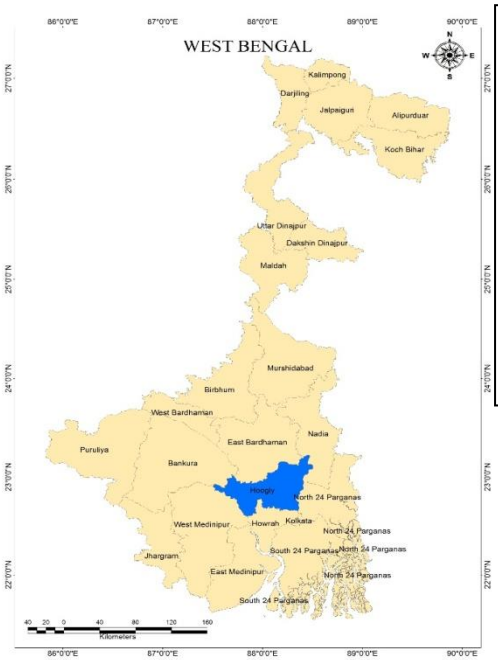
DISTRICT SURVEY REPORT
OF
HOOGHLY DISTRICT

(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 DelhiDated 25th of July 2018 and Enforcement and Monitoring Guidelines for Sand Mining (EMGSM) January 2020, Issued by Ministry of Environment, Forest and Climate Change (MoEF&CC) July, 2022



SEIAA Approval Date:

21st February 2023

(As published in the Minutes of 88th Meeting of SEIAA under Miscellaneous Section, Point No.1)

November, 2022

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

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

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

m^2 - Square meter

Mcum – Million Cubic Meter

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

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

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

Replenishment: 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

Hooghly district is one of the districts of the state of West Bengal in India, which is named after the Hooghly River. The headquarter of the district is at Chinsura (Chuchura). There are four sub-division in the district namely Chinsura Sadar, Chandannagar, Serampore and Arambag. There are 23 Police stations, 18 development blocks, 12 municipalities and 210 grampanchayets in this district. Other than municipality areas, each sub division contains community development blocks, which in turn are divided into rural areas and census towns. In total there are 40 urban units, 12 municipalities and 28 census towns.

The boundary of the Hooghly district is covered by the Hooghly River (sharing with Nadia in the East & North 24 Parganas in the South – East) in the East, Bardhaman in the North. Howrah in the South, Paschim Medinipore in the West, Bankura in the North-West.

Hooghly has a tropical climate. The annual mean temperature is 26.8^{o}C, although monthly mean temperatures range from 16^{o}C to 33^{o}C and maximum temperatures in Hooghly often exceed 38^{o}C. The main seasonal influence upon the climate is the monsoon. Maximum rainfall occurs during the monsoon in August and the average annual total is above 1,300 mm. Moderate northwesterly to northeasterly winds prevails for most of the year with a high frequency of calms. Summer is dominated by strong southwesterly monsoon winds. Winters are comfortable with temperatures lying between 11^{o}C to 17^{o}C.The average wind speed in Hooghly is 2.6 m/s with the maximum wind speed of around 11 m/s.

The district is rich in natural drainage lines. The total length of the drainage in Hooghly district is 461.83 km. Damodar, Dwarakeswar, Hooghly, Mundeswari are the main rivers of Hooghly district. The others tributaries are Sankari, Ghea, Kunti, Dankuni–khal and Baidyabati khal etc.

Hooghly district doesn't count to be a mineral rich district of the state, however sand mining and brick earth mining takes a vital role in the economic development of the district. Deposit of coarse to fine graded yellow sand, suitable for construction purpose, can be seen in the dry riverbed of Dwarkeshwar and Mundeshwari river.

Potential minor mineral blocks of Sand and other in-situ minerals have been identified and listed in this District Survey Report. Restriction zones are defined as per the EMGSM guidelines 2020. The total potential river bed deposit for the district comes to about 1.75 Mcum.

The district is generating considerable revenue from mining of minor minerals such as riverbed sand deposits. Revenue generated in the district of Hooghly from minor minerals during the period of 2017 to 2021 is Rs. 3.55 crores.

1 Preface

The need for District Survey Report (DSR) have been necessitated by Ministry of Environment, Forest and Climate Change (MoEF & CC) vide there Notification No. 125 (Extraordinary, Part II Section 3, Sub-section ii), S.O. 141 (E), dated 15th January 2016. The notification was addressed to bring certain amendments with respect to the EIA notification 2006 and in order to have a better control over the legislation. District level committee's 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 DSR has been specified. Monitoring Guidelines for Sand Mining (EMGSM) January 2020, Issued by MoEF & CC is prepared in consideration of various orders/directions issued by Hon'ble NGT in matters pertaining to illegal sand mining and also based on the reports submitted by expert committees and investigation teams. This DSR has been prepared in conformity with the S O 141 (E), S O 3611 (E) and other sand mining guidelines published by MoEF & CC time to time as well as the requirement specified in WBMMCR, 2016.

The purpose of DSR is to identify the mineral potential areas where mining can be allowed; and also, to distinguish areas where mining will not be allowed due to proximity to infrastructural structures and installations, areas of erosion, areas of environmental sensitivities etc.

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

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

The objectives of the District Survey Report are as follows:

1. To identify and quantify minor mineral resources for its optimal utilization.
2. To regulate sand and gravel mining, identification of site-specific end-use consumers and reduction in demand and supply gaps.
3. To facilitate use information technology (IT) for surveillance of the sand mining at each step.
4. To enable environmental clearance for cluster of sand and gravel mines.
5. To restrict illegal mining.
6. To reduce occurrences 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

2.1.1 Evolution of the Environmental Regulatory Framework:

Ministry of Environment, Forest and Climate Change (MoE &CC) has published several notifications time to time to formulate and implement the District Survey Report (DSR) for every district. Statutory Framework and its legal aspect with respect to DSR are tabulated in Table 2.1.

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

Year	Particulars
1994	The Ministry of Environment, Forest and 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 has issued EIA Notification SO 1533 (E), dated 14th September 2006, made mandatory to obtain environmental clearance for both Major and 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) for River bed mining and other minor minerals.
2016	The 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.

Year	Particulars
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 and 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.

2.1.2 Other Guidelines for Sand Mining in India:

The West Bengal Minor Minerals Concession Rules (WBMMCR), 2016

1) (a) No person shall undertake mining operation in any area prohibited by the 'Stale 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 (SSMMG), 2016 by MoEF&CC.

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

a) Parts of the river reach that experience deposition or aggradation shall be identified first. The Lease holder/ Environmental Clearance holder may be allowed to extract the sand and gravel deposit in these locations to manage aggradation problem.
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.

h) 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.

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.

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

j) 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.

k) 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.

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.

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

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

The Ministry of Environment Forest and 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 aggradation shall be identified. The Leaseholder/ Environmental Clearance holder may be allowed to extract the sand and gravel deposit in these locations to manage aggradation problem.
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.

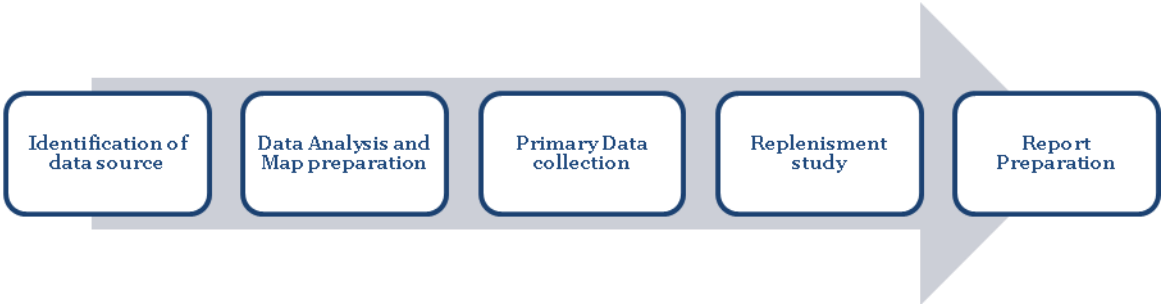


Figure 2.1: Steps followed in preparation of DSR

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

Data Analysis and Map preparation: Dataset which are captured during the report preparation, are gone through detail analysis work. District Survey Report involves the analytical implication of the captured dataset to prepare relevant maps.

Methodology adopted for preparation of relevant maps is explained below.

Land Use and Land Cover Map: Land Use and Land Cover classification is a complex process and requires consideration of many factors. The major steps of image classification may include determination of a suitable classification system via Visual Image Interpretation, selection of training samples, Satellite image (FCC-False Colour Composition) 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, Colour etc.) training set of the pixel has been taken. Pictorial descriptions of Land Use classification are explained in Figure 2.2.

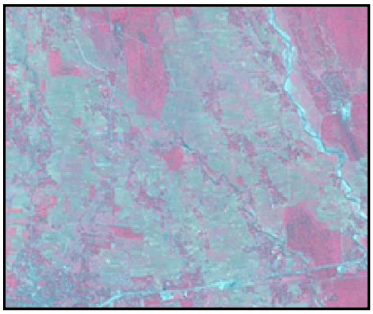
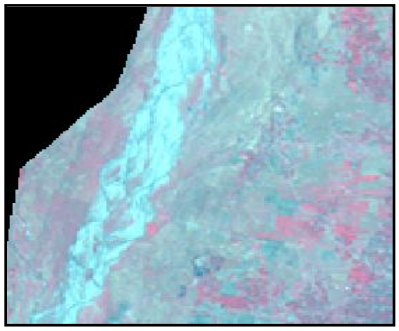
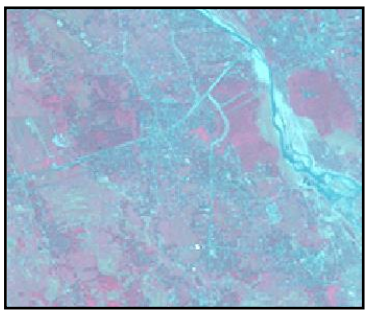
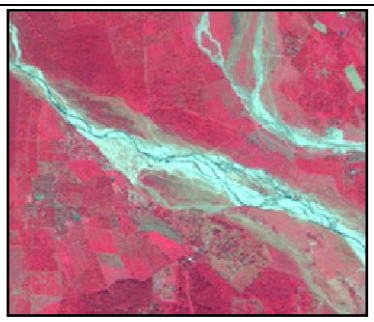
	
Agricultural Land - Based on their Geometrical shape, Red and Pink colour tone, Agricultural Land has been identified.	**Vegetation Covered Area** - Based on their continuous Red colour tone, Vegetation Covered Area has been identified.
	
Agricultural Fallow Land - Based on their Geometrical shape, Light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

Figure 2.2: Pictorial description of Land Use Classification methods (Source: ISRO RESOURCE Sat 2 LISS III Sensor, November 2020)

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 Composition) via Visual Image Interpretation and then digitisation has been taken into the consideration to prepare map including all the Geomorphological features according to their location. Pictorial descriptions of Geomorphological unit's classification are explained in Figure 2.3.

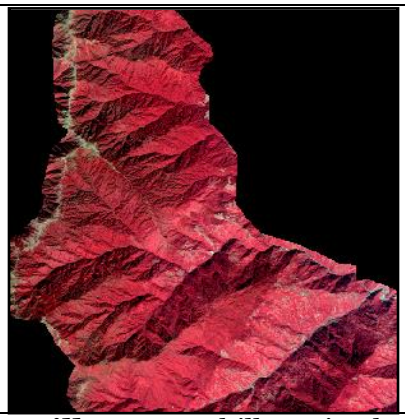
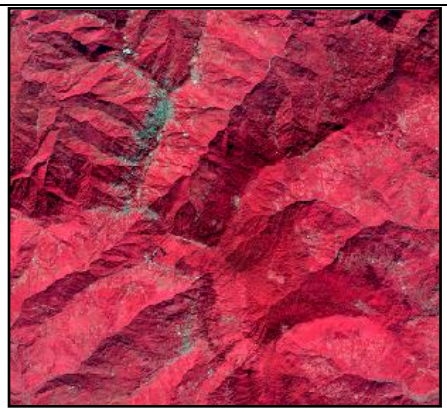
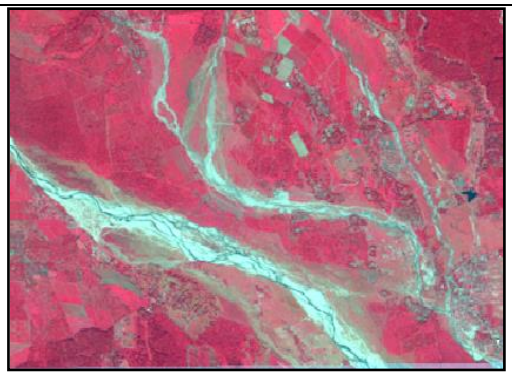
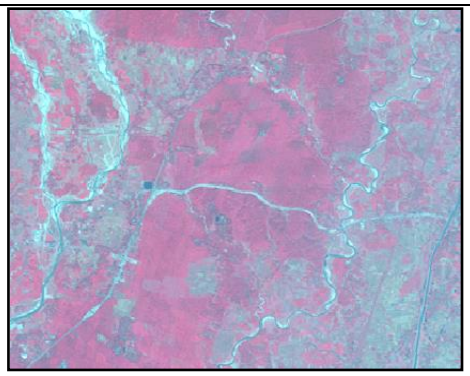
	
Upper Hills – Upper hilly region has been identified based on their high elevation and sharp edges of the land.	**Lower Hills** – Lower hilly has been identified based on their elevation and sharp edges which is comparatively less in height than upper hilly region.
	
Alluvial Fan- A fan-based deposition formed by stream where the velocity is abruptly decreased. In Satellite Imagery the flat area has been identified as Alluvial Fan just below the Lower hilly region.	**Alluvial Plain**- Alluvial plain is a largely flat landform created by the deposition of sediment over a long period. In satellite Imagery the flat land just below the Alluvial Fan has been identified as Alluvial Plain.

Figure 2.3: Pictorial description of Geomorphological Units Classification methods (Source: ISRO RESOURCE Sat 2 LISS III Sensor, November 2020)

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

Block Map/Transportation Map/Drainage Map:

- Raw Data collected from **National Informatics Centre (NIC Website) during 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 and 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 and National Park name has been filled in attribute table of the Layers

Final layout has been prepared by giving scale, legend, north arrow, etc.

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

Replenishment study: One of the principal causes of environmental impacts from in-stream mining is the removal of more sediment than the system can replenish. It is therefore need for replenishment study for riverbed sand in order to nullify the adverse impacts arising due to excess sand extraction. The annual rate of replenishment carried out on every river of the district to have proper assessment of the sand reserve for mining purposes.

Physical survey has been carried out by GPS/DGPS/ Total Station to define the topography, contours and offsets of the riverbed. The surveys clearly depict the important

attributes of the stretch of the river and its nearby important civil and other feature of importance. This information will provide the eligible spatial area for mining.

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

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, etc.
10. Sand can light a path by filling mason jars with sand and tea light which is another inexpensive way to make a walkway glow.
11. Sand helps to improve resistance (and thus traffic safety) in icy or snowy conditions.
12. Sand is needed 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

Hooghly district is one of the district of the state of West Bengal in India. It can alternatively spelt Hoogli or Hugli. The district is named after the Hooghly River. The headquarter of the district is at Chinsura (Chuchura). There are four sub-division in the district namely Chinsura Sadar, Chandannagar, Serampore and Arambag. The great rive Ganga flows through this district and enhances its importance. The total geographical area of the district is 3149 Km. (*https://hooghly.nic.in/*)**.** A Location map of Hooghly district is furnished below.

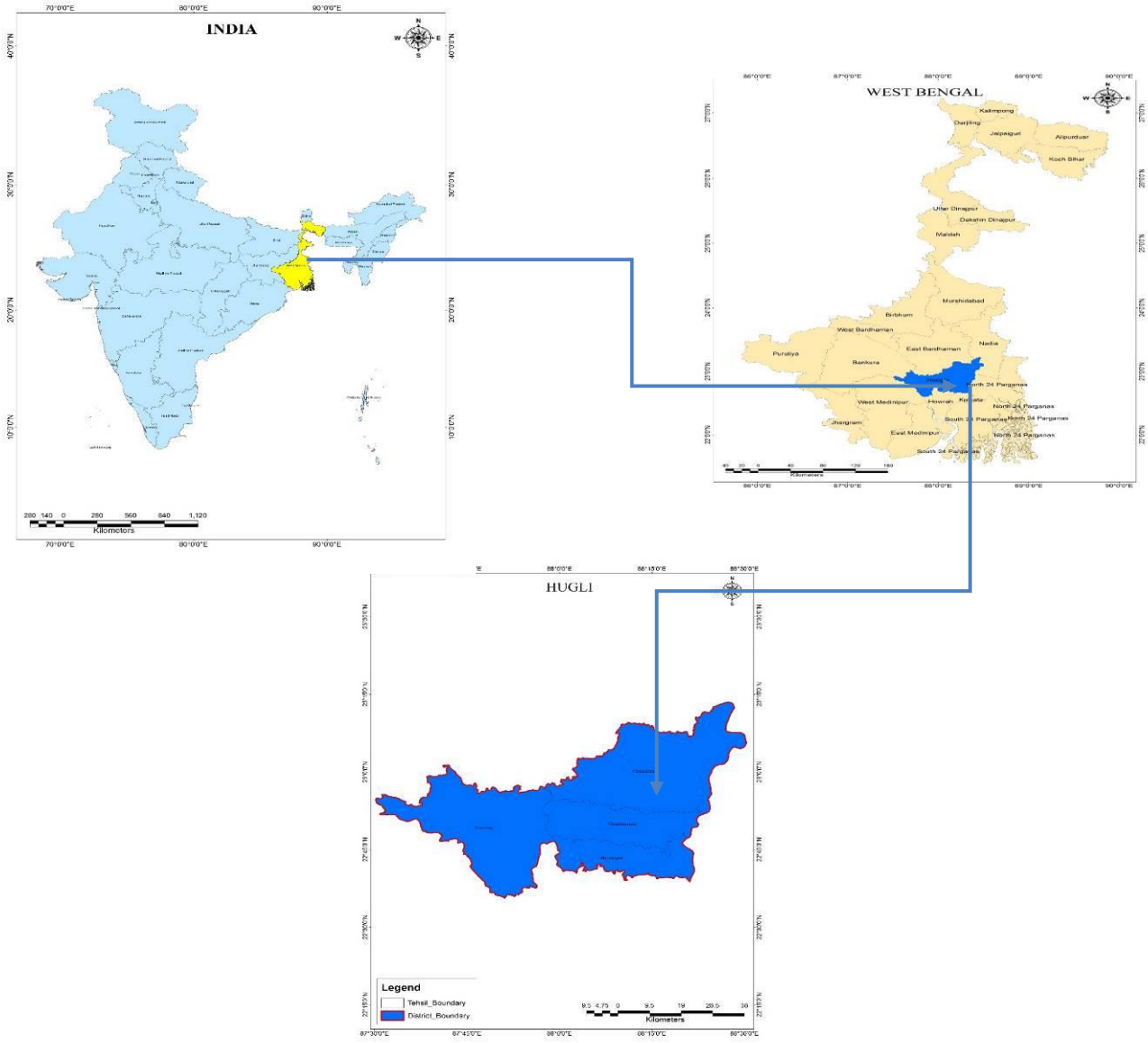


Figure 3.1: Location Map of Hooghly
(Source: National Informatics Centre and ESRI Base Map, September 2020)

The district is a rich zone both in agriculture and industry in West Bengal. There are 23 Police stations, 18 development blocks, 12 municipalities and 210 grampanchayets in this district. Other than municipality areas, each sub division contains community development blocks, which in turn are divided into rural areas and census towns. In total there are 40 urban units, 12 municipalities and 28 census towns. There are three Lok-sobha Constituencies in Hooghly district, namely Arambagh (with one assembly segment in Paschsim Medinipur), Hooghly, Serampur (with two assembly segments in Howrah district). There are eighteen Assembly Constituencies in Hooghly district, namely Uttarpara, Serampur, Champdani, Singur, Chandannagar, Chuchura, Balagarh, Pandua, Saptagram, Chanditala, Jangipara, Haripal, Dhaniakhali, Tarakeswar, Pursurah, Arambagh, Goghat, Khanakul.

Location of the District

Latitude:	North :	23° 01′ 20′′ N
	South :	22° 39′ 32′′ N
Longitude:	East :	88° 30′ 15′′ E
	West :	87° 30′ 20′′ E

This district falls under Survey of India Topo Sheet No. 73N/9, 73N/13, 73N/14, 73A/4, 73A/8, 73B/1, 73B/2, 73B/5 and 73B/6.

Boundary:-

The boundary of the Hooghly district is covered by the Hooghly river (sharing with Nadia in the East & North 24 Parganas in the South – East) in the East, Bardhaman in the North. Howrah in the South, Paschim Medinipore in the West, Bankura in the North-West.

Nature of Land:-

The district is a completely flat land with no place having more than an elevation of 200 meters. Most of the land of the district is alluvial type of soil due to well distribution of river system.

Administrative Units:-

The district comprises four subdivisions: **Chinsurah, Chandannagore, Srirampore and Arambagh.**

- No. of Blocks: 18
- No. of Panchayat Samities: 18
- No. of Municipalities: 11
- District Head Quarter: Chinsura
- Population with density of population: 5041976 and 1601 per sq. km

The district comprises four subdivisions:

i. Chinsurah (Hooghly Sadar),
ii. Chandannagar,
iii. Serampore
iv. Arambagh.

- **Chinsura sub division** consists of two municipalities (Hooghly-Chuchura and Bansberia) and five community development block: Balagarh, Chinsura-Magra, Dhaniakhali, Pandua and Polba-Dadpur.
  - Balagarh community development block consists of rural area with 13 grampanchayets and one census town : Badhagachhi.
  - Chinsurah-Magra community development block consist of rural area with 10 gram panchayets and 9 census town: Kodalia, Raghunathpur, Madhusudanpur, Amodghata, Sankhanagar, Chakbansberia, Kulihanda, Simla and Dharampur.
  - Dhaniakhali community development block consists of rural areas only with 18 grampanchayats.
  - Pandua community development block consists of rural areas with 16 grampanchayats and one census town : Pandua.
  - Polba-Dadpur community development block consists of rural areas only with 12 grampanchayats.

- **Chandannagar Sub-Division** consists of Chandannagar Municipal Corporation and three municipalities (Bhadreswar, Champdani and Tarakeswar) and three community development blocks: Haripal,Singur and Tarakeswar.
  - Haripal community development block consists of rural areas only with 15 grampanchayat.
  - Singur community development block consists of rural areas with 16 grampanchayats and one census town namely Singur.
  - Tarakeswar community development block consists of rural areas only with 10 gram panchayats.

- **Serampore Sub-Division** consists of five municipalities (Serampore, Uttarpara Kotrung, Konnagar, Rishra and Baidyabati) and four community development blocks: Chanditala-I, Chanditala-2, Jangipara and Serampore –Uttarpara.
  - Chanditala-I community development block consists of rural areas only with 9 gram panchayats.

- Chanditala-2 community development block consists of rural areas only with 12 gram panchayats and 10 census towns: Purba Tajpur, Khar Sarai, Begampur, Chikrand, Payaragachi, Barijhati, Garalgachha and Krishnapur.
- Jangipara community development block consists of rural areas only with 10 gram panchayats.

Serampur-Uttarpara community development block consists of rural areas only with 6 gram panchayas and 6 census town: Raghunathpur, Dakshinrajyadharpur, Bamunari, Rishra, Nabagram and Kanaipur.

- **Arambagh Sub-Division** consists of Arambag Municipality and six community development block : Arambag, Khanakul-I, Khanakul-2, Goghat-I, Goghat-2 and Pursura
  - Arambag community development block consists of rural areas only with 15 gram panchayats.
  - Khanakul-I community development block consists of rural areas only with 13 gram panchayats.
  - Khanakul-I community development block consists of rural areas only with 13 gram panchayats.
  - Khanakul-2 community development block consists of rural areas only with 11 gram panchayats.
  - Goghat-I community development block consists of rural areas only with 7 gram panchayats.
  - Goghat-2 community development block consists of rural areas only with 9 gram panchayats.
  - Pursurah community development block consists of rural areas only with 8 gram panchayats.

3.2 Climate Condition

Hooghly has a tropical savanna climate. The annual mean temperature is 26.80C, although monthly mean temperatures range from 16°C to 33°C and maximum temperatures in Hooghly often exceed 380C. The main seasonal influence upon the climate is the monsoon. Maximum rainfall occurs during the monsoon in August and the average annual total is above 1,500mm. Moderate northwesterly to northeasterly winds prevails for most of the year with a high frequency of calms. Summer is dominated by strong southwesterly monsoon winds. Winters are comfortable with temperatures lying between 11°C to 17°C.The average wind speed in Hooghly is 2.6 m/s with the maximum wind speed of around 11 m/s.

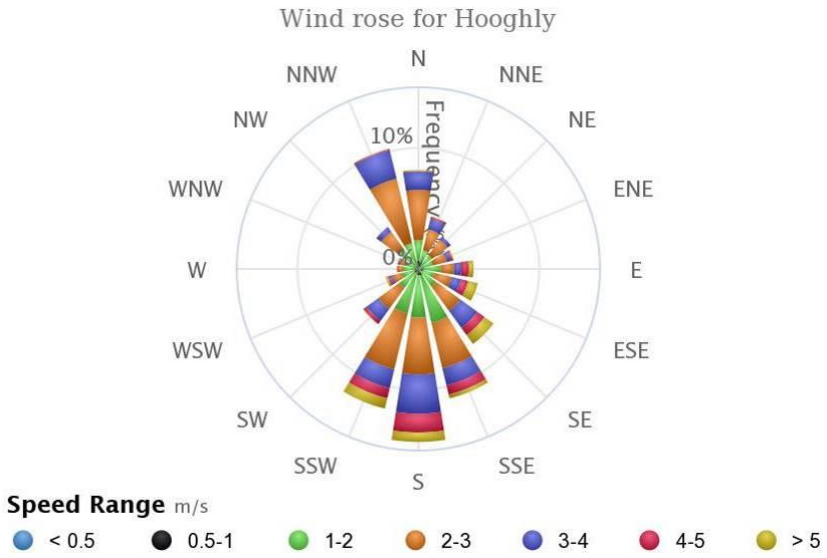


Figure 3.2: Wind Speed and Direction Distribution In Hooghly District

(Source: www.indianclimate.com*) Access On* September 2022

3.2.1 Temperature

The average Temperature of Hooghly is around 26°C although it vary from around 16°C during Winter (January) to 30°C during the Monsoon (June). The hottest month of the year is June with temperature varies from 25.0°C to 37.1°C. The coolest month is of the year is January, with temperature varies from 8.4°C to 26.8°C.

Table 3.1: Month wise temperature data of Hooghly district

Parameter	Minimum	Maximum	Average
January	8.4	26.8	16.3
February	14.1	32.8	22.8
March	17.3	34.9	27.7
April	22.2	35.6	28.7
May	23.4	36.1	29.8
June	25.0	37.1	30.1
July	26.0	35.4	28.9
August	26.1	33.6	29.1
September	25.0	35.0	29.0
October	19.6	35.4	27.1
November	16.6	32.4	23.6
December	10.3	27.7	18.6

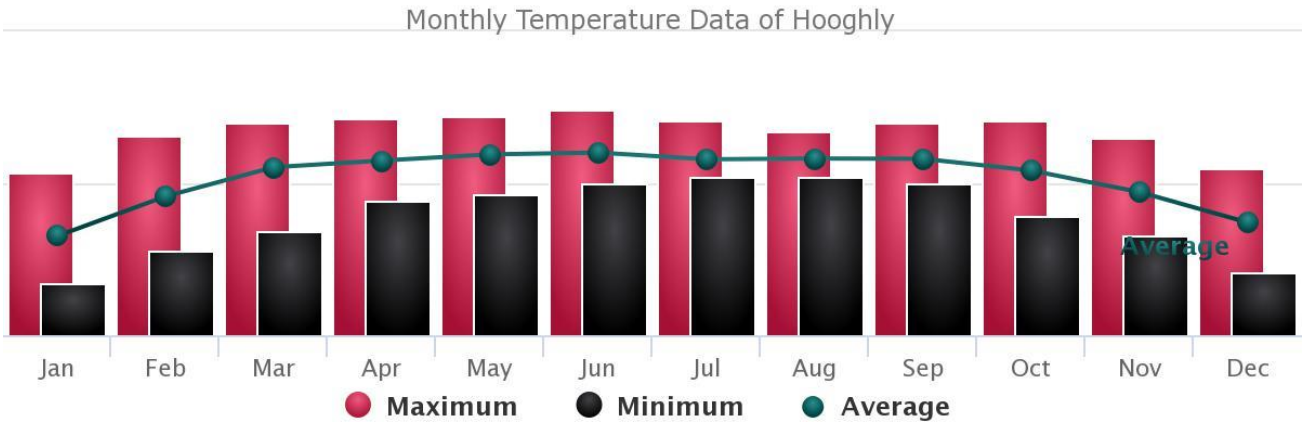


Figure 3.3: Graphical Representation of Monthly Temperature variation in Hooghly District

Source - https://www.indianclimate.com/ambient-temperature *Access On* September 2022

3.3 Rainfall and Humidity

Table 3.2: Month wise rainfal data (in mm) of Hooghly district

YEAR	2017	2018	2019	2020	2021	Average
JAN	0	0	0	29.1	0	5.82
FEB	0	0.3	86.4	2.3	1.1	18.02
MAR	23.9	5.7	32.4	63.1	0	25.02
APR	11.8	70.4	71.1	50.8	22.6	45.34
MAY	115.2	54.7	109.8	231.2	273.3	156.84
JUN	186.6	140.3	110.3	272.4	322.4	206.4
JUL	434.6	339.3	166.6	279.3	335	310.96
AUG	227	195	254.3	317.6	265.6	251.9
SEPT	180.8	148.7	206.3	93.1	318.3	189.44
OCT	212.4	20.1	131.7	101.1	151.9	123.44
NOV	25.2	0.9	59.8	1.7	24.5	22.42
DEC	19.9	22.7	17.5	0	140.6	40.14
Total	1437.4	998.1	1246.2	1441.7	1855.3	1395.74

https://hydro.imd.gov.in/hydrometweb/(S(jlwtu355zonzosn2igpju2mr))/DistrictRaifall.aspx
Access On September 2022

The average wind speed in Hooghly is 2.6 m/s with the maximum wind speed of around 11 m/s. The average ambient temperature remains 26°C, varies from 8.4°C to 37.1°C. The average relative humidity remains around 77%, varies from 21.2% to 98.6%. The station pressure varies from 1006 hPa to 990 hPa, averaged around 1019 hPa. Windrose of Hooghly shows that predominantly wind blow from the S - about 14.3% of all wind directions.

3.4 Topography and Terrain

The district is a completely flat land with no place having more than an elevation of 200 metre. According to genesis and evolution of landforms, the district can broadly have divided into two divisions i.e.;

- Old alluvial plains to the west of river Dwarakeswar.
- The monotonous level alluvial plains in the east which can be further divided into:-
    a. Natural Levee.
    b. Meander floor plain.
    c. Alluvial Plain.

The district is divided into three soil groups viz. (1) Gangetic Alluvium, (2) Alluvium deposit in Damodar and Dwarkeshwar Valley and (3) Red Soil Region.

The Hooghly, the Dwarkeshwar, the Damodar and the Rupnarayan are the main rivers of the district.

Source - *http://dcmsme.gov.in/old/dips/HOOGHLY_wb.pdf Access On* September 2022

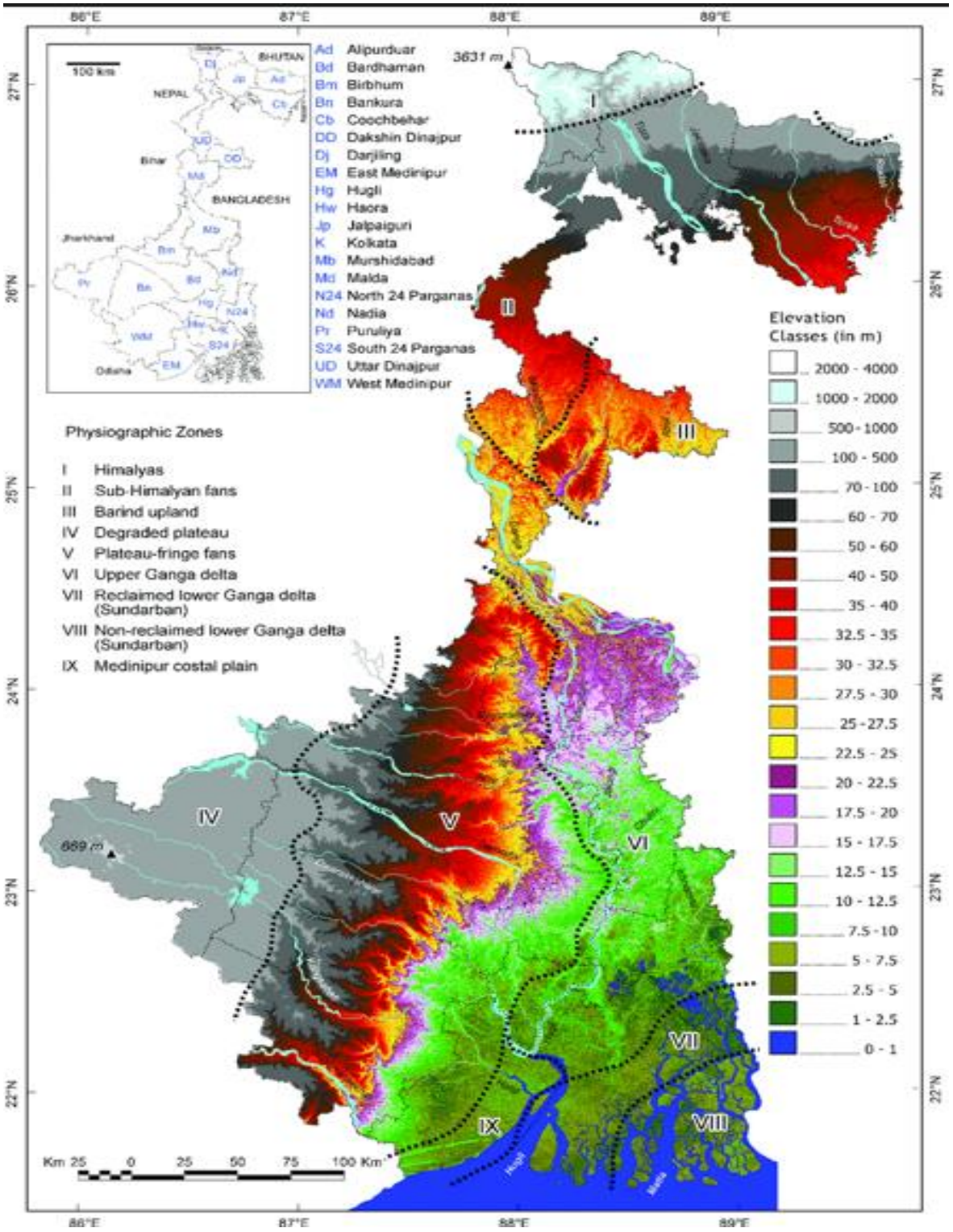


Figure 3.2: Physiographic map of West Bengal

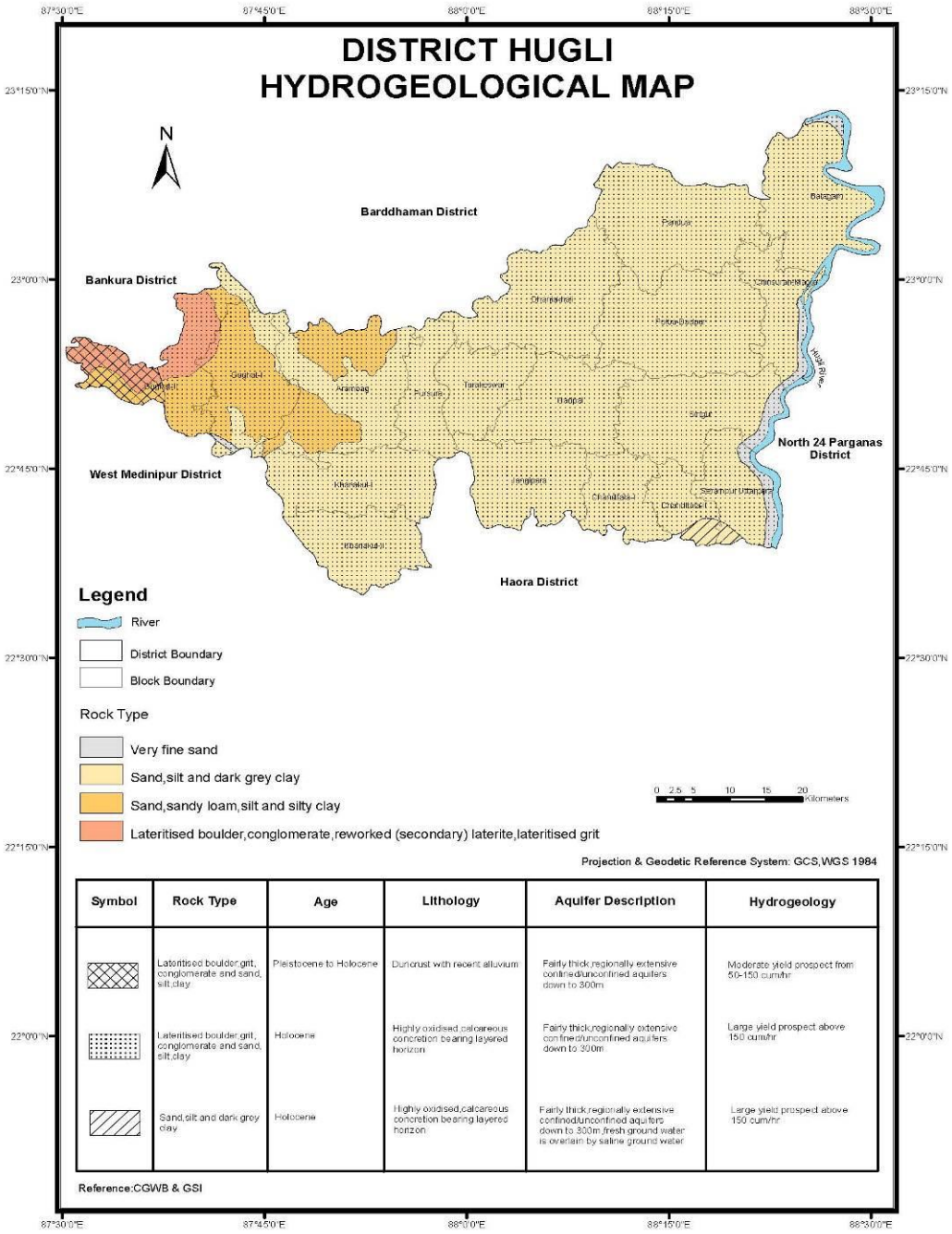
(Cartosat-1, Bhuvan India, September 2020)

3.5 Water courses and Hydrology

In Hooghly District the alluvium in the area forms a rich repository of ground water. Each aquifer system consists of two to three aquifers separated by thin clay layers, which are not regionally extensive. The material of the shallow aquifer is fine to medium grained sands in the upper part and coarser in the lower part. Generally the first aquifer is restricted within 60 to 80mbgl depth. However at some places like (Tarakeswar block) and Bhadreswar (Serampore-Uttarpara block) the 1st aquifer has been noticed to continue down to 127 mbgl and 113 mbgl depth respectively and further continuing downward.

Generally the second aquifer system starts below 90 mbgl. However in Dhaniakhali block at Uliara and Chandpur the second aquifer seems to start from 30m depth and continues at places down to a depth as high as 212 mbgl and further below. At Arambagh where exploratory well was constructed tapping only one aquifer system in the depth range of 32 to 65.5 mbgl, a yield of 50.45 m3/ hr at a draw down of only 5.12m was obtained.

At Arambagh where exploratory was constructed tapping only one aquifer system in the depth range of 32 to 65.5 mbgl, a yield of 50.45m^3 / hr at a drawdown of only 5.12m was obtained and the value of transmissivity was determined to be 4128.22m^2 /day. In Pursurah block, which is adjoining to Arambagh block a yield of 39m^3/hr was obtained for a drawdown of 2.65 m from an exploratory well constructed tapping the zone in the depth range of 85-94 mbgl and 124-148 mbgl at Srirampur and the value of trasmissivity was determined to be 1687.95m2/day. At Guptipara in Balagarh block it has been observed that shallow exploratory well tapping the zone in the depth range of 48-60 mbgl gives an yield of 36m3 /hr for a drawdown of 1.97m and the value of transmissivity was determined to be 1860m2 /day. The deep exploratory well constructed tapping the zone between 118-130 mbgl and 166-175 mbgl has yielded, 46m3/ hr for a drawdown of 1.97 m and the value of transmissivity ranges between 2443 to 2791m2/day. The value of storage co-efficient at Srirampur is 4.16X10^{-1}, which indicated that the tapped aquifer is under unconfined condition. At Guptipara the values of storage confident for shallow exploratory well and that of deep exploratory well 7.27X10_. and 3.17X10_. respectively, indicating that both the aquifers are under confined condition. At Natagarh the values of storage co-efficient for shallow exploratory well and that of deep exploratory well are 2.07X10-3 and 1.87X10-5 respectively,indicating that the shallow aquifer is likely to be under semi-confined, while the deeper aquifer is under confined condition.



Symbol	Rock Type	Age	Lithology	Aquifer Description	Hydrogeology
	Lateritised boulder,grit, conglomerate and sand, silt,clay	Pleistocene to Holocene	Duricrust with recent alluvium	Fairly thick,regionally extensive confined/unconfined aquifers down to 300m	Moderate yield prospect from 50-150 cum/hr
	Lateritised boulder,grit, conglomerate and sand, silt,clay	Holocene	Highly oxidised,calcareous concretion bearing layered horizon	Fairly thick,regionally extensive confined/unconfined aquifers down to 300m	Large yield prospect above 150 cum/hr
	Sand,silt and dark grey clay	Holocene	Highly oxidised,calcareous concretion bearing layered horizon	Fairly thick,regionally extensive confined/unconfined aquifers down to 300m,fresh ground water is overlain by saline grounds water	Large yield prospect above 150 cum/hr

Figure 3.3: Hydrogeological map of Hooghly district

(Source: State Water Investigation Directorate, Govt. of West Bengal, September 2020)

3.6 Ground water Resources

The dynamic ground water resources of Hugli district has been estimated jointly by CGWB and SWID, Govt. of West Bengal, following the norms laid down by GEC 1997 methodology and projected as on 31.03.04.
The reconciled figures are as under:

- Total Ground Water Resource : 160982 ham
- Net Annual Ground Water Availability : 152640 ham
- Existing Ground Water Draft for All Uses 59093 ham
  For Irrigation : 53047 ham
- For Domestic & Industrial Water Supply : 60468944 ham
- Stage of Ground Water Development : 38.71%
- Allocation for Domestic & Industrial Water Supply Requirement Upto Next 25 yrs. : 8419 ham
- Net Ground Water Available for future irrigation development : 91175 ham
- Categorization of blocks : 10 no. of blocks are categorized under 'Safe', 2 blocks are under 'Semi-critical' category

Source – CGWB Report

3.7 Drainage System

The district is rich in natural drainage lines. The total length of the drainage in Hooghly district is 461.83 km. Damodar, Dwarakeswar, Hooghly, Mundeswari and Saraswati are the main rivers of Hooghly district. The others tributaries are Sankari, Ghea, Kunti, Dankuni–khal and Baidyabati khal etc. At Tribeni near Bandel in Hooghly District in the Indian state of West Bengal the Bhagirathi branched off into three streams. The Saraswati flowed south-west beyond Saptagram, the Jamuna (this is distinct from the river of same name in northern India and several streams of the same name in eastern Bengal) flowed south-east, past the northern boundary of present-day town of Kalyani and the Bhagirathi proper flowing through the present Hooghly channel to Kolkata and then through Adi Ganga, past Kalighat, to the sea.

- **Damodar River-**Damodar River, river in northeastern India, rising with its many tributaries, notably the Bokaro and Konar, in the Chota Nagpur plateau of south-central Bihar state. It follows a generally eastward course for 368 miles (592 km) through West Bengal to join the Hugli (Hooghly) River southwest of Kolkata (Calcutta). Damodar River was earlier known as the "River of Sorrows"as it used to flood many areas of Bardhaman, Hooghly, Howrah and Medinipur districts. Even now the floods sometimes

affect the lower Damodar Valley, but the havoc it wreaked in earlier years is now a matter of history.

- **Dwarkeswar River-**The river originates near Madhabpur in Purulia district and enters Bankura district near Chhatna. It enters the southeastern tip of East Bardhaman District. It then passes through Hooghly District.The Silai joins it near Ghatal and the two together are known as Rupnarayan River, which flows into the Hooghly River near Gadiara in Howrah District.Dwarakeswar River has much sedimentation from low water (any season). In rainy seasons it is filled up with water; then huge sedimentations block the channel. Even near Arambagh the channel basin has been reduced by garbage and anthropogenic (man made) activities.

- **Hooghly River-**The Hooghly River or the Bhāgirathi-Hooghly, originally and in local tongues the 'Ganga', and also called Kati-Ganga, is an approximately 260-kilometre-long (160 mi) distributary of the Ganges River in West Bengal, India. The Ganges splits into the Padma and the Hooghly near Giria, Murshidabad. Today there is a further man-made bifurcation of the river upstream at Farakka. The Padma flows eastward into Bangladesh, whereas the Hooghly flows south through West Bengal. The river flows through the Rarh region, the lower deltaic districts of West Bengal, and eventually into the Bay of Bengal. The upper riparian zone of the river is called Bhagirathi while the lower riparian zone is called Hooghly. Major rivers that drain into the Bhagirathi-Hooghly include Mayurakshi, Jalangi, Ajay, Damodar, Rupnarayan and Haldi rivers other than the Ganges. Kolkata and Hugli-Chinsura, the headquarters of Hooghly (district), are located on the banks of this river.

- **Mundeswari River-** Mundeswari river is a small river in West Bengal which causes floods in Hooghly, Purba Medinipur and Howrah districts during the monsoons. Any discharge above 2,000 cubic metres per second (70,000 cu ft/s) downstream of Durgapur Barrage may cause flooding depending on the outfall condition of the Mundeswari at Harinkhola. It has been suggested that the banks of rivers such as Mundeswari should be protected with embankments to prevent floods

Source - https://www.riversgraphy.com

Hooghly River system of the district is further explained in Chapter 7.2.

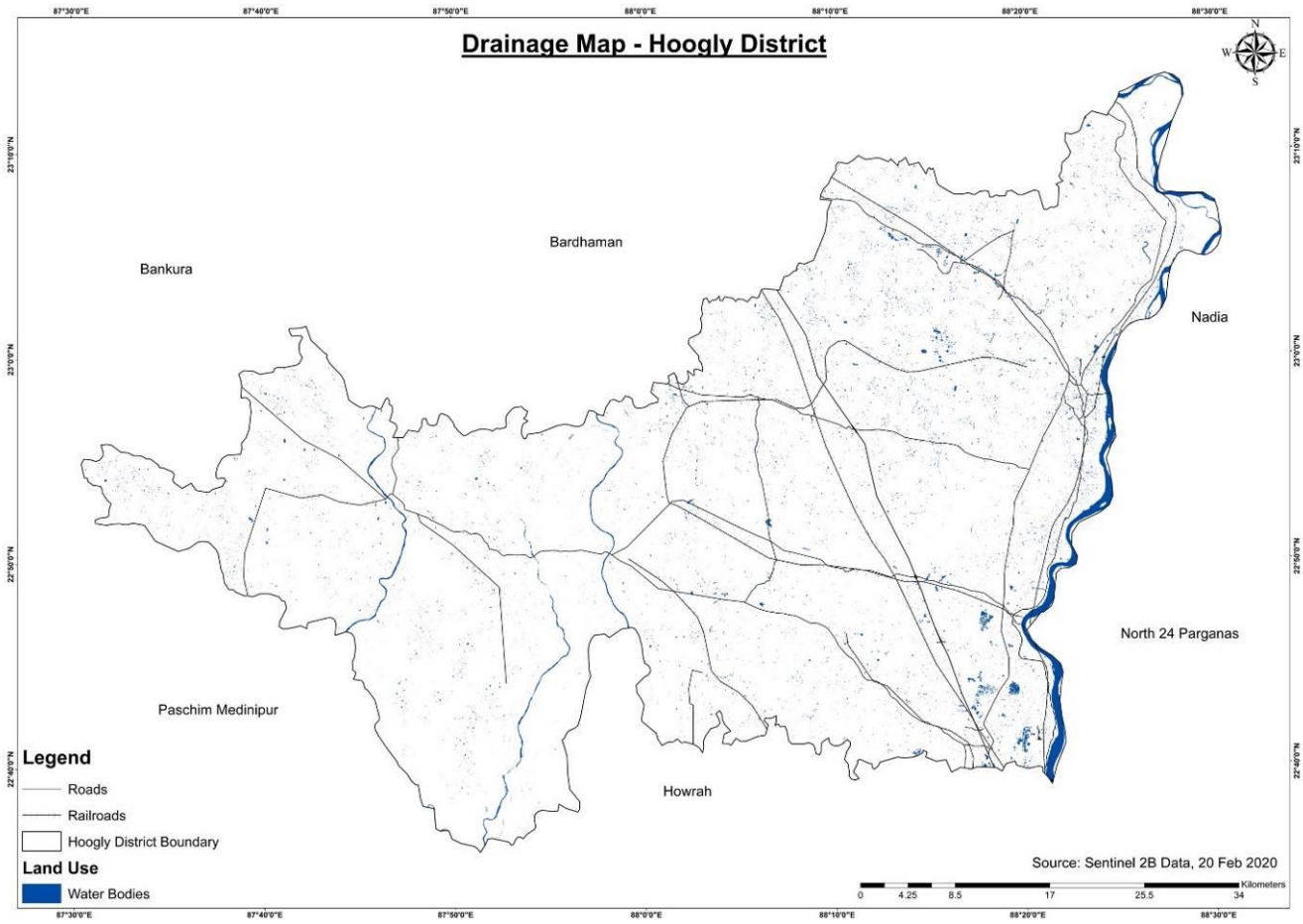


Figure 3.6: Drainage map of District

(Source: National Informatics Centre, September 2020)

3.8 Demography

The district has an total area of 3,149 sq km., 329.03 sq km is urban and 2819.97 sq km is rural. Out of total population of Hooghly, 6,126,251 in the district, 2,128,499 are in urban area and 3,390,646 are in rural area. 505,943 households are in urban, 781,480 are in rural area. 1,688,844 literate people are in urban, 2,389,544 are in rural area.

The administrative division and population of the district is given below:-

Table 3.3: Demographic data of Hooghly district

DEMOGRAPHY (Census 2011)	
Total Population	55.19 Lakhs
Male Population	28,14,653
Female Population	27,04,492
Population Growth	9.46%
Area Sq. Km.	3,149
Density / Km^2	1,753
Proportion to West Bengal Populatior	6.05%
Sex Ratio (Per 1000)	961
Child Sex Ratio (0-6 Age)	952
Average Literacy	81.80
Male Literacy	87.03
Female Literacy	76.36
Total Child Population (0-6 Age)	5,33,210
Male Population (0-6 Age)	2,73,116
Female Population (0-6 Age)	2,60,094
Literates	40,78,388
Male Literates	22,11,777
Female Literates	18,66,611
Child Proportion (0-6 Age)	9.66%
Boys Proportion (0-6 Age)	9.70%
Girls Proportion (0-6 Age)	9.62%

- Hooghly Blocks Population: -

According to 2011 Census of India, Hooghly District Blocks population, Below is the list of Hooghly Blocks households, total population and as per male and female statistics.

Table 3.4: Block wise population statistic of Hooghly district

Blocks	Population 2011	Male	Female	Households
Goghat I	140,030	71,804	68,226	31,203
Goghat II	160,585	82,262	78,323	35,446
Arambag	285,207	146,041	139,166	64,245
Pursura	173,437	88,908	84,529	39,752
Tarakeswar	179,148	91,534	87,614	41,975
Dhaniakhali	320,534	160,789	159,745	78,260
Pandua	316,197	159,323	156,874	74,139
Balagarh	228,998	116,828	112,170	55,881
Chinsurah Magra	247,055	126,061	120,994	57,690
Polba Dadpur	263,555	133,678	129,877	62,151
Haripal	261,073	131,757	129,316	60,041
Singur	276,413	140,334	136,079	64,703
Serampur Uttarpara	152,266	77,725	74,541	37,260
Chanditala I	179,825	90,032	89,793	37,681
Chanditala II	158,396	79,831	78,565	37,678
Jangipara	221,578	112,317	109,261	48,900
Khanakul I	254,434	130,712	123,722	56,890
Khanakul II	184,734	93,979	90,755	41,278

Source – Census 2011

3.9 Cropping pattern

Cropping intensity may be defined as the ratio between net cultivated area and total cultivated area. It indicates the intensity of cultivation in a region in a crop year. Higher will be the gross cropped area higher will be the intensity of cropping. Suitable soil, climatic condition, irrigation facilities help the farmers to grow more than one crop and thus increasing the intensity of cropping. Hooghly district covers total cropped area of 548.58 hectares ('000 ha.).

Table 3.5: Cropping intensity of Hooghly district

Agricultural Land Use	Area ('000 ha.)	Cropping Intensity (%)
Net Sown area	*219.91*	*249.45*
Area Sown more than once	*328.67*	
Gross cropped area	*548.58*	

Horticultural crops of the district offer a lot of scope in the value addition, productivity enhancement, export promotion, employment generation & economic development in the District. Efforts are being made to exploit the scope of organic farming, more hybrid varieties of vegetables as well as fruits, to maintain orchard in more judicious way, to increase area under fruits, floriculture, medicinal aromatic, spices cultivation and plantation crops.

Table 3.6: Horticulture cropped area of of Hooghly district

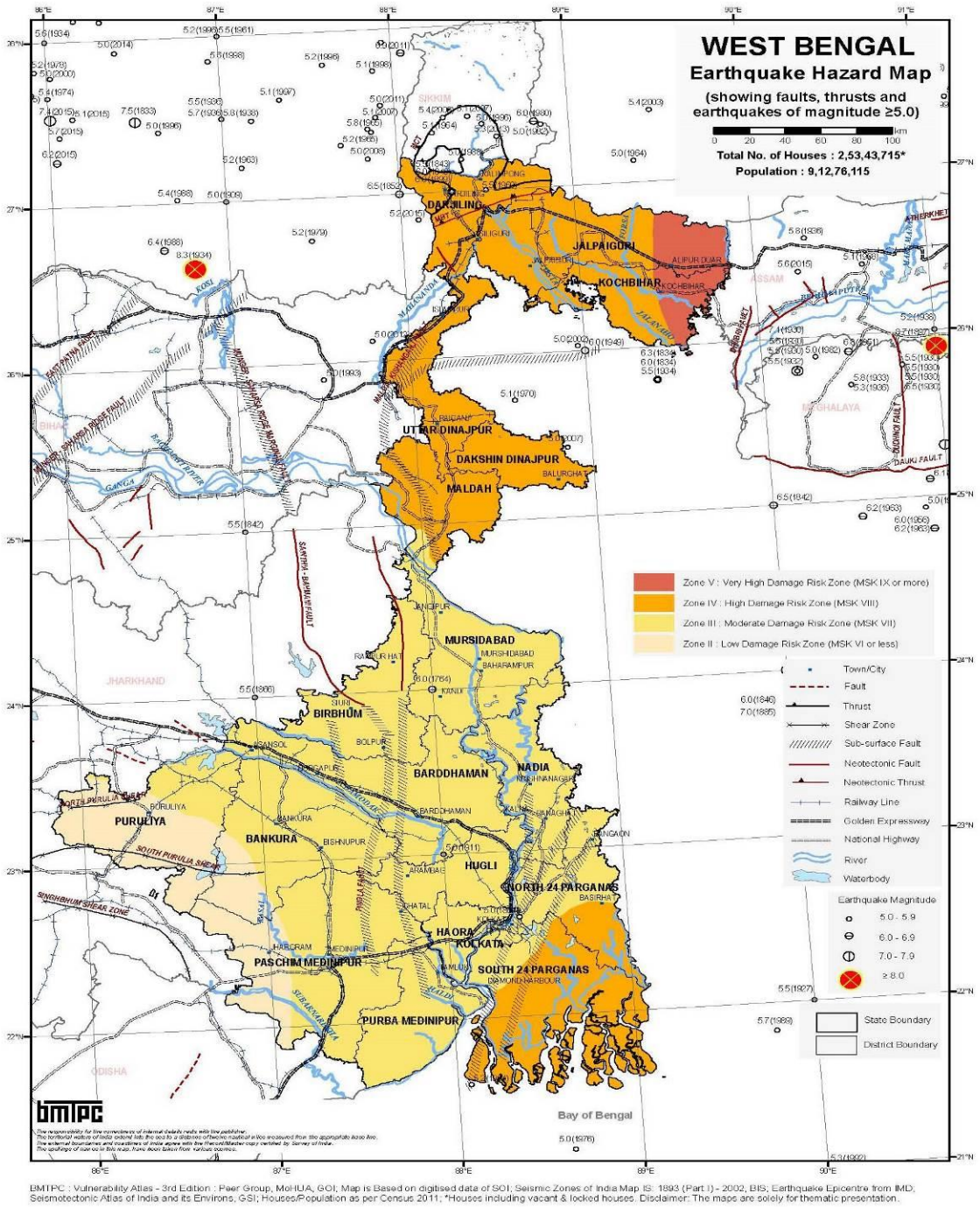
Horticulture Crops – Fruits	Area ('000 Ha) Rainfed
Mango	5.59
Banana	-
Guava	0.22
Litchi	0.22
Papaya	0.73

Source - Agriculture Contingency Plan for District,Hooghly Access On September 2022

3.10 Land Form and Seismicity

The district is a completely flat land with no place having more than an elevation of 200 metre. The river Hooghly borders it to the east. Most of the land of the district is alluvial type of soil due to well distribution of river system. Another major river is 'Damodar'.The entire area is a part of the Gangetic Delta. The Hooghly is a tidal river and has a high west bank.

Hooghly district is prone to disasters like flood, drought, cyclone etc., and in the past the district has experienced the intimidations of such disasters and falls under moderate damage risk zone in respect to seismicity proneness (*http://wbdmd.gov.in/pages/earthquake.aspx*). Hooghly district is categorized under seismically active zone - III i.e., moderate seismic intensity zone. Bureau of Indian Standards, based on the past seismic history, grouped the country into four seismic zones, viz. Zone - II, Zone –III, Zone-IV and Zone-V. Of these, Zone V is the most seismically active region, while Zone II is the least.



BMTPC : Vulnerability Atlas - 3rd Edition : Peer Group, MoHUA, GOI; Map is Based on digitised data of SOI; Seismic Zones of India Map IS: 1893 (Part I) - 2002, BIS; Earthquake Epicentre from IMD; Seismotectonic Atlas of India and its Environs, GSI; Houses/Population as per Census 2011; *Houses including vacant & locked houses. Disclaimer: The maps are solely for thematic presentation.

Figure 3.7: Earthquake zonation map of West Bengal
https://pib.gov.in/PressReleasePage.aspx?PRID=1740656 Access On September 2022

VULNERABILITY ANALYSIS

Table 3.7: Seasonality of Hazard index of of Hooghly district

Type of Hazards	April-June			July-Sept			Oct-Dec			Jan-March		
	H	A	I	H	A	I	H	A	I	H	A	I
Flood				Y	Y	Y	Y	Y	Y			
Storm	Y	Y	Y	Y	Y	Y						
Dengue	Y			Y			Y			Y		

H: Human, A: Animals, I: Infrastructure

Table 3.8: Distance of the Ward from the Risk Points (in Kms.)

Sl.No	Danger and Risk Points	Ward No.	Distance From the ward	Remarks
1.	Sea			
2.	River	8, 9, 15	4	Damodar River
3.	Weak Embankments	1,2,3,4,6,8,10,11,12,13	.5	Raner khal

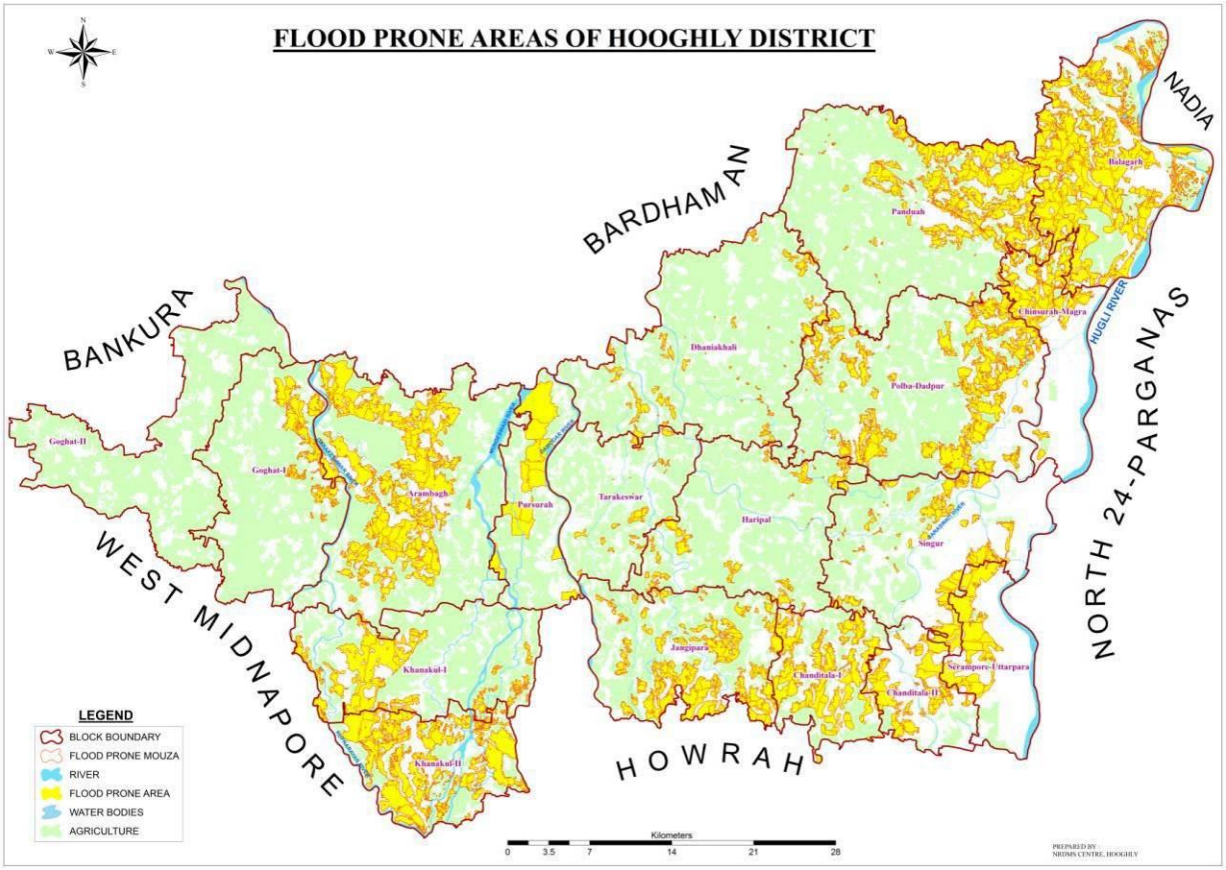


Figure. 3.8 Flood Prone area of Hooghly District

The Damodar River was once upon a time known as “Sorrow of Bengal” since this is flooded almost every year which receives huge quantum of water from the upland of the Chhotanagpur Plateau. Along with the catchment water, the river also receives a huge quantum of sediment loads. Several attempts have been undertaken from the historic period for flood control which has affected only after the Independence in 1948 when “Damodar Valley Corporation” has been formed. Damodar River was earlier known as the "River of Sorrows" as it used to flood many areas of Bardhaman, Hooghly, Howrah and Medinipur districts. Even now the floods sometimes affect the lower Damodar Valley, but the havoc it wreaked in earlier years is now a matter of history. The floods were virtually an annual ritual. In some years the damage was probably more. Many of the great floods of the Damodar are recorded in history — 1770, 1855, 1866, 1873–74, 1875–76, 1884–85, 1891–92, 1897, 1900, 1907, 1913, 1927, 1930, 1935 and 1943. In four of these floods (1770, 1855, 1913 and 1943) most of Bardhaman town was flooded. The first dam was built across the Barakar River, a tributary of the Damodar river at Tilaiya in 1953. The second one was built across the Konar River, another tributary of the Damodar river at Konar in 1955. Two dams across the rivers Barakar and Damodar were built at Maithon in 1957 and Panchet in 1958 respectively. Both the dams are some 8 kilometres (5 mi) upstream of the confluence point of the rivers. These four major dams are controlled and maintained by DVC. Durgapur Barrage was constructed downstream of the four dams in 1955, across the Damodar River at Durgapur, with head regulators for canals on either side for feeding an extensive system of canals and distributaries. In 1978, the government of Bihar (that was before the formation of the state of Jharkhand) constructed the Tenughat Dam across the Damodar river outside the control of DVC. These dams restrict the regular water flow of the river which has definitely affected in the flood management of the downstream areas. However, the upper dams receive huge sediment loads from the uphill plateau region and get obstructed in the dams. Almost every year, during late monsoon, the upper Dams releases water due bankfull situation of the river. The discharge water contains loads of sediments together. Usually, the river sediments are being divided into, bed load, suspended load and dissolved load. The sand depositions are form of bed load. These sediments ultimately got deposited in the lower regime of the river. The sediment load is mostly fine sands which has a potential for development as a construction material. Since the river is traversing coal mining potential areas, sands are also used for stowing as well.

https://en.wikipedia.org/wiki/Damodar_River

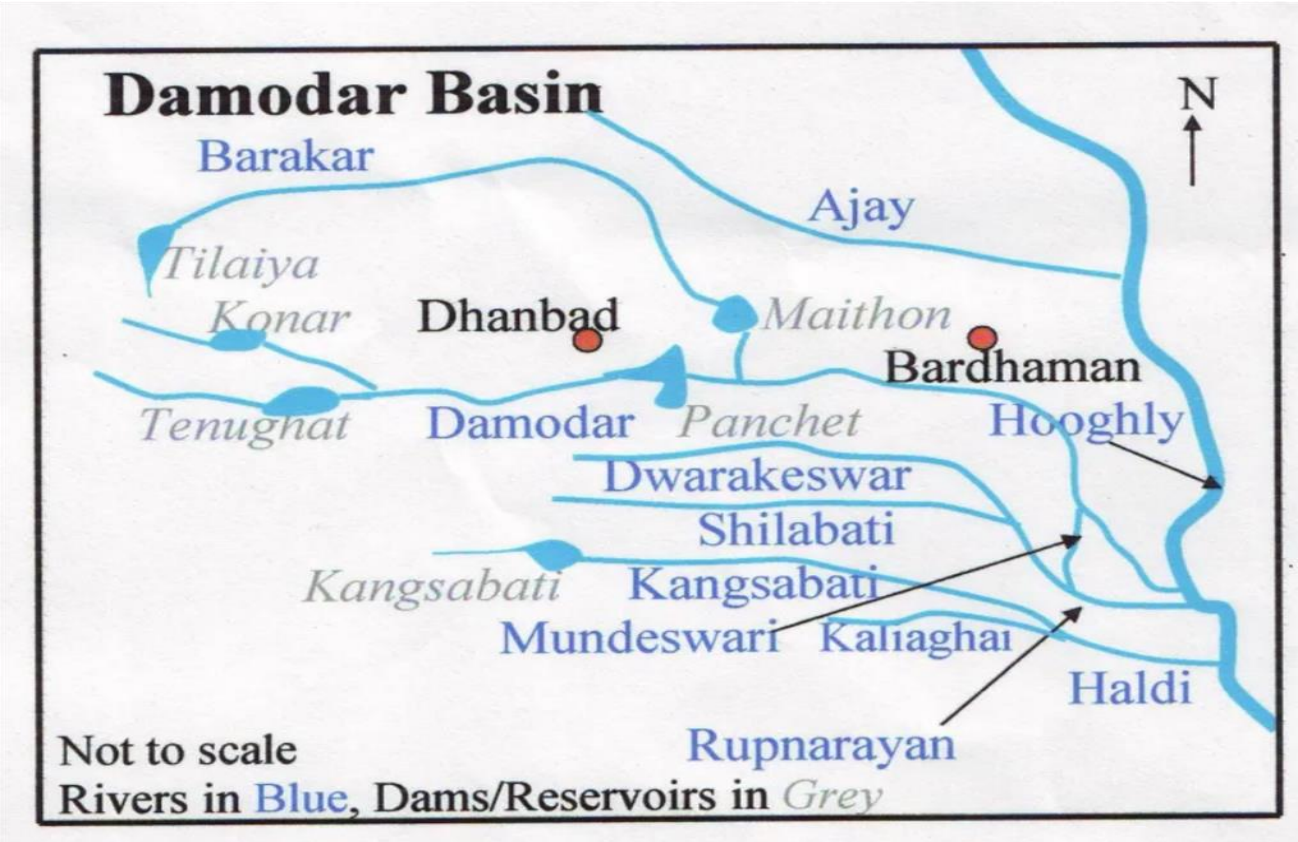


Figure 3.9: Map showing Dams/Reservoirs on Damodar River

3.11 Flora

The forests of West Bengal are classified into seven categories viz., Tropical Semi-Evergreen Forest, Tropical Moist Deciduous Forest, Tropical Dry Deciduous Forest, Littoral and Swampy Forest, Sub- Tropical Hill Forest, Eastern Himalayan Wet Temperate Forest and Alpine Forest. The forests of this state has a rich assemblage of diverse habitats and vegetation designated with the help of eight different forest types. The diverse fauna and flora of West Bengal possess the combined characteristics of the Himalayan, sub-Himalayan and Gangetic plain.

Forest are one of the renewable resources which may increase or decrease with time depending on natural conditions and the rate of exploitation. Tropical forests are found in the Hooghly district. Apart from the social forestry, small patches of forest land are located at Arambag range (chandur forest) and Goghat-1 (Bhadur forest) in Hooghly district.

The forest region under plantation extends over three types of areas; these are;

a) Areas which are on the river bank, have sandy soil, are subject to inundation, as well as dry patch, high soil temperature during summer.
b) Areas which are exposed to large scale inundation during rains, mostly in pardra and bhadur.

c) Highlands with established crops of teak or other different species in areas like pardra and bhadur mouza.

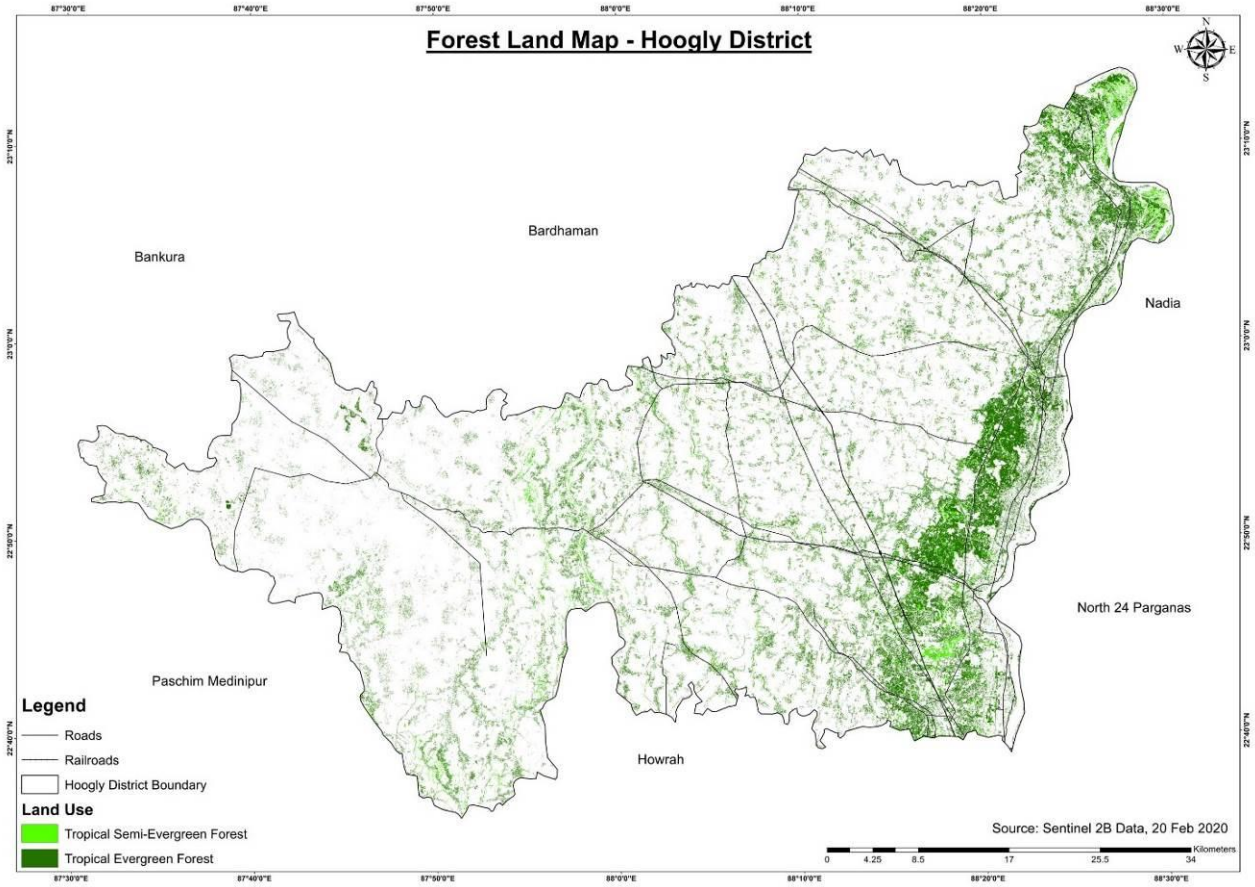


Figure 3.10: Map showing forest density of Hooghly district

(Source: Sentinel 2B Imagery Data, 20 February 2020)

3.12 Fauna

In West Bengal emphasis has been given to conservation and management of sustainable resources in order to achieve the goal of long-term biodiversity conservation. The overall strategy involves protection of critical habitats of endangered species. The strategies also focus on improved PA management, development of infrastructure, habitat improvement programme, reduction of man animal conflict, capacity building and involvement of local people in management of PA areas.The Bengal wilderness is also home of an array of highly endangered species like the Asian Elephant , Great one horned Rhino, Serow, Red Panda, Pigmy Hog, Bengal Florican, Black Necked Crane, Great pied Hornbill, Goliath Heron, Estuarine Crocodile, Salvator

Lizards, Olive Ridley Marine Turtle, rare Batagur terrapin, let alone being the habitat for most of the cats of India, e.g. Bengal Tiger and Leopard and the Clouded Leopard, Marbled Cat, Leopard Cat, Golden Cat, Jungle Cat and, Fishing Cat representing the lesser cats, etc.

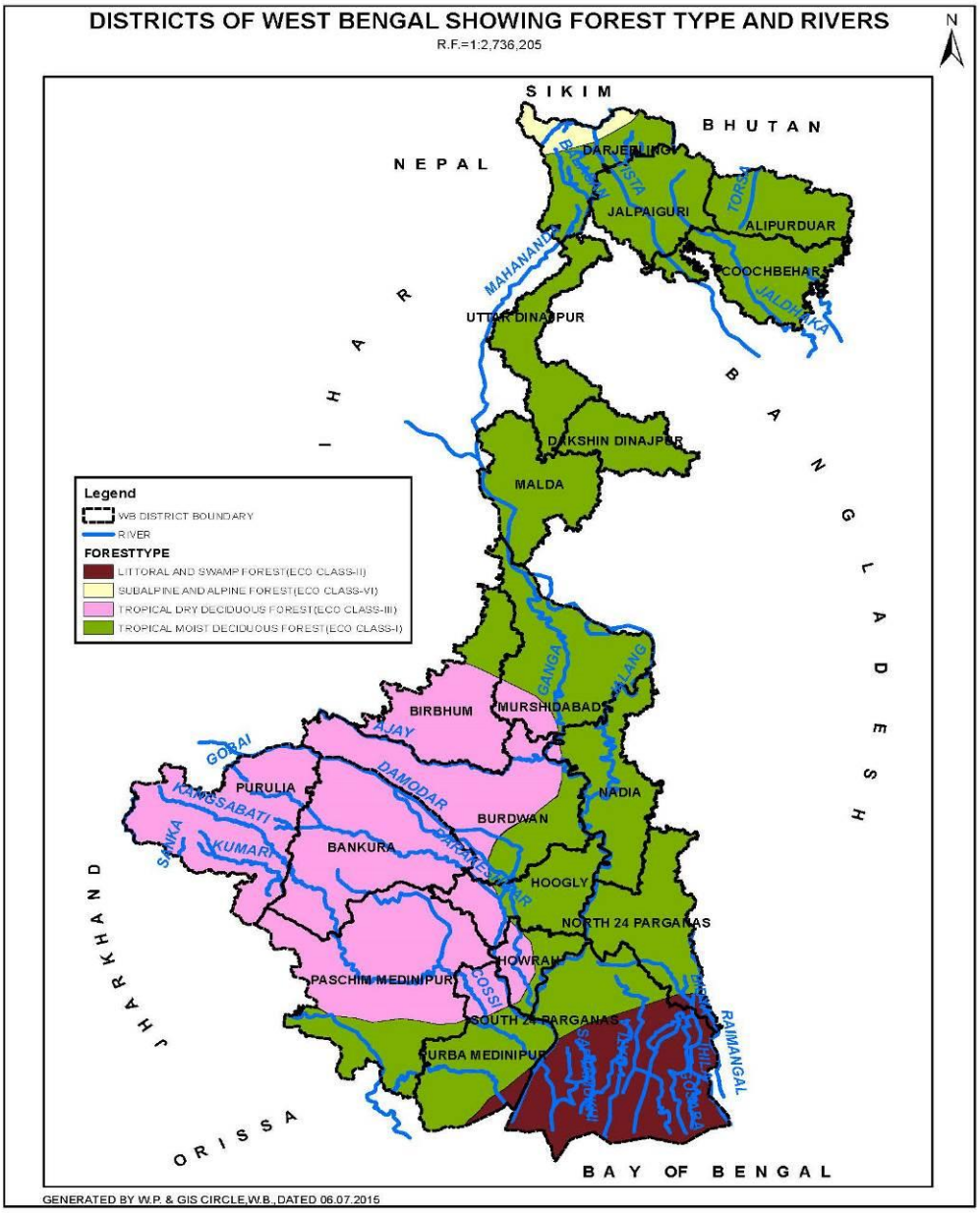


Figure 3.11: Forest diversity map of West Bengal

Source – National Informatics Centre, September 2020

4 Geomorphology of the district

4.1 General Landforms

The district is a completely flat land with no place having more than an elevation of 200 metre. The River Hooghly borders it to the east. Most of the land of the district is alluvial type of soil due to well distribution of river system. Another major river is 'Damodar'.The entire area is a part of the Gangetic Delta. The Hooghly is a tidal river and has a high west bank. The district is bordered by Howrah District to the south, Bardhaman District to the north, and to the east by the River Hooghly. Bankura District lies to the north-west, with Medinipur District to the south-west.

According to genesis and evolution of landforms the district can be broadly divided into two divisions i.e. :

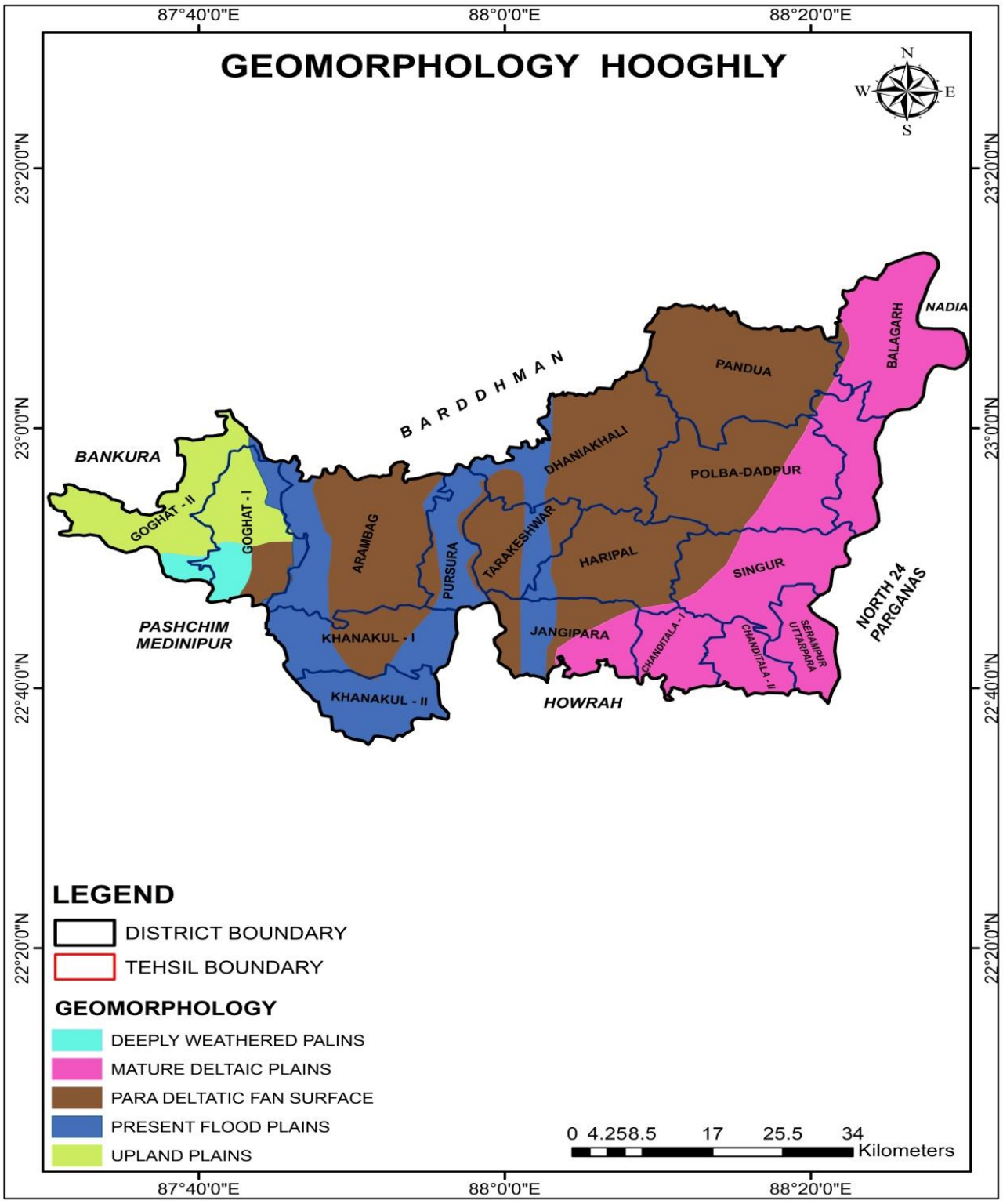
- Old alluvial plains to the west of river Dwarakeswar.
- The monotonous level alluvial plains in the east which can be further divided into:-
    d. Natural Levee.
    e. Meander floor plain.
    f. Alluvial Plain.

The hooghly estuary is a positive estuary of mixohaline type. It has an approximately funnel shaped wide mouth and probably due to the strong scouring action of the stream as well as tidal currents, a greater overall circulation is maintained. The tidal influence is felt in the upper reach of the river up to a- distance of 290 km. from the sea-face. The estuary experiences vertical turbulence to a high degree and is reported to have no appreciable stratification of temperature and salinities practically throughout its entire length (Bose, 1956). Based on the salinity characteristics, the estuary can roughly be divided into fresh, gradient, tidal and marine zones (Basu, 1965).

In the upper reaches the silt does not flocculate until salt water intrudes some months after the monsoon. The turbulence and vertical mixing is sufficient to keep much of the flocculate in suspension in the lower reaches which may interfere badly the distribution of plankton mass in this environment.

This estuarine complex of the tropics occupies an important place in the world map and can be categorised as 'River delta estuary' (formed at the mouth of large rivers) which has been advocated by Odum (1971) in addition to Pritchard's (1961) four categories of estuarine system.

Source - *District Industrial Profile, Hooghly, Ministry of MSME*
Source – National Informatics Centre



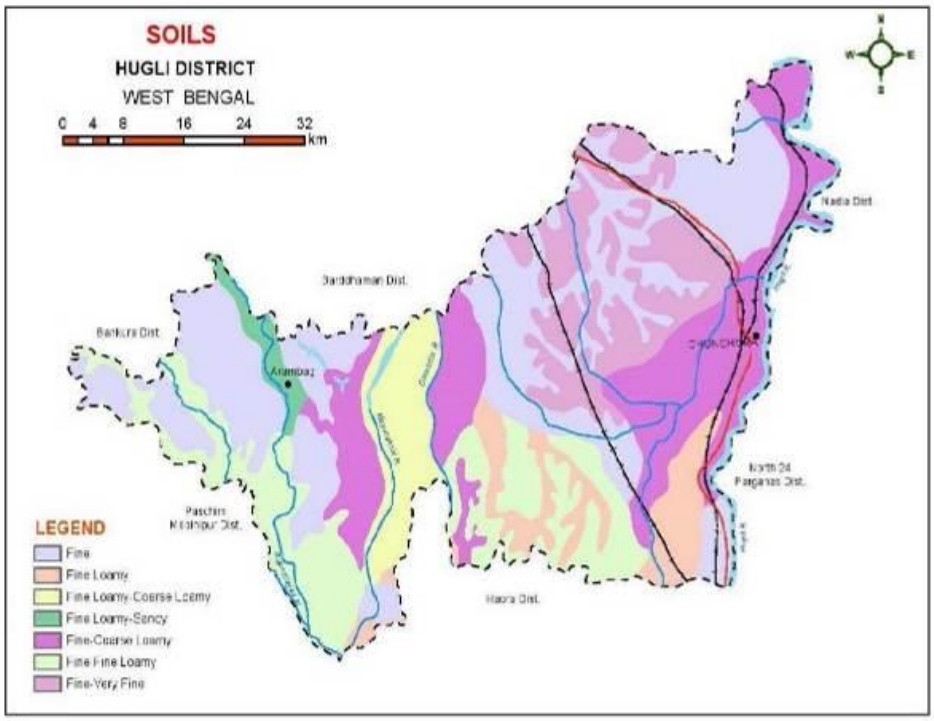
Source – National Informatics Centre, September 2020

Figure 4.1: Geomorphological map of Hooghly district

4.2 Soil and rock pattern

Soils of the area are taxonomically classified into three orders i.e. Alfisol, Inceptisols and Entisols. All the 18 soils series identified in the area are further classified into 7 sub-orders, 8 great groups, 14 subgroups and 18 families. Soils of the district have tremendous potential for variety of agriculture crops. Soils of the district has almost none to slight (65.79%) erosion followed by moderate erosion (14.54%) and slight to moderate erosion (16.82%). Alluvial plains (84.10%) are the major physiography of the district followed by flood plains (6.50%), stream bank (1.10%) and marshy land (1.04%).

- Level to nearly level slope 49,007ha 15.56%
- Nearly level to very gently slope 2,39,558ha 76.07%
- Very gently slope 3,466ha 1.10%
- Very gently to gently slope 192ha 0.06%



Source: NBSS & LUP Regional Centre, Kolkata

Figure 4.2: Soil Map of Hooghly District
(https://esdac.jrc.ec.europa.eu/content/west-bengal-soils-sheet-2, September 2020)

5 Land use pattern of the district

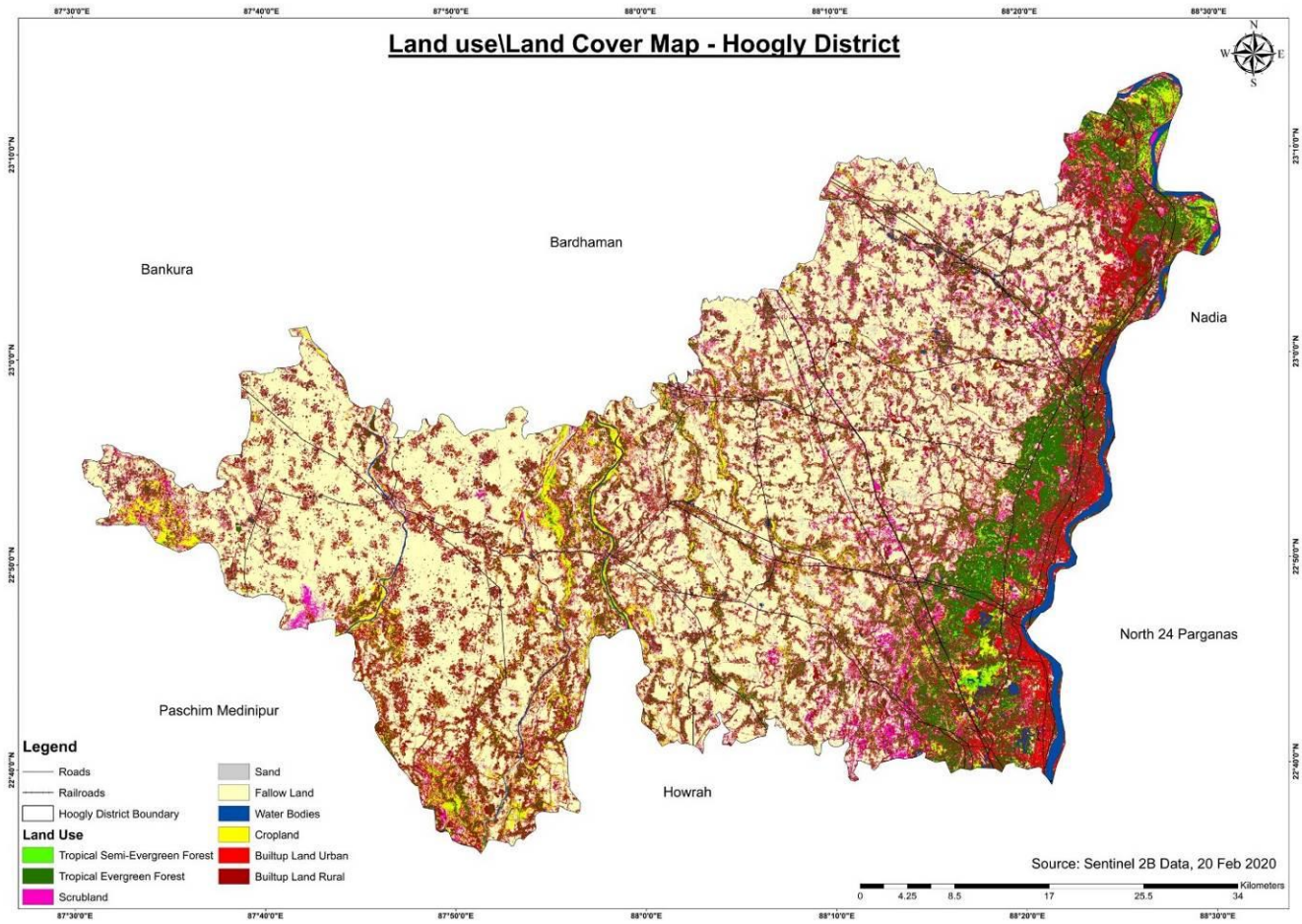
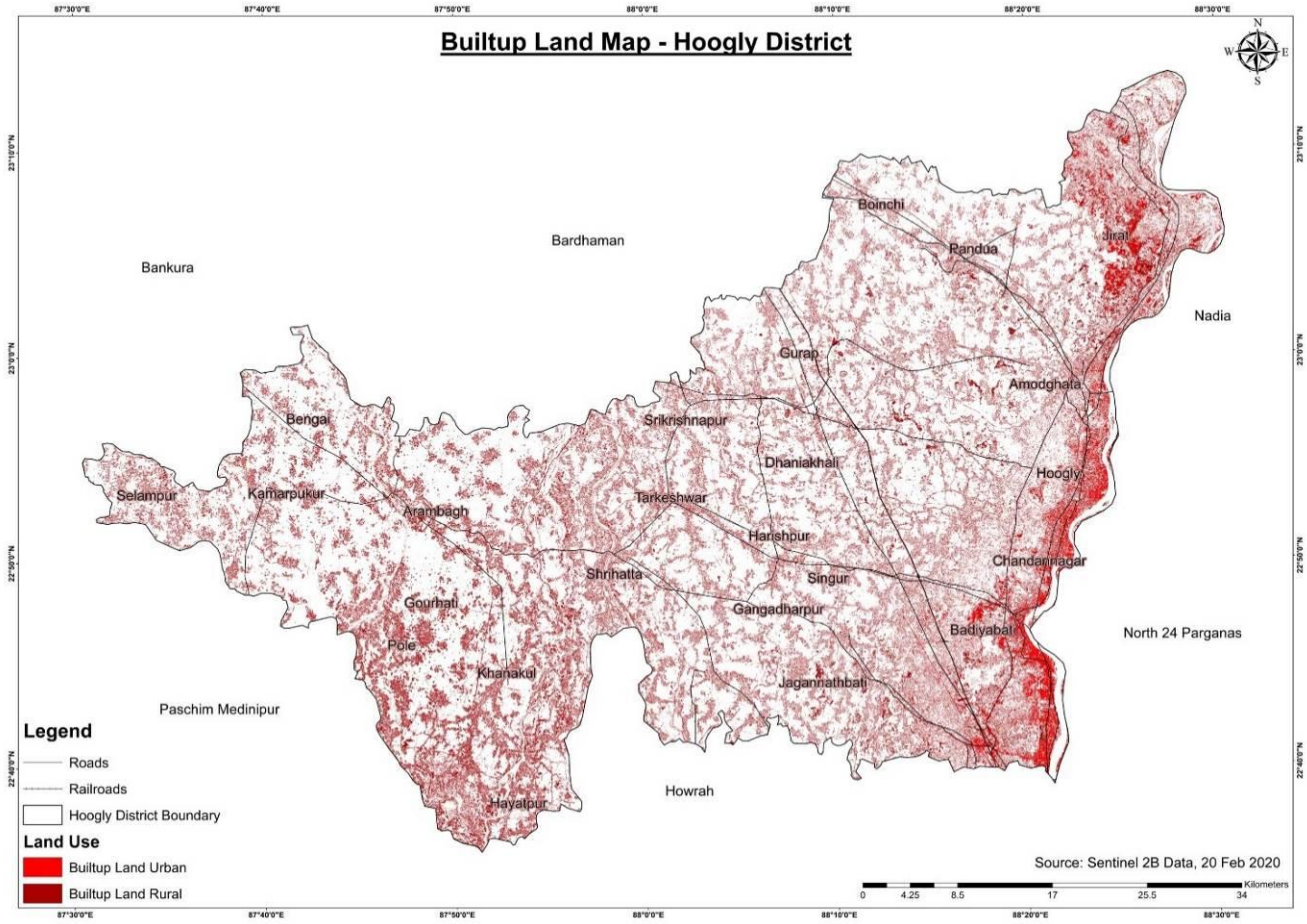


Figure 5.1: Land Use Land Cover map of Hooghly district

Table 5.1 land utilization statistic of Hooghly district

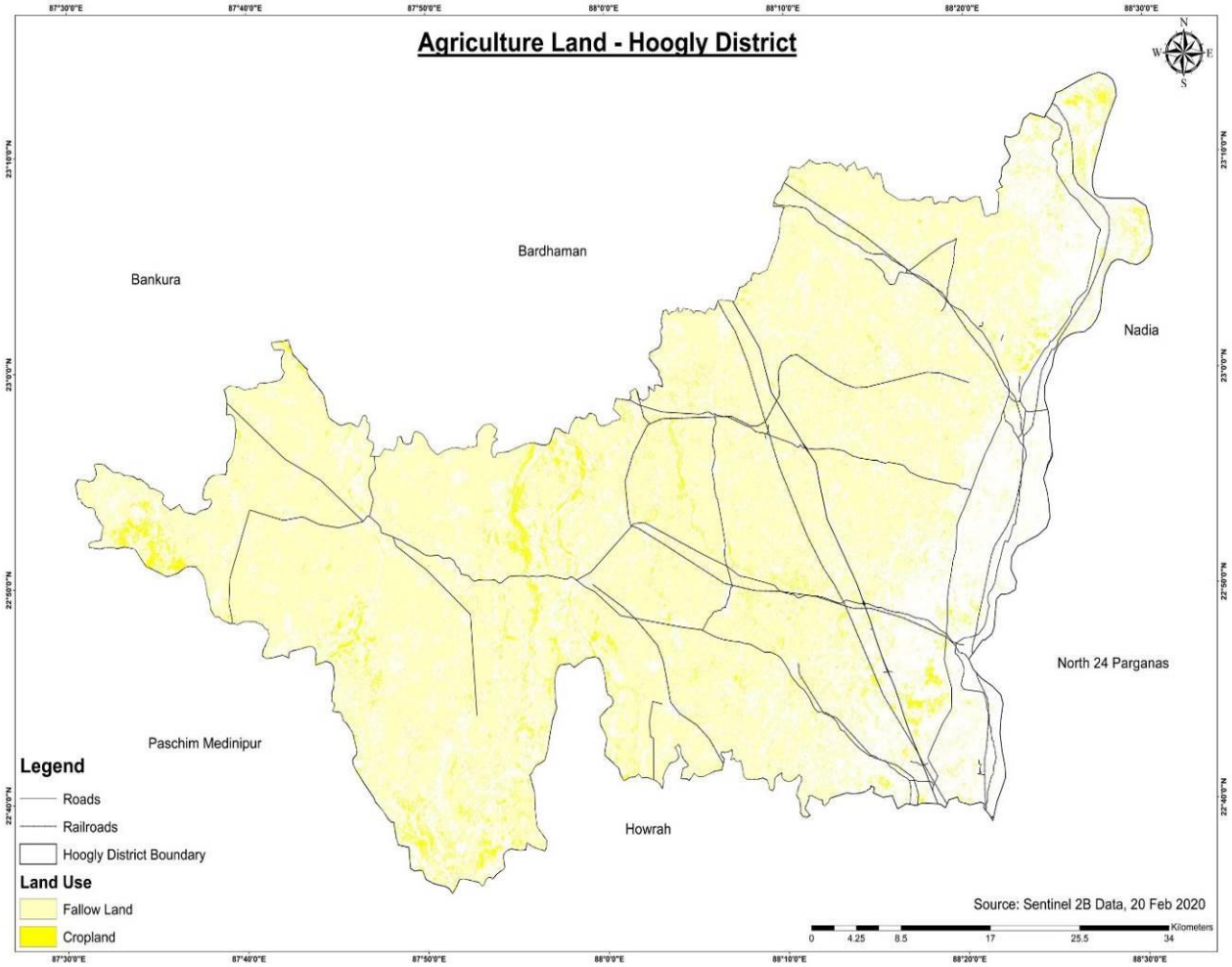
Sl. No.	Land Use	Area (In Hectares)	Percentage
1	Tropical Evergreen Forest	34556.648	11
2	Tropical Semi-Evergreen Forest	5883.86	1.87
3	Builtup Land Rural	61440.27	19.55
4	Water Bodies	7134.61	2.27
5	Scrubland	29987.37	9.54
6	Cropland	19919.46	6.34
7	Builtup Land Urban	1737.00	0.55

Sl. No.	Land Use	Area (In Hectares)	Percentage
8	**Sand**	2101.98	0.67
9	**Fallow Land**	151527.09	48.21
	Total	**314288.29**	**100**



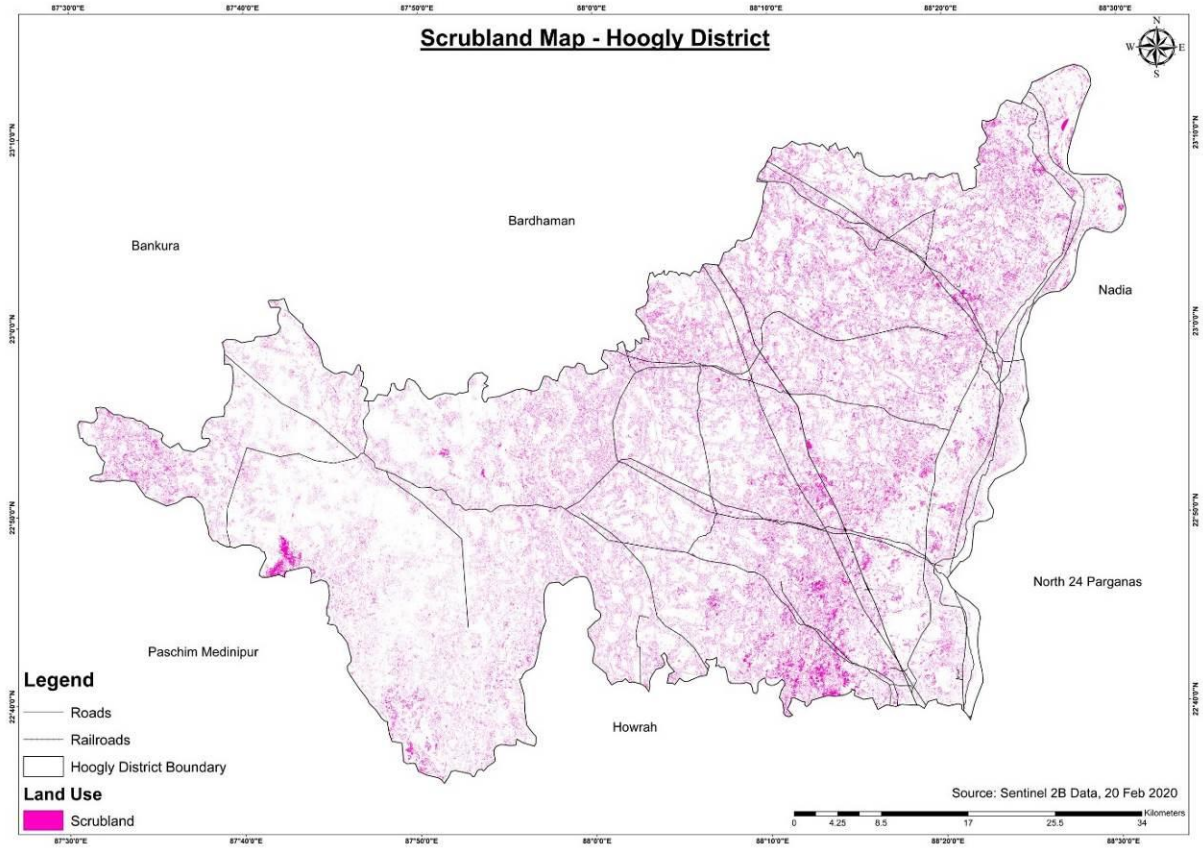
(Source: Sentinel 2B Imagery Data, 20 February 2020)

Figure 5.2: Builtup area map of Hooghly district



(Source: Sentinel 2B Imagery Data, 20 February 2020)

Figure 5.3: Agricultural land distribution map of Hooghly district



(Source: Sentinel 2B Imagery Data, 20 February 2020)

Figure 5.4: Scrub land distribution map of Hooghly district

5.1 Agriculture and Irrigation

Hooghly is one of the essential agro – based industrial districts of West Bengal, with almost 70% of its population dependent on agriculture and represents a necessary place in the field of agriculture in West Bengal

- Field Crops – Rice, Potato, Oilseeds, Wheat, Pulses, Jute
- Fruits – Mango, Banana, Gauva, Litchi, Papaya
- Vegetables – Brinjal, Cucurbits, Onion, Cauliflower, Cabbage, Okra

Irrigation

Table 5.2 Irrigation land statistic of Hooghly district

Irrigation	*Area ('000 Ha)*
Net Irrigated Area	*157.52*
Gross Irrigated Area	*213.53*
Rain fed Area	*371.05*

Table 5.3 Irrigation structure of Hooghly district

Sources of Irrigation	*Number*	*Area ('000 Ha)*	Percentage of total irrigated area
Canals	-	*52.40*	*23.43*
Tanks	*41448*	*21.00*	*9.39*
Open wells	-	-	-
Bore wells	-	*113.00*	*47.75*
Lift irrigation scheme	*19858*	*19.00*	*8.49*
Micro-irrigation	-	-	-
Other sources	-	*8.13*	*3.63*
Total Irrigated Area	-	*213.53*	*92.69*

(Source: Agriculture Contingency Plan for District Hooghly)

There are three Irrigation and waterways Divisions working in this District ---

1. Hooghly Irrigation and Waterways Division,
2. Lower Damodar Irrigation and Waterways,
3. Howrah Irrigation and Waterways.

(Source - https://www.agrifarming.in/ September 2020)

5.2 Horticulture

Horticultural crops of the district offer a lot of scope in the value addition, productivity enhancement, export promotion, employment generation & economic development in the district. Efforts are being made to exploit the scope of organic farming, more hybrid varieties of vegetables as well as fruits, to maintain orchard in more judicious way, to increase area under fruits, floriculture, medicinal aromatic, spices cultivation and plantation crops.

5.3 Mining

Hoogli district doesn't count to be a mineral rich district of the state, however sand mining and brick earth mining takes a vital role in the economic development of the district.
Deposit of coarse to fine grained yellow sand, suitable for construction purpose, can be seen in the dry riverbed of Dwarkeshwar and Mundeshwari river. Due to close proximity with important cities of the state, apart from sand mining, brick manufacturing industry is also blooming in the district. A very environment friendly silt earth mining is carried out in the district through arresting the silt sediment into silt ponds and using it as raw material for manufacturing bricks. Brick manufacturing industry, since decades, in the district plays a vital role in maintaining the demand-supply curve of construction grade bricks in the state.

6 Geology

The Bengal Basin in the northeastern part of Indian subcontinent, between the Indian Shield and Indo-Burman Ranges, comprises three geo-tectonic provinces: (1) The Stable Shelf; (2) The Central Deep Basin (extending from the Sylhet Trough in the northeast towards the Hatia Trough in the south); and (3) The Chittagong–Tripura Fold Belt. Due to location of the basin at the juncture of three interacting plates, viz., the Indian, Burma and Tibetan (Eurasian) Plates, the basin-fill history of these geo-tectonic provinces varied considerably. Precambrian metasediments and Permian–Carboniferous rocks have been encountered only in drill holes in the stable shelf province. After Precambrian peneplanation of the Indian Shield, sedimentation in the Bengal Basin started in isolated graben-controlled basins on the basement. With the breakup of Gondwanaland in the Jurassic and Cretaceous, and northward movement of the Indian Plate, the basin started downwarping in the Early Cretaceous and sedimentation started on the stable shelf and deep basin; and since then sedimentation has been continuous for most of the basin. Subsidence of the basin can be attributed to differential adjustments of the crust, collision with the various elements of south Asia, and uplift of the eastern Himalayas and the Indo-Burman Ranges. Movements along several well-established faults were initiated following the breakup of Gondwanaland and during downwarping in the Cretaceous.

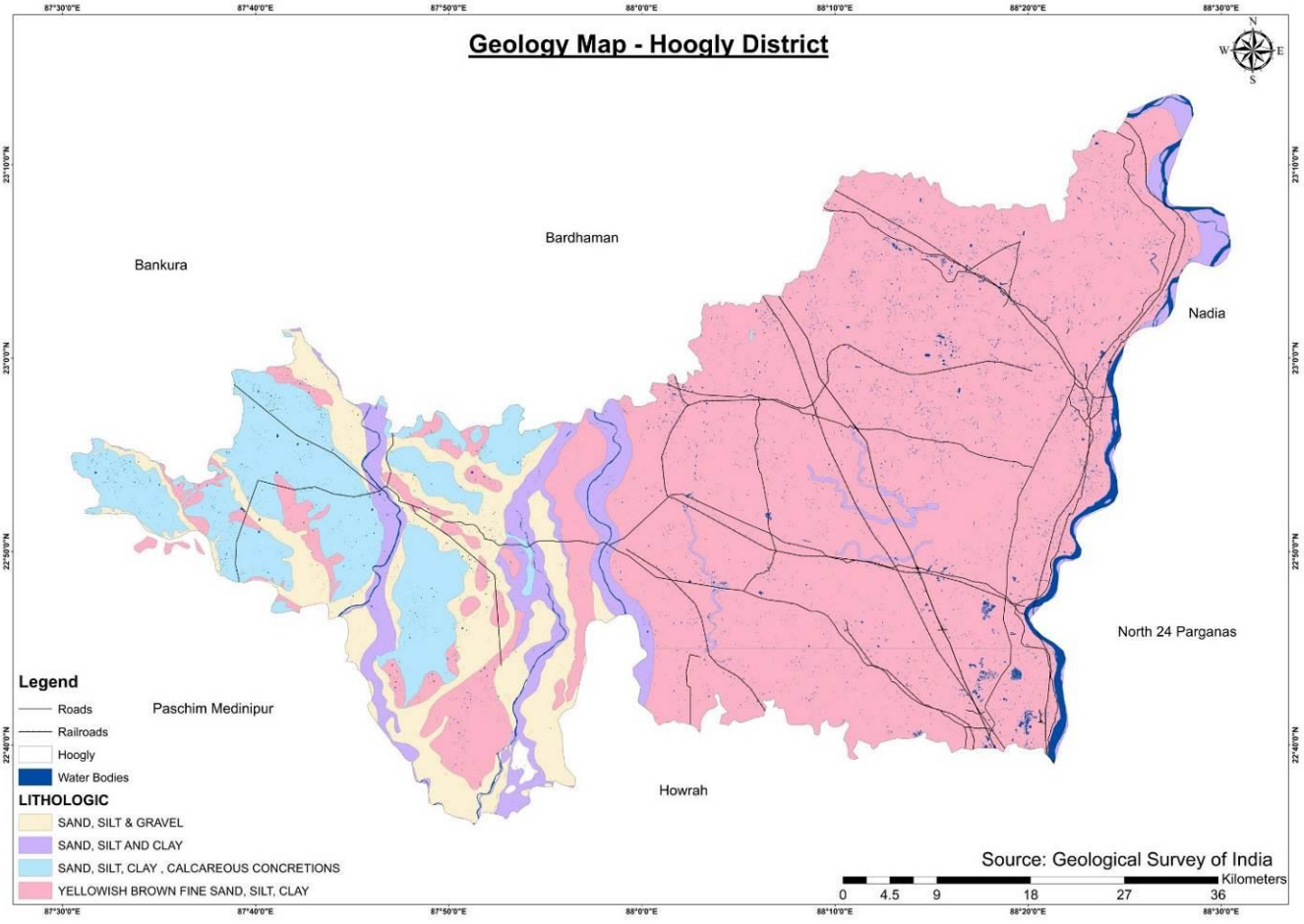
By Eocene, because of a major marine transgression, the stable shelf came under a carbonate regime, whereas the deep basinal area was dominated by deep-water sedimentation. A major switch in sedimentation pattern over the Bengal Basin occurred during the Middle Eocene to Early Miocene as a result of collision of India with the Burma and Tibetan Blocks. The influx of clastic sediment into the basin from the Himalayas to the north and the Indo-Burman Ranges to the east rapidly increased at this time; and this was followed by an increase in the rate of subsidence of the basin. At this stage, deep marine sedimentation dominated in the deep basinal part, while deep to shallow marine conditions prevailed in the eastern part of the basin. By Middle Miocene, with continuing collision events between the plates and uplift in the Himalayas and Indo-Burman Ranges, a huge influx of clastic sediments came into the basin from the northeast and east. Throughout theMiocene, the depositional settings continued to vary from deep marine in the basin to shallow and coastal marine in the marginal parts of the basin. From Pliocene onwards, large amounts of sediment were filling the Bengal Basin from the west and northwest; and major delta building processes continued to develop the present-day delta morphology.

Since the Cretaceous, architecture of the Bengal Basin has been changing due to the collision pattern and movements of the major plates in the region. However, three notable changes in basin configuration can be recognized that occurred during Early Eocene, Middle Miocene and Plio-Pleistocene times, when both the paleogeographic settings and source areas changed. The present basin configuration with the Ganges–Brahmaputra delta system on the north and the Bengal Deep Sea Fan on the south was established during the later part of Pliocene and Pleistocene; and delta progradation since then has been strongly affected by orogeny in the eastern Himalayas. Pleistocene glacial activities in the north accompanied sea level changes in the Bay of Bengal.

Hooghly district is situated in the stable shelf zone in the western flank of Bengal Basin. Archaean crystalline basement, Gondwana sediments and Rajmahal volcanics of Mesozoic age flank this part of Bengal Basin to the west and northwest. The district is covered by a huge thickness of Quaternary alluvium underlain by Tertiary and Mesozoic formation (Biswas 1959).

The sequence of sediments encountered in the borehole drilled reflects the change of an initially marine to estuarine depositional environment through a deltaic phase to finally a fluviatile framework. Thick flows of basalt encountered at more than 2500m depth. Onthe surface two types of alluvia of Quaternary age are found -- Older Alluvium and Newer Alluvium. Older alluvium mixed with kankar and laterite forms the higher ground in a limited area falling in northwestern part of the district in Goghat-I block. The rest of the district is covered by newer alluvium comprising sands of various grades with occasional gravels, clay, kankar and silt.

Subsurface structural feature of significance in this stable shelf zone is characterized by regionally homodinal sedimentary sequence gently dippingtowards ESE. The eastern part of the second zone is marked by normal faulting which passes through Arambagh and further eastwards towards Chinsurah there is complete absence of structural features.



(Source: Geological Survey of India)

Figure 6.1: Geological map of Hooghly district

7 Mineral wealth

7.1 Overview of mineral resources

The geological formation of Hooghly District indicates the presence of quite a number of major minerals and minor minerals.

7.2 Details of Resources

7.2.1 Sand and other riverbed minerals:

I. Drainage System

The district is rich in natural drainage lines. The total length of the drainage in Hooghly district is 461.83 km. Damodar, Dwarakeswar, Hooghly, Mundeswari and Saraswati are the main rivers of Hooghly district. The others tributaries are Sankari, Ghea, Kunti, Dankuni–khal and Baidyabati khal etc. At Tribeni near Bandel in Hooghly District in the Indian state of West Bengal the Bhagirathi branched off into three streams. The Saraswati flowed south-west beyond Saptagram, the Jamuna (this is distinct from the river of same name in northern India and several streams of the same name in eastern Bengal) flowed south-east, past the northern boundary of present-day town of Kalyani and the Bhagirathi proper flowing through the present Hooghly channel to Kolkata and then through Adi Ganga, past Kalighat, to the sea.

- **Damodar River-**Damodar River, river in northeastern India, rising with its many tributaries, notably the Bokaro and Konar, in the Chota Nagpur plateau of south-central Bihar state. It follows a generally eastward course for 368 miles (592 km) through West Bengal to join the Hugli (Hooghly) River southwest of Kolkata (Calcutta). Damodar River was earlier known as the "River of Sorrows"as it used to flood many areas of Bardhaman, Hooghly, Howrah and Medinipur districts. Even now the floods sometimes affect the lower Damodar Valley, but the havoc it wreaked in earlier years is now a matter of history.

- **Dwarkeswar River-**The river originates near Madhabpur in Purulia district and enters Bankura district near Chhatna. It cuts across the district flowing past the district headquarters and enters the southeastern tip of East Bardhaman District. It then passes through Hooghly District.The Silai joins it near Ghatal and the two together are known as Rupnarayan River, which flows into the Hooghly River near Gadiara in Howrah District.Dwarakeswar River has much sedimentation from low water (any season). In rainy seasons it is filled up with water; then huge sedimentations block the channel. Even near Arambagh the channel basin has been reduced by garbage and anthropogenic (man made) activities.

- **Hooghly River-**The Hooghly River or the Bhāgirathi-Hooghly, originally and in local tongues the 'Ganga', and also called Kati-Ganga, is an approximately 260-kilometre-long (160 mi) distributary of the Ganges River in West Bengal, India. The Ganges splits into

the Padma and the Hooghly near Giria, Murshidabad. Today there is a further man-made bifurcation of the river upstream at Farakka. The Padma flows eastward into Bangladesh, whereas the Hooghly flows south through West Bengal. The river flows through the Rarh region, the lower deltaic districts of West Bengal, and eventually into the Bay of Bengal. The upper riparian zone of the river is called Bhagirathi while the lower riparian zone is called Hooghly.

At Tribeni near Bandel in Hooghly District in the Indian state of West Bengal the Bhagirathi branched off into three streams. The Saraswati flowed south-west beyond Saptagram, the Jamuna (this is distinct from the river of same name in northern India and several streams of the same name in eastern Bengal) flowed south-east, past the northern boundary of present-day town of Kalyani and the Bhagirathi proper flowing through the present Hooghly channel to Kolkata and then through Adi Ganga, past Kalighat, to the sea. It is believed that the Saraswati flowed into an estuary near present-day Tamluk and received the waters of not only the Rupnarayan and Damodar but several other smaller streams.

Major rivers that drain into the Bhagirathi-Hooghly include Mayurakshi, Jalangi, Ajay, Damodar, Rupnarayan and Haldi rivers other than the Ganges. Kolkata and Hugli-Chinsura, the headquarters of Hooghly (district), are located on the banks of this river.

- **Mundeswari River-** Mundeswari river is a small river in West Bengal which causes floods in Hooghly, Purba Medinipur and Howrah districts during the monsoons. Any discharge above 2,000 cubic metres per second (70,000 cu ft/s) downstream of Durgapur Barrage may cause flooding depending on the outfall condition of the Mundeswari at Harinkhola. It has been suggested that the banks of rivers such as Mundeswari should be protected with embankments to prevent floods

The basin of river Damodar has a very special shape and this influences its flood pattern. The river has about 70% of its basin just upstream of Durgapur town. This upper catchment of Jharkhand plateau, above Durgapur, generates heavy run-off during high rainfall and is carried to Durgapur in a short time. From here, this discharge travels through the river, bifurcating at Beguahana. One branch, the lower Damodar with very small capacity, reaches the Hooghly on the west bank. The major discharge passes through the Mundeswari to meet the Rupnarayan. Any major discharge along the downstream of Durgapur Barrage may cause flood depending upon the outfall condition of the Mundeswari at Harinkhola. In Kangsabati river system, the Kangsabati Dam has a limited flood storage capacity which is very nominal. *http://wbdmd.gov.in/Pages/Flood2.aspx*. The Chota Nagpur Plateau receives an average annual rainfall of around 1,400 mm, almost all of it in the monsoon months between June and August. The huge volume of water that flows down the Damodar and its tributaries during the monsoons used to be a fury in the upper reaches of the valley. In the lower valley it used to overflow its banks and flood large areas.

Damodar River was earlier known as the "River of Sorrows" as it used to flood many areas of Bardhaman, Hooghly, Howrah and Medinipur districts. Even now the floods sometimes affect the lower Damodar Valley, but the havoc it wreaked in earlier years is now a matter of history.

The floods were virtually an annual ritual. In some years the damage was probably more. Many of the great floods of the Damodar are recorded in history — 1770, 1855, 1866, 1873–74, 1875–76, 1884–85, 1891–92, 1897, 1900, 1907, 1913, 1927, 1930, 1935 and 1943.

It has a number of tributaries and subtributaries, such as Barakar, Konar, Bokaro, Haharo, Jamunia, Ghari, Guaia, Khadia and Bhera. The Damodar and the Barakar trifurcates the Chota Nagpur plateau. The rivers pass through hilly areas with great force, sweeping away whatever lies in their path. *https://www.riversgraphy.com/damodar-river*

Table 7.1: Drainage system with description of main rivers

Sl.no	Name of the River	Area Drained (square km)	% Area Drained in the District
1	Hooghly	1168.07	37.165
2	Damodar	195.59	6.223
3	Mundeswari	309.522	9.848
4	Dwarkeshwar	351.12	11.171

Table 7.2: Salient Features of important rivers and streams

Salient Features of Important River and Streams				
S.no	**Name of the River Stream**	**Total Length in the District (in km)**	**Place of Origin**	**Altitude at Origin**
1	**Hooghly**	86.93	Nabadwip (West Bengal)	8 m
2	**Damodar**	23.83	Chulhapani (Jharkhand)	910 m
3	**Mundeswari**	42.29	Srirampur (Bardhaman District)	137 m
4	**Dwarkeshwar**	26.51	Purulia (West Bengal)	228 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 drainage basin is the foremost factor for annual deposition of sedimentary load. The study includes the following parameters:

i) Place of Origin

The place of origin of each of the five rivers is given in Table 7.3.

Table 7.3: Place of origin of rivers of Hooghly district

S.no	Name of the River Stream	Place of Origin	Altitude at Origin
1	**Hooghly**	Nabadwip (West Bengal)	8 m
2	**Damodar**	Chulhapani (Jharkhand)	910 m
3	**Mundeswari**	Srirampur (Bardhaman District)	137 m
4	**Dwarkeshwar**	Purulia (West Bengal)	228 m

ii) Catchment Area

Hooghly district is mainly drained by the Hooghly River, Dwarkeshwar River, Mundeswari River, and Damodar River and its tributary rivers which are forming the main catchment area.

iii) General profile of river stream

The district is rich in natural drainage lines. The total length of the drainage in Hooghly district is 461.83 km. Damodar, Dwarakeswar, Hooghly, Mundeswari are the main rivers of Hooghly district. The others tributaries are Saraswati, Sankari, Ghea, Kunti, Dankuni–khal and Baidyabati khal etc.

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 Birbhum district along with the distribution of the section lines are shown in Figure 7.1. River profile section and cross section views are presented in Figures 7.2 and 7.3.

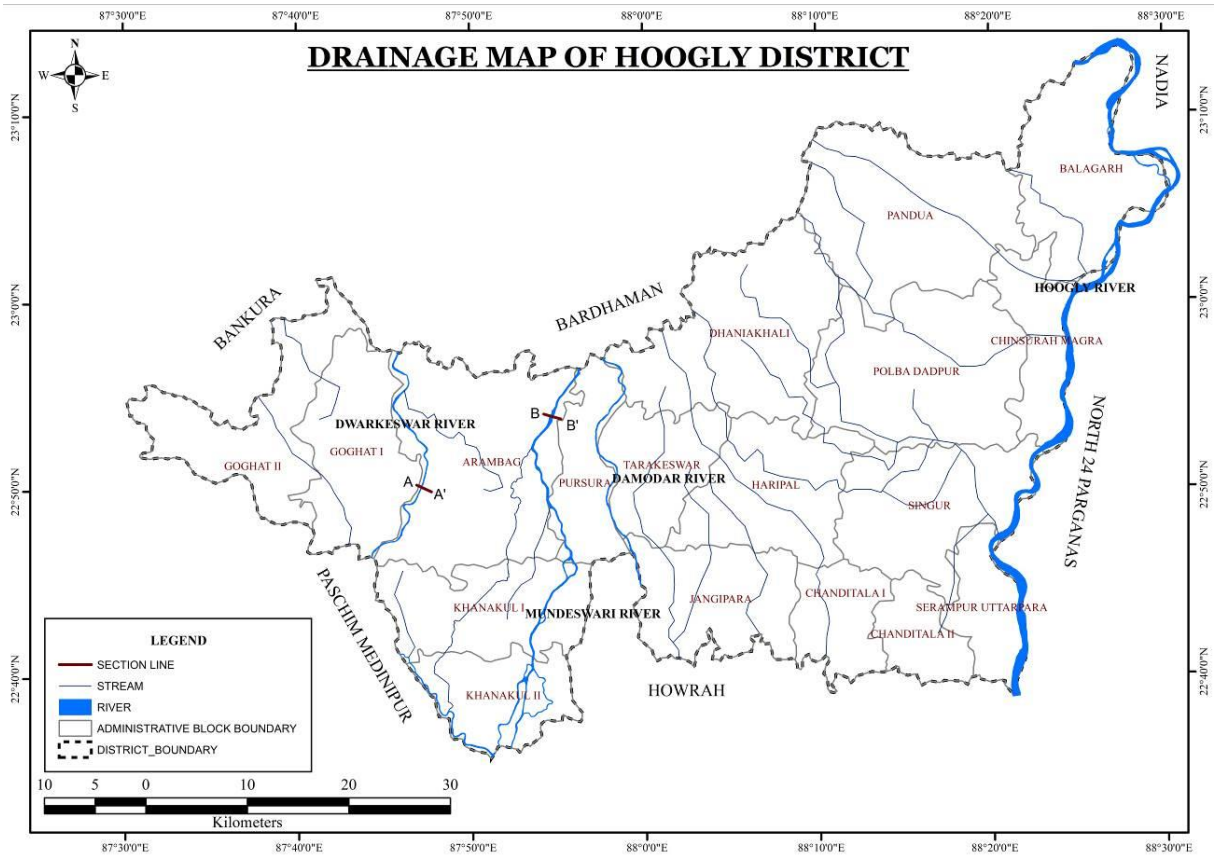


Figure 7.1: Drainage map of Hooghly district

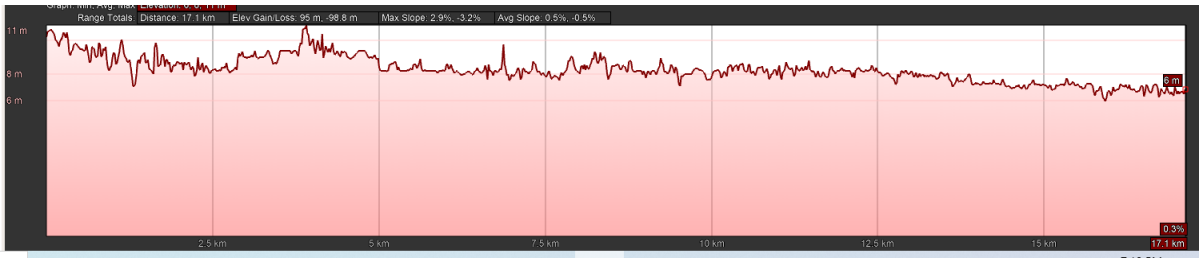


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Figure 7.2A: Profile section of Dwarakeswar River

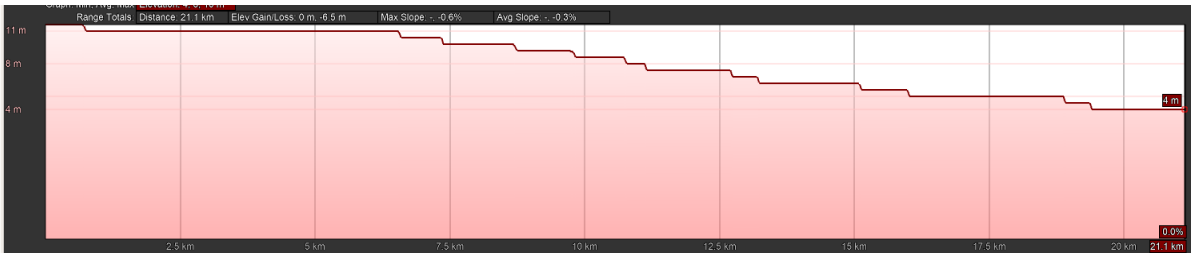

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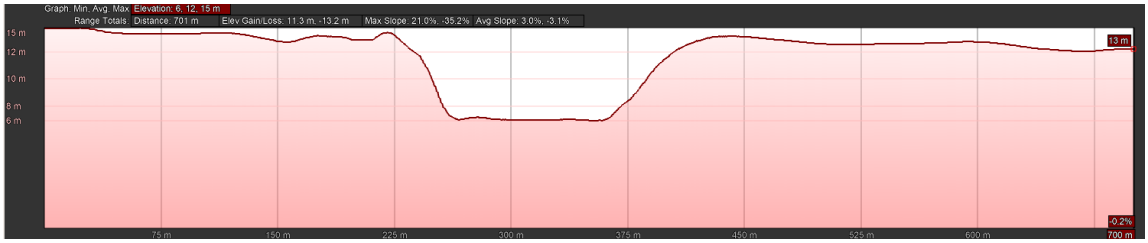
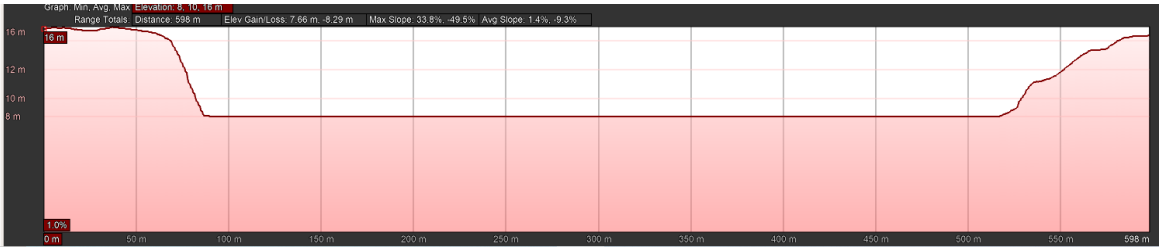
Figure 7.2B: Profile section of Mundeswari River



A A'

Figure 7.3A: Cross section view of Dwarakeswar River



B B'

Figure 7.3B: Cross section view of Mundeswari River

iv) Annual deposition factor

Annual deposition of riverbed materials depends on various factors, such as process of deposition, mode of sediment transport, sediment transportrate, sedimentation 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 are transported by either bedload or suspended load. In case of bedload, when there is insufficient bed shear stress and fluid turbulence is insufficient to keep the sediment moving, the grains looses horizontal

movement and rapidly come to rest. In case of suspended load the grains travel 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 as 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

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

v) Replenishment Study as per EMGSM guidelines 2020:

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

A. Replenishment study based on satellite imagery involves demarcation of sand bars potential for riverbed mining. Both pre and post monsoon images need to be analysed to established potential sand bars. Volume estimation of sand is done by multiplying Depth and Area of the sand bar. The sand bars are interpreted with the help of satellite imagery. Ground truthing has been done for 100% of the total identified sand bars. During ground truthing, width and length of each segment were physically measured. It has also been observed that in few cases, sand bars have attained more than 3 meters height from the average top level of the river beds. Considerations of sand resources have been restricted within 3 meters from the average top surface of the river bed.

B. Direct field measurement of the existing leases involving estimation of the volume diference of sand during pre and post-monsoon periods. With systematic data acquisition, a model has been 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.

V(A). Replenishment study based on field investigation:

Sedimentation in any river is dependent on sediment yield which 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 for all the river ghats on continuous basis for pre monsoon period and October- November 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 Mundeswari River

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 imageries. Frequency distribution did while selection of the ground truthing of the blocks.

3. **Data compilation:**

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

- Elevation levels of the different sand Ghats and Sand Bar's as measured at site.
- Extents of the sand bars are measured from the pre monsoon satellite imageries.
- Sand production data of the district.

All these data were compiled while estimation of the replenished sand in the Hooghly 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 imaginary 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 Hooghly district are Mundeswari and Dwarkeshwar rivers. Planning has been done for systematic sand mining in the rivers.

For calculating the area of sand bars, following categorization of land within the chanel area have been adopted:

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 Hooghly 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 Hooghly district during Pre and Post monsoon 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 Hooghly district

River Name	Pre-Monsoon no of ghats	Post-Monsoon no of ghats	Pre-Monsoon Sediment Load (Mcum)	Post Monsoon Sediment Load (Mcum)	Difference (Mcum)	Difference (%)
Dwarkeswar	2	6	0.63	0.73	0.10	17
Mundeswari	15	41	3.70	4.42	0.72	20
Damodar	3	2	0.03	0.03	0.00	14
Total	20	49	**4.36**	**5.19**	**0.83**	**19**

Thus, in the district, about 0.83 Million cum of sand has been found as an incremental volume increase when compared between pre- and post-monsoon sand reserve data.

Long-term satellite imagery study has also been carried out for sand producing rivers of the district to analyse the changes in river course. A representative map, showing long-term erosion-accretion areas on both the banks of Mundeswari River has been prepared and furnished in Plate No. 5. Map shows changes in river channel through erosion and accretion of river bank and in the process the river shows narrowing of width of the river course by almost 500m from 2001 to 2021.

V(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 were measured through DGPS/Total station just before the closure of the mines in pre-monsoon period and the same areas were resurveyed in the post-monsoon period. The difference between the depth of the surveyed areas were 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 after Replenishment	Thickness Replenished	Volume Replenished	Difference in RL	Replenishment Rate
		m2	m	m	Mcum	m	m	m	Mcum	m	%
Chakbense	Mundeswari	32800	7	2.95	0.097	4.05	6.95	2.90	0.095	0.05	98.2%
Bhabapur	Dwarakeswar	43200	9	2.90	0.125	6.10	8.94	2.84	0.123	0.06	98.0%
Chandpur	Dwarakeswar	24000	8	2.90	0.070	5.10	7.93	2.83	0.068	0.07	97.6%
Punja	Dwarakeswar	32000	8	3.00	0.096	5.00	7.91	2.91	0.093	0.09	97.0%
Baikunthapur	Damodar	34600	12	2.90	0.100	9.10	11.93	2.83	0.098	0.07	97.5%

Based on field investigation, the average replenishment rate for the year 2020 is about 97.66%.

Note: Sediment load may vary in subsequent years based on the replenishment

V(C). Replenishment estimation based on an empirical formula:

The river reaches with sand provide the resource and thus it is necessary to ascertain the rate of replenishment of the mineral. Regular replenishment study needs to be carried out to keep a balance between deposition and extraction. The replenishment estimation based on a theoretical empirical formula comprising of analytical models to calculate.

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

i. Methodology of the study:

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

a. Catchment yield calculation:

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

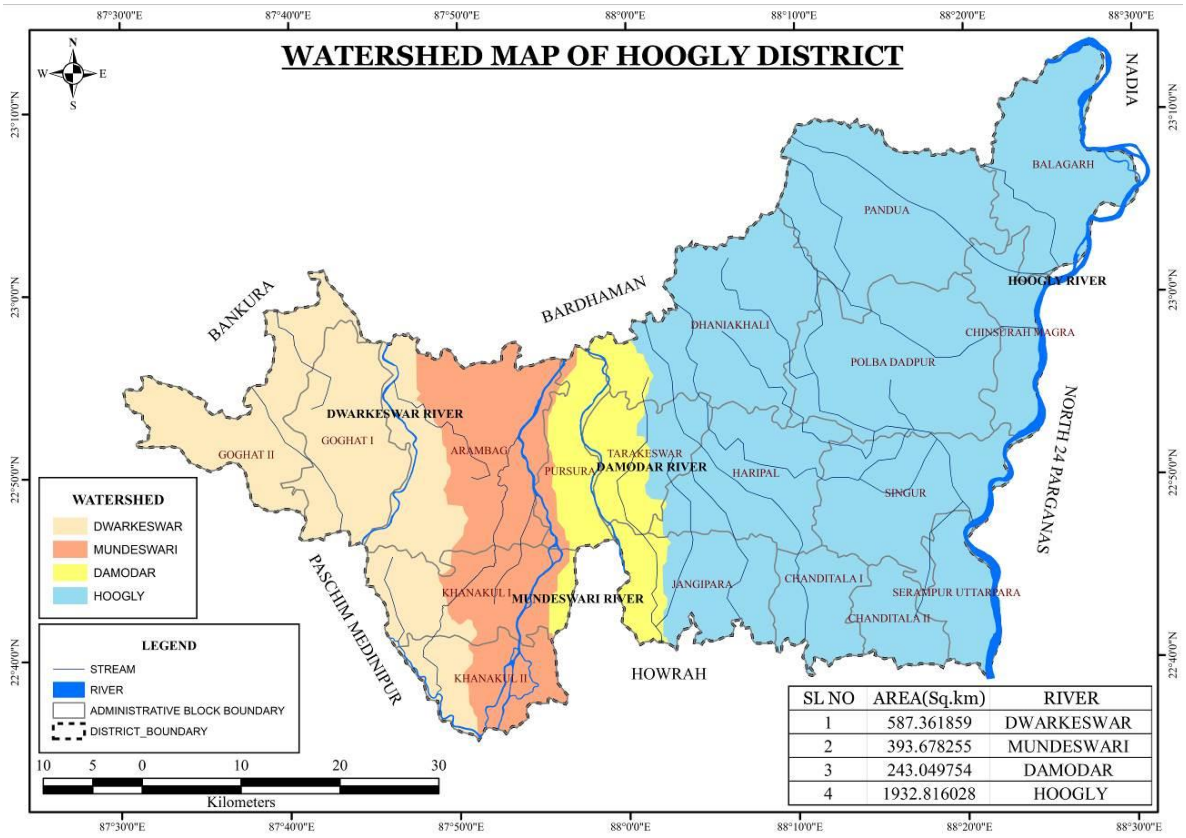


Figure 7.5: Watershed map of Hooghly district *(Source: World Wild Fund for Nature, September 2020)*

Catchment yield can be estimated using following formula:

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. Formula used as below:

Eq. 1: Catchment Yield (m3) =Catchment area (m2) X Runoff coefficient (%) X Rainfall (m)

Runoff coefficient of the catchment has been established based on Stange's table.

Strange (1892) studied the available rainfall and runoff and obtained yield ratios as functions of indicators representing catchment characleris1ics. Catchments are classified as good, average and bad according to the relative magnitudes of yieldthey give. 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.

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
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

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

Rainfalls return period for 25, 50 and 100 years calculated as below:
As per Weibull's Formula (Subramanya, 2008)**,**

Return period/Recurrence interval = (n+1)/m
Where: n number of years on record;
m is the rank of observed occurrences when arranged in descending order.

b. Peak Flood Discharge:

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 are as below:

- **As per Dicken's formula,**

Eq.2: $Q = CA^{3/4}$
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 plains and 14 to 28 for catchments in hills

- **As per Jarvis formula,**

Eq. 3: $Q = CA^{1/2}$
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,**

Eq. 4: 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, which are explained below:

Ackers and White Equation:

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

Eq. 5: $C_t = C_s G_s \left(d_{50}/h\right) \left(V/U_*\right) n' \left[\left(Fgr/A_1\right) - 1\right] m$

The dimensionless particle d_{gr} is calculated by:

Eq. 6: $d_{gr} = d_{50} \left(g(G_s-1)/v^2\right)^{1/3}$

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

Eq.7: $F_{gr} = (U^* n'/(G_s-1) g\, d_{50})^{1/2} \; (V/(5.66 \log(10h/d_{50}))^{1-n'}$

Where,

A_1= Critical particle mobility factor
C_s= Concentration coefficient in the sediment transport function
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

d. 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:

Eq.8: $g_b = 0.417[\tau_0 (\eta'/ \eta)^{1.5} - \tau c]^{1.5}$

Where,
gb = Rate of bed load transport (by weight) in N per m width of channel per second.

η' = Manning's coefficient pertaining to grain size on an unrippled bed and Strickler formula i.e. η' = (1/24) x d1/6 where d is the median size (d_{50}) of the bed sediment in m.

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

τc = Critical shear stress required to move the grain in N/m2 and given by equationτc = 0.687da, where da is mean or average size of the sediment in mm. This arithmetic average size is usually found to vary between d_{50} and d_{60}.
τ0= Unit tractive force produced by flowing water i.e. γwRS. Truly speaking, its value should be taken as the unit tractive force produced by the flowing water on bed = 0.97γwRS. R is the hydraulic mean depth of the channel (depth of flow for wider channel) and S is the bed slope.

e. 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 hyraulic 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) developed by Williams and Berndt (1977)

f. Dendy–Bolton Equation:

Dendy–Bolton formula (Dendy and Bolton 1976) 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 gully Erosion, Channel Bed and bank erosion 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:

Eq.9: (Q<2in) $S=1289*(Q)^{0.46}*[1.43-0.26 \text{ Log } (A)]$

For run off more than 2 inches:

Eq.10: (Q > 2 in): $S= 1958*(e^{-0.055*Q})*[1.43-0.26 \text{ Log } (A)]$
Where: S = Sediment yield (tons/sq miles/yr)

Q = Mean Annual runoff (inch)

A = Net drainage are in sq mile

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 ona 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 plant 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; andthere is less probability of an intense rainstorm over the entire basin. Both phenomena tendto decrease sediment yield per unit area.

Modified Universal Soil Loss Equation (MUSLE):

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

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:

Eq.11: Y=11.8 X(Q X qP).56 X K X Ls X C X P

Where,

Y = sediment yield of stream (t/yr/km2),
Q = average annual runoff (m3),
K = soil erodibility factor,
qP = Highest discharge recorded (m3/s),
Ls = gradient/slope length,
C = cover management factor,
P = erosion control practice

ii. Estimation of Replenishment:

The major sand producing rivers of the Hooghly district are Mundeswari, Dwarkeshwar rivers. 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 43%, as the rainfall in the district is 1440mm during 2020 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 Abhijit 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 given in Table 7.7.

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

Estimation parameter	Mundeswari	Dwarakeswar	Damodar
Catchment Area (m^2)	393680000	587360000	243050000
Annual Rainfall (m) (in 2020)	1.44	1.44	1.44
Strange Runoff coefficient (%)	43%	43%	43%
Annual Run-off (m) (in 2020)	0.3168	0.3168	0.3168
Catchment Yield (m^3)	243766656	363693312	150496560
Peak Flood Discharge (m^3/sec)	33538123.53	45275110.76	23358931.07
Flow depth d (m)	0.8	0.5	0.6
Channel width b (m)	450	120	150
Mean velocity v (m/s)	0.1	0.03	0.05
Channel slope S_o (m/m)	0.011	0.007	0.009
Sediment Yield (Tons/year)	10301.1	14564.1	10280.83
Estimated Annual Replenishment (in million m3)	0.19290	0.27274	0.19252

Sedimentation rate of a river is dependent on the annual rainfall of the district. Sedimentation rate for the period 2016-2020 of each river is presented in Table 7.8 and Figure 7.6.

Table 7.8: Year-wise sedimentation rate (tons/km^2/yr) for last 5 years of each river

Year	Mundeswari	Dwarakeswar	Damodar	Annual Rainfall
2017	26.45	25.07	28.12	**1437.4**
2018	68.42	64.84	72.74	**998.1**
2019	40	37.91	42.52	**1246.2**
2020	26.17	24.8	27.82	**1441.7**
2021	10.7	10.14	11.37	**1855.3**

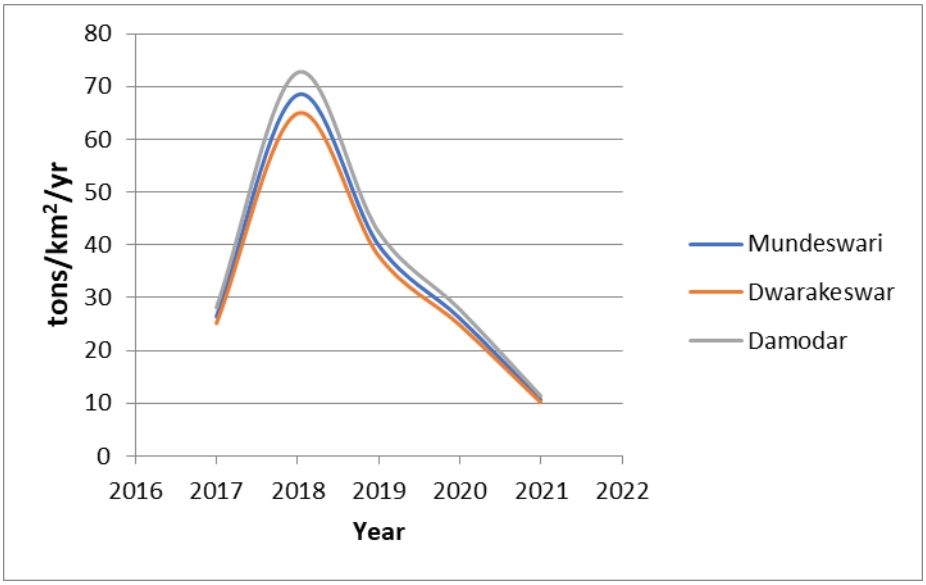


Figure 7.6: Graphical representation of year-wise sedimentation rate

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 Dandy- Bolton	Replenishment Rate
		m2	m	m	Mcum	m	cum	%
Chakbense	Mundeswari	32800	7	2.95	0.097	1.44	0.071	73.0%
Bhabapur	Dwarakeswar	43200	9	2.90	0.125		0.093	74.0%
Chandpur	Dwarakeswar	24000	8	2.90	0.070		0.053	76.0%
Punja	Dwarakeswar	32000	8	3.00	0.096		0.075	78.0%
Baikunthapur	Damodar	34600	12	2.90	0.100		0.078	77.5%

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	Mundeswari	River Name	Mundeswari
River	Mundeswari	Location	Chakbense	Location	Chakbense
Total Pre-monsoon Sand Bar Area	1479322 (sq.m)	Mining Area	32800 (Sq.m)	Lease Area	32800 (Sq.m)
Average Pre monsoon Thickness	2.5 (m)	Pre monsoon RL	7 (m)	Surface RL Before mining	7 (m)
Total Volume	3.70 (Mcum)	Sand Thickness	2.95 (m)	Mine out Thickness	2.95 (m)
Total Post-monsoon Sand Bar Area	1473410 (sq.m)	Volume excavated (Cum)	96760 (Cum)	Mine out Volume (Cum)	96760 (Cum)
Average Post-monsoon Thickness	3 (m)	Post monsoon RL	6.95 (m)	Drainage area for lease block	0.071 (Sq.km)
Total Volume	4.42 (Mcum)	Thickness	2.90 (m)	Monsoon Rainfall-2020	1.44 (m)
Total Pre and Post monsoon Volume Difference	0.72 (Mcum)	Volume deposited (Cum)	95018.32 (Cum)	Estimated Volume as per Dendy- Bolton (S = 1280 Q0.46[1.43 - 0.26 log(A)]) Where, Q is runoff, A is drainage area)	70634.8 (Cum)
Replenishment and Aggradation %	120%	Replenishment Rate	98.2%	Replenishment Rate	73%

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	Mundeswari	Dwarakeswar	Damodar
Estimated Annual Replenishment based on Satellite imageries **(*)**	120%	117%	114%
Estimated Annual Replenishment based on field investigation	98.2%	97.5%	97.5%
Estimated Annual Replenishment based on empirical formula	73.00%	76.00%	77.50%

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

vi) Total potential of minor mineral in the river bed

The major sand producing rivers of the Hooghly district are Mundeswari and Dwarkeshwar rivers. Planning has been done for systematic sand mining in the rivers.

B. Geological studies

i) Lithology of the catchment area

The district is a completely flat land with River Hooghly borders it to the east. Most of the land of the district is alluvial type of soil due to well distribution of river system. Another major river is 'Damodar'. The entire area is a part of the Gangetic Delta.

ii) Tectonics and structural behavior of rocks

Hooghly district is situated in the stable shelf zone in the western flank of Bengal Basin. Archaean crystalline basement, Gondwana sediments and Rajimahal volcanics of Mesozoic age flank this part of Bengal Basin to the west and northwest. The district is covered by a huge thickness of Quaternary alluvium underlain by Tertiary and Mesozoic formation.

Subsurface structural feature of significance in this stable shelf zone is characterized by regionally homodinal sedimentary sequence gently dipping towards ESE. The eastern part of the second zone is marked by normal faulting which passes through Arambagh and further eastwards towards Chinsurah there is complete absence of structural features.

C. Climate Factors

i) Intensity of rainfall

The average annual rainfall in the district is 1395mm. The rainfall during the monsoon season – June to September – constitutes 70 percent of the annual rainfall; July and August are the rainiest months. The district receives a mean annual rainfall varying from 998 to 1855 mm during 2017 to 2021.

ii) Climate zone

Hooghly has a tropical climate. The climate of this district is characterized by an oppressive hot summer, high humidity nearly all the year round and a well distributed rainfall in the south west monsoon season. The year may be divided into four seasons. The cold season is from about the middle of November to the end of February. The period from March to May is the summer season. The south west monsoon season commences about the beginning of June and lasts till the end of September. October and the first half of November may be termed as post-monsoon season.

iii) Temperature variation

The average Temperature of Hooghly is around 26°C although it vary from around 16°C during Winter (January) to 30°C during the Monsoon (June). The hottest month of the year is June with temperature varies from 25.0°C to 37.1°C. The coolest month is of the year is January, with temperature varies from 8.4°C to 26.8°C.

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

Table 7.11: River wise Thickness of sand bar considered mineable

River Name	Considered Mining Thickness (m)
Mundeswari	3.0
Dwarkeshwar	3.0

Based on geomorphology, geology, climate and mineable thickness of sand bar the annual deposition of riverbed minerals has been estimated. 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 kilometer (1 km) from major bridges and highways on both sides, or five times (5x) of the span (x) of a bridge/public civil structure (including water intake points) on up-stream side and ten times (10x) the span of such bridge on down-stream side, subjected to a minimum of 250 meters on the upstream side and 500 meters on the downstream side. The annual minable mineral potential is given in Table 7.13.

Table 7.13: Annual mineable mineral potential

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 meters)	Area recommended for mineral concession (in Sqm)	Mineable mineral potential (in Mcum) (60% of total mineral potential
1	Dwarkeswar	4%	2774.6093	153.1023	164680.173	0.30
2	Mundeswari	9%	15205.769	175.245	810118.6712	1.46

III. Riverbed Mineral Potential

Sand is the important riverbed mineral found to be potential for mining. Considerable quantity of quality sands are found to occur in part of Damodar, Ajay and Barakar Rivers. Table 7.14 summarizes the potential riverbed mineral deposits of the district. Smaller patches are also available locally in the other smaller rivers as well. Sand mining can be developed on cluster approach with restricted usage of Machinery's for lifting of sands. Development of river bed material with huge boulders also requires usage of machinery's to increase more production in turn revenue.

Table 7.14: Resources of Potential Riverbed Mineral

Boulder (Mcum)	Pebbles/ Gravel (Mcum)	Sand/White sand (Mcum)	Total Mineable, Mineral Potential (Mcum)
		1.75	1.75

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 7.15.

Table 7.15: 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	Zone	Co-ordinates		
				Latitude	Longitude	
1	DWARKESWAR RIVER	ARAMBAG	DW_ZONE_1	22° 57' 5.977" N	87° 45' 43.753" E	5420.240378
				22° 56' 41.444" N	87° 45' 31.302" E	
		ARAMBAG	DW_ZONE_2	22° 56' 29.527" N	87° 45' 36.885" E	10073.45889
				22° 56' 13.834" N	87° 46' 10.480" E	
		ARAMBAG	DW_ZONE_3	22° 54' 57.866" N	87° 45' 49.582" E	9033.972944
				22° 54' 46.282" N	87° 45' 34.631" E	
		ARAMBAG	DW_ZONE_4	22° 49' 22.754" N	87° 46' 40.764" E	3259.45474
				22° 49' 17.318" N	87° 46' 32.065" E	
2	MUNDESWARI RIVER	PURSURA	MU_ZONE_1	22° 56' 24.757" N	87° 56' 13.764" E	17746.31611
				22° 55' 56.715" N	87° 56' 0.179" E	
		ARAMBAG	MU_ZONE_2	22° 55' 56.715" N	87° 56' 0.179" E	16947.10246
				22° 55' 27.016" N	87° 55' 32.396" E	
		ARAMBAG	MU_ZONE_3	22° 53' 46.206" N	87° 54' 41.552" E	47384.50259
				22° 52' 0.154" N	87° 53' 40.852" E	
		ARAMBAG	MU_ZONE_4	22° 51' 17.526" N	87° 53' 46.114" E	14869.49724
				22° 51' 0.645" N	87° 53' 57.610" E	
		ARAMBAG	MU_ZONE_5	22° 50' 0.079" N	87° 54' 20.383" E	7342.722371
				22° 49' 34.933" N	87° 54' 22.937" E	
		PURSURA	MU_ZONE_6	22° 49' 21.396" N	87° 54' 28.626" E	20669.69241
				22° 48' 55.909" N	87° 54' 50.132" E	

		PURSURA	MU_ZONE_7	22° 46' 57.660" N	87° 55' 28.235" E	14941.35433
				22° 46' 24.456" N	87° 55' 41.189" E	
		KHANAKUL I	MU_ZONE_8	22° 46' 5.274" N	87° 55' 18.561" E	7556.42289
				22° 45' 33.838" N	87° 55' 23.415" E	
		KHANAKUL I	MU_ZONE_9	22° 43' 41.282" N	87° 54' 15.728" E	9592.673846
				22° 43' 28.898" N	87° 54' 8.167" E	
		KHANAKUL I	MU_ZONE_10	22° 42' 43.936" N	87° 53' 41.996" E	7784.007498
				22° 42' 30.996" N	87° 53' 33.148" E	
		KHANAKUL I	MU_ZONE_11	22° 41' 44.307" N	87° 53' 23.869" E	5951.142478
				22° 41' 30.874" N	87° 53' 30.031" E	
		KHANAKUL I	MU_ZONE_12	22° 41' 11.774" N	87° 53' 29.318" E	4033.405475
				22° 41' 2.589" N	87° 53' 28.106" E	
		KHANAKUL II	MU_ZONE_13	22° 41' 2.589" N	87° 53' 28.106" E	3599.073021
				22° 40' 56.133" N	87° 53' 26.796" E	
		KHANAKUL II	MU_ZONE_14	22° 39' 27.608" N	87° 53' 5.406" E	1078.731534
				22° 39' 2.894" N	87° 53' 0.720" E	
		KHANAKUL II	MU_ZONE_15	22° 38' 56.242" N	87° 52' 39.898" E	2496.779395
				22° 38' 48.964" N	87° 52' 41.097" E	
		KHANAKUL II	MU_ZONE_16	22° 38' 26.611" N	87° 52' 31.568" E	2481.209478
				22° 38' 18.532" N	87° 52' 26.305" E	
		KHANAKUL II	MU_ZONE_17	22° 37' 41.919" N	87° 52' 40.063" E	6632.87954
				22° 37' 29.210" N	87° 52' 29.209" E	
		KHANAKUL II	MU_ZONE_18	22° 38' 56.543" N	87° 54' 11.727" E	823.530081
				22° 38' 41.280" N	87° 54' 34.337" E	

NO MINING ZONE:

As per the Enforcement and 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 Mundeswari of Hooghly district is given in Figure 7.7. Table 7.16 summarized the area of no mining zones demarcated for each river of the district.

Table 7.15: No mining zone in the district

RIVER NAME	BLOCK NAME	ZONE	RESTRICTED AREA (SQ MTS)
DWARKESWAR RIVER	ARAMBAG	DW_ZONE_1	5420.240378
		DW_ZONE_2	10073.45889
		DW_ZONE_3	9033.972944
		DW_ZONE_4	3259.45474
MUNDESWARI RIVER	PURSURA	MU_ZONE_1	17746.31611
	ARAMBAG	MU_ZONE_2	16947.10246
		MU_ZONE_3	47384.50259
		MU_ZONE_4	14869.49724
		MU_ZONE_5	7342.722371
	PURSURA	MU_ZONE_6	20669.69241
		MU_ZONE_7	14941.35433
	KHANAKUL I	MU_ZONE_8	7556.42289
		MU_ZONE_9	9592.673846
		MU_ZONE_10	7784.007498
		MU_ZONE_11	5951.142478
		MU_ZONE_12	4033.405475
	KHANAKUL II	MU_ZONE_13	3599.073021
		MU_ZONE_14	1078.731534
		MU_ZONE_15	2496.779395
		MU_ZONE_16	2481.209478
		MU_ZONE_17	6632.87954
		MU_ZONE_18	823.530081

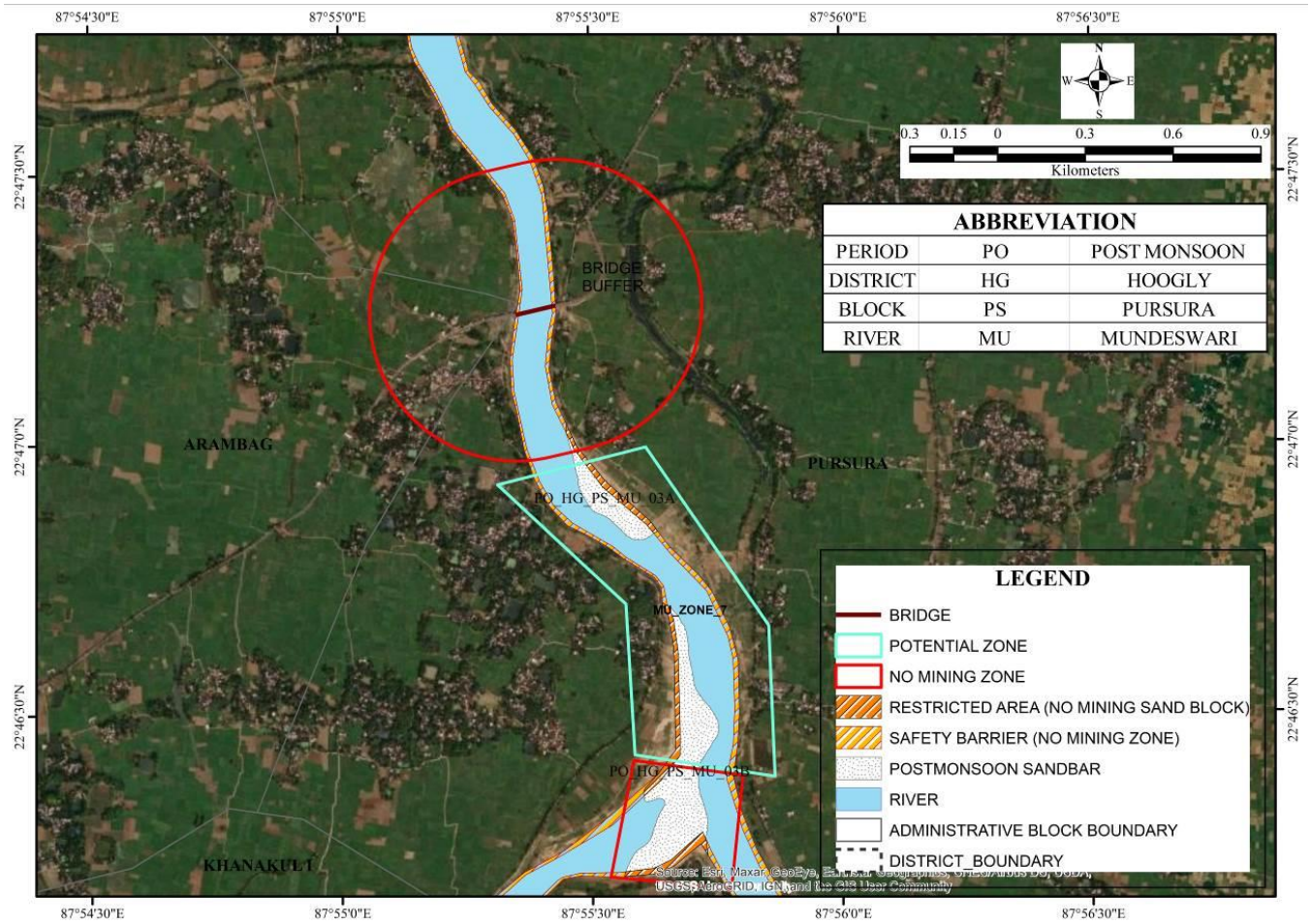


Figure 7.7: A representative map showing no-mining zone demarcated on Mundeswari River *(Source: ISRO RESOURCE Sat 2 LISS III Sensor, November 2020)*

7.2.2 In-situ Minerals:

I. Mineral Reserve

Hoogli district doesn't count to be a mineral rich district of the state, however sand mining and brick earth mining takes a vital role in the economic development of the district.
Deposit of coarse to fine graded yellow sand, suitable for construction purpose, can be seen in the dry riverbed of Dwarkeshwar and Mundeshwari river.

II. Mineral Potential

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

7.3 Mineral development prospect of the district with respect to Minor Mineral

The district is not having any mejar mineral resources and there are no mines in the district. However, collections of sand from the river-bed are the minor mineral sources. In this

district some of big rivers are flowing like Damodar, Hooghly, Mundeswari and Dwarakeswar, 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 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. Therefore, there is a need more scientific sand mining procedure. It is highly recommended to conduct detailed exploration to establish mineral resources of the district.

8 Overview of mining activity in the district

8.1 General overview

Hoogli district doesn't count to be a mineral rich district of the state, however sand mining and brick earth mining takes a vital role in the economic development of the district.

Deposit of coarse to fine graded yellow sand, suitable for construction purpose, can be seen in the dry riverbed of Dwarkeswar and Mundeswari river.

8.2 List of existing mining leases of the districts

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

Table 8.1: Details of EC Cleared Sand ghats of the districts (Sand)

ID	Block	Mouza	JL No	River	Road	Plot No	Area in Hectares	Latitude	Longitude	Bidder Name	Date of Issuance of Environmental Clearance (E.C.)	Date of Execution of Lease Deed	Lease Agreement Start Date (date of effect)	Lease Agreement Expiry Date	Quantum of Sand Extraction permissible as per Mining Plan (tonnes)
140/SB2021	ARAMBAGH	Bhabapur	1	Darakeswar	Kachha Road	5, 277	4.32	22° 57' 39.98"N	87° 45' 49.53"E	Madan Mohan Mondal	3/23/2018	11/2/2018	11/2/2018	1-Nov-23	856511.669
144/SB2021	ARAMBAGH	Chakbense	67	Mundeswari	Metal/Black top/Pitch/Pucca Road	508	3.28	22° 54' 4.93"N	87° 54' 40.22"E	Sunil Das	8/23/2018	1/2/2018	1/2/2018	1-Jan-23	668463.209
142/SB2021	ARAMBAGH	Par Adra	3	Darakeswar	Metal/Black top/Pitch/Pucca Road	368	1.66	22° 56' 54.15"N	87° 45' 34.24"E	Bharat Super Construction	8/23/2018	11/22/2018	11/22/2018	21-Nov-23	277686.953
143/SB2021	ARAMBAGH	Par Adra	3	Darakeswar	Metal/Black top/Pitch/Pucca Road	368	2.39	22° 56' 53.69"N	87° 45' 33.99"E	Sunil Das	12/4/2018	12/26/2018	12/26/2018	25-Dec-23	413601.297
147/SB2021	Arambagh (M)	Telipara	9	Darakeswar	Kachha Road	124, 259	4.76	22° 54' 2.67"N	87° 45' 47.23"E	Kalomoni Baski	8/23/2018	10/12/2018	10/12/2018	11-Oct-23	1156994.25
119/SB2021	Arambagh (M)	Chandpur	8	Darakeswar	Metal/Black top/Pitch/Pucca Road	1442	2.4	22° 91' 78.26"N	87° 76' 52.75"E	Surendra Kumar Kochar	12/29/2016	5/16/2017	5/16/2017	15-May-22	272.018
120/SB2021	GOGHAT-2	Amboula	17	Darakeswar	Metal/Black top/Pitch/Pucca Road	1, 525	4.2	23° 0' 9.40"N	87° 43' 26.70"E	Mahammad Humayun Kabir	12/29/2016	6/30/2017	6/30/2017	29-Jun-22	2391691.98
122/SB2021	GOGHAT-2	Punia	12	Darakeswar	Metal/Black top/Pitch/Pucca Road	395, 1013	3.2	23° 1' 26.60"N	87° 42' 20.80"E	Arijit Sen	3/6/2017	8/17/2017	8/17/2017	16-Aug-22	350081.037
123/SB2021	GOGHAT-2	Punia	12	Darakeswar	Kachha Road	1082	1.9	23° 1' 20.10"N	87° 42' 28.10"E	Rabi Singh	5/15/2017	8/11/2017	8/11/2017	10-Aug-22	207617.504
125/SB2021	Arambagh (M)	Chandpur	8	Darakeswar	Kachha Road	1442	2.5	22° 54' 43.73"N	87° 45' 34.06"E	Firdous Ahamed	11/14/2017	11/30/2017	11/30/2017	29-Nov-22	283630.47
131/SB2021	GOGHAT-1	Adra	30	Darakeswar	Kachha Road	386, 387, 396, 400, 410, 411, 412, 413, 414, 611	2.4	22° 56' 36.20"N	87° 45' 29.90"E	Sk Hasnujjaman	3/6/2017	4/17/2017	4/17/2017	16-Apr-22	186709.887
133/SB2021	PURSHURA	Baikunthapur	5	Damodar	Metal/Black top/Pitch/Pucca Road	2929	3.46	22° 54' 44.10"N	87° 58' 29.90"E	P Mukherjee and Co	3/20/2017	5/3/2017	5/3/2017	2-May-22	376586.009
137/SB2021	GOGHAT-1	Adra	30	Darakeswar	Kachha Road	409	2.4	22° 56' 28.17"N	87° 45' 41.13"E	P Mukherjee and Co	8/23/2018	1/17/2019	1/17/2019	16-Jan-24	486396.272
136/SB2021	Arambagh (M)	Daulatpur	10	Darakeswar	Kachha Road	783	2.47	22° 53' 47.40"N	87° 45' 57.33"E	Ainal Haque	11/14/2017	1/16/2018	1/16/2018	15-Jan-23	439444.084

8.3 Detail of production of sand and other minerals

Four years production of minor minerals (sand and other than sand) of Hooghly District is furnished in Table 8.3.

Table 8.3: Details of production of sand in Hooghly district

Sl. No.	Year	Production (cft.)	Production (cum)
1	2017-18	70,80,000	200481
2	2018-19	86,87,500	246000
3	2019-20	81,01,090	229395
4	2020-21	55,25,550	156465

Conversion factor: 1cum=35.315 cft

9 Details of revenue generated from mineral sector

Revenue generated from minor mineral (sand and other than sand) in Hooghly District is furnished in Table 9.1.

Table 9.1: District revenue generation from mineral sector (sand and other than sand)

(In Rs.)

Sl. No	Year	Royalty (Amount from Earth)
1	2017-18	5,25,92,895
2	2018-19	5,55,29,524
3	2019-20	4,76,69,682
4	2020-21	2,95,10,671

Sl. No	Year	Royalty (Amount from Sand)
1	2017-18	1,17,02,690
2	2018-19	1,43,34,375
3	2019-20	12,51,635
4	2020-21	82,88,325

10 Transport (Railway, road)

Roads: The district is well managed by the extensive road and rail connections with all the important places of the States. There are both Public and Private Communication systems, connecting different parts of the district and States. National Highway-57 Km and state highway-234 Km passes through the district. There are 313 Km of main district road, 1146.24 Km of other district road, 8700.87 Km of village road and 2167.69 Km of municipal road covered the road communication of this district.

Rail: The railway communication of the district, especially at the suburban area is very developed. Bandel is the railway head quarter off the district. Bandel is the largest and busiest rail station of the district and also a vital Junction Station of India. There are four junction station of Hooghly and they are; Bandel Junction, Dankuni junction, Kamarkundu junction and Seoraphuli junction. The railway of the district is under Howrah division. The first train of ER started its journey from Howrah to Hooghly.

Source - http://dcmsme.gov.in/old/dips/HOOGHLY_wb, https://hooghly.nic.in/

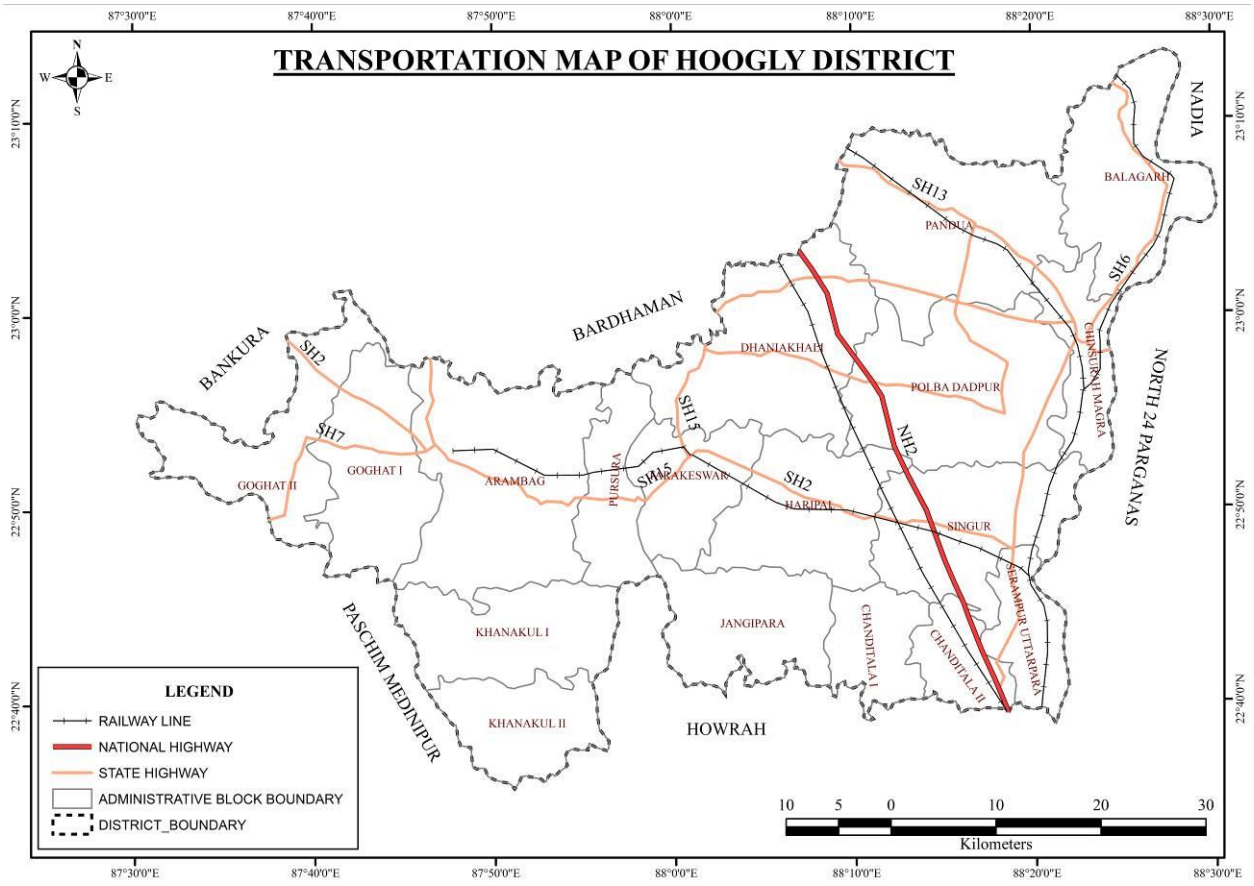


Figure 10.1: Transportation map of Purba Bardhaman District
(Source: National Informatics Centre)

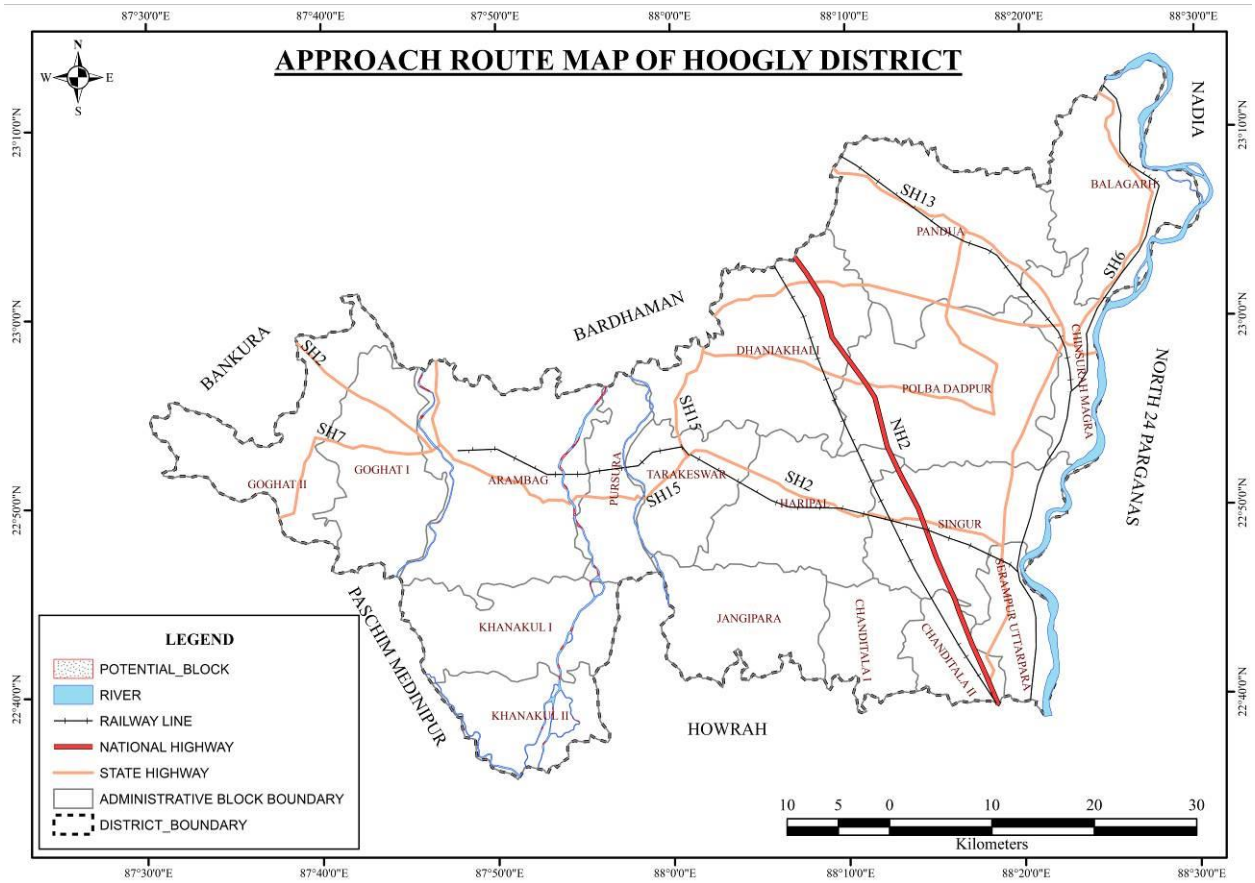


Figure 10.2: Map showing approach road to potential sand bars

(Source: National Informatics Centre)

11 Remedial measure to mitigate the impact of mining

11.1 Environmental Sensitivity

The Hooghly area represents a unique geo- environmental setup. As human population increases, forests are being depleted for the extension of agricultural lands, introduction of new settlements, roadways etc

Due to unprecedented growth of population during the last few decades, nature has started reacting sharply to the accumulated human guilt. Soil erosion and its conservation play an important role.

The land use practices play the most important role in determining the stability factors in respect of landslide hazards. Stone quarrying from the slope is another way of human intervention that causes occasional slope failure.

11.2 Sand mining Impact

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

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

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

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

Sand Mining in beaches disturbs the ecosystem of different fauna of the beaches. 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 there 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 land use practice and calls for urgent redressed by the competent authority.

11.3 Remedial measure

11.3.1 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.

11.3.2 Monitoring the Mining of Mineral and its Transportation:

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

11.3.3 Noise Management:

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

11.3.4 Air Pollution and Dust Management:

- The pollution due to transportation load on the environment will be effectively controlled and water sprinkling will also be done regularly.
- Air pollution due to dust, exhaust emission or fumes during mining and processing phase should be controlled and kept in permissible limits specified under environmental laws.

- The mineral transportation shall be carried out through covered trucks only and the vehicles carrying the mineral shall not be overloaded. Wheel washing facility should be installed and used.

11.3.5 Bio-Diversity Protection:

- Restoration of flora affected by mining should be done immediately. Twice the number of trees destroyed by mining to be planted preferably of indigenous species. Each EC holder should plant and maintain for lease period at least 5 trees per hectare in area near lease.
- 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 turtle and bird habitats shall 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.

11.3.6 Management of Instability and Erosion:

- Removal, stacking and utilization of top soil in mining are should be ensured. 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.

11.3.7 Waste Management:

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

11.3.8 Pollution Prevention:

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

11.3.9 Protection of Infrastructure:

- Mining activities shall not be done for mine lease where mining can cause danger to site of flood protection works, places of cultural, religious, historical, and 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 300-500 meter of bridge, 300 meter upstream and downstream of water supply / irrigation scheme, 100 meters from the edge of National Highway and railway line, 50 meters from a reservoir, canal or building, 25 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 consisting of existing condition cross-section data. Cross-sections must be surveyed between two monumented endpoints set back from the top of bank, and elevations should be referenced bench mark set;

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 establis.

13 Risk assessment and disaster management plan

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

13.1 Identification of risk due to river sand mining

There is no land degradation due to mining activities as mining is done only on river bed dry surface. There will be no OB or waste generation as the sand is exposed in the river bed and is completely selable. There will be neither any stacking of soil nor creation of OB dumps. The mining activity will carried out upto 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 risk in the mining activity which are as below:

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 would 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 license.

13.2.2 Measures to prevent incidents during Inundation/ Flooding:

To minimize the risk of flooding/ inundation following measures will 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 made aware of the location.
- Mining will 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 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 Conclusions and Recommendations

The District Survey Report 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 WBMMCR, 2016.

Potential areas of economic mineralization and mineral deposition have been identified and list is furnished in the report. Estimation of annual sand deposition by replenishment study been incorporated.

The district survey report has been prepared by utilizing both primary and secondary data. The primary data generation involved the satellite imagery study, site inspection, survey, ground truthing etc. while secondary data has been acquired through various authenticated sources and satellite imagery studies.

The district survey report of Hooghly district also describes the general geographical profile of the district, distribution of natural resources, livelihood, climatic condition and sources of revenue generation.

Major sand producing rivers of the district are Mundeswari and Dwarkeshwar. The rivers are mostly running west to south-east in the district. Both rivers are found to be good source of construction sand which fed the requirements of the state.

The district is generating considerable revenue from mining of minor minerals such as riverbed sand deposits. Revenue generated in the district of Hooghly from minor minerals during the period of 2017 to 2021 is Rs. 3.55 crores.

14.1 Conclusion

I. The river beds of the district are enriched with sand which is highly potential for mining.

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

III. The determined values of various methods as adopted for replenishment study gives a comparable value and in all cases the values are found to be 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.

IV. Field base study shows variation of replenishment from 97.00 to 98.20% in the district and for theoretical Replenishment study based on mining lease shows

variation from 73% to 78% with an average of 75.7% of replenishment rate in the district.

V. The total potential river bed deposit for the district comes to about 1.75 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

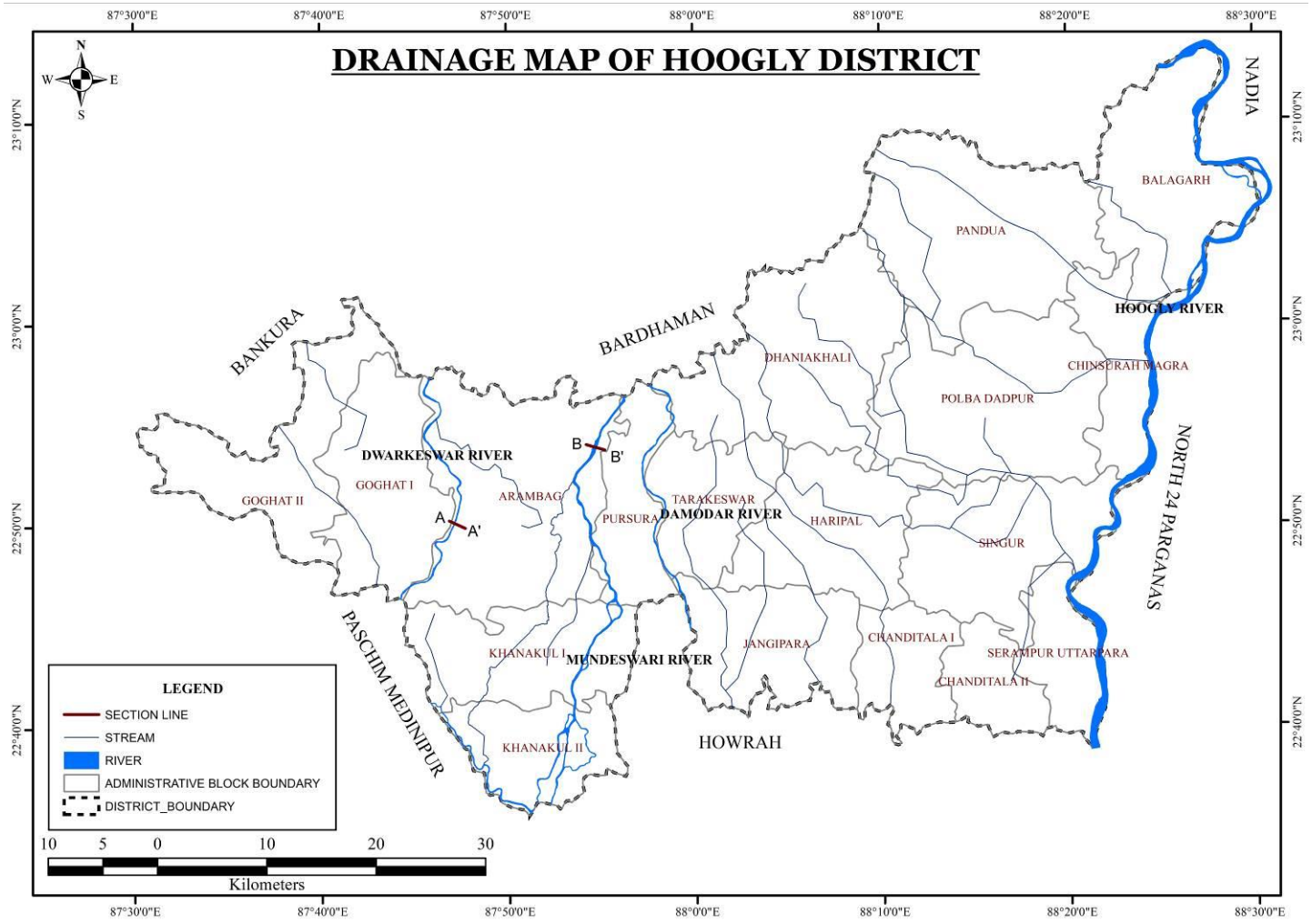


Plate 1A: Drainage Map of the District *(Source: National Informatics Centre -NIC Website, September 2020)*

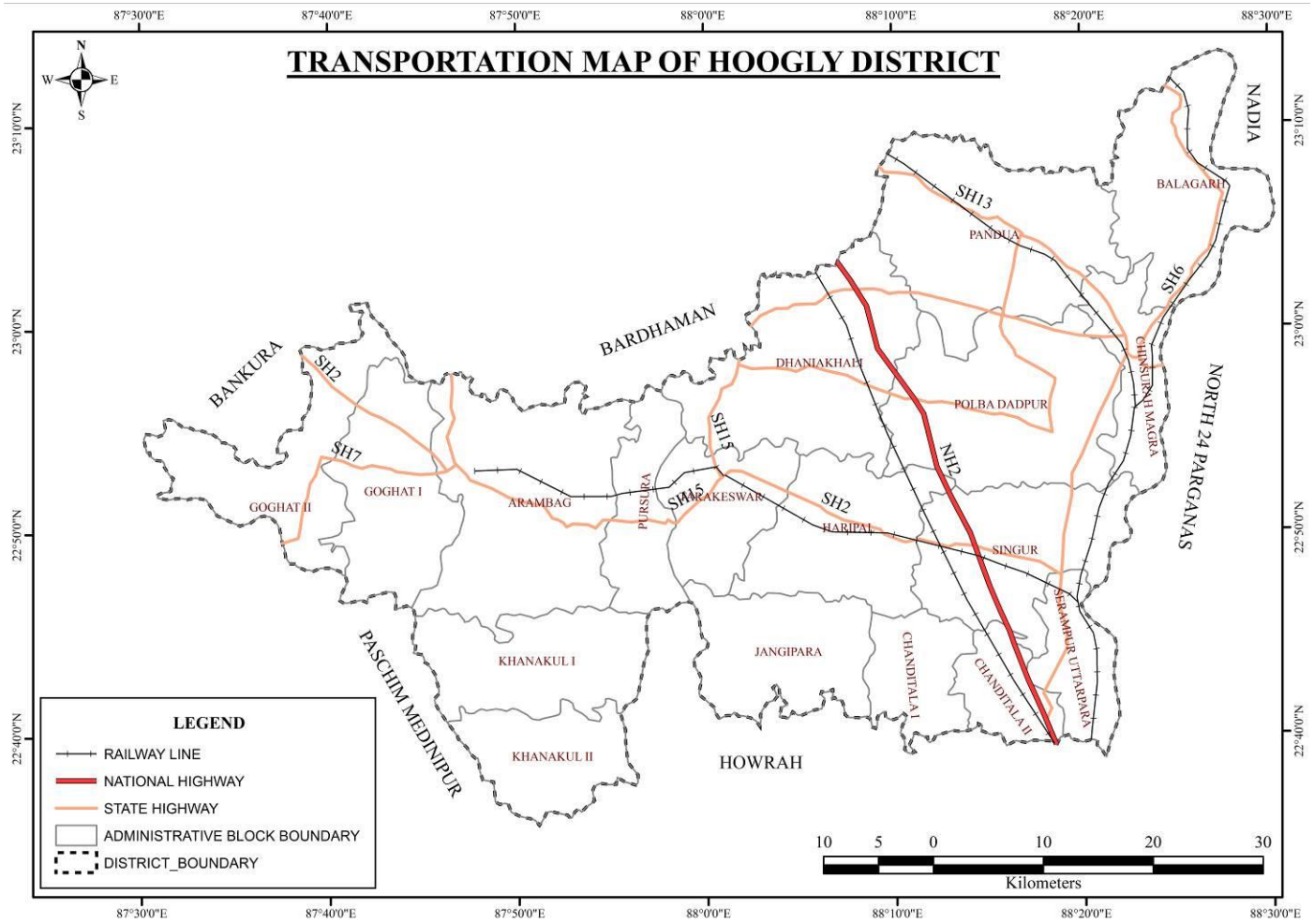


Plate No 1B: Location Map of dams, barrages, bridge showing on drainage system of the district *(Source: National Informatics Centre -NIC Website, September 2020)*

PLATE 2A

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

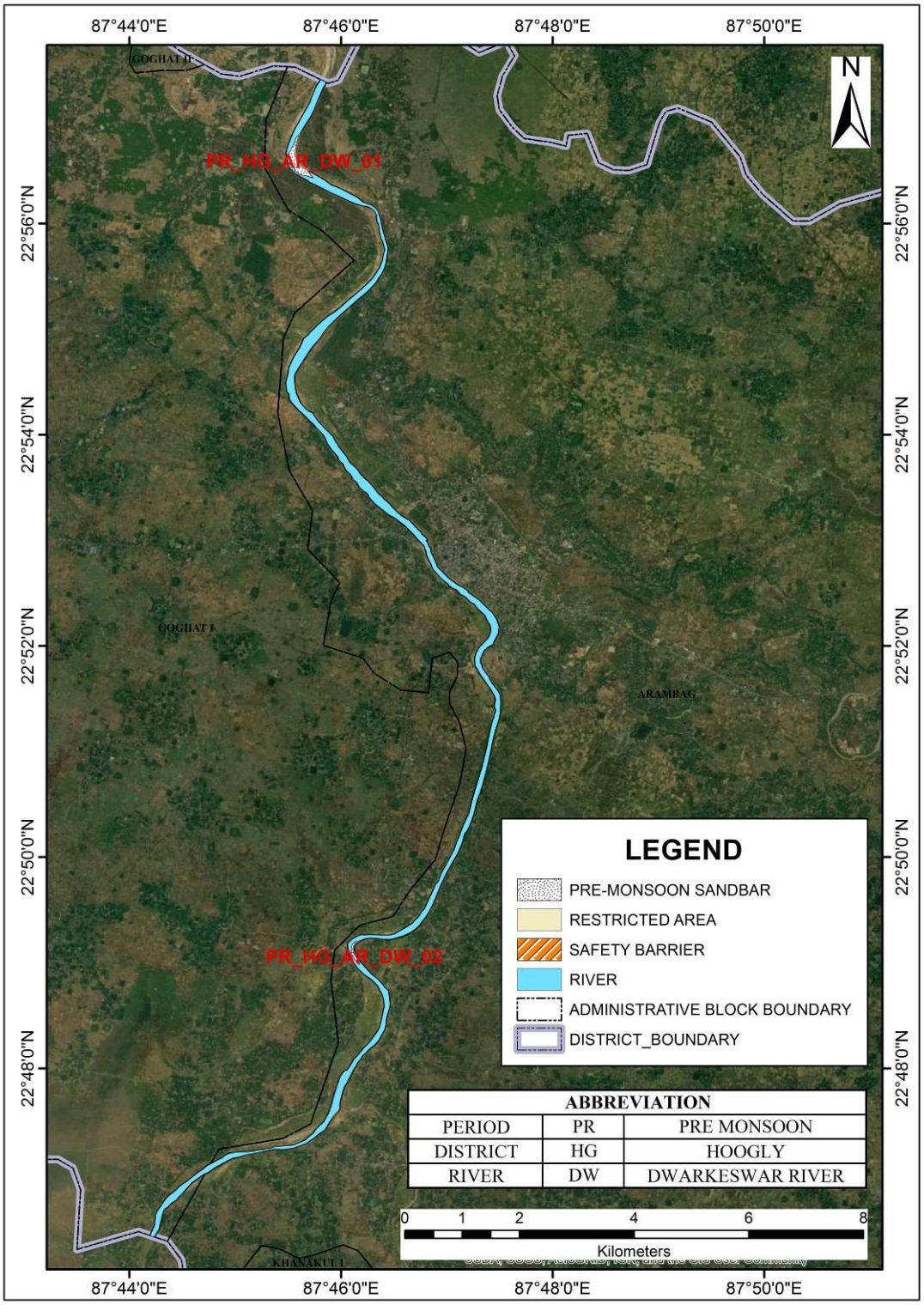


Plate 2A1: Distribution Map of Sand Bars on Rivers During Pre-Monsoon Period of Hooghly District *(Source: ISRO RESOURCE Sat 2 LISS III Sensor, March 2020)*

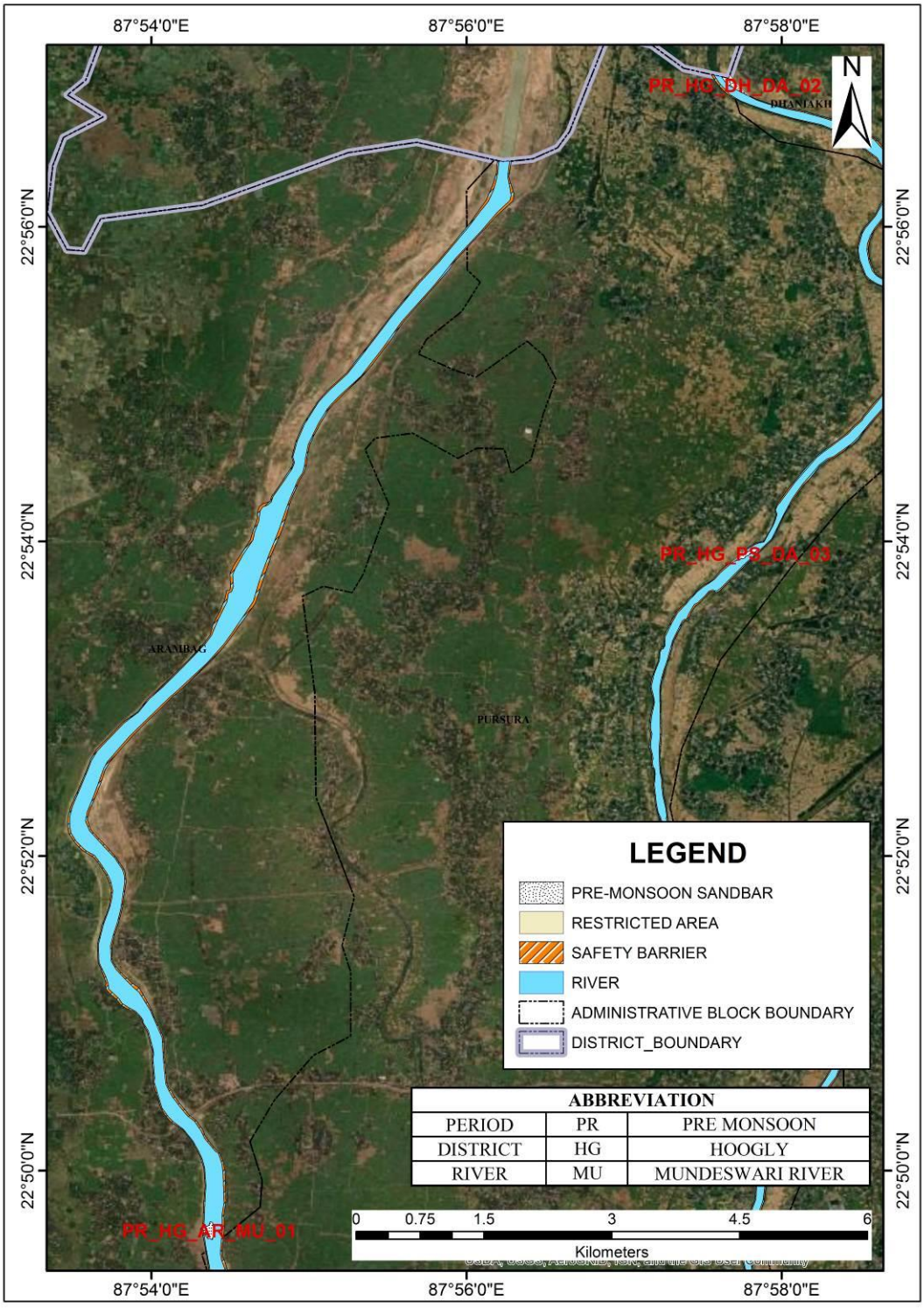


Plate 2A2: Distribution Map of Sand Bars on Rivers During Pre-Monsoon Period of Hooghly District *(Source: ISRO RESOURCE Sat 2 LISS III Sensor, March 2020)*

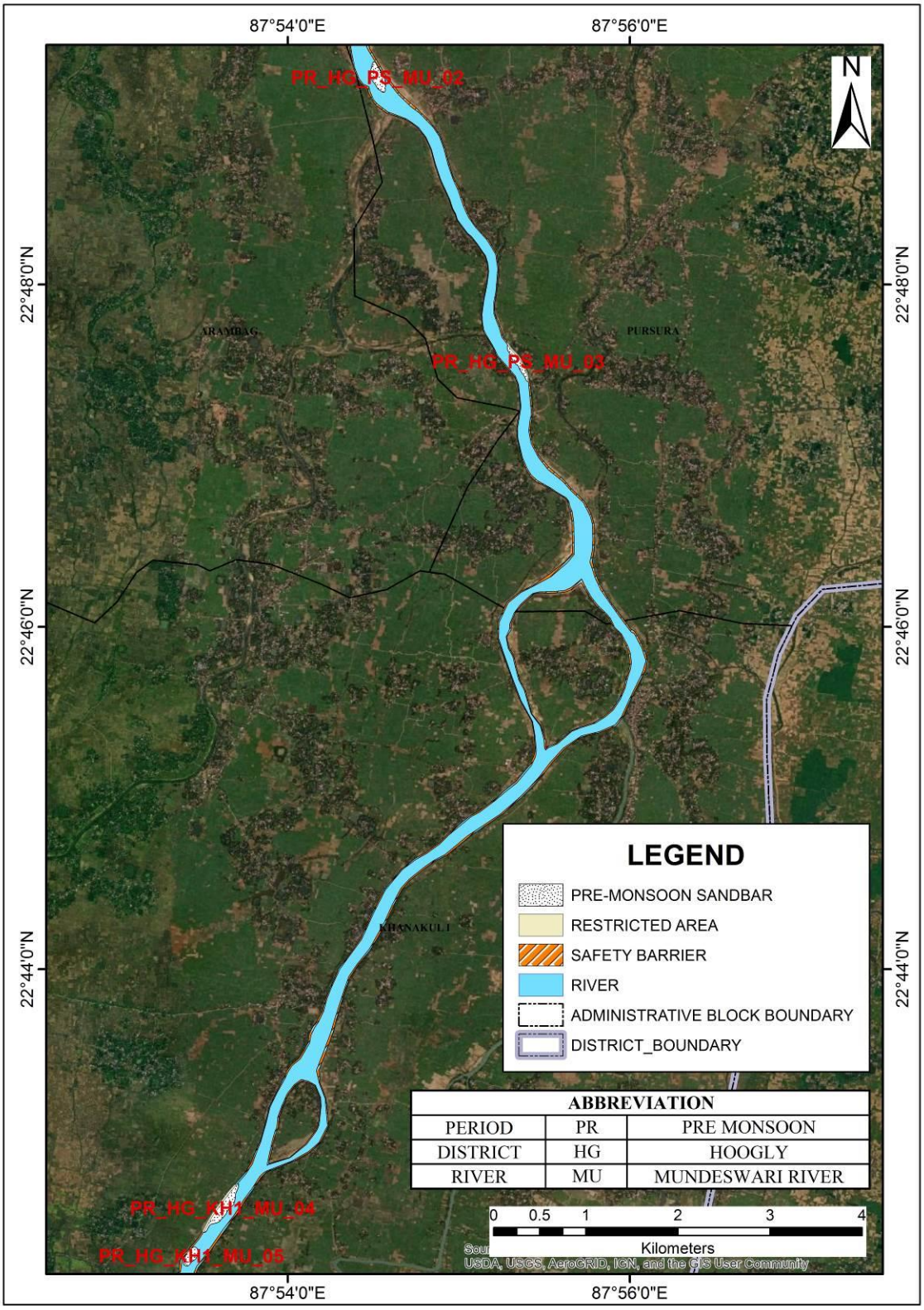


Plate 2A3: Distribution Map of Sand Bars on Rivers During Pre-Monsoon Period of Hooghly District *(Source: ISRO RESOURCE Sat 2 LISS III Sensor, March 2020)*

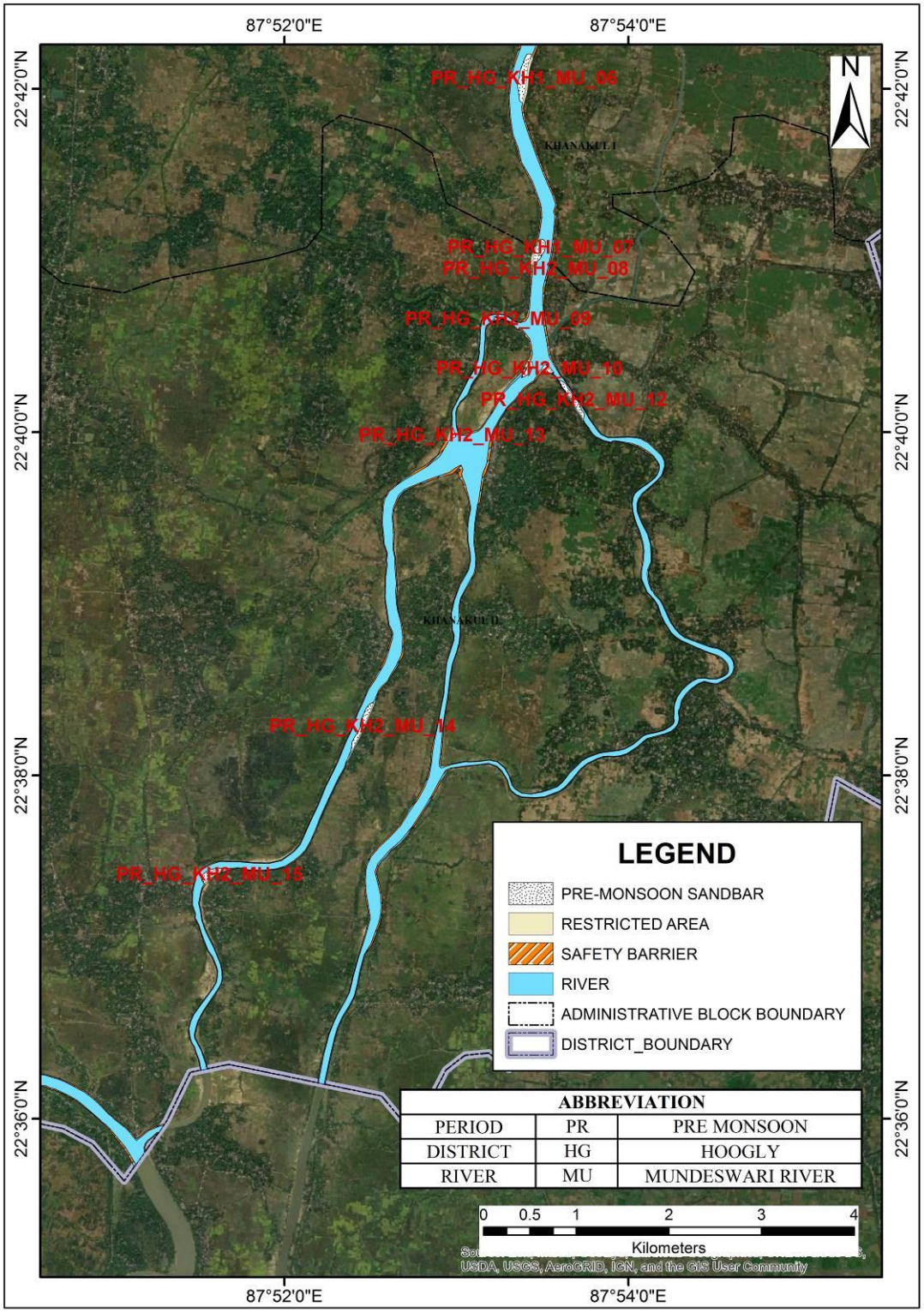


Plate 2A4: Distribution Map of Sand Bars on Rivers During Pre-Monsoon Period of Hooghly District *(Source: ISRO RESOURCE Sat 2 LISS III Sensor, March 2020)*

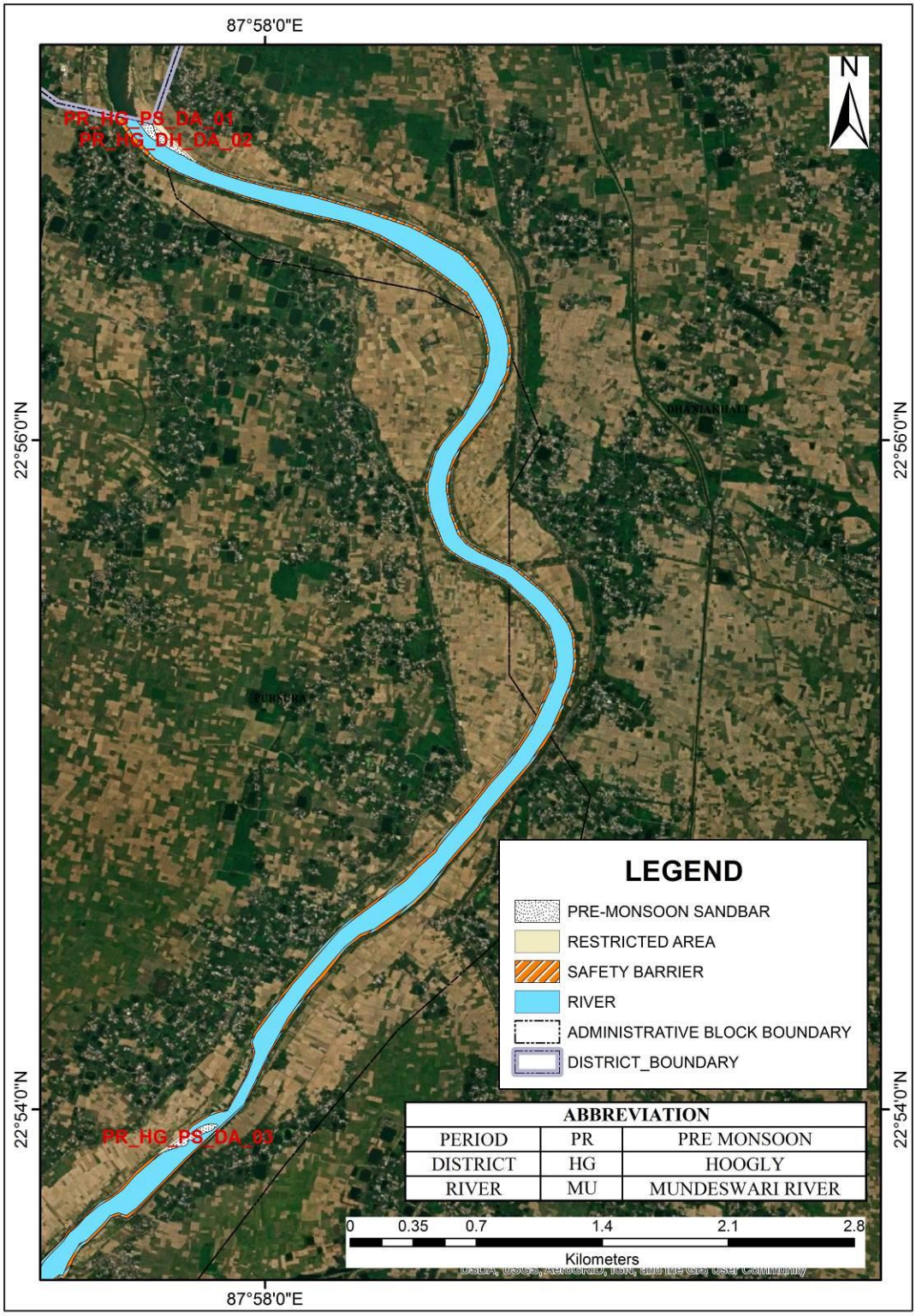


Plate 2A5: Distribution Map of Sand Bars on Rivers During Pre-Monsoon Period of Hooghly District *(Source: ISRO RESOURCE Sat 2 LISS III Sensor, March 2020)*

ANNEXURE 2B

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

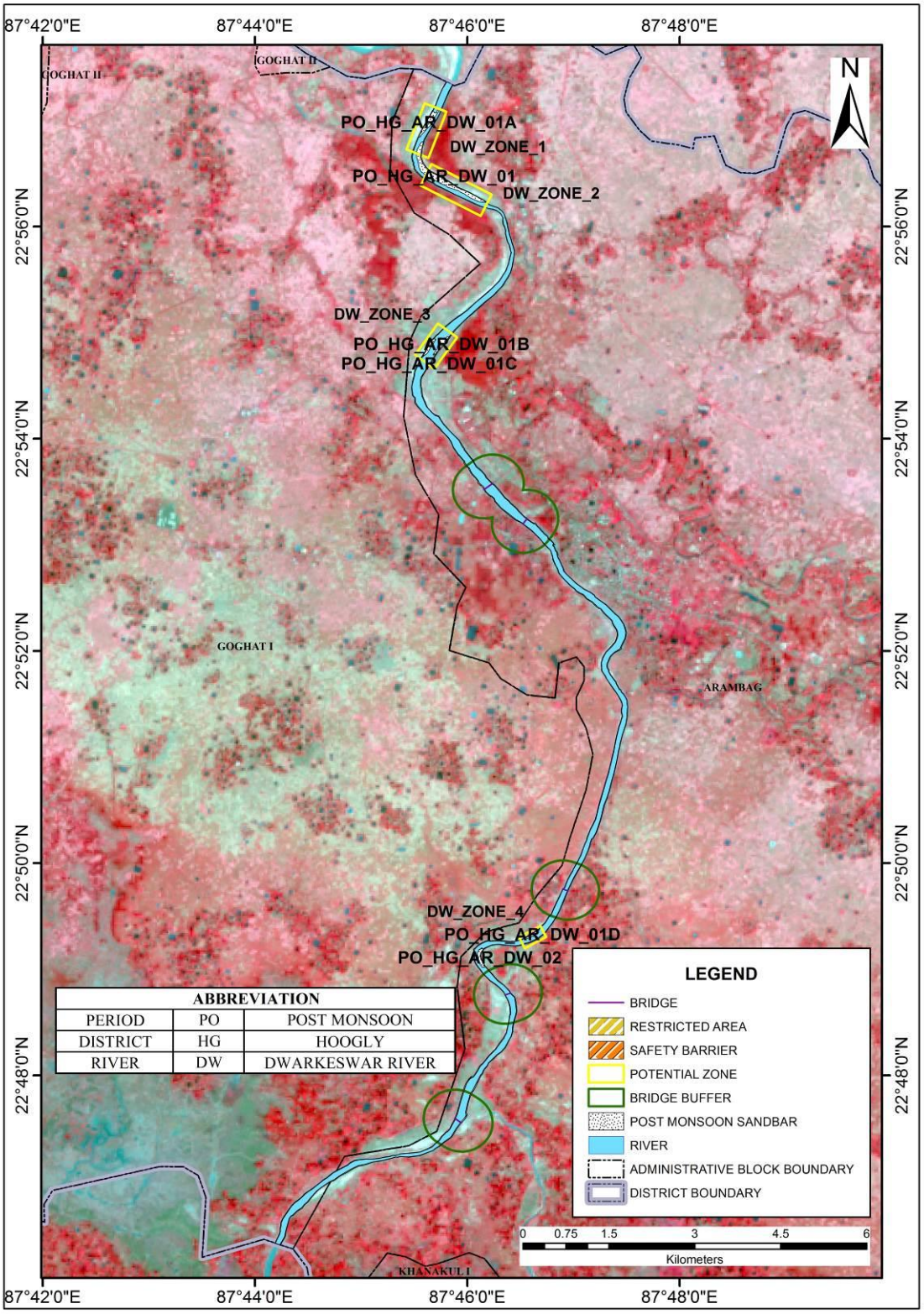


Plate 2B1: Distribution Map of Sand Bars on Rivers During Post-Monsoon Period of Hooghly District *(Source: ISRO RESOURCE Sat 2 LISS III Sensor, November 2020)*

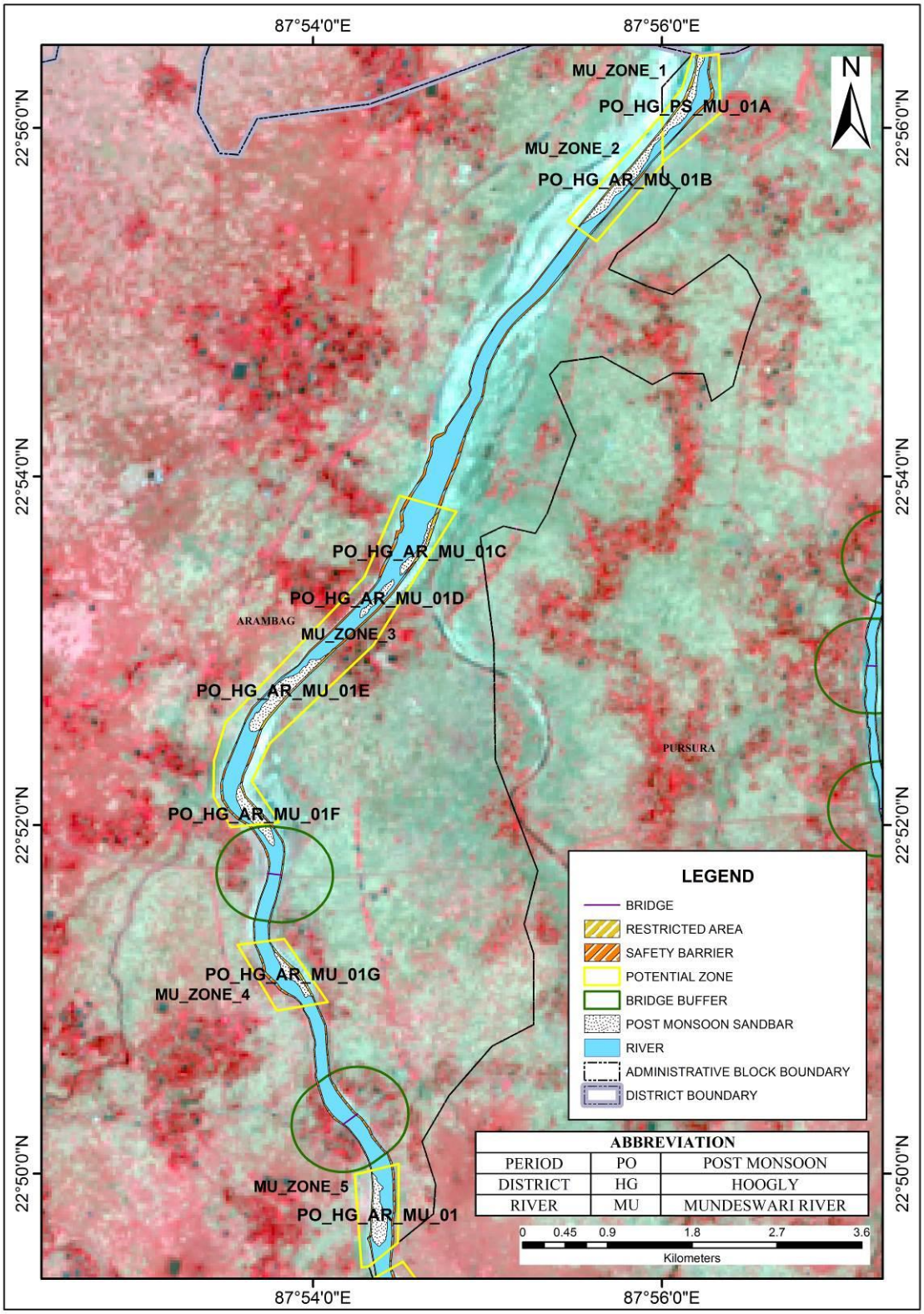


Plate 2B2: Distribution Map of Sand Bars on Rivers During Post-Monsoon Period of Hooghly District *(Source: ISRO RESOURCE Sat 2 LISS III Sensor, November 2020)*

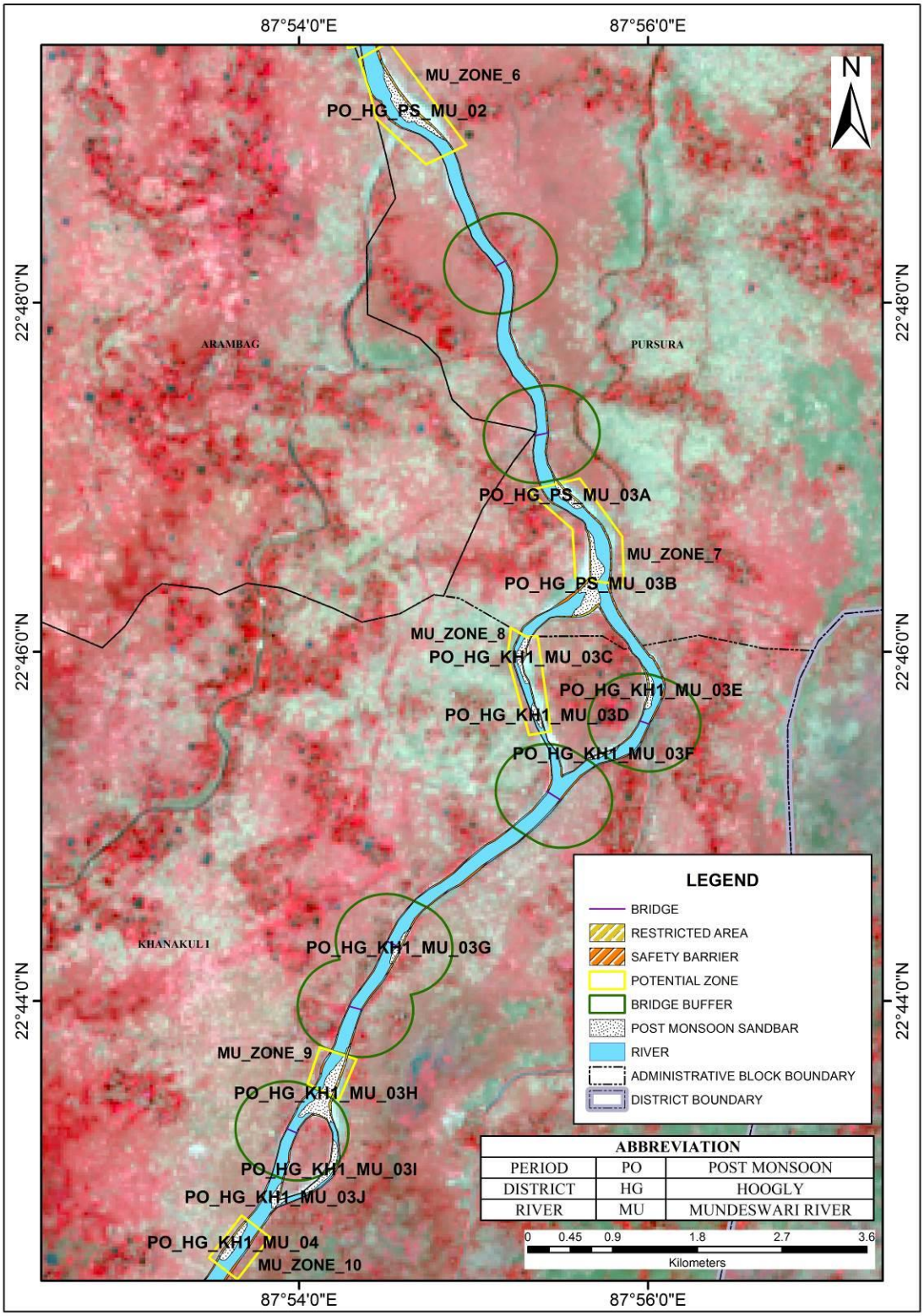


Plate 2B3: Distribution Map of Sand Bars on Rivers During Post-Monsoon Period of Hooghly District *(Source: ISRO RESOURCE Sat 2 LISS III Sensor, November 2020)*

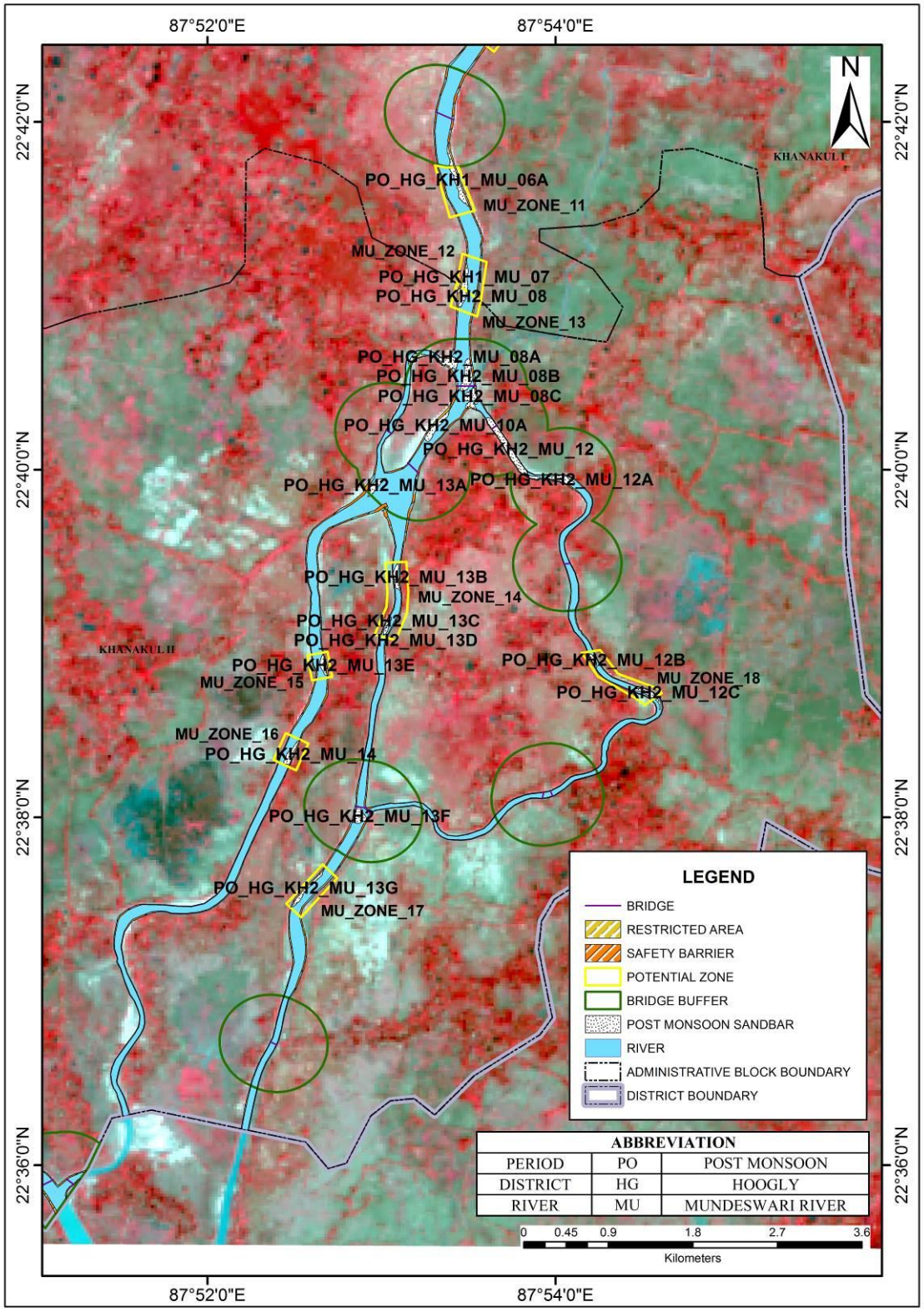


Plate 2B4: Distribution Map of Sand Bars on Rivers During Post-Monsoon Period of Hooghly District *(Source: ISRO RESOURCE Sat 2 LISS III Sensor, November 2020)*

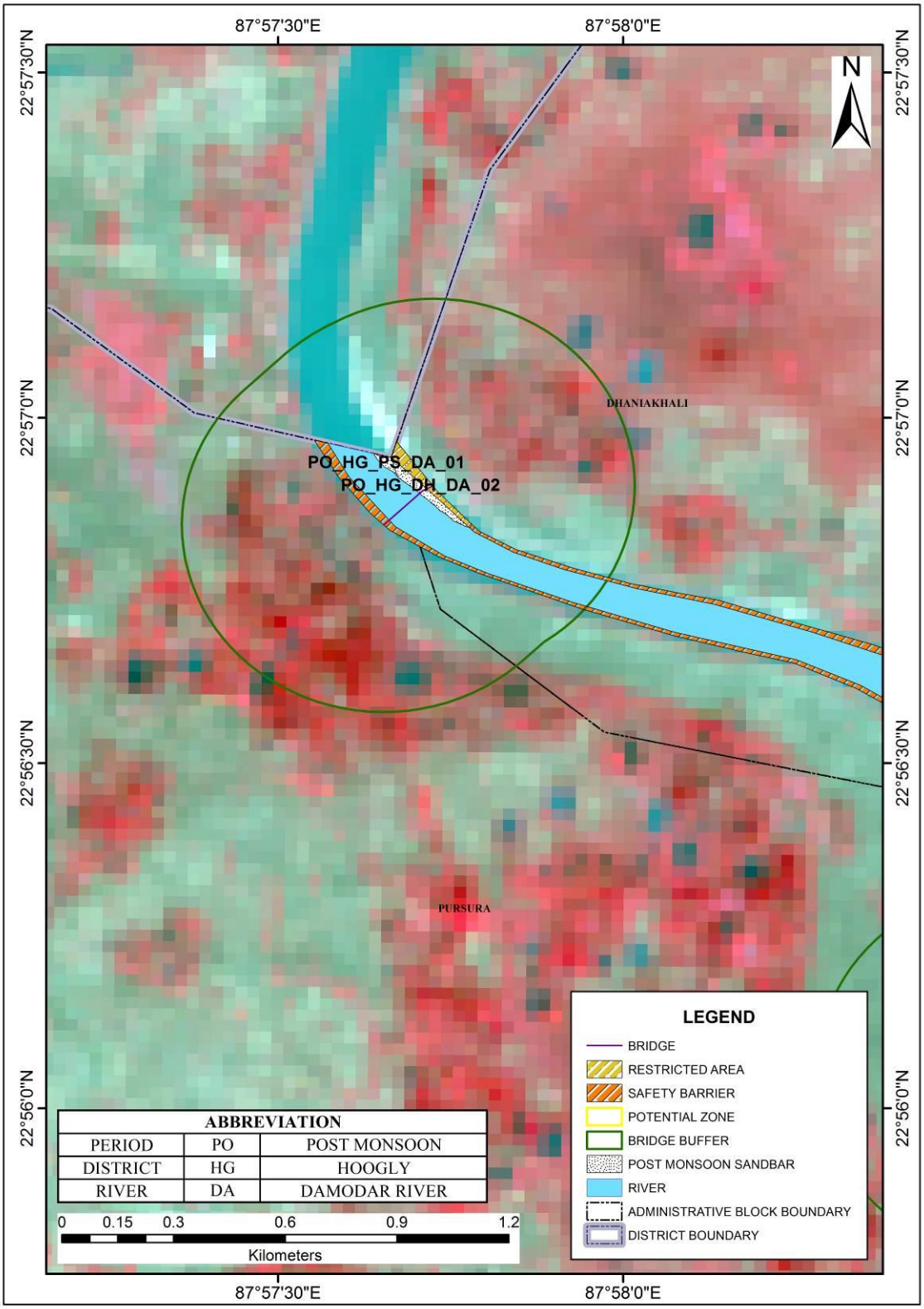


Plate 2B5: Distribution Map of Sand Bars on Rivers During Post-Monsoon Period of Hooghly District *(Source: ISRO RESOURCE Sat 2 LISS III Sensor, November 2020)*

PLATE3

WATERSHED MAP OF HOOGHLY DISTRICT

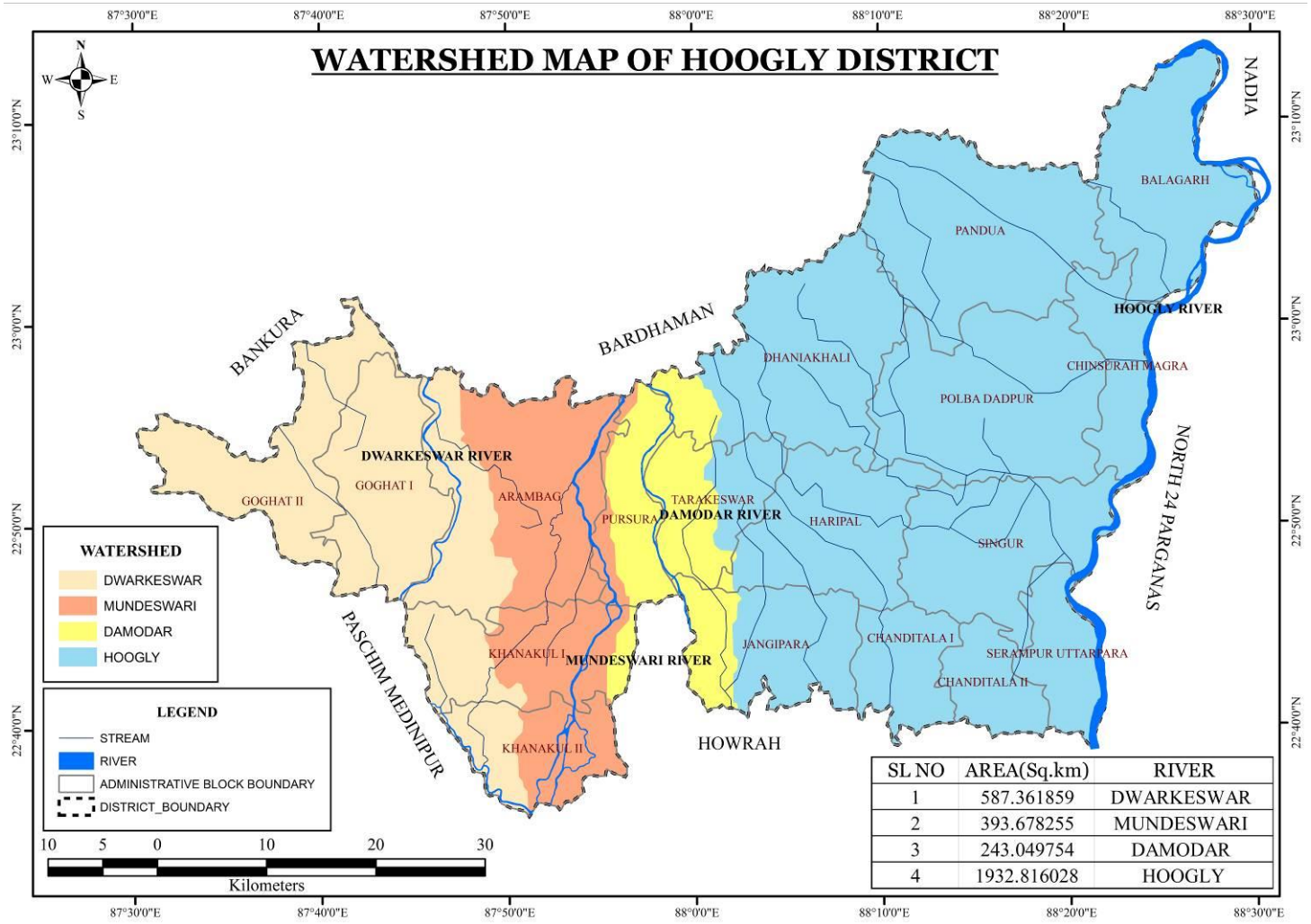


Plate 3A: Watershed map of the district *(Source: World Wild Fund for Nature, September 2020)*

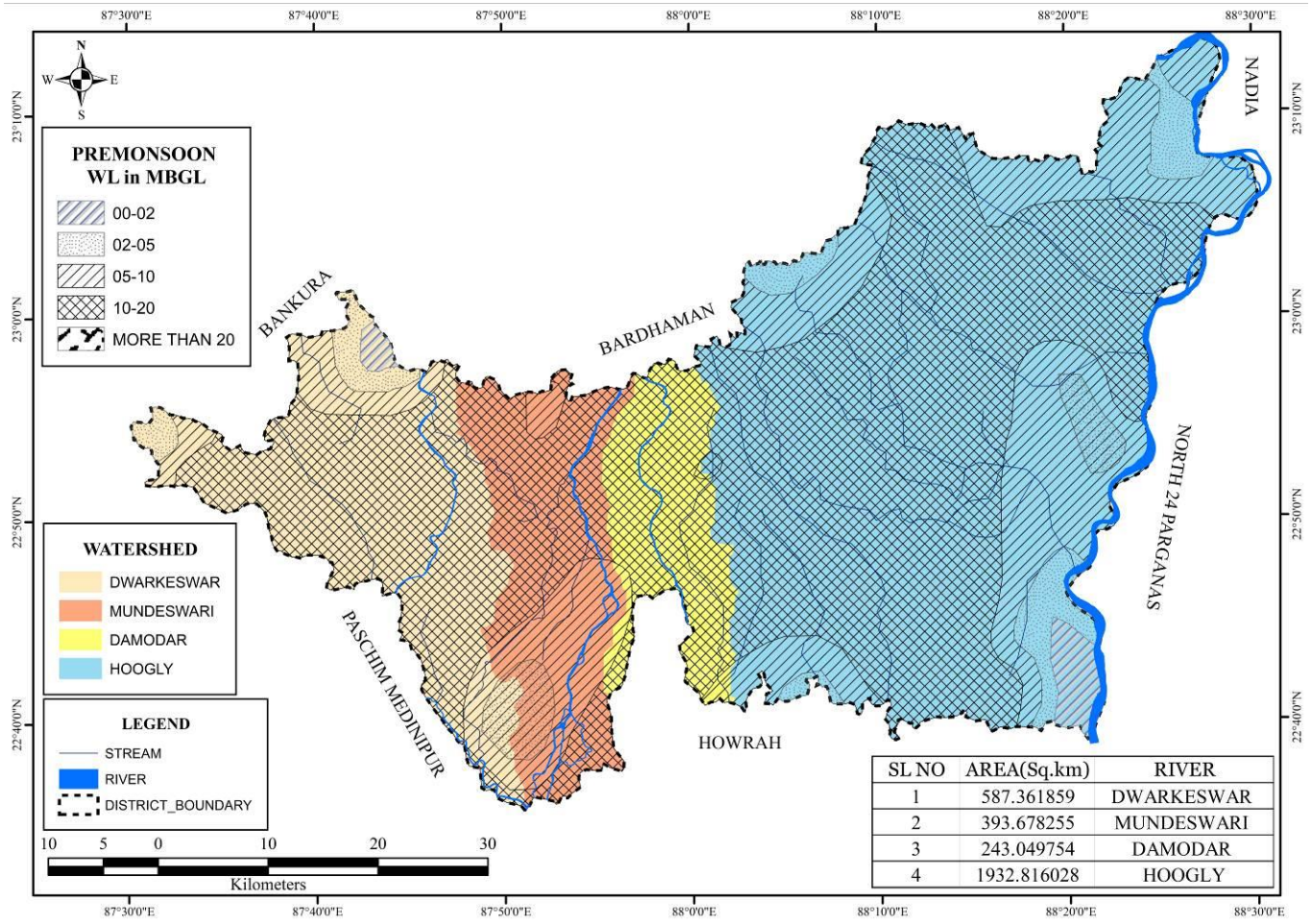


Plate 3B: District Watershed map showing ground water level during Pre-monsoon period *(Source: World Wild Fund for Nature, September 2020)*

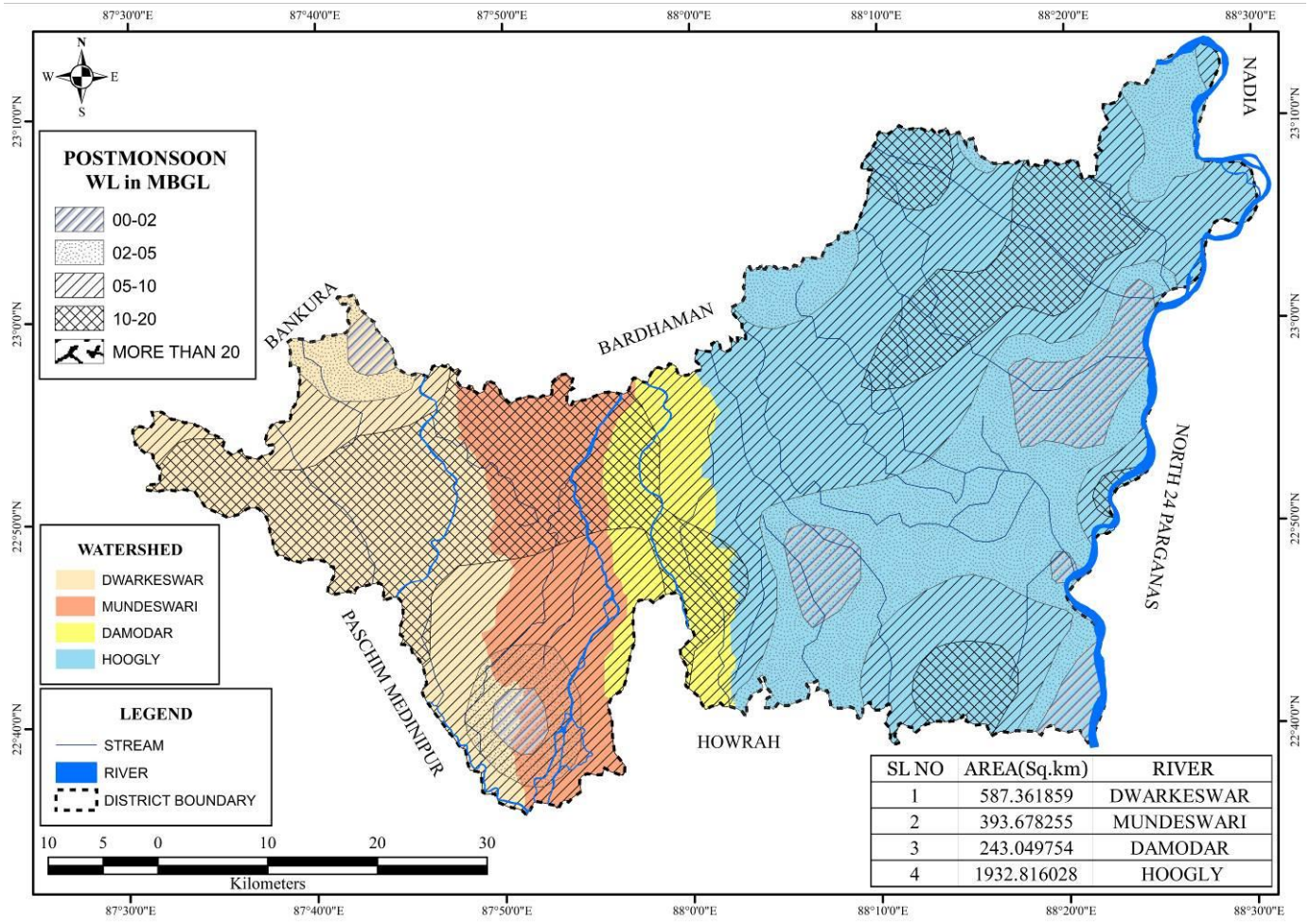


Plate 3C: District Watershed map showing ground water level during Post-monsoon period *(Source: World Wild Fund for Nature, September 2020)*

PLATE 4

FIELD SURVEY PHOTOGRAP

	
4A: Picture of Riverbed deposit of Dwarakeswar River (Date: 25/12/2020, Lat: 22° 56' 27.056 "N Long: 87° 45' 39.918 " E)	**4B: Picture of Riverbed deposit of Dwarakeswar River (Date: 25/12/2020,Lat: 22° 54' 49.044 "N Long: 87° 45' 37.928 " E)**
	
4C: Picture of Riverbed deposit of Mundeswari River (Date: 25/12/2020, Lat: 22° 38' 42.685 "N Long 87° 54' 30.812 " E)	**4D: Picture of Riverbed deposit of Mundeswari River (Date: 25/12/2020, Lat: 22° 52' 3.429" N Long: 87° 53' 36.764 "E)**

PLATE 5

LONG TERM EROSION-ACCRETION MAP

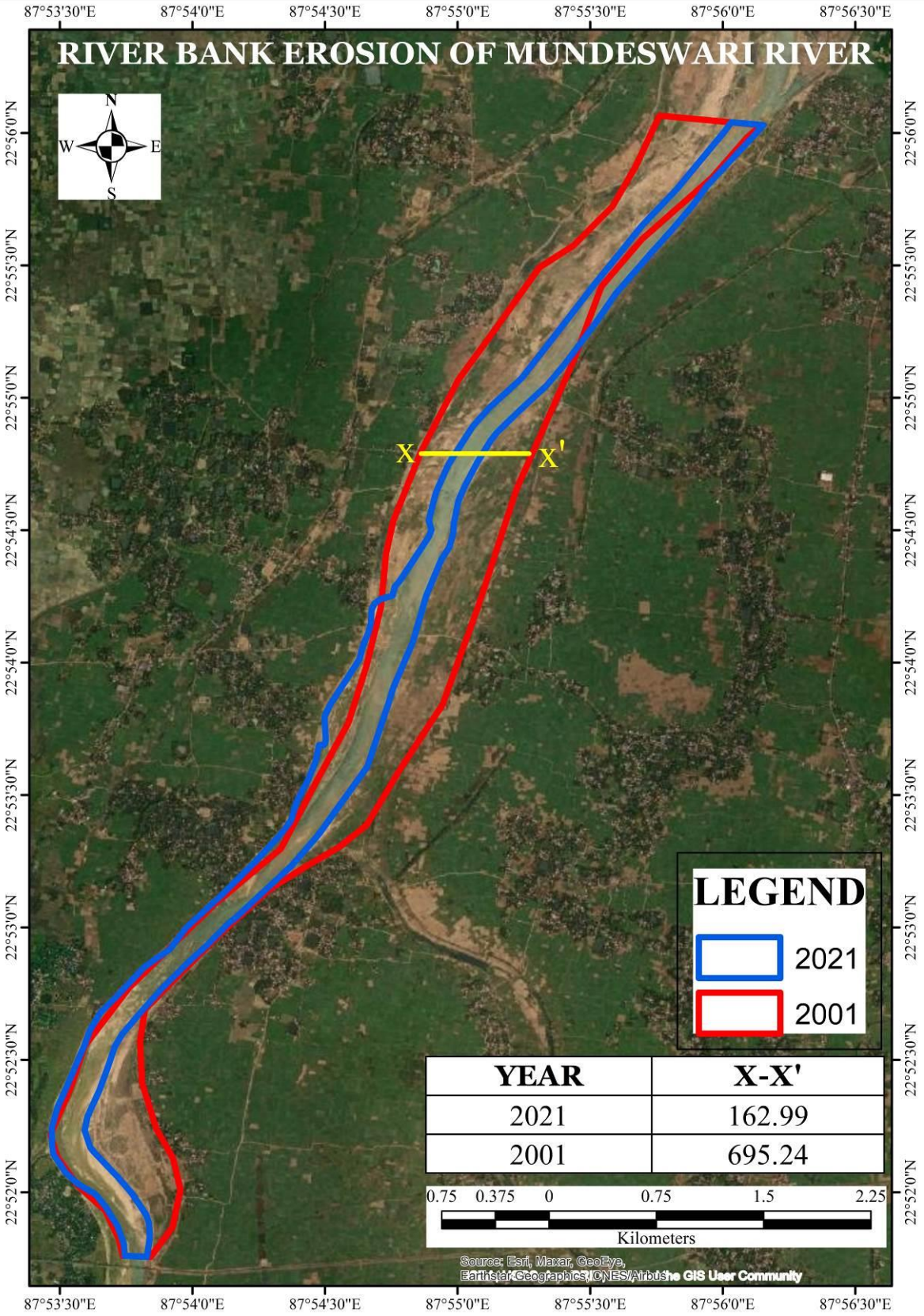


Plate 5: Map showing long-term (10-year or more) erosion-accretion areas on both the banks of Mundeswari River, Hooghly *(Source: ISRO RESOURCE Sat 2 LISS III Sensor, November 2022)*

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 49 to 77.
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 75-76.
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 7.4 pg 59.
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 7.14 pg 73 to 74.

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 75 to 76.
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 14-15.
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 75 to 76.
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 composing of all the potential sand zones for defining the resources. In a subsequent phase blocking of potential zones shall be done in due consultation with the district level committee. The areas mentioned in the observation points shall be excluded while blocking of sand mining leases which are part of these potential zones marked in this DSR.
11	The final area selected for the mining should be then divided into mining lease as per the requirement of State Government. It is suggested the mining lease area should be so selected as to cover the entire deposition area. Dividing a large area of deposition/aggradation into smaller mining leases should be avoided as it leads to loss of mineral and indirectly promote illegal mining.	Shall be Complied with.
12	Cluster situation shall be examined. A cluster is formed when one mining lease of homogenous mineral is within 500 meters of the other mining lease. In order to reduce the cluster formation mining lease size should be defined in such a way that distance between any two clusters preferably should not be less than 2.5 Km. Mining lease should be defined in such a way that the total area of the mining leases in a cluster should not be more than 10 Ha.	Noted. Due care will be taken while distribution of mining leases either to prevent cluster situation or keeping the prescribed distance in-between two mining clusters.
13	The number of a contiguous cluster needs to be ascertained. Contiguous cluster is formed when one cluster is at a distance of 2.5 Km from the other cluster.	Noted and shall be complied with.

Sl. No.	Particulars	Status
14	The mining outside the riverbed on Patta land/Khatedari land be granted when there is possibility of replenishment of material. In case, there is no replenishment then mining lease shall only be granted when there is no riverbed mining possibility within 5 KM of the Patta land/Khatedari land. For government projects, mining could be allowed on Patta land/Khatedari land but the mining should only be done by the Government agency and material should not be used for sale in the open market. Cluster situation as mentioned in para k above is also applicable for the mining in Patta land/Khatedari land.	Noted.
15	The State Government should define the transportation route from the mining lease considering the maximum production from the mines as at this stage the size of mining leases, their location, the quantity of mineral that can be mined safely etc. is available with the State Government. It is suggested that the transportation route should be selected in such a way that the movement of trucks/tippers/tractors from the villages having habitation should be avoided. The transportation route so selected should be verified by the State Government for its carrying capacity.	Noted and final transport route will be submitted during preparation of mine plan.
16	Potential site for mining having its impact on the forest, protected area, habitation, bridges etc, shall be avoided. For this, a sub-divisional committee may be formed which after the site visit shall decide its suitability for mining.	Shall be Complied with.
17	Public consultation-The Comments of the various stakeholders may be sought on the list of mining lease to be auctioned. The State Government shall give an advertisement in the local and national newspaper for seeking comments of the general public on the list of mining lease included in the DSR. The DSR should be placed in the public domain for at least one month from the date of publication of the advertisement for obtaining comments of the general public. The comments so received shall be placed before the sub-divisional committee for active consideration. The final list of sand mining areas [leases to be granted on riverbed &Patta land/Khatedari land, de-siltation location (ponds/lakes/dams), M-Sand Plants (alternate source of sand)] after the public hearing needs to be defined in the final DSR.	After publication of the West Bengal Sand Mining Policy, 2021, it is now eminent that State owned The West Bengal Mineral Development and Trading Corporation Limited (WBMDTCL) shall be responsible for mining of sand/ gravel/ river bed materials in whole state of West Bengal. However, the existing mining leases which were in effect before hand of this Gazzate notification July 2021 will be in operation till the year 2027-28. In order to have the rational distribution of mining leases as per the prevailing norms and guidelines grant of mining leases in the state of West Bengal shall be carried out in phases till all the blocks are under the ambit of WBMDTCL. This DSR thus consist of the identified potential sand deposite areas within which the existing and future mining leases shall occur. The details of the mining leases as and when granted shall follow the procedure described in EMGSM 2020 and prevailing norms.
18	The LOI should not be granted for mining area falling on both riverbed and outside riverbed. Therefore, in the same lease, both types of area should not be included.	Shall be Complied with.

Annexure 2

Estimation of Sand Resources based on sediment load comparison between Pre and Post Monsoon period of Hooghly District

Abbreviation used in the table as below

ABBREVIATION					
PERIOD	PR	PRE MONSOON	BLOCK	CH1	CHANDITALA I
	PO	POST MONSOON		CH2	CHANDITALA II
DISTRICT	HG	HOOGHLY		SU	SERAMPUR UTTARPARA
BLOCK	GO1	GOGHAT I		TR	TARAKESWAR
	GO2	GOGHAT II		PN	PANDUA
	KH1	KHANAKUL I		DH	DHANIAKHALI
	KH2	KHANAKUL II		HR	HARIPAL
	BL	BALAGARH		SN	SINGUR
	CM	CHINSURAH MAGRA	RIVER	DW	DWARKESWAR RIVER
	PD	POLBA DADPUR		MU	MUNDESWARI RIVER
	AR	ARAMBAG		DA	DAMODAR RIVER
	PS	PURSURA		HO	HOOGHLY RIVER
	JP	JANGIPARA			

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 Dwarkeswar River											
1	PR_HG_AR_DW_01	8.0	226270.0533	2.50	0.57	1	PO_HG_AR_DW_01A	9	37197.1961	3.00	0.11
						2	PO_HG_AR_DW_01	9	132307.6404	3.00	0.40
						3	PO_HG_AR_DW_01B	8	25526.4028	3.00	0.08
						4	PO_HG_AR_DW_01C	8	18623.1443	3.00	0.06
						5	PO_HG_AR_DW_01D	7	11092.0593	3.00	0.03
2	PR_HG_AR_DW_02	6.0	24865.1933	2.50	0.06	6	PO_HG_AR_DW_02		19082.8348	3.00	0.06
Estimation of Sand Resources in Pre monsoon period & Post monsoon period in sand bar regions of Mundeswari River											
1	PR_HG_AR_MU_01	9.0	86157.9561	2.50	0.22	1	PO_HG_AR_MU_01	11	83034.45655	3.00	0.25
						2	PO_HG_PS_MU_01A	11	78736.33773	3.00	0.24
						3	PO_HG_AR_MU_01B	10	107472.1345	3.00	0.32
						4	PO_HG_AR_MU_01C	10	43303.42367	3.00	0.13
						5	PO_HG_AR_MU_01D	10	26581.96862	3.00	0.08
						6	PO_HG_AR_MU_01E	9	131195.187	3.00	0.39
						7	PO_HG_AR_MU_01F	9	74519.56239	3.00	0.22
						8	PO_HG_AR_MU_01G	7	50872.37153	3.00	0.15
2	PR_HG_PS_MU_02	5.5	59031.7508	2.50	0.15	9	PO_HG_PS_MU_02	6	94115.29163	3.00	0.28
3	PR_HG_PS_MU_03	3.5	124264.3914	2.50	0.31	10	PO_HG_PS_MU_03A	4	32880.12648	3.00	0.10
						11	PO_HG_PS_MU_03B	4	109130.4475	3.00	0.33
						12	PO_HG_KH1_MU_03C	4	31043.47901	3.00	0.09
						13	PO_HG_KH1_MU_03D	4	13566.42484	3.00	0.04

Pre monsoon						Post monsoon					
SL	Sand	RL	Area in	Sand	San	SL	Sand Bar_Code	RL	Area in	Sand	Sand
						14	PO_HG_KH1_MU_03E	4	25081.93296	3.00	0.08
						15	PO_HG_KH1_MU_03F	4	11715.516	3.00	0.04
						16	PO_HG_KH1_MU_03G	4	19386.73014	3.00	0.06
						17	PO_HG_KH1_MU_03H	4	110219.1553	3.00	0.33
						18	PO_HG_KH1_MU_03I	4	40784.7311	3.00	0.12
						19	PO_HG_KH1_MU_03J	4	20756.88328	3.00	0.06
4	PR_HG_KH1_MU_04	3.5	152359.4994	2.50	0.38	20	PO_HG_KH1_MU_04	4	37205.06784	3.00	0.11
5	PR_HG_KH1_MU_05	3.5	118235.7529	2.50	0.30		PO_HG_KH1_MU_05	-	0		
6	PR_HG_KH1_MU_06	3.5	143339.7901	2.50	0.36	21	PO_HG_KH1_MU_06A	4	34034.76012	3.00	0.10
7	PR_HG_KH1_MU_07	3.0	113202.4562	2.50	0.28	22	PO_HG_KH1_MU_07	3	14415.62543	3.00	0.04
8	PR_HG_KH2_MU_08	6.5	39999.0215	2.50	0.10	23	PO_HG_KH2_MU_08	3	15027.66106	3.00	0.05
						24	PO_HG_KH2_MU_08A	7	18362.28113	3.00	0.06
						25	PO_HG_KH2_MU_08B	7	25092.30883	3.00	0.08
						26	PO_HG_KH2_MU_08C	7	14787.46987	3.00	0.04
9	PR_HG_KH2_MU_09	7.5	12106.0582	2.50	0.03	27	PO_HG_KH2_MU_09	8	8916.019163	3.00	0.03
10	PR_HG_KH2_MU_10	6.5	19836.9737	2.50	0.05	28	PO_HG_KH2_MU_10A	7	24946.74998	3.00	0.07
11	PR_HG_KH2_MU_11	6.5	16735.0751	2.50	0.04	29	PO_HG_KH2_MU_11	7	6189.828765	3.00	0.02
12	PR_HG_KH2_MU_12	6.0	221291.4849	2.50	0.55	30	PO_HG_KH2_MU_12	6	52397.03887	3.00	0.16
						31	PO_HG_KH2_MU_12A	6	13822.61576	3.00	0.04
						32	PO_HG_KH2_MU_12B	5	5094.226991	3.00	0.02
						33	PO_HG_KH2_MU_12C	6	12365.77994	3.00	0.04
13	PR_HG_KH2_MU_13	6.0	127410.5445	2.50	0.32	34	PO_HG_KH2_MU_13A	7	11306.2964	3.00	0.03
						35	PO_HG_KH2_MU_13B	8	10198.1314	3.00	0.03
						36	PO_HG_KH2_MU_13C	8	3478.778564	3.00	0.01
						37	PO_HG_KH2_MU_13D	7	2722.514298	3.00	0.01
						38	PO_HG_KH2_MU_13E	8	10871.73102	3.00	0.03
						39	PO_HG_KH2_MU_13F	6	14546.63935	3.00	0.04
						40	PO_HG_KH2_MU_13G	4	18558.23398	3.00	0.06
14	PR_HG_KH2_MU_14	3.5	128389.6264	2.50	0.32	41	PO_HG_KH2_MU_14	4	14674.874	3.00	0.04
15	PR_HG_KH2_MU_15	3.5	116961.8498	2.50	0.29		PO_HG_KH2_MU_15		0		
Estimation of Sand Resources in Pre monsoon period & Post monsoon period in sand bar regions of Damodar River											
1	PR_HG_PS_DA_01	11.5	4566.3954	2.50	0.01	1	PO_HG_PS_DA_01	12	1223.507578	3.00	0.00
2	PR_HG_DH_DA_02	11.5	3235.2617	2.50	0.01	2	PO_HG_DH_DA_02	12	10026.46389	3.00	0.03
3	PR_HG_PS_DA_03	11.5	4071.4394	2.50	0.01		PO_HG_PS_DA_03	0			

Annexure 3
Boundary Coordinates of Potential Blocks of Hooghly District

Abbreviation used in the table as below

ABBREVIATION					
PERIOD	PR	PRE MONSOON	BLOCK	CH1	CHANDITALA I
	PO	POST MONSOON		CH2	CHANDITALA II
DISTRICT	HG	HOOGHLY		SU	SERAMPUR UTTARPARA
BLOCK	GO1	GOGHAT I		TR	TARAKESWAR
	GO2	GOGHAT II		PN	PANDUA
	KH1	KHANAKUL I		DH	DHANIAKHALI
	KH2	KHANAKUL II		HR	HARIPAL
	BL	BALAGARH		SN	SINGUR
	CM	CHINSURAH MAGRA	RIVER	DW	DWARKESWAR RIVER
	PD	POLBA DADPUR		MU	MUNDESWARI RIVER
	AR	ARAMBAG		DA	DAMODAR RIVER
	PS	PURSURA		HO	HOOGHLY RIVER
	JP	JANGIPARA			

SANDBAR CODE	POINT_NO	LATITUDE	LONGITUDE
HG_AR_DW_01(IA)	1	22° 56' 40.435" N	87° 45' 33.728" E
	2	22° 56' 41.380" N	87° 45' 31.304" E
	3	22° 56' 42.163" N	87° 45' 31.267" E
	4	22° 56' 42.741" N	87° 45' 31.442" E
	5	22° 56' 43.127" N	87° 45' 31.577" E
	6	22° 56' 43.706" N	87° 45' 31.756" E
	7	22° 56' 44.388" N	87° 45' 32.082" E
	8	22° 56' 44.731" N	87° 45' 32.322" E
	9	22° 56' 45.125" N	87° 45' 32.612" E
	10	22° 56' 46.148" N	87° 45' 33.089" E
	11	22° 56' 46.543" N	87° 45' 33.331" E
	12	22° 56' 47.196" N	87° 45' 33.664" E
	13	22° 56' 47.551" N	87° 45' 33.957" E
	14	22° 56' 47.850" N	87° 45' 34.515" E
	15	22° 56' 47.940" N	87° 45' 35.230" E
	16	22° 56' 42.806" N	87° 45' 34.026" E
HG_AR_DW_01(IB)	1	22° 56' 28.477" N	87° 45' 43.997" E
	2	22° 56' 26.524" N	87° 45' 47.492" E
	3	22° 56' 24.489" N	87° 45' 50.925" E
	4	22° 56' 22.227" N	87° 45' 53.989" E
	5	22° 56' 19.986" N	87° 45' 59.334" E
	6	22° 56' 19.349" N	87° 46' 0.773" E

SANDBAR CODE	POINT_NO	LATITUDE	LONGITUDE
	7	22° 56' 14.888" N	87° 46' 9.099" E
	8	22° 56' 13.820" N	87° 46' 10.420" E
	9	22° 56' 13.780" N	87° 46' 8.328" E
	10	22° 56' 13.916" N	87° 46' 8.127" E
	11	22° 56' 13.958" N	87° 46' 7.047" E
	12	22° 56' 14.633" N	87° 46' 5.301" E
	13	22° 56' 15.221" N	87° 46' 3.847" E
	14	22° 56' 17.654" N	87° 45' 59.548" E
	15	22° 56' 17.745" N	87° 45' 59.195" E
	16	22° 56' 18.211" N	87° 45' 58.865" E
	17	22° 56' 18.513" N	87° 45' 58.482" E
	18	22° 56' 19.070" N	87° 45' 57.136" E
	19	22° 56' 19.240" N	87° 45' 56.509" E
	20	22° 56' 19.802" N	87° 45' 55.827" E
	21	22° 56' 19.975" N	87° 45' 55.536" E
	22	22° 56' 20.583" N	87° 45' 54.409" E
	23	22° 56' 20.973" N	87° 45' 52.999" E
	24	22° 56' 21.277" N	87° 45' 51.877" E
	25	22° 56' 21.933" N	87° 45' 50.156" E
	26	22° 56' 22.284" N	87° 45' 48.827" E
	27	22° 56' 23.218" N	87° 45' 47.851" E
	28	22° 56' 23.661" N	87° 45' 46.511" E
	29	22° 56' 25.095" N	87° 45' 43.780" E
	30	22° 56' 25.368" N	87° 45' 43.313" E
	31	22° 56' 27.056" N	87° 45' 39.918" E
	32	22° 56' 27.606" N	87° 45' 38.382" E
	33	22° 56' 28.298" N	87° 45' 37.531" E
	34	22° 56' 28.860" N	87° 45' 37.158" E
	35	22° 56' 29.115" N	87° 45' 36.677" E
	36	22° 56' 31.767" N	87° 45' 38.017" E
	37	22° 56' 31.458" N	87° 45' 38.323" E
	38	22° 56' 29.464" N	87° 45' 42.106" E
HG_AR_DW_01A	1	22° 57' 4.466" N	87° 45' 43.278" E
	2	22° 57' 3.880" N	87° 45' 42.991" E
	3	22° 57' 2.302" N	87° 45' 41.972" E
	4	22° 57' 1.826" N	87° 45' 41.736" E
	5	22° 57' 0.410" N	87° 45' 40.780" E
	6	22° 56' 59.941" N	87° 45' 40.498" E
	7	22° 56' 59.143" N	87° 45' 40.233" E

SANDBAR CODE	POINT_NO	LATITUDE	LONGITUDE
	8	22° 56' 58.309" N	87° 45' 39.721" E
	9	22° 56' 57.252" N	87° 45' 39.123" E
	10	22° 56' 56.387" N	87° 45' 38.468" E
	11	22° 56' 55.570" N	87° 45' 37.527" E
	12	22° 56' 54.490" N	87° 45' 36.604" E
	13	22° 56' 54.042" N	87° 45' 36.143" E
	14	22° 56' 53.109" N	87° 45' 35.366" E
	15	22° 56' 52.491" N	87° 45' 34.816" E
	16	22° 56' 51.088" N	87° 45' 33.555" E
	17	22° 56' 50.870" N	87° 45' 33.475" E
	18	22° 56' 50.478" N	87° 45' 32.651" E
	19	22° 56' 50.282" N	87° 45' 32.371" E
	20	22° 56' 53.726" N	87° 45' 33.916" E
	21	22° 56' 56.892" N	87° 45' 35.739" E
	22	22° 56' 58.701" N	87° 45' 36.712" E
	23	22° 57' 2.100" N	87° 45' 38.576" E
	24	22° 57' 5.605" N	87° 45' 40.668" E
	25	22° 57' 4.314" N	87° 45' 41.561" E
	26	22° 57' 4.269" N	87° 45' 42.372" E
	27	22° 57' 4.512" N	87° 45' 42.619" E
	28	22° 57' 4.705" N	87° 45' 42.614" E
	29	22° 57' 4.948" N	87° 45' 42.760" E
	30	22° 57' 5.875" N	87° 45' 43.042" E
	31	22° 57' 5.977" N	87° 45' 43.753" E
	32	22° 57' 5.099" N	87° 45' 43.822" E
	33	22° 57' 4.806" N	87° 45' 43.524" E
HG_AR_DW_01B	1	22° 54' 57.826" N	87° 45' 49.825" E
	2	22° 54' 55.121" N	87° 45' 48.088" E
	3	22° 54' 49.344" N	87° 45' 43.093" E
	4	22° 54' 48.031" N	87° 45' 42.246" E
	5	22° 54' 47.531" N	87° 45' 41.475" E
	6	22° 54' 47.291" N	87° 45' 40.756" E
	7	22° 54' 47.659" N	87° 45' 40.749" E
	8	22° 54' 48.246" N	87° 45' 41.088" E
	9	22° 54' 48.704" N	87° 45' 41.404" E
	10	22° 54' 49.166" N	87° 45' 41.635" E
	11	22° 54' 49.606" N	87° 45' 41.986" E
	12	22° 54' 50.048" N	87° 45' 42.459" E
	13	22° 54' 50.665" N	87° 45' 42.758" E

SANDBAR CODE	POINT_NO	LATITUDE	LONGITUDE
	14	22° 54' 50.864" N	87° 45' 42.849" E
	15	22° 54' 51.746" N	87° 45' 43.125" E
	16	22° 54' 52.179" N	87° 45' 43.158" E
	17	22° 54' 53.861" N	87° 45' 43.787" E
	18	22° 54' 54.102" N	87° 45' 44.162" E
	19	22° 54' 54.376" N	87° 45' 45.004" E
	20	22° 54' 54.802" N	87° 45' 44.952" E
	21	22° 54' 55.260" N	87° 45' 44.432" E
	22	22° 54' 56.161" N	87° 45' 44.386" E
	23	22° 54' 56.666" N	87° 45' 44.839" E
	24	22° 54' 56.859" N	87° 45' 45.797" E
	25	22° 54' 56.835" N	87° 45' 47.290" E
	26	22° 54' 57.187" N	87° 45' 48.134" E
	27	22° 54' 57.701" N	87° 45' 48.866" E
HG_AR_DW_01C	1	22° 54' 46.285" N	87° 45' 34.652" E
	2	22° 54' 49.258" N	87° 45' 36.499" E
	3	22° 54' 52.815" N	87° 45' 38.206" E
	4	22° 54' 54.500" N	87° 45' 38.802" E
	5	22° 54' 56.619" N	87° 45' 41.327" E
	6	22° 54' 56.236" N	87° 45' 42.144" E
	7	22° 54' 55.653" N	87° 45' 42.114" E
	8	22° 54' 54.977" N	87° 45' 41.367" E
	9	22° 54' 52.987" N	87° 45' 40.408" E
	10	22° 54' 52.023" N	87° 45' 39.852" E
	11	22° 54' 50.032" N	87° 45' 38.389" E
	12	22° 54' 49.673" N	87° 45' 38.255" E
	13	22° 54' 49.044" N	87° 45' 37.928" E
	14	22° 54' 48.449" N	87° 45' 37.545" E
	15	22° 54' 47.750" N	87° 45' 36.860" E
	16	22° 54' 47.352" N	87° 45' 36.129" E
	17	22° 54' 46.722" N	87° 45' 35.255" E
	18	22° 54' 46.308" N	87° 45' 34.800" E
HG_AR_DW_01D	1	22° 49' 17.224" N	87° 46' 32.676" E
	2	22° 49' 17.320" N	87° 46' 32.053" E
	3	22° 49' 18.941" N	87° 46' 34.865" E
	4	22° 49' 21.494" N	87° 46' 39.166" E
	5	22° 49' 22.402" N	87° 46' 40.519" E
	6	22° 49' 22.659" N	87° 46' 40.731" E
	7	22° 49' 22.308" N	87° 46' 40.623" E

SANDBAR CODE	POINT_NO	LATITUDE	LONGITUDE
	8	22° 49' 21.657" N	87° 46' 40.133" E
	9	22° 49' 21.128" N	87° 46' 39.693" E
	10	22° 49' 20.601" N	87° 46' 39.309" E
	11	22° 49' 20.277" N	87° 46' 39.039" E
	12	22° 49' 19.562" N	87° 46' 38.488" E
	13	22° 49' 19.158" N	87° 46' 38.107" E
	14	22° 49' 18.618" N	87° 46' 37.361" E
	15	22° 49' 18.569" N	87° 46' 36.797" E
	16	22° 49' 18.334" N	87° 46' 35.771" E
	17	22° 49' 18.011" N	87° 46' 35.166" E
	18	22° 49' 17.749" N	87° 46' 34.458" E
	19	22° 49' 17.434" N	87° 46' 33.682" E
	20	22° 49' 17.270" N	87° 46' 33.117" E
HG_AR_MU_01	1	22° 49' 59.428" N	87° 54' 21.168" E
	2	22° 49' 58.740" N	87° 54' 21.757" E
	3	22° 49' 58.342" N	87° 54' 21.914" E
	4	22° 49' 57.401" N	87° 54' 21.993" E
	5	22° 49' 57.184" N	87° 54' 22.229" E
	6	22° 49' 56.677" N	87° 54' 22.621" E
	7	22° 49' 56.387" N	87° 54' 22.975" E
	8	22° 49' 55.808" N	87° 54' 23.525" E
	9	22° 49' 55.338" N	87° 54' 23.996" E
	10	22° 49' 54.976" N	87° 54' 24.075" E
	11	22° 49' 54.650" N	87° 54' 23.918" E
	12	22° 49' 53.999" N	87° 54' 23.054" E
	13	22° 49' 53.637" N	87° 54' 22.936" E
	14	22° 49' 52.442" N	87° 54' 22.897" E
	15	22° 49' 51.936" N	87° 54' 23.054" E
	16	22° 49' 51.067" N	87° 54' 23.054" E
	17	22° 49' 50.090" N	87° 54' 23.054" E
	18	22° 49' 49.438" N	87° 54' 23.407" E
	19	22° 49' 49.040" N	87° 54' 23.564" E
	20	22° 49' 48.208" N	87° 54' 23.918" E
	21	22° 49' 47.122" N	87° 54' 24.036" E
	22	22° 49' 46.289" N	87° 54' 24.350" E
	23	22° 49' 44.878" N	87° 54' 25.450" E
	24	22° 49' 44.262" N	87° 54' 25.568" E
	25	22° 49' 42.996" N	87° 54' 25.568" E
	26	22° 49' 42.670" N	87° 54' 25.528" E

SANDBAR CODE	POINT_NO	LATITUDE	LONGITUDE
	27	22° 49' 41.584" N	87° 54' 25.528" E
	28	22° 49' 40.969" N	87° 54' 25.489" E
	29	22° 49' 40.317" N	87° 54' 25.372" E
	30	22° 49' 38.942" N	87° 54' 25.332" E
	31	22° 49' 38.010" N	87° 54' 25.057" E
	32	22° 49' 37.612" N	87° 54' 25.058" E
	33	22° 49' 36.526" N	87° 54' 24.469" E
	34	22° 49' 36.236" N	87° 54' 24.115" E
	35	22° 49' 35.440" N	87° 54' 23.330" E
	36	22° 49' 34.933" N	87° 54' 22.937" E
	37	22° 49' 35.150" N	87° 54' 22.270" E
	38	22° 49' 35.440" N	87° 54' 22.073" E
	39	22° 49' 35.802" N	87° 54' 21.641" E
	40	22° 49' 36.417" N	87° 54' 21.052" E
	41	22° 49' 36.815" N	87° 54' 20.620" E
	42	22° 49' 37.358" N	87° 54' 20.502" E
	43	22° 49' 37.792" N	87° 54' 20.424" E
	44	22° 49' 38.263" N	87° 54' 20.306" E
	45	22° 49' 38.469" N	87° 54' 19.938" E
	46	22° 49' 38.476" N	87° 54' 19.941" E
	47	22° 49' 48.893" N	87° 54' 20.421" E
	48	22° 49' 54.032" N	87° 54' 20.798" E
	49	22° 50' 0.088" N	87° 54' 20.355" E
	50	22° 49' 59.826" N	87° 54' 20.815" E
HG_PS_MU_01A	1	22° 55' 59.495" N	87° 56' 0.370" E
	2	22° 56' 5.525" N	87° 56' 4.893" E
	3	22° 56' 9.740" N	87° 56' 8.319" E
	4	22° 56' 13.851" N	87° 56' 10.204" E
	5	22° 56' 17.483" N	87° 56' 11.266" E
	6	22° 56' 21.252" N	87° 56' 11.985" E
	7	22° 56' 23.651" N	87° 56' 12.122" E
	8	22° 56' 25.044" N	87° 56' 12.513" E
	9	22° 56' 24.757" N	87° 56' 13.764" E
	10	22° 56' 24.846" N	87° 56' 14.619" E
	11	22° 56' 23.129" N	87° 56' 14.430" E
	12	22° 56' 21.995" N	87° 56' 13.940" E
	13	22° 56' 20.017" N	87° 56' 12.864" E
	14	22° 56' 17.584" N	87° 56' 12.391" E
	15	22° 56' 16.745" N	87° 56' 12.399" E

SANDBAR CODE	POINT_NO	LATITUDE	LONGITUDE
	16	22° 56' 16.001" N	87° 56' 12.209" E
	17	22° 56' 15.630" N	87° 56' 12.114" E
	18	22° 56' 14.888" N	87° 56' 12.121" E
	19	22° 56' 13.779" N	87° 56' 11.837" E
	20	22° 56' 12.029" N	87° 56' 11.855" E
	21	22° 56' 10.929" N	87° 56' 11.474" E
	22	22° 56' 10.197" N	87° 56' 11.287" E
	23	22° 56' 9.285" N	87° 56' 10.808" E
	24	22° 56' 7.739" N	87° 56' 10.047" E
	25	22° 56' 6.290" N	87° 56' 9.482" E
	26	22° 56' 3.858" N	87° 56' 8.254" E
	27	22° 56' 2.426" N	87° 56' 6.922" E
	28	22° 56' 1.444" N	87° 56' 6.070" E
	29	22° 55' 59.934" N	87° 56' 3.493" E
	30	22° 55' 59.579" N	87° 56' 2.729" E
	31	22° 55' 57.722" N	87° 56' 1.522" E
	32	22° 55' 56.715" N	87° 56' 0.179" E
HG_AR_MU_01B	1	22° 55' 59.238" N	87° 56' 0.156" E
	2	22° 55' 56.715" N	87° 56' 0.179" E
	3	22° 55' 56.227" N	87° 55' 59.449" E
	4	22° 55' 55.175" N	87° 55' 58.425" E
	5	22° 55' 54.650" N	87° 55' 57.771" E
	6	22° 55' 54.038" N	87° 55' 57.311" E
	7	22° 55' 52.905" N	87° 55' 56.870" E
	8	22° 55' 52.644" N	87° 55' 56.592" E
	9	22° 55' 52.210" N	87° 55' 56.510" E
	10	22° 55' 50.910" N	87° 55' 55.791" E
	11	22° 55' 49.442" N	87° 55' 55.366" E
	12	22° 55' 49.097" N	87° 55' 55.093" E
	13	22° 55' 48.839" N	87° 55' 55.102" E
	14	22° 55' 48.324" N	87° 55' 54.740" E
	15	22° 55' 47.124" N	87° 55' 53.741" E
	16	22° 55' 45.076" N	87° 55' 52.684" E
	17	22° 55' 44.821" N	87° 55' 52.410" E
	18	22° 55' 44.481" N	87° 55' 52.329" E
	19	22° 55' 43.548" N	87° 55' 51.612" E
	20	22° 55' 43.125" N	87° 55' 51.347" E
	21	22° 55' 42.872" N	87° 55' 51.263" E
	22	22° 55' 42.618" N	87° 55' 50.897" E

SANDBAR CODE	POINT_NO	LATITUDE	LONGITUDE
	23	22° 55' 42.534" N	87° 55' 50.712" E
	24	22° 55' 41.859" N	87° 55' 49.801" E
	25	22° 55' 40.850" N	87° 55' 48.718" E
	26	22° 55' 39.927" N	87° 55' 47.822" E
	27	22° 55' 39.341" N	87° 55' 47.194" E
	28	22° 55' 38.685" N	87° 55' 46.860" E
	29	22° 55' 38.136" N	87° 55' 46.205" E
	30	22° 55' 37.824" N	87° 55' 45.714" E
	31	22° 55' 37.629" N	87° 55' 45.470" E
	32	22° 55' 37.436" N	87° 55' 45.020" E
	33	22° 55' 36.819" N	87° 55' 44.051" E
	34	22° 55' 34.704" N	87° 55' 42.678" E
	35	22° 55' 33.890" N	87° 55' 42.156" E
	36	22° 55' 33.307" N	87° 55' 41.865" E
	37	22° 55' 31.971" N	87° 55' 40.595" E
	38	22° 55' 31.367" N	87° 55' 39.845" E
	39	22° 55' 30.280" N	87° 55' 38.159" E
	40	22° 55' 29.630" N	87° 55' 37.132" E
	41	22° 55' 29.202" N	87° 55' 36.396" E
	42	22° 55' 28.861" N	87° 55' 35.793" E
	43	22° 55' 28.607" N	87° 55' 35.364" E
	44	22° 55' 28.058" N	87° 55' 34.512" E
	45	22° 55' 27.556" N	87° 55' 33.664" E
	46	22° 55' 27.099" N	87° 55' 32.993" E
	47	22° 55' 27.045" N	87° 55' 32.546" E
	48	22° 55' 33.899" N	87° 55' 38.167" E
	49	22° 55' 38.628" N	87° 55' 42.073" E
	50	22° 55' 46.851" N	87° 55' 49.782" E
	51	22° 55' 50.791" N	87° 55' 53.037" E
HG_AR_MU_01C	1	22° 53' 26.082" N	87° 54' 29.928" E
	2	22° 53' 26.916" N	87° 54' 30.046" E
	3	22° 53' 27.709" N	87° 54' 30.046" E
	4	22° 53' 28.214" N	87° 54' 29.889" E
	5	22° 53' 28.683" N	87° 54' 29.967" E
	6	22° 53' 28.935" N	87° 54' 30.124" E
	7	22° 53' 29.512" N	87° 54' 30.359" E
	8	22° 53' 30.197" N	87° 54' 30.907" E
	9	22° 53' 30.413" N	87° 54' 31.141" E
	10	22° 53' 30.702" N	87° 54' 31.572" E

SANDBAR CODE	POINT_NO	LATITUDE	LONGITUDE
	11	22° 53' 31.567" N	87° 54' 32.433" E
	12	22° 53' 31.892" N	87° 54' 32.746" E
	13	22° 53' 32.324" N	87° 54' 33.450" E
	14	22° 53' 32.433" N	87° 54' 34.038" E
	15	22° 53' 33.298" N	87° 54' 34.742" E
	16	22° 53' 33.731" N	87° 54' 35.055" E
	17	22° 53' 34.308" N	87° 54' 35.525" E
	18	22° 53' 35.281" N	87° 54' 36.542" E
	19	22° 53' 35.534" N	87° 54' 36.699" E
	20	22° 53' 36.074" N	87° 54' 37.129" E
	21	22° 53' 36.399" N	87° 54' 37.364" E
	22	22° 53' 36.687" N	87° 54' 37.560" E
	23	22° 53' 37.408" N	87° 54' 37.834" E
	24	22° 53' 37.769" N	87° 54' 37.990" E
	25	22° 53' 38.382" N	87° 54' 38.147" E
	26	22° 53' 39.392" N	87° 54' 38.303" E
	27	22° 53' 39.644" N	87° 54' 38.421" E
	28	22° 53' 40.257" N	87° 54' 38.617" E
	29	22° 53' 40.545" N	87° 54' 38.773" E
	30	22° 53' 41.158" N	87° 54' 39.047" E
	31	22° 53' 41.843" N	87° 54' 39.164" E
	32	22° 53' 42.276" N	87° 54' 39.282" E
	33	22° 53' 42.997" N	87° 54' 39.360" E
	34	22° 53' 43.430" N	87° 54' 39.438" E
	35	22° 53' 44.043" N	87° 54' 39.634" E
	36	22° 53' 44.512" N	87° 54' 39.986" E
	37	22° 53' 45.269" N	87° 54' 40.691" E
	38	22° 53' 45.665" N	87° 54' 40.965" E
	39	22° 53' 46.235" N	87° 54' 41.583" E
	40	22° 53' 44.773" N	87° 54' 41.052" E
	41	22° 53' 37.097" N	87° 54' 38.749" E
	42	22° 53' 28.408" N	87° 54' 32.904" E
	43	22° 53' 27.776" N	87° 54' 32.003" E
	44	22° 53' 27.452" N	87° 54' 31.690" E
	45	22° 53' 27.272" N	87° 54' 31.650" E
	46	22° 53' 26.550" N	87° 54' 30.985" E
	47	22° 53' 26.082" N	87° 54' 30.241" E
HG_AR_MU_01D	1	22° 53' 11.360" N	87° 54' 16.341" E
	2	22° 53' 11.396" N	87° 54' 16.185" E

SANDBAR CODE	POINT_NO	LATITUDE	LONGITUDE
	3	22° 53' 12.153" N	87° 54' 16.106" E
	4	22° 53' 12.478" N	87° 54' 16.224" E
	5	22° 53' 12.767" N	87° 54' 16.224" E
	6	22° 53' 13.163" N	87° 54' 16.302" E
	7	22° 53' 13.885" N	87° 54' 16.537" E
	8	22° 53' 14.498" N	87° 54' 17.007" E
	9	22° 53' 14.715" N	87° 54' 17.398" E
	10	22° 53' 14.823" N	87° 54' 17.555" E
	11	22° 53' 14.967" N	87° 54' 17.946" E
	12	22° 53' 15.436" N	87° 54' 18.651" E
	13	22° 53' 16.446" N	87° 54' 19.434" E
	14	22° 53' 16.843" N	87° 54' 19.669" E
	15	22° 53' 17.024" N	87° 54' 19.787" E
	16	22° 53' 17.312" N	87° 54' 20.139" E
	17	22° 53' 18.034" N	87° 54' 21.040" E
	18	22° 53' 18.359" N	87° 54' 21.236" E
	19	22° 53' 19.008" N	87° 54' 21.707" E
	20	22° 53' 19.657" N	87° 54' 22.138" E
	21	22° 53' 21.388" N	87° 54' 23.704" E
	22	22° 53' 22.109" N	87° 54' 24.291" E
	23	22° 53' 22.542" N	87° 54' 24.760" E
	24	22° 53' 22.830" N	87° 54' 25.230" E
	25	22° 53' 23.551" N	87° 54' 26.326" E
	26	22° 53' 23.948" N	87° 54' 26.756" E
	27	22° 53' 24.561" N	87° 54' 27.461" E
	28	22° 53' 24.453" N	87° 54' 27.617" E
	29	22° 53' 23.335" N	87° 54' 27.891" E
	30	22° 53' 22.362" N	87° 54' 27.383" E
	31	22° 53' 21.929" N	87° 54' 27.070" E
	32	22° 53' 21.136" N	87° 54' 26.404" E
	33	22° 53' 20.018" N	87° 54' 25.543" E
	34	22° 53' 19.441" N	87° 54' 25.387" E
	35	22° 53' 19.044" N	87° 54' 25.035" E
	36	22° 53' 18.864" N	87° 54' 24.526" E
	37	22° 53' 18.576" N	87° 54' 23.900" E
	38	22° 53' 18.251" N	87° 54' 23.234" E
	39	22° 53' 17.998" N	87° 54' 22.882" E
	40	22° 53' 17.637" N	87° 54' 22.450" E
	41	22° 53' 16.122" N	87° 54' 21.549" E

SANDBAR CODE	POINT_NO	LATITUDE	LONGITUDE
	42	22° 53' 15.689" N	87° 54' 21.236" E
	43	22° 53' 15.292" N	87° 54' 20.413" E
	44	22° 53' 14.029" N	87° 54' 19.317" E
	45	22° 53' 13.236" N	87° 54' 18.847" E
	46	22° 53' 12.803" N	87° 54' 18.573" E
	47	22° 53' 12.550" N	87° 54' 18.299" E
	48	22° 53' 12.262" N	87° 54' 17.947" E
	49	22° 53' 11.829" N	87° 54' 17.359" E
	50	22° 53' 11.576" N	87° 54' 17.007" E
	51	22° 53' 11.432" N	87° 54' 16.655" E
HG_AR_MU_01E	1	22° 52' 59.351" N	87° 54' 5.739" E
	2	22° 52' 48.963" N	87° 53' 55.055" E
	3	22° 52' 45.783" N	87° 53' 51.821" E
	4	22° 52' 35.860" N	87° 53' 43.159" E
	5	22° 52' 33.448" N	87° 53' 41.843" E
	6	22° 52' 32.946" N	87° 53' 41.662" E
	7	22° 52' 32.945" N	87° 53' 41.659" E
	8	22° 52' 32.475" N	87° 53' 40.680" E
	9	22° 52' 32.114" N	87° 53' 39.779" E
	10	22° 52' 32.295" N	87° 53' 38.682" E
	11	22° 52' 32.403" N	87° 53' 38.486" E
	12	22° 52' 33.052" N	87° 53' 38.133" E
	13	22° 52' 33.558" N	87° 53' 37.977" E
	14	22° 52' 34.532" N	87° 53' 37.976" E
	15	22° 52' 35.281" N	87° 53' 38.248" E
	16	22° 52' 36.219" N	87° 53' 38.678" E
	17	22° 52' 36.725" N	87° 53' 39.266" E
	18	22° 52' 37.013" N	87° 53' 39.540" E
	19	22° 52' 38.529" N	87° 53' 40.127" E
	20	22° 52' 39.179" N	87° 53' 41.537" E
	21	22° 52' 40.478" N	87° 53' 42.086" E
	22	22° 52' 40.767" N	87° 53' 42.242" E
	23	22° 52' 41.381" N	87° 53' 42.634" E
	24	22° 52' 41.742" N	87° 53' 42.908" E
	25	22° 52' 42.391" N	87° 53' 43.692" E
	26	22° 52' 42.825" N	87° 53' 44.162" E
	27	22° 52' 43.547" N	87° 53' 44.592" E
	28	22° 52' 43.691" N	87° 53' 44.631" E
	29	22° 52' 44.810" N	87° 53' 45.141" E

SANDBAR CODE	POINT_NO	LATITUDE	LONGITUDE
	30	22° 52' 44.521" N	87° 53' 44.984" E
	31	22° 52' 44.665" N	87° 53' 45.101" E
	32	22° 52' 46.001" N	87° 53' 45.767" E
	33	22° 52' 44.990" N	87° 53' 45.297" E
	34	22° 52' 46.145" N	87° 53' 45.924" E
	35	22° 52' 47.048" N	87° 53' 46.550" E
	36	22° 52' 47.481" N	87° 53' 46.864" E
	37	22° 52' 48.302" N	87° 53' 47.246" E
	38	22° 52' 48.953" N	87° 53' 47.871" E
	39	22° 52' 50.143" N	87° 53' 49.776" E
	40	22° 52' 50.504" N	87° 53' 50.167" E
	41	22° 52' 50.648" N	87° 53' 50.441" E
	42	22° 52' 50.793" N	87° 53' 50.715" E
	43	22° 52' 50.829" N	87° 53' 51.303" E
	44	22° 52' 51.190" N	87° 53' 52.321" E
	45	22° 52' 51.298" N	87° 53' 52.948" E
	46	22° 52' 51.623" N	87° 53' 53.536" E
	47	22° 52' 52.309" N	87° 53' 54.750" E
	48	22° 52' 52.851" N	87° 53' 55.455" E
	49	22° 52' 53.717" N	87° 53' 56.043" E
	50	22° 52' 54.619" N	87° 53' 56.983" E
	51	22° 52' 54.764" N	87° 53' 57.766" E
	52	22° 52' 55.197" N	87° 53' 58.040" E
	53	22° 52' 56.965" N	87° 53' 59.176" E
	54	22° 52' 56.893" N	87° 53' 58.941" E
	55	22° 52' 56.929" N	87° 53' 59.960" E
	56	22° 52' 57.110" N	87° 54' 2.232" E
	57	22° 52' 56.929" N	87° 54' 1.683" E
	58	22° 52' 58.010" N	87° 54' 3.561" E
	59	22° 52' 58.373" N	87° 54' 4.190" E
	60	22° 52' 58.446" N	87° 54' 4.386" E
	61	22° 52' 58.590" N	87° 54' 4.503" E
	62	22° 52' 58.662" N	87° 54' 4.698" E
	63	22° 52' 59.203" N	87° 54' 5.441" E
	64	22° 52' 59.276" N	87° 54' 5.637" E
	65	22° 53' 0.531" N	87° 54' 6.952" E
	66	22° 52' 59.509" N	87° 54' 5.902" E
	67	22° 52' 59.925" N	87° 54' 6.224" E
	68	22° 53' 0.430" N	87° 54' 6.576" E

SANDBAR CODE	POINT_NO	LATITUDE	LONGITUDE
	69	22° 53' 0.861" N	87° 54' 7.329" E
HG_AR_MU_01F	1	22° 52' 0.525" N	87° 53' 44.591" E
	2	22° 52' 0.085" N	87° 53' 40.152" E
	3	22° 52' 1.046" N	87° 53' 39.116" E
	4	22° 52' 1.335" N	87° 53' 38.646" E
	5	22° 52' 2.057" N	87° 53' 37.979" E
	6	22° 52' 3.140" N	87° 53' 36.921" E
	7	22° 52' 3.429" N	87° 53' 36.764" E
	8	22° 52' 3.718" N	87° 53' 36.411" E
	9	22° 52' 5.090" N	87° 53' 35.353" E
	10	22° 52' 6.353" N	87° 53' 34.844" E
	11	22° 52' 6.642" N	87° 53' 34.765" E
	12	22° 52' 7.689" N	87° 53' 34.138" E
	13	22° 52' 8.520" N	87° 53' 33.746" E
	14	22° 52' 9.458" N	87° 53' 33.511" E
	15	22° 52' 10.578" N	87° 53' 33.510" E
	16	22° 52' 11.119" N	87° 53' 33.589" E
	17	22° 52' 12.491" N	87° 53' 33.941" E
	18	22° 52' 12.961" N	87° 53' 34.137" E
	19	22° 52' 13.178" N	87° 53' 34.176" E
	20	22° 52' 14.080" N	87° 53' 34.607" E
	21	22° 52' 14.423" N	87° 53' 35.076" E
	22	22° 52' 13.383" N	87° 53' 34.881" E
	23	22° 52' 9.655" N	87° 53' 36.471" E
	24	22° 52' 3.460" N	87° 53' 42.062" E
	25	22° 52' 1.093" N	87° 53' 44.309" E
HG_AR_MU_01G	1	22° 51' 7.979" N	87° 53' 55.330" E
	2	22° 51' 0.890" N	87° 53' 59.654" E
	3	22° 51' 1.151" N	87° 53' 58.198" E
	4	22° 51' 0.717" N	87° 53' 57.178" E
	5	22° 51' 2.778" N	87° 53' 56.158" E
	6	22° 51' 5.128" N	87° 53' 54.627" E
	7	22° 51' 6.285" N	87° 53' 53.410" E
	8	22° 51' 7.948" N	87° 53' 50.467" E
	9	22° 51' 9.901" N	87° 53' 49.172" E
	10	22° 51' 13.407" N	87° 53' 47.917" E
	11	22° 51' 17.464" N	87° 53' 46.127" E
	12	22° 51' 16.641" N	87° 53' 46.613" E
	13	22° 51' 12.365" N	87° 53' 50.615" E

SANDBAR CODE	POINT_NO	LATITUDE	LONGITUDE
	14	22° 51' 9.789" N	87° 53' 53.246" E
HG_PS_MU_02	1	22° 49' 2.271" N	87° 54' 43.245" E
	2	22° 49' 0.023" N	87° 54' 46.260" E
	3	22° 48' 55.860" N	87° 54' 50.238" E
	4	22° 48' 56.330" N	87° 54' 49.219" E
	5	22° 48' 56.646" N	87° 54' 48.590" E
	6	22° 48' 57.226" N	87° 54' 47.678" E
	7	22° 48' 57.702" N	87° 54' 46.760" E
	8	22° 48' 58.259" N	87° 54' 46.249" E
	9	22° 48' 58.392" N	87° 54' 46.019" E
	10	22° 48' 58.604" N	87° 54' 45.558" E
	11	22° 48' 59.083" N	87° 54' 44.781" E
	12	22° 48' 59.377" N	87° 54' 44.291" E
	13	22° 48' 59.777" N	87° 54' 43.801" E
	14	22° 49' 0.099" N	87° 54' 43.193" E
	15	22° 49' 0.554" N	87° 54' 42.323" E
	16	22° 49' 0.608" N	87° 54' 42.060" E
	17	22° 49' 1.118" N	87° 54' 40.779" E
	18	22° 49' 1.927" N	87° 54' 39.994" E
	19	22° 49' 2.197" N	87° 54' 39.555" E
	20	22° 49' 2.197" N	87° 54' 39.116" E
	21	22° 49' 2.105" N	87° 54' 38.758" E
	22	22° 49' 2.157" N	87° 54' 38.586" E
	23	22° 49' 2.131" N	87° 54' 38.210" E
	24	22° 49' 2.000" N	87° 54' 37.949" E
	25	22° 49' 2.026" N	87° 54' 37.402" E
	26	22° 49' 2.131" N	87° 54' 37.173" E
	27	22° 49' 3.023" N	87° 54' 35.970" E
	28	22° 49' 3.682" N	87° 54' 35.456" E
	29	22° 49' 3.735" N	87° 54' 35.369" E
	30	22° 49' 4.263" N	87° 54' 34.997" E
	31	22° 49' 4.925" N	87° 54' 34.450" E
	32	22° 49' 6.150" N	87° 54' 33.671" E
	33	22° 49' 7.381" N	87° 54' 32.771" E
	34	22° 49' 7.810" N	87° 54' 32.597" E
	35	22° 49' 8.349" N	87° 54' 32.334" E
	36	22° 49' 8.592" N	87° 54' 32.159" E
	37	22° 49' 9.132" N	87° 54' 31.837" E
	38	22° 49' 9.891" N	87° 54' 31.513" E

SANDBAR CODE	POINT_NO	LATITUDE	LONGITUDE
	39	22° 49' 10.761" N	87° 54' 31.718" E
	40	22° 49' 10.326" N	87° 54' 31.513" E
	41	22° 49' 10.462" N	87° 54' 31.601" E
	42	22° 49' 10.571" N	87° 54' 31.601" E
	43	22° 49' 10.898" N	87° 54' 31.747" E
	44	22° 49' 11.526" N	87° 54' 31.747" E
	45	22° 49' 11.717" N	87° 54' 31.688" E
	46	22° 49' 13.002" N	87° 54' 31.001" E
	47	22° 49' 13.926" N	87° 54' 30.392" E
	48	22° 49' 14.721" N	87° 54' 30.041" E
	49	22° 49' 14.827" N	87° 54' 29.983" E
	50	22° 49' 15.464" N	87° 54' 29.776" E
	51	22° 49' 15.305" N	87° 54' 29.893" E
	52	22° 49' 15.704" N	87° 54' 29.688" E
	53	22° 49' 16.557" N	87° 54' 29.334" E
	54	22° 49' 17.361" N	87° 54' 29.096" E
	55	22° 49' 18.707" N	87° 54' 29.086" E
	56	22° 49' 19.572" N	87° 54' 29.110" E
	57	22° 49' 19.870" N	87° 54' 29.049" E
	58	22° 49' 20.115" N	87° 54' 28.930" E
	59	22° 49' 20.387" N	87° 54' 28.840" E
	60	22° 49' 21.041" N	87° 54' 28.747" E
	61	22° 49' 21.177" N	87° 54' 28.658" E
	62	22° 49' 21.433" N	87° 54' 28.626" E
	63	22° 49' 17.183" N	87° 54' 31.239" E
	64	22° 49' 11.865" N	87° 54' 34.528" E
	65	22° 49' 6.437" N	87° 54' 38.914" E
HG_PS_MU_03A	1	22° 46' 49.240" N	87° 55' 35.413" E
	2	22° 46' 49.628" N	87° 55' 34.426" E
	3	22° 46' 49.671" N	87° 55' 34.238" E
	4	22° 46' 51.358" N	87° 55' 32.405" E
	5	22° 46' 51.879" N	87° 55' 31.650" E
	6	22° 46' 52.487" N	87° 55' 30.137" E
	7	22° 46' 53.053" N	87° 55' 29.664" E
	8	22° 46' 53.707" N	87° 55' 29.284" E
	9	22° 46' 54.537" N	87° 55' 28.714" E
	10	22° 46' 55.413" N	87° 55' 28.427" E
	11	22° 46' 56.335" N	87° 55' 28.330" E
	12	22° 46' 56.907" N	87° 55' 28.138" E

SANDBAR CODE	POINT_NO	LATITUDE	LONGITUDE
	13	22° 46' 57.590" N	87° 55' 27.932" E
	14	22° 46' 57.871" N	87° 55' 29.147" E
	15	22° 46' 55.192" N	87° 55' 31.269" E
	16	22° 46' 50.915" N	87° 55' 36.587" E
	17	22° 46' 49.986" N	87° 55' 37.406" E
	18	22° 46' 49.671" N	87° 55' 37.020" E
	19	22° 46' 49.412" N	87° 55' 36.546" E
	20	22° 46' 49.240" N	87° 55' 36.026" E
HG_PS_MU_03B	1	22° 46' 24.217" N	87° 55' 42.809" E
	2	22° 46' 24.648" N	87° 55' 39.881" E
	3	22° 46' 25.295" N	87° 55' 40.428" E
	4	22° 46' 27.926" N	87° 55' 40.455" E
	5	22° 46' 36.807" N	87° 55' 40.264" E
	6	22° 46' 40.453" N	87° 55' 39.715" E
	7	22° 46' 41.876" N	87° 55' 39.085" E
	8	22° 46' 41.580" N	87° 55' 39.579" E
	9	22° 46' 40.720" N	87° 55' 40.352" E
	10	22° 46' 39.997" N	87° 55' 40.737" E
	11	22° 46' 39.591" N	87° 55' 41.074" E
	12	22° 46' 39.051" N	87° 55' 41.265" E
	13	22° 46' 37.613" N	87° 55' 41.503" E
	14	22° 46' 37.165" N	87° 55' 41.550" E
	15	22° 46' 36.137" N	87° 55' 41.643" E
	16	22° 46' 35.022" N	87° 55' 41.880" E
	17	22° 46' 34.222" N	87° 55' 41.973" E
	18	22° 46' 33.956" N	87° 55' 42.068" E
	19	22° 46' 32.848" N	87° 55' 42.303" E
	20	22° 46' 32.317" N	87° 55' 42.588" E
	21	22° 46' 30.379" N	87° 55' 44.150" E
	22	22° 46' 29.020" N	87° 55' 44.997" E
	23	22° 46' 27.274" N	87° 55' 44.842" E
	24	22° 46' 26.838" N	87° 55' 44.412" E
	25	22° 46' 26.013" N	87° 55' 43.934" E
	26	22° 46' 24.800" N	87° 55' 43.125" E
HG_KH1_MU_03C	1	22° 45' 49.052" N	87° 55' 18.258" E
	2	22° 45' 49.172" N	87° 55' 17.894" E
	3	22° 45' 49.556" N	87° 55' 17.555" E
	4	22° 45' 49.870" N	87° 55' 17.424" E
	5	22° 45' 50.454" N	87° 55' 17.160" E

SANDBAR CODE	POINT_NO	LATITUDE	LONGITUDE
	6	22° 45' 52.034" N	87° 55' 16.596" E
	7	22° 45' 52.234" N	87° 55' 16.515" E
	8	22° 45' 53.599" N	87° 55' 16.074" E
	9	22° 45' 53.983" N	87° 55' 15.962" E
	10	22° 45' 54.240" N	87° 55' 15.958" E
	11	22° 45' 54.498" N	87° 55' 15.847" E
	12	22° 45' 54.889" N	87° 55' 15.507" E
	13	22° 45' 55.582" N	87° 55' 15.244" E
	14	22° 45' 56.555" N	87° 55' 14.947" E
	15	22° 45' 57.059" N	87° 55' 14.835" E
	16	22° 45' 59.489" N	87° 55' 14.784" E
	17	22° 46' 0.038" N	87° 55' 14.928" E
	18	22° 46' 0.158" N	87° 55' 15.030" E
	19	22° 46' 0.712" N	87° 55' 15.333" E
	20	22° 46' 1.368" N	87° 55' 15.769" E
	21	22° 46' 1.711" N	87° 55' 16.027" E
	22	22° 46' 2.377" N	87° 55' 16.204" E
	23	22° 46' 2.874" N	87° 55' 16.464" E
	24	22° 46' 3.424" N	87° 55' 16.753" E
	25	22° 46' 4.030" N	87° 55' 17.070" E
	26	22° 46' 4.335" N	87° 55' 17.202" E
	27	22° 46' 4.769" N	87° 55' 17.604" E
	28	22° 46' 5.271" N	87° 55' 18.166" E
	29	22° 46' 5.283" N	87° 55' 19.681" E
	30	22° 46' 5.018" N	87° 55' 19.477" E
	31	22° 46' 1.085" N	87° 55' 17.900" E
	32	22° 45' 59.043" N	87° 55' 17.777" E
	33	22° 45' 56.466" N	87° 55' 16.557" E
	34	22° 45' 52.519" N	87° 55' 17.270" E
	35	22° 45' 49.394" N	87° 55' 19.011" E
	36	22° 45' 49.228" N	87° 55' 19.050" E
	37	22° 45' 49.052" N	87° 55' 18.648" E
HG_KH1_MU_03D	1	22° 45' 33.838" N	87° 55' 23.338" E
	2	22° 45' 34.376" N	87° 55' 22.720" E
	3	22° 45' 35.250" N	87° 55' 22.171" E
	4	22° 45' 35.990" N	87° 55' 21.826" E
	5	22° 45' 36.400" N	87° 55' 21.482" E
	6	22° 45' 37.153" N	87° 55' 20.920" E
	7	22° 45' 37.618" N	87° 55' 20.780" E

SANDBAR CODE	POINT_NO	LATITUDE	LONGITUDE
	8	22° 45' 38.136" N	87° 55' 20.613" E
	9	22° 45' 38.484" N	87° 55' 20.526" E
	10	22° 45' 39.109" N	87° 55' 20.487" E
	11	22° 45' 39.486" N	87° 55' 20.399" E
	12	22° 45' 39.764" N	87° 55' 20.206" E
	13	22° 45' 40.222" N	87° 55' 19.874" E
	14	22° 45' 40.400" N	87° 55' 19.816" E
	15	22° 45' 40.964" N	87° 55' 19.829" E
	16	22° 45' 41.300" N	87° 55' 19.902" E
	17	22° 45' 41.767" N	87° 55' 20.134" E
	18	22° 45' 42.237" N	87° 55' 20.342" E
	19	22° 45' 42.368" N	87° 55' 20.557" E
	20	22° 45' 42.368" N	87° 55' 20.749" E
	21	22° 45' 41.623" N	87° 55' 20.943" E
	22	22° 45' 40.252" N	87° 55' 21.628" E
	23	22° 45' 37.867" N	87° 55' 22.958" E
	24	22° 45' 35.758" N	87° 55' 23.545" E
	25	22° 45' 35.392" N	87° 55' 23.571" E
	26	22° 45' 34.681" N	87° 55' 23.622" E
	27	22° 45' 34.282" N	87° 55' 23.724" E
	28	22° 45' 33.838" N	87° 55' 23.569" E
HG_KH1_MU_03H	1	22° 43' 29.465" N	87° 54' 11.968" E
	2	22° 43' 27.383" N	87° 54' 11.154" E
	3	22° 43' 29.232" N	87° 54' 7.508" E
	4	22° 43' 29.508" N	87° 54' 7.724" E
	5	22° 43' 30.149" N	87° 54' 8.212" E
	6	22° 43' 30.455" N	87° 54' 8.383" E
	7	22° 43' 31.001" N	87° 54' 8.469" E
	8	22° 43' 31.207" N	87° 54' 8.571" E
	9	22° 43' 31.760" N	87° 54' 8.696" E
	10	22° 43' 32.038" N	87° 54' 8.682" E
	11	22° 43' 33.019" N	87° 54' 9.017" E
	12	22° 43' 33.692" N	87° 54' 9.293" E
	13	22° 43' 35.022" N	87° 54' 10.319" E
	14	22° 43' 35.240" N	87° 54' 10.505" E
	15	22° 43' 35.495" N	87° 54' 10.574" E
	16	22° 43' 36.377" N	87° 54' 11.599" E
	17	22° 43' 36.747" N	87° 54' 11.942" E
	18	22° 43' 38.211" N	87° 54' 12.895" E

SANDBAR CODE	POINT_NO	LATITUDE	LONGITUDE
	19	22° 43' 38.705" N	87° 54' 13.442" E
	20	22° 43' 39.164" N	87° 54' 13.794" E
	21	22° 43' 40.442" N	87° 54' 14.743" E
	22	22° 43' 40.833" N	87° 54' 15.103" E
	23	22° 43' 40.951" N	87° 54' 15.264" E
	24	22° 43' 41.361" N	87° 54' 15.486" E
	25	22° 43' 41.167" N	87° 54' 16.080" E
	26	22° 43' 40.814" N	87° 54' 15.970" E
	27	22° 43' 37.716" N	87° 54' 15.093" E
HG_KH1_MU_04	1	22° 42' 30.856" N	87° 53' 33.686" E
	2	22° 42' 30.996" N	87° 53' 33.148" E
	3	22° 42' 31.206" N	87° 53' 32.872" E
	4	22° 42' 31.769" N	87° 53' 32.654" E
	5	22° 42' 33.442" N	87° 53' 33.592" E
	6	22° 42' 41.117" N	87° 53' 39.129" E
	7	22° 42' 42.680" N	87° 53' 40.500" E
	8	22° 42' 44.121" N	87° 53' 41.754" E
	9	22° 42' 43.645" N	87° 53' 42.033" E
	10	22° 42' 42.615" N	87° 53' 42.019" E
	11	22° 42' 40.555" N	87° 53' 41.016" E
	12	22° 42' 38.900" N	87° 53' 40.160" E
	13	22° 42' 36.483" N	87° 53' 38.773" E
	14	22° 42' 34.216" N	87° 53' 37.545" E
	15	22° 42' 32.803" N	87° 53' 36.335" E
	16	22° 42' 30.961" N	87° 53' 34.670" E
HG_KH1_MU_06A	1	22° 41' 30.875" N	87° 53' 30.175" E
	2	22° 41' 30.907" N	87° 53' 29.849" E
	3	22° 41' 31.198" N	87° 53' 29.524" E
	4	22° 41' 31.392" N	87° 53' 29.453" E
	5	22° 41' 32.078" N	87° 53' 28.282" E
	6	22° 41' 32.937" N	87° 53' 27.617" E
	7	22° 41' 33.438" N	87° 53' 26.984" E
	8	22° 41' 34.009" N	87° 53' 26.644" E
	9	22° 41' 36.028" N	87° 53' 26.625" E
	10	22° 41' 36.586" N	87° 53' 26.430" E
	11	22° 41' 37.078" N	87° 53' 26.119" E
	12	22° 41' 38.286" N	87° 53' 25.796" E
	13	22° 41' 39.771" N	87° 53' 25.152" E
	14	22° 41' 41.324" N	87° 53' 24.926" E

SANDBAR CODE	POINT_NO	LATITUDE	LONGITUDE
	15	22° 41' 42.378" N	87° 53' 24.232" E
	16	22° 41' 43.832" N	87° 53' 23.356" E
	17	22° 41' 44.298" N	87° 53' 23.262" E
	18	22° 41' 44.327" N	87° 53' 25.117" E
	19	22° 41' 35.516" N	87° 53' 28.302" E
HG_KH1_MU_07	1	22° 41' 9.371" N	87° 53' 28.960" E
	2	22° 41' 11.766" N	87° 53' 29.316" E
	3	22° 41' 11.508" N	87° 53' 29.411" E
	4	22° 41' 10.181" N	87° 53' 29.621" E
	5	22° 41' 8.837" N	87° 53' 29.871" E
	6	22° 41' 8.113" N	87° 53' 29.894" E
	7	22° 41' 7.317" N	87° 53' 29.596" E
	8	22° 41' 6.608" N	87° 53' 29.460" E
	9	22° 41' 5.055" N	87° 53' 29.594" E
	10	22° 41' 4.596" N	87° 53' 29.690" E
	11	22° 41' 2.860" N	87° 53' 29.749" E
	12	22° 41' 1.576" N	87° 53' 29.471" E
	13	22° 41' 3.061" N	87° 53' 27.469" E
HG_KH2_MU_08	1	22° 41' 1.576" N	87° 53' 29.471" E
	2	22° 41' 0.982" N	87° 53' 29.426" E
	3	22° 41' 0.295" N	87° 53' 29.336" E
	4	22° 40' 59.721" N	87° 53' 29.204" E
	5	22° 40' 58.763" N	87° 53' 28.898" E
	6	22° 40' 57.992" N	87° 53' 28.474" E
	7	22° 40' 57.298" N	87° 53' 27.901" E
	8	22° 40' 56.542" N	87° 53' 27.712" E
	9	22° 40' 56.201" N	87° 53' 27.355" E
	10	22° 40' 56.133" N	87° 53' 26.796" E
	11	22° 40' 56.254" N	87° 53' 26.481" E
	12	22° 41' 0.682" N	87° 53' 26.712" E
	13	22° 41' 3.061" N	87° 53' 27.469" E
HG_KH2_MU_12B	1	22° 38' 51.746" N	87° 54' 13.852" E
	2	22° 38' 52.014" N	87° 54' 13.698" E
	3	22° 38' 52.508" N	87° 54' 13.360" E
	4	22° 38' 52.512" N	87° 54' 13.359" E
	5	22° 38' 52.812" N	87° 54' 13.215" E
	6	22° 38' 53.175" N	87° 54' 12.992" E
	7	22° 38' 53.571" N	87° 54' 12.756" E
	8	22° 38' 53.367" N	87° 54' 12.891" E

SANDBAR CODE	POINT_NO	LATITUDE	LONGITUDE
	9	22° 38' 54.044" N	87° 54' 12.516" E
	10	22° 38' 54.345" N	87° 54' 12.389" E
	11	22° 38' 55.038" N	87° 54' 12.018" E
	12	22° 38' 55.613" N	87° 54' 11.724" E
	13	22° 38' 55.720" N	87° 54' 11.665" E
	14	22° 38' 56.173" N	87° 54' 11.689" E
	15	22° 38' 56.314" N	87° 54' 11.549" E
	16	22° 38' 56.466" N	87° 54' 11.523" E
	17	22° 38' 56.543" N	87° 54' 11.727" E
	18	22° 38' 56.544" N	87° 54' 11.842" E
	19	22° 38' 56.272" N	87° 54' 12.201" E
	20	22° 38' 56.044" N	87° 54' 12.776" E
	21	22° 38' 55.764" N	87° 54' 13.257" E
	22	22° 38' 55.261" N	87° 54' 13.587" E
	23	22° 38' 55.123" N	87° 54' 13.632" E
	24	22° 38' 54.922" N	87° 54' 13.801" E
	25	22° 38' 54.596" N	87° 54' 13.924" E
	26	22° 38' 53.951" N	87° 54' 13.944" E
	27	22° 38' 53.459" N	87° 54' 14.075" E
	28	22° 38' 53.245" N	87° 54' 14.118" E
	29	22° 38' 52.993" N	87° 54' 14.149" E
	30	22° 38' 52.842" N	87° 54' 14.203" E
	31	22° 38' 52.672" N	87° 54' 14.235" E
	32	22° 38' 52.503" N	87° 54' 14.244" E
	33	22° 38' 52.403" N	87° 54' 14.276" E
	34	22° 38' 52.018" N	87° 54' 14.273" E
	35	22° 38' 51.880" N	87° 54' 14.218" E
	36	22° 38' 51.772" N	87° 54' 14.142" E
	37	22° 38' 51.723" N	87° 54' 13.979" E
HG_KH2_MU_12C	1	22° 38' 44.422" N	87° 54' 30.867" E
	2	22° 38' 43.517" N	87° 54' 32.868" E
	3	22° 38' 42.955" N	87° 54' 33.710" E
	4	22° 38' 42.664" N	87° 54' 33.845" E
	5	22° 38' 42.450" N	87° 54' 33.925" E
	6	22° 38' 42.099" N	87° 54' 34.187" E
	7	22° 38' 41.502" N	87° 54' 34.662" E
	8	22° 38' 41.006" N	87° 54' 33.936" E
	9	22° 38' 41.179" N	87° 54' 33.593" E
	10	22° 38' 41.295" N	87° 54' 33.299" E

SANDBAR CODE	POINT_NO	LATITUDE	LONGITUDE
	11	22° 38' 41.632" N	87° 54' 32.607" E
	12	22° 38' 41.983" N	87° 54' 32.170" E
	13	22° 38' 42.342" N	87° 54' 31.464" E
	14	22° 38' 42.487" N	87° 54' 31.149" E
	15	22° 38' 42.685" N	87° 54' 30.812" E
	16	22° 38' 42.884" N	87° 54' 30.550" E
	17	22° 38' 43.254" N	87° 54' 30.043" E
	18	22° 38' 43.434" N	87° 54' 29.437" E
	19	22° 38' 43.583" N	87° 54' 28.670" E
	20	22° 38' 43.657" N	87° 54' 28.138" E
	21	22° 38' 43.665" N	87° 54' 27.189" E
	22	22° 38' 43.756" N	87° 54' 26.445" E
	23	22° 38' 43.829" N	87° 54' 26.196" E
	24	22° 38' 44.013" N	87° 54' 26.200" E
	25	22° 38' 44.234" N	87° 54' 26.564" E
	26	22° 38' 44.257" N	87° 54' 26.859" E
	27	22° 38' 44.271" N	87° 54' 27.556" E
	28	22° 38' 44.293" N	87° 54' 27.702" E
	29	22° 38' 44.392" N	87° 54' 28.074" E
	30	22° 38' 44.399" N	87° 54' 28.751" E
	31	22° 38' 44.621" N	87° 54' 29.393" E
HG_KH2_MU_13B	1	22° 39' 18.555" N	87° 53' 6.068" E
	2	22° 39' 18.628" N	87° 53' 5.915" E
	3	22° 39' 18.804" N	87° 53' 5.786" E
	4	22° 39' 18.908" N	87° 53' 5.595" E
	5	22° 39' 18.953" N	87° 53' 5.358" E
	6	22° 39' 19.058" N	87° 53' 5.098" E
	7	22° 39' 19.360" N	87° 53' 4.850" E
	8	22° 39' 19.744" N	87° 53' 4.660" E
	9	22° 39' 20.313" N	87° 53' 4.603" E
	10	22° 39' 20.736" N	87° 53' 4.613" E
	11	22° 39' 21.355" N	87° 53' 4.551" E
	12	22° 39' 21.977" N	87° 53' 4.490" E
	13	22° 39' 22.601" N	87° 53' 4.245" E
	14	22° 39' 22.985" N	87° 53' 4.113" E
	15	22° 39' 23.377" N	87° 53' 4.053" E
	16	22° 39' 24.423" N	87° 53' 3.997" E
	17	22° 39' 24.917" N	87° 53' 4.169" E
	18	22° 39' 25.948" N	87° 53' 4.551" E

SANDBAR CODE	POINT_NO	LATITUDE	LONGITUDE
	19	22° 39' 26.510" N	87° 53' 4.787" E
	20	22° 39' 26.730" N	87° 53' 4.912" E
	21	22° 39' 26.929" N	87° 53' 5.061" E
	22	22° 39' 27.608" N	87° 53' 5.406" E
	23	22° 39' 27.746" N	87° 53' 5.502" E
	24	22° 39' 27.607" N	87° 53' 5.760" E
	25	22° 39' 27.385" N	87° 53' 5.854" E
	26	22° 39' 27.021" N	87° 53' 5.956" E
	27	22° 39' 26.332" N	87° 53' 5.992" E
	28	22° 39' 25.836" N	87° 53' 5.859" E
	29	22° 39' 25.215" N	87° 53' 5.597" E
	30	22° 39' 24.672" N	87° 53' 5.378" E
	31	22° 39' 24.533" N	87° 53' 5.329" E
	32	22° 39' 23.602" N	87° 53' 5.374" E
	33	22° 39' 23.095" N	87° 53' 5.559" E
	34	22° 39' 22.801" N	87° 53' 5.708" E
	35	22° 39' 22.260" N	87° 53' 5.834" E
	36	22° 39' 21.680" N	87° 53' 5.870" E
	37	22° 39' 21.320" N	87° 53' 5.946" E
	38	22° 39' 20.441" N	87° 53' 6.018" E
	39	22° 39' 19.930" N	87° 53' 6.135" E
	40	22° 39' 19.572" N	87° 53' 6.293" E
	41	22° 39' 19.567" N	87° 53' 6.294" E
	42	22° 39' 18.715" N	87° 53' 6.412" E
	43	22° 39' 18.540" N	87° 53' 6.317" E
HG_KH2_MU_13C	1	22° 39' 9.453" N	87° 53' 2.976" E
	2	22° 39' 9.233" N	87° 53' 3.238" E
	3	22° 39' 8.833" N	87° 53' 3.414" E
	4	22° 39' 8.286" N	87° 53' 3.442" E
	5	22° 39' 8.027" N	87° 53' 3.280" E
	6	22° 39' 7.327" N	87° 53' 2.618" E
	7	22° 39' 6.321" N	87° 53' 1.892" E
	8	22° 39' 6.278" N	87° 53' 1.336" E
	9	22° 39' 6.332" N	87° 53' 1.152" E
	10	22° 39' 6.627" N	87° 53' 1.258" E
HG_KH2_MU_13D	1	22° 39' 2.894" N	87° 53' 0.850" E
	2	22° 39' 2.929" N	87° 53' 0.661" E
	3	22° 39' 3.579" N	87° 53' 0.622" E
	4	22° 39' 3.811" N	87° 53' 0.660" E

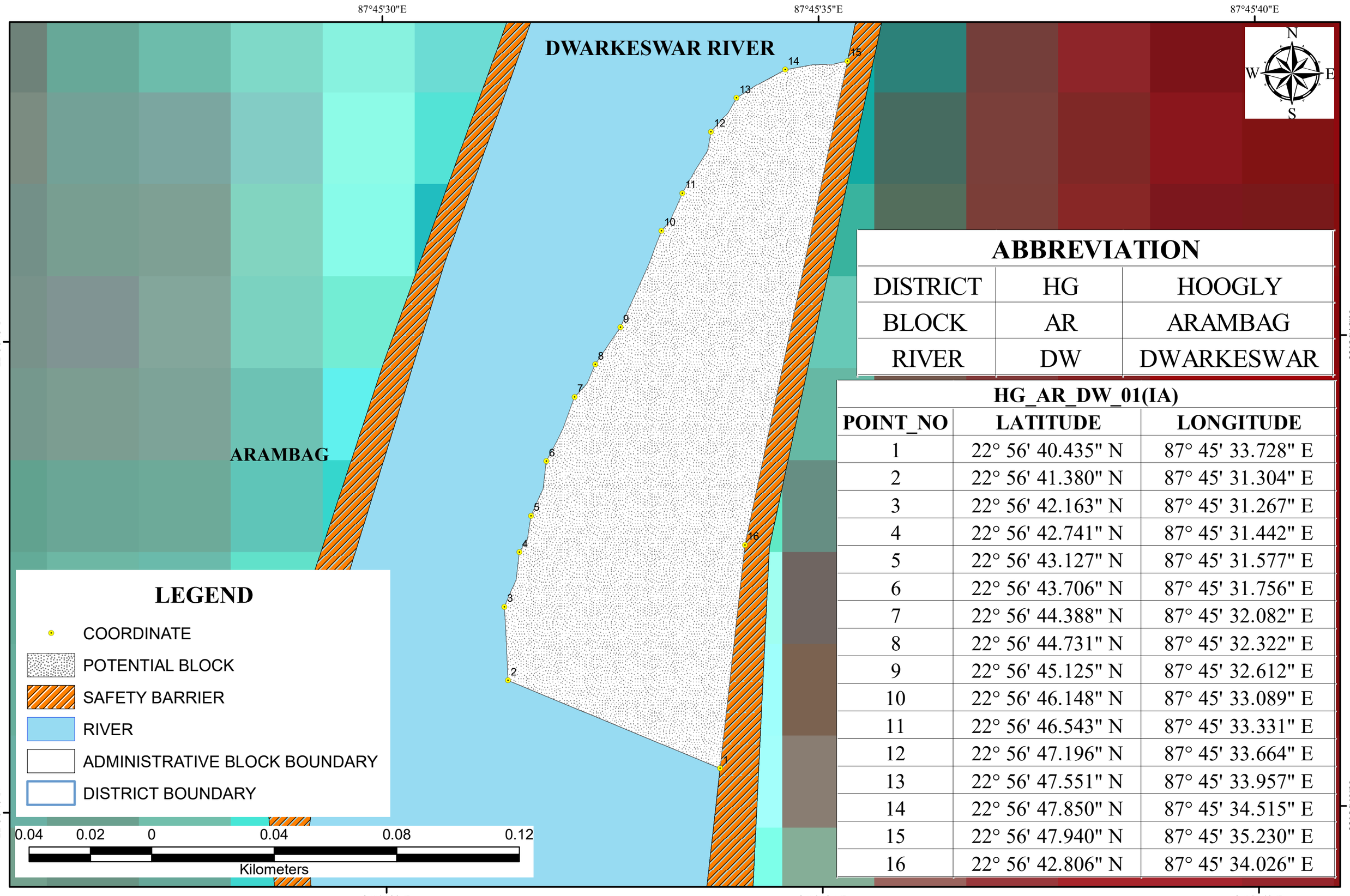
SANDBAR CODE	POINT_NO	LATITUDE	LONGITUDE
	5	22° 39' 4.154" N	87° 53' 0.766" E
	6	22° 39' 4.443" N	87° 53' 0.823" E
	7	22° 39' 4.734" N	87° 53' 0.901" E
	8	22° 39' 4.918" N	87° 53' 0.986" E
	9	22° 39' 5.345" N	87° 53' 1.391" E
	10	22° 39' 5.632" N	87° 53' 1.552" E
	11	22° 39' 5.884" N	87° 53' 1.657" E
	12	22° 39' 6.101" N	87° 53' 1.843" E
	13	22° 39' 6.161" N	87° 53' 2.059" E
	14	22° 39' 6.261" N	87° 53' 2.234" E
	15	22° 39' 6.241" N	87° 53' 2.295" E
	16	22° 39' 6.142" N	87° 53' 2.319" E
	17	22° 39' 5.768" N	87° 53' 2.413" E
	18	22° 39' 4.837" N	87° 53' 2.215" E
	19	22° 39' 4.379" N	87° 53' 2.080" E
	20	22° 39' 4.074" N	87° 53' 1.921" E
	21	22° 39' 3.736" N	87° 53' 1.728" E
	22	22° 39' 3.454" N	87° 53' 1.517" E
	23	22° 39' 3.278" N	87° 53' 1.285" E
HG_KH2_MU_13E	1	22° 38' 48.989" N	87° 52' 40.925" E
	2	22° 38' 49.065" N	87° 52' 40.688" E
	3	22° 38' 49.323" N	87° 52' 40.482" E
	4	22° 38' 50.000" N	87° 52' 40.114" E
	5	22° 38' 50.660" N	87° 52' 39.737" E
	6	22° 38' 51.194" N	87° 52' 39.342" E
	7	22° 38' 52.107" N	87° 52' 38.857" E
	8	22° 38' 52.353" N	87° 52' 38.788" E
	9	22° 38' 52.875" N	87° 52' 38.754" E
	10	22° 38' 53.868" N	87° 52' 38.832" E
	11	22° 38' 54.945" N	87° 52' 39.151" E
	12	22° 38' 55.627" N	87° 52' 39.379" E
	13	22° 38' 56.120" N	87° 52' 39.740" E
	14	22° 38' 56.240" N	87° 52' 39.894" E
	15	22° 38' 53.627" N	87° 52' 40.590" E
	16	22° 38' 51.558" N	87° 52' 40.877" E
	17	22° 38' 48.963" N	87° 52' 41.224" E
HG_KH2_MU_13G	1	22° 37' 29.192" N	87° 52' 29.129" E
	2	22° 37' 31.647" N	87° 52' 30.297" E
	3	22° 37' 35.224" N	87° 52' 33.360" E

SANDBAR CODE	POINT_NO	LATITUDE	LONGITUDE
	4	22° 37' 38.267" N	87° 52' 36.608" E
	5	22° 37' 41.957" N	87° 52' 40.059" E
	6	22° 37' 40.712" N	87° 52' 39.589" E
	7	22° 37' 40.125" N	87° 52' 39.529" E
	8	22° 37' 39.752" N	87° 52' 39.249" E
	9	22° 37' 39.494" N	87° 52' 38.837" E
	10	22° 37' 39.136" N	87° 52' 38.517" E
	11	22° 37' 38.740" N	87° 52' 38.100" E
	12	22° 37' 38.649" N	87° 52' 37.925" E
	13	22° 37' 37.849" N	87° 52' 37.093" E
	14	22° 37' 37.185" N	87° 52' 36.588" E
	15	22° 37' 36.342" N	87° 52' 35.428" E
	16	22° 37' 35.693" N	87° 52' 34.844" E
	17	22° 37' 35.162" N	87° 52' 34.137" E
	18	22° 37' 34.945" N	87° 52' 33.975" E
	19	22° 37' 34.186" N	87° 52' 33.482" E
	20	22° 37' 33.519" N	87° 52' 33.039" E
	21	22° 37' 32.389" N	87° 52' 32.569" E
	22	22° 37' 31.765" N	87° 52' 32.131" E
	23	22° 37' 31.377" N	87° 52' 31.959" E
	24	22° 37' 30.952" N	87° 52' 31.691" E
	25	22° 37' 30.676" N	87° 52' 31.063" E
	26	22° 37' 29.887" N	87° 52' 30.516" E
	27	22° 37' 29.358" N	87° 52' 29.764" E
HG_KH2_MU_14	1	22° 38' 22.529" N	87° 52' 30.050" E
	2	22° 38' 18.246" N	87° 52' 28.253" E
	3	22° 38' 18.450" N	87° 52' 27.443" E
	4	22° 38' 18.485" N	87° 52' 27.155" E
	5	22° 38' 18.497" N	87° 52' 26.868" E
	6	22° 38' 18.532" N	87° 52' 26.305" E
	7	22° 38' 18.793" N	87° 52' 26.268" E
	8	22° 38' 19.665" N	87° 52' 26.510" E
	9	22° 38' 19.940" N	87° 52' 26.641" E
	10	22° 38' 20.249" N	87° 52' 27.163" E
	11	22° 38' 20.748" N	87° 52' 27.099" E
	12	22° 38' 21.628" N	87° 52' 27.264" E
	13	22° 38' 22.014" N	87° 52' 27.424" E
	14	22° 38' 22.904" N	87° 52' 28.050" E
	15	22° 38' 23.226" N	87° 52' 28.661" E

SANDBAR CODE	POINT_NO	LATITUDE	LONGITUDE
	16	22° 38' 23.679" N	87° 52' 29.157" E
	17	22° 38' 24.239" N	87° 52' 29.589" E
	18	22° 38' 24.763" N	87° 52' 29.971" E
	19	22° 38' 25.544" N	87° 52' 30.460" E
	20	22° 38' 25.848" N	87° 52' 30.642" E
	21	22° 38' 26.242" N	87° 52' 30.917" E
	22	22° 38' 26.619" N	87° 52' 31.608" E

Annexure 4
Map showing of Potential Blocks of Hooghly District

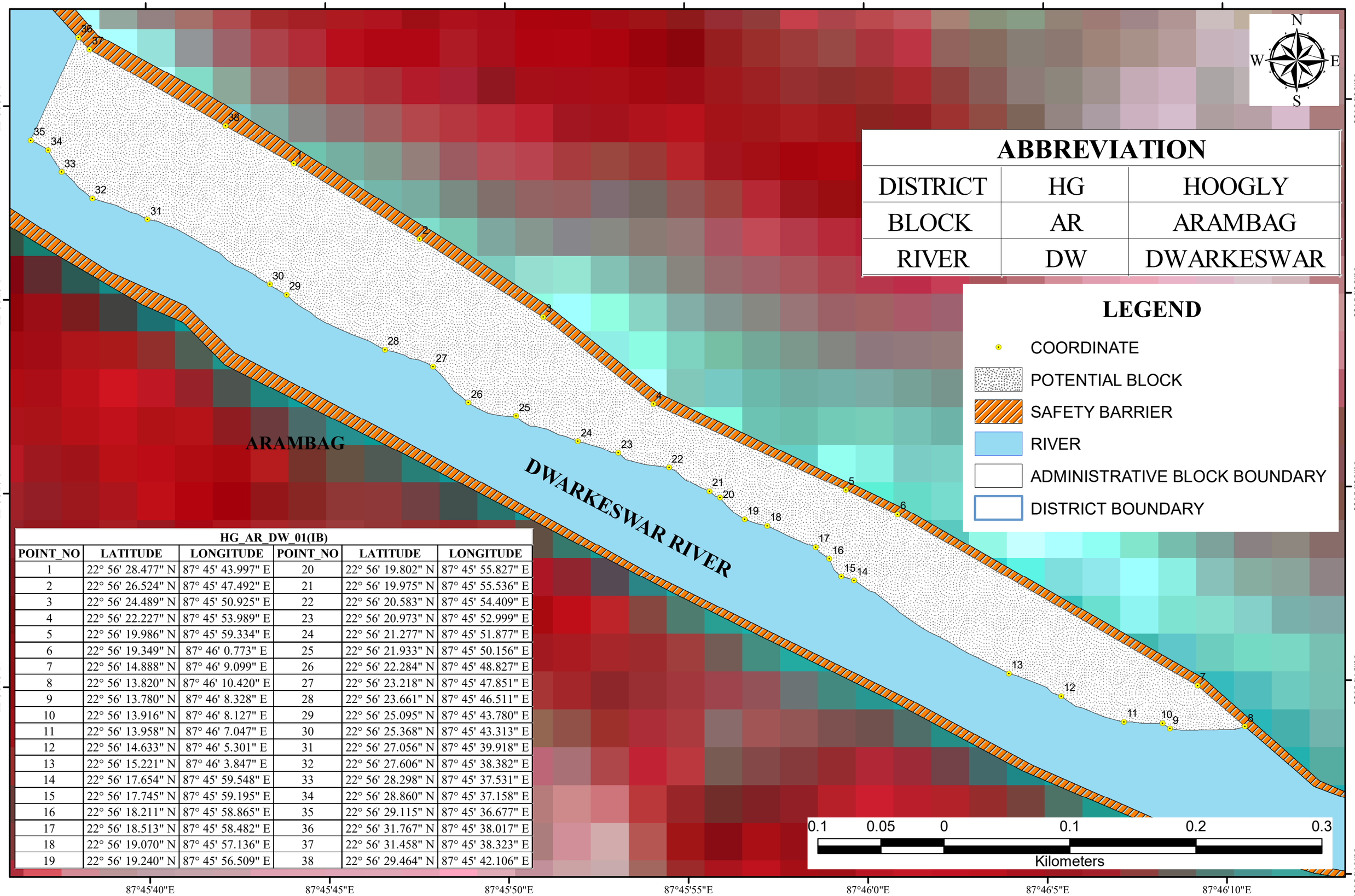
POTENTIAL BLOCK HG_AR_DW_01(IA) OF DWARKESWAR RIVER



ABBREVIATION		
DISTRICT	HG	HOOGLY
BLOCK	AR	ARAMBAG
RIVER	DW	DWARKESWAR

HG_AR_DW_01(IA)		
POINT_NO	LATITUDE	LONGITUDE
1	22° 56' 40.435" N	87° 45' 33.728" E
2	22° 56' 41.380" N	87° 45' 31.304" E
3	22° 56' 42.163" N	87° 45' 31.267" E
4	22° 56' 42.741" N	87° 45' 31.442" E
5	22° 56' 43.127" N	87° 45' 31.577" E
6	22° 56' 43.706" N	87° 45' 31.756" E
7	22° 56' 44.388" N	87° 45' 32.082" E
8	22° 56' 44.731" N	87° 45' 32.322" E
9	22° 56' 45.125" N	87° 45' 32.612" E
10	22° 56' 46.148" N	87° 45' 33.089" E
11	22° 56' 46.543" N	87° 45' 33.331" E
12	22° 56' 47.196" N	87° 45' 33.664" E
13	22° 56' 47.551" N	87° 45' 33.957" E
14	22° 56' 47.850" N	87° 45' 34.515" E
15	22° 56' 47.940" N	87° 45' 35.230" E
16	22° 56' 42.806" N	87° 45' 34.026" E

POTENTIAL BLOCK HG_AR_DW_01(IB) OF DWARKESWAR RIVER



ABBREVIATION

DISTRICT	HG	HOOGLY
BLOCK	AR	ARAMBAG
RIVER	DW	DWARKESWAR

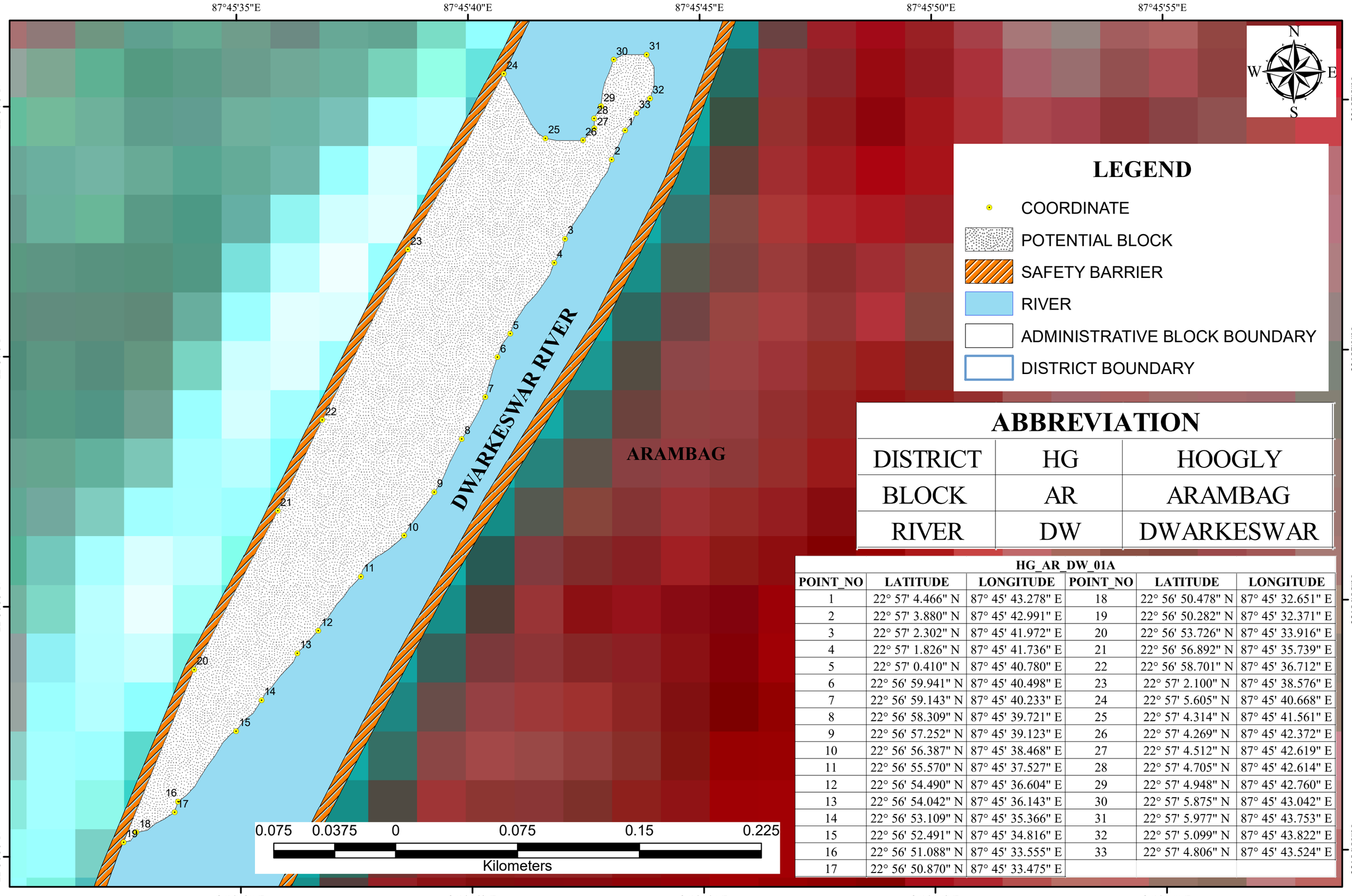
LEGEND

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

HG_AR_DW_01(IB)

POINT_NO	LATITUDE	LONGITUDE	POINT_NO	LATITUDE	LONGITUDE
1	22° 56' 28.477" N	87° 45' 43.997" E	20	22° 56' 19.802" N	87° 45' 55.827" E
2	22° 56' 26.524" N	87° 45' 47.492" E	21	22° 56' 19.975" N	87° 45' 55.536" E
3	22° 56' 24.489" N	87° 45' 50.925" E	22	22° 56' 20.583" N	87° 45' 54.409" E
4	22° 56' 22.227" N	87° 45' 53.989" E	23	22° 56' 20.973" N	87° 45' 52.999" E
5	22° 56' 19.986" N	87° 45' 59.334" E	24	22° 56' 21.277" N	87° 45' 51.877" E
6	22° 56' 19.349" N	87° 46' 0.773" E	25	22° 56' 21.933" N	87° 45' 50.156" E
7	22° 56' 14.888" N	87° 46' 9.099" E	26	22° 56' 22.284" N	87° 45' 48.827" E
8	22° 56' 13.820" N	87° 46' 10.420" E	27	22° 56' 23.218" N	87° 45' 47.851" E
9	22° 56' 13.780" N	87° 46' 8.328" E	28	22° 56' 23.661" N	87° 45' 46.511" E
10	22° 56' 13.916" N	87° 46' 8.127" E	29	22° 56' 25.095" N	87° 45' 43.780" E
11	22° 56' 13.958" N	87° 46' 7.047" E	30	22° 56' 25.368" N	87° 45' 43.313" E
12	22° 56' 14.633" N	87° 46' 5.301" E	31	22° 56' 27.056" N	87° 45' 39.918" E
13	22° 56' 15.221" N	87° 46' 3.847" E	32	22° 56' 27.606" N	87° 45' 38.382" E
14	22° 56' 17.654" N	87° 45' 59.548" E	33	22° 56' 28.298" N	87° 45' 37.531" E
15	22° 56' 17.745" N	87° 45' 59.195" E	34	22° 56' 28.860" N	87° 45' 37.158" E
16	22° 56' 18.211" N	87° 45' 58.865" E	35	22° 56' 29.115" N	87° 45' 36.677" E
17	22° 56' 18.513" N	87° 45' 58.482" E	36	22° 56' 31.767" N	87° 45' 38.017" E
18	22° 56' 19.070" N	87° 45' 57.136" E	37	22° 56' 31.458" N	87° 45' 38.323" E
19	22° 56' 19.240" N	87° 45' 56.509" E	38	22° 56' 29.464" N	87° 45' 42.106" E

POTENTIAL BLOCK HG_AR_DW_01A OF DWARKESWAR RIVER



LEGEND

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

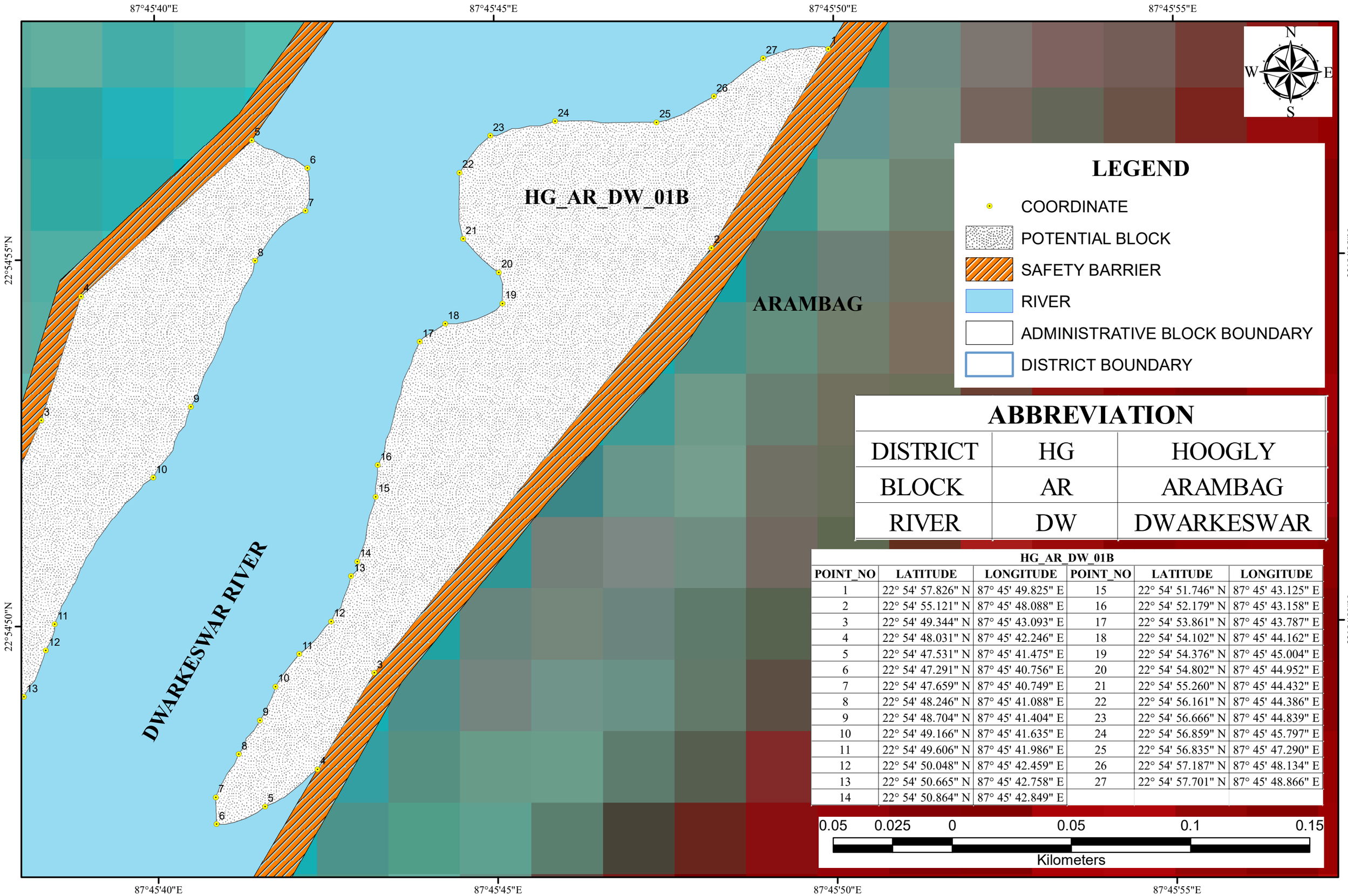
ABBREVIATION

DISTRICT	HG	HOOGLY
BLOCK	AR	ARAMBAG
RIVER	DW	DWARKESWAR

HG_AR_DW_01A

POINT_NO	LATITUDE	LONGITUDE	POINT_NO	LATITUDE	LONGITUDE
1	22° 57' 4.466" N	87° 45' 43.278" E	18	22° 56' 50.478" N	87° 45' 32.651" E
2	22° 57' 3.880" N	87° 45' 42.991" E	19	22° 56' 50.282" N	87° 45' 32.371" E
3	22° 57' 2.302" N	87° 45' 41.972" E	20	22° 56' 53.726" N	87° 45' 33.916" E
4	22° 57' 1.826" N	87° 45' 41.736" E	21	22° 56' 56.892" N	87° 45' 35.739" E
5	22° 57' 0.410" N	87° 45' 40.780" E	22	22° 56' 58.701" N	87° 45' 36.712" E
6	22° 56' 59.941" N	87° 45' 40.498" E	23	22° 57' 2.100" N	87° 45' 38.576" E
7	22° 56' 59.143" N	87° 45' 40.233" E	24	22° 57' 5.605" N	87° 45' 40.668" E
8	22° 56' 58.309" N	87° 45' 39.721" E	25	22° 57' 4.314" N	87° 45' 41.561" E
9	22° 56' 57.252" N	87° 45' 39.123" E	26	22° 57' 4.269" N	87° 45' 42.372" E
10	22° 56' 56.387" N	87° 45' 38.468" E	27	22° 57' 4.512" N	87° 45' 42.619" E
11	22° 56' 55.570" N	87° 45' 37.527" E	28	22° 57' 4.705" N	87° 45' 42.614" E
12	22° 56' 54.490" N	87° 45' 36.604" E	29	22° 57' 4.948" N	87° 45' 42.760" E
13	22° 56' 54.042" N	87° 45' 36.143" E	30	22° 57' 5.875" N	87° 45' 43.042" E
14	22° 56' 53.109" N	87° 45' 35.366" E	31	22° 57' 5.977" N	87° 45' 43.753" E
15	22° 56' 52.491" N	87° 45' 34.816" E	32	22° 57' 5.099" N	87° 45' 43.822" E
16	22° 56' 51.088" N	87° 45' 33.555" E	33	22° 57' 4.806" N	87° 45' 43.524" E
17	22° 56' 50.870" N	87° 45' 33.475" E			

POTENTIAL BLOCK HG_AR_DW_01B OF DWARKESWAR RIVER



LEGEND

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

ABBREVIATION

DISTRICT	HG	HOOGLY
BLOCK	AR	ARAMBAG
RIVER	DW	DWARKESWAR

HG_AR_DW_01B

POINT_NO	LATITUDE	LONGITUDE	POINT_NO	LATITUDE	LONGITUDE
1	22° 54' 57.826" N	87° 45' 49.825" E	15	22° 54' 51.746" N	87° 45' 43.125" E
2	22° 54' 55.121" N	87° 45' 48.088" E	16	22° 54' 52.179" N	87° 45' 43.158" E
3	22° 54' 49.344" N	87° 45' 43.093" E	17	22° 54' 53.861" N	87° 45' 43.787" E
4	22° 54' 48.031" N	87° 45' 42.246" E	18	22° 54' 54.102" N	87° 45' 44.162" E
5	22° 54' 47.531" N	87° 45' 41.475" E	19	22° 54' 54.376" N	87° 45' 45.004" E
6	22° 54' 47.291" N	87° 45' 40.756" E	20	22° 54' 54.802" N	87° 45' 44.952" E
7	22° 54' 47.659" N	87° 45' 40.749" E	21	22° 54' 55.260" N	87° 45' 44.432" E
8	22° 54' 48.246" N	87° 45' 41.088" E	22	22° 54' 56.161" N	87° 45' 44.386" E
9	22° 54' 48.704" N	87° 45' 41.404" E	23	22° 54' 56.666" N	87° 45' 44.839" E
10	22° 54' 49.166" N	87° 45' 41.635" E	24	22° 54' 56.859" N	87° 45' 45.797" E
11	22° 54' 49.606" N	87° 45' 41.986" E	25	22° 54' 56.835" N	87° 45' 47.290" E
12	22° 54' 50.048" N	87° 45' 42.459" E	26	22° 54' 57.187" N	87° 45' 48.134" E
13	22° 54' 50.665" N	87° 45' 42.758" E	27	22° 54' 57.701" N	87° 45' 48.866" E
14	22° 54' 50.864" N	87° 45' 42.849" E			

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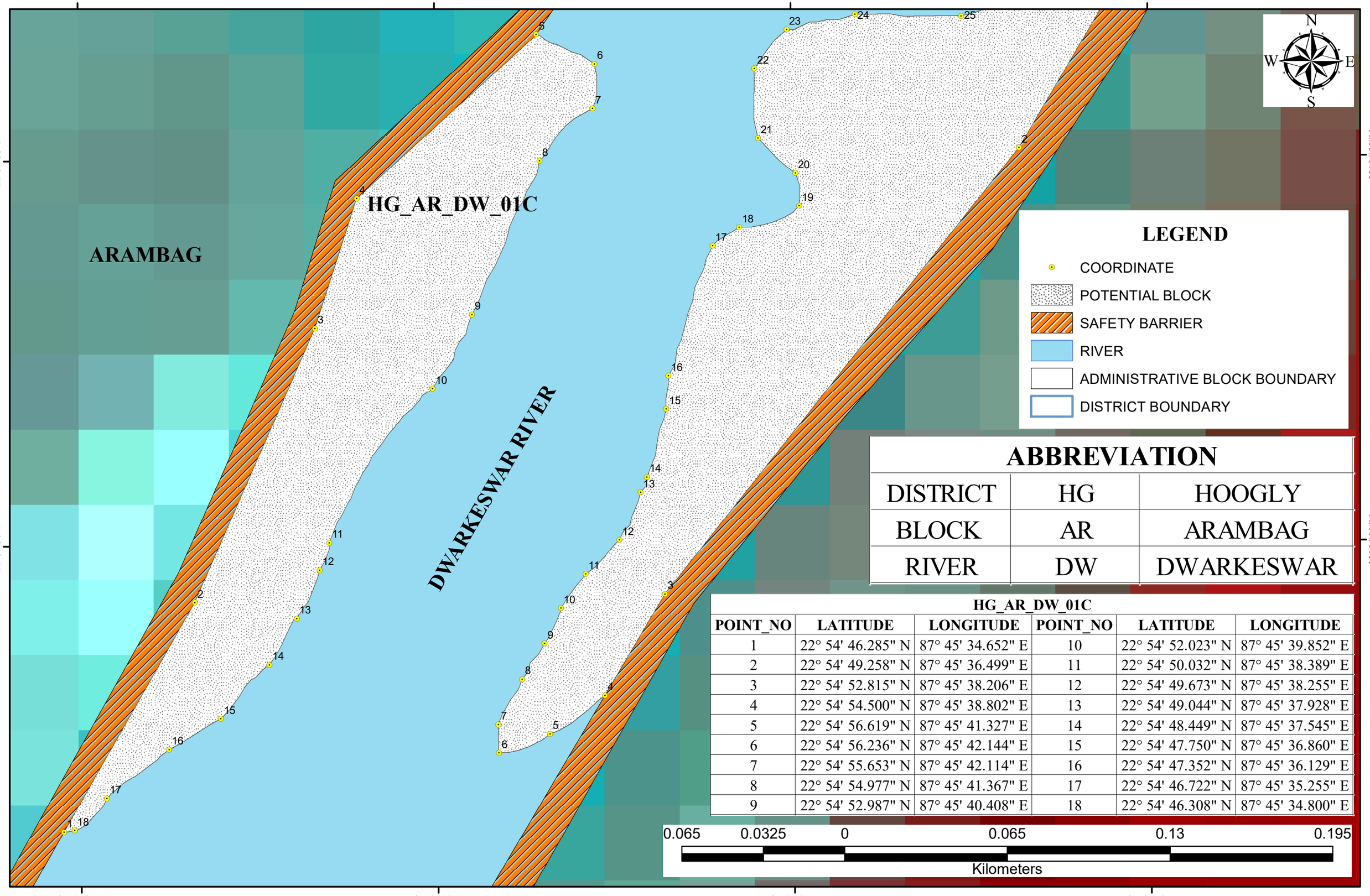
Kilometers

POTENTIAL BLOCK HG_AR_DW_01C OF DWARKESWAR RIVER



ABBREVIATION		
DISTRICT	HG	HOOGLY
BLOCK	AR	ARAMBAG
RIVER	DW	DWARKESWAR

HG_AR_DW_01C

POINT_NO	LATITUDE	LONGITUDE	POINT_NO	LATITUDE	LONGITUDE
1	22° 54' 46.285" N	87° 45' 34.652" E	10	22° 54' 52.023" N	87° 45' 39.852" E
2	22° 54' 49.258" N	87° 45' 36.499" E	11	22° 54' 50.032" N	87° 45' 38.389" E
3	22° 54' 52.815" N	87° 45' 38.206" E	12	22° 54' 49.673" N	87° 45' 38.255" E
4	22° 54' 54.500" N	87° 45' 38.802" E	13	22° 54' 49.044" N	87° 45' 37.928" E
5	22° 54' 56.619" N	87° 45' 41.327" E	14	22° 54' 48.449" N	87° 45' 37.545" E
6	22° 54' 56.236" N	87° 45' 42.144" E	15	22° 54' 47.750" N	87° 45' 36.860" E
7	22° 54' 55.653" N	87° 45' 42.114" E	16	22° 54' 47.352" N	87° 45' 36.129" E
8	22° 54' 54.977" N	87° 45' 41.367" E	17	22° 54' 46.722" N	87° 45' 35.255" E
9	22° 54' 52.987" N	87° 45' 40.408" E	18	22° 54' 46.308" N	87° 45' 34.800" E

POTENTIAL BLOCK HG_AR_DW_01D OF DWARKESWAR RIVER

HG_AR_DW_01D					
POINT_NO	LATITUDE	LONGITUDE	POINT_NO	LATITUDE	LONGITUDE
1	22° 49' 17.224" N	87° 46' 32.676" E	11	22° 49' 20.277" N	87° 46' 39.039" E
2	22° 49' 17.320" N	87° 46' 32.053" E	12	22° 49' 19.562" N	87° 46' 38.488" E
3	22° 49' 18.941" N	87° 46' 34.865" E	13	22° 49' 19.158" N	87° 46' 38.107" E
4	22° 49' 21.494" N	87° 46' 39.166" E	14	22° 49' 18.618" N	87° 46' 37.361" E
5	22° 49' 22.402" N	87° 46' 40.519" E	15	22° 49' 18.569" N	87° 46' 36.797" E
6	22° 49' 22.659" N	87° 46' 40.731" E	16	22° 49' 18.334" N	87° 46' 35.771" E
7	22° 49' 22.308" N	87° 46' 40.623" E	17	22° 49' 18.011" N	87° 46' 35.166" E
8	22° 49' 21.657" N	87° 46' 40.133" E	18	22° 49' 17.749" N	87° 46' 34.458" E
9	22° 49' 21.128" N	87° 46' 39.693" E	19	22° 49' 17.434" N	87° 46' 33.682" E
10	22° 49' 20.601" N	87° 46' 39.309" E	20	22° 49' 17.270" N	87° 46' 33.117" E

ABBREVIATION		
DISTRICT	HG	HOOGLY
BLOCK	AR	ARAMBAG
RIVER	DW	DWARKESWAR

LEGEND

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

ARAMBAG

DWARKESWAR RIVER

N
W
E
S

87°46'32"E 87°46'34"E 87°46'36"E 87°46'38"E 87°46'40"E

22°49'22"N 22°49'20"N 22°49'18"N

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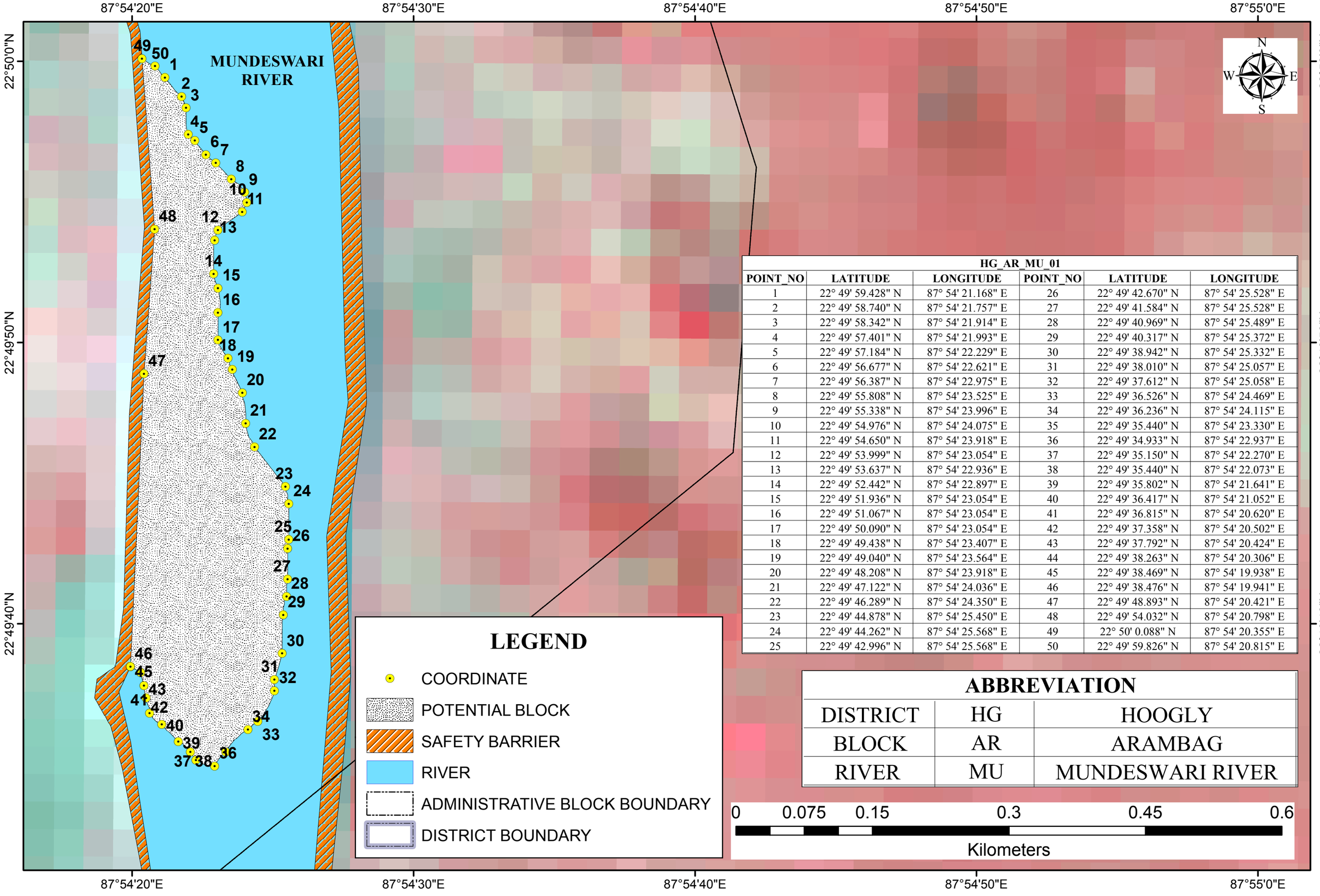
Kilometers

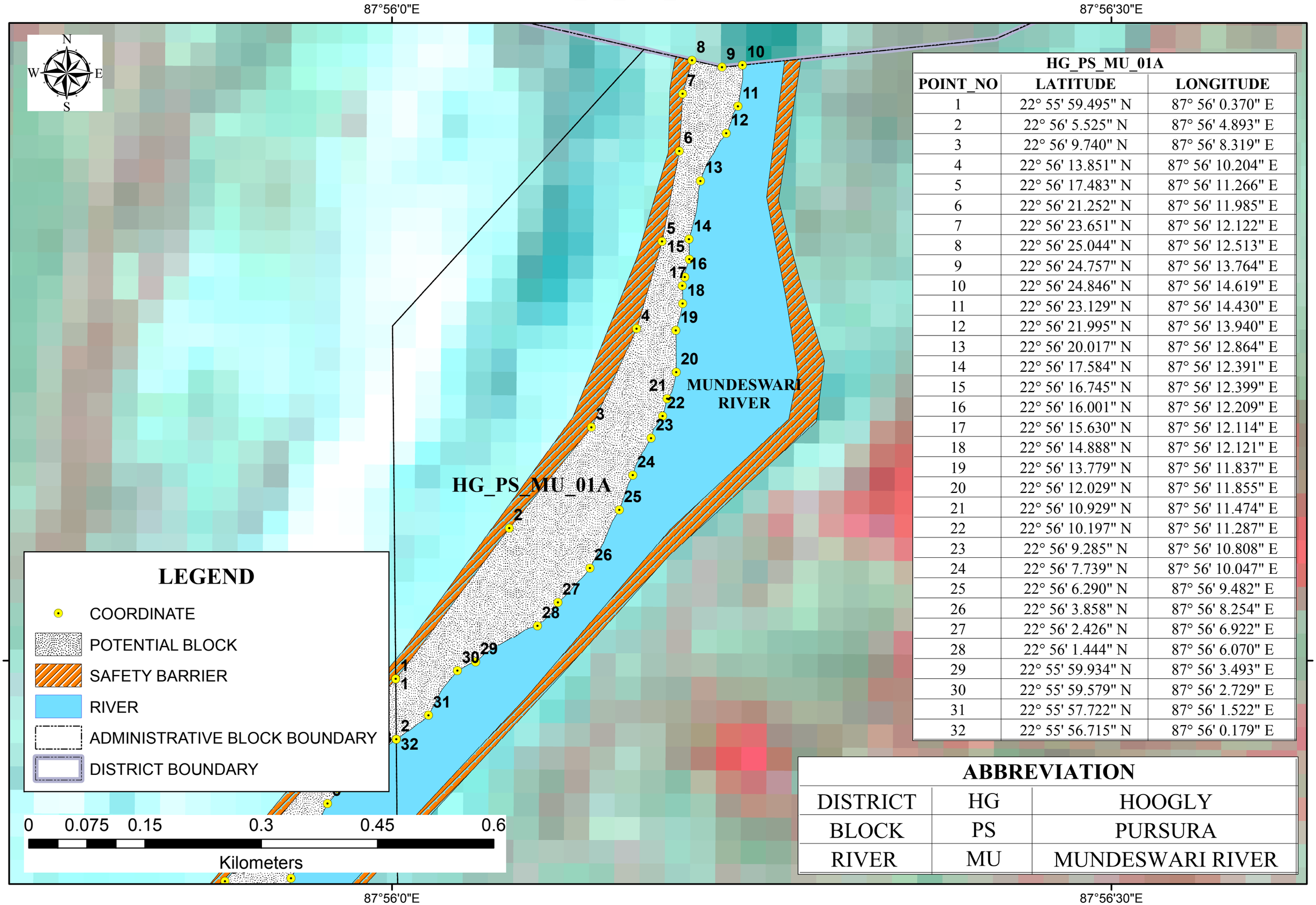
POTENTIAL BLOCK HG_AR_MU_01 OF MUNDESWARI RIVER



HG_AR_MU_01					
POINT_NO	LATITUDE	LONGITUDE	POINT_NO	LATITUDE	LONGITUDE
1	22° 49' 59.428" N	87° 54' 21.168" E	26	22° 49' 42.670" N	87° 54' 25.528" E
2	22° 49' 58.740" N	87° 54' 21.757" E	27	22° 49' 41.584" N	87° 54' 25.528" E
3	22° 49' 58.342" N	87° 54' 21.914" E	28	22° 49' 40.969" N	87° 54' 25.489" E
4	22° 49' 57.401" N	87° 54' 21.993" E	29	22° 49' 40.317" N	87° 54' 25.372" E
5	22° 49' 57.184" N	87° 54' 22.229" E	30	22° 49' 38.942" N	87° 54' 25.332" E
6	22° 49' 56.677" N	87° 54' 22.621" E	31	22° 49' 38.010" N	87° 54' 25.057" E
7	22° 49' 56.387" N	87° 54' 22.975" E	32	22° 49' 37.612" N	87° 54' 25.058" E
8	22° 49' 55.808" N	87° 54' 23.525" E	33	22° 49' 36.526" N	87° 54' 24.469" E
9	22° 49' 55.338" N	87° 54' 23.996" E	34	22° 49' 36.236" N	87° 54' 24.115" E
10	22° 49' 54.976" N	87° 54' 24.075" E	35	22° 49' 35.440" N	87° 54' 23.330" E
11	22° 49' 54.650" N	87° 54' 23.918" E	36	22° 49' 34.933" N	87° 54' 22.937" E
12	22° 49' 53.999" N	87° 54' 23.054" E	37	22° 49' 35.150" N	87° 54' 22.270" E
13	22° 49' 53.637" N	87° 54' 22.936" E	38	22° 49' 35.440" N	87° 54' 22.073" E
14	22° 49' 52.442" N	87° 54' 22.897" E	39	22° 49' 35.802" N	87° 54' 21.641" E
15	22° 49' 51.936" N	87° 54' 23.054" E	40	22° 49' 36.417" N	87° 54' 21.052" E
16	22° 49' 51.067" N	87° 54' 23.054" E	41	22° 49' 36.815" N	87° 54' 20.620" E
17	22° 49' 50.090" N	87° 54' 23.054" E	42	22° 49' 37.358" N	87° 54' 20.502" E
18	22° 49' 49.438" N	87° 54' 23.407" E	43	22° 49' 37.792" N	87° 54' 20.424" E
19	22° 49' 49.040" N	87° 54' 23.564" E	44	22° 49' 38.263" N	87° 54' 20.306" E
20	22° 49' 48.208" N	87° 54' 23.918" E	45	22° 49' 38.469" N	87° 54' 19.938" E
21	22° 49' 47.122" N	87° 54' 24.036" E	46	22° 49' 38.476" N	87° 54' 19.941" E
22	22° 49' 46.289" N	87° 54' 24.350" E	47	22° 49' 48.893" N	87° 54' 20.421" E
23	22° 49' 44.878" N	87° 54' 25.450" E	48	22° 49' 54.032" N	87° 54' 20.798" E
24	22° 49' 44.262" N	87° 54' 25.568" E	49	22° 50' 0.088" N	87° 54' 20.355" E
25	22° 49' 42.996" N	87° 54' 25.568" E	50	22° 49' 59.826" N	87° 54' 20.815" E

ABBREVIATION		
DISTRICT	HG	HOOGLY
BLOCK	AR	ARAMBAG
RIVER	MU	MUNDESWARI RIVER

POTENTIAL BLOCK HG_PS_MU_01A OF MUNDESWARI RIVER

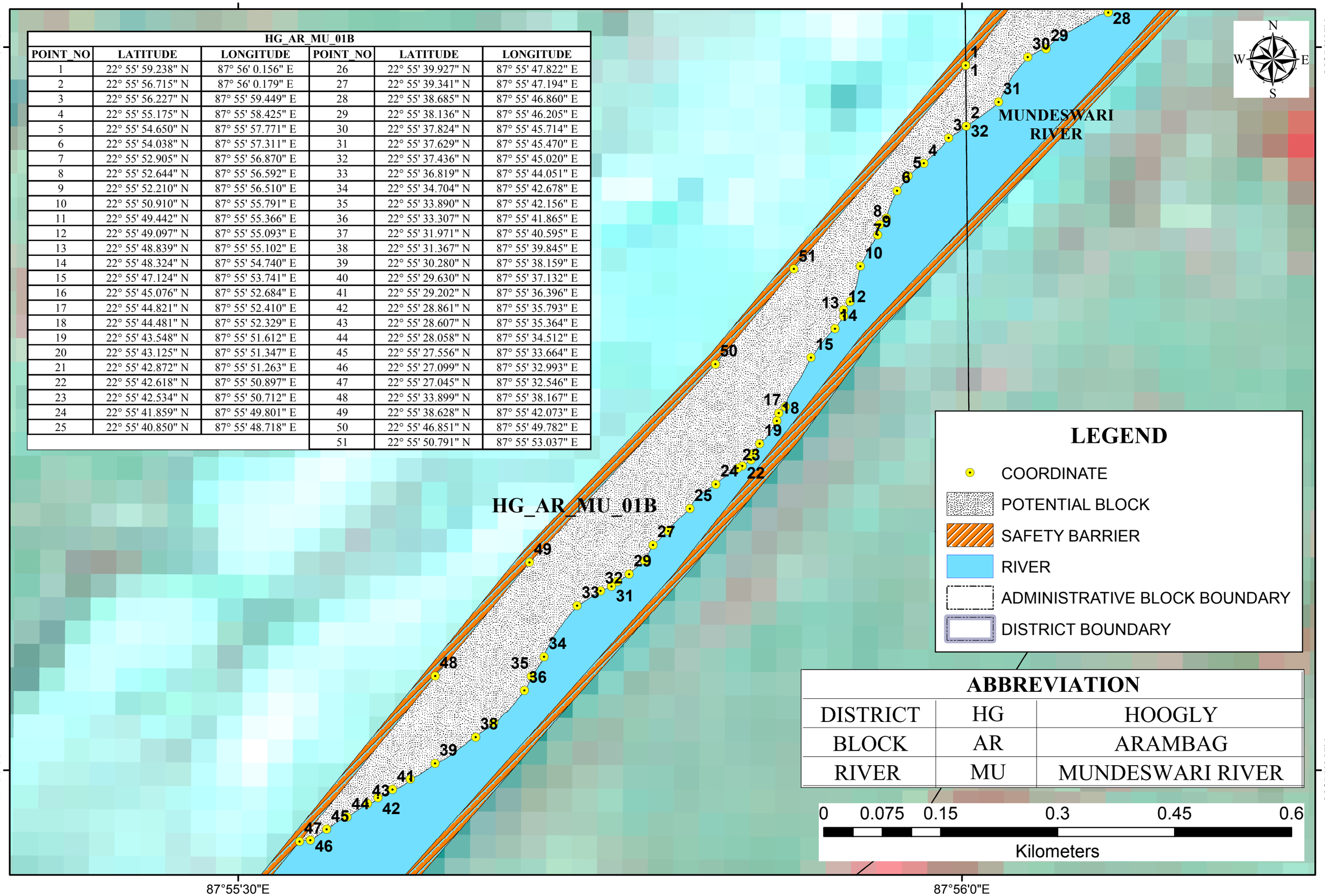


HG_PS_MU_01A		
POINT_NO	LATITUDE	LONGITUDE
1	22° 55' 59.495" N	87° 56' 0.370" E
2	22° 56' 5.525" N	87° 56' 4.893" E
3	22° 56' 9.740" N	87° 56' 8.319" E
4	22° 56' 13.851" N	87° 56' 10.204" E
5	22° 56' 17.483" N	87° 56' 11.266" E
6	22° 56' 21.252" N	87° 56' 11.985" E
7	22° 56' 23.651" N	87° 56' 12.122" E
8	22° 56' 25.044" N	87° 56' 12.513" E
9	22° 56' 24.757" N	87° 56' 13.764" E
10	22° 56' 24.846" N	87° 56' 14.619" E
11	22° 56' 23.129" N	87° 56' 14.430" E
12	22° 56' 21.995" N	87° 56' 13.940" E
13	22° 56' 20.017" N	87° 56' 12.864" E
14	22° 56' 17.584" N	87° 56' 12.391" E
15	22° 56' 16.745" N	87° 56' 12.399" E
16	22° 56' 16.001" N	87° 56' 12.209" E
17	22° 56' 15.630" N	87° 56' 12.114" E
18	22° 56' 14.888" N	87° 56' 12.121" E
19	22° 56' 13.779" N	87° 56' 11.837" E
20	22° 56' 12.029" N	87° 56' 11.855" E
21	22° 56' 10.929" N	87° 56' 11.474" E
22	22° 56' 10.197" N	87° 56' 11.287" E
23	22° 56' 9.285" N	87° 56' 10.808" E
24	22° 56' 7.739" N	87° 56' 10.047" E
25	22° 56' 6.290" N	87° 56' 9.482" E
26	22° 56' 3.858" N	87° 56' 8.254" E
27	22° 56' 2.426" N	87° 56' 6.922" E
28	22° 56' 1.444" N	87° 56' 6.070" E
29	22° 55' 59.934" N	87° 56' 3.493" E
30	22° 55' 59.579" N	87° 56' 2.729" E
31	22° 55' 57.722" N	87° 56' 1.522" E
32	22° 55' 56.715" N	87° 56' 0.179" E

ABBREVIATION		
DISTRICT	HG	HOOGLY
BLOCK	PS	PURSURA
RIVER	MU	MUNDESWARI RIVER

POTENTIAL BLOCK HG_AR_MU_01B OF MUNDESWARI RIVER

HG_AR_MU_01B					
POINT_NO	LATITUDE	LONGITUDE	POINT_NO	LATITUDE	LONGITUDE
1	22° 55' 59.238" N	87° 56' 0.156" E	26	22° 55' 39.927" N	87° 55' 47.822" E
2	22° 55' 56.715" N	87° 56' 0.179" E	27	22° 55' 39.341" N	87° 55' 47.194" E
3	22° 55' 56.227" N	87° 55' 59.449" E	28	22° 55' 38.685" N	87° 55' 46.860" E
4	22° 55' 55.175" N	87° 55' 58.425" E	29	22° 55' 38.136" N	87° 55' 46.205" E
5	22° 55' 54.650" N	87° 55' 57.771" E	30	22° 55' 37.824" N	87° 55' 45.714" E
6	22° 55' 54.038" N	87° 55' 57.311" E	31	22° 55' 37.629" N	87° 55' 45.470" E
7	22° 55' 52.905" N	87° 55' 56.870" E	32	22° 55' 37.436" N	87° 55' 45.020" E
8	22° 55' 52.644" N	87° 55' 56.592" E	33	22° 55' 36.819" N	87° 55' 44.051" E
9	22° 55' 52.210" N	87° 55' 56.510" E	34	22° 55' 34.704" N	87° 55' 42.678" E
10	22° 55' 50.910" N	87° 55' 55.791" E	35	22° 55' 33.890" N	87° 55' 42.156" E
11	22° 55' 49.442" N	87° 55' 55.366" E	36	22° 55' 33.307" N	87° 55' 41.865" E
12	22° 55' 49.097" N	87° 55' 55.093" E	37	22° 55' 31.971" N	87° 55' 40.595" E
13	22° 55' 48.839" N	87° 55' 55.102" E	38	22° 55' 31.367" N	87° 55' 39.845" E
14	22° 55' 48.324" N	87° 55' 54.740" E	39	22° 55' 30.280" N	87° 55' 38.159" E
15	22° 55' 47.124" N	87° 55' 53.741" E	40	22° 55' 29.630" N	87° 55' 37.132" E
16	22° 55' 45.076" N	87° 55' 52.684" E	41	22° 55' 29.202" N	87° 55' 36.396" E
17	22° 55' 44.821" N	87° 55' 52.410" E	42	22° 55' 28.861" N	87° 55' 35.793" E
18	22° 55' 44.481" N	87° 55' 52.329" E	43	22° 55' 28.607" N	87° 55' 35.364" E
19	22° 55' 43.548" N	87° 55' 51.612" E	44	22° 55' 28.058" N	87° 55' 34.512" E
20	22° 55' 43.125" N	87° 55' 51.347" E	45	22° 55' 27.556" N	87° 55' 33.664" E
21	22° 55' 42.872" N	87° 55' 51.263" E	46	22° 55' 27.099" N	87° 55' 32.993" E
22	22° 55' 42.618" N	87° 55' 50.897" E	47	22° 55' 27.045" N	87° 55' 32.546" E
23	22° 55' 42.534" N	87° 55' 50.712" E	48	22° 55' 33.899" N	87° 55' 38.167" E
24	22° 55' 41.859" N	87° 55' 49.801" E	49	22° 55' 38.628" N	87° 55' 42.073" E
25	22° 55' 40.850" N	87° 55' 48.718" E	50	22° 55' 46.851" N	87° 55' 49.782" E
			51	22° 55' 50.791" N	87° 55' 53.037" E



POTENTIAL BLOCK HG_AR_MU_01C OF MUNDESWARI RIVER

HG_AR_MU_01C					
POINT_NO	LATITUDE	LONGITUDE	POINT_NO	LATITUDE	LONGITUDE
1	22° 53' 26.082" N	87° 54' 29.928" E	24	22° 53' 37.769" N	87° 54' 37.990" E
2	22° 53' 26.916" N	87° 54' 30.046" E	25	22° 53' 38.382" N	87° 54' 38.147" E
3	22° 53' 27.709" N	87° 54' 30.046" E	26	22° 53' 39.392" N	87° 54' 38.303" E
4	22° 53' 28.214" N	87° 54' 29.889" E	27	22° 53' 39.644" N	87° 54' 38.421" E
5	22° 53' 28.683" N	87° 54' 29.967" E	28	22° 53' 40.257" N	87° 54' 38.617" E
6	22° 53' 28.935" N	87° 54' 30.124" E	29	22° 53' 40.545" N	87° 54' 38.773" E
7	22° 53' 29.512" N	87° 54' 30.359" E	30	22° 53' 41.158" N	87° 54' 39.047" E
8	22° 53' 30.197" N	87° 54' 30.907" E	31	22° 53' 41.843" N	87° 54' 39.164" E
9	22° 53' 30.413" N	87° 54' 31.141" E	32	22° 53' 42.276" N	87° 54' 39.282" E
10	22° 53' 30.702" N	87° 54' 31.572" E	33	22° 53' 42.997" N	87° 54' 39.360" E
11	22° 53' 31.567" N	87° 54' 32.433" E	34	22° 53' 43.430" N	87° 54' 39.438" E
12	22° 53' 31.892" N	87° 54' 32.746" E	35	22° 53' 44.043" N	87° 54' 39.634" E
13	22° 53' 32.324" N	87° 54' 33.450" E	36	22° 53' 44.512" N	87° 54' 39.986" E
14	22° 53' 32.433" N	87° 54' 34.038" E	37	22° 53' 45.269" N	87° 54' 40.691" E
15	22° 53' 33.298" N	87° 54' 34.742" E	38	22° 53' 45.665" N	87° 54' 40.965" E
16	22° 53' 33.731" N	87° 54' 35.055" E	39	22° 53' 46.235" N	87° 54' 41.583" E
17	22° 53' 34.308" N	87° 54' 35.525" E	40	22° 53' 44.773" N	87° 54' 41.052" E
18	22° 53' 35.281" N	87° 54' 36.542" E	41	22° 53' 37.097" N	87° 54' 38.749" E
19	22° 53' 35.534" N	87° 54' 36.699" E	42	22° 53' 28.408" N	87° 54' 32.904" E
20	22° 53' 36.074" N	87° 54' 37.129" E	43	22° 53' 27.776" N	87° 54' 32.003" E
21	22° 53' 36.399" N	87° 54' 37.364" E	44	22° 53' 27.452" N	87° 54' 31.690" E
22	22° 53' 36.687" N	87° 54' 37.560" E	45	22° 53' 27.272" N	87° 54' 31.650" E
23	22° 53' 37.408" N	87° 54' 37.834" E	46	22° 53' 26.550" N	87° 54' 30.985" E
			47	22° 53' 26.082" N	87° 54' 30.241" E

87°54'30"E

22°53'30"N

MUNDESWARI RIVER

N
W E
S

LEGEND

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

ABBREVIATION		
DISTRICT	HG	HOOGLY
BLOCK	AR	ARAMBAG
RIVER	MU	MUNDESWARI RIVER

0 0.045 0.09 0.18 0.27 0.36

Kilometers

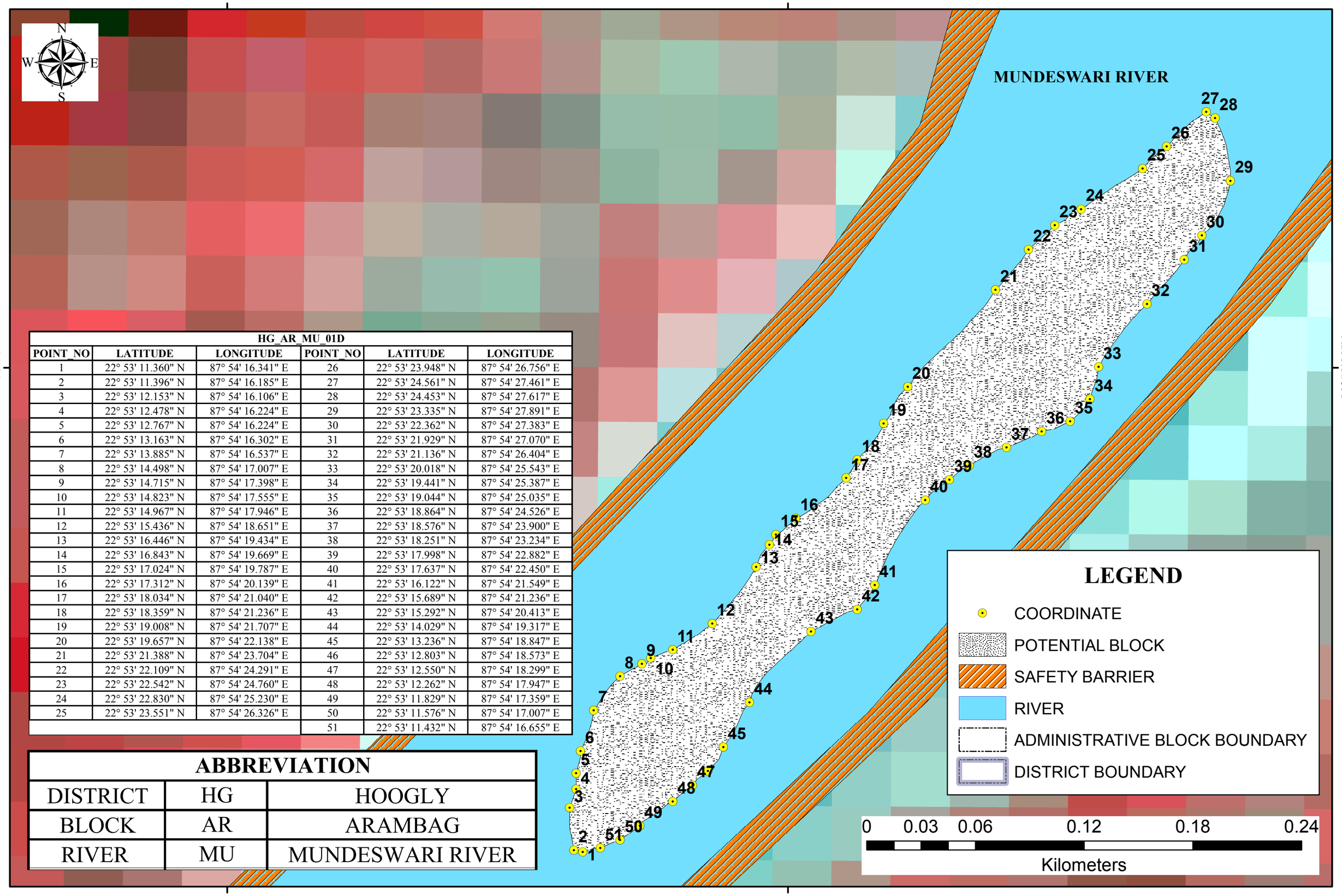
22°53'30"N

87°54'30"E

POTENTIAL BLOCK HG_AR_MU_01D OF MUNDESWARI RIVER

87°54'10"E 87°54'20"E

22°53'20"N



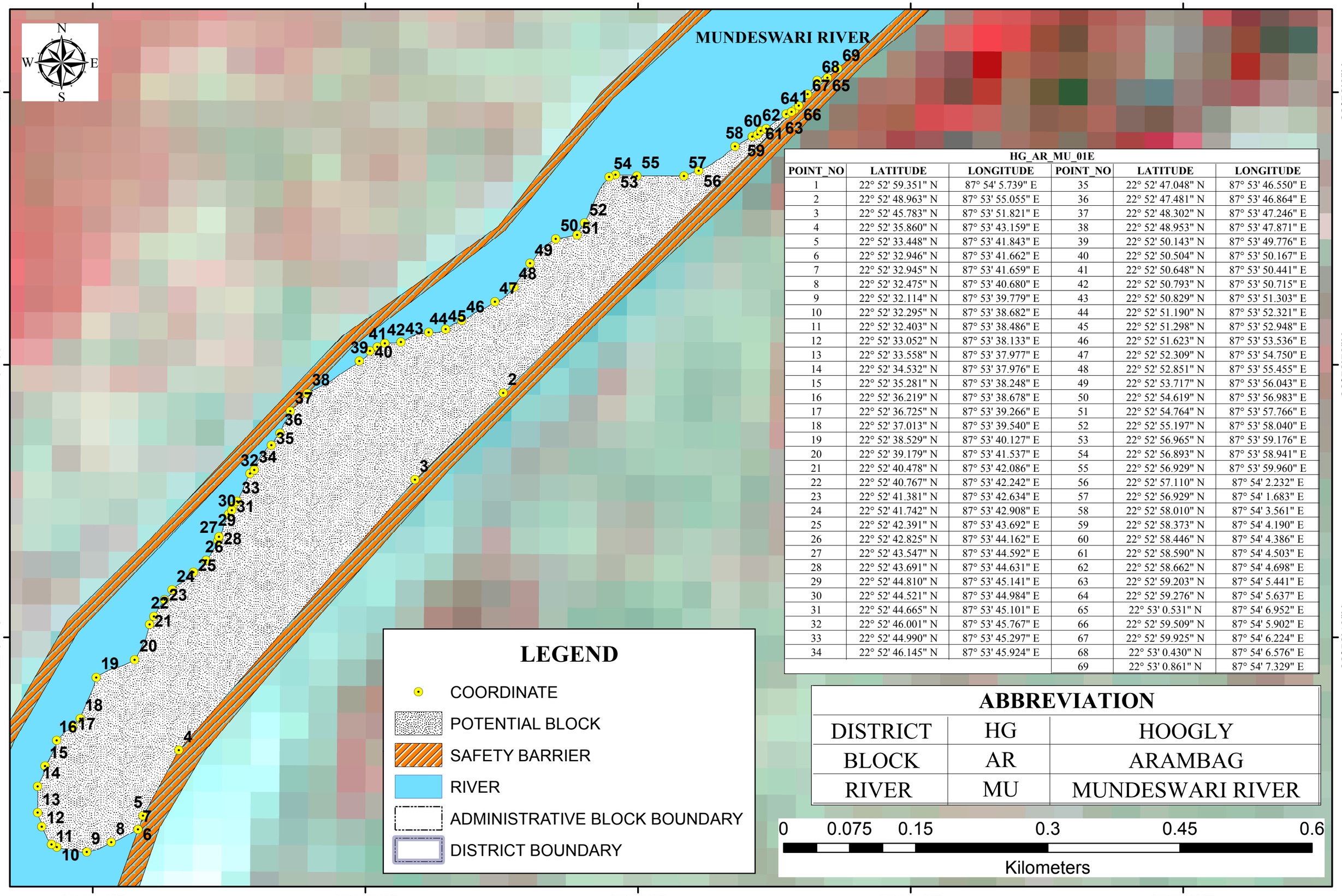
HG_AR_MU_01D					
POINT_NO	LATITUDE	LONGITUDE	POINT_NO	LATITUDE	LONGITUDE
1	22° 53' 11.360" N	87° 54' 16.341" E	26	22° 53' 23.948" N	87° 54' 26.756" E
2	22° 53' 11.396" N	87° 54' 16.185" E	27	22° 53' 24.561" N	87° 54' 27.461" E
3	22° 53' 12.153" N	87° 54' 16.106" E	28	22° 53' 24.453" N	87° 54' 27.617" E
4	22° 53' 12.478" N	87° 54' 16.224" E	29	22° 53' 23.335" N	87° 54' 27.891" E
5	22° 53' 12.767" N	87° 54' 16.224" E	30	22° 53' 22.362" N	87° 54' 27.383" E
6	22° 53' 13.163" N	87° 54' 16.302" E	31	22° 53' 21.929" N	87° 54' 27.070" E
7	22° 53' 13.885" N	87° 54' 16.537" E	32	22° 53' 21.136" N	87° 54' 26.404" E
8	22° 53' 14.498" N	87° 54' 17.007" E	33	22° 53' 20.018" N	87° 54' 25.543" E
9	22° 53' 14.715" N	87° 54' 17.398" E	34	22° 53' 19.441" N	87° 54' 25.387" E
10	22° 53' 14.823" N	87° 54' 17.555" E	35	22° 53' 19.044" N	87° 54' 25.035" E
11	22° 53' 14.967" N	87° 54' 17.946" E	36	22° 53' 18.864" N	87° 54' 24.526" E
12	22° 53' 15.436" N	87° 54' 18.651" E	37	22° 53' 18.576" N	87° 54' 23.900" E
13	22° 53' 16.446" N	87° 54' 19.434" E	38	22° 53' 18.251" N	87° 54' 23.234" E
14	22° 53' 16.843" N	87° 54' 19.669" E	39	22° 53' 17.998" N	87° 54' 22.882" E
15	22° 53' 17.024" N	87° 54' 19.787" E	40	22° 53' 17.637" N	87° 54' 22.450" E
16	22° 53' 17.312" N	87° 54' 20.139" E	41	22° 53' 16.122" N	87° 54' 21.549" E
17	22° 53' 18.034" N	87° 54' 21.040" E	42	22° 53' 15.689" N	87° 54' 21.236" E
18	22° 53' 18.359" N	87° 54' 21.236" E	43	22° 53' 15.292" N	87° 54' 20.413" E
19	22° 53' 19.008" N	87° 54' 21.707" E	44	22° 53' 14.029" N	87° 54' 19.317" E
20	22° 53' 19.657" N	87° 54' 22.138" E	45	22° 53' 13.236" N	87° 54' 18.847" E
21	22° 53' 21.388" N	87° 54' 23.704" E	46	22° 53' 12.803" N	87° 54' 18.573" E
22	22° 53' 22.109" N	87° 54' 24.291" E	47	22° 53' 12.550" N	87° 54' 18.299" E
23	22° 53' 22.542" N	87° 54' 24.760" E	48	22° 53' 12.262" N	87° 54' 17.947" E
24	22° 53' 22.830" N	87° 54' 25.230" E	49	22° 53' 11.829" N	87° 54' 17.359" E
25	22° 53' 23.551" N	87° 54' 26.326" E	50	22° 53' 11.576" N	87° 54' 17.007" E
			51	22° 53' 11.432" N	87° 54' 16.655" E

ABBREVIATION		
DISTRICT	HG	HOOGLY
BLOCK	AR	ARAMBAG
RIVER	MU	MUNDESWARI RIVER

87°54'10"E 87°54'20"E

22°53'20"N

POTENTIAL BLOCK HG_AR_MU_01E OF MUNDESWARI RIVER



HG_AR_MU_01E					
POINT_NO	LATITUDE	LONGITUDE	POINT_NO	LATITUDE	LONGITUDE
1	22° 52' 59.351" N	87° 54' 5.739" E	35	22° 52' 47.048" N	87° 53' 46.550" E
2	22° 52' 48.963" N	87° 53' 55.055" E	36	22° 52' 47.481" N	87° 53' 46.864" E
3	22° 52' 45.783" N	87° 53' 51.821" E	37	22° 52' 48.302" N	87° 53' 47.246" E
4	22° 52' 35.860" N	87° 53' 43.159" E	38	22° 52' 48.953" N	87° 53' 47.871" E
5	22° 52' 33.448" N	87° 53' 41.843" E	39	22° 52' 50.143" N	87° 53' 49.776" E
6	22° 52' 32.946" N	87° 53' 41.662" E	40	22° 52' 50.504" N	87° 53' 50.167" E
7	22° 52' 32.945" N	87° 53' 41.659" E	41	22° 52' 50.648" N	87° 53' 50.441" E
8	22° 52' 32.475" N	87° 53' 40.680" E	42	22° 52' 50.793" N	87° 53' 50.715" E
9	22° 52' 32.114" N	87° 53' 39.779" E	43	22° 52' 50.829" N	87° 53' 51.303" E
10	22° 52' 32.295" N	87° 53' 38.682" E	44	22° 52' 51.190" N	87° 53' 52.321" E
11	22° 52' 32.403" N	87° 53' 38.486" E	45	22° 52' 51.298" N	87° 53' 52.948" E
12	22° 52' 33.052" N	87° 53' 38.133" E	46	22° 52' 51.623" N	87° 53' 53.536" E
13	22° 52' 33.558" N	87° 53' 37.977" E	47	22° 52' 52.309" N	87° 53' 54.750" E
14	22° 52' 34.532" N	87° 53' 37.976" E	48	22° 52' 52.851" N	87° 53' 55.455" E
15	22° 52' 35.281" N	87° 53' 38.248" E	49	22° 52' 53.717" N	87° 53' 56.043" E
16	22° 52' 36.219" N	87° 53' 38.678" E	50	22° 52' 54.619" N	87° 53' 56.983" E
17	22° 52' 36.725" N	87° 53' 39.266" E	51	22° 52' 54.764" N	87° 53' 57.766" E
18	22° 52' 37.013" N	87° 53' 39.540" E	52	22° 52' 55.197" N	87° 53' 58.040" E
19	22° 52' 38.529" N	87° 53' 40.127" E	53	22° 52' 56.965" N	87° 53' 59.176" E
20	22° 52' 39.179" N	87° 53' 41.537" E	54	22° 52' 56.893" N	87° 53' 58.941" E
21	22° 52' 40.478" N	87° 53' 42.086" E	55	22° 52' 56.929" N	87° 53' 59.960" E
22	22° 52' 40.767" N	87° 53' 42.242" E	56	22° 52' 57.110" N	87° 54' 2.232" E
23	22° 52' 41.381" N	87° 53' 42.634" E	57	22° 52' 56.929" N	87° 54' 1.683" E
24	22° 52' 41.742" N	87° 53' 42.908" E	58	22° 52' 58.010" N	87° 54' 3.561" E
25	22° 52' 42.391" N	87° 53' 43.692" E	59	22° 52' 58.373" N	87° 54' 4.190" E
26	22° 52' 42.825" N	87° 53' 44.162" E	60	22° 52' 58.446" N	87° 54' 4.386" E
27	22° 52' 43.547" N	87° 53' 44.592" E	61	22° 52' 58.590" N	87° 54' 4.503" E
28	22° 52' 43.691" N	87° 53' 44.631" E	62	22° 52' 58.662" N	87° 54' 4.698" E
29	22° 52' 44.810" N	87° 53' 45.141" E	63	22° 52' 59.203" N	87° 54' 5.441" E
30	22° 52' 44.521" N	87° 53' 44.984" E	64	22° 52' 59.276" N	87° 54' 5.637" E
31	22° 52' 44.665" N	87° 53' 45.101" E	65	22° 53' 0.531" N	87° 54' 6.952" E
32	22° 52' 46.001" N	87° 53' 45.767" E	66	22° 52' 59.509" N	87° 54' 5.902" E
33	22° 52' 44.990" N	87° 53' 45.297" E	67	22° 52' 59.925" N	87° 54' 6.224" E
34	22° 52' 46.145" N	87° 53' 45.924" E	68	22° 53' 0.430" N	87° 54' 6.576" E
			69	22° 53' 0.861" N	87° 54' 7.329" E

ABBREVIATION		
DISTRICT	HG	HOOGLY
BLOCK	AR	ARAMBAG
RIVER	MU	MUNDESWARI RIVER

POTENTIAL BLOCK HG_AR_MU_01F OF MUNDESWARI RIVER

87°53'30"E 87°53'40"E 87°53'50"E

22°52'10"N 22°52'0"N

N W E S

HG_AR_MU_01F		
POINT_NO	LATITUDE	LONGITUDE
1	22° 52' 0.525" N	87° 53' 44.591" E
2	22° 52' 0.085" N	87° 53' 40.152" E
3	22° 52' 1.046" N	87° 53' 39.116" E
4	22° 52' 1.335" N	87° 53' 38.646" E
5	22° 52' 2.057" N	87° 53' 37.979" E
6	22° 52' 3.140" N	87° 53' 36.921" E
7	22° 52' 3.429" N	87° 53' 36.764" E
8	22° 52' 3.718" N	87° 53' 36.411" E
9	22° 52' 5.090" N	87° 53' 35.353" E
10	22° 52' 6.353" N	87° 53' 34.844" E
11	22° 52' 6.642" N	87° 53' 34.765" E
12	22° 52' 7.689" N	87° 53' 34.138" E
13	22° 52' 8.520" N	87° 53' 33.746" E
14	22° 52' 9.458" N	87° 53' 33.511" E
15	22° 52' 10.578" N	87° 53' 33.510" E
16	22° 52' 11.119" N	87° 53' 33.589" E
17	22° 52' 12.491" N	87° 53' 33.941" E
18	22° 52' 12.961" N	87° 53' 34.137" E
19	22° 52' 13.178" N	87° 53' 34.176" E
20	22° 52' 14.080" N	87° 53' 34.607" E
21	22° 52' 14.423" N	87° 53' 35.076" E
22	22° 52' 13.383" N	87° 53' 34.881" E
23	22° 52' 9.655" N	87° 53' 36.471" E
24	22° 52' 3.460" N	87° 53' 42.062" E
25	22° 52' 1.093" N	87° 53' 44.309" E

LEGEND

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

MUNDESWARI RIVER

ABBREVIATION		
DISTRICT	HG	HOOGLY
BLOCK	AR	ARAMBAG
RIVER	MU	MUNDESWARI RIVER

0 0.045 0.09 0.18 0.27 0.36

Kilometers

POTENTIAL BLOCK HG_AR_MU_01G OF MUNDESWARI RIVER

87°53'50"E 87°54'0"E 87°54'10"E

22°51'10"N

MUNDESWARI RIVER

HG_AR_MU_01G		
POINT_NO	LATITUDE	LONGITUDE
1	22° 51' 7.979" N	87° 53' 55.330" E
2	22° 51' 0.890" N	87° 53' 59.654" E
3	22° 51' 1.151" N	87° 53' 58.198" E
4	22° 51' 0.717" N	87° 53' 57.178" E
5	22° 51' 2.778" N	87° 53' 56.158" E
6	22° 51' 5.128" N	87° 53' 54.627" E
7	22° 51' 6.285" N	87° 53' 53.410" E
8	22° 51' 7.948" N	87° 53' 50.467" E
9	22° 51' 9.901" N	87° 53' 49.172" E
10	22° 51' 13.407" N	87° 53' 47.917" E
11	22° 51' 17.464" N	87° 53' 46.127" E
12	22° 51' 16.641" N	87° 53' 46.613" E
13	22° 51' 12.365" N	87° 53' 50.615" E
14	22° 51' 9.789" N	87° 53' 53.246" E

LEGEND

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

0 0.045 0.09 0.18 0.27 0.36

Kilometers

ABBREVIATION		
DISTRICT	HG	HOOGLY
BLOCK	AR	ARAMBAG
RIVER	MU	MUNDESWARI RIVER

22°51'10"N

87°53'50"E 87°54'0"E 87°54'10"E

POTENTIAL BLOCK HG_PS_MU_02 OF MUNDESWARI RIVER

87°54'30"E 87°54'40"E 87°54'50"E 87°55'0"E 87°55'10"E

22°49'20"N 22°49'10"N 22°49'0"N

MUNDESWARI RIVER

HG_PS_MU_02					
POINT_NO	LATITUDE	LONGITUDE	POINT_NO	LATITUDE	LONGITUDE
1	22° 49' 2.271" N	87° 54' 43.245" E	33	22° 49' 7.381" N	87° 54' 32.771" E
2	22° 49' 0.023" N	87° 54' 46.260" E	34	22° 49' 7.810" N	87° 54' 32.597" E
3	22° 48' 55.860" N	87° 54' 50.238" E	35	22° 49' 8.349" N	87° 54' 32.334" E
4	22° 48' 56.330" N	87° 54' 49.219" E	36	22° 49' 8.592" N	87° 54' 32.159" E
5	22° 48' 56.646" N	87° 54' 48.590" E	37	22° 49' 9.132" N	87° 54' 31.837" E
6	22° 48' 57.226" N	87° 54' 47.678" E	38	22° 49' 9.891" N	87° 54' 31.513" E
7	22° 48' 57.702" N	87° 54' 46.760" E	39	22° 49' 10.761" N	87° 54' 31.718" E
8	22° 48' 58.259" N	87° 54' 46.249" E	40	22° 49' 10.326" N	87° 54' 31.513" E
9	22° 48' 58.392" N	87° 54' 46.019" E	41	22° 49' 10.462" N	87° 54' 31.601" E
10	22° 48' 58.604" N	87° 54' 45.558" E	42	22° 49' 10.571" N	87° 54' 31.601" E
11	22° 48' 59.083" N	87° 54' 44.781" E	43	22° 49' 10.898" N	87° 54' 31.747" E
12	22° 48' 59.377" N	87° 54' 44.291" E	44	22° 49' 11.526" N	87° 54' 31.747" E
13	22° 48' 59.777" N	87° 54' 43.801" E	45	22° 49' 11.717" N	87° 54' 31.688" E
14	22° 49' 0.099" N	87° 54' 43.193" E	46	22° 49' 13.002" N	87° 54' 31.001" E
15	22° 49' 0.554" N	87° 54' 42.323" E	47	22° 49' 13.926" N	87° 54' 30.392" E
16	22° 49' 0.608" N	87° 54' 42.060" E	48	22° 49' 14.721" N	87° 54' 30.041" E
17	22° 49' 1.118" N	87° 54' 40.779" E	49	22° 49' 14.827" N	87° 54' 29.983" E
18	22° 49' 1.927" N	87° 54' 39.994" E	50	22° 49' 15.464" N	87° 54' 29.776" E
19	22° 49' 2.197" N	87° 54' 39.555" E	51	22° 49' 15.305" N	87° 54' 29.893" E
20	22° 49' 2.197" N	87° 54' 39.116" E	52	22° 49' 15.704" N	87° 54' 29.688" E
21	22° 49' 2.105" N	87° 54' 38.758" E	53	22° 49' 16.557" N	87° 54' 29.334" E
22	22° 49' 2.157" N	87° 54' 38.586" E	54	22° 49' 17.361" N	87° 54' 29.096" E
23	22° 49' 2.131" N	87° 54' 38.210" E	55	22° 49' 18.707" N	87° 54' 29.086" E
24	22° 49' 2.000" N	87° 54' 37.949" E	56	22° 49' 19.572" N	87° 54' 29.110" E
25	22° 49' 2.026" N	87° 54' 37.402" E	57	22° 49' 19.870" N	87° 54' 29.049" E
26	22° 49' 2.131" N	87° 54' 37.173" E	58	22° 49' 20.115" N	87° 54' 28.930" E
27	22° 49' 3.023" N	87° 54' 35.970" E	59	22° 49' 20.387" N	87° 54' 28.840" E
28	22° 49' 3.682" N	87° 54' 35.456" E	60	22° 49' 21.041" N	87° 54' 28.747" E
29	22° 49' 3.735" N	87° 54' 35.369" E	61	22° 49' 21.177" N	87° 54' 28.658" E
30	22° 49' 4.263" N	87° 54' 34.997" E	62	22° 49' 21.433" N	87° 54' 28.626" E
31	22° 49' 4.925" N	87° 54' 34.450" E	63	22° 49' 17.183" N	87° 54' 31.239" E
32	22° 49' 6.150" N	87° 54' 33.671" E	64	22° 49' 11.865" N	87° 54' 34.528" E
			65	22° 49' 6.437" N	87° 54' 38.914" E

ABBREVIATION		
DISTRICT	HG	HOOGLY
BLOCK	PS	PURSURA
RIVER	MU	MUNDESWARI RIVER

0 0.075 0.15 0.3 0.45 0.6

Kilometers

LEGEND

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

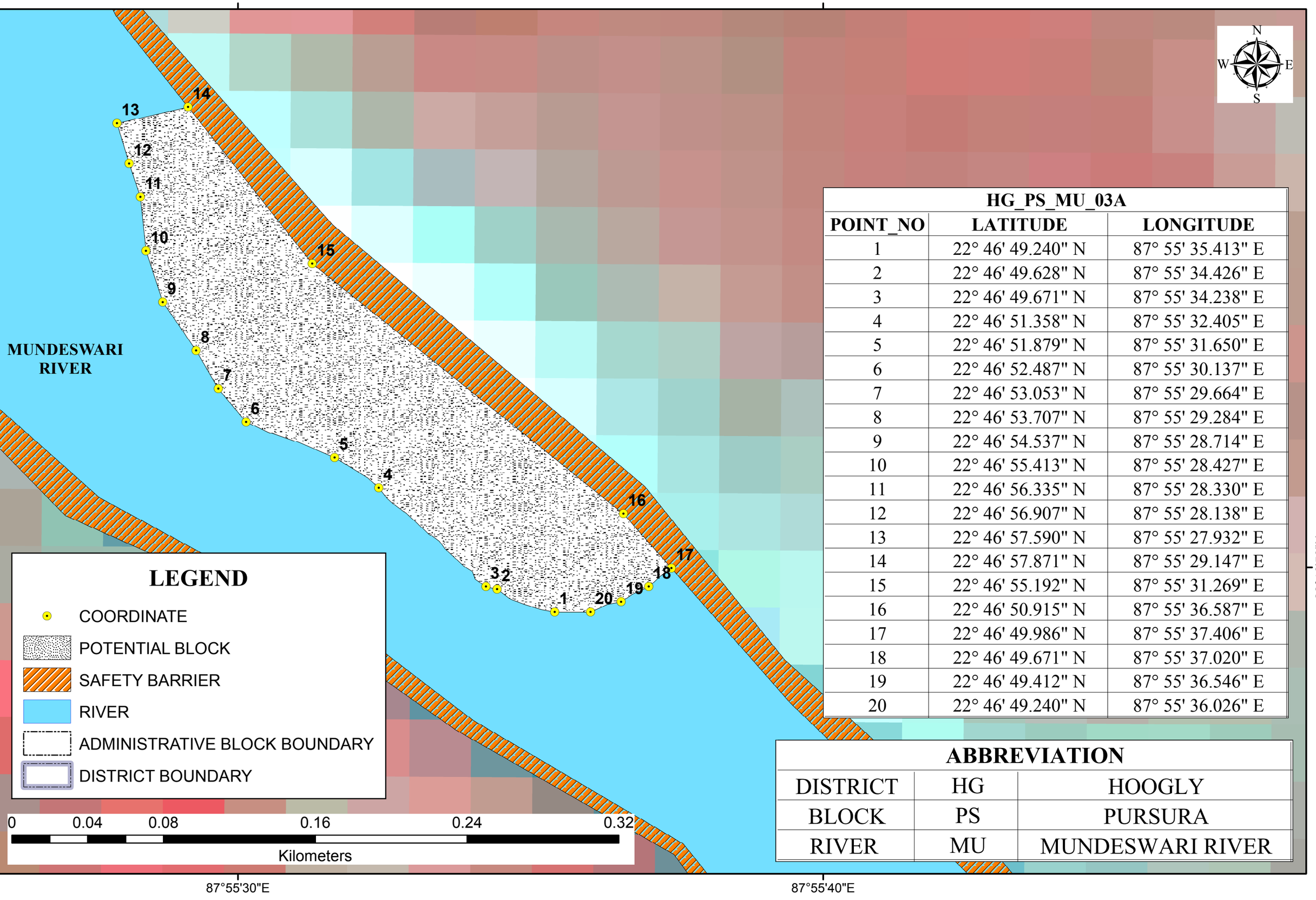
POTENTIAL BLOCK HG_PS_MU_03A OF MUNDESWARI RIVER

87°55'30"E

87°55'40"E

22°46'50"N

MUNDESWARI RIVER



HG_PS_MU_03A		
POINT_NO	LATITUDE	LONGITUDE
1	22° 46' 49.240" N	87° 55' 35.413" E
2	22° 46' 49.628" N	87° 55' 34.426" E
3	22° 46' 49.671" N	87° 55' 34.238" E
4	22° 46' 51.358" N	87° 55' 32.405" E
5	22° 46' 51.879" N	87° 55' 31.650" E
6	22° 46' 52.487" N	87° 55' 30.137" E
7	22° 46' 53.053" N	87° 55' 29.664" E
8	22° 46' 53.707" N	87° 55' 29.284" E
9	22° 46' 54.537" N	87° 55' 28.714" E
10	22° 46' 55.413" N	87° 55' 28.427" E
11	22° 46' 56.335" N	87° 55' 28.330" E
12	22° 46' 56.907" N	87° 55' 28.138" E
13	22° 46' 57.590" N	87° 55' 27.932" E
14	22° 46' 57.871" N	87° 55' 29.147" E
15	22° 46' 55.192" N	87° 55' 31.269" E
16	22° 46' 50.915" N	87° 55' 36.587" E
17	22° 46' 49.986" N	87° 55' 37.406" E
18	22° 46' 49.671" N	87° 55' 37.020" E
19	22° 46' 49.412" N	87° 55' 36.546" E
20	22° 46' 49.240" N	87° 55' 36.026" E

LEGEND

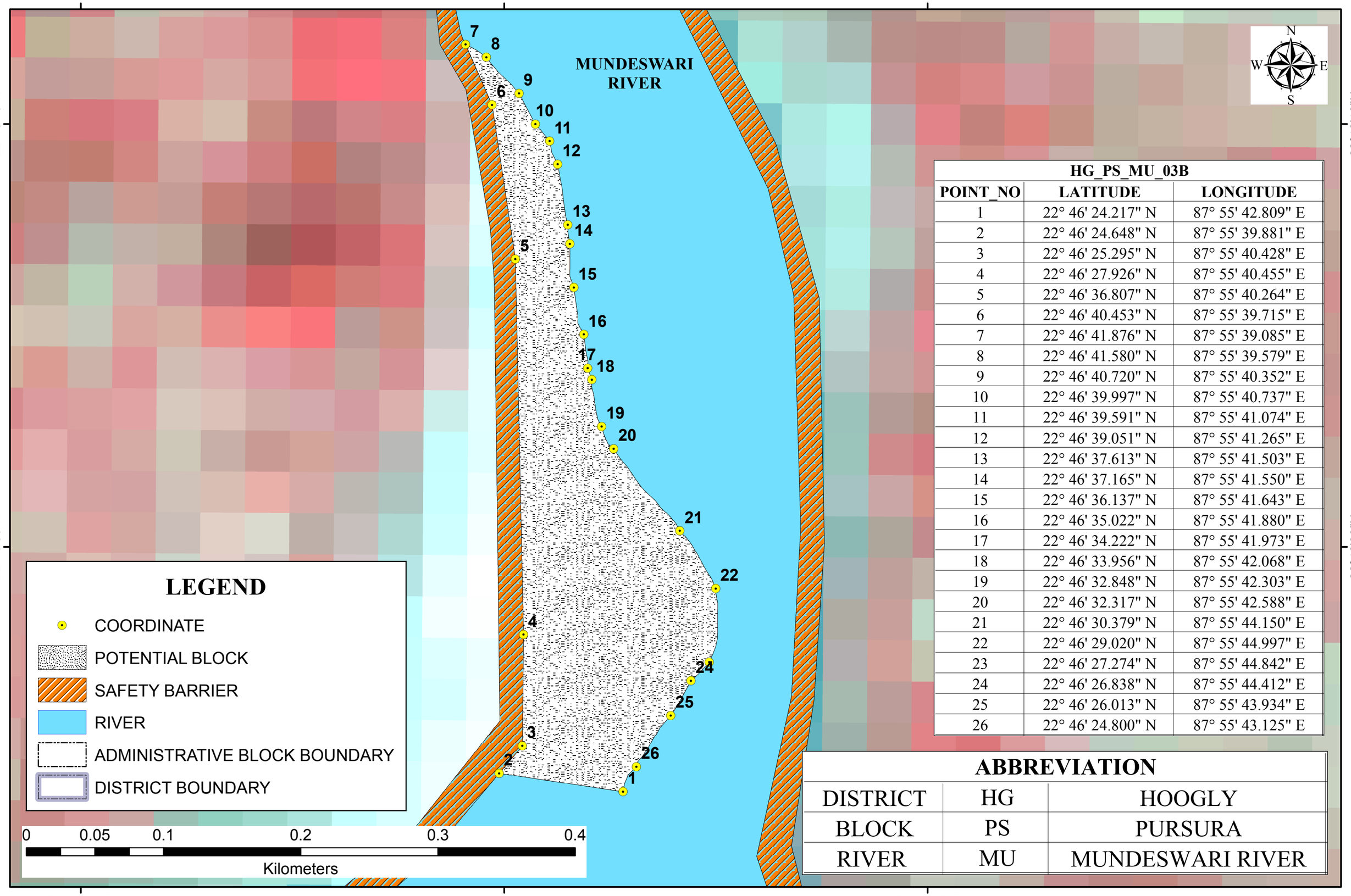
- COORDINATE
- POTENTIAL BLOCK
- SAFETY BARRIER
- RIVER
- ADMINISTRATIVE BLOCK BOUNDARY
- DISTRICT BOUNDARY

0 0.04 0.08 0.16 0.24 0.32

Kilometers

ABBREVIATION		
DISTRICT	HG	HOOGLY
BLOCK	PS	PURSURA
RIVER	MU	MUNDESWARI RIVER

POTENTIAL BLOCK HG_PS_MU_03B OF MUNDESWARI RIVER



HG_PS_MU_03B		
POINT_NO	LATITUDE	LONGITUDE
1	22° 46' 24.217" N	87° 55' 42.809" E
2	22° 46' 24.648" N	87° 55' 39.881" E
3	22° 46' 25.295" N	87° 55' 40.428" E
4	22° 46' 27.926" N	87° 55' 40.455" E
5	22° 46' 36.807" N	87° 55' 40.264" E
6	22° 46' 40.453" N	87° 55' 39.715" E
7	22° 46' 41.876" N	87° 55' 39.085" E
8	22° 46' 41.580" N	87° 55' 39.579" E
9	22° 46' 40.720" N	87° 55' 40.352" E
10	22° 46' 39.997" N	87° 55' 40.737" E
11	22° 46' 39.591" N	87° 55' 41.074" E
12	22° 46' 39.051" N	87° 55' 41.265" E
13	22° 46' 37.613" N	87° 55' 41.503" E
14	22° 46' 37.165" N	87° 55' 41.550" E
15	22° 46' 36.137" N	87° 55' 41.643" E
16	22° 46' 35.022" N	87° 55' 41.880" E
17	22° 46' 34.222" N	87° 55' 41.973" E
18	22° 46' 33.956" N	87° 55' 42.068" E
19	22° 46' 32.848" N	87° 55' 42.303" E
20	22° 46' 32.317" N	87° 55' 42.588" E
21	22° 46' 30.379" N	87° 55' 44.150" E
22	22° 46' 29.020" N	87° 55' 44.997" E
23	22° 46' 27.274" N	87° 55' 44.842" E
24	22° 46' 26.838" N	87° 55' 44.412" E
25	22° 46' 26.013" N	87° 55' 43.934" E
26	22° 46' 24.800" N	87° 55' 43.125" E

ABBREVIATION		
DISTRICT	HG	HOOGLY
BLOCK	PS	PURSURA
RIVER	MU	MUNDESWARI RIVER

POTENTIAL BLOCK HG_KH1_MU_03C OF MUNDESWARI RIVER

87°55'10"E 87°55'20"E 87°55'30"E

22°46'0"N

22°45'50"N

MUNDESWARI RIVER

HG_KH1_MU_03C					
POINT_NO	LATITUDE	LONGITUDE	POINT_NO	LATITUDE	LONGITUDE
1	22° 45' 49.052" N	87° 55' 18.258" E	19	22° 46' 0.712" N	87° 55' 15.333" E
2	22° 45' 49.172" N	87° 55' 17.894" E	20	22° 46' 1.368" N	87° 55' 15.769" E
3	22° 45' 49.556" N	87° 55' 17.555" E	21	22° 46' 1.711" N	87° 55' 16.027" E
4	22° 45' 49.870" N	87° 55' 17.424" E	22	22° 46' 2.377" N	87° 55' 16.204" E
5	22° 45' 50.454" N	87° 55' 17.160" E	23	22° 46' 2.874" N	87° 55' 16.464" E
6	22° 45' 52.034" N	87° 55' 16.596" E	24	22° 46' 3.424" N	87° 55' 16.753" E
7	22° 45' 52.234" N	87° 55' 16.515" E	25	22° 46' 4.030" N	87° 55' 17.070" E
8	22° 45' 53.599" N	87° 55' 16.074" E	26	22° 46' 4.335" N	87° 55' 17.202" E
9	22° 45' 53.983" N	87° 55' 15.962" E	27	22° 46' 4.769" N	87° 55' 17.604" E
10	22° 45' 54.240" N	87° 55' 15.958" E	28	22° 46' 5.271" N	87° 55' 18.166" E
11	22° 45' 54.498" N	87° 55' 15.847" E	29	22° 46' 5.283" N	87° 55' 19.681" E
12	22° 45' 54.889" N	87° 55' 15.507" E	30	22° 46' 5.018" N	87° 55' 19.477" E
13	22° 45' 55.582" N	87° 55' 15.244" E	31	22° 46' 1.085" N	87° 55' 17.900" E
14	22° 45' 56.555" N	87° 55' 14.947" E	32	22° 45' 59.043" N	87° 55' 17.777" E
15	22° 45' 57.059" N	87° 55' 14.835" E	33	22° 45' 56.466" N	87° 55' 16.557" E
16	22° 45' 59.489" N	87° 55' 14.784" E	34	22° 45' 52.519" N	87° 55' 17.270" E
17	22° 46' 0.038" N	87° 55' 14.928" E	35	22° 45' 49.394" N	87° 55' 19.011" E
18	22° 46' 0.158" N	87° 55' 15.030" E	36	22° 45' 49.228" N	87° 55' 19.050" E
			37	22° 45' 49.052" N	87° 55' 18.648" E

LEGEND

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

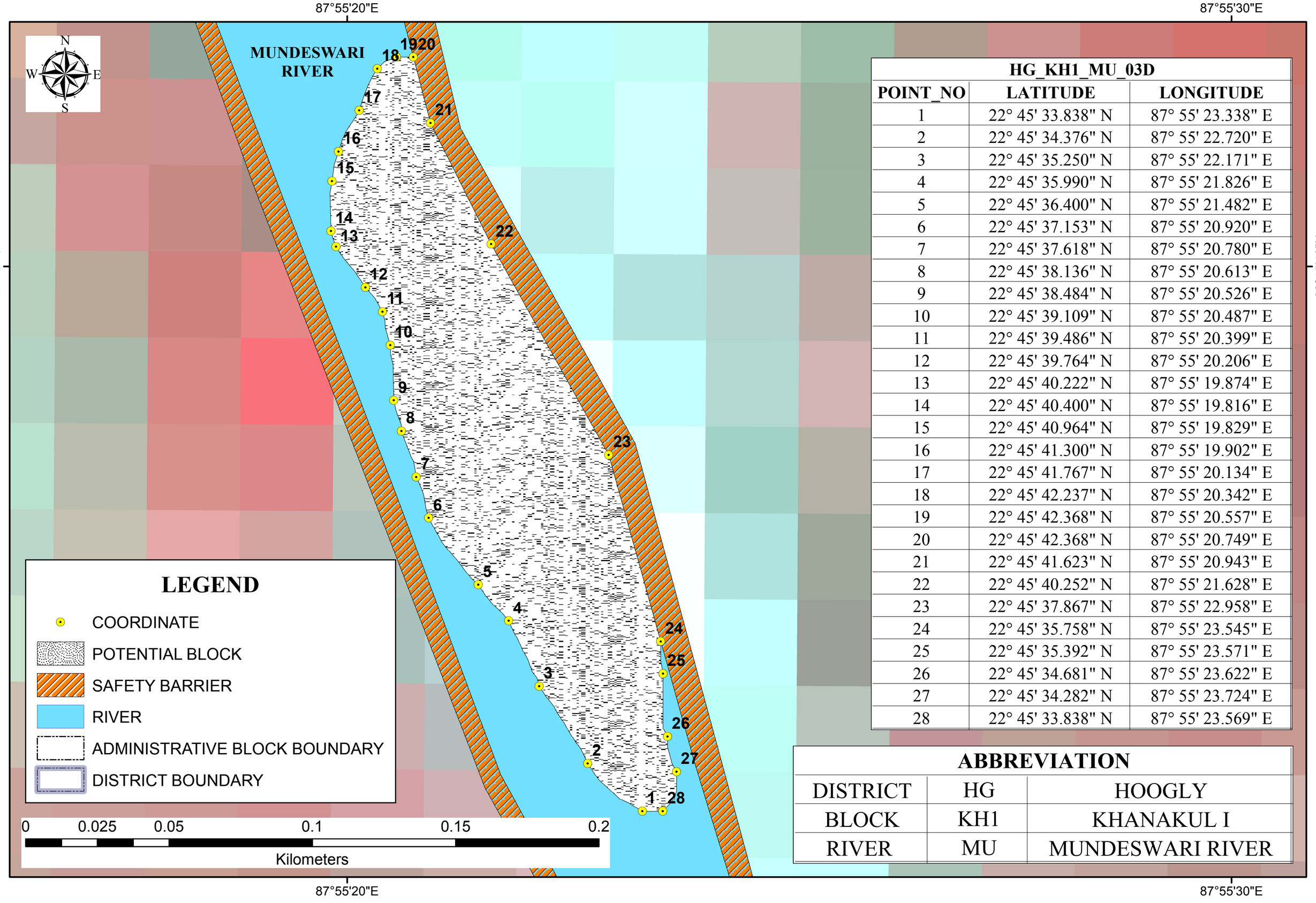
0 0.05 0.1 0.2 0.3 0.4

Kilometers

ABBREVIATION

DISTRICT	HG	HOOGLY
BLOCK	KH1	KHANAKUL I
RIVER	MU	MUNDESWARI RIVER

POTENTIAL BLOCK HG_KH1_MU_03D OF MUNDESWARI RIVER



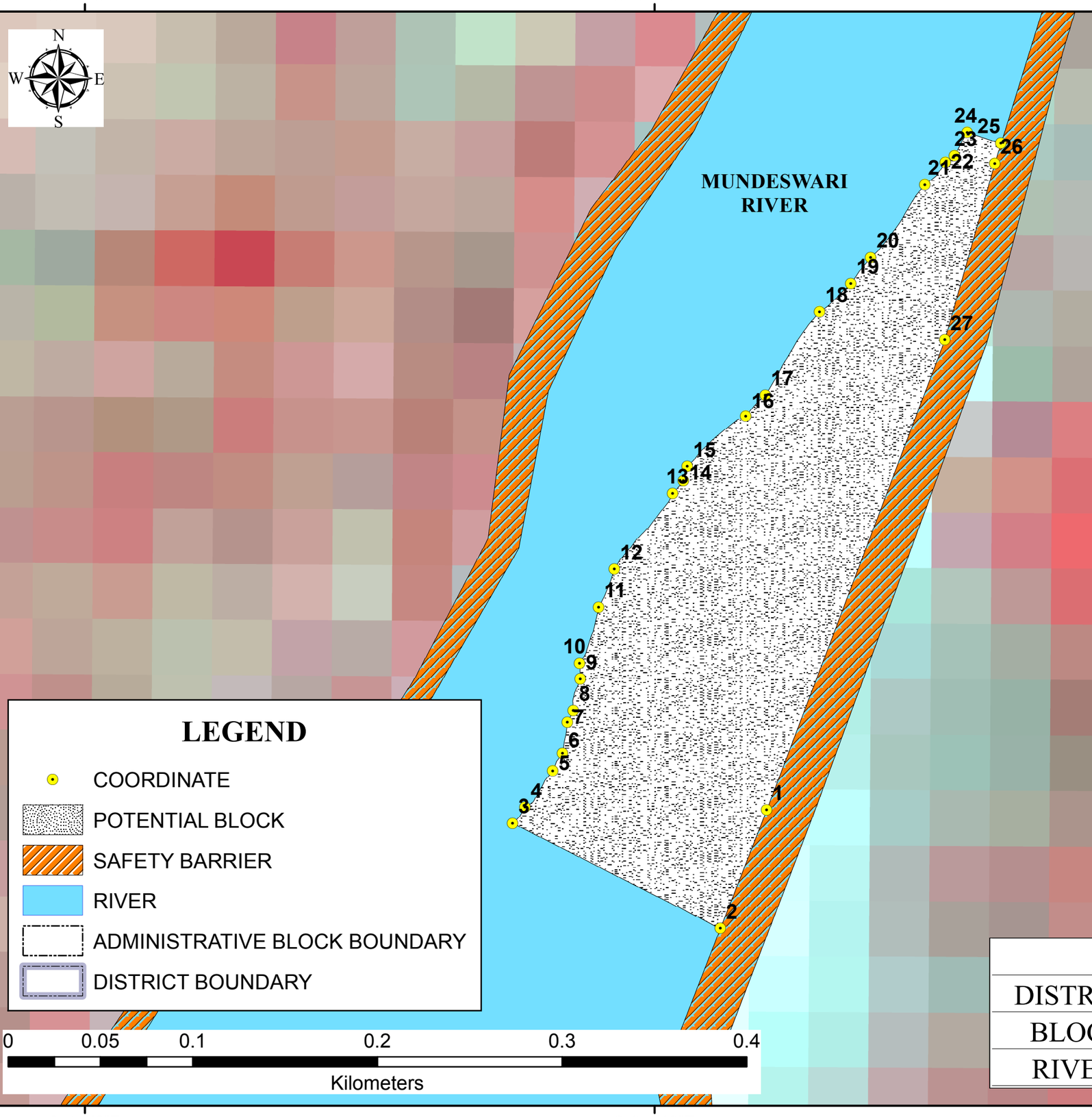
HG_KH1_MU_03D		
POINT_NO	LATITUDE	LONGITUDE
1	22° 45' 33.838" N	87° 55' 23.338" E
2	22° 45' 34.376" N	87° 55' 22.720" E
3	22° 45' 35.250" N	87° 55' 22.171" E
4	22° 45' 35.990" N	87° 55' 21.826" E
5	22° 45' 36.400" N	87° 55' 21.482" E
6	22° 45' 37.153" N	87° 55' 20.920" E
7	22° 45' 37.618" N	87° 55' 20.780" E
8	22° 45' 38.136" N	87° 55' 20.613" E
9	22° 45' 38.484" N	87° 55' 20.526" E
10	22° 45' 39.109" N	87° 55' 20.487" E
11	22° 45' 39.486" N	87° 55' 20.399" E
12	22° 45' 39.764" N	87° 55' 20.206" E
13	22° 45' 40.222" N	87° 55' 19.874" E
14	22° 45' 40.400" N	87° 55' 19.816" E
15	22° 45' 40.964" N	87° 55' 19.829" E
16	22° 45' 41.300" N	87° 55' 19.902" E
17	22° 45' 41.767" N	87° 55' 20.134" E
18	22° 45' 42.237" N	87° 55' 20.342" E
19	22° 45' 42.368" N	87° 55' 20.557" E
20	22° 45' 42.368" N	87° 55' 20.749" E
21	22° 45' 41.623" N	87° 55' 20.943" E
22	22° 45' 40.252" N	87° 55' 21.628" E
23	22° 45' 37.867" N	87° 55' 22.958" E
24	22° 45' 35.758" N	87° 55' 23.545" E
25	22° 45' 35.392" N	87° 55' 23.571" E
26	22° 45' 34.681" N	87° 55' 23.622" E
27	22° 45' 34.282" N	87° 55' 23.724" E
28	22° 45' 33.838" N	87° 55' 23.569" E

ABBREVIATION		
DISTRICT	HG	HOOGLY
BLOCK	KH1	KHANAKUL I
RIVER	MU	MUNDESWARI RIVER

POTENTIAL BLOCK HG_KH1_MU_03H OF MUNDESWARI RIVER

87°54'0"E 87°54'10"E 87°54'20"E

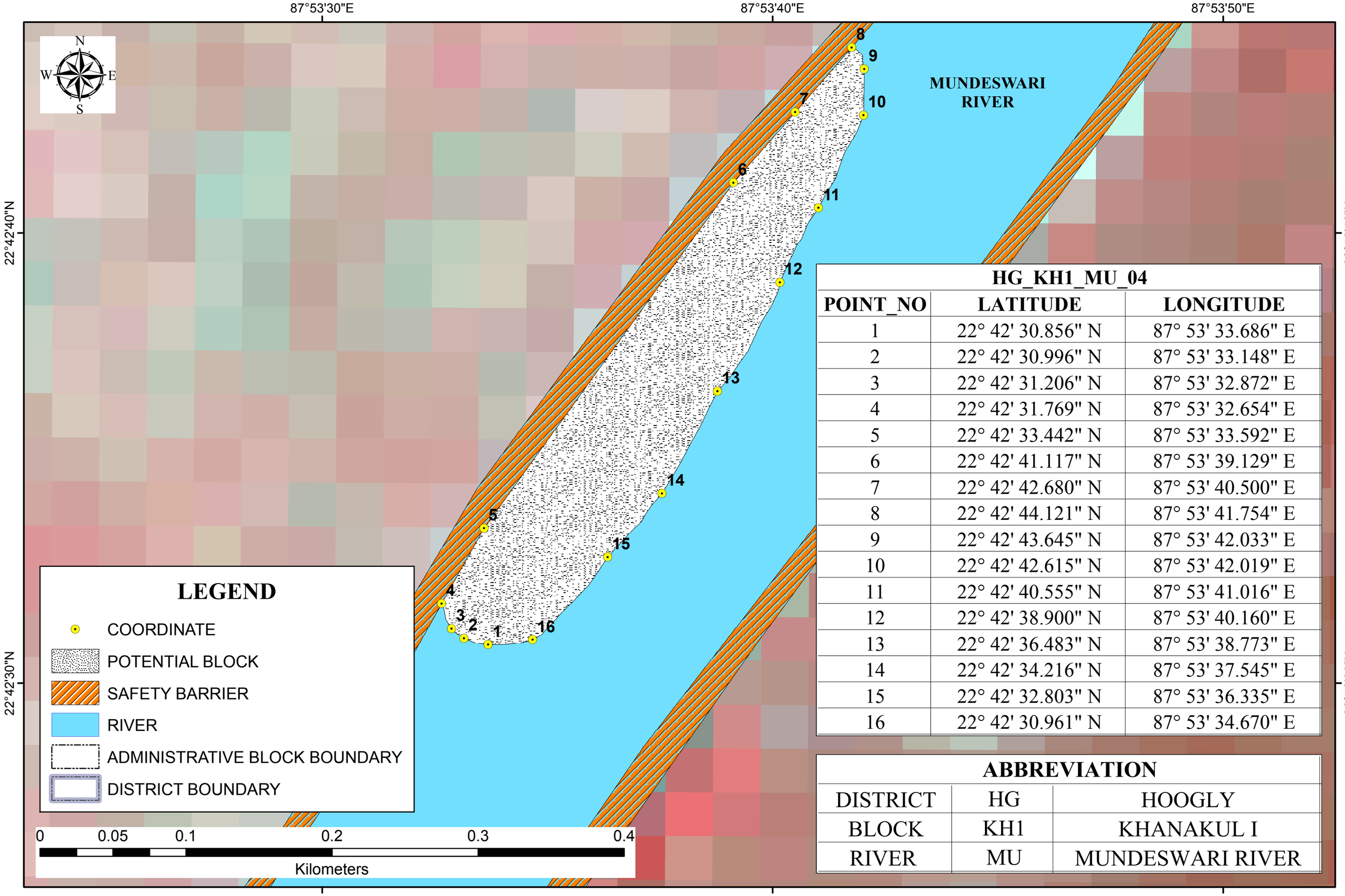
22°43'40"N 22°43'30"N



HG_KH1_MU_03H		
POINT_NO	LATITUDE	LONGITUDE
1	22° 43' 29.465" N	87° 54' 11.968" E
2	22° 43' 27.383" N	87° 54' 11.154" E
3	22° 43' 29.232" N	87° 54' 7.508" E
4	22° 43' 29.508" N	87° 54' 7.724" E
5	22° 43' 30.149" N	87° 54' 8.212" E
6	22° 43' 30.455" N	87° 54' 8.383" E
7	22° 43' 31.001" N	87° 54' 8.469" E
8	22° 43' 31.207" N	87° 54' 8.571" E
9	22° 43' 31.760" N	87° 54' 8.696" E
10	22° 43' 32.038" N	87° 54' 8.682" E
11	22° 43' 33.019" N	87° 54' 9.017" E
12	22° 43' 33.692" N	87° 54' 9.293" E
13	22° 43' 35.022" N	87° 54' 10.319" E
14	22° 43' 35.240" N	87° 54' 10.505" E
15	22° 43' 35.495" N	87° 54' 10.574" E
16	22° 43' 36.377" N	87° 54' 11.599" E
17	22° 43' 36.747" N	87° 54' 11.942" E
18	22° 43' 38.211" N	87° 54' 12.895" E
19	22° 43' 38.705" N	87° 54' 13.442" E
20	22° 43' 39.164" N	87° 54' 13.794" E
21	22° 43' 40.442" N	87° 54' 14.743" E
22	22° 43' 40.833" N	87° 54' 15.103" E
23	22° 43' 40.951" N	87° 54' 15.264" E
24	22° 43' 41.361" N	87° 54' 15.486" E
25	22° 43' 41.167" N	87° 54' 16.080" E
26	22° 43' 40.814" N	87° 54' 15.970" E
27	22° 43' 37.716" N	87° 54' 15.093" E

ABBREVIATION		
DISTRICT	HG	HOOGLY
BLOCK	KH1	KHANAKUL I
RIVER	MU	MUNDESWARI RIVER

POTENTIAL BLOCK HG_KH1_MU_04 OF MUNDESWARI RIVER



HG_KH1_MU_04		
POINT_NO	LATITUDE	LONGITUDE
1	22° 42' 30.856" N	87° 53' 33.686" E
2	22° 42' 30.996" N	87° 53' 33.148" E
3	22° 42' 31.206" N	87° 53' 32.872" E
4	22° 42' 31.769" N	87° 53' 32.654" E
5	22° 42' 33.442" N	87° 53' 33.592" E
6	22° 42' 41.117" N	87° 53' 39.129" E
7	22° 42' 42.680" N	87° 53' 40.500" E
8	22° 42' 44.121" N	87° 53' 41.754" E
9	22° 42' 43.645" N	87° 53' 42.033" E
10	22° 42' 42.615" N	87° 53' 42.019" E
11	22° 42' 40.555" N	87° 53' 41.016" E
12	22° 42' 38.900" N	87° 53' 40.160" E
13	22° 42' 36.483" N	87° 53' 38.773" E
14	22° 42' 34.216" N	87° 53' 37.545" E
15	22° 42' 32.803" N	87° 53' 36.335" E
16	22° 42' 30.961" N	87° 53' 34.670" E

ABBREVIATION		
DISTRICT	HG	HOOGLY
BLOCK	KH1	KHANAKUL I
RIVER	MU	MUNDESWARI RIVER

POTENTIAL BLOCK HG_KH1_MU_06A OF MUNDESWARI RIVER

87°53'20"E 87°53'30"E 87°53'40"E

22°41'40"N

22°41'30"N

MUNDESWARI RIVER

HG_KH1_MU_06A		
POINT_NO	LATITUDE	LONGITUDE
1	22° 41' 30.875" N	87° 53' 30.175" E
2	22° 41' 30.907" N	87° 53' 29.849" E
3	22° 41' 31.198" N	87° 53' 29.524" E
4	22° 41' 31.392" N	87° 53' 29.453" E
5	22° 41' 32.078" N	87° 53' 28.282" E
6	22° 41' 32.937" N	87° 53' 27.617" E
7	22° 41' 33.438" N	87° 53' 26.984" E
8	22° 41' 34.009" N	87° 53' 26.644" E
9	22° 41' 36.028" N	87° 53' 26.625" E
10	22° 41' 36.586" N	87° 53' 26.430" E
11	22° 41' 37.078" N	87° 53' 26.119" E
12	22° 41' 38.286" N	87° 53' 25.796" E
13	22° 41' 39.771" N	87° 53' 25.152" E
14	22° 41' 41.324" N	87° 53' 24.926" E
15	22° 41' 42.378" N	87° 53' 24.232" E
16	22° 41' 43.832" N	87° 53' 23.356" E
17	22° 41' 44.298" N	87° 53' 23.262" E
18	22° 41' 44.327" N	87° 53' 25.117" E
19	22° 41' 35.516" N	87° 53' 28.302" E

LEGEND

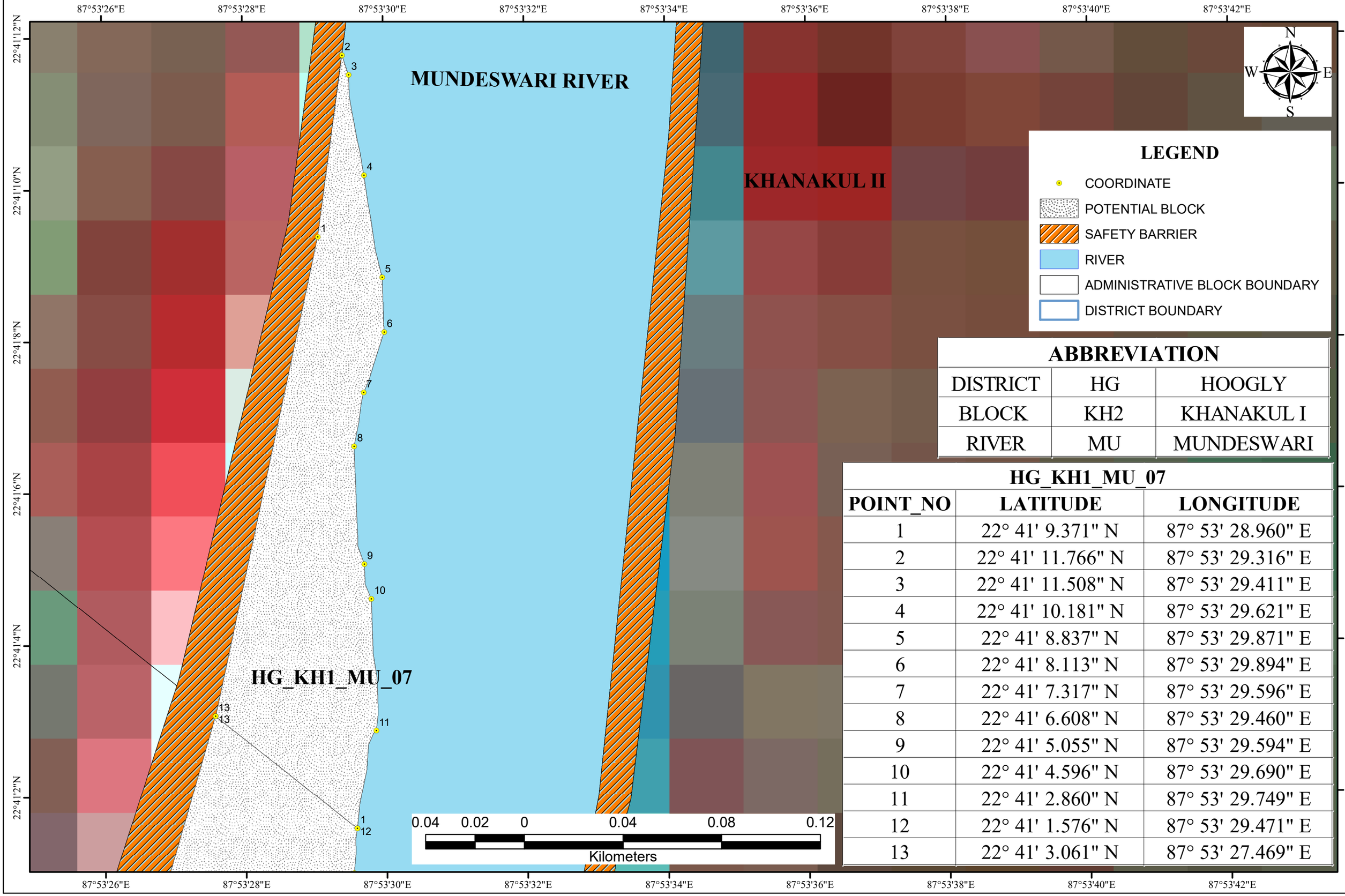
- COORDINATE
- POTENTIAL BLOCK
- SAFETY BARRIER
- RIVER
- ADMINISTRATIVE BLOCK BOUNDARY
- DISTRICT BOUNDARY

0 0.0425 0.085 0.17 0.255 0.34

Kilometers

ABBREVIATION		
DISTRICT	HG	HOOGLY
BLOCK	KH1	KHANAKUL I
RIVER	MU	MUNDESWARI RIVER

POTENTIAL BLOCK HG_KH1_MU_07 OF MUNDESWARI RIVER



LEGEND

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

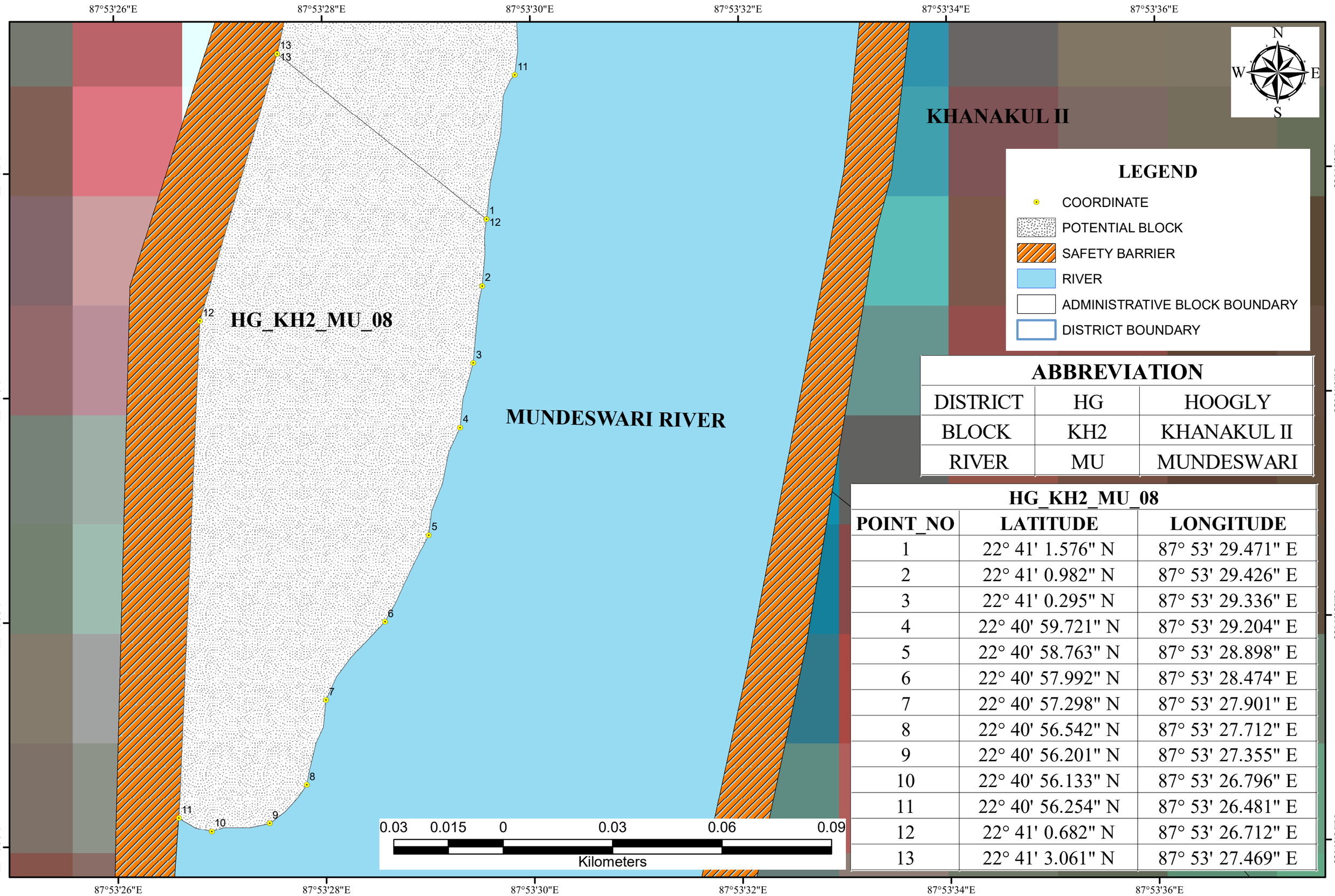
ABBREVIATION

DISTRICT	HG	HOOGLY
BLOCK	KH2	KHANAKUL I
RIVER	MU	MUNDESWARI

HG_KH1_MU_07

POINT_NO	LATITUDE	LONGITUDE
1	22° 41' 9.371" N	87° 53' 28.960" E
2	22° 41' 11.766" N	87° 53' 29.316" E
3	22° 41' 11.508" N	87° 53' 29.411" E
4	22° 41' 10.181" N	87° 53' 29.621" E
5	22° 41' 8.837" N	87° 53' 29.871" E
6	22° 41' 8.113" N	87° 53' 29.894" E
7	22° 41' 7.317" N	87° 53' 29.596" E
8	22° 41' 6.608" N	87° 53' 29.460" E
9	22° 41' 5.055" N	87° 53' 29.594" E
10	22° 41' 4.596" N	87° 53' 29.690" E
11	22° 41' 2.860" N	87° 53' 29.749" E
12	22° 41' 1.576" N	87° 53' 29.471" E
13	22° 41' 3.061" N	87° 53' 27.469" E

POTENTIAL BLOCK HG_KH2_MU_08 OF MUNDESWARI RIVER



LEGEND

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

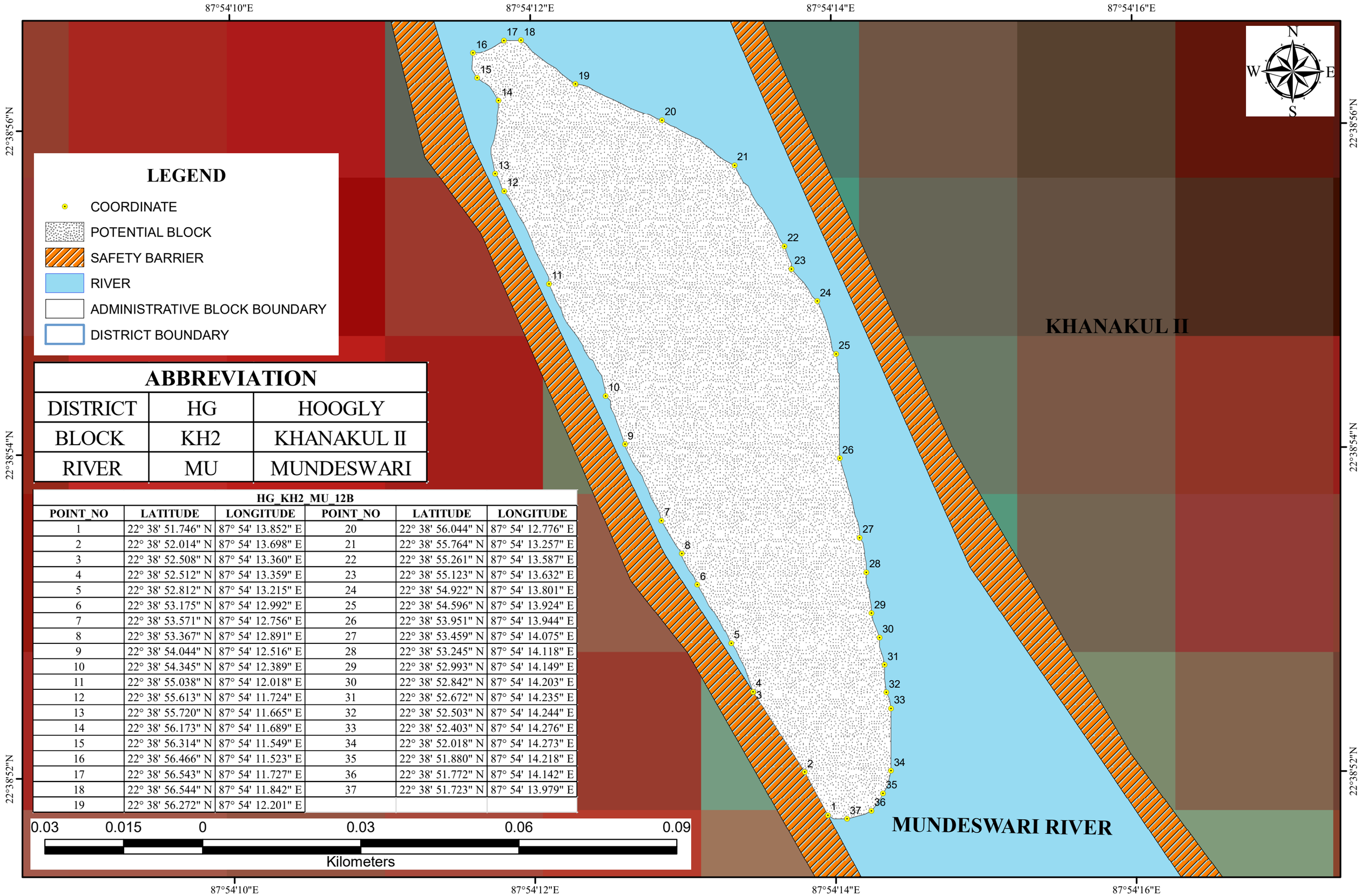
ABBREVIATION

DISTRICT	HG	HOOGLY
BLOCK	KH2	KHANAKUL II
RIVER	MU	MUNDESWARI

HG_KH2_MU_08

POINT_NO	LATITUDE	LONGITUDE
1	22° 41' 1.576" N	87° 53' 29.471" E
2	22° 41' 0.982" N	87° 53' 29.426" E
3	22° 41' 0.295" N	87° 53' 29.336" E
4	22° 40' 59.721" N	87° 53' 29.204" E
5	22° 40' 58.763" N	87° 53' 28.898" E
6	22° 40' 57.992" N	87° 53' 28.474" E
7	22° 40' 57.298" N	87° 53' 27.901" E
8	22° 40' 56.542" N	87° 53' 27.712" E
9	22° 40' 56.201" N	87° 53' 27.355" E
10	22° 40' 56.133" N	87° 53' 26.796" E
11	22° 40' 56.254" N	87° 53' 26.481" E
12	22° 41' 0.682" N	87° 53' 26.712" E
13	22° 41' 3.061" N	87° 53' 27.469" E

POTENTIAL BLOCK HG_KH2_MU_12B OF MUNDESWARI RIVER



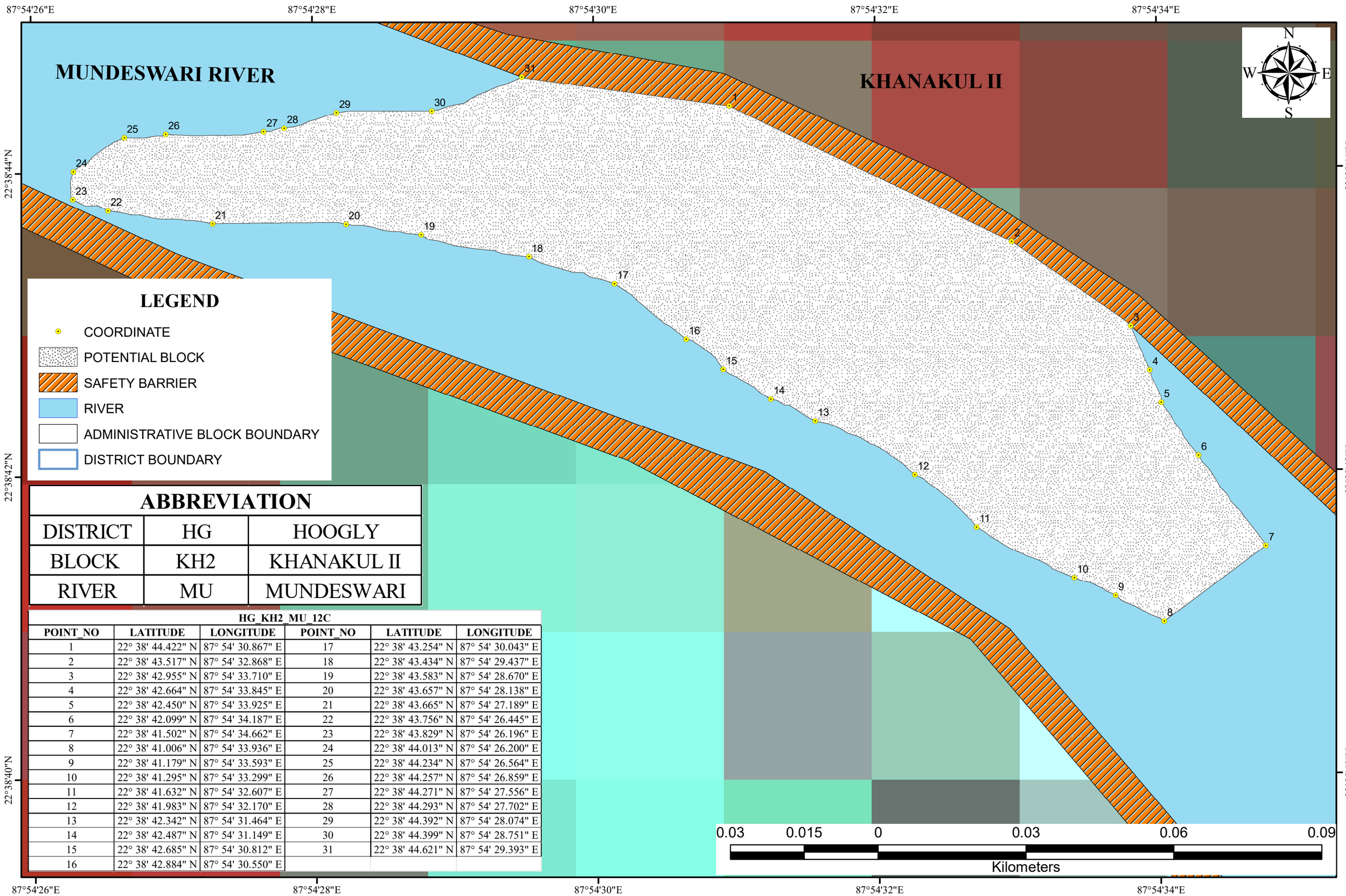
ABBREVIATION

DISTRICT	HG	HOOGLY
BLOCK	KH2	KHANAKUL II
RIVER	MU	MUNDESWARI

HG_KH2_MU_12B

POINT_NO	LATITUDE	LONGITUDE	POINT_NO	LATITUDE	LONGITUDE
1	22° 38' 51.746" N	87° 54' 13.852" E	20	22° 38' 56.044" N	87° 54' 12.776" E
2	22° 38' 52.014" N	87° 54' 13.698" E	21	22° 38' 55.764" N	87° 54' 13.257" E
3	22° 38' 52.508" N	87° 54' 13.360" E	22	22° 38' 55.261" N	87° 54' 13.587" E
4	22° 38' 52.512" N	87° 54' 13.359" E	23	22° 38' 55.123" N	87° 54' 13.632" E
5	22° 38' 52.812" N	87° 54' 13.215" E	24	22° 38' 54.922" N	87° 54' 13.801" E
6	22° 38' 53.175" N	87° 54' 12.992" E	25	22° 38' 54.596" N	87° 54' 13.924" E
7	22° 38' 53.571" N	87° 54' 12.756" E	26	22° 38' 53.951" N	87° 54' 13.944" E
8	22° 38' 53.367" N	87° 54' 12.891" E	27	22° 38' 53.459" N	87° 54' 14.075" E
9	22° 38' 54.044" N	87° 54' 12.516" E	28	22° 38' 53.245" N	87° 54' 14.118" E
10	22° 38' 54.345" N	87° 54' 12.389" E	29	22° 38' 52.993" N	87° 54' 14.149" E
11	22° 38' 55.038" N	87° 54' 12.018" E	30	22° 38' 52.842" N	87° 54' 14.203" E
12	22° 38' 55.613" N	87° 54' 11.724" E	31	22° 38' 52.672" N	87° 54' 14.235" E
13	22° 38' 55.720" N	87° 54' 11.665" E	32	22° 38' 52.503" N	87° 54' 14.244" E
14	22° 38' 56.173" N	87° 54' 11.689" E	33	22° 38' 52.403" N	87° 54' 14.276" E
15	22° 38' 56.314" N	87° 54' 11.549" E	34	22° 38' 52.018" N	87° 54' 14.273" E
16	22° 38' 56.466" N	87° 54' 11.523" E	35	22° 38' 51.880" N	87° 54' 14.218" E
17	22° 38' 56.543" N	87° 54' 11.727" E	36	22° 38' 51.772" N	87° 54' 14.142" E
18	22° 38' 56.544" N	87° 54' 11.842" E	37	22° 38' 51.723" N	87° 54' 13.979" E
19	22° 38' 56.272" N	87° 54' 12.201" E			

POTENTIAL BLOCK HG_KH2_MU_12C OF MUNDESWARI RIVER



LEGEND

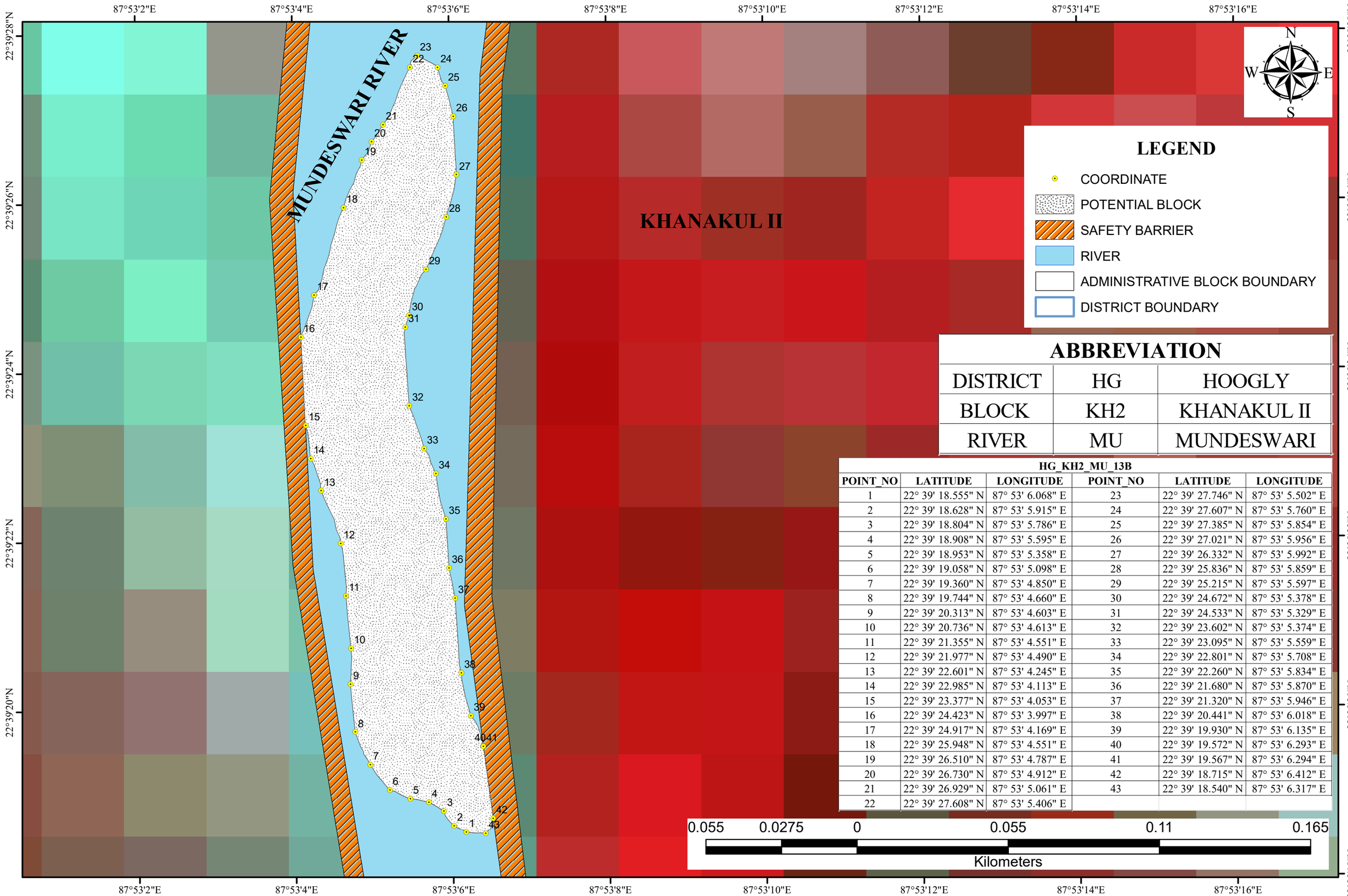
- COORDINATE
- POTENTIAL BLOCK
- SAFETY BARRIER
- RIVER
- ADMINISTRATIVE BLOCK BOUNDARY
- DISTRICT BOUNDARY

ABBREVIATION		
DISTRICT	HG	HOOGLY
BLOCK	KH2	KHANAKUL II
RIVER	MU	MUNDESWARI

HG_KH2_MU_12C

POINT_NO	LATITUDE	LONGITUDE	POINT_NO	LATITUDE	LONGITUDE
1	22° 38' 44.422" N	87° 54' 30.867" E	17	22° 38' 43.254" N	87° 54' 30.043" E
2	22° 38' 43.517" N	87° 54' 32.868" E	18	22° 38' 43.434" N	87° 54' 29.437" E
3	22° 38' 42.955" N	87° 54' 33.710" E	19	22° 38' 43.583" N	87° 54' 28.670" E
4	22° 38' 42.664" N	87° 54' 33.845" E	20	22° 38' 43.657" N	87° 54' 28.138" E
5	22° 38' 42.450" N	87° 54' 33.925" E	21	22° 38' 43.665" N	87° 54' 27.189" E
6	22° 38' 42.099" N	87° 54' 34.187" E	22	22° 38' 43.756" N	87° 54' 26.445" E
7	22° 38' 41.502" N	87° 54' 34.662" E	23	22° 38' 43.829" N	87° 54' 26.196" E
8	22° 38' 41.006" N	87° 54' 33.936" E	24	22° 38' 44.013" N	87° 54' 26.200" E
9	22° 38' 41.179" N	87° 54' 33.593" E	25	22° 38' 44.234" N	87° 54' 26.564" E
10	22° 38' 41.295" N	87° 54' 33.299" E	26	22° 38' 44.257" N	87° 54' 26.859" E
11	22° 38' 41.632" N	87° 54' 32.607" E	27	22° 38' 44.271" N	87° 54' 27.556" E
12	22° 38' 41.983" N	87° 54' 32.170" E	28	22° 38' 44.293" N	87° 54' 27.702" E
13	22° 38' 42.342" N	87° 54' 31.464" E	29	22° 38' 44.392" N	87° 54' 28.074" E
14	22° 38' 42.487" N	87° 54' 31.149" E	30	22° 38' 44.399" N	87° 54' 28.751" E
15	22° 38' 42.685" N	87° 54' 30.812" E	31	22° 38' 44.621" N	87° 54' 29.393" E
16	22° 38' 42.884" N	87° 54' 30.550" E			

POTENTIAL BLOCK HG_KH2_MU_13B OF MUNDESWARI RIVER



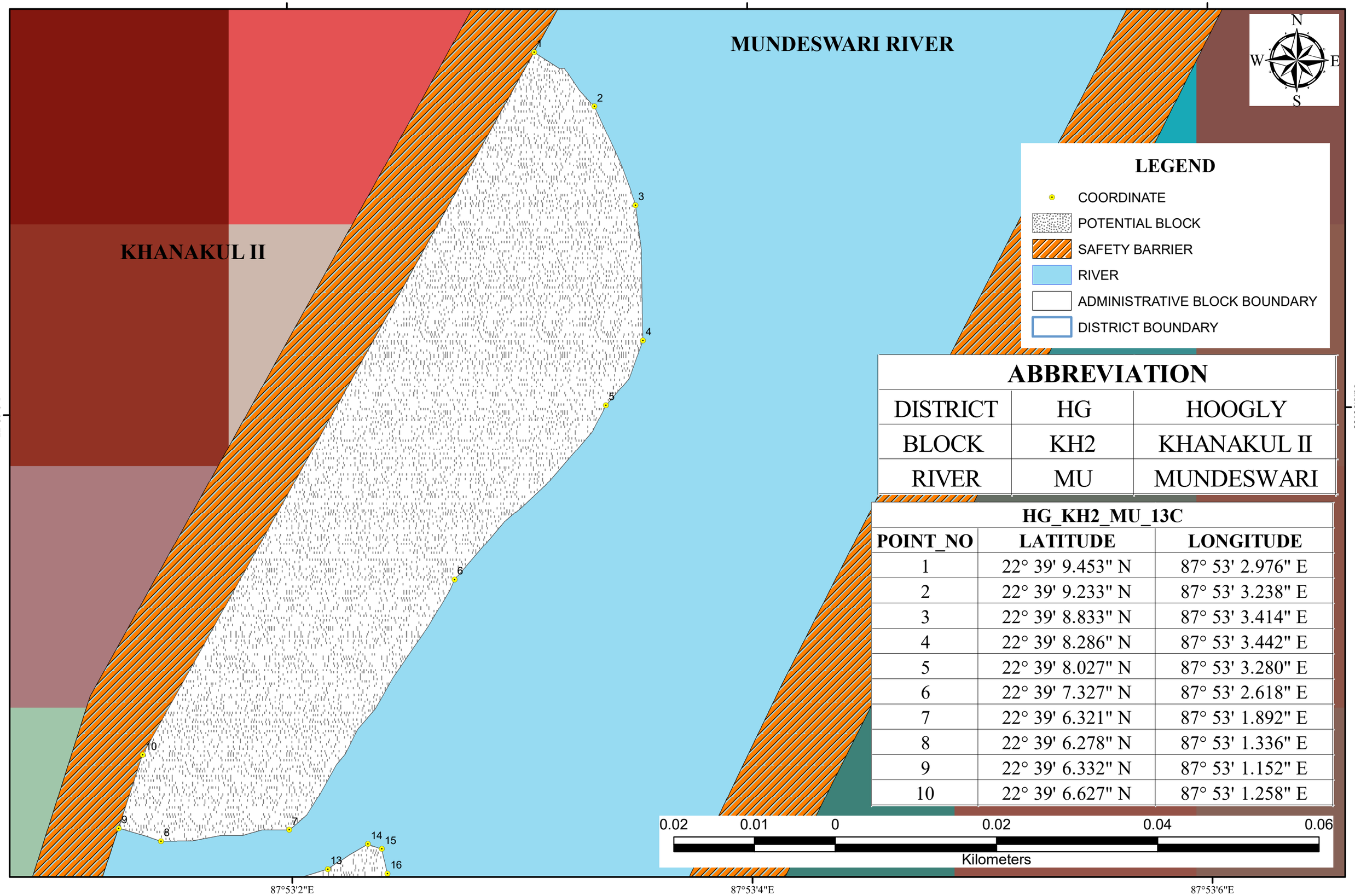
ABBREVIATION

DISTRICT	HG	HOOGLY
BLOCK	KH2	KHANAKUL II
RIVER	MU	MUNDESWARI

HG_KH2_MU_13B

POINT_NO	LATITUDE	LONGITUDE	POINT_NO	LATITUDE	LONGITUDE
1	22° 39' 18.555" N	87° 53' 6.068" E	23	22° 39' 27.746" N	87° 53' 5.502" E
2	22° 39' 18.628" N	87° 53' 5.915" E	24	22° 39' 27.607" N	87° 53' 5.760" E
3	22° 39' 18.804" N	87° 53' 5.786" E	25	22° 39' 27.385" N	87° 53' 5.854" E
4	22° 39' 18.908" N	87° 53' 5.595" E	26	22° 39' 27.021" N	87° 53' 5.956" E
5	22° 39' 18.953" N	87° 53' 5.358" E	27	22° 39' 26.332" N	87° 53' 5.992" E
6	22° 39' 19.058" N	87° 53' 5.098" E	28	22° 39' 25.836" N	87° 53' 5.859" E
7	22° 39' 19.360" N	87° 53' 4.850" E	29	22° 39' 25.215" N	87° 53' 5.597" E
8	22° 39' 19.744" N	87° 53' 4.660" E	30	22° 39' 24.672" N	87° 53' 5.378" E
9	22° 39' 20.313" N	87° 53' 4.603" E	31	22° 39' 24.533" N	87° 53' 5.329" E
10	22° 39' 20.736" N	87° 53' 4.613" E	32	22° 39' 23.602" N	87° 53' 5.374" E
11	22° 39' 21.355" N	87° 53' 4.551" E	33	22° 39' 23.095" N	87° 53' 5.559" E
12	22° 39' 21.977" N	87° 53' 4.490" E	34	22° 39' 22.801" N	87° 53' 5.708" E
13	22° 39' 22.601" N	87° 53' 4.245" E	35	22° 39' 22.260" N	87° 53' 5.834" E
14	22° 39' 22.985" N	87° 53' 4.113" E	36	22° 39' 21.680" N	87° 53' 5.870" E
15	22° 39' 23.377" N	87° 53' 4.053" E	37	22° 39' 21.320" N	87° 53' 5.946" E
16	22° 39' 24.423" N	87° 53' 3.997" E	38	22° 39' 20.441" N	87° 53' 6.018" E
17	22° 39' 24.917" N	87° 53' 4.169" E	39	22° 39' 19.930" N	87° 53' 6.135" E
18	22° 39' 25.948" N	87° 53' 4.551" E	40	22° 39' 19.572" N	87° 53' 6.293" E
19	22° 39' 26.510" N	87° 53' 4.787" E	41	22° 39' 19.567" N	87° 53' 6.294" E
20	22° 39' 26.730" N	87° 53' 4.912" E	42	22° 39' 18.715" N	87° 53' 6.412" E
21	22° 39' 26.929" N	87° 53' 5.061" E	43	22° 39' 18.540" N	87° 53' 6.317" E
22	22° 39' 27.608" N	87° 53' 5.406" E			

POTENTIAL BLOCK HG_KH2_MU_13C OF MUNDESWARI RIVER



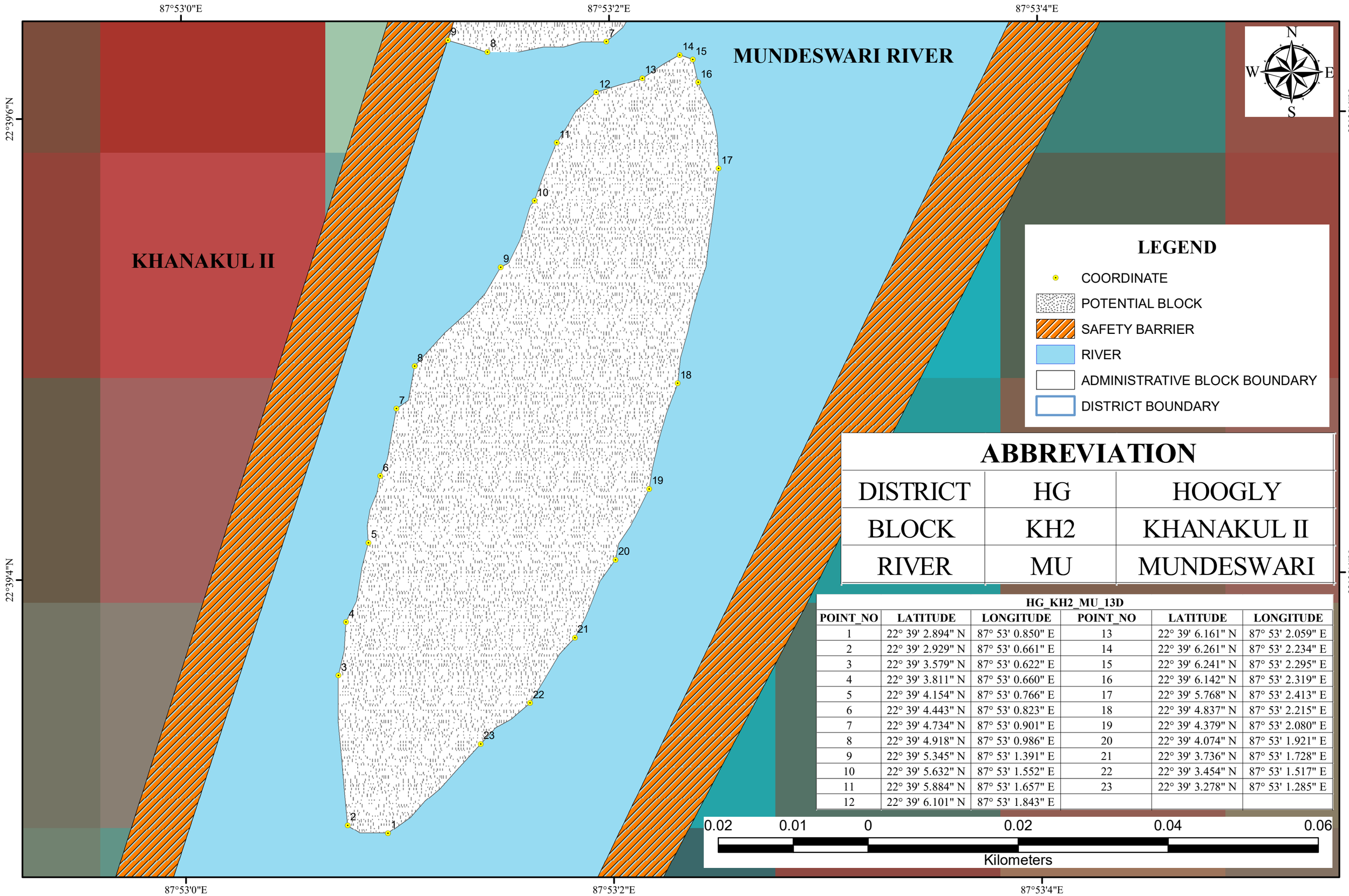
ABBREVIATION

DISTRICT	HG	HOOGLY
BLOCK	KH2	KHANAKUL II
RIVER	MU	MUNDESWARI

HG_KH2_MU_13C

POINT_NO	LATITUDE	LONGITUDE
1	22° 39' 9.453" N	87° 53' 2.976" E
2	22° 39' 9.233" N	87° 53' 3.238" E
3	22° 39' 8.833" N	87° 53' 3.414" E
4	22° 39' 8.286" N	87° 53' 3.442" E
5	22° 39' 8.027" N	87° 53' 3.280" E
6	22° 39' 7.327" N	87° 53' 2.618" E
7	22° 39' 6.321" N	87° 53' 1.892" E
8	22° 39' 6.278" N	87° 53' 1.336" E
9	22° 39' 6.332" N	87° 53' 1.152" E
10	22° 39' 6.627" N	87° 53' 1.258" E

POTENTIAL BLOCK HG_KH2_MU_13D OF MUNDESWARI RIVER



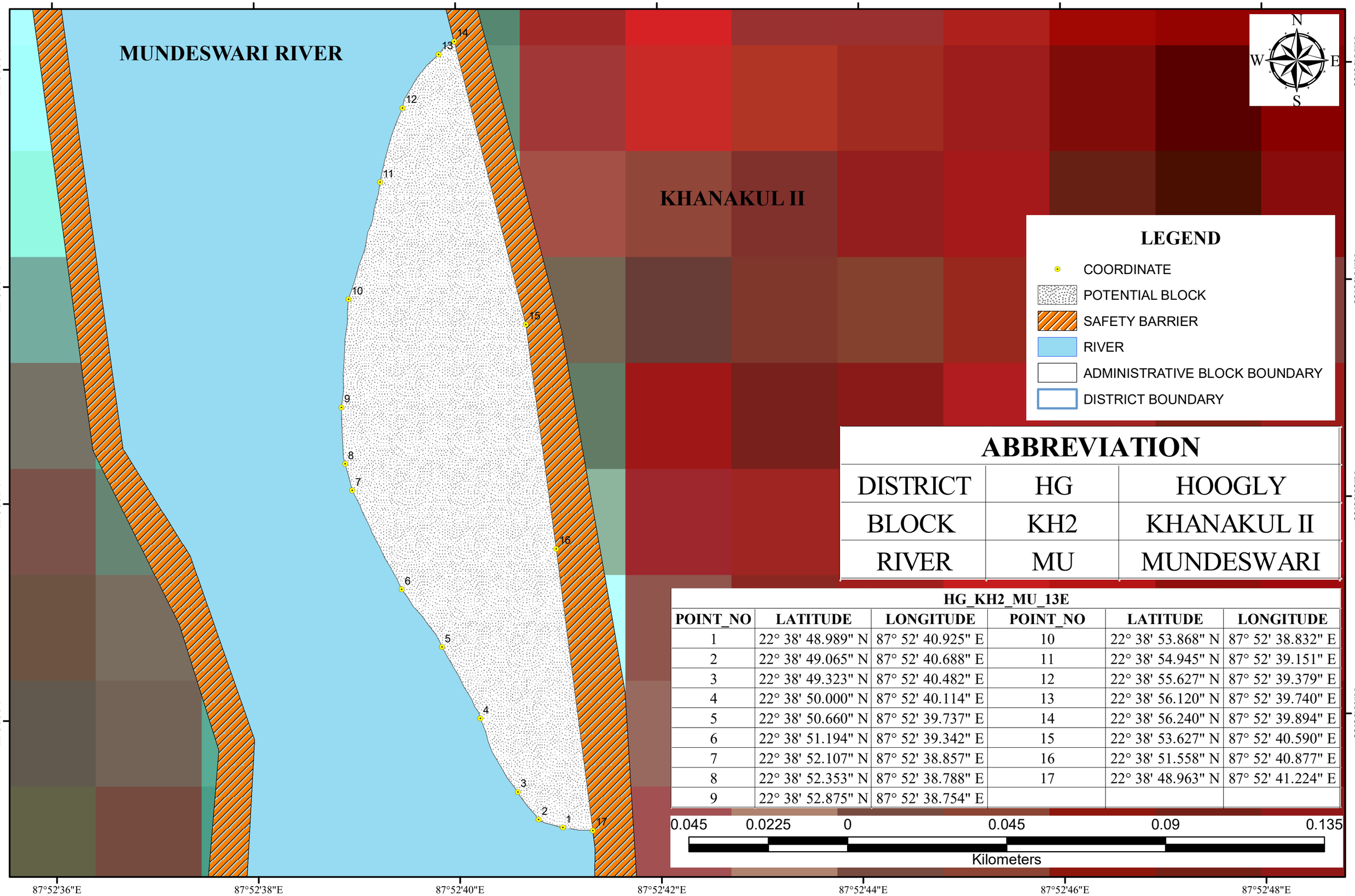
ABBREVIATION

DISTRICT	HG	HOOGLY
BLOCK	KH2	KHANAKUL II
RIVER	MU	MUNDESWARI

HG_KH2_MU_13D

POINT_NO	LATITUDE	LONGITUDE	POINT_NO	LATITUDE	LONGITUDE
1	22° 39' 2.894" N	87° 53' 0.850" E	13	22° 39' 6.161" N	87° 53' 2.059" E
2	22° 39' 2.929" N	87° 53' 0.661" E	14	22° 39' 6.261" N	87° 53' 2.234" E
3	22° 39' 3.579" N	87° 53' 0.622" E	15	22° 39' 6.241" N	87° 53' 2.295" E
4	22° 39' 3.811" N	87° 53' 0.660" E	16	22° 39' 6.142" N	87° 53' 2.319" E
5	22° 39' 4.154" N	87° 53' 0.766" E	17	22° 39' 5.768" N	87° 53' 2.413" E
6	22° 39' 4.443" N	87° 53' 0.823" E	18	22° 39' 4.837" N	87° 53' 2.215" E
7	22° 39' 4.734" N	87° 53' 0.901" E	19	22° 39' 4.379" N	87° 53' 2.080" E
8	22° 39' 4.918" N	87° 53' 0.986" E	20	22° 39' 4.074" N	87° 53' 1.921" E
9	22° 39' 5.345" N	87° 53' 1.391" E	21	22° 39' 3.736" N	87° 53' 1.728" E
10	22° 39' 5.632" N	87° 53' 1.552" E	22	22° 39' 3.454" N	87° 53' 1.517" E
11	22° 39' 5.884" N	87° 53' 1.657" E	23	22° 39' 3.278" N	87° 53' 1.285" E
12	22° 39' 6.101" N	87° 53' 1.843" E			

POTENTIAL BLOCK HG_KH2_MU_13E OF MUNDESWARI RIVER



LEGEND

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

ABBREVIATION

DISTRICT	HG	HOOGLY
BLOCK	KH2	KHANAKUL II
RIVER	MU	MUNDESWARI

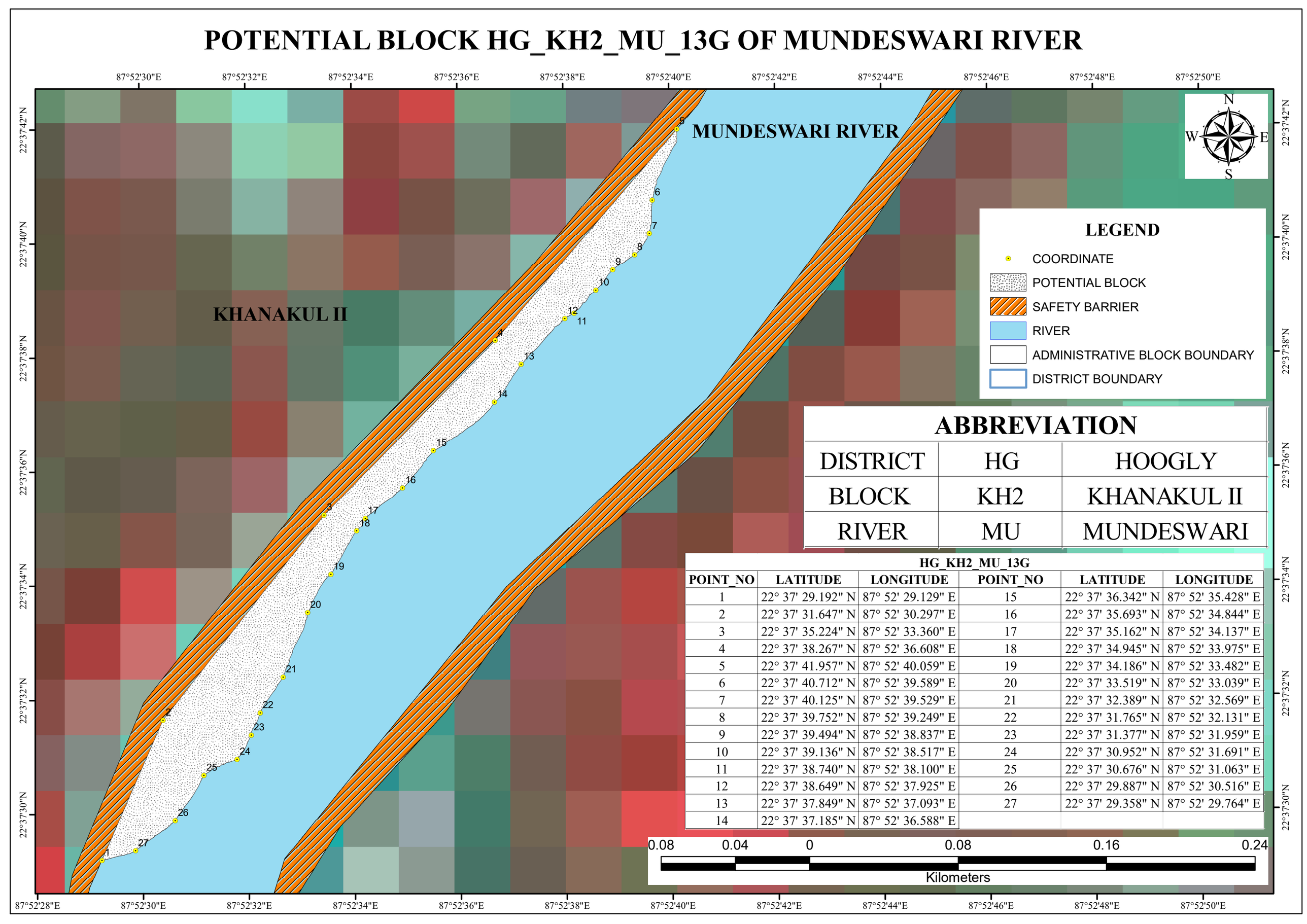
HG_KH2_MU_13E

POINT_NO	LATITUDE	LONGITUDE	POINT_NO	LATITUDE	LONGITUDE
1	22° 38' 48.989" N	87° 52' 40.925" E	10	22° 38' 53.868" N	87° 52' 38.832" E
2	22° 38' 49.065" N	87° 52' 40.688" E	11	22° 38' 54.945" N	87° 52' 39.151" E
3	22° 38' 49.323" N	87° 52' 40.482" E	12	22° 38' 55.627" N	87° 52' 39.379" E
4	22° 38' 50.000" N	87° 52' 40.114" E	13	22° 38' 56.120" N	87° 52' 39.740" E
5	22° 38' 50.660" N	87° 52' 39.737" E	14	22° 38' 56.240" N	87° 52' 39.894" E
6	22° 38' 51.194" N	87° 52' 39.342" E	15	22° 38' 53.627" N	87° 52' 40.590" E
7	22° 38' 52.107" N	87° 52' 38.857" E	16	22° 38' 51.558" N	87° 52' 40.877" E
8	22° 38' 52.353" N	87° 52' 38.788" E	17	22° 38' 48.963" N	87° 52' 41.224" E
9	22° 38' 52.875" N	87° 52' 38.754" E			

0.045 0.0225 0 0.045 0.09 0.135

Kilometers

POTENTIAL BLOCK HG_KH2_MU_13G OF MUNDESWARI RIVER



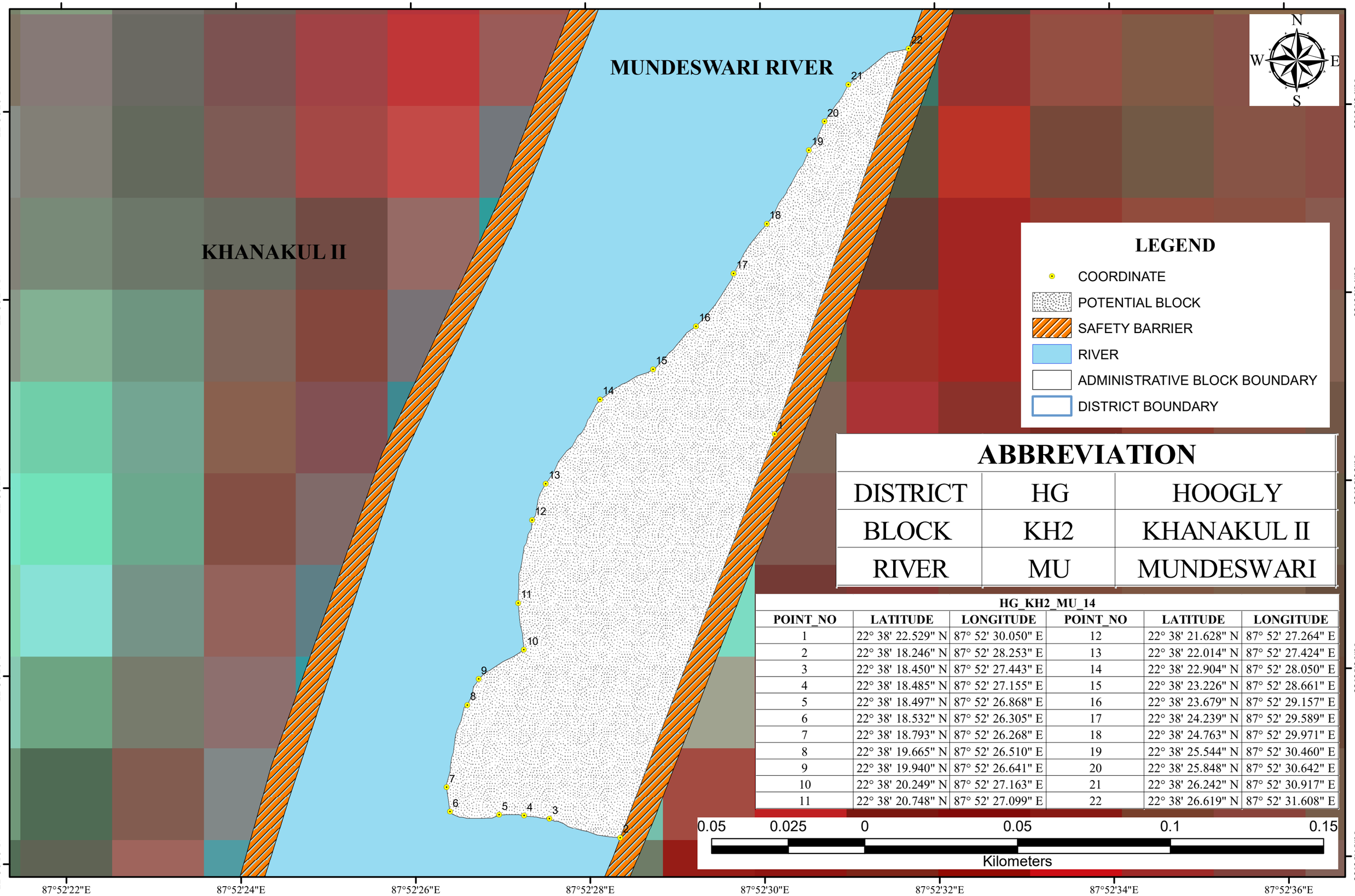
ABBREVIATION

DISTRICT	HG	HOOGLY
BLOCK	KH2	KHANAKUL II
RIVER	MU	MUNDESWARI

HG_KH2_MU_13G

POINT_NO	LATITUDE	LONGITUDE	POINT_NO	LATITUDE	LONGITUDE
1	22° 37' 29.192" N	87° 52' 29.129" E	15	22° 37' 36.342" N	87° 52' 35.428" E
2	22° 37' 31.647" N	87° 52' 30.297" E	16	22° 37' 35.693" N	87° 52' 34.844" E
3	22° 37' 35.224" N	87° 52' 33.360" E	17	22° 37' 35.162" N	87° 52' 34.137" E
4	22° 37' 38.267" N	87° 52' 36.608" E	18	22° 37' 34.945" N	87° 52' 33.975" E
5	22° 37' 41.957" N	87° 52' 40.059" E	19	22° 37' 34.186" N	87° 52' 33.482" E
6	22° 37' 40.712" N	87° 52' 39.589" E	20	22° 37' 33.519" N	87° 52' 33.039" E
7	22° 37' 40.125" N	87° 52' 39.529" E	21	22° 37' 32.389" N	87° 52' 32.569" E
8	22° 37' 39.752" N	87° 52' 39.249" E	22	22° 37' 31.765" N	87° 52' 32.131" E
9	22° 37' 39.494" N	87° 52' 38.837" E	23	22° 37' 31.377" N	87° 52' 31.959" E
10	22° 37' 39.136" N	87° 52' 38.517" E	24	22° 37' 30.952" N	87° 52' 31.691" E
11	22° 37' 38.740" N	87° 52' 38.100" E	25	22° 37' 30.676" N	87° 52' 31.063" E
12	22° 37' 38.649" N	87° 52' 37.925" E	26	22° 37' 29.887" N	87° 52' 30.516" E
13	22° 37' 37.849" N	87° 52' 37.093" E	27	22° 37' 29.358" N	87° 52' 29.764" E
14	22° 37' 37.185" N	87° 52' 36.588" E			

POTENTIAL BLOCK HG_KH2_MU_14 OF MUNDESWARI RIVER



ABBREVIATION		
DISTRICT	HG	HOOGLY
BLOCK	KH2	KHANAKUL II
RIVER	MU	MUNDESWARI

HG_KH2_MU_14

POINT_NO	LATITUDE	LONGITUDE	POINT_NO	LATITUDE	LONGITUDE
1	22° 38' 22.529" N	87° 52' 30.050" E	12	22° 38' 21.628" N	87° 52' 27.264" E
2	22° 38' 18.246" N	87° 52' 28.253" E	13	22° 38' 22.014" N	87° 52' 27.424" E
3	22° 38' 18.450" N	87° 52' 27.443" E	14	22° 38' 22.904" N	87° 52' 28.050" E
4	22° 38' 18.485" N	87° 52' 27.155" E	15	22° 38' 23.226" N	87° 52' 28.661" E
5	22° 38' 18.497" N	87° 52' 26.868" E	16	22° 38' 23.679" N	87° 52' 29.157" E
6	22° 38' 18.532" N	87° 52' 26.305" E	17	22° 38' 24.239" N	87° 52' 29.589" E
7	22° 38' 18.793" N	87° 52' 26.268" E	18	22° 38' 24.763" N	87° 52' 29.971" E
8	22° 38' 19.665" N	87° 52' 26.510" E	19	22° 38' 25.544" N	87° 52' 30.460" E
9	22° 38' 19.940" N	87° 52' 26.641" E	20	22° 38' 25.848" N	87° 52' 30.642" E
10	22° 38' 20.249" N	87° 52' 27.163" E	21	22° 38' 26.242" N	87° 52' 30.917" E
11	22° 38' 20.748" N	87° 52' 27.099" E	22	22° 38' 26.619" N	87° 52' 31.608" E

Annexure 5
SEIAA 88th Meeting (21st February, 2023) Minutes of Meeting

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State Environment Impact Assessment Authority
West Bengal
Minutes of SEIAA Meeting

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Subject:	**88th meeting of SEIAA**
Venue:-	**Conference Room of Environment Department, Prani Sampad Bhavan, 5th Floor, LB – Block, Sector – III, Salt Lake, Kolkata – 700106**
From :-	**21 February 2023**
To :-	**21 February 2023**

(1) Proposed construction of a Residential complex with all modern amenities at Premises No. 1, Rustomjee Parsee Road, Ward No. 6, Borough– I, P.S. – Cossipore, Kolkata – 700002, West Bengal by **M/s. Oswal Residential Buildings LLP.**

Proposal No. :- SIA/WB/INFRA2/408662/2022, File No. : EN/T-II-1/078/2022, Type-EC

INTRODUCTION

The proponent made online application vide proposal no. **SIA/WB/INFRA2/408662/2022** dated **03 Dec 2022** 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. **8(a) Building / Construction** projects under Category "**B2**" of EIA Notification 2006.

SEAC recommended the proposed project for Environmental Clearance during its 63rd meeting held on 18.01.2023.

PROJECT DETAILS

The project of M/s **Oswal Residential Buildings LLP** located in as follows :

S. No.	State	District
(1.)	West Bengal	Kolkata

DELIBERATION IN SEIAA

SEIAA considered the recommendation of SEAC and observed that the project proponent (PP) should submit the following in the PARIVESH Portal:-

1. **Original land ownership document/s.**
2. **Original land classification document and subsequent changes, if any.**
3. **In case the proposed project area belonged to more than one owner, an amalgamation certificate from KMC.**
4. **NGT order dated 13.02.2015 and its compliance.**
5. **Guidelines framed by the trustees of KOPT as mentioned in the point no. 2(i) in the letter vide no. Admn./6454/Antrix Housing/2 dated 16.08.2016.**

RECOMMENDATIONS OF SEIAA

Therefore, the application for EC is deferred for additional information.

CONCLUSION

Deferred (Additional Information).

(2) Proposed project for installation of 2x10 Tonnes Induction Furnaces at JL No. 90, Touzi No. 1, C.S. Plot Nos. 33(P), 34(P), 35(F), 36(F), 37(F), 38(F), 57(P), 61(P), 596(P), 597(P), 698(P), 599(P), 600(P), 602(P), 604(P), 605(P), 606(P), 608(P), 609(P), 36/532, Touzi No. 10, C.S. Plot Nos. 37(P), 38(P), 39(F), 40(F), 41(P), 42(P), 579(P), 589(P), 590(P), 591(F), 592(F), 593(P), 594(P), 595(P), 597(P), 427(F), Raturia, Angadpur Industrial Area, Dist – Paschim Bardhaman, Durgapur – 713215, West Bengal by **M/s. C. P. Re-Rollers Limited.**

Proposal No. :- SIA/WB/IND/69795/2019, File No. : EN/T-II-1/021/2019, Type-EC

INTRODUCTION

The proponent made online application vide proposal no. **SIA/WB/IND/69795/2019** dated **08 Dec 2021** 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 project proponent (PP) obtained ToR for the proposed project vide Memo No. 414-2N-26/2019(E) dated 06.05.2019 against proposal no. SIA/WB/IND/30878/2019.

SEAC recommended the proposed project for Environmental Clearance during its 50th meeting held on 31.08.2022 with the additional conditions mentioned in O.M. issued by MoEF&CC vide F No. 22-23/2018.IA.III(Pt.) dated 31.10.2019 as the project is located within the municipal boundaries of Durgapur Municipal Corporation which is declared as Severely Polluted Area.

The proposal was placed before SEIAA in its 79th meeting held on 10.11.2022 and it was observed that some documents required to be uploaded in the PARIVESH Portal. The project proponent uploaded documents on 15.02.2023.

PROJECT DETAILS

The project of M/s **C. P. Re-Rollers Limited** located in as follows :

S. No.	State	District
(1.)	West Bengal	Paschim Bardhaman

DELIBERATION IN SEIAA

SEIAA considered the submission uploaded by the project proponent on 15.02.2023 and observed that based on the order of the Hon'ble NGT, Eastern Bench, Kolkata decided to conduct a site inspection of the industrial unit on 28.02.2023 and a hearing of the PP on 02.03.2023 before passing appropriate orders. It was also observed that the plantation plan approved by the DFO is to be uploaded.

RECOMMENDATIONS OF SEIAA

Therefore, the application for EC is deferred for further consideration.

CONCLUSION

Deferred for further consideration.

(3) Proposed Residential, mercantile & MLCP project near Vega Circle Mall, Sevok Road, at Plot no. (LR) – 555, 611, Plot no. (RS) – 82, 82/298, 81/297, Khatian no. (LR) – 545, 2516, Khatian no. (RS) – 282/1, 282/3, 282/5, JL No.- 02, Mouza- Dabgram, Parganas Baikunthapur, P.S.- Bhaktinagar, District- Jalpaiguri, under Siliguri Municipal Corporation, West Bengal by **M/s. Shree Vinayak Constructions.**

Proposal No. :- SIA/WB/MIS/257178/2022, File No. : EN/T-II-1/008/2022, Type-EC

INTRODUCTION

The proponent made online application vide proposal no. **SIA/WB/MIS/257178/2022** dated **17 Feb 2022** 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. **8(a) Building and Construction** projects under Category "**B2**" of EIA Notification 2006.

The SEAC in its 55th meeting held on 09.11.2022 recommended that based on the letter vide No. 2945/WL/2W-682(Part-III)/2019 dated 28.09.2022 received from Principal Chief Conservator of Forest (Wildlife) and Chief Wildlife Warden wherein it was confirmed that the proposed project site is falling within the eco-sensitive zone of Mahananda Wildlife Sanctuary. Hon'ble Supreme Court of India in its order dated 03.06.2022 in its L.A No.1000 of 2003 in W.P.202 of 1995 ordered that no new structure shall be permitted to come up in ESZ, hence, permission for the above proposal (SIA/WB/MIS/257178/2022) cannot be granted.

The proposal was placed before SEIAA in its 81st meeting held on 06.12.2022 and it was decided to request the PP for a hearing before the final decision on the EC application is taken. Accordingly, the PP is requested to appear before SEIAA for hearing in the 88th meeting on 21.02.2023.

PROJECT DETAILS

The project of M/s. **Shree Vinayak Constructions** located in as follows :

S. No.	State	District
(1.)	West Bengal	Jalpaiguri

DELIBERATION IN SEIAA

The PP attended the hearing before SEIAA and submitted copies of few documents from the Divisional Forest Officer, Darjeeling Wildlife Division along with enclosures wherein it is mentioned that the project site lies at a distance of about 6.35 km and 6.6 km respectively which is falling out of ESZ declared for Mahananda Wildlife Sancutary. The PP to be intimated to submit NOC / clearance from Chief Wildlife Warden, West Bengal in this regard.

RECOMMENDATIONS OF SEIAA

Therefore, the application for EC is deferred for additional information.

CONCLUSION

Deferred (Additional Information).

(4) Proposed Dhantali Sand Mine on Bura Raidak river in area of 1.21 Ha. (3.00 Acres) at Plot No: 05(RS), JL No.: 28, Mouza – Dhantali, Block – Kumargram, Dist – Alipurduar, West Bengal by **Atiar Rahaman.**

Proposal No. :- SIA/WB/MIN/412060/2022, File No. : EN/T-II-1/003/2023, Type-EC

INTRODUCTION

The proponent made online application vide proposal no. **SIA/WB/MIN/412060/2022** dated **28 Dec 2022** 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. **1(a) Mining of minerals** projects under Category "**B2**" of EIA Notification 2006.

SEAC recommended for rejection of the proposed project for Environmental Clearance during its 63rd meeting held on 18.01.2023. Based on the submission and presentation made by the project proponent, the SEAC during its 63rd meeting held on 18.01.2023 observed that the plot area for the proposed project (geo-coordinates) as reported in the approved Mine Plan does not fall within the potential mining zone recorded in the approved District Survey Report (DSR) of Alipurduar district. SEAC further observed that the plot area appears to be near Buxa National Park. The PP has not uploaded valid LoI, cluster certificate from the competent authority, and other relevant documents from the competent authority.

The SEAC, therefore, recommended that the proposed project, in its present form, cannot be considered for further processing of Environmental Clearance.

PROJECT DETAILS

The project of **Atiar Rahaman** located in as follows :

S. No.	State	District
(1.)	West Bengal	Alipurduar

DELIBERATION IN SEIAA

SEIAA considered the recommendation of SEAC and accepted the same.

RECOMMENDATIONS OF SEIAA

The EC application is rejected.

CONCLUSION

Rejected.

(5) Proposed Chittalghata Sand & stone Mine on Mahananda river in area of 11.24 Acres / 4.55 Ha. at Plot No: 604, 606, 607, 610, 612, 613, 619, 620, 622, 624-627, 630, JL No.: 1, Mouza – Chittalghata, PS – Chopra, Dist – Uttar Dinajpur, West Bengal by **Krishna Agarwal.**

Proposal No. :- SIA/WB/MIN/408730/2022, File No. : EN/T-II-1/002/2023, Type-EC

INTRODUCTION

The proponent made online application vide proposal no. **SIA/WB/MIN/408730/2022** dated

22 Dec 2022 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. **1(a) Mining of minerals** projects under Category "**B2**" of EIA Notification 2006.

SEAC recommended for rejection of the proposed project for Environmental Clearance during its 63rd meeting held on 18.01.2023. Based on the submission and presentation made by the PP, the SEAC during its 63rd meeting held on 18.01.2023 observed that the plot area for the proposed project (geo-coordinates) as reported in the approved Mine Plan does not fall within the potential mining zone recorded in the approved District Survey Report (DSR) of Uttar Dinajpur district. Also, the PP has not uploaded valid LoI, cluster certificate from the competent authority, and a few other relevant documents.

The SEAC, therefore, recommended that the proposed project, in its present form, cannot be considered for further processing of Environmental Clearance.

PROJECT DETAILS

The project of **Krishna Agarwal** located in as follows :

S. No.	State	District
(1.)	West Bengal	Uttar Dinajpur

DELIBERATION IN SEIAA

SEIAA considered the recommendation of SEAC and accepted the same.

RECOMMENDATIONS OF SEIAA

The EC application is rejected.

CONCLUSION

Rejected.

(6) Proposed Kotalsole Sand Mine on Kangsabati river in area of 11.86 Acres / 4.80 Ha. at Plot No: 194, JL No.: 108, Mouza – Kotalsole, Block & PS – Sarenga, Dist – Bankura, West Bengal by **Arun Kumar.**

Proposal No. :- SIA/WB/MIN/411215/2022, File No. : EN/T-II-1/117/2022, Type-EC

INTRODUCTION

The proponent made online application vide proposal no. **SIA/WB/MIN/411215/2022** dated **18 Dec 2022** 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. **1(a) Mining of minerals** under Category "**B2**" of EIA Notification 2006.

SEAC recommended for rejection of the proposed project for Environmental Clearance during its 63rd meeting held on 18.01.2023. Based on the submission and presentation made by the PP, the SEAC during its 63rd meeting held on 18.01.2023 observed that the plot area for the proposed project (geo-coordinates) as reported in the approved Mine Plan does not fall within the potential mining zone recorded in the approved District Survey Report (DSR) of Bankura district. Also, the PP has not uploaded valid LoI, cluster certificate from the competent authority, and other relevant documents.

The SEAC, therefore, recommended that the proposed project, in its present form, cannot be considered for further processing of Environmental Clearance.

PROJECT DETAILS

The project of **Arun Kumar** located in as follows :

S. No.	State	District
(1.)	West Bengal	Bankura

DELIBERATION IN SEIAA

SEIAA considered the recommendation of SEAC and accepted the same.

RECOMMENDATIONS OF SEIAA

The EC application is rejected.

CONCLUSION

Rejected.

(7) Proposed Chhoto Chowkirboss Sand Mine on river Raidak-I in area of : 2.89 Acres (1.95 Ha) at Plot No: 430, 447, 448, 750, & 752(LR), JL No.: 124, Mouza – Chhoto Chowkirboss, Block – Alipurduar II, Dist - Alipurduar, West Bengal by **S Agarwal.**

Proposal No. :- SIA/WB/MIN/409371/2022, File No. : EN/T-II-1/116/2022, Type-EC

INTRODUCTION

The proponent made online application vide proposal no. **SIA/WB/MIN/409371/2022** dated **14 Dec 2022** 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. **1(a) Mining of minerals** under Category "**B2**" of EIA Notification 2006.

SEAC recommended for rejection of the proposed project for Environmental Clearance during its 63rd meeting held on 18.01.2023. Based on the submission and presentation made by the PP, the SEAC during its 63rd meeting held on 18.01.2023 observed that the plot area for the proposed project (geo-coordinates) as reported in the approved Mine Plan does not fall within the potential mining zone recorded in the approved District Survey Report (DSR) of Alipurduar district. SEAC further observed that the plot area appears to be near Buxa National Park.

The SEAC, therefore, recommended that the proposed project, in its present form, cannot be considered for further processing of Environmental Clearance.

PROJECT DETAILS

The project of **S Agarwal** located in as follows :

S. No.	State	District
(1.)	West Bengal	Alipurduar

DELIBERATION IN SEIAA

SEIAA considered the recommendation of SEAC and accepted the same.

RECOMMENDATIONS OF SEIAA

The EC application is rejected.

CONCLUSION

Rejected.

(8) Proposed Malbagicha Sand Mine on river Silabati in area of 2.82 acres (1.14 Ha) at Plot No. 48(P), 56, 57(P), 58(P), 59, 60, 61(P), & 62(P), J.L. No.- 411, Mouza – Malbagicha, PS – Garhbeta, Dist – Paschim Medinipur, West Bengal by **Ataur Rahaman Mondal.**

Proposal No. :- SIA/WB/MIN/260787/2022, File No. : EN/T-II-1/080/2022, Type-EC

INTRODUCTION

The proponent made online application vide proposal no. **SIA/WB/MIN/260787/2022** dated **13 Dec 2022** 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. **1(a) Mining of minerals** under Category "**B2**" of EIA Notification 2006.

SEAC recommended for rejection of the proposed project for Environmental Clearance during its 63rd meeting held on 18.01.2023. Based on the submission and presentation made by the PP, the SEAC during its 63rd meeting held on 18.01.2023 observed that the plot area for the proposed project (geo-coordinates) as reported in the approved Mine Plan does not fall within the potential mining zone recorded in the approved District Survey Report (DSR) of Paschim Medinipur district. Also, the PP has not uploaded valid LoI, cluster certificate from the competent authority, and a few other relevant documents.

The SEAC, therefore, recommended that the proposed project, in its present form, cannot be considered for further processing of Environmental Clearance.

PROJECT DETAILS

The project of **Ataur Rahaman Mondal** located in as follows :

S. No.	State	District
(1.)	West Bengal	Paschim Medinipur

DELIBERATION IN SEIAA

SEIAA considered the recommendation of SEAC and accepted the same.

RECOMMENDATIONS OF SEIAA

The EC application is rejected.

CONCLUSION

Rejected.

(9) Proposed Chhipra Sand Mine on river Raidak-I in area of 2.82 Ha. at Plot no: 336, 337 & 355 (LR), J.L. No.-125, Mouza: Chhipra, Block: Alipurduar-II, District: Alipurduar, West Bengal by **HMHG Construction.**

Proposal No. :- SIA/WB/MIN/409416/2022, File No. : EN/T-II-1/115/2022, Type-EC

INTRODUCTION

The proponent made online application vide proposal no. **SIA/WB/MIN/409416/2022** dated **13 Dec 2022** 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. **1(a) Mining of minerals** under Category "**B2**" of EIA Notification 2006.

SEAC recommended for rejection of the proposed project for Environmental Clearance during its 63rd meeting held on 18.01.2023. Based on the submission and presentation made by the PP, the SEAC during its 63rd meeting held on 18.01.2023 observed that the plot area for the proposed project (geo-coordinates) as reported in the approved Mine Plan does not fall within the potential mining zone recorded in the approved District Survey Report (DSR) of Alipurduar district. SEAC further observed that the plot area appears to be near Buxa National Park.

The SEAC, therefore, recommended that the proposed project, in its present form, cannot be considered for further processing of Environmental Clearance.

PROJECT DETAILS

The project of M/s. **HMHG Construction** located in as follows :

S. No.	State	District
(1.)	West Bengal	Alipurduar

DELIBERATION IN SEIAA

SEIAA considered the recommendation of SEAC and accepted the same.

RECOMMENDATIONS OF SEIAA

The EC application is rejected.

CONCLUSION

Rejected.

(10) Proposed Bhalukmura Sand Mine on river Silabati in area of 5 acres (2.02 Ha) at Plot No. 16(P), 63(P) & 77(P), J.L. No.- 795, Mouza – Bhalukmura, PS – Garhbeta, Dist – Paschim Medinipur, West Bengal by **Prasanta Karak.**

Proposal No. :- SIA/WB/MIN/260047/2022, File No. : EN/T-II-1/081/2022, Type-EC

INTRODUCTION

The proponent made online application vide proposal no. **SIA/WB/MIN/260047/2022** dated **12 Dec 2022** 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. **1(a) Mining of minerals** under Category "**B2**" of EIA Notification 2006.

SEAC recommended for rejection of the proposed project for Environmental Clearance during its 63rd meeting held on 18.01.2023. Based on the submission and presentation made by the PP, the SEAC during its 63rd meeting held on 18.01.2023 observed that the plot area for the proposed project (geo-coordinates) as reported in the approved Mine Plan does not fall within the potential mining zone recorded in the approved District Survey Report (DSR) of Paschim Medinipur district. Also, the PP has not uploaded valid LoI, cluster certificate from the competent authority, and a few other relevant documents.

The SEAC, therefore, recommended that the proposed project, in its present form, cannot be considered for further processing of Environmental Clearance.

PROJECT DETAILS

The project of **Prasanta Karak** located in as follows :

S. No.	State	District
(1.)	West Bengal	Paschim Medinipur

DELIBERATION IN SEIAA

SEIAA considered the recommendation of SEAC and accepted the same.

RECOMMENDATIONS OF SEIAA

The EC application is rejected.

CONCLUSION

Rejected.

(11) Proposed Bangpur Sand Mine on river Damodar in area of 7.96 acres (3.22 Ha) at Plot No. 1859(P), 1860(P) & ors. J.L. No.- 32, Mouza – Bangpur, PS – Bardhaman, Dist – Purba Bardhaman, West Bengal by **Sanjay Bhakta.**

Proposal No. :- SIA/WB/MIN/409062/2022, File No. : EN/T-II-1/119/2022, Type-EC

INTRODUCTION

The proponent made online application vide proposal no. **SIA/WB/MIN/409062/2022** dated **08 Dec 2022** 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. **1(a) Mining of minerals** under Category "**B2**" of EIA Notification 2006.

SEAC recommended for rejection of the proposed project for Environmental Clearance during its 63rd meeting held on 18.01.2023. Based on the submission and presentation made by the PP, the SEAC during its 63rd meeting held on 18.01.2023 observed that the plot area for the proposed project (geo-coordinates) as reported in the approved Mine Plan does not fall within the potential mining zone recorded in the approved District Survey Report (DSR) of Purba Bardhaman district. Also, the PP has not uploaded valid LoI, cluster certificate from the competent authority, and a few other relevant documents.

The SEAC, therefore, recommended that the proposed project, in its present form, cannot be considered for further processing of Environmental Clearance.

PROJECT DETAILS

The project of **Sanjay Bhakta** located in as follows :

S. No.	State	District
(1.)	West Bengal	Purba Bardhaman

DELIBERATION IN SEIAA

SEIAA considered the recommendation of SEAC and accepted the same.

RECOMMENDATIONS OF SEIAA

The EC application is rejected.

CONCLUSION

Rejected.

(12) Proposed Nimai Sand and Stone Mine in NIMAI SIL 8 Sand Block on river Balason in the area of 2.7 Ha (6.67 Acres) at Mouza - Nimai, J.L. No.: 57, Plot Nos. 289(P), 290(P), 315(P), 321(P), 322(P), P.S. – Matigara, Dist. – Darjeeling, West Bengal by **Santosh Singh.**

Proposal No. :- SIA/WB/MIN/273925/2022, File No. : EN/T-II-1/010/2023, Type-EC

INTRODUCTION

The proponent made online application vide proposal no. **SIA/WB/MIN/273925/2022** dated **28 Nov 2022** 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. **1(a) Mining of minerals** under Category "**B2**" of EIA Notification 2006.

SEAC recommended for rejection of the proposed project for Environmental Clearance during its 64th meeting held on 01.02.2023. This application for EC was noted to be a duplicate one. An earlier application for the same project was considered in the 61st meeting of SEAC held on 04.01.2023. Considering the above, the SEAC recommended that the proposal may be rejected.

PROJECT DETAILS

The project of **Santosh Singh** located in as follows :

S. No.	State	District
(1.)	West Bengal	Darjeeling

DELIBERATION IN SEIAA

SEIAA considered the recommendation of SEAC and accepted the same.

RECOMMENDATIONS OF SEIAA

The EC application is rejected.

CONCLUSION
Rejected.

(13) Proposed Fakirpur Sand Mine on river Damodar over an area of 5 Ha (12.33 Acres) at Mouza - Fakirpur, J.L. No.: 25, Plot No. 1293(P), 1377(P) etc. P.S. – Bardhaman, Dist. – Purba Bardhaman, West Bengal by **Mohan Choudhury.**

Proposal No. :- SIA/WB/MIN/264681/2022, File No. : EN/T-II-1/019/2023, Type-EC

INTRODUCTION

The proponent made online application vide proposal no. **SIA/WB/MIN/264681/2022** dated **24 Dec 2022** 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. **1(a) Mining of minerals** under Category "**B2**" of EIA Notification 2006.

SEAC recommended for rejection of the proposed project for Environmental Clearance during its 64th meeting held on 01.02.2023. The PP appeared for the presentation without NABET accredited consultant. It was also observed that the lease area is 5 ha. and therefore, should have been applied under ToR category as specified in the O.M. issued by MoEF&CC dated 12.12.2018.

Based on the submission and presentation made by the PP, the SEAC observed that the geo-coordinates of the proposed plot given in the approved Mining cum Progressive Mine Closure Plan does not give a proper representation of the lease area for the proposed project. Also, the PP has not uploaded valid LOI, original LOI mentioning the plot nos. showing the exact location, cluster certificate from the competent authority, and other related documents.

The SEAC, therefore, recommended that the proposed project, in its present form, cannot be considered for further processing of Environmental Clearance.

PROJECT DETAILS

The project of **Mohan Choudhury** located in as follows :

S. No.	State	District
(1.)	West Bengal	Purba Bardhaman

DELIBERATION IN SEIAA

SEIAA considered the recommendation of SEAC and accepted the same.

RECOMMENDATIONS OF SEIAA

The EC application is rejected.

CONCLUSION

Rejected.

(14) Proposed Krishnadebpur Sand Mine on river Bhagirathi over an area of 1.84 Ha (4.54 Acres) at Mouza - Krishnadebpur, J.L. No.: 91 Plot No. 2251(P), (HAL 3199, 3200 & ORS., P.S. – Kalna, Dist. – Purba Bardhaman, West Bengal by **Basiruddin Seikh.**

Proposal No. :- SIA/WB/MIN/274629/2022, File No. : EN/T-II-1/016/2023, Type-EC

INTRODUCTION

The proponent made online application vide proposal no. **SIA/WB/MIN/274629/2022** dated **18 Jan 2023** 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. **1(a) Mining of minerals** under Category "**B2**" of EIA Notification 2006.

SEAC recommended for rejection of the proposed project for Environmental Clearance during its 64th meeting held on 01.02.2023. The PP appeared for the presentation without NABET accredited consultant. Based on the submission and presentation made by the PP, the SEAC observed that the plot area for the proposed project (geo-coordinates) as reported in the approved Mining cum Progressive Mine Closure Plan does not fall within the potential mining zone recorded in the approved District Survey Report (DSR) of Purba Bardhaman district. Also, the PP has not uploaded cluster certificate from the competent authority, and other related documents.

The SEAC, therefore, recommended that the proposed project, in its present form, cannot be considered for further processing of Environmental Clearance.

PROJECT DETAILS

The project of **Basiruddin Seikh** located in as follows :

S. No.	State	District
(1.)	West Bengal	Purba Bardhaman

DELIBERATION IN SEIAA

SEIAA considered the recommendation of SEAC and accepted the same.

RECOMMENDATIONS OF SEIAA

The EC application is rejected.

CONCLUSION

Rejected.

(15) Proposed Kansra Sand Mine on river Damodar over an area of 1.75 Ha (4.3 Acres) at Mouza - Kansra, J.L. No.: 44 Plot No. 1345(P), Block & P.S. – Jamalpur, Dist. – Purba Bardhaman, West Bengal by **Basudev Majhi.**

Proposal No. :- SIA/WB/MIN/262037/2022, File No. : EN/T-II-1/017/2023, Type-EC

INTRODUCTION

The proponent made online application vide proposal no. **SIA/WB/MIN/262037/2022** dated **26 Dec 2022** 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. **1(a) Mining of minerals** under Category "**B2**" of EIA Notification 2006.

SEAC recommended for rejection of the proposed project for Environmental Clearance during its 64th meeting held on 01.02.2023. The PP did not engage any NABET accredited environmental consultant and appeared himself for the EC presentation. Based on the submission and presentation made by the PP, the SEAC observed that the plot area for the proposed project (geo-coordinates) as reported in the approved Mining cum Progressive Mine Closure Plan does not fall within the potential mining zone recorded in the approved District Survey Report (DSR) of Purba Bardhaman district. Also, the PP has not uploaded valid LOI, original LOI mentioning the plot nos. showing the exact location and cluster certificate from the competent authority, and other related documents.

The SEAC, therefore, recommended that the proposed project, in its present form, cannot be considered for further processing of Environmental Clearance.

PROJECT DETAILS

The project of **Basudev Majhi** located in as follows :

S. No.	State	District
(1.)	West Bengal	Purba Bardhaman

DELIBERATION IN SEIAA

SEIAA considered the recommendation of SEAC and accepted the same.

RECOMMENDATIONS OF SEIAA

The EC application is rejected.

CONCLUSION

Rejected.

(16) Proposed Kogram Sand Mine on river Ajay over an area of 3.4 Ha (8.41 Acres) at Mouza - Kogram, J.L. No.: 58 Plot No. 284(P), 285(P) & Ors. P.S. – Mongalkote, Dist. – Purba Bardhaman, West Bengal by **Ashok Kumar Saha.**

Proposal No. :- SIA/WB/MIN/408625/2022, File No. : EN/T-II-1/015/2023, Type-EC

INTRODUCTION

The proponent made online application vide proposal no. **SIA/WB/MIN/408625/2022** dated **19 Jan 2023** 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. **1(a) Mining of minerals** under Category "**B2**" of EIA Notification 2006.

SEAC recommended for rejection of the proposed project for Environmental Clearance during its 64th meeting held on 01.02.2023. The PP did not engage any NABET accredited environmental consultant and appeared himself for the EC presentation. Based on the submission and presentation made by the PP, the SEAC observed that the plot area for the proposed project (geo-coordinates) as reported in the approved Mining cum Progressive Mine Closure Plan does not fall within the potential mining zone recorded in the approved District Survey Report (DSR) of Purba Bardhaman. Also, the PP has not uploaded pre-feasibility report and cluster certificate from the competent authority, and other related documents.

The SEAC, therefore, recommended that the proposed project, in its present form, cannot be considered for further processing of Environmental Clearance.

PROJECT DETAILS

The project of **Ashok Kumar Saha** located in as follows :

S. No.	State	District
(1.)	West Bengal	Purba Bardhaman

DELIBERATION IN SEIAA

SEIAA considered the recommendation of SEAC and accepted the same.

RECOMMENDATIONS OF SEIAA

The EC application is rejected.

CONCLUSION

Rejected.

(17) Proposed Bhattagram Sand Mine on river Silabati over an area of 0.80 Ha (1.98 Acres) at Mouza - Bhattagram, J.L. No.: 399, Plot No. 680(P), P.S. – Garhbeta, Dist. – Paschim Medinipur, West Bengal by **Mr. Bablu Sarkar.**

Proposal No. :- SIA/WB/MIN/259966/2022, File No. : EN/T-II-1/021/2023, Type-EC

INTRODUCTION

The proponent made online application vide proposal no. **SIA/WB/MIN/259966/2022** dated **21 Jan 2023** 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. **1(a) Mining of minerals** under Category "**B2**" of EIA Notification 2006.

SEAC recommended for rejection of the proposed project for Environmental Clearance during its 64th meeting held on 01.02.2023. Based on the submission and presentation made by the PP, the SEAC observed that the plot area for the proposed project (geo-coordinates) as reported in the approved Mine Plan does not fall within the potential mining zone recorded in the approved District Survey Report (DSR) of Paschim Medinipur district. Also, the PP has not uploaded valid LoI, cluster certificate from the competent authority and other related documents.

The SEAC, therefore, recommended that the proposed project, in its present form, cannot be considered for further processing of Environmental Clearance.

PROJECT DETAILS

The project of **Mr. Bablu Sarkar** located in as follows :

S. No.	State	District
(1.)	West Bengal	Paschim Medinipur

DELIBERATION IN SEIAA

SEIAA considered the recommendation of SEAC and accepted the same.

RECOMMENDATIONS OF SEIAA

The EC application is rejected.

CONCLUSION

Rejected.

(18) Proposed Idilpur Sand Mine on river Damodar over an area of 4.98 Ha (12.3 Acres) at Mouza - Idilpur, J.L. No.: 24, Plot No. 829(P) to 131(P), 1267, 1420(P), 1425(P) – 1428(P), 1430(P), 1431(P), 1436(P), 1603(P), 1604(P), P.S. – Bardhaman, Dist. – Purba Bardhaman, West Bengal by **Namita Enterprise, Idilpur.**

Proposal No. :- SIA/WB/MIN/262127/2022, File No. : EN/T-II-1/023/2023, Type-EC

INTRODUCTION

The proponent made online application vide proposal no. **SIA/WB/MIN/262127/2022** dated **23 Dec 2022** 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. **1(a) Mining of minerals** under Category "**B2**" of EIA Notification 2006.

SEAC recommended for rejection of the proposed project for Environmental Clearance during its 64th meeting held on 01.02.2023. The PP did not engage any NABET accredited environmental consultant and appeared himself for the EC presentation. Based on the submission and presentation made by the PP, the SEAC observed that the plot area for the proposed project (geo-coordinates) as reported in the approved Mining cum Progressive Mine Closure Plan does not fall within the potential mining zone recorded in the approved District Survey Report (DSR) of Purba Bardhaman. Also, the PP has not uploaded valid LoI, cluster certificate from the competent authority, and other related documents.

The SEAC, therefore, recommended that the proposed project, in its present form, cannot be considered for further processing of Environmental Clearance.

PROJECT DETAILS

The project of **Namita Enterprise, Idilpur** located in as follows :

S. No.	State	District
(1.)	West Bengal	Purba Bardhaman

DELIBERATION IN SEIAA

SEIAA considered the recommendation of SEAC and accepted the same.

RECOMMENDATIONS OF SEIAA

The EC application is rejected.

CONCLUSION

Rejected.

(19) Proposed Baranda Sand Mine on river Silabati over an area of 0.90 Ha (2.22 Acres) at Mouza - Baranda, J.L. No.: 572, Plot No. 1(P) P.S. – Garhbeta, Dist. – Paschim Medinipur, West Bengal by **Ataur Rahaman Mondal.**

Proposal No. :- SIA/WB/MIN/260727/2022, File No. : EN/T-II-1/020/2023, Type-EC

INTRODUCTION

The proponent made online application vide proposal no. **SIA/WB/MIN/260727/2022** dated **21 Jan 2023** 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. **1(a) Mining of minerals** under Category "**B2**" of EIA Notification 2006.

SEAC recommended for rejection of the proposed project for Environmental Clearance during its 64th meeting held on 01.02.2023. Based on the submission and presentation made by the PP, the SEAC observed that the plot area for the proposed project (geo-coordinates) as reported in the approved Mine Plan does not fall within the potential mining zone recorded in the approved District Survey Report (DSR) of Paschim Medinipur district. Also, the PP has not uploaded cluster certificate from the competent authority and other related documents.

The SEAC, therefore, recommended that the proposed project, in its present form, cannot be considered for further processing of Environmental Clearance.

PROJECT DETAILS

The project of **Ataur Rahaman Mondal** located in as follows :

S. No.	State	District
(1.)	West Bengal	Paschim Medinipur

DELIBERATION IN SEIAA

SEIAA considered the recommendation of SEAC and accepted the same.

RECOMMENDATIONS OF SEIAA

The EC application is rejected.

CONCLUSION

Rejected.

(20) Proposed Residential cum Commercial Complex at L.R. Plot No. – 81, 82, 83, 84, 101, 102, L.R. Khatian No. – 3409, J.L. No. – 72, Mouza – Kawakhari, Pargana – Patharghata, P.S. – Matigara, under Matigara Panchayat Samity, Dist. – Darjeeling, West Bengal by **M/s. Realm Construction** (VIOLATION CASE)**.**

Proposal No. :- SIA/WB/INFRA2/411577/2022, File No. : EN/T-II-1/004/2023, Type-TOR

INTRODUCTION

The proponent made online application under violation category vide proposal no. **SIA/WB/INFRA2/411577/2022** dated **26 Dec 2022** seeking Terms of reference (TOR) under the provisions of the EIA Notification, 2006 for the above mentioned proposed project. The proposed project activity is listed at S. No. **8(a) Building and Construction** projects under Category **B2** of EIA Notification, 2006.

The SEAC during its 62nd meeting held on 11.01.2023 recommended the proposal for Standard Terms of Reference under violation category.

PROJECT DETAILS

The project of **M/s. Realm Construction** located in as follows :

S. No.	State	District
(1.)	West Bengal	Darjeeling

The salient features of the project submitted by the project proponent is available at Report under online proposal no. **SIA/WB/INFRA2/411577/2022.**

DELIBERATION IN SEIAA

SEIAA considered the recommendation of SEAC and decided that the PP should provide the following documents:-

1. **A notarized affidavit as per the enclosed format given in Annexure – 1.**
2. **Land ownership documents along with mutation certificate.**
3. **Developers Agreement.**
4. **The plot nos. mentioned in the certificate in land conversion and other documents do not match with the land use certificate issued by Matigara Panchayat Samity.**
5. **Concurrence for waste water discharge, solid waste disposal and other services from the Competent**

Authority.

6. **Ground water permission from the Competent Authority indicating the quantity of water to be abstracted and also the running hours of the pump for the bore wells.**
7. **Power of Attorney in the name of M/s. Realm Construction.**
8. **Present status of construction of the project clearly showing the violation portion with photographs.**
9. **Commitment / undertaking regarding shape of '*Nalah'* to confirm that the character and physical *shape* of the said Nalah will remain unchanged. Management plan of the *Nalah* during construction phase and also for the post construction phase, along with plan of protection of the micro-flora and fauna at the bank of the *Nalah*. The ownership of that particular segment of a continuous *Nalah* should be ensured.**
10. **Depth of '*Nalah'* throughout the entire stretch.**
11. **No high-tension electrical line should run across the proposed project site. Communication with WBSEDCL regarding relocation of the pole should be submitted.**
12. **Basement depth. A report on the impact of basement on confined water /groundwater flow to be submitted.**
13. **Subsurface hydro-geological study of the area. Detail Chemical analysis of groundwater from at least nearby five wells along with their geographical location and depth should also be submitted with the hydrogeological report. Detail design of all artificial recharge structures should be submitted based on sub-surface geology.**
14. **Measures taken to control pollution from surface runoff during monsoon.**
15. **Storm water management during construction and post construction phase.**
16. **Undertaking to be submitted regarding location of recharge pits which should be shifted away from driveway.**
17. **While submitting the land use plan within the project area, the details (exact width) of underground service lines including fire, electrical, sewerage and drainage should be depicted with a different colour in order to assess that the area required for exclusive tree plantation does not overlap with these underground service lines. The plan should be certified by the project architect.**
18. **Proposal for organic waste composter.**

RECOMMENDATIONS OF SEIAA

Therefore, the application for EC is deferred for additional information.

CONCLUSION

Deferred (Additional Information).

Annexure – 1

UNDERTAKING for Building projects

(To be done on Non-Judicial Stamp Paper of valuation Rs.10/- and duly notarized)

I, son of _____(Father's Name)_____, resident _____(Address)_____ presently working as ____(Designation)_____ of M/ _____(Organization Name)_____ am an authorized person of the above named organization, do hereb solemnly declare and state as follows :

1) THAT M/s._____ are the project proponent in respect of the _____(Proje Name)_____.

2. THAT M/s._____ has constructed _____ sq.mt. built-up area at premis No._____.

3. THAT in terms of EIA Notification 2006 and amendments thereof, our project falls within the purview environment clearance.

4. THAT M/s._____ has failed to get prior environmental clearance as per statutory provisions of EI Notification due to the reasons mentioned below: (please mentioned the reasons) –

i.
ii.
iii.
iv.

5. THAT M/s._____ has submitted the application form for obtaining necessary Terms of Referen / Environmental Clearance as per EIA Notification, 2006 and its amendments issued by the Ministry of Environment, Forest Climate Change & Standard Operating Procedure (SoP) issued by MoEF&CC vide its OM dated 07.07.2021 which w upheld by hon'ble Supreme Court vide its order dated 09.12.2021 (MoEF&CC O.M. No.22-21/2020-IA.III[E 138949] dat 28.01.2022).

6. Now I, on behalf of the Project Proponent undertake the followings :-

a) To comply with all statutory requirements/norms, for obtaining Environmental Clearance;
b) To take all necessary permissions/licences/clearances from the concerned Government Departments and to subm compliance before the State Level Appraisal Committee, West Bengal;
c) To take all measures for the protection of the environment as may be prescribed by the Central Government or the Sta Government from time to time at the expenses of the project proponent.

7. THAT the project proponent also undertakes not to repeat such violation in future, in case of violation, the ToR/E shall be liable to be terminated.

The above-mentioned statements are true to the best of my knowledge and belief.

DEPONENT

(21) Proposed Jujuti Sand mining project of 9.13 acres / 3.69 Ha. in Damodar river at Plot No. 1101(P)/D, Mouza – Jujuti, JL No. 123, PS - Galsi, Dist – Purba Bardhaman, West Bengal by **Raja Ghosh.**

Proposal No. :- SIA/WB/MIN/60356/2021, File No. : EN/T-II-1/114/2022, Type-TOR

INTRODUCTION

The proponent made online application vide proposal no. **SIA/WB/MIN/60356/2021** dated **21 Dec 2022** seeking Terms of reference (TOR) under the provisions of the EIA Notification, 2006 for the above mentioned proposed project. The proposed project activity is listed at S. No. **1(a) Mining of minerals** projects under Category **B** of EIA Notification, 2006.

The SEAC during its 63rd meeting held on 18.01.2023 recommended issuance of standard Terms of Reference for EIA preparation for the project with the following additional conditions :-

1. A Cluster certificate from the competent authority should be submitted.
2. A need-based EMP, prepared in accordance with the MoEF&CC Office Memorandum vide F. No. 22-65/2017.IA.III dated 30.09.2020.
3. Details of accredited consultant including valid NABET accreditation certificate should be submitted.
4. Study report on base flow level measured at 5 points with date and supporting photographs. It should be committed that mining will be done at least 1m above the base flow level. Accordingly, if required, the proposal may also be revised.

The proponent, – while applying for environmental clearance, shall upload in the PARIVESH portal, the EIA/EMP report along with the documents/ sought above.

PROJECT DETAILS

The project of **Raja Ghosh** located in as follows :

S. No.	State	District
(1.)	West Bengal	Purba Bardhaman

The salient features of the project submitted by the project proponent is available at Report under online proposal no. **SIA/WB/MIN/60356/2021.**

DELIBERATION IN SEIAA

SEIAA considered the recommendation of SEAC and accepted the same.

RECOMMENDATIONS OF SEIAA

SEIAA approved the proposal for ToR.

CONCLUSION

Approved ToR.

Conditions

A. STANDARD TERMS OF REFERENCE

1. Year-wise production details since 1994 should be given, clearly stating the highest production achieved in any one year prior to 1994. It may also be categorically informed whether there had been any increase in production after the EIA Notification 1994 came into force, w.r.t. the highest production achieved prior to 1994.
2. A copy of the document in support of the fact that the Proponent is the rightful lessee of the mine should be given.
3. All documents including approved mine plan, EIA and Public Hearing should be compatible with one another in terms of the mine lease area, production levels, waste generation and its management, mining technology etc. and should be in the name of the lessee.
4. All corner coordinates of the mine lease area, superimposed on a High Resolution Imagery/ toposheet, topographic sheet, geomorphology and geology of the area should be provided. Such an Imagery of the proposed area should clearly show the land use and other ecological features of the study area (core and buffer zone).
5. Information should be provided in Survey of India Toposheet in 1:50,000 scale indicating geological map of the area, geomorphology of land forms of the area, existing minerals and mining history of the area, important water bodies, streams and rivers and soil characteristics.
6. Details about the land proposed for mining activities should be given with information as to whether mining conforms to the land use policy of the State; land diversion for mining should have approval from State land use board or the concerned authority.
7. It should be clearly stated whether the proponent Company has a well laid down Environment Policy approved by its Board of Directors? If so, it may be spelt out in the EIA Report with description of the prescribed operating process/procedures to bring into focus any infringement/deviation/violation of the environmental or forest norms/ conditions? The hierarchical system or administrative order of the Company to deal with the environmental issues and for ensuring compliance with the EC conditions may also be given. The system of reporting of non-compliances / violations of environmental norms to the Board of Directors of the Company and/or shareholders or stakeholders at large, may also be detailed in the EIA Report.
8. Issues relating to Mine Safety, including subsidence study in case of underground mining and slope study in case of open cast mining, blasting study etc. should be detailed. The proposed safeguard measures in each case should also be provided.
9. The study area will comprise of 10 km zone around the mine lease from lease periphery and the data contained in the EIA such as waste generation etc. should be for the life of the mine / lease period.
10. Land use of the study area delineating forest area, agricultural land, grazing land, wildlife sanctuary, national park, migratory routes of fauna, water bodies, human settlements and other ecological features should be indicated. Land use plan of the mine lease area should be prepared to encompass preoperational, operational and post operational phases and submitted. Impact, if any, of change of land use should be given.
11. Details of the land for any Over Burden Dumps outside the mine lease, such as extent of land area, distance from mine lease, its land use, R&R issues, if any, should be given.
12. A Certificate from the Competent Authority in the State Forest Department should be provided, confirming the involvement of forest land, if any, in the project area. In the event of any contrary claim by the Project Proponent regarding the status of forests, the site may be inspected by the State Forest Department along with the Regional Office of the Ministry to ascertain the status of forests, based on which, the Certificate in this regard as mentioned above be issued. In all such cases, it would be desirable for representative of the State Forest Department to assist the Expert Appraisal Committees.

13. Status of forestry clearance for the broken up area and virgin forestland involved in the Project including deposition of net present value (NPV) and compensatory afforestation (CA) should be indicated. A copy of the forestry clearance should also be furnished.
14. Implementation status of recognition of forest rights under the Scheduled Tribes and other Traditional Forest Dwellers (Recognition of Forest Rights) Act, 2006 should be indicated.
15. The vegetation in the RF / PF areas in the study area, with necessary details, should be given.
16. A study shall be got done to ascertain the impact of the Mining Project on wildlife of the study area and details furnished. Impact of the project on the wildlife in the surrounding and any other protected area and accordingly, detailed mitigative measures required, should be worked out with cost implications and submitted.
17. Location of National Parks, Sanctuaries, Biosphere Reserves, Wildlife Corridors, Ramsar site Tiger/Elephant Reserves/(existing as well as proposed), if any, within 10 km of the mine lease should be clearly indicated, supported by a location map duly authenticated by Chief Wildlife Warden. Necessary clearance, as may be applicable to such projects due to proximity of the ecologically sensitive areas as mentioned above, should be obtained from the Standing Committee of National Board of Wildlife and copy furnished.
18. A detailed biological study of the study area [core zone and buffer zone (10 km radius of the periphery of the mine lease)] shall be carried out. Details of flora and fauna, endangered, endemic and RET Species duly authenticated, separately for core and buffer zone should be furnished based on such primary field survey, clearly indicating the Schedule of the fauna present. In case of any scheduled-I fauna found in the study area, the necessary plan alongwith budgetary provisions for their conservation should be prepared in consultation with State Forest and Wildlife Department and details furnished. Necessary allocation of funds for implementing the same should be made as part of the project cost.
19. Proximity to Areas declared as 'Critically Polluted' or the Project areas likely to come under the 'Aravali Range', (attracting court restrictions for mining operations), should also be indicated and where so required, clearance certifications from the prescribed Authorities, such as the SPCB or State Mining Department should be secured and furnished to the effect that the proposed mining activities could be considered.
20. Similarly, for coastal Projects, A CRZ map duly authenticated by one of the authorized agencies demarcating LTL. HTL, CRZ area, location of the mine lease w.r.t CRZ, coastal features such as mangroves, if any, should be furnished. (Note: The Mining Projects falling under CRZ would also need to obtain approval of the concerned Coastal Zone Management Authority).
21. R&R Plan/compensation details for the Project Affected People (PAP) should be furnished. While preparing the R&R Plan, the relevant State/National Rehabilitation & Resettlement Policy should be kept in view. In respect of SCs /STs and other weaker sections of the society in the study area, a need based sample survey, family-wise, should be undertaken to assess their requirements, and action programmes prepared and submitted accordingly, integrating the sectorial programmes of line departments of the State Government. It may be clearly brought out whether the village(s) located in the mine lease area will be shifted or not. The issues relating to shifting of village(s) including their R&R and socio-economic aspects should be discussed in the Report.
22. One season (non-monsoon) [i.e. March-May (Summer Season); October-December (post monsoon season) ; December-February (winter season)]primary baseline data on ambient air quality as per CPCB Notification of 2009, water quality, noise level, soil and flora and fauna shall be collected and the AAQ and other data so compiled presented date-wise in the EIA and EMP Report. Site-specific meteorological data should also be collected. The location of the monitoring stations should be such as to represent whole of the study area and justified keeping in view the pre-dominant downwind direction and location of sensitive receptors. There should be at least one monitoring station within 500 m of the mine lease in the pre-dominant downwind direction. The mineralogical composition of PM10, particularly for free silica, should be given.
23. Air quality modeling should be carried out for prediction of impact of the project on the air quality of the area. It should also take into account the impact of movement of vehicles for transportation of mineral. The details of the model used and input parameters used for modeling should be provided. The air quality contours may be shown on a location map clearly indicating the location of the site, location of sensitive receptors, if any, and the habitation.

The wind roses showing pre-dominant wind direction may also be indicated on the map.

24. The water requirement for the Project, its availability and source should be furnished. A detailed water balance should also be provided. Fresh water requirement for the Project should be indicated.
25. Necessary clearance from the Competent Authority for drawl of requisite quantity of water for the Project should be provided.
26. Description of water conservation measures proposed to be adopted in the Project should be given. Details of rainwater harvesting proposed in the Project, if any, should be provided.
27. Impact of the Project on the water quality, both surface and groundwater, should be assessed and necessary safeguard measures, if any required, should be provided.
28. Based on actual monitored data, it may clearly be shown whether working will intersect groundwater. Necessary data and documentation in this regard may be provided. In case the working will intersect groundwater table, a detailed Hydro Geological Study should be undertaken and Report furnished. The Report inter-alia, shall include details of the aquifers present and impact of mining activities on these aquifers. Necessary permission from Central Ground Water Authority for working below ground water and for pumping of ground water should also be obtained and copy furnished.
29. Details of any stream, seasonal or otherwise, passing through the lease area and modification / diversion proposed, if any, and the impact of the same on the hydrology should be brought out.
30. Information on site elevation, working depth, groundwater table etc. Should be provided both in AMSL and bgl. A schematic diagram may also be provided for the same.
31. A time bound Progressive Greenbelt Development Plan shall be prepared in a tabular form (indicating the linear and quantitative coverage, plant species and time frame) and submitted, keeping in mind, the same will have to be executed up front on commencement of the Project. Phase-wise plan of plantation and compensatory afforestation should be charted clearly indicating the area to be covered under plantation and the species to be planted. The details of plantation already done should be given. The plant species selected for green belt should have greater ecological value and should be of good utility value to the local population with emphasis on local and native species and the species which are tolerant to pollution.
32. Impact on local transport infrastructure due to the Project should be indicated. Projected increase in truck traffic as a result of the Project in the present road network (including those outside the Project area) should be worked out, indicating whether it is capable of handling the incremental load. Arrangement for improving the infrastructure, if contemplated (including action to be taken by other agencies such as State Government) should be covered. Project Proponent shall conduct Impact of Transportation study as per Indian Road Congress Guidelines.
33. Details of the onsite shelter and facilities to be provided to the mine workers should be included in the EIA Report.
34. Conceptual post mining land use and Reclamation and Restoration of mined out areas (with plans and with adequate number of sections) should be given in the EIA report.
35. Occupational Health impacts of the Project should be anticipated and the proposed preventive measures spelt out in detail. Details of pre-placement medical examination and periodical medical examination schedules should be incorporated in the EMP. The project specific occupational health mitigation measures with required facilities proposed in the mining area may be detailed.
36. Public health implications of the Project and related activities for the population in the impact zone should be systematically evaluated and the proposed remedial measures should be detailed along with budgetary allocations.
37. Measures of socio economic significance and influence to the local community proposed to be provided by the Project Proponent should be indicated. As far as possible, quantitative dimensions may be given with time frames for implementation.
38. Detailed environmental management plan (EMP) to mitigate the environmental impacts which, should inter-alia include the impacts of change of land use, loss of agricultural and grazing land, if any, occupational health impacts besides other impacts specific to the proposed Project.

39. Public Hearing points raised and commitment of the Project Proponent on the same along with time bound Action Plan with budgetary provisions to implement the same should be provided and also incorporated in the final EIA/EMP Report of the Project.
40. Details of litigation pending against the project, if any, with direction /order passed by any Court of Law against the Project should be given.
41. The cost of the Project (capital cost and recurring cost) as well as the cost towards implementation of EMP should be clearly spelt out.
42. A Disaster management Plan shall be prepared and included in the EIA/EMP Report.
43. Benefits of the Project if the Project is implemented should be spelt out. The benefits of the Project shall clearly indicate environmental, social, economic, employment potential, etc.
44. Besides the above, the below mentioned general points are also to be followed:-
    a. Executive Summary of the EIA/EMP Report
    b. All documents to be properly referenced with index and continuous page numbering.
    c. Where data are presented in the Report especially in Tables, the period in which the data were collected and the sources should be indicated.
    d. Project Proponent shall enclose all the analysis/testing reports of water, air, soil, noise etc. using the MoEF&CC/NABL accredited laboratories. All the original analysis/testing reports should be available during appraisal of the Project.
    e. Where the documents provided are in a language other than English, an English translation should be provided.
    f. The Questionnaire for environmental appraisal of mining projects as devised earlier by the Ministry shall also be filled and submitted.
    g. While preparing the EIA report, the instructions for the Proponents and instructions for the Consultants issued by MoEF&CC vide O.M. No. J-11013/41/2006-IA.II(I) dated 4th August, 2009, which are available on the website of this Ministry, should be followed.
    h. Changes, if any made in the basic scope and project parameters (as submitted in Form-I and the PFR for securing the TOR) should be brought to the attention of MoEF&CC with reasons for such changes and permission should be sought, as the TOR may also have to be altered. Post Public Hearing changes in structure and content of the draft EIA/EMP (other than modifications arising out of the P.H. process) will entail conducting the PH again with the revised documentation.
    i. As per the circular no. J-11011/618/2010-IA.II(I) dated 30.5.2012, certified report of the status of compliance of the conditions stipulated in the environment clearance for the existing operations of the project, should be obtained from the Regional Office of Ministry of Environment, Forest and Climate Change, as may be applicable.
    j. The EIA report should also include (i) surface plan of the area indicating contours of main topographic features, drainage and mining area, (ii) geological maps and sections and (iii) sections of the mine pit and external dumps, if any, clearly showing the land features of the adjoining area.

B. Additional Conditions :

1. Cluster certificate from the competent authority should be submitted.
2. Need-based EMP, prepared in accordance with the MoEF&CC Office Memorandum vide F. No. 22-65/2017.IA.III dated 30.09.2020.
3. Details of accredited consultant including valid NABET accreditation certificate should be submitted.
4. Study report on base flow level measured at 5 points with date and supporting photographs. It should be

committed that mining will be done at least 1m above the base flow level. Accordingly, if required, the proposal may also be revised.

The project proponent is requested to submit the final EIA/EMP prepared as per the above-mentioned ToRs and incorporating all the issues raised during Public Hearing / Public Consultation to the SEAC for further consideration of the proposal for environmental clearance.

The proponent, – while applying for environmental clearance, shall upload in the PARIVESH portal, the EIA/EMP report along with the documents/ sought above.

The ToR is valid for a period of 3 (three) years from the date of issue.

(22) Proposed Chaitpur Sand Mine project in river Damodar in area of 7.75 Acres / 3.14 Hectares at Plot No. 1453(P), 1454(P), 1480(P), 1564(P), 1581(P), 1585(P), JL No. 84, Mouza – Chairpur, PS – Bardhaman, Dist – Purba Bardhaman, West Bengal by **Buddhadeb Adhikari.**

Proposal No. :- SIA/WB/MIN/73729/2022, File No. : EN/T-II-1/087/2022, Type-TOR

INTRODUCTION

The proponent made online application vide proposal no. **SIA/WB/MIN/73729/2022** dated **21 Dec 2022** seeking Terms of reference (TOR) under the provisions of the EIA Notification, 2006 for the above mentioned proposed project. The proposed project activity is listed at S. No. **1(a) Mining of minerals** projects under Category **B** of EIA Notification, 2006.

The SEAC during its 63rd meeting held on 18.01.2023 recommended issuance of Standard Terms of Reference for EIA preparation for the project with the following additional conditions :-

1. Valid LOI from the competent authority.
2. Cluster certificate from the competent authority should be submitted.
3. Need-based EMP, prepared in accordance with the MoEF&CC Office Memorandum vide F. No. 22-65/2017.IA.III dated 30.09.2020.
4. Details of accredited consultant including valid NABET accreditation certificate should be submitted.
5. Study report on base flow level measured at 5 points with date and supporting photographs. It should be committed that mining will be done at least 1m above the base flow level. Accordingly, if required, the proposal may also be revised.

The proponent, – while applying for environmental clearance, shall upload in the PARIVESH portal, the EIA/EMP report along with the documents/ sought above.

PROJECT DETAILS

The project of **Buddhadeb Adhikari** located in as follows :

S. No.	State	District
(1.)	West Bengal	Purba Bardhaman

The salient features of the project submitted by the project proponent is available at Report under online proposal no.

SIA/WB/MIN/73729/2022.

DELIBERATION IN SEIAA

SEIAA considered the recommendation of SEAC and accepted the same.

RECOMMENDATIONS OF SEIAA

SEIAA approved the proposal for ToR.

CONCLUSION

Approved ToR.

Conditions

A. STANDARD TERMS OF REFERENCE

1. Year-wise production details since 1994 should be given, clearly stating the highest production achieved in any one year prior to 1994. It may also be categorically informed whether there had been any increase in production after the EIA Notification 1994 came into force, w.r.t. the highest production achieved prior to 1994.
2. A copy of the document in support of the fact that the Proponent is the rightful lessee of the mine should be given.
3. All documents including approved mine plan, EIA and Public Hearing should be compatible with one another in terms of the mine lease area, production levels, waste generation and its management, mining technology etc. and should be in the name of the lessee.
4. All corner coordinates of the mine lease area, superimposed on a High Resolution Imagery/ toposheet, topographic sheet, geomorphology and geology of the area should be provided. Such an Imagery of the proposed area should clearly show the land use and other ecological features of the study area (core and buffer zone).
5. Information should be provided in Survey of India Toposheet in 1:50,000 scale indicating geological map of the area, geomorphology of land forms of the area, existing minerals and mining history of the area, important water bodies, streams and rivers and soil characteristics.
6. Details about the land proposed for mining activities should be given with information as to whether mining conforms to the land use policy of the State; land diversion for mining should have approval from State land use board or the concerned authority.
7. It should be clearly stated whether the proponent Company has a well laid down Environment Policy approved by its Board of Directors? If so, it may be spelt out in the EIA Report with description of the prescribed operating process/procedures to bring into focus any infringement/deviation/violation of the environmental or forest norms/ conditions? The hierarchical system or administrative order of the Company to deal with the environmental issues and for ensuring compliance with the EC conditions may also be given. The system of reporting of non-compliances / violations of environmental norms to the Board of Directors of the Company and/or shareholders or stakeholders at large, may also be detailed in the EIA Report.
8. Issues relating to Mine Safety, including subsidence study in case of underground mining and slope study in case of open cast mining, blasting study etc. should be detailed. The proposed safeguard measures in each case should also be provided.
9. The study area will comprise of 10 km zone around the mine lease from lease periphery and the data contained in

the EIA such as waste generation etc. should be for the life of the mine / lease period.

10. Land use of the study area delineating forest area, agricultural land, grazing land, wildlife sanctuary, national park, migratory routes of fauna, water bodies, human settlements and other ecological features should be indicated. Land use plan of the mine lease area should be prepared to encompass preoperational, operational and post operational phases and submitted. Impact, if any, of change of land use should be given.
11. Details of the land for any Over Burden Dumps outside the mine lease, such as extent of land area, distance from mine lease, its land use, R&R issues, if any, should be given.
12. A Certificate from the Competent Authority in the State Forest Department should be provided, confirming the involvement of forest land, if any, in the project area. In the event of any contrary claim by the Project Proponent regarding the status of forests, the site may be inspected by the State Forest Department along with the Regional Office of the Ministry to ascertain the status of forests, based on which, the Certificate in this regard as mentioned above be issued. In all such cases, it would be desirable for representative of the State Forest Department to assist the Expert Appraisal Committees.
13. Status of forestry clearance for the broken up area and virgin forestland involved in the Project including deposition of net present value (NPV) and compensatory afforestation (CA) should be indicated. A copy of the forestry clearance should also be furnished.
14. Implementation status of recognition of forest rights under the Scheduled Tribes and other Traditional Forest Dwellers (Recognition of Forest Rights) Act, 2006 should be indicated.
15. The vegetation in the RF / PF areas in the study area, with necessary details, should be given.
16. A study shall be got done to ascertain the impact of the Mining Project on wildlife of the study area and details furnished. Impact of the project on the wildlife in the surrounding and any other protected area and accordingly, detailed mitigative measures required, should be worked out with cost implications and submitted.
17. Location of National Parks, Sanctuaries, Biosphere Reserves, Wildlife Corridors, Ramsar site Tiger/Elephant Reserves/(existing as well as proposed), if any, within 10 km of the mine lease should be clearly indicated, supported by a location map duly authenticated by Chief Wildlife Warden. Necessary clearance, as may be applicable to such projects due to proximity of the ecologically sensitive areas as mentioned above, should be obtained from the Standing Committee of National Board of Wildlife and copy furnished.
18. A detailed biological study of the study area [core zone and buffer zone (10 km radius of the periphery of the mine lease)] shall be carried out. Details of flora and fauna, endangered, endemic and RET Species duly authenticated, separately for core and buffer zone should be furnished based on such primary field survey, clearly indicating the Schedule of the fauna present. In case of any scheduled-I fauna found in the study area, the necessary plan along with budgetary provisions for their conservation should be prepared in consultation with State Forest and Wildlife Department and details furnished. Necessary allocation of funds for implementing the same should be made as part of the project cost.
19. Proximity to Areas declared as 'Critically Polluted' or the Project areas likely to come under the 'Aravali Range', (attracting court restrictions for mining operations), should also be indicated and where so required, clearance certifications from the prescribed Authorities, such as the SPCB or State Mining Department should be secured and furnished to the effect that the proposed mining activities could be considered.
20. Similarly, for coastal Projects, A CRZ map duly authenticated by one of the authorized agencies demarcating LTL. HTL, CRZ area, location of the mine lease w.r.t CRZ, coastal features such as mangroves, if any, should be furnished. (Note: The Mining Projects falling under CRZ would also need to obtain approval of the concerned Coastal Zone Management Authority).
21. R&R Plan/compensation details for the Project Affected People (PAP) should be furnished. While preparing the R&R Plan, the relevant State/National Rehabilitation & Resettlement Policy should be kept in view. In respect of SCs /STs and other weaker sections of the society in the study area, a need based sample survey, family-wise, should be undertaken to assess their requirements, and action programmes prepared and submitted accordingly, integrating the sectorial programmes of line departments of the State Government. It may be clearly brought out

whether the village(s) located in the mine lease area will be shifted or not. The issues relating to shifting of village(s) including their R&R and socio-economic aspects should be discussed in the Report.

22. One season (non-monsoon) [i.e. March-May (Summer Season); October-December (post monsoon season) ; December-February (winter season)]primary baseline data on ambient air quality as per CPCB Notification of 2009, water quality, noise level, soil and flora and fauna shall be collected and the AAQ and other data so compiled presented date-wise in the EIA and EMP Report. Site-specific meteorological data should also be collected. The location of the monitoring stations should be such as to represent whole of the study area and justified keeping in view the pre-dominant downwind direction and location of sensitive receptors. There should be at least one monitoring station within 500 m of the mine lease in the pre-dominant downwind direction. The mineralogical composition of PM10, particularly for free silica, should be given.
23. Air quality modeling should be carried out for prediction of impact of the project on the air quality of the area. It should also take into account the impact of movement of vehicles for transportation of mineral. The details of the model used and input parameters used for modeling should be provided. The air quality contours may be shown on a location map clearly indicating the location of the site, location of sensitive receptors, if any, and the habitation. The wind roses showing pre-dominant wind direction may also be indicated on the map.
24. The water requirement for the Project, its availability and source should be furnished. A detailed water balance should also be provided. Fresh water requirement for the Project should be indicated.
25. Necessary clearance from the Competent Authority for drawl of requisite quantity of water for the Project should be provided.
26. Description of water conservation measures proposed to be adopted in the Project should be given. Details of rainwater harvesting proposed in the Project, if any, should be provided.
27. Impact of the Project on the water quality, both surface and groundwater, should be assessed and necessary safeguard measures, if any required, should be provided.
28. Based on actual monitored data, it may clearly be shown whether working will intersect groundwater. Necessary data and documentation in this regard may be provided. In case the working will intersect groundwater table, a detailed Hydro Geological Study should be undertaken and Report furnished. The Report inter-alia, shall include details of the aquifers present and impact of mining activities on these aquifers. Necessary permission from Central Ground Water Authority for working below ground water and for pumping of ground water should also be obtained and copy furnished.
29. Details of any stream, seasonal or otherwise, passing through the lease area and modification / diversion proposed, if any, and the impact of the same on the hydrology should be brought out.
30. Information on site elevation, working depth, groundwater table etc. Should be provided both in AMSL and bgl. A schematic diagram may also be provided for the same.
31. A time bound Progressive Greenbelt Development Plan shall be prepared in a tabular form (indicating the linear and quantitative coverage, plant species and time frame) and submitted, keeping in mind, the same will have to be executed up front on commencement of the Project. Phase-wise plan of plantation and compensatory afforestation should be charted clearly indicating the area to be covered under plantation and the species to be planted. The details of plantation already done should be given. The plant species selected for green belt should have greater ecological value and should be of good utility value to the local population with emphasis on local and native species and the species which are tolerant to pollution.
32. Impact on local transport infrastructure due to the Project should be indicated. Projected increase in truck traffic as a result of the Project in the present road network (including those outside the Project area) should be worked out, indicating whether it is capable of handling the incremental load. Arrangement for improving the infrastructure, if contemplated (including action to be taken by other agencies such as State Government) should be covered. Project Proponent shall conduct Impact of Transportation study as per Indian Road Congress Guidelines.
33. Details of the onsite shelter and facilities to be provided to the mine workers should be included in the EIA

Report.

34. Conceptual post mining land use and Reclamation and Restoration of mined out areas (with plans and with adequate number of sections) should be given in the EIA report.
35. Occupational Health impacts of the Project should be anticipated and the proposed preventive measures spelt out in detail. Details of pre-placement medical examination and periodical medical examination schedules should be incorporated in the EMP. The project specific occupational health mitigation measures with required facilities proposed in the mining area may be detailed.
36. Public health implications of the Project and related activities for the population in the impact zone should be systematically evaluated and the proposed remedial measures should be detailed along with budgetary allocations.
37. Measures of socio-economic significance and influence to the local community proposed to be provided by the Project Proponent should be indicated. As far as possible, quantitative dimensions may be given with time frames for implementation.
38. Detailed environmental management plan (EMP) to mitigate the environmental impacts which, should inter-alia include the impacts of change of land use, loss of agricultural and grazing land, if any, occupational health impacts besides other impacts specific to the proposed Project.
39. Public Hearing points raised and commitment of the Project Proponent on the same along with time bound Action Plan with budgetary provisions to implement the same should be provided and also incorporated in the final EIA/EMP Report of the Project.
40. Details of litigation pending against the project, if any, with direction /order passed by any Court of Law against the Project should be given.
41. The cost of the Project (capital cost and recurring cost) as well as the cost towards implementation of EMP should be clearly spelt out.
42. A Disaster management Plan shall be prepared and included in the EIA/EMP Report.
43. Benefits of the Project if the Project is implemented should be spelt out. The benefits of the Project shall clearly indicate environmental, social, economic, employment potential, etc.
44. Besides the above, the below mentioned general points are also to be followed:-
    a. Executive Summary of the EIA/EMP Report
    b. All documents to be properly referenced with index and continuous page numbering.
    c. Where data are presented in the Report especially in Tables, the period in which the data were collected and the sources should be indicated.
    d. Project Proponent shall enclose all the analysis/testing reports of water, air, soil, noise etc. using the MoEF&CC/NABL accredited laboratories. All the original analysis/testing reports should be available during appraisal of the Project.
    e. Where the documents provided are in a language other than English, an English translation should be provided.
    f. The Questionnaire for environmental appraisal of mining projects as devised earlier by the Ministry shall also be filled and submitted.
    g. While preparing the EIA report, the instructions for the Proponents and instructions for the Consultants issued by MoEF&CC vide O.M. No. J-11013/41/2006-IA.II(I) dated 4th August, 2009, which are available on the website of this Ministry, should be followed.
    h. Changes, if any made in the basic scope and project parameters (as submitted in Form-I and the PFR for securing the TOR) should be brought to the attention of MoEF&CC with reasons for such changes and permission should be sought, as the TOR may also have to be altered. Post Public Hearing changes in structure and content of the draft EIA/EMP (other than modifications arising out of the P.H. process) will

entail conducting the PH again with the revised documentation.

i. As per the circular no. J-11011/618/2010-IA.II(I) dated 30.5.2012, certified report of the status of compliance of the conditions stipulated in the environment clearance for the existing operations of the project, should be obtained from the Regional Office of Ministry of Environment, Forest and Climate Change, as may be applicable.

j. The EIA report should also include (i) surface plan of the area indicating contours of main topographic features, drainage and mining area, (ii) geological maps and sections and (iii) sections of the mine pit and external dumps, if any, clearly showing the land features of the adjoining area.

B. Additional Terms of Reference

1) Valid LOI from the competent authority.
2) Cluster certificate from the competent authority should be submitted.
3) Need-based EMP, prepared in accordance with the MoEF&CC Office Memorandum vide F. No. 22-65/2017.IA.III dated 30.09.2020.
4) Details of accredited consultant including valid NABET accreditation certificate should be submitted.
5) Study report on base flow level measured at 5 points with date and supporting photographs. It should be committed that mining will be done at least 1m above the base flow level. Accordingly, if required, the proposal may also be revised.

The project proponent is requested to submit the final EIA/EMP prepared as per the above-mentioned ToRs and incorporating all the issues raised during Public Hearing / Public Consultation to the SEAC for further consideration of the proposal for environmental clearance.

The proponent, – while applying for environmental clearance, shall upload in the PARIVESH portal, the EIA/EMP report along with the documents/ sought above.

The ToR is valid for a period of 3 (three) years from the date of issue.

(23) Proposed Ghanesharpur sand mine on Kangshabati river at JL no. 109, Plot No. 84(P), 85(P) & 86(P), Mouza - Ghanesharpur, P.S. - Sadar, Dist.- Paschim Medinipur, West Bengal by **Kartick Jana.**

Proposal No. :- SIA/WB/MIN/72819/2022, File No. : EN/T-II-1/007/2023, Type-TOR

INTRODUCTION

The proponent made online application vide proposal no. **SIA/WB/MIN/72819/2022** dated **07 Jan 2023** seeking Terms of reference (TOR) under the provisions of the EIA Notification, 2006 for the above mentioned proposed project. The proposed project activity is listed at S. No. **1(a) Mining of minerals** projects under Category **B** of EIA Notification, 2006.

The SEAC during its 64th meeting held on 01.02.2023 recommended issuance of standard Terms of Reference for EIA preparation for the project with the following additional conditions: -

1. Valid LOI to be obtained from the competent authority.
2. Necessary cluster certificate may be obtained from the competent authority and the same may be submitted/ uploaded along with the EIA.
3. As stipulated in the MoEF&CC Office Memorandum vide F. No. 22-65/2017.IA.III dated 30.09.2020 all the commitments made by the project proponent to address the concerns raised during the public consultation shall be

clearly spelt out and the same shall be made part of the Environment Management Plan.

4. Details of accreditation of the environmental consultant including a copy of the valid NABET accreditation certificate should be submitted/ uploaded.
5. A base line study may be conducted on the base flow level (to be measured at least at 5 points giving the dates of measurement). The study report should also contain supporting photographs. It should be committed that mining will be done at least 1m above the base flow level. Accordingly, if required, the proposal may be revised.

The proponent, – while applying for environmental clearance, shall upload in the PARIVESH portal, the EIA/EMP report along with the documents/ reports sought above.

PROJECT DETAILS

The project of **Kartick Jana** located in as follows :

S. No.	State	District
(1.)	West Bengal	Paschim Medinipur

The salient features of the project submitted by the project proponent is available at Report under online proposal no. **SIA/WB/MIN/72819/2022.**

DELIBERATION IN SEIAA

SEIAA considered the recommendation of SEAC and accepted the same.

RECOMMENDATIONS OF SEIAA

SEIAA approved the proposal for ToR.

CONCLUSION

Approved ToR.

Conditions

A. STANDARD TERMS OF REFERENCE

1. Year-wise production details since 1994 should be given, clearly stating the highest production achieved in any on year prior to 1994. It may also be categorically informed whether there had been any increase in production afte the EIA Notification 1994 came into force, w.r.t. the highest production achieved prior to 1994.
2. A copy of the document in support of the fact that the Proponent is the rightful lessee of the mine should be given.
3. All documents including approved mine plan, EIA and Public Hearing should be compatible with one another i terms of the mine lease area, production levels, waste generation and its management, mining technology etc. an should be in the name of the lessee.
4. All corner coordinates of the mine lease area, superimposed on a High Resolution Imagery/ toposheet, topographi sheet, geomorphology and geology of the area should be provided. Such an Imagery of the proposed area shoul clearly show the land use and other ecological features of the study area (core and buffer zone).

5. Information should be provided in Survey of India Toposheet in 1:50,000 scale indicating geological map of th area, geomorphology of land forms of the area, existing minerals and mining history of the area, important wate bodies, streams and rivers and soil characteristics.
6. Details about the land proposed for mining activities should be given with information as to whether mining conforms to the land use policy of the State; land diversion for mining should have approval from State land us board or the concerned authority.
7. It should be clearly stated whether the proponent Company has a well laid down Environment Policy approved b its Board of Directors? If so, it may be spelt out in the EIA Report with description of the prescribed operatin process/procedures to bring into focus any infringement/deviation/violation of the environmental or forest norms conditions? The hierarchical system or administrative order of the Company to deal with the environmental issue and for ensuring compliance with the EC conditions may also be given. The system of reporting of non compliances / violations of environmental norms to the Board of Directors of the Company and/or shareholders o stakeholders at large, may also be detailed in the EIA Report.
8. Issues relating to Mine Safety, including subsidence study in case of underground mining and slope study in cas of open cast mining, blasting study etc. should be detailed. The proposed safeguard measures in each case shoul also be provided.
9. The study area will comprise of 10 km zone around the mine lease from lease periphery and the data contained i the EIA such as waste generation etc. should be for the life of the mine / lease period.
10. Land use of the study area delineating forest area, agricultural land, grazing land, wildlife sanctuary, national park migratory routes of fauna, water bodies, human settlements and other ecological features should be indicated. Lan use plan of the mine lease area should be prepared to encompass preoperational, operational and post operationa phases and submitted. Impact, if any, of change of land use should be given.
11. Details of the land for any Over Burden Dumps outside the mine lease, such as extent of land area, distance fro mine lease, its land use, R&R issues, if any, should be given.
12. A Certificate from the Competent Authority in the State Forest Department should be provided, confirming th involvement of forest land, if any, in the project area. In the event of any contrary claim by the Project Proponen regarding the status of forests, the site may be inspected by the State Forest Department along with the Regiona Office of the Ministry to ascertain the status of forests, based on which, the Certificate in this regard as mentione above be issued. In all such cases, it would be desirable for representative of the State Forest Department to assis the Expert Appraisal Committees.
13. Status of forestry clearance for the broken up area and virgin forestland involved in the Project includin deposition of net present value (NPV) and compensatory afforestation (CA) should be indicated. A copy of th forestry clearance should also be furnished.
14. Implementation status of recognition of forest rights under the Scheduled Tribes and other Traditional Fores Dwellers (Recognition of Forest Rights) Act, 2006 should be indicated.
15. The vegetation in the RF / PF areas in the study area, with necessary details, should be given.
16. A study shall be got done to ascertain the impact of the Mining Project on wildlife of the study area and detail furnished. Impact of the project on the wildlife in the surrounding and any other protected area and accordingly detailed mitigative measures required, should be worked out with cost implications and submitted.
17. Location of National Parks, Sanctuaries, Biosphere Reserves, Wildlife Corridors, Ramsar site Tiger/Elephan Reserves/(existing as well as proposed), if any, within 10 km of the mine lease should be clearly indicated supported by a location map duly authenticated by Chief Wildlife Warden. Necessary clearance, as may b applicable to such projects due to proximity of the ecologically sensitive areas as mentioned above, should b obtained from the Standing Committee of National Board of Wildlife and copy furnished.
18. A detailed biological study of the study area [core zone and buffer zone (10 km radius of the periphery of the min lease)] shall be carried out. Details of flora and fauna, endangered, endemic and RET Species duly authenticated separately for core and buffer zone should be furnished based on such primary field survey, clearly indicating th

Schedule of the fauna present. In case of any scheduled-I fauna found in the study area, the necessary plan alon with budgetary provisions for their conservation should be prepared in consultation with State Forest and Wildlif Department and details furnished. Necessary allocation of funds for implementing the same should be made as pa of the project cost.

19. Proximity to Areas declared as 'Critically Polluted' or the Project areas likely to come under the 'Aravali Range (attracting court restrictions for mining operations), should also be indicated and where so required, clearanc certifications from the prescribed Authorities, such as the SPCB or State Mining Department should be secured an furnished to the effect that the proposed mining activities could be considered.
20. Similarly, for coastal Projects, A CRZ map duly authenticated by one of the authorized agencies demarcating LTL HTL, CRZ area, location of the mine lease w.r.t CRZ, coastal features such as mangroves, if any, should b furnished. (Note: The Mining Projects falling under CRZ would also need to obtain approval of the concerne Coastal Zone Management Authority).
21. R&R Plan/compensation details for the Project Affected People (PAP) should be furnished. While preparing th R&R Plan, the relevant State/National Rehabilitation & Resettlement Policy should be kept in view. In respect o SCs /STs and other weaker sections of the society in the study area, a need based sample survey, family-wise should be undertaken to assess their requirements, and action programmes prepared and submitted accordingly integrating the sectorial programmes of line departments of the State Government. It may be clearly brought ou whether the village(s) located in the mine lease area will be shifted or not. The issues relating to shifting o village(s) including their R&R and socio-economic aspects should be discussed in the Report.
22. One season (non-monsoon) [i.e. March-May (Summer Season); October-December (post monsoon season) December-February (winter season)]primary baseline data on ambient air quality as per CPCB Notification o 2009, water quality, noise level, soil and flora and fauna shall be collected and the AAQ and other data so compile presented date-wise in the EIA and EMP Report. Site-specific meteorological data should also be collected. Th location of the monitoring stations should be such as to represent whole of the study area and justified keeping i view the pre-dominant downwind direction and location of sensitive receptors. There should be at least on monitoring station within 500 m of the mine lease in the pre-dominant downwind direction. The mineralogica composition of PM10, particularly for free silica, should be given.
23. Air quality modeling should be carried out for prediction of impact of the project on the air quality of the area. I should also take into account the impact of movement of vehicles for transportation of mineral. The details of th model used and input parameters used for modeling should be provided. The air quality contours may be shown o a location map clearly indicating the location of the site, location of sensitive receptors, if any, and the habitation The wind roses showing pre-dominant wind direction may also be indicated on the map.
24. The water requirement for the Project, its availability and source should be furnished. A detailed water balanc should also be provided. Fresh water requirement for the Project should be indicated.
25. Necessary clearance from the Competent Authority for drawl of requisite quantity of water for the Project shoul be provided.
26. Description of water conservation measures proposed to be adopted in the Project should be given. Details o rainwater harvesting proposed in the Project, if any, should be provided.
27. Impact of the Project on the water quality, both surface and groundwater, should be assessed and necessar safeguard measures, if any required, should be provided.
28. Based on actual monitored data, it may clearly be shown whether working will intersect groundwater. Necessar data and documentation in this regard may be provided. In case the working will intersect groundwater table, detailed Hydro Geological Study should be undertaken and Report furnished. The Report inter-alia, shall includ details of the aquifers present and impact of mining activities on these aquifers. Necessary permission from Centra Ground Water Authority for working below ground water and for pumping of ground water should also b obtained and copy furnished.
29. Details of any stream, seasonal or otherwise, passing through the lease area and modification / diversion proposed

if any, and the impact of the same on the hydrology should be brought out.

30. Information on site elevation, working depth, groundwater table etc. Should be provided both in AMSL and bgl. A schematic diagram may also be provided for the same.
31. A time bound Progressive Greenbelt Development Plan shall be prepared in a tabular form (indicating the linea and quantitative coverage, plant species and time frame) and submitted, keeping in mind, the same will have to b executed up front on commencement of the Project. Phase-wise plan of plantation and compensatory afforestatio should be charted clearly indicating the area to be covered under plantation and the species to be planted. Th details of plantation already done should be given. The plant species selected for green belt should have greate ecological value and should be of good utility value to the local population with emphasis on local and nativ species and the species which are tolerant to pollution.
32. Impact on local transport infrastructure due to the Project should be indicated. Projected increase in truck traffic a a result of the Project in the present road network (including those outside the Project area) should be worked ou indicating whether it is capable of handling the incremental load. Arrangement for improving the infrastructure, i contemplated (including action to be taken by other agencies such as State Government) should be covered. Proje Proponent shall conduct Impact of Transportation study as per Indian Road Congress Guidelines.
33. Details of the onsite shelter and facilities to be provided to the mine workers should be included in the EIA Report.
34. Conceptual post mining land use and Reclamation and Restoration of mined out areas (with plans and wit adequate number of sections) should be given in the EIA report.
35. Occupational Health impacts of the Project should be anticipated and the proposed preventive measures spelt out i detail. Details of pre-placement medical examination and periodical medical examination schedules should b incorporated in the EMP. The project specific occupational health mitigation measures with required facilitie proposed in the mining area may be detailed.
36. Public health implications of the Project and related activities for the population in the impact zone should b systematically evaluated and the proposed remedial measures should be detailed along with budgetary allocations.
37. Measures of socio-economic significance and influence to the local community proposed to be provided by th Project Proponent should be indicated. As far as possible, quantitative dimensions may be given with time frame for implementation.
38. Detailed environmental management plan (EMP) to mitigate the environmental impacts which, should inter-ali include the impacts of change of land use, loss of agricultural and grazing land, if any, occupational health impact besides other impacts specific to the proposed Project.
39. Public Hearing points raised and commitment of the Project Proponent on the same along with time bound Actio Plan with budgetary provisions to implement the same should be provided and also incorporated in the fina EIA/EMP Report of the Project.
40. Details of litigation pending against the project, if any, with direction /order passed by any Court of Law agains the Project should be given.
41. The cost of the Project (capital cost and recurring cost) as well as the cost towards implementation of EMP shoul be clearly spelt out.
42. A Disaster management Plan shall be prepared and included in the EIA/EMP Report.
43. Benefits of the Project if the Project is implemented should be spelt out. The benefits of the Project shall clearl indicate environmental, social, economic, employment potential, etc.
44. Besides the above, the below mentioned general points are also to be followed:-
    a. Executive Summary of the EIA/EMP Report (enclosed as **Annexure – A**).
    b. All documents to be properly referenced with index and continuous page numbering.
    c. Where data are presented in the Report especially in Tables, the period in which the data were collected an the sources should be indicated.

d. Project Proponent shall enclose all the analysis/testing reports of water, air, soil, noise etc. using th MoEF&CC/NABL accredited laboratories. All the original analysis/testing reports should be available durin appraisal of the Project.

e. Where the documents provided are in a language other than English, an English translation should b provided.

f. The Questionnaire for environmental appraisal of mining projects as devised earlier by the Ministry shall als be filled and submitted.

g. While preparing the EIA report, the instructions for the Proponents and instructions for the Consultants issue by MoEF&CC vide O.M. No. J-11013/41/2006-IA.II(I) dated 4th August, 2009, which are available on th website of this Ministry, should be followed.

h. Changes, if any made in the basic scope and project parameters (as submitted in Form-I and the PFR fo securing the TOR) should be brought to the attention of MoEF&CC with reasons for such changes an permission should be sought, as the TOR may also have to be altered. Post Public Hearing changes in structur and content of the draft EIA/EMP (other than modifications arising out of the P.H. process) will entai conducting the PH again with the revised documentation.

i. As per the circular no. J-11011/618/2010-IA.II(I) dated 30.5.2012, certified report of the status of complianc of the conditions stipulated in the environment clearance for the existing operations of the project, should b obtained from the Regional Office of Ministry of Environment, Forest and Climate Change, as may b applicable.

j. The EIA report should also include (i) surface plan of the area indicating contours of main topographi features, drainage and mining area, (ii) geological maps and sections and (iii) sections of the mine pit an external dumps, if any, clearly showing the land features of the adjoining area.

B. Additional Terms of Reference

1. Valid LOI to be obtained from the competent authority.
2. Necessary cluster certificate may be obtained from the competent authority and the same may be submitted/ uploa along with the EIA.
3. As stipulated in the MoEF&CC Office Memorandum vide F. No. 22-65/2017.IA.III dated 30.09.2020 all commitments made by the project proponent to address the concerns raised during the public consultation shal clearly spelt out and the same shall be made part of the Environment Management Plan.
4. Details of accreditation of the environmental consultant including a copy of the valid NABET accreditation certifi should be submitted/ uploaded.
5. A base line study may be conducted on the base flow level (to be measured at least at 5 points giving the date measurement). The study report should also contain supporting photographs. It should be committed that mining be done at least 1m above the base flow level. Accordingly, if required, the proposal may be revised.

The project proponent is requested to submit the final EIA/EMP prepared as per the above-mentioned ToRs an incorporating all the issues raised during Public Hearing / Public Consultation to the SEAC for further consideration of th proposal for environmental clearance.

The proponent, – while applying for environmental clearance, shall upload in the PARIVESH portal, the EIA/EMP report along with the documents/ sought above.

The ToR is valid for a period of 3 (three) years from the date of issue.

Annexure - A

Executive Summary

The Executive summary of the EIA/EMP report in about 8-10 pages should be prepared incorporating the information on following points:

1) Project name and location (Village, District, State, Industrial Estate (if applicable).
2) Products and capacities. If expansion proposal, then existing products with capacities and reference to earlier EC.
3) Requirement of land, raw material, water, power, fuel, with source of supply (Quantitative).
4) Process description in brief, specifically indicating the gaseous emission, liquid effluent and solid and hazardous wastes.
5) Measures for mitigating the impact on the environment and mode of discharge or disposal.
6) Capital cost of the project, estimated time of completion.
7) Site selected for the project - Nature of land - Agricultural (single/double crop), barren, Govt./private land, status of is acquisition, nearby (in 2-3 km.) water body, population, with in 10km. other industries, forest, eco-sensitive zones, accessibility, (note - in case of industrial estate this information may not be necessary).
8) Baseline environmental data - air quality, surface and ground water quality, soil characteristic, flora and fauna, socio-economic condition of the nearby population.
9) Identification of hazards in handling, processing and storage of hazardous material and safety system provided to mitigate the risk.
10) Likely impact of the project on air, water, land, flora-fauna and nearby population.
11) Emergency preparedness plan in case of natural or in plant emergencies.
12) Issues raised during public hearing (if applicable) and response given.
13) Environment Management Plan (EMP) as per Office Memorandum issued by the MoEF & CC vide F. No. 22-65/2017-IA.III dated 30.09.2020 with proposed expenditure.
14) Occupational Health Measures.
15) Post project monitoring plan.

(24) Proposed Nischintapur Sand Mine on Kangshabati River in the area of 2.80 Ha (6.92 Acres) at Mouza - Nischintapur, J.L. No.: 48, Plot Nos. 1(P), 2(P), P.S. – Medinipur, Dist. – Paschim Medinipur, West Bengal by **Deep Dutta.**

Proposal No. :- SIA/WB/MIN/73865/2022, File No. : EN/T-II-1/008/2023, Type-TOR

INTRODUCTION

The proponent made online application vide proposal no. **SIA/WB/MIN/73865/2022** dated **07 Jan 2023** seeking Terms of reference (TOR) under the provisions of the EIA Notification, 2006 for the above mentioned proposed project. The proposed project activity is listed at S. No. **1(a) Mining of minerals** projects under Category **B** of EIA Notification, 2006.

The SEAC during its 64th meeting held on 01.02.2023 recommended issuance of standard Terms of Reference for EIA preparation for the project with the following additional conditions :-

1. Cluster certificate from the competent authority should be submitted.
2. Need-based EMP, prepared in accordance with the MoEF&CC Office Memorandum vide F. No. 22-65/2017.IA.III dated 30.09.2020.
3. Details of accreditation of the environmental consultant including a copy of the valid NABET accreditation certificate may be submitted/ uploaded.
4. A base line study may be conducted on the base flow level (to be measured at least at 5 points giving the dates of measurement). The study report should also contain supporting photographs. It should be committed that mining will be done at least 1m above the base flow level. Accordingly, if required, the proposal may be revised.

The proponent, – while applying for environmental clearance, shall upload in the PARIVESH portal, the EIA/EMP report along with the documents/ sought above.

PROJECT DETAILS

The project of **Deep Dutta** located in as follows :

S. No.	State	District
(1.)	West Bengal	Paschim Medinipur

The salient features of the project submitted by the project proponent is available at Report under online proposal no. **SIA/WB/MIN/73865/2022.**

DELIBERATION IN SEIAA

SEIAA considered the recommendation of SEAC and accepted the same.

RECOMMENDATIONS OF SEIAA

SEIAA approved the proposal for ToR.

CONCLUSION

Approved ToR.

Conditions
A. STANDARD TERMS OF REFERENCE 1. Year-wise production details since 1994 should be given, clearly stating the highest production achieved in any on year prior to 1994. It may also be categorically informed whether there had been any increase in production afte the EIA Notification 1994 came into force, w.r.t. the highest production achieved prior to 1994. 2. A copy of the document in support of the fact that the Proponent is the rightful lessee of the mine should be given. 3. All documents including approved mine plan, EIA and Public Hearing should be compatible with one another i terms of the mine lease area, production levels, waste generation and its management, mining technology etc. an should be in the name of the lessee. 4. All corner coordinates of the mine lease area, superimposed on a High Resolution Imagery/ toposheet, topographi

sheet, geomorphology and geology of the area should be provided. Such an Imagery of the proposed area shoul clearly show the land use and other ecological features of the study area (core and buffer zone).

5. Information should be provided in Survey of India Toposheet in 1:50,000 scale indicating geological map of th area, geomorphology of land forms of the area, existing minerals and mining history of the area, important wate bodies, streams and rivers and soil characteristics.
6. Details about the land proposed for mining activities should be given with information as to whether minin conforms to the land use policy of the State; land diversion for mining should have approval from State land us board or the concerned authority.
7. It should be clearly stated whether the proponent Company has a well laid down Environment Policy approved b its Board of Directors? If so, it may be spelt out in the EIA Report with description of the prescribed operatin process/procedures to bring into focus any infringement/deviation/violation of the environmental or forest norms conditions? The hierarchical system or administrative order of the Company to deal with the environmental issue and for ensuring compliance with the EC conditions may also be given. The system of reporting of non compliances / violations of environmental norms to the Board of Directors of the Company and/or shareholders o stakeholders at large, may also be detailed in the EIA Report.
8. Issues relating to Mine Safety, including subsidence study in case of underground mining and slope study in cas of open cast mining, blasting study etc. should be detailed. The proposed safeguard measures in each case shoul also be provided.
9. The study area will comprise of 10 km zone around the mine lease from lease periphery and the data contained i the EIA such as waste generation etc. should be for the life of the mine / lease period.
10. Land use of the study area delineating forest area, agricultural land, grazing land, wildlife sanctuary, national park migratory routes of fauna, water bodies, human settlements and other ecological features should be indicated. Lan use plan of the mine lease area should be prepared to encompass preoperational, operational and post operationa phases and submitted. Impact, if any, of change of land use should be given.
11. Details of the land for any Over Burden Dumps outside the mine lease, such as extent of land area, distance fro mine lease, its land use, R&R issues, if any, should be given.
12. A Certificate from the Competent Authority in the State Forest Department should be provided, confirming th involvement of forest land, if any, in the project area. In the event of any contrary claim by the Project Proponen regarding the status of forests, the site may be inspected by the State Forest Department along with the Regiona Office of the Ministry to ascertain the status of forests, based on which, the Certificate in this regard as mentione above be issued. In all such cases, it would be desirable for representative of the State Forest Department to assis the Expert Appraisal Committees.
13. Status of forestry clearance for the broken up area and virgin forestland involved in the Project includin deposition of net present value (NPV) and compensatory afforestation (CA) should be indicated. A copy of th forestry clearance should also be furnished.
14. Implementation status of recognition of forest rights under the Scheduled Tribes and other Traditional Fores Dwellers (Recognition of Forest Rights) Act, 2006 should be indicated.
15. The vegetation in the RF / PF areas in the study area, with necessary details, should be given.
16. A study shall be got done to ascertain the impact of the Mining Project on wildlife of the study area and detail furnished. Impact of the project on the wildlife in the surrounding and any other protected area and accordingly detailed mitigative measures required, should be worked out with cost implications and submitted.
17. Location of National Parks, Sanctuaries, Biosphere Reserves, Wildlife Corridors, Ramsar site Tiger/Elephan Reserves/(existing as well as proposed), if any, within 10 km of the mine lease should be clearly indicated supported by a location map duly authenticated by Chief Wildlife Warden. Necessary clearance, as may b applicable to such projects due to proximity of the ecologically sensitive areas as mentioned above, should b obtained from the Standing Committee of National Board of Wildlife and copy furnished.

18. A detailed biological study of the study area [core zone and buffer zone (10 km radius of the periphery of the min lease)] shall be carried out. Details of flora and fauna, endangered, endemic and RET Species duly authenticated separately for core and buffer zone should be furnished based on such primary field survey, clearly indicating th Schedule of the fauna present. In case of any scheduled-I fauna found in the study area, the necessary plan alon with budgetary provisions for their conservation should be prepared in consultation with State Forest and Wildlif Department and details furnished. Necessary allocation of funds for implementing the same should be made as pa of the project cost.
19. Proximity to Areas declared as 'Critically Polluted' or the Project areas likely to come under the 'Aravali Range (attracting court restrictions for mining operations), should also be indicated and where so required, clearanc certifications from the prescribed Authorities, such as the SPCB or State Mining Department should be secured an furnished to the effect that the proposed mining activities could be considered.
20. Similarly, for coastal Projects, A CRZ map duly authenticated by one of the authorized agencies demarcating LTL HTL, CRZ area, location of the mine lease w.r.t CRZ, coastal features such as mangroves, if any, should b furnished. (Note: The Mining Projects falling under CRZ would also need to obtain approval of the concerne Coastal Zone Management Authority).
21. R&R Plan/compensation details for the Project Affected People (PAP) should be furnished. While preparing th R&R Plan, the relevant State/National Rehabilitation & Resettlement Policy should be kept in view. In respect o SCs /STs and other weaker sections of the society in the study area, a need based sample survey, family-wise should be undertaken to assess their requirements, and action programmes prepared and submitted accordingly integrating the sectorial programmes of line departments of the State Government. It may be clearly brought ou whether the village(s) located in the mine lease area will be shifted or not. The issues relating to shifting o village(s) including their R&R and socio-economic aspects should be discussed in the Report.
22. One season (non-monsoon) [i.e. March-May (Summer Season); October-December (post monsoon season) December-February (winter season)]primary baseline data on ambient air quality as per CPCB Notification o 2009, water quality, noise level, soil and flora and fauna shall be collected and the AAQ and other data so compile presented date-wise in the EIA and EMP Report. Site-specific meteorological data should also be collected. Th location of the monitoring stations should be such as to represent whole of the study area and justified keeping i view the pre-dominant downwind direction and location of sensitive receptors. There should be at least on monitoring station within 500 m of the mine lease in the pre-dominant downwind direction. The mineralogica composition of PM10, particularly for free silica, should be given.
23. Air quality modeling should be carried out for prediction of impact of the project on the air quality of the area. I should also take into account the impact of movement of vehicles for transportation of mineral. The details of th model used and input parameters used for modeling should be provided. The air quality contours may be shown o a location map clearly indicating the location of the site, location of sensitive receptors, if any, and the habitation The wind roses showing pre-dominant wind direction may also be indicated on the map.
24. The water requirement for the Project, its availability and source should be furnished. A detailed water balanc should also be provided. Fresh water requirement for the Project should be indicated.
25. Necessary clearance from the Competent Authority for drawl of requisite quantity of water for the Project shoul be provided.
26. Description of water conservation measures proposed to be adopted in the Project should be given. Details o rainwater harvesting proposed in the Project, if any, should be provided.
27. Impact of the Project on the water quality, both surface and groundwater, should be assessed and necessar safeguard measures, if any required, should be provided.
28. Based on actual monitored data, it may clearly be shown whether working will intersect groundwater. Necessar data and documentation in this regard may be provided. In case the working will intersect groundwater table, detailed Hydro Geological Study should be undertaken and Report furnished. The Report inter-alia, shall includ details of the aquifers present and impact of mining activities on these aquifers. Necessary permission from Centra Ground Water Authority for working below ground water and for pumping of ground water should also b

obtained and copy furnished.

29. Details of any stream, seasonal or otherwise, passing through the lease area and modification / diversion proposed if any, and the impact of the same on the hydrology should be brought out.
30. Information on site elevation, working depth, groundwater table etc. Should be provided both in AMSL and bgl. A schematic diagram may also be provided for the same.
31. A time bound Progressive Greenbelt Development Plan shall be prepared in a tabular form (indicating the linea and quantitative coverage, plant species and time frame) and submitted, keeping in mind, the same will have to b executed up front on commencement of the Project. Phase-wise plan of plantation and compensatory afforestatio should be charted clearly indicating the area to be covered under plantation and the species to be planted. Th details of plantation already done should be given. The plant species selected for green belt should have greate ecological value and should be of good utility value to the local population with emphasis on local and nativ species and the species which are tolerant to pollution.
32. Impact on local transport infrastructure due to the Project should be indicated. Projected increase in truck traffic a a result of the Project in the present road network (including those outside the Project area) should be worked out indicating whether it is capable of handling the incremental load. Arrangement for improving the infrastructure, i contemplated (including action to be taken by other agencies such as State Government) should be covered. Projec Proponent shall conduct Impact of Transportation study as per Indian Road Congress Guidelines.
33. Details of the onsite shelter and facilities to be provided to the mine workers should be included in the EIA Report.
34. Conceptual post mining land use and Reclamation and Restoration of mined out areas (with plans and wit adequate number of sections) should be given in the EIA report.
35. Occupational Health impacts of the Project should be anticipated and the proposed preventive measures spelt out i detail. Details of pre-placement medical examination and periodical medical examination schedules should b incorporated in the EMP. The project specific occupational health mitigation measures with required facilitie proposed in the mining area may be detailed.
36. Public health implications of the Project and related activities for the population in the impact zone should b systematically evaluated and the proposed remedial measures should be detailed along with budgetary allocations.
37. Measures of socio-economic significance and influence to the local community proposed to be provided by th Project Proponent should be indicated. As far as possible, quantitative dimensions may be given with time frame for implementation.
38. Detailed environmental management plan (EMP) to mitigate the environmental impacts which, should inter-ali include the impacts of change of land use, loss of agricultural and grazing land, if any, occupational health impact besides other impacts specific to the proposed Project.
39. Public Hearing points raised and commitment of the Project Proponent on the same along with time bound Actio Plan with budgetary provisions to implement the same should be provided and also incorporated in the fina EIA/EMP Report of the Project.
40. Details of litigation pending against the project, if any, with direction /order passed by any Court of Law agains the Project should be given.
41. The cost of the Project (capital cost and recurring cost) as well as the cost towards implementation of EMP shoul be clearly spelt out.
42. A Disaster management Plan shall be prepared and included in the EIA/EMP Report.
43. Benefits of the Project if the Project is implemented should be spelt out. The benefits of the Project shall clearl indicate environmental, social, economic, employment potential, etc.
44. Besides the above, the below mentioned general points are also to be followed:-
    a. Executive Summary of the EIA/EMP Report (enclosed as **Annexure – B**).
    b. All documents to be properly referenced with index and continuous page numbering.

c. Where data are presented in the Report especially in Tables, the period in which the data were collected an the sources should be indicated.

d. Project Proponent shall enclose all the analysis/testing reports of water, air, soil, noise etc. using th MoEF&CC/NABL accredited laboratories. All the original analysis/testing reports should be available durin appraisal of the Project.

e. Where the documents provided are in a language other than English, an English translation should b provided.

f. The Questionnaire for environmental appraisal of mining projects as devised earlier by the Ministry shall als be filled and submitted.

g. While preparing the EIA report, the instructions for the Proponents and instructions for the Consultants issue by MoEF&CC vide O.M. No. J-11013/41/2006-IA.II(I) dated 4th August, 2009, which are available on th website of this Ministry, should be followed.

h. Changes, if any made in the basic scope and project parameters (as submitted in Form-I and the PFR fo securing the TOR) should be brought to the attention of MoEF&CC with reasons for such changes an permission should be sought, as the TOR may also have to be altered. Post Public Hearing changes in structur and content of the draft EIA/EMP (other than modifications arising out of the P.H. process) will entai conducting the PH again with the revised documentation.

i. As per the circular no. J-11011/618/2010-IA.II(I) dated 30.5.2012, certified report of the status of complianc of the conditions stipulated in the environment clearance for the existing operations of the project, should b obtained from the Regional Office of Ministry of Environment, Forest and Climate Change, as may b applicable.

j. The EIA report should also include (i) surface plan of the area indicating contours of main topographi features, drainage and mining area, (ii) geological maps and sections and (iii) sections of the mine pit an external dumps, if any, clearly showing the land features of the adjoining area.

B. Additional Terms of Reference

i. Cluster certificate from the competent authority should be submitted.

ii. Need-based EMP, prepared in accordance with the MoEF&CC Office Memorandum vide F. No. 22-65/2017.IA. dated 30.09.2020.

iii. Details of accreditation of the environmental consultant including a copy of the valid NABET accreditati certificate may be submitted/ uploaded.

iv. A base line study may be conducted on the base flow level (to be measured at least at 5 points giving the dates measurement). The study report should also contain supporting photographs. It should be committed that mining w be done at least 1m above the base flow level. Accordingly, if required, the proposal may be revised.

The project proponent is requested to submit the final EIA/EMP prepared as per the above-mentioned ToRs an incorporating all the issues raised during Public Hearing / Public Consultation to the SEAC for further consideration of th proposal for environmental clearance.

The proponent, – while applying for environmental clearance, shall upload in the PARIVESH portal, the EIA/EMP report along with the documents/ sought above.

The ToR is valid for a period of 3 (three) years from the date of issue.

Annexure - B

Executive Summary

The Executive summary of the EIA/EMP report in about 8-10 pages should be prepared incorporating the information on following points:

1) Project name and location (Village, District, State, Industrial Estate (if applicable).
2) Products and capacities. If expansion proposal, then existing products with capacities and reference to earlier EC.
3) Requirement of land, raw material, water, power, fuel, with source of supply (Quantitative).
4) Process description in brief, specifically indicating the gaseous emission, liquid effluent and solid and hazardous wastes.
5) Measures for mitigating the impact on the environment and mode of discharge or disposal.
6) Capital cost of the project, estimated time of completion.
7) Site selected for the project - Nature of land - Agricultural (single/double crop), barren, Govt./private land, status of is acquisition, nearby (in 2-3 km.) water body, population, with in 10km. other industries, forest, eco-sensitive zones, accessibility, (note - in case of industrial estate this information may not be necessary).
8) Baseline environmental data - air quality, surface and ground water quality, soil characteristic, flora and fauna, socio-economic condition of the nearby population.
9) Identification of hazards in handling, processing and storage of hazardous material and safety system provided to mitigate the risk.
10) Likely impact of the project on air, water, land, flora-fauna and nearby population.
11) Emergency preparedness plan in case of natural or in plant emergencies.
12) Issues raised during public hearing (if applicable) and response given.
13) Environment Management Plan (EMP) as per Office Memorandum issued by the MoEF & CC vide F. No. 22-65/2017-IA.III dated 30.09.2020 with proposed expenditure.
14) Occupational Health Measures.
15) Post project monitoring plan.

MISCELLANEOUS

1. Discussion on draft DSRs of **Hooghly, Howrah and Nadia**.

DSRs of Hooghly, Howrah and Nadia are approved.