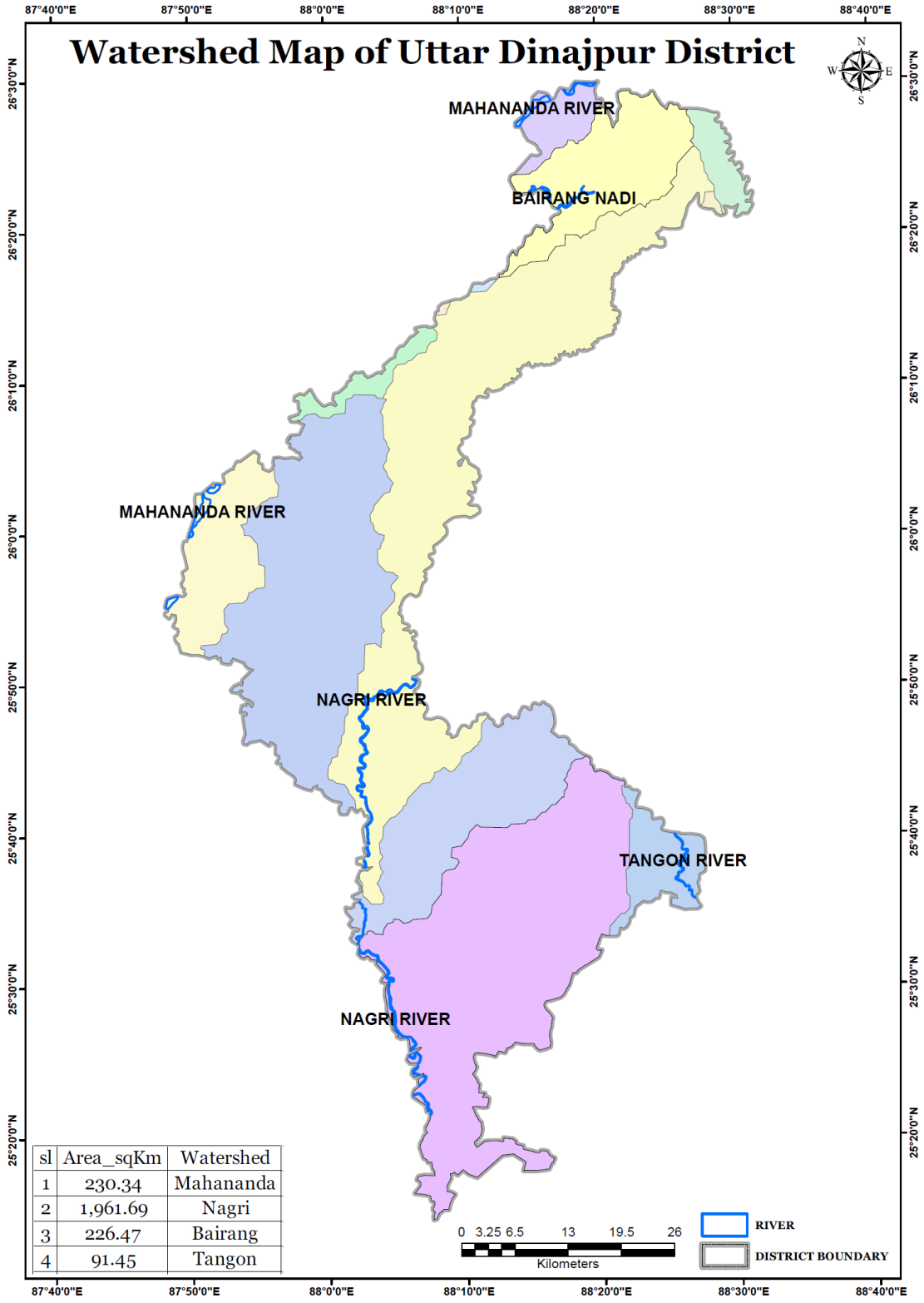
SCALE 1:50,000 — Kilometers: 0 0.5 1 2 3 4

ABBREVIATION FORM					
PERIOD	PO	POSTMONSOON	BLOCK	HB	HEMTABAD
DISTRICT	UD	UTTAR DINAJPUR	BLOCK	KD	KARANDIGHI
BLOCK	CP	CHOPRA	BLOCK	IH	ITAHAR
BLOCK	IP	ISLAMPUR	RIVER	MH	MAHANANDA RIVER
BLOCK	GP1	GOPALPOKHAR-I	RIVER	DH	DAHUK RIVER
BLOCK	GP2	GOPALPOKHAR-II	RIVER	FH	FULHAR RIVER
BLOCK	RG	RAIGANJ	RIVER	NG	NAGRI RIVER
BLOCK	KG	KALIAGANJ	RIVER	TG	TANGON RIVER

Plate 2B8: Distribution Map of Sand Bars on Rivers During Post-Monsoon Period of Uttar Dinajpur District*(Source: ISRO RESOURCE Sat 2 LISS III Sensor, Nov2020)*

PLATE3

WATERSHED MAP OF THE DISTRICT



sl	Area_sqKm	Watershed
1	230.34	Mahananda
2	1,961.69	Nagri
3	226.47	Bairang
4	91.45	Tangon

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

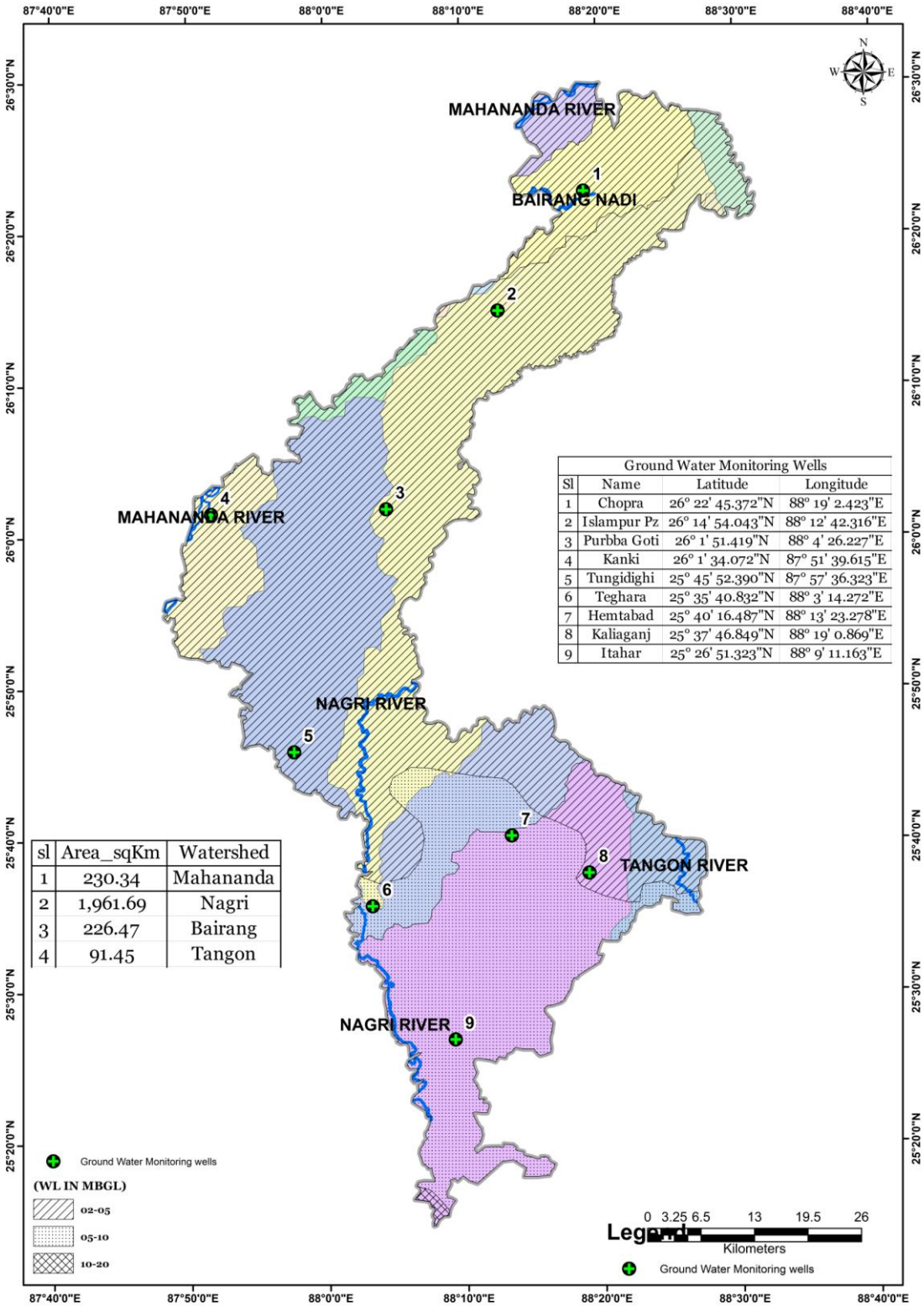


Plate 3B: District Watershed map showing ground water level during Pre-monsoon period *(Source: World Wild Fund for Nature, Sept 2020)*

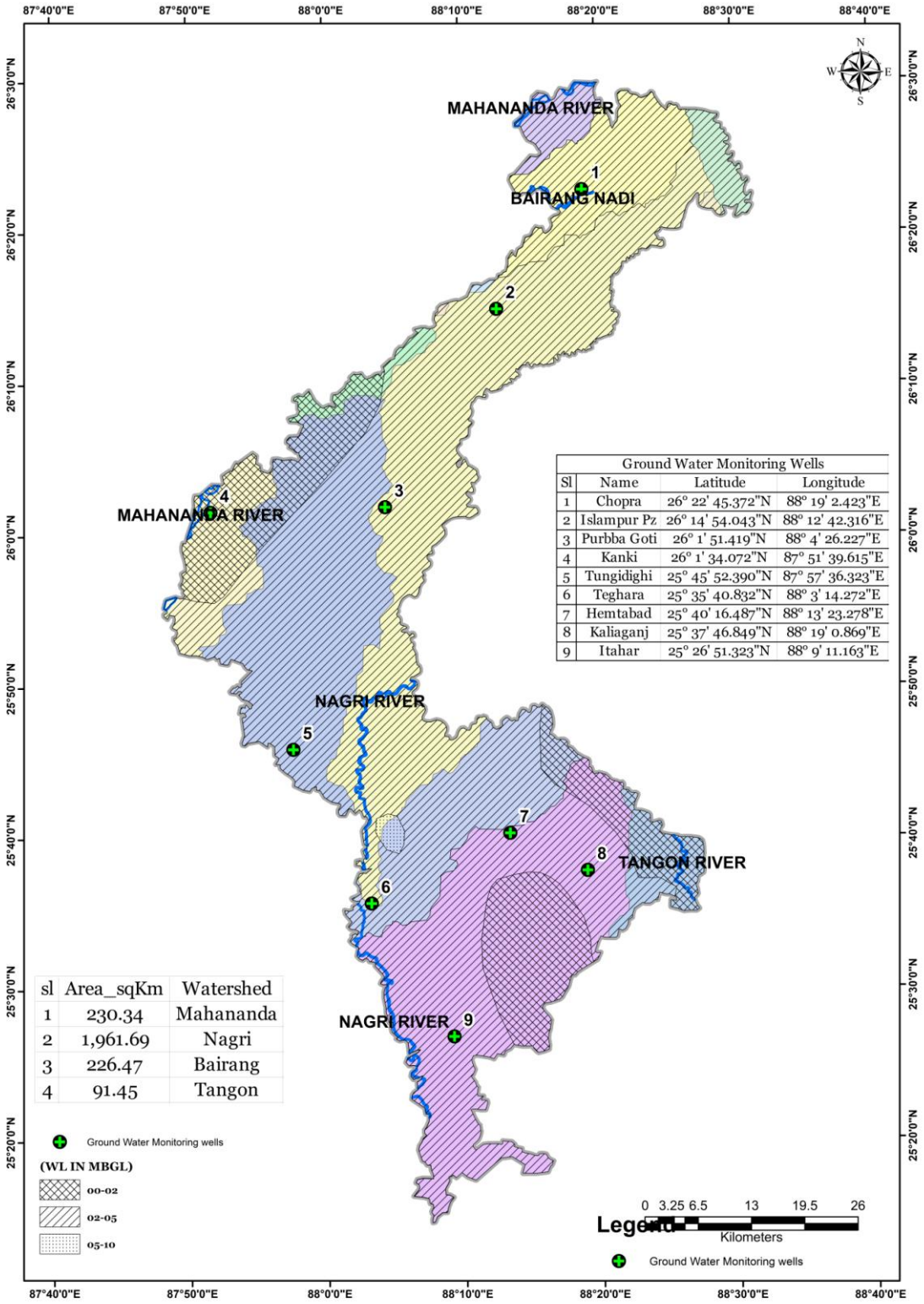


Plate 3C: District Watershed map showing ground water level during Post-monsoon period *(Source: World Wild Fund for Nature, Sept 2020)*

PLATE 4

FIELD SURVEY PHOTOGRAPHS

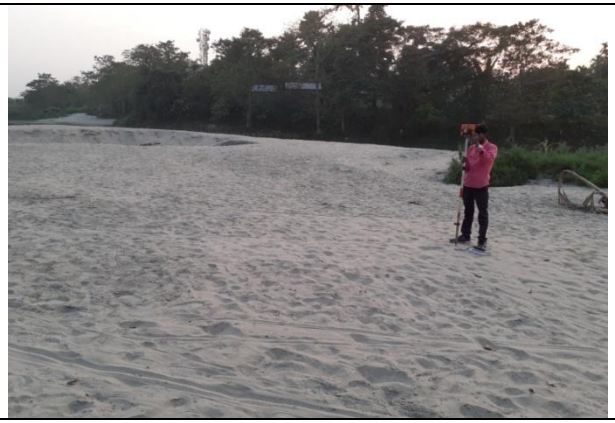
	
4A: Sand bar deposit in Nagri River (Date: 27/12/2020, Lat: 25°50'14.622" N Long: 88°6' 30.125" E)	**4B: Sand bar deposit in Fulhar River (Date: 27/12/2020, Lat:26° 3' 15.481" N Long: 87° 52' 12.455" E)**
	
4C: Sand bar deposit in Mahananda River (Date: 27/12/2020, Lat: 26° 28' 8.722" N Long: 88° 15' 18.117" E)	**4D: Sand bar deposit in Tangon River (Date: 27/12/2020, Lat: 25° 38' 11.768" N Long:88° 26' 4.252" E)**

PLATE 5

LONG TERM EROSION-ACCRETION MAP OF NAGRI RIVER

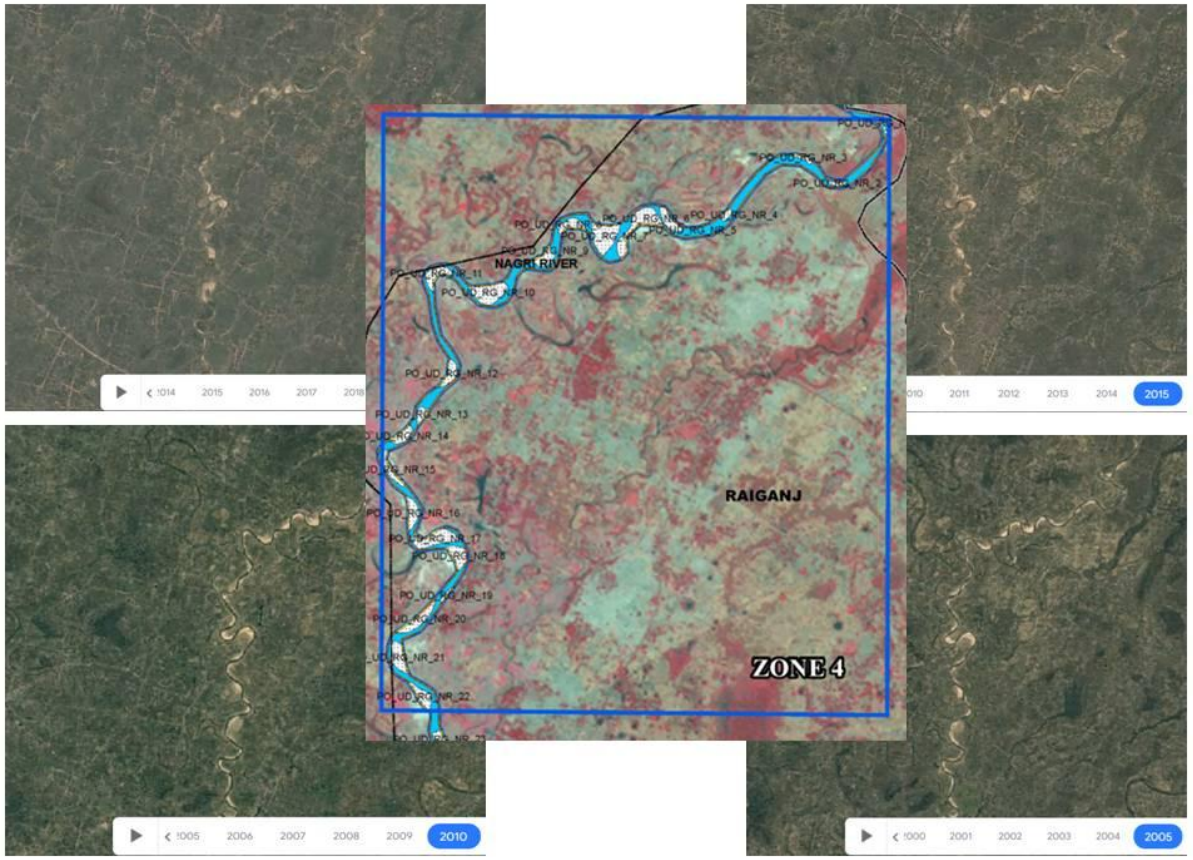


Plate 5A: Long term Nagri River map showing very less erosion/ accretion along its banks.*(Source: ISRO RESOURCE Sat 2 LISS III Sensor)*

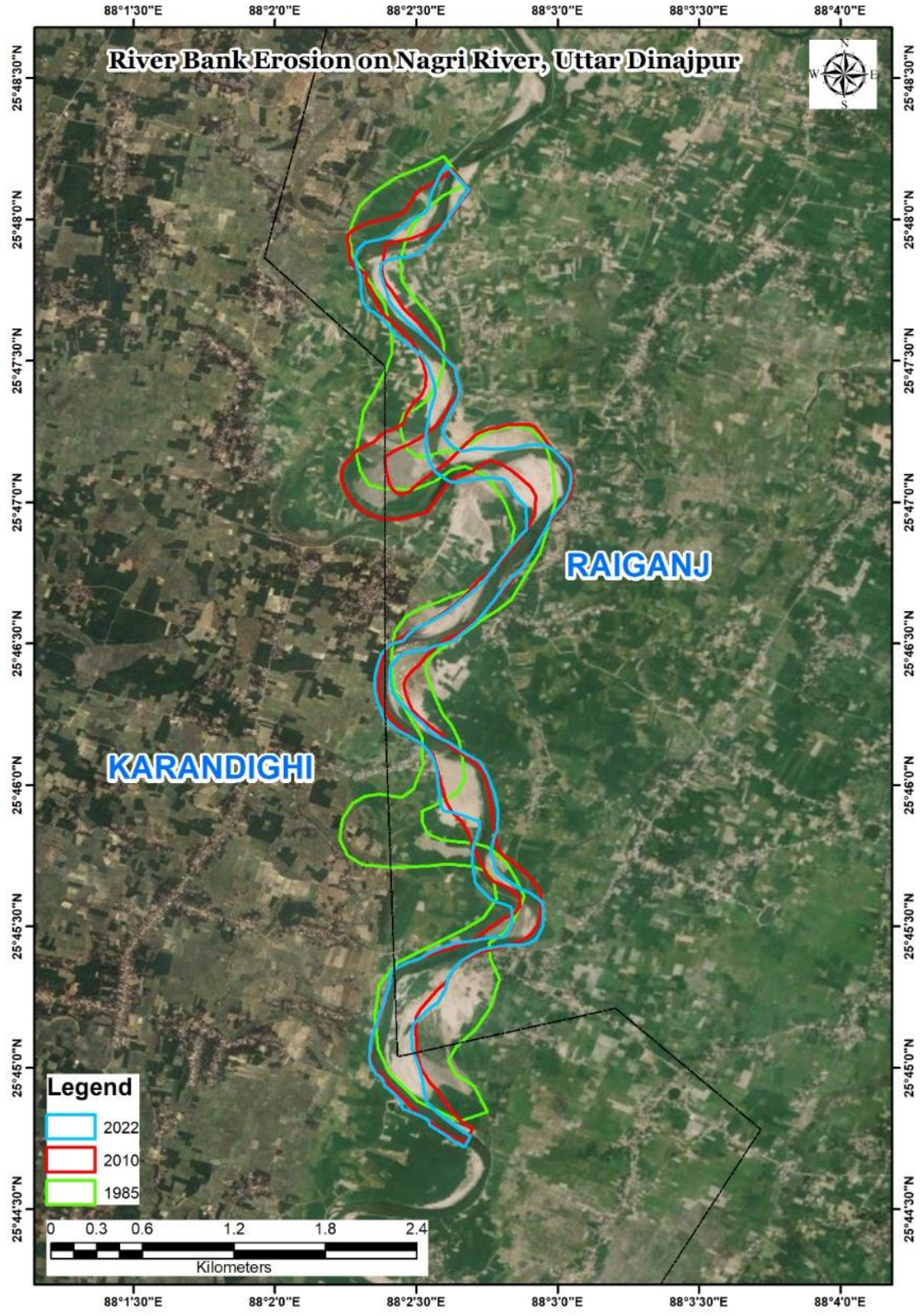


Plate 5B: Map showing long-term (10-year or more) erosion-accretion areas on both the banks of Nagri River, Uttar Dinajpur *(Source: ISRO RESOURCE Sat 2 LISS III Sensor)*

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 68 to 100.
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 98-99.
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 7.2 pg 80 to 82.
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 7.9 pg 96 to 97.

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 98-99.
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 19.
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 98-99.
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 inbetween 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 Uttar Dinajpur District

Abbreviation used in the table as below

Particulars	Code	Details	Particulars	Code	Details
PERIOD	PR	PRE-MONSOON	BLOCK	HB	HEMTABAD
PERIOD	PO	POST-MONSOON	BLOCK	KD	KARANDIGHI
DISTRICT	UD	UTTAR DINAJPUR	BLOCK	IH	ITAHAR
BLOCK	CP	CHOPRA	RIVER	MH	MAHANANDA RIVER
BLOCK	IP	ISLAMPUR	RIVER	DH	DAHUK RIVER
BLOCK	GP1	GOPALPOKHAR-I	RIVER	FH	FULHAR RIVER
BLOCK	GP2	GOPALPOKHAR-II	RIVER	NG	NAGRI RIVER
BLOCK	RG	RAIGANJ	RIVER	TG	TANGON RIVER
BLOCK	KG	KALIAGANJ			

Pre monsoon						Post monsoon					
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**
Estimation of Sand Resources in Pre monsoon period & Post monsoon period in sand bar regions of Mahananda River											
1	PR_UD_CP_MH_1	83.9	134007.56	1.4	0.19	1	PO_UD_CP_MH_1	84	130364.11	1.5	0.20
2	PR_UD_CP_MH_2	83.9	82110.46	1.4	0.11	2	PO_UD_CP_MH_2	84	73288.38	1.5	0.11
3	PR_UD_CP_MH_3	82.9	162207.47	1.4	0.23	3	PO_UD_CP_MH_3	83	162207.5	1.5	0.24
4	PR_UD_CP_MH_4	80.9	105449.46	1.4	0.15	4	PO_UD_CP_MH_4	81	105449.5	1.5	0.16
5	PR_UD_CP_MH_5	79.9	21164.23	1.4	0.03	5	PO_UD_CP_MH_5	80	21164.23	1.5	0.03
6	PR_UD_CP_MH_6	78.9	168671.94	1.4	0.24	6	PO_UD_CP_MH_6	79	168671.9	1.5	0.25
7	PR_UD_CP_MH_7	78.9	114184.69	1.4	0.16	7	PO_UD_CP_MH_7	79	114184.7	1.5	0.17
8	PR_UD_CP_MH_8	78.9	117702.67	1.4	0.16	8	PO_UD_CP_MH_8	79	117702.7	1.5	0.18
9	PR_UD_CP_MH_9	77.9	160914.07	1.4	0.23	9	PO_UD_CP_MH_9	78	148350.1	1.5	0.22
10	PR_UD_CP_MH_10	76.9	56807.09	1.4	0.08	10	PO_UD_CP_MH_10	77	28977.32	1.5	0.04
11	PR_UD_CP_MH_11	76.9	67888.91	1.4	0.10	11	PO_UD_CP_MH_11	77	54746.95	1.5	0.08
Estimation of Sand Resources in Pre monsoon period & Post monsoon period in sand bar regions of Dahuk River											
1	PR_UD_CP_DH_1	77.5	5045.78	2	0.01	1	PO_UD_CP_DH_1	78	3125.382	2.2	0.01
2	PR_UD_CP_DH_2	76.5	18364.51	2	0.03	2	PO_UD_CP_DH_2	77	15866.38	2.2	0.03
3	PR_UD_CP_DH_3	74.5	13859.3	2	0.02	3	PO_UD_CP_DH_3	75	13859.3	2.2	0.03
4	PR_UD_CP_DH_4	74.5	8496.92	2	0.01	4	PO_UD_CP_DH_4	75	5329.036	2.2	0.01
5	PR_UD_CP_DH_5	74.5	23753.69	2	0.04	5	PO_UD_CP_DH_5	75	23113.65	2.2	0.05

Pre monsoon						Post monsoon					
S L 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**
6	PR_UD_CP_DH_6	74.5	39589.97	2	0.07	6	PO_UD_CP_DH_6	75	36962.57	2.2	0.08
7	PR_UD_CP_DH_7	74.5	36809.91	2	0.06	7	PO_UD_CP_DH_7	75	36628	2.2	0.08
8	PR_UD_CP_DH_8	74.5	42124.05	2	0.07	8	PO_UD_CP_DH_8	75	41676.95	2.2	0.09
9	PR_UD_CP_DH_9	69.5	31331.97	2	0.05	9	PO_UD_CP_DH_9	70	22136.27	2.2	0.05
10	PR_UD_CP_DH_10	65.5	21278.96	2	0.04	10	PO_UD_CP_DH_10	66	15860.86	2.2	0.03
11	PR_UD_CP_DH_11	65.5	17559.88	2	0.03	11	PO_UD_CP_DH_11	66	12252.45	2.2	0.03
Estimation of Sand Resources in Pre monsoon period & Post monsoon period in sand bar regions of Tangon River											
1	PR_UD_CP_TG_1	32.9	7553.35	1.4	0.01	1	PO_UD_KG_TG_1	33	7553.347	1.5	0.01
2	PR_UD_CP_TG_2	32.9	16934.38	1.4	0.02	2	PO_UD_KG_TG_2	33	16934.38	1.5	0.03
3	PR_UD_CP_TG_3	32.9	38962.38	1.4	0.05	3	PO_UD_KG_TG_3	33	38962.38	1.5	0.06
4	PR_UD_CP_TG_4	31.9	25656.06	1.4	0.04	4	PO_UD_KG_TG_4	32	25656.06	1.5	0.04
5	PR_UD_CP_TG_5	30.9	9055.67	1.4	0.01	5	PO_UD_KG_TG_5	31	9055.671	1.5	0.01
6	PR_UD_CP_TG_6	28.9	2300.25	1.4	0.00	6	PO_UD_KG_TG_6	29	2300.249	1.5	0.00
Estimation of Sand Resources in Pre monsoon period & Post monsoon period in sand bar regions of Fulhar River											
1	PR_UD_GP2_FH_1	42.5	320998.63	2	0.64	1	PO_UD_GP2_FH_1	43	317685.9	2.5	0.79
2	PR_UD_GP2_FH_2	42.5	191001.85	2	0.38	2	PO_UD_GP2_FH_2	43	288969.1	2.5	0.72
3	PR_UD_GP2_FH_3	42.5	1122698.4	2	2.25	3	PO_UD_GP2_FH_3	43	961168.9	2.5	2.40
4	PR_UD_GP2_FH_4	40.5	299774.22	2	0.60	4	PO_UD_GP2_FH_4	41	122622.9	2.5	0.31
5	PR_UD_KD_FH_5	39.5	126631.36	2	0.25	5	PO_UD_GP2_FH_5	40	140823.1	2.5	0.35
6	PR_UD_KD_FH_6	37.5	223768.2	2	0.45	6	PO_UD_GP2_FH_6A	38	259455	2.5	0.65
						7	PO_UD_GP2_FH_6B	37	75661.14	2.5	0.19
Estimation of Sand Resources in Pre monsoon period & Post monsoon period in sand bar regions of Nagri River											
1	PR_UD_RG_NG_1	35.9	25833.09	1.9	0.05	1	PO_UD_RG_NR_1	36	12030.52	2	0.02
2	PR_UD_RG_NG_2	36.9	20253.33	1.9	0.04	2	PO_UD_RG_NR_2	37	11328.68	2	0.02
3	PR_UD_RG_NG_3	36.9	22584.48	1.9	0.04	3	PO_UD_RG_NR_3	37	16754.04	2	0.03
4	PR_UD_RG_NG_4	36.9	14917.98	1.9	0.03	4	PO_UD_RG_NR_4	37	14917.96	2	0.03
5	PR_UD_RG_NG_5	36.9	46422.72	1.9	0.09	5	PO_UD_RG_NR_5	37	43447.95	2	0.09
6	PR_UD_RG_NG_6	36.9	136428.01	1.9	0.26	6	PO_UD_RG_NR_6	37	136428	2	0.27
7	PR_UD_RG_NG_7	36.9	127332.51	1.9	0.24	7	PO_UD_RG_NR_7	37	117950.7	2	0.24
8	PR_UD_RG_NG_8	36.9	66037.48	1.9	0.13	8	PO_UD_RG_NR_8	37	48451.38	2	0.10
9	PR_UD_RG_NG_9	35.9	65144.69	1.9	0.12	9	PO_UD_RG_NR_9	36	49632.35	2	0.10
10	PR_UD_RG_NG_10	35.9	125777.59	1.9	0.24	10	PO_UD_RG_NR_10	36	112783.2	2	0.23
11	PR_UD_RG_NG_11	34.9	58256.49	1.9	0.11	11	PO_UD_RG_NR_11	35	58256.49	2	0.12

Pre monsoon						Post monsoon					
S L 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**
12	PR_UD_RG_NG_12	34.9	48219.97	1.9	0.09	12	PO_UD_RG_NR_12	35	48219.97	2	0.10
13	PR_UD_RG_NG_13	33.9	32245.94	1.9	0.06	13	PO_UD_RG_NR_13	34	26573.7	2	0.05
14	PR_UD_RG_NG_14	33.9	41604.56	1.9	0.08	14	PO_UD_RG_NR_14	34	41604.56	2	0.08
15	PR_UD_RG_NG_15	33.9	47930.25	1.9	0.09	15	PO_UD_RG_NR_15	34	47930.25	2	0.10
16	PR_UD_RG_NG_16	33.9	56806.69	1.9	0.11	16	PO_UD_RG_NR_16	34	56806.69	2	0.11
17	PR_UD_RG_NG_17	33.9	102283.52	1.9	0.19	17	PO_UD_RG_NR_17	34	102283.5	2	0.20
18	PR_UD_RG_NG_18	33.9	60964.19	1.9	0.12	18	PO_UD_RG_NR_18	34	60964.19	2	0.12
19	PR_UD_RG_NG_19	32.9	22116.5	1.9	0.04	19	PO_UD_RG_NR_19	33	12927.97	2	0.03
20	PR_UD_RG_NG_20	32.9	74323.14	1.9	0.14	20	PO_UD_RG_NR_20	33	74323.14	2	0.15
21	PR_UD_RG_NG_21	32.9	69172.69	1.9	0.13	21	PO_UD_RG_NR_21	33	69172.69	2	0.14
22	PR_UD_RG_NG_22	32.9	63617.16	1.9	0.12	22	PO_UD_RG_NR_22	33	54369	2	0.11
23	PR_UD_RG_NG_23	32.9	40718.05	1.9	0.08	23	PO_UD_RG_NR_23	33	33959.48	2	0.07
24	PR_UD_RG_NG_24	32.9	41470.46	1.9	0.08	24	PO_UD_RG_NR_24	33	41470.46	2	0.08
25	PR_UD_RG_NG_25	32.9	100171.7	1.9	0.19	25	PO_UD_RG_NR_25	33	78713.03	2	0.16
26	PR_UD_KD_NG_27	33.9	57572.71	1.9	0.11	26	PO_UD_KD_NR_26	34	55443.89	2	0.11
27	PR_UD_KD_NG_28	33.9	77364.28	1.9	0.15	27	PO_UD_KD_NR_27	34	57572.71	2	0.12
28	PR_UD_KD_NG_29	33.9	53318.49	1.9	0.10	28	PO_UD_KD_NR_28	34	77364.28	2	0.15
29	PR_UD_KD_NG_30	33.9	56702.7	1.9	0.11	29	PO_UD_KD_NR_29	34	53318.49	2	0.11
30	PR_UD_RG_NG_31	33.9	85345.27	1.9	0.16	30	PO_UD_KD_NR_30	34	51997.1	2	0.10
31	PR_UD_KD_NG_32	33.9	10808.06	1.9	0.02	31	PO_UD_RG_NR_31	34	59902.75	2	0.12
32	PR_UD_RG_NG_33	33.9	32793.48	1.9	0.06	32	PO_UD_KD_NR_32	34	10849.67	2	0.02
33	PR_UD_RG_NG_34	34.9	17367.23	1.9	0.03	33	PO_UD_RG_NR_33	35	32743.91	2	0.07
34	PR_UD_RG_NG_35	34.9	24916.74	1.9	0.05	34	PO_UD_RG_NR_34	35	17367.23	2	0.03
35	PR_UD_KD_NG_26	35.9	81156.59	1.9	0.15	35	PO_UD_RG_NR_35	36	24921.02	2	0.05
36	PR_UD_RG_NG_36	35.9	15999.93	1.9	0.03	36	PO_UD_RG_NR_36	36	15999.93	2	0.03
37	PR_UD_RG_NG_37	36.9	22271.52	1.9	0.04	37	PO_UD_RG_NR_37	37	22271.52	2	0.04
38	PR_UD_RG_NG_38	37.9	22022.06	1.9	0.04	38	PO_UD_RG_NR_38	38	22069.31	2	0.04
39	PR_UD_RG_NG_39	37.9	23389.54	1.9	0.04	39	PO_UD_RG_NR_39	38	23389.54	2	0.05
40	PR_UD_RG_NG_40	37.9	35931.69	1.9	0.07	40	PO_UD_RG_NR_40	38	44647.44	2	0.09

Annexure 3
Boundary Coordinates of Potential Blocks of Uttar Dinajpur District

Abbreviation used in the table as below

Particulars	Code	Details	Particulars	Code	Details
DISTRICT	UD	UTTAR DINAJPUR	BLOCK	KD	KARANDIGHI
BLOCK	CP	CHOPRA	BLOCK	IH	ITAHAR
BLOCK	IP	ISLAMPUR	RIVER	MH	MAHANANDA RIVER
BLOCK	GP1	GOPALPOKHAR-I	RIVER	DH	DAHUK RIVER
BLOCK	GP2	GOPALPOKHAR-II	RIVER	FH	FULHAR RIVER
BLOCK	RG	RAIGANJ	RIVER	NR	NAGRI RIVER
BLOCK	KG	KALIAGANJ	RIVER	TG	TANGON RIVER
BLOCK	HB	HEMTABAD			

ID	POINT_NO	LATITUDE	LONGITUDE
UD_RG_NR_1	1	25° 50' 20.190" N	88° 6' 23.807" E
	2	25° 50' 20.297" N	88° 6' 24.985" E
	3	25° 50' 20.190" N	88° 6' 27.341" E
	4	25° 50' 17.942" N	88° 6' 30.125" E
	5	25° 50' 13.980" N	88° 6' 31.410" E
	6	25° 50' 10.982" N	88° 6' 29.803" E
	7	25° 50' 14.622" N	88° 6' 30.125" E
	8	25° 50' 17.299" N	88° 6' 28.947" E
UD_RG_NR_2	1	25° 49' 52.202" N	88° 6' 10.993" E
	2	25° 49' 50.705" N	88° 6' 9.910" E
	3	25° 49' 50.193" N	88° 6' 6.579" E
	4	25° 49' 50.641" N	88° 6' 4.208" E
	5	25° 49' 51.299" N	88° 6' 2.551" E
	6	25° 49' 52.809" N	88° 6' 1.852" E
	7	25° 49' 52.489" N	88° 6' 2.609" E
	8	25° 49' 52.146" N	88° 6' 4.048" E
	9	25° 49' 52.146" N	88° 6' 8.091" E
UD_RG_NR_3	1	25° 50' 0.724" N	88° 5' 53.862" E
	2	25° 50' 0.118" N	88° 5' 52.108" E
	3	25° 50' 1.672" N	88° 5' 51.438" E
	4	25° 50' 2.357" N	88° 5' 49.314" E
	5	25° 50' 3.385" N	88° 5' 46.367" E
	6	25° 50' 3.620" N	88° 5' 43.929" E
	7	25° 50' 4.295" N	88° 5' 44.417" E
	8	25° 50' 4.331" N	88° 5' 46.132" E

ID	POINT_NO	LATITUDE	LONGITUDE
	9	25° 50' 3.261" N	88° 5' 52.013" E
	10	25° 50' 1.534" N	88° 5' 53.975" E
UD_RG_NR_4	1	25° 49' 36.423" N	88° 5' 12.457" E
	2	25° 49' 34.723" N	88° 5' 9.780" E
	3	25° 49' 36.626" N	88° 5' 8.277" E
	4	25° 49' 36.732" N	88° 5' 8.371" E
	5	25° 49' 37.014" N	88° 5' 8.848" E
	6	25° 49' 39.663" N	88° 5' 12.071" E
	7	25° 49' 40.481" N	88° 5' 12.656" E
	8	25° 49' 39.938" N	88° 5' 13.914" E
	9	25° 49' 38.648" N	88° 5' 13.902" E
	10	25° 49' 36.423" N	88° 5' 12.457" E
	11	25° 49' 40.066" N	88° 5' 11.493" E
	12	25° 49' 39.964" N	88° 5' 11.369" E
	13	25° 49' 40.042" N	88° 5' 11.444" E
UD_RG_NR_5	1	25° 49' 30.427" N	88° 4' 48.338" E
	2	25° 49' 30.133" N	88° 4' 46.169" E
	3	25° 49' 32.331" N	88° 4' 42.083" E
	4	25° 49' 34.047" N	88° 4' 40.331" E
	5	25° 49' 38.084" N	88° 4' 38.658" E
	6	25° 49' 39.944" N	88° 4' 38.332" E
	7	25° 49' 41.287" N	88° 4' 38.116" E
	8	25° 49' 41.485" N	88° 4' 39.258" E
	9	25° 49' 40.915" N	88° 4' 41.122" E
	10	25° 49' 39.842" N	88° 4' 41.961" E
	11	25° 49' 37.121" N	88° 4' 42.583" E
	12	25° 49' 34.809" N	88° 4' 45.255" E
	13	25° 49' 33.532" N	88° 4' 47.112" E
	14	25° 49' 31.550" N	88° 4' 49.887" E
UD_RG_NR_12	1	25° 48' 21.501" N	88° 2' 49.068" E
	2	25° 48' 21.392" N	88° 2' 47.472" E
	3	25° 48' 22.163" N	88° 2' 48.772" E
	4	25° 48' 27.018" N	88° 2' 52.410" E
	5	25° 48' 32.716" N	88° 2' 53.210" E
	6	25° 48' 34.105" N	88° 2' 53.405" E
	7	25° 48' 33.014" N	88° 2' 55.402" E

ID	POINT_NO	LATITUDE	LONGITUDE
	8	25° 48' 31.423" N	88° 2' 56.605" E
	9	25° 48' 28.667" N	88° 2' 57.112" E
	10	25° 48' 26.263" N	88° 2' 56.559" E
	11	25° 48' 24.280" N	88° 2' 54.945" E
	12	25° 48' 22.173" N	88° 2' 51.354" E
UD_RG_NR_19	1	25° 46' 51.439" N	88° 2' 54.013" E
	2	25° 46' 44.306" N	88° 2' 48.264" E
	3	25° 46' 45.649" N	88° 2' 47.712" E
	4	25° 46' 48.208" N	88° 2' 49.891" E
	5	25° 46' 50.932" N	88° 2' 52.667" E
UD_RG_NR_23	1	25° 45' 39.338" N	88° 2' 50.958" E
	2	25° 45' 38.924" N	88° 2' 48.818" E
	3	25° 45' 39.469" N	88° 2' 47.754" E
	4	25° 45' 42.175" N	88° 2' 45.166" E
	5	25° 45' 43.690" N	88° 2' 43.755" E
	6	25° 45' 46.059" N	88° 2' 43.300" E
	7	25° 45' 46.699" N	88° 2' 45.161" E
	8	25° 45' 46.916" N	88° 2' 45.762" E
	9	25° 45' 47.449" N	88° 2' 47.243" E
	10	25° 45' 42.981" N	88° 2' 48.838" E
	11	25° 45' 40.034" N	88° 2' 51.739" E
UD_RG_NR_25	1	25° 45' 3.613" N	88° 2' 29.270" E
	2	25° 45' 3.189" N	88° 2' 26.612" E
	3	25° 45' 17.024" N	88° 2' 26.121" E
	4	25° 45' 20.027" N	88° 2' 27.505" E
	5	25° 45' 21.251" N	88° 2' 30.427" E
	6	25° 45' 21.765" N	88° 2' 33.168" E
	7	25° 45' 22.279" N	88° 2' 35.652" E
	8	25° 45' 22.879" N	88° 2' 37.451" E
	9	25° 45' 22.985" N	88° 2' 37.739" E
	10	25° 45' 16.392" N	88° 2' 30.508" E
	11	25° 45' 5.265" N	88° 2' 29.044" E
UD_KD_NR_28	1	25° 44' 15.622" N	88° 2' 26.513" E
	2	25° 44' 12.183" N	88° 2' 28.751" E
	3	25° 44' 13.072" N	88° 2' 25.179" E
	4	25° 44' 16.020" N	88° 2' 18.795" E

ID	POINT_NO	LATITUDE	LONGITUDE
	5	25° 44' 18.405" N	88° 2' 16.086" E
	6	25° 44' 22.076" N	88° 2' 13.863" E
	7	25° 44' 25.097" N	88° 2' 12.346" E
	8	25° 44' 28.748" N	88° 2' 12.852" E
	9	25° 44' 30.340" N	88° 2' 15.834" E
	10	25° 44' 30.864" N	88° 2' 17.619" E
	11	25° 44' 29.679" N	88° 2' 18.083" E
	12	25° 44' 29.554" N	88° 2' 18.015" E
	13	25° 44' 29.046" N	88° 2' 15.990" E
	14	25° 44' 24.063" N	88° 2' 15.947" E
	15	25° 44' 19.798" N	88° 2' 18.965" E
	16	25° 44' 17.629" N	88° 2' 22.886" E
UD_KD_NR_32	1	25° 43' 21.126" N	88° 2' 15.962" E
	2	25° 43' 21.113" N	88° 2' 16.051" E
	3	25° 43' 16.446" N	88° 2' 9.829" E
	4	25° 43' 16.714" N	88° 2' 9.177" E
	5	25° 43' 17.881" N	88° 2' 9.567" E
	6	25° 43' 19.594" N	88° 2' 10.645" E
	7	25° 43' 20.756" N	88° 2' 11.642" E
	8	25° 43' 21.296" N	88° 2' 13.090" E
	9	25° 43' 21.285" N	88° 2' 13.382" E
UD_RG_NR_33	1	25° 43' 2.004" N	88° 2' 13.331" E
	2	25° 43' 1.733" N	88° 2' 12.721" E
	3	25° 43' 2.017" N	88° 2' 11.433" E
	4	25° 43' 3.132" N	88° 2' 9.467" E
	5	25° 43' 4.308" N	88° 2' 8.566" E
	6	25° 43' 6.102" N	88° 2' 7.898" E
	7	25° 43' 7.756" N	88° 2' 7.533" E
	8	25° 43' 10.027" N	88° 2' 7.476" E
	9	25° 43' 10.847" N	88° 2' 8.167" E
	10	25° 43' 10.844" N	88° 2' 8.658" E
	11	25° 43' 10.769" N	88° 2' 10.704" E
	12	25° 43' 5.947" N	88° 2' 12.028" E
	13	25° 43' 5.552" N	88° 2' 12.329" E
	14	25° 43' 4.334" N	88° 2' 13.254" E
	15	25° 43' 3.516" N	88° 2' 13.496" E

ID	POINT_NO	LATITUDE	LONGITUDE
	16	25° 43' 2.004" N	88° 2' 13.331" E
	17	25° 43' 6.337" N	88° 2' 12.661" E
	18	25° 43' 6.213" N	88° 2' 12.697" E
	19	25° 43' 6.219" N	88° 2' 12.693" E
UD_RG_NR_36	1	25° 39' 56.428" N	88° 2' 53.693" E
	2	25° 39' 52.405" N	88° 2' 54.350" E
	3	25° 39' 52.901" N	88° 2' 53.106" E
	4	25° 39' 55.142" N	88° 2' 52.366" E
	5	25° 39' 58.757" N	88° 2' 52.018" E
	6	25° 40' 1.080" N	88° 2' 51.849" E
	7	25° 40' 1.067" N	88° 2' 53.514" E
	8	25° 40' 0.381" N	88° 2' 53.437" E
UD_RG_NR_37	1	25° 39' 30.500" N	88° 2' 58.638" E
	2	25° 39' 29.822" N	88° 2' 57.013" E
	3	25° 39' 32.696" N	88° 2' 55.728" E
	4	25° 39' 35.250" N	88° 2' 54.611" E
	5	25° 39' 36.284" N	88° 2' 54.392" E
	6	25° 39' 37.247" N	88° 2' 54.401" E
	7	25° 39' 37.598" N	88° 2' 55.082" E
	8	25° 39' 37.634" N	88° 2' 55.555" E
	9	25° 39' 37.565" N	88° 2' 55.566" E
	10	25° 39' 36.302" N	88° 2' 57.241" E
	11	25° 39' 33.316" N	88° 2' 59.233" E
	12	25° 39' 32.827" N	88° 2' 59.779" E
UD_RG_NR_39	1	25° 38' 14.569" N	88° 2' 41.532" E
	2	25° 38' 12.793" N	88° 2' 41.570" E
	3	25° 38' 13.104" N	88° 2' 40.197" E
	4	25° 38' 15.135" N	88° 2' 38.839" E
	5	25° 38' 16.858" N	88° 2' 38.427" E
	6	25° 38' 18.795" N	88° 2' 38.112" E
	7	25° 38' 21.117" N	88° 2' 38.180" E
	8	25° 38' 22.517" N	88° 2' 38.081" E
	9	25° 38' 23.070" N	88° 2' 39.289" E
	10	25° 38' 20.521" N	88° 2' 41.283" E
	11	25° 38' 18.996" N	88° 2' 41.705" E
	12	25° 38' 16.791" N	88° 2' 41.700" E

ID	POINT_NO	LATITUDE	LONGITUDE
UD_RG_NR_40	1	25° 37' 56.859" N	88° 2' 44.060" E
	2	25° 37' 56.309" N	88° 2' 36.528" E
	3	25° 38' 0.034" N	88° 2' 34.080" E
	4	25° 38' 0.399" N	88° 2' 34.663" E
	5	25° 38' 2.476" N	88° 2' 38.478" E
	6	25° 38' 2.760" N	88° 2' 38.624" E
	7	25° 38' 2.819" N	88° 2' 38.865" E
	8	25° 38' 4.272" N	88° 2' 40.016" E
	9	25° 38' 4.610" N	88° 2' 40.968" E
	10	25° 38' 3.398" N	88° 2' 42.001" E
	11	25° 38' 0.468" N	88° 2' 42.829" E
	12	25° 37' 58.397" N	88° 2' 43.855" E
UD_CP_DH_1	1	26° 26' 44.769" N	88° 26' 2.527" E
	2	26° 26' 44.023" N	88° 26' 2.604" E
	3	26° 26' 42.636" N	88° 26' 2.655" E
	4	26° 26' 41.813" N	88° 26' 2.604" E
	5	26° 26' 42.236" N	88° 26' 1.707" E
	6	26° 26' 43.126" N	88° 26' 1.159" E
	7	26° 26' 44.291" N	88° 26' 1.090" E
	8	26° 26' 44.840" N	88° 26' 1.365" E
	9	26° 26' 44.769" N	88° 26' 1.833" E
UD_CP_DH_2	1	26° 26' 30.043" N	88° 25' 52.021" E
	2	26° 26' 29.358" N	88° 25' 51.849" E
	3	26° 26' 28.330" N	88° 25' 50.393" E
	4	26° 26' 27.474" N	88° 25' 47.738" E
	5	26° 26' 26.703" N	88° 25' 44.996" E
	6	26° 26' 26.126" N	88° 25' 41.947" E
	7	26° 26' 27.108" N	88° 25' 42.528" E
	8	26° 26' 29.036" N	88° 25' 45.949" E
	9	26° 26' 29.443" N	88° 25' 47.576" E
	10	26° 26' 29.372" N	88° 25' 48.545" E
	11	26° 26' 30.091" N	88° 25' 50.292" E
	12	26° 26' 30.331" N	88° 25' 51.971" E
	13	26° 26' 30.068" N	88° 25' 52.016" E
UD_CP_DH_4	1	26° 25' 32.578" N	88° 24' 43.184" E
	2	26° 25' 31.803" N	88° 24' 43.042" E

ID	POINT_NO	LATITUDE	LONGITUDE
	3	26° 25' 30.569" N	88° 24' 41.808" E
	4	26° 25' 30.364" N	88° 24' 40.267" E
	5	26° 25' 30.364" N	88° 24' 38.005" E
	6	26° 25' 30.822" N	88° 24' 38.494" E
	7	26° 25' 31.122" N	88° 24' 38.944" E
	8	26° 25' 31.678" N	88° 24' 39.865" E
	9	26° 25' 32.257" N	88° 24' 41.343" E
	10	26° 25' 32.663" N	88° 24' 42.478" E
UD_CP_DH_6	1	26° 24' 45.899" N	88° 23' 39.558" E
	2	26° 24' 45.633" N	88° 23' 37.231" E
	3	26° 24' 46.276" N	88° 23' 34.018" E
	4	26° 24' 47.818" N	88° 23' 31.577" E
	5	26° 24' 49.231" N	88° 23' 29.778" E
	6	26° 24' 50.773" N	88° 23' 29.007" E
	7	26° 24' 55.142" N	88° 23' 29.007" E
	8	26° 24' 55.142" N	88° 23' 30.137" E
	9	26° 24' 51.612" N	88° 23' 31.590" E
	10	26° 24' 50.856" N	88° 23' 32.690" E
	11	26° 24' 50.131" N	88° 23' 33.248" E
	12	26° 24' 49.656" N	88° 23' 34.433" E
	13	26° 24' 49.618" N	88° 23' 34.489" E
	14	26° 24' 49.613" N	88° 23' 34.541" E
	15	26° 24' 49.360" N	88° 23' 35.175" E
	16	26° 24' 48.846" N	88° 23' 38.516" E
	17	26° 24' 48.829" N	88° 23' 38.584" E
	18	26° 24' 48.054" N	88° 23' 39.814" E
	19	26° 24' 47.854" N	88° 23' 40.109" E
	20	26° 24' 47.133" N	88° 23' 40.171" E
UD_CP_DH_7	1	26° 25' 8.119" N	88° 23' 14.980" E
	2	26° 25' 6.036" N	88° 23' 15.265" E
	3	26° 25' 6.143" N	88° 23' 15.168" E
	4	26° 25' 7.327" N	88° 23' 12.415" E
	5	26° 25' 8.043" N	88° 23' 7.251" E
	6	26° 25' 7.658" N	88° 23' 5.997" E
	7	26° 25' 8.119" N	88° 23' 4.273" E
	8	26° 25' 10.475" N	88° 23' 6.093" E

ID	POINT_NO	LATITUDE	LONGITUDE
	9	26° 25' 11.867" N	88° 23' 8.342" E
	10	26° 25' 12.188" N	88° 23' 9.305" E
	11	26° 25' 12.188" N	88° 23' 11.340" E
	12	26° 25' 10.903" N	88° 23' 13.374" E
UD_CP_DH_10	1	26° 21' 37.482" N	88° 17' 47.066" E
	2	26° 21' 37.482" N	88° 17' 46.423" E
	3	26° 21' 38.124" N	88° 17' 45.010" E
	4	26° 21' 39.280" N	88° 17' 43.211" E
	5	26° 21' 41.079" N	88° 17' 39.999" E
	6	26° 21' 42.430" N	88° 17' 36.140" E
	7	26° 21' 43.342" N	88° 17' 36.210" E
	8	26° 21' 42.417" N	88° 17' 39.145" E
	9	26° 21' 38.964" N	88° 17' 46.593" E
	10	26° 21' 37.933" N	88° 17' 47.919" E
UD_CP_DH_11	1	26° 21' 33.302" N	88° 17' 15.188" E
	2	26° 21' 30.748" N	88° 17' 12.354" E
	3	26° 21' 31.044" N	88° 17' 11.719" E
	4	26° 21' 33.265" N	88° 17' 15.144" E
	5	26° 21' 37.178" N	88° 17' 18.406" E
	6	26° 21' 39.792" N	88° 17' 19.815" E
	7	26° 21' 38.974" N	88° 17' 21.322" E
UD_CP_MH_1	1	26° 29' 39.493" N	88° 19' 44.136" E
	2	26° 29' 38.422" N	88° 19' 40.495" E
	3	26° 29' 38.958" N	88° 19' 35.677" E
	4	26° 29' 40.028" N	88° 19' 30.644" E
	5	26° 29' 41.956" N	88° 19' 25.612" E
	6	26° 29' 43.669" N	88° 19' 23.149" E
	7	26° 29' 45.634" N	88° 19' 22.276" E
	8	26° 29' 45.460" N	88° 19' 24.449" E
	9	26° 29' 44.430" N	88° 19' 42.030" E
	10	26° 29' 44.277" N	88° 19' 49.958" E
	11	26° 29' 41.313" N	88° 19' 47.669" E
UD_CP_MH_4	1	26° 28' 37.542" N	88° 16' 34.030" E
	2	26° 28' 35.448" N	88° 16' 31.192" E
	3	26° 28' 34.837" N	88° 16' 28.101" E
	4	26° 28' 34.829" N	88° 16' 15.568" E

ID	POINT_NO	LATITUDE	LONGITUDE
	5	26° 28' 34.347" N	88° 16' 11.260" E
	6	26° 28' 34.437" N	88° 16' 10.902" E
	7	26° 28' 38.506" N	88° 16' 10.580" E
	8	26° 28' 38.292" N	88° 16' 14.114" E
	9	26° 28' 37.863" N	88° 16' 16.898" E
	10	26° 28' 36.364" N	88° 16' 21.609" E
	11	26° 28' 36.471" N	88° 16' 26.535" E
	12	26° 28' 41.504" N	88° 16' 34.780" E
	13	26° 28' 46.800" N	88° 16' 40.323" E
	14	26° 28' 43.787" N	88° 16' 42.119" E
UD_CP_MH_5	1	26° 28' 49.694" N	88° 16' 35.019" E
	2	26° 28' 47.895" N	88° 16' 27.181" E
	3	26° 28' 50.465" N	88° 16' 27.823" E
	4	26° 28' 52.392" N	88° 16' 29.237" E
	5	26° 28' 52.906" N	88° 16' 30.265" E
	6	26° 28' 52.906" N	88° 16' 32.449" E
	7	26° 28' 52.135" N	88° 16' 33.991" E
UD_CP_MH_7	1	26° 28' 10.821" N	88° 15' 36.581" E
	2	26° 28' 10.479" N	88° 15' 30.413" E
	3	26° 28' 12.706" N	88° 15' 30.413" E
	4	26° 28' 17.332" N	88° 15' 39.836" E
	5	26° 28' 24.356" N	88° 15' 47.032" E
	6	26° 28' 26.926" N	88° 15' 51.143" E
	7	26° 28' 27.288" N	88° 15' 52.149" E
	8	26° 28' 16.328" N	88° 15' 46.629" E
	9	26° 28' 15.727" N	88° 15' 46.556" E
	10	26° 28' 14.419" N	88° 15' 44.976" E
UD_CP_MH_9	1	26° 27' 44.328" N	88° 15' 8.814" E
	2	26° 27' 43.897" N	88° 15' 5.022" E
	3	26° 27' 48.394" N	88° 15' 4.636" E
	4	26° 27' 50.579" N	88° 15' 4.508" E
	5	26° 27' 53.791" N	88° 15' 4.379" E
	6	26° 27' 57.132" N	88° 15' 5.150" E
	7	26° 28' 0.216" N	88° 15' 6.563" E
	8	26° 28' 0.297" N	88° 15' 6.650" E
	9	26° 28' 3.989" N	88° 15' 11.675" E

ID	POINT_NO	LATITUDE	LONGITUDE
	10	26° 28' 4.713" N	88° 15' 15.172" E
	11	26° 28' 4.841" N	88° 15' 18.642" E
	12	26° 28' 4.970" N	88° 15' 22.496" E
	13	26° 27' 59.830" N	88° 15' 16.329" E
	14	26° 27' 53.919" N	88° 15' 12.731" E
	15	26° 27' 47.495" N	88° 15' 11.575" E
	16	26° 27' 46.513" N	88° 15' 11.276" E
UD_CP_MH_11	1	26° 26' 58.536" N	88° 14' 22.236" E
	2	26° 26' 58.201" N	88° 14' 15.527" E
	3	26° 27' 0.355" N	88° 14' 18.953" E
	4	26° 27' 3.997" N	88° 14' 23.306" E
	5	26° 27' 6.246" N	88° 14' 26.197" E
	6	26° 27' 9.607" N	88° 14' 30.688" E
	7	26° 27' 12.690" N	88° 14' 32.658" E
	8	26° 27' 14.147" N	88° 14' 34.629" E
	9	26° 27' 13.545" N	88° 14' 35.145" E
	10	26° 27' 13.457" N	88° 14' 35.066" E
	11	26° 27' 7.563" N	88° 14' 30.594" E
	12	26° 27' 3.312" N	88° 14' 27.576" E
	13	26° 27' 1.213" N	88° 14' 25.555" E
UD_KG_TG_1	1	25° 39' 55.957" N	88° 25' 22.592" E
	2	25° 39' 55.915" N	88° 25' 22.512" E
	3	25° 39' 55.924" N	88° 25' 21.602" E
	4	25° 39' 57.347" N	88° 25' 20.328" E
	5	25° 39' 58.106" N	88° 25' 20.109" E
	6	25° 39' 59.344" N	88° 25' 20.124" E
	7	25° 40' 0.380" N	88° 25' 20.175" E
	8	25° 40' 0.351" N	88° 25' 20.379" E
UD_KG_TG_3	1	25° 37' 30.999" N	88° 25' 50.372" E
	2	25° 37' 30.083" N	88° 25' 47.325" E
	3	25° 37' 30.681" N	88° 25' 46.348" E
	4	25° 37' 33.144" N	88° 25' 50.333" E
	5	25° 37' 36.886" N	88° 25' 53.508" E
	6	25° 37' 39.657" N	88° 25' 54.155" E
	7	25° 37' 42.121" N	88° 25' 50.172" E
	8	25° 37' 42.298" N	88° 25' 49.929" E

ID	POINT_NO	LATITUDE	LONGITUDE
	9	25° 37' 42.600" N	88° 25' 51.269" E
	10	25° 37' 42.577" N	88° 25' 53.640" E
	11	25° 37' 40.915" N	88° 25' 56.466" E
	12	25° 37' 38.243" N	88° 25' 57.098" E
	13	25° 37' 34.990" N	88° 25' 55.542" E
	14	25° 37' 32.437" N	88° 25' 52.855" E
UD_KG_TG_4	1	25° 37' 5.224" N	88° 25' 24.200" E
	2	25° 37' 4.485" N	88° 25' 22.446" E
	3	25° 37' 4.629" N	88° 25' 20.737" E
	4	25° 37' 4.834" N	88° 25' 20.783" E
	5	25° 37' 6.615" N	88° 25' 21.888" E
	6	25° 37' 8.981" N	88° 25' 26.654" E
	7	25° 37' 13.116" N	88° 25' 31.437" E
	8	25° 37' 10.584" N	88° 25' 31.928" E
	9	25° 37' 9.357" N	88° 25' 30.775" E
	10	25° 37' 7.866" N	88° 25' 28.481" E
	11	25° 37' 6.508" N	88° 25' 26.644" E
UD_KG_TG_6	1	25° 36' 13.020" N	88° 26' 22.181" E
	2	25° 36' 12.819" N	88° 26' 21.609" E
	3	25° 36' 12.826" N	88° 26' 20.870" E
	4	25° 36' 13.038" N	88° 26' 20.303" E
	5	25° 36' 13.611" N	88° 26' 19.798" E
	6	25° 36' 14.007" N	88° 26' 19.987" E
	7	25° 36' 13.576" N	88° 26' 22.460" E
UD_GP2_FH_1	1	26° 3' 12.130" N	87° 52' 7.396" E
	2	26° 3' 5.716" N	87° 51' 54.162" E
	3	26° 3' 0.775" N	87° 51' 39.035" E
	4	26° 3' 0.744" N	87° 51' 29.800" E
	5	26° 3' 2.973" N	87° 51' 22.771" E
	6	26° 3' 10.541" N	87° 51' 32.357" E
	7	26° 3' 6.765" N	87° 51' 39.994" E
	8	26° 3' 6.473" N	87° 51' 45.883" E
	9	26° 3' 8.933" N	87° 51' 50.982" E
	10	26° 3' 10.429" N	87° 51' 52.946" E
	11	26° 3' 11.391" N	87° 51' 53.506" E
	12	26° 3' 11.881" N	87° 51' 55.097" E

ID	POINT_NO	LATITUDE	LONGITUDE
	13	26° 3' 18.393" N	87° 52' 2.762" E
	14	26° 3' 21.493" N	87° 52' 4.729" E
	15	26° 3' 21.150" N	87° 52' 12.574" E
	16	26° 3' 18.887" N	87° 52' 13.993" E
	17	26° 3' 15.481" N	87° 52' 12.455" E
UD_GP2_FH_2	1	26° 2' 58.463" N	87° 51' 58.165" E
	2	26° 2' 50.996" N	87° 51' 45.770" E
	3	26° 2' 51.332" N	87° 51' 31.955" E
	4	26° 2' 52.954" N	87° 51' 26.467" E
	5	26° 2' 58.996" N	87° 51' 17.734" E
	6	26° 3' 1.346" N	87° 51' 20.710" E
	7	26° 2' 58.939" N	87° 51' 26.082" E
	8	26° 2' 56.953" N	87° 51' 34.637" E
	9	26° 2' 58.062" N	87° 51' 46.903" E
	10	26° 3' 1.669" N	87° 51' 55.022" E
	11	26° 3' 4.525" N	87° 52' 2.779" E
	12	26° 3' 1.197" N	87° 52' 1.921" E
	13	26° 3' 0.669" N	87° 52' 1.417" E
UD_GP2_FH_3	1	26° 2' 20.934" N	87° 51' 17.357" E
	2	26° 2' 19.839" N	87° 51' 20.681" E
	3	26° 2' 20.680" N	87° 51' 23.900" E
	4	26° 2' 21.312" N	87° 51' 26.047" E
	5	26° 2' 20.225" N	87° 51' 28.181" E
	6	26° 2' 16.563" N	87° 51' 29.344" E
	7	26° 2' 10.979" N	87° 51' 28.232" E
	8	26° 2' 6.371" N	87° 51' 25.700" E
	9	26° 2' 1.291" N	87° 51' 25.246" E
	10	26° 1' 58.884" N	87° 51' 23.999" E
	11	26° 1' 50.292" N	87° 51' 17.968" E
	12	26° 1' 42.891" N	87° 51' 15.058" E
	13	26° 1' 34.434" N	87° 51' 9.047" E
	14	26° 1' 24.130" N	87° 51' 0.788" E
	15	26° 1' 23.965" N	87° 51' 0.637" E
	16	26° 1' 29.441" N	87° 50' 58.897" E
	17	26° 1' 38.072" N	87° 50' 53.605" E
	18	26° 1' 43.965" N	87° 50' 50.969" E

ID	POINT_NO	LATITUDE	LONGITUDE
	19	26° 1' 45.261" N	87° 50' 51.790" E
	20	26° 1' 46.689" N	87° 50' 51.000" E
	21	26° 1' 56.012" N	87° 50' 55.876" E
	22	26° 2' 8.952" N	87° 51' 7.393" E
	23	26° 2' 16.999" N	87° 51' 10.069" E
	24	26° 2' 24.328" N	87° 51' 6.909" E
	25	26° 2' 28.309" N	87° 51' 6.343" E
	26	26° 2' 23.970" N	87° 51' 12.976" E
UD_GP2_FH_4	1	26° 1' 16.919" N	87° 50' 30.965" E
	2	26° 1' 20.438" N	87° 50' 35.750" E
	3	26° 1' 25.143" N	87° 50' 40.067" E
	4	26° 1' 31.232" N	87° 50' 46.774" E
	5	26° 1' 25.185" N	87° 50' 51.371" E
	6	26° 1' 20.351" N	87° 50' 50.622" E
	7	26° 1' 16.852" N	87° 50' 42.387" E
UD_CP_MH_10	1	26° 27' 29.678" N	88° 14' 45.165" E
	2	26° 27' 28.007" N	88° 14' 40.797" E
	3	26° 27' 28.117" N	88° 14' 38.936" E
	4	26° 27' 31.605" N	88° 14' 43.551" E
	5	26° 27' 36.718" N	88° 14' 46.897" E
	6	26° 27' 38.158" N	88° 14' 48.506" E
UD_CP_MH_8	1	26° 28' 8.850" N	88° 15' 22.603" E
	2	26° 28' 8.422" N	88° 15' 18.749" E
	3	26° 28' 8.722" N	88° 15' 18.117" E
	4	26° 28' 10.384" N	88° 15' 20.379" E
	5	26° 28' 15.818" N	88° 15' 28.262" E
	6	26° 28' 24.982" N	88° 15' 30.037" E
	7	26° 28' 27.053" N	88° 15' 34.382" E
	8	26° 28' 27.588" N	88° 15' 37.487" E
	9	26° 28' 24.376" N	88° 15' 37.380" E
	10	26° 28' 22.342" N	88° 15' 35.881" E
	11	26° 28' 20.414" N	88° 15' 34.275" E
	12	26° 28' 17.523" N	88° 15' 31.919" E
	13	26° 28' 15.703" N	88° 15' 30.313" E
	14	26° 28' 13.240" N	88° 15' 27.957" E
	15	26° 28' 10.777" N	88° 15' 25.601" E

ID	POINT_NO	LATITUDE	LONGITUDE
UD_CP_MH_6	1	26° 28' 34.978" N	88° 15' 57.482" E
	2	26° 28' 34.635" N	88° 15' 53.884" E
	3	26° 28' 36.348" N	88° 15' 52.857" E
	4	26° 28' 41.107" N	88° 15' 57.615" E
	5	26° 28' 41.239" N	88° 15' 59.882" E
	6	26° 28' 46.851" N	88° 16' 7.555" E
	7	26° 28' 52.027" N	88° 16' 20.064" E
	8	26° 28' 52.760" N	88° 16' 22.715" E
	9	26° 28' 52.281" N	88° 16' 22.324" E
	10	26° 28' 44.914" N	88° 16' 12.730" E
	11	26° 28' 39.089" N	88° 16' 5.363" E
UD_CP_MH_3	1	26° 29' 15.855" N	88° 18' 29.979" E
	2	26° 29' 15.772" N	88° 18' 29.973" E
	3	26° 29' 15.853" N	88° 18' 29.967" E
	4	26° 29' 15.855" N	88° 18' 29.979" E
	5	26° 29' 2.462" N	88° 18' 17.482" E
	6	26° 29' 0.492" N	88° 18' 8.567" E
	7	26° 29' 0.842" N	88° 18' 1.927" E
	8	26° 29' 1.051" N	88° 18' 1.509" E
	9	26° 29' 1.227" N	88° 18' 1.245" E
	10	26° 29' 3.520" N	88° 18' 6.723" E
	11	26° 29' 10.330" N	88° 18' 17.002" E
	12	26° 29' 14.313" N	88° 18' 24.069" E
	13	26° 29' 15.212" N	88° 18' 26.382" E
	14	26° 29' 15.632" N	88° 18' 28.732" E
	15	26° 29' 13.833" N	88° 18' 28.727" E
	16	26° 29' 10.728" N	88° 18' 28.157" E
	17	26° 29' 6.500" N	88° 18' 25.004" E
UD_CP_MH_2	1	26° 29' 32.227" N	88° 18' 29.561" E
	2	26° 29' 25.923" N	88° 18' 28.776" E
	3	26° 29' 29.776" N	88° 18' 28.513" E
	4	26° 29' 34.380" N	88° 18' 28.299" E
	5	26° 29' 39.305" N	88° 18' 29.584" E
	6	26° 29' 43.267" N	88° 18' 33.332" E
	7	26° 29' 44.445" N	88° 18' 36.544" E
	8	26° 29' 43.095" N	88° 18' 40.678" E

ID	POINT_NO	LATITUDE	LONGITUDE
	9	26° 29' 35.228" N	88° 18' 32.104" E
UD_CP_DH_3	1	26° 25' 45.267" N	88° 24' 58.127" E
	2	26° 25' 43.006" N	88° 24' 58.949" E
	3	26° 25' 43.017" N	88° 24' 58.925" E
	4	26° 25' 43.377" N	88° 24' 58.687" E
	5	26° 25' 44.952" N	88° 24' 55.970" E
	6	26° 25' 43.816" N	88° 24' 52.466" E
	7	26° 25' 43.567" N	88° 24' 52.056" E
	8	26° 25' 43.691" N	88° 24' 51.822" E
	9	26° 25' 45.473" N	88° 24' 52.919" E
	10	26° 25' 46.501" N	88° 24' 53.878" E
	11	26° 25' 46.981" N	88° 24' 55.111" E
	12	26° 25' 46.981" N	88° 24' 56.208" E
	13	26° 25' 46.227" N	88° 24' 57.373" E
UD_CP_DH_5	1	26° 24' 40.053" N	88° 23' 58.475" E
	2	26° 24' 39.839" N	88° 23' 57.297" E
	3	26° 24' 41.445" N	88° 23' 57.083" E
	4	26° 24' 43.372" N	88° 23' 56.012" E
	5	26° 24' 45.193" N	88° 23' 53.870" E
	6	26° 24' 46.799" N	88° 23' 53.228" E
	7	26° 24' 49.583" N	88° 23' 52.800" E
	8	26° 24' 51.296" N	88° 23' 53.335" E
	9	26° 24' 51.510" N	88° 23' 54.941" E
	10	26° 24' 50.503" N	88° 23' 54.823" E
	11	26° 24' 50.206" N	88° 23' 54.531" E
	12	26° 24' 47.758" N	88° 23' 54.443" E
	13	26° 24' 44.225" N	88° 23' 58.078" E
	14	26° 24' 41.941" N	88° 23' 58.672" E
	15	26° 24' 40.595" N	88° 23' 58.655" E
UD_CP_DH_8	1	26° 24' 41.909" N	88° 22' 54.100" E
	2	26° 24' 37.088" N	88° 22' 53.182" E
	3	26° 24' 34.183" N	88° 22' 52.088" E
	4	26° 24' 33.922" N	88° 22' 52.411" E
	5	26° 24' 32.476" N	88° 22' 50.601" E
	6	26° 24' 33.118" N	88° 22' 46.490" E
	7	26° 24' 34.660" N	88° 22' 45.076" E

ID	POINT_NO	LATITUDE	LONGITUDE
	8	26° 24' 36.716" N	88° 22' 44.948" E
	9	26° 24' 38.001" N	88° 22' 45.462" E
	10	26° 24' 38.130" N	88° 22' 46.104" E
	11	26° 24' 37.873" N	88° 22' 48.803" E
	12	26° 24' 39.158" N	88° 22' 50.473" E
UD_CP_DH_9	1	26° 23' 39.114" N	88° 20' 48.417" E
	2	26° 23' 38.789" N	88° 20' 48.037" E
	3	26° 23' 39.245" N	88° 20' 48.420" E
	4	26° 23' 40.873" N	88° 20' 48.848" E
	5	26° 23' 42.329" N	88° 20' 49.362" E
	6	26° 23' 42.329" N	88° 20' 50.819" E
	7	26° 23' 42.757" N	88° 20' 53.731" E
	8	26° 23' 42.813" N	88° 20' 58.891" E
	9	26° 23' 41.724" N	88° 20' 59.139" E
	10	26° 23' 40.928" N	88° 20' 57.252" E
	11	26° 23' 40.928" N	88° 20' 57.007" E
	12	26° 23' 40.757" N	88° 20' 54.437" E
	13	26° 23' 40.329" N	88° 20' 52.467" E
	14	26° 23' 39.658" N	88° 20' 51.200" E
UD_GP2_FH_5	1	25° 55' 43.079" N	87° 48' 53.289" E
	2	25° 55' 41.383" N	87° 48' 49.093" E
	3	25° 55' 45.875" N	87° 48' 45.509" E
	4	25° 55' 49.843" N	87° 48' 43.349" E
	5	25° 55' 51.664" N	87° 48' 43.928" E
	6	25° 55' 55.858" N	87° 48' 56.371" E
	7	25° 55' 54.582" N	87° 48' 57.078" E
	8	25° 55' 50.701" N	87° 48' 59.049" E
	9	25° 55' 46.572" N	87° 48' 59.115" E
UD_GP2_FH_6A	1	25° 55' 27.666" N	87° 48' 37.166" E
	2	25° 55' 24.792" N	87° 48' 32.144" E
	3	25° 55' 24.819" N	87° 48' 27.389" E
	4	25° 55' 30.164" N	87° 48' 25.143" E
	5	25° 55' 36.455" N	87° 48' 22.903" E
	6	25° 55' 40.322" N	87° 48' 23.405" E
	7	25° 55' 43.069" N	87° 48' 24.375" E
	8	25° 55' 43.537" N	87° 48' 24.392" E

ID	POINT_NO	LATITUDE	LONGITUDE
	9	25° 55' 45.928" N	87° 48' 26.914" E
	10	25° 55' 47.725" N	87° 48' 32.245" E
	11	25° 55' 45.949" N	87° 48' 32.289" E
	12	25° 55' 43.783" N	87° 48' 35.032" E
	13	25° 55' 43.339" N	87° 48' 37.597" E
	14	25° 55' 40.749" N	87° 48' 39.292" E
	15	25° 55' 33.611" N	87° 48' 39.243" E
	16	25° 55' 27.762" N	87° 48' 37.230" E
UD_GP2_FH_6B	1	25° 55' 23.927" N	87° 48' 17.587" E
	2	25° 55' 23.585" N	87° 48' 17.201" E
	3	25° 55' 36.557" N	87° 48' 20.610" E
	4	25° 55' 31.895" N	87° 48' 23.062" E
	5	25° 55' 26.383" N	87° 48' 24.547" E
	6	25° 55' 24.748" N	87° 48' 24.631" E
	7	25° 55' 24.343" N	87° 48' 20.158" E
UD_RG_NR_6	1	25° 49' 35.387" N	88° 4' 38.799" E
	2	25° 49' 33.006" N	88° 4' 39.918" E
	3	25° 49' 33.901" N	88° 4' 34.530" E
	4	25° 49' 33.949" N	88° 4' 28.051" E
	5	25° 49' 28.194" N	88° 4' 21.280" E
	6	25° 49' 21.097" N	88° 4' 21.643" E
	7	25° 49' 18.282" N	88° 4' 18.315" E
	8	25° 49' 21.168" N	88° 4' 17.081" E
	9	25° 49' 24.817" N	88° 4' 16.734" E
	10	25° 49' 27.286" N	88° 4' 17.821" E
	11	25° 49' 28.987" N	88° 4' 20.345" E
	12	25° 49' 31.787" N	88° 4' 23.183" E
	13	25° 49' 34.327" N	88° 4' 23.966" E
	14	25° 49' 37.004" N	88° 4' 24.750" E
	15	25° 49' 39.400" N	88° 4' 26.444" E
	16	25° 49' 40.959" N	88° 4' 29.651" E
	17	25° 49' 41.287" N	88° 4' 31.707" E
	18	25° 49' 41.057" N	88° 4' 34.898" E
	19	25° 49' 37.046" N	88° 4' 37.674" E
UD_RG_NR_7	1	25° 49' 33.719" N	88° 4' 6.287" E
	2	25° 49' 32.759" N	88° 4' 13.538" E

ID	POINT_NO	LATITUDE	LONGITUDE
	3	25° 49' 33.992" N	88° 4' 18.455" E
	4	25° 49' 31.683" N	88° 4' 18.012" E
	5	25° 49' 30.034" N	88° 4' 17.693" E
	6	25° 49' 27.502" N	88° 4' 15.922" E
	7	25° 49' 25.236" N	88° 4' 15.217" E
	8	25° 49' 24.101" N	88° 4' 14.195" E
	9	25° 49' 23.022" N	88° 4' 13.167" E
	10	25° 49' 21.531" N	88° 4' 11.522" E
	11	25° 49' 19.770" N	88° 4' 10.075" E
	12	25° 49' 21.161" N	88° 4' 8.035" E
	13	25° 49' 25.446" N	88° 4' 5.413" E
	14	25° 49' 31.646" N	88° 4' 4.404" E
	15	25° 49' 34.963" N	88° 4' 4.799" E
UD_RG_NR_8	1	25° 49' 33.644" N	88° 4' 0.737" E
	2	25° 49' 31.616" N	88° 4' 1.644" E
	3	25° 49' 32.435" N	88° 3' 58.388" E
	4	25° 49' 32.620" N	88° 3' 51.867" E
	5	25° 49' 30.221" N	88° 3' 49.173" E
	6	25° 49' 28.772" N	88° 3' 48.960" E
	7	25° 49' 30.282" N	88° 3' 48.067" E
	8	25° 49' 32.650" N	88° 3' 47.731" E
	9	25° 49' 34.543" N	88° 3' 49.644" E
	10	25° 49' 35.914" N	88° 3' 51.957" E
	11	25° 49' 37.027" N	88° 3' 54.827" E
	12	25° 49' 36.385" N	88° 3' 57.440" E
	13	25° 49' 35.014" N	88° 3' 58.939" E
UD_RG_NR_9	1	25° 49' 15.261" N	88° 3' 41.447" E
	2	25° 49' 14.871" N	88° 3' 38.569" E
	3	25° 49' 16.524" N	88° 3' 35.923" E
	4	25° 49' 17.765" N	88° 3' 34.867" E
	5	25° 49' 17.933" N	88° 3' 35.488" E
	6	25° 49' 20.062" N	88° 3' 40.289" E
	7	25° 49' 24.208" N	88° 3' 43.452" E
	8	25° 49' 21.480" N	88° 3' 44.942" E
	9	25° 49' 20.555" N	88° 3' 46.124" E
	10	25° 49' 16.186" N	88° 3' 44.273" E

ID	POINT_NO	LATITUDE	LONGITUDE
UD_RG_NR_10	1	25° 49' 6.314" N	88° 3' 22.696" E
	2	25° 49' 3.316" N	88° 3' 20.940" E
	3	25° 49' 0.360" N	88° 3' 17.770" E
	4	25° 48' 57.919" N	88° 3' 13.787" E
	5	25° 48' 58.656" N	88° 3' 9.491" E
	6	25° 49' 0.997" N	88° 3' 6.852" E
	7	25° 49' 4.200" N	88° 3' 4.029" E
	8	25° 49' 7.062" N	88° 3' 2.653" E
	9	25° 49' 6.133" N	88° 3' 4.382" E
	10	25° 49' 6.322" N	88° 3' 8.490" E
	11	25° 49' 6.898" N	88° 3' 15.671" E
	12	25° 49' 8.375" N	88° 3' 20.213" E
	13	25° 49' 8.483" N	88° 3' 20.364" E
UD_RG_NR_11	1	25° 49' 12.909" N	88° 2' 54.937" E
	2	25° 49' 11.372" N	88° 2' 54.923" E
	3	25° 49' 11.940" N	88° 2' 54.244" E
	4	25° 49' 12.708" N	88° 2' 48.319" E
	5	25° 49' 8.867" N	88° 2' 45.331" E
	6	25° 49' 4.101" N	88° 2' 45.534" E
	7	25° 49' 5.507" N	88° 2' 43.754" E
	8	25° 49' 8.184" N	88° 2' 42.257" E
	9	25° 49' 12.228" N	88° 2' 41.913" E
	10	25° 49' 13.597" N	88° 2' 42.970" E
	11	25° 49' 14.760" N	88° 2' 44.822" E
	12	25° 49' 15.585" N	88° 2' 49.111" E
	13	25° 49' 15.075" N	88° 2' 52.675" E
UD_RG_NR_13	1	25° 48' 10.388" N	88° 2' 41.977" E
	2	25° 48' 4.107" N	88° 2' 37.166" E
	3	25° 48' 5.333" N	88° 2' 37.031" E
	4	25° 48' 8.774" N	88° 2' 36.966" E
	5	25° 48' 11.265" N	88° 2' 37.368" E
	6	25° 48' 12.205" N	88° 2' 38.137" E
	7	25° 48' 12.712" N	88° 2' 39.471" E
	8	25° 48' 11.794" N	88° 2' 40.501" E
	9	25° 48' 11.481" N	88° 2' 42.831" E
UD_RG_NR_14	1	25° 47' 56.993" N	88° 2' 30.735" E

ID	POINT_NO	LATITUDE	LONGITUDE
	2	25° 47' 55.989" N	88° 2' 26.831" E
	3	25° 47' 56.870" N	88° 2' 23.894" E
	4	25° 47' 57.479" N	88° 2' 23.277" E
	5	25° 47' 58.692" N	88° 2' 25.648" E
	6	25° 48' 0.395" N	88° 2' 28.095" E
	7	25° 48' 3.025" N	88° 2' 31.876" E
	8	25° 48' 4.525" N	88° 2' 33.194" E
	9	25° 48' 3.330" N	88° 2' 34.496" E
	10	25° 48' 1.354" N	88° 2' 34.194" E
	11	25° 47' 58.956" N	88° 2' 32.843" E
UD_RG_NR_15	1	25° 47' 37.672" N	88° 2' 30.413" E
	2	25° 47' 36.857" N	88° 2' 30.031" E
	3	25° 47' 36.950" N	88° 2' 29.082" E
	4	25° 47' 39.556" N	88° 2' 25.399" E
	5	25° 47' 41.119" N	88° 2' 23.323" E
	6	25° 47' 44.492" N	88° 2' 20.692" E
	7	25° 47' 48.541" N	88° 2' 19.778" E
	8	25° 47' 51.295" N	88° 2' 19.517" E
	9	25° 47' 53.521" N	88° 2' 20.866" E
	10	25° 47' 53.339" N	88° 2' 22.290" E
	11	25° 47' 53.213" N	88° 2' 22.375" E
	12	25° 47' 53.084" N	88° 2' 22.023" E
	13	25° 47' 48.879" N	88° 2' 21.100" E
	14	25° 47' 41.863" N	88° 2' 25.983" E
UD_RG_NR_16	1	25° 47' 17.780" N	88° 2' 33.854" E
	2	25° 47' 16.682" N	88° 2' 32.410" E
	3	25° 47' 18.593" N	88° 2' 32.295" E
	4	25° 47' 20.412" N	88° 2' 32.185" E
	5	25° 47' 28.551" N	88° 2' 32.448" E
	6	25° 47' 32.331" N	88° 2' 31.481" E
	7	25° 47' 32.328" N	88° 2' 31.986" E
	8	25° 47' 31.715" N	88° 2' 33.501" E
	9	25° 47' 29.980" N	88° 2' 35.576" E
	10	25° 47' 27.476" N	88° 2' 36.979" E
	11	25° 47' 24.289" N	88° 2' 37.711" E
	12	25° 47' 20.946" N	88° 2' 36.067" E

ID	POINT_NO	LATITUDE	LONGITUDE
UD_RG_NR_17	1	25° 47' 13.693" N	88° 2' 56.883" E
	2	25° 47' 11.906" N	88° 2' 56.564" E
	3	25° 47' 11.785" N	88° 2' 54.283" E
	4	25° 47' 11.663" N	88° 2' 52.154" E
	5	25° 47' 11.545" N	88° 2' 49.417" E
	6	25° 47' 10.807" N	88° 2' 46.750" E
	7	25° 47' 9.806" N	88° 2' 42.486" E
	8	25° 47' 8.465" N	88° 2' 37.610" E
	9	25° 47' 11.030" N	88° 2' 34.821" E
	10	25° 47' 13.100" N	88° 2' 34.003" E
	11	25° 47' 15.025" N	88° 2' 34.324" E
	12	25° 47' 15.879" N	88° 2' 35.139" E
	13	25° 47' 12.701" N	88° 2' 37.183" E
	14	25° 47' 13.480" N	88° 2' 41.671" E
	15	25° 47' 16.415" N	88° 2' 45.546" E
	16	25° 47' 17.982" N	88° 2' 50.127" E
	17	25° 47' 16.823" N	88° 2' 52.123" E
	18	25° 47' 15.563" N	88° 2' 55.152" E
UD_RG_NR_18	1	25° 46' 59.358" N	88° 2' 57.840" E
	2	25° 46' 59.069" N	88° 2' 56.670" E
	3	25° 47' 3.118" N	88° 2' 55.541" E
	4	25° 47' 9.028" N	88° 2' 51.534" E
	5	25° 47' 9.071" N	88° 2' 50.507" E
	6	25° 47' 9.863" N	88° 2' 51.321" E
	7	25° 47' 10.254" N	88° 2' 54.288" E
	8	25° 47' 9.469" N	88° 2' 58.233" E
	9	25° 47' 8.562" N	88° 2' 59.973" E
	10	25° 47' 7.111" N	88° 3' 0.796" E
	11	25° 47' 6.202" N	88° 3' 0.949" E
	12	25° 47' 3.478" N	88° 3' 1.225" E
	13	25° 47' 1.614" N	88° 2' 59.760" E
UD_RG_NR_20	1	25° 46' 31.274" N	88° 2' 31.462" E
	2	25° 46' 31.132" N	88° 2' 27.282" E
	3	25° 46' 31.335" N	88° 2' 25.996" E
	4	25° 46' 33.794" N	88° 2' 29.775" E
	5	25° 46' 37.901" N	88° 2' 36.001" E

ID	POINT_NO	LATITUDE	LONGITUDE
	6	25° 46' 43.479" N	88° 2' 42.724" E
	7	25° 46' 45.964" N	88° 2' 45.039" E
	8	25° 46' 43.819" N	88° 2' 44.965" E
	9	25° 46' 40.562" N	88° 2' 43.417" E
	10	25° 46' 38.252" N	88° 2' 41.782" E
	11	25° 46' 33.644" N	88° 2' 36.802" E
UD_RG_NR_21	1	25° 46' 14.951" N	88° 2' 30.563" E
	2	25° 46' 12.849" N	88° 2' 31.701" E
	3	25° 46' 13.225" N	88° 2' 29.785" E
	4	25° 46' 14.883" N	88° 2' 26.475" E
	5	25° 46' 17.222" N	88° 2' 24.121" E
	6	25° 46' 19.002" N	88° 2' 23.410" E
	7	25° 46' 25.748" N	88° 2' 23.410" E
	8	25° 46' 26.941" N	88° 2' 24.016" E
	9	25° 46' 27.707" N	88° 2' 25.067" E
	10	25° 46' 26.229" N	88° 2' 28.169" E
	11	25° 46' 25.996" N	88° 2' 28.145" E
	12	25° 46' 19.348" N	88° 2' 29.438" E
UD_RG_NR_22	1	25° 45' 57.011" N	88° 2' 42.162" E
	2	25° 45' 56.197" N	88° 2' 41.699" E
	3	25° 45' 57.352" N	88° 2' 40.026" E
	4	25° 46' 1.785" N	88° 2' 36.305" E
	5	25° 46' 3.987" N	88° 2' 35.285" E
	6	25° 46' 6.129" N	88° 2' 34.293" E
	7	25° 46' 8.811" N	88° 2' 32.108" E
	8	25° 46' 8.940" N	88° 2' 33.623" E
	9	25° 46' 7.022" N	88° 2' 35.524" E
	10	25° 46' 5.738" N	88° 2' 37.837" E
	11	25° 46' 3.975" N	88° 2' 42.413" E
	12	25° 46' 2.080" N	88° 2' 42.776" E
	13	25° 45' 58.985" N	88° 2' 42.749" E
UD_RG_NR_24	1	25° 45' 28.069" N	88° 2' 48.414" E
	2	25° 45' 27.997" N	88° 2' 44.329" E
	3	25° 45' 29.599" N	88° 2' 46.366" E
	4	25° 45' 32.954" N	88° 2' 50.527" E
	5	25° 45' 36.599" N	88° 2' 51.905" E

ID	POINT_NO	LATITUDE	LONGITUDE
	6	25° 45' 36.743" N	88° 2' 53.120" E
	7	25° 45' 34.472" N	88° 2' 54.881" E
	8	25° 45' 32.322" N	88° 2' 54.862" E
	9	25° 45' 29.858" N	88° 2' 53.772" E
UD_KD_NR_26	1	25° 44' 47.749" N	88° 2' 42.739" E
	2	25° 44' 46.381" N	88° 2' 42.026" E
	3	25° 44' 51.778" N	88° 2' 32.957" E
	4	25° 44' 58.719" N	88° 2' 24.470" E
	5	25° 45' 0.750" N	88° 2' 23.619" E
	6	25° 45' 2.011" N	88° 2' 29.488" E
	7	25° 44' 58.583" N	88° 2' 29.956" E
	8	25° 44' 54.690" N	88° 2' 31.351" E
	9	25° 44' 51.431" N	88° 2' 36.657" E
UD_KD_NR_27	1	25° 44' 33.580" N	88° 2' 40.229" E
	2	25° 44' 30.704" N	88° 2' 36.405" E
	3	25° 44' 30.861" N	88° 2' 29.522" E
	4	25° 44' 31.844" N	88° 2' 27.394" E
	5	25° 44' 32.430" N	88° 2' 27.174" E
	6	25° 44' 32.409" N	88° 2' 30.105" E
	7	25° 44' 34.296" N	88° 2' 36.281" E
	8	25° 44' 37.162" N	88° 2' 40.239" E
	9	25° 44' 43.250" N	88° 2' 41.918" E
	10	25° 44' 42.905" N	88° 2' 43.990" E
	11	25° 44' 39.252" N	88° 2' 43.721" E
	12	25° 44' 36.895" N	88° 2' 42.632" E
UD_KD_NR_29	1	25° 43' 50.740" N	88° 2' 24.102" E
	2	25° 43' 50.220" N	88° 2' 23.019" E
	3	25° 43' 51.385" N	88° 2' 23.637" E
	4	25° 43' 53.229" N	88° 2' 24.615" E
	5	25° 43' 59.112" N	88° 2' 26.759" E
	6	25° 44' 6.568" N	88° 2' 27.295" E
	7	25° 44' 10.020" N	88° 2' 25.697" E
	8	25° 44' 8.598" N	88° 2' 28.530" E
	9	25° 44' 7.473" N	88° 2' 29.470" E
	10	25° 44' 5.021" N	88° 2' 30.348" E
	11	25° 44' 4.752" N	88° 2' 30.376" E

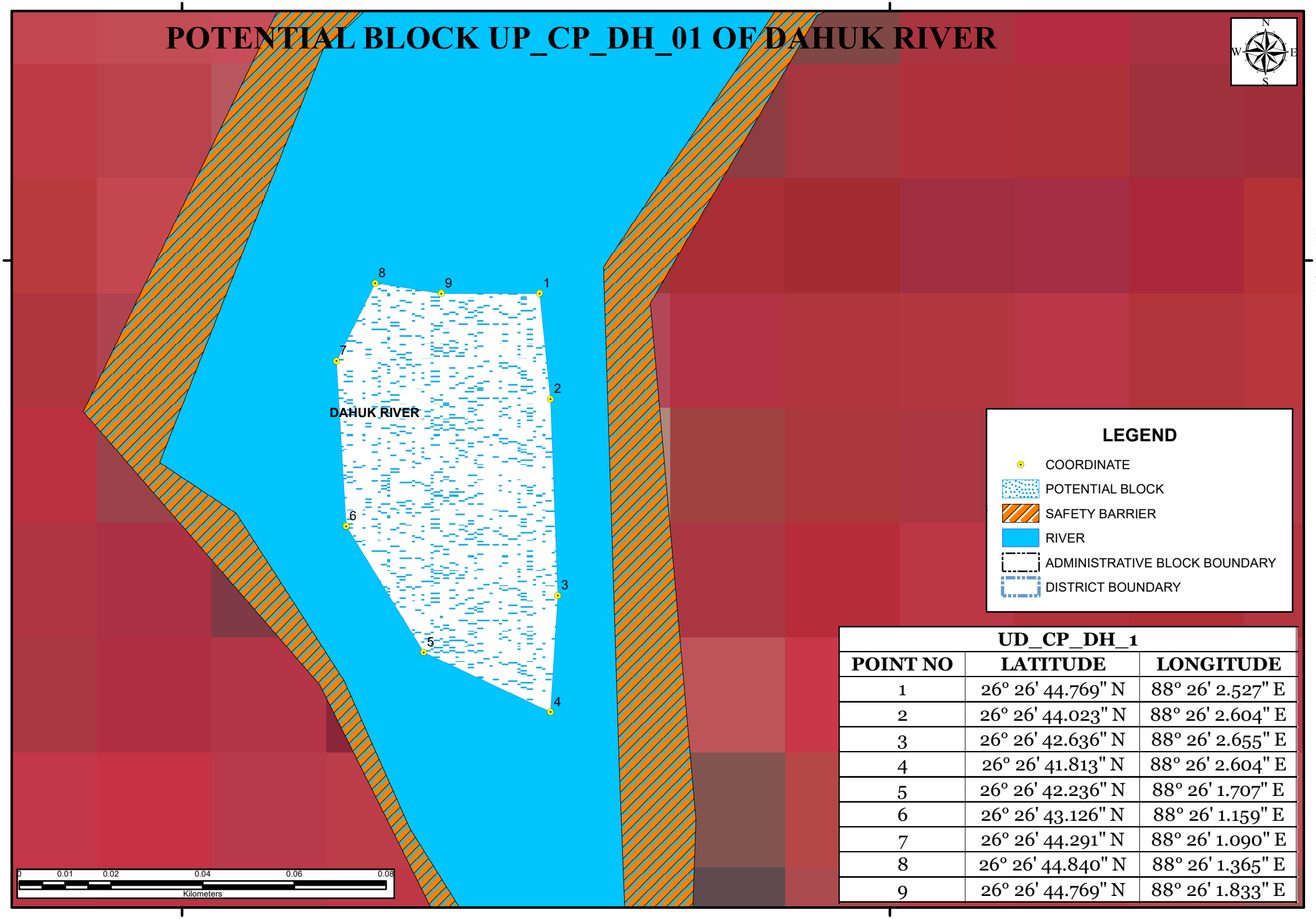
ID	POINT_NO	LATITUDE	LONGITUDE
	12	25° 43' 58.443" N	88° 2' 29.391" E
	13	25° 43' 53.387" N	88° 2' 26.783" E
UD_KD_NR_30	1	25° 43' 32.414" N	88° 2' 31.120" E
	2	25° 43' 31.309" N	88° 2' 29.646" E
	3	25° 43' 31.828" N	88° 2' 28.922" E
	4	25° 43' 34.426" N	88° 2' 26.381" E
	5	25° 43' 39.258" N	88° 2' 24.239" E
	6	25° 43' 42.189" N	88° 2' 23.315" E
	7	25° 43' 44.681" N	88° 2' 23.527" E
	8	25° 43' 46.824" N	88° 2' 24.590" E
	9	25° 43' 47.961" N	88° 2' 25.684" E
	10	25° 43' 39.859" N	88° 2' 26.967" E
	11	25° 43' 32.825" N	88° 2' 31.702" E
UD_RG_NR_31	1	25° 43' 20.313" N	88° 2' 36.966" E
	2	25° 43' 17.003" N	88° 2' 27.247" E
	3	25° 43' 18.672" N	88° 2' 24.755" E
	4	25° 43' 20.011" N	88° 2' 24.337" E
	5	25° 43' 19.264" N	88° 2' 26.350" E
	6	25° 43' 20.592" N	88° 2' 29.992" E
	7	25° 43' 23.166" N	88° 2' 32.879" E
	8	25° 43' 26.110" N	88° 2' 34.209" E
	9	25° 43' 27.761" N	88° 2' 33.445" E
	10	25° 43' 27.881" N	88° 2' 33.228" E
	11	25° 43' 28.310" N	88° 2' 33.498" E
	12	25° 43' 28.016" N	88° 2' 36.230" E
	13	25° 43' 25.313" N	88° 2' 38.941" E
UD_RG_NR_34	1	25° 42' 38.522" N	88° 2' 30.193" E
	2	25° 42' 38.169" N	88° 2' 29.472" E
	3	25° 42' 38.384" N	88° 2' 28.221" E
	4	25° 42' 38.756" N	88° 2' 26.800" E
	5	25° 42' 39.747" N	88° 2' 25.328" E
	6	25° 42' 41.926" N	88° 2' 23.581" E
	7	25° 42' 43.113" N	88° 2' 23.648" E
	8	25° 42' 43.621" N	88° 2' 24.792" E
	9	25° 42' 43.741" N	88° 2' 26.056" E
	10	25° 42' 43.587" N	88° 2' 26.027" E

ID	POINT_NO	LATITUDE	LONGITUDE
	11	25° 42' 40.785" N	88° 2' 27.287" E
UD_RG_NR_35	1	25° 42' 17.472" N	88° 2' 47.013" E
	2	25° 42' 8.420" N	88° 2' 47.765" E
	3	25° 42' 9.869" N	88° 2' 45.730" E
	4	25° 42' 12.881" N	88° 2' 45.472" E
	5	25° 42' 15.463" N	88° 2' 45.210" E
	6	25° 42' 18.128" N	88° 2' 45.233" E
	7	25° 42' 19.846" N	88° 2' 45.628" E
	8	25° 42' 20.123" N	88° 2' 46.316" E
	9	25° 42' 20.388" N	88° 2' 46.940" E
UD_RG_NR_38	1	25° 38' 42.117" N	88° 2' 52.909" E
	2	25° 38' 41.938" N	88° 2' 52.471" E
	3	25° 38' 42.831" N	88° 2' 51.798" E
	4	25° 38' 43.565" N	88° 2' 52.833" E
	5	25° 38' 44.560" N	88° 2' 54.140" E
	6	25° 38' 46.027" N	88° 2' 55.221" E
	7	25° 38' 46.619" N	88° 2' 55.391" E
	8	25° 38' 44.851" N	88° 2' 55.447" E
	9	25° 38' 44.164" N	88° 2' 55.298" E
	10	25° 38' 43.438" N	88° 2' 54.628" E
UD_KG_TG_2	1	25° 38' 13.331" N	88° 26' 7.117" E
	2	25° 38' 12.226" N	88° 26' 5.870" E
	3	25° 38' 11.768" N	88° 26' 4.252" E
	4	25° 38' 11.583" N	88° 26' 1.214" E
	5	25° 38' 11.895" N	88° 26' 0.127" E
	6	25° 38' 12.245" N	88° 25' 59.514" E
	7	25° 38' 12.677" N	88° 25' 59.347" E
	8	25° 38' 12.603" N	88° 26' 1.162" E
	9	25° 38' 13.559" N	88° 26' 4.916" E
	10	25° 38' 16.844" N	88° 26' 6.131" E
	11	25° 38' 16.980" N	88° 26' 6.052" E
	12	25° 38' 17.751" N	88° 26' 8.024" E
	13	25° 38' 16.889" N	88° 26' 8.298" E
	14	25° 38' 15.000" N	88° 26' 7.943" E
UD_KG_TG_5	1	25° 36' 32.967" N	88° 26' 5.028" E
	2	25° 36' 31.984" N	88° 26' 6.624" E

ID	POINT_NO	LATITUDE	LONGITUDE
	3	25° 36' 32.111" N	88° 26' 10.417" E
	4	25° 36' 30.996" N	88° 26' 9.738" E
	5	25° 36' 30.406" N	88° 26' 8.498" E
	6	25° 36' 30.423" N	88° 26' 6.791" E
	7	25° 36' 31.475" N	88° 26' 4.812" E
	8	25° 36' 33.461" N	88° 26' 3.982" E
	9	25° 36' 34.742" N	88° 26' 4.285" E

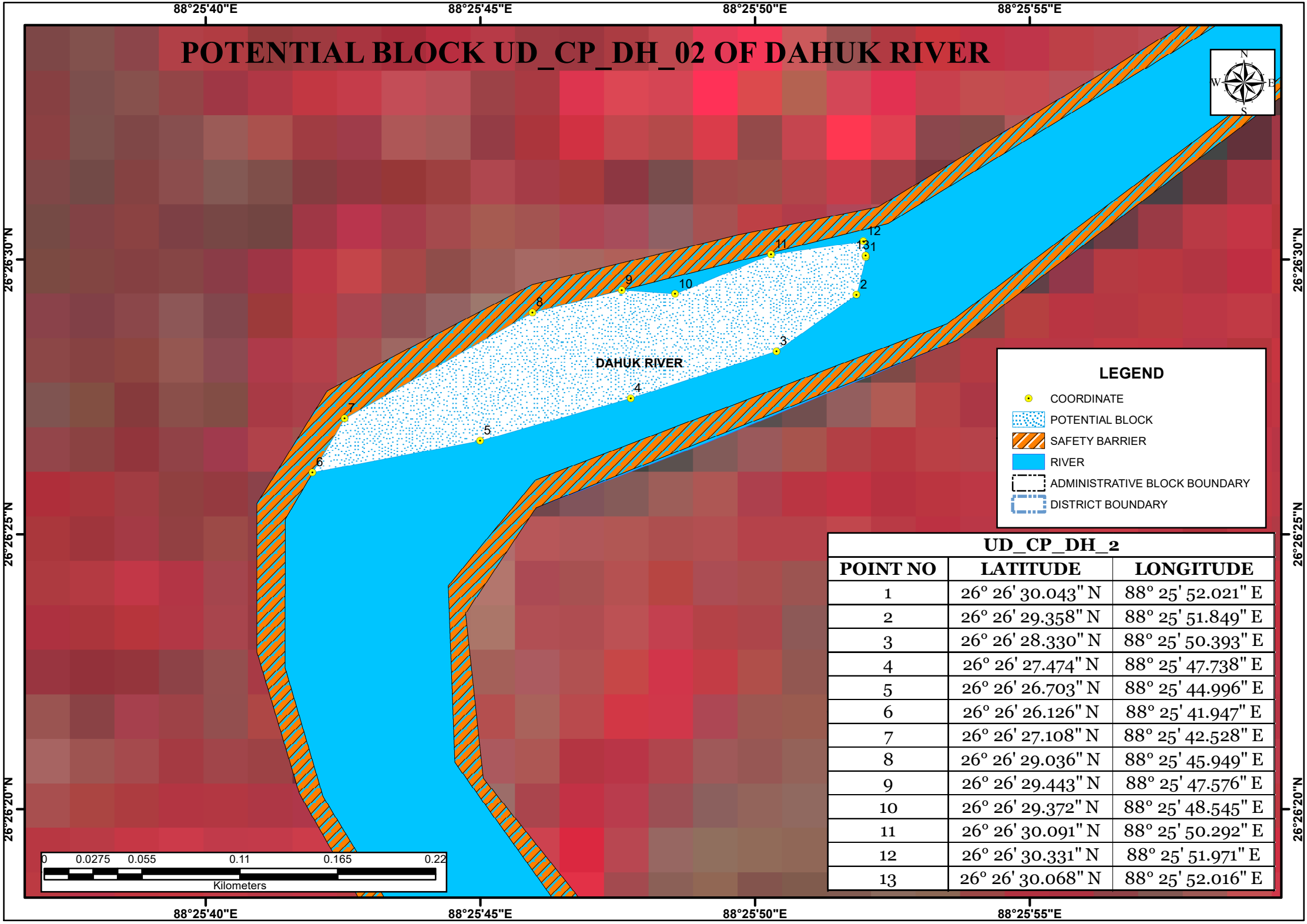
Annexure 4
Map showing of Potential Blocks of Uttar Dinajpur District

POTENTIAL BLOCK UP_CP_DH_01 OF DAHUK RIVER



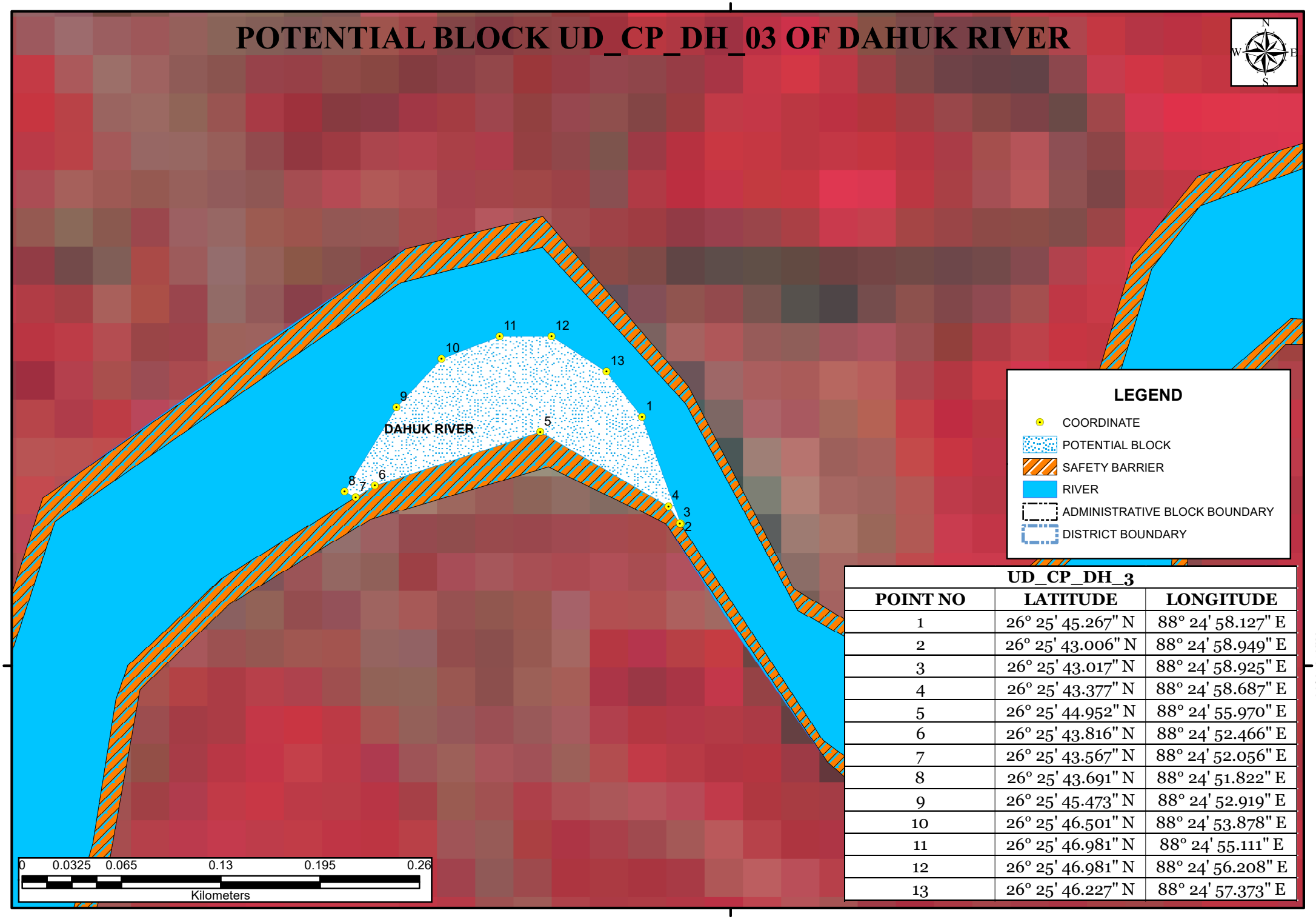
UD_CP_DH_1		
POINT NO	LATITUDE	LONGITUDE
1	26° 26' 44.769" N	88° 26' 2.527" E
2	26° 26' 44.023" N	88° 26' 2.604" E
3	26° 26' 42.636" N	88° 26' 2.655" E
4	26° 26' 41.813" N	88° 26' 2.604" E
5	26° 26' 42.236" N	88° 26' 1.707" E
6	26° 26' 43.126" N	88° 26' 1.159" E
7	26° 26' 44.291" N	88° 26' 1.090" E
8	26° 26' 44.840" N	88° 26' 1.365" E
9	26° 26' 44.769" N	88° 26' 1.833" E

POTENTIAL BLOCK UD_CP_DH_02 OF DAHUK RIVER



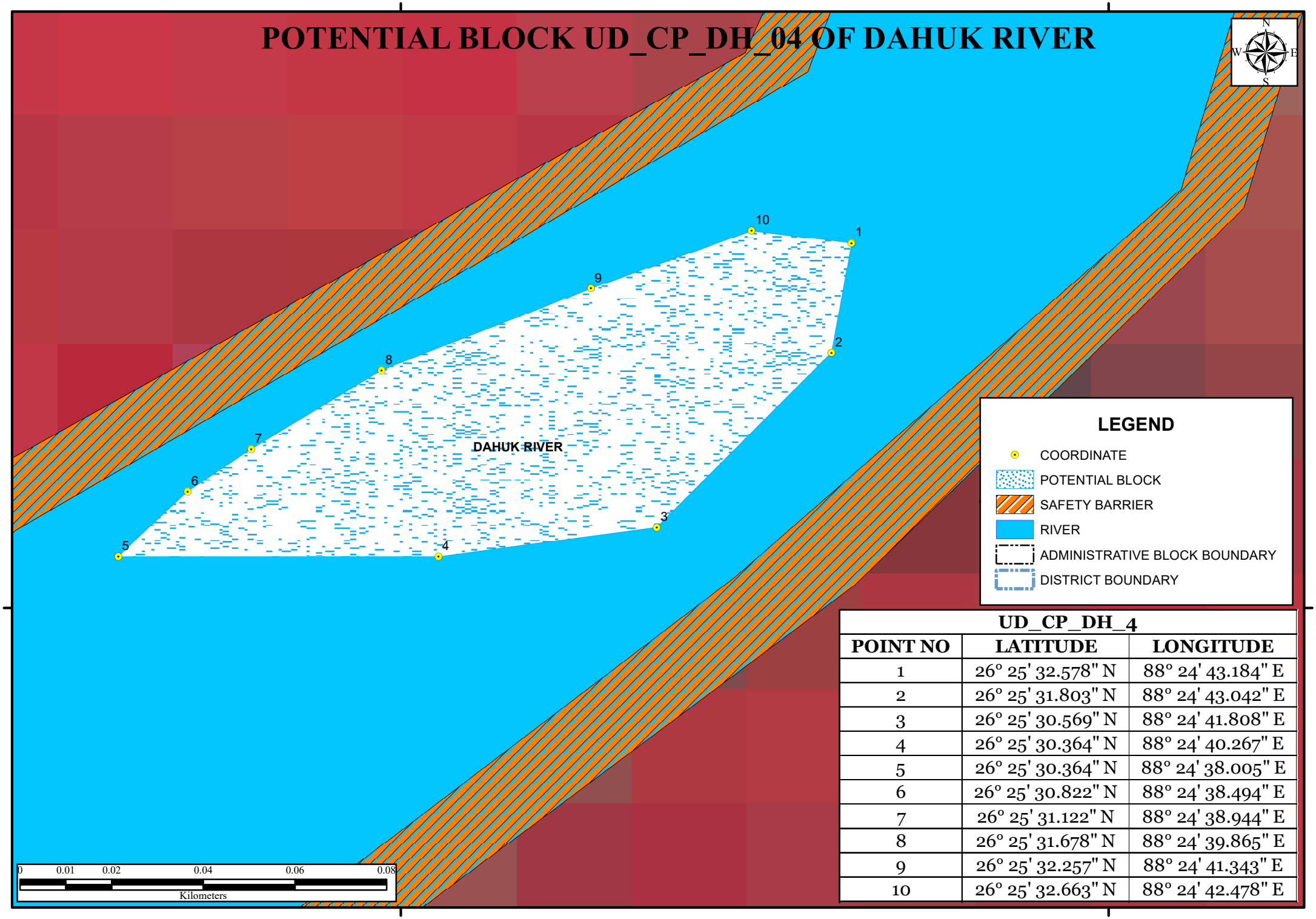
UD_CP_DH_2		
POINT NO	LATITUDE	LONGITUDE
1	26° 26' 30.043" N	88° 25' 52.021" E
2	26° 26' 29.358" N	88° 25' 51.849" E
3	26° 26' 28.330" N	88° 25' 50.393" E
4	26° 26' 27.474" N	88° 25' 47.738" E
5	26° 26' 26.703" N	88° 25' 44.996" E
6	26° 26' 26.126" N	88° 25' 41.947" E
7	26° 26' 27.108" N	88° 25' 42.528" E
8	26° 26' 29.036" N	88° 25' 45.949" E
9	26° 26' 29.443" N	88° 25' 47.576" E
10	26° 26' 29.372" N	88° 25' 48.545" E
11	26° 26' 30.091" N	88° 25' 50.292" E
12	26° 26' 30.331" N	88° 25' 51.971" E
13	26° 26' 30.068" N	88° 25' 52.016" E

POTENTIAL BLOCK UD_CP_DH_03 OF DAHUK RIVER



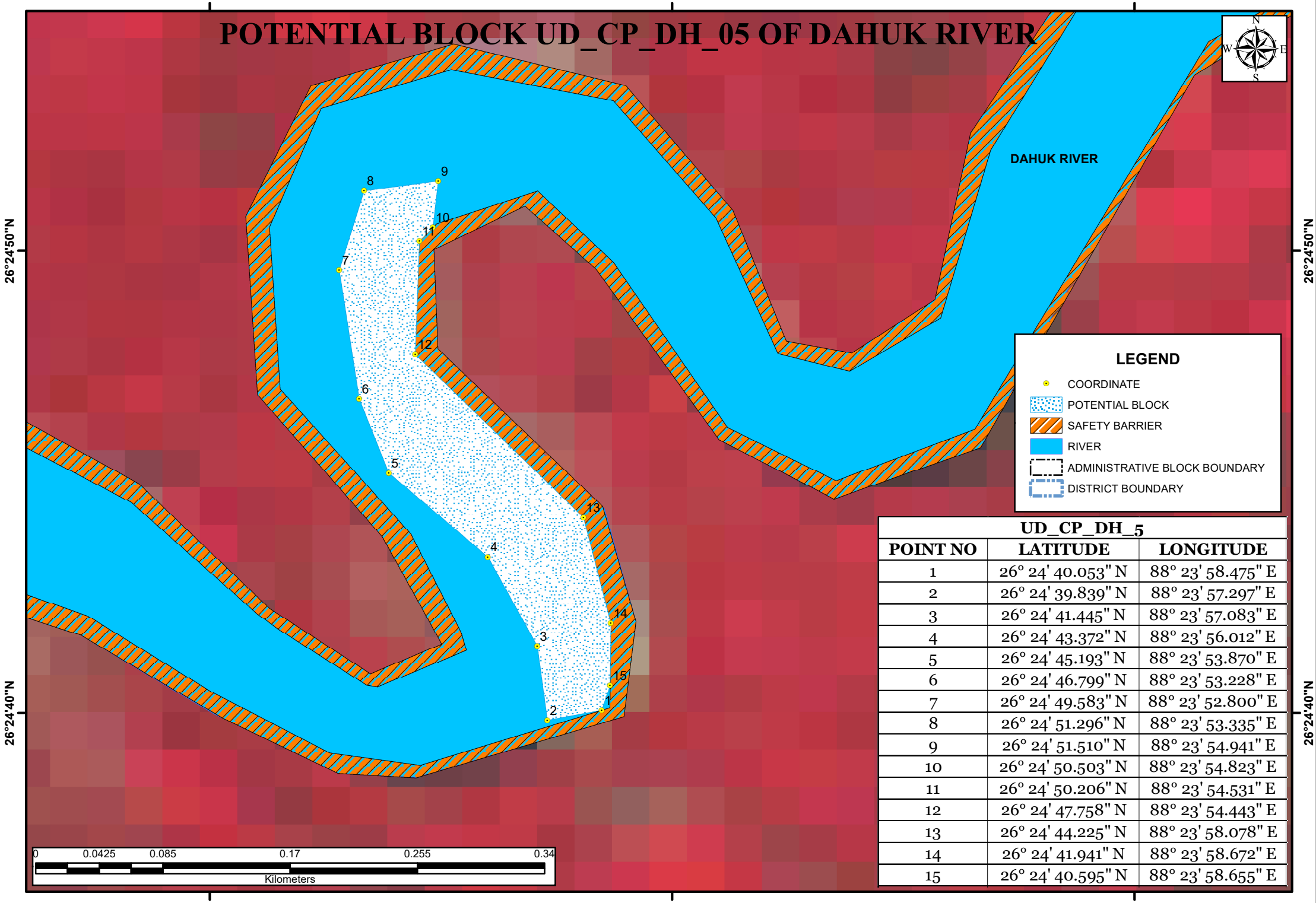
UD_CP_DH_3		
POINT NO	LATITUDE	LONGITUDE
1	26° 25' 45.267" N	88° 24' 58.127" E
2	26° 25' 43.006" N	88° 24' 58.949" E
3	26° 25' 43.017" N	88° 24' 58.925" E
4	26° 25' 43.377" N	88° 24' 58.687" E
5	26° 25' 44.952" N	88° 24' 55.970" E
6	26° 25' 43.816" N	88° 24' 52.466" E
7	26° 25' 43.567" N	88° 24' 52.056" E
8	26° 25' 43.691" N	88° 24' 51.822" E
9	26° 25' 45.473" N	88° 24' 52.919" E
10	26° 25' 46.501" N	88° 24' 53.878" E
11	26° 25' 46.981" N	88° 24' 55.111" E
12	26° 25' 46.981" N	88° 24' 56.208" E
13	26° 25' 46.227" N	88° 24' 57.373" E

POTENTIAL BLOCK UD_CP_DH_04 OF DAHUK RIVER



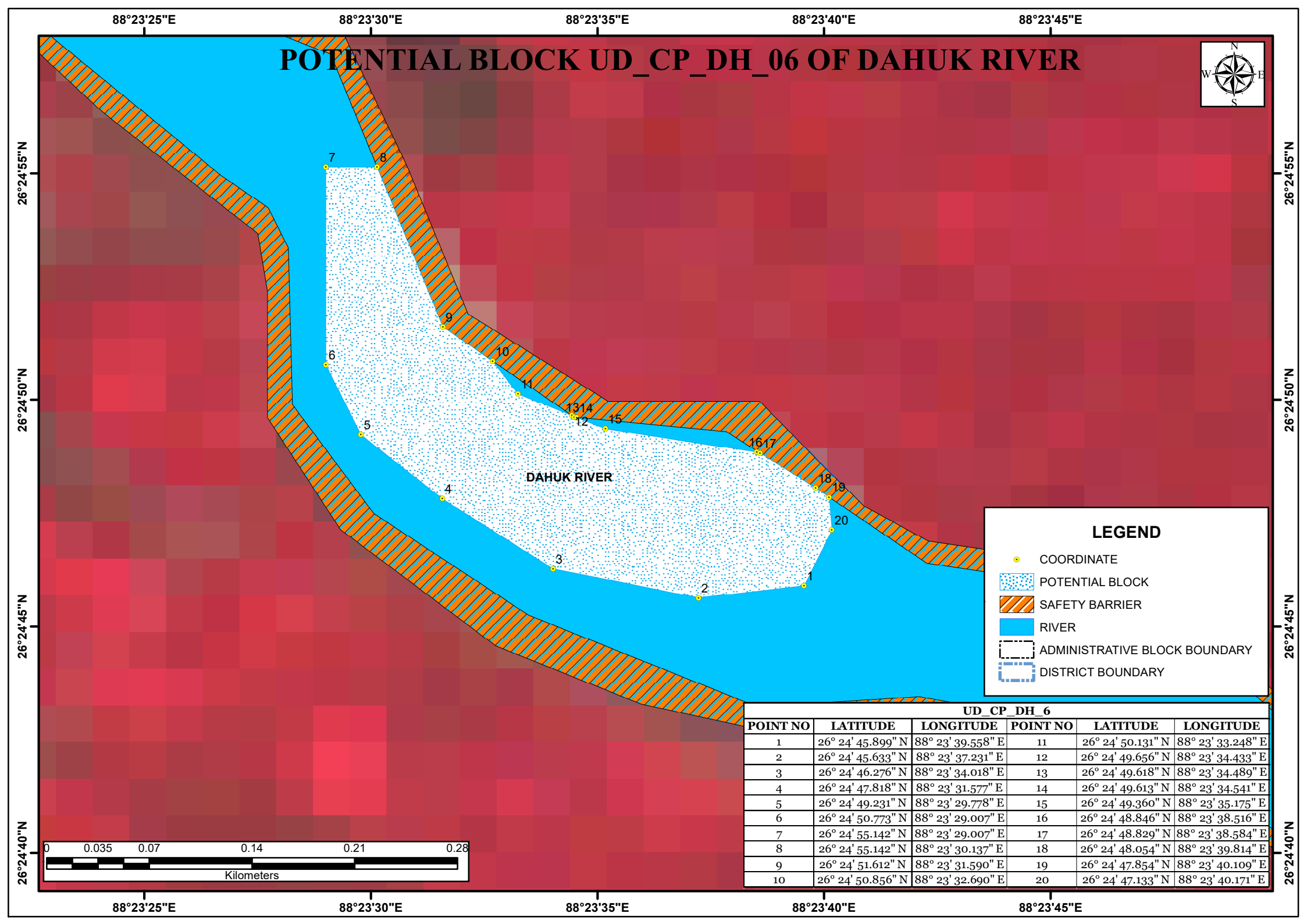
UD_CP_DH_4		
POINT NO	LATITUDE	LONGITUDE
1	26° 25' 32.578" N	88° 24' 43.184" E
2	26° 25' 31.803" N	88° 24' 43.042" E
3	26° 25' 30.569" N	88° 24' 41.808" E
4	26° 25' 30.364" N	88° 24' 40.267" E
5	26° 25' 30.364" N	88° 24' 38.005" E
6	26° 25' 30.822" N	88° 24' 38.494" E
7	26° 25' 31.122" N	88° 24' 38.944" E
8	26° 25' 31.678" N	88° 24' 39.865" E
9	26° 25' 32.257" N	88° 24' 41.343" E
10	26° 25' 32.663" N	88° 24' 42.478" E

POTENTIAL BLOCK UD_CP_DH_05 OF DAHUK RIVER



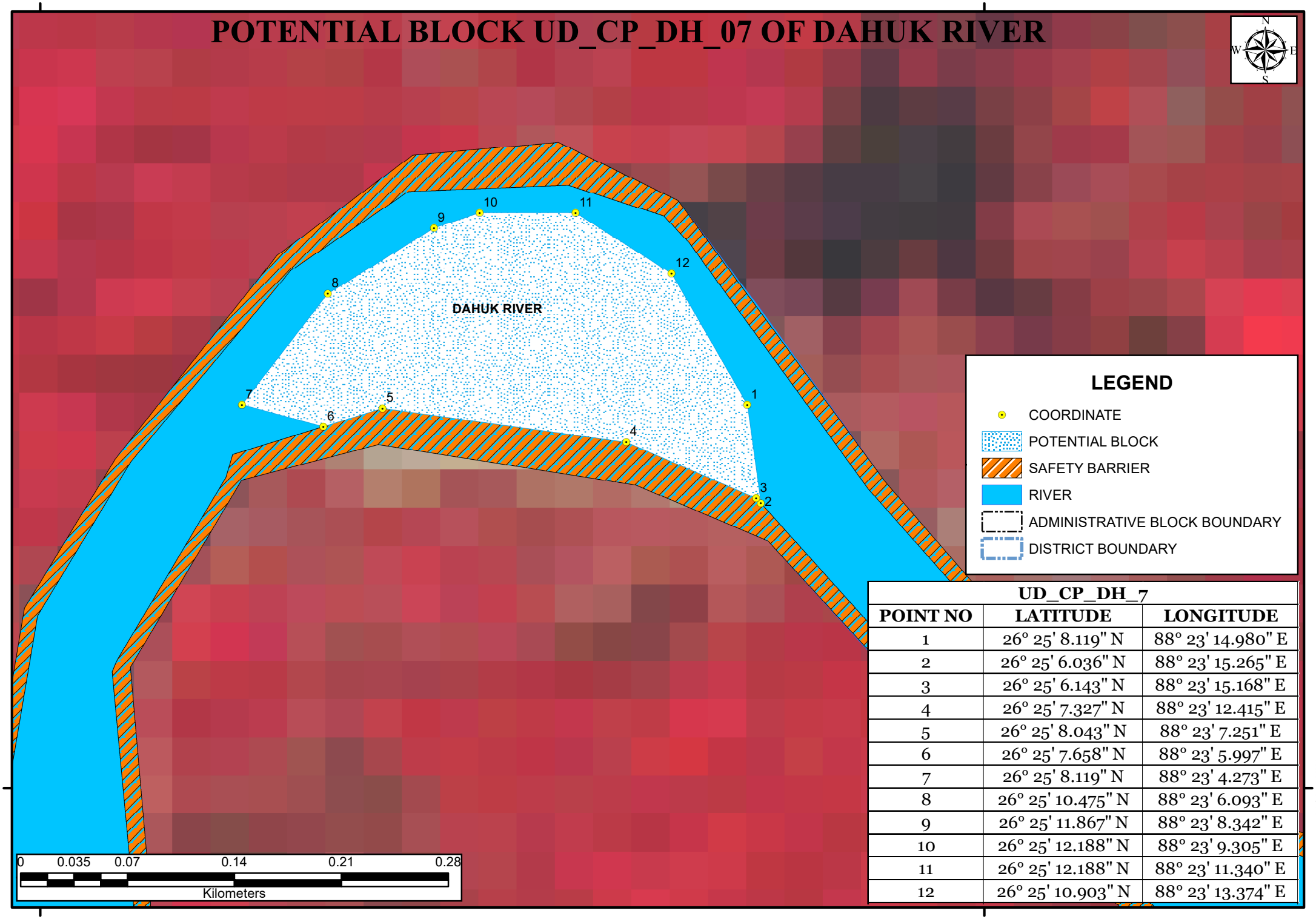
UD_CP_DH_5		
POINT NO	LATITUDE	LONGITUDE
1	26° 24' 40.053" N	88° 23' 58.475" E
2	26° 24' 39.839" N	88° 23' 57.297" E
3	26° 24' 41.445" N	88° 23' 57.083" E
4	26° 24' 43.372" N	88° 23' 56.012" E
5	26° 24' 45.193" N	88° 23' 53.870" E
6	26° 24' 46.799" N	88° 23' 53.228" E
7	26° 24' 49.583" N	88° 23' 52.800" E
8	26° 24' 51.296" N	88° 23' 53.335" E
9	26° 24' 51.510" N	88° 23' 54.941" E
10	26° 24' 50.503" N	88° 23' 54.823" E
11	26° 24' 50.206" N	88° 23' 54.531" E
12	26° 24' 47.758" N	88° 23' 54.443" E
13	26° 24' 44.225" N	88° 23' 58.078" E
14	26° 24' 41.941" N	88° 23' 58.672" E
15	26° 24' 40.595" N	88° 23' 58.655" E

POTENTIAL BLOCK UD_CP_DH_06 OF DAHUK RIVER



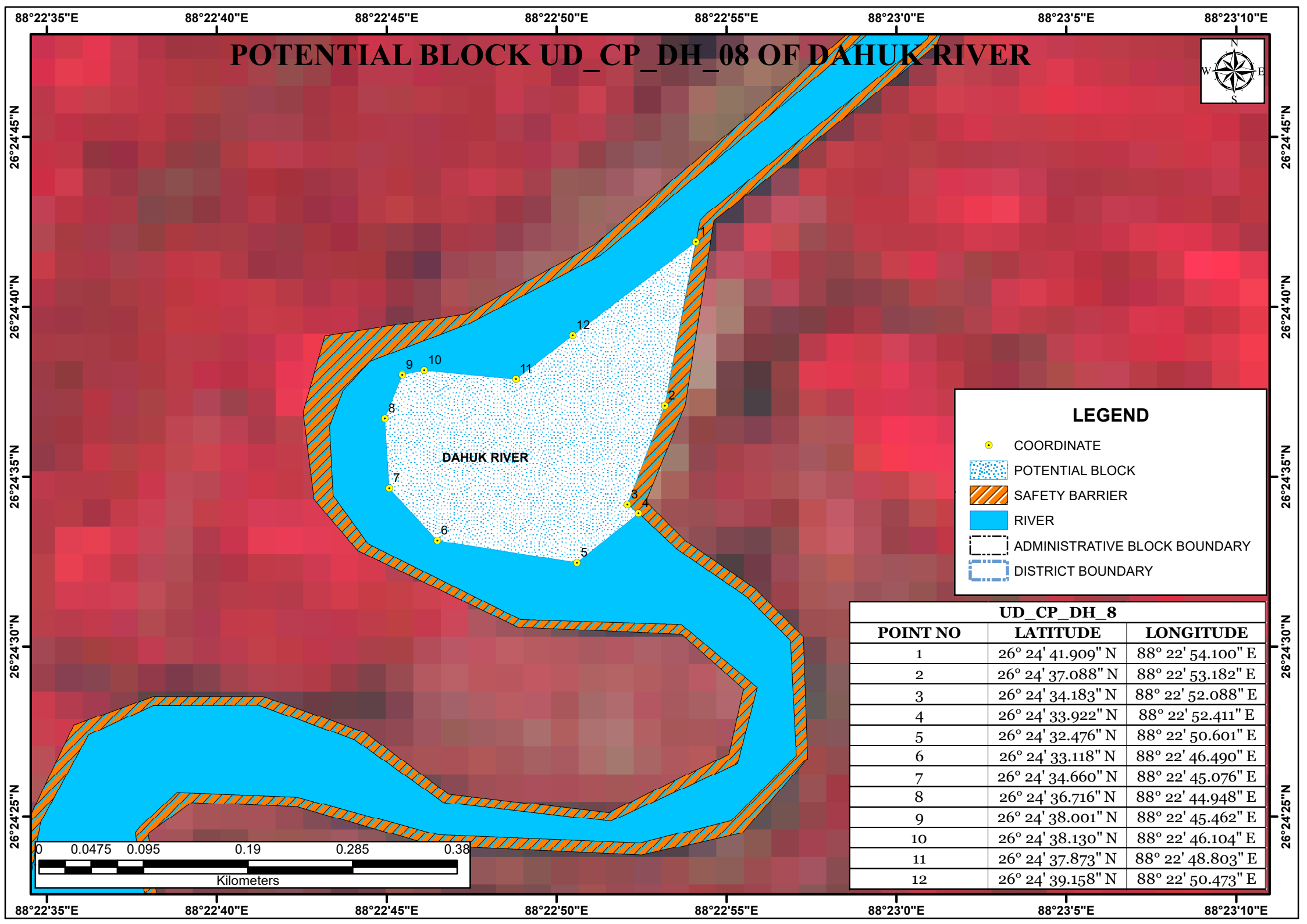
UD_CP_DH_6					
POINT NO	LATITUDE	LONGITUDE	POINT NO	LATITUDE	LONGITUDE
1	26° 24' 45.899" N	88° 23' 39.558" E	11	26° 24' 50.131" N	88° 23' 33.248" E
2	26° 24' 45.633" N	88° 23' 37.231" E	12	26° 24' 49.656" N	88° 23' 34.433" E
3	26° 24' 46.276" N	88° 23' 34.018" E	13	26° 24' 49.618" N	88° 23' 34.489" E
4	26° 24' 47.818" N	88° 23' 31.577" E	14	26° 24' 49.613" N	88° 23' 34.541" E
5	26° 24' 49.231" N	88° 23' 29.778" E	15	26° 24' 49.360" N	88° 23' 35.175" E
6	26° 24' 50.773" N	88° 23' 29.007" E	16	26° 24' 48.846" N	88° 23' 38.516" E
7	26° 24' 55.142" N	88° 23' 29.007" E	17	26° 24' 48.829" N	88° 23' 38.584" E
8	26° 24' 55.142" N	88° 23' 30.137" E	18	26° 24' 48.054" N	88° 23' 39.814" E
9	26° 24' 51.612" N	88° 23' 31.590" E	19	26° 24' 47.854" N	88° 23' 40.109" E
10	26° 24' 50.856" N	88° 23' 32.690" E	20	26° 24' 47.133" N	88° 23' 40.171" E

POTENTIAL BLOCK UD_CP_DH_07 OF DAHUK RIVER



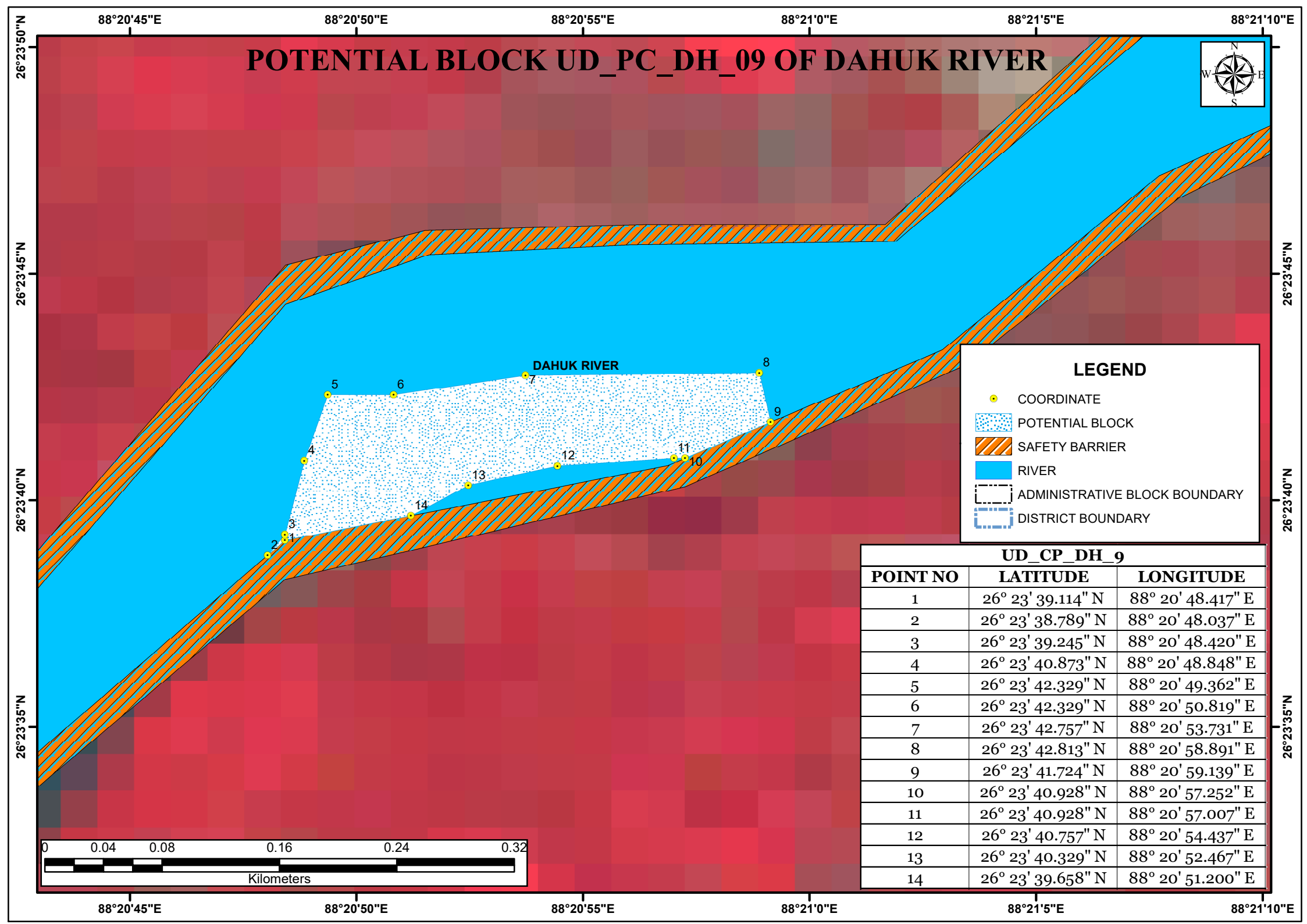
UD_CP_DH_7		
POINT NO	**LATITUDE**	**LONGITUDE**
1	26° 25' 8.119" N	88° 23' 14.980" E
2	26° 25' 6.036" N	88° 23' 15.265" E
3	26° 25' 6.143" N	88° 23' 15.168" E
4	26° 25' 7.327" N	88° 23' 12.415" E
5	26° 25' 8.043" N	88° 23' 7.251" E
6	26° 25' 7.658" N	88° 23' 5.997" E
7	26° 25' 8.119" N	88° 23' 4.273" E
8	26° 25' 10.475" N	88° 23' 6.093" E
9	26° 25' 11.867" N	88° 23' 8.342" E
10	26° 25' 12.188" N	88° 23' 9.305" E
11	26° 25' 12.188" N	88° 23' 11.340" E
12	26° 25' 10.903" N	88° 23' 13.374" E

POTENTIAL BLOCK UD_CP_DH_08 OF DAHUK RIVER



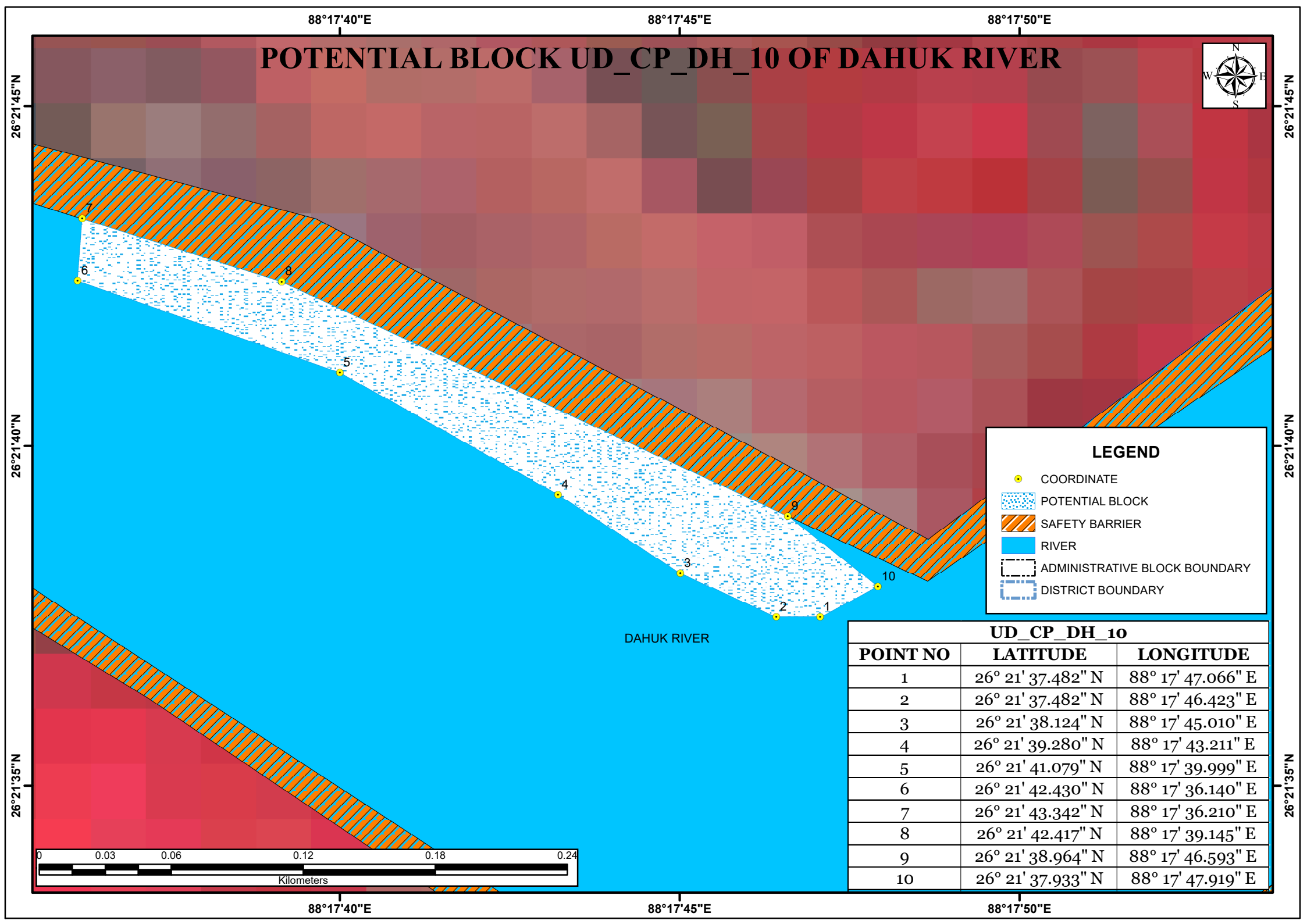
UD_CP_DH_8		
POINT NO	LATITUDE	LONGITUDE
1	26° 24' 41.909" N	88° 22' 54.100" E
2	26° 24' 37.088" N	88° 22' 53.182" E
3	26° 24' 34.183" N	88° 22' 52.088" E
4	26° 24' 33.922" N	88° 22' 52.411" E
5	26° 24' 32.476" N	88° 22' 50.601" E
6	26° 24' 33.118" N	88° 22' 46.490" E
7	26° 24' 34.660" N	88° 22' 45.076" E
8	26° 24' 36.716" N	88° 22' 44.948" E
9	26° 24' 38.001" N	88° 22' 45.462" E
10	26° 24' 38.130" N	88° 22' 46.104" E
11	26° 24' 37.873" N	88° 22' 48.803" E
12	26° 24' 39.158" N	88° 22' 50.473" E

POTENTIAL BLOCK UD_PC_DH_09 OF DAHUK RIVER

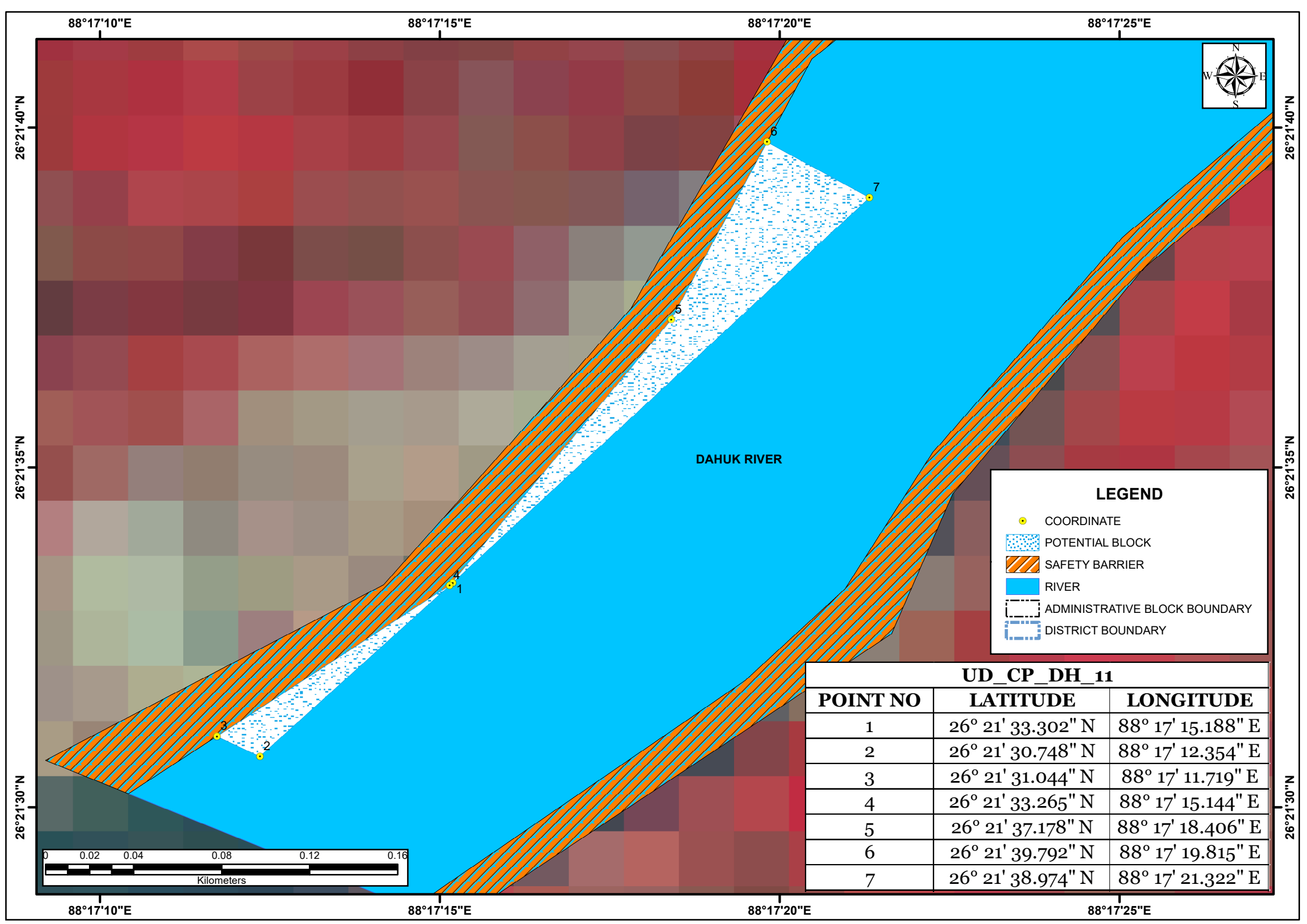


UD_CP_DH_9		
POINT NO	LATITUDE	LONGITUDE
1	26° 23' 39.114" N	88° 20' 48.417" E
2	26° 23' 38.789" N	88° 20' 48.037" E
3	26° 23' 39.245" N	88° 20' 48.420" E
4	26° 23' 40.873" N	88° 20' 48.848" E
5	26° 23' 42.329" N	88° 20' 49.362" E
6	26° 23' 42.329" N	88° 20' 50.819" E
7	26° 23' 42.757" N	88° 20' 53.731" E
8	26° 23' 42.813" N	88° 20' 58.891" E
9	26° 23' 41.724" N	88° 20' 59.139" E
10	26° 23' 40.928" N	88° 20' 57.252" E
11	26° 23' 40.928" N	88° 20' 57.007" E
12	26° 23' 40.757" N	88° 20' 54.437" E
13	26° 23' 40.329" N	88° 20' 52.467" E
14	26° 23' 39.658" N	88° 20' 51.200" E

POTENTIAL BLOCK UD_CP_DH_10 OF DAHUK RIVER

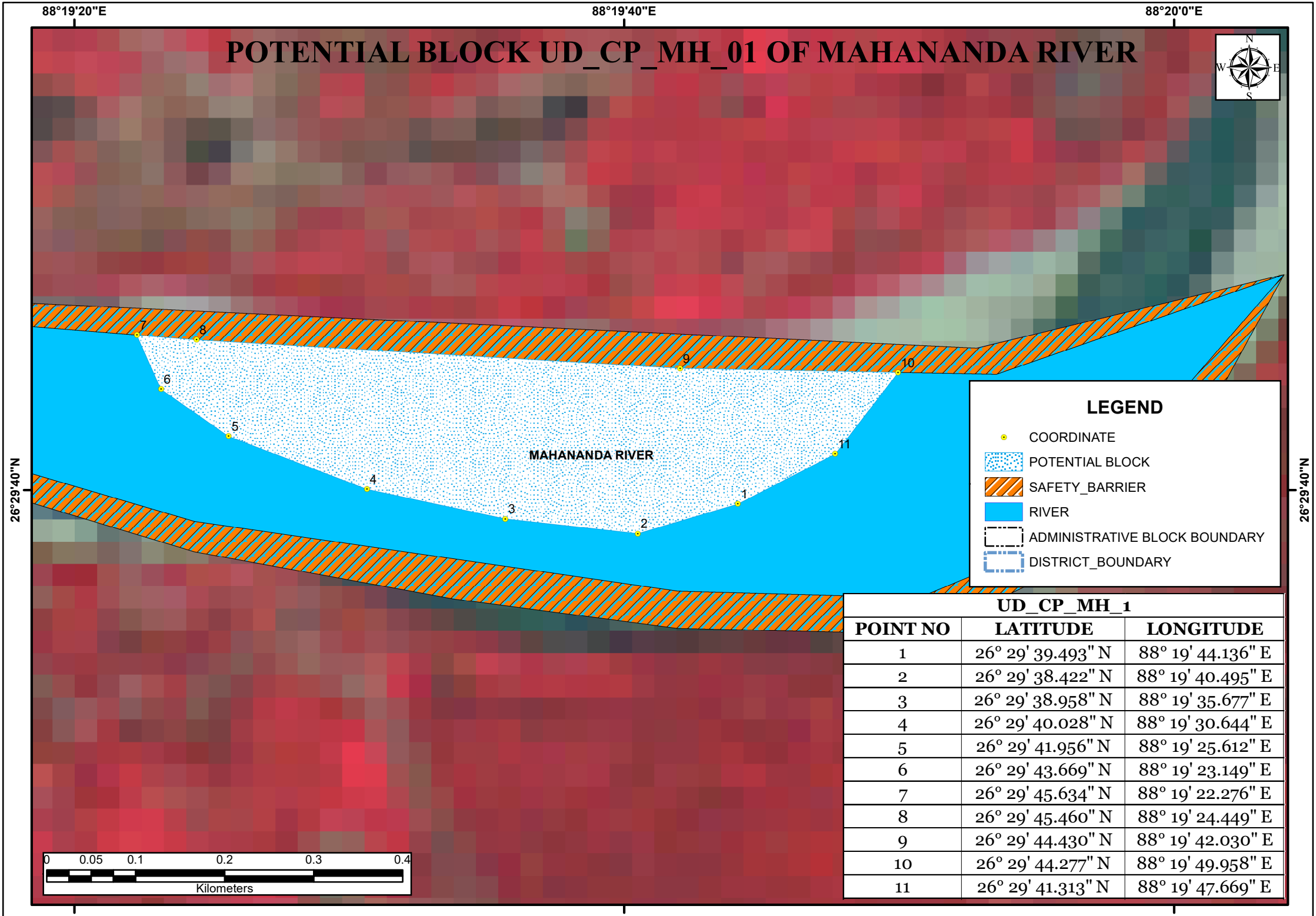


UD_CP_DH_10		
POINT NO	LATITUDE	LONGITUDE
1	26° 21' 37.482" N	88° 17' 47.066" E
2	26° 21' 37.482" N	88° 17' 46.423" E
3	26° 21' 38.124" N	88° 17' 45.010" E
4	26° 21' 39.280" N	88° 17' 43.211" E
5	26° 21' 41.079" N	88° 17' 39.999" E
6	26° 21' 42.430" N	88° 17' 36.140" E
7	26° 21' 43.342" N	88° 17' 36.210" E
8	26° 21' 42.417" N	88° 17' 39.145" E
9	26° 21' 38.964" N	88° 17' 46.593" E
10	26° 21' 37.933" N	88° 17' 47.919" E



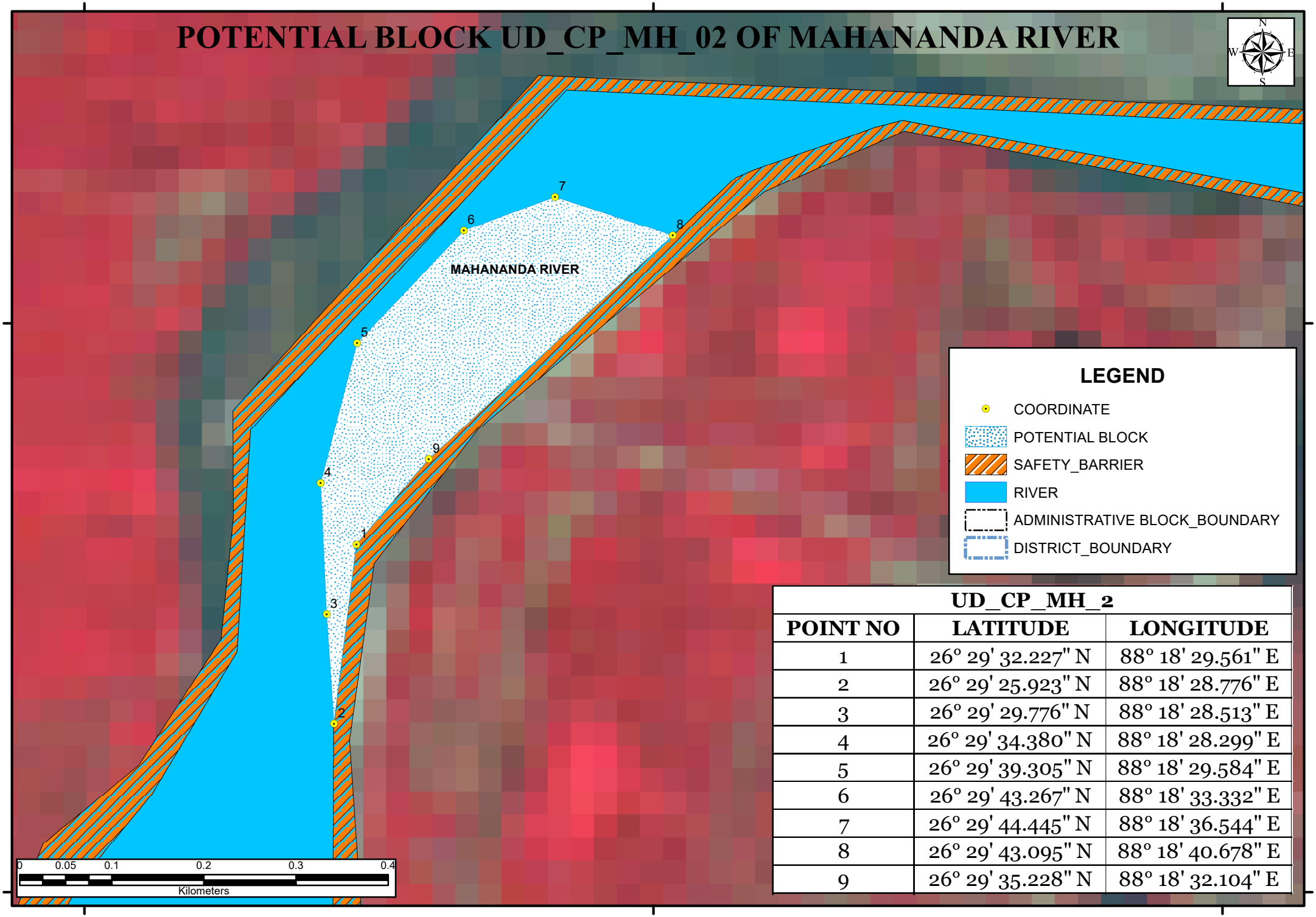
UD_CP_DH_11		
POINT NO	LATITUDE	LONGITUDE
1	26° 21' 33.302" N	88° 17' 15.188" E
2	26° 21' 30.748" N	88° 17' 12.354" E
3	26° 21' 31.044" N	88° 17' 11.719" E
4	26° 21' 33.265" N	88° 17' 15.144" E
5	26° 21' 37.178" N	88° 17' 18.406" E
6	26° 21' 39.792" N	88° 17' 19.815" E
7	26° 21' 38.974" N	88° 17' 21.322" E

POTENTIAL BLOCK UD_CP_MH_01 OF MAHANANDA RIVER



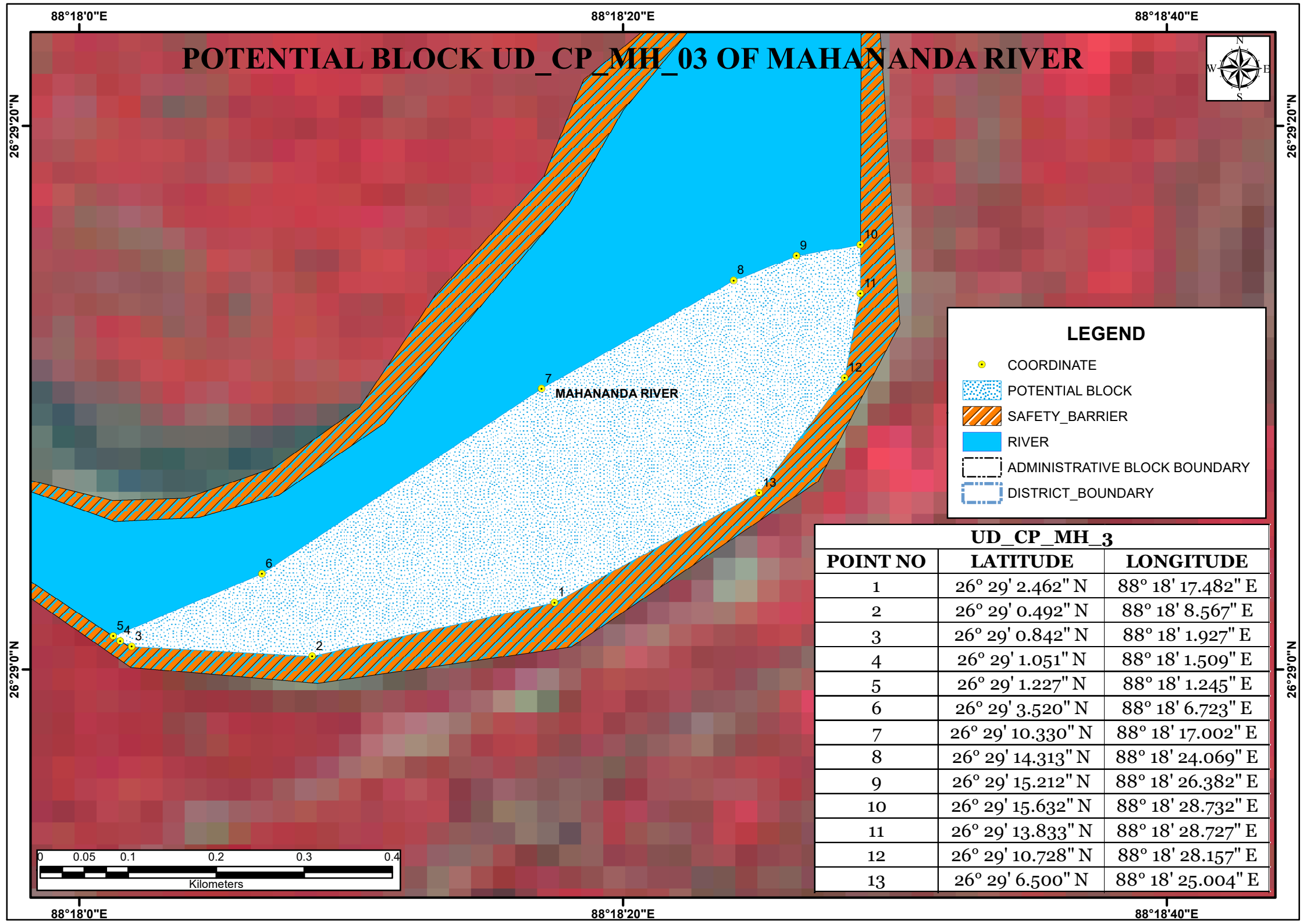
UD_CP_MH_1		
POINT NO	LATITUDE	LONGITUDE
1	26° 29' 39.493" N	88° 19' 44.136" E
2	26° 29' 38.422" N	88° 19' 40.495" E
3	26° 29' 38.958" N	88° 19' 35.677" E
4	26° 29' 40.028" N	88° 19' 30.644" E
5	26° 29' 41.956" N	88° 19' 25.612" E
6	26° 29' 43.669" N	88° 19' 23.149" E
7	26° 29' 45.634" N	88° 19' 22.276" E
8	26° 29' 45.460" N	88° 19' 24.449" E
9	26° 29' 44.430" N	88° 19' 42.030" E
10	26° 29' 44.277" N	88° 19' 49.958" E
11	26° 29' 41.313" N	88° 19' 47.669" E

POTENTIAL BLOCK UD_CP_MH_02 OF MAHANANDA RIVER



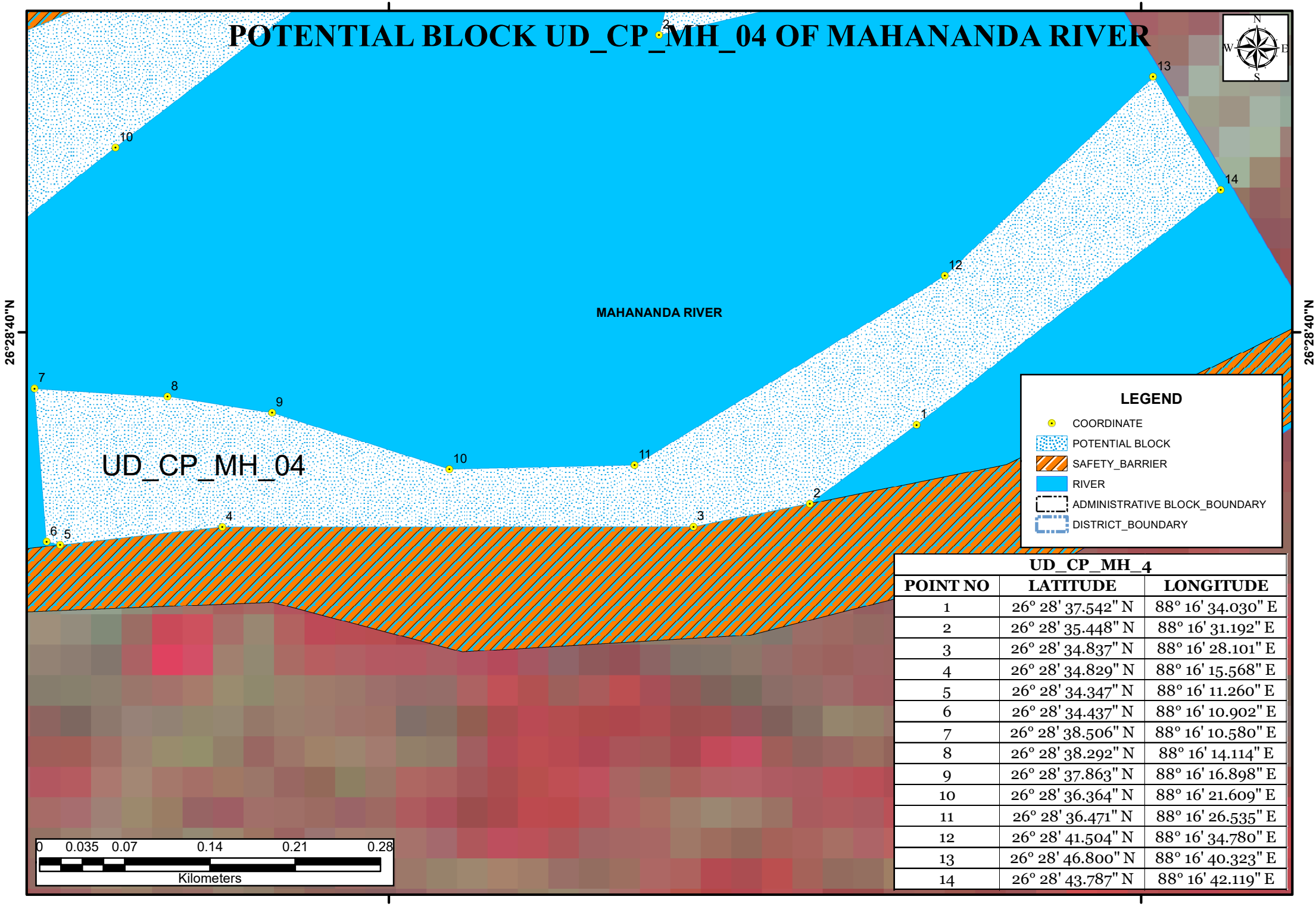
UD_CP_MH_2		
POINT NO	LATITUDE	LONGITUDE
1	26° 29' 32.227" N	88° 18' 29.561" E
2	26° 29' 25.923" N	88° 18' 28.776" E
3	26° 29' 29.776" N	88° 18' 28.513" E
4	26° 29' 34.380" N	88° 18' 28.299" E
5	26° 29' 39.305" N	88° 18' 29.584" E
6	26° 29' 43.267" N	88° 18' 33.332" E
7	26° 29' 44.445" N	88° 18' 36.544" E
8	26° 29' 43.095" N	88° 18' 40.678" E
9	26° 29' 35.228" N	88° 18' 32.104" E

POTENTIAL BLOCK UD_CP_MH_03 OF MAHANANDA RIVER



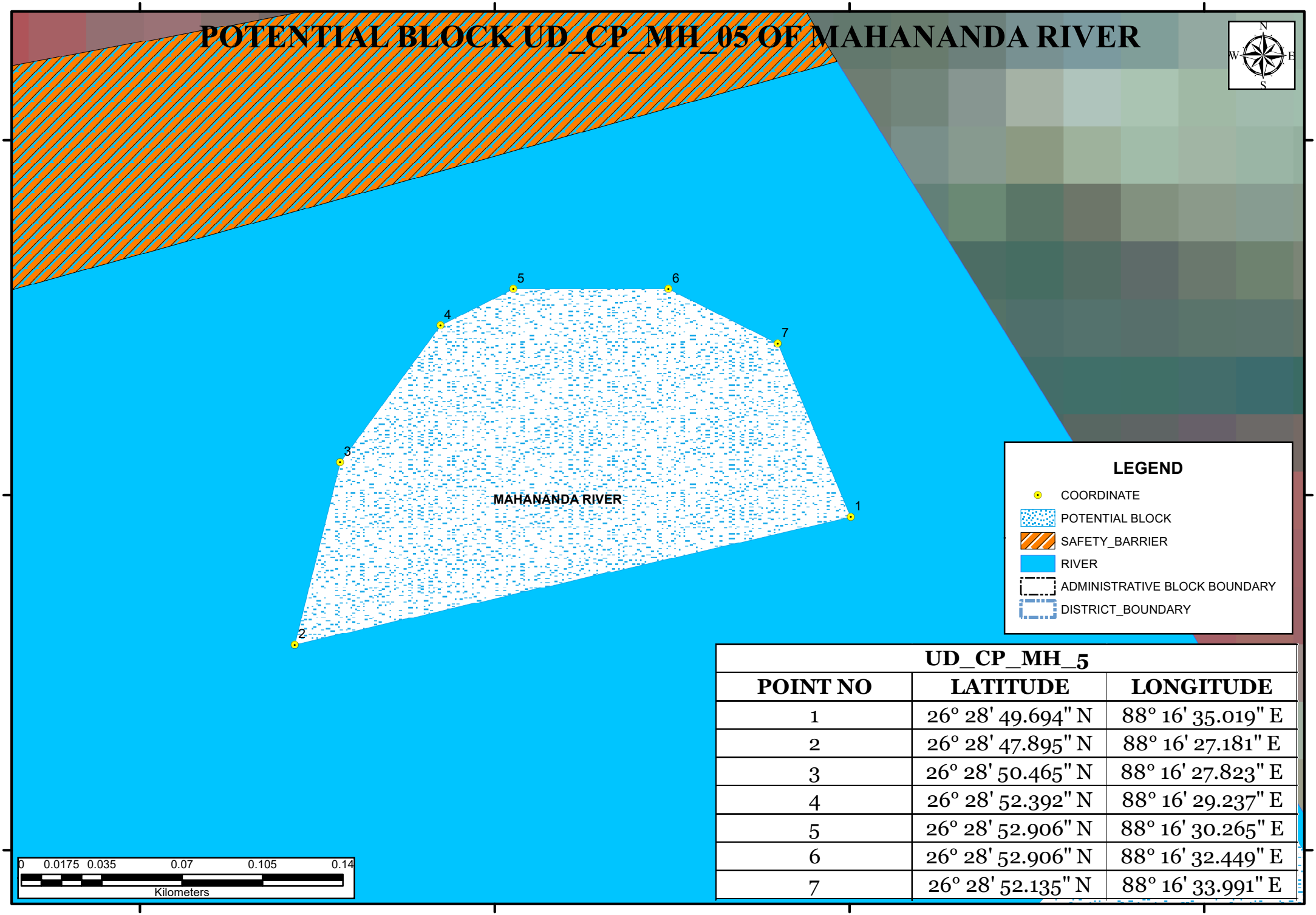
UD_CP_MH_3		
POINT NO	LATITUDE	LONGITUDE
1	26° 29' 2.462" N	88° 18' 17.482" E
2	26° 29' 0.492" N	88° 18' 8.567" E
3	26° 29' 0.842" N	88° 18' 1.927" E
4	26° 29' 1.051" N	88° 18' 1.509" E
5	26° 29' 1.227" N	88° 18' 1.245" E
6	26° 29' 3.520" N	88° 18' 6.723" E
7	26° 29' 10.330" N	88° 18' 17.002" E
8	26° 29' 14.313" N	88° 18' 24.069" E
9	26° 29' 15.212" N	88° 18' 26.382" E
10	26° 29' 15.632" N	88° 18' 28.732" E
11	26° 29' 13.833" N	88° 18' 28.727" E
12	26° 29' 10.728" N	88° 18' 28.157" E
13	26° 29' 6.500" N	88° 18' 25.004" E

POTENTIAL BLOCK UD_CP_MH_04 OF MAHANANDA RIVER



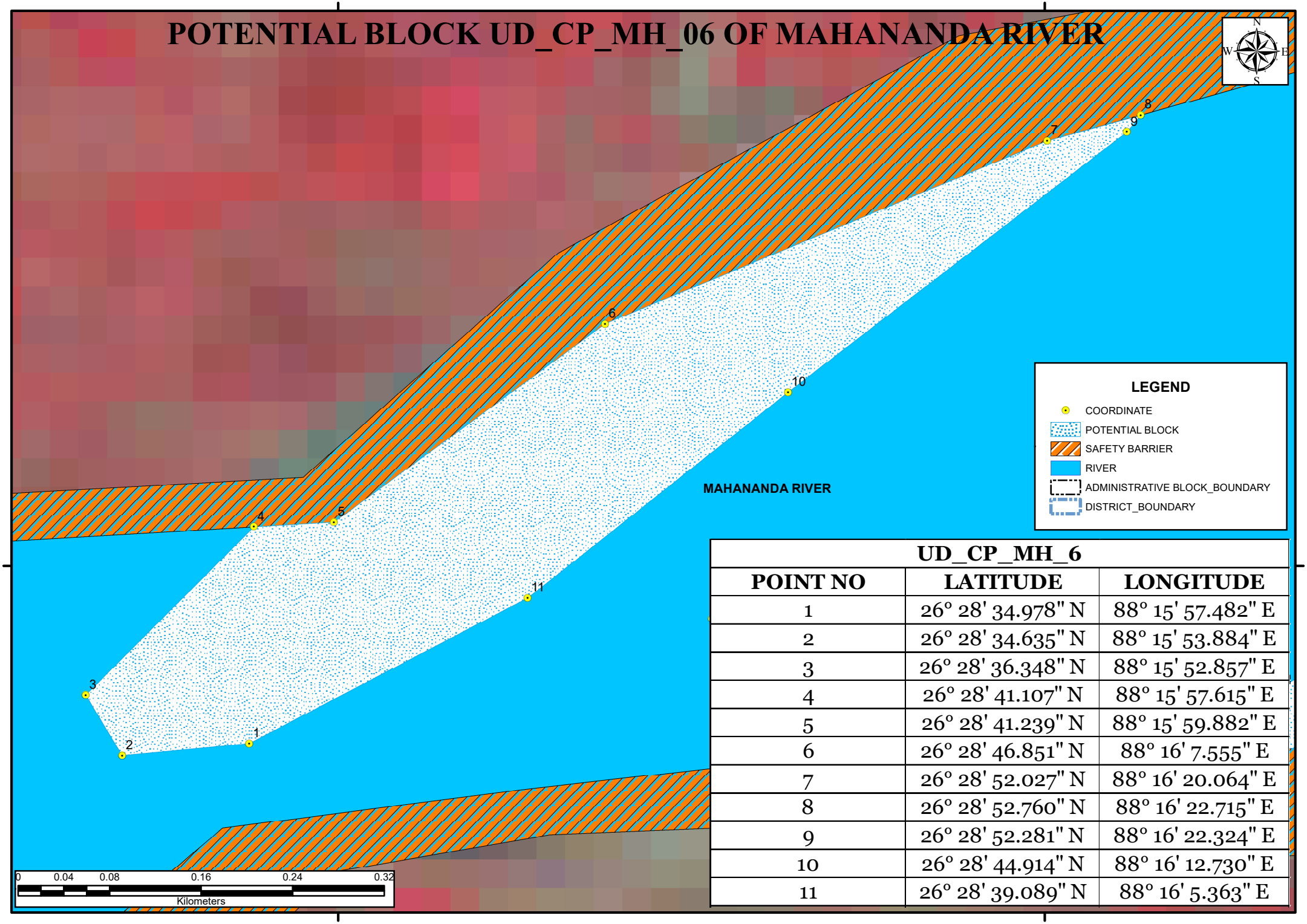
UD_CP_MH_4		
POINT NO	LATITUDE	LONGITUDE
1	26° 28' 37.542" N	88° 16' 34.030" E
2	26° 28' 35.448" N	88° 16' 31.192" E
3	26° 28' 34.837" N	88° 16' 28.101" E
4	26° 28' 34.829" N	88° 16' 15.568" E
5	26° 28' 34.347" N	88° 16' 11.260" E
6	26° 28' 34.437" N	88° 16' 10.902" E
7	26° 28' 38.506" N	88° 16' 10.580" E
8	26° 28' 38.292" N	88° 16' 14.114" E
9	26° 28' 37.863" N	88° 16' 16.898" E
10	26° 28' 36.364" N	88° 16' 21.609" E
11	26° 28' 36.471" N	88° 16' 26.535" E
12	26° 28' 41.504" N	88° 16' 34.780" E
13	26° 28' 46.800" N	88° 16' 40.323" E
14	26° 28' 43.787" N	88° 16' 42.119" E

POTENTIAL BLOCK UD_CP_MH_05 OF MAHANANDA RIVER



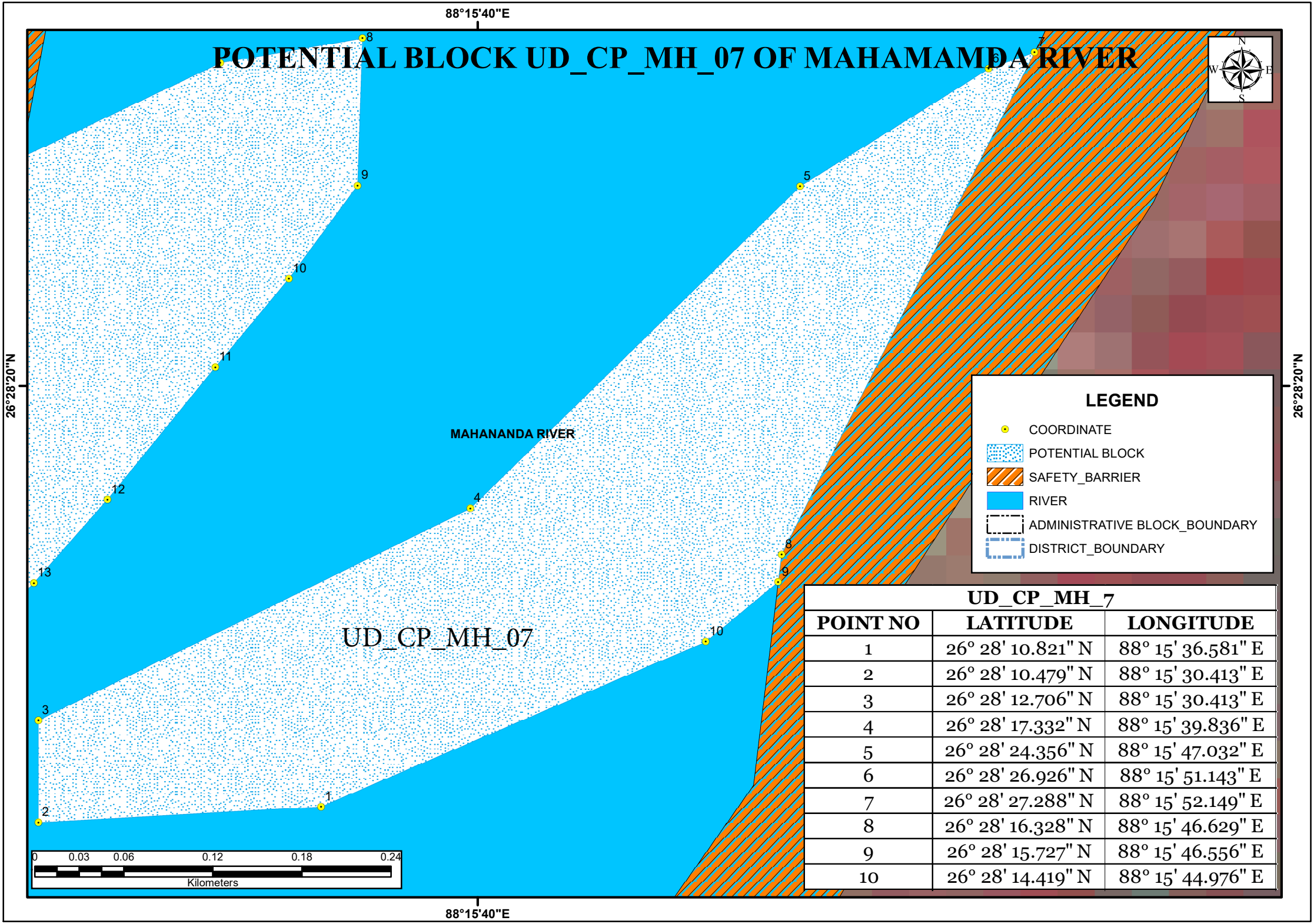
UD_CP_MH_5		
POINT NO	LATITUDE	LONGITUDE
1	26° 28' 49.694" N	88° 16' 35.019" E
2	26° 28' 47.895" N	88° 16' 27.181" E
3	26° 28' 50.465" N	88° 16' 27.823" E
4	26° 28' 52.392" N	88° 16' 29.237" E
5	26° 28' 52.906" N	88° 16' 30.265" E
6	26° 28' 52.906" N	88° 16' 32.449" E
7	26° 28' 52.135" N	88° 16' 33.991" E

POTENTIAL BLOCK UD_CP_MH_06 OF MAHANANDA RIVER



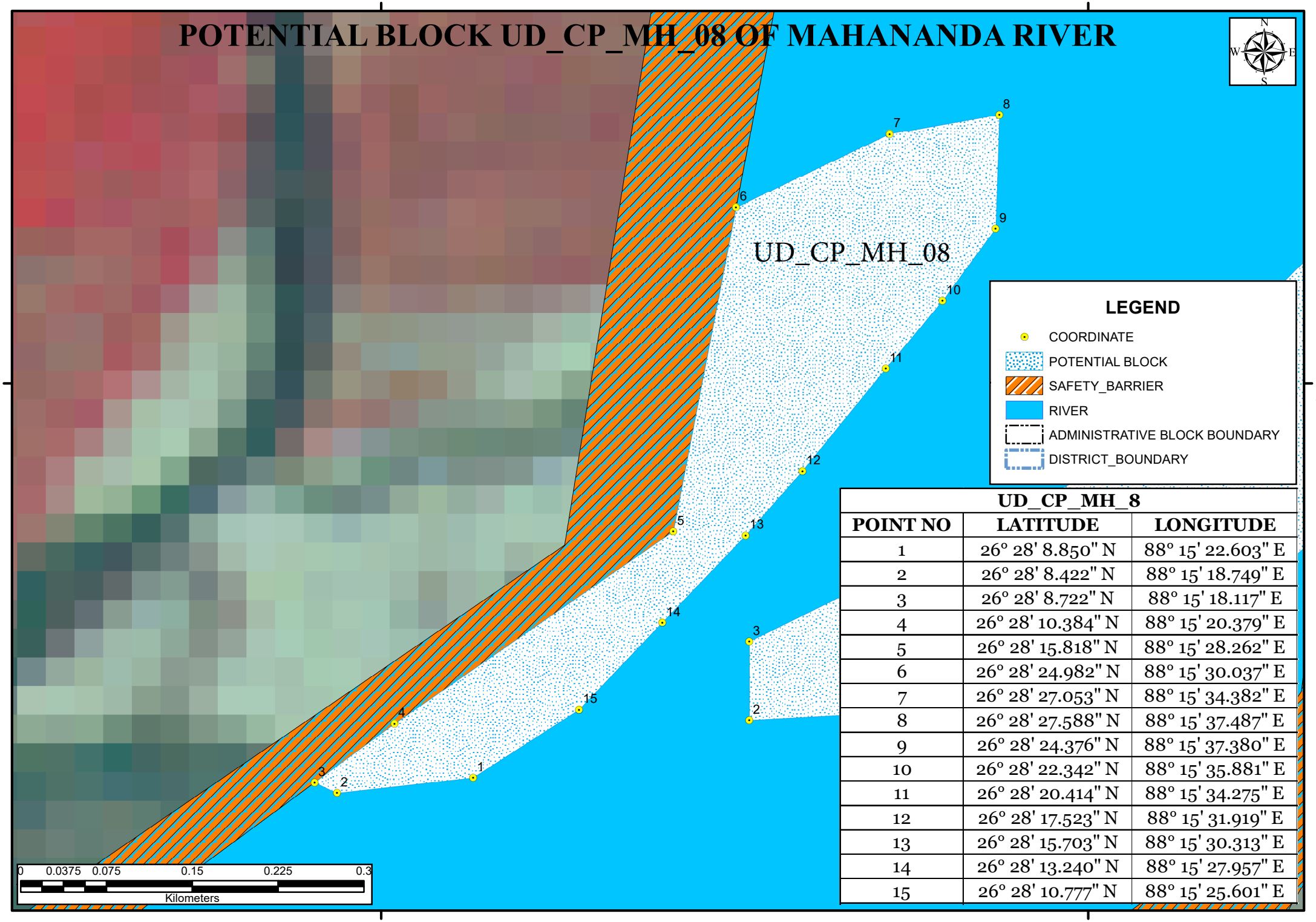
UD_CP_MH_6		
POINT NO	**LATITUDE**	**LONGITUDE**
1	26° 28' 34.978" N	88° 15' 57.482" E
2	26° 28' 34.635" N	88° 15' 53.884" E
3	26° 28' 36.348" N	88° 15' 52.857" E
4	26° 28' 41.107" N	88° 15' 57.615" E
5	26° 28' 41.239" N	88° 15' 59.882" E
6	26° 28' 46.851" N	88° 16' 7.555" E
7	26° 28' 52.027" N	88° 16' 20.064" E
8	26° 28' 52.760" N	88° 16' 22.715" E
9	26° 28' 52.281" N	88° 16' 22.324" E
10	26° 28' 44.914" N	88° 16' 12.730" E
11	26° 28' 39.089" N	88° 16' 5.363" E

POTENTIAL BLOCK UD_CP_MH_07 OF MAHAMAMDA RIVER



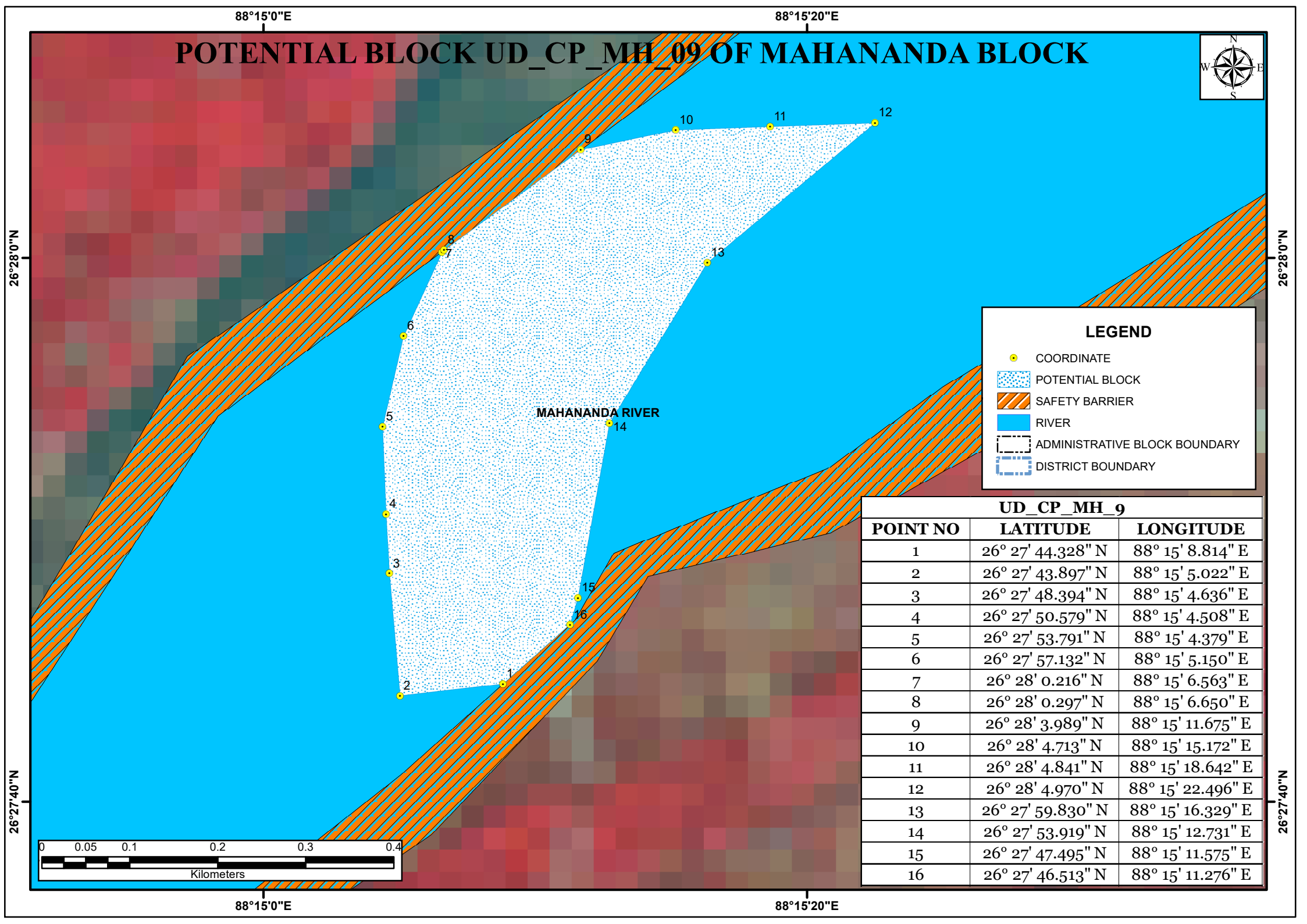
UD_CP_MH_7		
POINT NO	LATITUDE	LONGITUDE
1	26° 28' 10.821" N	88° 15' 36.581" E
2	26° 28' 10.479" N	88° 15' 30.413" E
3	26° 28' 12.706" N	88° 15' 30.413" E
4	26° 28' 17.332" N	88° 15' 39.836" E
5	26° 28' 24.356" N	88° 15' 47.032" E
6	26° 28' 26.926" N	88° 15' 51.143" E
7	26° 28' 27.288" N	88° 15' 52.149" E
8	26° 28' 16.328" N	88° 15' 46.629" E
9	26° 28' 15.727" N	88° 15' 46.556" E
10	26° 28' 14.419" N	88° 15' 44.976" E

POTENTIAL BLOCK UD_CP_MH_08 OF MAHANANDA RIVER



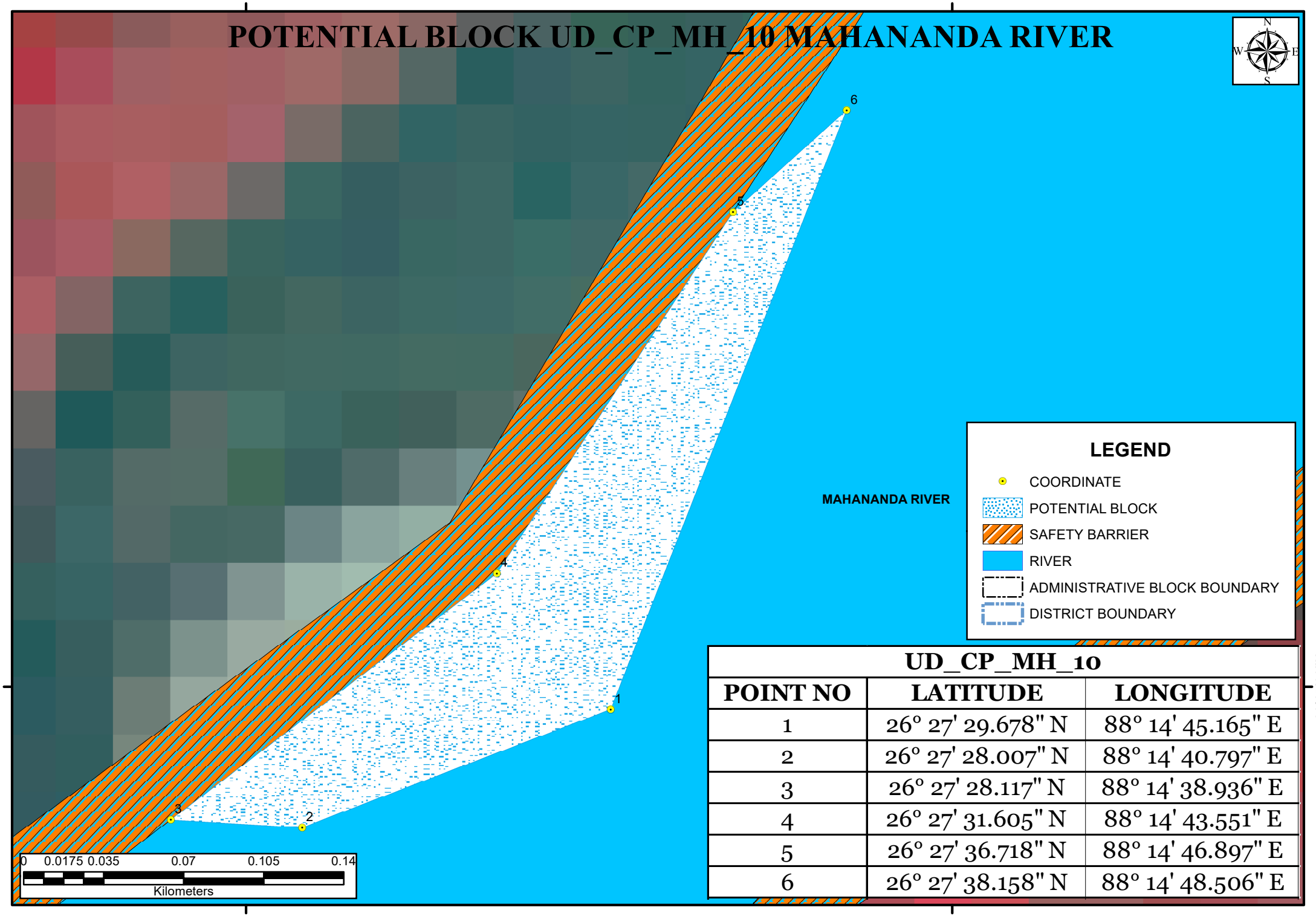
UD_CP_MH_8		
POINT NO	LATITUDE	LONGITUDE
1	26° 28' 8.850" N	88° 15' 22.603" E
2	26° 28' 8.422" N	88° 15' 18.749" E
3	26° 28' 8.722" N	88° 15' 18.117" E
4	26° 28' 10.384" N	88° 15' 20.379" E
5	26° 28' 15.818" N	88° 15' 28.262" E
6	26° 28' 24.982" N	88° 15' 30.037" E
7	26° 28' 27.053" N	88° 15' 34.382" E
8	26° 28' 27.588" N	88° 15' 37.487" E
9	26° 28' 24.376" N	88° 15' 37.380" E
10	26° 28' 22.342" N	88° 15' 35.881" E
11	26° 28' 20.414" N	88° 15' 34.275" E
12	26° 28' 17.523" N	88° 15' 31.919" E
13	26° 28' 15.703" N	88° 15' 30.313" E
14	26° 28' 13.240" N	88° 15' 27.957" E
15	26° 28' 10.777" N	88° 15' 25.601" E

POTENTIAL BLOCK UD_CP_MH_09 OF MAHANANDA BLOCK



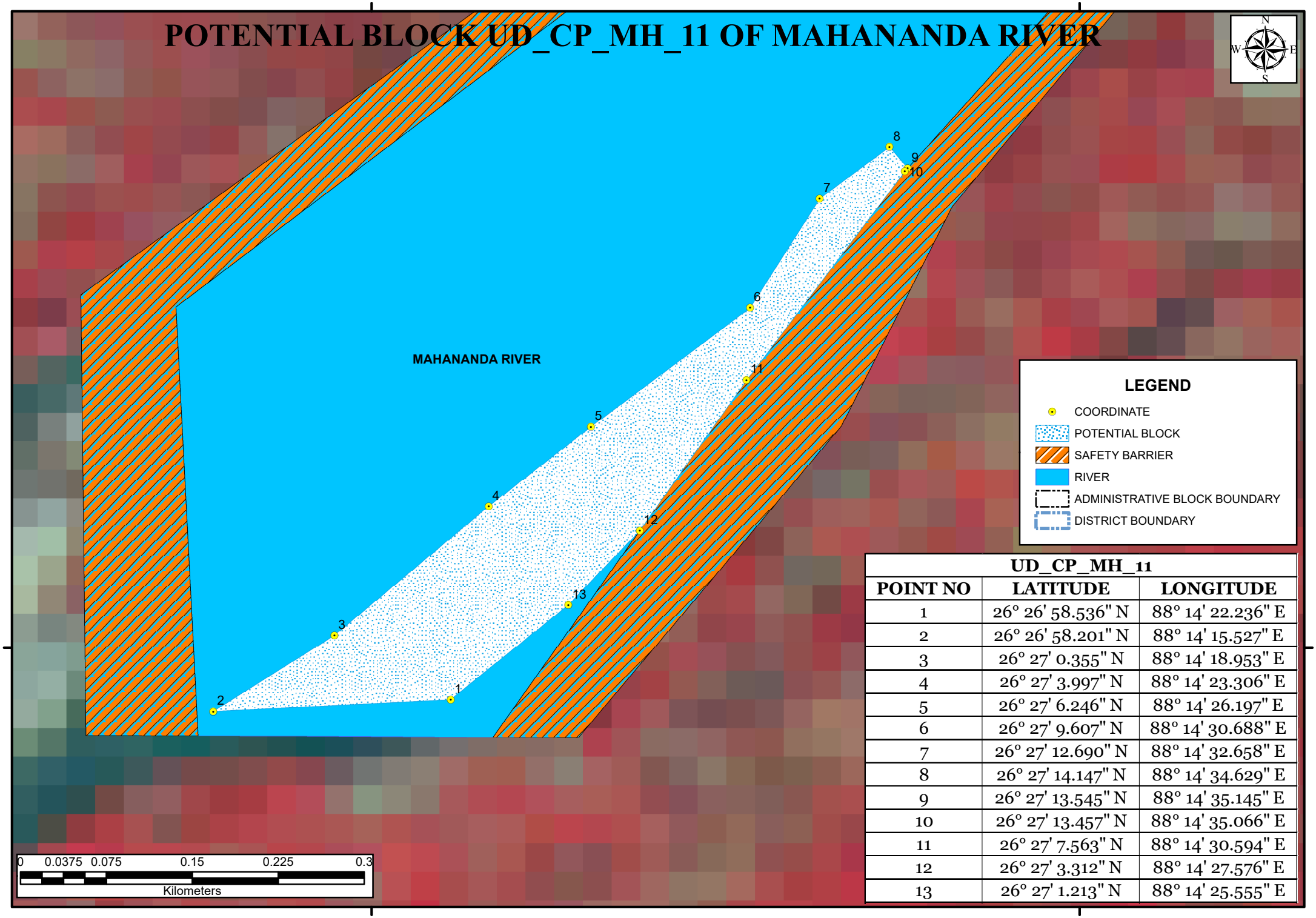
UD_CP_MH_9		
POINT NO	LATITUDE	LONGITUDE
1	26° 27' 44.328" N	88° 15' 8.814" E
2	26° 27' 43.897" N	88° 15' 5.022" E
3	26° 27' 48.394" N	88° 15' 4.636" E
4	26° 27' 50.579" N	88° 15' 4.508" E
5	26° 27' 53.791" N	88° 15' 4.379" E
6	26° 27' 57.132" N	88° 15' 5.150" E
7	26° 28' 0.216" N	88° 15' 6.563" E
8	26° 28' 0.297" N	88° 15' 6.650" E
9	26° 28' 3.989" N	88° 15' 11.675" E
10	26° 28' 4.713" N	88° 15' 15.172" E
11	26° 28' 4.841" N	88° 15' 18.642" E
12	26° 28' 4.970" N	88° 15' 22.496" E
13	26° 27' 59.830" N	88° 15' 16.329" E
14	26° 27' 53.919" N	88° 15' 12.731" E
15	26° 27' 47.495" N	88° 15' 11.575" E
16	26° 27' 46.513" N	88° 15' 11.276" E

POTENTIAL BLOCK UD_CP_MH_10 MAHANANDA RIVER



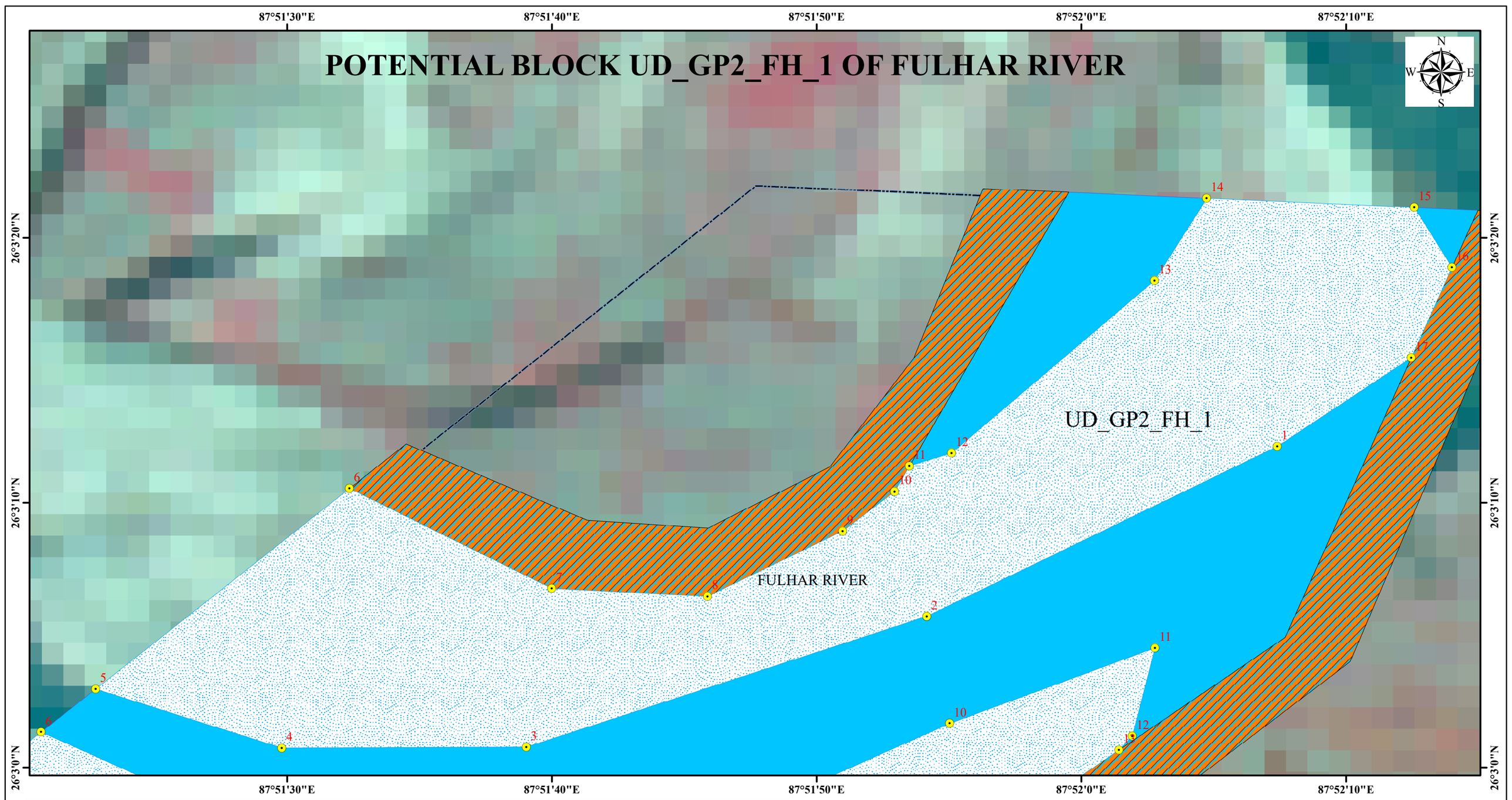
UD_CP_MH_10		
POINT NO	LATITUDE	LONGITUDE
1	26° 27' 29.678" N	88° 14' 45.165" E
2	26° 27' 28.007" N	88° 14' 40.797" E
3	26° 27' 28.117" N	88° 14' 38.936" E
4	26° 27' 31.605" N	88° 14' 43.551" E
5	26° 27' 36.718" N	88° 14' 46.897" E
6	26° 27' 38.158" N	88° 14' 48.506" E

POTENTIAL BLOCK UD_CP_MH_11 OF MAHANANDA RIVER



UD_CP_MH_11		
POINT NO	LATITUDE	LONGITUDE
1	26° 26' 58.536" N	88° 14' 22.236" E
2	26° 26' 58.201" N	88° 14' 15.527" E
3	26° 27' 0.355" N	88° 14' 18.953" E
4	26° 27' 3.997" N	88° 14' 23.306" E
5	26° 27' 6.246" N	88° 14' 26.197" E
6	26° 27' 9.607" N	88° 14' 30.688" E
7	26° 27' 12.690" N	88° 14' 32.658" E
8	26° 27' 14.147" N	88° 14' 34.629" E
9	26° 27' 13.545" N	88° 14' 35.145" E
10	26° 27' 13.457" N	88° 14' 35.066" E
11	26° 27' 7.563" N	88° 14' 30.594" E
12	26° 27' 3.312" N	88° 14' 27.576" E
13	26° 27' 1.213" N	88° 14' 25.555" E

POTENTIAL BLOCK UD_GP2_FH_1 OF FULHAR RIVER



UD_GP2_FH_1					
POINT NO	**LATITUDE**	**LONGITUDE**	**POINT NO**	**LATITUDE**	**LONGITUDE**
1	26° 3' 12.130" N	87° 52' 7.396" E	10	26° 3' 10.429" N	87° 51' 52.946" E
2	26° 3' 5.716" N	87° 51' 54.162" E	11	26° 3' 11.391" N	87° 51' 53.506" E
3	26° 3' 0.775" N	87° 51' 39.035" E	12	26° 3' 11.881" N	87° 51' 55.097" E
4	26° 3' 0.744" N	87° 51' 29.800" E	13	26° 3' 18.393" N	87° 52' 2.762" E
5	26° 3' 2.973" N	87° 51' 22.771" E	14	26° 3' 21.493" N	87° 52' 4.729" E
6	26° 3' 10.541" N	87° 51' 32.357" E	15	26° 3' 21.150" N	87° 52' 12.574" E
7	26° 3' 6.765" N	87° 51' 39.994" E	16	26° 3' 18.887" N	87° 52' 13.993" E
8	26° 3' 6.473" N	87° 51' 45.883" E	17	26° 3' 15.481" N	87° 52' 12.455" E
9	26° 3' 8.933" N	87° 51' 50.982" E			

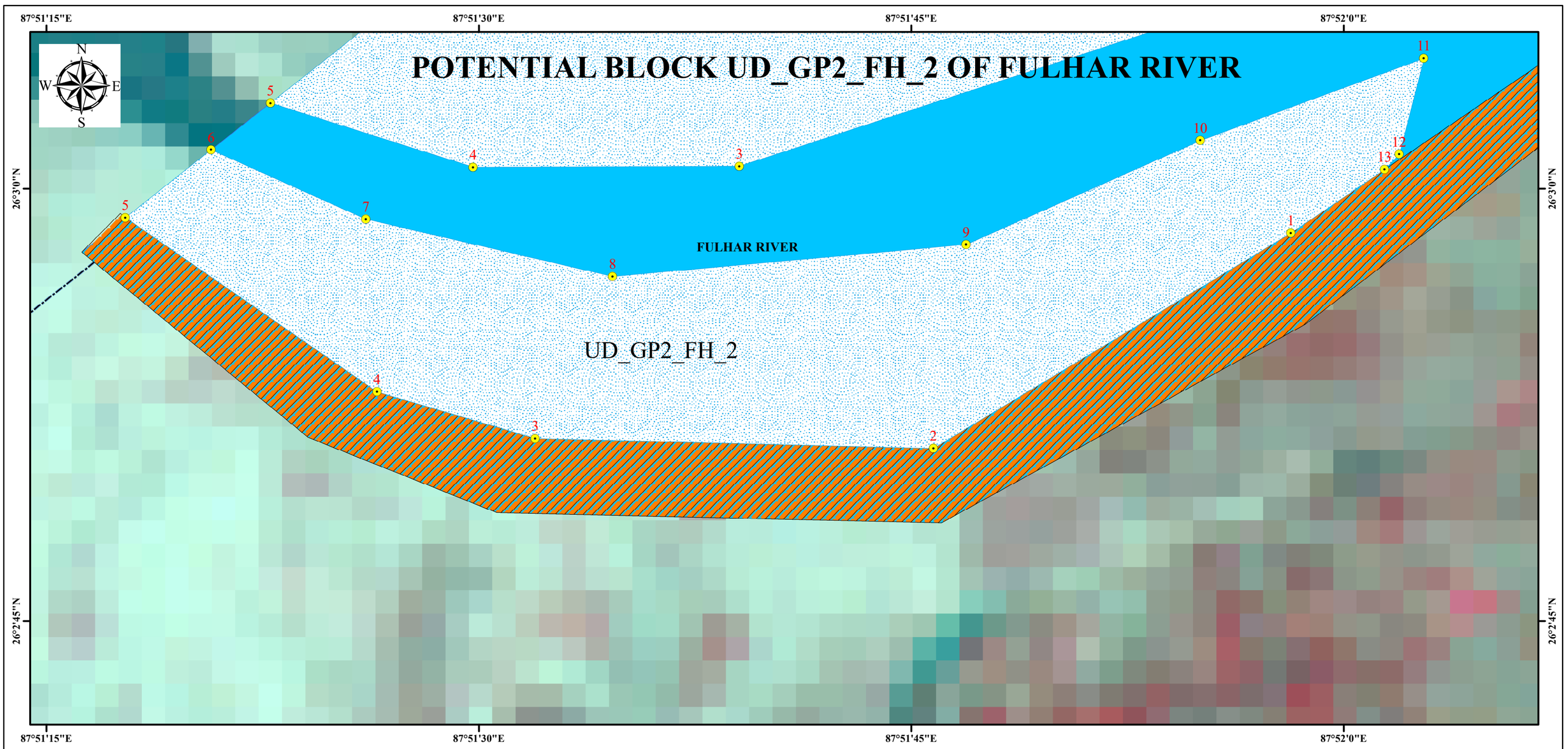
0 0.05 0.1 0.2 0.3 0.4

Kilometers

LEGEND

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

POTENTIAL BLOCK UD_GP2_FH_2 OF FULHAR RIVER



UD_GP2_FH_2					
POINT NO	LATITUDE	LONGITUDE	POINT NO	LATITUDE	LONGITUDE
1	26° 2' 58.463" N	87° 51' 58.165" E	8	26° 2' 56.953" N	87° 51' 34.637" E
2	26° 2' 50.996" N	87° 51' 45.770" E	9	26° 2' 58.062" N	87° 51' 46.903" E
3	26° 2' 51.332" N	87° 51' 31.955" E	10	26° 3' 1.669" N	87° 51' 55.022" E
4	26° 2' 52.954" N	87° 51' 26.467" E	11	26° 3' 4.525" N	87° 52' 2.779" E
5	26° 2' 58.996" N	87° 51' 17.734" E	12	26° 3' 1.197" N	87° 52' 1.921" E
6	26° 3' 1.346" N	87° 51' 20.710" E	13	26° 3' 0.669" N	87° 52' 1.417" E
7	26° 2' 58.939" N	87° 51' 26.082" E			

0 0.05 0.1 0.2 0.3 0.4

Kilometers

LEGEND

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

POTENTIAL BLOCK UD_GP2_FH_3 OF FULHAR RIVER

87°51'0"E 87°51'15"E 87°51'30"E 87°51'45"E

26°2'30"N 26°2'15"N 26°2'0"N 26°1'45"N 26°1'30"N 26°1'15"N

N W E S

FULHAR RIVER

LEGEND

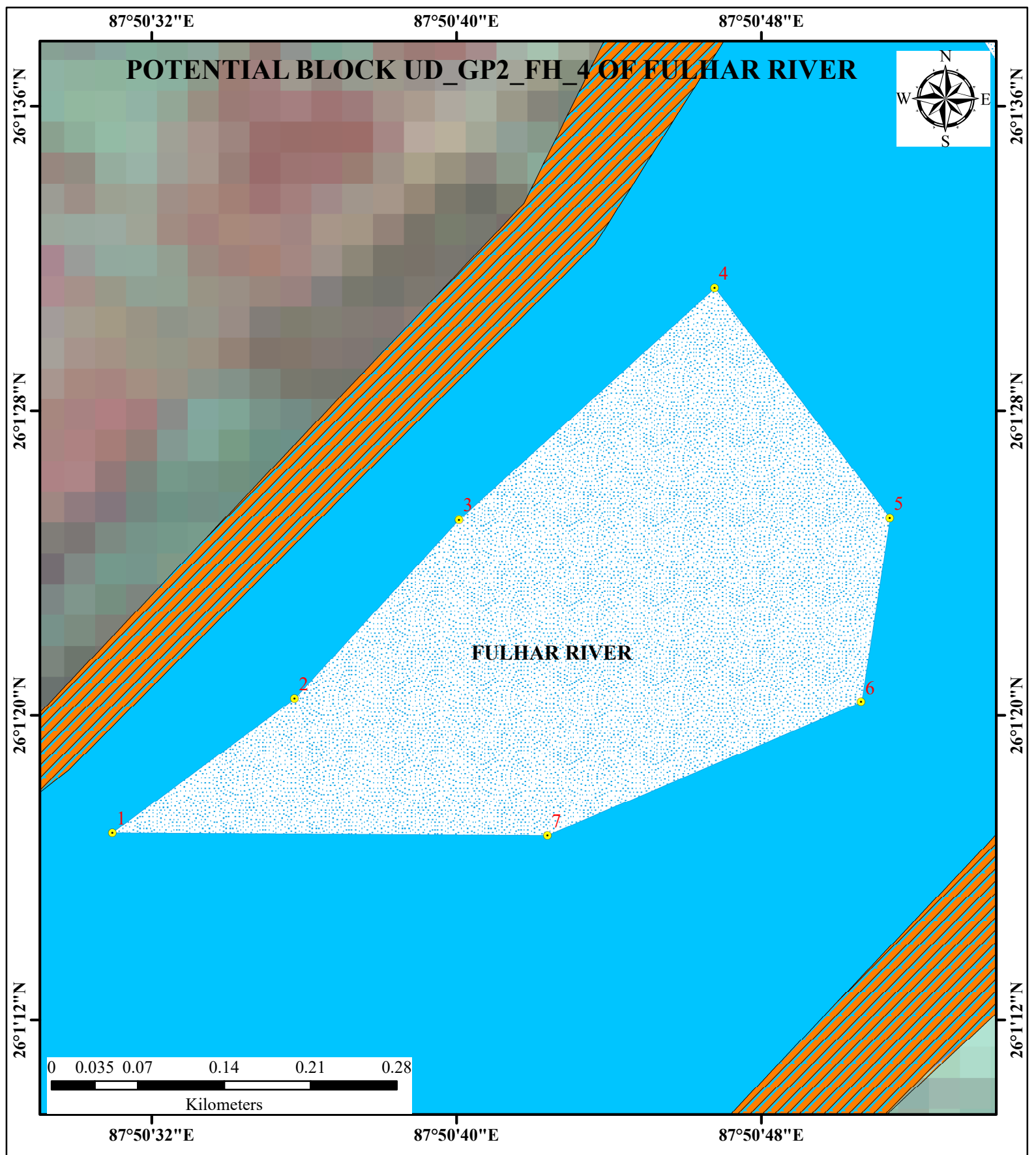
- COORDINATE
- POTENTIAL BLOCK
- SAFETY BARRIER
- RIVER
- ADMINISTRATIVE BLOCK BOUNDARY
- DISTRICT BOUNDARY

UD_GP2_FH_3

POINT NO	LATITUDE	LONGITUDE
1	26° 2' 20.934" N	87° 51' 17.357" E
2	26° 2' 19.839" N	87° 51' 20.681" E
3	26° 2' 20.680" N	87° 51' 23.900" E
4	26° 2' 21.312" N	87° 51' 26.047" E
5	26° 2' 20.225" N	87° 51' 28.181" E
6	26° 2' 16.563" N	87° 51' 29.344" E
7	26° 2' 10.979" N	87° 51' 28.232" E
8	26° 2' 6.371" N	87° 51' 25.700" E
9	26° 2' 1.291" N	87° 51' 25.246" E
10	26° 1' 58.884" N	87° 51' 23.999" E
11	26° 1' 50.292" N	87° 51' 17.968" E
12	26° 1' 42.891" N	87° 51' 15.058" E
13	26° 1' 34.434" N	87° 51' 9.047" E
14	26° 1' 24.130" N	87° 51' 0.788" E
15	26° 1' 23.965" N	87° 51' 0.637" E
16	26° 1' 29.441" N	87° 50' 58.897" E
17	26° 1' 38.072" N	87° 50' 53.605" E
18	26° 1' 43.965" N	87° 50' 50.969" E
19	26° 1' 45.261" N	87° 50' 51.790" E
20	26° 1' 46.689" N	87° 50' 51.000" E
21	26° 1' 56.012" N	87° 50' 55.876" E
22	26° 2' 8.952" N	87° 51' 7.393" E
23	26° 2' 16.999" N	87° 51' 10.069" E
24	26° 2' 24.328" N	87° 51' 6.909" E
25	26° 2' 28.309" N	87° 51' 6.343" E
26	26° 2' 23.970" N	87° 51' 12.976" E

0 0.1 0.2 0.4 0.6 0.8

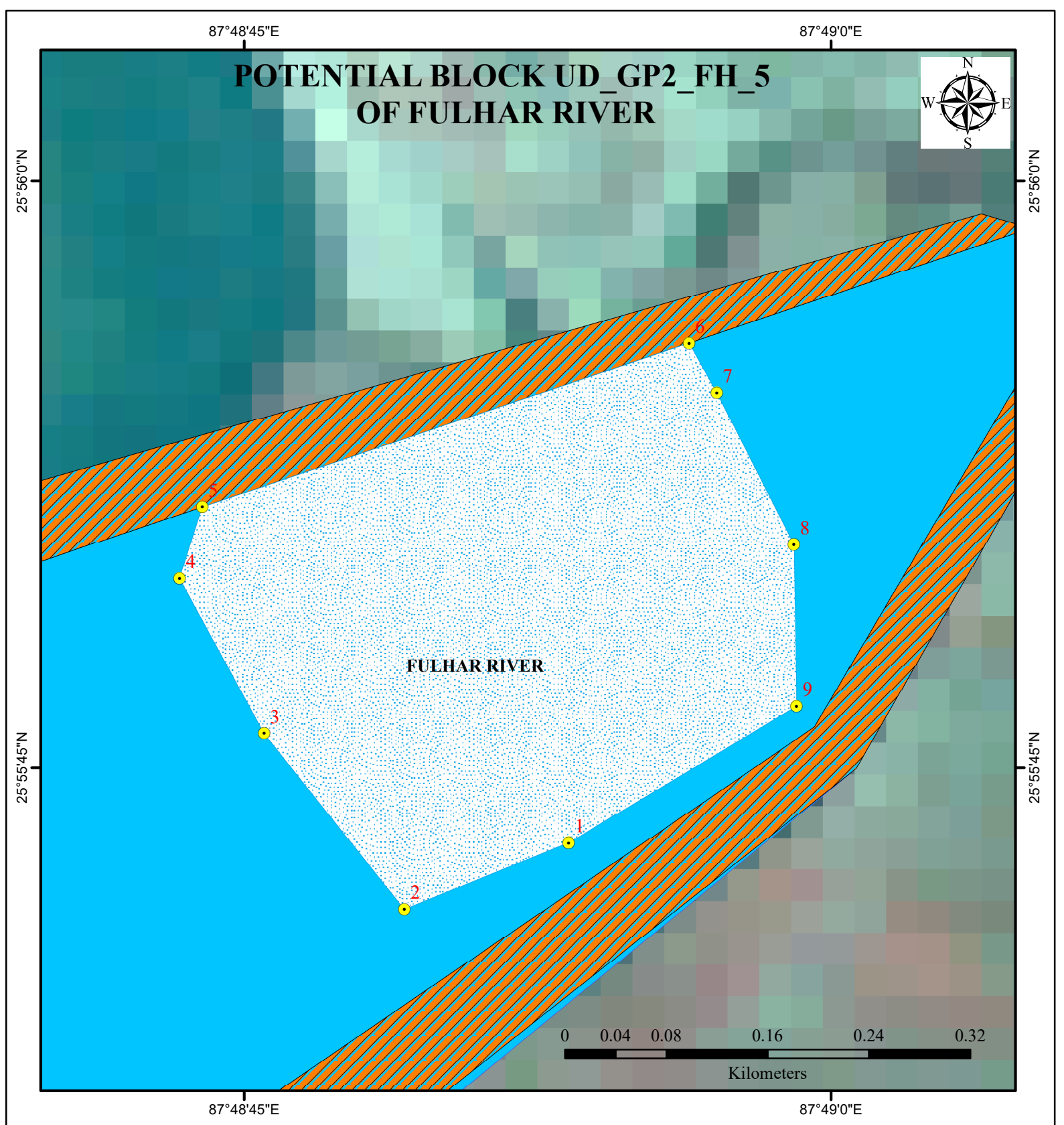
Kilometers



UD_GP2_FH_4		
POINT NO	LATITUDE	LONGITUDE
1	26° 1' 16.919" N	87° 50' 30.965" E
2	26° 1' 20.438" N	87° 50' 35.750" E
3	26° 1' 25.143" N	87° 50' 40.067" E
4	26° 1' 31.232" N	87° 50' 46.774" E
5	26° 1' 25.185" N	87° 50' 51.371" E
6	26° 1' 20.351" N	87° 50' 50.622" E
7	26° 1' 16.852" N	87° 50' 42.387" E

LEGEND

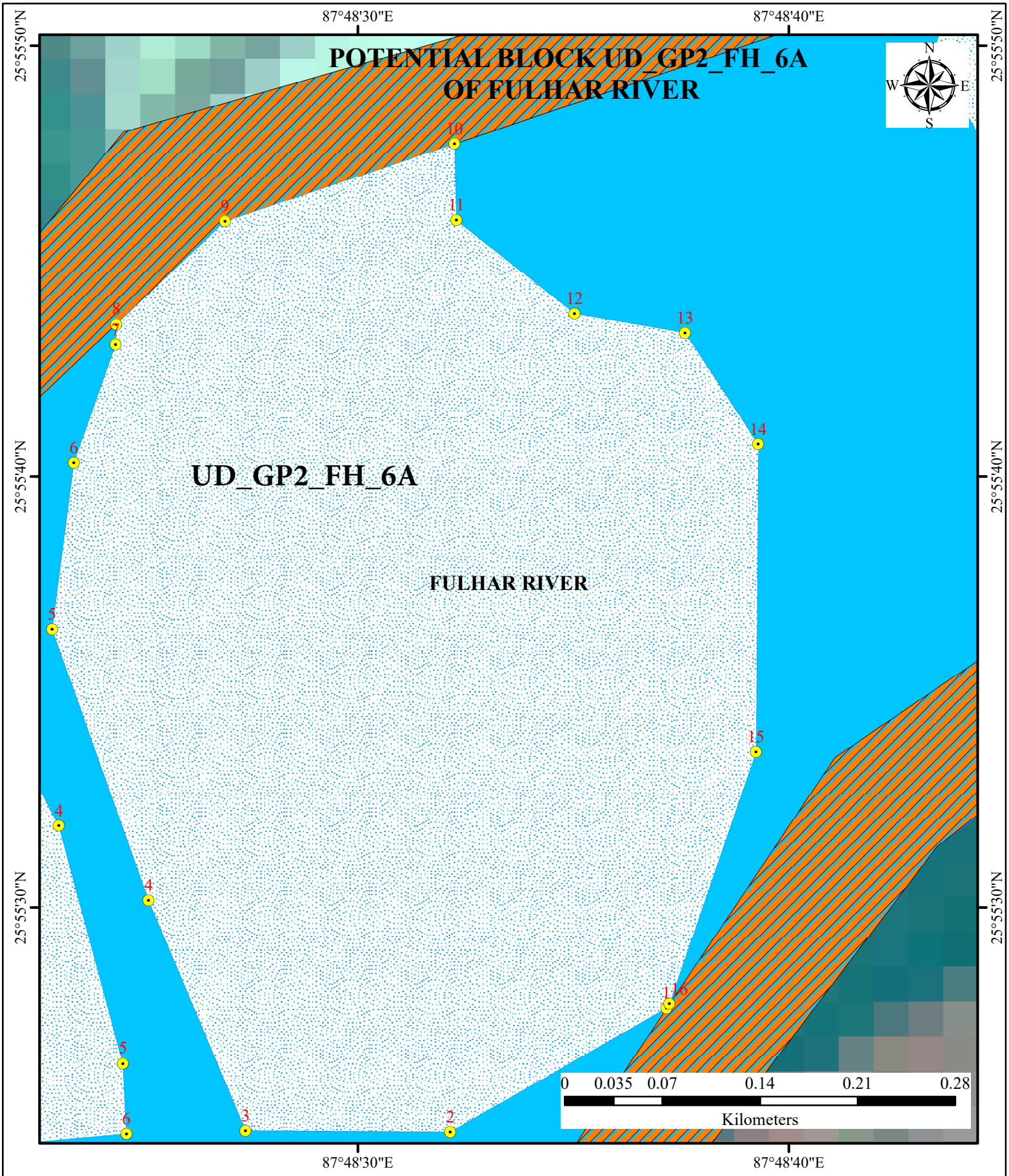
- COORDINATE
- POTENTIAL BLOCK
- SAFETY BARRIER
- RIVER
- ADMINISTRATIVE BLOCK BOUNDARY
- DISTRICT BOUNDARY



UD_GP2_FH_5		
POINT NO	LATITUDE	LONGITUDE
1	25° 55' 43.079" N	87° 48' 53.289" E
2	25° 55' 41.383" N	87° 48' 49.093" E
3	25° 55' 45.875" N	87° 48' 45.509" E
4	25° 55' 49.843" N	87° 48' 43.349" E
5	25° 55' 51.664" N	87° 48' 43.928" E
6	25° 55' 55.858" N	87° 48' 56.371" E
7	25° 55' 54.582" N	87° 48' 57.078" E
8	25° 55' 50.701" N	87° 48' 59.049" E
9	25° 55' 46.572" N	87° 48' 59.115" E

LEGEND

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

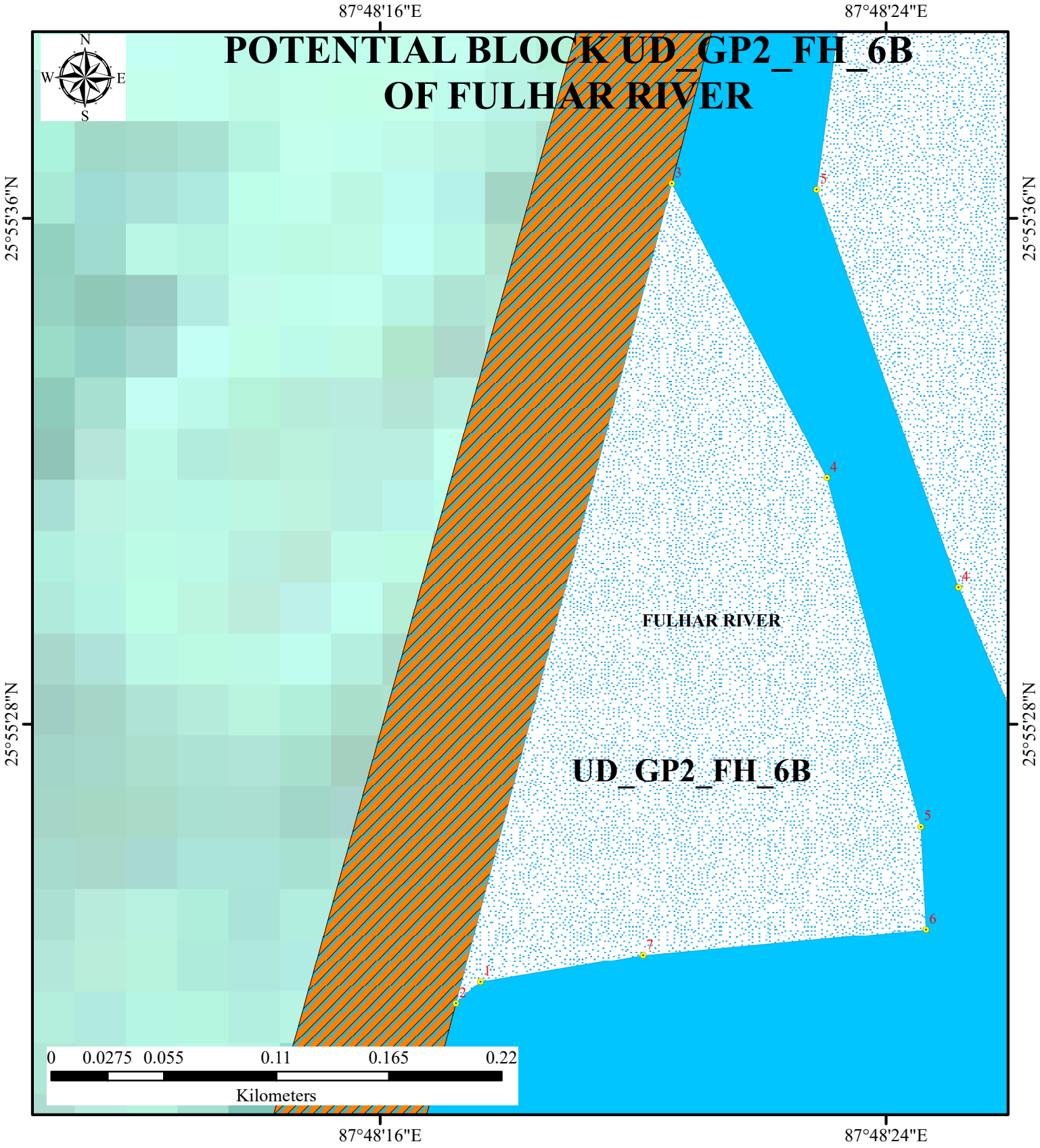


UD_GP2_FH_6A					
POINT NO	LATITUDE	LONGITUDE	POINT NO	LATITUDE	LONGITUDE
1	25° 55' 27.666" N	87° 48' 37.166" E	9	25° 55' 45.928" N	87° 48' 26.914" E
2	25° 55' 24.792" N	87° 48' 32.144" E	10	25° 55' 47.725" N	87° 48' 32.245" E
3	25° 55' 24.819" N	87° 48' 27.389" E	11	25° 55' 45.949" N	87° 48' 32.289" E
4	25° 55' 30.164" N	87° 48' 25.143" E	12	25° 55' 43.783" N	87° 48' 35.032" E
5	25° 55' 36.455" N	87° 48' 22.903" E	13	25° 55' 43.339" N	87° 48' 37.597" E
6	25° 55' 40.322" N	87° 48' 23.405" E	14	25° 55' 40.749" N	87° 48' 39.292" E
7	25° 55' 43.069" N	87° 48' 24.375" E	15	25° 55' 33.611" N	87° 48' 39.243" E
8	25° 55' 43.537" N	87° 48' 24.392" E	16	25° 55' 27.762" N	87° 48' 37.230" E

LEGEND

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

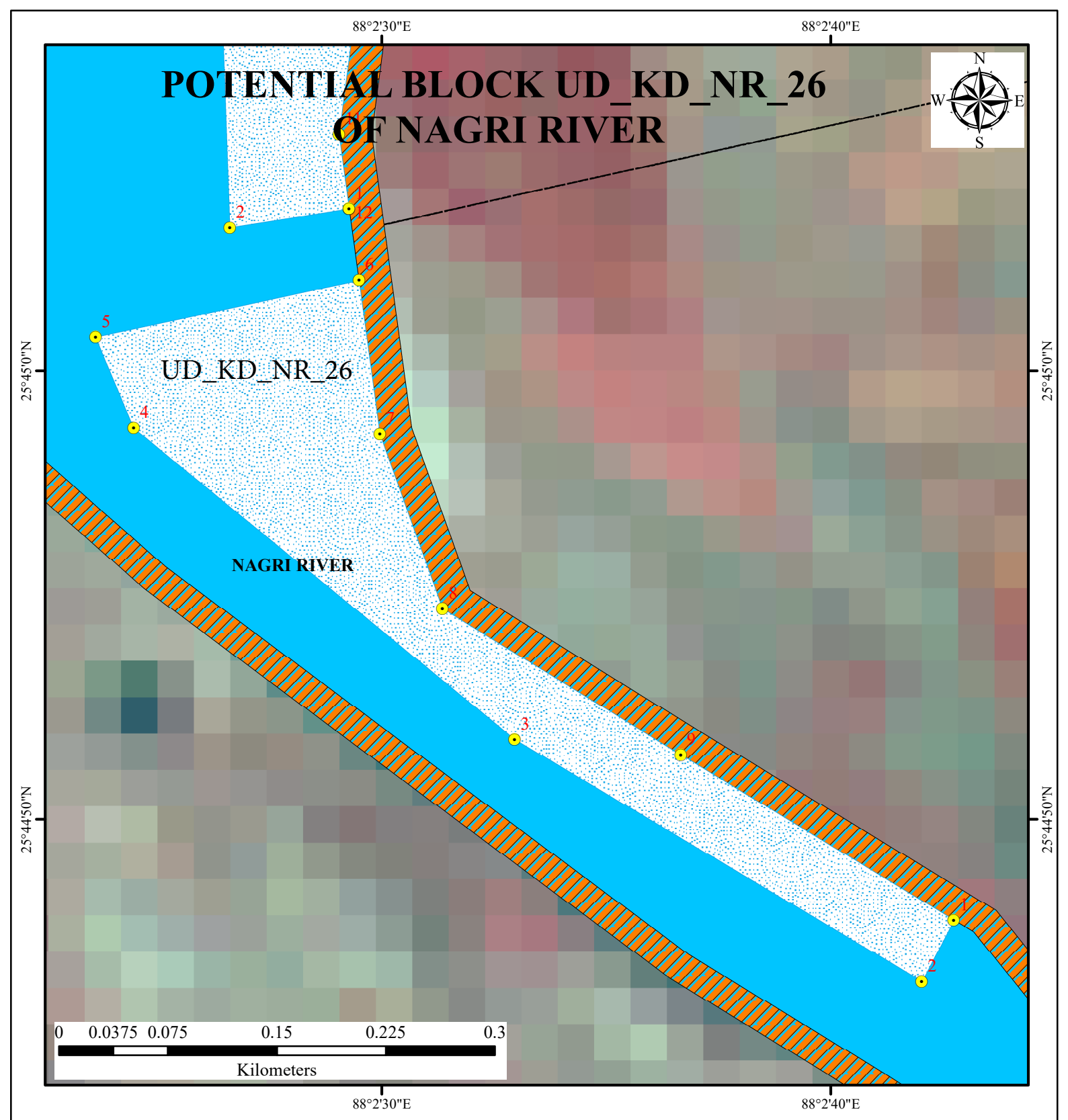
POTENTIAL BLOCK UD_GP2_FH_6B OF FULHAR RIVER



UD_GP2_FH_6B		
POINT NO	**LATITUDE**	**LONGITUDE**
1	25° 55' 23.927" N	87° 48' 17.587" E
2	25° 55' 23.585" N	87° 48' 17.201" E
3	25° 55' 36.557" N	87° 48' 20.610" E
4	25° 55' 31.895" N	87° 48' 23.062" E
5	25° 55' 26.383" N	87° 48' 24.547" E
6	25° 55' 24.748" N	87° 48' 24.631" E
7	25° 55' 24.343" N	87° 48' 20.158" E

LEGEND

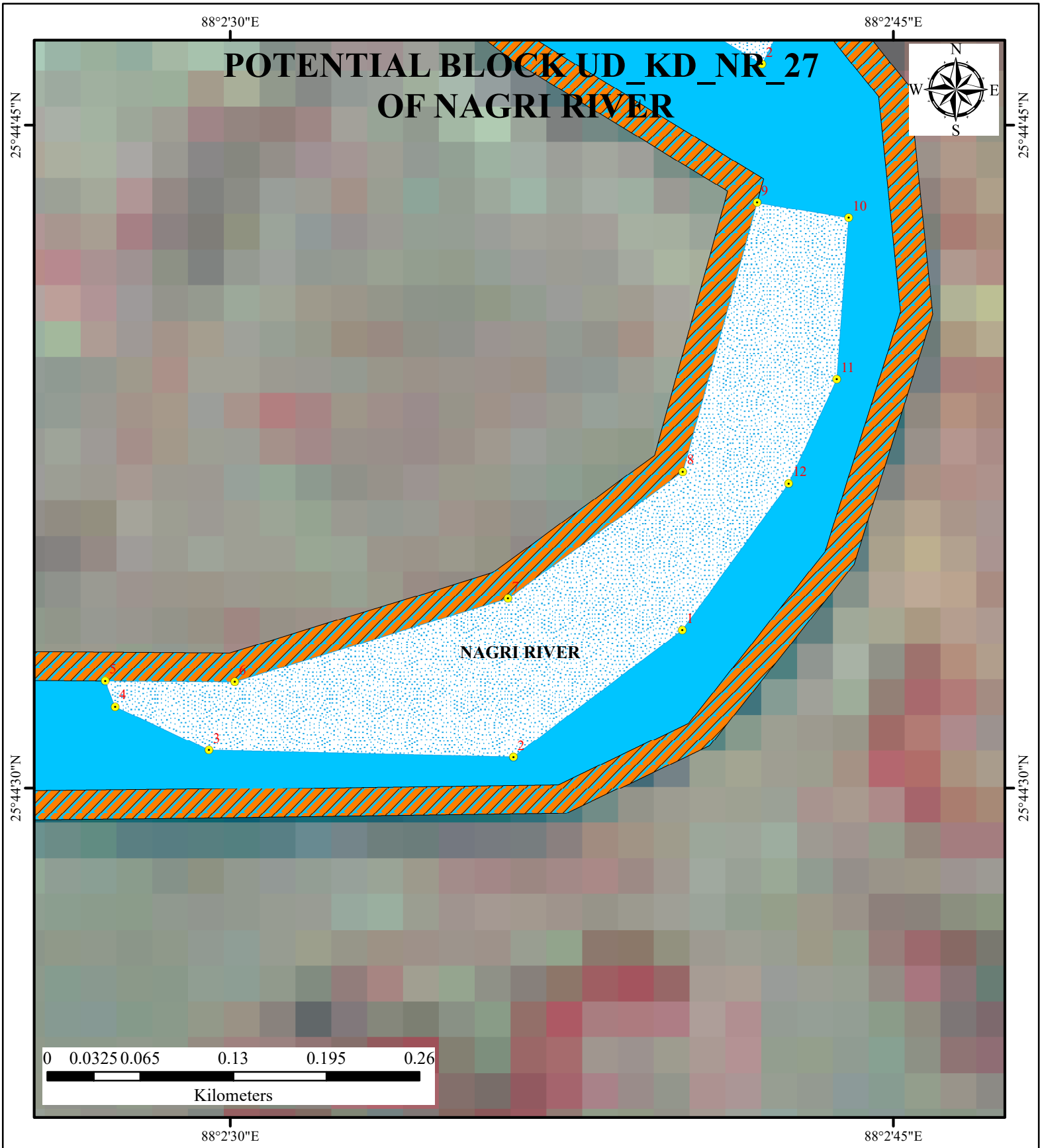
- COORDINATE
- POTENTIAL BLOCK
- SAFETY BARRIER
- RIVER
- ADMINISTRATIVE BLOCK BOUNDARY
- DISTRICT BOUNDARY



UD_KD_NR_26		
POINT NO	LATITUDE	LONGITUDE
1	25° 44' 47.749" N	88° 2' 42.739" E
2	25° 44' 46.381" N	88° 2' 42.026" E
3	25° 44' 51.778" N	88° 2' 32.957" E
4	25° 44' 58.719" N	88° 2' 24.470" E
5	25° 45' 0.750" N	88° 2' 23.619" E
6	25° 45' 2.011" N	88° 2' 29.488" E
7	25° 44' 58.583" N	88° 2' 29.956" E
8	25° 44' 54.690" N	88° 2' 31.351" E
9	25° 44' 51.431" N	88° 2' 36.657" E

LEGEND

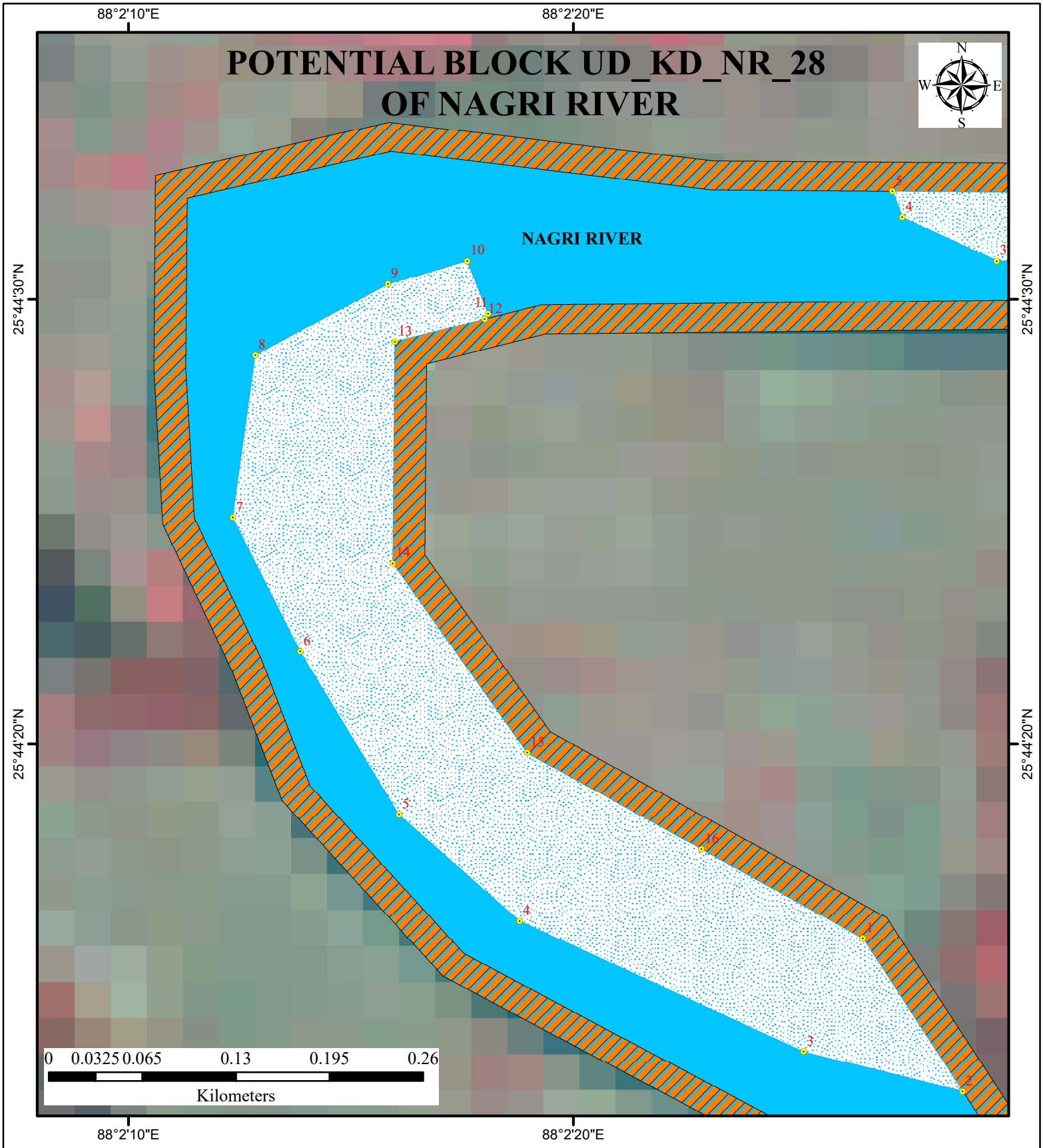
- COORDINATE
- POTENTIAL BLOCK
- SAFETY BARRIER
- RIVER
- ADMINISTRATIVE BLOCK BOUNDARY
- DISTRICT BOUNDARY



UD_KD_NR_27					
POINT NO	LATITUDE	LONGITUDE	POINT NO	LATITUDE	LONGITUDE
1	25° 44' 33.580" N	88° 2' 40.229" E	7	25° 44' 34.296" N	88° 2' 36.281" E
2	25° 44' 30.704" N	88° 2' 36.405" E	8	25° 44' 37.162" N	88° 2' 40.239" E
3	25° 44' 30.861" N	88° 2' 29.522" E	9	25° 44' 43.250" N	88° 2' 41.918" E
4	25° 44' 31.844" N	88° 2' 27.394" E	10	25° 44' 42.905" N	88° 2' 43.990" E
5	25° 44' 32.430" N	88° 2' 27.174" E	11	25° 44' 39.252" N	88° 2' 43.721" E
6	25° 44' 32.409" N	88° 2' 30.105" E	12	25° 44' 36.895" N	88° 2' 42.632" E

LEGEND

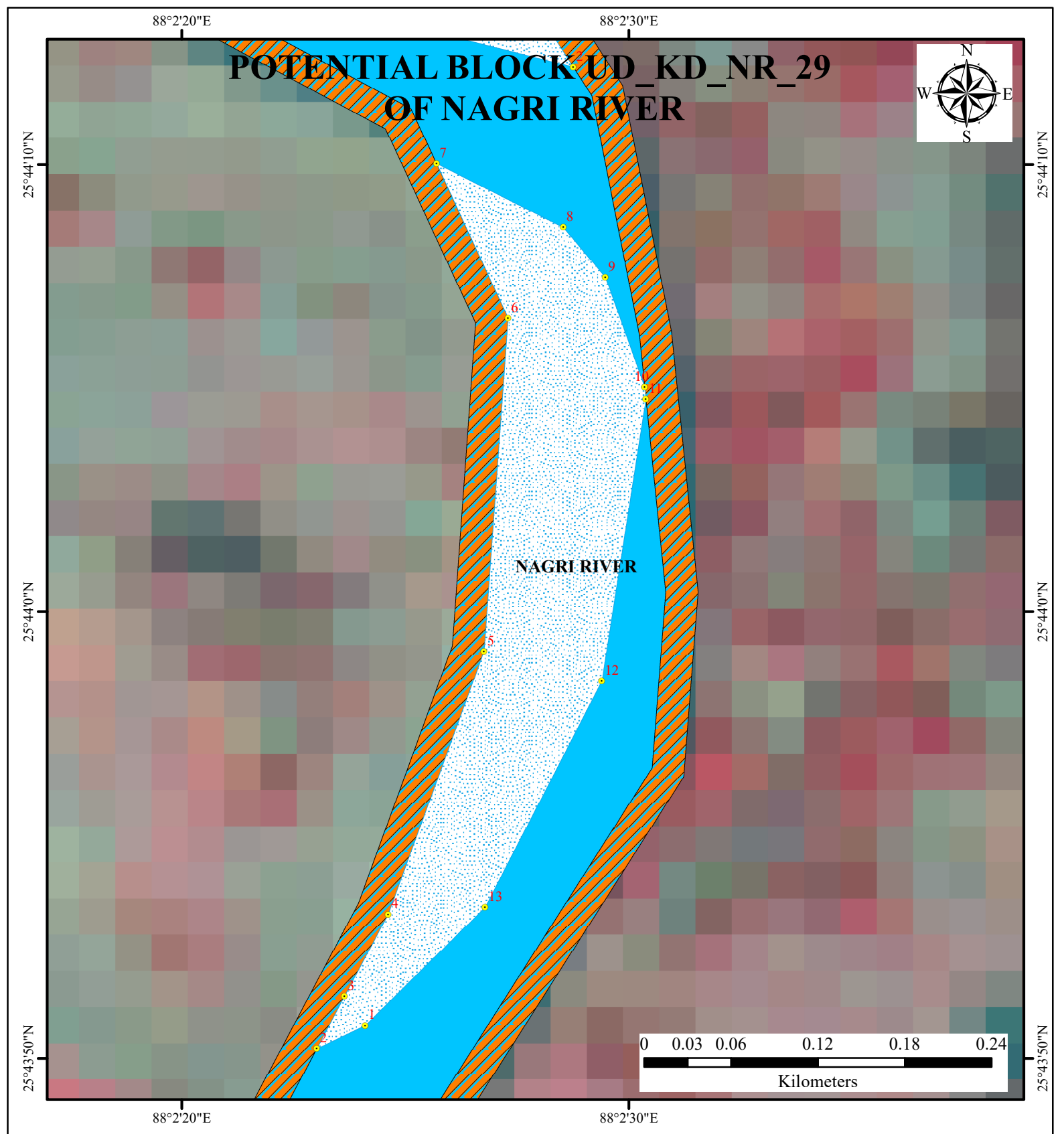
- COORDINATE
- POTENTIAL BLOCK
- SAFETY BARRIER
- RIVER
- ADMINISTRATIVE BLOCK BOUNDARY
- DISTRICT BOUNDARY



UD_KD_NR_28					
POINT NO	LATITUDE	LONGITUDE	POINT NO	LATITUDE	LONGITUDE
1	25° 44' 15.622" N	88° 2' 26.513" E	9	25° 44' 30.340" N	88° 2' 15.834" E
2	25° 44' 12.183" N	88° 2' 28.751" E	10	25° 44' 30.864" N	88° 2' 17.619" E
3	25° 44' 13.072" N	88° 2' 25.179" E	11	25° 44' 29.679" N	88° 2' 18.083" E
4	25° 44' 16.020" N	88° 2' 18.795" E	12	25° 44' 29.554" N	88° 2' 18.015" E
5	25° 44' 18.405" N	88° 2' 16.086" E	13	25° 44' 29.046" N	88° 2' 15.990" E
6	25° 44' 22.076" N	88° 2' 13.863" E	14	25° 44' 24.063" N	88° 2' 15.947" E
7	25° 44' 25.097" N	88° 2' 12.346" E	15	25° 44' 19.798" N	88° 2' 18.965" E
8	25° 44' 28.748" N	88° 2' 12.852" E	16	25° 44' 17.629" N	88° 2' 22.886" E

LEGEND

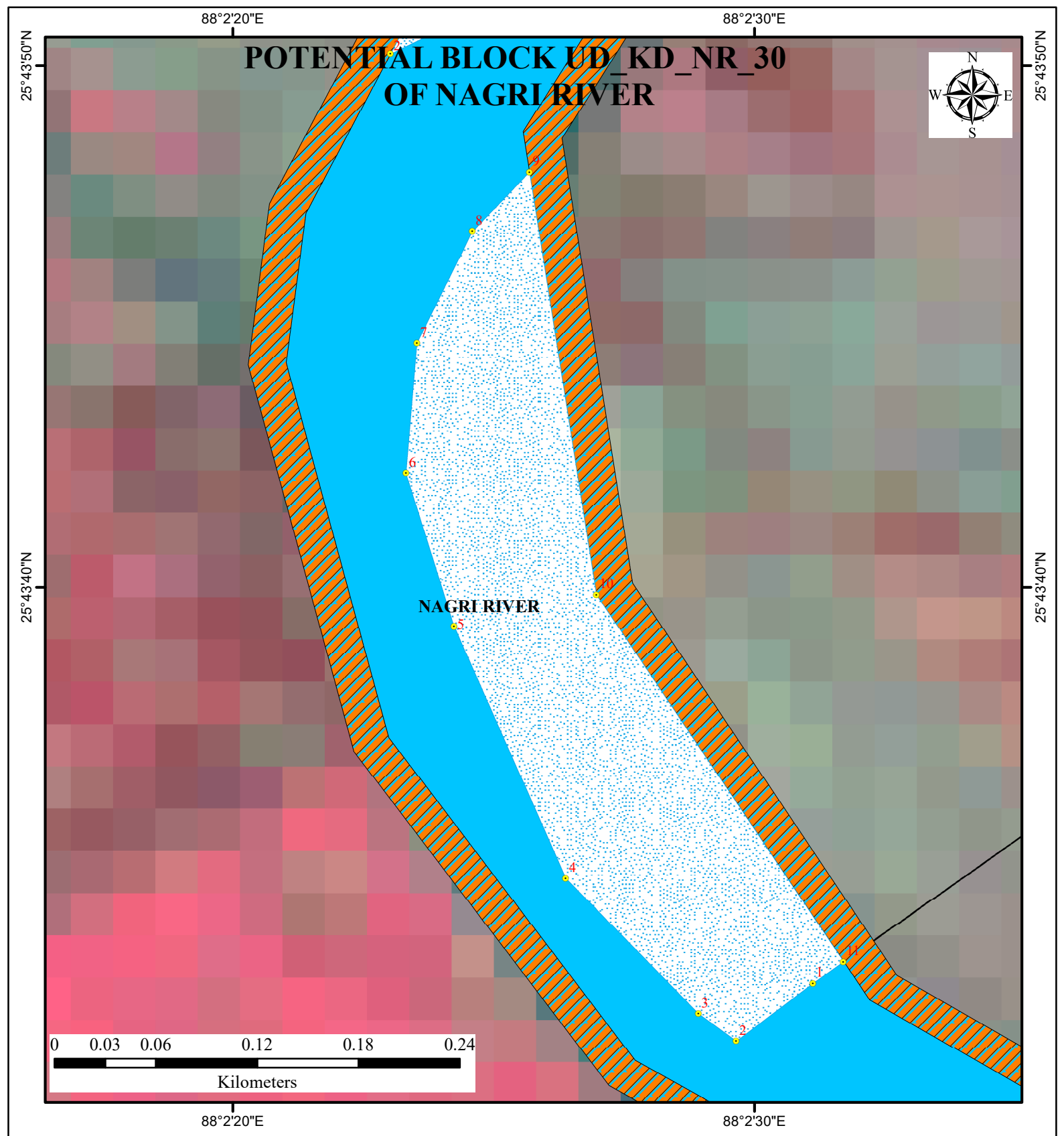
- COORDINATE
- POTENTIAL BLOCK
- SAFETY BARRIER
- RIVER
- ADMINISTRATIVE BLOCK BOUNDARY
- DISTRICT BOUNDARY



UD_KD_NR_29					
POINT NO	LATITUDE	LONGITUDE	POINT NO	LATITUDE	LONGITUDE
1	25° 43' 50.740" N	88° 2' 24.102" E	8	25° 44' 8.598" N	88° 2' 28.530" E
2	25° 43' 50.220" N	88° 2' 23.019" E	9	25° 44' 7.473" N	88° 2' 29.470" E
3	25° 43' 51.385" N	88° 2' 23.637" E	10	25° 44' 5.021" N	88° 2' 30.348" E
4	25° 43' 53.229" N	88° 2' 24.615" E	11	25° 44' 4.752" N	88° 2' 30.376" E
5	25° 43' 59.112" N	88° 2' 26.759" E	12	25° 43' 58.443" N	88° 2' 29.391" E
6	25° 44' 6.568" N	88° 2' 27.295" E	13	25° 43' 53.387" N	88° 2' 26.783" E
7	25° 44' 10.020" N	88° 2' 25.697" E			

LEGEND

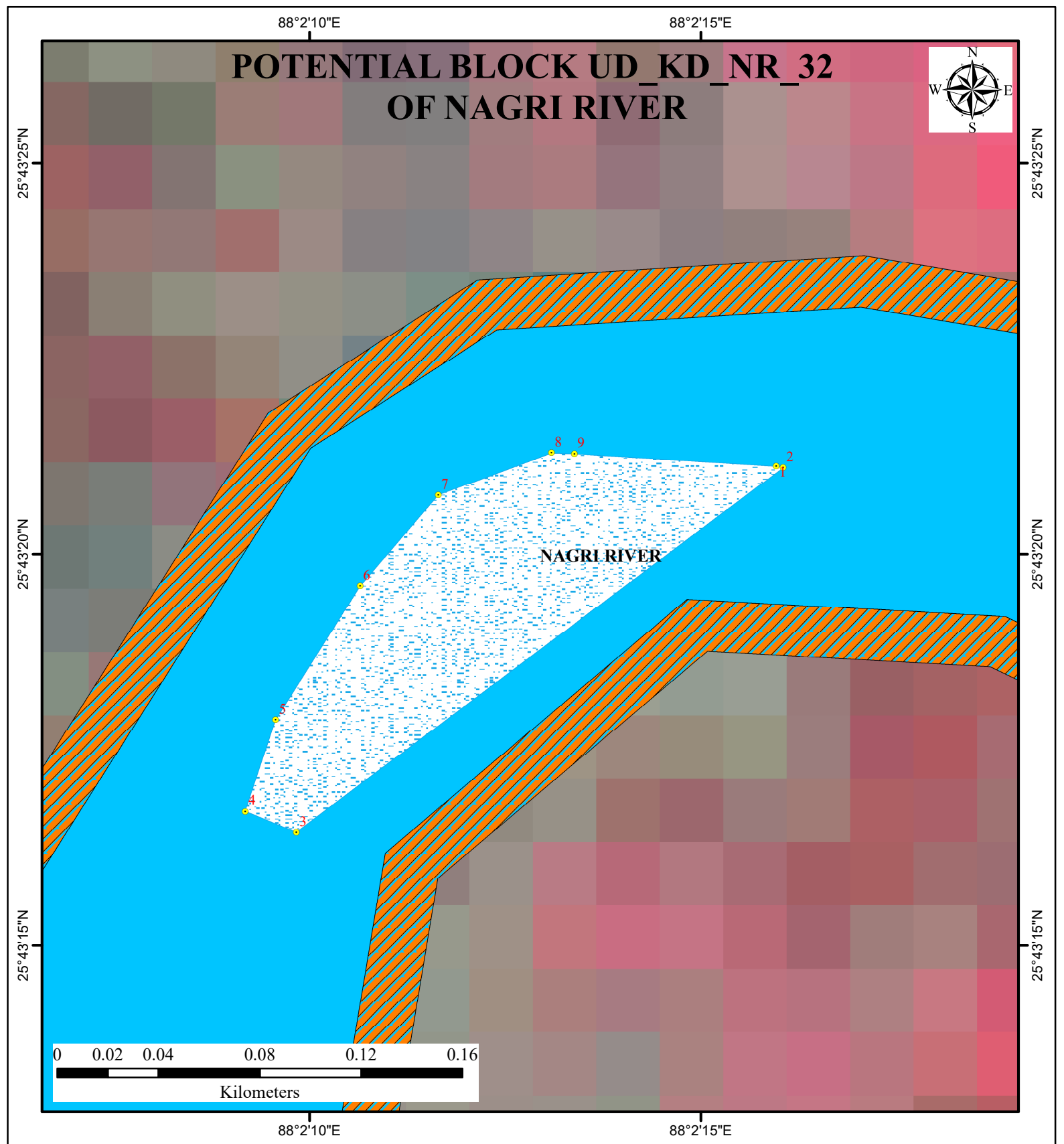
- COORDINATE
- POTENTIAL BLOCK
- SAFETY BARRIER
- RIVER
- ADMINISTRATIVE BLOCK BOUNDARY
- DISTRICT BOUNDARY



UD_KD_NR_30		
POINT NO	**LATITUDE**	**LONGITUDE**
1	25° 43' 32.414" N	88° 2' 31.120" E
2	25° 43' 31.309" N	88° 2' 29.646" E
3	25° 43' 31.828" N	88° 2' 28.922" E
4	25° 43' 34.426" N	88° 2' 26.381" E
5	25° 43' 39.258" N	88° 2' 24.239" E
6	25° 43' 42.189" N	88° 2' 23.315" E
7	25° 43' 44.681" N	88° 2' 23.527" E
8	25° 43' 46.824" N	88° 2' 24.590" E
9	25° 43' 47.961" N	88° 2' 25.684" E
10	25° 43' 39.859" N	88° 2' 26.967" E
11	25° 43' 32.825" N	88° 2' 31.702" E

LEGEND

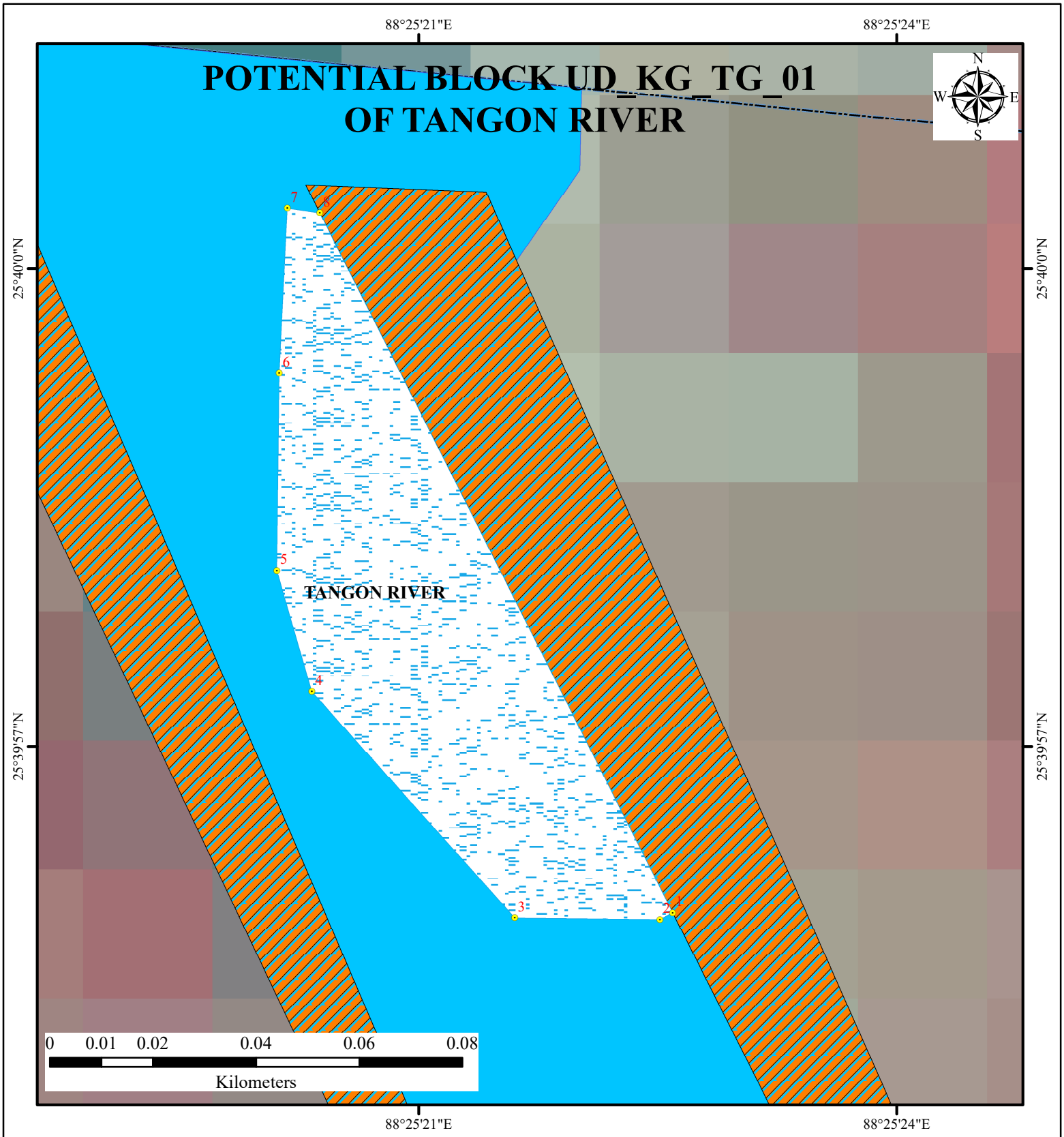
- COORDINATE
- POTENTIAL BLOCK
- SAFETY BARRIER
- RIVER
- ADMINISTRATIVE BLOCK BOUNDARY
- DISTRICT BOUNDARY



UD_KD_NR_32		
POINT NO	**LATITUDE**	**LONGITUDE**
1	25° 43' 21.126" N	88° 2' 15.962" E
2	25° 43' 21.113" N	88° 2' 16.051" E
3	25° 43' 16.446" N	88° 2' 9.829" E
4	25° 43' 16.714" N	88° 2' 9.177" E
5	25° 43' 17.881" N	88° 2' 9.567" E
6	25° 43' 19.594" N	88° 2' 10.645" E
7	25° 43' 20.756" N	88° 2' 11.642" E
8	25° 43' 21.296" N	88° 2' 13.090" E
9	25° 43' 21.285" N	88° 2' 13.382" E

LEGEND

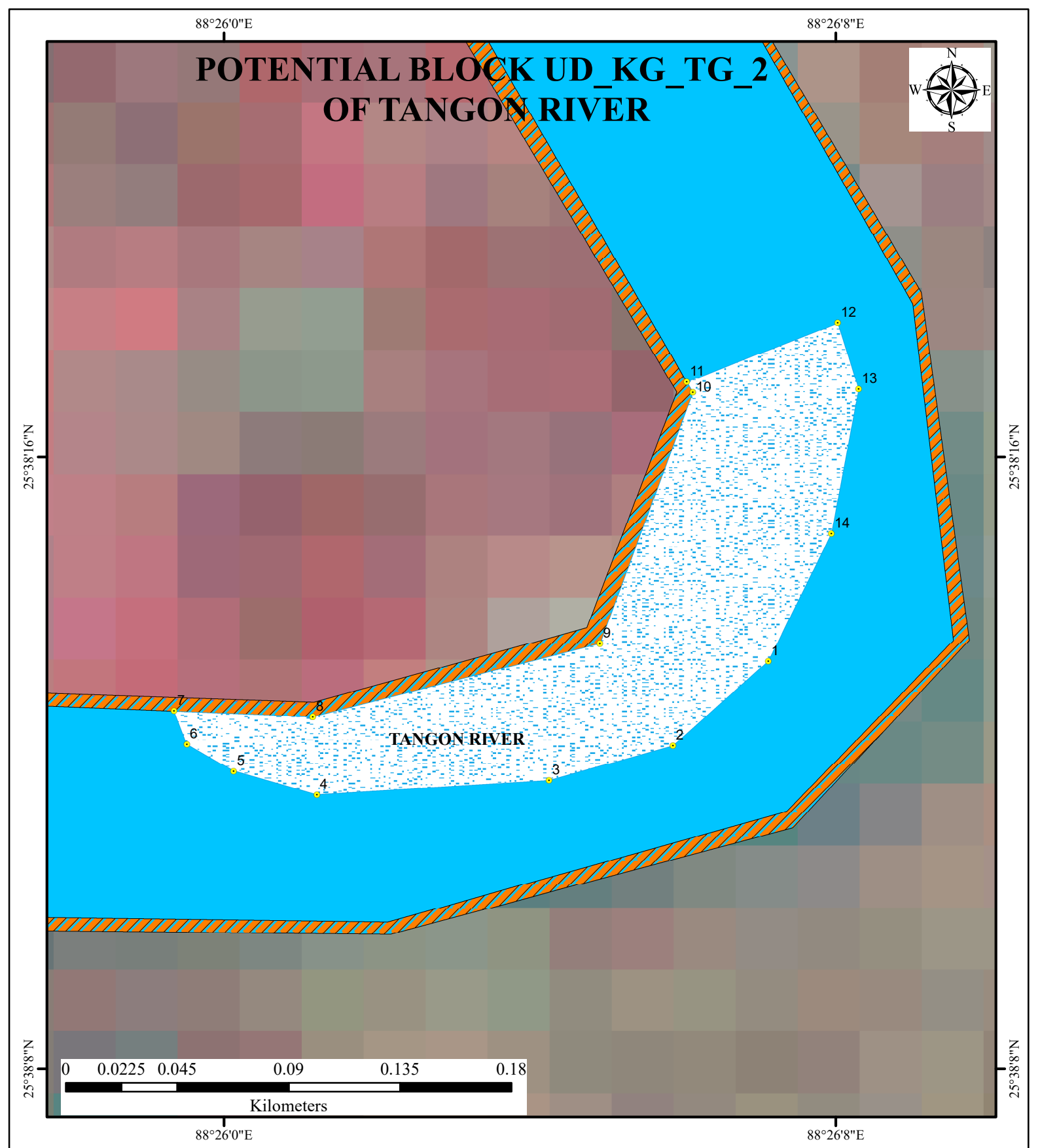
- COORDINATE
- POTENTIAL BLOCK
- SAFETY BARRIER
- RIVER
- ADMINISTRATIVE BLOCK BOUNDARY
- DISTRICT BOUNDARY



UD_KG_TG_1		
POINT NO	**LATITUDE**	**LONGITUDE**
1	25° 39' 55.957" N	88° 25' 22.592" E
2	25° 39' 55.915" N	88° 25' 22.512" E
3	25° 39' 55.924" N	88° 25' 21.602" E
4	25° 39' 57.347" N	88° 25' 20.328" E
5	25° 39' 58.106" N	88° 25' 20.109" E
6	25° 39' 59.344" N	88° 25' 20.124" E
7	25° 40' 0.380" N	88° 25' 20.175" E
8	25° 40' 0.351" N	88° 25' 20.379" E

LEGEND

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

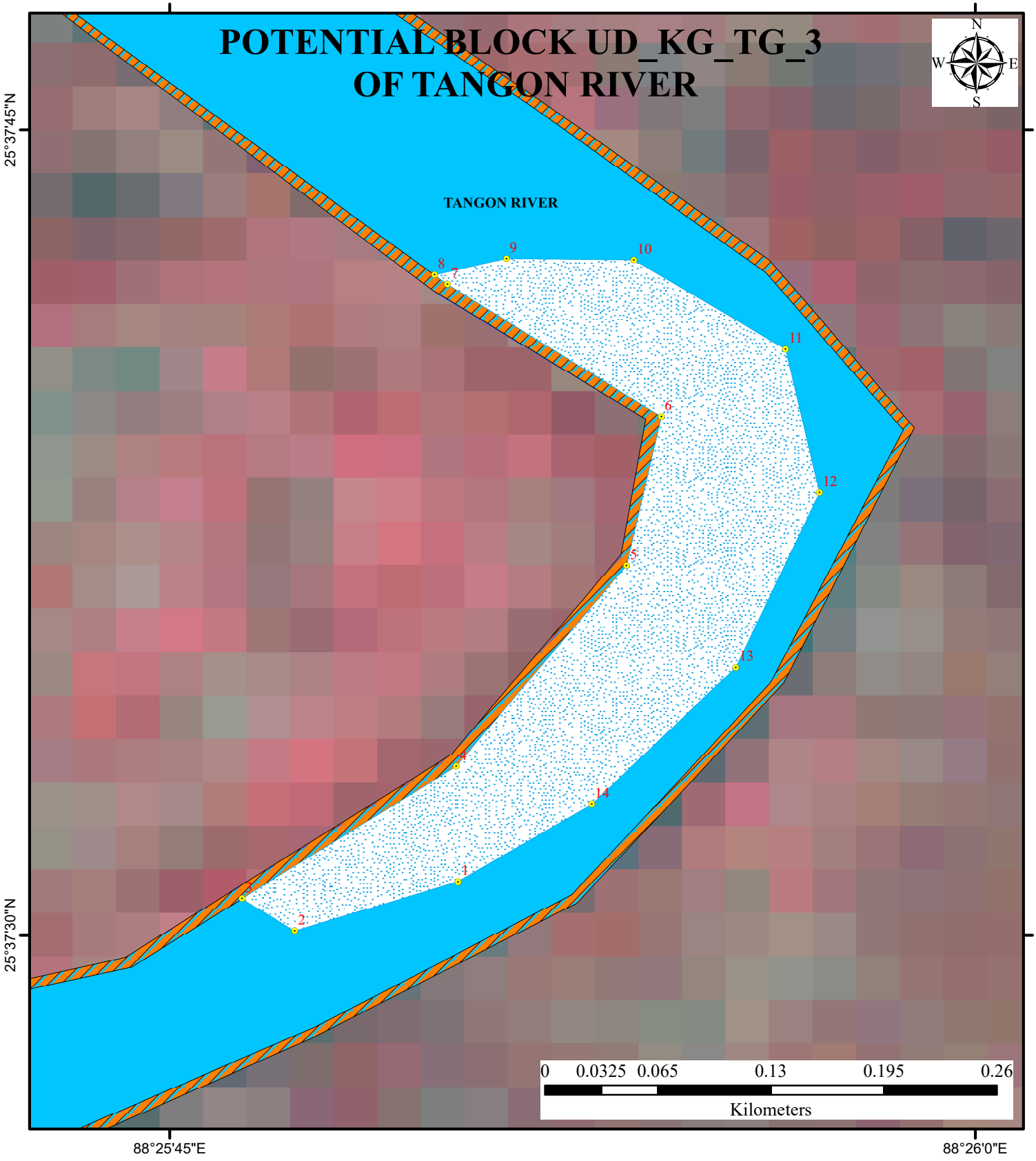


UD_KG_TG_2					
POINT NO	LATITUDE	LONGITUDE	POINT NO	LATITUDE	LONGITUDE
1	25° 38' 13.331" N	88° 26' 7.117" E	8	25° 38' 12.603" N	88° 26' 1.162" E
2	25° 38' 12.226" N	88° 26' 5.870" E	9	25° 38' 13.559" N	88° 26' 4.916" E
3	25° 38' 11.768" N	88° 26' 4.252" E	10	25° 38' 16.844" N	88° 26' 6.131" E
4	25° 38' 11.583" N	88° 26' 1.214" E	11	25° 38' 16.980" N	88° 26' 6.052" E
5	25° 38' 11.895" N	88° 26' 0.127" E	12	25° 38' 17.751" N	88° 26' 8.024" E
6	25° 38' 12.245" N	88° 25' 59.514" E	13	25° 38' 16.889" N	88° 26' 8.298" E
7	25° 38' 12.677" N	88° 25' 59.347" E	14	25° 38' 15.000" N	88° 26' 7.943" E

LEGEND

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

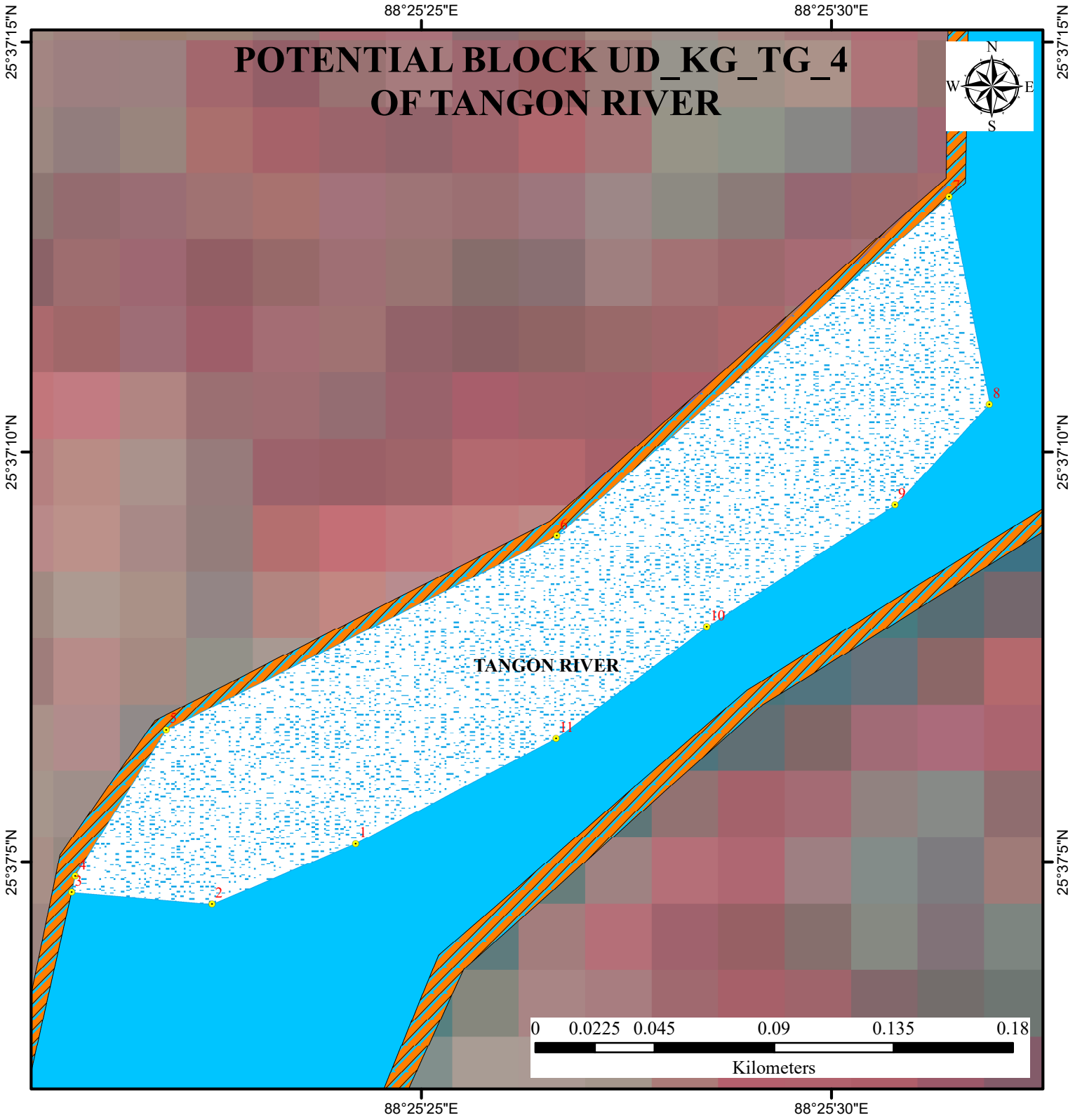
POTENTIAL BLOCK UD_KG_TG_3 OF TANGON RIVER



UD_KG_TG_3					
POINT NO	LATITUDE	LONGITUDE	POINT NO	LATITUDE	LONGITUDE
1	25° 37' 30.999" N	88° 25' 50.372" E	8	25° 37' 42.298" N	88° 25' 49.929" E
2	25° 37' 30.083" N	88° 25' 47.325" E	9	25° 37' 42.600" N	88° 25' 51.269" E
3	25° 37' 30.681" N	88° 25' 46.348" E	10	25° 37' 42.577" N	88° 25' 53.640" E
4	25° 37' 33.144" N	88° 25' 50.333" E	11	25° 37' 40.915" N	88° 25' 56.466" E
5	25° 37' 36.886" N	88° 25' 53.508" E	12	25° 37' 38.243" N	88° 25' 57.098" E
6	25° 37' 39.657" N	88° 25' 54.155" E	13	25° 37' 34.990" N	88° 25' 55.542" E
7	25° 37' 42.121" N	88° 25' 50.172" E	14	25° 37' 32.437" N	88° 25' 52.855" E

LEGEND

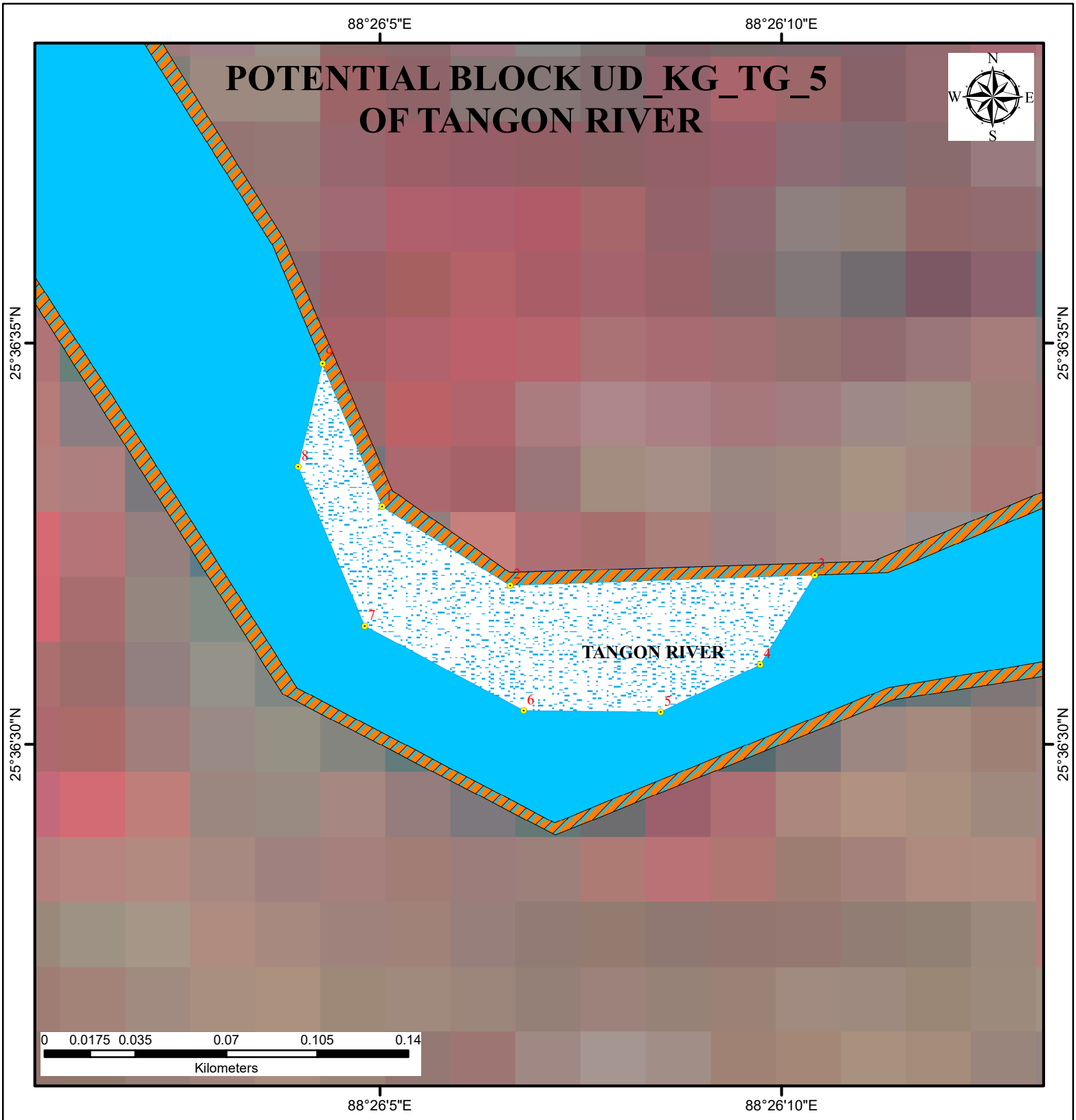
- COORDINATE
- POTENTIAL BLOCK
- SAFETY BARRIER
- RIVER
- ADMINISTRATIVE BLOCK BOUNDARY
- DISTRICT BOUNDARY



UD_KG_TG_4		
POINT NO	**LATITUDE**	**LONGITUDE**
1	25° 37' 5.224" N	88° 25' 24.200" E
2	25° 37' 4.485" N	88° 25' 22.446" E
3	25° 37' 4.629" N	88° 25' 20.737" E
4	25° 37' 4.834" N	88° 25' 20.783" E
5	25° 37' 6.615" N	88° 25' 21.888" E
6	25° 37' 8.981" N	88° 25' 26.654" E
7	25° 37' 13.116" N	88° 25' 31.437" E
8	25° 37' 10.584" N	88° 25' 31.928" E
9	25° 37' 9.357" N	88° 25' 30.775" E
10	25° 37' 7.866" N	88° 25' 28.481" E
11	25° 37' 6.508" N	88° 25' 26.644" E

LEGEND

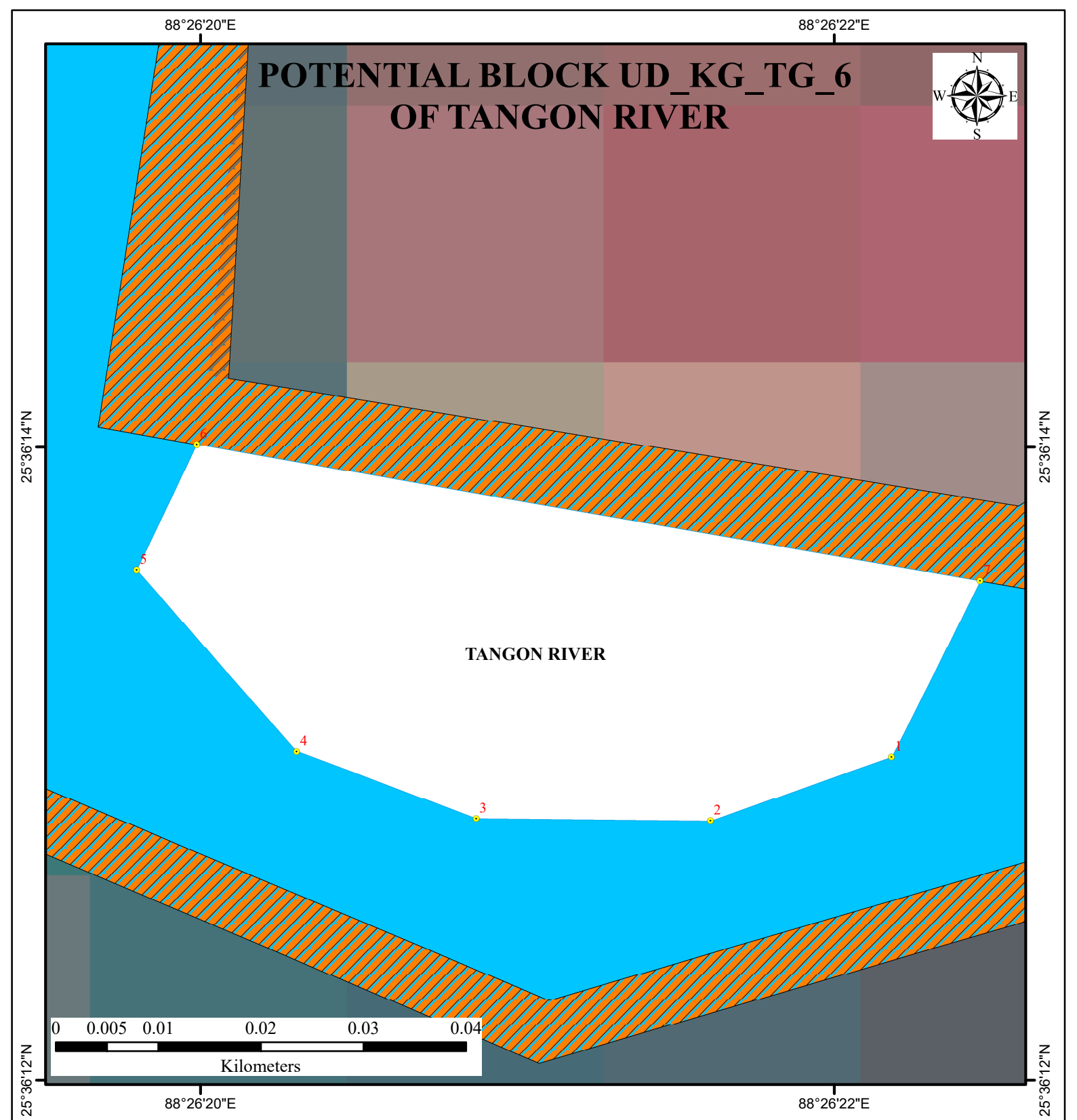
- COORDINATE
- POTENTIAL BLOCK
- SAFETY BARRIER
- RIVER
- ADMINISTRATIVE BLOCK BOUNDARY
- DISTRICT BOUNDARY



UD_KG_TG_5		
POINT NO	**LATITUDE**	**LONGITUDE**
1	25° 36' 32.967" N	88° 26' 5.028" E
2	25° 36' 31.984" N	88° 26' 6.624" E
3	25° 36' 32.111" N	88° 26' 10.417" E
4	25° 36' 30.996" N	88° 26' 9.738" E
5	25° 36' 30.406" N	88° 26' 8.498" E
6	25° 36' 30.423" N	88° 26' 6.791" E
7	25° 36' 31.475" N	88° 26' 4.812" E
8	25° 36' 33.461" N	88° 26' 3.982" E
9	25° 36' 34.742" N	88° 26' 4.285" E

LEGEND

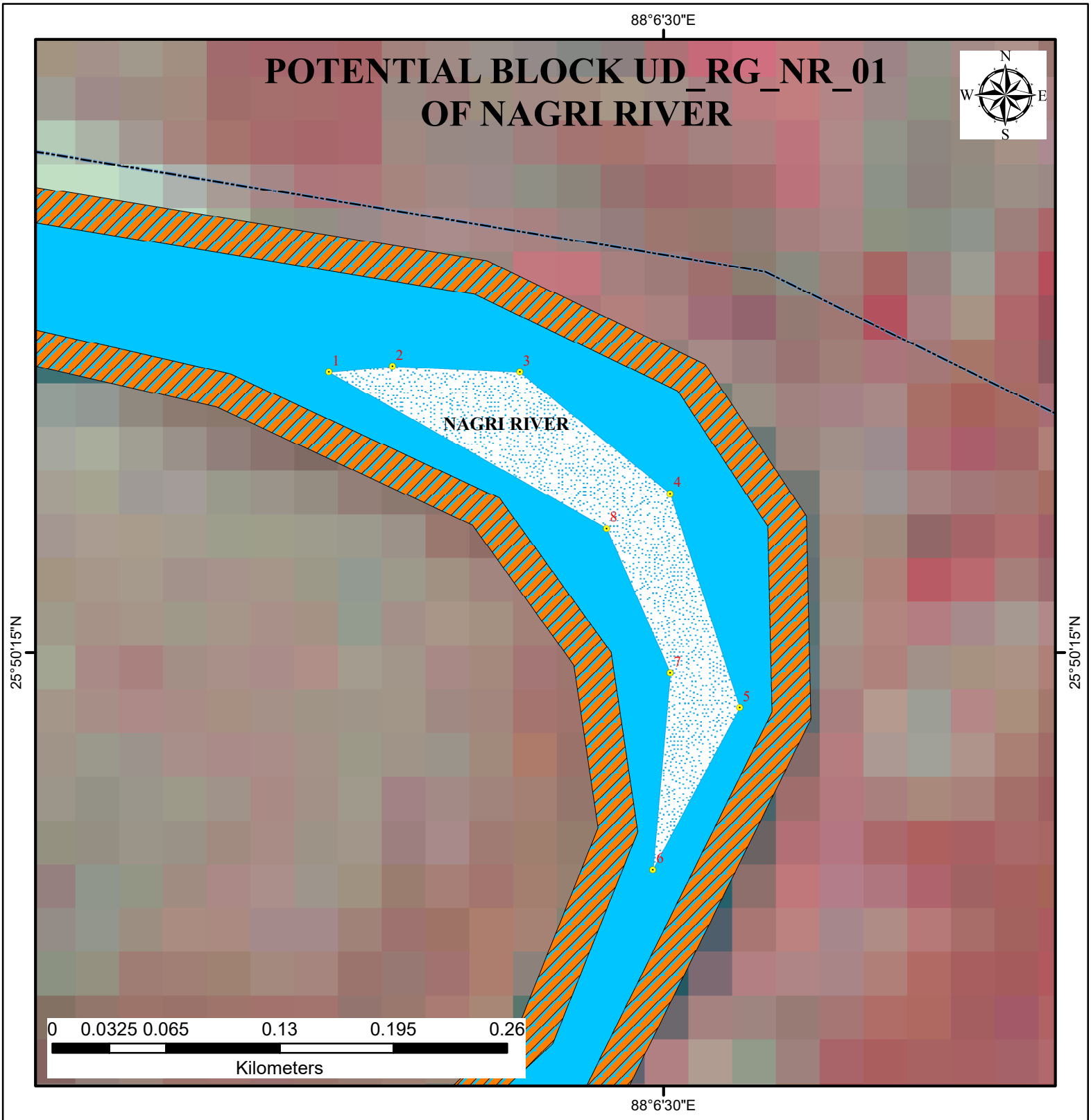
- COORDINATE
- POTENTIAL BLOCK
- SAFETY BARRIER
- RIVER
- ADMINISTRATIVE BLOCK BOUNDARY
- DISTRICT BOUNDARY



UD_KG_TG_6		
POINT NO	**LATITUDE**	**LONGITUDE**
1	25° 36' 13.020" N	88° 26' 22.181" E
2	25° 36' 12.819" N	88° 26' 21.609" E
3	25° 36' 12.826" N	88° 26' 20.870" E
4	25° 36' 13.038" N	88° 26' 20.303" E
5	25° 36' 13.611" N	88° 26' 19.798" E
6	25° 36' 14.007" N	88° 26' 19.987" E
7	25° 36' 13.576" N	88° 26' 22.460" E

LEGEND

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

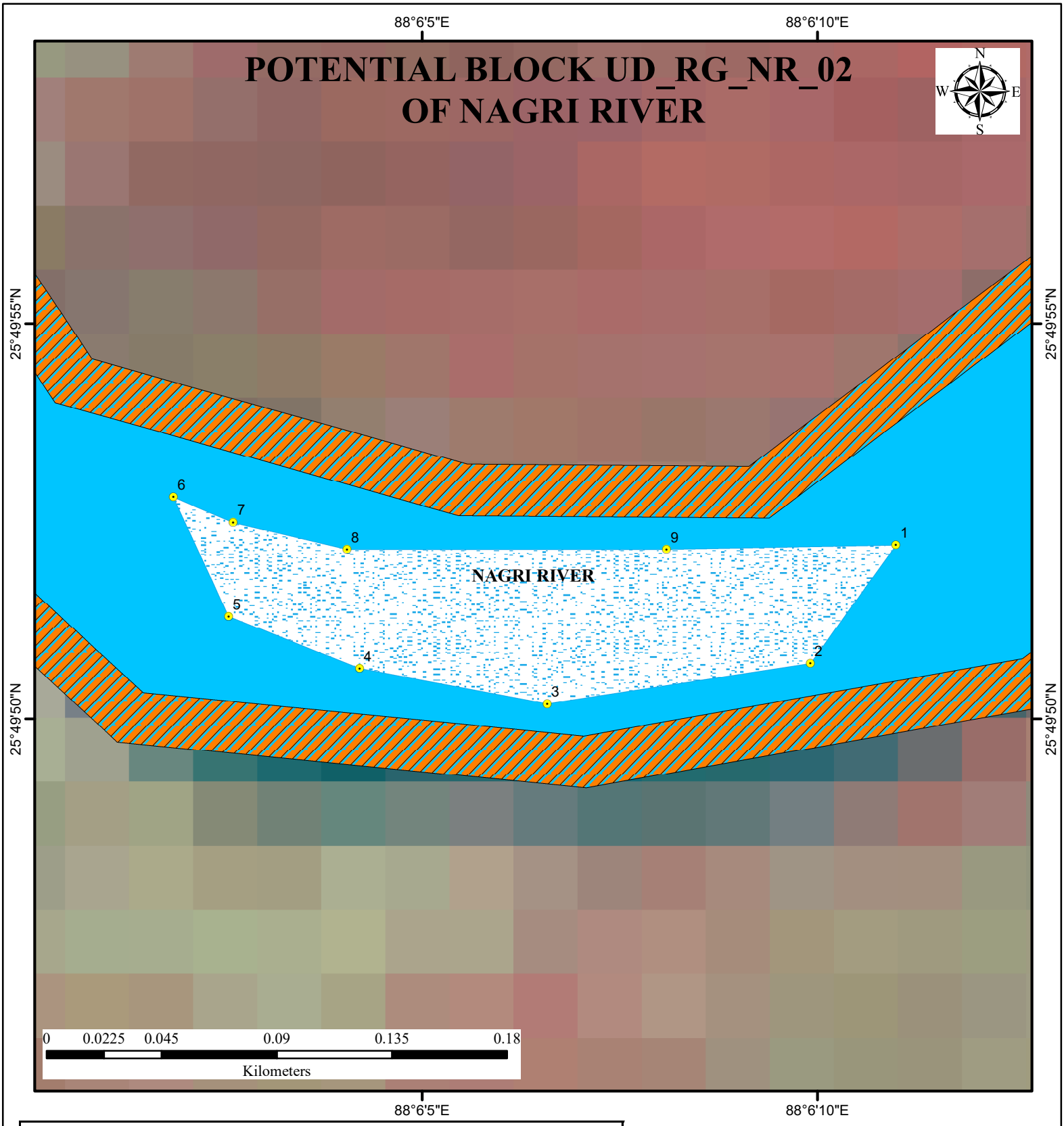


UD_RG_NR_1		
POINT NO	**LATITUDE**	**LONGITUDE**
1	25° 50' 20.190" N	88° 6' 23.807" E
2	25° 50' 20.297" N	88° 6' 24.985" E
3	25° 50' 20.190" N	88° 6' 27.341" E
4	25° 50' 17.942" N	88° 6' 30.125" E
5	25° 50' 13.980" N	88° 6' 31.410" E
6	25° 50' 10.982" N	88° 6' 29.803" E
7	25° 50' 14.622" N	88° 6' 30.125" E
8	25° 50' 17.299" N	88° 6' 28.947" E

LEGEND

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

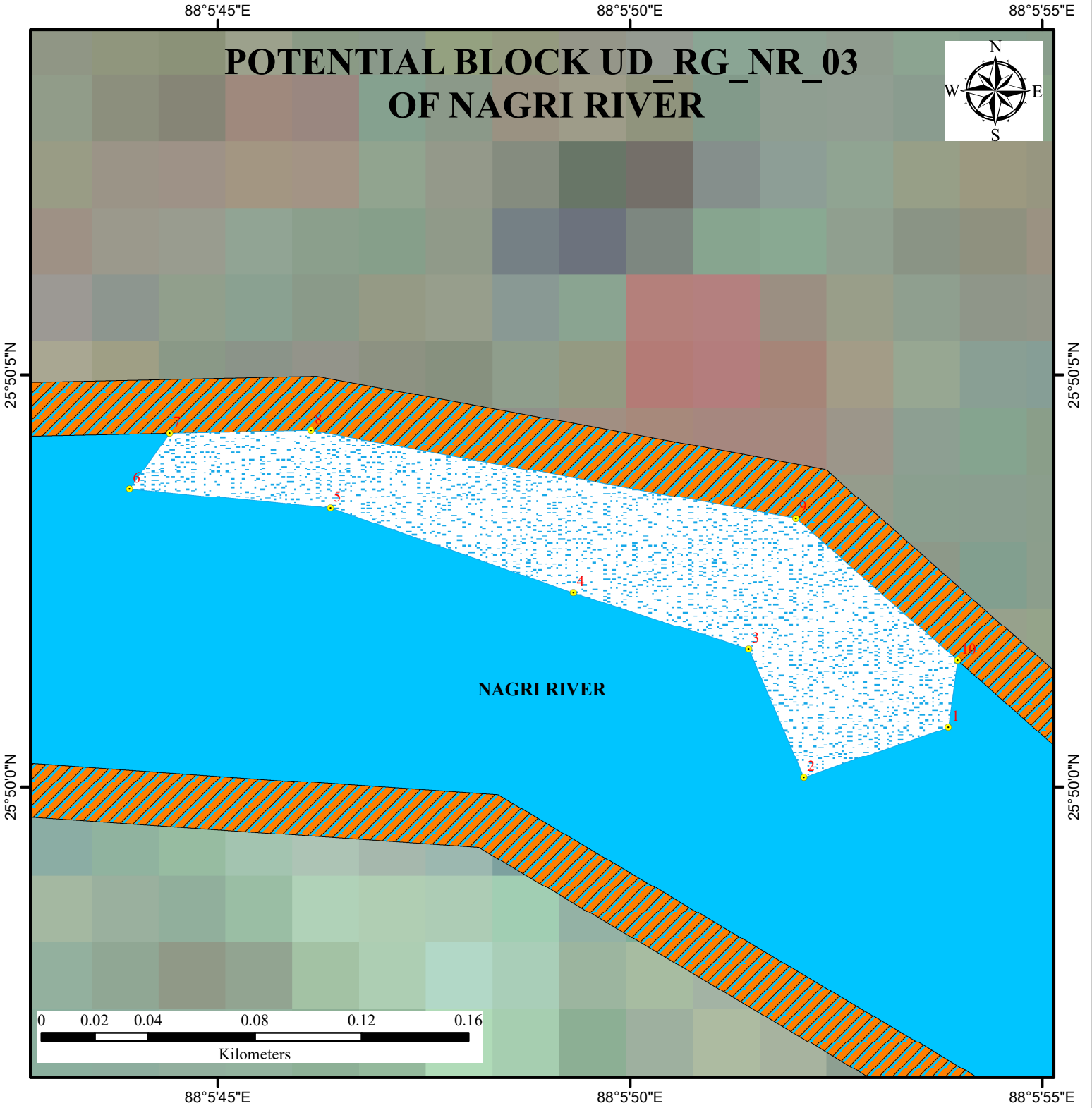
POTENTIAL BLOCK UD_RG_NR_02 OF NAGRI RIVER



UD_RG_NR_2		
POINT NO	LATITUDE	LONGITUDE
1	25° 49' 52.202" N	88° 6' 10.993" E
2	25° 49' 50.705" N	88° 6' 9.910" E
3	25° 49' 50.193" N	88° 6' 6.579" E
4	25° 49' 50.641" N	88° 6' 4.208" E
5	25° 49' 51.299" N	88° 6' 2.551" E
6	25° 49' 52.809" N	88° 6' 1.852" E
7	25° 49' 52.489" N	88° 6' 2.609" E
8	25° 49' 52.146" N	88° 6' 4.048" E
9	25° 49' 52.146" N	88° 6' 8.091" E

LEGEND

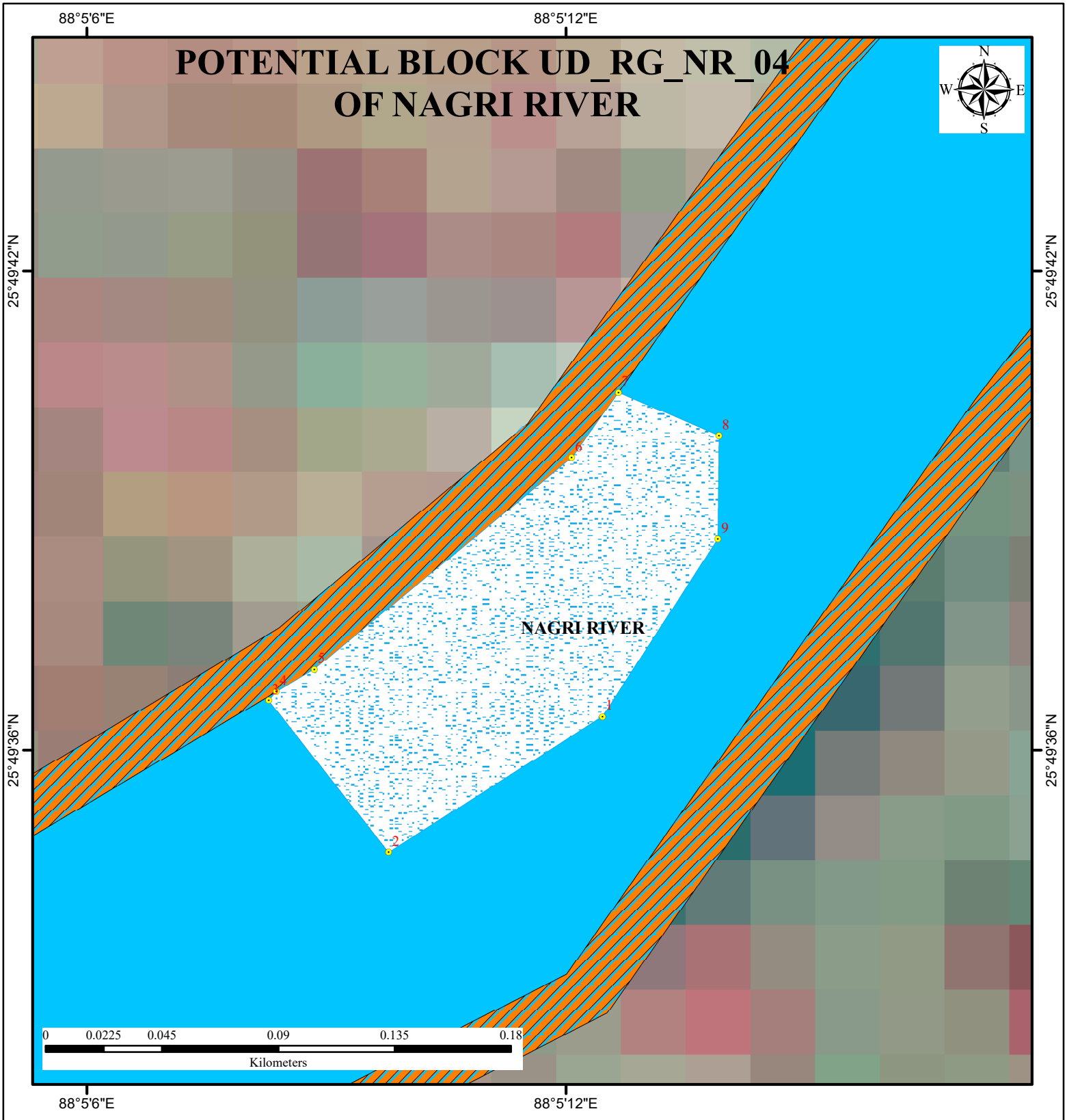
- COORDINATE
- POTENTIAL BLOCK
- SAFETY BARRIER
- RIVER
- ADMINISTRATIVE BLOCK BOUNDARY
- DISTRICT BOUNDARY



UD_RG_NR_3		
POINT NO	**LATITUDE**	**LONGITUDE**
1	25° 50' 0.724" N	88° 5' 53.862" E
2	25° 50' 0.118" N	88° 5' 52.108" E
3	25° 50' 1.672" N	88° 5' 51.438" E
4	25° 50' 2.357" N	88° 5' 49.314" E
5	25° 50' 3.385" N	88° 5' 46.367" E
6	25° 50' 3.620" N	88° 5' 43.929" E
7	25° 50' 4.295" N	88° 5' 44.417" E
8	25° 50' 4.331" N	88° 5' 46.132" E
9	25° 50' 3.261" N	88° 5' 52.013" E
10	25° 50' 1.534" N	88° 5' 53.975" E

LEGEND

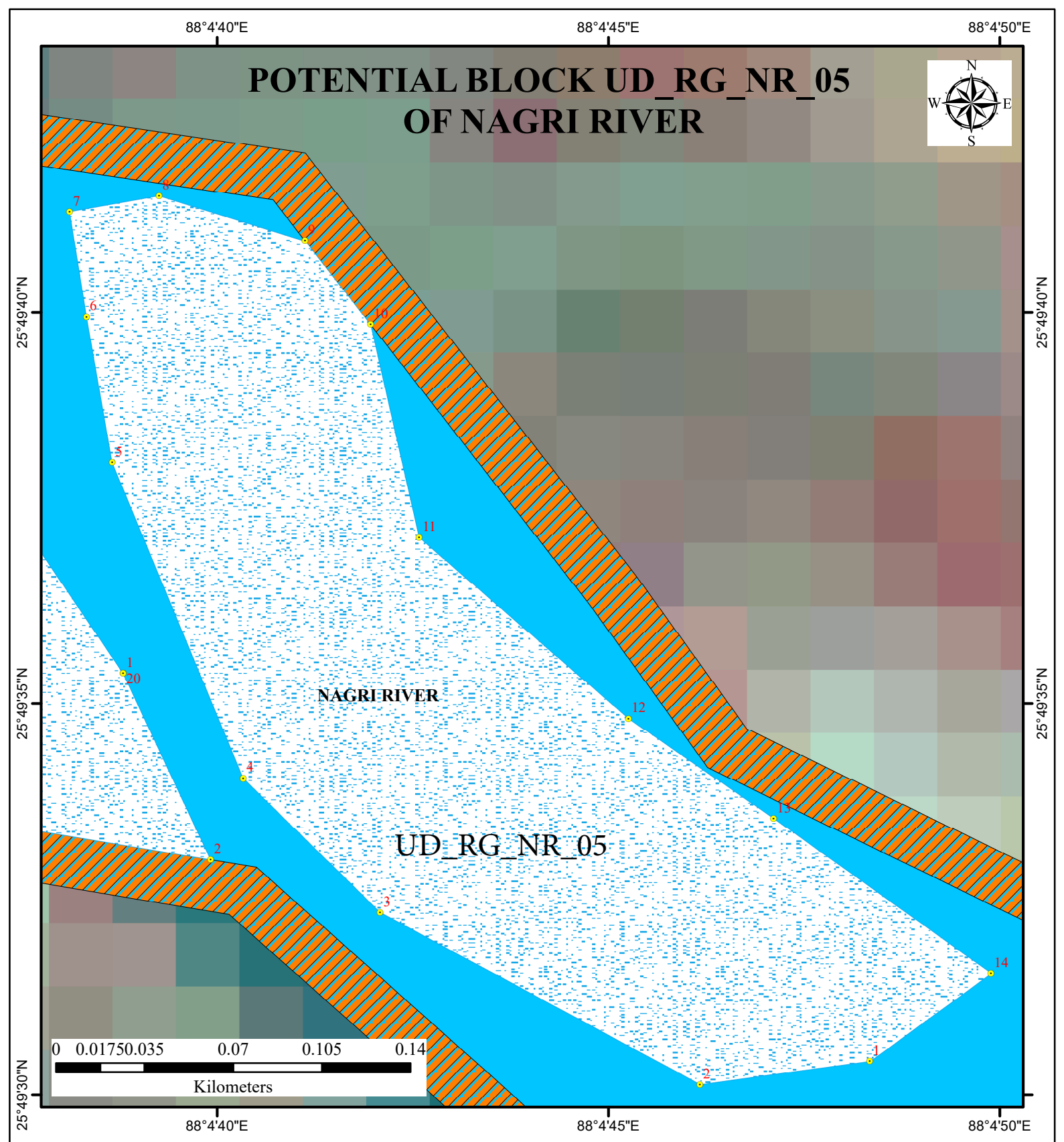
- COORDINATE
- POTENTIAL BLOCK
- SAFETY BARRIER
- RIVER
- ADMINISTRATIVE BLOCK BOUNDARY
- DISTRICT BOUNDARY



UD_RG_NR_4		
POINT NO	LATITUDE	LONGITUDE
1	25° 49' 36.423" N	88° 5' 12.457" E
2	25° 49' 34.723" N	88° 5' 9.780" E
3	25° 49' 36.626" N	88° 5' 8.277" E
4	25° 49' 36.732" N	88° 5' 8.371" E
5	25° 49' 37.014" N	88° 5' 8.848" E
6	25° 49' 39.663" N	88° 5' 12.071" E
7	25° 49' 40.481" N	88° 5' 12.656" E
8	25° 49' 39.938" N	88° 5' 13.914" E
9	25° 49' 38.648" N	88° 5' 13.902" E

LEGEND

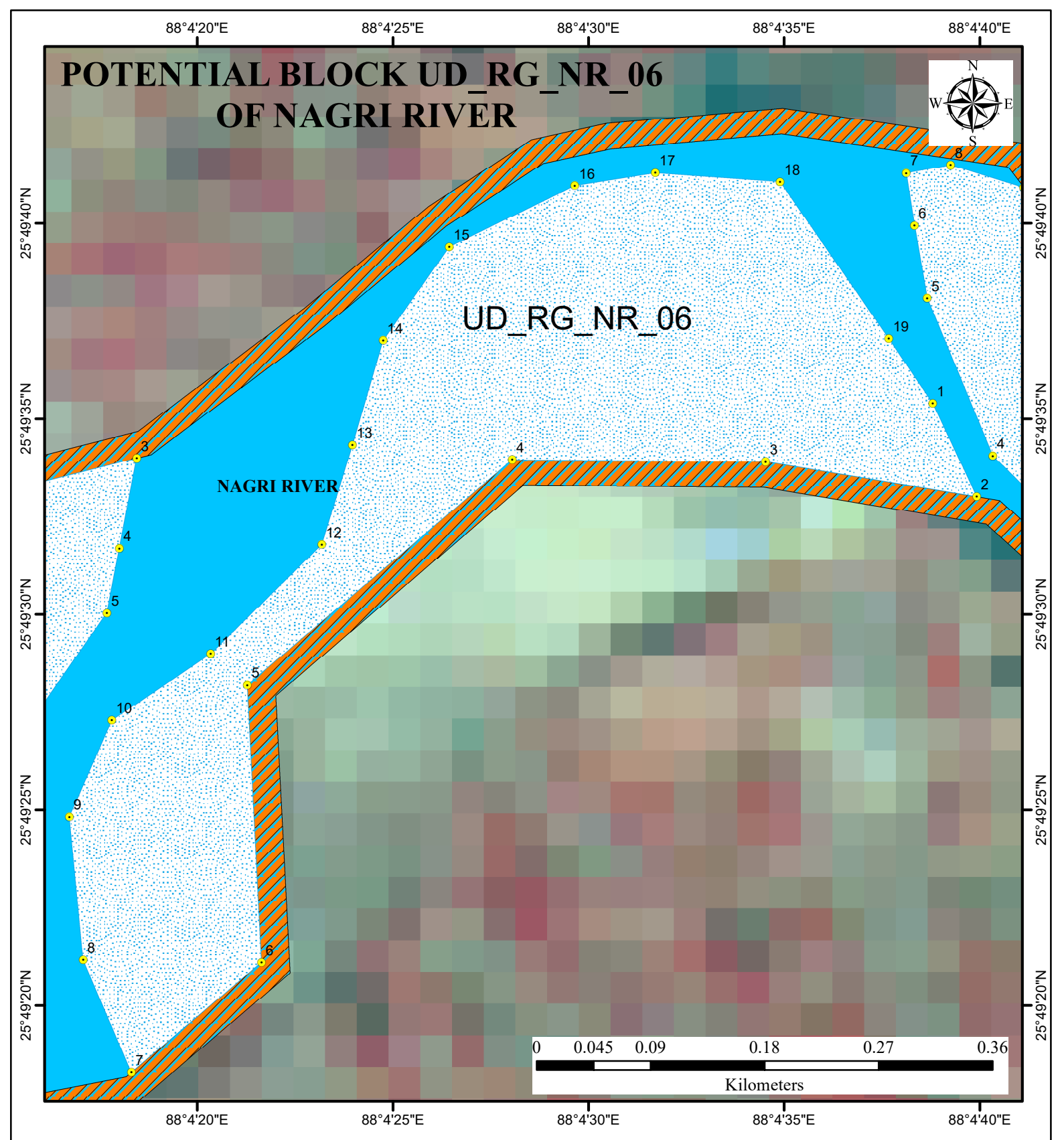
- COORDINATE
- POTENTIAL BLOCK
- SAFETY BARRIER
- RIVER
- ADMINISTRATIVE BLOCK BOUNDARY
- DISTRICT BOUNDARY



UD_RG_NR_5					
POINT_NO	LATITUDE	LONGITUDE	POINT_NO	LATITUDE	LONGITUDE
1	25° 49' 30.427" N	88° 4' 48.338" E	8	25° 49' 41.485" N	88° 4' 39.258" E
2	25° 49' 30.133" N	88° 4' 46.169" E	9	25° 49' 40.915" N	88° 4' 41.122" E
3	25° 49' 32.331" N	88° 4' 42.083" E	10	25° 49' 39.842" N	88° 4' 41.961" E
4	25° 49' 34.047" N	88° 4' 40.331" E	11	25° 49' 37.121" N	88° 4' 42.583" E
5	25° 49' 38.084" N	88° 4' 38.658" E	12	25° 49' 34.809" N	88° 4' 45.255" E
6	25° 49' 39.944" N	88° 4' 38.332" E	13	25° 49' 33.532" N	88° 4' 47.112" E
7	25° 49' 41.287" N	88° 4' 38.116" E	14	25° 49' 31.550" N	88° 4' 49.887" E

LEGEND

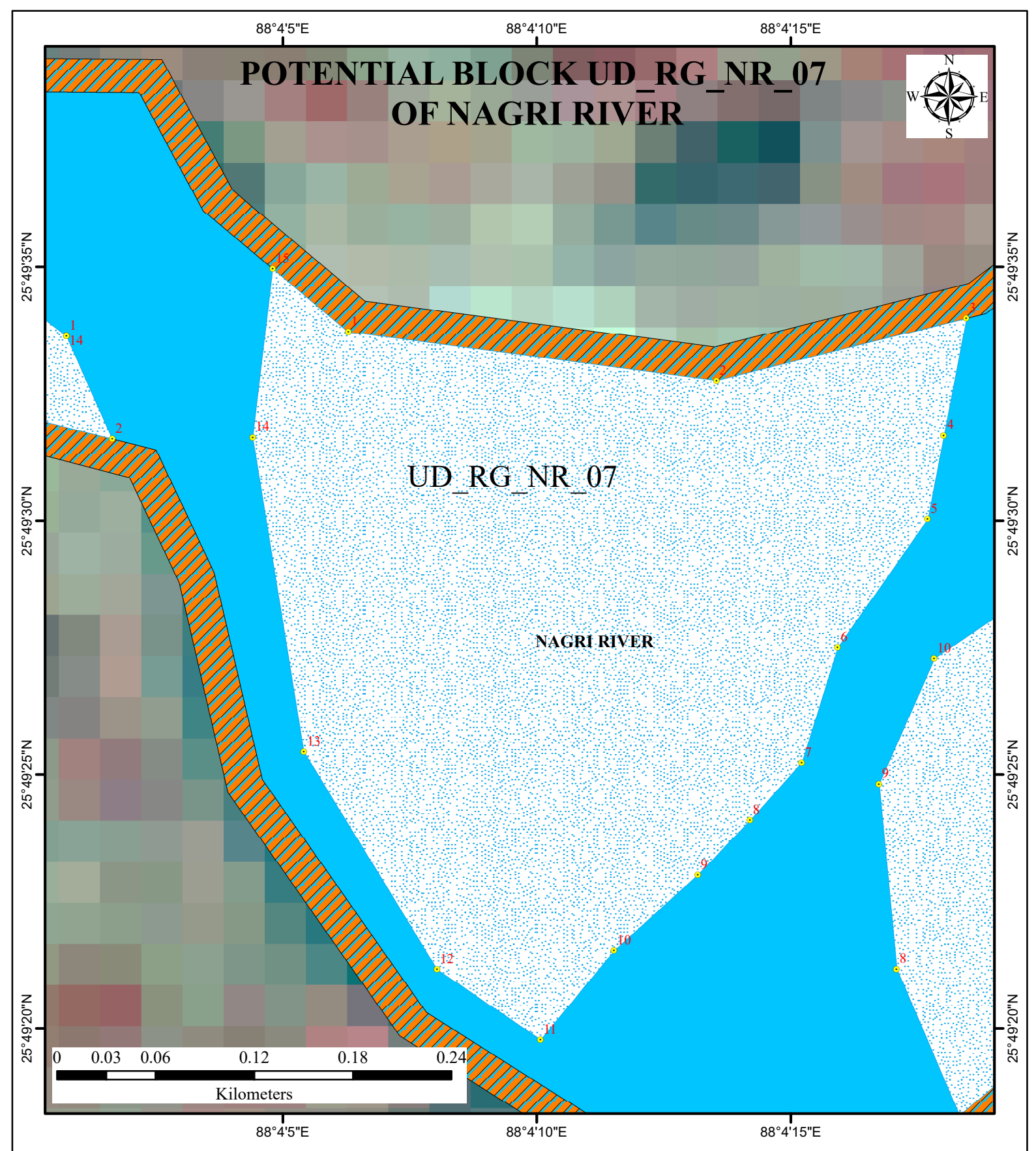
- COORDINATE
- POTENTIAL BLOCK
- SAFETY BARRIER
- RIVER
- ADMINISTRATIVE BLOCK BOUNDARY
- DISTRICT BOUNDARY



UD_RG_NR_6					
POINT NO	LATITUDE	LONGITUDE	POINT NO	LATITUDE	LONGITUDE
1	25° 49' 35.387" N	88° 4' 38.799" E	11	25° 49' 28.987" N	88° 4' 20.345" E
2	25° 49' 33.006" N	88° 4' 39.918" E	12	25° 49' 31.787" N	88° 4' 23.183" E
3	25° 49' 33.901" N	88° 4' 34.530" E	13	25° 49' 34.327" N	88° 4' 23.966" E
4	25° 49' 33.949" N	88° 4' 28.051" E	14	25° 49' 37.004" N	88° 4' 24.750" E
5	25° 49' 28.194" N	88° 4' 21.280" E	15	25° 49' 39.400" N	88° 4' 26.444" E
6	25° 49' 21.097" N	88° 4' 21.643" E	16	25° 49' 40.959" N	88° 4' 29.651" E
7	25° 49' 18.282" N	88° 4' 18.315" E	17	25° 49' 41.287" N	88° 4' 31.707" E
8	25° 49' 21.168" N	88° 4' 17.081" E	18	25° 49' 41.057" N	88° 4' 34.898" E
9	25° 49' 24.817" N	88° 4' 16.734" E	19	25° 49' 37.046" N	88° 4' 37.674" E
10	25° 49' 27.286" N	88° 4' 17.821" E			

LEGEND

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

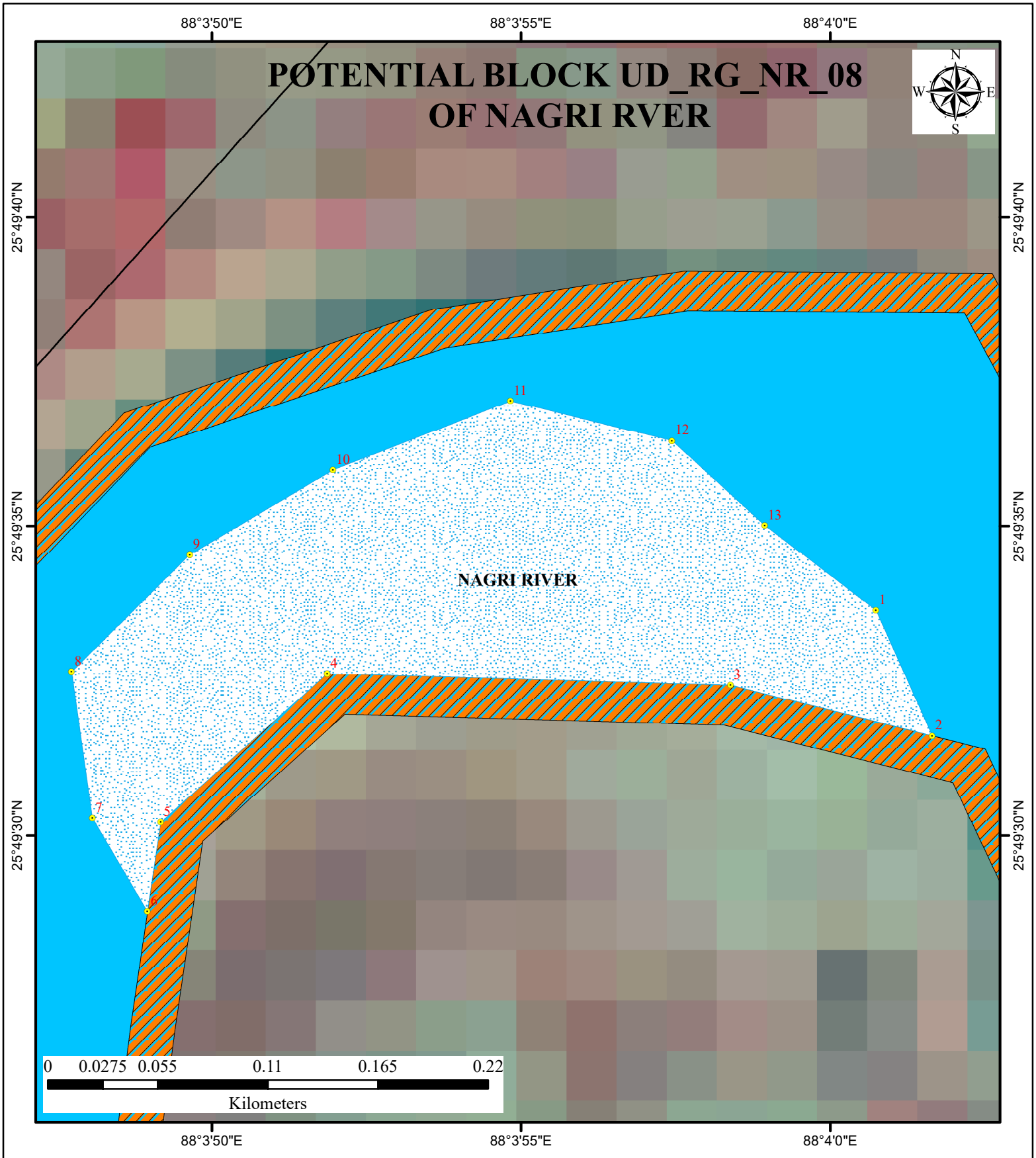


UD_RG_NR_7					
POINT NO	LATITUDE	LONGITUDE	POINT NO	LATITUDE	LONGITUDE
1	25° 49' 33.719" N	88° 4' 6.287" E	9	25° 49' 23.022" N	88° 4' 13.167" E
2	25° 49' 32.759" N	88° 4' 13.538" E	10	25° 49' 21.531" N	88° 4' 11.522" E
3	25° 49' 33.992" N	88° 4' 18.455" E	11	25° 49' 19.770" N	88° 4' 10.075" E
4	25° 49' 31.683" N	88° 4' 18.012" E	12	25° 49' 21.161" N	88° 4' 8.035" E
5	25° 49' 30.034" N	88° 4' 17.693" E	13	25° 49' 25.446" N	88° 4' 5.413" E
6	25° 49' 27.502" N	88° 4' 15.922" E	14	25° 49' 31.646" N	88° 4' 4.404" E
7	25° 49' 25.236" N	88° 4' 15.217" E	15	25° 49' 34.963" N	88° 4' 4.799" E
8	25° 49' 24.101" N	88° 4' 14.195" E			

LEGEND

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

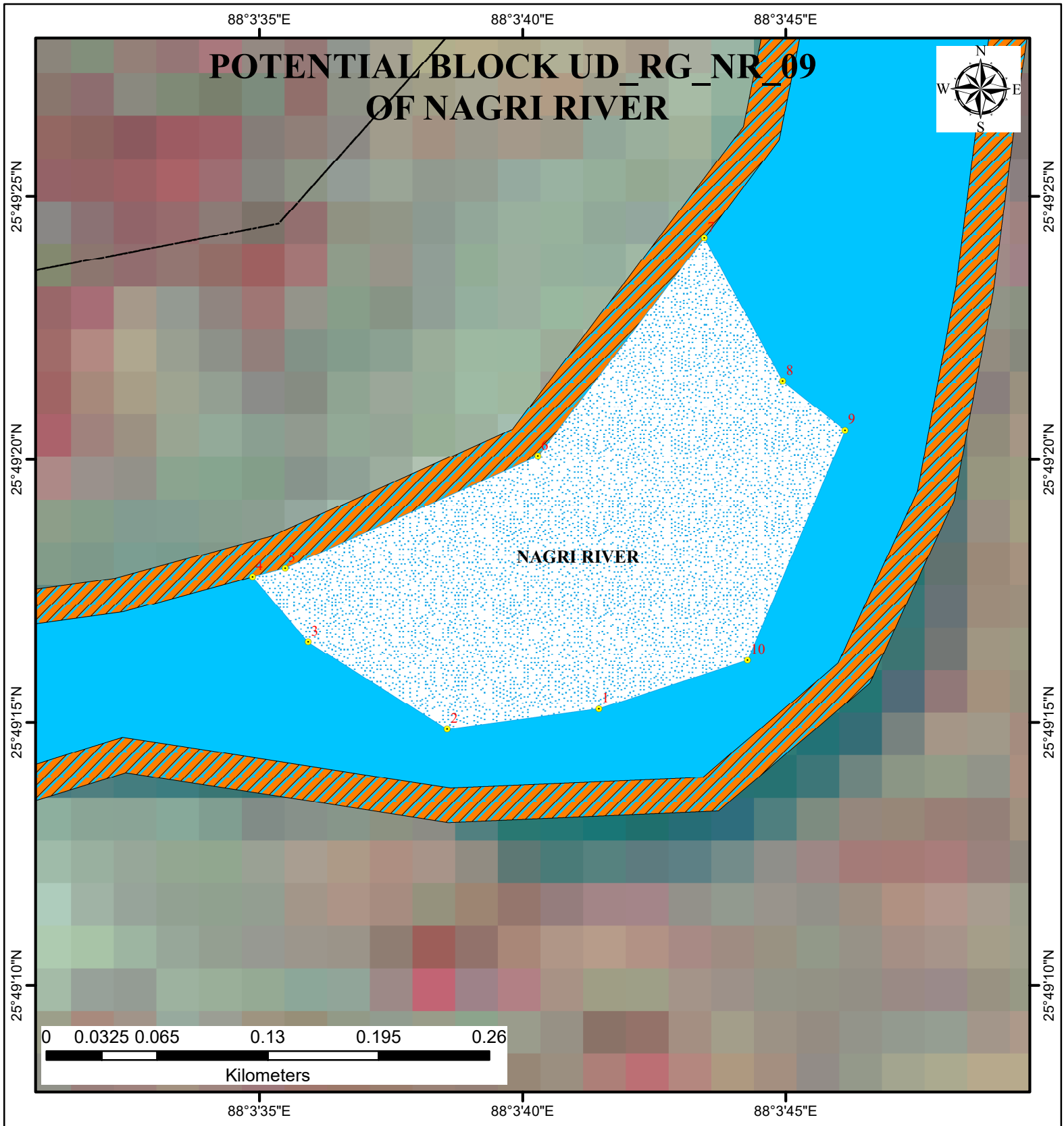
POTENTIAL BLOCK UD_RG_NR_08 OF NAGRI RVER



UD_RG_NR_8					
POINT NO	LATITUDE	LONGITUDE	POINT NO	LATITUDE	LONGITUDE
1	25° 49' 33.644" N	88° 4' 0.737" E	8	25° 49' 32.650" N	88° 3' 47.731" E
2	25° 49' 31.616" N	88° 4' 1.644" E	9	25° 49' 34.543" N	88° 3' 49.644" E
3	25° 49' 32.435" N	88° 3' 58.388" E	10	25° 49' 35.914" N	88° 3' 51.957" E
4	25° 49' 32.620" N	88° 3' 51.867" E	11	25° 49' 37.027" N	88° 3' 54.827" E
5	25° 49' 30.221" N	88° 3' 49.173" E	12	25° 49' 36.385" N	88° 3' 57.440" E
6	25° 49' 28.772" N	88° 3' 48.960" E	13	25° 49' 35.014" N	88° 3' 58.939" E
7	25° 49' 30.282" N	88° 3' 48.067" E			

LEGEND

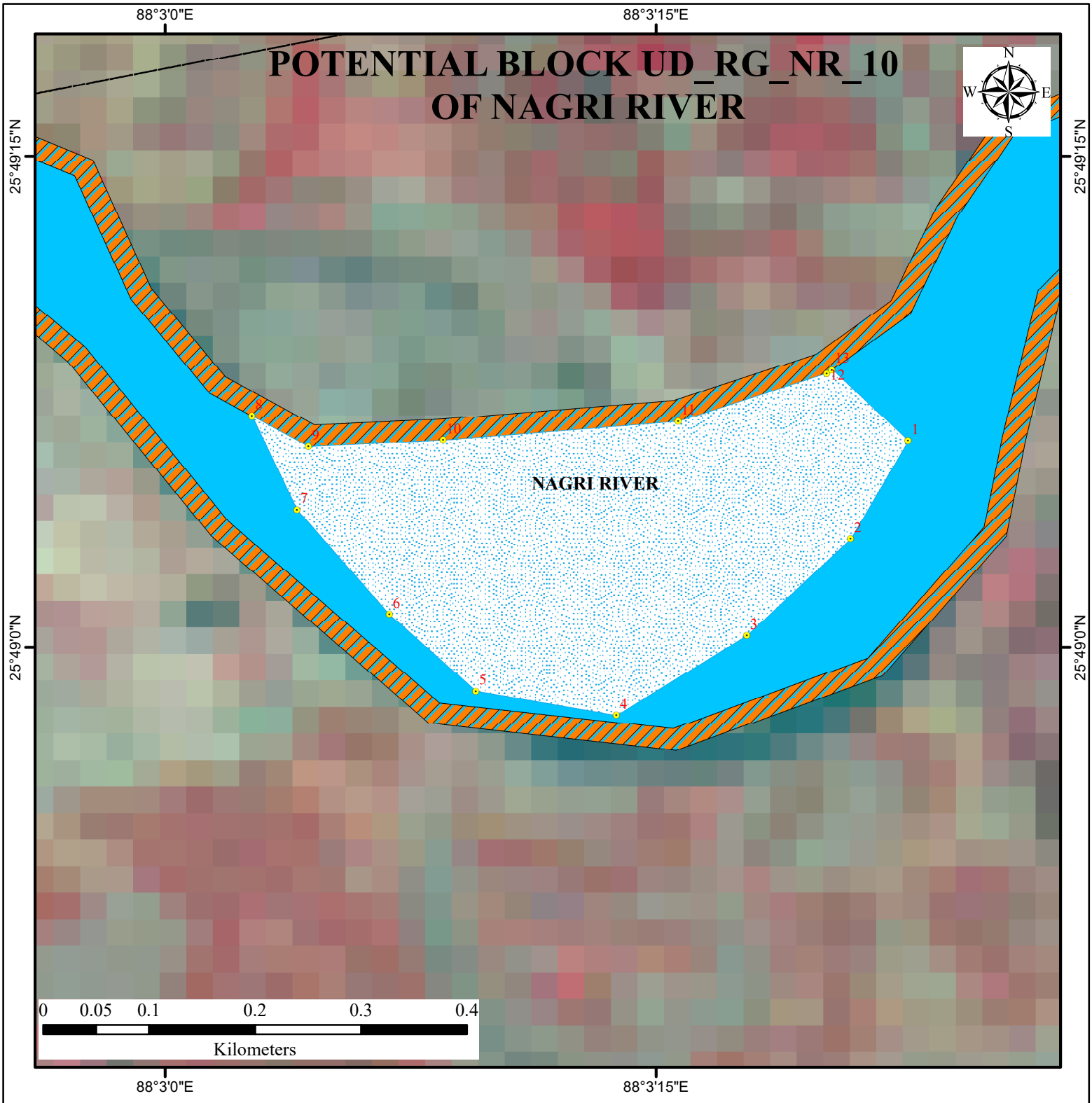
- COORDINATE
- POTENTIAL BLOCK
- SAFETY BARRIER
- RIVER
- ADMINISTRATIVE BLOCK BOUNDARY
- DISTRICT BOUNDARY



UD_RG_NR_9		
POINT NO	**LATITUDE**	**LONGITUDE**
1	25° 49' 15.261" N	88° 3' 41.447" E
2	25° 49' 14.871" N	88° 3' 38.569" E
3	25° 49' 16.524" N	88° 3' 35.923" E
4	25° 49' 17.765" N	88° 3' 34.867" E
5	25° 49' 17.933" N	88° 3' 35.488" E
6	25° 49' 20.062" N	88° 3' 40.289" E
7	25° 49' 24.208" N	88° 3' 43.452" E
8	25° 49' 21.480" N	88° 3' 44.942" E
9	25° 49' 20.555" N	88° 3' 46.124" E
10	25° 49' 16.186" N	88° 3' 44.273" E

LEGEND

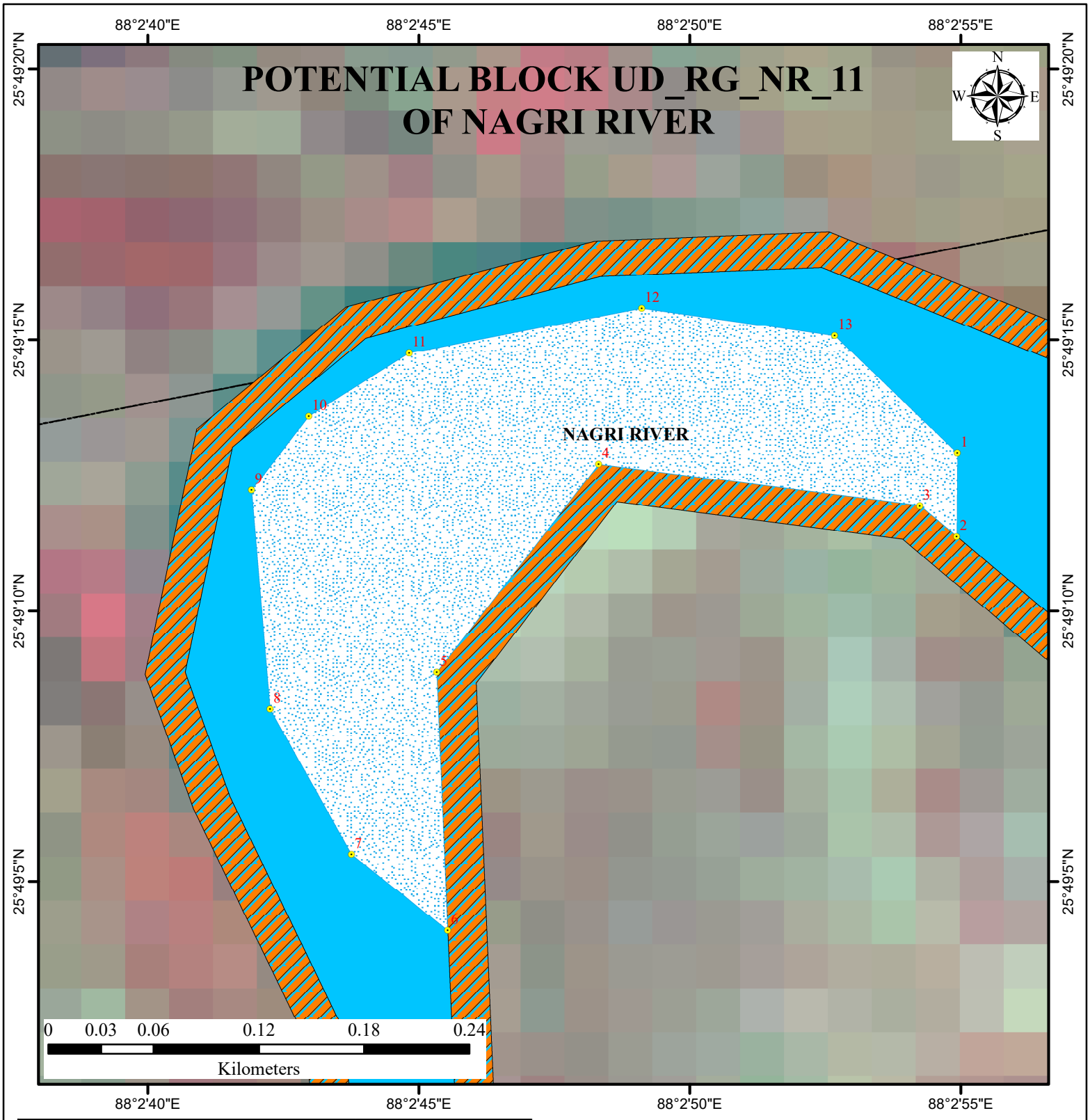
- COORDINATE
- POTENTIAL BLOCK
- SAFETY BARRIER
- RIVER
- ADMINISTRATIVE BLOCK BOUNDARY
- DISTRICT BOUNDARY



UD_RG_NR_10					
POINT NO	LATITUDE	LONGITUDE	POINT NO	LATITUDE	LONGITUDE
1	25° 49' 6.314" N	88° 3' 22.696" E	8	25° 49' 7.062" N	88° 3' 2.653" E
2	25° 49' 3.316" N	88° 3' 20.940" E	9	25° 49' 6.133" N	88° 3' 4.382" E
3	25° 49' 0.360" N	88° 3' 17.770" E	10	25° 49' 6.322" N	88° 3' 8.490" E
4	25° 48' 57.919" N	88° 3' 13.787" E	11	25° 49' 6.898" N	88° 3' 15.671" E
5	25° 48' 58.656" N	88° 3' 9.491" E	12	25° 49' 8.375" N	88° 3' 20.213" E
6	25° 49' 0.997" N	88° 3' 6.852" E	13	25° 49' 8.483" N	88° 3' 20.364" E
7	25° 49' 4.200" N	88° 3' 4.029" E			

LEGEND

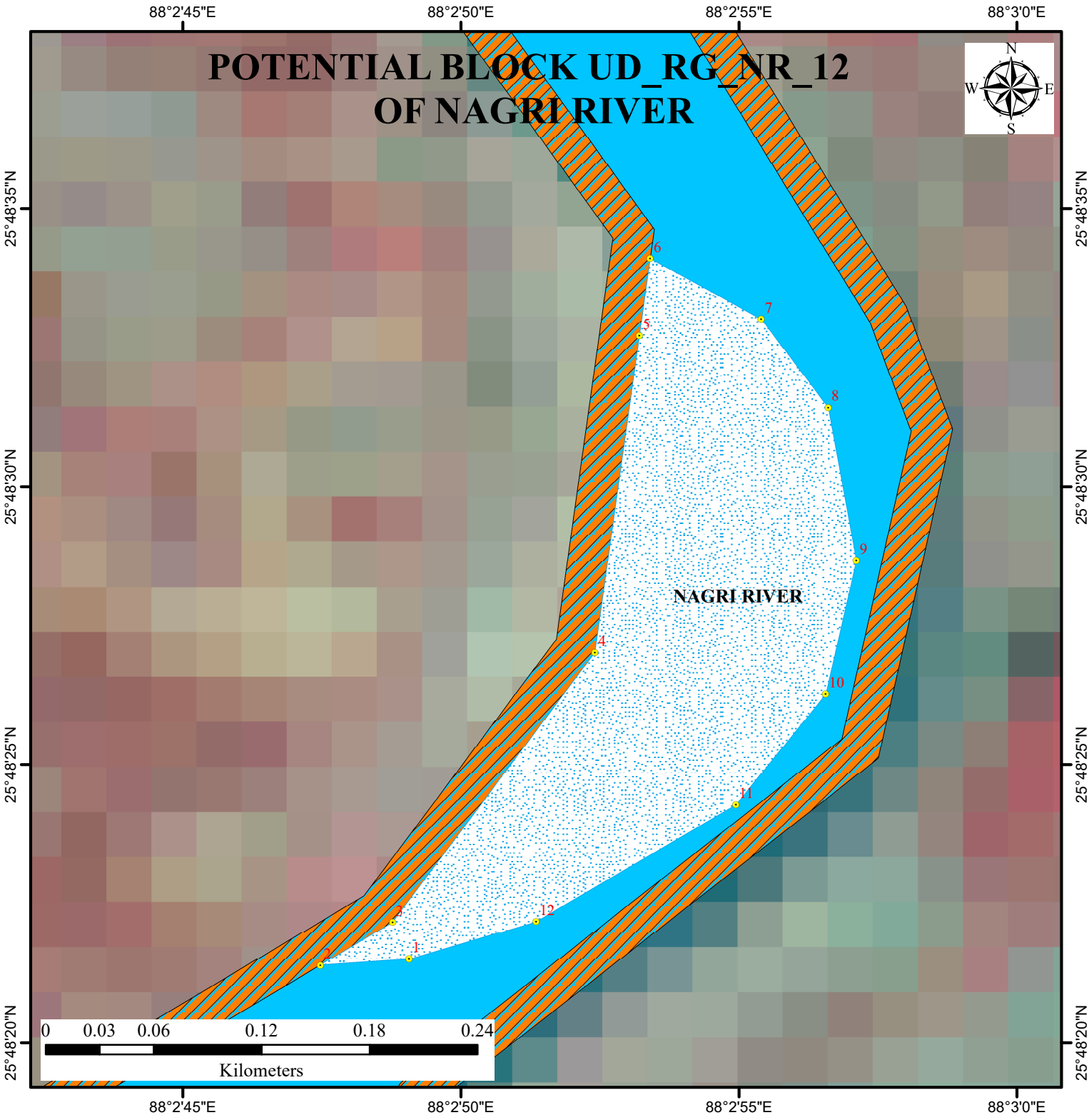
- COORDINATE
- POTENTIAL BLOCK
- SAFETY BARRIER
- RIVER
- ADMINISTRATIVE BLOCK BOUNDARY
- DISTRICT BOUNDARY



UD_RG_NR_11		
POINT NO	**LATITUDE**	**LONGITUDE**
1	25° 49' 12.909" N	88° 2' 54.937" E
2	25° 49' 11.372" N	88° 2' 54.923" E
3	25° 49' 11.940" N	88° 2' 54.244" E
4	25° 49' 12.708" N	88° 2' 48.319" E
5	25° 49' 8.867" N	88° 2' 45.331" E
6	25° 49' 4.101" N	88° 2' 45.534" E
7	25° 49' 5.507" N	88° 2' 43.754" E
8	25° 49' 8.184" N	88° 2' 42.257" E
9	25° 49' 12.228" N	88° 2' 41.913" E
10	25° 49' 13.597" N	88° 2' 42.970" E
11	25° 49' 14.760" N	88° 2' 44.822" E
12	25° 49' 15.585" N	88° 2' 49.111" E
13	25° 49' 15.075" N	88° 2' 52.675" E

LEGEND

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

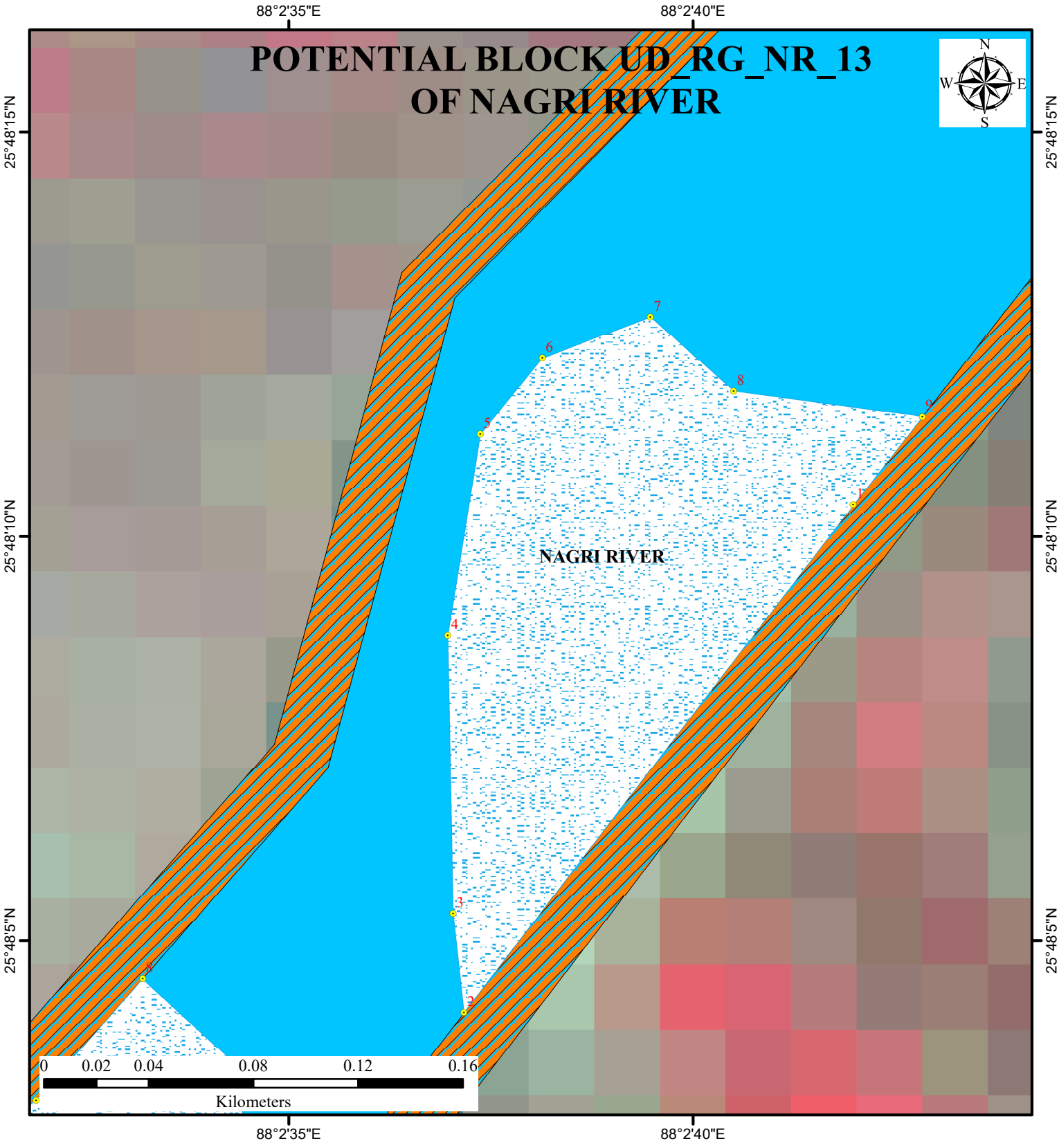


UD_RG_NR_12					
POINT_NO	LATITUDE	LONGITUDE	POINT_NO	LATITUDE	LONGITUDE
1	25° 48' 21.501" N	88° 2' 49.068" E	7	25° 48' 33.014" N	88° 2' 55.402" E
2	25° 48' 21.392" N	88° 2' 47.472" E	8	25° 48' 31.423" N	88° 2' 56.605" E
3	25° 48' 22.163" N	88° 2' 48.772" E	9	25° 48' 28.667" N	88° 2' 57.112" E
4	25° 48' 27.018" N	88° 2' 52.410" E	10	25° 48' 26.263" N	88° 2' 56.559" E
5	25° 48' 32.716" N	88° 2' 53.210" E	11	25° 48' 24.280" N	88° 2' 54.945" E
6	25° 48' 34.105" N	88° 2' 53.405" E	12	25° 48' 22.173" N	88° 2' 51.354" E

LEGEND

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

POTENTIAL BLOCK UD_RG_NR_13 OF NAGRI RIVER

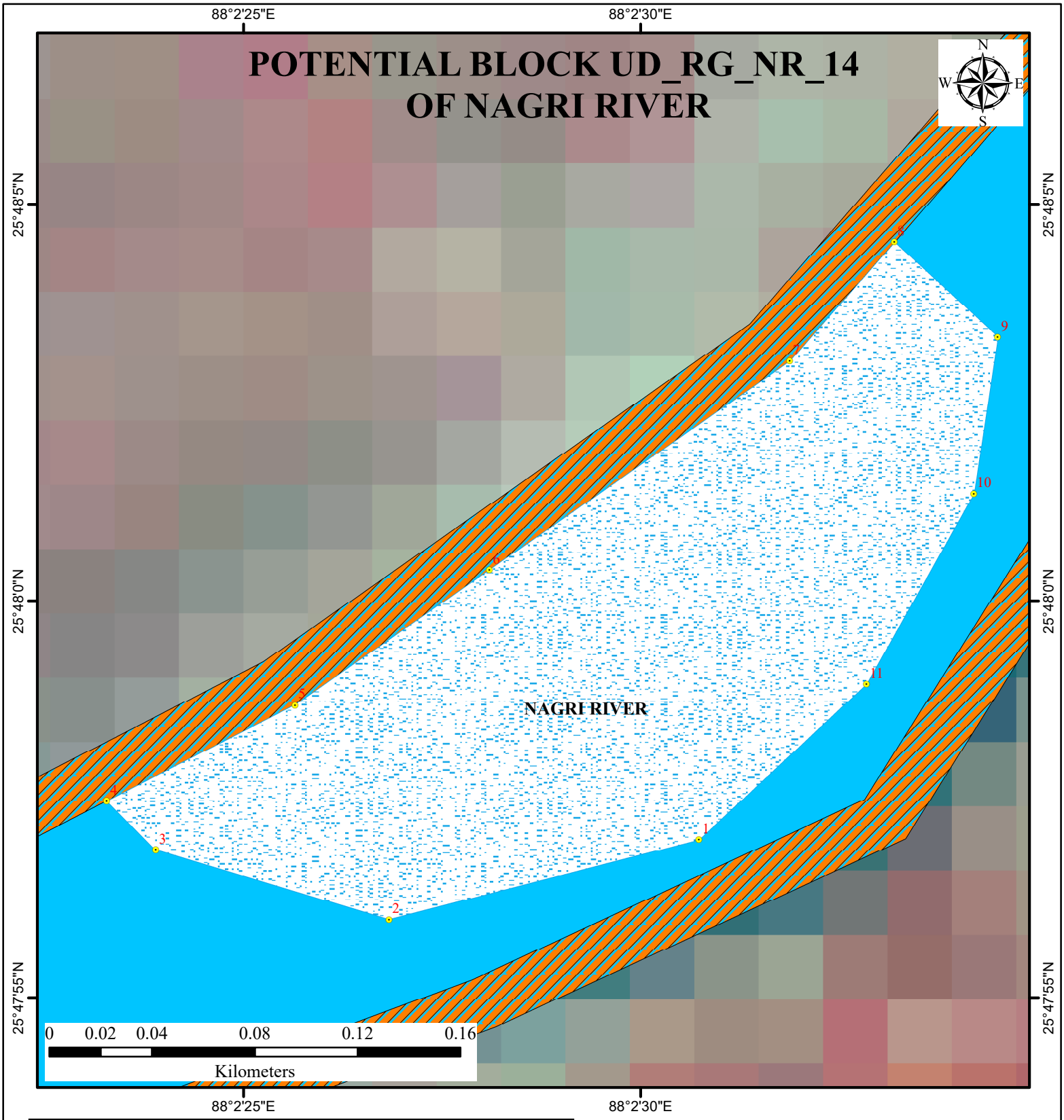


UD_RG_NR_13		
POINT NO	**LATITUDE**	**LONGITUDE**
1	25° 48' 10.388" N	88° 2' 41.977" E
2	25° 48' 4.107" N	88° 2' 37.166" E
3	25° 48' 5.333" N	88° 2' 37.031" E
4	25° 48' 8.774" N	88° 2' 36.966" E
5	25° 48' 11.265" N	88° 2' 37.368" E
6	25° 48' 12.205" N	88° 2' 38.137" E
7	25° 48' 12.712" N	88° 2' 39.471" E
8	25° 48' 11.794" N	88° 2' 40.501" E
9	25° 48' 11.481" N	88° 2' 42.831" E

LEGEND

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

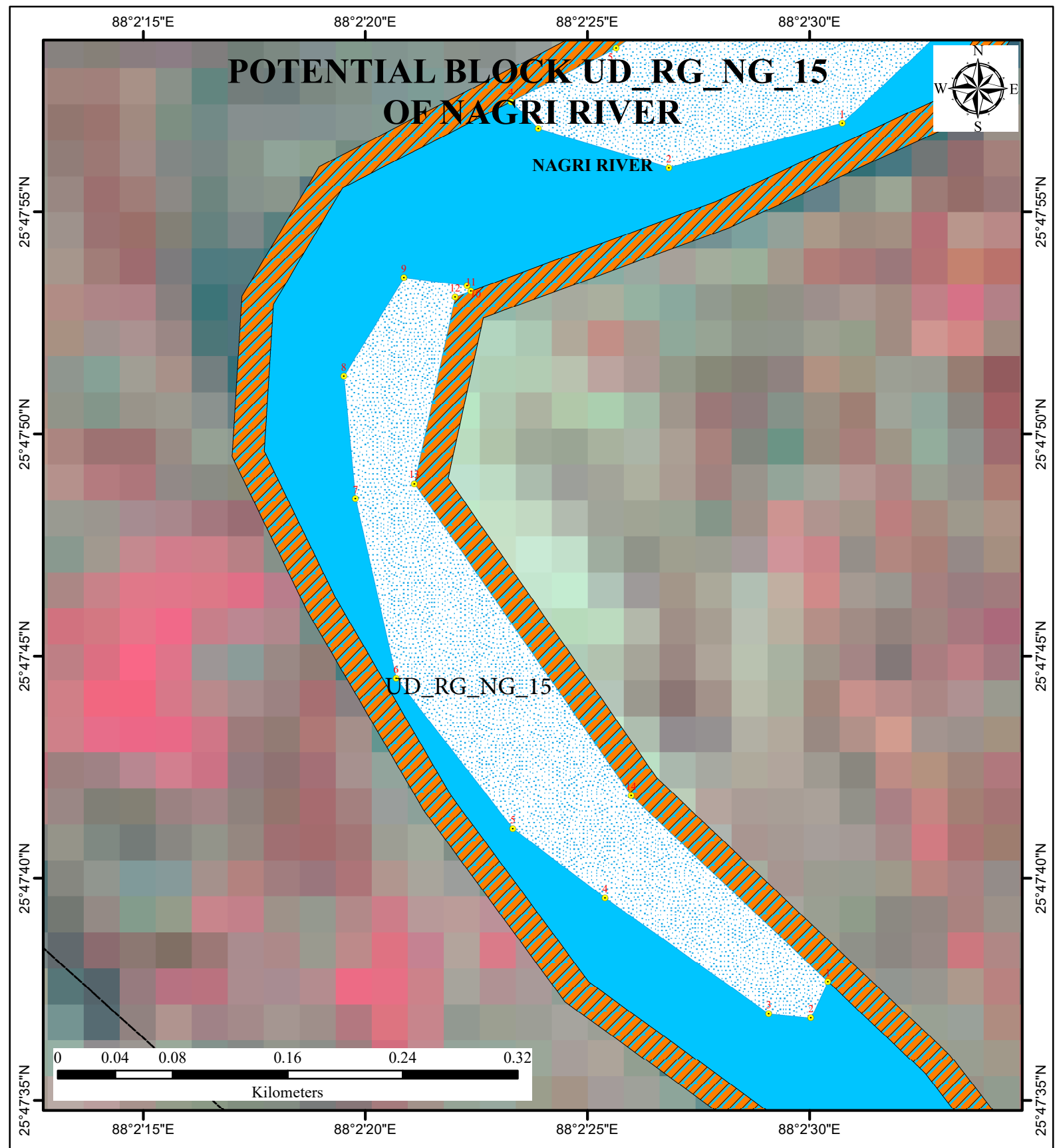
POTENTIAL BLOCK UD_RG_NR_14 OF NAGRI RIVER



UD_RG_NR_14		
POINT NO	**LATITUDE**	**LONGITUDE**
1	25° 47' 56.993" N	88° 2' 30.735" E
2	25° 47' 55.989" N	88° 2' 26.831" E
3	25° 47' 56.870" N	88° 2' 23.894" E
4	25° 47' 57.479" N	88° 2' 23.277" E
5	25° 47' 58.692" N	88° 2' 25.648" E
6	25° 48' 0.395" N	88° 2' 28.095" E
7	25° 48' 3.025" N	88° 2' 31.876" E
8	25° 48' 4.525" N	88° 2' 33.194" E
9	25° 48' 3.330" N	88° 2' 34.496" E
10	25° 48' 1.354" N	88° 2' 34.194" E
11	25° 47' 58.956" N	88° 2' 32.843" E

LEGEND

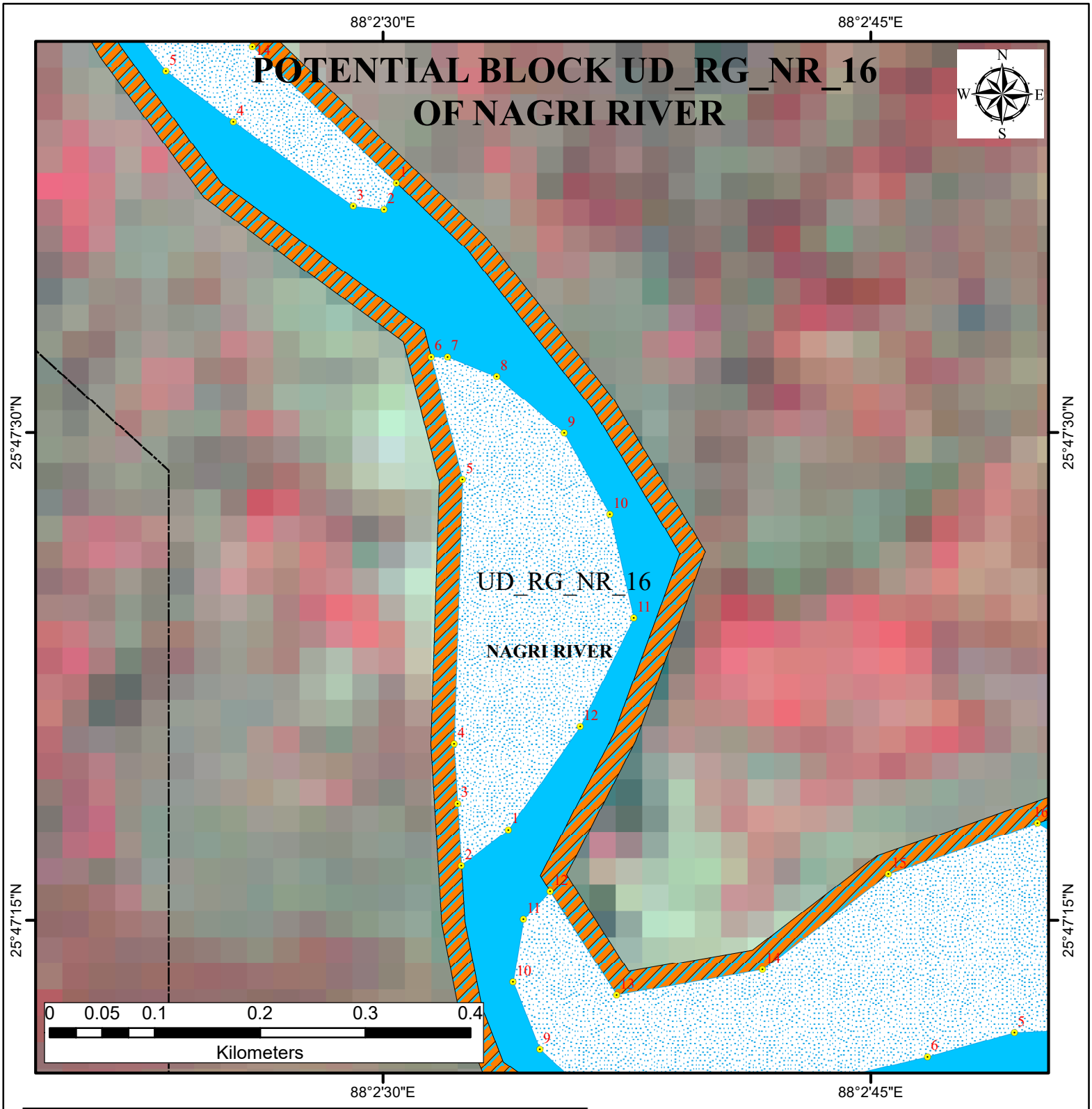
- COORDINATE
- POTENTIAL BLOCK
- SAFETY BARRIER
- RIVER
- ADMINISTRATIVE BLOCK BOUNDARY
- DISTRICT BOUNDARY



UD_RG_NR_15					
POINT NO	LATITUDE	LONGITUDE	POINT NO	LATITUDE	LONGITUDE
1	25° 47' 37.672" N	88° 2' 30.413" E	8	25° 47' 51.295" N	88° 2' 19.517" E
2	25° 47' 36.857" N	88° 2' 30.031" E	9	25° 47' 53.521" N	88° 2' 20.866" E
3	25° 47' 36.950" N	88° 2' 29.082" E	10	25° 47' 53.339" N	88° 2' 22.290" E
4	25° 47' 39.556" N	88° 2' 25.399" E	11	25° 47' 53.213" N	88° 2' 22.375" E
5	25° 47' 41.119" N	88° 2' 23.323" E	12	25° 47' 53.084" N	88° 2' 22.023" E
6	25° 47' 44.492" N	88° 2' 20.692" E	13	25° 47' 48.879" N	88° 2' 21.100" E
7	25° 47' 48.541" N	88° 2' 19.778" E	14	25° 47' 41.863" N	88° 2' 25.983" E

LEGEND

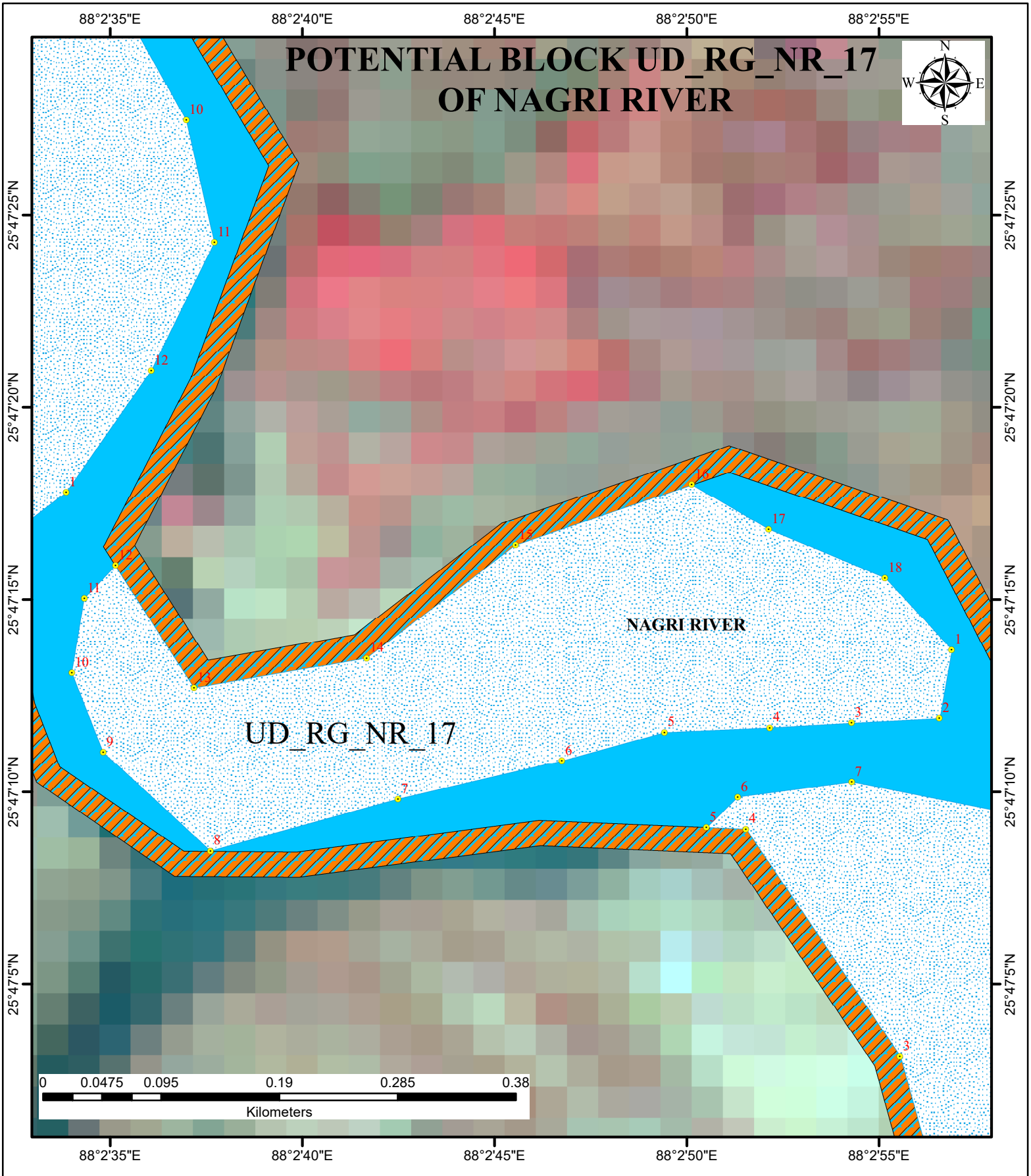
- COORDINATE
- POTENTIAL BLOCK
- SAFETY BARRIER
- RIVER
- ADMINISTRATIVE BLOCK BOUNDARY
- DISTRICT BOUNDARY



UD_RG_NR_16		
POINT NO	LATITUDE	LONGITUDE
1	25° 47' 17.780" N	88° 2' 33.854" E
2	25° 47' 16.682" N	88° 2' 32.410" E
3	25° 47' 18.593" N	88° 2' 32.295" E
4	25° 47' 20.412" N	88° 2' 32.185" E
5	25° 47' 28.551" N	88° 2' 32.448" E
6	25° 47' 32.331" N	88° 2' 31.481" E
7	25° 47' 32.328" N	88° 2' 31.986" E
8	25° 47' 31.715" N	88° 2' 33.501" E
9	25° 47' 29.980" N	88° 2' 35.576" E
10	25° 47' 27.476" N	88° 2' 36.979" E
11	25° 47' 24.289" N	88° 2' 37.711" E
12	25° 47' 20.946" N	88° 2' 36.067" E

LEGEND

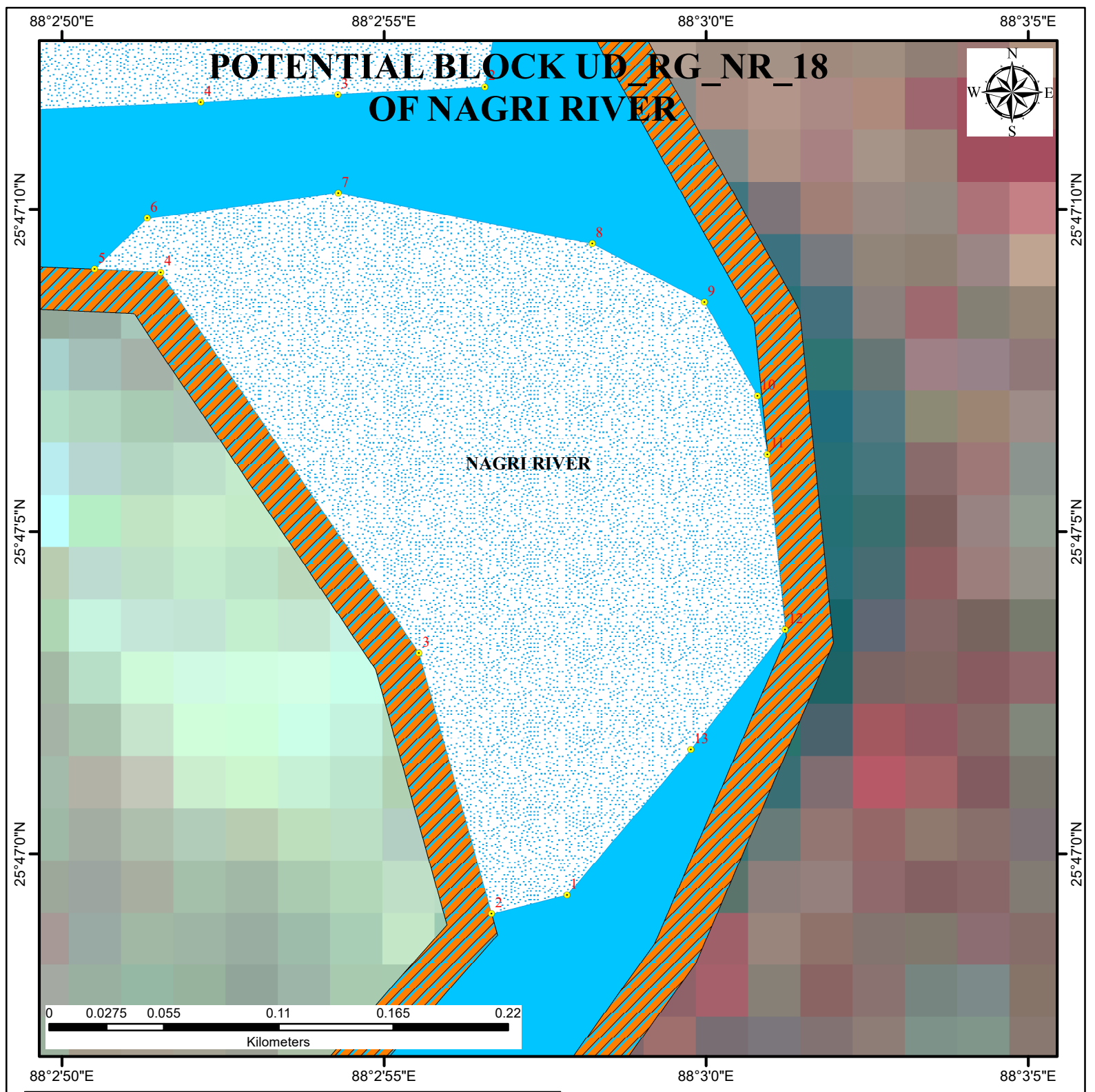
- COORDINATE
- POTENTIAL BLOCK
- SAFETY BARRIER
- RIVER
- ADMINISTRATIVE BLOCK BOUNDARY
- DISTRICT BOUNDARY



UD_RG_NR_17					
POINT NO	LATITUDE	LONGITUDE	POINT NO	LATITUDE	LONGITUDE
1	25° 47' 13.693" N	88° 2' 56.883" E	10	25° 47' 13.100" N	88° 2' 34.003" E
2	25° 47' 11.906" N	88° 2' 56.564" E	11	25° 47' 15.025" N	88° 2' 34.324" E
3	25° 47' 11.785" N	88° 2' 54.283" E	12	25° 47' 15.879" N	88° 2' 35.139" E
4	25° 47' 11.663" N	88° 2' 52.154" E	13	25° 47' 12.701" N	88° 2' 37.183" E
5	25° 47' 11.545" N	88° 2' 49.417" E	14	25° 47' 13.480" N	88° 2' 41.671" E
6	25° 47' 10.807" N	88° 2' 46.750" E	15	25° 47' 16.415" N	88° 2' 45.546" E
7	25° 47' 9.806" N	88° 2' 42.486" E	16	25° 47' 17.982" N	88° 2' 50.127" E
8	25° 47' 8.465" N	88° 2' 37.610" E	17	25° 47' 16.823" N	88° 2' 52.123" E
9	25° 47' 11.030" N	88° 2' 34.821" E	18	25° 47' 15.563" N	88° 2' 55.152" E

LEGEND

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

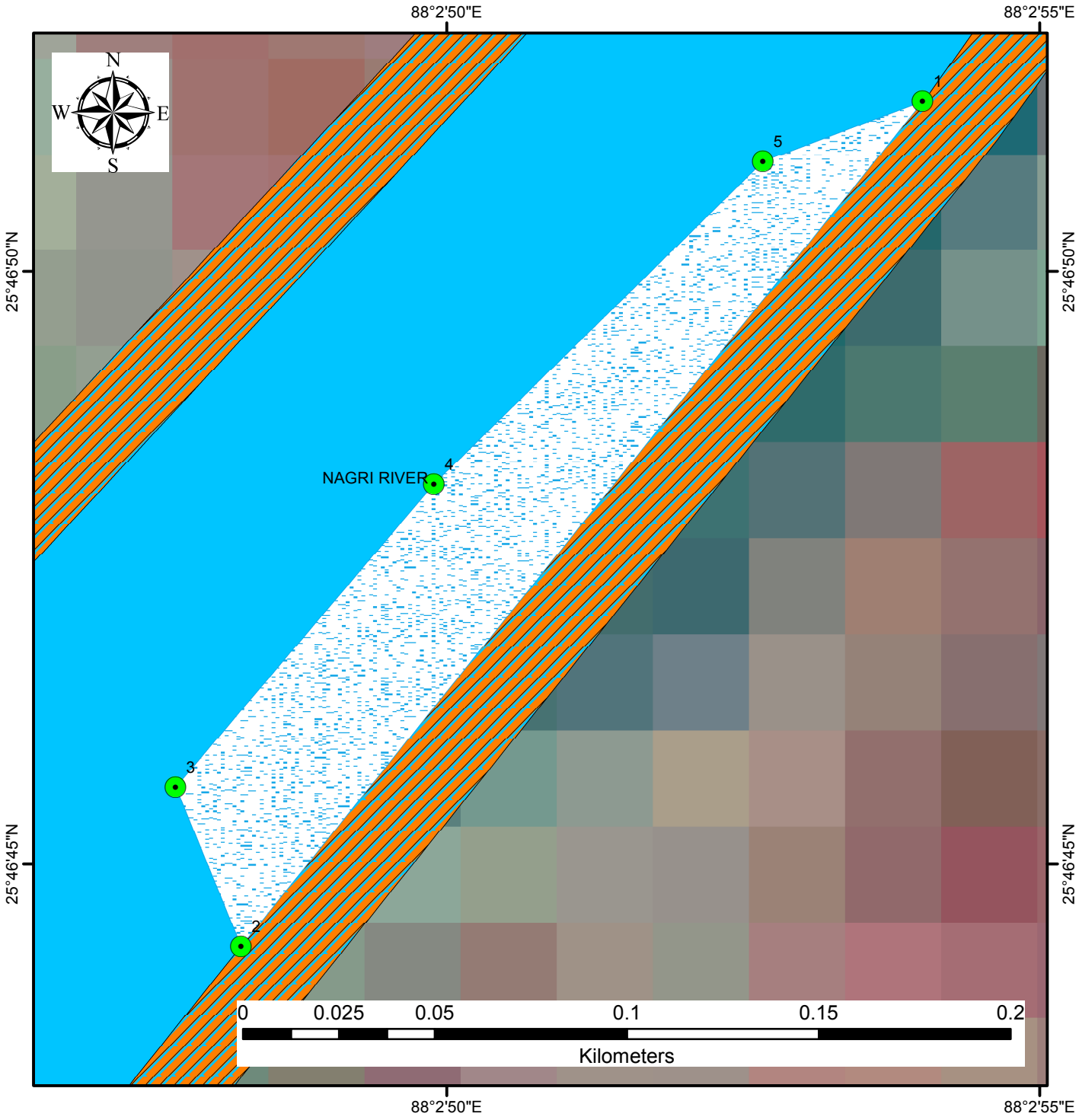


UD_RG_NR_18		
POINT NO	**LATITUDE**	**LONGITUDE**
1	25° 46' 59.358" N	88° 2' 57.840" E
2	25° 46' 59.069" N	88° 2' 56.670" E
3	25° 47' 3.118" N	88° 2' 55.541" E
4	25° 47' 9.028" N	88° 2' 51.534" E
5	25° 47' 9.071" N	88° 2' 50.507" E
6	25° 47' 9.863" N	88° 2' 51.321" E
7	25° 47' 10.254" N	88° 2' 54.288" E
8	25° 47' 9.469" N	88° 2' 58.233" E
9	25° 47' 8.562" N	88° 2' 59.973" E
10	25° 47' 7.111" N	88° 3' 0.796" E
11	25° 47' 6.202" N	88° 3' 0.949" E
12	25° 47' 3.478" N	88° 3' 1.225" E
13	25° 47' 1.614" N	88° 2' 59.760" E

LEGEND

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

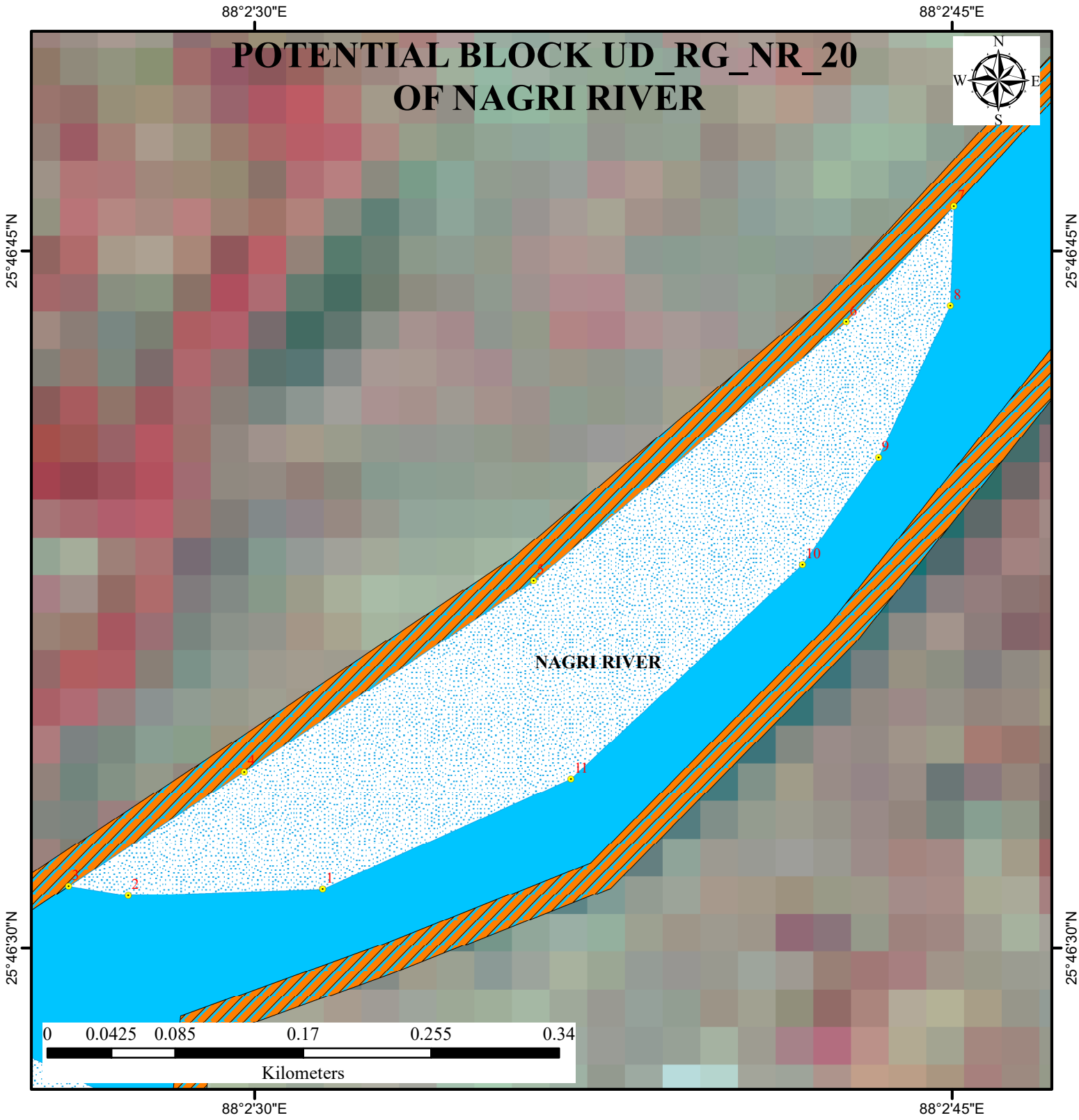
POTENTIAL BLOCK UD_RG_NR_19 OF NAGRI RIVER



UD_RG_NR_19		
POINT NO	LATITUDE	LONGITUDE
1	25° 46' 51.439" N	88° 2' 54.013" E
2	25° 46' 44.306" N	88° 2' 48.264" E
3	25° 46' 45.649" N	88° 2' 47.712" E
4	25° 46' 48.208" N	88° 2' 49.891" E
5	25° 46' 50.932" N	88° 2' 52.667" E

LEGEND

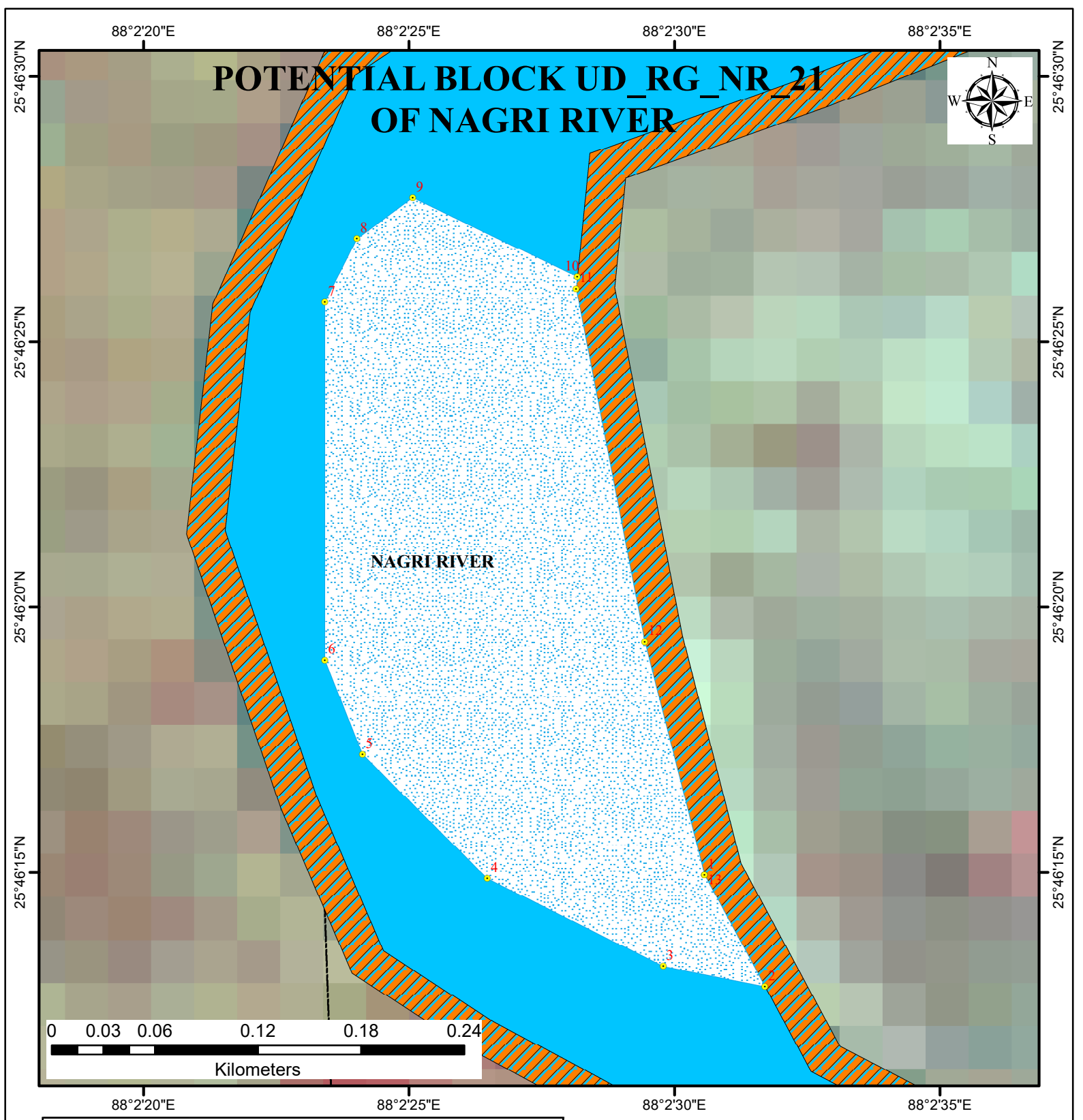
- COORDINATE
- POTENTIAL BLOCK
- SAFETY BARRIER
- RIVER
- BLOCK BOUNDARY
- DISTRICT BOUNDARY



UD_RG_NR_20		
POINT NO	**LATITUDE**	**LONGITUDE**
1	25° 46' 31.274" N	88° 2' 31.462" E
2	25° 46' 31.132" N	88° 2' 27.282" E
3	25° 46' 31.335" N	88° 2' 25.996" E
4	25° 46' 33.794" N	88° 2' 29.775" E
5	25° 46' 37.901" N	88° 2' 36.001" E
6	25° 46' 43.479" N	88° 2' 42.724" E
7	25° 46' 45.964" N	88° 2' 45.039" E
8	25° 46' 43.819" N	88° 2' 44.965" E
9	25° 46' 40.562" N	88° 2' 43.417" E
10	25° 46' 38.252" N	88° 2' 41.782" E
11	25° 46' 33.644" N	88° 2' 36.802" E

LEGEND

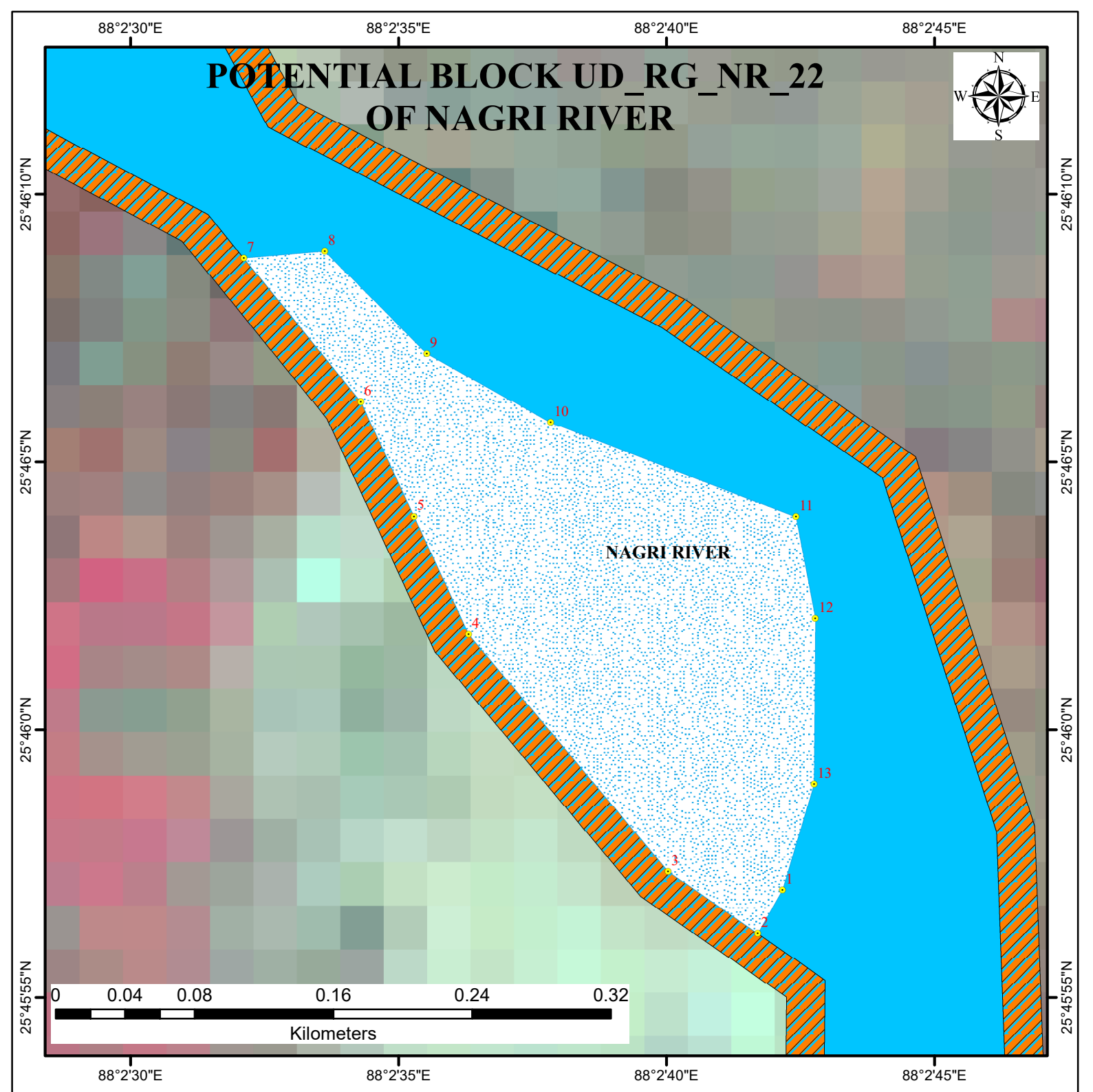
- COORDINATE
- POTENTIAL BLOCK
- SAFETY BARRIER
- RIVER
- ADMINISTRATIVE BLOCK BOUNDARY
- DISTRICT BOUNDARY



UD_RG_NR_21		
POINT NO	**LATITUDE**	**LONGITUDE**
1	25° 46' 14.951" N	88° 2' 30.563" E
2	25° 46' 12.849" N	88° 2' 31.701" E
3	25° 46' 13.225" N	88° 2' 29.785" E
4	25° 46' 14.883" N	88° 2' 26.475" E
5	25° 46' 17.222" N	88° 2' 24.121" E
6	25° 46' 19.002" N	88° 2' 23.410" E
7	25° 46' 25.748" N	88° 2' 23.410" E
8	25° 46' 26.941" N	88° 2' 24.016" E
9	25° 46' 27.707" N	88° 2' 25.067" E
10	25° 46' 26.229" N	88° 2' 28.169" E
11	25° 46' 25.996" N	88° 2' 28.145" E
12	25° 46' 19.348" N	88° 2' 29.438" E

LEGEND

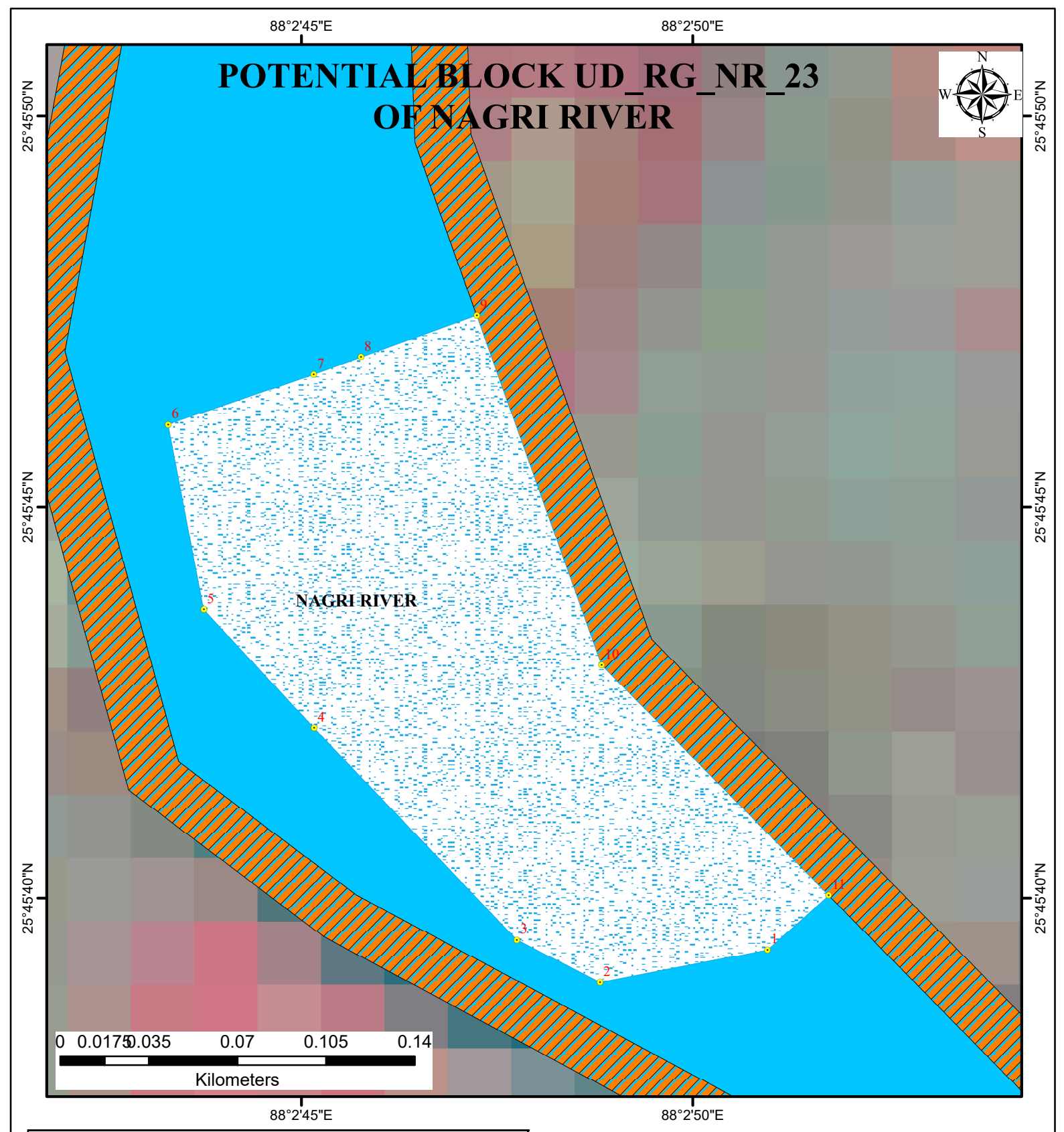
- COORDINATE
- POTENTIAL BLOCK
- SAFETY BARRIER
- RIVER
- ADMINISTRATIVE BLOCK BOUNDARY
- DISTRICT BOUNDARY



UD_RG_NR_22		
POINT NO	**LATITUDE**	**LONGITUDE**
1	25° 45' 57.011" N	88° 2' 42.162" E
2	25° 45' 56.197" N	88° 2' 41.699" E
3	25° 45' 57.352" N	88° 2' 40.026" E
4	25° 46' 1.785" N	88° 2' 36.305" E
5	25° 46' 3.987" N	88° 2' 35.285" E
6	25° 46' 6.129" N	88° 2' 34.293" E
7	25° 46' 8.811" N	88° 2' 32.108" E
8	25° 46' 8.940" N	88° 2' 33.623" E
9	25° 46' 7.022" N	88° 2' 35.524" E
10	25° 46' 5.738" N	88° 2' 37.837" E
11	25° 46' 3.975" N	88° 2' 42.413" E
12	25° 46' 2.080" N	88° 2' 42.776" E
13	25° 45' 58.985" N	88° 2' 42.749" E

LEGEND

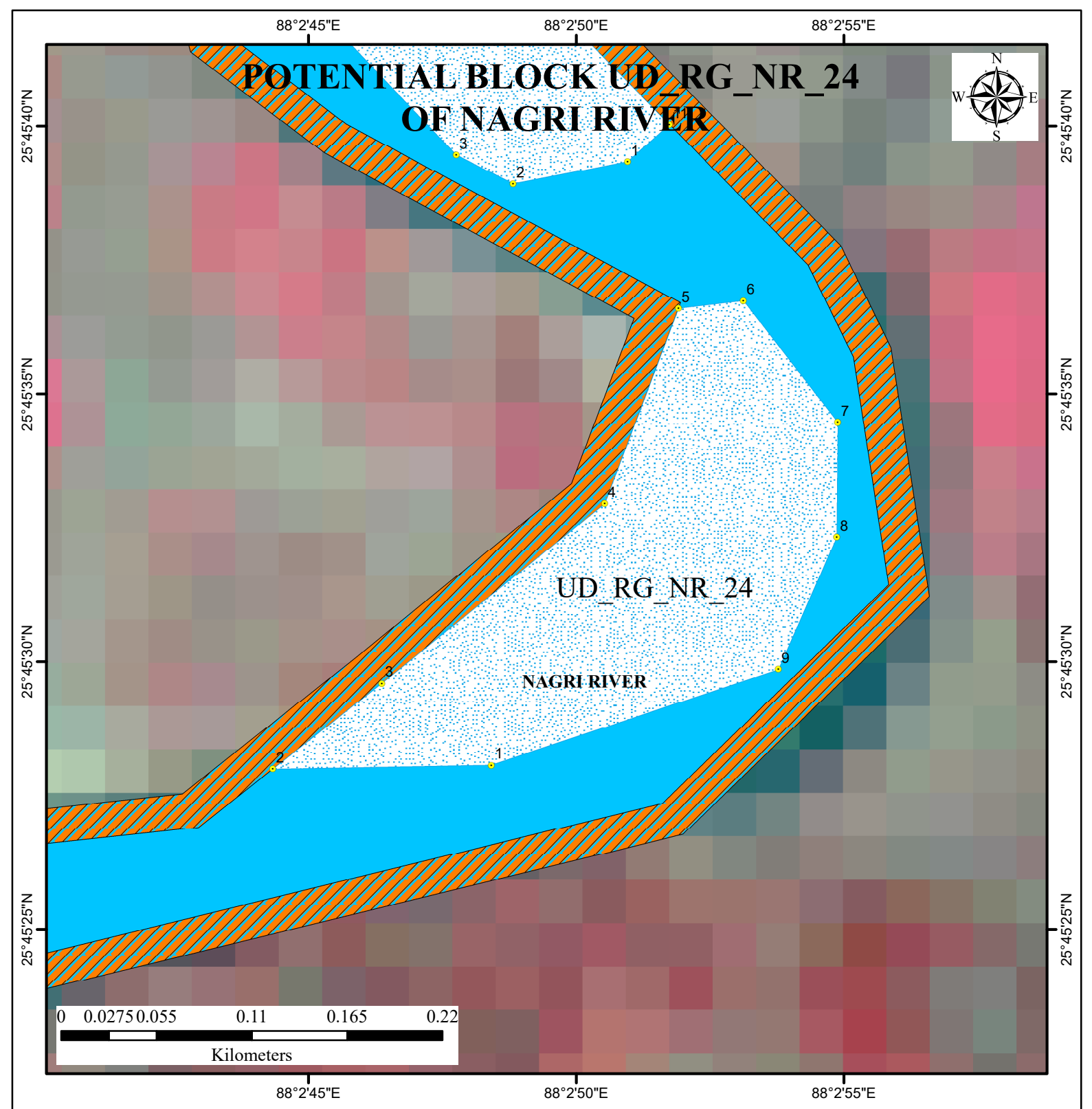
- COORDINATE
- POTENTIAL BLOCK
- SAFETY BARRIER
- RIVER
- ADMINISTRATIVE BLOCK BOUNDARY
- DISTRICT BOUNDARY



UD_RG_NR_23		
POINT NO	**LATITUDE**	**LONGITUDE**
1	25° 45' 39.338" N	88° 2' 50.958" E
2	25° 45' 38.924" N	88° 2' 48.818" E
3	25° 45' 39.469" N	88° 2' 47.754" E
4	25° 45' 42.175" N	88° 2' 45.166" E
5	25° 45' 43.690" N	88° 2' 43.755" E
6	25° 45' 46.059" N	88° 2' 43.300" E
7	25° 45' 46.699" N	88° 2' 45.161" E
8	25° 45' 46.916" N	88° 2' 45.762" E
9	25° 45' 47.449" N	88° 2' 47.243" E
10	25° 45' 42.981" N	88° 2' 48.838" E
11	25° 45' 40.034" N	88° 2' 51.739" E

LEGEND

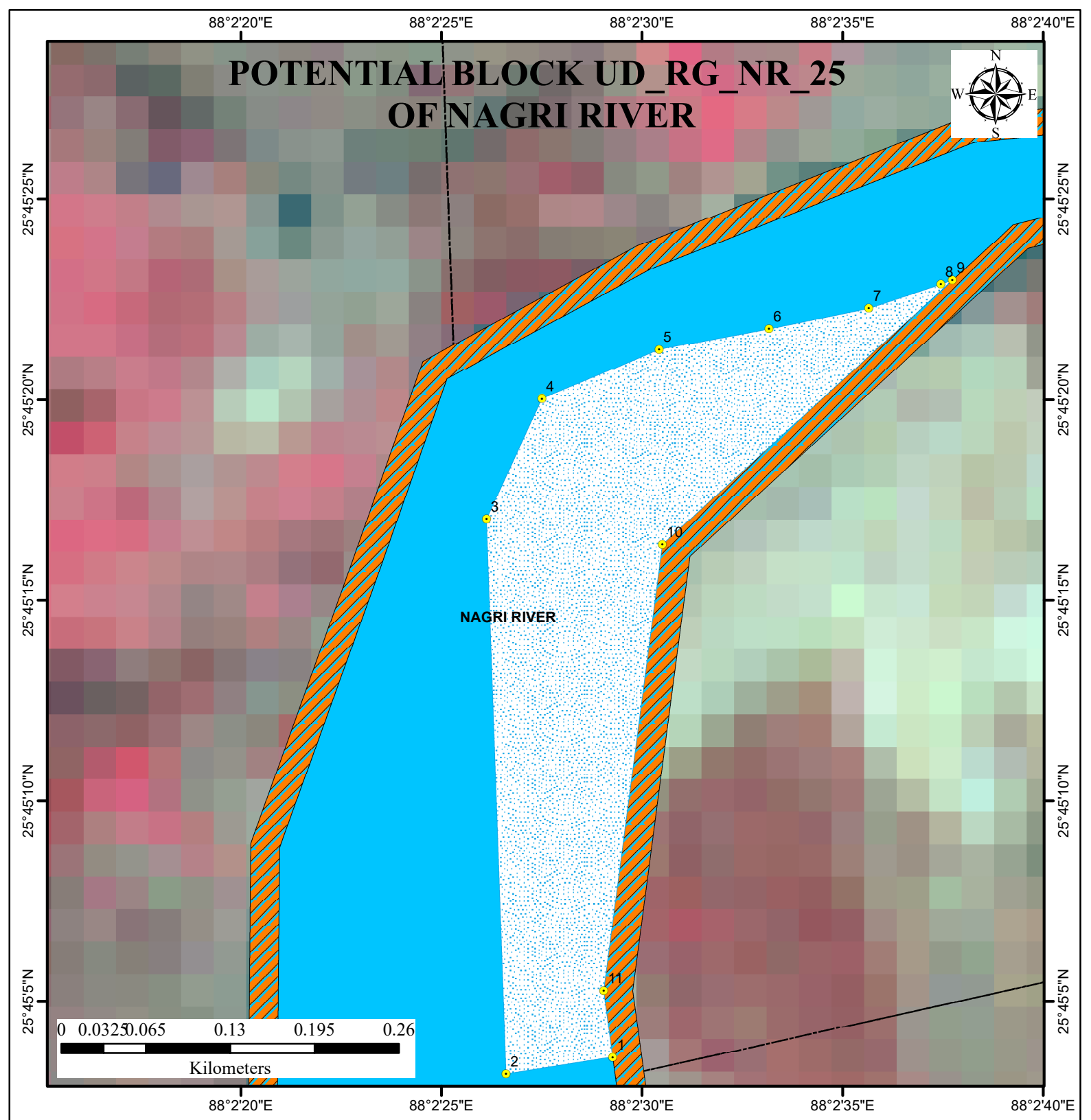
- COORDINATE
- POTENTIAL BLOCK
- SAFETY BARRIER
- RIVER
- ADMINISTRATIVE BLOCK BOUNDARY
- DISTRICT BOUNDARY



UD_RG_NR_24		
POINT NO	**LATITUDE**	**LONGITUDE**
1	25° 45' 28.069" N	88° 2' 48.414" E
2	25° 45' 27.997" N	88° 2' 44.329" E
3	25° 45' 29.599" N	88° 2' 46.366" E
4	25° 45' 32.954" N	88° 2' 50.527" E
5	25° 45' 36.599" N	88° 2' 51.905" E
6	25° 45' 36.743" N	88° 2' 53.120" E
7	25° 45' 34.472" N	88° 2' 54.881" E
8	25° 45' 32.322" N	88° 2' 54.862" E
9	25° 45' 29.858" N	88° 2' 53.772" E

LEGEND

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

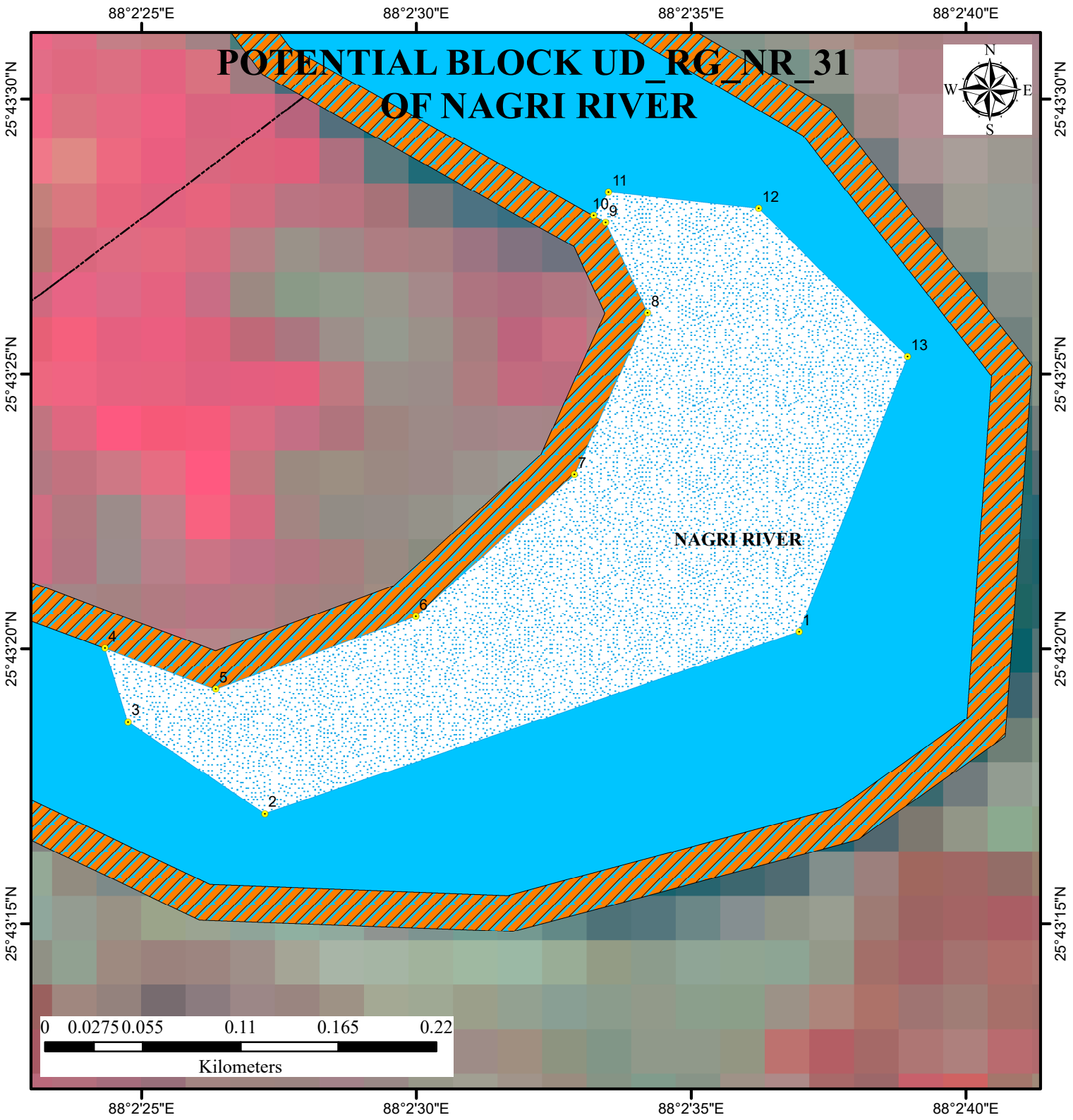


UD_RG_NR_25		
POINT NO	**LATITUDE**	**LONGITUDE**
1	25° 45' 3.613" N	88° 2' 29.270" E
2	25° 45' 3.189" N	88° 2' 26.612" E
3	25° 45' 17.024" N	88° 2' 26.121" E
4	25° 45' 20.027" N	88° 2' 27.505" E
5	25° 45' 21.251" N	88° 2' 30.427" E
6	25° 45' 21.765" N	88° 2' 33.168" E
7	25° 45' 22.279" N	88° 2' 35.652" E
8	25° 45' 22.879" N	88° 2' 37.451" E
9	25° 45' 22.985" N	88° 2' 37.739" E
10	25° 45' 16.392" N	88° 2' 30.508" E
11	25° 45' 5.265" N	88° 2' 29.044" E

LEGEND

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

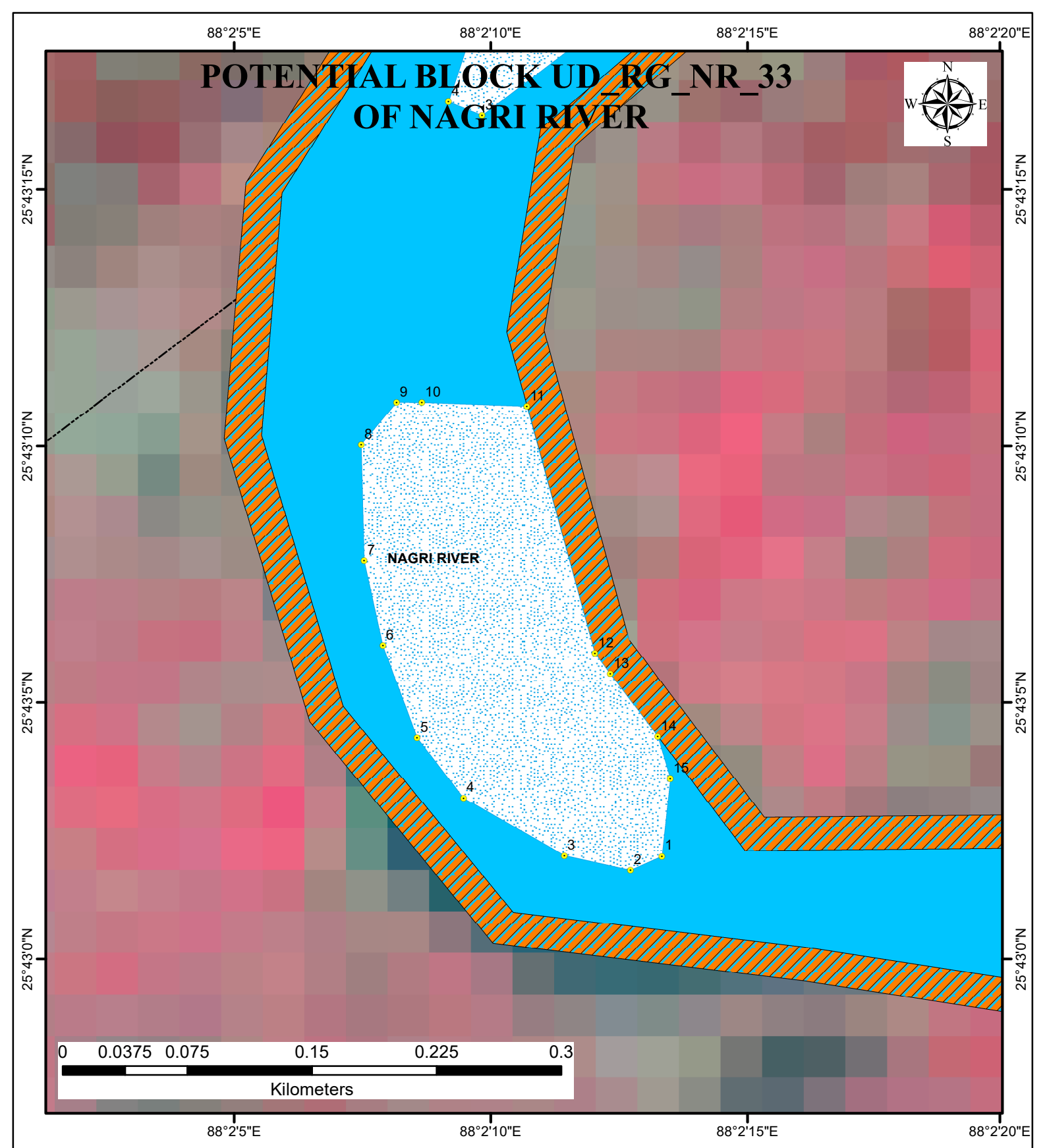
POTENTIAL BLOCK UD_RG_NR_31 OF NAGRI RIVER



UD_RG_NR_31		
POINT NO	**LATITUDE**	**LONGITUDE**
1	25° 43' 20.313" N	88° 2' 36.966" E
2	25° 43' 17.003" N	88° 2' 27.247" E
3	25° 43' 18.672" N	88° 2' 24.755" E
4	25° 43' 20.011" N	88° 2' 24.337" E
5	25° 43' 19.264" N	88° 2' 26.350" E
6	25° 43' 20.592" N	88° 2' 29.992" E
7	25° 43' 23.166" N	88° 2' 32.879" E
8	25° 43' 26.110" N	88° 2' 34.209" E
9	25° 43' 27.761" N	88° 2' 33.445" E
10	25° 43' 27.881" N	88° 2' 33.228" E
11	25° 43' 28.310" N	88° 2' 33.498" E
12	25° 43' 28.016" N	88° 2' 36.230" E
13	25° 43' 25.313" N	88° 2' 38.941" E

LEGEND

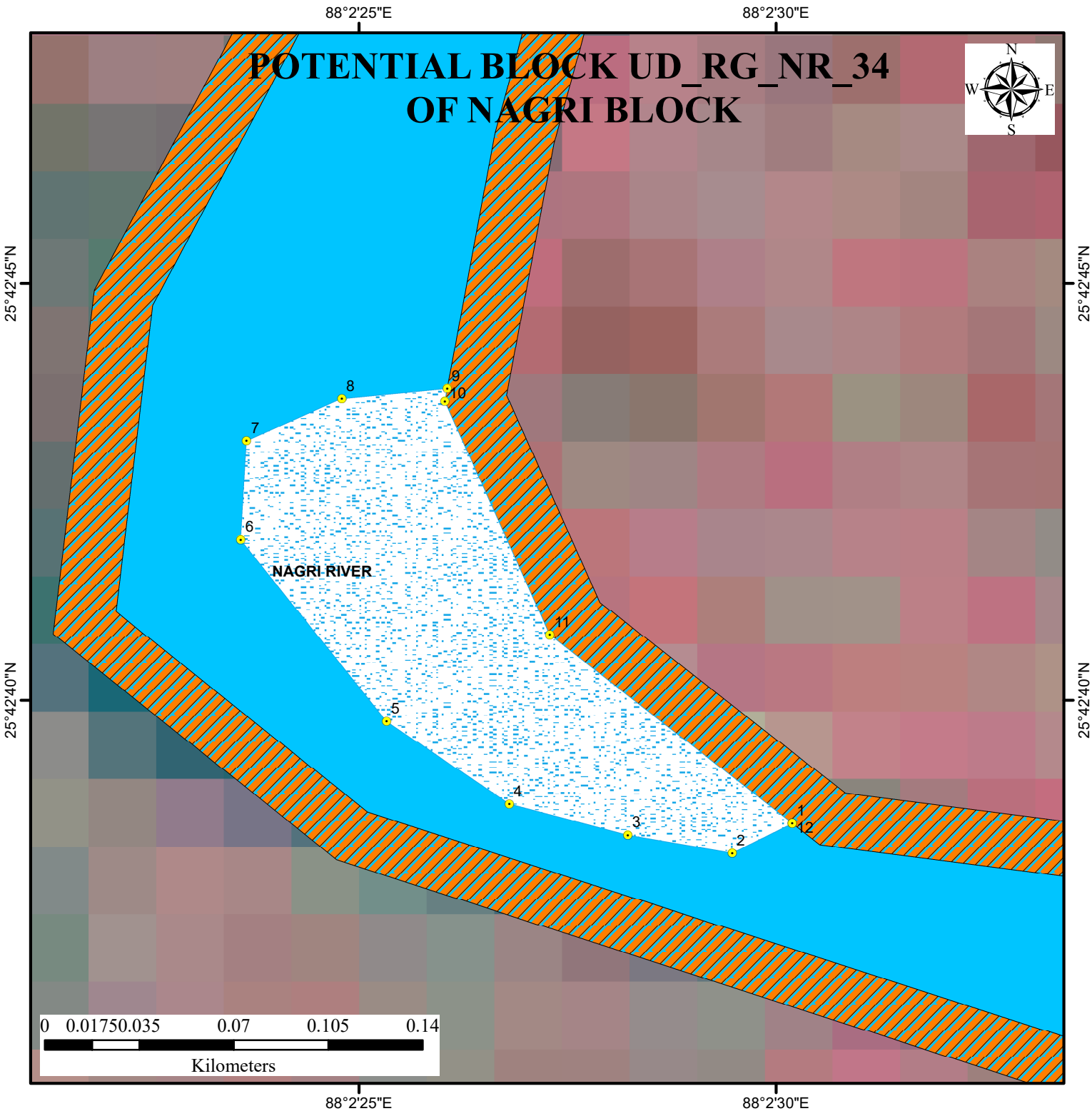
- COORDINATE
- POTENTIAL BLOCK
- SAFETY BARRIER
- RIVER
- ADMINISTRATIVE BLOCK BOUNDARY
- DISTRICT BOUNDARY



UD_RG_NR_33					
POINT NO	LATITUDE	LONGITUDE	POINT NO	LATITUDE	LONGITUDE
1	25° 43' 2.004" N	88° 2' 13.331" E	9	25° 43' 10.847" N	88° 2' 8.167" E
2	25° 43' 1.733" N	88° 2' 12.721" E	10	25° 43' 10.844" N	88° 2' 8.658" E
3	25° 43' 2.017" N	88° 2' 11.433" E	11	25° 43' 10.769" N	88° 2' 10.704" E
4	25° 43' 3.132" N	88° 2' 9.467" E	12	25° 43' 5.947" N	88° 2' 12.028" E
5	25° 43' 4.308" N	88° 2' 8.566" E	13	25° 43' 5.552" N	88° 2' 12.329" E
6	25° 43' 6.102" N	88° 2' 7.898" E	14	25° 43' 4.334" N	88° 2' 13.254" E
7	25° 43' 7.756" N	88° 2' 7.533" E	15	25° 43' 3.516" N	88° 2' 13.496" E
8	25° 43' 10.027" N	88° 2' 7.476" E			

LEGEND

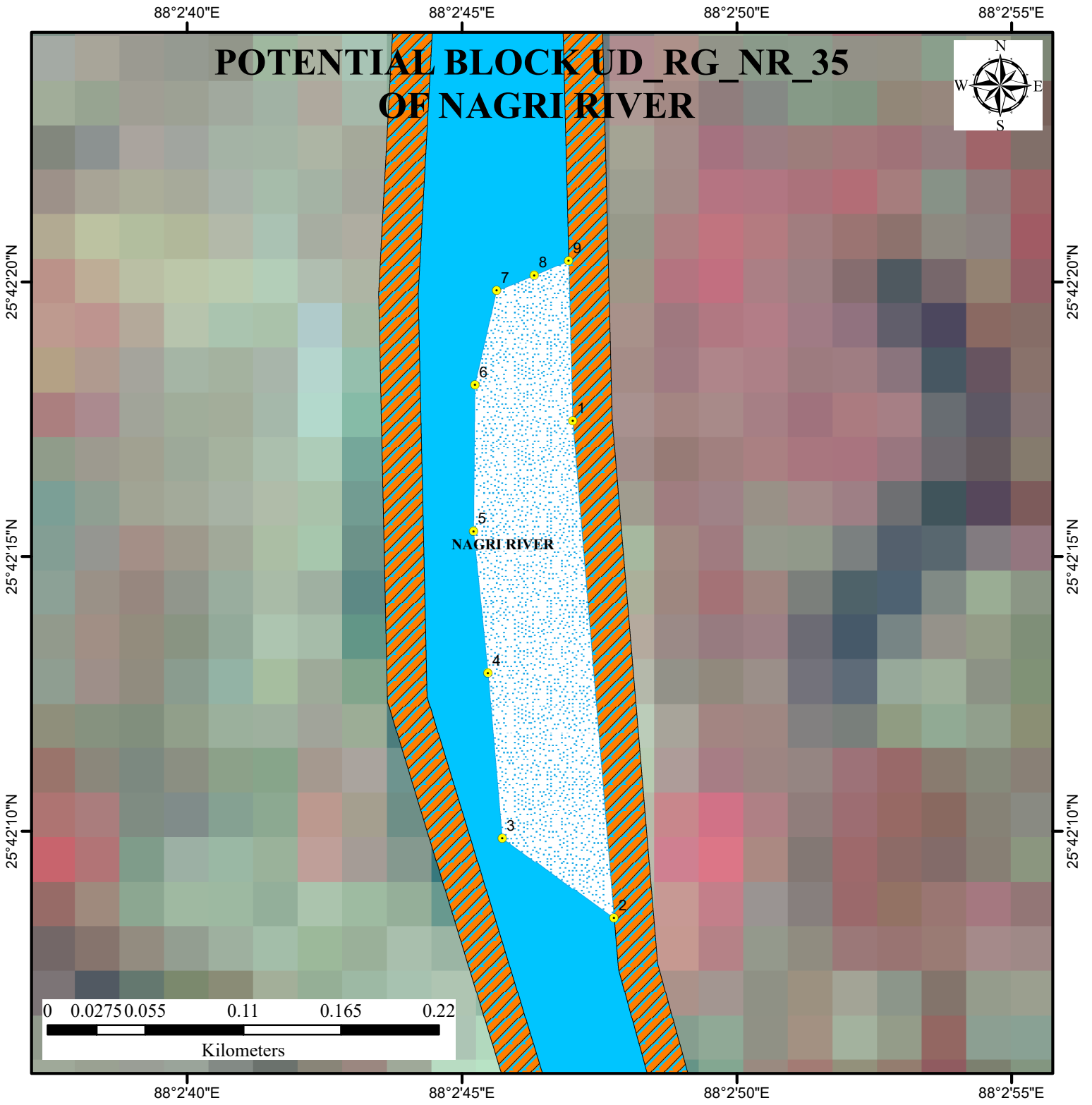
- COORDINATE
- POTENTIAL BLOCK
- SAFETY BARRIER
- RIVER
- ADMINISTRATIVE BLOCK BOUNDARY
- DISTRICT BOUNDARY



UD_RG_NR_34		
POINT NO	**LATITUDE**	**LONGITUDE**
1	25° 42' 38.522" N	88° 2' 30.193" E
2	25° 42' 38.169" N	88° 2' 29.472" E
3	25° 42' 38.384" N	88° 2' 28.221" E
4	25° 42' 38.756" N	88° 2' 26.800" E
5	25° 42' 39.747" N	88° 2' 25.328" E
6	25° 42' 41.926" N	88° 2' 23.581" E
7	25° 42' 43.113" N	88° 2' 23.648" E
8	25° 42' 43.621" N	88° 2' 24.792" E
9	25° 42' 43.741" N	88° 2' 26.056" E
10	25° 42' 43.587" N	88° 2' 26.027" E
11	25° 42' 40.785" N	88° 2' 27.287" E

LEGEND

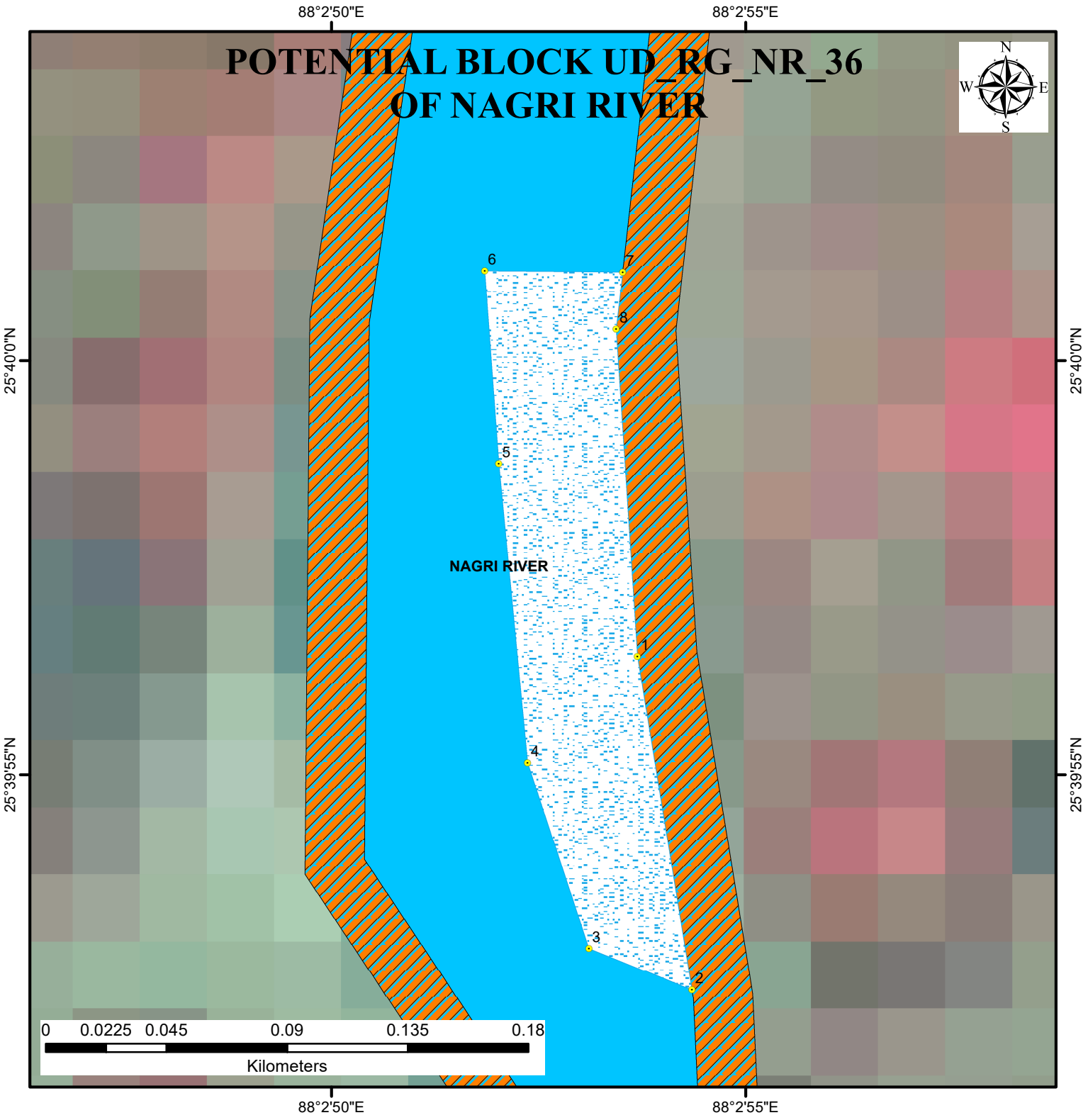
- COORDINATE
- POTENTIAL BLOCK
- SAFETY BARRIER
- RIVER
- ADMINISTRATIVE BLOCK BOUNDARY
- DISTRICT BOUNDARY



UD_RG_NR_35		
POINT NO	LATITUDE	LONGITUDE
1	25° 42' 17.472" N	88° 2' 47.013" E
2	25° 42' 8.420" N	88° 2' 47.765" E
3	25° 42' 9.869" N	88° 2' 45.730" E
4	25° 42' 12.881" N	88° 2' 45.472" E
5	25° 42' 15.463" N	88° 2' 45.210" E
6	25° 42' 18.128" N	88° 2' 45.233" E
7	25° 42' 19.846" N	88° 2' 45.628" E
8	25° 42' 20.123" N	88° 2' 46.316" E
9	25° 42' 20.388" N	88° 2' 46.940" E

LEGEND

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

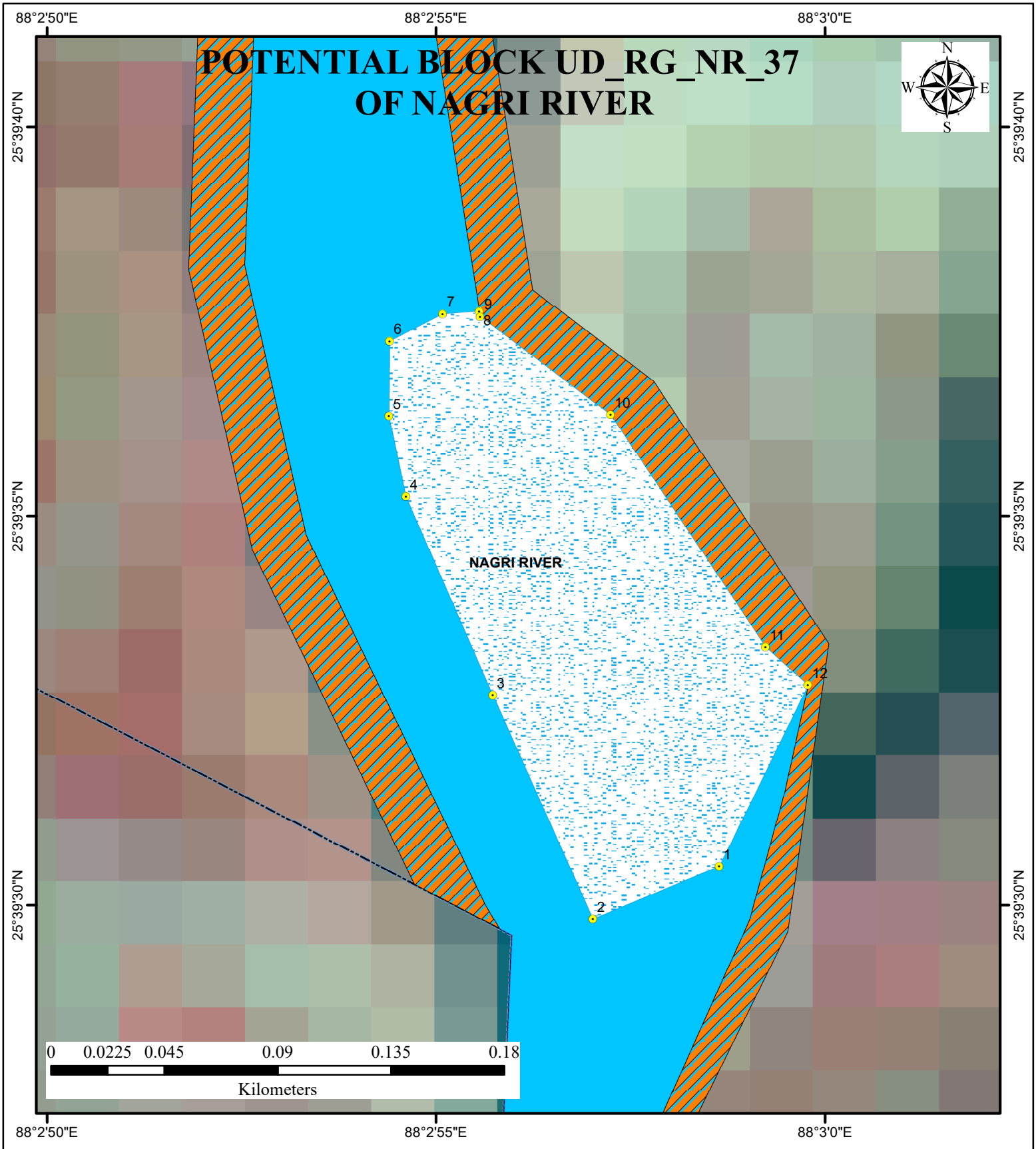


UD_RG_NR_36		
POINT NO	LATITUDE	LONGITUDE
1	25° 39' 56.428" N	88° 2' 53.693" E
2	25° 39' 52.405" N	88° 2' 54.350" E
3	25° 39' 52.901" N	88° 2' 53.106" E
4	25° 39' 55.142" N	88° 2' 52.366" E
5	25° 39' 58.757" N	88° 2' 52.018" E
6	25° 40' 1.080" N	88° 2' 51.849" E
7	25° 40' 1.067" N	88° 2' 53.514" E
8	25° 40' 0.381" N	88° 2' 53.437" E

LEGEND

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

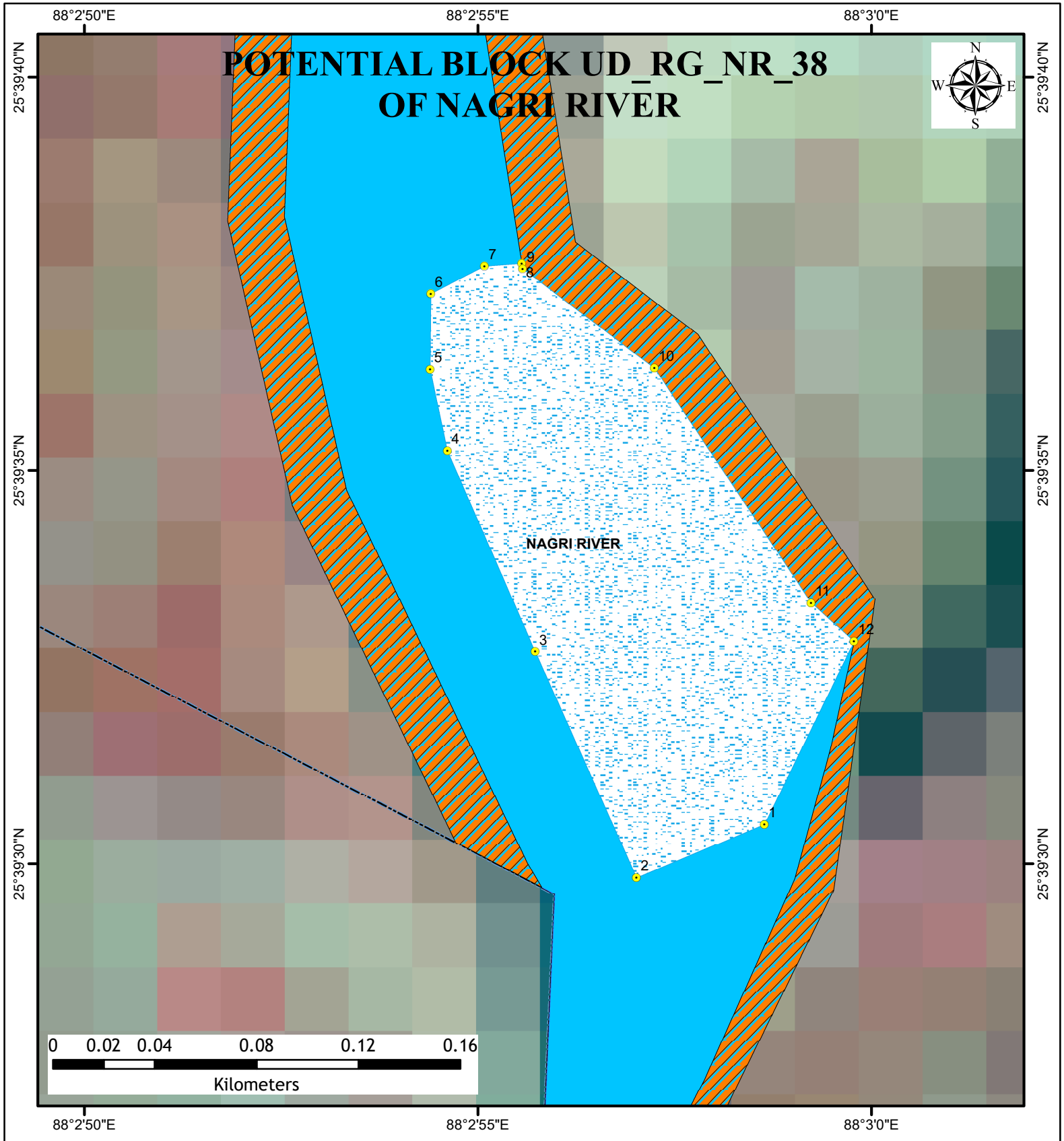
POTENTIAL BLOCK UD_RG_NR_37 OF NAGRI RIVER



UD_RG_NR_37					
POINT NO	LATITUDE	LONGITUDE	POINT NO	LATITUDE	LONGITUDE
1	25° 39' 30.500" N	88° 2' 58.638" E	7	25° 39' 37.598" N	88° 2' 55.082" E
2	25° 39' 29.822" N	88° 2' 57.013" E	8	25° 39' 37.634" N	88° 2' 55.555" E
3	25° 39' 32.696" N	88° 2' 55.728" E	9	25° 39' 37.565" N	88° 2' 55.566" E
4	25° 39' 35.250" N	88° 2' 54.611" E	10	25° 39' 36.302" N	88° 2' 57.241" E
5	25° 39' 36.284" N	88° 2' 54.392" E	11	25° 39' 33.316" N	88° 2' 59.233" E
6	25° 39' 37.247" N	88° 2' 54.401" E	12	25° 39' 32.827" N	88° 2' 59.779" E

LEGEND

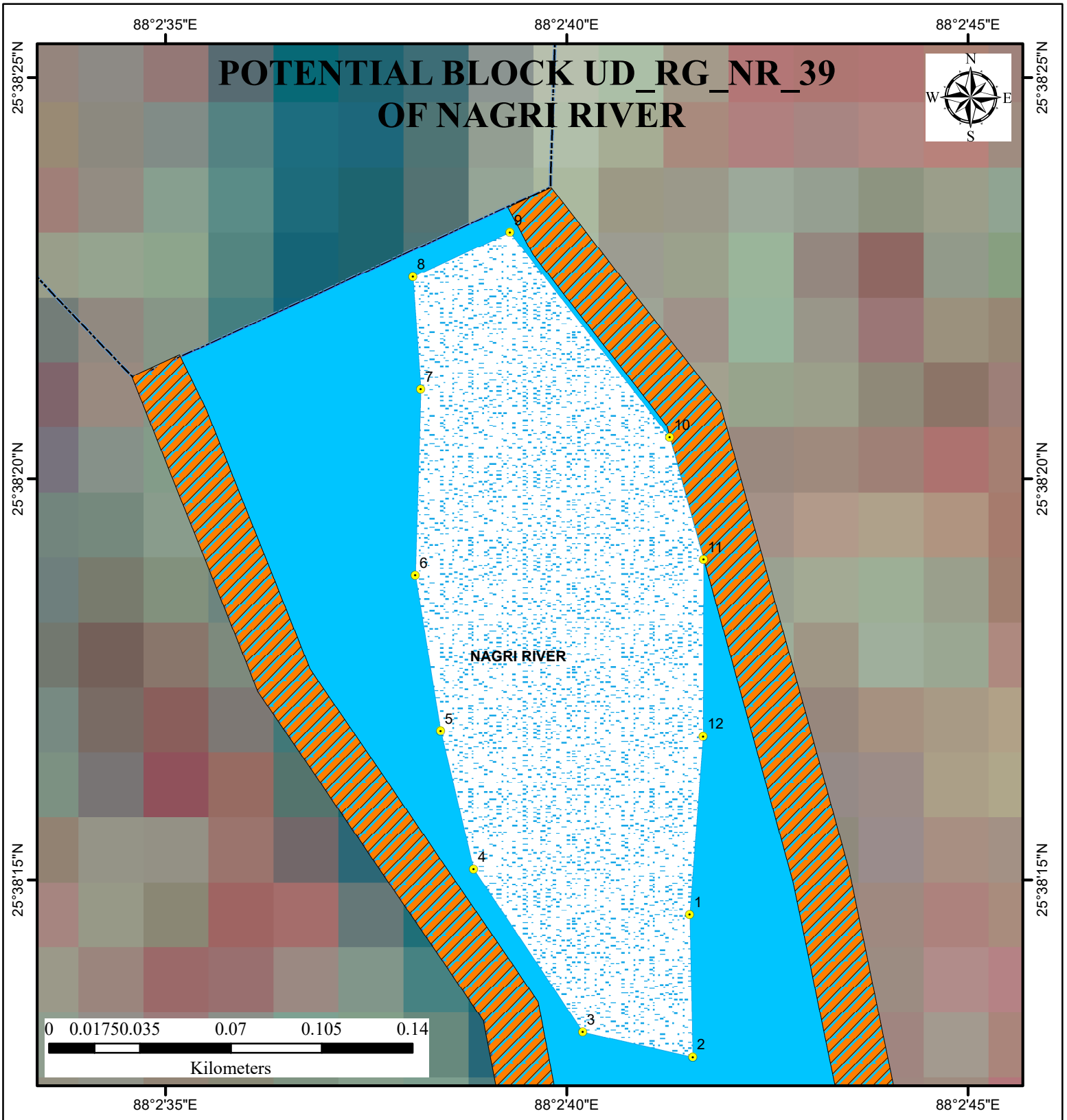
- COORDINATE
- POTENTIAL BLOCK
- SAFETY BARRIER
- RIVER
- ADMINITRATIVE BLOCK BOUNDARY
- DISTRICT BOUNDARY



UD_RG_NR_38		
POINT NO	LATITUDE	LONGITUDE
1	25° 39' 30.500" N	88° 2' 58.638" E
2	25° 39' 29.822" N	88° 2' 57.013" E
3	25° 39' 32.696" N	88° 2' 55.728" E
4	25° 39' 35.250" N	88° 2' 54.611" E
5	25° 39' 36.284" N	88° 2' 54.392" E
6	25° 39' 37.247" N	88° 2' 54.401" E
7	25° 39' 37.598" N	88° 2' 55.082" E
8	25° 39' 37.634" N	88° 2' 55.555" E
9	25° 39' 37.565" N	88° 2' 55.566" E
10	25° 39' 36.302" N	88° 2' 57.241" E
11	25° 39' 33.316" N	88° 2' 59.233" E
12	25° 39' 32.827" N	88° 2' 59.779" E

LEGEND

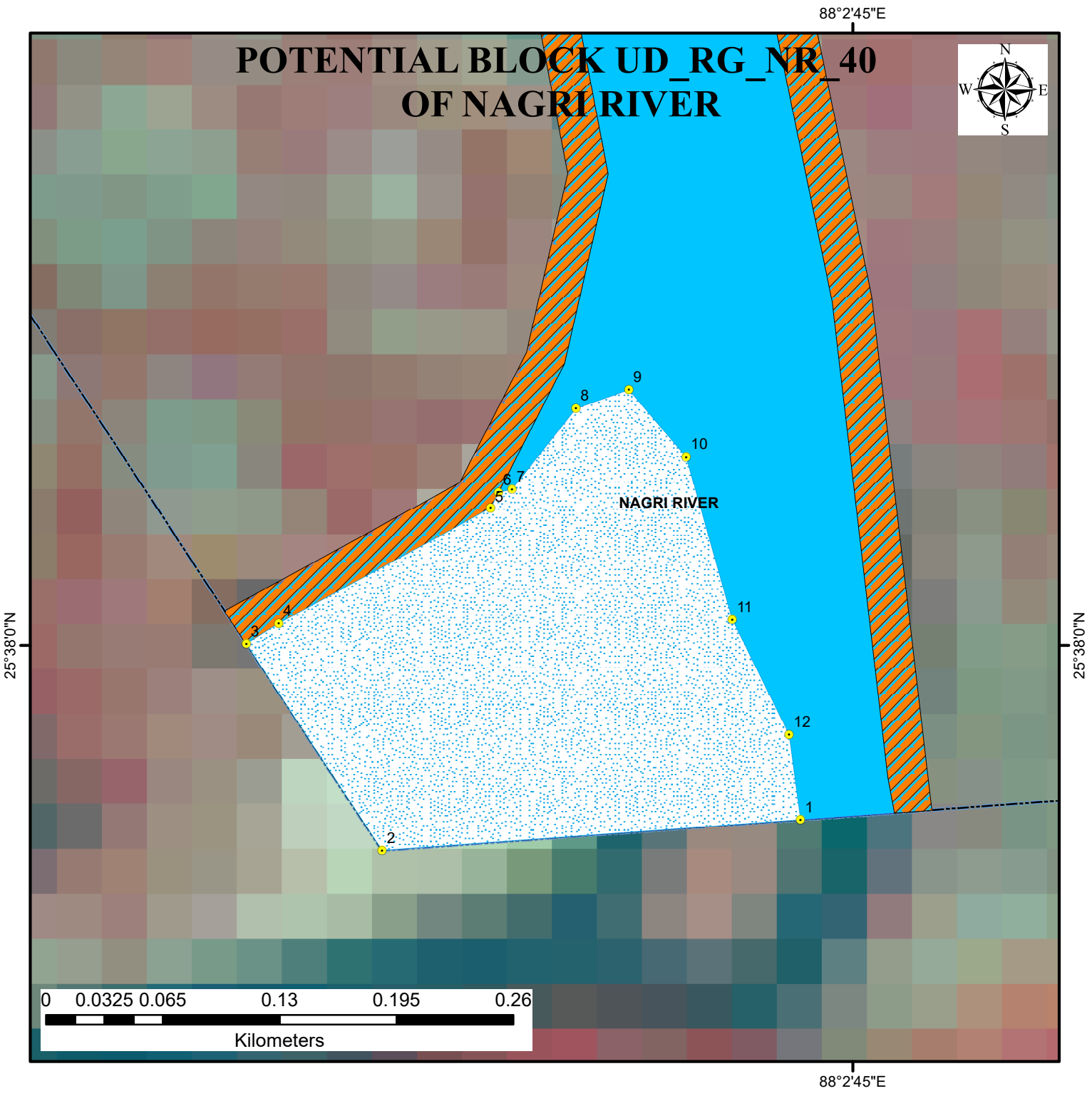
- COORDINATE
- POTENTIAL BLOCK
- SAFETY BARRIER
- RIVER
- ADMINISTRATIVE BLOCK BOUNDARY
- DISTRICT BOUNDARY



UD_RG_NR_39		
POINT NO	LATITUDE	LONGITUDE
1	25° 38' 14.569" N	88° 2' 41.532" E
2	25° 38' 12.793" N	88° 2' 41.570" E
3	25° 38' 13.104" N	88° 2' 40.197" E
4	25° 38' 15.135" N	88° 2' 38.839" E
5	25° 38' 16.858" N	88° 2' 38.427" E
6	25° 38' 18.795" N	88° 2' 38.112" E
7	25° 38' 21.117" N	88° 2' 38.180" E
8	25° 38' 22.517" N	88° 2' 38.081" E
9	25° 38' 23.070" N	88° 2' 39.289" E
10	25° 38' 20.521" N	88° 2' 41.283" E
11	25° 38' 18.996" N	88° 2' 41.705" E
12	25° 38' 16.791" N	88° 2' 41.700" E

LEGEND

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



UD_RG_NR_40		
POINT NO	**LATITUDE**	**LONGITUDE**
1	25° 37' 56.859" N	88° 2' 44.060" E
2	25° 37' 56.309" N	88° 2' 36.528" E
3	25° 38' 0.034" N	88° 2' 34.080" E
4	25° 38' 0.399" N	88° 2' 34.663" E
5	25° 38' 2.476" N	88° 2' 38.478" E
6	25° 38' 2.760" N	88° 2' 38.624" E
7	25° 38' 2.819" N	88° 2' 38.865" E
8	25° 38' 4.272" N	88° 2' 40.016" E
9	25° 38' 4.610" N	88° 2' 40.968" E
10	25° 38' 3.398" N	88° 2' 42.001" E
11	25° 38' 0.468" N	88° 2' 42.829" E
12	25° 37' 58.397" N	88° 2' 43.855" E

LEGEND

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

ANNEXURE 5.1

Compliance to the Observations

Government of West Bengal

Office of the District Magistrate &District Collector

Uttar Dinajpur, Karnajora, Raiganj

Memo No. 1045/MM/2021, dated 10.09.2021

SL NO	OBSERVATIONS	COMPLIANCE
1	The sand block mentioned at Sl. No. 4 & 12 are identically same and the sand block mentioned at Sl. No. 5 & 11 are identically same. It appears that the same sand blocks of Sl.No. 4 & 5 have been mentioned twice in the list.	Complied With.
2	The persons mentioned at Sl.No. 1, 2, 3, 4, 5, 6 & 8 only in the list are the lessees of the sand blocks mentioned against their names. But in case of Sl. No. 7 &Sl/ No. 9 to 16 (excepting Sl. No. 11 & 12 which are same as 5 & 4 respectively) the persons mentioned in the list are only the highest bidders (not the Lessees) in e-auction and no lease settlement has been made in favour of them.	Complied With.
3	Some other errors in respect of Plot Nos./ Name of Mouza mentioned in respect of the sand blocks. (In this connection a list of all the sand blocks for which e-auction was held are enclosed herewith for your ready reference.)	Complied With.

Details of Auctioned Sand Blocks in Uttar Dinajpur District

Sl No	Name of Block/ Sand block ID	Name of River	Name of Mouza with J.L. No.	Area of Sand Block (in Hectare)	L.R. Plot No.	Date of Auction	Name of successful bidder	Present status	Status
1	Chopra/ MMR/ UD/ SB-01	Mahananda	Mouza-Chopra, JL No.24	4.5	127(P), 563(P), 587(P), 588(P), 624, 625	26.11.2016-28.11.2016	Ambey Niwas Pvt. Ltd.	Agency submitted prayer for substitution of all the plots on 24.10.2017. E.C. Issued on 27.06.2018 by DEIAA and the same communicated to the agency on the same date. But the Agency not yet submitted registered deed for execution.	Complied With.
2	Chopra/ MMR/ UD/ SB-02	Berang	Mouza-Paschim Ariagaon, JL No.39	5	2542(P), 2545(P), 2553P), 2554(P), 2555(P)	03.10.2016-05.10.2016	Md. HasibulRahaman	Lease deed executed in favour of Md. HasibulRahaman.	
3	Chopra/ MMR/ UD/ SB-03	Mahananda	Mouza-Paschim Dangapara, JL No.10	6.05	36(P)	27.09.2016-29.09.2016	Sudipta Bose	Lease deed executed in favour of Sudipta Bose	
4	Chopra/ MMR/ UD/ SB-04	Mahananda	Mouza-Barbilla, JL No.09	7.25	2194	27.09.2016-29.09.2016	Bidyut Ranjan Thakur	Prayer submitted by the Agency for LOI time extension, but rejected. Mining plan sent to Sr. Geologist, Siliguri. As per BL &LRO report mining operation not feasible due to a Graveyard at a distance of 130 meters. WP No. 3059(W) of 2019 initiated by the Agency.	
5	Chopra/ MMR/ UD/ SB-05	Mahananda	Mouza-Chitalghata, JL No.01	2.59	8401(P), 8401/ 9792(P)	26.11.2016-28.11.2016	Ambey Niwas Pvt. Ltd.	Lease deed executed in favour of Ambey Niwas Pvt. Ltd.	
6	Chopra/ MMR/ UD/ SB-06	Mahananda	Mouza-Chitalghata, JL No.01	7.8	123-127, 128(P), 130-133, 134(P), 137(P), 8401(P), 8404(P)	27.09.2016-29.09.2016	Md. Sefiul	Lease deed executed in favour of Md. Sefiul	
7	Chopra/ MMR/ UD/ SB-07	Mahananda	Mouza-Chitalghata, JL No.01	7.4	81(P), 83-92(P), 95(P), 96(P), 99(P), 100(P), 101(P), 134(P), 135(P), 136(P), 140(P), 141-143, 146, 147	26.11.2016-28.11.2016	AdyamaaTrde Link Pvt. Ltd.	LOI issued on 04.01.2017 but the Agency did not submit mining plan. Again letter issued from this office to the Agency on 05.02.2018 to submit mining plan at an early date. But till date the Agency has not submitted mining plan.	
8	Chopra/ MMR/ UD/ SB-08	Mahananda	Mouza-Chitalghata, JL No.01	3.65	24(P), 25(P), 81(P)	26.11.2016-28.11.2016	AdyamaaTrde Link Pvt. Ltd.	Lease deed executed in favour of AdyamaaTrde Link Pvt. Ltd. WP No.29996(W) pf 2016 of Md. NayarAlam vs State of West Bengal and Ors.	

Sl No	Name of Block/ Sand block ID	Name of River	Name of Mouza with J.L. No.	Area of Sand Block (in Hectare)	L.R. Plot No.	Date of Auction	Name of successful bidder	Present status	Status
9	Chopra/ MMR/ UD/ SB-09	Mahananda	Mouza-Chitalghata, JL No.01	3.89	81(P)	27.09.2016-29.09.2016	Md. Islamuddin	Lease deed executed in favour of Md. Islamuddin	
10	Chopra/ MMR/ UD/ SB-10	Mahananda	Mouza-Chitalghata, JL No.01/ 4.55	4.55	604, 606, 607, 610, 612, 613, 619, 620, 622, 624-627, 630	27.09.2016-29.09.2016	Krishna Gopal Agarwal	EC not allowed in DEIAA meeting on 24.04.2017 and the matter has been intimated to the agency vide this office letter dated 23.06.2017	
11	Chopra/ MMR/ UD/ SB-14	Dahuk	Mouza-Dakshin Ariagaon, JL No.35	1.8	2181(P), 2928, 2929	03.10.2016-05.10.2016	Md. Nazimul Haque	Lease deed executed in favour of Md. Nazimul Haque	
12	Chopra/ MMR/ UD/ SB-15	Dahuk	Mouza-Tharais	0.3	501, 582	26.11.2016-28.11.2016	Firoz Aktar	Highest Bidder unable to pay the 1/ 3rd Bid Money.	
13	Chopra/ MMR/ UD/ SB-16	Tangon	Mouza-Uttar Krishnapur, JL No.55	0.99	234	12.04.2017-14.04.2017	Debabrata Kar	LOI issued. Ecissued by DEIAA. Lease Deed submitted by the Agency, but not executed due to NGT Order.	
14	Chopra/ MMR/ UD/ SB-17	Tangon	Mouza-Faridpur, JL No.70	0.26	10	24.06.2017-26.06.2017	Mrinal Roy	LOI issued. EC issued by DEIAA. Mining plan not yet submitted. Lease Deed can not be executed due to NGT Order.	
15	Chopra/ MMR/ UD/ SB-18	Tangon	Mouza-Faridpur, JL No.66	0.1	1410	12.04.2017-14.04.2017	Mrinal Roy	LOI issued. Mining plan not yet submitted.	
16	Chopra/ MMR/ UD/ SB-19	Tangon	Mouza-Faridpur, JL No.49	2.03	517	24.06.2017-26.06.2017	Mrinal Roy	LOI issued. EC issued by DEIAA. Lease Deed can not yet submitted by the Agency. Lease Deed can not be executed due to NGT Order.	
17	Chopra/ MMR/ UD/ SB-20	Mahananda	Mouza-Faridpur, JL No.233	0.22	101, 103	24.06.2017-26.06.2017	AbaidurRahaman	LOI issued. EC issued by DEIAA. Lease Deed submitted by the Agency but not be executed due to NGT Order.	
18	Chopra/ MMR/ UD/ SB-21	Mahananda	Mouza-Faridpur, JL No.155	0.25	1888	24.06.2017-26.06.2017	MhabubAlam	LOI issued. EC issued by DEIAA. Lease Deed submitted by the Agency but not be executed due to NGT Order.	

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 upto 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 25 to 29. 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 doesnot shows much difference when studied the image archives from 1985 to 2022, however, a stretch of Nagri River shows curtailed Ox-Bow lake is being furnished as one of the representative image detection study. Change in last 10 years found to be negligible.
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 zones are furnished in Annexure-2. However, DGPS survey of each blocks 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.	Depth of Mining Considered for each potential zones are furnished on the basis of average and is given in Table no 7.9, Page no 91. However, after finalization of the sand Blocks, each blocks shall be surveyed again during

Sl. No.	Observations	Compliance
		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.
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 blocks 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	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 in Plate no 2A and 2B.
14	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.	Furnished in Plate no 2A and 2B
15	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.
16	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.
17	The suggested mining depth should be indicated for each block in the table (not done for PurbaBardhaman).	Complied with. Suggested mining depths are furnished in Annexure-2.
18	Order of sections in the report are not logical in some reports.	Corrected and as per specified format of DSR.
19	A table showing all general compliances in DSR as per the Mining Rules may be furnished.	Complied with. Given as Annexure-1
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.

Sl. No.	Observations	Compliance
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 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

Sl. No.	Observations	Compliance
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.	ENVIScentre 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 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.	Part of comment 30.
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.

Sl. No.	Observations	Compliance
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 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 given 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 80.
8	Citation of reference should be given for Empirical formula by which Replenishment calculated.	Complied with and given in page no 85 to 89.
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 113-116.
11	Reference should be in a standard referencing format	Complied with and given in page no 117-118.
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 4.
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 68th Meeting (26th July, 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:- 68th meeting of SEIAA

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

From :- 26 Jul 2022

To :- 26 Jul 2022

1. Proposal No. :- **SIA/WB/IND/31555/2019** File No- **EN/T-II-1/020/2019** Proposed installation of 2 X 20 MT Induction Furnaces and 1,48,800MT/Annum Rolling Mill at LR Plot Nos. (enclosed as Annexure – 1), Village & Mouza – Nidhirampur, PS – Gangajalghati, JL No. 034, PIN – 722133, District - Bankura, West Bengal by **M/s. Shree Ramdoot Rollers Pvt. Ltd.**	Type- **EC**

INTRODUCTION

The proponent made online application vide proposal no. **SIA/WB/IND/31555/2019** dated **26 Feb 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. **3(a) Metallurgical industries (ferrous & non ferrous)**, under Category "**B1**" of EIA Notification 2006 and the proposal is appraised at State level.

The **Installation of 2 X 20 MT Induction Furnaces with Continuous Caster and 1,48,800 MT/Annum Rolling Mill** of M/s **SHREE RAMDOOT ROLLERS PVT LTD** located in Village & Mouza – Nidhirampur, PS – Gangajalghati, JL No. 034, PIN – 722133, District – Bankura, State **West Bengal** was initially received in the Ministry on **26 Feb 2019** for obtaining Terms of Reference (ToR) as per EIA Notification, 2006. The Project was appraised by the State Expert Appraisal Committee [SEAC] during its **172nd Meeting** meeting held between **30 Apr 2019** to **30 Apr 2019** and prescribed ToRs to the project for undertaking detailed EIA study for obtaining Environmental Clearance. Accordingly, ToR was prescribed to the project on **06 May 2019**.

The project was placed in the 66th meeting of SEIAA held on 05.07.2022 and it was observed that some documents required to be uploaded in the PARIVESH Portal. The project proponent uploaded documents on 11.07.2022.

PROJECT DETAILS

The project of M/s **SHREE RAMDOOT ROLLERS PVT LTD** located in as follows :

State of the project				
S. No.	**State**	**District**	**Tehsil**	**Village**
(1.)	West Bengal	Bankura	Gangajalghati	Nidhirampur

14. **Project configuration/product details**

S. No.	Project configuration/product details	Quantity	Unit	Other Unit	Mode of Transport/Transmission of Product	Other Mode of Transport

2 X 20 MT Induction Furnaces with continuous caster and 1,48,800MT/Annum Rolling Mill		

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.)	Silico Manganese	858	1		India	Road		2
(2.)	MS Scrap	16948	1		India	Road		2
(3.)	Scrap	3570	1		India	Road		2
(4.)	sponge Iron	104555	1		India	Road		2
(5.)	Pig Iron	19693	1		India	Road		2
(6.)	Aluminium	24.8	1		India	Road		2
(7.)	Ferro Alloy, FeSi	100	1		India	Road		2

Details of Previous ToR								
S. No.	**Item**	**Quantity**	**Unit**	**Other Unit**	**Source**	**Mode of Transport/Transmission of Product**	**Other Mode of Transport**	**Distance of Source from Project Site(Kilometers)**
ToR issued vide Memo No. 413-2N-24/2019(E) dated 06.05.2019 for 2 X 20 MT Induction Furnaces with continuous caster and 1,48,800MT/Annum Rolling Mill								

Expansion Details :					
S. No.	**Product/Activity (Capacity / Area)**	**Quantity**		**Unit**	**Other Unit**
		From	**To**		
(1.)	TMT Rebars/Rods	0	148800	Tons per Annum(TPA)	
(2.)	M.S. Ignots/Billets	45000	75280	Tons per Annum(TPA)	

DELIBERATION IN SEIAA

SEIAA considered the submission uploaded on 11.07.2022 by the project proponent and accepted the same.

RECOMMENDATIONS OF SEIAA

The application for EC is approved under violation category.

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 the necessary permission from the Competent Authority, in case of drawl of ground water or in case of drawl of surface water required for the project. vi. The project proponent shall obtain authorization under the Hazardous and other Waste Management Rules, 2016 as amended from time to time. **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 vide G.S.R.277(E) dated 31st March 2012 (applicable to IF / EAF) as amended from time to time as amended from time to time) 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 laboratories recognized under Environment (Protection) Act, 1986 or NABL accredited laboratories. iii. The project proponent shall install system carryout Continuous 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 SO2 and NO_x in reference to SO2 and NO_x 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. (case to case basis small plants: Manual; Large plants: Continuous) iv. The project proponent shall submit monthly summary report of continuous stack emission and air quality monitoring and results of manual stack monitoring and manual monitoring of air quality / fugitive emissions to Regional Office of MoEF&CC/SEIAA, Zonal office of CPCB and Regional Office of SPCB along with six-monthly monitoring report. v. Appropriate Air Pollution Control (APC) system shall be provided for all the dust generating points including fugitive dust from all vulnerable sources. vi. The project proponent shall provide leakage detection and mechanized bag cleaning facilities for better maintenance of bags.

vii. Sufficient number of mobile or stationery vacuum cleaners shall be provided to clean plant roads, shop floors, roofs, regularly.

viii. Recycle and reuse iron are fines, coal and coke fines, lime fines and such other fines collected in the pollution control devices and vacuum cleaning devices in the process after briquetting / agglomeration.

ix. The project proponent shall use leak proof trucks / dumpers carrying coal and other raw materials and cover them with tarpaulin.

x. The project proponent shall provide covered sheds for raw materials like scrap and sponge iron, lump ore, coke, coal, etc.

xi. The project proponent shall provide primary and secondary fume extraction system at all melting furnaces.

xii. Design the ventilation system for adequate air changes as per ACGIH document for all tunnels, motor houses, Oil Cellars.

III. Water quality monitoring and preservation

i. The project proponent shall install 24x7 continuous effluent monitoring system with respect to standards prescribed in Environment (Protection) Rules 1986 vide G.S.R.277(E) dated 31st March 2012 (applicable to IF / EAF) as amended from time to time; as amended from time to time) 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. (case to case basis small plants: Manual; Large plants: Continuous)

ii. The project proponent shall monitor regularly ground water quality at least twice a year (pre and post monsoon) at sufficient numbers of piezometers / sampling wells in the plant and adjacent areas through labs recognized under Environment (Protection) Act, 1986 and NABL accredited laboratories.

iii. The project proponent shall submit monthly summary report of continuous effluent monitoring and results of manual effluent testing and manual monitoring of ground water quality to Regional Office of MoEF&CC/SEIAA, Zonal office of CPCB and Regional Office of SPCB along with six-monthly monitoring report.

iv. Adhere to 'Zero Liquid Discharge'.

v. Sewage Treatment Plant shall be provided for treatment of domestic wastewater to meet the prescribed standards.

vi. The project proponent shall provide the ETP for effluents of rolling mills to meet the standards prescribed in G.S.R.277(E)31st March 2012 (applicable to IF / EAF) as amended from time to time.

vii. Garland drains and collection pits shall be provided for each stock pile to arrest the run-off in the event of heavy rains and to check the water pollution due to surface run off.

viii. The project proponent shall practice rainwater harvesting to maximum possible extent.

ix. The project proponent shall make efforts to minimise water consumption in the steel plant complex by segregation of used water, practicing cascade use and by recycling treated water.

IV. Noise monitoring and prevention

i. Noise level survey shall be carried as per the prescribed guidelines and report in this regard shall be submitted to Regional Officer of the Ministry / SEIAA as a part of six-monthly compliance report.

ii. 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 project proponent shall provide waste heat recovery system (pre-heating of combustion air) at the flue gases of reheating furnaces.

ii. Practice hot charging of slabs and billets / blooms as far as possible.

iii. Ensure installation of regenerative type burners on all reheating furnaces.

iv. Provide solar power generation on roof tops of buildings, for solar light system for all common areas, street lights, parking around project area and maintain the same regularly.

v. Provide the project proponent for LED lights in their offices and residential areas.

VI. Waste management

i. Used refractories shall be recycled as far as possible.

ii. Oily scum and metallic sludge recovered from roiling mills ETP shall be mixed, dried, and briquetted and reused melting Furnaces.

iii. The waste oil, grease and other hazardous waste shall be disposed of as per the Hazardous & Other Waste (Management & Transboundary Movement) Rules, 2016.

iv. Kitchen waste shall be composted or converted to biogas for further use. (to be decided on case to case basis depending on type and size of plant).

VII. Green Belt

i. Green belt shall be developed in an area equal to 33% of the plant area with a native tree species in accordance with CPCB guidelines. The greenbelt shall inter alia cover the entire periphery of the plant. The project proponent should follow plantation plan approved by DFO, Bankura North Division vide Memo no. 1282/13-2 dated 30.05.2022.

ii. The project proponent shall prepare GHG emissions inventory for the plant and shall submit the programme for reduction of the same including carbon sequestration including plantation.

VIII. 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 project proponent shall carry out heat stress analysis for the workmen who work in high temperature work zone and provide Personal Protection Equipment (PPE) as per the norms of Factory Act.

iii. 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.

iv. Occupational health surveillance or the workers shall be done on a regular basis and records maintained as per the Factories Act.

IX. Environment Management Plan (EMP)

i. The project proponent should submit the proposed EMP on 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 for expansion project is given in Annexure-2.

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/SEIAA 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 / SEIAA 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.

vii. All the recommendations made in the Charter on Corporate Responsibility for Environment Protection (CREP) for the plants shall be implemented.

X. Miscellaneous

i. The environmental clearance accorded shall be valid for a period of 10 years for the proposed project.

ii. 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.

iii. 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.

iv. The project proponent shall upload the status of compliance of the stipulated environment clearance conditions, including result of monitored data on their website and update the same on half-yearly basis.

v. The project proponent shall monitor the criteria pollutants level namely; PM10, SO2, 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.

vi. 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 /SEIAA at environment clearance portal.

vii. 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.

viii. The project proponent shall inform the Regional Office as well as the Ministry/SEIAA. 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.

a. The project authorities must strictly adhere to the stipulations made by the State Pollution Control Board and the State Government.

b. 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 / SEAC.

ix. 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)/SEIAA.

x. 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.

xi. The Ministry / SEIAA may revoke or suspend the clearance, if implementation of any of the above conditions is not satisfactory.

xii. The Ministry / SEIAA reserves the right to stipulate additional conditions if found necessary. The Company in a time bound manner shall implement these conditions.

xiii. The Regional Office of this Ministry / SEIAA shall monitor compliance of the stipulated conditions. The project authorities should extend full cooperation to the officer(s) of the Regional Office / SEIAA by furnishing the requisite data / information / monitoring reports.

xiv. 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.

xv. 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

List of Plot Nos. for the project of Shree Ramdoot Rollers Pvt. Ltd.

Khatian No:-1618				
SL No.	**Plot No.**	**Total area of the plot (in acre)**	**% in Total Plot**	**Share (in acre)**
1	3255	0.11	1.000	**0.11**
2	3256	0.12	1.000	**0.12**
3	3257	0.02	1.000	**0.02**
4	3258	0.02	1.000	**0.02**
5	3259	0.05	1.000	**0.05**
6	3260	0.05	1.000	**0.05**
7	3261	0.12	1.000	**0.12**
8	3262	0.36	1.000	**0.36**
9	3263	0.06	1.000	**0.06**
10	3264	0.06	1.000	**0.06**
11	3265	0.04	1.000	**0.04**
12	3266	0.06	1.000	**0.06**
13	3328	0.14	1.000	**0.14**
14	3329	0.17	1.000	**0.17**
15	3330	0.22	1.000	**0.22**
16	3331	0.08	1.000	**0.08**

17	3332	0.12	1.000	**0.12**
18	3333	0.06	1.000	**0.06**
19	3334	0.04	1.000	**0.04**
20	3335	0.05	1.000	**0.05**
21	3336	0.26	1.000	**0.26**
22	3339	0.02	1.000	**0.02**
23	3340	0.04	1.000	**0.04**
24	3341	0.03	1.000	**0.03**
25	3342	0.06	1.000	**0.06**
26	3343	0.04	0.500	**0.02**
27	3344	0.06	1.000	**0.06**
28	3345	0.04	1.000	**0.04**
29	3346	0.06	1.000	**0.06**
30	3347	0.03	1.000	**0.03**
31	3348	0.03	1.000	**0.03**
32	3349	0.05	1.000	**0.05**
33	3350	0.12	1.000	**0.12**
34	3351	0.06	1.000	**0.06**
35	3352	0.01	1.000	**0.01**
36	3353	0.08	1.000	**0.08**
37	3354	0.16	1.000	**0.16**
38	3355	0.02	1.000	**0.02**
39	3356	0.06	1.000	**0.06**
40	3357	0.23	1.000	**0.23**
41	3358	0.25	1.000	**0.25**
42	3359	0.04	1.000	**0.04**
43	3360	0.08	1.000	**0.08**
44	3361	0.05	1.000	**0.05**
45	3362	0.02	1.000	**0.02**
46	3363	0.07	1.000	**0.07**
47	3364	0.03	1.000	**0.03**
48	3365	0.03	1.000	**0.03**
49	3366	0.1	1.000	**0.10**
50	3367	0.04	1.000	**0.04**
51	3368	0.03	1.000	**0.03**
52	3369	0.02	1.000	**0.02**
53	3370	0.02	1.000	**0.02**
54	3371	0.05	1.000	**0.05**
55	3372	0.02	1.000	**0.02**
56	3373	0.09	1.000	**0.09**
57	3374	0.28	1.000	**0.28**
58	3375	0.48	1.000	**0.48**
59	3382	0.1	1.000	**0.10**
60	3383	0.63	1.000	**0.63**
61	3384	0.8	1.000	**0.80**
62	3385	0.11	1.000	**0.11**

63	3386	0.99	0.125	**0.12**
		Total (A)		**6.85**

Khatian No:-1618				
SL No.	**Plot No.**	**Total area of the plot(in acre)**	**% in Total Plot**	**Share (in acre)**
1	3327	0.42	0.167	0.07
		Total (B)		**0.07**

Khatian No:-1687				
SL No.	**Plot No.**	**Total area of the plot (in acre)**	**% in Total Plot**	**Share (in acre)**
1	3105	1.35	0.1250	**0.16**
2	3145	0.10	1.0000	**0.10**
3	3146	0.92	1.0000	**0.92**
4	3150	0.14	1.0000	**0.14**
5	3151	0.82	1.0000	**0.82**
6	3152	0.11	1.0000	**0.11**
7	3153	0.09	1.0000	**0.09**
8	3154	0.61	1.0000	**0.61**
9	3179	0.21	0.0314	**0.01**
10	3181	0.27	1.0000	**0.27**
11	3186	0.26	0.9999	**0.26**
12	3187	0.35	1.0000	**0.35**
13	3188	0.31	1.0000	**0.31**
14	3189	0.26	1.0000	**0.26**
15	3190	0.24	1.0000	**0.24**
16	3191	0.67	1.0000	**0.67**
17	3192	0.26	1.0000	**0.26**
18	3193	0.12	1.0000	**0.12**
19	3194	0.13	1.0000	**0.13**
20	3195	0.11	1.0000	**0.11**
21	3196	0.37	1.0000	**0.37**
22	3197	0.39	1.0000	**0.39**
23	3198	0.16	1.0000	**0.16**
24	3199	0.02	1.0000	**0.02**
25	3200	0.21	1.0000	**0.21**
26	3201	0.46	1.0000	**0.46**
27	3202	0.25	1.0000	**0.25**
28	3203	0.27	1.0000	**0.27**
29	3204	0.21	1.0000	**0.21**

30	3206	0.12	1.0000	**0.12**
31	3207	0.39	0.5000	**0.19**
32	3208	0.22	1.0000	**0.22**
33	3209	0.28	0.1071	**0.03**
34	3211	0.18	0.1666	**0.03**
35	3212	0.52	0.3846	**0.20**
36	3213	0.46	0.4402	**0.20**
37	3217	0.36	0.6667	**0.24**
38	3218	0.52	0.4038	**0.21**
39	3223	0.31	1.0000	**0.31**
40	3226	0.15	0.6222	**0.10**
41	3227	0.14	0.7142	**0.10**
42	3229	0.21	1.0000	**0.21**
43	3232	0.26	1.0000	**0.26**
44	3233	0.04	1.0000	**0.04**
45	3234	0.08	1.0000	**0.08**
46	3235	0.08	1.0000	**0.08**
47	3237	0.08	1.0000	**0.08**
48	3238	0.05	1.0000	**0.05**
49	3239	0.11	1.0000	**0.11**
50	3240	0.02	1.0000	**0.02**
51	3242	0.12	1.0000	**0.12**
52	3243	0.01	1.0000	**0.01**
53	3244	0.26	1.0000	**0.26**
54	3245	0.27	1.0000	**0.27**
55	3246	0.29	1.0000	**0.29**
56	3247	0.06	1.0000	**0.06**
57	3248	0.05	1.0000	**0.05**
58	3249	0.70	1.0000	**0.70**
59	3250	0.14	1.0000	**0.14**
60	3251	0.01	1.0000	**0.01**
61	3252	1.00	1.0000	**1.00**
62	3253	0.04	1.0000	**0.04**
63	3254	0.02	1.0000	**0.02**
64	3267	0.18	1.0000	**0.18**
65	3268	0.10	1.0000	**0.10**
66	3269	0.06	1.0000	**0.06**
67	3270	0.10	1.0000	**0.10**
68	3271	0.36	0.0833	**0.03**
69	3292	0.27	0.0500	**0.01**
70	3376	0.08	1.0000	**0.08**
71	3377	0.08	1.0000	**0.08**
72	3378	0.02	1.0000	**0.02**
73	3379	0.01	1.0000	**0.01**
74	3380	0.01	1.0000	**0.01**
75	3381	0.21	1.0000	**0.21**

76	3386	0.99	0.3750	**0.37**
		Total (C)		**15.39**

TOTAL LAND (A+B+C) = 22.31 Acres

Annexure-2

NEED BASED ACTIVITIES FOR LOCAL PEOPLE FOR EXPANSION PROJECT

(This will be in addition to the activities for existing project for which EC was obtained vide no. EN/2430/T-II-1/166/2007 dated 12.11.2008)

S.NO.	ACTIVITY	TIME FRAME	AMOUNT INVOLVED (INR)
1	Provision of solar panel lighting around common areas of road up to approx. 1.5 km	Within 12 months	6,00,000
2	Provision of Medical check up and Eye Testing along with Cataract operation and providing spectacles free of cost	Within 6-9 months	8,00,000
3	Construction of separate toilets for boys & girls in nearby schools	Within 12-18 months	6,00,000
4	Providing free computers to the nearby schools	within 12-18 months	2,60,000
5	Provision of RO treatment facility with cooling water supply in the nearby schools	within 12-18 months	2,00,000
6	Construction of approach road of around 1400 meter	Within 6-9 months	55,00,000
7	Providing medicine and supplements to nearby Goshalas	With 3-6 months	2,50,000

II. MISCELLANEOUS

(1) Discussion regarding compliance of W.P.A. 11523 of 2022 dated 30.06.2022 of Calcutta High Court.

Background:

M/s. Shree Ramdoot Rollers Pvt. Ltd. being the project proponent made an online application vide proposal no. SIA/WB/IND/31555/2019 dated 26.02.2022 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. 3(a) Metallurgical industries (ferrous & non ferrous) under Category "B1" of EIA Notification 2006.

The application was being processed from time to time based on their submittals. In 63rd SEIAA meeting held on 14.06.2022, the application for EC was deferred because the application was incomplete in nature. One of the reasons for such deferment was the engagement of environmental consultant without NABET accreditation as consultant for the project.

SEIAA verified the updated list published on 09.05.2022 of accredited consultant organization vide url:

https://nabet.qci.org.in/status-amp-register and found that the consulting organization namely Pacific Scientific Consultancy Private Limited is not listed therein. Therefore, the PP was requested to engage a NABET Accredited Environmental Consultant Organization for the project.

Meanwhile, Hon'ble Calcutta High Court issued an order vide W.P.A. 11523 of 2022 dated 30.06.2022 wherein M/s. Pacific Scientific Consultancy Pvt. Ltd. & Ors, represented as petitioner and The State of West Bengal & Ors. as respondent.

The court disposed off the matter with the directive to consider the petitioner's application afresh and come to a reasoned order within a period of six weeks from the date of communication of the court order.

Observation:

The matter was discussed in detail by SEIAA in the presence of the Sr. Law Officer, Dept. of Environment, Govt. of WB. In the SEIAA meeting dated 14.06.2022 it was decided that 'henceforth environmental consultant without NABET accreditation shall not be allowed to act as consultant for any project being submitted for EC'. Though SEIAA has also accepted the environmental consultants who had obtained specific stay orders from different courts.

As mentioned above, SEIAA is bound to comply with the Notifications and Govt. Orders issued by MoEF&CC, GoI from time to time. Regarding engagement of environmental consultant for any project, NABET accreditation is mandatory as mentioned both in the Office Memorandum vide F. No. J-11013/77/2004-IA II (I) dated 28.06.2010 and Notification No. S.O.648(E) dated 03.03.2016 and PARIVESH portal. It is being observed that the consulting organizations without NABET accreditation are engaged by the project proponents time and again and they produce stay orders from the different courts in order to accept them as consultants. SEIAA find it difficult to entertain such agencies without NABET accreditation as there is no specific time period mentioned in such stay orders which are presented before the SEIAA, WB.

The environmental consultant organization has a critical role in preparation of Environmental Impact Assessment Report & Environment Management Plan. NABET accreditation checks and ensures the quality of such organizations. The environmental parameters and correct prediction of impacts play a crucial role in safeguarding the environment and public at large.

Hence, in the interest of public and environmental cause it was decided to file an Appeal against the aforesaid order of Hon'ble Calcutta High Court regarding quashing the impugned decision of SEIAA, WB as stated in the Minutes of the Meeting dated 14.06.2022.

A senior advocate may please be engaged to file this appeal and it is further suggested that MoEF&CC may be included as respondent in the matter.

(2) Discussion on draft DSRs of Uttar Dinajpur and Murshidabad.

The DSRs of Uttar Dinajpur and Murshidabad are approved.