DISTRICT SURVEY REPORT OF PURULIA DISTRICT

(Modified)

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



SEIAA APPROVAL DATE:

23rd February 2024

(As published in the Minutes of 33rd Meeting of SEIAA under Any other Item(s), Point No.4.1.4)

1st Modification: 29th November 2023
1st Approval: 14th October 2022

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

Version 2

Brief About Modifications

Version No	DSR Status	Date	Remarks
Version-1	1st Approved DSR	14/10/22	DSR prepared as per guidelines.
Version-2	1st Modification	29/11/23	DSR modified to incorporate district boundary modification and inclusion of potential deposits of insitu mineral.

GOVERNMENT OF WEST BENGAL
DIRECTORATE OF MINES & MINERALS
4, ABANINDRANATH TAGORE SARANI (CAMAC STREET), 2ND FLOOR,
KOLKATA – 700016
e-mail: dir.dmm-wb@nic.in

No. MD/2C-642/20/452

Kolkata, 5th December, 2023

To
The Chairperson
State Expert Appraisal Committee (SEAC)
West Bengal.

Sub: Approval of Modified District Survey Report of Purulia district reg.

Sir,
Enclosed please find the soft copy of the Modified District Survey Report (DSR) of Purulia district in West Bengal. This is for your kind information and necessary action for approval as per norms.

Enclosure: As stated above.

Yours faithfully,

05/12/23

DIRECTOR OF MINES & MINERALS.
GOVERNMENT OF WEST BENGAL

No. MD/2C-642/20/452/1(2)

Kolkata, 5th December, 2023

Copy forwarded for information to:
1. The Member Secretary, SEIAA, West Bengal.
2. The Chairman & Managing Director, West Bengal Minerals Development & Trading Corporation Ltd.

05/12/23

DIRECTOR OF MINES & MINERALS
GOVERNMENT OF WEST BENGAL

GOVERNMENT OF WEST BENGAL
DIRECTORATE OF MINES & MINERALS
4, ABANINDRANATH TAGORE SARANI (CAMAC STREET), 2ND FLOOR,
KOLKATA – 700016
e-mail: dir.dmm-wb@nic.in

No. MD/2C-642/20/451

Kolkata, 5th December, 2023

TO WHOM IT MAY CONCERN

This is to certify that the Modified District Survey Report of Purulia District in West Bengal has been prepared in accordance with the prevailing norms and guidelines applicable for the purpose. This Modified District Survey Report has been duly consulted through the District Authority concerned and the comments and observations as received from the District Authority has been duly incorporated in the report. Authorized officials of the Directorate of Mines & Minerals under the Department of Industry, Commerce and Enterprises, Govt. of West Bengal has scrutinized the Modified District Survey Report of Purulia District and found the same to be in order.

Now, this Modified District Survey Report of Purulia district is forwarded to the State Level Environment Impact Assessment Authority (SEIAA), West Bengal for necessary approval.

05/12/23

DIRECTOR OF MINES & MINERALS.
GOVERNMENT OF WEST BENGAL

GOVT OF WEST BENGAL
OFFICE OF THE ADDITIONAL DISTRICT MAGISTRATE AND
DISTRICT LAND AND LAND REFORMS OFFICER
PURULIA ; WEST BENGAL
Email- dllroprl2020@Gmail.com

MEMO NO -: VI/ 1590/ 3521 /M/DSR/21 **DATE -: 13/10/2023**

To,

The Director of Mines & Minerals.
Government of West Bengal.
4, Abanindra Nath Sarani , Shilpa Sadan , 2nd Floor,
Kol – 700016.

Sub : Certificate for uploading modified District Survey Report of Purulia District Website.

Madam/Sir ,

The proposed modified DSR received from DMM,WB was published duly for receiving claims and objection from 21/08/2023 to 20/09/2023.

The screen shot of district website has been attached herewith as **Annexure -I** for ready reference. Also the claim and objection received from public has been attached herewith as **Annexure –II** and co-ordinates of the existing mining sites has been attached herewith as **Annexure –III.**

Now the draft is hereby sent back to the end of DMM for further verification and taking necessary steps for its finalization.

Yours faithfully

13/10/23

Additional District Magistrate
and
District Land and Land Reforms Officer.
Purulia.

Enclosure :
As stated. (10 Pages)

MEMO NO -: VI/ 1590/ 3521/1 **/M/DSR/21** **DATE -:** 13**/10/2023.**

Copy forwarded for information to :-

1).The Chairman & Managing Director , WBMDTCL , WBIIDC Building, 3rd Floor,. DJ-10, DJ Block, Saltlake City,. Kolkata-700091 .

13/10/23

Additional District Magistrate
and
District Land and Land Reforms Officer.
Purulia.

Table of Content

Chapter No	Subject	Page No
	Executive Summary	**1**
1	**Preface**	**2**
2	**Introduction**	**3-17**
GENERAL PART		
3	**General Profile of the District**	**18-38**
	a. General Information	18-21
	b. Climate Condition	21-22
	c. Rainfall and humidity	22-23
	d. Topography & Terrain	23-24
	e. Water courses and Hydrology	24-26
	f. Ground water Development	27-30
	g. Drainage System	31
	h. Demography	31-34
	i. Cropping pattern	34
	j. Land Form and Seismicity	34-37
	k. Flora	37
	l. Fauna	37-38
4	**Physiography of the District**	**39-43**
	4.1 General Landforms	39
	4.2 Soil and rock pattern	39-42
	4.3 Different geomorphology units	42-43
5	**Land Use Pattern of The District**	**44-52**

Chapter No	Subject	Page No
	5.1 Forest	47-48
	5.2 Agriculture and Irrigation	48-49
	5.3 Horticulture	50-51
	5.4 Mining	52
6	**Geology**	**53-56**
PART A- RIVERBED DEPOSITS		
7	**Mineral Wealth**	**57-87**
	7.1 Overview of mineral resources	57
	7.2 Sand and other riverbed minerals	57-111
	I. Drainage System	57-59
	II. Annual deposition of riverbed minerals	59-82
	A. Geomorphological studies	59-80
	i. Place of Origin	59
	ii. Catchment Area	59
	iii. General profile of river stream	59-62
	iv. Annual deposition factor	62-65
	v. Replenishment Study as per EMGSM guidelines 2020	65-80
	vi. Total potential of minor mineral in the river bed	80
	B. Geological studies	80-81
	i. Lithology of the catchment area	80
	ii. Tectonics and structural behavior of rocks	81
	C. Climate Factors	81-82
	i. Intensity of rainfall	81
	ii. Climate zone	81

Chapter No	Subject	Page No
	iii. Temperature variation	81-82
	III. Riverbed Mineral Potential	82-87
8	**Overview Of Mining Activity in The District**	**88-102**
	8.1 General overview	88
	8.2 List of existing mining leases of the districts (location, area, period for each minor mineral)	88-102
	8.3 Detail of production of sand and other minerals during last three years	102
9	**Details Of Revenue Generated from Mineral Sector During Last Five Years**	**103**
10	**Transport**	**104-106**
PART B- INSITU MINOR MINERAL DEPOSITS		
11	**In-situ Minerals**	**107-155**
	11.1 Mineral Reserve	107-108
	11.2 Mineral Potential	108-138
	11.3 Mineral Development Prospect of the district with respect to Minor Mineral and Existing Leases of the District	139-154
	11.4 Exploration requirement of the district	155
11	**Remedial measure to mitigate the impact of Mining**	**156-159**
12	**Suggested reclamation plan for already mined out areas**	**160**
13	**Risk assessment & disaster management plan**	**161-162**
14	**Conclusion and Recommendation**	**163-164**
15	**References**	**165**

List of Plates

Plate No	Subject	Page No
Plate 1A	Drainage Map of the District	P1-P2
Plate 1B	Location Map of dams, barrages, bridge showing on drainage system	P3
Plate 2A1-2A28	Distribution Map of Sand Bars on Rivers During Pre-Monsoon Period of Purulia District	P4-P32
Plate 2B1-2B29	Distribution Map of Sand Bars on Rivers During Post-Monsoon Period of Purulia District	P33-P62
Plate 3A	Watershed map of Purulia District	P63-P64
Plate 3B	District Watershed map showing ground water level during pre-monsoon level	P65
Plate 3C	District Watershed map showing ground water level during post-monsoon level	P66
Plate 4	Field Survey Photographs	P67-P68
Plate 5	Long-term River course erosion/ accretion map	P69-P70
Plate 6	Geological map of Purulia district	P71-P72

List of Annexure

Annexure No	Subject	Page No
Annexure 1	Compliance as per Enforcement & Monitoring Guidelines for sand Mining, 2020 (MoEF& CC) for preparation of District Survey Report	A1 (1-4)
Annexure 2	Estimation of Sand Resources based on sediment load comparison between Pre and Post Monsoon period of Purulia District	A2 (1-6)
Annexure 3	Coordinates of Potential Blocks of Purulia District	A3 (1-35)
Annexure 4	Maps showing Potential Blocks of Purulia District	-
Annexure 5	Maps showing Potential In-situ Minor Mineral Blocks of Purulia District	-
Annexure 6	SEIAA MOM	-
Annexure 7	Reasons for DSR Modifications	A7 (1-8)

List of Figure

Figure No	Subject	Page No
Figure 2.1	Steps followed in preparation of DSR	12
Figure 2.2	Pictorial description of Land Use Classification methods	13
Figure 2.3	Pictorial description of Geomorphological Units Classification methods	14
Figure 3.1	Location Map of Purulia	19
Figure 3.2	Block Divisional Map of Purulia	21
Figure 3.3	Graphical Representation of Purulia District Rainfall	23
Figure 3.4	Physiographic Map of Purulia District	24
Figure 3.5	Hydrogeological Map of Purulia District	26
Figure 3.6	Graphical Representation of Pre-Monsoon and Post-Monsoon Water Level Data	27
Figure 3.7	Block wise Hydrograph of water level of the district	28-30
Figure 3.8	Drainage Map of Purulia District	31
Figure 3.9	Population Distribution in Purulia District	33
Figure 3.10	Demographic Map Showing Block-Wise Literacy Rate of Purulia District	34
Figure 3.11	Earthquake Zonation Map of West Bengal Highlighting the Purulia District Position	36
Figure 3.12	District Location with Respect To Wildlife Sanctuary of West Bengal	38
Figure 4.1	Soil Map of Purulia District	42
Figure 4.2	Geomorphological Map of Purulia District	43
Figure 5.1	Land Use Pattern of Purulia District	45
Figure 5.2	Land Use Land Cover Map of Purulia District	46
Figure 6.1	Geological Map of Purulia District	56
Figure 7.1	Plan Showing the Major Rivers Along with The Distribution of Section Lines	60
Figure 7.2	Profile Sections of Mejor river of Purulia district	60-61
Figure 7.3	Cross Sections of Mejor river of Purulia district	61-62
Figure 7.4	Site View of River Kumari (Monsoon 2020)	67
Figure 7.5	Watershed map of Purulia district	71
Figure 7.6	Graphical representation of year-wise sedimentation rate	78
Figure 7.7	A representative map showing no-mining zone demarcated on	87

	Dwarakeswar River	
Figure 8.1	MDTCL Auctioned block map plotted on potential sand blocks of Purulia district	96-102
Figure 10.1	Transportation Map of Purulia District	105
Figure 10.2	Map showing approach road to potential sand bars	106
Figure 11.1	In-situ mineral occurrences shown on geological map of Purulia district	138

List of Tables

Table No	Subject	Page No
Table 2.1	Statutory Framework and Guidelines on DSR With Time Scale	5-6
Table 3.1	Block Distribution of Purulia District	19-20
Table 3.2	Annual Rainfall Recorded in Purulia District	22
Table 3.3	Monthly Mean Temperature Distribution of Purulia District	22
Table 3.4	Demographic Distribution of Purulia District	32-33
Table 4.1	Description of District Soil Type	40-41
Table 5.1	Classification of Land Utilisation Statistics in the District	44
Table 5.2	Distribution of Villages According to Agricultural Land Use, 2011	45-46
Table 5.3	Classification of Forest Area, Out-Turn of Forest Produce, Revenue and Expenditure of Forest Department	47-48
Table 5.4	Production of Principal Crops in the Purulia District	49
Table 5.5	Production of Fruits and Vegetables in the District	50-51
Table 5.6	Production of Flowers in the District	51
Table 6.1	Geological succession of Purulia	53-54
Table 7.1	Drainage System with Description of Main Rivers	58
Table 7.2	Salient Features of Important Rivers and Streams	58-59
Table 7.3	Place of Origin of important rivers and streams	59
Table 7.4	Sediment Load Comparison Between Pre and Post Monsoon Period for Different Rivers of Purulia District	68
Table 7.5	Replenishment rate of the district	69
Table 7.6	Runoff coefficient of the catchment based on Strange's table	72
Table 7.7	Replenishment parameter estimated for each river in the district	77-78
Table 7.8	Year-wise sedimentation rate for last 5 years of each river	78
Table 7.9	River wise replenishment rate estimation based on empirical formula	79
Table 7.10	Illustration of replenishment rate calculation based on 3 methods	79-80
Table 7.11	Comparison of replenishment study	80
Table 7.12	River wise Thickness of sand bar considered mineable	82
Table 7.13	Annual Deposition of Riverbed Minerals	82
Table 7.14	Resources Of Potential Riverbed Mineral	83
Table 7.15	Potential Zone of Riverbed Mineral	83-85
Table 7.16	No Mining zone of the district riverbed deposits	86-87
Table 8.1	Details of Sand Mining Leases of The Districts	89-94
Table 8.2	List of WBMDTCL Sand Auction Block of the district	95
Table 8.3	Details Of Production of Sand as Per Mine Plan in Purulia District	102
Table 9.1	District Revenue Generation from Mineral Sector	103
Table 11.1	In-Situ Minerals Occurrences	109-137
Table 11.2	List of existing mining leases of the district (other than sand)	140-144
Table 11.3	List of mining leases of West Bengal Mineral Development & Trading Corporation Limited of the district (other than sand)	144-149
Table 11.4	List of mineral blocks of West Bengal Mineral Development & Trading Corporation Limited of the district (other than sand)	149-154

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 - Kilometre

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

The West Bengal Sand Mining Policy, 2021

EMGSM-2020- Enforcement & Monitoring Guidelines for Sand Mining

West Bengal Raiyati Policy 2022

PR-	Pre Monsoon
PO-	Post Monsoon
PUR	PURULIA
NE	NETURIA
KS	KASHIPUR
M1	MANBAZAR-I
PU	PUNCHA
P1	PURULIA-I
P2	PURULIA-II
JR	JOYPUR
BR	BARABAZAR
BG	BAGMUNDI
JL	JHALDA
J2	JHALDA-II
DMD	DAMODAR
DW	DWARAKESWAR

KB	KANGSABATI
KR	KUMARI
SR	SUBARNAREKHA
BS	BLACK STONE
CC	CHINA CLAY
FC	FIRE CLAY
FLDS	FELDSPAR
GR	GRANITE/Quartz/ Feldspar
QT	QUARTZ
QTZ	QUARTZITE
GSI	Geological Survey of India
DMM	Directorate of Mines and Minerals

Key Definitions

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

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

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

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

Restricted Area: Sandbars or part of sandbars which are falling within restricted area. As per the Enforcement & Monitoring Guidelines for Sand Mining (EMGSM) 2020 the restricted zone for mining is a distance from the bank is ¼th of river width and not be less than 7.5 meters. Also, there is a no mining zone up to a distance of 1 kilometre (1 km) from major bridges and highways on both sides, or five times (5x) of the span (x) of a bridge/public civil structure (including water intake points) on up-stream side and ten times (10x) the span of such bridge on down-stream side, subjected to a minimum of 250 meters on the upstream side and 500 meters on the downstream side. No mining zone has been marked for an area up to a width of 100 meters from the active edge of embankments.

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

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

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

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

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

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

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

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

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

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

EXECUTIVE SUMMARY

Purulia district is located in western boundary of West Bengal. It is situated within 22°4´North to 23°45´North latitudes and 85°55´East to 86°55´East longitudes. Geographically the district is part of ancient plateau of Chotanagpur. Purulia is surrounded on its three sides by the State of Jharkhand, on the North by Bokaro and Dhanbad, on the South by East Singbhum and in the West by Ranchi. On the Eastern side the district of West Bengal namely Jhargram, Bankura and Paschim Bardhaman covers the flank. The district covers an area of around 6259 sq. km.

Topographically the district shows gradual decent from the uneven Chhotanagpur plateau in the west to the plain land of the state in the east. The district of Purulia is divided into three sub-micro regions on the basis of elevation and the nature of topography, viz. 1) Damodar–Darkeshwar Upland, 2) Upper Kasai Basin, and 3) Bagmundi–Bundwan Upland.

The drainage system of the district is controlled by rivers like Damodar, Dwarakeswar, Kangsabati, Kumari and Subarnarekh. These rivers are found to be good source of construction sand. The district is generating considerable revenue from mining riverbed sand deposits. Revenue collected during the period of 2016 to January 2019 is Rs. 9.37 crores.

Geologically the district holds diverse groups of rocks of various geological ages ranging from Archaean to recent, viz. (i) the Chhotanagpur Gneissic Complex (covers most part of the district), (ii) plutonic gabbro and anorthositic rocks, (ii) meta-sedimentaries and metabasics of Singhbhum Group, (iv) Dalma Group of basic volcanic rocks, (v) intrusive granites (Kuilapal, Manbhum granites), (vi) Gondwana Group of sedimentaries with coal seams and (vii) Quaternary sediments in order of decreasing antiquity.

Purulia district holds several important minerals deposits. As per GSI (2001), the important deposits (reserves in million tonnes) are Coal (54), Apatite (16.733), China Clay (23.882), Crystalline Limestone (17.95), Copper (0.112), Kyanite (26.525 tonnes), Barytes (433 tonnes), Dimension Stones (Puruliy black: 1.586 m. cu. m, Spotty black: 3.870 m. cu. m, Pink streaky gneiss: 1.463 m. cu. m, Pink spotty/ ribbon gneiss: 7.940 m. cu. m and pink porphyry 0.425 m. cu. m) and Rare Metals (Cs, Li, Rb) in Beku area. Besides, minor occurrences of minerals include gold, graphite, beryl, corundum, rutile, fluorite, feldspar, galena and mica. Construction material and building stones have fairly good potential in the district.

In Bankura district, total 9.19 Mcum potential riverbed sand deposits have been estimated and a total 109 in-situ minor mineral potential blocks identified.

The District Survey Report (DSR) has been modified to incorporate district boundary revision based on Survey of India database. Modified DSR also includes potential zones with respect to insitu minor mineral deposits of the district.

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. Enforcement &Monitoring Guidelines for Sand Mining (EMGSM) January 2020, Issued by MoEF&CC is prepared in consideration of various orders/directions issued by Hon'ble NGT in matters pertaining to illegal sand mining and also based on the reports submitted by expert committees and investigation teams. This DSR has been prepared in conformity with the S O 141 (E), S O 3611 (E) and other sand mining guidelines published by MOEF& CC time to time as well as the requirement specified in West Bengal Minor Mineral Concession Rule (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 Purulia district also describes the general geographical profile of the district, distribution of natural resources, livelihood, climatic condition, and sources of revenue generation.

Modification of the District Survey Report (DSR) is required because of the following:

- To include insitu minor mineral potential zones of the district into the DSR.
- To incorporate district boundary revision based on Survey of India database instead of district portal information.
- To include the potential sandbars based on 2022 Satellite Imagery study for quantification of potential sandbars.

The modified DSR Report has been presented in 3 parts. The 1st part contains the general information of the district. The 2nd part highlights the riverbed deposits that is sand and gravels. The 3rd part of the modified report contains the occurrences of institu minor mineral deposits of the district. The modifications of the DSR of Purulia have been furnished in Annexure 7.

2 Introduction

The District Survey Report of Purulia 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 of flood in the area.
7. To maintain the aquatic habitats.
8. To protect ground water in the area by limiting extraction of material in riverbeds to an elevation above the base flow.
9. To maintain data records viz. details of mineral resource, potential area, lease, approved mining plan, co-ordinates of lease hold areas, and revenue generation.
10. To design a scientific mining plan and estimate ultimate pit limit.
11. To frame a comprehensive guideline for mining of sand and other minor minerals.



The District Survey report (DSR) is comprised of secondary data published and endorsed by various departments and websites about geology of the area, mineral resources, climate, topography, land form, forest, rivers, soil, agriculture, road, transportation, irrigation etc. Data on lease and mining activities in the district, revenue etc. are collected and collated from concern district DL&LRO office and 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 (MoEF& CC) has published several notifications time to time to formulate and implement the District Survey Report (DSR) for every district. Statutory Frame work and its legal aspect with respect to DSR are tabulated in Table 2.1.

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

Year	Particulars
1994	The Ministry of Environment, Forest & Climate Change (MoEF&CC) published Environmental Impact Assessment Notification 1994 which is only applicable for the Major Minerals more than 5 ha.
2006	In order to cover the minor minerals also into the purview 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 & 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	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,

Year	Particulars
	prospecting license-cum-mining leases and mining leases in respect of minor minerals by auction process. The rule also incorporates EIA 2016 also includes SSMG2016 for minor mineral mining.
2018	MoEF& CC published a notification S.O. 3611(E) Dated 25th July, 2018 and recommended the format for District Survey Report .The notification stated about the objective of DSR i.e "Identification of areas of aggradations or deposition where mining can be allowed; and identification of areas of erosion and proximity to infrastructural structures and installations where mining should be prohibited and calculation of annual rate of replenishment and allowing time for replenishment after mining in that area".
2020	Enforcement & Monitoring Guidelines for Sand Mining (EMGSM) 2020 has been published modifying Sustainable sand Mining Guidelines, 2016 by MoEF& CC for effective enforcement of regulatory provisions and their monitoring. The EMGSM 2020 directed the states to carry out river audits, put detailed survey reports of all mining areas online and in the public domain, conduct replenishment studies of river beds, constantly monitor mining with drones, aerial surveys, ground surveys and set up dedicated task forces at district levels. The guidelines also push for online sales and purchase of sand and other riverbed materials to make the process transparent. They propose night surveillance of mining activity through night-vision drones.
2021	The West Bengal Sand Mining Policy, 2021- The State Government through this policy intends to govern the excavation, transportation, storage, sale and consumption of sand. The State Government intends to appoint the West Bengal Mineral Development and Trading Corporation Ltd. ("WBMDTCL") as the designated agency, in order to effectively address the issues of indiscriminate mining of sand, black-marketing, artificial supply shortage through hoarding and to ensure compliance with environmental regulations and affordable pricing for the end consumers.
2022	The Policy of Mining of Minor Minerals in Private/Raiyati land-The state government in November 2022 introduced a new 'Raiyati' policy 2022 for the mining of minor minerals on private land. The interested Raiyat/Group of Raiyats/Company as Raiyat shall apply for grant of Letter of Intent (LoI) to the state nodal agency (WBMDTCL) for an area of minimum 1 Ha on their own land(s) along with land details for all minor minerals except morrum.



2.1.2 Other Guidelines for Sand Mining:

A) he 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 center 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 center-to-center 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 & Monitoring Guidelines for sand Mining, 2020 (MoEF& CC)

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

a) Parts of the river reach that experience deposition or 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 kilometer (1 km) from major bridges and highways on both sides, or five times (5x) of the span (x) of a bridge/public civil structure (including water intake points) on up-stream side and ten times (10x) the span of such bridge on down-stream side, subjected to a minimum of 250 meters on the upstream side and 500 meters on the downstream side.

i) The sediment sampling should include the bed material and bed material load before, during and after the extraction period. Develop a sediment rating curve at the upstream end of the potential reach using the surveyed cross-section. Using the historical or gauged flow rating curve, determine the suitable period of high flow that can replenish the extracted volume. Calculate the extraction volume based on the sediment rating curve and high flow period after determining the allowable mining depth.

j) Sand and gravel could be extracted from the downstream of the sand bar at river bends. Retaining the upstream one to two-thirds of the bar and riparian vegetation is accepted as a method to promote channel stability.

k) The flood discharge capacity of the river could be maintained in areas where there is a significant flood hazard to existing structures or infrastructure. Sand and gravel mining may be allowed to maintain the natural flow capacity based on surveyed cross-section history. Alternatively, off-channel or floodplain extraction is recommended to allow rivers to replenish the quantity taken out during mining.

l) The Piedmont Zone (Bhabhar area) particularly in the Himalayan foothills, where riverbed material is mined, this sandy-gravelly track constitutes excellent conduits and holds the greater potential for groundwater recharge. Mining in such areas should be preferred in locations selected away from the channel bank stretches.

m) Mining depth should be restricted to 3 meters and distance from the bank should be ¼th or river width and should not be less than 7.5 meters.

n) The borrow area should preferably be located on the riverside of the proposed embankment because they get silted in the course of time. For low embankment, less than 6 m in height, borrow area should not be selected within 25 m from the toe/heel of the embankment. In the case of the higher embankment, the distance should not be less than 50 m. In order to obviate the development of flow parallels to the embankment, crossbars of width eight times the depth of borrow pits spaced 50 to 60 meter center-to-center should be left in the borrow pits.

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

p) A buffer distance /un-mined block of 50 meters after every block of 1000 meters over which mining is undertaken or at such distance as may be the directed/prescribed by the regulatory authority shall be maintained.

q) A buffer distance /unmined block of 50 meters after every block of 1000 meters over which mining is undertaken or at such distance as may be the directed/prescribed by the regulatory authority shall be maintained.

r) River bed sand mining shall be restricted within the central 3/4th width of the river/rivulet or 7.5 meters (inward) from river banks but up to 10% of the width of the river, as the case may be and decided by regulatory authority while granting environmental clearance in consultation with irrigation department. Regulating authority while regulating the zone of river bed mining shall ensure that the objective to minimize the effects of riverbank erosion and consequential channel migration are achieved to the extent possible. In general, the area for removal of minerals shall not exceed 60% of the mine lease area, and any deviation or relaxation in this regard shall be adequately supported by the scientific report.

s) Mining Plan for the mining leases(non-government) on agricultural fields/Patta land shall only be approved if there is a possibility of replenishment of the mineral or when there is no riverbed mining possibility within 5 KM of the Patta land/Khatedari land. For government projects mining could be allowed on Patta land/Khatedari land but the mining should only be done by the Government agency and material should not be used for sale in the open market.

The minerals reserve for 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 Composite) pre-processing, selection of suitable classification approaches, post-classification processing, and accuracy assessment.

Here LISS-III satellite Imagery has been taken for Supervised Classification as supervised classification can be much more accurate than unsupervised classification, but depends heavily on the training sites, the skill of the individual processing the image, and the spectral distinctness of the classes in broader scale.

According to the Visual Image Interpretation (Tone, Texture, Colour etc.) training set of the pixel has been taken. Pictorial descriptions of Land Use classification are explained in Figure 2.2.

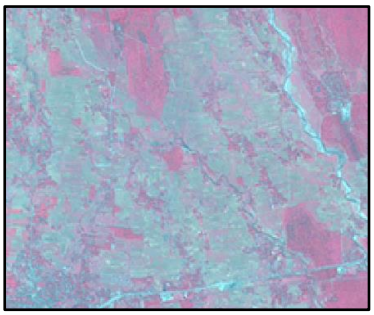
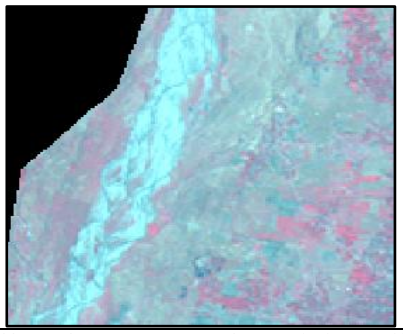
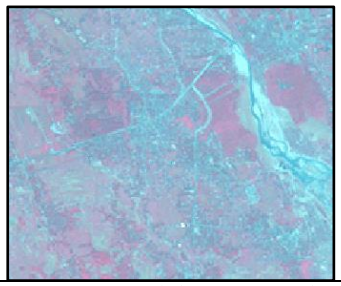
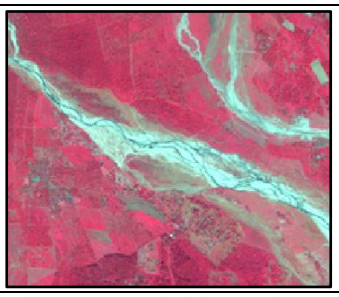
	
Agricultural Land - Based on their Geometrical shape, Red and Pink colour tone, Agricultural Land has been identified.	**Vegetation Covered Area** - Based on their continuous Red colour tone, Vegetation Covered Area has been identified.
	
Agricultural Fallow Land - Based on their Geometrical shape, Light and dark cyanwith light pink colour tone, Agricultural Land has been identified.	**Badland 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

Geomorphological Map: The major steps of preparing Geomorphological Map is identifying features like – Alluvial Fan, Alluvial Plain, Hilly Region etc. from Satellite Imagery (FCC-False Colour Composite) via Visual Image Interpretation and then 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.

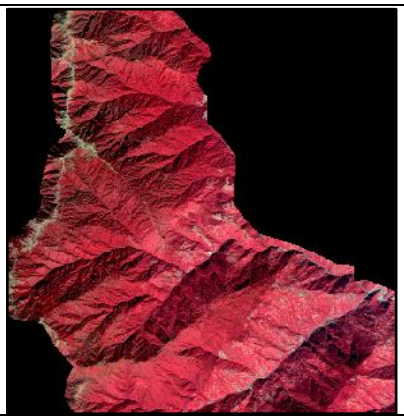
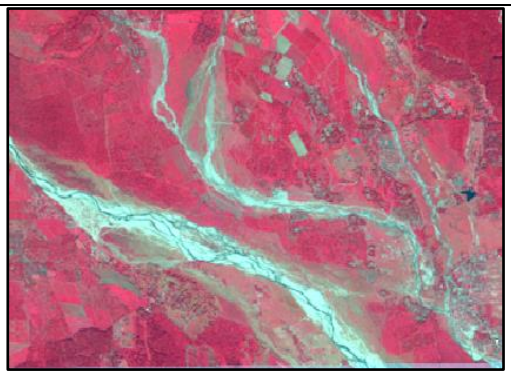
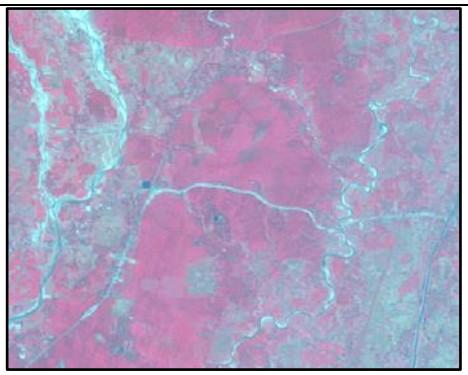
	
Upper Hills – Upper hilly region has been identified based on their high elevation and sharp edges of the land.	**Lower Hills** – Lower hilly has been identified based on their elevation and sharp edges which is comparatively less in height than upper hilly region.
	
Alluvial Fan- A fan-based deposition 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

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 & Protected Areas during August 2020.**
- Data has been geo-referenced using GIS software.
- Digitization of Wildlife Sanctuary& National Park and superimposed it over Block Boundary.
- Wildlife Sanctuary & National Park name has been filled in attribute table of the Layers

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

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

Replenishment study: One of the principal causes of environmental impacts from in-stream mining is the removal of more sediment than the system can replenish. It is therefore need for replenishment study for 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. We need sand in the beaches where tides, storms or any form of preconceived changes to the shoreline crumble the first sand.
13. Sand containing silica is used for making glass in the automobile and food industry- even household products for the kitchen.
14. Sand is a strong strand which is used for plaster, mortar, concrete, and asphalt.
15. The usual bricks formulated of clay only are way weaker and lesser in weight than blocks made of clay mixed with sand.

GENERAL PART

3 General Profile of the district

3.1 General Information

The district of Purulia was carved out of the former Manbhum district of Bihar and was merged with the State of West Bengal in November 1956. The district occupies 5th position in the State in respect of its size with an area of 6259 sq.km. Purulia is surrounded on its three sides by the State of Jharkhand, on the North by Bokaro and Dhanbad, on the South by East Singbhum and in the West by Ranchi. On the Eastern side the district of West Bengal namely Jhargram, Bankura and Paschim Bardhaman covers the flank. The district lies between 22°4' to 23°45' North Latitude and 85°55' to 86°55' East Longitude (Figure 3.1).

(http://purulia.gov.in/aboutDistrict/introduction.html).

The district of Purulia has four Sub-divisions namely (a) Purulia Sadar, (b) Raghunathpur (c) Manbazar (d) Jhalda. The district is divided into 20 Community Development (C.D.) Blocks (Table 3.1). Purulia Sadar Sub –division consists of five blocks namely Arsha, Balarampur, Hura, Purulia - I and Purulia-II. Raghunathpur Sub– division consists of six blocks namely Kashipur, Neturia, Para, Santuri Raghunathpur–I and Raghunathpur –II. Manbazar Sub – division consists of five blocks namely Barabazar, Bandwan, Manbazar – I, Manbazar – II and Puncha. Jhalda Sub – division consists of four blocks namely Bagmundi, Jhalda–I, Jhalda –II and Joypur. There are three Municipalities namely Purulia Municipality, Raghunathpur Municipality and Jhalda Municipality (Figure 3.2).

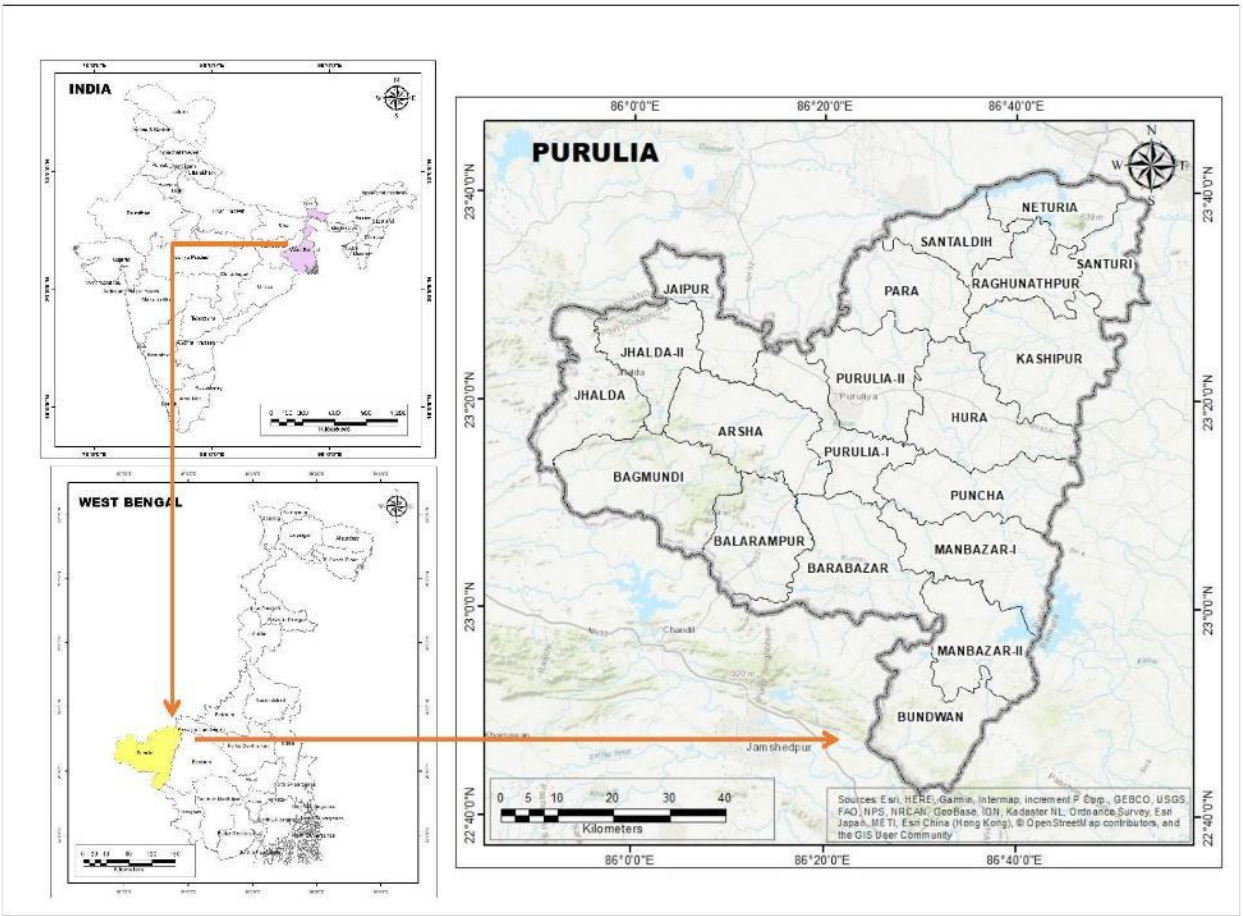


Figure 3.1: Location Map of Purulia
(Source: National Informatics Center and ESRI Base Map)

Table 3.1: Block distribution of Purulia District

Sub-Division	C.D.Block/ M	No of Gram Panchayat	Area (Sq. Km.) (2001)
Sadar (W) Sub-Division	**7/ 1**	**759**	**2327.98**
	Arsha	110	375.04
	Baghmundi	101	427.95
	Balarampur	100	300.88
	Barabazar	133	418.06
	Jaypur	98	230.47
	Jhalda-I	108	315.09
	Jhalda-II	109	256.61
	Jhalda(M)		3.88
Sadar (E) Sub-Division	**7/ 1**	**746**	**2336.20**
	Bandowan	78	351.25
	Hura	118	382.21

Sub-Division	C.D.Block/ M	No of Gram Panchayat	Area (Sq. Km.) (2001)
	Manbazar -I	125	381.32
	Manbazar -II	83	285.81
	Puncha	108	330.11
	Purulia-I	110	281.50
	Purulia-II	124	310.10
	Purulia(M)		13.90
Raghunathpur Sub-Division	**6/ 1**	**627**	**1559.68**
	Kashipur	151	451.31
	Neturia	81	203.65
	Para	147	312.59
	Raghunathpur-I	97	201.82
	Raghunathpur-II	87	197.67
	Santuri	64	12.95
	Raghunathpur(M)		179.69
District Total- 3	**20/ 3**	**2132**	**6259.00**

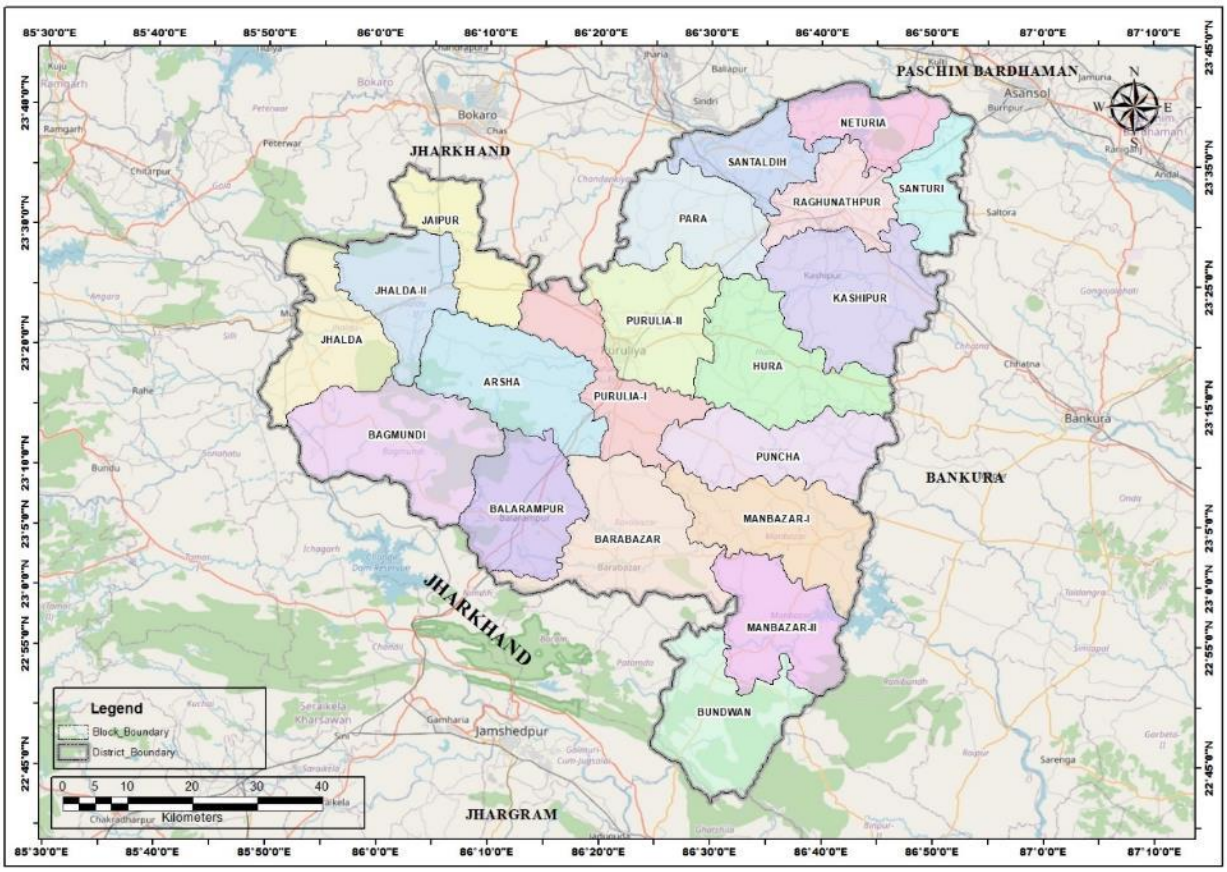


Figure 3.2: Block divisional map of Purulia

(Source: National Informatics Center)

3.2 Climate Condition

Purulia district is one of the drought prone districts of West Bengal. It has a sub-tropical climate nature and is characterized by high evaporation and low precipitation. Temperature is very high in summer and low in winter. The relative humidity is high in monsoon season, being 75 per cent to 85 per cent. In hot summer it comes down to 25 per cent to 35 per cent. (Census, 2011).

3.2.1 Temperature

The temperature of Purulia district varies from 43°C to 7°C. The maximum temperature is usually reached during summer and the lowest temperature is reached during the cold winter, between December to January.

The average maximum and minimum temperature recorded around Purulia Town during preceding five years is as follows:

Table 3.2: Monthly average temperature distribution of Purulia District

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec
Avg. Temperature (°C)	17.3 °C	21.3 °C	26.2 °C	30.4 °C	31 °C	29.6 °C	27.3 °C	27 °C	26.6 °C	24.9 °C	21.6 °C	18.1 °C
Min. Temperature (°C)	10.5 °C	14.1 °C	18.5 °C	23.2 °C	25.7 °C	26.2 °C	25 °C	24.7 °C	24 °C	20.7 °C	15.9 °C	11.8 °C
Max. Temperature (°C)	24.2 °C	28.3 °C	33.5 °C	37.8 °C	37.3 °C	34.1 °C	30.6 °C	30.4 °C	30.2 °C	29.4 °C	27.5 °C	24.5 °C

(Source: https://en.climate-data.org/asia/india/west-bengal/Purulia-48738/)

3.3 Rainfall and Humidity

The rainy season in the district commence from June and lasts till September. The average annual rainfall is 1386 mm (Figure 3.3). The maximum rainfall in the area as per IMD data was recorded in the month of July followed by August and September. The following table shows the annual total rainfall recorded for Purulia district along with the month(s) while maximum precipitation is recorded over 5 years from 2016-2020 (https://hydro.imd.gov.in/hydrometweb/(S(f4tylo451lnr2uyaewdej155))/DistrictRaifall.aspx) (Table 3.3).

Table 3.3: Annual rainfall recorded in Purulia District

Month	2016	2017	2018	2019	2020	Average
Jan	5	0.1	0	0.1	44.4	9.92
Feb	15.5	0	0.5	32.5	2.9	10.28
Mar	5.5	13.6	3.3	28.5	61.6	22.5
Apr	0.1	43.7	76.5	53.1	58.2	46.32
May	73.5	115.3	73.3	115.4	153.5	106.2
Jun	151.8	186.2	209.2	99.6	266.6	182.68
Jul	250.1	568.2	274.8	239	278.8	322.18
Aug	506.8	249.6	233.9	344.9	315.8	330.2
Sept	329.6	197	175.4	307.1	197.7	241.36
Oct	30	180.5	44.9	172	58.3	97.14
Nov	0	10.6	0	0	3.6	2.84
Dec	0	1.1	48.4	22.8	0.7	14.6
Yearly Total	1367.9	1565.9	1140.2	1415	1442.1	1386.2

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

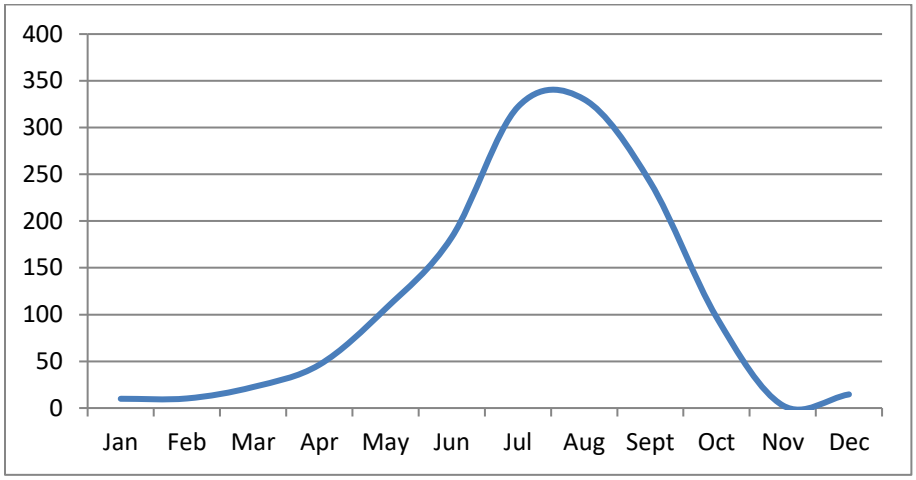


Figure 3.3: Graphical representation of Purulia District Rainfall

3.3.1 Relative Humidity, Wind speed & Wind direction

In entire Purulia relative humidity is spread uniformly. The relative humidity is ranging from 40 - 85% in the district. The drier months of March and April are less humid with the relative humidity of around 40%.

The average hourly wind speed in Purulia experiences significant seasonal variation over the course of the year. The windier part of the year lasts for 4.4 months, from April 30 to September 12, with average wind speeds of more than 6.4 miles per hour. The windiest month of the year in Purulia is June, with an average hourly wind speed of 7.9 miles per hour. The calmer time of year lasts for 7.6 months, from September 12 to April 30. The calmest month of the year in Purulia is October, with an average hourly wind speed of 4.8 miles per hour (https://weatherspark.com/y/111227/Average-Weather-in-Purulia-India-Year-Round#Sections-Humidity).

3.4 Topography and Terrain

The topographical feature shows gradual decent from the uneven Chhotanagpur plateau to the plain land of the state in the east. The district of Purulia is divided into three sub-micro regions on the basis of elevation and the nature of topography, viz. 1) Damodar–Darkeshwar Upland, 2) Upper Kasai Basin, and 3) Bagmundi–Bundwan Upland (Source: Census, 2011).

The hills abound to the west while plains gradually appear to the east. Absolute relief increases towards the west and south. General elevation of the district ranges from 70 m to 720 m. Figure 3.4 is the physiographic map of the Purulia district.

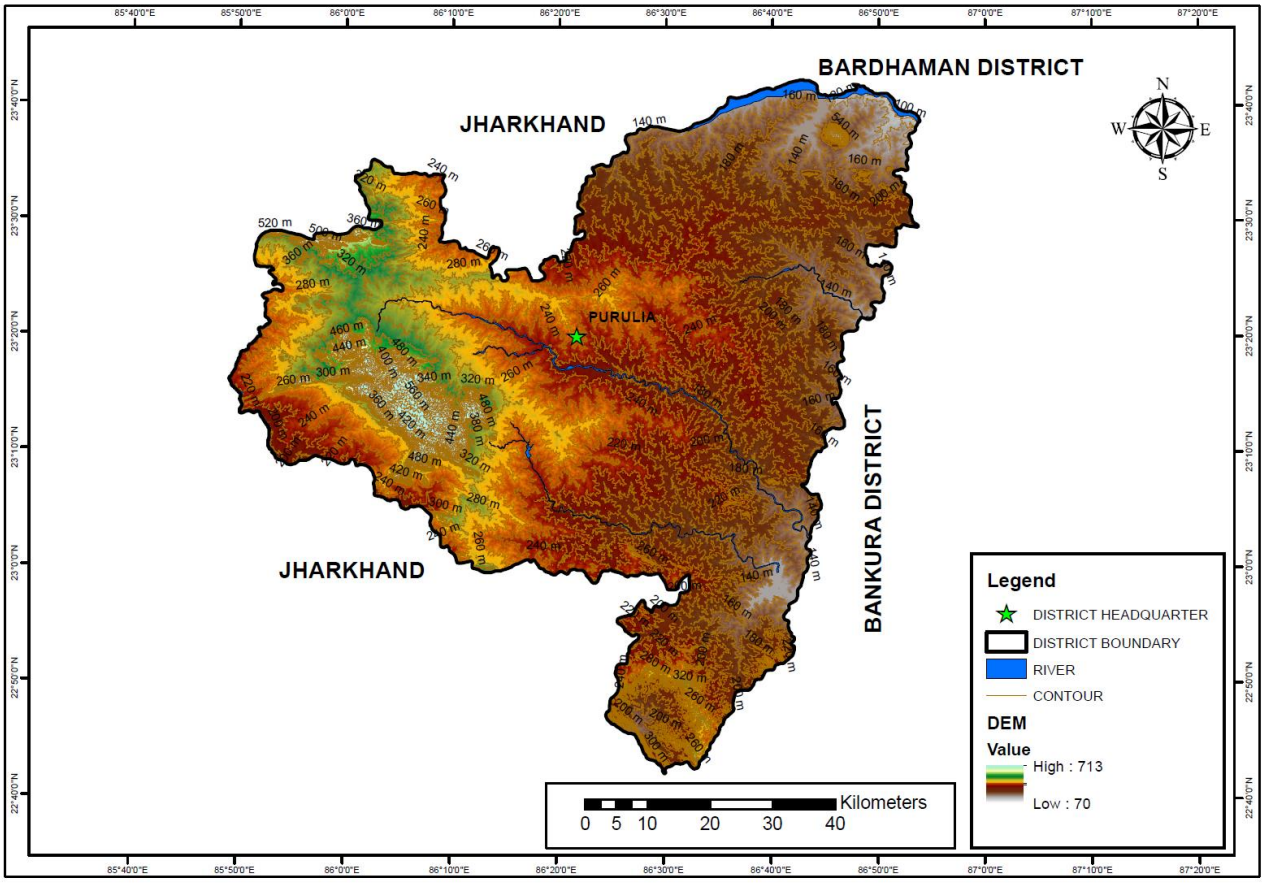


Figure 3.4: Physiographic map of Purulia District
(Source: Cartosat-1,Bhuvan India)

3.5 Water courses and Hydrology

Ground water potentiality and availability of any region depends on the geologically controlled aquifer system of the region. Regionally Purulia district is a part of Chhotanagpur Gneissic Complex (CGC) of Eastern Indian Peninsular Shield, lying to the north of Singbhum Craton. Geological set up of Purulia district shows that the district is underlain by Pre-Cambrian Metamorphic except in some parts of northeast where Gondwana sediments predominate. Unconsolidated sediments of recent or sub-recent age are found as narrow stretches along the major river courses. Granite and granite-gneisses are most common rocks with widespread occurrence in the district into which metabasics occur as intrusive. The study conducted by the Central Ground Water Board in Purulia district shows that ground water occurs in Purulia within four distinct zones, i.e. (i) weathered mantle, (ii) saprolitic zone, (iii) fractured zone of hard rock and (iv) zone of unconsolidated sediments. The weathered Mantle varies in depth in different parts of the district and its maximum thickness reaches up to 25 meters. Ground water occurs in water table conditions and predominantly developed by open dug wells. In saprolitic zone which

is sandwiched between weathered mantle and un-weathered granitic rocks, ground water occurs in semi confined conditions. In the hard crystalline rocks ground water occurs in saturated fractures situated well beneath the ground. The occurrences of these fractures are generally restricted to 50 – 110 mbgl. In Gondwana sediment zones, fractures are encountered at 103 m depth. They are located within the depth of 24 to 36 mbgl. Along the river valleys, stretches the zone of unconsolidated sediments in 5 to 13 mbgl level. This narrow zone varies in thickness and its areal extent is limited within 1 – 2 km across the valley. Saturated thickness of alluvial tract varies from 1 m to 5.5 m.

Figure 4.5 represents hydrogeological map of the district.

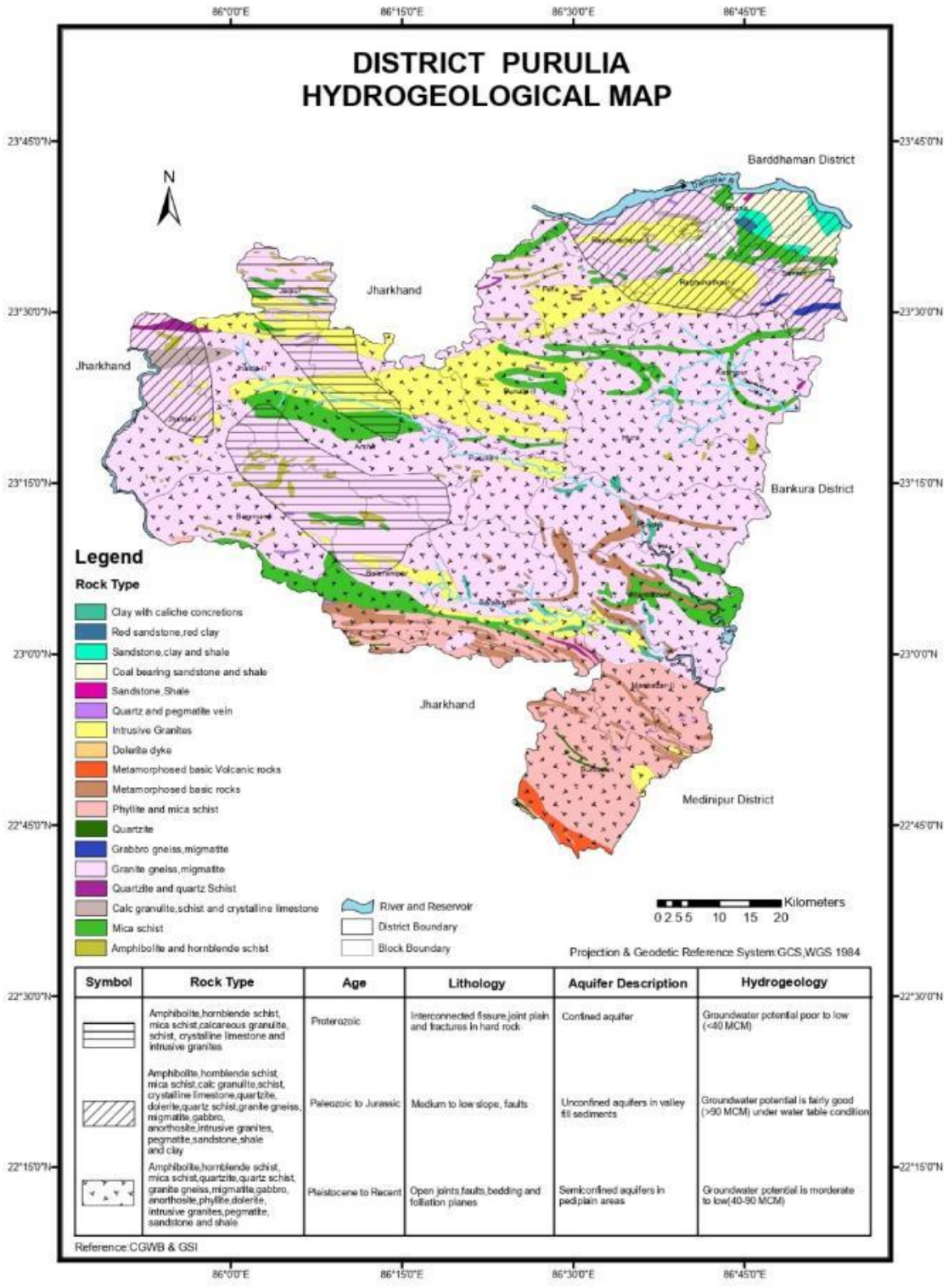


Figure 3.5: Hydrogeological map of Purulia district

3.6 Ground water development

In Purulia district, ground water occurs in four hydro-geological conditions i.e. weathered mantle, saprolitic zone, and fractured zones on hard rocks and in unconsolidated sediments. Total dynamic ground water reserve of Purulia district is assessed as 70147 hector meters (ha m). Only 9666 ha m or 13.78% of the net ground water availability is currently abstracted. Distribution of ground water reserve varies greatly among different blocks of Purulia district, so as the utilization. Sixteen out of twenty blocks of the district belong to low groundwater utilization class. So, a huge groundwater potential is left unutilized in Purulia district. It is intentional in some blocks while in others, low yielding capacity of the aquifers restricted proper ground water development.

Ground water in Purulia is neutral to slightly alkaline in nature, with pH ranging between 7.6 and 8.2. Electrical conductivity value varies from 141 to 2830 micromohs/cm at 25°c. Chloride value ranges between 11 and 355 mg/l. Iron concentration varies from 0.01 to 1.9 mg/l. Fluoride concentration varies from 0.43 to 1.9 mg/l. Micro-watershed planning, particularly rain water harvesting seems to be the viable solution to the water scarcity in Purulia district.

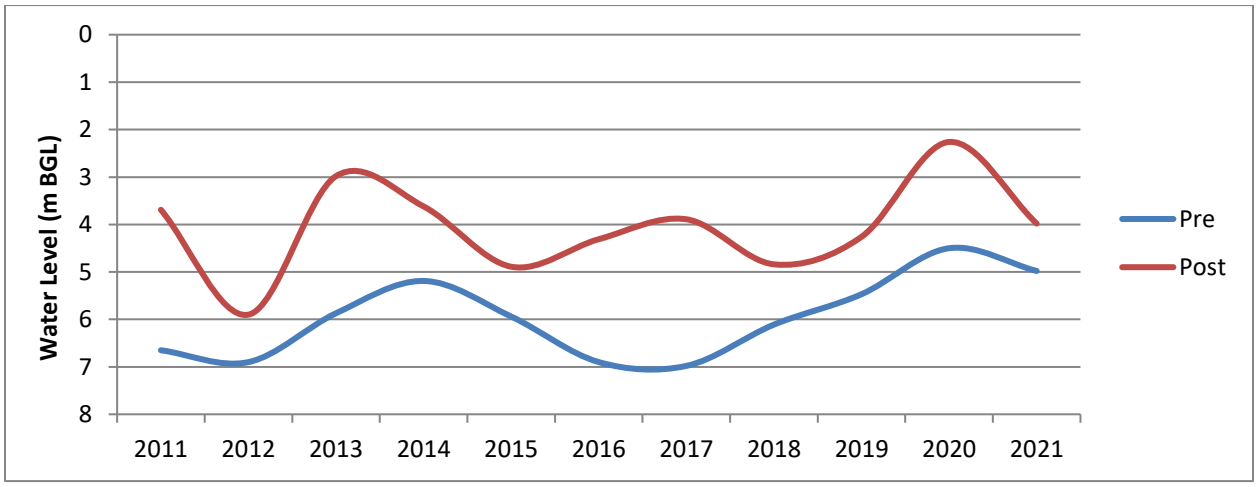
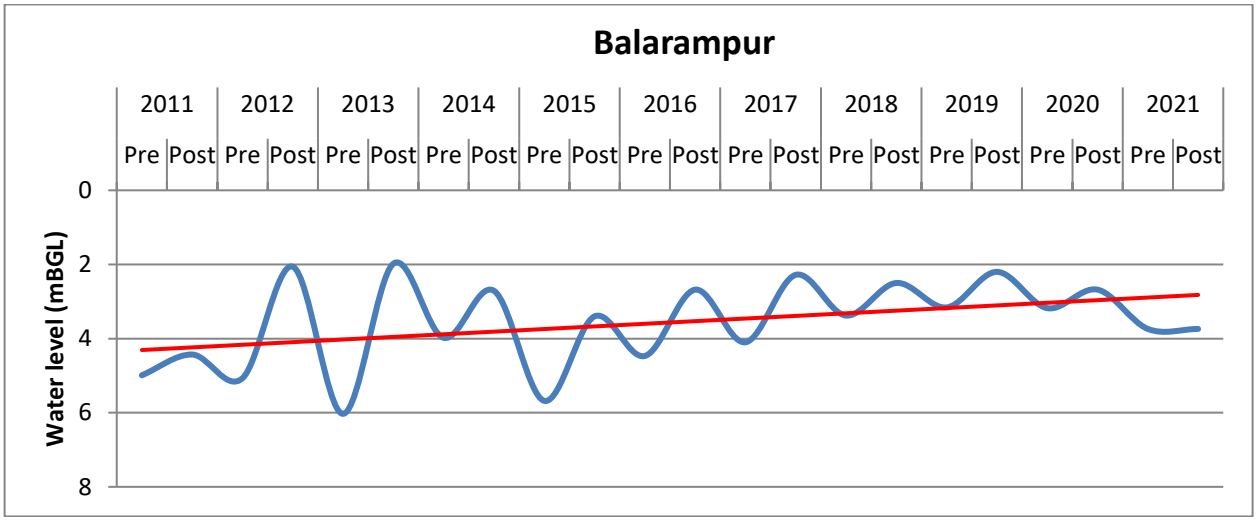
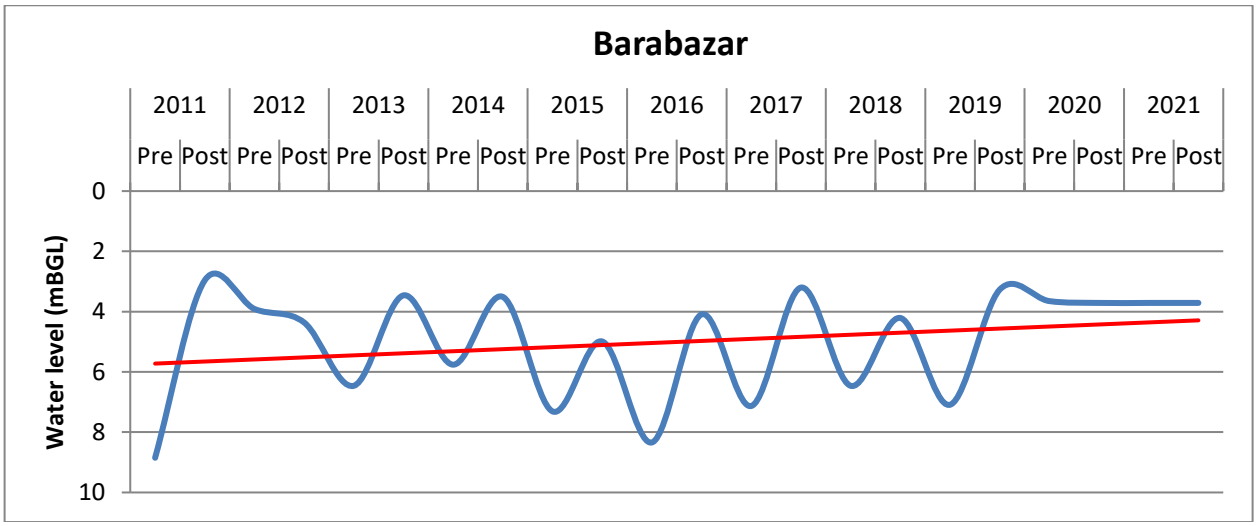


Figure 3.6: Graphical representation of pre-monsoon and post-monsoon water level data of Bagmundi block

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


Balarampur
2011 2012 2013 2014 2015 2016 2017 2018 2019 2020 2021
Pre Post Pre Post Pre Post Pre Post Pre Post Pre Post Pre Post Pre Post Pre Post Pre Post Pre Post
0
2
4
6
8
Water level (mBGL)


Barabazar
2011 2012 2013 2014 2015 2016 2017 2018 2019 2020 2021
Pre Post Pre Post Pre Post Pre Post Pre Post Pre Post Pre Post Pre Post Pre Post Pre Post Pre Post
0
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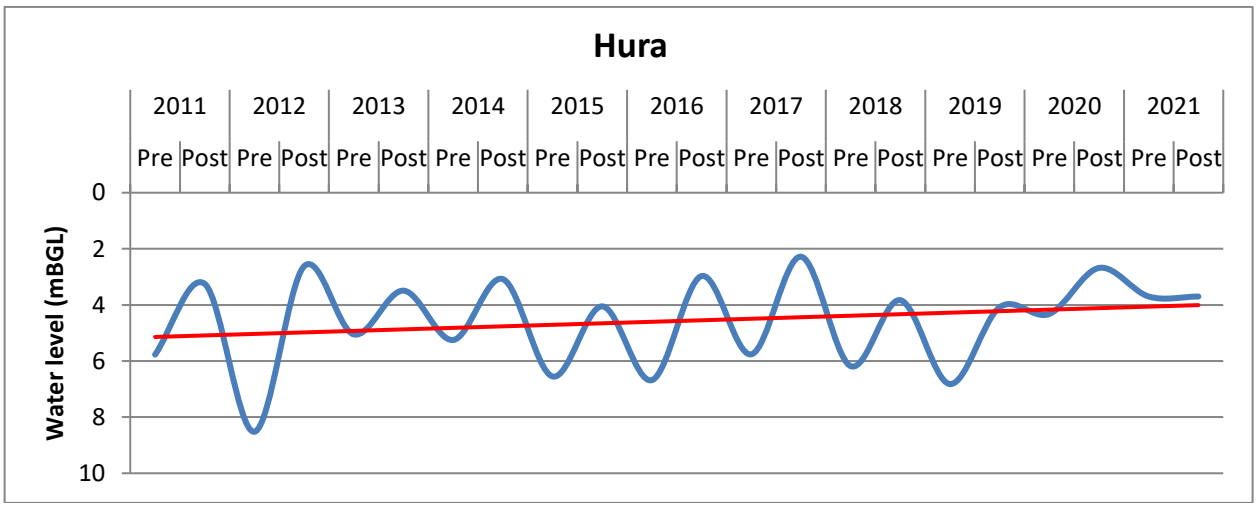
Water level (mBGL)


Hura
2011 2012 2013 2014 2015 2016 2017 2018 2019 2020 2021
Pre Post Pre Post Pre Post Pre Post Pre Post Pre Post Pre Post Pre Post Pre Post Pre Post Pre Post
0
2
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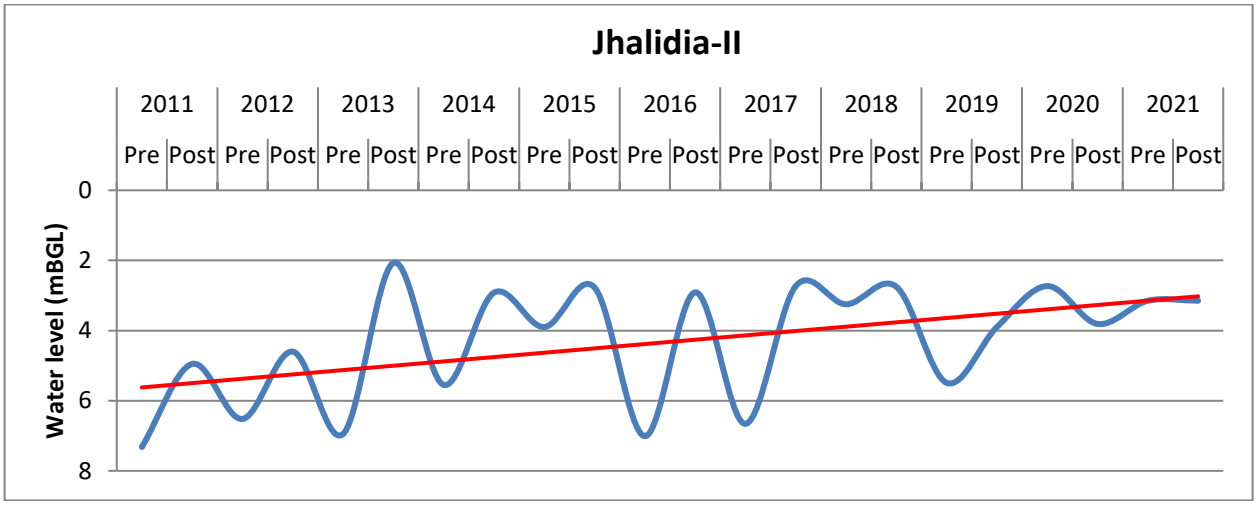
Water level (mBGL)


Jhalidia-II
2011
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Pre
Post
Water level (mBGL)
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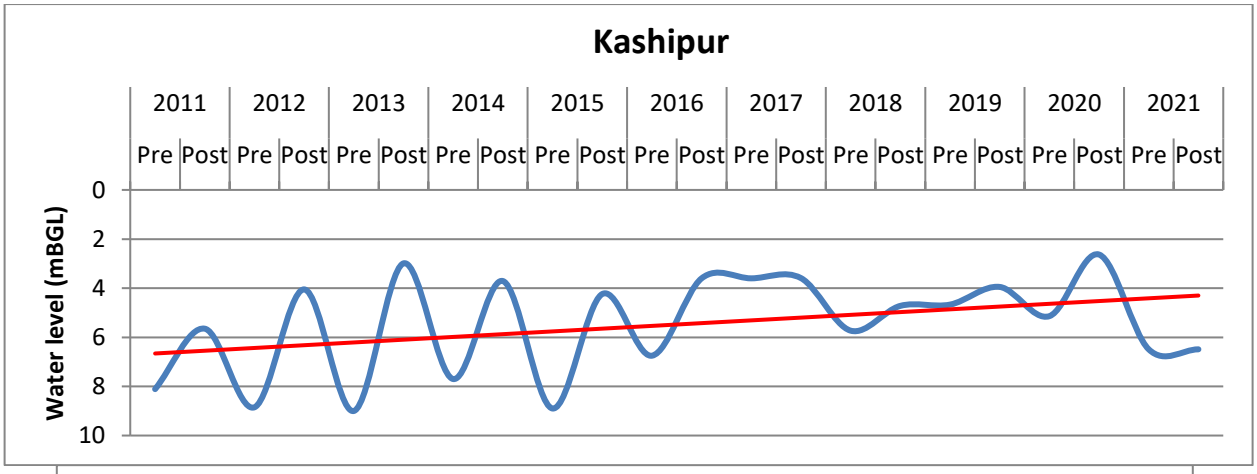
Kashipur
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Water level (mBGL)
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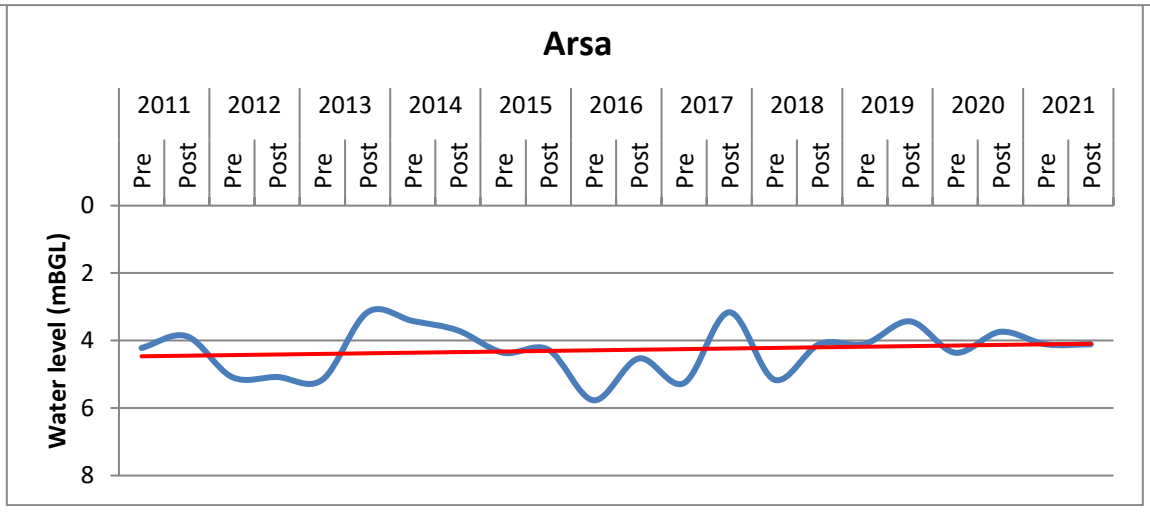
Arsa
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Water level (mBGL)
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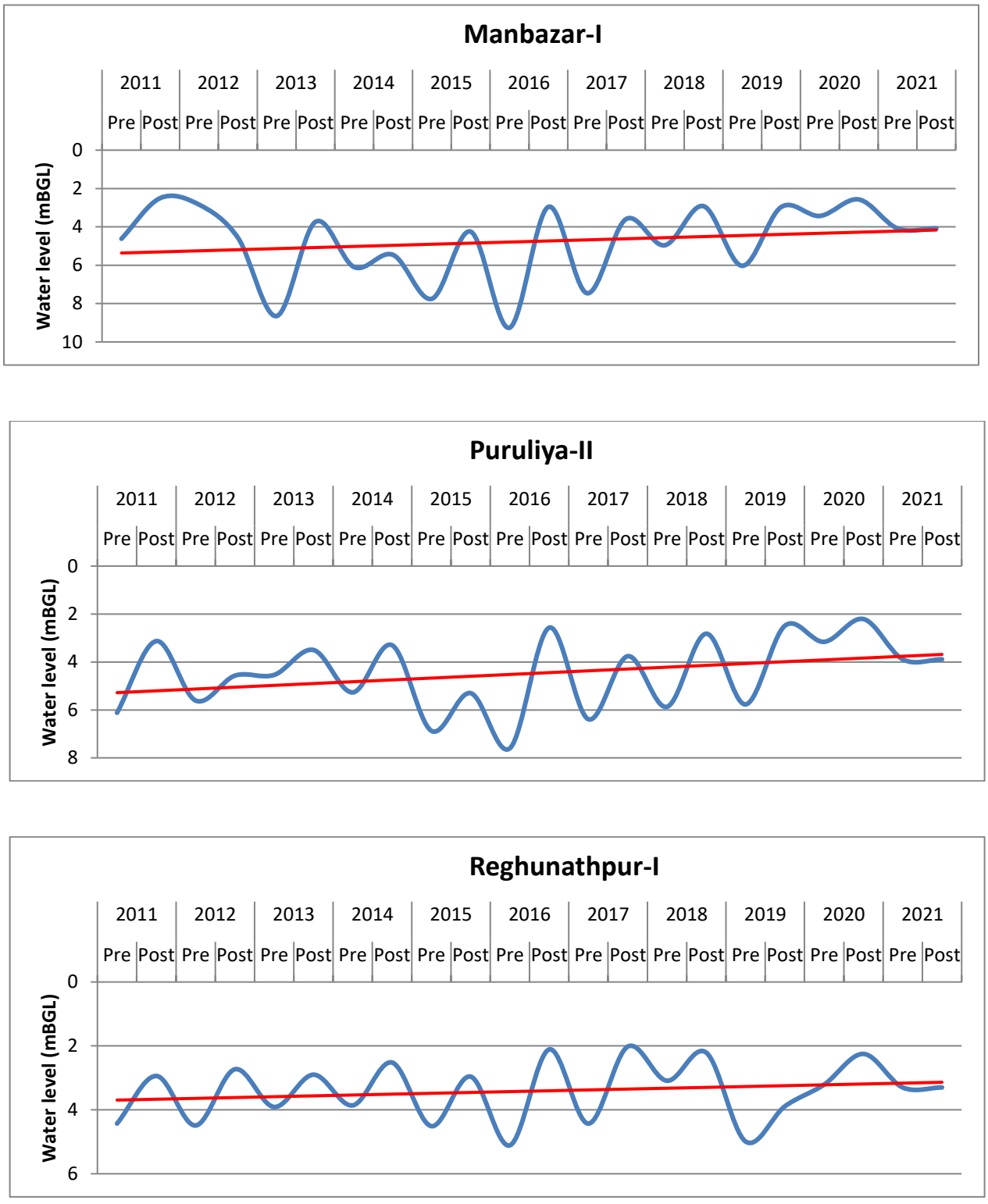

Figure 3.7: Block wise Hydrograph showing variation of water level during 2011 to 2021

3.7 Drainage System

Several rivers flow across Purulia district. Among these Kangsabati (Kasai/Cossey/ Kansai), Kumari, Dwarakeswar, Subarnarekha and Damodar are the important ones. The main drainage of the district is controlled by river Kangsabati which drains more than three-fifth of the district's water.

A Drainage map of Purulia District is furnished as Figure 3.8 and as in Plate 1.

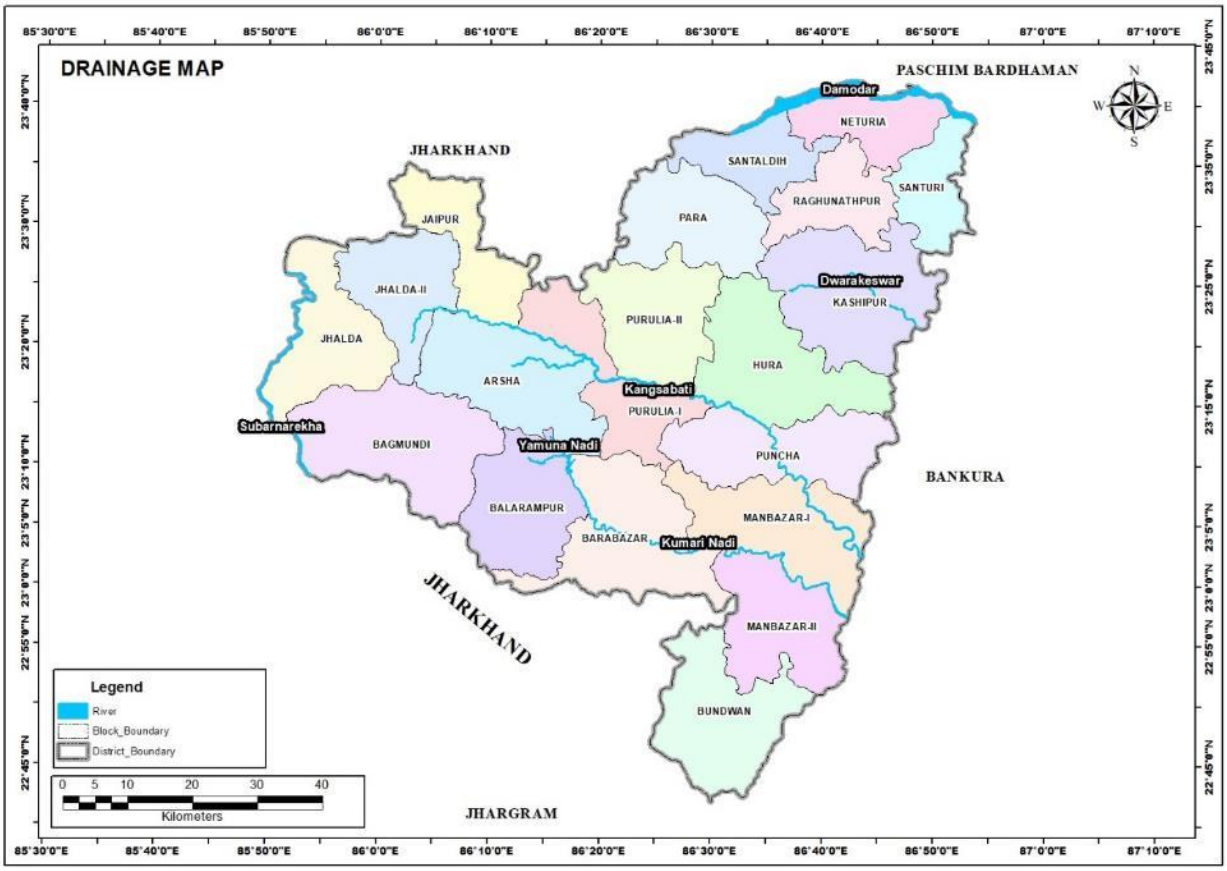

Figure 3.8: Drainage map of Purulia District
(Source: National Information Center)

3.8 Demography

As per 2011 census of India, Purulia has a population of 2,930,115 in 2011 out of which 1,496,996 are male and 1,433,119 are female. Literate people are 1,624,905 out of 1,002,058 are male and 622,847 are female. People living in Purulia depend on multiple skills, total workers are 1,249,642 out of which men are 801,254 and women are 448,388. Total 166,814 Cultivators are

depended on agriculture farming out of 145,180 are cultivated by men and 21,634 are women. 128,475 people works in agricultural land as labor, men are 88,883 and 39,592 are women. Purulia sex ratio is 957 females per 1000 of males.

Out of total population, 25,56,801 reside in rural areas and 3,73,314 are from urban areas (Table 3.4). Total decadal growth rate of population of the district has followed a trend which increased and decreased in every alternate decade from 1951-61 to 2001-2011 and rural decadal growth rate has followed a decreasing trend except in 1981-1991. However, the urban growth rate does not follow any specific trend. But the urban growth rate drastically increased during 1961-1971 and again during 2001-2011. Density of total population of the district has been increased from 218 per sq. km. in 1961 Census to 468 per sq. km. in 2011 Census. Similarly, the density of rural population has also increased from 205 per sq. km. in 1961 Census to 418 per sq. km. in 2011 Census.

Figure 3.9 and 3.10 representing block wise population distribution and literacy rate respectively for Purulia district.

Table 3.4: Demographic distribution of Purulia District

Sub-Division / C.D.Block / M	Area (Sq. Km.) (2001)	Male	Female	Total Population	Literacy Rate
Sadar (W) Sub-Division	**2327.98**	**447699**	**428028**	**875727**	**59.62**
Arsha	375.04	65917	63231	129148	54.78
Baghmundi	427.95	57599	54849	112448	57.17
Balarampur	300.88	60446	57656	118102	60.40
Barabazar	418.06	74208	72719	146927	63.27
Jaypur	230.47	58186	53582	111768	57.94
Jhalda-I	315.09	58793	56955	115748	66.18
Jhalda-II	256.61	63235	60479	123714	54.76
Jhalda(M)	3.88	9315	8557	17872	76.78
Sadar (E) Sub-Division	**2336.20**	**466290**	**447661**	**913951**	**66.68**
Bandowan	351.25	42281	41413	83694	61.38
Hura	382.21	64453	62990	127443	68.79
Manbazar-I	381.32	64280	63321	127601	63.78
Manbazar-II	285.81	43361	41892	85253	60.27
Puncha	330.11	54642	53487	108129	68.14
Purulia-I	281.50	64798	60520	125318	64.77
Purulia-II	310.10	73383	69324	142707	63.39
Purulia(M)	13.90	59092	54714	113806	82.09
Raghunathpur Sub-Division	**1559.68**	**384089**	**362749**	**746838**	**67.58**
Kashipur	451.31	95255	91783	187038	71.06
Neturia	203.65	46970	43679	90649	65.14

Sub-Division / C.D.Block / M	Area (Sq. Km.) (2001)	Male	Female	Total Population	Literacy Rate
Para	312.59	90291	84329	174620	65.62
Raghunathpur-I	201.82	53445	50341	103786	67.36
Raghunathpur-II	197.67	50925	48301	99226	67.29
Raghunathpur(M)	12.95	11389	10543	21932	77.07
Santuri	179.69	35814	33773	69587	64.15
District Total (2011)	**6259.00**	**1298078**	**1238438**	**2536516**	**64.48**

(Source: Census, 2011)

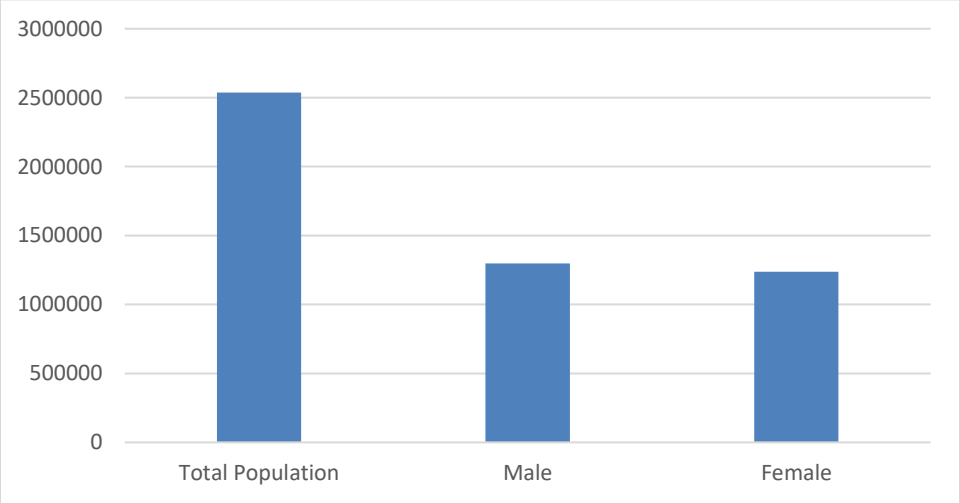

Figure 3.9: Population distribution in Purulia District

(Source: Census, 2011)

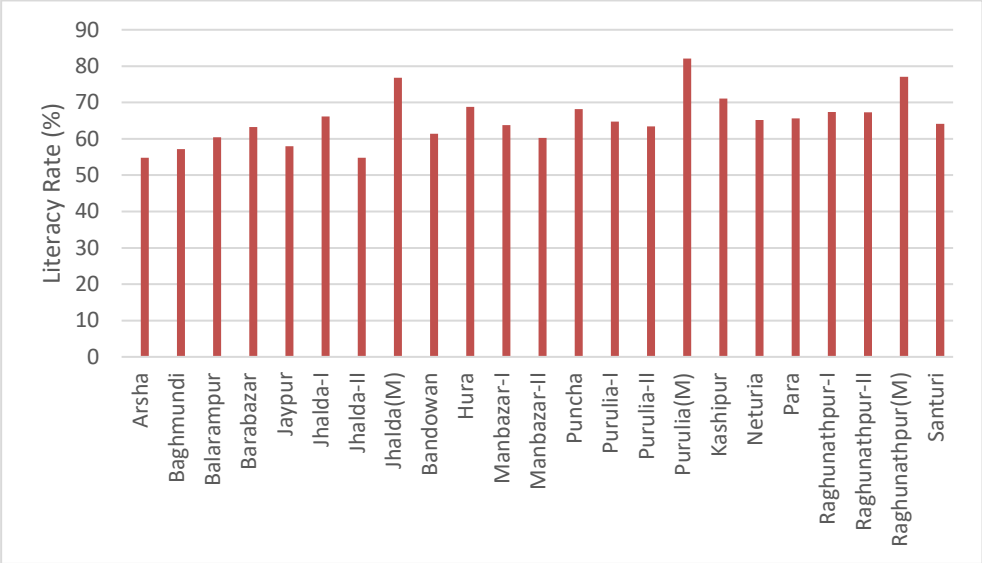

Figure 3.10: Demographic map showing Block-wise Literacy rate of Purulia District

(Source: Census, 2011)

3.9 Cropping pattern

The crops of Purulia district broadly classify into non-plantation crops. The major crops cultivated in the district of Purulia are rice, maize, pulses (black gram and red gram), oil seeds (mustard), and potato. Rice is the only rain fed kharif crop which grows over the area of 308.7 hectare.

Like other regions of India, Purulia district is also characterized by its seasonal agricultural practices. There are four main distinct and important farming systems practiced on the cultivated land in the study area – Bhadai (early autumn), Aghani (Late autumn), Rabi (Spring) and Garma (Summer). Bhadai crops are harvested in September-October, Aghani within November-December, Rabi in March-April and Garma crops are harvested in summer months. Cropland in the Purulia upland and plain area may be classified into four lands e.g. Danga (non-agricultural high land), Baid (High level land), Kanali (Medium level land), Bahal (Low level land). About 40-50 percent of the cultivated land is under single crop. The proportion of double and triple cropped area is very limited (https://ijrrssonline.in/HTMLPaper.aspx?Journal=International%20Journal%20of%20Reviews%20and%20Research%20in%20Social%20Sciences;PID=2019-7-2-1).

3.10 Land Form and Seismicity

The seismic hazard map of India was updated in 2000 (Figure 3.11) by the Bureau of Indian Standards (BIS). There are no major changes in the zones in West Bengal with the exception of the merging of Zones I and II in the 1984 BIS map. Western sections of the northern districts of Jalpaiguri and Coochbehar lie in Zone V. The remaining parts of these two districts,

along with the districts of Purulia, Uttar Dinajpur, Dakshin Dinajpur, Maldah, 24 North Parganas and 24 South Parganas lie in Zone IV. The rest of the state along with the city of Kolkata lies in Zone III.

Purulia district is mostly dominated by Archacan granite gneiss and to a much lesser extent, Quaternary semi consolidated sediments, Permo Carboniferous sandstone shale, Pre Cambrian massive granites and quartzite and with Recent alluvium sediments deposition. Granite, granite gneiss and phylite & mica schist are the dominant rocks formed in the southern Purulia district.

Southern part of the district falls under the Seismic Zone II (in a scale of I to V in ascending order of propensity f Seismic Activity), which is classified as the low-damage risk zone. This is the least seismically active zone, meaning the areas that fall under these zones in have a low chance of having an earthquake. Northern part of the district falls under Zone III which is classified as a Moderate Damage Risk Zone.

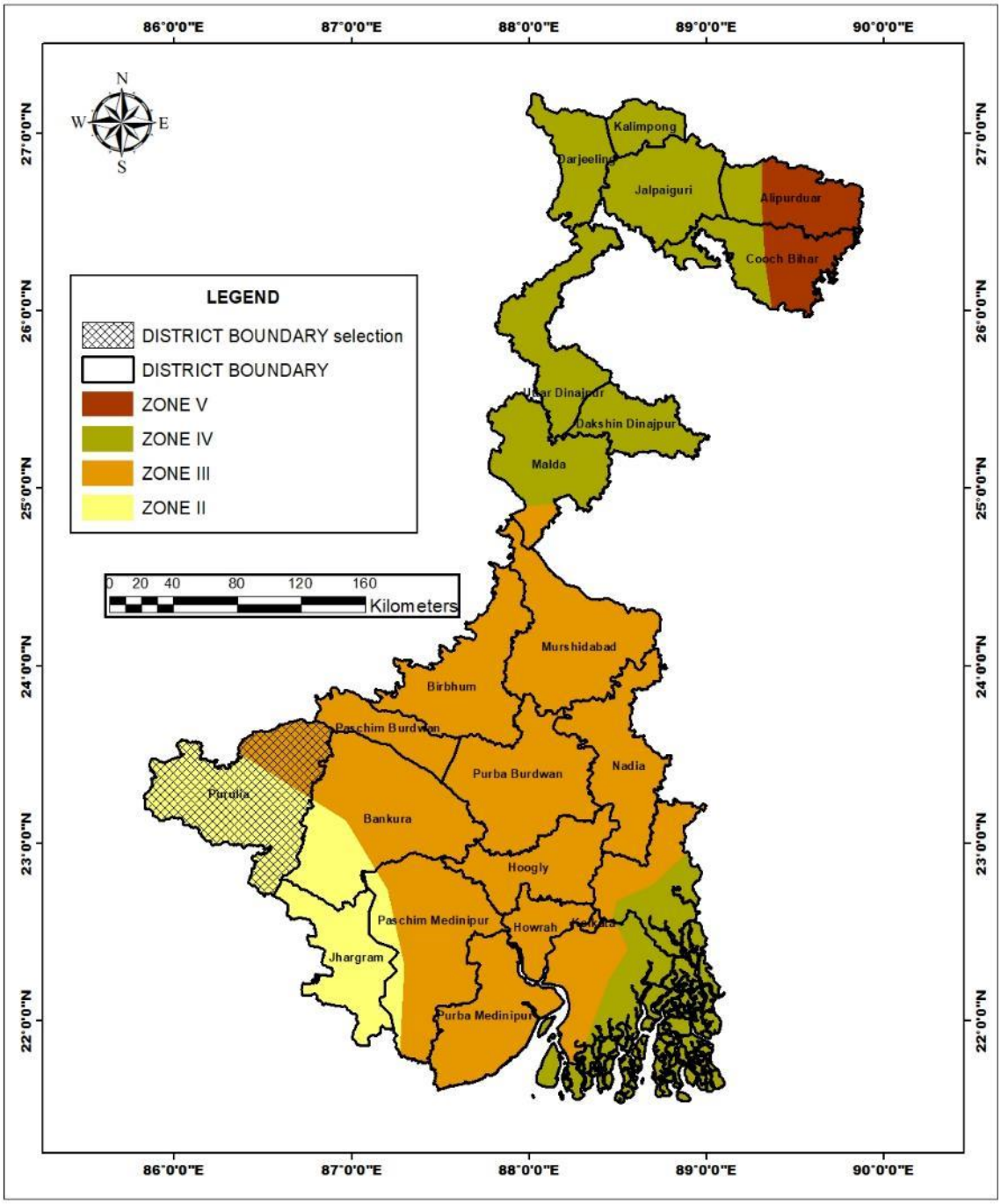

Figure 3.11: Earthquake zonation map of West Bengal highlighting the Purulia district position

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

3.10.1 Drought:

The district is characterized by undulating topography with rugged hilly terrains in the western and southern parts. Purulia is well known as a drought prone district and falls within the semi-arid region of the state. The district is situated within the agro-climatic region of Eastern Plateau and Hills and sub-region Chhotonagpur south and West Bengal plateau. The district has a sub-tropical climate and is characterized by high evaporation and low precipitation. Average annual rainfall varies between 1100 and 1500 mm. The relative humidity is high in monsoon season, being 75% to 85%. But in hot summer it comes down to 25% to 35%. Temperature varies over a wide range from 70 Celsius in winter to 48.500 Celsius in the summer. Soil erosion is the most prominent phenomenon of the district resulting huge deposition of fertile soil in the valley region. Vast areas of land remained uncultivable wasteland (Disaster Management Plan, Purulia).

Drought is the notable disaster in the district prevailing more or less every year causing hazard and miserable condition in agriculture and in supply of drinking water.

3.11 Flora

The species of flora is predominant in the plateau area of Purulia. Trees like Palas, Kul, Mahul, Kenod, Bhela, Dha, Pial, Arjun, Asan, Chhatui etc. are found in numbers. Some of these trees bear both grand looking flowers and sweet fruits. In the forest Sal, Karum, Sisha, Gumhar, Akashmani, Kusum, Eucalyptus, Fig, Banyan, various bushes and herbs are found. Now-a-days wastelands are being brought under the green shed of various classes of plants by the Forest Department and the Panchayat functionaries.

3.12 Fauna

As regards the species of fauna in the district, they are Elephant, found in the jungles (forests) of Ayodhya Region, Bundwan an d Kuilapal. Besides Elephants, the forest of Purulia is also the wild abode of Bear, Wolf, Hyaena, Wild Hog, Rabbit, Deer, Monkey, Bush Cat, Jackal, Fox etc. The abode of Avis are in the stones groves of Agodya, Jaichandi Phar, Panchet and Vultures, Falcon, Kite, Owl, Bat, Peacock, Wild Crow, Dove, Wild Fowl, Rose band, Parrot, Cuckoo, Sparrow and many other birds are found in the forest trees spread over the entire district. Migratory birds are also seen on the quite watery, greenery spots in the winter season (Census, 2011).

Location of Wild Life Sanctuary and National Parks are shown in the Map of West Bengal (Figure 3.12). As per the map of ENVIS Centre on Wildlife and Protected Areas, there is one National Park and four Sanctuaries situated within the Purulia district.

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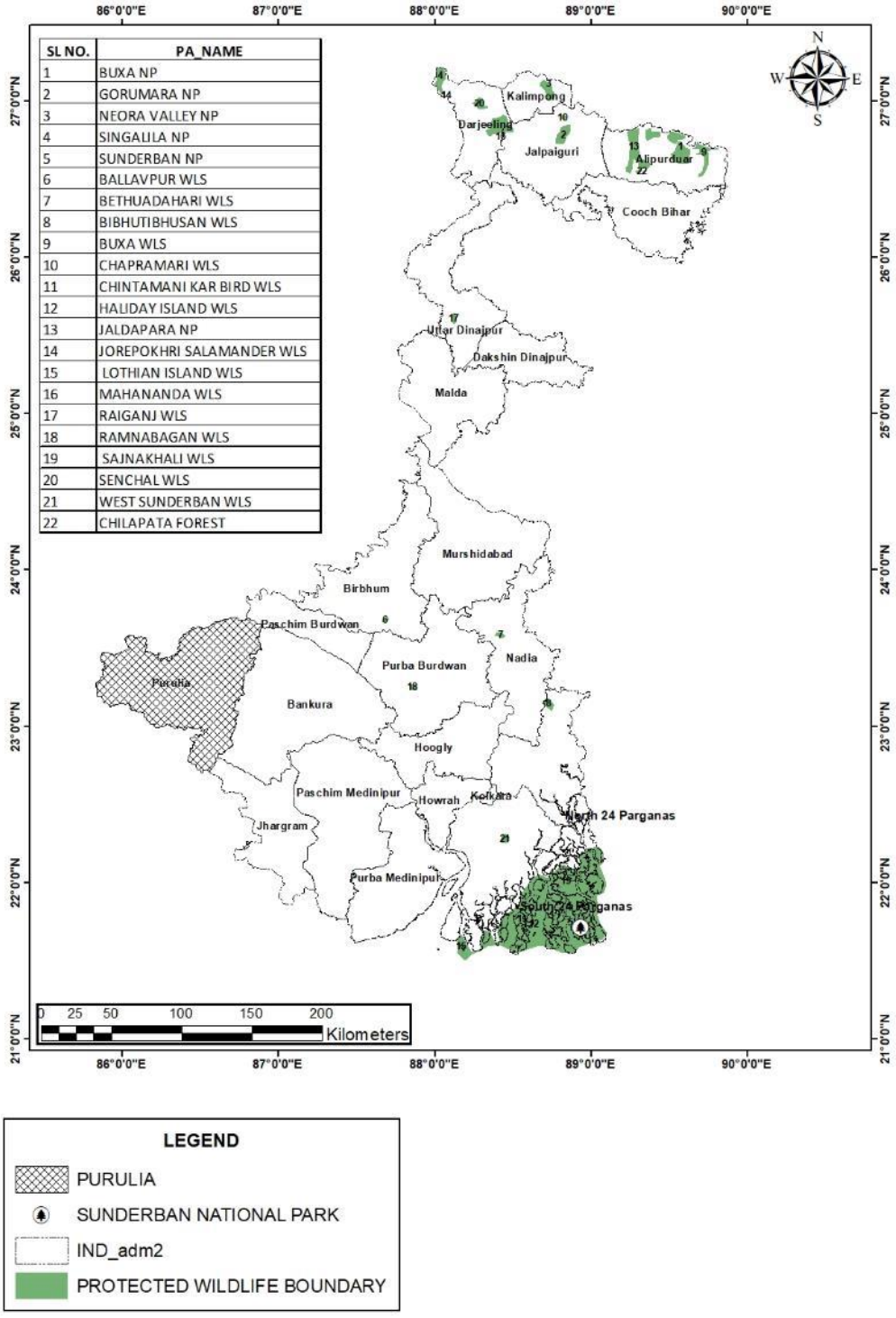


SL NO.	PA_NAME
1	BUXA NP
2	GORUMARA NP
3	NEORA VALLEY NP
4	SINGALILA NP
5	SUNDERBAN NP
6	BALLAVPUR WLS
7	BETHUADAHARI WLS
8	BIBHUTIBHUSAN WLS
9	BUXA WLS
10	CHAPRAMARI WLS
11	CHINTAMANI KAR BIRD WLS
12	HALIDAY ISLAND WLS
13	JALDAPARA NP
14	JOREPOKHRI SALAMANDER WLS
15	LOTHIAN ISLAND WLS
16	MAHANANDA WLS
17	RAIGANJ WLS
18	RAMNABAGAN WLS
19	SAJNAKHALI WLS
20	SENCHAL WLS
21	WEST SUNDERBAN WLS
22	CHILAPATA FOREST

Figure 3.12: District location with respect to Wild Life Sanctuary of West Bengal
(Source: http://wiienvis.nic.in/)

4 Physiography of the district

4.1 General Landforms

Physiographically, most part of the Purulia district is considered as pediplain with widely scattered residual hills produce by denudational process. The district forms the part of the Ranchi pediplain. Presence of hills like Ayodhya, Baghmundi, Panchet, Joychandi pahar with moderate absolute altitude and of moderately low relative relief, indicate that this region is in the old stage of cycle of erosion. The hills towards west while plains gradually appear towards east. Absolute relief increases towards the west and south. General elevation of the land surface ranges from 300 m to 150 m, the master slope being towards the east and southeast. Most of the streams have easterly to south easterly course except the northerly flowing tributaries of Damodar River and the westerly flowing tributaries of Subarnarekha River which form the part of the northern and western boundaries of the district respectively. Most of the streams have cut deep valleys into the eastern lateritic uplands.

4.2 Soil and rock pattern

The Purulia district is covered by mostly residual soil formed by weathering of bed rocks. The soil in the district is in general of the residual type derived from the weathering of the Archean granites, gneisses, and schist.

The soil map found five major soil types found in the district, they are gravelly loam, loam, fine loamy, fine, and coarse loamy. The fine loamy is most appropriate for agricultural crop. The crops grown are rice, wheat, maize etc. Wheat is the major Rabi crop become both as flooded and rain encouraged conditions. Wheat growing areas fall under Santuri, Raghunathpur-I & II and Neturia blocks in the north; Kashipur, Hura and Puncha in the east and Jhalda-I & II and Arsha blocks in the west. The zone goes under the fine to coarse loamy soils. Maize is developed in bring down slope regions of the study area. The reasonable ranges for developing maize happen in patches inside the block of Neturia, Raghunathpur - II in the north; Purulia-I at the middle; and Kashipur and Hura in the east https://www.researchgate.net/publication/319503665_Land_Suitability_Analysis_for_Agricultural_Crop_using_Remote_Sensing_and_GIS-A_Case_Study_of_Purulia_District).

Figure 4.1 is showing soil pattern of the district Purulia. Soil type of the district is tabulated in Table 4.1.

Table 4.1: Description of District soil type

MAP SYMBOL	DESCRIPTION	TAXONOMIC NAME
GRANITE GNEISS LANDSCAPE (EcA) (OLD RED, YELLOW GREY CATENARY SOIL)		
W091	Very deep, moderately well drained, fine loamy soils occuring on very gently sloping to undulating foot hill slopes with loamy surface and severe erosion associated with shallow, some what excessively drained, coarse loamy soils subject to moderate erosion	Fine Loamy, Typic Haplustalfs
		Loamy, Lithic Ustochrepts
W092	Very shallow, well drained, gravelly loamy soils occuring on gently sloping ridges with loamy to gravelly loamy surface and severe erosion associated with shallow, moderately well drained, loamy soils	Loamy, Lithic Ustorthents
		Loamy, Lithic Ustochrespts
W093	Shallow, somewhat excessively drained , gravelly loamy soils occuring on gently sloping subdued ridges with gravelly loamy surface and severe erosion associated with very shallow excessively drained gravelly loamy soils	Loamy, Lithic Ustochrepts
		Loamy, Lithic Ustorthentsts
W094	Deep,well drained , loamy soils occuring on very gently slopping to undulating plain with loamy surface and moderate erosion associated with deep, moderately well drained, loamy soils	Fine Loamy, Typic Haplustalfs
		Fine Loamy Typic Ustochrepts
W095	Shallow, moderately well drained, coarse loamy soils occuring on gently sloping to undulating plain with gravelly loamy surface and moderate erosion associated with shallow moderately well drained , gravelly loamy soils	Loamy, Lithic Ustochrepts
		Fine Lithic, Haplustalfs
W096	Shallow, moderately well drained, gravelly loamy soils occuring on very gently sloping to undulating plain with gravelly loamy surface and moderate erosion associated with shallow well drained , fine loamy soils	Loamy, Lithic Haplustalfs
		Fine, Loamy Plinthustalfs
W097	Very deep, imperfectly drained, fine soils occuring on very gently sloping to undulating plain with loamy surface and moderate erosion associated with deep, imperfectly drained, fine soils	Fine, Typic Haplustalfs
		Fine, Aquic Haplustalfs
W098	Very deep, moderately well drained, fine loamy soils occuring on very gently sloping to undulating plain with loamy surface and moderate erosion associated with very deep, imperfecly drained, fine loamy soils	Fine Loamy, Typic Haplustalfs
		Fine loamy, Aquic Paleustalfs
W099	Shallow, well drained, gravelly loamy soils occuring on very gently sloping to undulating granite gneiss plain with gravelly loamy surface and moderate erosion associated with deep imperfectly drained , fine loamy soils	Loamy, Lithic Haplustalfs
		Fine Loamy,Typic Ustochrepts
W102	Very deep, well drained, fine loamy soils occuring on very gently sloping to undulating platue with loamy surface and	Fine Loamy, Typic Haplustalfs

MAP SYMBOL	DESCRIPTION	TAXONOMIC NAME
	moderate erosion associated with shallow, well drained, gravelly loamy soils	Loamy,Lithic Ustochrepts
W104	Very deep, imperfectly drained, fine soils occuring on gently sloping to undulating platue with loamy surface and severe erosion associated with very deep, imperfectly drained, fine soils	Fine, Typic Paleustalfs
		Fine, Typic Haplustalfs
W105	Shalow, well drained, gravelly loamy soils occuring on very gently sloping to undulating platue with gravelly loamy surface and moderate erosion associated with rock outcrops	Loamy, Lithic Ustorthentsts
		Rock outcrops
W106	Very deep, well drained, fine loamy soils occuring on very gently sloping to undulating platue with loamy surface and moderate erosion associated with shallow, well drained, gravelly loamy soils	Fine Loamy,Typic Ustochrepts
		Loamy-skeletal, Lithic Ustorthentsts
W107	Very deep, well drained, coarse loamy soils occuring on very gently sloping valleys on undulating platue with loamy surface and moderate erosion associated with very deep, moderately well drained, fine loamy soils	Coarse loamy Typic Ustifluvents
		Fine Loamy,Typic Ustochrepts
DHARWAR LANDSCAPE (EcB) (LATENITIC SOIL)		
W108	Very shallow , somewhat exessively drained, gravelly loamy soils occurring on gently sloping narrow hill slopes with gravelly loamy surface and moderate erosion associated with deep , well drained, coarse loamy soils	Loamy-skeletal, Lithic Ustorthentsts
		Fine Loamy, Typic Haplustalfs
W111	Deep, moderately well drained, fine loamy soils occurring on gently sloping to undulating upland with loamy surface and moderate erosion associated with moderately deep , well drained,fine loamy soils	Fine Loamy, Typic Haplustalfs
		Fine loamy,Typic Paleustalfs
W112	Very deep, moderately well drained, fine loamy soils occuring on very gently sloping to undulating upland with loamy surface and moderate erosion associated with moderately deep, well drained, fine loamy soils	Fine Loamy, Typic Haplustalfs
		Fine, Typic Paleustalfs
GONDOWANA LANDSCAPE (EcC) (LATERITIC SHALLOW SOILS)		
W113	Shallow , imperfectly drained, coarse loamy soils occuring on very gently sloping to undulating plain with gravelly loamy surface and moderate erosion associated with moderately deep, imperfectly drained, fine soils	Loamy, Lithic Haplustalfs
		Fine, Aquic Haplustalfs
W115	Shallow , imperfectly drained, coarse loamy soils occuring on very gently sloping to undulating plain with gravelly loamy surface and moderate erosion associated with shallow, deep, imperfectly drained, gravelly loamy soils	Loamy, Lithic Haplustalfs
		Loamy, Lithic Ustochrepts

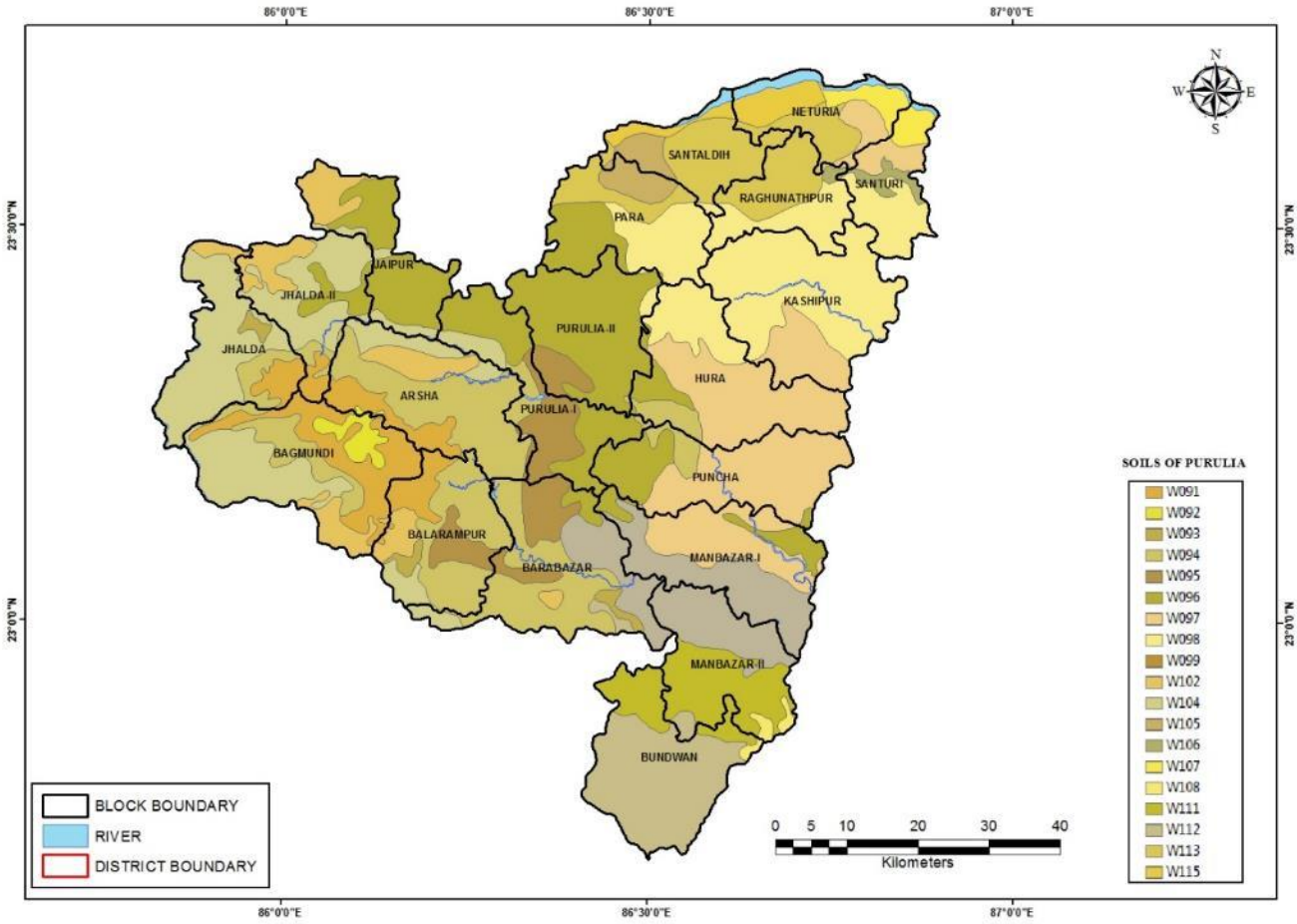


Figure 4.1: Soil Map of Purulia District
(Source: https://esdac.jrc.ec.europa.eu/content/west-bengal-soils-sheet-2)

4.3 Different geomorphologic units

The topographical feature shows gradual decent from the uneven Chhotanagpur plateau to the plain land of the state in the east. The district of Purulia is divided into three sub-micro regions on the basis of elevation and the nature of topography, viz. 1) Damodar–Darkeshwar Upland, 2) Upper Kasai Basin, and 3) Bagmundi–Bundwan Upland.

1) Damodar–Darkeshwar Upland: This region lies in the north–east of the district bordering Jharkhand (erstwhile Bihar) to the north, West and South. The area becomes undulating with hillocks of hard rocks, which are extended from the high plateau of Central India and Chotanagpur. There are some hills ranging from 150 to 750 meters approximately in altitude.

2) Upper Kasai Basin: The region extends in the central part of the district, where the Kasai River flows. The region has undulating land but in the lower part, there are degraded low lands.

The elevation rises from 200 to 300 metres and its general slope is from West to East and South–east.

3) Bagmundi–Bandwan Upland: This region lies over the north–western and the Southern portion of the district. It is a highland area descending from the Ranchi plateau. At some places the high lands are very steep and crisscrossed by the streams. In Bagmundi and Balarampur areas, the Ayodhya Range forms the main high lands. It acts like the watershed for both Kangsabati and Subarnarekha. The elevation ranges from 475 to 700 meters approximately. The soils of the region are red sandy, red loamy and alluvial. The elevation of the district from main sea level is 677 metres.

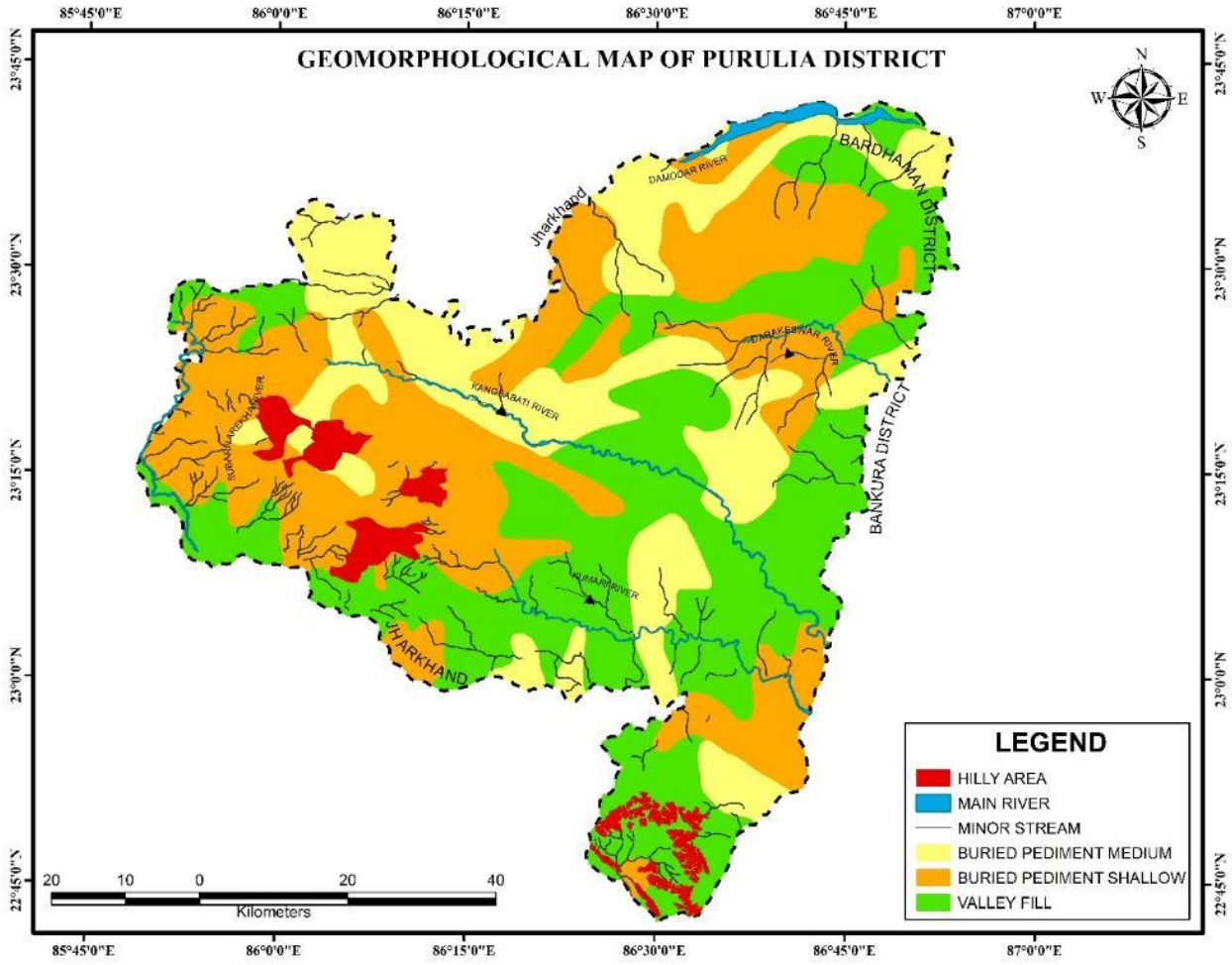


Figure 4.2: Geomorphological map of Purulia District

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

5 Land use pattern of the district

Purulia district is situated on the eastern fringe of Chotanagpur Plateau. The general scenario is undulating land with scattered hills. According to the structure and land form, Purulia is a part of the Ranchi peneplains.

The eighth class of LU/LC presence in this study area in particular, forest, waterbody, barren land, river sand, vegetation, settlement, agriculture land and agricultural fallow land. The forest land cover 6321 sq km (10.45%) in south-western and south-eastern part, waterbody cover 2320 sq km (3.83%) in eastern and north-eastern part, river sand cover 189 sq. km. (0.31%), barren land covers 15241 sq. km. (25.20%) in southern and middle to northern part, vegetation cover 9221 sq km (15.25%) in eastern part, settlement covers 1257 sq km (2.07%) in northern, southern, northeastern and middle part, agricultural fallow covers 2044 sq. km. (3.38%) in overall part of the study area and agricultural land covers 23781 sq km (39.47%) in overall part of the study area (Table 5.1).

Figure 5.1 is pie diagram representing broad land use pattern of the district and Figure 5.2 is Land Use Land Cover map of the district.

Table 5.1: Classification of Land Utilisation Statistics in the district

(In thousand hectares)

Year	2009-10	2010-11	2011-12	2012-13	2013-14
Reporting Area (In Thousand Hectares)	625.65	625.65	625.65	625.65	625.65
Forest Area	75.05	75.05	75.05	75.05	75.05
Area under Non-agricultural use	104.48	105.72	109.06	109.97	113.44
Barren & unculturable land	5.31	3.20	2.01	1.56	1.25
Permanent pastures & other grazing land	2.56	1.81	0.80	0.67	0.43
Land under Misc. tree groves not included in Net area sown	3.19	2.52	2.36	2.67	3.51
Culturable waste land	8.23	7.60	7.73	6.66	3.47
Fallow land other than Current fallow	4.72	4.22	4.70	4.11	2.82
Current fallow	102.70	199.40	128.54	126.36	116.53
Net area sown	319.41	226.13	295.40	298.60	309.14

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

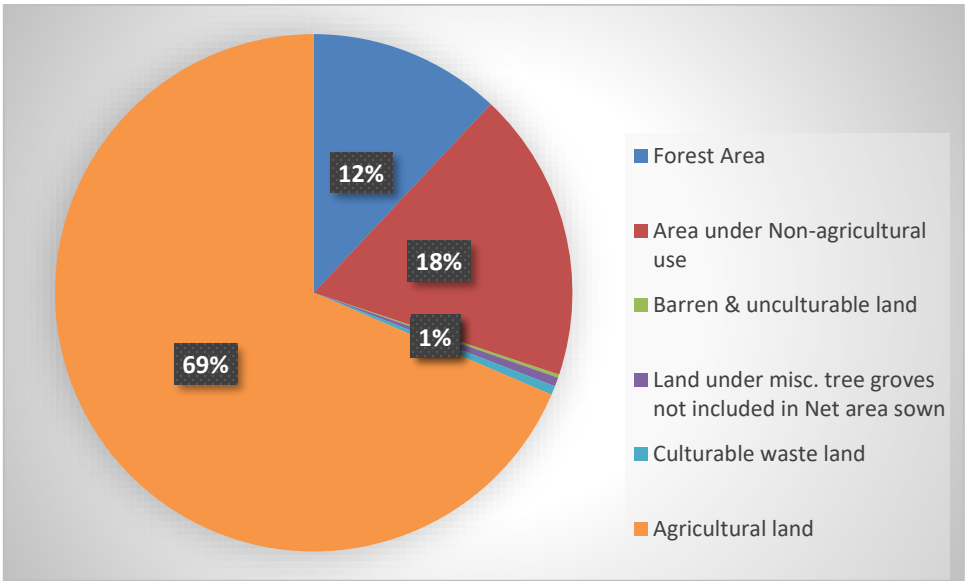


Figure 5.1: Land use pattern of Purulia District

Table 5.2 shows the distribution of agricultural land, both irrigated and non-irrigated land in different blocks of Purulia district. In the district around 58% land area is available for cultivation. Irrigation is considered as an important factor for cultivation. As per the Census 2011 dataset, 26% of the cultivable land is under irrigation. The proportions of cultivable area in Raghunathpur-II block with respect to its total area is lowest. Neturia and Budwan blocks have less than 10% proportion of irrigated area in the district.

Table 5. 5.2: Distribution of Villages according to Land Use, 2011

Name of C.D. Block	Total area (in Hectares)	Percentage of cultivable area to total area	Percentage of irrigated area to cultivable area
Jaipur	22005.14	58.86	29.75
Purulia-II	28747.48	63.48	31.75
Para	28207.01	63.08	28.61
Raghunathpur-II	18582.04	29.04	67.53
Raghunathpur-I	17931.78	61.76	19.3
Neturia	18367.22	35.48	5.19
Santuri	17072.82	68.68	34.07
Kashipur	42751.58	56.05	28.63
Hura	37887.29	60.24	24.48
Purulia-I	26782.75	61.25	31.1
Puncha	32473.34	58.12	27.29
Arsha	37437.53	60.24	18.16

Name of C.D. Block	Total area (in Hectares)	Percentage of cultivable area to total area	Percentage of irrigated area to cultivable area
Jhalda-I	29329.43	50.2	20.42
Jhalda-II	23925.26	62.12	25.91
Bagmundi	42095.84	61.42	40.67
Balarampur	29083.88	73.96	19.13
Barabazar	40699.43	62.24	17.09
Manbazar-I	36181.54	53.48	19.99
Manbazar-II	27428.09	58.19	28.98
Bundwan	34643.08	41.64	9.41
Total	**591632.53**	**57.53**	**25.66**

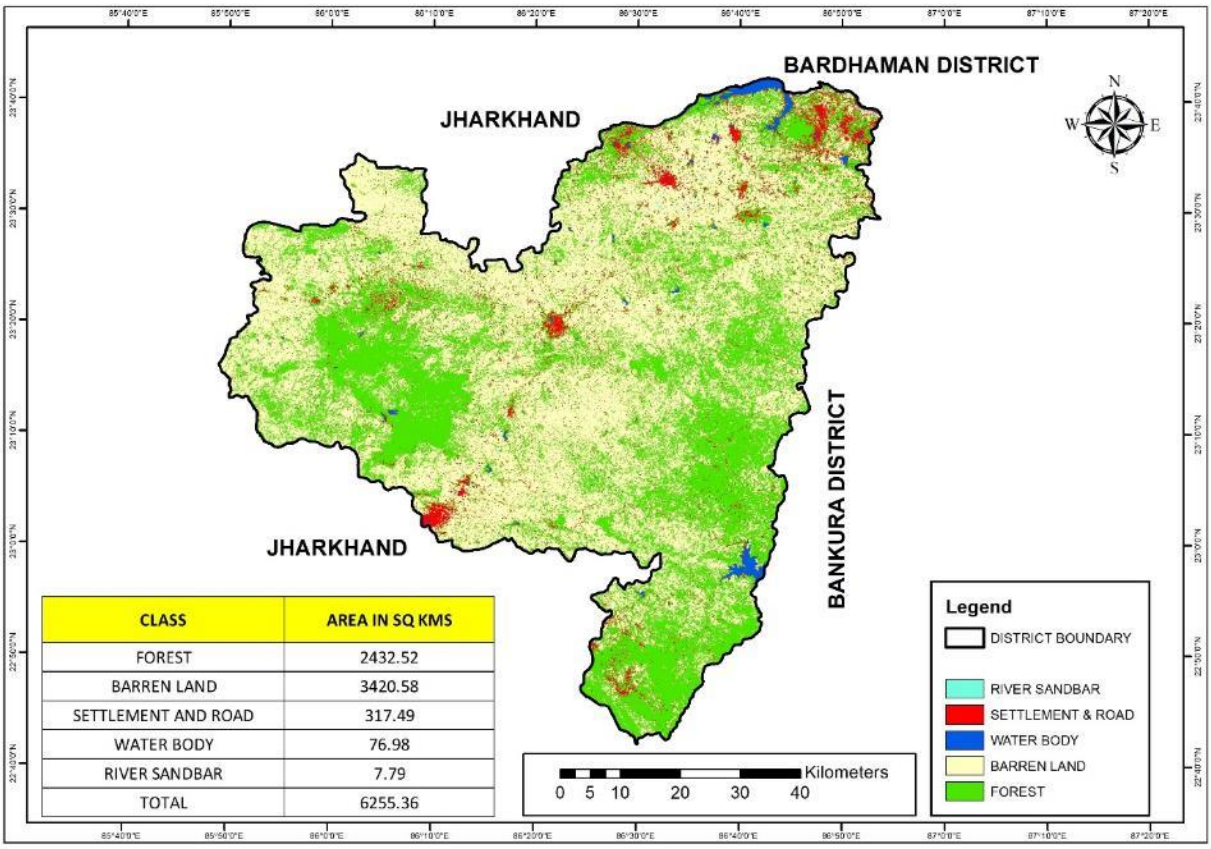


Figure 5.2: Land Use Land Cover map of Purulia District
(Source: Resourcesat-1&2 – Liss-3, Bhuvan India)

5.1 Forest -detail of the area

As per Satellite Imagery data 52.47% of total geographical area is used for agriculture. 29.69 % are under forest coverage (including social forestry) and 10.15 per cent are identified as Wasteland (14.11 %). The natural forests of the district are mostly of mixed nature.

As per Census, 2011, out of the total forest area of district Purulia, 56,264.66 hectares of land is under protected forest and 10,435.62 hectares of land is under reserved forest. From the forest produce the Government collected revenue of 9,653 thousand rupees.

The natural forests of the district are mostly of mixed nature and restricted to northwest part of the district covering Ajodhya Hills and Panchet hills of northeast. As per Table 5.2, the forest cover of this district is increasing compare to its past status. The extensive farm and social forestry plantation programs might have contributed in a big way to the increase in the forest cover.

Table 5.3: Classification of Forest Area, Out-turn of Forest Produce, Revenue and Expenditure of Forest Department

Item	Unit	2009-10	2010-11	2011-12	2012-13	2013-14
1. Area by class of forest	-	-	-	-	-	
Reserved forest	Hectare	10435.62	10435.62	10435.62	10435.62	10435.62
Protected forest	"	56264.00	56264.66	56264.66	56264.66	58830.87
Unclassed state forest	"	26596.65	26441.40	26441.40	26441.40	23173.28
Khas forest	"	22274.99	34191.05	34191.05	34191.05	22274.99
Vested waste land	"	-	175.64	175.64	175.64	-
Forest owned by corporate bodies	"	-	-	-	-	-
Forest owned by private individuals	"	1660.00	-	-	-	-
Forest owned by civil authorities	"	-	-	-	-	-
Total		**117231.26**	**127508.37**	**127508.37**	**127508.37**	**114714.76**
2. Forest Produce		-				
Timber	Thousand cu.metre	0.332	0.069	0.066	0.623	0.616
Fuel	"	11.659	2.217	1.526	4.719	6.324
Pulpwood	"	2.251	1.931	1.440	2.620	3.652
Pole	Number	4118	3702	678	42270	36691
Post	,,	1218	14405	6272	10702	2096
3. Revenue & Expenditure						

Item	Unit	2009-10	2010-11	2011-12	2012-13	2013-14
Revenue	Rs.in thousand	7227	9653	15162	4192	17599
Expenditure	"	326512	502559	258205	104791	116328

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

5.2 Agriculture & Irrigation

Cultivation of this district is predominantly mono-cropped. About 60 % of the total cultivated land is upland. Out of the total agricultural holding about 73 % belongs to small and marginal farmers having scattered and fragmented smallholding. Paddy is the primary crop of the district. 57 % of the total land is under net-cropped area and only 15 % of the net cropped area is under multi crop cultivation. 83 % of the net-cropped area is under Kharif paddy cultivation. Cropping intensity is 114.59. The crops are grown mostly under rainfed condition, generally with low fertilizer consumption per unit area Thus per hectare production is also low as compared to other districts of West Bengal (http://purulia.gov.in/aboutDistrict/district_profile.html).

The district has the broad categories of paddy producing land identified as (1) Bahal (2) Kalali and (3) Baid. Bahal lands are the quality paddy land, Kanali are the second class, while Baid is the poorest class paddy land. Agriculture is the principal occupation of the people. About 40 per cent of the total land area is used for agricultural purposes. Cultivation in extensive way is done mostly in the Damodar Valley, for these areas has good irrigation facility. The main agricultural crops are the paddy, pulses, oilseeds, maize, sugarcane and vegetables. The famous agriculture produce of the district is lac, production of which is at present on the wane. The district is gradually gaining reputation for tea and teak (segun) cultivation also. The land area under principal crops in the district and production of principal crops in the district for the last five years are shown in Table 5.3 (Source: Census, 2011).

Total net irrigated land of this district is 87816 ha which is 21.57 % of the gross cropped area. There is altogether 32 Nos. of medium irrigation Schemes in this district. Out of these schemes, 26 are completed and 6 are in various stages of execution. Irrigation potential created by these schemes are 39388 ha. There are altogether 135 State owned and operated RLI schemes. Out of these 110 schemes are functional. Number of RLI schemes under other departments are 150. Total no. of Jalatirtha schemes under various departments are 366. Total no. of Check Dams are 519. Total no. of SFMIS are 682. Other minor irrigation schemes are 987 (http://purulia.gov.in/aboutDistrict/district_profile.html).

Table 5.4: Production of Principal Crops in the district of Purulia (thousand tonnes)

Crops		2009-10	2010-11	2011-12	2012-13	2013-14
Foodgrains:						
1.	**Rice**	**598.8**	**261.8**	**732.3**	**730.7**	**731.5**
	Aus	0.1	<50 tonnes	0.2	0.3	0.1
	Aman	597.9	261.5	731.8	729.6	730.1
	Boro	0.8	0.3	0.3	0.9	1.3
2.	Wheat	2.6	5.2	4.2	3.3	2.7
3.	Barley	-	-	-	-	-
4.	Maize	9.8	9.5	9.8	12.1	11.2
5.	Other Cereals	0.2	0.1	0.1	0.1	0.1
	Total Cereals	**611.4**	**276.6**	**746.4**	**746.2**	**745.5**
6.	Gram	<50 tonnes	0.1	0.1	0.2	0.3
7.	Tur	0.1	0.1	<50 tonnes	0.2	0.4
8.	Other Pulses	4.0	2.4	3.6	3.7	3.5
	Total Pulses	**4.1**	**2.6**	**3.7**	**4.1**	**4.2**
	Total Foodgrains	**615.5**	**279.2**	**750.1**	**750.3**	**749.7**
Oil Seeds:						
1.	Rapeseed & Mustard	0.7	0.5	0.7	0.6	3.2
2.	Linseed	0.1	0.1	0.1	0.1	<50 tonnes
3.	Other Oil seeds	1.1	1.5	1.0	1.2	1.3
	Total Oil seeds	**1.9**	**2.1**	**1.8**	**1.9**	**4.5**
Fibres:						
1.	Jute	-	-	-	-	0.2
2.	Mesta	0.1	0.1	<50 tonnes	-	-
3.	Other Fibres	2.4	<50 tonnes	0.4	0.2	0.7
	Total Fibres	**2.5**	**0.1**	**0.4**	**0.2**	**0.9**
Miscellaneous crops:						
1.	Sugarcane	25.3	11.5	20.3	11.2	7.9
2.	Potato	24.9	15.9	17.4	17.2	43.7
3.	Tobacco	<50 tonnes	-	-	-	-
4.	Tea(P)	-	-	-	-	-
5.	Chillies (dry)	2.1	2.1	1.7	1.8	1.8
6.	Ginger	0.2	0.2	0.2	0.2	0.2
	Total Miscellaneous crops	**52.5**	**29.7**	**39.6**	**30.4**	**53.6**

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

5.3 Horticulture

The agro-climatic and soil condition in the district is suitable for horticultural crops like Mango, Banana, Pomegranate, Sweet Orange (Mosambi), Guava, Acid Lime (Kagzi/Pati), Apple Ber, Watermelon, Tomato, Peas, Bhindi, Kharif & Rabi Onion, Cole Crops, Cucurbits, etc. The total area in 2020-21 under cultivation of major fruit crops was 6930 ha with the production recorded at 49105 MT, while the major vegetable crops were grown in an area of 44870 ha with a production of 1104390 MT. Spice crops like Chilli, Coriander, Ginger, Turmeric, Garlic etc. were cultivated in 2035 ha with a production of nearly 5150 MT, and Plantation crops like Cashewnut has been produced in an area of 150 ha at 50 MT. Both cut flowers and loose flowers including Gladiolus, Marigold, Tuberose, etc. have been produced in an area of 48 ha at 75 MT.

The Department of Horticulture is stressing upon horticultural crops under crop diversification schemes, implemented under MATIR SRISHTI, RKVY, MIDH, State Development Scheme, etc. and tirelessly working towards increasing production area in the district for cash generating fruit & vegetable crops by providing improved planting material of the crops, setting up of new orchards, packhouses, vermicompost units, and rejuvenation of age-old fruit orchards, encouraging Integrated Pest & Nutrient Management Practices, offering regular demonstrations and trainings to farmers and field level officials on the cultivation technology of new age fruit crops such as Dragon fruit, propagation techniques, intercropping with vegetables, spices and pulses in orchard, and promotion of flower and spices.

Besides, the Department is also encouraging farmers to grow mushroom, medicinal and aromatic plants and set up post-harvest management units. In view of better returns, a shift towards plantation and floricultural crops is anticipated in the coming years especially in the context of commercialization of horticulture (http://www.purulia.gov.in/distAdmin/departments/horticulture/horticulture.html).

Table 5.4 explained production of horticulture crop in the district.

Table 5.5: Production of Fruits and Vegetables in the district

Name of Fruits / Vegetables		Production (Thousand tonnes)				
		2009-10	2010-11	2011-12	2012-13	2013-14
A.	**Fruits**					
	Mango	5.05	5.25	6.00	6.95	5.05
	Banana	0.37	0.37	0.47	0.54	0.55
	Pineapple	0.59	0.59	0.31	0.21	0.22
	Papaya	10.78	10.86	11.06	11.07	14.02
	Guava	8.23	9.23	9.23	9.60	10.00
	Jackfruit	3.48	3.48	3.50	3.80	3.89

Name of Fruits / Vegetables		Production (Thousand tonnes)				
		2009-10	2010-11	2011-12	2012-13	2013-14
	Litchi	0.44	0.44	0.45	0.40	0.42
	Mandarin Orange	-	-	-	-	-
	Other Citrus	2.96	2.96	3.17	3.20	3.30
	Sapota	2.11	2.11	2.11	2.20	2.30
	Others	4.47	5.48	5.46	5.70	5.80
	Total	**38.48**	**40.77**	**41.76**	**43.67**	**45.55**
B.	**Vegetables**					
	Tomato	76.69	77.69	77.89	77.90	78.43
	Cabbage	61.77	62.64	62.80	63.50	64.21
	Cauliflower	31.45	31.86	31.96	33.40	34.76
	Peas	1.17	1.17	1.05	1.20	1.26
	Brinjal	168.75	149.10	175.90	176.10	165.00
	Onion	4.89	5.02	5.05	5.10	6.20
	Cucurbits	105.93	109.65	109.66	109.80	110.06
	Ladies Finger	37.74	38.81	38.11	38.30	35.40
	Radish	7.59	2.03	7.88	8.04	7.60
	Others	26.76	57.57	28.25	29.77	30.16
	Total	**522.74**	**535.54**	**538.55**	**543.11**	**533.08**

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

Table 5.6: Production of Flowers in the district

Name of Flowers	Production				
	2009-10	2010-11	2011-12	2012-13	2013-14
Rose	0.010	0.016	0.016	0.017	0.033
Chrysanthemum	-	-	-	-	-
Gladiolus	-	-	-	-	0.020
Tuberose	-	-	-	0.041	0.050
Marigold	0.015	0.019	0.023	0.035	0.040
Jasmine	-	-	-	-	-
Seasonal Flower	-	-	-	-	-
Misc.Flower	0.006	0.007	0.012	0.014	0.015

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

5.4 Mining

The district has many minerals, although the deposits of only a few of them are adequate for commercial venture. Most important workable mineral deposit of the district is coal. Apart from coal, there are deposits of a number of minerals like Rock Phosphate (Apatite), Lime Stone, Road Metal, Decorative Stone, Moulding Sand, Glass Sand and China Clay (Source: Census, 2011).

6 Geology

Purulia district of West Bengal is geologically dominated mostly by Proterozic hard granite gneiss rocks including soft phyllite and mica schist of Singhbhum group as part of Chotanagpur plateau.

Regionally, the district holds diverse groups of rocks of various geological ages ranging from Archaean to recent, viz. (i) the Chhotanagpur Gneissic Complex (covers most part of the district), (ii) plutonic gabbro and anorthositic rocks, (ii) meta-sedimentaries and metabasics of Singhbhum Group, (iv) Dalma Group of basic volcanic rocks, (v) intrusive granites (Kuilapal, Manbhum granites), (vi) Gondwana Group of sedimentaries with coal seams and (vii) Quaternary sediments in order of decreasing antiquity.

The boundary between the Singhbhum Group and the Gneissic Complex is closely followed by a prominent, mineralised (copper, lead, apatite-magnetite), WNW-ESE trending tectonically disturbed shear zone, known as 'South Purulia Shear Zone'.

Another such shear zone has been traced further to the north between Jhalida and Raghunathpur and is designated as 'North Purulia Shear Zone' (NPSZ). This zone is associated with barytes; apatite-magnetie and REE mineralisations. There are numerous lineaments picked up by remote sensing and depicted on the map, but their tectonic significance is not known. A little to the north of NPSZ, there is a parallel zone of mega lineament; a number of rare metal (Cs, Rb) bearing pegmatites occur in its western part (Source: GSI 2001).

Table 6.1: Geological succession of Purulia

AGE	GROUPNAME/FORMATION		LITHOLOGY
Quaternary	Sijua Formation		Coarse to fine sand slit & clay, Lithomargic clay yellow clay, Calcareous modules & laterite.
	Unconformity		
Triassic	Upper Gondwana		Sandstone (Supra-Panchet)
	Unconformity		
Permian	Lower Gondwana	Panchet formation	Sand stone & Shale Raniganj formation Sand, shale &coal seams

AGE	GROUPNAME/FORMATION		LITHOLOGY
		Damuda Group	Barren measures formation Ironstone, shale & ferruginous sandstone
	Unconformity		
Proterozoic	Intrusive granite / Dalma group of volcanics / Singbbhum complex		Metamorphosed basic volcanics, phyllite mica schist, quartzite, anorthosite, gabbro
Archean	Chotanagpur gneissic complex		Granite – gneiss, Migmatites, Calc granulite, mica schist, Amphibolites, Hornblende-schist.

The rocks of various geological ages found in the district may be grouped into following categories:

Chotanagpur Gneissic Complex:

a. Granite gneiss and Migmatite: They cover almost 56 percent of the total area of the district and are found in all blocks except the Bandoan& the southern part of Barabazar, Balarampur, Manbazar, north eastern part of Nituria and southern Santuri. These rocks are hard & foliated and can easily beweathered.

b. Quartz and Quartz Schists: These hard-layered rocks occur mainly in extreme northwestern Part of Jhalda and as small patches in Barabazar and Para.

c. Calc-granulites, calc schists and crystalline limestones: These rocks are found in northern part of Jhalda and as small patches in Jaipur and Nituria.

d. Mica schist: These soft and flaky rocks occur in central part of Jhalda II, north of Arsa, southern part of Bagmundi, Balarampur, Barabazar, as patches in Jaypur, Purulia II, Para, Kashipore, Santuri, extreme northwestern part of Raghunathpur and eastern part of Manbazar.

e. Amphibolites and Hornblende schists:In Jaypur, JhaldaII, Arsa, Bagmundi, Para, Raghunathpur and Santuria, amphibolites and hornblende schists occur as insignificant patches.

Singhbhum Group:

a. Phyllite sand mica schists: Southern part of Balarampur, Barabazar and most part of Bandoan blockare covered by these soft flaky rocks.

b. Quartzite: Insignificant patches of quartzite are found in Balarampur and Bandoan.

Intrusive Granites:

Kuilapal (GRk), Manbhum (GRm) and other Granites: These hard & massive rocks occur mainly innorth Jhalda, Jaypur, Arsa, Purulia, Para, Raghunathpur, Nituria, Balarampur, Barabazar, Manbazar and as small patches in Bagmundi and Bandoan blocks.

Gondwana Group of Sedimentary Rocks with Coal Seams:

a. Clays with caliche concretions: These rocks are soft and unconsolidated and occur as small patches in Hura and Manbazar blocks

b. Red sandstones and red clays: Very insignificant patches of the medium hard to soft layeredsedimentary rocks are found mainly in Nituria.

c. Sandstones, clay sand shales: These are found in Nituria and Santuri blocks.
d. Coal bearing sandstones and shales: These rocks are considered as a part of Raniganj Formation and found mainly in Nituria and Santuri.

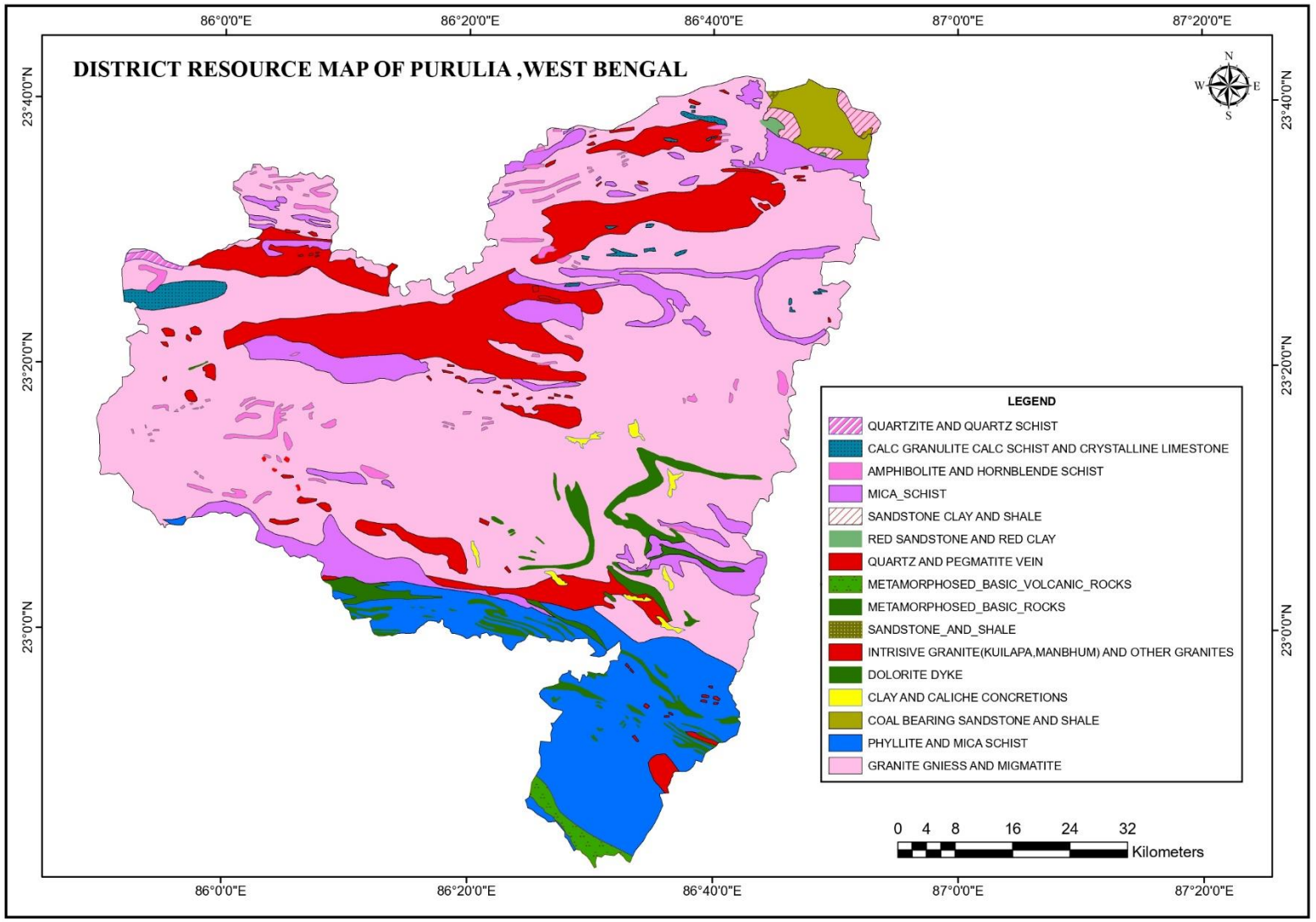


Figure 6.1: Geological map of Purulia district

PART A: RIVERBED DEPOSITS

7 Mineral wealth

7.1 Overview of mineral resources

Purulia district is very rich is mineral deposits. Good number of important minerals like coal, copper, china clay, feldspar, fire clay, fluorite, gold, graphite, iron-ore, kyanite, kaolinite, lime stone, moulding sand, manganese, pegmatilic vein quartz, rock phosphate, uranium etc. are available in this district.

7.2 Details of Resources

7.2.1 Sand and other riverbed minerals:

I. Drainage System

Several rivers flow across Purulia district. Among these Kangsabati (Kasai/Cossey/ Kansai), Kumari, Dwarakeswar, Subarnarekha and Damodar are the important ones. The main drainage of the district is controlled by river Kasai which drains more than three-fifth of the district's water (Source: Census, 2011).

River Subarnarekha: River Subarnarekha is the westernmost river in district Purulia which originates from a surface spring to the South-East of Ranchi town in the Chhotanagpur Plateau in the State of Jharkhand. Subarnarekha creates the Western boundary of the district which is an inter-State boundary of West Bengal with the State of Jharkhand. The flow of the river in this region is in North-South direction. This is the only river in the district Purulia which flows from North to South. Other rivers flow in an easterly or South-easterly courses. Several large and small tributaries meet Subarnarekha inside district Purulia as right bank tributaries. The course of Subarnarekha is mostly bordering the C. D. Block Jhalda I and a small portion beside C. D. Block Baghmundi.

River Kangsabati/ Kansai/ Cossey / Kasai: River Kangsabati is one of the largest rivers of district Purulia cutting the district in North-South territories. Kangsabati river is created from the confluence of two smaller river streams namely Saharjhor and Girgiri and takes the name of Kangsabati (Kansai/ Cossey / Kasai) from Tigra village of C.D. Block Jhalda-II C.D. Block. The area is geographically a part of the Chhota Nagpur Plateau. In its course inside district Purulia, Kangsabati receives several large and small rivulets, perennial streams and small brooks while flowing through the plateau region as North and South bank tributaries and grows in its full form. The flow of the river is from West to East with slightly South-ward turns. After crossing C. D. Block Jhalda-II, it creates the natural North-South boundary between C. D. Blocks Jaipur and Arsha, Purulia-I and Arsha, Purulia-II and Purulia-I, Hura and Puncha before entering C.D. Block Manbazar. From Manbazar it exits the district. Kangsabati Reservoir is created from the course of river Kangsabati to meet the water requirements of the inhabitants of the district. River Bandu is one important tributary of river of Kangsabati.

River Damodar: River Damodar marks the Northern boundary of the district Purulia. The river rises in Palamou of Latehar district of Jharkhand in the Chhotanagpur Plateau region. Only a small portion of this inter-state river flows beside district Purulia. It creates the Northern boundary of C. D. Blocks Raghunathpur II, Neturia and C.D. Block Santuri to the North East. Mautar Jhora Nala and Uttala Nadi are the two smaller river streams flowing through district Purulia and connected with river Damodar.

River Dwarakeswar: The Dwarakeswar river rises from the lands to the East of Bagalia rail station on the Asansol-Purulia section. The Dwarakeswar flows East up to Kashipur and then South-east. It receives numerous tributaries on its both banks.

River Kumari: The Kumari River flows from the Eastern part of the Baghmundi uplands covered by the dense sal forest. From its source above 630 metres to its confluence at an altitude about 230 meters, this river flows South–Southeast almost in a straight and steep channel and then turns east. Near Manbazar it takes a sharp bend towards the South-east and becomes a perennial stream debouching into the Kangsabati reservoir.

Table 7.1: Drainage system with description of main rivers

S.No.	Name of the River	Area drained (Sq.km)	% Area drained in the district
1	Damodar River	40.08	0.64%
2	Dwarakeswar River	2.79	0.04%
3	Kangsabati River	15.46	0.25%
4	Kumari River	8.25	0.13%
5	Subarnarekha River	8.18	0.13%

Table 7.2: Salient Features of important rivers and streams

S.No.	Name of the River or Stream	Total Length in the District (in Km)	Place of origin	Altitude at Origin
1	Damodar River	41.2	Palamau Hill at Chhotonagpur pleatu	2610m
2	Dwarakeswar River	29.03	Tillboni Hill	370m
3	Kangsabati River	103.93	Jabarban peak of Ghoramara pahar	600m
4	Kumari River	67.8	Baghmundi Hill	266m

S.No.	Name of the River or Stream	Total Length in the District (in Km)	Place of origin	Altitude at Origin
5	Subarnarekha River	43.26	Piska near Ranchi	610m

II. Annual deposition of riverbed minerals

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

A. Geomorphological studies

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

i) Place of Origin

Table 7.3: Place of Origin of important rivers and streams

Name of the River or Stream	Place of origin
Damodar River	Palamau Hill at Chhotonagpur pleatu
Dwarakeswar River	Tillboni Hill
Kangsabati River	Jabarban peak of Ghoramara pahar
Kumari River	Baghmundi Hill
Subarnarekha River	Piska near Ranchi

ii) Catchment Area

The principal rivers of this district are Subarnarekha, Kangasabati, Kumari, Dwarakeswar, Damodar, etc. Catchment area of the district is mainly having undulating topography with local slopes causing rill or gully erosion. Most parts of the Purulia district may be considered as peneplain of Ranchi.

iii) General profile of river stream

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

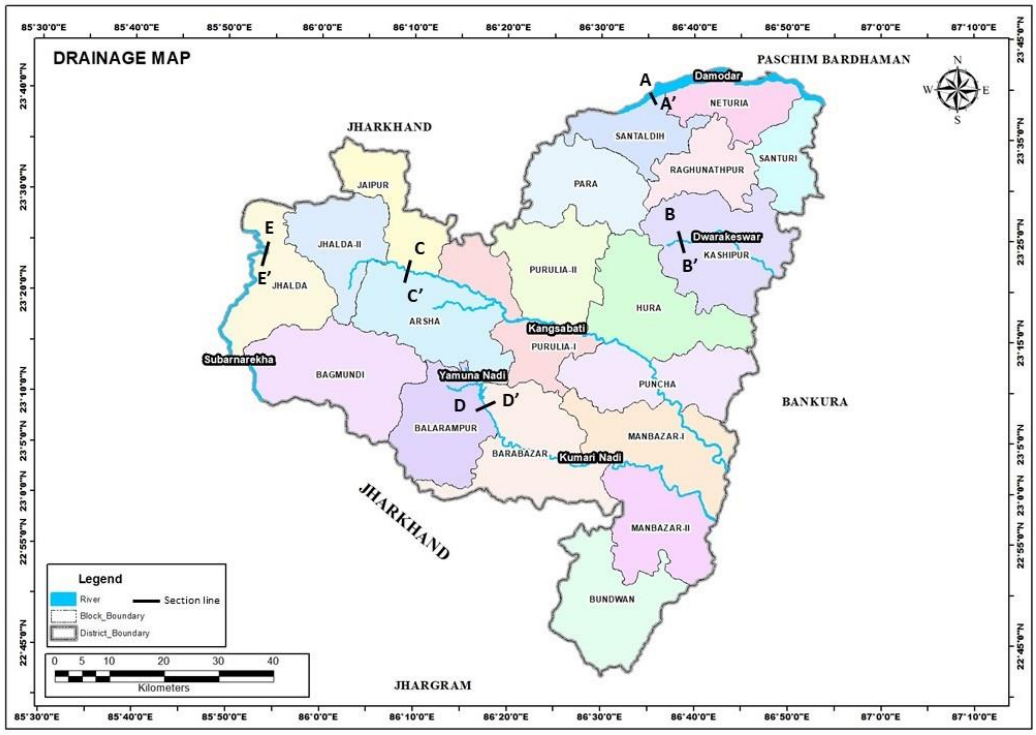


Figure 7.1: Plan showing the major rivers along with the distribution of Section Lines



Figure 7.2A: Profile section of Damodar River



Figure 7.2B: Profile section of Dwarakeswar River



Figure 7.2C: Profile section of Kangsabati River



Figure 7.2D: Profile section of Kumari River



Figure 7.2E: Profile section of Subarnarekha River



Figure 7.3A: Cross section view of Damodar River



Figure 7.3B: Cross section view of Dwarakeswar River



Figure 7.3C: Cross section view of Kangsabati River



Figure 7.3D: Cross section view of Kumari River



Figure 7.3C: Cross section view of Subarnarekha River

iv) Annual deposition factor

Annual deposition of riverbed materials depends on various factors, such as process of deposition, mode of sediment transport, sediment transport rate and 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 transported by either bedload or suspended load. In case of bedload, when there is insufficient bed shear stress and fluid turbulence are insufficient to keep the sediment moving, the grain cease horizontal movement and rapidly come to rest. In case of suspended load the grain settle longer distance vertically through the fluid before coming to rest.

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

2. Mode of sediment transport in rivers

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

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

Bed load: Bedload is the portion of sediment transport that rolls, slides or bounces along the bottom of a waterway. This sediment is not truly suspended, as it sustains intermittent contact with the streambed, and the movement is neither uniform nor continuous. Bedload occurs when the force of the water flow is strong enough to overcome the weight and cohesion of the sediment.

While the particles are pushed along, they typically do not move as fast as the water around them, as the flow rate is not great enough to fully suspend them. Bedload transport can occur during low flows (smaller particles) or at high flows (for larger particles). Approximately 5-20% of total sediment transport is bedload. In situations where the flow rate is strong enough, some of the smaller bedload particles can be pushed up into the water column and become suspended.

Suspended load: While there is often overlap, the suspended load and suspended sediment are not the same thing. Suspended sediment are any particles found in the water column, whether the water is flowing or not. The suspended load, on the other hand, is the amount of sediment carried downstream within the water column by the water flow. Suspended loads require moving water, as the water flow creates small upward currents (turbulence) that keep the particles above the bed. The size of the particles that can be carried as suspended load is dependent on the flow rate. Larger particles are more likely to fall through the upward currents to the bottom, unless the flow rate increases, increasing the turbulence at the streambed. In addition, suspended sediment will not necessarily remain suspended if the flow rate slows.

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

3. Sediment Transport Rate

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

4. Estimation of Sedimentation

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

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

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

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

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

5. Sediment Yield

The water that reaches a stream and its tributaries carries sediment eroded from the entire area drained by it. The total amount of erosional debris exported from such a drainage basin is its sediment load or sediment discharge and the sediment yield is the sediment discharge divided by the total drainage area of the river upstream of the cross section at which the sediment discharge is measured or estimated. Sediment yield is generally expressed as a volume or weight per unit area of drainage basin—e.g., as tons per square 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 difference of sand during pre- and post-monsoon period. With systematic data acquisition, a model has developed for calculation of sediment yield and annual replenishment with variable components.
C. The replenishment estimation based on a theoretical empirical formula with the estimation of bed-load transport comprising of analytical models to calculate the replenishment estimation.

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 7.2: Site View of Kumari 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 imagery.

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 imagery.
- Sand production data of the district.

All these data were compiled while estimation of the replenished sand in the Purulia 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 Purulia district are Damodar, Dwarakeswar, Kangsabati, Kumari and Subarnarekha Rivers. Planning has been done for systematic sand mining in the rivers.

From the ground survey and satellite imagery study altogether 81 sand bars are identified in Purulia district during pre-monsoon period of which 6 are falling in Damodar River, 15 are falling on Dwarakeswar River, 38 sand bars are falling in Kangsabati River, 13 are on Kumari River and remaining 9 are falling on Subarnarekha River.

In the post monsoon period, altogether 94 sand bars are identified in Purulia district of which 7 are falling in Damodar River, 13 are falling on Dwarakeswar River, 55 sand bars are falling in Kangsabati River, 12 are on Kumari River and remaining 7 are falling on Subarnarekha River.

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

a. The untapped Sand Bars.
b. The Sand bars worked in the pre-monsoon period.
c. Main channel course within the channel.

A summary of sediment load comparison between pre- and post-monsoon periods for different rivers Purulia district is given in Table 7.4 and details of each sand bars along with their sand resources in pre monsoon and post monsoon period are provided in Annexure-2. Maps showing distribution of sand bars on rivers of the district during pre- and post-monsoon periods are depicted in Plate-2A and 2B respectively.

Table 7.4: Sediment load comparison between Pre and Post Monsoon period for different rivers of Purulia district

River Name	Pre-Monsoon no of ghats	Post-Monsoon no of ghats	Pre-Monsoon Sediment Load (Mcum)	Post Monsoon Sediment Load (Mcum)	Variance (Mcum)	Variance (%)
DAMODAR	7	9	5.98	8.59	2.61	44
DWARAKESWAR	15	13	2.43	3.60	1.17	48
KANGSABATI	38	55	4.58	7.58	3.00	65
KUMARI	13	13	0.70	1.16	0.46	66
SUBARNAREKHA	9	7	3.53	4.08	0.56	16
Total =	**82**	**97**	**17.22**	**25.00**	**7.79**	**45**

Thus, in Purulia district, about 7.79 million cum of sand has been found as an incremental volume when compared between pre and post monsoon sand reserve data. The average replenishment and aggradation rate for the year comes to about 145%.

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

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 No. 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	cum	m	m	m	cum	m	%
Sunuri1, Santuri	Damodar	31000.00	87.00	2.95	91450.00	84.05	86.95	2.90	89803.90	0.05	98.20%
Sunuri3, Santuri	Damodar	42000.00	91.00	2.90	121800.00	88.10	90.94	2.84	119364.00	0.06	98.00%
Deoli, Santuri	Damodar	34000.00	85.00	2.90	98600.00	82.10	84.93	2.83	96233.60	0.07	97.60%
Banshra, Kashipur	Dwarakeswar	14500.00	158.00	3.00	43500.00	155.00	157.91	2.91	42195.00	0.09	97.00%
Suaria, Kashipur	Dwarakeswar	66100.00	145.00	2.90	191690.00	142.10	144.93	2.83	186897.75	0.07	97.50%
Rangamati, Kashipur	Dwarakeswar	30000.00	144.00	2.90	87000.00	141.10	143.94	2.84	85173.00	0.06	97.90%
Khatanga, Manbazar1	Kangsabati	8000.00	135.00	2.80	22400.00	132.20	134.91	2.71	21705.60	0.09	96.90%
Kudlung B, Hura	Kangsabati	29000.00	186.00	2.78	80620.00	183.22	185.90	2.68	77798.30	0.10	96.50%
Kalupara, Puncha	Kangsabati	16000.00	139.00	2.80	44800.00	136.20	138.89	2.69	43008.00	0.11	96.00%
Sardi, Bagmundi	Subarnarekha	30200.00	193.00	2.80	84560.00	190.20	192.89	2.69	81346.72	0.11	96.20%
Tulin 5, Jhalda 1	Subarnarekha	29000.00	240.00	2.75	79750.00	237.25	239.89	2.64	76560.00	0.11	96.00%
Marcha, Bagmundi	Subarnarekha	103200.00	195.00	2.85	294120.00	192.15	194.91	2.76	285002.28	0.09	96.90%

The average replenishment rate for the year comes to about 97.06%.

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.

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.

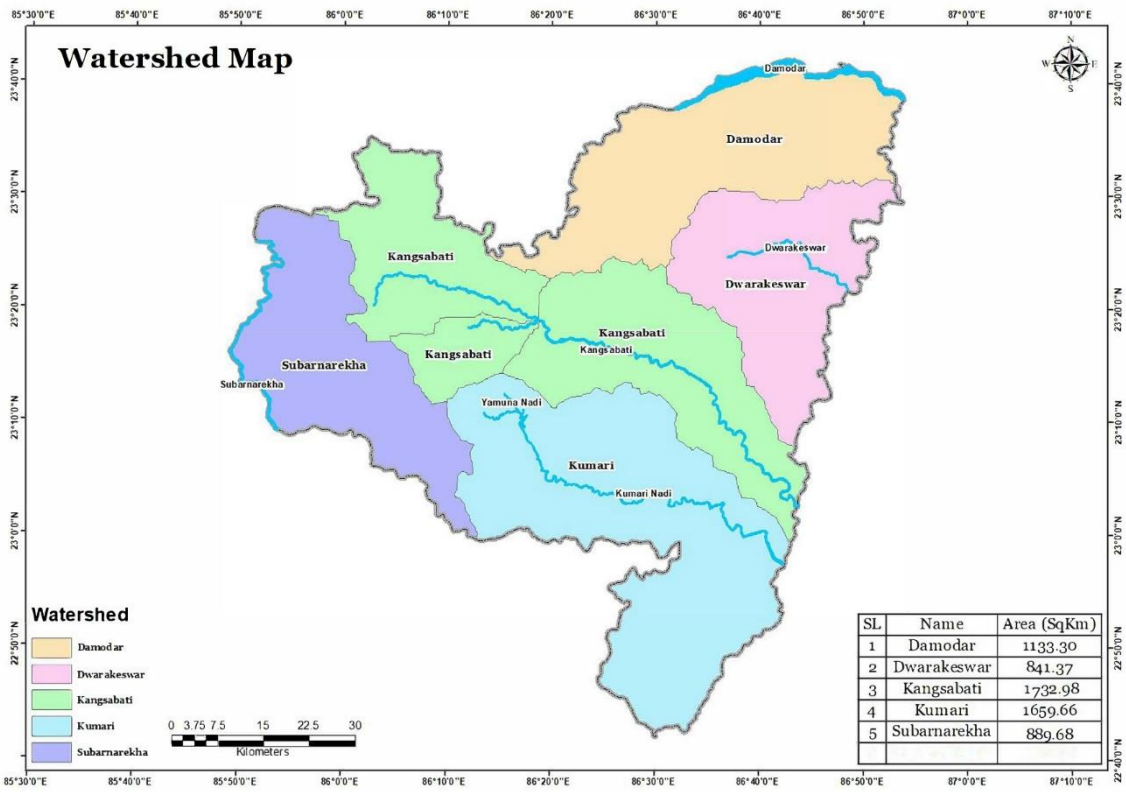


Figure 7.3: Watershed map of Purulia district

Catchment Yield can be estimated using following formula:

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

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

Strange (1892) studied the available rainfall and runoff and obtained yield ratios as functions of indicators representing catchment characleris1ics. Catchments are classified as good, average and bad according to the relative magnitudes of yield they 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. Based on the study Strange established runoff coefficient table as given below:



Table No. 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
660.4	21.8	16.3	10.9	1422.4	55.5	41.6	27.7
685.8	22.9	17.1	11.4	1447.8	56.6	42.4	28.3
711.2	24	18	12	1473.2	57.8	43.3	28.9
736.6	25.1	18.8	12.5	1498.6	58.9	44.4	29.4
762	26.3	19.7	13.1	1524	60	45	30

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

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

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

Where: n number of years on record;

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



b. Peak Flood Discharge Calculation:

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

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

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

Where: Q is Maximum flood discharge (m^3/sec) in a river
A is Area of catchment in Sq. Km
C is Constant whose value varies widely between 2.8 to 5.6 for catchments in plains and 14 to 28 for catchments in hills

As per Jarvis formula (Subramanya, 2008)**,**

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

Where: Q is Maximum flood discharge (m^3/sec) in a river
A is Area of catchment in Sq. Km
C is Constant whose value varies between 1.77 as minimum and 177 as maximum. Limiting or 100 percent chance floods are given by the value of C of 177

As per Rational formula (Subramanya, 2008)**,**

$$\mathbf{Q = CIA}$$

Where: Q is Maximum flood discharge (m^3/sec) in a river
A is Area of catchment in Sq. Km
C is Runoff coefficient which depends on the characteristics of the catchment area. It is a ratio of runoff: rainfall
I is Intensity of rainfall (in m/sec)

c. Bed Load Transport Calculation:

The most important problems in river engineering are to predict bed load transport rates in torrential floods flowing from mountainous streams. Three modes of transport namely; rolling, sliding and saltation may occur simultaneously in bed load transport. The different modes of transportation are closely related and it is difficult, if not impossible, to separate them



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

Ackers and White Equation:

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

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

The dimensionless particle d_{gr} is calculated by:

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

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

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

Where,

A_1 = Critical particle mobility factor
C_s = Concentration coefficient in the sediment transport function
C_t = Total sediment concentration
d_{50} = Median grainsize
d_{gr} = Dimensionless particle diameter
F_{gr} = Particle mobility parameter
g = Acceleration of gravity
D_s, S_g = Specific gravity
h = Water depth
m = Exponent in the sediment transport function
n' = Manning roughness coefficient
U_* = Shear velocity
V = Mean flow velocity
ν = Kinematic viscosity

Meyer – Peter's equation:

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

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

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

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



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

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

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

d. Sediment Yield Estimation:

Sedimentation occurred as the velocity decreases along with its ability to carry sediment. Coarse sediments deposit first, then interfere with the channel conveyance, and may cause additional river meanders and distributaries. The area of the flowing water expands, the depth decreases, the velocity is reduced, and eventually even fine sediments begin to deposit. As a result, deltas may be formed in the upper portion of reservoirs. The deposited material may later be moved to deeper portions of the reservoir by hydraulic processes within the water body.

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

1. Dendy – Bolton Equation
2. Yang Equations
3. Engelund-Hansen Equation
4. Modified Universal Soil Loss Equation (MUSLE) developed by Williams and Berndt (1977)

Dendy – Bolton Equation:

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

- The formula uses catchment area and mean annual runoff as key determinants.
- It does not differentiate in basin wide smaller streams and their characteristics.
- Dendy and Bolton equation calculates all types of sediment yield i.e. sheet and rill Erosion 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:

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

For run off more than 2 inches:

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

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 on a regional basis for preliminary watershed planning. Computed sediment yields normally would be low for highly erosive areas and high for well stabilized drainage basins with high 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; and there is less probability of an intense rainstorm over the entire basin. Both phenomena tend to decrease sediment yield per unit area.

Modified Universal Soil Loss Equation (MUSLE):

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

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

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

Where,

Y = sediment yield of stream (t/yr/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:

Physiographically, most parts of the Purulia district may be considered as peneplain with slight undulating surface configuration forming the part of the Ranchi peneplain. Few monadnocks & small eroded hills also present in the district. Absolute relief increases towards the west and south. General elevation of the land surface ranges from 300 m to 150 m, the master slope being towards the east and southeast.

The major sand producing rivers of the Purulia district are Damodar, Dwarakeswar, Kangsabati, Kumari and Subarnarekha 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 42%, as the rainfall in the district is 1442 mm and the characteristic of the catchment of the district is average in nature.
- Peak flood discharge of the river of the district calculated based on Dicken's formula which is more applicable to north Indian and central Indian catchment. Here Dicken constant C is taken as 12 in present study as per published literature by Saha (2002).
- Bed load transport has not been computed in the regional aspect of the district, as the values are highly dependent on local factors such as particle mobility factor, roughness coefficient, Shear velocity, Mean flow velocity, Kinematic viscosity etc.
- Sedimentation yield calculated as per Dendy Bolton formula as the equations express the general relationships between sediment yield, runoff, and drainage area.
- Computed sediment yields by Dendy Bolton formula normally would be low for highly erosive areas and high for well stabilized drainage basins with high plant density because the equations are derived from average values.
- Dendy and Boltan formula also says that actual sediment yield from individual drainage basin may vary 10-fold or even 100-fold from computed yields. Since the district river basins comprise sedimentary rocks with good average rainfall therefore the estimated replenishment is considered as 50-fold of computed results sediment yield

The data estimated for each river in the district are tabulated below.

Table No. 7.7: Replenishment parameter estimated for each river in the district

Estimation parameter	Damodar	Dwarakeswar	Kangsabati	Kumari	Subarnarekha
Catchment Area (m^2)	1133300000	841370000	1732980000	1659660000	889680000
Annual Rainfall (m) (in 2020)	1.44	1.44	1.44	1.44	1.44
Strange Runoff coefficient (%)	42%	42%	42%	42%	42%
Annual Run-off (m) (in 2020)	0.3168	0.3168	0.3168	0.3168	0.3168

Catchment Yield (m^3)	685419840	508860576	1048106304	1003762368	538078464
Peak Flood Discharge (m^3/sec)	74120768.35	59281817.91	101923988.23	98672377.21	61816813.83
Flow depth d (m)	0.8	0.5	0.6	0.3	0.3
Channel width b (m)	450	120	150	90	180
Mean velocity v (m/s)	0.1	0.03	0.05	0.04	0.04
Channel slope S_o (m/m)	0.011	0.007	0.009	0.006	0.005
Sediment Yield (Tons/year)	25544.51	19822.56	36541.02	35240.69	20790.65
Estimated Annual Replenishment (in million m3)	0.47836	0.37121	0.68429	0.65994	0.38934

Year-wise sedimentation rate for last 5 years in each river has been calculated as below. Sedimentation rate of a river is dependent on the annual rainfall of the district.

Table No. 7.8: Year-wise sedimentation rate for last 5 years of each river

Year	Damodar	Dwarakeswar	Kangsabati	Kumari	Subarnarekha
2016	26.47	27.67	24.76	24.93	27.44
2017	17.24	18.02	16.13	16.24	17.87
2018	43.34	45.3	40.54	40.83	44.93
2019	23.9	24.98	22.36	22.52	24.78
2020	22.54	23.56	21.09	21.23	23.37

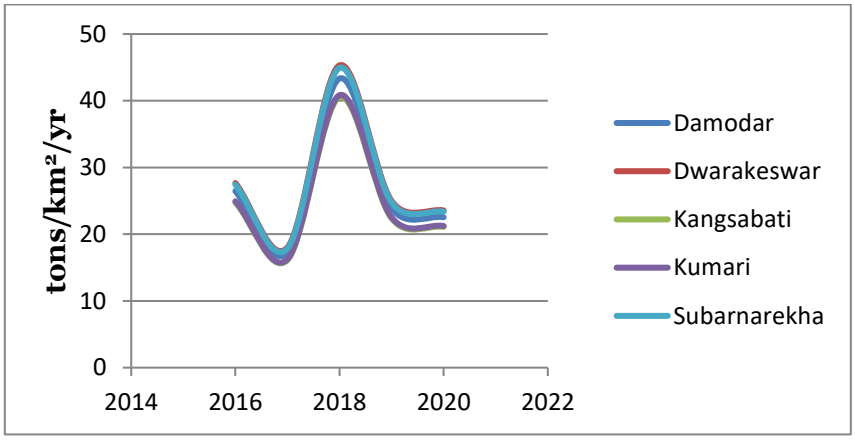


Figure No. 7.6: Graphical representation of year-wise sedimentation rate



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

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	cum	m	cum	%
Sunuri1, Santuri	Damodar	31000.00	87.00	2.95	91450.00	1.44	66758.50	73.00%
Sunuri3, Santuri	Damodar	42000.00	91.00	2.90	121800.00		90132.00	74.00%
Deoli, Santuri	Damodar	34000.00	85.00	2.90	98600.00		74936.00	76.00%
Banshra, Kashipur	Dwarakeswar	14500.00	158.00	3.00	43500.00		33930.00	78.00%
Suaria, Kashipur	Dwarakeswar	66100.00	145.00	2.90	191690.00		148559.75	77.50%
Rangamati, Kashipur	Dwarakeswar	30000.00	144.00	2.90	87000.00		66120.00	76.00%
Khatanga, Manbazar1	Kangsabati	8000.00	135.00	2.80	22400.00		16979.20	75.80%
Kudlung B, Hura	Kangsabati	29000.00	186.00	2.78	80620.00		60465.00	75.00%
Kalupara, Puncha	Kangsabati	16000.00	139.00	2.80	44800.00		32256.00	72.00%
Sardi, Bagmundi	Subarnarekha	30200.00	193.00	2.80	84560.00		63420.00	75.00%
Tulin 5, Jhalda 1	Subarnarekha	29000.00	240.00	2.75	79750.00		60610.00	76.00%
Marcha, Bagmundi	Subarnarekha	103200.00	195.00	2.85	294120.00		217648.80	74.00%

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	Kangsabati	River Name	Kangsabati
River	Kangsabati	Location	Khatanga	Location	Khatanga
Total Pre-monsoon Sand Bar Area	2298082 (sq.m)	Mining Area	8000 (Sq.m)	Lease Area	8000 (Sq.m)
Average Pre monsoon Thickness	2.0 (m)	Pre monsoon RL	135 (m)	Surface RL Before mining	135 (m)
Total Volume	4.6 (Mcum)	Sand Thickness	2.80 (m)	Mine out Thickness	2.80 (m)
Total Post-monsoon Sand Bar Area	3836130 (sq.m)	Volume excavated (Cum)	22400.00 (Cum)	Mine out Volume (Cum)	22400.00 (Cum)

Average Postmonsoon Thickness	2.0 (m)	Post monsoon RL	134.91 (m)	Drainage area for lease block	0.067 (Sq.km)
Total Volume	7.67 (M.cum)	Thickness	2.71 (m)	Monsoon Rainfall-2020	1.44 (m)
Total Pre and Post monsoon Volume Difference	3.08 (M.cum)	Volume deposited (Cum)	21705.00 (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)	16979.00 (Cum)
Replenishment and Agrredation %	167%	Replenishment Rate	96.9%	Replenishment Rate	75.8%

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	Damodar	Dwarakeswar	Kangsabati	Subarnarekha
Estimated Annual Replenishment based on Sattelite imegaries **(*)**	135%	149%	167%	117%
Estimated Annual Replenishment based on field investigation	97.93%	97.47	96.47%	96.37%
Estimated Annual Replenishment based on empirical formula	74.33%	77.17	74.27%	75.00%

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

vi) Total potential of minor mineral in the river bed

The major sand producing rivers of the Purulia district are Damodar, Dwarakeswar, Kangsabati, Kumari and Subarnarekha Rivers. Planning has been done for systematic sand mining in the rivers.

B. Geological studies

i) Lithology of the catchment area

The district Purulia is underlain by Precambrian metamorphites. Gondwana sedimentation of Permian and Triassic age has noted in the north eastern parts of the district. Unconsolidated sediments noted along major rivers and streams.

ii) Tectonics and structural behavior of rocks

Structurally isoclinal folds plunging gently towards east or west noted in the district. General E-W strike of the formations is predominant with moderate to steep northerly and southerly dips. Reversals of dips are the manifestations of regional folding and shearing of the concerned rocks locally. Well-developed and prominent foliations in the meta-sediments having uniform WNW-ESE strike and with steep dips due north are also noticeable here.

C. Climate Factors

i) Intensity of rainfall

The average annual rainfall is 1368.59 mm. The maximum rainfall in the area as per IMD data was recorded in the month of July followed by August and September. The rainy season in the district commence from June and lasts till September. The intensity of rainfall due to depressions sometimes becomes very great and may cause enhanced soil erosion in the district.

ii) Climate zone

Purulia is one of the drought prone districts of West Bengal. It has a sub-tropical climate nature and is characterized by high evaporation and low precipitation. 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

Temperature along with other meteorological conditions of the district is more or less uniform. The cold season commences by about the middle of November when the temperature begins to decrease. January is the coldest month with the mean daily maximum and minimum temperature at 28°C and 10°C respectively. By about the end of February the temperature begins to increase and April is s the hottest month, the mean maximum daily temperature is 39 °C and the mean minimum daily temperature is 25 °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 7.12: River wise Thickness of sand bar considered mineable

River Name	Considered Mining Thickness (m)
Damodar	3
Dwarakeswar	2.5
Kangsabati	2
Kumari	1.5
Subarnarekha	1.5

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 deposition of Riverbed minerals

Sl. No.	River or Stream	Portion of the river stream recommended for mineral concession (%)	Length of area recommended for mineral concession (in meter)	Average width of area recommended for mineral concession (in meters)	Area recommended for mineral concession (in Sqm)	Mineable mineral potential (in Mcum) (60% of total mineral potential
1	Damodar	12%	8439.146	326.8238	1429047.435	2.57
2	Dwarakeswar	30%	14752.25	102.8563	841003.127	1.26
3	Kangsabati	19%	55375.65	136.1917	2939846.32	3.53
4	Kumari	9%	12990.12	76.21781	580378.711	0.52
5	Subarnarekha	47%	30503.01	159.0831	1917428.63	1.30
TOTAL						9.19

III. Riverbed Mineral Potential

Sand is the important riverbed mineral found to be potential for mining. Considerable quantity of quality sands is found to occur Damodar, Dwarakeswar, Kangsabati, Kumari and Subarnarekha Rivers. Table 7.14 summarizes the potential riverbed mineral deposits of the district.

Table 7.14: Resources of Potential Riverbed Mineral

Boulder (Mcum)	Pebbles/Gravel (Mcum)	Sand/White sand (Mcum)	Total Mineable, Mineral Potential (Mcum)
			9.19

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	DAMODAR	NETURIA	ZONE 1	23° 40' 51.710" N	86° 49' 56.409" E	261116
				23° 39' 57.342" N	86° 51' 22.091" E	
		NETURIA	ZONE 2	23° 40' 42.175" N	86° 46' 1.808" E	299917
				23° 41' 10.369" N	86° 48' 48.718" E	
2	DWARAKESWAR	KASHIPUR	ZONE 3	23° 25' 7.906" N	86° 38' 16.130" E	8437
				23° 25' 4.517" N	86° 38' 29.793" E	
		KASHIPUR	ZONE 5	23° 25' 46.551" N	86° 41' 21.971" E	32862
				23° 26' 8.405" N	86° 42' 41.095" E	
		KASHIPUR	ZONE 6	23° 25' 56.424" N	86° 43' 48.016" E	200763
				23° 23' 24.761" N	86° 46' 9.463" E	
		KASHIPUR	ZONE 7	23° 23' 3.006" N	86° 47' 17.122" E	35524
				23° 22' 17.712" N	86° 47' 57.020" E	
		KASHIPUR	ZONE 8	23° 21' 51.155" N	86° 48' 26.182" E	19633
				23° 21' 36.935" N	86° 49' 7.007" E	
3	KANGSABATI	MANBAZAR-I	ZONE 9	23° 3' 54.119" N	86° 42' 34.520" E	57598
				23° 2' 31.732" N	86° 43' 22.286" E	
		MANBAZAR-I	ZONE 10	23° 5' 58.609" N	86° 40' 12.011" E	58902
				23° 4' 54.954" N	86° 41' 47.885" E	
		MANBAZAR-I	ZONE 11	23° 8' 7.670" N	86° 38' 19.539" E	18508
				23° 6' 45.481" N	86° 38' 50.640" E	
		PUNCHA	ZONE 12	23° 8' 55.303" N	86° 37' 35.202" E	5410

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	
				23° 9' 0.495" N	86° 37' 43.433" E	
		PUNCHA	ZONE 13	23° 10' 0.737" N	86° 36' 40.570" E	28927
				23° 9' 26.298" N	86° 36' 52.387" E	
		PUNCHA	ZONE 14	23° 13' 4.945" N	86° 35' 14.782" E	39488
				23° 10' 50.024" N	86° 36' 10.515" E	
		PUNCHA	ZONE 15	23° 14' 16.000" N	86° 33' 16.474" E	16521
				23° 13' 13.993" N	86° 35' 3.376" E	
		PURULIA-I	ZONE 17	23° 16' 52.864" N	86° 24' 16.348" E	99702
				23° 15' 49.951" N	86° 28' 58.614" E	
		21	ZONE 18	23° 17' 14.550" N	86° 22' 33.799" E	2027
				23° 17' 17.984" N	86° 23' 10.677" E	
		PURULIA-I	ZONE 19	23° 17' 0.578" N	86° 20' 22.267" E	12455
				23° 17' 10.153" N	86° 20' 48.671" E	
		PURULIA-I	ZONE 20	23° 19' 14.285" N	86° 18' 12.543" E	67663
				23° 17' 22.045" N	86° 19' 38.895" E	
		ARSHA	ZONE 21	23° 21' 4.450" N	86° 13' 57.234" E	81545
				23° 19' 58.377" N	86° 16' 56.825" E	
		JAIPUR	ZONE 22	23° 21' 51.859" N	86° 11' 13.255" E	45737
				23° 21' 32.538" N	86° 12' 19.742" E	
		JAIPUR	ZONE 23	23° 22' 3.758" N	86° 9' 2.617" E	10318
				23° 21' 59.482" N	86° 9' 25.967" E	
		JHALDA-II	ZONE 24	23° 22' 56.955" N	86° 6' 2.827" E	22371
				23° 22' 48.962" N	86° 6' 48.505" E	
		JHALDA-II	ZONE 25	23° 22' 53.793" N	86° 4' 8.492" E	20236
				23° 22' 58.979" N	86° 4' 52.410" E	
4	KUMARI	BARABAZAR	ZONE 26	23° 2' 56.125" N	86° 26' 50.324" E	21332
				23° 2' 54.569" N	86° 28' 3.222" E	
		BARABAZAR	ZONE 28	23° 3' 39.893" N	86° 30' 15.976" E	1439
				23° 3' 22.326" N	86° 30' 58.512" E	
		MANBAZAR-I	ZONE 29	23° 2' 45.181" N	86° 31' 16.385" E	25690
				23° 2' 51.705" N	86° 31' 57.647" E	
		MANBAZAR-II	ZONE 30	23° 2' 44.478" N	86° 35' 13.579" E	69474
				23° 0' 58.028" N	86° 36' 54.574" E	
		MANBAZAR-II	ZONE 31	23° 0' 47.560" N	86° 38' 8.726" E	4894
				23° 0' 35.189" N	86° 38' 16.256" E	

Sl.No	Rivers or Streams	Location of potential zones				Area within prohibited zone as per rule 3 of WBMMC Rules, 2016 (in sq.m)
		Administrative Block	Zone	Co-ordinates		
				Latitude	Longitude	
5	SUBARNAREKHA	BAGHMUNDI	ZONE 32	23° 11' 19.027" N	85° 52' 58.543" E	169781
				23° 9' 18.438" N	85° 53' 41.127" E	
		JHALDA-I	ZONE 33	23° 15' 7.562" N	85° 49' 55.605" E	533028
				23° 12' 18.691" N	85° 52' 36.322" E	
		JHALDA-I	ZONE 33A	23° 19' 11.635" N	85° 51' 21.414" E	417808
				23° 15' 59.526" N	85° 49' 14.330" E	
		JHALDA-I	ZONE 34	23° 21' 0.133" N	85° 52' 58.503" E	49958
				23° 20' 31.254" N	85° 52' 18.474" E	
		JHALDA-I	ZONE 35	23° 25' 33.837" N	85° 53' 13.348" E	56303
				23° 23' 38.956" N	85° 53' 1.275" E	

NO MINING ZONE:

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

No mining zone has been marked for an area up to a width of 100 meters from the active edge of embankments. Also, the concave side of the river is marked as no mining zone, as mining is this area will affect the course of river in future and will erode the river bank. A representative map of no mining zone shown on River Dwarakeswar of Purulia district is given in Figure 7.7.

Table 7.16: No mining zone in the district

RIVER NAME	BLOCK NAME	ZONE	RESTRICTED AREA (SQ MTS)
DAMODAR	NETURIA	1	261115.5444
		2	299917.1497
DWARAKESWAR	KASHIPUR	3	8437.275945
		5	32861.97049
		6	200763.0201
		7	35523.8061
		8	19632.5204
KANGSABATI	MANBAZAR-I	9	57597.61496
		10	58902.46275
		11	18507.88474
	PUNCHA	12	5409.506201
		13	28927.00718
		14	39488.3428
	HURA & PUNCHA	15	16521.03022
	PURULIA-I & PURULIA-II	17	99702.1495
	PURULIA-II	18	2026.706055
		19	12455.13347
	PURULIA-I & ARSHA	20	67662.65533
		21	81544.96804
	ARSHA & JAIPUR	22	45736.516
	JAIPUR	23	10317.89134
	JHALDA-II	24	22371.37536
		25	20236.0822
KUMARI	BARABAZAR	26	21331.54059
		28	1438.572036
		29	25690.32988

RIVER NAME	BLOCK NAME	ZONE	RESTRICTED AREA (SQ MTS)
		30	69474.32209
		31	4894.495333
SUBARNAREKHA	BAGMUNDI	32	169781.2013
	JHALDA	33	533028.0769
		33A	417807.8859
		34	49958.1988
		35	56302.76959

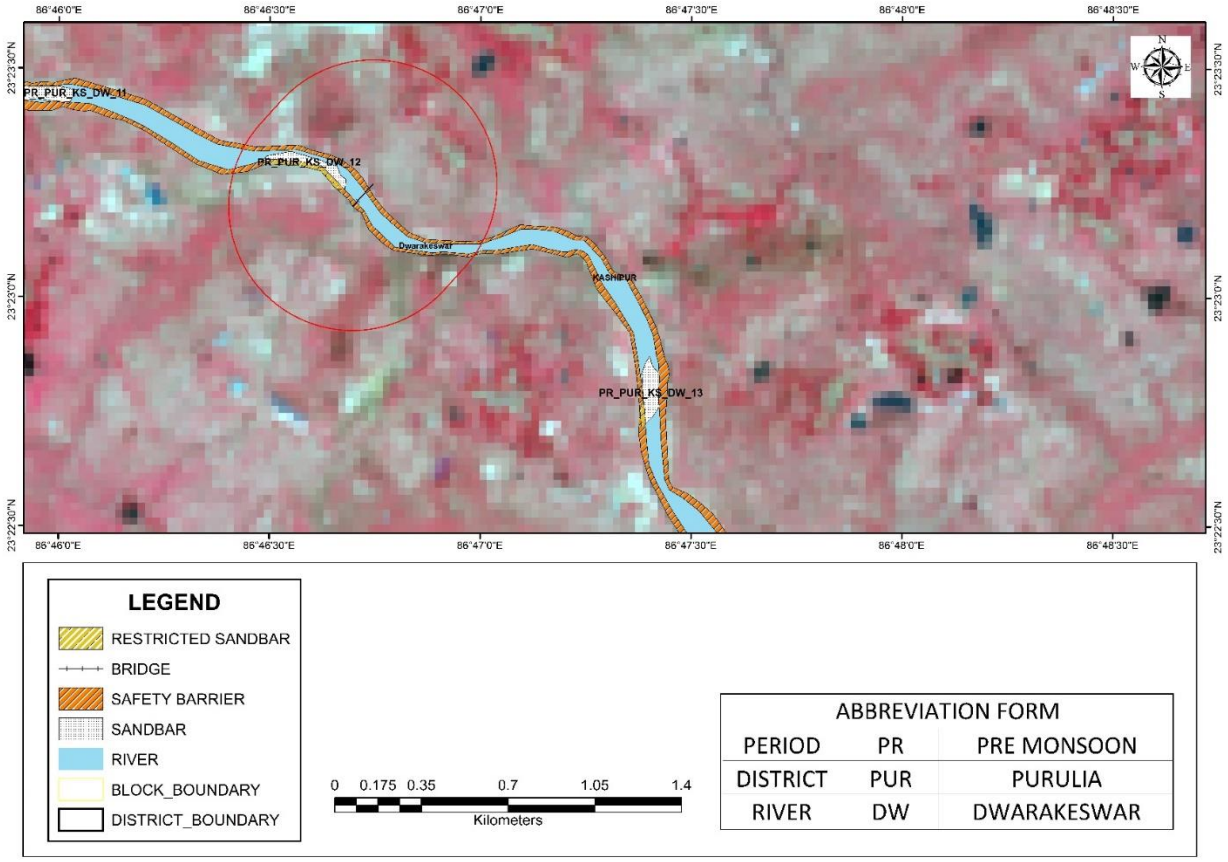


Figure No. 7.7: A representative map showing no-mining zone demarcated on Dwarakeswar River

8 Overview of mining activity in the district

8.1 General overview

In Purulia district mining activity is mainly associated with coal, quartz-feldspar, granite, dolerite and China clay deposits. Collection of sand from river-bed is one of the main minor mineral sources of the district. These materials are primarily utilized for construction purpose.

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 mining leases of the districts

S.No	District	Name of Bidder	Sandghat ID	River Name	Block Name	JL No	Plot	Mineable Reserve	LOI Date
1	Purulia	Uttam Mahato	2018_WB_1300	Kumari	Barabazar	191	1	5822.64 cum	25-02-2019
2	Purulia	Sabir Ansari	2018_WB_1283	Kangsabati	Puncha	35 and 43	7074 (p), 616 (p)	55239 cum	25-02-2019

ID	Block	Mouza	JL No	River	Road	Plot No	Area in Hectares	Latitude	Longitude	Bidder Name	Date of Issuance of Environmental Clearance (E.C.)	Date of Execution of Lease Deed	Lease Agreement Start Date (date of effect)	Lease Agreement Expiry Date	Quantum of Sand Extraction permissible as per Mining Plan (tonnes)	Reasons for non-execution of lease deed
1505/SB2021	KASHIPUR	BANSHRA	8	Darakeswar	Kachha Road	1366	0.7	23° 25' 6.97''N	86° 37' 55.94''E	Joydeb Addhya	10/28/2016	11/1/2017	11/1/2017	31-Oct-22	4874.587	
872/SB2021	HURA	KUDLUNG	52	Kangsabati / Kansai	Kachha Road	5355	2.75	23° 15' 30.60''N	86° 29' 59.50''E							
873/SB2021	ARSHA	KORANG, BEREDA	94, 10	Kumari	Kachha Road	3611,1426	0.82	23° 10' 43.45''N	86° 16' 59.56''E							
874/SB2021	ARSHA	JURI,KORANG	93, 94	Jamuna	Kachha Road	1694, 3618	0.86	23° 10' 43.45''N	86° 16' 59.56''E							
1507/SB2021	BARABAZAR	TENTLO	187	Kumari	Kachha Road	1156	2.08	23° 2' 47.90''N	86° 27' 19.55''E							
1504/SB2021	JHALDA-2	TIGRA	241	Kangsabati / Kansai	Kachha Road	2252	2.25	23° 22' 26.10''N	86° 3' 43.05''E	AMBEY NIWAS PVT LTD						EC Awaiting
858/SB2021	MANBAZAR-1	KALABANI	93	Kangsabati / Kansai	Kachha Road	408	2.089	23° 4' 50.00''N	86° 42' 34.80''E	GEE DEE MINING PVT LTD	2/13/2017	6/7/2017	6/7/2017	6-Jun-22	26012.966	
620/SB2021	JHALDA-1	TULIN	42	Subarnarekha	Kachha Road	2001	4	23° 23' 47.70''N	85° 52' 26.30''E							
878/SB2021	KASHIPUR	RANGAMATI	159	Darakeswar	Kachha Road	1	3	23° 25' 53.70''N	86° 42' 13.40''E							
637/SB2021	ARSHA	JHARIADIH	78	Kangsabati / Kansai	Kachha Road	1577	3.5	23° 18' 23.60''N	86° 15' 35.80''E	PRASANTA BANERJEE	7/26/2017	11/6/2019	11/6/2019	5-Nov-24	68071.313	
643/SB2021	JHALDA-1	TULIN	42	Subarnarekha	Kachha Road	1372	3.4	23° 23' 32.50''N	85° 52' 37.00''E	Rajesh Kumar Tantia	7/26/2017	7/21/2021	7/21/2021	20-Jul-26	66126.418	

ID	Block	Mouza	JL No	River	Road	Plot No	Area in Hectares	Latitude	Longitude	Bidder Name	Date of Issuance of Environmental Clearance (E.C.)	Date of Execution of Lease Deed	Lease Agreement Start Date (date of effect)	Lease Agreement Expiry Date	Quantum of Sand Extraction permissible as per Mining Plan (tonnes)	Reasons for non-execution of lease deed
646/SB 2021	JHALDA-1	TULIN	42	Subarnarekha	Kachha Road	4260	2.9	23° 22' 43.70''N	85° 52' 33.80''E	Rajesh Kumar Tantia	7/26/2017	12/24/2020	12/24/2020	23-Dec-25	56401.945	
649/SB 2021	HURA	KESHERGARH	54	Kangsabati / Kansai	Kachha Road	2201	1.9	23° 14' 51.02''N	86° 32' 16.47''E							
651/SB 2021	ARSHA	JHARIADIH	78	Kangsabati / Kansai	Kachha Road	540	2.2	23° 18' 29.00''N	86° 15' 6.70''E	Ramlal Tantia	7/26/2017	9/15/2017	9/15/2017	14-Sep-22	42787.682	
660/SB 2021	PUNCHA	KONAPARA	33	Kangsabati / Kansai	Kachha Road	1	1.2	23° 15' 0.30''N	86° 30' 21.50''E							
663/SB 2021	ARSHA	BRIDDHITANR	47	Kangsabati / Kansai	Kachha Road	90,91	0.6	23° 22' 26.60''N	86° 8' 44.50''E							
718/SB 2021	MANBAZAR-1	KALUPARA	143	Kangsabati / Kansai	Kachha Road	364	1.6	23° 5' 27.60''N	86° 40' 46.60''E							
746/SB 2021	KASHIPUR	JAGANNATHDIH	134	Darakeswar	Kachha Road	2644	0.42	23° 22' 2.21''N	86° 48' 20.50''E							
724/SB 2021	PURULIA-2	LUKUIDIH	174	Kangsabati / Kansai	Kachha Road	721	1.17	23° 15' 54.00''N	86° 28' 37.10''E	Shyamsundar Gorai	10/28/2016	2/28/2017	2/28/2017	27-Feb-22	29290.113	
752/SB 2021	KASHIPUR	KALLOLI	37	Darakeswar	Kachha Road	1474	3.03	23° 25' 41.53''N	86° 41' 15.44''E							
761/SB 2021	MANBAZAR-1	BASUDI	92	Kangsabati / Kansai	Kachha Road	1460, 652/1462	1.26	23° 4' 57.84''N	86° 41' 59.53''E							
747/SB 2021	KASHIPUR	JAGANNATHDIH	134	Darakeswar	Kachha Road	2	0.44	23° 22' 21.16''N	86° 47' 36.79''E							
849/SB 2021	PUNCHA	KENDADIH	55	Kangsabati / Kansai	Kachha Road	2263	4.98	23° 9' 10.10''N	86° 37' 28.20''E							
860/SB 2021	NETURIA	HIRAKHUN	97	Damodar	Kachha Road	337	2.68	23° 40' 8.91''N	86° 51' 12.65''E	Joy Majee	12/1/2016	4/19/2017	4/18/2017	17-Apr-22	26110.746	
861/SB 2021	KASHIPUR	JAGANNATHDIH	134	Darakeswar	Kachha Road	2	0.44	23° 22' 21.16''N	86° 47' 36.79''E							
863/SB 2021	MANBAZAR-1	PARULDIHA	132	Kangsabati / Kansai	Kachha Road	880	1.31	23° 5' 43.83''N	86° 40' 15.32''E							
864/SB 2021	BAGMUNDI	MARCHA	15	Subarnarekha	Kachha Road	214, 215	4.18	23° 10' 38.89''N	85° 52' 58.63''E	Janak Kumar	10/28/2016	6/20/2017	6/20/2017	19-Jun-22	29246.094	

ID	Block	Mouza	JL No	River	Road	Plot No	Area in Hectares	Latitude	Longitude	Bidder Name	Date of Issuance of Environmental Clearance (E.C.)	Date of Execution of Lease Deed	Lease Agreement Start Date (date of effect)	Lease Agreement Expiry Date	Quantum of Sand Extraction permissible as per Mining Plan (tonnes)	Reasons for non-execution of lease deed
866/SB 2021	SANTURI	SHUNURI	1	Damodar	Kachha Road	1	3.1	23° 39' 18.27''N	86° 51' 55.73''E	Mark Enclave Private Limited	7/26/2017	12/18/2017	12/18/2017	17-Dec-22	123987.034	
867/SB 2021	MANBAZAR-1	PATHARKATA	58	Kangsabati / Kansai	Kachha Road	625	0.93	23° 7' 58.27''N	86° 38' 21.93''E	Ajijun Ansari	1/17/2017	5/16/2017	5/16/2017	15-May-22	7205.624	
869/SB 2021	HURA	KUDLUNG	52	Kangsabati / Kansai	Kachha Road	5355	1.45	23° 26' 38.86''N	86° 48' 10.45''E	Sanjib Tantia	12/1/2016	3/27/2017	3/27/2017	26-Mar-22	18048.622	
870/SB 2021	JHALDA-2	PANRRAMA	237	Kangsabati / Kansai	Kachha Road	1312	1.3	23° 22' 50.92''N	86° 6' 31.88''E	Rajesh Kumar Tantia	12/1/2016	3/28/2017	3/28/2017	27-Mar-22	42301.459	
871/SB 2021	HURA	KUDLUNG	52	Kangsabati / Kansai	Kachha Road	5355	2.9	23° 15' 45.70''N	86° 29' 27.20''E							
875/SB 2021	SANTURI	DEULI	2	Damodar	Kachha Road	1	3.4	23° 39' 8.76''N	86° 52' 38.80''E	Malay Panja	7/26/2017	9/20/2017	9/20/2017	19-Sep-22	136667.747	
877/SB 2021	KASHIPUR	NARAYAN GARH	40	Darakeswar	Kachha Road	1620	2.51	23° 26' 7.14''N	86° 42' 43.83''E							
1290/SB2021	MANBAZAR-1	BARAGAJARI	95	Kangsabati / Kansai	Kachha Road	179	1.6	23° 3' 52.10''N	86° 42' 12.80''E	Chittaranjan Mandal	9/21/2017	1/30/2019	1/30/2019	29-Jan-24	31118.314	
1863/SB2021	BAGMUNDI	RANGAMATI	1	Subarnarekha	Kachha Road	908	2.6	23° 13' 23.95''N	85° 51' 53.39''E							
1391/SB2021	SANTURI	SUNURI	1	Damodar	Kachha Road	1	4.2	23° 39' 6.48''N	86° 52' 22.52''E	Gurusharan Gandhi	9/21/2017	9/20/2017	9/20/2017	19-Sep-22	163371.151	
1408/SB2021	KASHIPUR	SUARIA	39	Darakeswar	Kachha Road	436	2.68	23° 25' 51.95''N	86° 41' 59.46''E	Manoj Kumar Sing	11/10/2016	8/2/2017	8/2/2017	1-Aug-22	38430.875	
1434/SB2021	BARABAZAR	AYODHYA	191	Kumari	Kachha Road	1	1.91	23° 3' 43.85''N	86° 30' 21.49''E							
1475/SB2021	MANBAZAR-2	CHALKA	175	Kumari	Kachha Road	1855	0.53	23° 0' 44.29''N	86° 38' 12.89''E							
1508/SB2021	BALARAMPUR	BANKUDI	7	Jamuna	Kachha Road	1183	0.52	23° 11' 57.80''N	86° 16' 8.65''E							
1510/SB2021	HURA	KESHERGARH	54	Kangsabati / Kansai	Kachha Road	2201	0.98	23° 24' 57.94''N	86° 54' 27.58''E	Ritz and Company	1/17/2017	1/25/2021	1/25/2021	24-Jan-26	10184.765	
1860/SB2021	JHALDA-2	TIGRA	241	Kangsabati / Kansai	Kachha Road	2252	1.28	23° 22' 55.02''N	86° 4' 2.21''E							

ID	Block	Mouza	JL No	River	Road	Plot No	Area in Hectares	Latitude	Longitude	Bidder Name	Date of Issuance of Environmental Clearance (E.C.)	Date of Execution of Lease Deed	Lease Agreement Start Date (date of effect)	Lease Agreement Expiry Date	Quantum of Sand Extraction permissible as per Mining Plan (tonnes)	Reasons for non-execution of lease deed
1862/SB2021	JHALDA-1	TULIN	42	Subarnarekha	Kachha Road	1365	1.5	23° 38' 34.09''N	85° 87' 77.36''E							
1859/SB2021	MANBAZAR-1	AKSHYPUR	64	Kangsabati / Kansai	Kachha Road	821	1.68	23° 6' 6.43''N	86° 40' 10.19''E	Sukumar Gope Mandal	10/28/2016	5/16/2017	5/16/2017	15-May-22	40961.912	
1865/SB2021	BAGMUNDI	SUISA	8	Subarnarekha	Kachha Road	1278	3	23° 11' 38.29''N	85° 53' 2.55''E							
1866/SB2021	BAGMUNDI	SUISA	8	Subarnarekha	Kachha Road	1278	3.2	23° 12' 5.94''N	85° 52' 49.82''E							
1868/SB2021	MANBAZAR-1	PALASBANI	65	Kangsabati / Kansai	Kachha Road	204	2	23° 9' 25.57''N	86° 67' 22.25''E							
1870/SB2021	SANTURI	SUNURI	1	Damodar	Kachha Road	1	3.6	23° 39' 22.47''N	86° 52' 12.56''E							
1871/SB2021	SANTURI	SUNURI	1	Damodar	Kachha Road	1	4	23° 39' 27.70''N	86° 52' 5.36''E							
1872/SB2021	SANTURI	SUNURI	1	Damodar	Kachha Road	1	3.1	23° 39' 8.82''N	86° 52' 3.03''E							
1873/SB2021	PUNCHA	BANSA, DELANG	38, 40	Kangsabati / Kansai	Kachha Road	3803, 2545	2	23° 11' 0.72''N	86° 36' 4.27''E							
1874/SB2021	BARABAZAR	TENTLO	187	Kumari	Kachha Road	1156	2.08	23° 2' 47.90''N	86° 27' 19.55''E							
1876/SB2021	PUNCHA	MAHESPUR, DHADKIDIH	36, 41	Kangsabati / Kansai	Kachha Road	2875, 6525, 789/2084	2.6	23° 11' 56.52''N	86° 35' 46.40''E							
1590/SB2021	PUNCHA	JAMBAID, GAGDA	35, 43	Kangsabati / Kansai	Kachha Road	7074, 616	2.8	23° 13' 2.97''N	86° 35' 17.82''E	Sabir Ansari						EC Awaiting
1877/SB2021	JHALDA-2	TIGRA	241	Kangsabati / Kansai	Kachha Road	2252	1.16	23° 22' 54.71''N	86° 4' 30.35''E							
1869/SB2021	SANTURI	SUNURI	1	Damodar	Kachha Road	1	3.6	23° 39' 20.38''N	86° 52' 17.39''E							
1879/SB2021	PUNCHA	MAHESPUR, GAGDA	36, 43	Kangsabati / Kansai	Kachha Road	2874, 617	2	23° 12' 21.28''N	86° 35' 44.31''E							

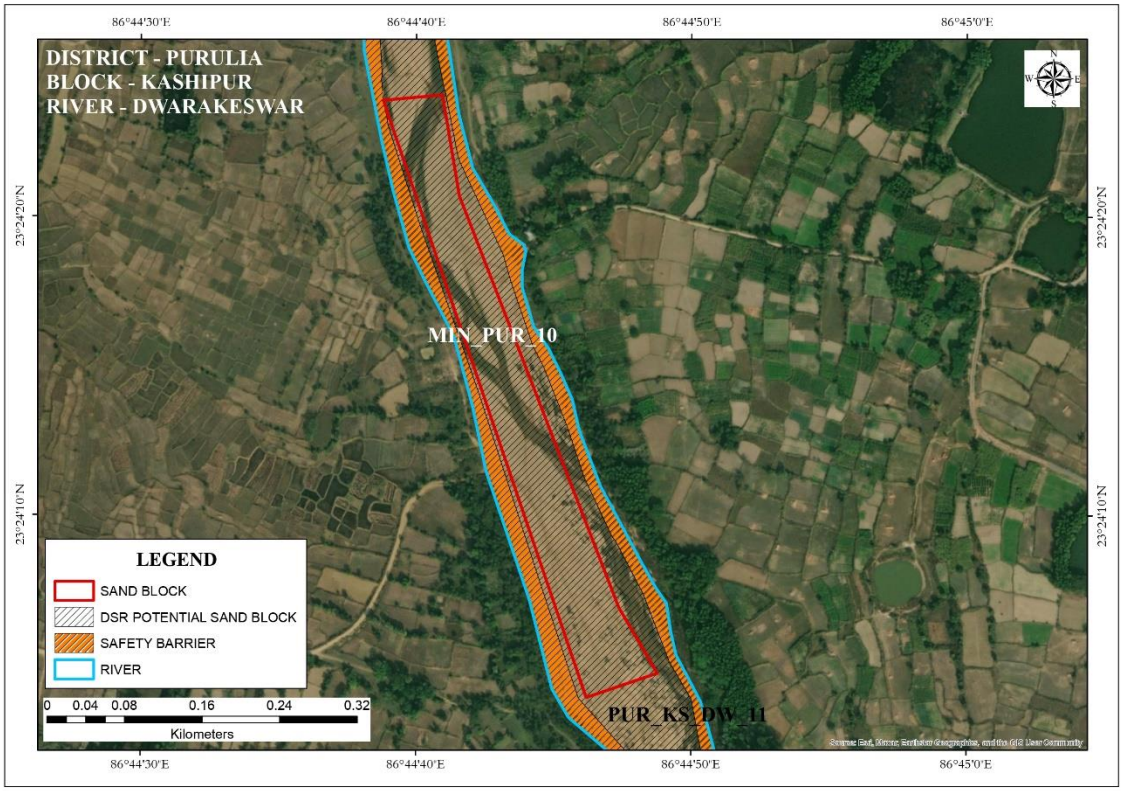
ID	Block	Mouza	JL No	River	Road	Plot No	Area in Hectares	Latitude	Longitude	Bidder Name	Date of Issuance of Environmental Clearance (E.C.)	Date of Execution of Lease Deed	Lease Agreement Start Date (date of effect)	Lease Agreement Expiry Date	Quantum of Sand Extraction permissible as per Mining Plan (tonnes)	Reasons for non-execution of lease deed
1880/SB2021	MANBAZAR-1	DOLDERIA	13	Kangsabati / Kansai	Kachha Road	2201	1.8	22° 59' 56.08''N	86° 38' 26.21''E							
410/SB2021	MANBAZAR-1	PALASBANI	65	Kangsabati / Kansai	Kachha Road	205	1.3	23° 5' 26.98''N	86° 40' 44.32''E							
616/SB2021	ARSHA	JHARIADIH	78	Bandhu	Kachha Road	603	1.9	23° 18' 13.60''N	86° 15' 14.80''E							
619/SB2021	ARSHA	BRIDDHITANR	47	Kangsabati / Kansai	Kachha Road	1	1.2	23° 22' 15.80''N	86° 8' 22.50''E							
653/SB2021	ARSHA	JHARIADIH	78	Kangsabati / Kansai	Kachha Road	290	1.5	23° 18' 42.10''N	86° 14' 54.10''E	Ramlal Tantia	7/26/2021	10/25/2019	10/25/2019	24-Oct-24	29173.42	
859/SB2021	ARSHA	HENSLA	77	Bandhu	Kachha Road	124	0.9	23° 18' 22.62''N	86° 15' 35.75''E							
862/SB2021	BAGMUNDI	SARIDI	16	Subarnarekha	Kachha Road	676, 1134	3.02	23° 9' 45.50''N	85° 53' 22.00''E							
865/SB2021	SANTURI	SHUNURI	1	Damodar	Kachha Road	1	4.2	23° 39' 6.20''N	86° 52' 9.74''E	Jai Tara Carriers Private Limited	7/26/2017	9/22/2017	9/22/2017	21-Sep-22	171636.953	
868/SB2021	ARSHA	BRIDDHITANR	47	Kangsabati / Kansai	Kachha Road	213	0.8	23° 22' 15.00''N	86° 8' 52.50''E							
876/SB2021	KASHIPUR	JAGANNATHDIH	134	Darakeswar	Kachha Road	1042	0.53	23° 22' 2.20''N	86° 48' 20.50''E							
879/SB2021	MANBAZAR-1	KHATANGA	96	Kangsabati / Kansai	Kachha Road	1	0.8	23° 3' 49.40''N	86° 42' 11.50''E							
1500/SB2021	KASHIPUR	KALLOLI	37	Darakeswar	Kachha Road	1474	2.01	23° 25' 36.19''N	86° 40' 58.98''E							
1503/SB2021	KASHIPUR	RAGHUNATHPUR	140	Darakeswar	Kachha Road	1045	1.86	23° 22' 40.75''N	86° 47' 23.57''E							
1506/SB2021	BARABAZAR	AYODHYA	191	Kumari	Kachha Road	1500	0.76	23° 3' 21.20''N	86° 30' 58.18''E							
1526/SB2021	JHALDA-2	BANAHATA	238	Kangsabati / Kansai	Kachha Road	826	0.78	23° 22' 57.57''N	86° 6' 8.59''E	Raghab Bagaria	11/10/2016	3/15/2017	3/15/2017	14-Mar-22	22366.288	
1586/SB2021	KASHIPUR	NARAYANGARH	40	Darakeswar	Kachha Road	1619, 1620	1.62	23° 25' 55.10''N	86° 42' 9.14''E							

ID	Block	Mouza	JL No	River	Road	Plot No	Area in Hectares	Latitude	Longitude	Bidder Name	Date of Issuance of Environmental Clearance (E.C.)	Date of Execution of Lease Deed	Lease Agreement Start Date (date of effect)	Lease Agreement Expiry Date	Quantum of Sand Extraction permissible as per Mining Plan (tonnes)	Reasons for non-execution of lease deed
1858/SB2021	HURA	KESHERGARH	54	Kangsabati / Kansai	Kachha Road	2201	0.73	23° 15' 7.90''N	86° 31' 46.20''E	GEE DEE MINING PVT LTD	2/13/2017	8/31/2019	8/31/2019	30-Aug-24	18670.989	
1861/SB2021	JHALDA-1	TULIN	42	Subarnarekha	Kachha Road	1	1.4	23° 39' 9.05''N	86° 87' 43.06''E							
1864/SB2021	BAGMUNDI	SUISA	8	Subarnarekha	Kachha Road	1278	3.2	23° 11' 21.63''N	85° 53' 0.07''E							
1867/SB2021	JHALDA-1	GURIDI	28	Subarnarekha	Kachha Road	1033	2	23° 24' 19.19''N	85° 53' 57.15''E							
1875/SB2021	PUNCHA	MAHESPUR, DHADKIDI	36, 41	Kangsabati / Kansai	Kachha Road	6525, 789/2084	3.45	23° 11' 33.57''N	86° 35' 36.13''E							
1878/SB2021	SANTURI	SUNURI	1	Damodar	Kachha Road	1	3.6	23° 39' 20.38''N	86° 52' 17.39''E							

Based on DSR potential blocks, sand blocks are auctioned for the district which area given as Table 8.2 and map of these blocks are given as Figure 8.1.

Table 8.2: List of WBMDTCL Sand Auction Block of the district

SL. NO	BLOCK ID	AREA (Ha)	DSR POTENTIAL ZONE CODE	DISTRICT	BLOCK	RIVER
1	MIN_PUR_10	3.480439	PUR_KS_DW_11	PURULIA	KASHIPUR	DWARAKESWAR
2	MIN_PUR_11	3.541408	PUR_KS_DW_11	PURULIA	KASHIPUR	DWARAKESWAR
3	MIN_PUR_12	2.899845	PUR_P2_KB_26	PURULIA	PURULIA-II	KANGSABATI
4	MIN_PUR_13	10.834462	PUR_P1_KB_34	PURULIA	PURULIA-I	KANGSABATI
5	MIN_PUR_15	10.152302	PUR_JL_SR_07	PURULIA	JHALDA	SUBARNAREKHA
6	MIN_PUR_18	3.200707	PUR_KS_DW_11	PURULIA	KASHIPUR	DWARAKESWAR
7	MIN_PUR_19	3.47596	PUR_KS_DW_13	PURULIA	KASHIPUR	DWARAKESWAR
8	MIN_PUR_20	2.18467	PUR_KS_DW_13A	PURULIA	KASHIPUR	DWARAKESWAR
9	MIN_PUR_21	2.464241	PUR_PU_KB_11	PURULIA	PUNCHA	KANGSABATI
10	MIN_PUR_35	3.00429	PUR_M1_KB_03B	PURULIA	MANBAZAR-I	KANGSABATI
11	MIN_PUR_36	1.845294	PUR_M1_KB_03A	PURULIA	MANBAZAR-I	KANGSABATI
12	MIN_PUR_37	2.122048	PUR_M1_KB_03	PURULIA	MANBAZAR-I	KANGSABATI
13	MIN_PUR_38	2.187943	PUR_M1_KB_05	PURULIA	MANBAZAR-I	KANGSABATI


DISTRICT - PURULIA
BLOCK - KASHIPUR
RIVER - DWARAKESWAR
MIN_PUR_10
PUR_KS_DW_11
LEGEND
SAND BLOCK
DSR POTENTIAL SAND BLOCK
SAFETY BARRIER
RIVER
0 0.04 0.08 0.16 0.24 0.32
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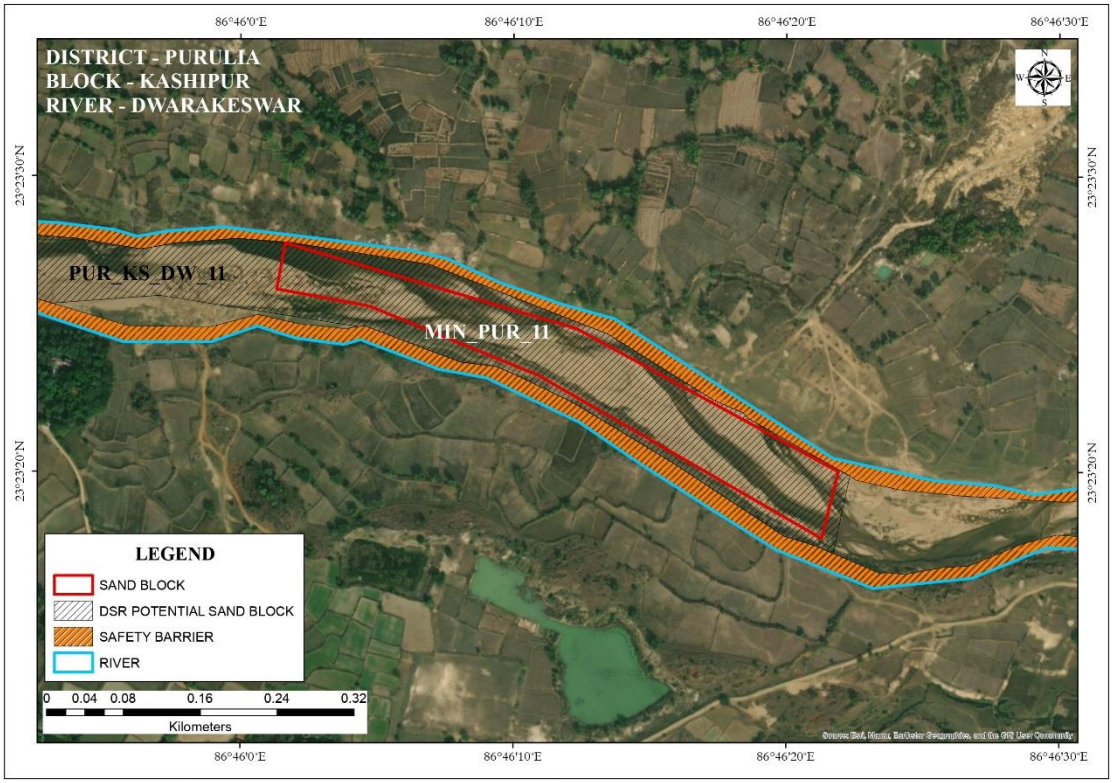
86°44'50"E
86°45'0"E
23°24'20"N
23°24'10"N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BLOCK - KASHIPUR
RIVER - DWARAKESWAR
PUR_KS_DW_11
MIN_PUR_11
LEGEND
SAND BLOCK
DSR POTENTIAL SAND BLOCK
SAFETY BARRIER
RIVER
0 0.04 0.08 0.16 0.24 0.32
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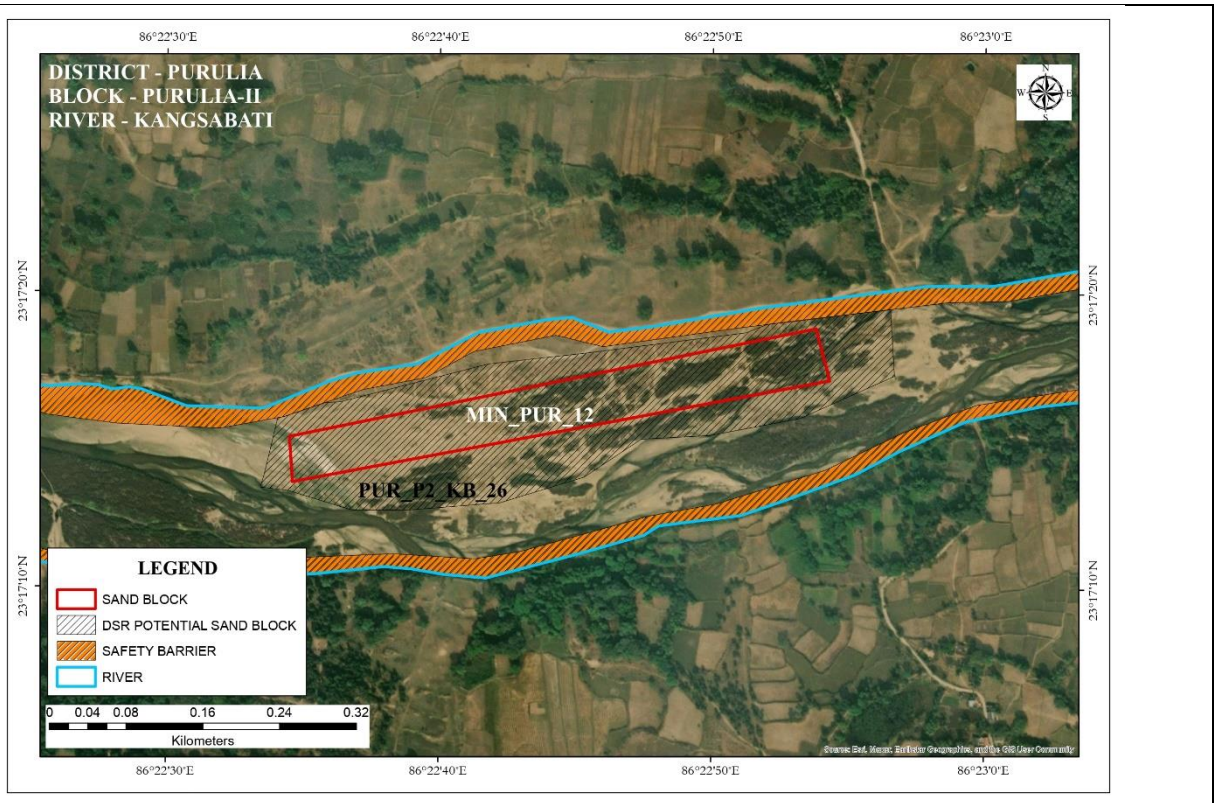
86°46'20"E
86°46'30"E
23°23'30"N
23°23'20"N


86°22'30"E
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86°22'50"E
86°23'0"E
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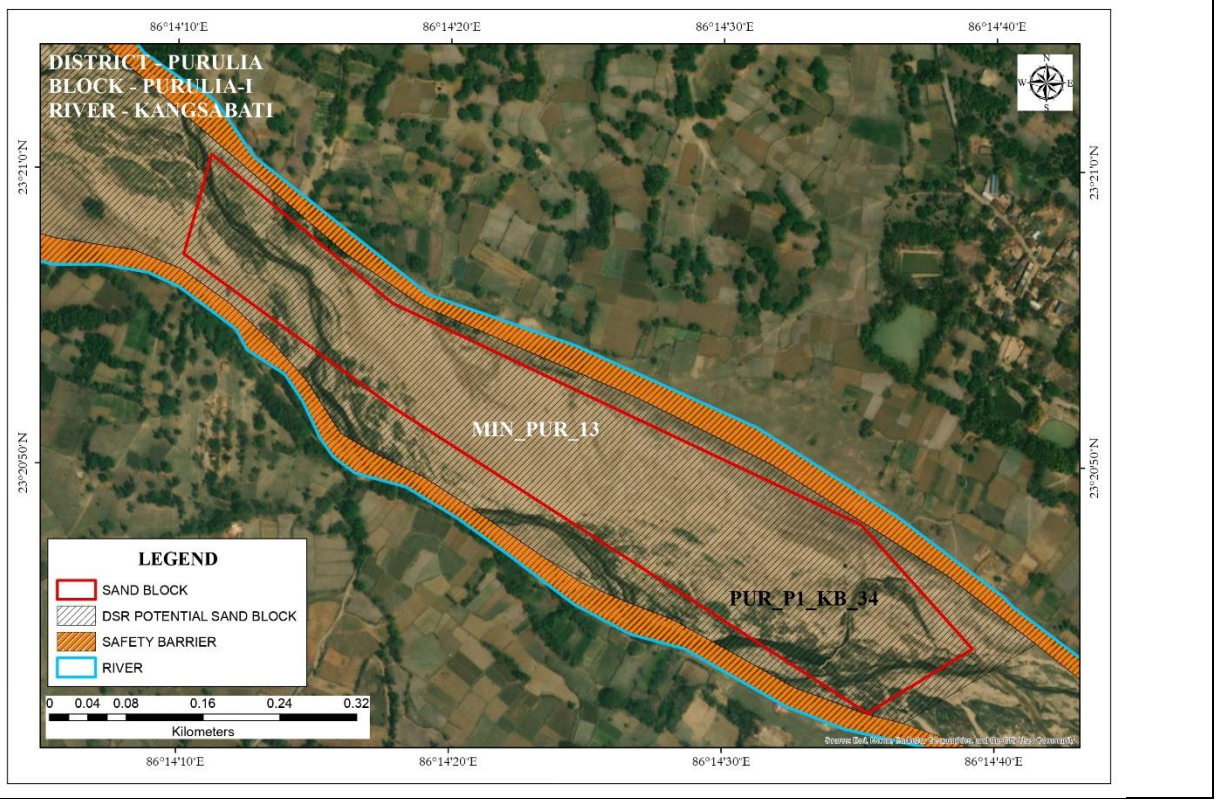
BLOCK - PURULIA-II
RIVER - KANGSABATI
23°17'20"N
23°17'10"N
MIN_PUR_12
PUR_P2_KB_26
LEGEND
SAND BLOCK
DSR POTENTIAL SAND BLOCK
SAFETY BARRIER
RIVER
0 0.04 0.08 0.16 0.24 0.32
Kilometers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86°14'30"E
86°14'40"E
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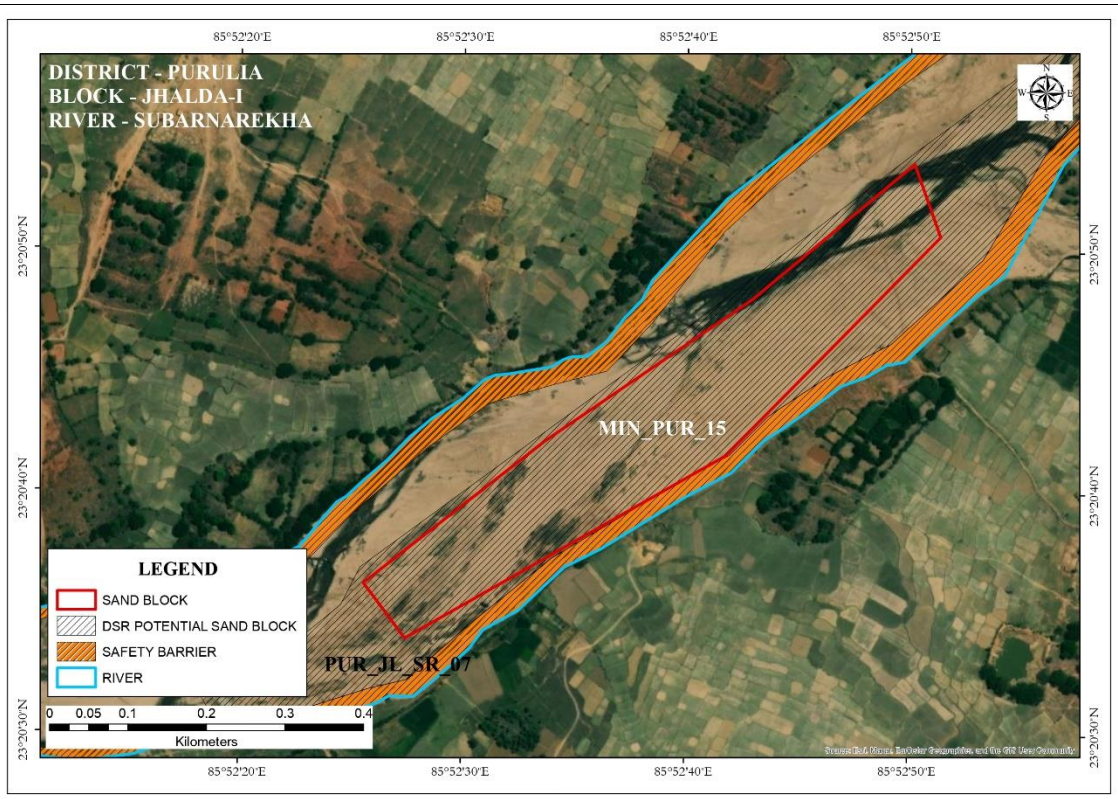
BLOCK - PURULIA-I
RIVER - KANGSABATI
23°21'0"N
23°20'50"N
MIN_PUR_13
PUR_P1_KB_34
LEGEND
SAND BLOCK
DSR POTENTIAL SAND BLOCK
SAFETY BARRIER
RIVER
0 0.04 0.08 0.16 0.24 0.32
Kilometers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BLOCK - JHALDA-I
RIVER - SUBARNAREKHA
MIN_PUR_15
PUR_JL_SR_07
LEGEND
SAND BLOCK
DSR POTENTIAL SAND BLOCK
SAFETY BARRIER
RIVER
0 0.05 0.1 0.2 0.3 0.4
Kilometers
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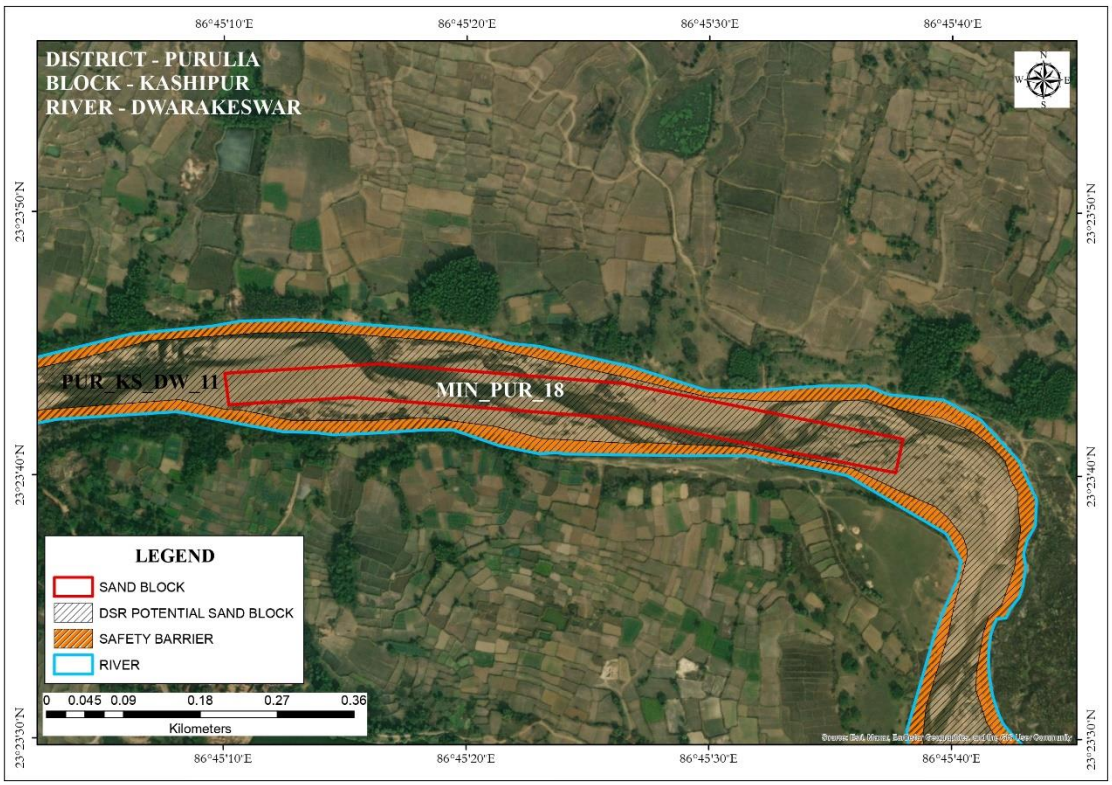
85°52'30"E
85°52'40"E
85°52'50"E
23°20'50"N
23°20'40"N
23°20'30"N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BLOCK - KASHIPUR
RIVER - DWARAKESWAR
PUR_KS_DW_11
MIN_PUR_18
LEGEND
SAND BLOCK
DSR POTENTIAL SAND BLOCK
SAFETY BARRIER
RIVER
0 0.045 0.09 0.18 0.27 0.36
Kilometers
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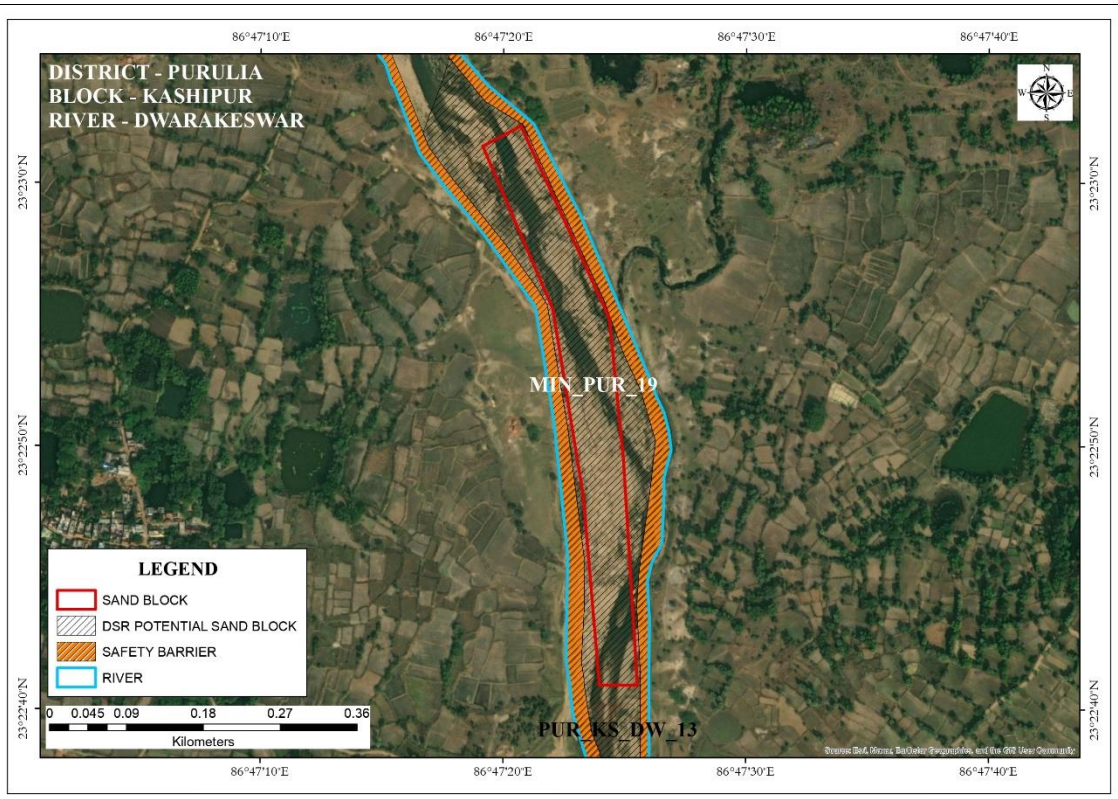
86°45'20"E
86°45'30"E
86°45'40"E
23°23'50"N
23°23'40"N
23°23'30"N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BLOCK - KASHIPUR
RIVER - DWARAKESWAR
MIN_PUR_19
PUR_KS_DW_13
LEGEND
SAND BLOCK
DSR POTENTIAL SAND BLOCK
SAFETY BARRIER
RIVER
0 0.045 0.09 0.18 0.27 0.36
Kilometers
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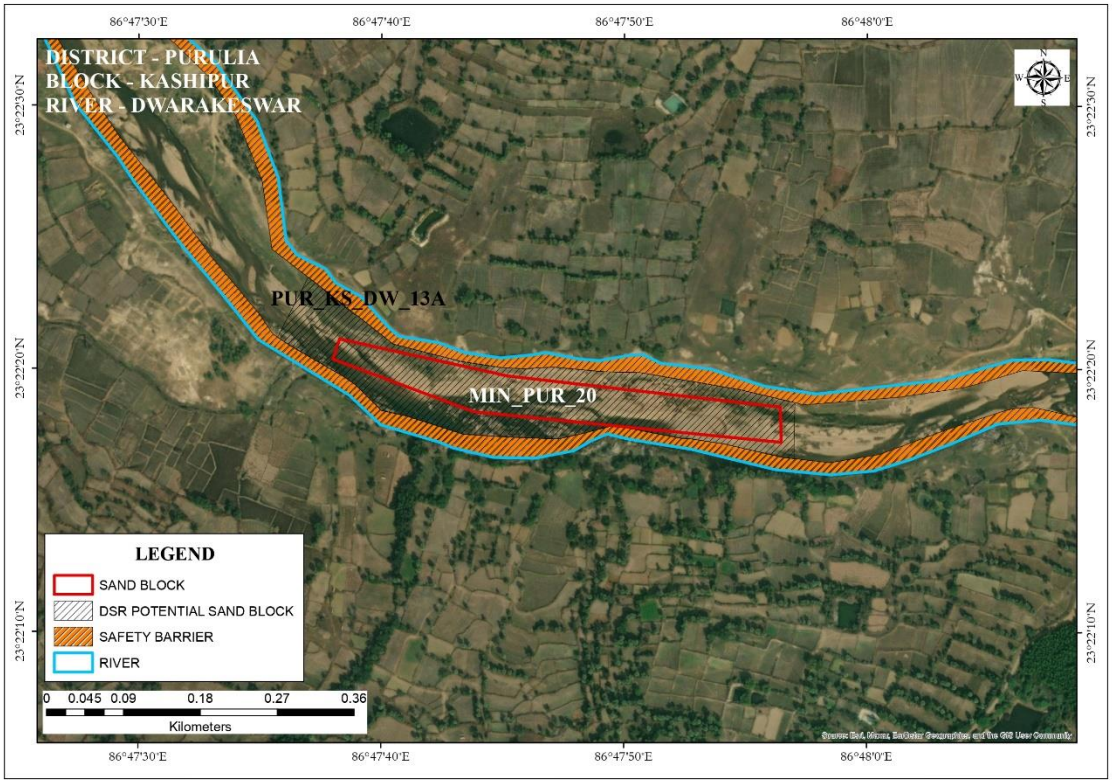
86°47'30"E
86°47'40"E
23°23'0"N
23°22'50"N
23°22'40"N


DISTRICT - PURULIA
BLOCK - KASHIPUR
RIVER - DWARAKESWAR
PUR_KS_DW_13A
MIN_PUR_20
LEGEND
SAND BLOCK
DSR POTENTIAL SAND BLOCK
SAFETY BARRIER
RIVER
0 0.045 0.09 0.18 0.27 0.36
Kilometers
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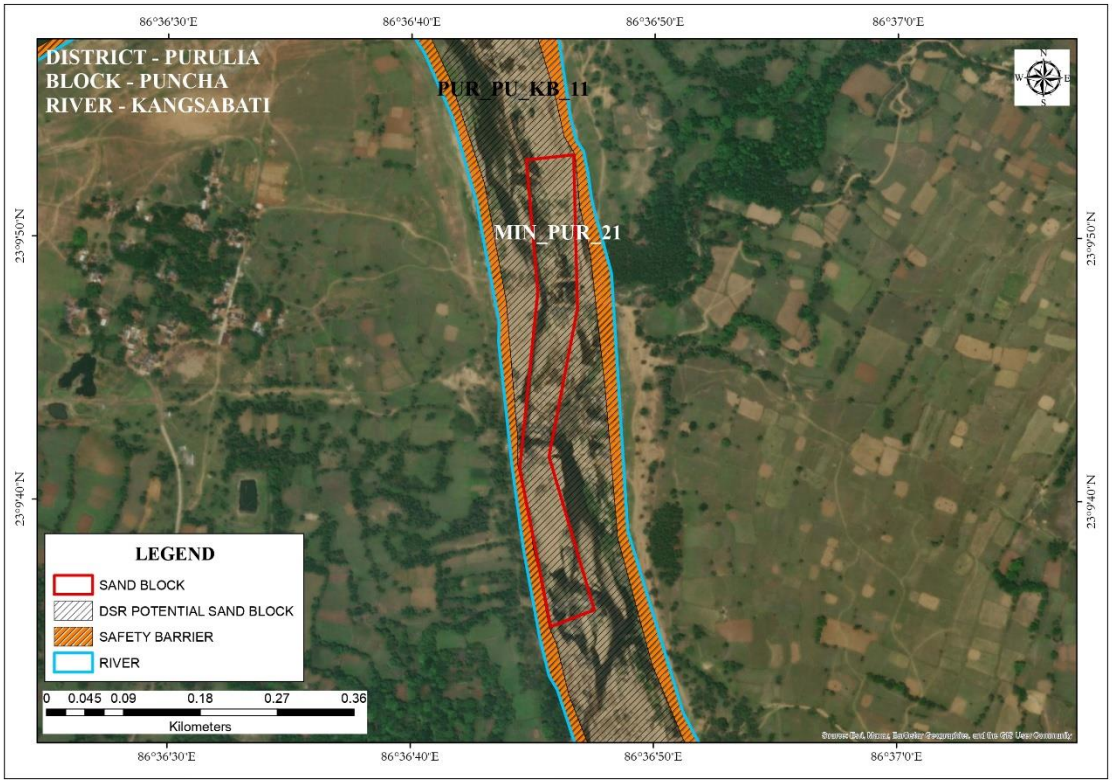
86°47'50"E
86°48'0"E
23°22'30"N
23°22'20"N
23°22'10"N


DISTRICT - PURULIA
BLOCK - PUNCHA
RIVER - KANGSABATI
PUR_PU_KB_11
MIN_PUR_21
LEGEND
SAND BLOCK
DSR POTENTIAL SAND BLOCK
SAFETY BARRIER
RIVER
0 0.045 0.09 0.18 0.27 0.36
Kilometers
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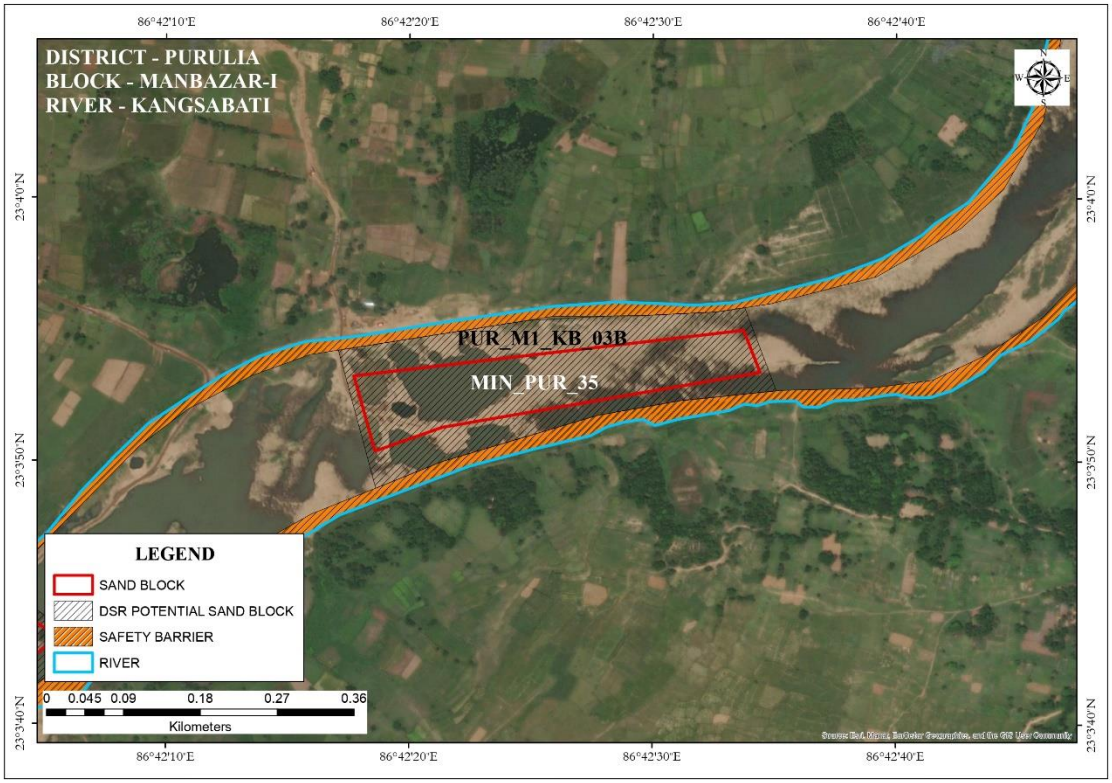
86°36'50"E
86°37'0"E
23°9'50"N
23°9'40"N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BLOCK - MANBAZAR-I
RIVER - KANGSABATI
PUR_M1_KB_03B
MIN_PUR_35
LEGEND
SAND BLOCK
DSR POTENTIAL SAND BLOCK
SAFETY BARRIER
RIVER
0 0.045 0.09 0.18 0.27 0.36
Kilometers
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86°42'30"E
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23°4'0"N
23°3'50"N
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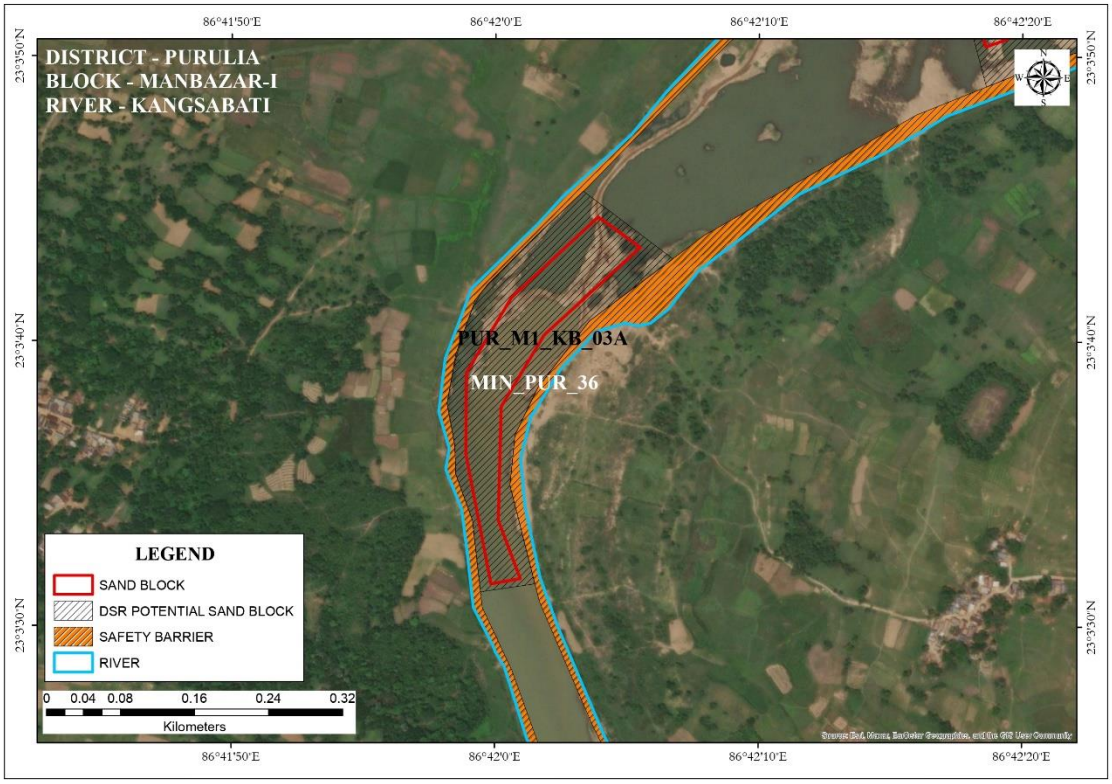
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BLOCK - MANBAZAR-I
RIVER - KANGSABATI
PUR_M1_KB_03A
MIN_PUR_36
LEGEND
SAND BLOCK
DSR POTENTIAL SAND BLOCK
SAFETY BARRIER
RIVER
0 0.04 0.08 0.16 0.24 0.32
Kilometers
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86°42'10"E
86°42'20"E
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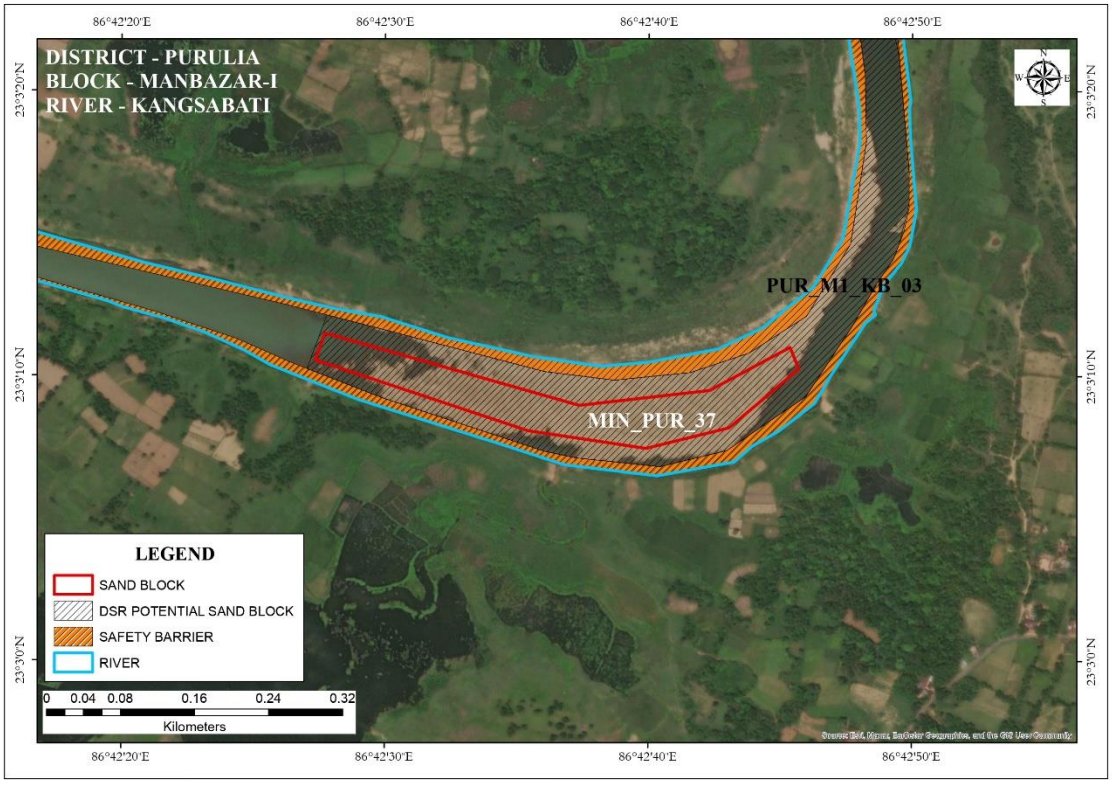
23°34'0"N
23°33'0"N


DISTRICT - PURULIA
BLOCK - MANBAZAR-I
RIVER - KANGSABATI
PUR_M1_KB_03
MIN_PUR_37
LEGEND
SAND BLOCK
DSR POTENTIAL SAND BLOCK
SAFETY BARRIER
RIVER
0 0.04 0.08 0.16 0.24 0.32
Kilometers
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23°30'0"N

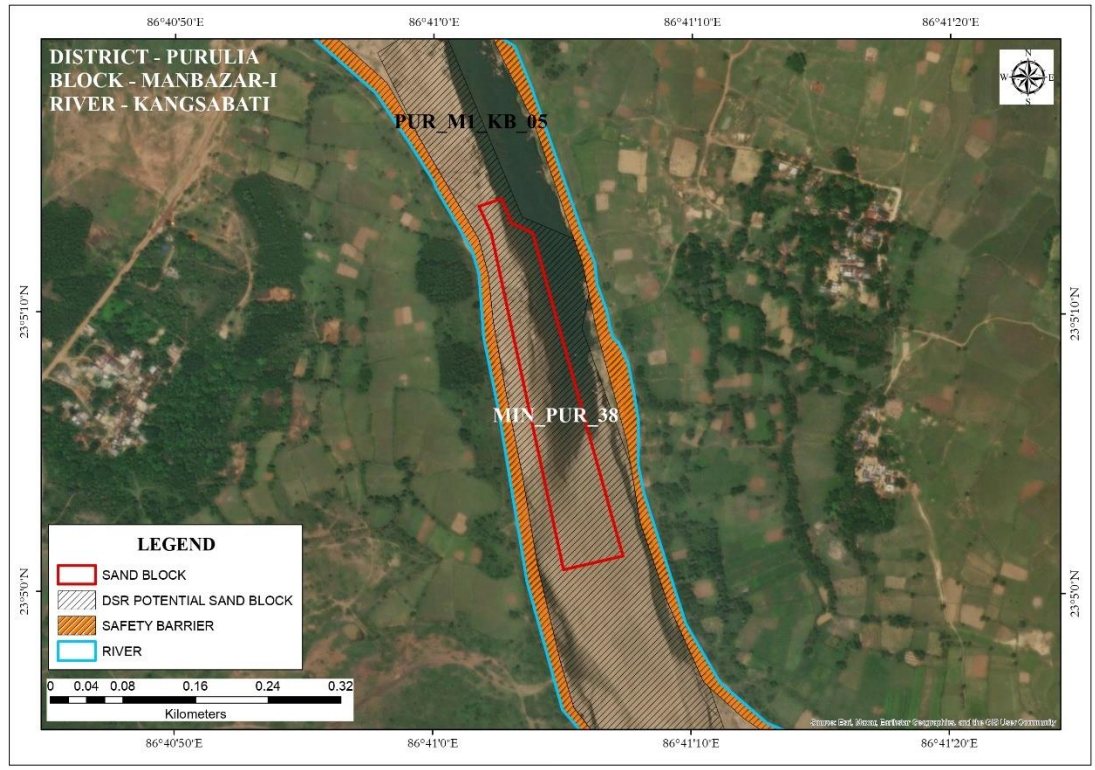

Figure 8.1: Auction block map plotted on potential sand blocks of Purulia district

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

Details of production of 3 years of Purulia District is furnished below.

Table 8.3: Details of production of sand as per mine plan in Purulia district

Sl. No.	Year	Name of mineral	Total Production (inCft.)	Total Production in cum
1	2017-2018	Sand	18,91,82,216.00	5357043.79
2	2018-2019	Sand	27,98,76,622.00	7925223.36
3	2019-2020	Sand	29,96,25,800.00	8484457.81

Conversion factor: 1cum=35.315 cft

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

Details of revenue generation of 3 years of Purulia District is furnished below.

Table 9.1: District revenue generation from mineral sector

(In Rs.)

Year	Royalty	Cess	Total revenue
2016-17	NA	NA	1,66,02,220.00
2017-18	NA	NA	4,34,80,360.00
2018-19	NA	NA	3,36,39,243.00

10 Transport (Railway, road)

The Road network of district Purulia is well built and several National and State Highways pass through the district. National Highway 32 (NH-32) connects this district with Jamshedpur, Bokaro, Dhanbad and others. NH-60A connects Puruliya with State Highway-9 (SH-9) at Bankura and subsequently to NH-2 at Durgapur. SH-5 also plays important role in district's transport network as it connects the towns like Raghunathpur, Adra, Santaldih and Neturia to NH-2 at Neamatpur and Asansol. Purulia has excellent road connectivity with Raniganj-Asansol industrial belt.

The district is served by three rail connections provided by the South Eastern Railways. One line runs from Jharkhand in the South through the district up to Asansol passing through Adra Division. Another line runs between Bankura and Dhanbad also via the Adra Division. The third line connects Puruliya with Jharkhand. Major cities and towns like Ranchi, Tatanagar, Patna, Howrah, Dhanbad, Asansol, Bhubaneswar, Durgapur, Mumbai, Chennai and New Delhi are now well connected with the district.

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

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

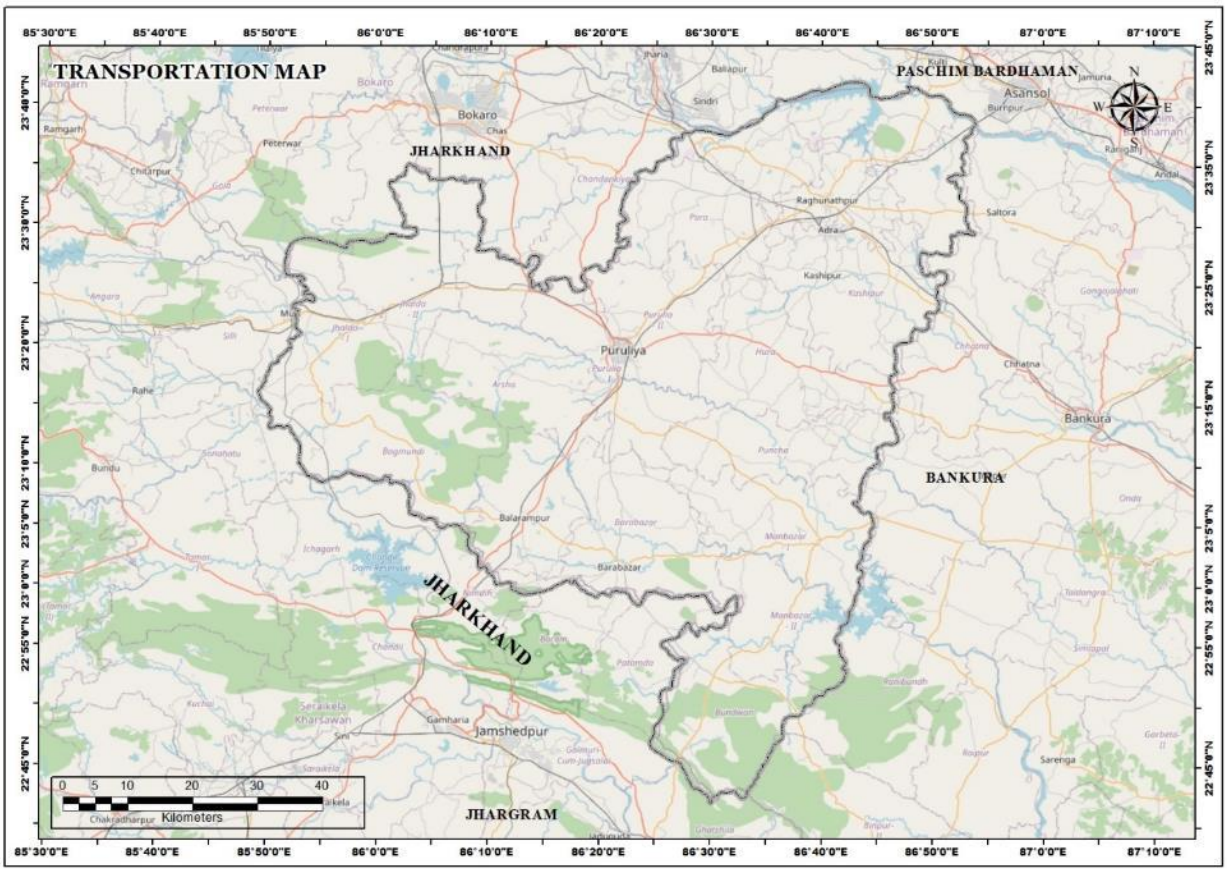

Figure 10.1: Transportation map of Purulia District
(Source: National Information Centre)

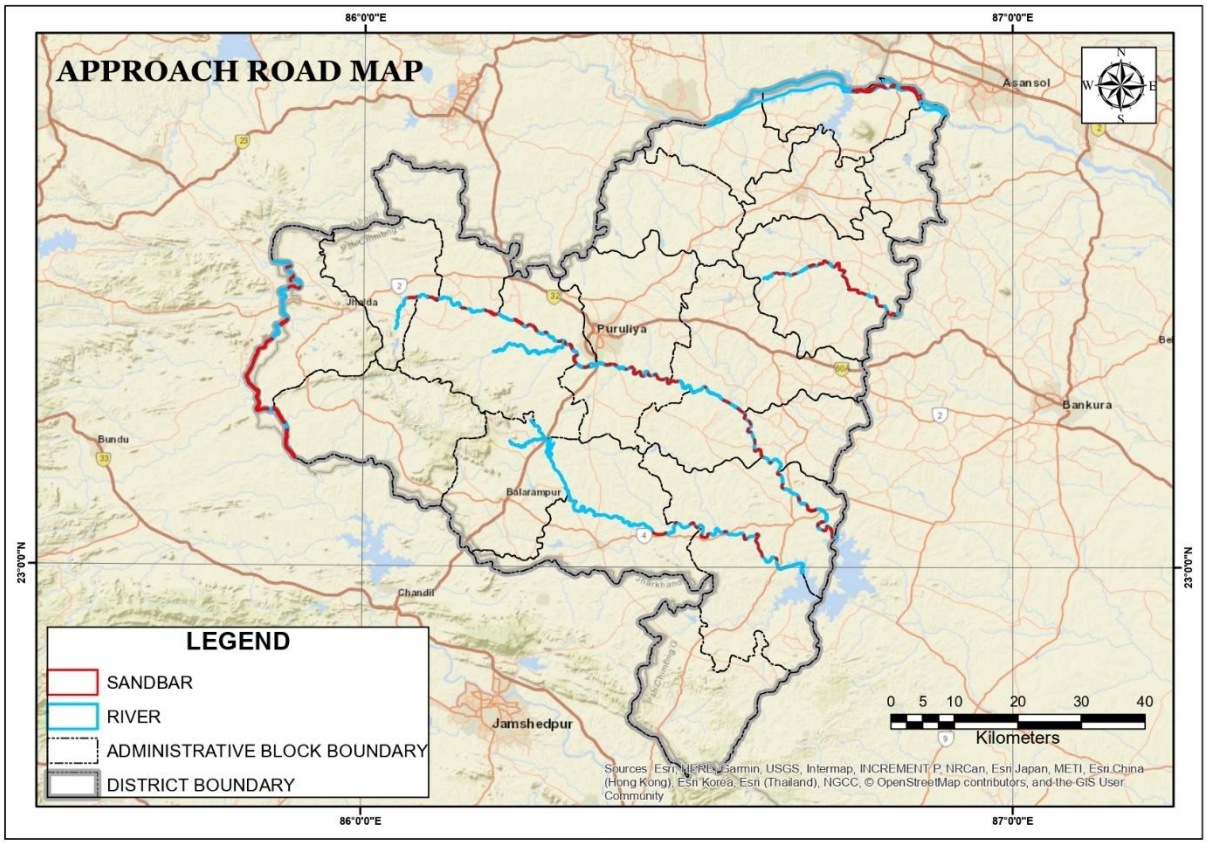

Figure 10.2: Map showing approach road to potential sand bars
(Source: National Informatics Centre)

PART B: INSITU MINOR MINERAL DEPOSITS

11 In-situ Minerals:

11.1 Mineral Reserve

Purulia district holds many important minerals deposits. As per GSI (2001), the important deposits (reserves in million tonnes) are Coal (54), Apatite (16.733), China Clay (23.882), Crystalline Limestone (17.95), Copper (0.112), Kyanite (26.525 tonnes), Barytes (433 tonnes), Dimension Stones (Purulia black: 1.586 m. cu. m, Spotty black: 3.870 m. cu. m, Pink streaky gneiss: 1.463 m. cu. m, Pink spotty/ ribbon gneiss: 7.940 m. cu. m and pink porphyry 0.425 m. cu. m) and Rare Metals (Cs, Li, Rb) in Beku area.

Besides, minor occurrences of minerals include gold, graphite, beryl, corundum, rutile, fluorite, feldspar, galena and mica. Construction material and building stones have fairly good potential in the district.

Coal: Till now coal mining has been the most important extractive industry in Purulia. An estimated deposit of coal in Purulia is 43 million of high-grade quality and 11 million low grade quality coals. Working collieries are all in the Neturia Police Station area.

Copper: Recently a 6-meter-deep ancient copper mine has been unearthed at Tamakhun under Manbazar PS; the estimated reserves is 8000 tonnes. Copper mineralisation has been located within brecciated sericite-quartz-schist of Proterozoic age.

Iron-ore: Small patches of iron-ore found at Panchet Hills, Jhalda, Gourangdi, Supur and Manbazar. Most of these are associated with pegmaties, magnetite and rutile.

Gold: Gold is found nearly all the streams of the district. Totko Nala, Kumari nala both tributaries of Kangsavati are said to be most productive streams of gold.

Limestone: Lime stone deposits are in several pockets of the districts. There is about 18 million tons of lime stone deposits at Jabar and Ichahatu.

Fluorite: This is an important and unavoidable mineral used in steel and chemical industries. It is a rare mineral and therefore of great significance. In Purulia its deposits are at Belamu hills under Jhalda PS.

Kyanite and Graphite: Kyanite and Graphite both have been found at Kalajhor, Kahipur, Goijrangadih, bongora, Dimadiha and in the Panchet Hill area.

Uranium: Uranium is a radio-active mineral and found at Kuilipal, the tri-junction of Purulia, Bankura and Wet Medinipur districts.

The apatite-magnetite mineralisation occurs in the southern part of the Purulia district. The important apatite occurrences are located in Beldih and Mednitanr in the western part and Chirugora, Purtaha Kutni and Dandodih-Gamardih in the eastern part. Apatite deposit is being exploited by the West Bengal Mineral Development and Trading Corporation Ltd. (WBMDTCL) since 1975 and marketed as direct application in fertiliser industry.

Baryte veins occur impersistently along a 12 Km. long E-W trending belt in Purulia district extending from Malthal in the East to Ukma in the West.

11.2 Mineral Potential

Purulia district have huge mineral potentiality with respect to minor mineral deposits. Occurrences of small books of Ruby Mica and also ordinary mica, varying in size from 2.5 sq. cm. to 20.5 sq. cm. have been reported from Adabana, Bhursa, Kumargarh in Purulia district and Kaduria, Pirrabani area of Bankura district.

Rear Mineral such as 'bastnaesite, allanite and barite occurrences noted within an abandoned pegmatite quarry near Nawahatu, Purulia district. Interesting occurrences of pollucite, the only ore of caesium within pegmatite veins adjacent to calc-silicate rock near Beku lying to the north of NPSZ has been reported.

A number of occurrences of steatite are reported from Khusbani, Puklunkata and Haludbani in Purulia district.

The Chhotanagpur Granite Gneiss Complex, covering parts of Purulia hold huge potential for dimension stone.

Ilmenite and Rutile bearing quartz and pegmatite veins have been found in a number of localities within a radius of about 10 km of Gaurangdih in Purulia district. Ilmenite also occurs in pegmatite and quartz veins near Manbazar and Jhalda area of Purulia district.

A list of identified potential zones with respect to in-situ minor minerals are furnished in Table 11.1. Figure 11.1 shows potential mineral deposits zone map plotted on geological map of Purulia district.

Table 11.1: In-situ Minerals Occurrences

Sr. No	Name of the Mineral (Zone-Code)	Area of mineralized zone (Ha)	Depth of mineralization (m)	Geological resource (mcum)	Whether virgin or partially explored	Administrative block	Co-ordinate		Area within prohibited zone as per Rule 3 of 7 WBMNC Rules 16	Infrastructure available near the mineralized zone
1	PUR_BS_ZONE_01 (Black stone)	671.22	50	268	Virgin	PURULIA-II	23° 23' 16.884" N	86° 21' 48.679" E	No	Available
							23° 24' 40.352" N	86° 22' 0.362" E		
							23° 24' 1.328" N	86° 23' 45.025" E		
							23° 23' 47.591" N	86° 24' 10.591" E		
							23° 23' 17.339" N	86° 23' 43.211" E		
2	PUR_BS_ZONE_02 (Black stone)	367.48	50	146.99202	Virgin	PURULIA-II	23° 22' 51.301" N	86° 21' 53.722" E	No	Available
							23° 22' 13.328" N	86° 23' 43.278" E		
							23° 21' 49.803" N	86° 23' 34.619" E		
							23° 21' 57.608" N	86° 21' 52.189" E		
3	PUR_BS_ZONE_03 (Black stone)	429.70	50	172	Virgin	PURULIA-II	23° 24' 19.797" N	86° 24' 9.104" E	No	Available
							23° 23' 35.060" N	86° 26' 19.504" E		
							23° 22' 58.799" N	86° 25' 44.761" E		
							23° 23' 27.064" N	86° 24' 42.673" E		
							23° 23' 21.826" N	86° 24' 22.563" E		
4	PUR_BS_ZONE_04 (Black stone)	664.12	50	265.64765	Virgin	PURULIA-II	23° 26' 2.012" N	86° 25' 3.920" E	No	Available
							23° 25' 52.121" N	86° 26' 35.355" E		
							23° 24' 40.094" N	86° 26' 31.182" E		
							23° 24' 47.927" N	86° 25' 44.722" E		
							23° 24' 27.991" N	86° 25' 27.748" E		
							23° 24' 38.945" N	86° 24' 48.825" E		
5	PUR_BS_ZONE_05 (Black stone)	403.69	50	161.476	Virgin	HURA	23° 24' 50.475" N	86° 34' 38.663" E	No	Available
							23° 24' 39.233" N	86° 34' 33.665" E		
							23° 24' 46.433" N	86° 33' 37.006" E		
							23° 25' 28.997" N	86° 33' 25.702" E		
							23° 25' 27.931" N	86° 33' 41.789" E		

Sr. No	Name of the Mineral (Zone-Code)	Area of mineralized zone (Ha)	Depth of mineralization (m)	Geological resource (mcum)	Whether virgin or partially explored	Administrative block	Co-ordinate		Area within prohibited zone as per Rule 3 of 7 WBMNC Rules 16	Infrastructure available near the mineralized zone
							23° 25' 26.051" N	86° 34' 10.142" E		
							23° 25' 23.202" N	86° 34' 53.076" E		
							23° 25' 20.662" N	86° 35' 31.305" E		
							23° 24' 47.115" N	86° 35' 28.372" E		
6	PUR_BS_ZONE_06 (Black stone)	1400.75	50	560.29957	Virgin	HURA	23° 21' 27.880" N	86° 31' 51.029" E	No	Available
							23° 22' 14.375" N	86° 31' 57.421" E		
							23° 22' 36.703" N	86° 32' 19.711" E		
							23° 22' 30.185" N	86° 33' 11.227" E		
							23° 22' 44.744" N	86° 34' 3.606" E		
							23° 23' 13.150" N	86° 34' 8.524" E		
							23° 23' 17.741" N	86° 35' 29.628" E		
							23° 22' 30.339" N	86° 35' 27.280" E		
							23° 22' 19.436" N	86° 35' 2.357" E		
							23° 22' 4.513" N	86° 34' 48.051" E		
							23° 21' 20.016" N	86° 34' 46.685" E		
7	PUR_BS_ZONE_07 (Black stone)	362.31	50	144.92459	Virgin	HURA	23° 23' 20.439" N	86° 34' 53.740" E	No	Available
							23° 23' 40.771" N	86° 34' 31.864" E		
							23° 23' 21.735" N	86° 34' 8.156" E		
							23° 23' 49.580" N	86° 33' 56.879" E		
							23° 23' 56.990" N	86° 34' 16.291" E		
							23° 24' 21.867" N	86° 34' 4.885" E		
							23° 24' 19.417" N	86° 34' 53.135" E		
							23° 24' 39.211" N	86° 35' 11.392" E		
							23° 24' 36.918" N	86° 35' 33.552" E		
							23° 24' 3.511" N	86° 35' 31.897" E		
							23° 23' 52.750" N	86° 35' 11.257" E		

Sr. No	Name of the Mineral (Zone-Code)	Area of mineralized zone (Ha)	Depth of mineralization (m)	Geological resource (mcum)	Whether virgin or partially explored	Administrative block	Co-ordinate		Area within prohibited zone as per Rule 3 of 7 WBMNC Rules 16	Infrastructure available near the mineralized zone
8	PUR_BS_ZONE_08 (Black stone)	853.08	50	341.23359	Virgin	PURULIA-II	23° 24' 48.618" N	86° 22' 33.889" E	No	Available
							23° 26' 9.927" N	86° 23' 2.584" E		
							23° 26' 3.508" N	86° 24' 41.008" E		
							23° 25' 29.835" N	86° 24' 25.950" E		
							23° 25' 20.329" N	86° 24' 14.805" E		
							23° 25' 5.998" N	86° 24' 47.313" E		
							23° 24' 25.678" N	86° 24' 32.762" E		
9	PUR_BS_ZONE_09 (Black stone)	9222.30	50	3688.919	Partially explored	SANTURI	23° 33' 49.733" N	86° 47' 27.156" E	No	Available
							23° 34' 0.105" N	86° 52' 19.946" E		
							23° 32' 11.691" N	86° 52' 53.704" E		
							23° 31' 14.936" N	86° 53' 36.781" E		
							23° 30' 36.910" N	86° 53' 40.171" E		
							23° 30' 36.120" N	86° 53' 48.356" E		
							23° 30' 11.512" N	86° 53' 51.877" E		
							23° 30' 0.182" N	86° 52' 39.299" E		
							23° 28' 5.323" N	86° 47' 41.797" E		
							23° 29' 47.837" N	86° 46' 7.508" E		
							23° 30' 13.733" N	86° 46' 18.634" E		
							23° 31' 30.535" N	86° 47' 14.880" E		
							23° 32' 16.451" N	86° 47' 45.012" E		
10	PUR_BS_ZONE_10 (Black stone)	2363.98	50	945.59357	Virgin	PUNCHA	23° 13' 23.523" N	86° 31' 33.738" E	No	Available
							23° 13' 23.866" N	86° 33' 31.771" E		
							23° 10' 57.474" N	86° 33' 33.229" E		
							23° 10' 14.516" N	86° 32' 39.488" E		
							23° 10' 1.391" N	86° 30' 29.626" E		
							23° 10' 46.556" N	86° 30' 17.832" E		

Sr. No	Name of the Mineral (Zone-Code)	Area of mineralized zone (Ha)	Depth of mineralization (m)	Geological resource (mcum)	Whether virgin or partially explored	Administrative block	Co-ordinate		Area within prohibited zone as per Rule 3 of 7 WBMNC Rules 16	Infrastructure available near the mineralized zone
							23° 11' 28.414" N	86° 31' 5.524" E		
							23° 12' 13.901" N	86° 31' 38.870" E		
11	PUR_BS_ZONE_11 (Black stone)	5202.36	50	2080.9429	Virgin	MANBAZAR-I	23° 7' 25.545" N	86° 34' 49.817" E	No	Available
							23° 7' 55.443" N	86° 36' 4.048" E		
							23° 6' 49.339" N	86° 38' 54.574" E		
							23° 2' 59.847" N	86° 37' 11.644" E		
							23° 3' 53.953" N	86° 33' 15.678" E		
							23° 5' 42.883" N	86° 34' 18.564" E		
							23° 5' 58.515" N	86° 34' 14.594" E		
							23° 6' 58.167" N	86° 35' 22.720" E		
12	PUR_BS_ZONE_12 (Black stone)	2755.94	50	1102.3742	Virgin	MANBAZAR-II	22° 54' 51.976" N	86° 39' 7.586" E	No	Available
							22° 54' 49.545" N	86° 39' 36.900" E		
							22° 55' 4.027" N	86° 39' 52.764" E		
							22° 55' 3.620" N	86° 40' 3.911" E		
							22° 54' 46.616" N	86° 40' 12.204" E		
							22° 54' 44.701" N	86° 40' 35.275" E		
							22° 54' 23.063" N	86° 40' 57.478" E		
							22° 54' 15.522" N	86° 41' 16.282" E		
							22° 52' 56.615" N	86° 42' 19.361" E		
							22° 52' 27.718" N	86° 42' 7.410" E		
							22° 52' 12.144" N	86° 41' 53.281" E		
							22° 52' 9.247" N	86° 41' 28.156" E		
							22° 51' 25.329" N	86° 40' 8.411" E		
							22° 51' 47.947" N	86° 39' 16.133" E		
							22° 52' 10.054" N	86° 38' 34.572" E		
13		4753.09	50		Virgin		22° 55' 12.019" N	86° 30' 54.423" E	No	Available

Sr. No	Name of the Mineral (Zone-Code)	Area of mineralized zone (Ha)	Depth of mineralization (m)	Geological resource (mcum)	Whether virgin or partially explored	Administrative block	Co-ordinate		Area within prohibited zone as per Rule 3 of 7 WBMNC Rules 16	Infrastructure available near the mineralized zone
	PUR_BS_ZONE_13 (Black stone)			1901.2351		MANBAZAR-II,BANDUAN	22° 54' 56.282" N	86° 32' 14.471" E		
							22° 55' 11.792" N	86° 32' 27.458" E		
							22° 54' 57.908" N	86° 33' 1.756" E		
							22° 54' 29.721" N	86° 33' 23.407" E		
							22° 52' 50.426" N	86° 36' 34.620" E		
							22° 52' 1.563" N	86° 36' 42.295" E		
							22° 51' 56.496" N	86° 35' 3.888" E		
							22° 51' 25.810" N	86° 32' 38.401" E		
							22° 52' 8.949" N	86° 31' 21.004" E		
							22° 52' 58.956" N	86° 29' 59.954" E		
							22° 55' 12.019" N	86° 30' 54.423" E		
14	PUR_BS_ZONE_14 (Black stone)	2287.23	50	914.89006	Virgin	BANDUAN	22° 44' 54.467" N	86° 28' 48.283" E	No	Available
							22° 45' 37.172" N	86° 28' 26.604" E		
							22° 45' 41.754" N	86° 32' 3.921" E		
							22° 45' 43.713" N	86° 33' 38.055" E		
							22° 44' 26.987" N	86° 33' 37.562" E		
							22° 43' 54.518" N	86° 29' 18.709" E		
15	PUR_BS_ZONE_15 (Black stone)	3055.92	50	1222.3676	Virgin	MANBAZAR-II	22° 59' 0.127" N	86° 33' 0.413" E	No	Available
							22° 58' 36.434" N	86° 35' 51.000" E		
							22° 58' 40.308" N	86° 36' 56.971" E		
							22° 57' 55.659" N	86° 38' 5.535" E		
							22° 57' 48.287" N	86° 38' 29.846" E		
							22° 56' 3.130" N	86° 37' 10.602" E		
							22° 55' 19.037" N	86° 36' 54.377" E		
							22° 56' 47.078" N	86° 35' 10.986" E		
							22° 58' 11.446" N	86° 33' 5.812" E		



Sr. No	Name of the Mineral (Zone-Code)	Area of mineralized zone (Ha)	Depth of mineralization (m)	Geological resource (mcum)	Whether virgin or partially explored	Administrative block	Co-ordinate		Area within prohibited zone as per Rule 3 of 7 WBMNC Rules 16	Infrastructure available near the mineralized zone
							22° 58' 35.907" N	86° 33' 3.099" E		
							22° 58' 38.328" N	86° 33' 2.831" E		
16	PUR_BS_ZONE_16 (Black stone)	865.18	50	346.07146	Virgin	BANDUAN	22° 50' 10.635" N	86° 35' 20.875" E	No	Available
							22° 50' 42.402" N	86° 36' 1.256" E		
							22° 50' 51.443" N	86° 36' 38.736" E		
							22° 50' 46.620" N	86° 36' 46.135" E		
							22° 49' 41.004" N	86° 37' 6.420" E		
							22° 48' 4.528" N	86° 36' 7.934" E		
17	PUR_BS_ZONE_17 (Black stone)	2086.40	50	834.55943	Virgin	ARSHA	23° 15' 12.709" N	86° 15' 0.000" E	No	Available
							23° 16' 56.885" N	86° 15' 13.854" E		
							23° 16' 35.504" N	86° 19' 34.302" E		
							23° 15' 7.631" N	86° 18' 48.666" E		
18	PUR_BS_ZONE_18 (Black stone)	1217.39	50	486.95622	Virgin	PURULIA-I	23° 16' 9.514" N	86° 21' 35.004" E	No	Available
							23° 16' 13.690" N	86° 25' 5.916" E		
							23° 15' 17.468" N	86° 25' 18.451" E		
							23° 15' 0.176" N	86° 21' 26.127" E		
19	PUR_BS_ZONE_19 (Black stone)	7312.51	50	2925.003	Virgin	BALARAMPUR	23° 8' 41.107" N	86° 6' 5.818" E	No	Available
							23° 11' 35.458" N	86° 9' 44.969" E		
							23° 9' 10.913" N	86° 14' 55.123" E		
							23° 6' 30.483" N	86° 12' 59.895" E		
20	PUR_BS_ZONE_20 (Black stone)	1575.44	50	630.17715	Virgin	JHALDA-II	23° 26' 40.365" N	86° 4' 3.044" E	No	Available
							23° 28' 29.076" N	86° 4' 41.344" E		
							23° 28' 18.402" N	86° 5' 34.802" E		
							23° 28' 0.353" N	86° 5' 37.910" E		
							23° 27' 57.103" N	86° 6' 10.946" E		
							23° 28' 20.452" N	86° 6' 29.611" E		

Sr. No	Name of the Mineral (Zone-Code)	Area of mineralized zone (Ha)	Depth of mineralization (m)	Geological resource (mcum)	Whether virgin or partially explored	Administrative block	Co-ordinate		Area within prohibited zone as per Rule 3 of 7 WBMNC Rules 16	Infrastructure available near the mineralized zone
							23° 28' 10.470" N	86° 7' 19.577" E		
							23° 26' 45.078" N	86° 6' 22.995" E		
							23° 25' 59.747" N	86° 6' 12.884" E		
							23° 25' 52.769" N	86° 5' 23.229" E		
							23° 26' 26.139" N	86° 4' 44.609" E		
21	PUR_BS_ZONE_21 (Black stone)	2805.01	50	1122.0022	Virgin	PARA,RAGHUNATHPUR-I,KASHIPUR	23° 28' 21.072" N	86° 34' 55.115" E	No	Available
							23° 28' 19.135" N	86° 34' 7.274" E		
							23° 27' 48.967" N	86° 34' 18.563" E		
							23° 28' 12.899" N	86° 30' 57.587" E		
							23° 28' 51.867" N	86° 31' 30.394" E		
							23° 28' 38.374" N	86° 33' 2.316" E		
							23° 29' 4.371" N	86° 33' 52.784" E		
							23° 29' 5.305" N	86° 34' 35.037" E		
							23° 29' 58.733" N	86° 35' 6.585" E		
							23° 30' 6.616" N	86° 36' 0.202" E		
							23° 28' 47.154" N	86° 37' 7.823" E		
							23° 28' 28.289" N	86° 37' 5.491" E		
							23° 28' 20.889" N	86° 38' 17.144" E		
							23° 27' 16.854" N	86° 38' 7.247" E		
							23° 27' 27.461" N	86° 35' 23.827" E		
							23° 28' 19.383" N	86° 35' 24.807" E		
22	PUR_BS_ZONE_22 (Black stone)	784.85	50	313.93909	Virgin	KASHIPUR	23° 27' 55.498" N	86° 42' 2.535" E	No	Available
							23° 28' 16.959" N	86° 43' 33.192" E		
							23° 28' 36.979" N	86° 43' 42.711" E		
							23° 28' 34.118" N	86° 44' 3.933" E		
							23° 28' 8.944" N	86° 44' 8.273" E		

Sr. No	Name of the Mineral (Zone-Code)	Area of mineralized zone (Ha)	Depth of mineralization (m)	Geological resource (mcum)	Whether virgin or partially explored	Administrative block	Co-ordinate		Area within prohibited zone as per Rule 3 of 7 WBMNC Rules 16	Infrastructure available near the mineralized zone
							23° 28' 0.020" N	86° 44' 22.467" E		
							23° 28' 22.096" N	86° 44' 53.017" E		
							23° 28' 8.510" N	86° 45' 6.011" E		
							23° 27' 12.973" N	86° 44' 39.304" E		
							23° 26' 54.846" N	86° 44' 3.902" E		
23	PUR_BS_ZONE_23 (Black stone)	21676.75	50	8670.6997	Partially explored	PUNCHA,HURA,KASHIPUR	23° 23' 54.829" N	86° 43' 53.491" E	No	Available
							23° 22' 52.853" N	86° 44' 18.685" E		
							23° 23' 2.193" N	86° 45' 0.138" E		
							23° 22' 58.541" N	86° 45' 2.941" E		
							23° 22' 12.663" N	86° 44' 35.019" E		
							23° 21' 53.854" N	86° 44' 42.662" E		
							23° 21' 52.906" N	86° 45' 35.786" E		
							23° 19' 3.695" N	86° 46' 54.905" E		
							23° 17' 45.443" N	86° 46' 25.133" E		
							23° 16' 19.125" N	86° 46' 20.425" E		
							23° 14' 54.471" N	86° 46' 28.564" E		
							23° 14' 19.202" N	86° 46' 5.872" E		
							23° 13' 52.811" N	86° 45' 11.785" E		
							23° 13' 58.664" N	86° 43' 29.360" E		
							23° 14' 3.994" N	86° 39' 15.680" E		
							23° 15' 4.694" N	86° 37' 25.732" E		
							23° 18' 31.890" N	86° 37' 42.857" E		
							23° 20' 31.206" N	86° 39' 31.639" E		
							23° 21' 57.803" N	86° 40' 43.886" E		
							23° 22' 50.732" N	86° 40' 51.588" E		

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							23° 23' 24.212" N	86° 42' 25.187" E		
							23° 23' 53.915" N	86° 42' 35.748" E		
24	PUR_BS_ZONE_24 (Black stone)	5632.64	50	2253.0544	Partially explored	KASHIPUR	23° 23' 13.778" N	86° 46' 47.350" E	No	Available
							23° 24' 6.380" N	86° 45' 0.000" E		
							23° 24' 59.746" N	86° 44' 28.461" E		
							23° 26' 40.141" N	86° 45' 23.805" E		
							23° 25' 34.025" N	86° 50' 26.985" E		
							23° 23' 49.413" N	86° 50' 54.145" E		
							23° 22' 55.348" N	86° 49' 49.379" E		
							23° 22' 22.968" N	86° 49' 26.636" E		
							23° 22' 18.554" N	86° 48' 21.327" E		
							23° 22' 33.365" N	86° 47' 36.568" E		
							23° 23' 10.678" N	86° 47' 18.013" E		
25	PUR_BS_ZONE_25 (Black stone)	94.17	50	37.667514	Virgin	RAGHUNATHPUR-II	23° 37' 13.843" N	86° 30' 42.546" E	No	Available
							23° 37' 16.579" N	86° 31' 11.083" E		
							23° 36' 36.856" N	86° 30' 58.649" E		
							23° 36' 39.472" N	86° 30' 28.808" E		
26	PUR_BS_ZONE_26 (Black stone)	241.62	50	96.649009	Virgin	RAGHUNATHPUR-II	23° 37' 0.689" N	86° 26' 49.796" E	No	Available
							23° 37' 6.583" N	86° 27' 14.282" E		
							23° 37' 24.437" N	86° 27' 27.233" E		
							23° 37' 24.816" N	86° 28' 2.108" E		
							23° 37' 9.240" N	86° 28' 13.655" E		
							23° 37' 4.522" N	86° 27' 52.386" E		
							23° 36' 44.102" N	86° 27' 43.926" E		
							23° 36' 54.223" N	86° 27' 22.736" E		
							23° 36' 44.004" N	86° 27' 15.776" E		

Sr. No	Name of the Mineral (Zone-Code)	Area of mineralized zone (Ha)	Depth of mineralization (m)	Geological resource (mcum)	Whether virgin or partially explored	Administrative block	Co-ordinate		Area within prohibited zone as per Rule 3 of 7 WBMNC Rules 16	Infrastructure available near the mineralized zone
							23° 36' 20.691" N	86° 27' 28.756" E		
							23° 36' 10.129" N	86° 26' 57.711" E		
27	PUR_BS_ZONE_27 (Black stone)	258.05	50	103.22037	Virgin	PARA	23° 32' 25.076" N	86° 23' 14.205" E	No	Available
							23° 32' 51.063" N	86° 23' 59.550" E		
							23° 33' 2.379" N	86° 24' 42.950" E		
							23° 32' 45.516" N	86° 25' 1.167" E		
							23° 32' 16.013" N	86° 24' 13.147" E		
							23° 32' 7.156" N	86° 23' 25.485" E		
28	PUR_BS_ZONE_28 (Black stone)	2228.19	50	891.27643	Virgin	BALARAMPUR	23° 0' 12.745" N	86° 13' 6.512" E	No	Available
							23° 0' 49.048" N	86° 13' 36.447" E		
							23° 1' 46.661" N	86° 12' 54.845" E		
							23° 2' 55.905" N	86° 13' 45.339" E		
							23° 2' 50.543" N	86° 17' 45.670" E		
							23° 1' 16.813" N	86° 16' 32.375" E		
							23° 1' 24.583" N	86° 15' 4.717" E		
							23° 1' 25.491" N	86° 14' 29.389" E		
							23° 0' 30.915" N	86° 13' 56.932" E		
							23° 0' 24.818" N	86° 14' 8.517" E		
							22° 59' 52.443" N	86° 13' 47.684" E		
29	PUR_BS_ZONE_29 (Black stone)	1205.82	50	482.32734	Virgin	BALARAMPUR	23° 3' 16.725" N	86° 9' 52.023" E	No	Available
							23° 3' 16.538" N	86° 10' 4.172" E		
							23° 3' 29.155" N	86° 10' 14.996" E		
							23° 3' 20.789" N	86° 10' 44.055" E		
							23° 3' 5.373" N	86° 10' 56.271" E		
							23° 3' 3.367" N	86° 11' 20.505" E		
							23° 2' 58.079" N	86° 11' 29.648" E		

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							23° 2' 44.669" N	86° 11' 25.214" E		
							23° 2' 16.443" N	86° 12' 4.665" E		
							23° 0' 47.993" N	86° 10' 56.591" E		
							23° 1' 18.924" N	86° 10' 48.411" E		
							23° 1' 52.336" N	86° 10' 11.992" E		
							23° 2' 28.955" N	86° 9' 42.168" E		
							23° 3' 4.782" N	86° 9' 16.472" E		
							23° 3' 14.747" N	86° 8' 41.637" E		
							23° 3' 40.073" N	86° 8' 58.574" E		
30	PUR_BS_ZONE_30 (Black stone)	2912.04	50	1164.816	Partially explored	BARABAZAR	23° 1' 58.906" N	86° 25' 27.982" E	No	Available
							23° 2' 20.191" N	86° 25' 35.590" E		
							23° 0' 16.483" N	86° 31' 9.575" E		
							22° 59' 13.020" N	86° 32' 0.377" E		
							22° 58' 31.260" N	86° 31' 2.067" E		
							22° 59' 13.383" N	86° 30' 14.986" E		
							22° 59' 39.054" N	86° 30' 4.088" E		
							22° 59' 26.076" N	86° 27' 34.700" E		
							22° 59' 32.371" N	86° 27' 20.975" E		
							23° 0' 0.455" N	86° 27' 36.462" E		
							23° 0' 37.800" N	86° 26' 52.416" E		
							23° 0' 57.176" N	86° 27' 0.801" E		
							23° 1' 11.878" N	86° 26' 33.041" E		
							23° 0' 49.780" N	86° 26' 23.414" E		
							23° 0' 34.361" N	86° 25' 29.233" E		
							23° 1' 11.260" N	86° 25' 12.912" E		
							23° 1' 41.253" N	86° 25' 39.497" E		

Sr. No	Name of the Mineral (Zone-Code)	Area of mineralized zone (Ha)	Depth of mineralization (m)	Geological resource (mcum)	Whether virgin or partially explored	Administrative block	Co-ordinate		Area within prohibited zone as per Rule 3 of 7 WBMNC Rules 16	Infrastructure available near the mineralized zone
31	PUR_BS_ZONE_31 (Black stone)	424.66	50	169.86257	Virgin	MANBAZAR-II	22° 56' 46.149" N	86° 39' 34.798" E	No	Available
							22° 56' 15.197" N	86° 41' 9.633" E		
							22° 55' 19.004" N	86° 40' 24.061" E		
							22° 55' 56.403" N	86° 39' 28.977" E		
32	PUR_BS_ZONE_32 (Black stone)	614.65	50	245.86	Partially explored	MANBAZAR-II, BANDUAN	22° 56' 13.872" N	86° 32' 22.297" E	No	Available
							22° 56' 23.978" N	86° 31' 48.258" E		
							22° 57' 28.637" N	86° 31' 56.508" E		
							22° 57' 28.403" N	86° 32' 20.858" E		
							22° 57' 21.655" N	86° 33' 7.801" E		
							22° 56' 35.260" N	86° 33' 9.308" E		
							22° 56' 33.302" N	86° 33' 16.907" E		
							22° 55' 53.613" N	86° 33' 39.331" E		
							22° 55' 40.420" N	86° 33' 29.063" E		
							22° 55' 53.498" N	86° 32' 58.365" E		
33	PUR_BS_ZONE_33 (Black stone)	19637.70	50	7855.0809	Partially explored	BALARAMPUR	23° 5' 3.356" N	86° 15' 3.435" E	No	Available
							23° 7' 9.120" N	86° 16' 25.251" E		
							23° 7' 4.945" N	86° 17' 5.940" E		
							23° 7' 59.859" N	86° 18' 35.833" E		
							23° 9' 28.322" N	86° 21' 20.455" E		
							23° 9' 22.103" N	86° 25' 3.334" E		
							23° 8' 26.445" N	86° 27' 20.924" E		
							23° 8' 25.191" N	86° 29' 14.700" E		
							23° 7' 54.989" N	86° 30' 57.969" E		
							23° 5' 39.291" N	86° 31' 12.598" E		
							23° 3' 51.272" N	86° 30' 47.058" E		
							23° 3' 51.838" N	86° 28' 4.449" E		



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							23° 3' 25.449" N	86° 26' 59.750" E		
							23° 4' 2.079" N	86° 24' 57.055" E		
							23° 4' 44.916" N	86° 23' 55.592" E		
							23° 5' 13.621" N	86° 20' 51.030" E		
							23° 4' 58.168" N	86° 17' 59.641" E		
34	PUR_BS_ZONE_34 (Black stone)	1435.91	50	574.364	Virgin	BALARAMPUR	23° 4' 2.458" N	86° 8' 45.142" E	No	Available
							23° 4' 31.834" N	86° 8' 58.273" E		
							23° 4' 4.184" N	86° 11' 52.591" E		
							23° 3' 37.704" N	86° 14' 51.547" E		
							23° 3' 8.022" N	86° 14' 44.952" E		
							23° 2' 54.541" N	86° 12' 53.527" E		
							23° 3' 22.157" N	86° 11' 11.000" E		
35	PUR_BS_ZONE_35 (Black stone)	1088.05	50	435.21872	Virgin	BARABAZAR	23° 1' 11.908" N	86° 18' 54.503" E	No	Available
							23° 1' 51.138" N	86° 20' 55.850" E		
							23° 0' 42.565" N	86° 21' 59.617" E		
							22° 59' 51.373" N	86° 19' 24.185" E		
36	PUR_BS_ZONE_36 (Black stone)	54.09	50	21.635803	Virgin		23° 23' 3.003" N	86° 46' 49.657" E	No	Available
							23° 23' 1.956" N	86° 47' 10.164" E		
							23° 22' 26.454" N	86° 47' 2.532" E		
							23° 22' 27.725" N	86° 46' 48.317" E		
37	PUR_BS_ZONE_37 (Black stone)	36.94	50	14.774256	Partially explored	BARABAZAR	23° 1' 0.478" N	86° 22' 54.203" E	No	Available
							23° 1' 2.340" N	86° 23' 30.795" E		
							23° 0' 59.657" N	86° 23' 32.317" E		
							23° 0' 40.734" N	86° 23' 5.912" E		
38	PUR_BS_ZONE_38 (Black stone)	7.88	50	3.1516192	Partially explored	BARABAZAR	23° 2' 2.930" N	86° 23' 51.254" E	No	Available
							23° 2' 7.285" N	86° 23' 56.143" E		



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							23° 2' 0.712" N	86° 24' 5.320" E		
							23° 1' 53.878" N	86° 24' 0.000" E		
39	PUR_BS_ZONE_39 (Black stone)	6.64	50	2.656	Virgin	MANBAZAR-II	22° 54' 23.966" N	86° 41' 52.067" E	No	Available
							22° 54' 27.118" N	86° 41' 57.912" E		
							22° 54' 23.520" N	86° 42' 4.193" E		
							22° 54' 20.170" N	86° 42' 4.441" E		
							22° 54' 16.021" N	86° 41' 59.469" E		
40	PUR_BS_ZONE_40 (Black stone)	130.27	50	52.108	Virgin	PARA	23° 33' 23.485" N	86° 27' 15.194" E	No	Available
							23° 33' 26.535" N	86° 27' 58.065" E		
							23° 32' 52.315" N	86° 27' 57.318" E		
							23° 32' 46.237" N	86° 27' 16.654" E		
41	PUR_BS_ZONE_41 (Black stone)	382.71	50	153.08	Virgin	PARA	23° 33' 55.358" N	86° 28' 58.976" E	No	Available
							23° 33' 57.986" N	86° 30' 6.167" E		
							23° 32' 55.006" N	86° 30' 5.658" E		
							23° 32' 48.932" N	86° 28' 56.997" E		
42	PUR_BS_ZONE_42 (Black stone)	547.56	50	219.02	Virgin	BARABAZAR	23° 2' 34.612" N	86° 20' 57.668" E	No	Available
							23° 3' 50.732" N	86° 20' 58.341" E		
							23° 3' 48.087" N	86° 22' 18.129" E		
							23° 2' 25.001" N	86° 22' 14.775" E		
43	PUR_CC_ZONE_01 (China Clay)	235.77	25	47.154832	Partially explored	MANBAZAR-II	22° 59' 46.546" N	86° 35' 23.992" E	No	Available
							22° 59' 43.558" N	86° 36' 6.939" E		
							22° 58' 45.192" N	86° 35' 55.401" E		
							22° 58' 54.868" N	86° 35' 4.075" E		
44	PUR_CC_ZONE_02 (China Clay)	253.84	25	50.768751	Partially explored	MANBAZAR-II	22° 59' 28.907" N	86° 38' 20.810" E	No	Available
							22° 59' 7.345" N	86° 39' 14.954" E		
							22° 58' 24.432" N	86° 38' 46.071" E		

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							22° 58' 38.258" N	86° 37' 56.412" E		
45	PUR_CC_ZONE_03 (China Clay)	55.47	25	11.093571	Partially explored	JHALDA-II	23° 26' 9.495" N	86° 3' 25.699" E	No	Available
							23° 26' 2.598" N	86° 3' 46.110" E		
							23° 25' 38.346" N	86° 3' 30.395" E		
							23° 25' 46.468" N	86° 3' 7.738" E		
46	PUR_CC_ZONE_04 (China Clay)	71.33	25	14.265192	Partially explored	JHALDA-II	23° 26' 9.993" N	86° 2' 2.216" E	No	Available
							23° 26' 35.683" N	86° 2' 17.648" E		
							23° 26' 23.556" N	86° 2' 39.181" E		
							23° 25' 56.188" N	86° 2' 30.520" E		
47	PUR_CC_ZONE_05 (China Clay)	106.21	25	21.242902	Partially explored	PARA,PURULIA-II	23° 26' 55.972" N	86° 24' 31.290" E	No	Available
							23° 26' 47.910" N	86° 25' 0.700" E		
							23° 26' 13.928" N	86° 25' 1.315" E		
							23° 26' 11.654" N	86° 24' 28.690" E		
48	PUR_CC_ZONE_06 (China Clay)	46.89	25	9.3775596	Partially explored	NETURIA,RAGHUNATHPUR-I	23° 37' 20.147" N	86° 42' 28.922" E	No	Available
							23° 37' 33.084" N	86° 42' 49.528" E		
							23° 37' 21.658" N	86° 43' 4.103" E		
							23° 37' 2.641" N	86° 42' 52.939" E		
49	PUR_CC_ZONE_07 (China Clay)	444.31	25	9.3775596	Partially explored	JHALDA-I	23° 26' 2.784" N	85° 53' 36.279" E	No	Available
							23° 26' 10.568" N	85° 54' 5.445" E		
							23° 25' 58.763" N	85° 54' 19.035" E		
							23° 26' 14.090" N	85° 54' 59.597" E		
							23° 25' 10.270" N	85° 55' 34.177" E		
							23° 24' 44.567" N	85° 54' 59.707" E		
50	PUR_FC_ZONE_01 (Fire Clay)	48.25	25	9.6493866	Partially explored	BALARAMPUR	23° 3' 17.624" N	86° 10' 58.420" E	No	Available
							23° 3' 3.367" N	86° 11' 20.505" E		

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							23° 2' 47.551" N	86° 11' 6.155" E		
							23° 2' 58.197" N	86° 10' 45.173" E		
51	PUR_FC_ZONE_02 (Fire Clay)	93.65	25	18.729736	Partially explored	BALARAMPUR	23° 3' 30.749" N	86° 10' 16.460" E	No	Available
							23° 3' 21.573" N	86° 10' 51.033" E		
							23° 2' 54.289" N	86° 10' 36.671" E		
							23° 3' 9.900" N	86° 9' 58.806" E		
52	PUR_FC_ZONE_03 (Fire Clay)	78.16	25	15.632032	Partially explored	KASHIPUR	23° 24' 4.123" N	86° 50' 23.341" E	No	Available
							23° 24' 0.062" N	86° 50' 48.981" E		
							23° 23' 26.710" N	86° 50' 36.902" E		
							23° 23' 33.351" N	86° 50' 10.794" E		
53	PUR_FLDS_ZONE_01 (Feldspar)	1174.27	35	246.59609	Partially explored	BALARAMPUR,BARABAZAR	23° 8' 17.324" N	86° 15' 57.736" E	No	Available
							23° 9' 31.727" N	86° 16' 44.692" E		
							23° 9' 4.663" N	86° 18' 29.045" E		
							23° 7' 14.054" N	86° 18' 51.933" E		
54	PUR_FLDS_ZONE_02 (Feldspar)	273.11	36	58.991255	Partially explored	ARSHA,BARABAZAR	23° 11' 41.464" N	86° 18' 16.042" E	No	Available
							23° 11' 27.222" N	86° 19' 22.930" E		
							23° 10' 47.770" N	86° 19' 18.762" E		
							23° 10' 45.749" N	86° 18' 15.020" E		
55	PUR_FLDS_ZONE_03 (Feldspar)	11.65	37	2.586696	Partially explored	BARABAZAR	23° 0' 42.131" N	86° 22' 57.812" E	No	Available
							23° 0' 45.580" N	86° 23' 12.674" E		
							23° 0' 37.126" N	86° 23' 15.960" E		
							23° 0' 33.718" N	86° 23' 2.498" E		
56	PUR_FLDS_ZONE_04 (Feldspar)	32.95	38	7.5126	Partially explored	NETURIA	23° 39' 52.145" N	86° 40' 39.905" E	No	Available
							23° 40' 8.198" N	86° 40' 49.602" E		
							23° 39' 56.685" N	86° 41' 7.324" E		
							23° 39' 41.421" N	86° 40' 54.525" E		

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57	PUR_GR_ZONE_01 (Granite/ Quartz/ Feldspar)	1681.76	50	504.52655	Partially explored	JHALDA-I & JHALDA-II	23° 23' 28.293" N	85° 54' 58.496" E	No	Available
							23° 23' 42.666" N	85° 58' 13.630" E		
							23° 23' 47.817" N	85° 59' 23.794" E		
							23° 22' 38.688" N	85° 59' 26.863" E		
							23° 22' 21.155" N	85° 58' 49.787" E		
							23° 22' 33.354" N	85° 58' 3.260" E		
							23° 22' 6.897" N	85° 57' 43.337" E		
							23° 22' 28.083" N	85° 56' 29.643" E		
							23° 22' 30.866" N	85° 55' 6.028" E		
58	PUR_GR_ZONE_02 (Granite/ Quartz/ Feldspar)	1526.53	50	457.95894	Virgin	JHALDA-I	23° 22' 11.656" N	85° 53' 9.075" E	No	Available
							23° 22' 8.421" N	85° 55' 24.124" E		
							23° 21' 58.695" N	85° 56' 13.685" E		
							23° 21' 14.340" N	85° 56' 19.070" E		
							23° 20' 39.758" N	85° 56' 18.478" E		
							23° 20' 33.900" N	85° 53' 2.895" E		
59	PUR_GR_ZONE_03 (Granite/ Quartz/ Feldspar)	3499.15	50	1049.7438	Virgin	JHALDA-I & BAGHMUNDI	23° 19' 31.558" N	85° 54' 52.622" E	No	Available
							23° 19' 26.536" N	85° 57' 19.850" E		
							23° 17' 28.366" N	85° 58' 43.662" E		
							23° 16' 8.384" N	85° 54' 31.922" E		
							23° 17' 50.362" N	85° 53' 35.208" E		
60	PUR_GR_ZONE_04 (Granite/ Quartz/ Feldspar)	751.10	50	225.33108	Virgin	RAGHUNATHPUR-II & PARA	23° 36' 7.506" N	86° 30' 36.021" E	No	Available
							23° 36' 14.095" N	86° 31' 5.585" E		
							23° 36' 30.889" N	86° 31' 52.789" E		
							23° 36' 29.473" N	86° 31' 52.946" E		
							23° 36' 3.555" N	86° 31' 52.921" E		
							23° 35' 21.209" N	86° 31' 49.532" E		

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							23° 34' 2.379" N	86° 30' 57.619" E		
							23° 35' 11.754" N	86° 29' 58.050" E		
							23° 35' 26.822" N	86° 30' 44.576" E		
							23° 35' 45.373" N	86° 30' 42.810" E		
61	PUR_GR_ZONE_05 (Granite/ Quartz/ Feldspar)	264.02	50	79.206473	Virgin	RAGHUNATHPUR-I & RAGHUNATHPUR-II	23° 35' 35.873" N	86° 42' 14.279" E	No	Available
							23° 35' 37.545" N	86° 40' 33.681" E		
							23° 36' 3.941" N	86° 40' 29.802" E		
							23° 36' 12.952" N	86° 41' 39.862" E		
							23° 36' 1.256" N	86° 42' 4.256" E		
62	PUR_GR_ZONE_06 (Granite/ Quartz/ Feldspar)	287.42	50	86.226821	Virgin	RAGHUNATHPUR-II	23° 36' 30.539" N	86° 31' 59.736" E	No	Available
							23° 36' 30.606" N	86° 32' 22.027" E		
							23° 37' 8.167" N	86° 32' 31.583" E		
							23° 37' 10.034" N	86° 32' 44.999" E		
							23° 36' 40.706" N	86° 32' 55.721" E		
							23° 36' 36.530" N	86° 32' 55.293" E		
							23° 35' 54.695" N	86° 33' 2.495" E		
							23° 35' 30.982" N	86° 32' 29.389" E		
							23° 36' 1.762" N	86° 32' 14.659" E		
63	PUR_GR_ZONE_07 (Granite/ Quartz/ Feldspar)	712.41	50	213.72167	Virgin	PARA	23° 31' 1.235" N	86° 27' 49.305" E	No	Available
							23° 31' 49.652" N	86° 29' 4.245" E		
							23° 31' 6.058" N	86° 29' 59.724" E		
							23° 30' 43.662" N	86° 29' 30.252" E		
							23° 30' 19.183" N	86° 29' 58.781" E		
							23° 29' 56.778" N	86° 29' 26.626" E		
							23° 30' 17.093" N	86° 28' 48.037" E		
							23° 30' 8.339" N	86° 28' 39.929" E		

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64	PUR_GR_ZONE_08 (Granite/ Quartz/ Feldspar)	716.14	50	214.84121	Virgin	PARA	23° 30' 0.190" N	86° 32' 9.754" E	No	Available
							23° 30' 6.785" N	86° 32' 10.260" E		
							23° 30' 15.147" N	86° 31' 46.119" E		
							23° 30' 12.653" N	86° 31' 18.327" E		
							23° 31' 35.628" N	86° 31' 30.158" E		
							23° 31' 35.097" N	86° 32' 22.598" E		
							23° 30' 36.913" N	86° 32' 23.500" E		
							23° 30' 30.215" N	86° 32' 23.604" E		
							23° 30' 16.636" N	86° 33' 5.062" E		
							23° 29' 42.591" N	86° 33' 14.133" E		
							23° 29' 28.937" N	86° 31' 54.981" E		
							23° 29' 56.498" N	86° 31' 36.133" E		
65	PUR_GR_ZONE_09 (Granite/ Quartz/ Feldspar)	154.42	50	46.326702	Virgin	RAGHUNATHPUR-I	23° 31' 51.181" N	86° 36' 36.445" E	No	Available
							23° 32' 23.419" N	86° 37' 0.799" E		
							23° 32' 26.364" N	86° 37' 30.251" E		
							23° 31' 35.132" N	86° 37' 27.625" E		
66	PUR_GR_ZONE_10 (Granite/ Quartz/ Feldspar)	206.56	50	61.96711	Virgin	RAGHUNATHPUR-I	23° 31' 28.494" N	86° 37' 58.249" E	No	Available
							23° 32' 19.437" N	86° 38' 2.213" E		
							23° 32' 18.670" N	86° 38' 42.528" E		
							23° 31' 18.100" N	86° 38' 42.504" E		
67	PUR_GR_ZONE_11 (Granite/ Quartz/ Feldspar)	245.76	50	73.726626	Virgin	RAGHUNATHPUR-I	23° 33' 12.347" N	86° 41' 1.293" E	No	Available
							23° 32' 59.250" N	86° 42' 18.971" E		
							23° 32' 22.063" N	86° 42' 9.348" E		
							23° 32' 27.110" N	86° 41' 10.360" E		
68	PUR_GR_ZONE_12 (Granite/ Quartz/ Feldspar)	267.83	50	80.347943	Virgin	RAGHUNATHPUR-I	23° 32' 16.414" N	86° 40' 57.134" E	No	Available
							23° 32' 20.601" N	86° 41' 25.306" E		

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							23° 32' 3.419" N	86° 41' 38.037" E		
							23° 31' 44.547" N	86° 42' 7.193" E		
							23° 31' 21.437" N	86° 41' 40.187" E		
							23° 31' 36.366" N	86° 41' 19.251" E		
							23° 31' 14.829" N	86° 41' 5.679" E		
							23° 31' 34.228" N	86° 40' 43.426" E		
69	PUR_GR_ZONE_13 (Granite/ Quartz/ Feldspar)	402.97	50	120.89138	Virgin	PARA	23° 28' 19.180" N	86° 29' 11.512" E	No	Available
							23° 28' 44.850" N	86° 28' 29.253" E		
							23° 29' 42.193" N	86° 29' 34.325" E		
							23° 29' 14.554" N	86° 29' 47.214" E		
							23° 29' 22.243" N	86° 30' 21.355" E		
							23° 29' 7.477" N	86° 30' 31.671" E		
							23° 28' 46.876" N	86° 30' 0.118" E		
							23° 28' 43.750" N	86° 29' 55.330" E		
70	PUR_GR_ZONE_14 (Granite/ Quartz/ Feldspar)	1851.81	50	555.54234	Partially explored	RAGHUNATHPUR-I & SANTURI	23° 32' 11.687" N	86° 42' 49.613" E	No	Available
							23° 33' 17.901" N	86° 44' 8.077" E		
							23° 33' 44.692" N	86° 45' 5.771" E		
							23° 33' 29.789" N	86° 45' 49.478" E		
							23° 33' 25.870" N	86° 45' 18.966" E		
							23° 33' 4.384" N	86° 45' 13.419" E		
							23° 33' 2.502" N	86° 45' 22.512" E		
							23° 32' 51.395" N	86° 46' 53.041" E		
							23° 32' 14.679" N	86° 47' 43.849" E		
							23° 31' 30.535" N	86° 47' 14.880" E		
							23° 31' 53.047" N	86° 45' 32.964" E		
							23° 32' 5.842" N	86° 45' 28.461" E		



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							23° 32' 7.089" N	86° 45' 14.748" E		
							23° 31' 25.287" N	86° 45' 2.992" E		
							23° 30' 58.722" N	86° 44' 55.521" E		
							23° 31' 10.025" N	86° 44' 30.292" E		
							23° 31' 36.335" N	86° 44' 40.111" E		
							23° 32' 6.822" N	86° 44' 34.689" E		
							23° 32' 16.818" N	86° 43' 39.030" E		
							23° 32' 0.068" N	86° 43' 23.514" E		
							23° 31' 46.886" N	86° 43' 13.371" E		
							23° 31' 29.222" N	86° 42' 59.132" E		
							23° 31' 53.422" N	86° 42' 25.301" E		
							23° 32' 5.925" N	86° 42' 40.204" E		
71	PUR_GR_ZONE_15 (Granite/ Quartz/ Feldspar)	350.00	50	104.99961	Partially explored	RAGHUNATHPUR-I	23° 33' 43.769" N	86° 41' 59.696" E	No	Available
							23° 33' 8.861" N	86° 43' 45.720" E		
							23° 32' 31.210" N	86° 43' 6.379" E		
							23° 32' 38.215" N	86° 42' 57.853" E		
							23° 32' 36.754" N	86° 42' 49.121" E		
							23° 32' 11.136" N	86° 42' 42.010" E		
							23° 32' 4.694" N	86° 42' 20.524" E		
							23° 33' 1.704" N	86° 42' 30.253" E		
72	PUR_GR_ZONE_16 (Granite/ Quartz/ Feldspar)	288.91	50	86.672351	Virgin	RAGHUNATHPUR-I	23° 30' 22.931" N	86° 40' 33.050" E	No	Available
							23° 30' 58.108" N	86° 41' 9.016" E		
							23° 30' 52.188" N	86° 41' 43.290" E		
							23° 31' 14.970" N	86° 42' 18.842" E		
							23° 30' 57.857" N	86° 42' 32.316" E		
							23° 30' 22.911" N	86° 42' 6.195" E		

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73	PUR_GR_ZONE_17 (Granite/ Quartz/ Feldspar)	276.42	50	82.924763	Virgin	RAGHUNATHPUR-I	23° 31' 19.302" N	86° 38' 57.293" E	No	Available
							23° 31' 56.977" N	86° 39' 39.744" E		
							23° 31' 29.981" N	86° 40' 4.670" E		
							23° 31' 0.305" N	86° 40' 32.735" E		
							23° 30' 53.141" N	86° 39' 25.800" E		
74	PUR_GR_ZONE_18 (Granite/ Quartz/ Feldspar)	1278.24	50	383.47061	Partially explored	PURULIA-II	23° 21' 23.962" N	86° 22' 1.280" E	No	Available
							23° 21' 40.118" N	86° 22' 25.008" E		
							23° 21' 39.868" N	86° 23' 39.997" E		
							23° 22' 5.014" N	86° 23' 58.187" E		
							23° 21' 23.194" N	86° 25' 52.514" E		
							23° 19' 53.956" N	86° 25' 3.316" E		
75	PUR_GR_ZONE_19 (Granite/ Quartz/ Feldspar)	481.85	50	144.55619	Partially explored	PURULIA-II	23° 17' 37.887" N	86° 22' 5.492" E	No	Available
							23° 18' 28.808" N	86° 22' 45.307" E		
							23° 17' 21.424" N	86° 24' 49.618" E		
							23° 17' 8.440" N	86° 24' 45.216" E		
							23° 17' 32.669" N	86° 23' 8.771" E		
							23° 17' 20.256" N	86° 22' 57.395" E		
76	PUR_GR_ZONE_20 (Granite/ Quartz/ Feldspar)	266.39	50	79.917411	Partially explored	PURULIA-I	23° 15' 55.566" N	86° 25' 49.498" E	No	Available
							23° 16' 18.292" N	86° 26' 14.916" E		
							23° 15' 50.324" N	86° 27' 14.259" E		
							23° 15' 12.737" N	86° 27' 1.352" E		
							23° 15' 23.689" N	86° 26' 24.660" E		
77	PUR_GR_ZONE_21 (Granite/ Quartz/ Feldspar)	131.74	50	39.521644	Partially explored	PURULIA-II	23° 25' 24.915" N	86° 28' 27.034" E	No	Available
							23° 25' 30.658" N	86° 28' 39.000" E		
							23° 25' 12.064" N	86° 29' 35.517" E		
							23° 24' 42.525" N	86° 29' 0.577" E		

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78	PUR_GR_ZONE_22 (Granite/ Quartz/ Feldspar)	1673.80	50	502.13857	Partially explored	BALARAMPUR & BAGHMUNDI	23° 11' 13.728" N	86° 11' 31.187" E	No	Available
							23° 12' 39.470" N	86° 12' 23.324" E		
							23° 11' 43.116" N	86° 15' 22.201" E		
							23° 10' 12.634" N	86° 14' 51.993" E		
79	PUR_GR_ZONE_23 (Granite/ Quartz/ Feldspar)	3440.70	50	1032.2109	Partially explored	BAGHMUNDI	23° 12' 35.066" N	86° 1' 46.264" E	No	Available
							23° 13' 34.505" N	86° 1' 58.681" E		
							23° 13' 19.625" N	86° 3' 15.131" E		
							23° 13' 58.188" N	86° 3' 50.901" E		
							23° 11' 50.824" N	86° 7' 0.818" E		
							23° 9' 37.511" N	86° 6' 10.491" E		
80	PUR_GR_ZONE_24 (Granite/ Quartz/ Feldspar)	423.24	50	126.97102	Partially explored	HURA & PURULIA-II	23° 25' 36.347" N	86° 30' 37.899" E	No	Available
							23° 25' 17.369" N	86° 32' 14.559" E		
							23° 24' 34.319" N	86° 32' 3.895" E		
							23° 24' 43.309" N	86° 30' 25.416" E		
81	PUR_GR_ZONE_25 (Granite/ Quartz/ Feldspar)	1095.34	50	328.60281	Virgin	MANBAZAR-I	23° 4' 29.054" N	86° 39' 11.170" E	No	Available
							23° 3' 8.072" N	86° 41' 6.671" E		
							23° 1' 59.152" N	86° 40' 24.439" E		
							23° 2' 58.089" N	86° 38' 24.543" E		
82	PUR_GR_ZONE_26 (Granite/ Quartz/ Feldspar)	1666.94	50	500.08214	Virgin	PUNCHA & MANBAZAR-I	23° 10' 16.042" N	86° 37' 41.376" E	No	Available
							23° 11' 15.672" N	86° 39' 37.551" E		
							23° 9' 1.106" N	86° 40' 59.457" E		
							23° 8' 1.231" N	86° 39' 42.693" E		
83	PUR_GR_ZONE_27 (Granite/ Quartz/ Feldspar)	1415.71	50	424.71187	Virgin	JAIPUR & JHALDA-II	23° 24' 12.790" N	86° 5' 51.461" E	No	Available
							23° 26' 3.596" N	86° 7' 52.290" E		
							23° 24' 50.425" N	86° 9' 18.534" E		
							23° 23' 22.403" N	86° 7' 27.245" E		

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84	PUR_GR_ZONE_28 (Granite/ Quartz/ Feldspar/ Apatite)	120.09	50	36.028298	Partially explored	BARABAZAR & BALARAMPUR	23° 2' 58.080" N	86° 17' 24.737" E	No	Available
							23° 3' 29.758" N	86° 17' 28.290" E		
							23° 3' 22.374" N	86° 18' 10.354" E		
							23° 2' 49.313" N	86° 18' 5.318" E		
85	PUR_GR_ZONE_29 (Granite/ Quartz/ Feldspar)	201.13	50	60.340343	Partially explored	JHALDA-II	23° 27' 22.494" N	86° 0' 19.291" E	No	Available
							23° 27' 52.541" N	86° 0' 36.411" E		
							23° 27' 33.315" N	86° 1' 38.101" E		
							23° 27' 0.172" N	86° 1' 21.000" E		
86	PUR_GR_ZONE_30 (Granite/ Quartz/ Feldspar)	156.32	50	46.896259	Virgin	BARABAZAR	23° 2' 36.604" N	86° 28' 36.751" E	No	Available
							23° 3' 1.384" N	86° 28' 50.020" E		
							23° 2' 50.791" N	86° 29' 40.034" E		
							23° 2' 14.742" N	86° 29' 33.777" E		
87	PUR_GR_ZONE_31 (Granite/ Quartz/ Feldspar)	55.08	50	16.522841	Virgin	BARABAZAR	23° 2' 41.707" N	86° 25' 44.152" E	No	Available
							23° 2' 58.943" N	86° 25' 51.982" E		
							23° 2' 48.725" N	86° 26' 21.777" E		
							23° 2' 28.895" N	86° 26' 10.238" E		
88	PUR_GR_ZONE_32 (Granite/ Quartz/ Feldspar)	93.64	50	28.092991	Virgin	KASHIPUR	23° 23' 0.066" N	86° 36' 51.819" E	No	Available
							23° 23' 26.504" N	86° 37' 28.955" E		
							23° 22' 45.656" N	86° 37' 31.217" E		
							23° 22' 38.526" N	86° 37' 11.247" E		
89	PUR_QT_ZONE_01 (Quartz)	1807.54	35	379.58342	Virgin	JAIPUR	23° 32' 15.282" N	86° 1' 35.414" E	No	Available
							23° 32' 32.794" N	86° 1' 46.518" E		
							23° 33' 2.337" N	86° 2' 15.384" E		
							23° 32' 47.986" N	86° 3' 5.654" E		
							23° 31' 52.945" N	86° 3' 4.034" E		
							23° 31' 46.156" N	86° 5' 4.113" E		

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							23° 31' 41.772" N	86° 5' 22.667" E		
							23° 30' 53.111" N	86° 8' 7.921" E		
							23° 30' 22.306" N	86° 7' 17.881" E		
							23° 30' 48.945" N	86° 3' 58.503" E		
90	PUR_QT_ZONE_02 (Quartz)	322.67	35	67.761357	Virgin	MANBAZAR-II	23° 2' 16.820" N	86° 31' 46.348" E	No	Available
							23° 2' 44.031" N	86° 32' 12.571" E		
							23° 2' 38.831" N	86° 32' 27.774" E		
							23° 2' 54.730" N	86° 32' 39.652" E		
							23° 3' 9.436" N	86° 32' 42.621" E		
							23° 3' 7.137" N	86° 32' 49.652" E		
							23° 2' 47.674" N	86° 33' 12.288" E		
							23° 2' 39.010" N	86° 33' 6.320" E		
							23° 2' 45.183" N	86° 32' 58.350" E		
							23° 2' 40.509" N	86° 32' 50.347" E		
							23° 2' 38.416" N	86° 32' 53.400" E		
							23° 2' 24.247" N	86° 32' 48.658" E		
							23° 2' 1.703" N	86° 33' 3.515" E		
							23° 2' 13.094" N	86° 33' 15.330" E		
							23° 2' 8.528" N	86° 33' 44.072" E		
							23° 1' 48.787" N	86° 32' 59.793" E		
							23° 1' 45.788" N	86° 32' 49.065" E		
91	PUR_QT_ZONE_03 (Quartz)	420.50	35	88.305053	Virgin	NETURIA	23° 39' 35.802" N	86° 41' 0.462" E	No	Available
							23° 40' 30.104" N	86° 41' 50.307" E		
							23° 40' 1.416" N	86° 43' 0.897" E		
							23° 39' 8.790" N	86° 41' 44.891" E		
92		106.73	35			MANBAZAR-II	22° 54' 20.110" N	86° 41' 25.491" E	No	Available

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	PUR_QT_ZONE_04 (Quartz)			22.412511	Partially explored		22° 54' 33.577" N	86° 41' 48.866" E		
							22° 53' 56.460" N	86° 42' 17.182" E		
							22° 53' 41.627" N	86° 41' 59.383" E		
93	PUR_QT_ZONE_05 (Quartz)	181.61	35	38.138072	Partially explored	JHALDA-II	23° 28' 28.377" N	86° 3' 35.491" E	No	Available
							23° 28' 16.935" N	86° 4' 12.755" E		
							23° 27' 34.165" N	86° 4' 1.082" E		
							23° 27' 50.504" N	86° 3' 8.447" E		
94	PUR_QT_ZONE_06 (Quartz)	57.45	35	12.064204	Partially explored	BANDUAN	22° 43' 14.658" N	86° 31' 21.244" E	No	Available
							22° 43' 34.626" N	86° 31' 23.030" E		
							22° 43' 30.591" N	86° 31' 55.323" E		
							22° 43' 10.971" N	86° 31' 54.647" E		
95	PUR_QT_ZONE_07 (Quartz)	18.40	35	3.8630857	Partially explored	BARABAZAR	22° 59' 52.989" N	86° 14' 27.665" E	No	Available
							23° 0' 4.488" N	86° 14' 28.642" E		
							23° 0' 6.215" N	86° 14' 44.395" E		
							22° 59' 54.461" N	86° 14' 47.731" E		
96	PUR_QT_ZONE_08 (Quartz)	99.30	35	20.853326	Partially explored	MANBAZAR-II	22° 59' 30.110" N	86° 36' 20.074" E	No	Available
							22° 59' 46.939" N	86° 36' 40.471" E		
							22° 59' 39.720" N	86° 37' 19.526" E		
							22° 59' 13.453" N	86° 37' 9.377" E		
97	PUR_QT_ZONE_09 (Quartz)	281.58	35	59.131909	Partially explored	SANTURI	23° 32' 41.638" N	86° 50' 32.701" E	No	Available
							23° 32' 56.216" N	86° 51' 34.512" E		
							23° 32' 7.038" N	86° 51' 55.098" E		
							23° 31' 57.435" N	86° 50' 47.818" E		
98	PUR_QT_ZONE_10 (Quartz)	64.41	35	13.52526	Partially explored	PUNCHA	23° 11' 41.994" N	86° 31' 41.817" E	No	Available
							23° 12' 6.552" N	86° 31' 54.017" E		
							23° 11' 51.140" N	86° 32' 19.481" E		



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							23° 11' 30.713" N	86° 32' 7.544" E		
99	PUR_QT_ZONE_11 (Quartz)	76.69	35	16.104569	Partially explored	MANBAZAR-I	23° 7' 6.307" N	86° 34' 45.323" E	No	Available
							23° 7' 24.241" N	86° 35' 15.734" E		
							23° 7' 4.517" N	86° 35' 36.460" E		
							23° 6' 50.433" N	86° 35' 1.884" E		
100	PUR_QT_ZONE_12 (Quartz)	20.57	35	4.3205417	Partially explored	BARABAZAR	23° 1' 4.719" N	86° 22' 47.336" E	No	Available
							23° 1' 8.532" N	86° 23' 5.445" E		
							23° 0' 57.712" N	86° 23' 10.652" E		
							23° 0' 50.819" N	86° 22' 57.299" E		
101	PUR_QT_ZONE_13 (Quartz)	240.34	35	50.471246	Partially explored	MANBAZAR-II,BANDUAN	22° 53' 11.802" N	86° 37' 1.675" E	No	Available
							22° 53' 14.664" N	86° 37' 59.330" E		
							22° 52' 25.056" N	86° 38' 0.640" E		
							22° 52' 11.336" N	86° 37' 21.847" E		
102	PUR_QT_ZONE_14 (Quartz)	32.34	35	6.7910842	Partially explored	BARABAZAR	23° 0' 7.590" N	86° 14' 49.560" E	No	Available
							23° 0' 11.801" N	86° 15' 6.638" E		
							22° 59' 52.922" N	86° 15' 17.151" E		
							22° 59' 49.922" N	86° 14' 57.428" E		
103	PUR_QT_ZONE_15 (Quartz)	118.66	35	24.917704	Partially explored	MANBAZAR-II	22° 55' 11.423" N	86° 39' 29.845" E	No	Available
							22° 55' 32.635" N	86° 39' 50.971" E		
							22° 54' 58.892" N	86° 40' 25.329" E		
							22° 54' 43.337" N	86° 39' 53.043" E		
104	PUR_QT_ZONE_16 (Quartz)	2.15	35	0.4525042	Partially explored	BARABAZAR	23° 0' 52.134" N	86° 23' 39.846" E	No	Available
							23° 0' 49.510" N	86° 23' 45.505" E		
							23° 0' 46.082" N	86° 23' 43.428" E		
							23° 0' 49.286" N	86° 23' 37.503" E		
105		141.04	35			JAIPUR	23° 33' 2.692" N	86° 1' 33.763" E	No	Available

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	PUR_QTZ_ZONE_01 (Quartzite)			29.617627	Partially explored		23° 33' 27.434" N	86° 2' 7.875" E		
							23° 33' 6.900" N	86° 2' 36.997" E		
							23° 32' 36.187" N	86° 2' 6.476" E		
106	PUR_QTZ_ZONE_02 (Quartzite)	270.49	35	56.802102	Partially explored	RAGHUNATHPUR-II	23° 34' 27.169" N	86° 34' 1.006" E	No	Available
							23° 34' 18.850" N	86° 34' 58.845" E		
							23° 33' 32.843" N	86° 35' 4.245" E		
							23° 33' 30.249" N	86° 34' 1.193" E		
107	PUR_QTZ_ZONE_03 (Quartzite)	252.02	35	52.92368	Partially explored	RAGHUNATHPUR-I,II	23° 33' 54.040" N	86° 39' 12.492" E	No	Available
							23° 33' 56.852" N	86° 39' 47.434" E		
							23° 32' 53.626" N	86° 40' 17.020" E		
							23° 32' 45.043" N	86° 39' 28.436" E		
108	PUR_QTZ_ZONE_04 (Quartzite)	22.77	35	4.7824295	Partially explored	RAGHUNATHPUR-I	23° 36' 20.688" N	86° 42' 2.103" E	No	Available
							23° 36' 23.318" N	86° 42' 19.335" E		
							23° 36' 10.298" N	86° 42' 24.067" E		
							23° 36' 5.477" N	86° 42' 6.748" E		
109	PUR_QT_FLDS_ZONE_1 (Quartz/ Feldspar)	201.13	36	43.445047	Partially explored	JHALDA-II	23° 27' 22.494" N	86° 0' 19.291" E	No	Available
							23° 27' 52.541" N	86° 0' 36.411" E		
							23° 27' 33.315" N	86° 1' 38.101" E		
							23° 27' 0.172" N	86° 1' 21.000" E		
110	PUR_QT_FLDS_ZONE_2 (Quartz/ Feldspar)	474.43	37	105.32277	Partially explored	BALARAMPUR	23° 11' 51.753" N	86° 13' 36.776" E	No	Available
							23° 11' 38.333" N	86° 14' 48.053" E		
							23° 10' 22.699" N	86° 14' 18.931" E		
							23° 10' 42.943" N	86° 13' 12.407" E		
111	PUR_QT_FLDS_ZONE_3 (Quartz/ Feldspar)	7.19	38	1.6390836	Partially explored	NATURI	23° 32' 23.142" N	86° 50' 47.120" E	No	Available
							23° 32' 27.775" N	86° 51' 0.861" E		
							23° 32' 23.106" N	86° 51' 3.442" E		

Sr. No	Name of the Mineral (Zone-Code)	Area of mineralized zone (Ha)	Depth of mineralization (m)	Geological resource (mcum)	Whether virgin or partially explored	Administrative block	Co-ordinate		Area within prohibited zone as per Rule 3 of 7 WBMNC Rules 16	Infrastructure available near the mineralized zone
							23° 32' 17.698" N	86° 50' 49.170" E		

NOTE: In-situ Minerals Occurrences table also given as Annexure 5.
 # Geological resources given in the table is tentative and determination of actual resources need geological exploration in the means of mapping, drilling etc.

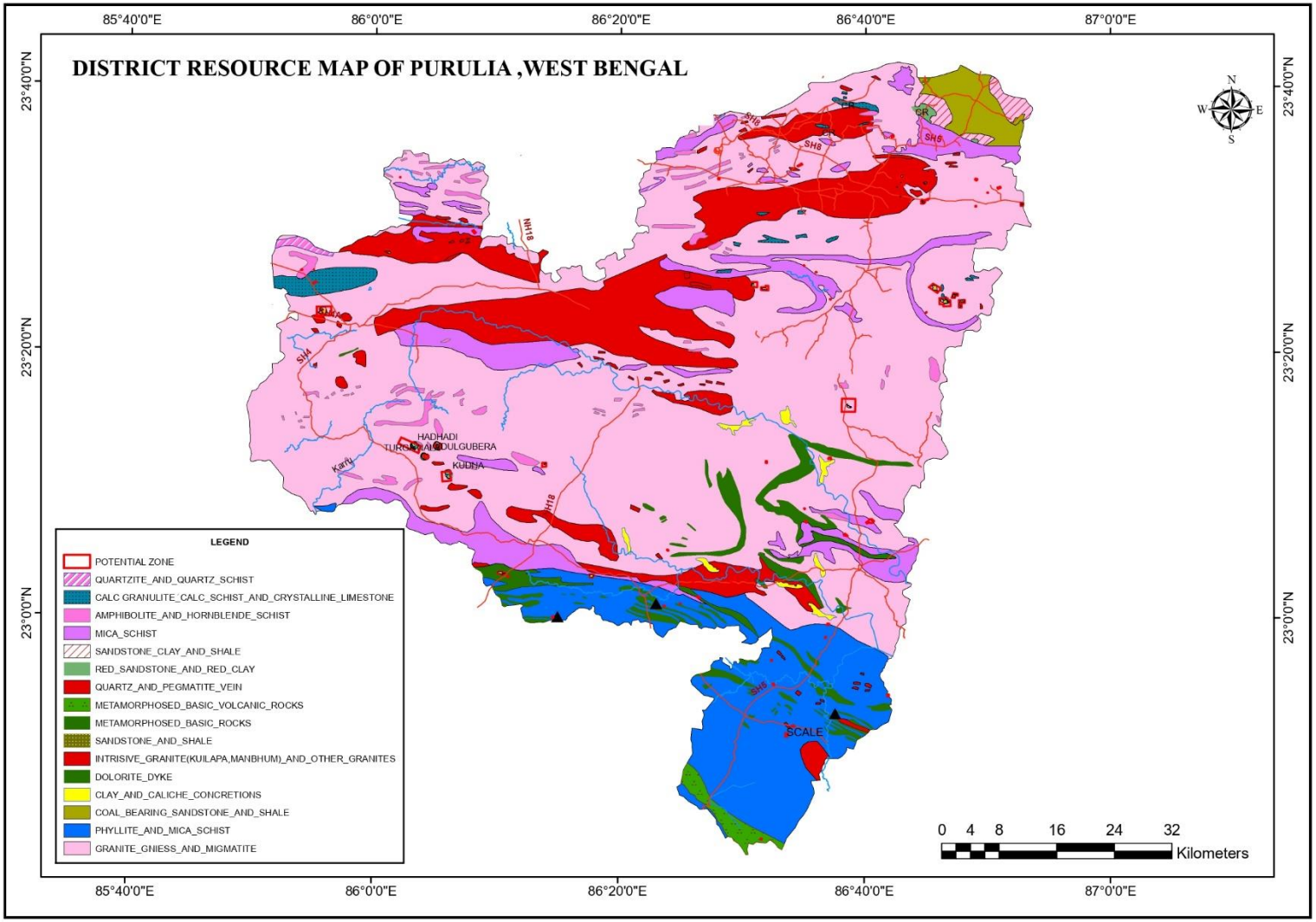

Figure 11.1: In-situ mineral occurrences shown on geological map of Purulia district (Source: GSI, 2001)

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

The district has many minerals, although the deposits of only a few of them are adequate for commercial venture. Most important workable mineral deposit of the district is coal. Apart from coal, there are deposits of a number of minerals like Rock Phosphate (Apatite), Limestone, Blackstone, Decorative Stone, Moulding Sand, Glass Sand and China Clay. Existing insitu minor mineral leases of the district tabulated below.



Table 11.2: List of existing mining leases of the district (other than sand)

SL. NO.	BLOCK	MINERALS	NAME OF MOUZA	PLOT NO.	AREA (ACRES)	GEOLOGICALRESERVE (METRIC TONNES)	MINABLE RESERVE (METRIC TONNES)	NAME OF LEASE HOLDER	LEASE DEED NUMBER WITH DATE
1.	Manbazar-II	Quartz	Bardahi-308	1(P)	7.90	921.67	553.00	R.S. Minerals Pvt. Ltd (M/L date 06.05.10 Registered on 01.07.10)	From 06.05.2010 For 20 years
2.	Raghunathpur-I	Granite	Talsankra-163	3310(p)	2.48	292.52304	175.51	Todi Minerals Pvt.Ltd.	From 28.07.2005 For 20 years
3.	Puncha	Quartz	Kenda-17	2541	2.52	143309.60	105643.83	Agamon Mineral Pvt.Ltd.-	-
4.	Manbazar-II	Quartz	Chalka-175	475,476	5.44	172247.70	134016.33	S. K. Enterprise	
5.	Bandwan	Quartz	Mahulbani-51	436	2.58	225225.35	164752.31	Jayanta Bhattacharya	-
6.	Manbazar-I	Quartz	Metayala-45	4986	4.56	242060.60	207351.3	Maithon Alloys Ltd.	

SL. NO.	BLOCK	MINERALS	NAME OF MOUZA	PLOT NO.	AREA (ACRES)	GEOLOGICALRESERVE (METRIC TONNES)	MINABLE RESERVE (METRIC TONNES)	NAME OF LEASE HOLDER	LEASE DEED NUMBER WITH DATE
7.	Barabazar	Quartz	Berada-104	2.13	2.13	224118.8	159646.76	Kalkons	-
8.	Barabazar	Quartz	Gobindapur-170	1242	0.73	150340.50	90628.64	JBS Project Ltd.	
9.	Jhalda-II	Quartz	Khatanga-191	4	1.93	135050.45	67445.90	Bankura Mines & Minera ls	-
10.	Manbazar-II	Quartz	Kendajore-310	173	2.37	-	-	Biswarup Dutta	-
11.	Santuri	MouldingSand	Rakta-10	367,381-392	12.70	-	-	Shri Anath Bandhu Majhi	M/L Date 18.6.04 Registered on 23.07.04
12.	Hura	Quartz & Feldspar	Kaliabasa-98	3366	2.99	-	-	M/s Rathin Enterprise	M/L Date22. 5.01
13	Santuri	Quartz &Feldspar	Amdiha-74	386,388,389	4.55	-	-	Shri Sukumar Naru	M/L Date15.0 2.00
14	Santuri	Quartz &Feldspar	Jiyathol—64	1378(P)	8.23	317000	253600	Shri Sanjoy Mondal	M/L Date14.1 2.98



SL. NO.	BLOCK	MINERALS	NAME OF MOUZA	PLOT NO.	AREA (ACRES)	GEOLOGICALRESERVE (METRIC TONNES)	MINABLE RESERVE (METRIC TONNES)	NAME OF LEASE HOLDER	LEASE DEED NUMBER WITH DATE
15	Kashipur	Fireclay	Jinamonipur - 129	935	2.97	259350	220447.50	Shri Ashok Bhai Patel	M/L Date 5.7.13
16	Jhalda	Granite	Bansa-35	973	3.30	-	-	M/s Eastern Minerals &Trading Agency	M/L Date23.5.05 registered on 28.5.20 05
17	Hura	Granite	Maguria-72	12975(P)	3.46	-	-	M/s Eastern Minerals &Trading Agency	M/L Date 6.8.08 registered on29.8.08
18	Raghunathpur	Granite	Talsankra-163	2974	2.07	12557.52	106723.89	M/s Todi Minerals (P)Ltd.	M/L Date28.7.05 registered on9.9.05
19	Barabazar	BlackStone	Dhargram-203	2431(p)	39			Sukriti Pebbles	1-140101029 Dtd on 02.05.2019
20	Kashipur	BlackStone	Sutabai-63	6601	9.38			Pratim Bhowmick	Pending For EC
21	Manbazar-II	BlackStone	Hesla-207	1630	14.8			Shri ArunKataruka	Pending For EC

SL. NO.	BLOCK	MINERALS	NAME OF MOUZA	PLOT NO.	AREA (ACRES)	GEOLOGICALRESERVE (METRIC TONNES)	MINABLE RESERVE (METRIC TONNES)	NAME OF LEASE HOLDER	LEASE DEED NUMBER WITH DATE
22	Santuri	BlackStone	Ledason-87	73	5			Shri Arjun Mondal	Pending For EC
23	Hura	Granite	Tilabani-4	1114	11.36	1769853.589cmt	1504375.551cmt	Todi Minarels Pvt.Ltd (3)	85dtdon 12.02.2007
24	Barabazar	Quratz& Feldspar	Mirmi	293,294(P), 295,296,297,316,317,318,319, 320,323,324, 325,326,327, 328,330(P),335(P)	16.00		0.59 MillionTonnes		
25	Hura	Granite	Bara Panjania	3986(P)	38.09		1.50 Millioncum		
26	Raghunathpur	Granite	Dhunia	850	7.64		0.28 Millioncum		

SL. NO.	BLOCK	MINERALS	NAME OF MOUZA	PLOT NO.	AREA (ACRES)	GEOLOGICALRESERVE (METRIC TONNES)	MINABLE RESERVE (METRIC TONNES)	NAME OF LEASE HOLDER	LEASE DEED NUMBER WITH DATE
27	Hura	Granite	Maguria-Lalpur		6.61		Approximately 604 200 cum (Lalpur) &710 500 cum (Maguria-Lalpur) (G4) reserve considering hilly part and10 m below ground level has been assessed in this area by GSI		
28	Jaypur	BlackStone (Basic rock)	Jorro	2836	7.1		150000cum		

Table 11.3: List of mining leases of West Bengal Mineral Development & Trading Corporation Limited of the district (other than sand)

Sl. No.	Name of the Mine	Name of the Mineral	Area in Acre	Vested / Govt. Land (in Acre)	Grant Order	Lease executed on	Name of the MDOP	E.C. Validity	Year of Contract	Mineral Reserve	Status
1	Palsara-I	Black Stone	28.00	28.00	254-CI/O/MM-58/03/M2 dt. 22.04.2003	31.01.2005		31.01.2005	Pending for Tender	1.7 Lack Tonne	

Sl. No.	Name of the Mine	Name of the Mineral	Area in Acre	Vested / Govt. Land (in Acre)	Grant Order	Lease executed on	Name of the MDOP	E.C. Validity	Year of Contract	Mineral Reserve	Status
2	Palsara-II	Black Stone	20.50	20.50	931-CI/MM/71/10/MINES dt 23.11.2010	27.02.2015	Terminated	27.02.2035	27.02.2015	6.052 million tonne	Stopped
3	Palsara-III	Black Stone	8.66	8.66	Waiting for Grant Order		Pending for Tender			6.83 lac tonne	
4	Sutabai	Black Stone	31.53	4.12	162-CI/O/MIN/MDTC/GEN-MIS/02/2018 14.03.2019						
5	Rautara	Black Stone	99.5	0.17	Waiting for Grant Order						
6	Gayapahari	Black Stone	69.5	2.20	Waiting for Grant Order						
7	Paharpur 1	Black Stone	62.33	14.09	Waiting for Grant Order Application Date 19.12.2016						
8	Paharpur 2	Black Stone	22	7.35	Waiting for Grant Order Application Date 27.12.2016						

Sl. No.	Name of the Mine	Name of the Mineral	Area in Acre	Vested / Govt. Land (in Acre)	Grant Order	Lease executed on	Name of the MDOP	E.C. Validity	Year of Contract	Mineral Reserve	Status
9	Mirmi (Old)	Quartz & Feldspar	9.09	9.09	126-CIMaj-Min/017/02 dt. 11.04.2007	25.08.2008	Pending tendering	EC Pending		2.9 lac tonne	Non Operational
10	Mirmi (New)	Quartz & Feldspar	16.00	8.38	704 CI/MIN/MDT-MIS/08/2015		Pending tendering	EC Pending		5.8 lac tonne	Non Operational
11	Chirugora & Basantapur	Apatite	12.28 & 12.20	12.28 & 12.20	Not issued	Exploration not completed		EC Pending		2.38 Million tonne	
12	Beldih	Apatite	33.28	Land Belongs to WBMDTCL	66-CI/O/Maj-Min/06/06/Mi, dt.28.02.2007	25.05.2009	IRCNLP	EC Pending	2013	4.56 Million tonne	Non Operational
13	Malti	Fire Clay	48.00	48.00	213-CI/O/Mej-Min/027, Dt. 09.06.2006	27.05.2009	Terminated	27.05.2029		150767.6 tonne	Non Operational
14	Boro Panjania	Granite	38.09	38.09	142-MM-243/03/M2, dt. 09.03.2004		Diversified Vyapar Pvt Ltd (JV Partner)	Upto Lease Date	27.07.2017	8.47 Million tonne	Non Operational

Sl. No.	Name of the Mine	Name of the Mineral	Area in Acre	Vested / Govt. Land (in Acre)	Grant Order	Lease executed on	Name of the MDOP	E.C. Validity	Year of Contract	Mineral Reserve	Status
15	Senera	Granite	18.4	18.04	446-CI/Dt. 18.03.1994		Diversified Vyapar Pvt Ltd (JV Partner)	Do	14.09.2017	0.292 Million Cu. Metre	Non Operational
16	Paschim Bero	Granite	41.5	41.5	1080-CI/-D, dt. 02.09.1999		Diversified Vyapar Pvt Ltd (JV Partner)	Do	14.09.2017	7.14 Million Cubic Metre	Non Operational
17	Khajura-564	Granite	6.72	6.72	268-(CI)/MIN/MDT-MIS/01/2016 dt. 06.05.2016		IRCNLP (JV Partner)	Do	11.04.2018	0.597 Million Cubic Metre	Non Operational
18	Khajura-271	Granite	3.89	3.89	274-CI/O/MIN/MDTC-MIS/06/2017 dt. 04.12.2017		IRCNLP (JV Partner)	Do	11.04.2018	0.056 Million Cubic Metre	Non Operational
19	Granite Mine, Barasini, Purulia	Granite	2.70	2.70	170-CI/O/MIN/MDT-MIS/11/2015 dated 16.03.2016		Diversified Vyapar Pvt Ltd (JV Partner)				Non Operational

Sl. No.	Name of the Mine	Name of the Mineral	Area in Acre	Vested / Govt. Land (in Acre)	Grant Order	Lease executed on	Name of the MDOP	E.C. Validity	Year of Contract	Mineral Reserve	Status
20	Granite Mine, Dulalpur, Raghunathpur	Granite	5.23	5.23	172-CI/O/MIN/MDT-MIS/09/2015 dated 16.03.2016		Diversified Vyapar Pvt Ltd (JV Partner)				Non Operational
21	Granite Mine, Raidhi, Raghunathpur	Granite	3.07	3.07	134-CI/O/MIN/MDT-MIS/12/2015 dated 02.03.2016		Diversified Vyapar Pvt Ltd (JV Partner)				Non Operational
22	Dhunia	Granite	7.64	7.64	521-C&I/D dt. 29.03.1994	Not Granted	Diversified Vyapar Pvt Ltd (JV Partner)	Upto Lease Date	NA	0.279 Cubic Metre	Non Operational
23	Boro Panjania	Granite	38.09	38.09	142-MM-243/03/M2, dt. 09.03.2004		Diversified Vyapar Pvt Ltd (JV Partner)	Upto Lease Date	27.07.2017	8.47 Million tonne	Non Operational
24	Senera	Granite	18.4	18.4	446-CI/Dt. 18.03.1994		Diversified Vyapar Pvt Ltd (JV Partner)	Do	14.09.2017	0.292 Million Cu. Metre	Non Operational

Sl. No.	Name of the Mine	Name of the Mineral	Area in Acre	Vested / Govt. Land (in Acre)	Grant Order	Lease executed on	Name of the MDOP	E.C. Validity	Year of Contract	Mineral Reserve	Status
25	Turga mine in Kudna and Baghmundi Mouza	Granite	721.548		362-ICE/O/MING/GEN-MIS/32/2021					10.95 million tonnes mineable reserve	

Table 11.4: List of mineral blocks of West Bengal Mineral Development & Trading Corporation Limited of the district (other than sand)

Sr. No	Name of mineral	Name of associated minerals, if any	Host rock of mineralisation	Area of mineralized zone	Mineral reserve (approx.) mentioning grade	Location for potential mineralized zones			Remarks
						Administrative block	Mouza	Coordinates	
1	Granite	NA	Country rock is granite	42.34 Acres	Approximately 0.484 Million cum (G4) reserve considering hilly part and 10 m below ground level has been assessed in this area by GSI	Hura	Bara Panjania	23°24'52.52"N, 86°30'56.81"E	Kolkata Gazette Reservation Notif. no. 420- CI/O/MDTC-MISC/005/02/MI, Dated 08.11.2002 by C&I Dept, GoWB.
2	Granite	NA	Country rock is granite	23.09 Acres	-	Hura	Bara Panjania	23°25'6.67"N, 86°31'4.07"E	Kolkata Gazette Reservation Notif. no. 420- CI/O/MDTC-MISC/005/02/MI, Dated 08.11.2002 by C&I Dept, GoWB.

Sr. No	Name of mineral	Name of associated minerals, if any	Host rock of mineralisation	Area of mineralized zone	Mineral reserve (approx.) mentioning grade	Location for potential mineralized zones			Remarks
						Administrative block	Mouza	Coordinates	
3	Granite	NA	Country rock is granite	7.26 Acres	-	Raghunathpur	Khajura	23°32’20.11”N, 86°42’32.97”E	Kolkata Gazette Reservation Notif. no. 420- CI/O/MDTC-MISC/005/02/MI, Dated 08.11.2002 by C&I Dept, GoWB.
4	Granite	NA	Country rock is granite	4.00 Acres	-	Raghunathpur	Arrah	23°30'44.87"N, 86°41'56.02"E	-
5	Granite	NA	Country rock is granite	0.70 Acres	-	Raghunathpur	Senera	23°33’04.72”N, 86°43’09.56”E	Kolkata Gazette Reservation Notif. no. 420- CI/O/MDTC-MISC/005/02/MI, Dated 08.11.2002 by C&I Dept, GoWB.
6	Granite	NA	Country rock is granite	79.30 Acres	-	Raghunathpur	Bero West	23°32'19.95"N, 86°45'36.92"E	Kolkata Gazette Reservation Notif. no. 420- CI/O/MDTC-MISC/005/02/MI, Dated 08.11.2002 by C&I Dept, GoWB.
7	Granite	NA	Country rock is granite	54.25 Acres	-	Raghunathpur	Bero West	23°32'01.14"N, 86°45'36.04"E	Kolkata Gazette Reservation Notif. no. 420- CI/O/MDTC-MISC/005/02/MI, Dated 08.11.2002 by C&I Dept, GoWB.
8	Granite	NA	Country rock is granite	30.40 Acres	-	Raghunathpur	Dhunia	23°31’42.62”N, 86°44’41.73”E	-
9	Granite	NA	Country rock is granite	156.17 Acres	-	Raghunathpur	Nanduara	23°31'20.31"N, 86°40'1.47"E	-
10	Granite	NA	Country rock is granite	5.21 Acres	-	Raghunathpur	Talsankra	23°33’29.41”N, 86°42’21.06”E	-
11	Granite	NA	Country rock is granite	214.0 Acres	-	Jhalda	Jhalda	23°22'23.27"N, 85°57'37.16"E	-

Sr. No	Name of mineral	Name of associated minerals, if any	Host rock of mineralisation	Area of mineralized zone	Mineral reserve (approx.) mentioning grade	Location for potential mineralized zones			Remarks
						Administrative block	Mouza	Coordinates	
12	Granite	NA	Country rock is granite	6.33 Acres	-	Raghunathpur	Khajura	23°32'04.15"N, 86°42'42.73"E	Kolkata Gazette Reservation Notif. no. 420- CI/O/MDTC-MISC/005/02/MI, Dated 08.11.2002 by C&I Dept, GoWB.
13	Coloured Granite	NA	Country rock is granite	19.08 Acre	To be explored	Raghunathpur-I	Dhunia, JL No. 202	23°31'11.88"N - 23°31'25.68"N & 86°44'36.16"E - 86°44'51.01"E	Geological Report prepared by WBMDTCL (G4)
14	Black Stone / Granite	NA	Granite gneiss	15.70 Acre	To be explored	Santuri	Kalipahari, JL No. 93	23°31'4.42"N - 23°31'12.73"N & 86°52'41.38"E - 86°52'53.59"E	
15	Coloured Granite	NA	Country rock is granite	37.91 Acre	To be explored	Purulia-II	Sindurpur, JL No. 111	23°24'53.21"N - 23°25'10.10"N & 86°30'38.66"E - 86°30'56.53"E	
16	Black Granite / Black Stone	NA	Medium to high grade metamorphic rocks	38.43 Acre	To be explored	Hura	Manguria-Lalpur, JL No. 72	23°15'47.97"N - 23°16'4.53"N & 86°38'30.23"E - 86°38'30.23"E	Geological Report prepared by WBMDTCL (G4); GSI report on Detailed survey for Dimension Stone in parts of Purulia, Bankura and Birbhum districts, West Bengal by Niroj Kumar

Sr. No	Name of mineral	Name of associated minerals, if any	Host rock of mineralisation	Area of mineralized zone	Mineral reserve (approx.) mentioning grade	Location for potential mineralized zones			Remarks
						Administrative block	Mouza	Coordinates	
17	Black Granite / Black Stone	NA	Medium to high grade metamorphic rocks	26.06 Acre	To be explored	Hura	Manguria-Lalpur, JL No. 72	23°15'39.68"N - 23°15'58.72"N & 86°38'57.66"E - 86°39'11.81"E	Sarkar and Tapan Ghosh, Year: 2000
18	Black Granite / Black Stone	NA	Medium to high grade metamorphic rocks	34.152 Acre	To be explored	Hura	Manguria-Lalpur, JL No. 72	23°15'26.13"N - 23°15'36.19"N & 86°38'36.06"E - 86°39'8.48"E	
19	Coloured Granite	NA	Country rock is granite	216.852 Acre	To be explored	Jhalda-I	Bansa, JL No. 35	23°22'38.86"N - 23°23'11.99"N & 85°55'21.12"E - 85°56'6.81"E	
20	Quartz - Feldspar	NA	Pegmatite & Quartz vein	-	To be explored	Kotshila	Jabor (JL: 176)	-	Exploration work will be carried out for Quartz & Feldspar within these 19 areas by WBMDTCL for subsequent reservation
21	Quartz - Feldspar	NA	Pegmatite & Quartz vein	-	To be explored	Kotshila	Khatanga (JL: 191)	-	
22	Quartz - Feldspar	NA	Pegmatite & Quartz vein	-	To be explored	Kotshila	Simni (JL: 211)	-	
23	Quartz - Feldspar	NA	Pegmatite & Quartz vein	-	To be explored	Barabazar	Berada (JL: 104)	-	

Sr. No	Name of mineral	Name of associated minerals, if any	Host rock of mineralisation	Area of mineralized zone	Mineral reserve (approx.) mentioning grade	Location for potential mineralized zones			Remarks
						Administrative block	Mouza	Coordinates	
24	Quartz - Feldspar	NA	Pegmatite & Quartz vein	-	To be explored	Barabazar	Hetyakol (JL: 03)	-	
25	Quartz - Feldspar	NA	Pegmatite & Quartz vein	-	To be explored	Bandwan	Barakarma (JL: 48)	-	
26	Quartz - Feldspar	NA	Pegmatite & Quartz vein	-	To be explored	Bandwan	Kukurdabar (JL: 56)	-	
27	Quartz - Feldspar	NA	Pegmatite & Quartz vein	-	To be explored	Boro	Haridi (JL: 213)	-	
28	Quartz - Feldspar	NA	Pegmatite & Quartz vein	-	To be explored	Boro	Kendjore (JL: 310)	-	
29	Quartz - Feldspar	NA	Pegmatite & Quartz vein	-	To be explored	Boro	Sindradih (JL: 231)	-	
30	Quartz - Feldspar	NA	Pegmatite & Quartz vein	-	To be explored	Manbazar -II	Jamgoria (JL: 44)	-	
31	Quartz - Feldspar	NA	Pegmatite & Quartz vein	-	To be explored	Manbazar -II	Basantapur (JL: 197)	-	
32	Quartz - Feldspar	NA	Pegmatite & Quartz vein	-	To be explored	Manbazar -II	Jogda (JL: 190)	-	
33	Quartz - Feldspar	NA	Pegmatite & Quartz vein	-	To be explored	Manbazar -II	Kalapati (JL: 315)	-	

Sr. No	Name of mineral	Name of associated minerals, if any	Host rock of mineralisation	Area of mineralized zone	Mineral reserve (approx.) mentioning grade	Location for potential mineralized zones			Remarks
						Administrative block	Mouza	Coordinates	
34	Quartz - Feldspar	NA	Pegmatite & Quartz vein	-	To be explored	Santuri	Manjuri (JL: 60)	-	
35	Quartz - Feldspar	NA	Pegmatite & Quartz vein	-	To be explored	Santuri	Tarabari (JL: 65)	-	
36	Quartz - Feldspar	NA	Pegmatite & Quartz vein	-	To be explored	Santuri	Ambari (JL: 63)	-	
37	Quartz - Feldspar	NA	Pegmatite & Quartz vein	-	To be explored	Barabhum	Taladihi (JL: 209)	-	
38	Quartz - Feldspar	NA	Pegmatite & Quartz vein	-	To be explored	Hura	Pirrah (JL: 09)	-	



11.4 Exploration requirement of the district

The scope of sand Exploration in this district is very high. Therefore, there is a need for scientific sand mining process establishment. District also has considerable in-situ minor mineral deposits; however, extent of these deposits is not well established. Therefore, it is highly recommended to conduct detailed exploration (G2 level) to establish mineral resources of the district.

12 Remedial measure to mitigate the impact of Mining

12.1 Environmental Sensitivity

The district landform 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.

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

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



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 of beaches and river bank and makes the ecosystem unstable. If there are popular tourist destination, tourism potential of such areas will decline.

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

12.3 Remedial measure

12.3.1 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.

12.3.2 Monitoring the Mining of Mineral and its Transportation:

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

12.3.3 Noise Management:

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

12.3.4 Air Pollution and Dust Management:

- The pollution due to transportation load on the environment will be effectively controlled and water sprinkling will also be done regularly.



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

12.3.5 Bio-Diversity Protection:

- Restoration of flora affected by mining should be done immediately. Five times the number of trees destroyed by mining to be planted preferably of indigenous species. Each EC holder shall have to undertake plantation of trees over at least 20% of the total area of lease in the same plot or plots utilised for such working.
- No mining lease shall be granted in the forest area without forest clearance in accordance with the provisions of the Forest Conservation Act, 1980 and the rules made there under.
- Protection of natural home of any wild animal shall have to be ensured.
- No felling of tree near quarry is allowed. For mining lease within 10km of the National Park / Sanctuary or in Eco-Sensitive Zone of the Protected Area, recommendation of Standing Committee of National Board of Wild Life (NBWL) has to be obtained as per the Hon'ble Supreme Court order in I.A. No. 460 of 2004.
- Spring sources should not be affected due to mining activities. Necessary protection measures are to be incorporated.

12.3.6 Management of Instability and Erosion:

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

12.3.7 Waste Management:

- Site clearance and tidiness is very much needed to have less visual impact of mining.



- Dumping of waste shall be done in earmarked places as approved in Mining Plan.
- Rubbish burial shall not be done in the rivers.

12.3.8 Pollution Prevention:

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

12.3.9 Protection of Infrastructure:

- Mining activities shall not be done for mine lease where mining can cause danger to site of flood protection works, places of cultural, religious, historical, and archeological importance.
- For carrying out mining in proximity to any bridge or embankment, appropriate safety zone should be worked out on case to case basis, taking into account the structural parameters, location aspects and flow rate, and no mining should be carried out in the safety zone so worked out.
- Mining shall not be undertaken in a mining lease located in 200-500 meter of bridge, 200 meter upstream and downstream of water supply / irrigation scheme, 100 meters from the edge of National Highway and railway line, 50 meters from a reservoir, canal or building, 25 meter from the edge of State Highway and 10 meters from the edge of other roads except on special exemption by the Sub-Divisional level Joint Inspection Committee.

13 Suggested reclamation plan for already mined out areas

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

a) A baseline survey of river cross section. The study of cross section is basis for delineating channel form. Cross-sections must be surveyed between two monumented endpoints set on the river banks, and elevations should be referenced based on benchmark set in the area;

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

c) The cross-section of the replenished bar should be the same as the baseline data. This illustrates that the bar elevation after the bar is replenished will be the same as the bar before extraction;

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

e) A planting plan developed by a plant ecologist familiar with the flora of the river for any areas such as roads that need to be restored;

f) Each EC holder shall have to undertake plantation of trees over at least 20% of the total area of the plot or plots of land as subject to such working in accordance with a plan approved by the concerned Divisional Forest Officer holding jurisdiction, provided further the competent authority i.e, The Divisional Forest Officer may fix up norms for plantation of trees in a particular area regarding choice of species, spacing, no's of trees and maintenance etc.

g) A monitoring plan has to establish.

14 Risk assessment & disaster management plan

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

14.1 Identification of risk due to river sand mining

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

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

14.2 Mitigation measures

14.2.1 Measures to prevent accidents during loading and transportation:

- During the loading 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.

14.2.2 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.

14.2.3 Measures for mitigation to quick sand condition:

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

14.3 Disaster management plan

As the depth of mining will be maximum of 3m below the surface level considering local condition, the risk related to mining activity is much less. The mining operation will be carried out under the supervision of experienced and qualified Mines Manager having Certificate of Competency to manage the mines granted by DGMS. All the provisions of Mines Act 1952, MMR 1961 and MinesRules 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.

15 Conclusion and Recommendation

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.

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.

Purulia district is a part of Chhotanagpur Gneissic Complex (CGC) of Eastern Indian Peninsular Shield, lying to the north of Singbhum Craton. Geological set up of Purulia district shows that the district is underlain by Pre-Cambrian Metamorphic except in some parts of northeast where Gondwana sediments predominate. The hilly terrain situated abound the western part of the district while plains gradually appear to the east. Absolute relief increases towards the west and south. General elevation of the district ranges from 70 m to 720 m

The district is characterized by humid tropical monsoon climate. The average annual rainfall in the district is 1386mm (2016-2020).

Northern part of the district falls under Zone III which is classified as a Moderate Damage Risk Zone while southern part of the district falls under the Seismic Zone II.

Meta-dolerites, quartz veins, limestone deposits, china clay deposits, glass sands, mica deposits, talc and steatite deposits reported from Khusbani, Pukulunkata, Haludbani of Purulia and dimension stones derived from Chhotanagpur Granite Gneissic complexes are all together forming the minerals resources of the district. 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 has been incorporated in the report.

The district is generating considerable revenue from mining of riverbed sand deposits. Revenue generated in the district from minor minerals during the period of 2016 to January 2019 is Rs. 9.37 crores.

The district has an upside potential for development of riverbed sand. The occurrence has been reported by Directorate of Mines and Minerals, Government of West Bengal and others in previous instances. It requires further systematic and scientific approach to quantify the resource along with their grade assessment. The occurrences are mostly observed in the river Damodar, Dwarakeswar, Kangsabati Kumari and Subarnarekha. This report also recommends undertaking detail exploration (G2 level) program to assess the mineral occurrences of the district and should have a proper development and production plan for the specified minerals.

15.1 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 surveys 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 96.0 to 98.2% in the district and for theoretical replenishment study based on mining lease shows variation from 72% to 78% with an average of 75.3% of replenishment rate in the district.

V. The total potential river bed deposit for the district comes to about 9.19 Mcum.

VI. In the district a total 111 in-situ minor mineral potential block have been identified.

15.2 Recommendation:

1. The mining lease distribution for the district must be carried out by involving a district level committee constituted with inter-disciplinary members of various departments including irrigation and waterways, DL&LRO, forest, biodiversity, wetland management, SWID or any other relevant department which the district authority may find suitable to include.
2. While recommending for Mining Leases, the District Level Committee should ensure the protection of Biodiversity Zones as recorded by relevant Government Agenesis from time to time.
3. During finalization of mining leases for the district, strict adherence of Supreme Court orders No 1501 dated 03/06/2022 should be followed.
4. Efforts should be given to restrict distribution of mining leases along the confluence zone of the rivers where rich aquatic habitats are reported.
5. Since the state of West Bengal has royalty system in volumetric measurement, specific gravity for sand and gravel has not been determined during this study. However, during the finalization of mining lease if it is found necessary to conduct such test may be initiated by the state government on case-to-case basis.
6. It is recommended to have a periodical review along with primary data collection during pre- and post-monsoon periods to record the seasonal variance of the sedimentation rate on annual basis and update replenishment rate of the district.

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PLATE 1

DRAINAGE MAP OF THE DISTRICT

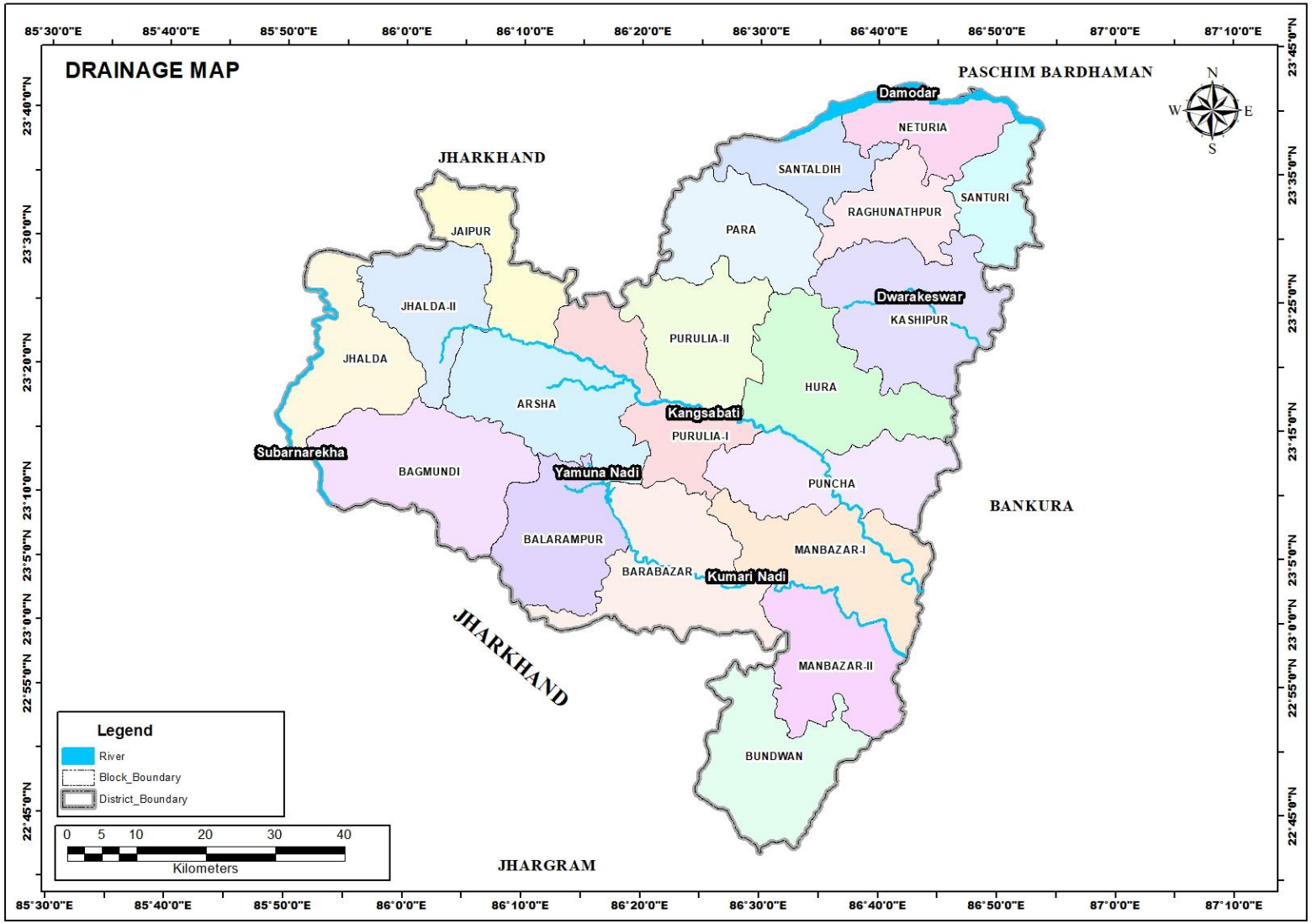
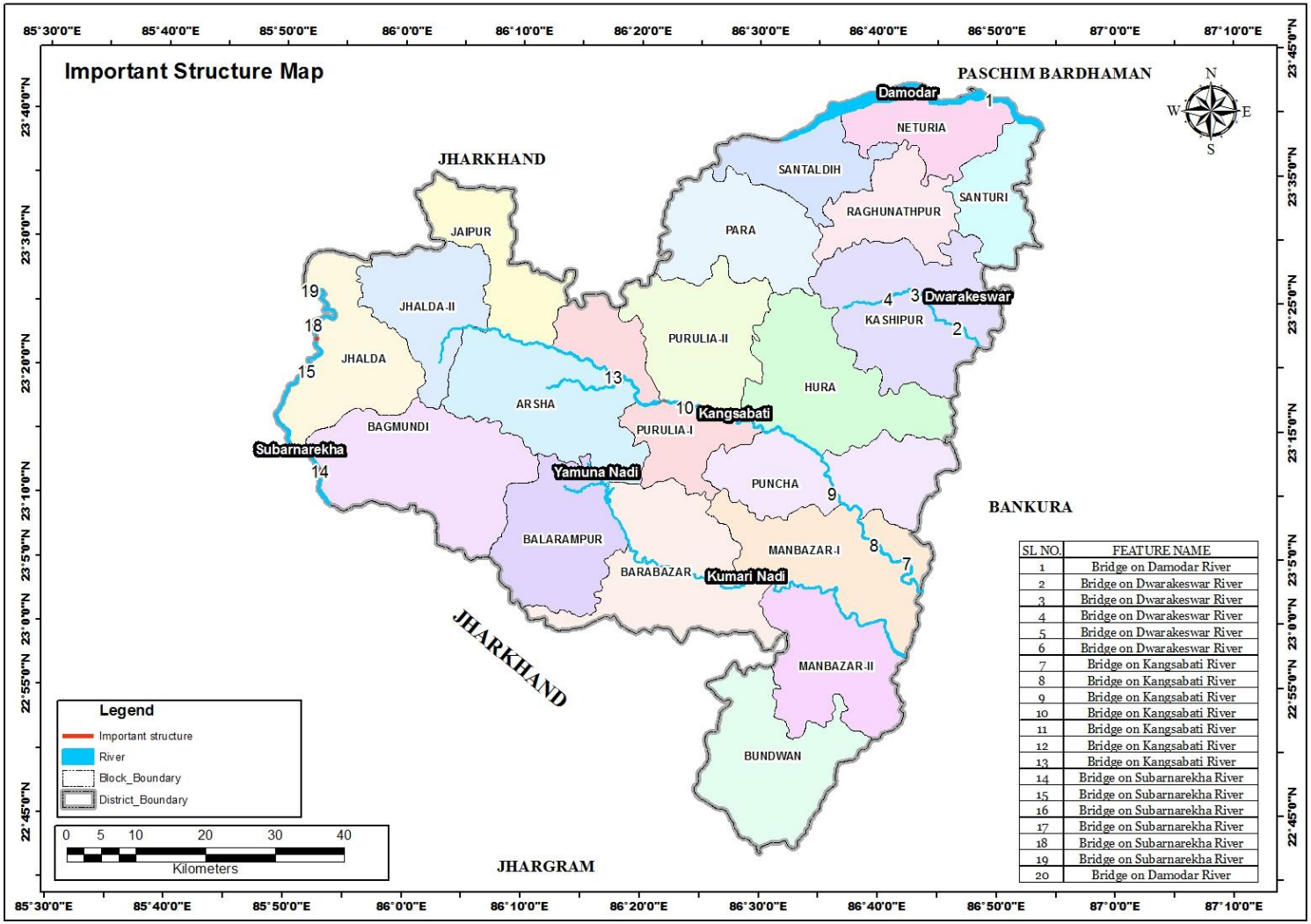


Plate 1A: Drainage Map of the District *(Source: National Informatics Centre -NIC Website, Sept 2020)*



SL NO.	FEATURE NAME
1	Bridge on Damodar River
2	Bridge on Dwarakeswar River
3	Bridge on Dwarakeswar River
4	Bridge on Dwarakeswar River
5	Bridge on Dwarakeswar River
6	Bridge on Dwarakeswar River
7	Bridge on Kangsabati River
8	Bridge on Kangsabati River
9	Bridge on Kangsabati River
10	Bridge on Kangsabati River
11	Bridge on Kangsabati River
12	Bridge on Kangsabati River
13	Bridge on Kangsabati River
14	Bridge on Subarnarekha River
15	Bridge on Subarnarekha River
16	Bridge on Subarnarekha River
17	Bridge on Subarnarekha River
18	Bridge on Subarnarekha River
19	Bridge on Subarnarekha River
20	Bridge on Damodar River

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

PLATE 2A

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

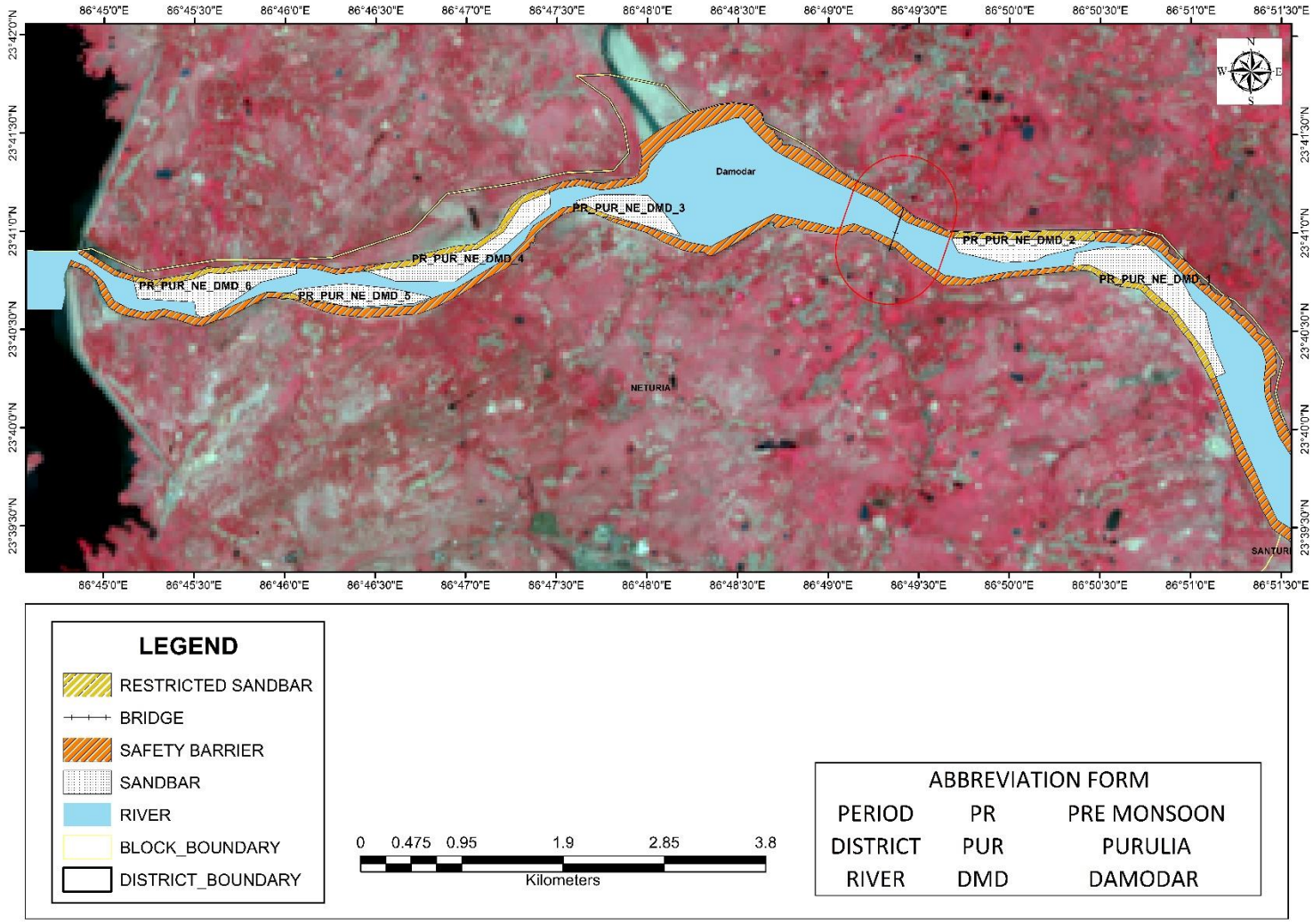


Plate 2A1: Distribution Map of Sand Bars on Damodar River During Pre-Monsoon Period of Purulia District
(Source: ISRO RESOURCE Sat 2 LISS III Sensor, 2020)

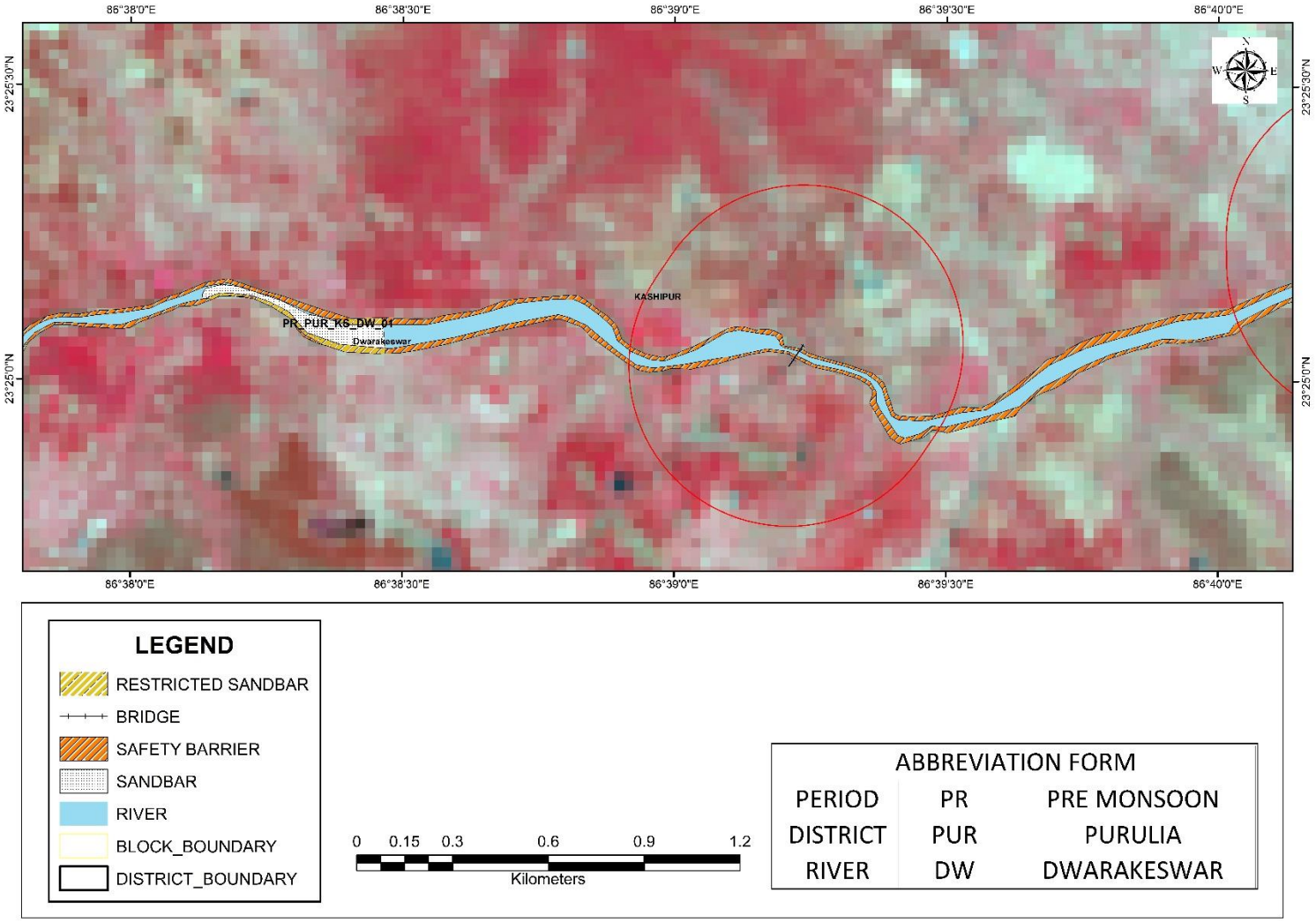


Plate 2A2: Distribution Map of Sand Bars on Dwarakeswar River During Pre-Monsoon Period of Purulia District
(Source: ISRO RESOURCE Sat 2 LISS III Sensor, 2020)

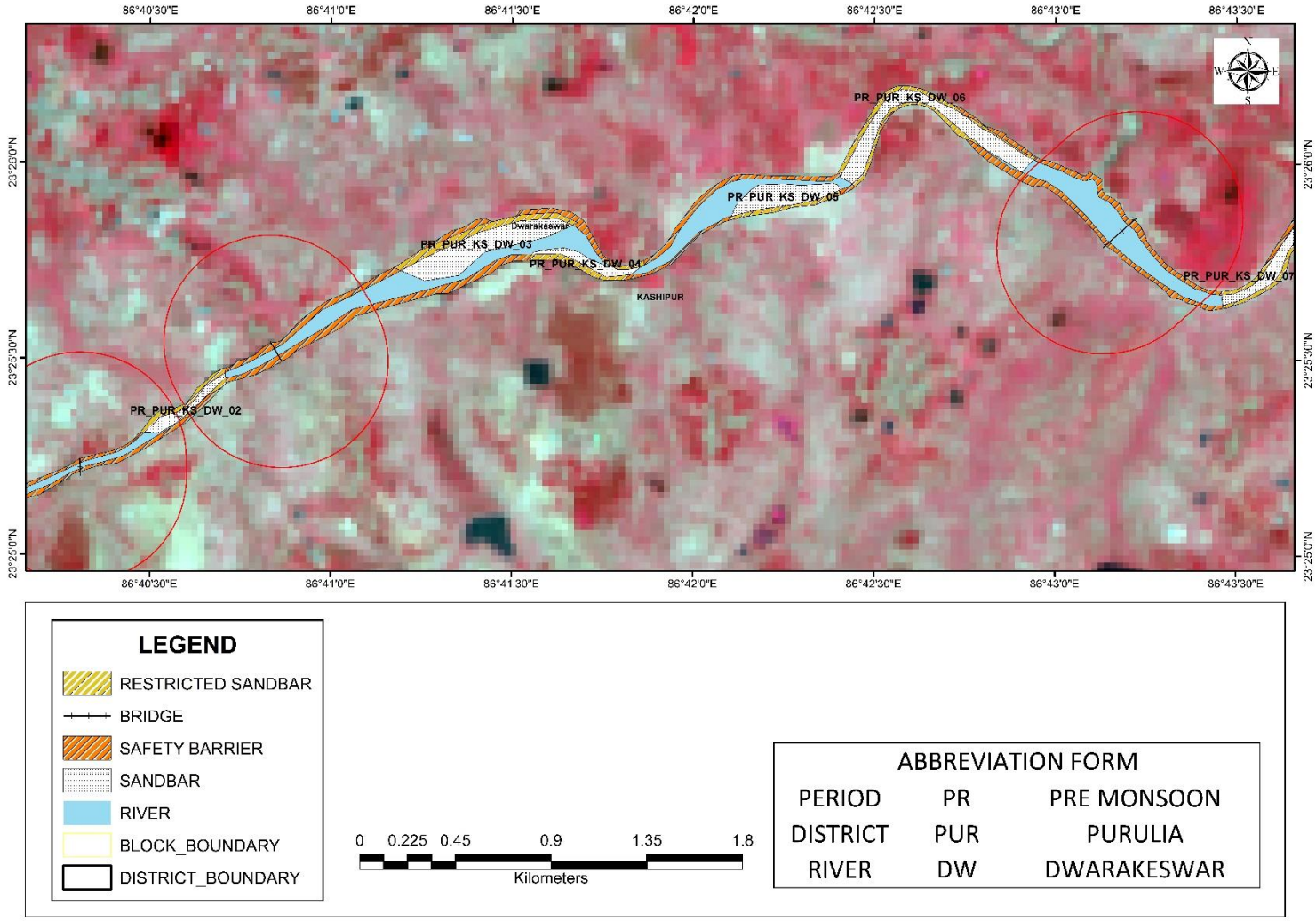


Plate 2A3: Distribution Map of Sand Bars on Dwarakeswar River During Pre-Monsoon Period of Purulia District
(Source: ISRO RESOURCE Sat 2 LISS III Sensor, 2020)

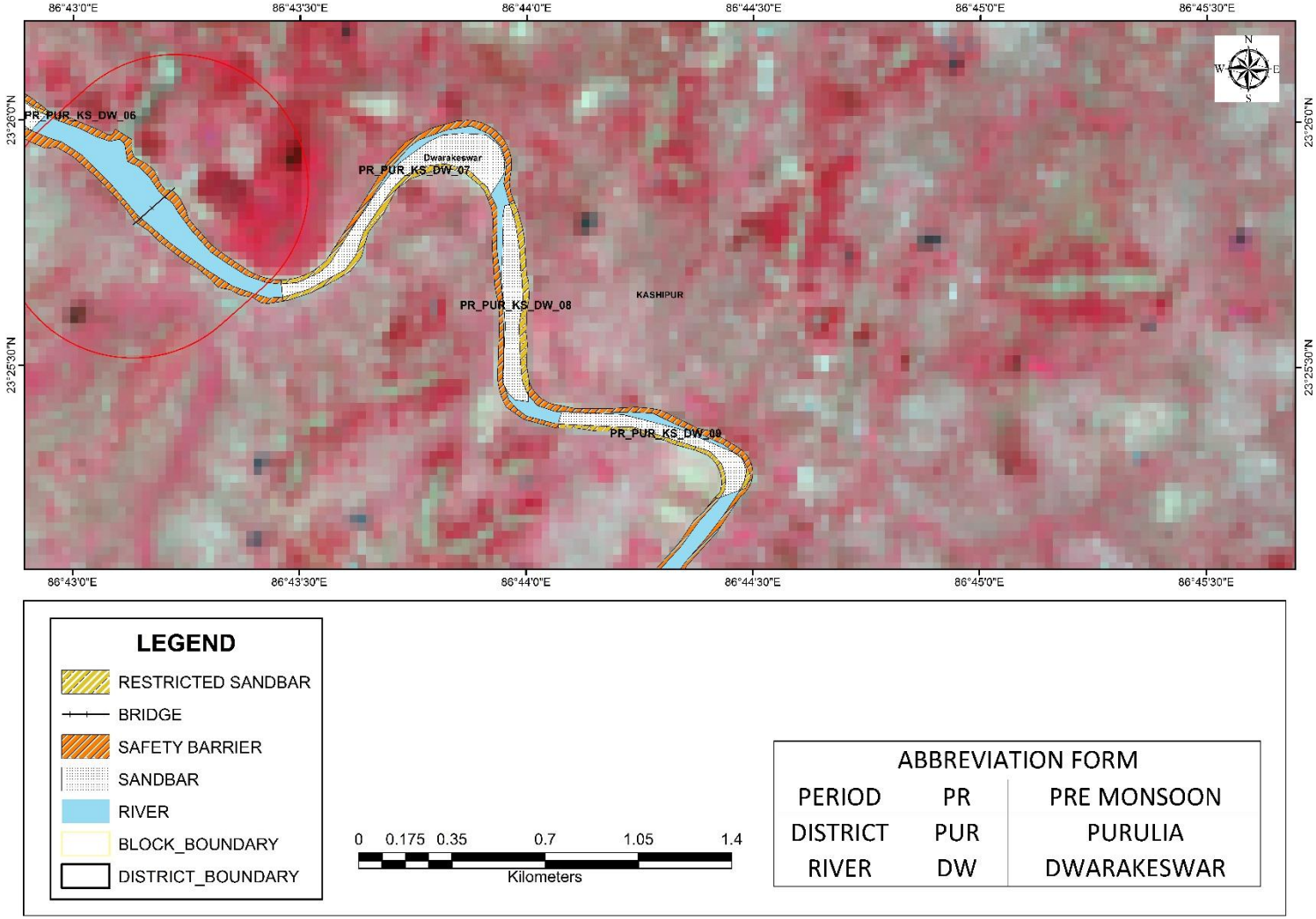


Plate 2A4: Distribution Map of Sand Bars on Dwarakeswar River During Pre-Monsoon Period of Purulia District
(Source: ISRO RESOURCE Sat 2 LISS III Sensor, 2020)

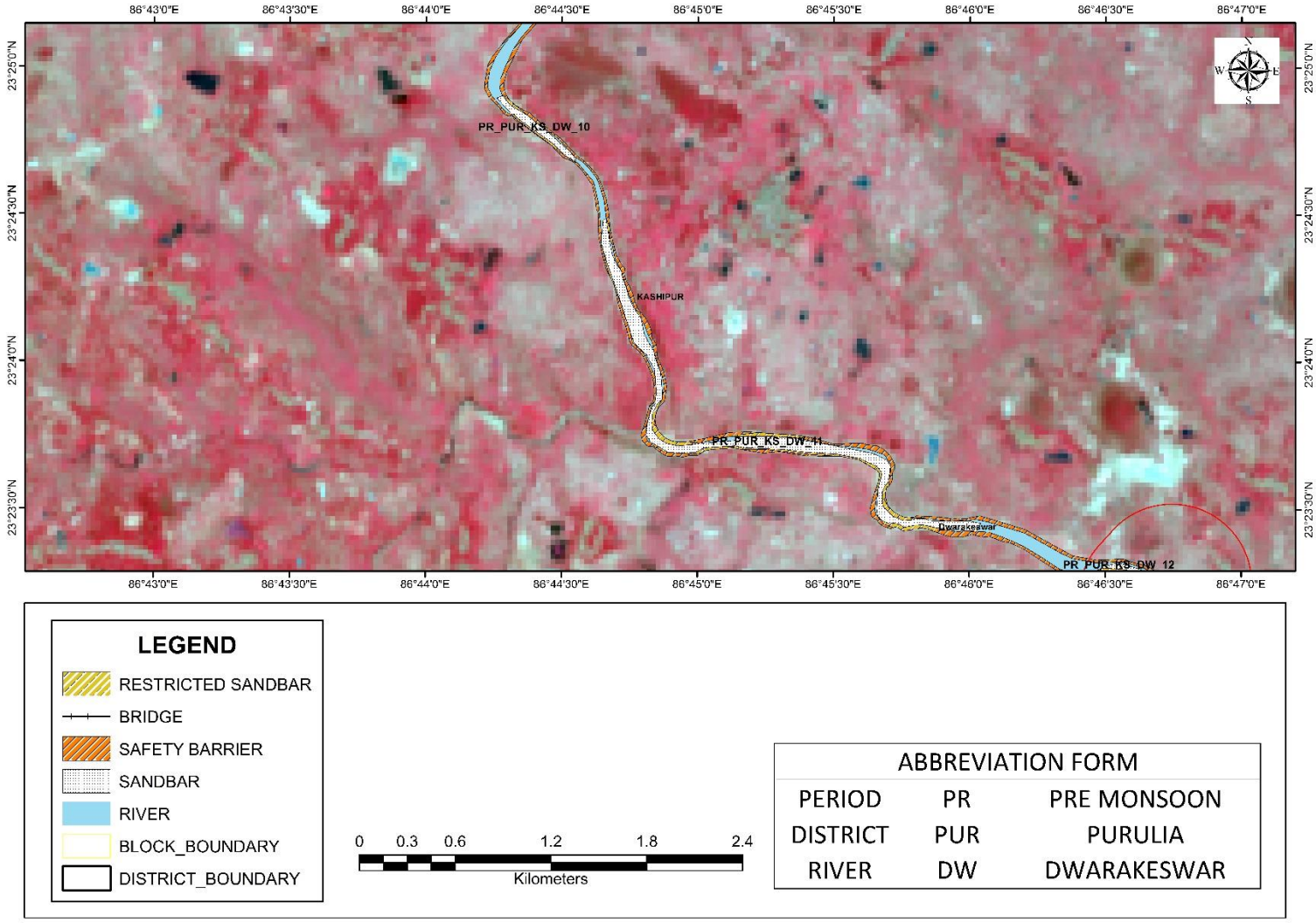


Plate 2A5: Distribution Map of Sand Bars on Dwarakeswar River During Pre-Monsoon Period of Purulia District
(Source: ISRO RESOURCE Sat 2 LISS III Sensor, 2020)

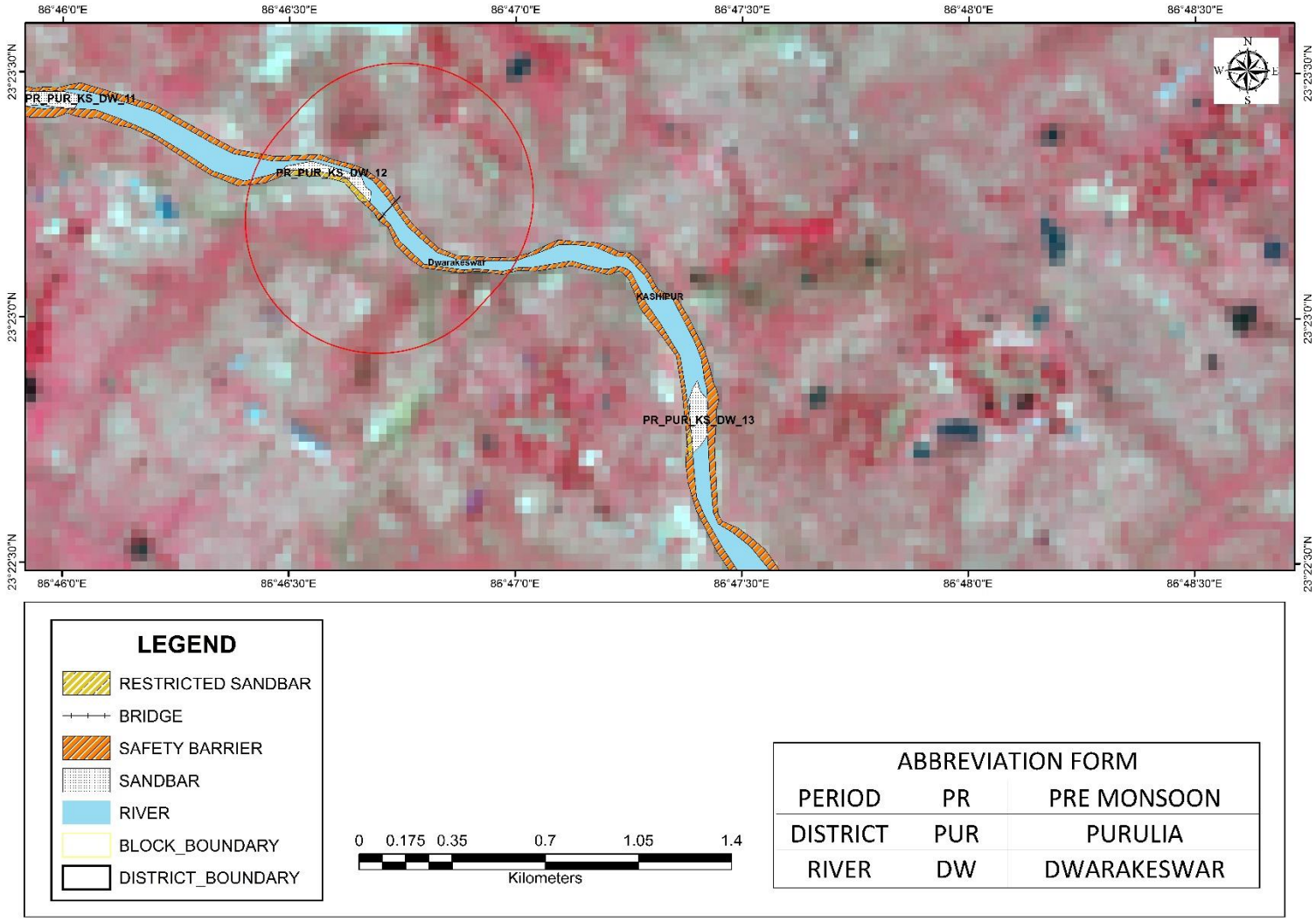


Plate 2A6: Distribution Map of Sand Bars on Dwarakeswar River During Pre-Monsoon Period of Purulia District
(Source: ISRO RESOURCE Sat 2 LISS III Sensor, 2020)

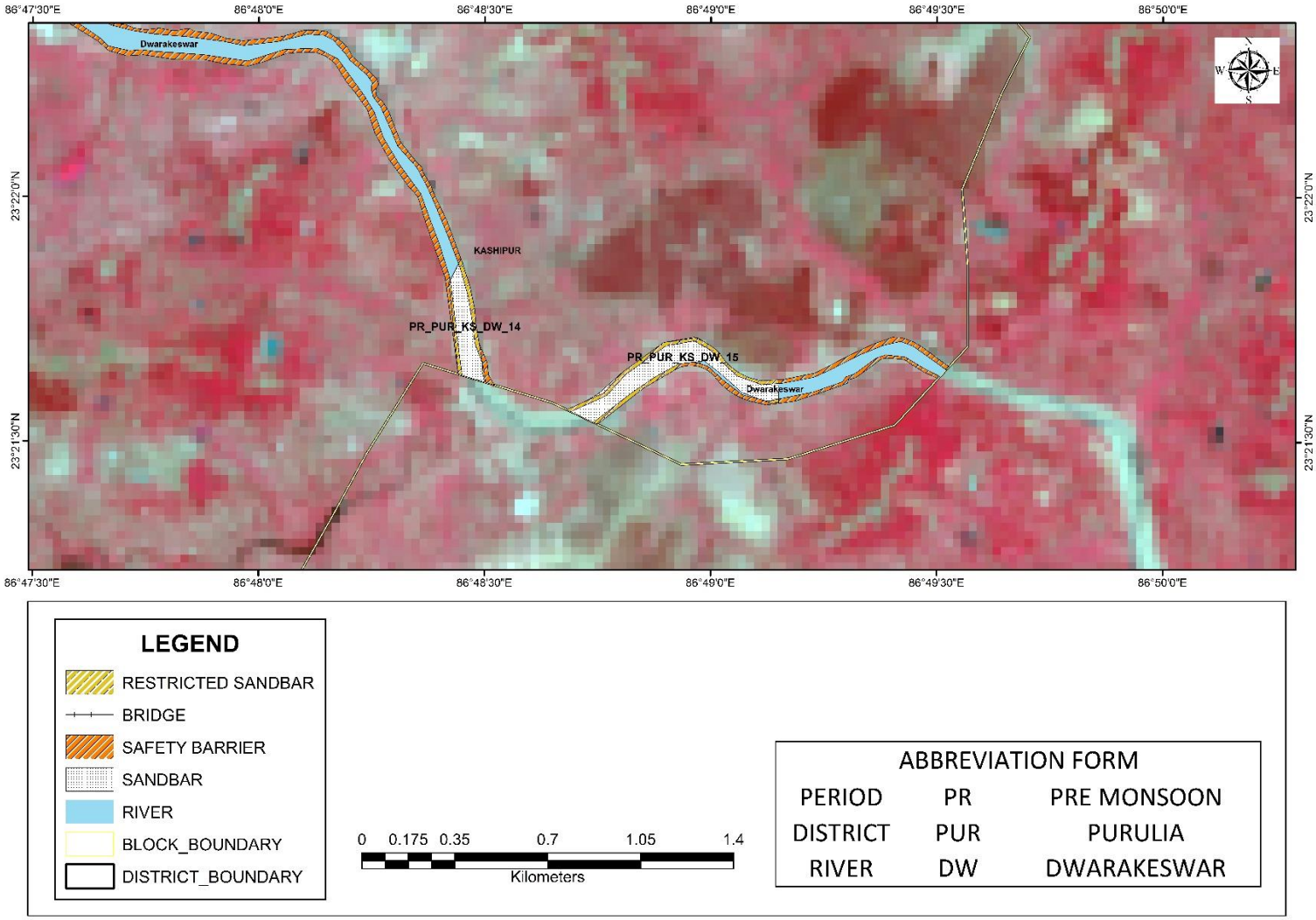


Plate 2A7: Distribution Map of Sand Bars on Dwarakeswar River During Pre-Monsoon Period of Purulia District
(Source: ISRO RESOURCE Sat 2 LISS III Sensor, 2020)

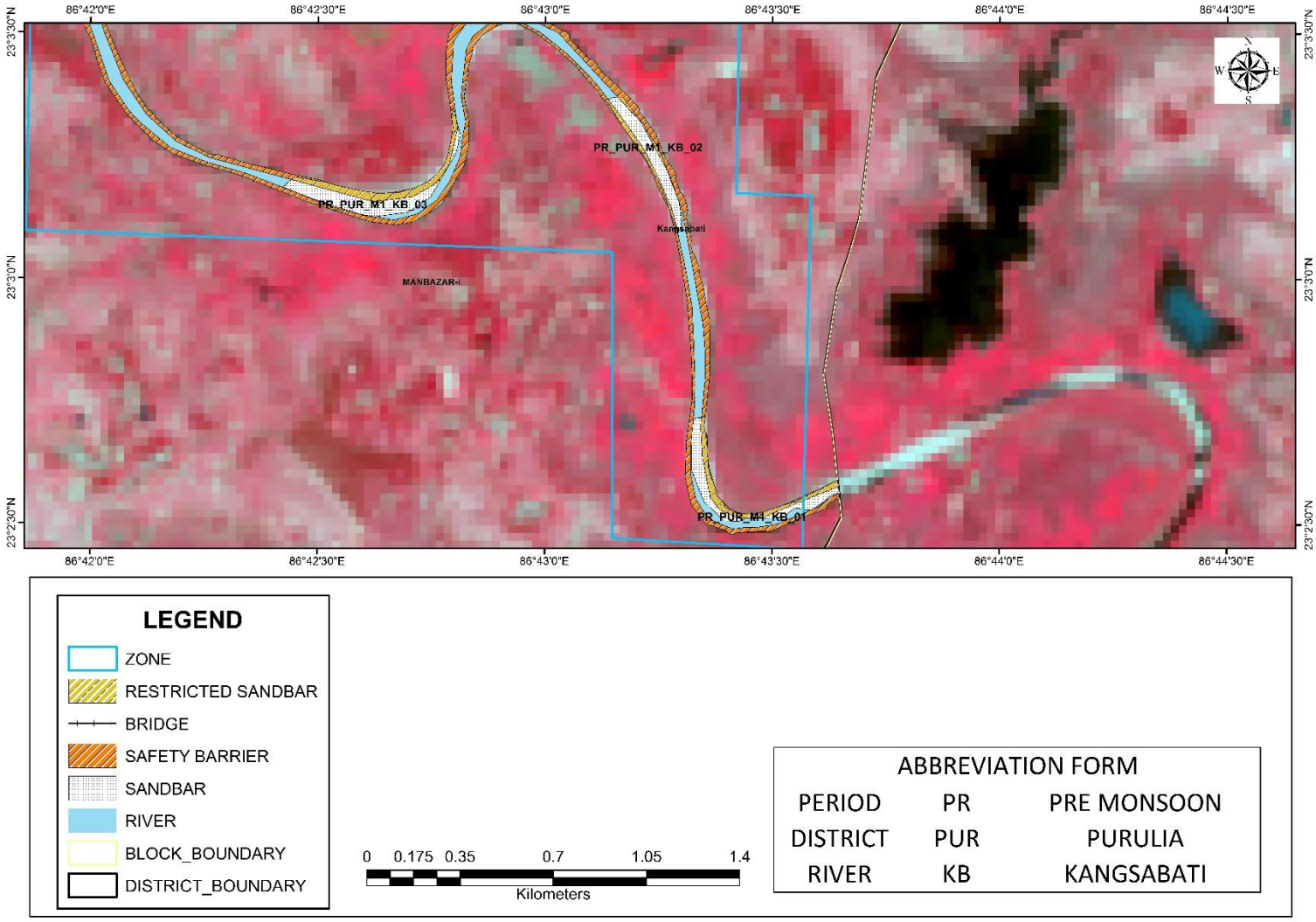


Plate 2A8: Distribution Map of Sand Bars on Kangsabati River During Pre-Monsoon Period of Purulia District
(Source: ISRO RESOURCE Sat 2 LISS III Sensor, 2020)

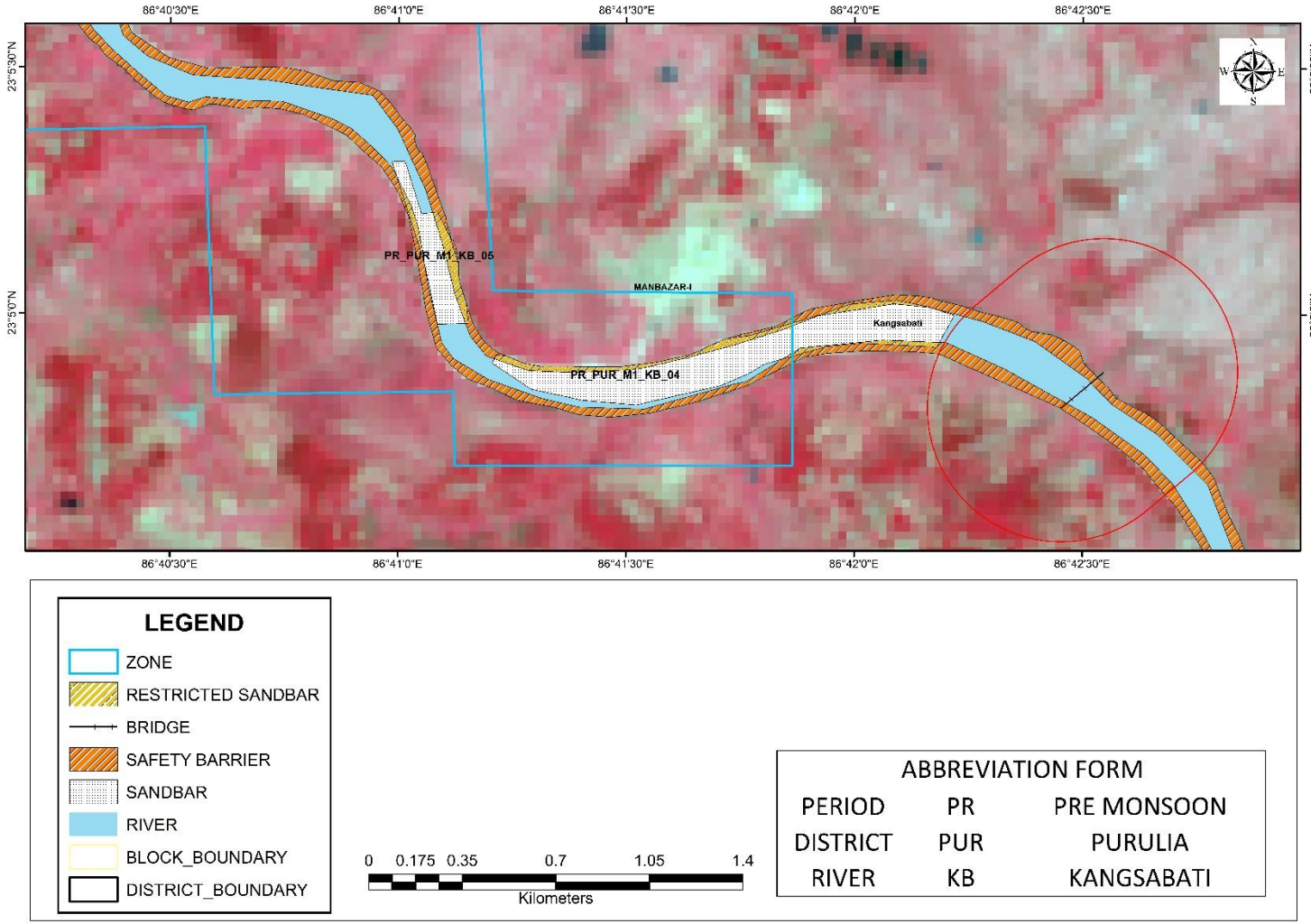


Plate 2A9: Distribution Map of Sand Bars on Kangsabati River During Pre-Monsoon Period of Purulia District
(Source: ISRO RESOURCE Sat 2 LISS III Sensor, 2020)

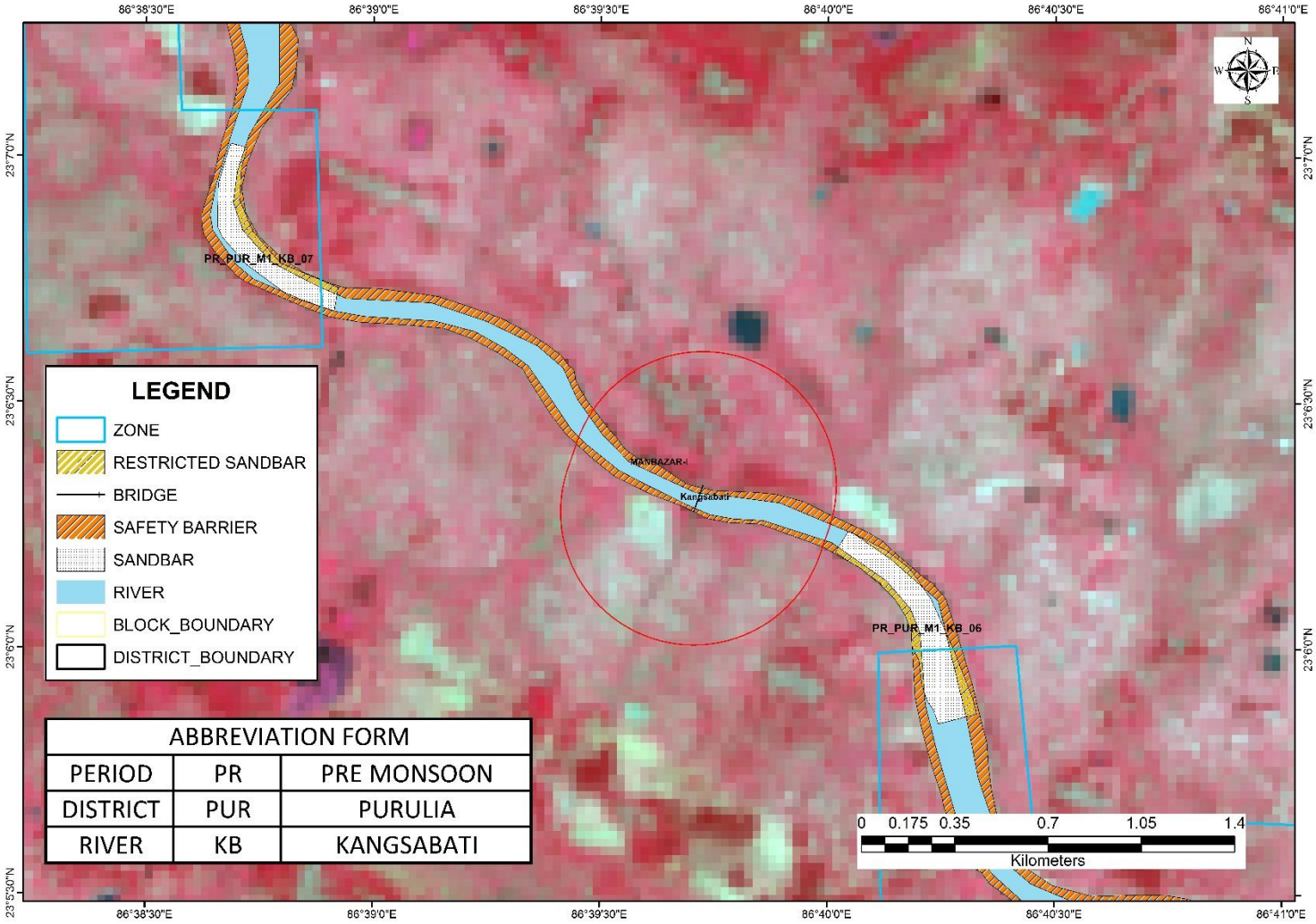


Plate 2A10: Distribution Map of Sand Bars on Kangsabati River During Pre-Monsoon Period of Purulia District
(Source: ISRO RESOURCE Sat 2 LISS III Sensor, 2020)

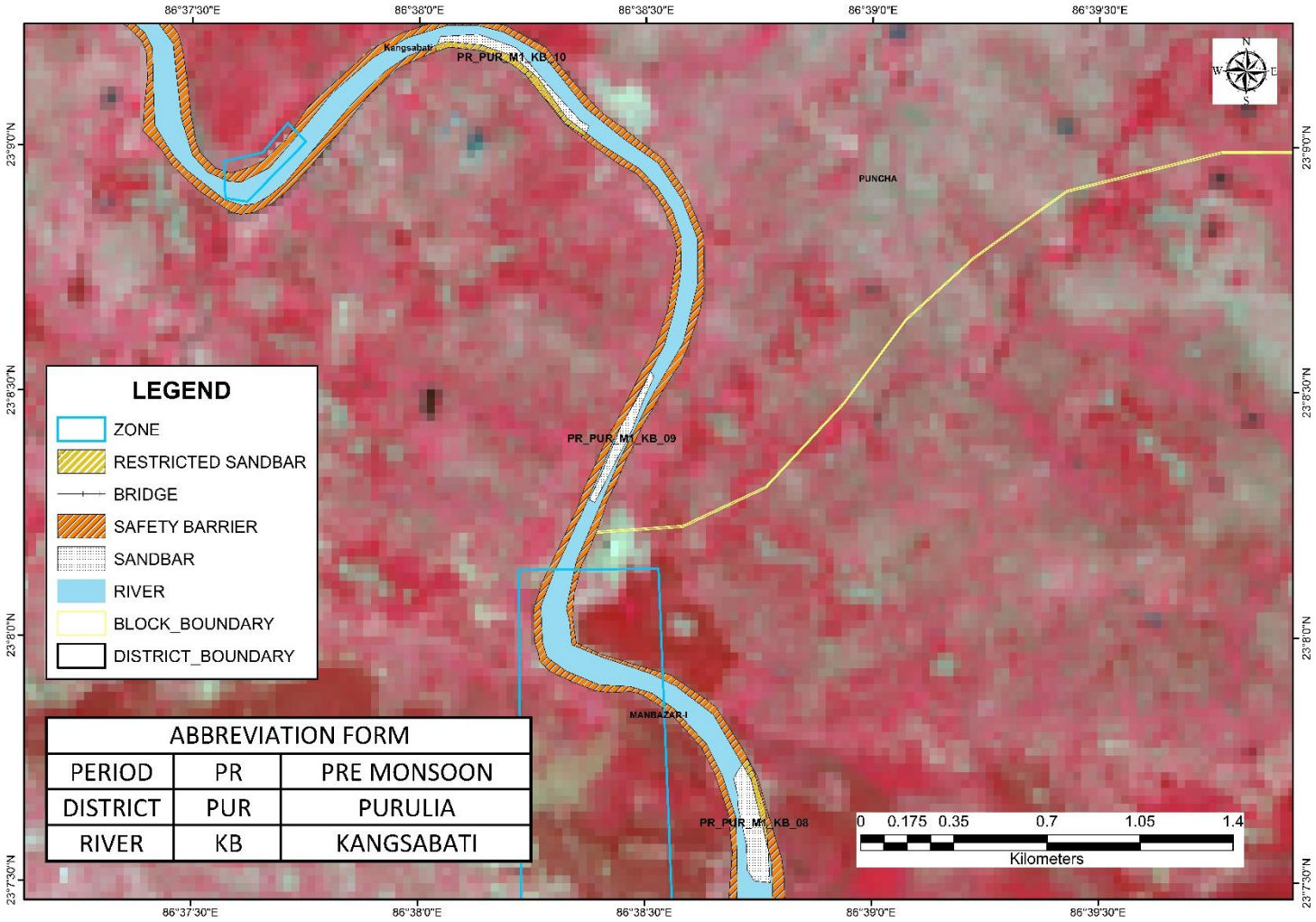


Plate 2A11: Distribution Map of Sand Bars on Kangsabati River During Pre-Monsoon Period of Purulia District
(Source: ISRO RESOURCE Sat 2 LISS III Sensor, 2020)

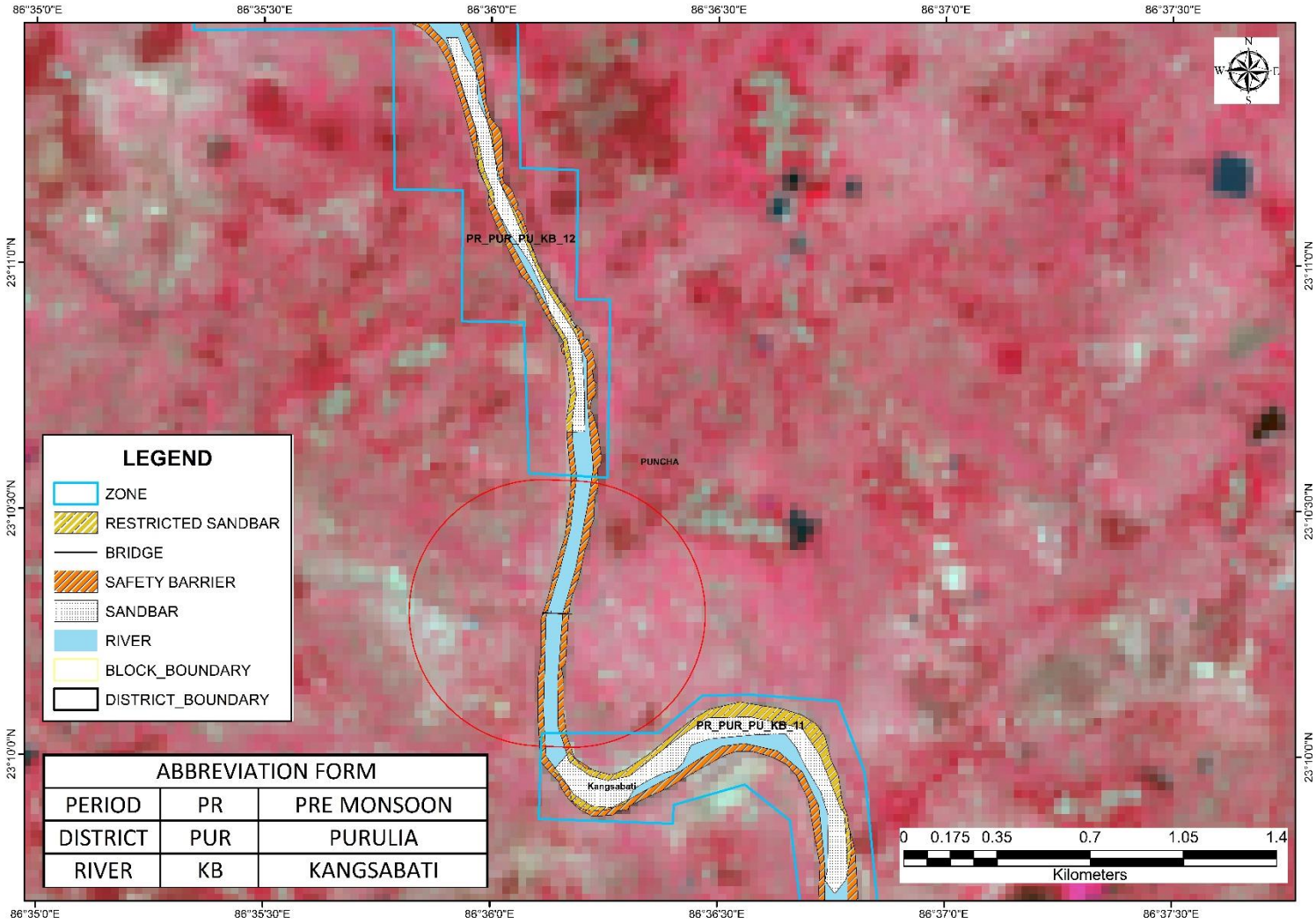


Plate 2A12: Distribution Map of Sand Bars on Kangsabati River During Pre-Monsoon Period of Purulia District
(Source: ISRO RESOURCE Sat 2 LISS III Sensor, 2020)

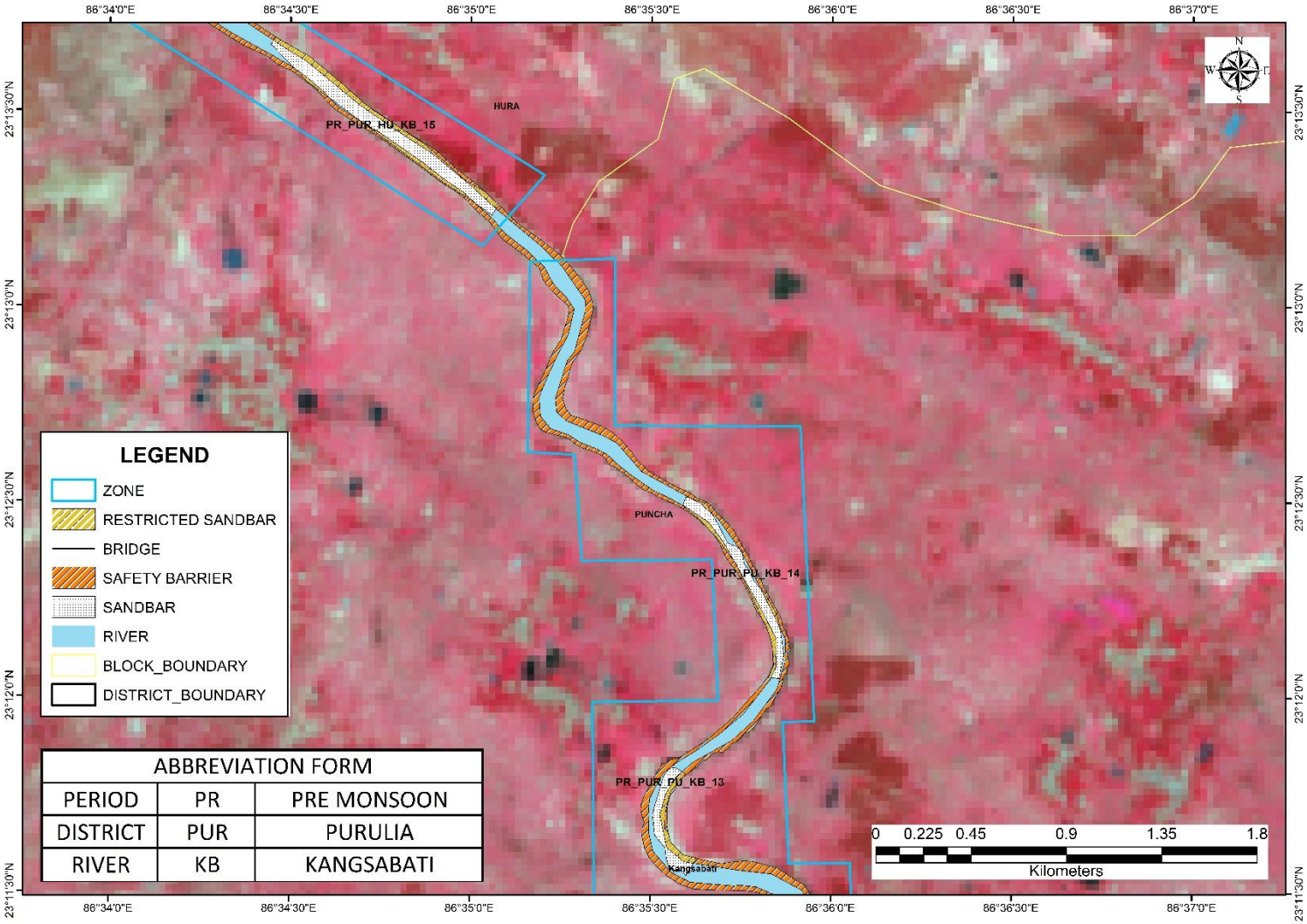


Plate 2A13: Distribution Map of Sand Bars on Kangsabati River During Pre-Monsoon Period of Purulia District
(Source: ISRO RESOURCE Sat 2 LISS III Sensor, 2020)

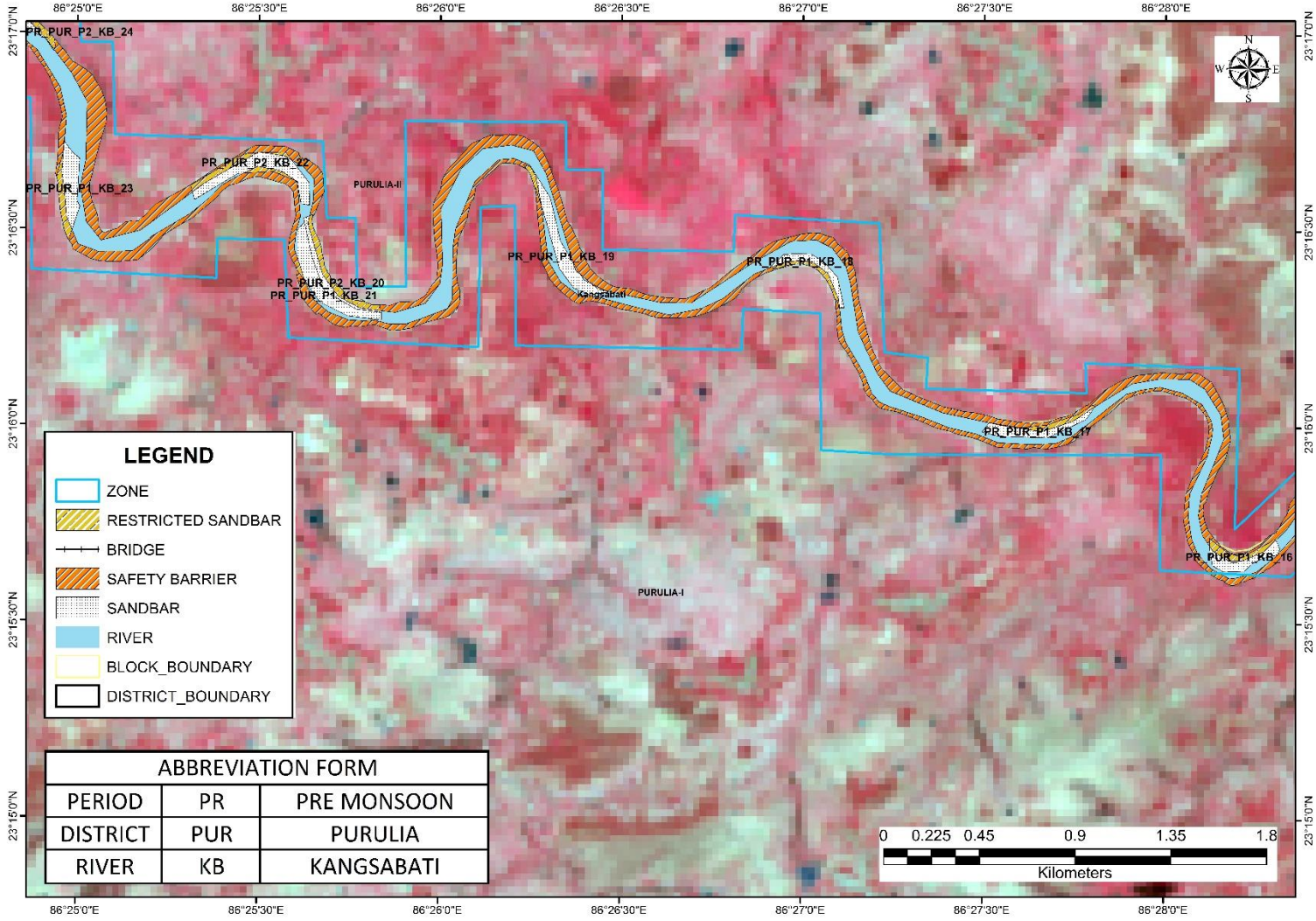


Plate 2A14: Distribution Map of Sand Bars on Kangsabati River During Pre-Monsoon Period of Purulia District
(Source: ISRO RESOURCE Sat 2 LISS III Sensor, 2020)

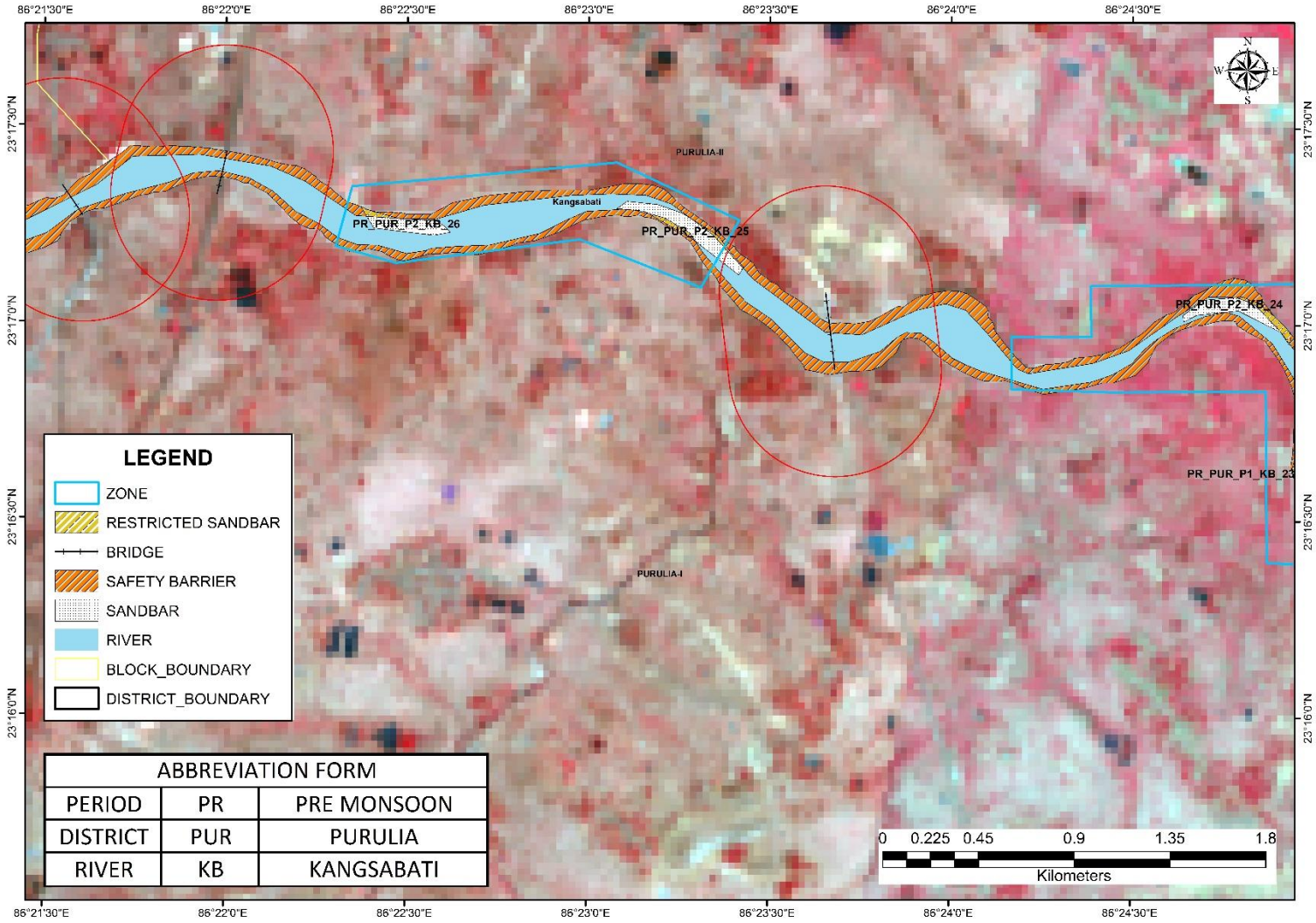


Plate 2A15: Distribution Map of Sand Bars on Kangsabati River During Pre-Monsoon Period of Purulia District
(Source: ISRO RESOURCE Sat 2 LISS III Sensor, 2020)

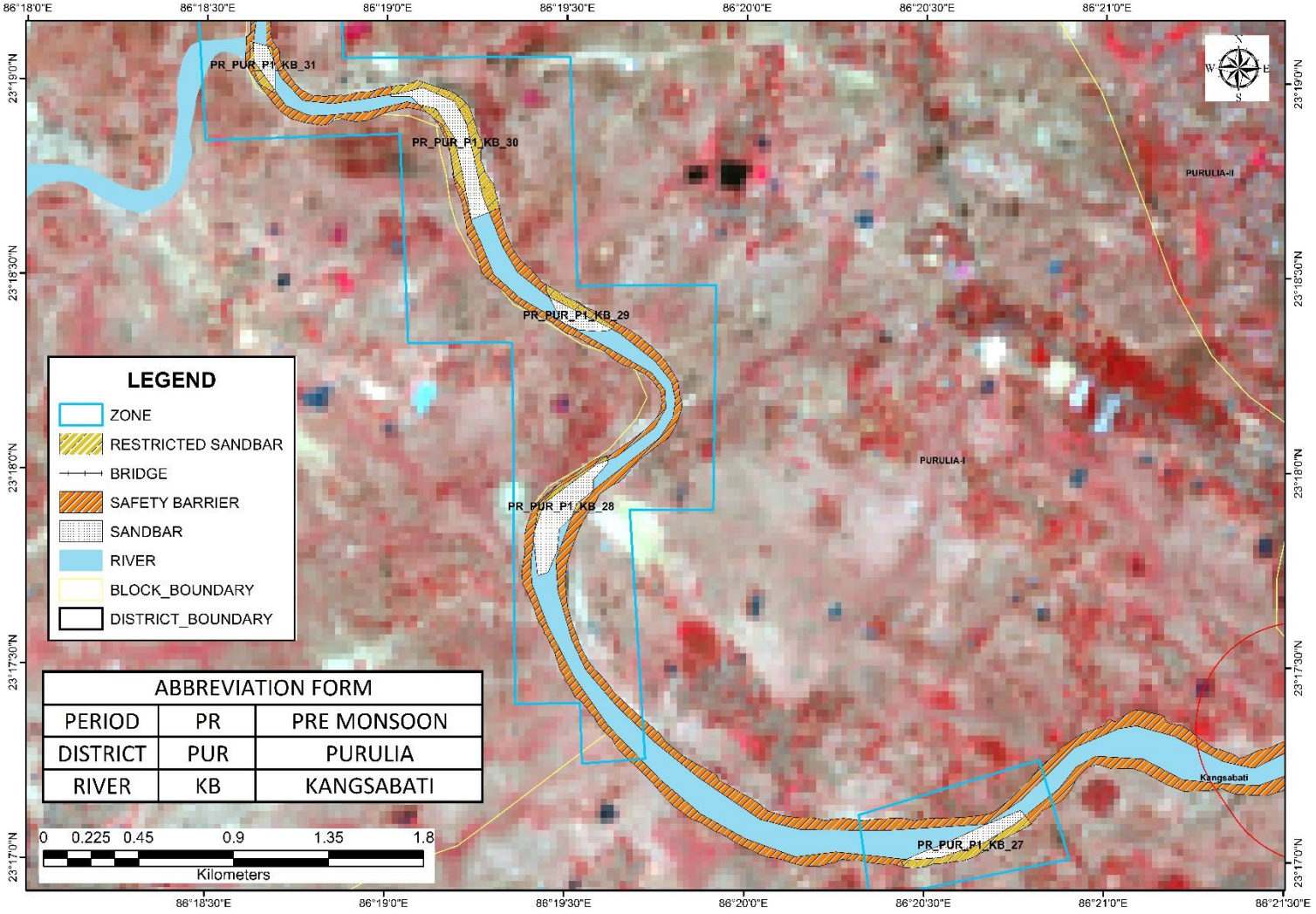


Plate 2A16: Distribution Map of Sand Bars on Kangsabati River During Pre-Monsoon Period of Purulia District
(Source: ISRO RESOURCE Sat 2 LISS III Sensor, 2020)

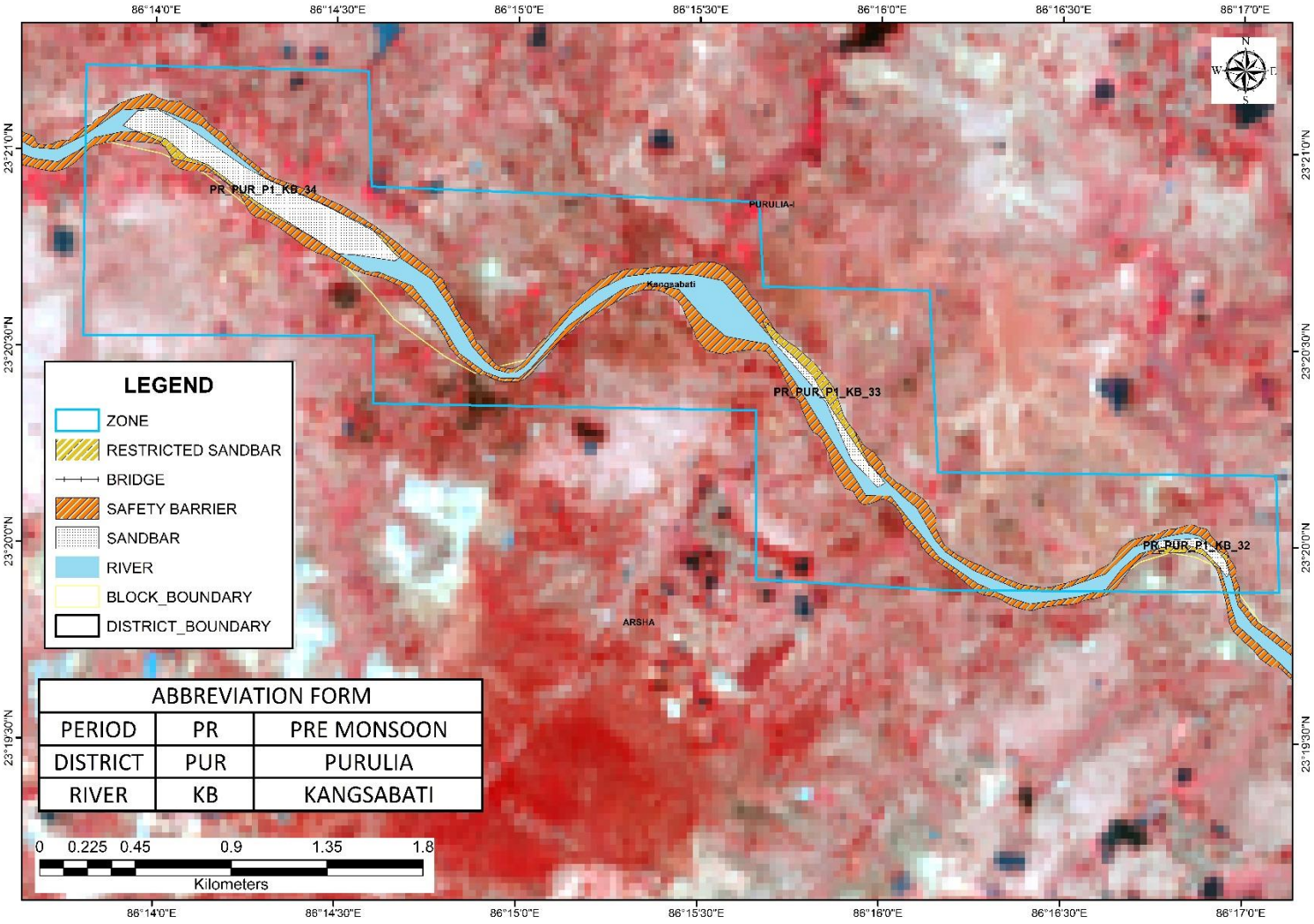


Plate 2A17: Distribution Map of Sand Bars on Kangsabati River During Pre-Monsoon Period of Purulia District
(Source: ISRO RESOURCE Sat 2 LISS III Sensor, 2020)

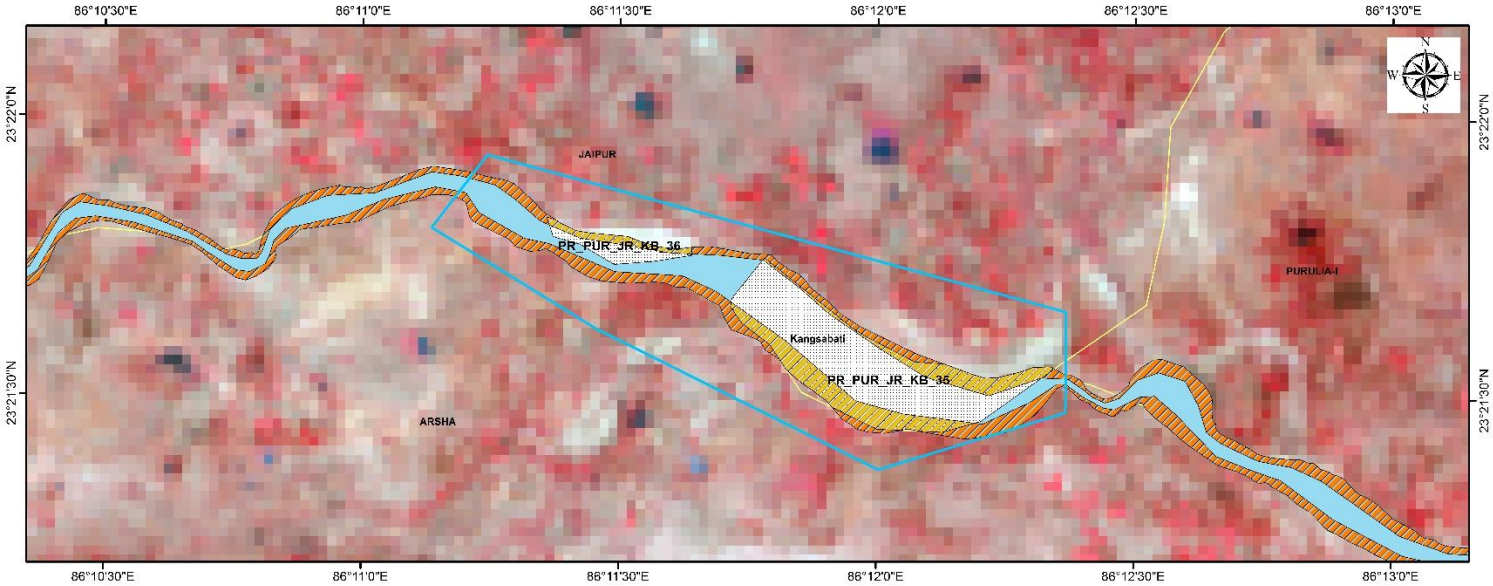


Plate 2A18: Distribution Map of Sand Bars on Kangsabati River During Pre-Monsoon Period of Purulia District
(Source: ISRO RESOURCE Sat 2 LISS III Sensor, 2020)

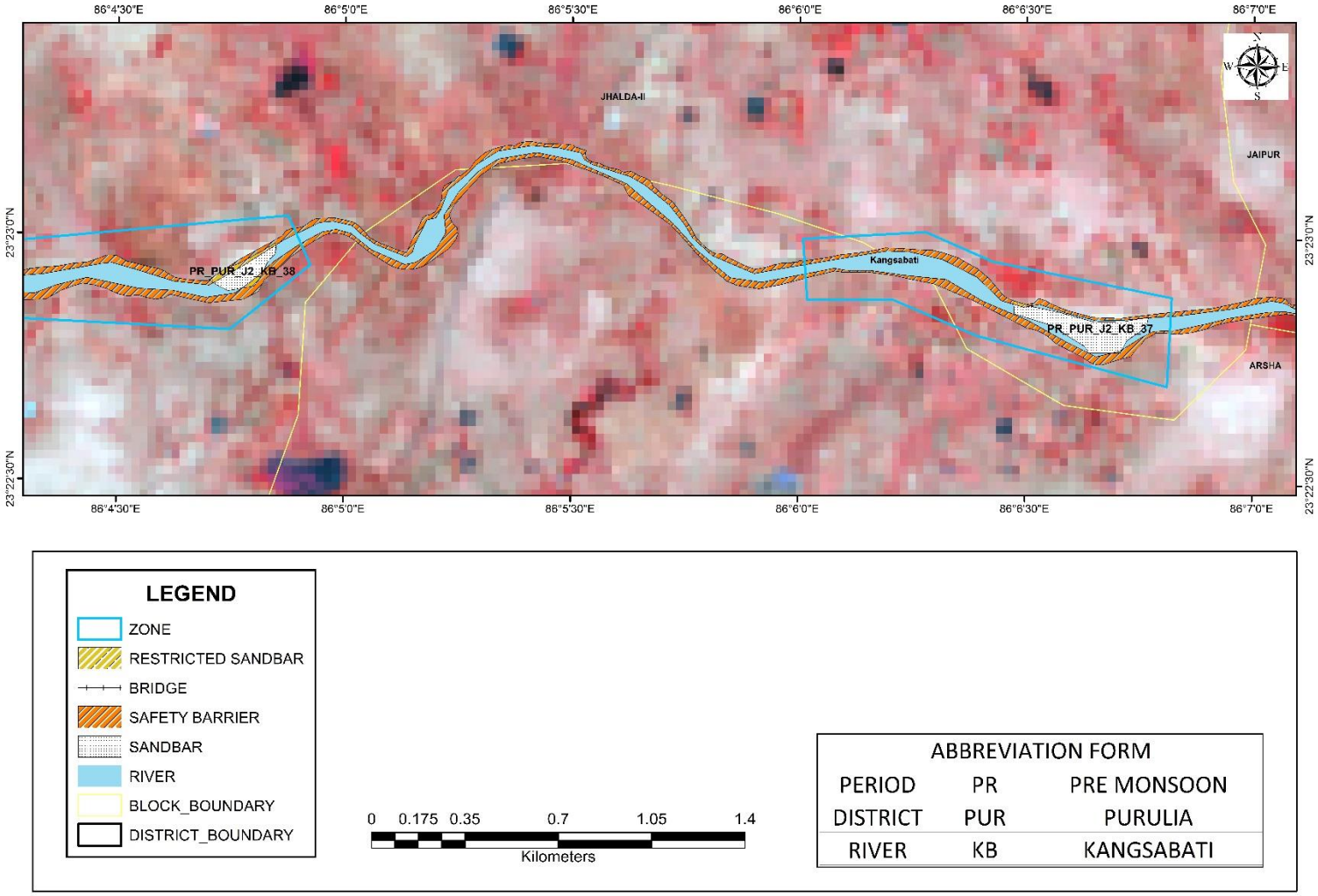


Plate 2A19: Distribution Map of Sand Bars on Kangsabati River During Pre-Monsoon Period of Purulia District
(Source: ISRO RESOURCE Sat 2 LISS III Sensor, 2020)

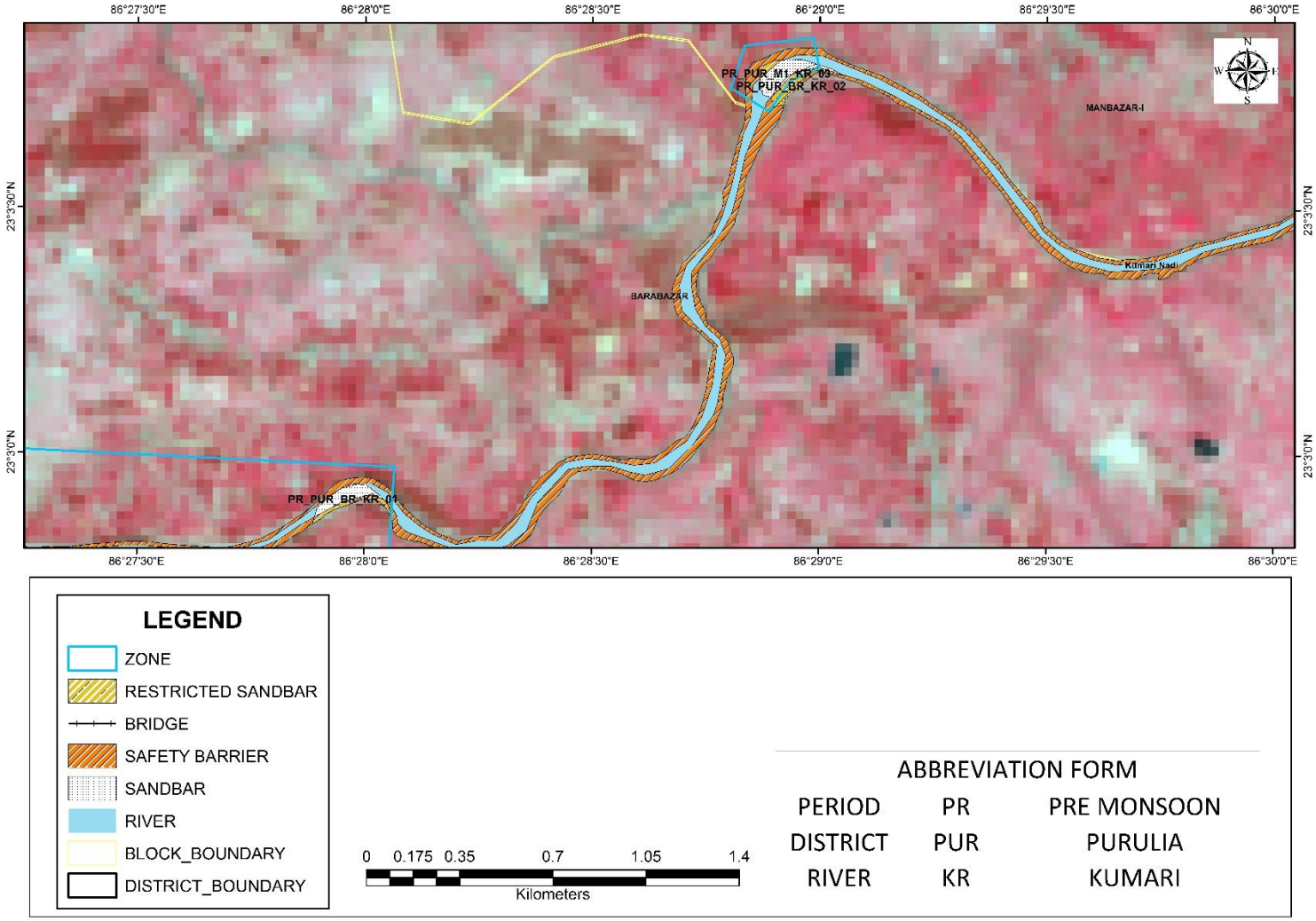


Plate 2A20: Distribution Map of Sand Bars on Kumari River During Pre-Monsoon Period of Purulia District
(Source: ISRO RESOURCE Sat 2 LISS III Sensor, 2020)

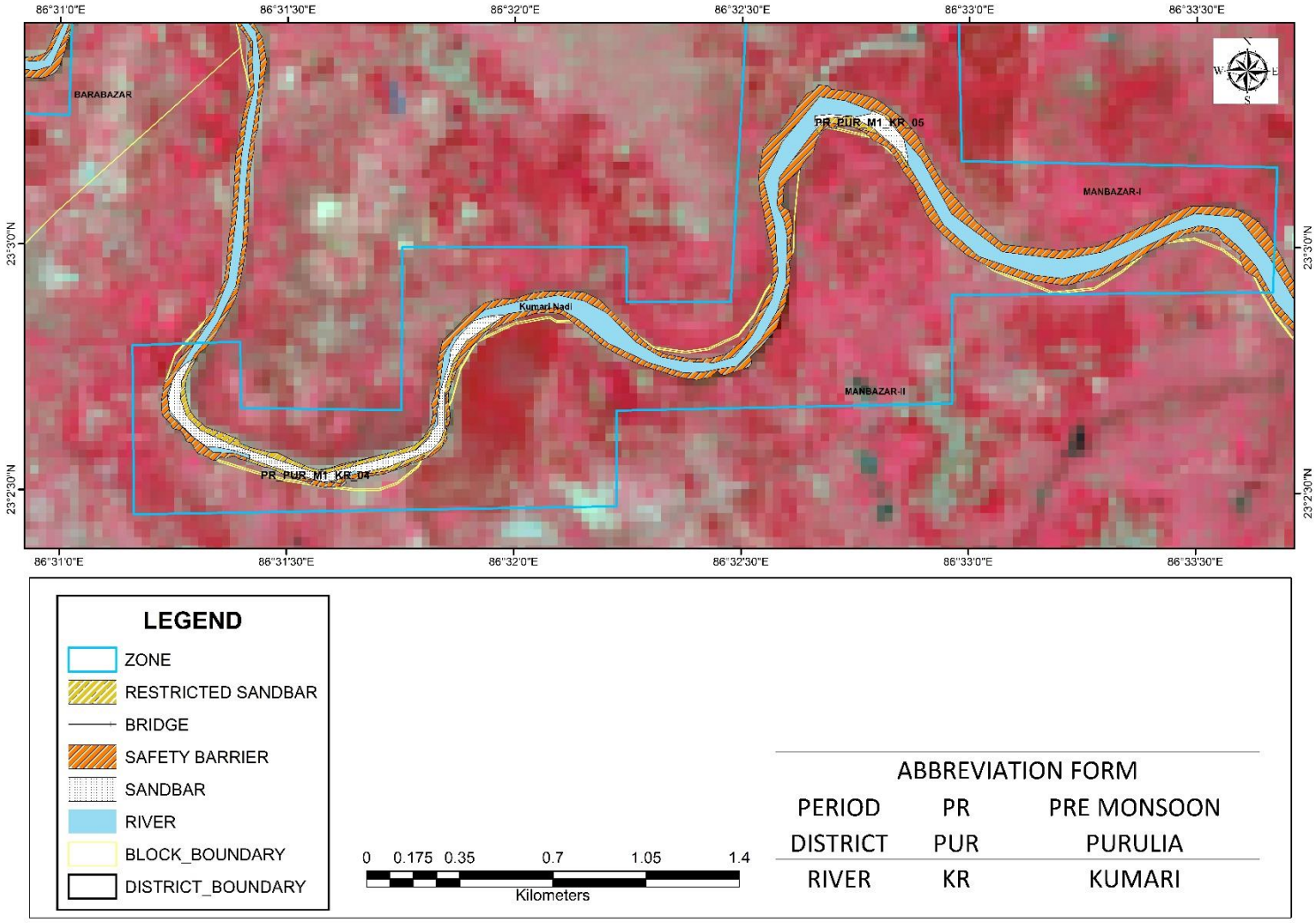


Plate 2A21: Distribution Map of Sand Bars on Kumari River During Pre-Monsoon Period of Purulia District
(Source: ISRO RESOURCE Sat 2 LISS III Sensor, 2020)

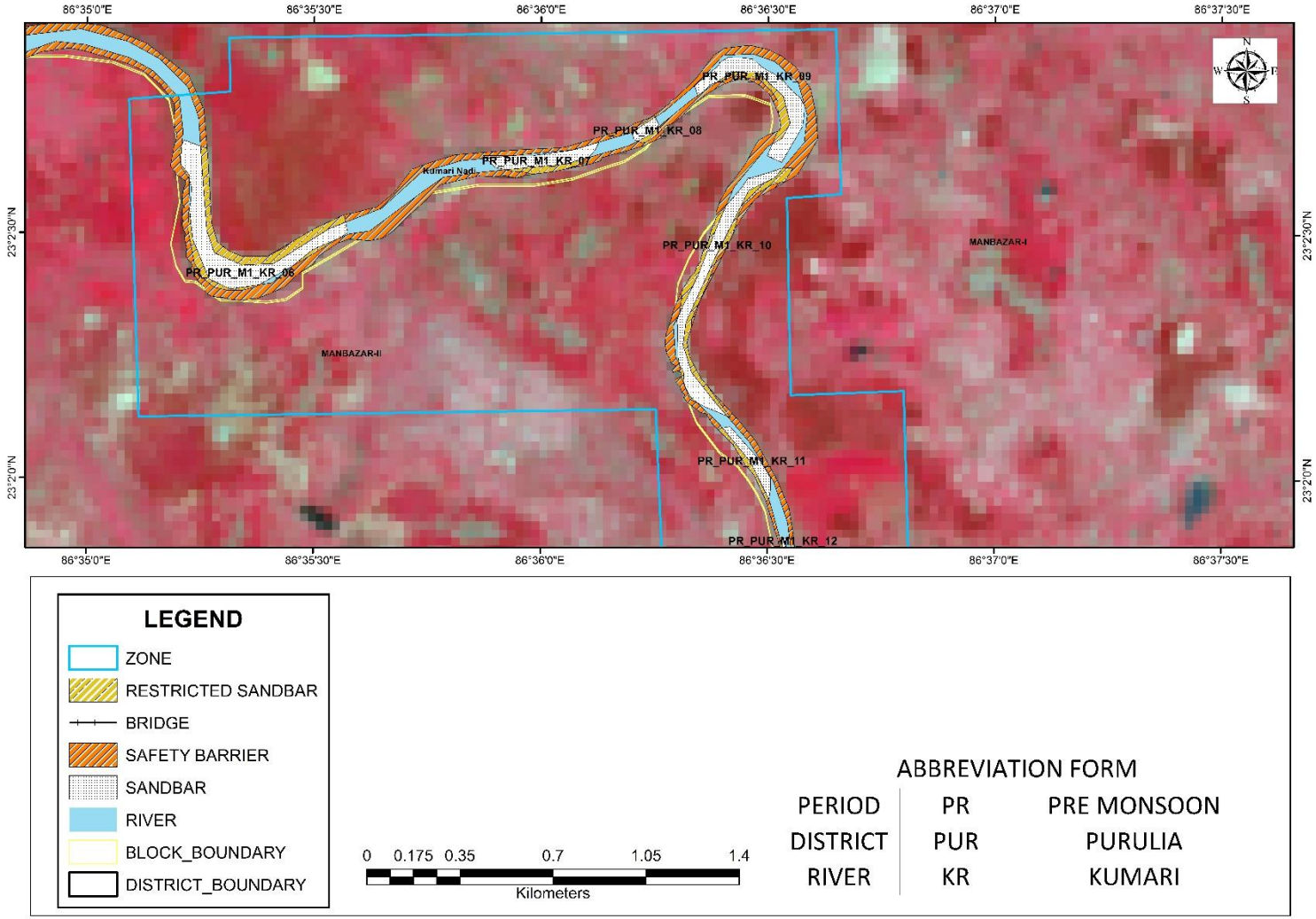


Plate 2A22: Distribution Map of Sand Bars on Kumari River During Pre-Monsoon Period of Purulia District
(Source: ISRO RESOURCE Sat 2 LISS III Sensor, 2020)

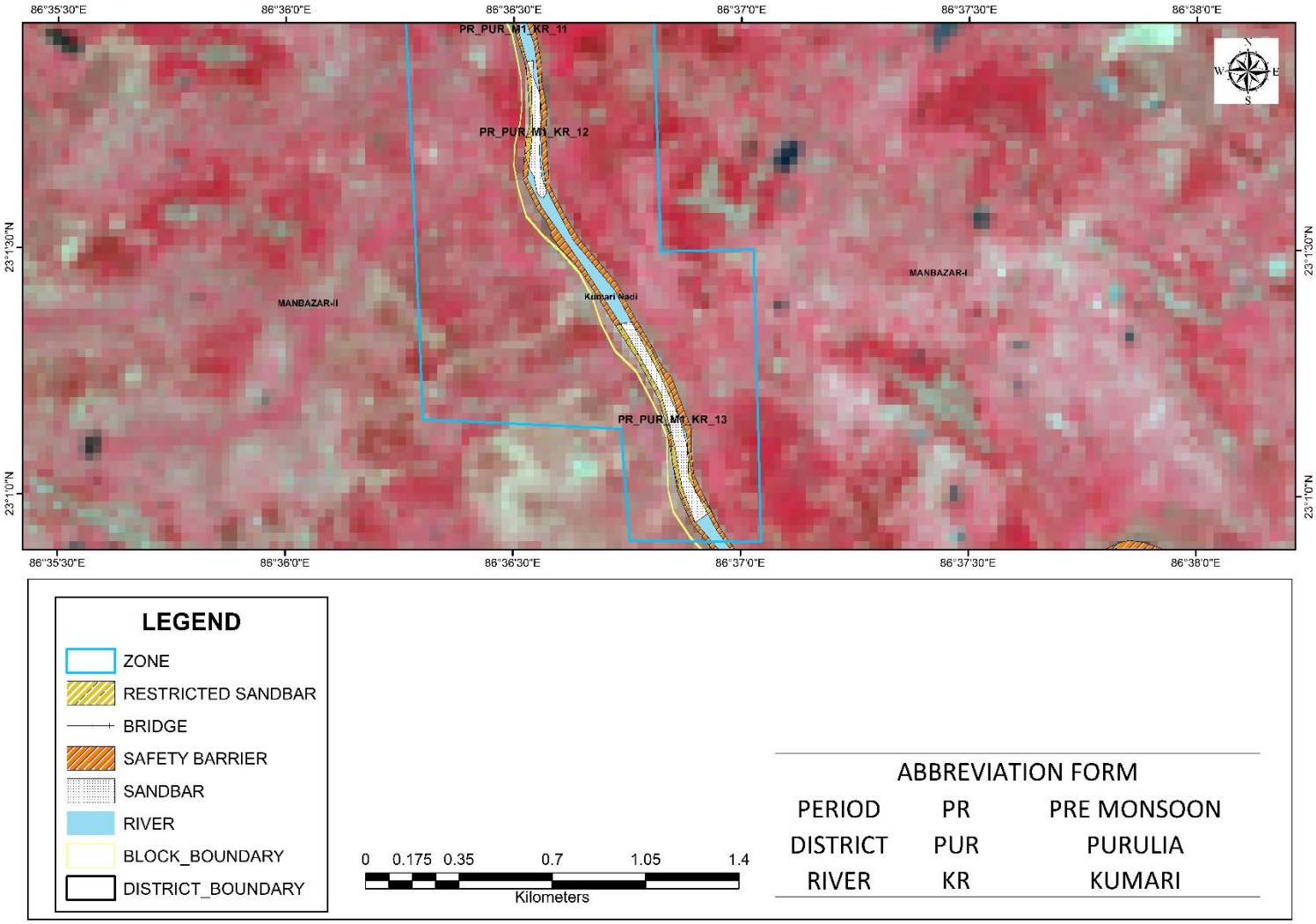


Plate 2A23: Distribution Map of Sand Bars on Kumari River During Pre-Monsoon Period of Purulia District
(Source: ISRO RESOURCE Sat 2 LISS III Sensor, 2020)

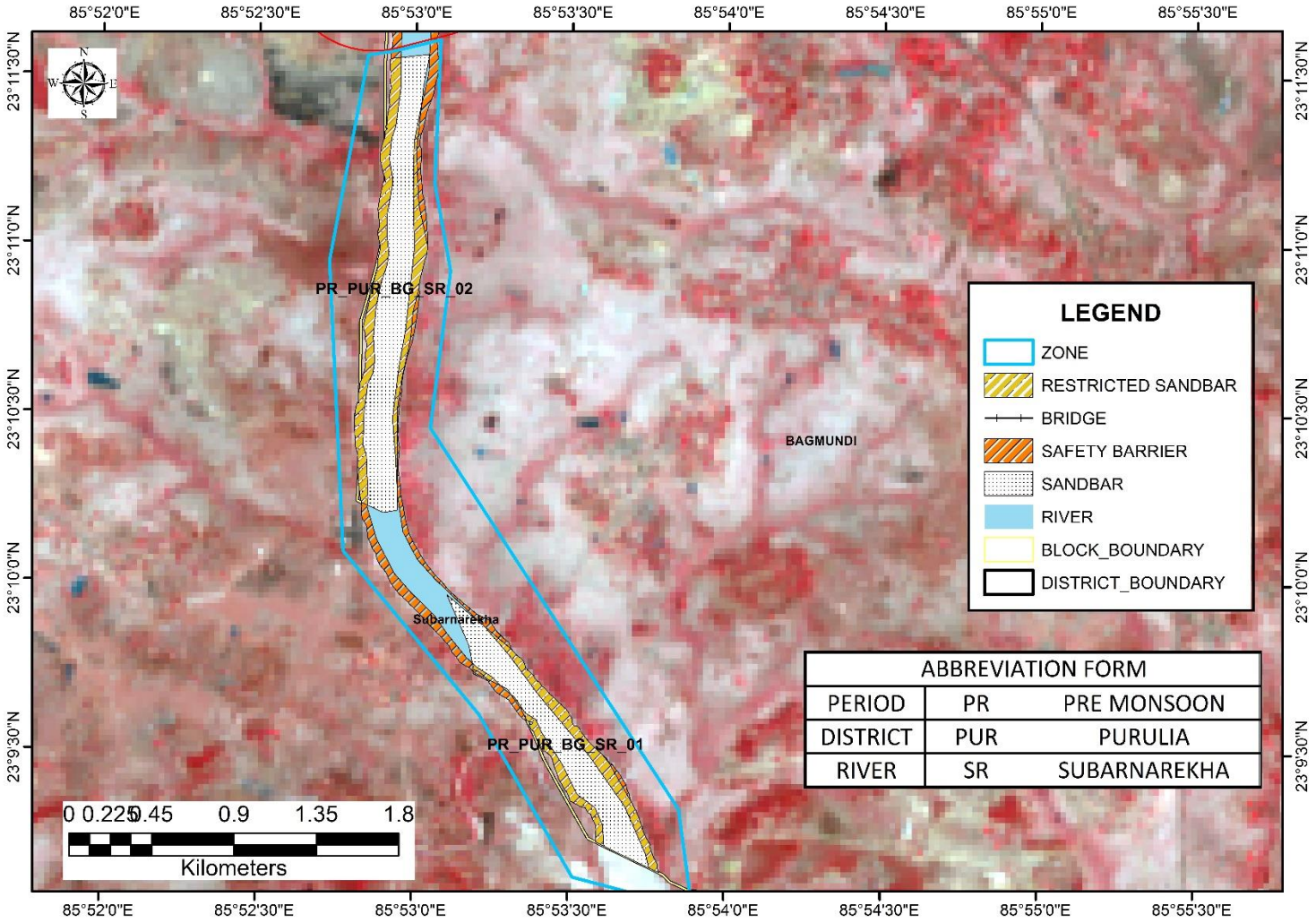


Plate 2A24: Distribution Map of Sand Bars on Subarnarekha River During Pre-Monsoon Period of Purulia District *(Source: ISRO RESOURCE Sat 2 LISS III Sensor, 2020)*

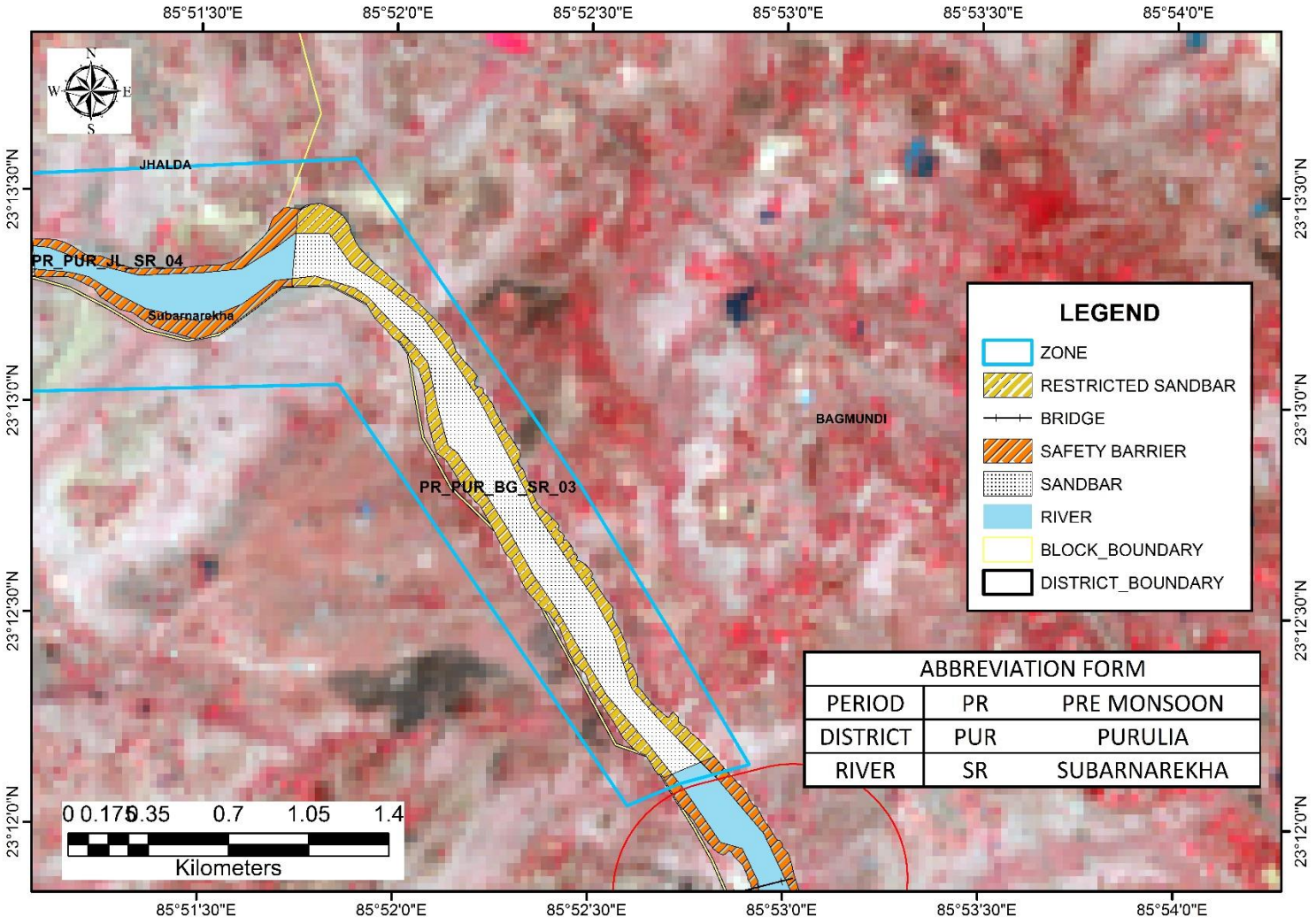


Plate 2A25: Distribution Map of Sand Bars on Subarnarekha River During Pre-Monsoon Period of Purulia District *(Source: ISRO RESOURCE Sat 2 LISS III Sensor, 2020)*

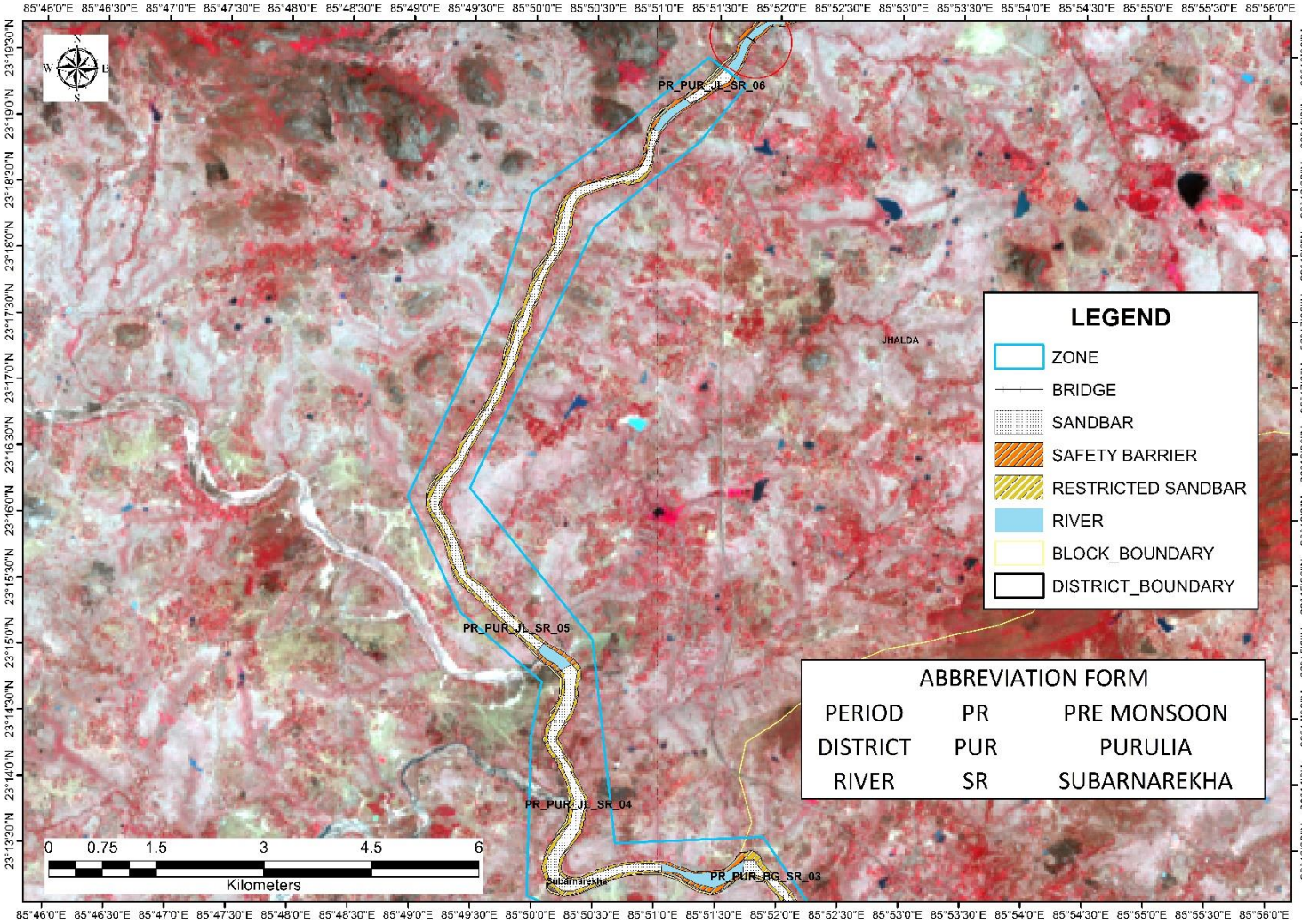


Plate 2A26: Distribution Map of Sand Bars on Subarnarekha River During Pre-Monsoon Period of Purulia District *(Source: ISRO RESOURCE Sat 2 LISS III Sensor, 2020)*

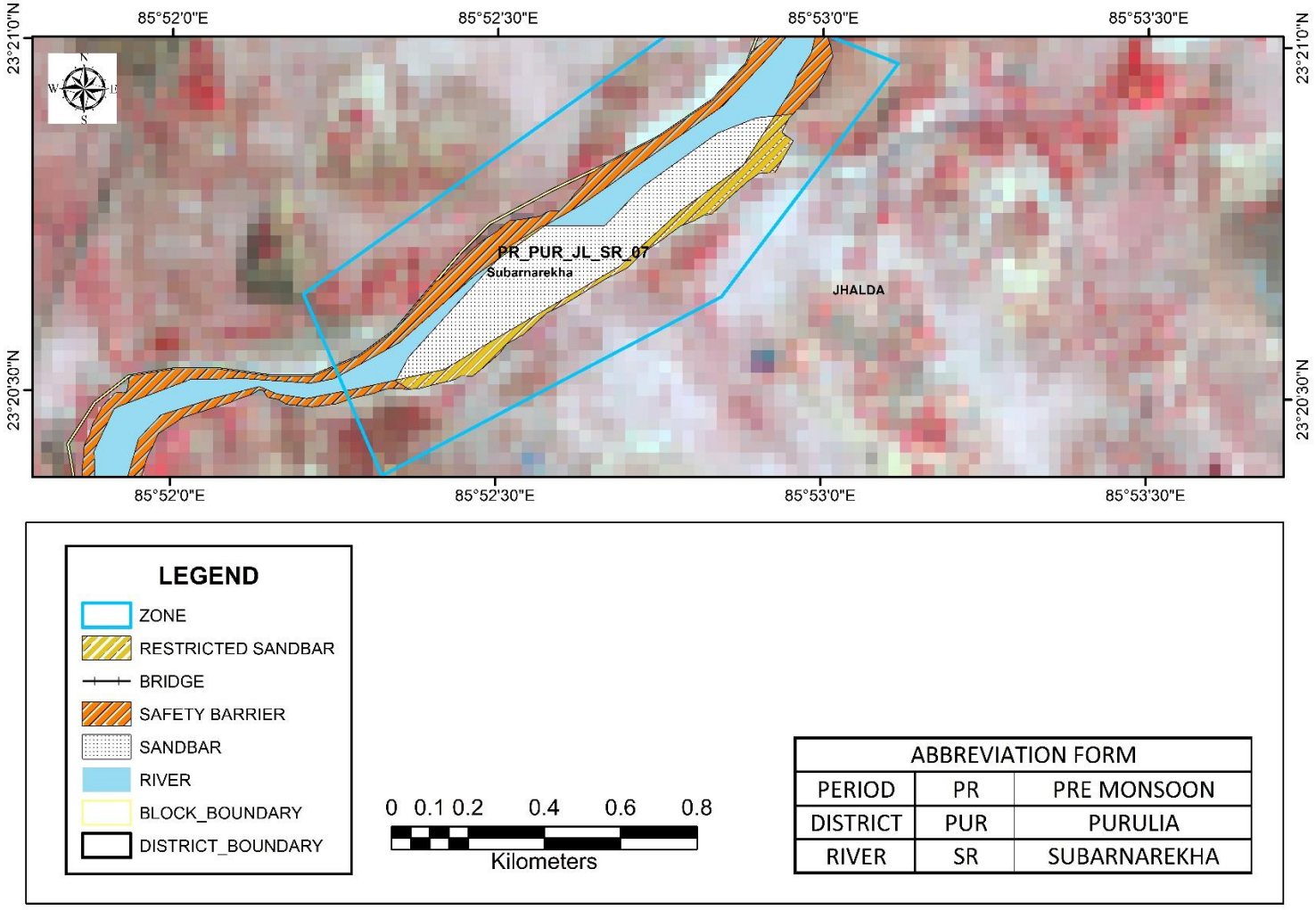


Plate 2A27: Distribution Map of Sand Bars on Subarnarekha River During Pre-Monsoon Period of Purulia District *(Source: ISRO RESOURCE Sat 2 LISS III Sensor, 2020)*

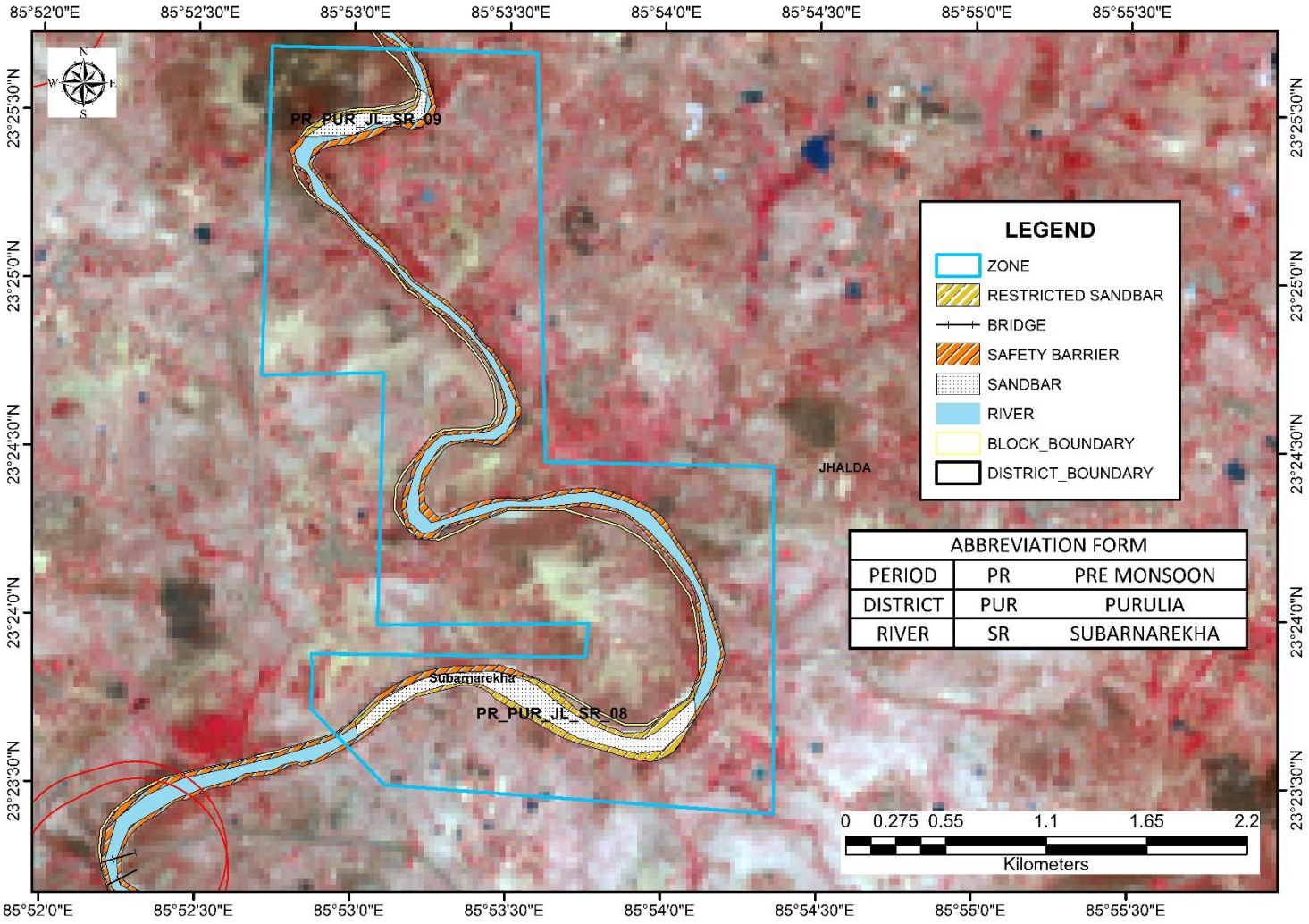


Plate 2A28: Distribution Map of Sand Bars on Subarnarekha River During Pre-Monsoon Period of Purulia District *(Source: ISRO RESOURCE Sat 2 LISS III Sensor, 2020)*

PLATE 2B

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

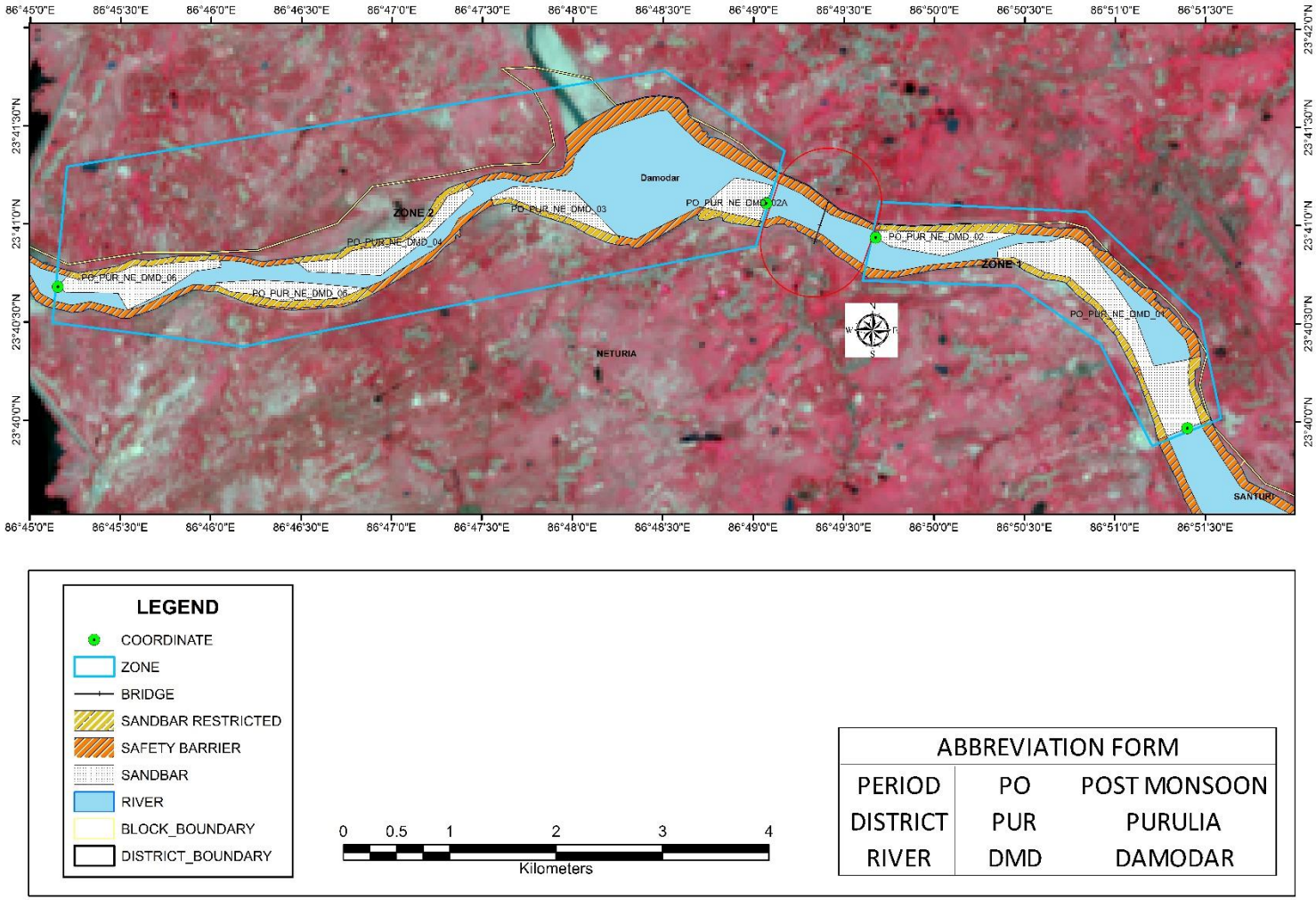
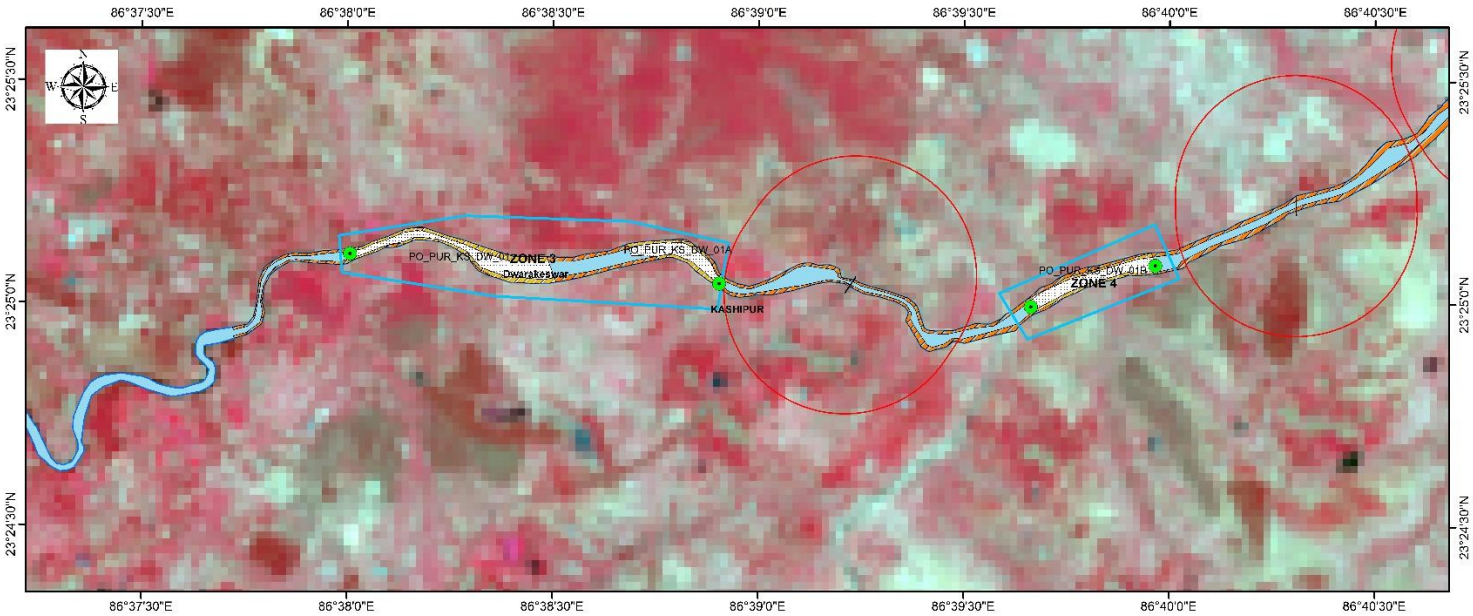


Plate 2B1: Distribution Map of Sand Bars with potential zones on Damodar River During Post-Monsoon Period of Purulia District *(Source: ISRO RESOURCE Sat 2 LISS III Sensor, 2020)*



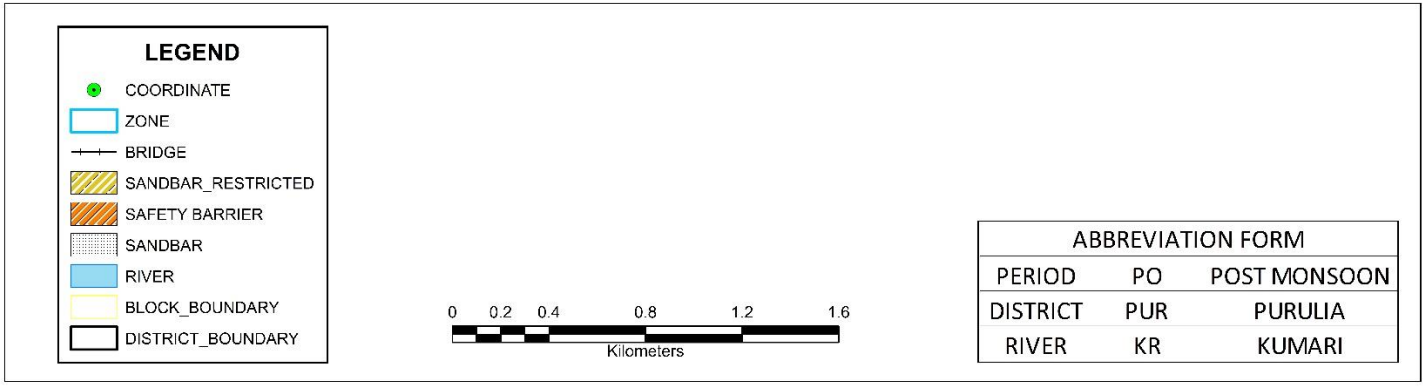


Plate 2B2: Distribution Map of Sand Bars with potential zones on Dwarkeswar River During Post-Monsoon Period of Purulia District *(Source: ISRO RESOURCE Sat 2 LISS III Sensor, 2020)*

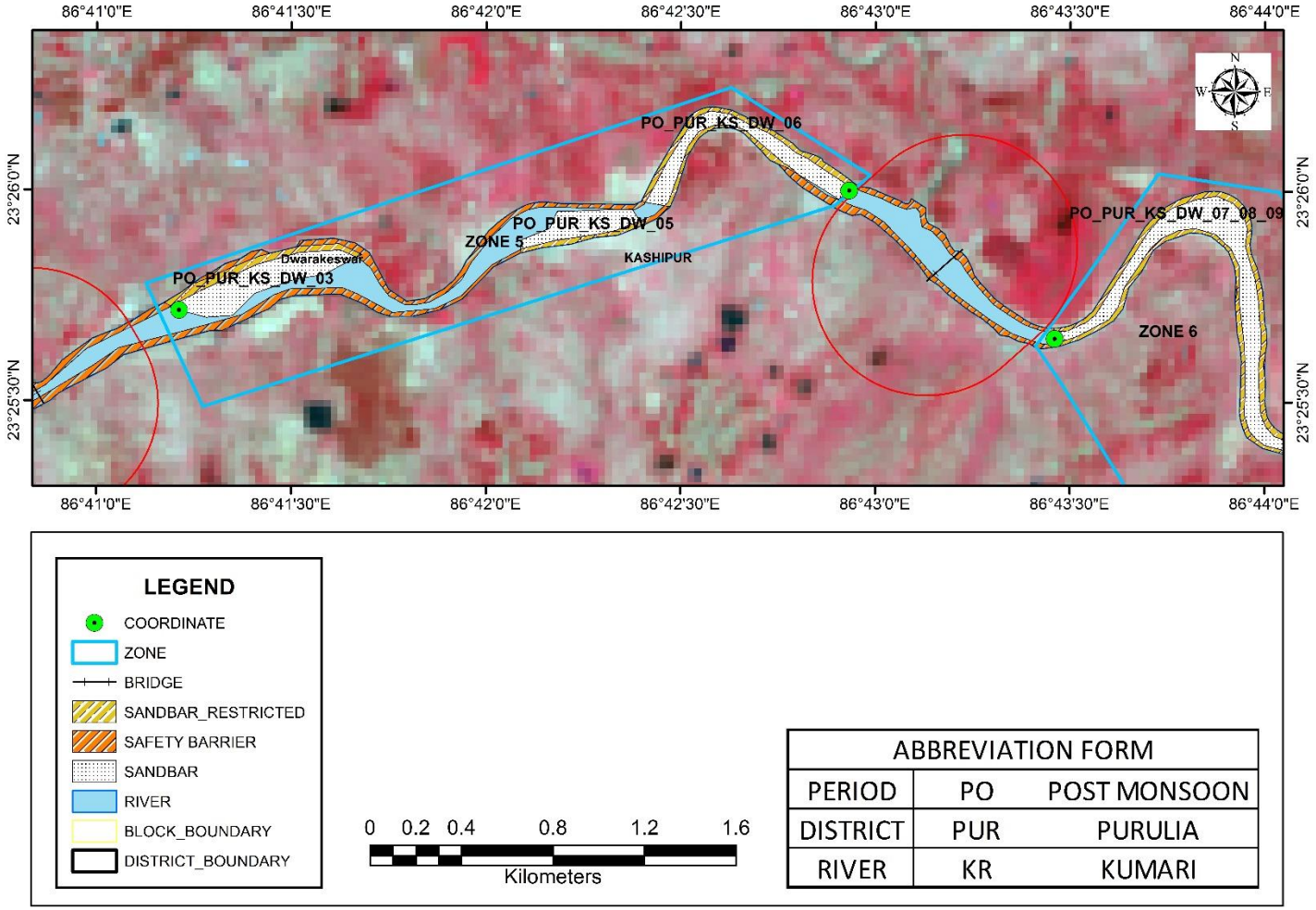


Plate 2B3: Distribution Map of Sand Bars with potential zones on Dwarkeswar River During Post-Monsoon Period of Purulia District *(Source: ISRO RESOURCE Sat 2 LISS III Sensor, 2020)*

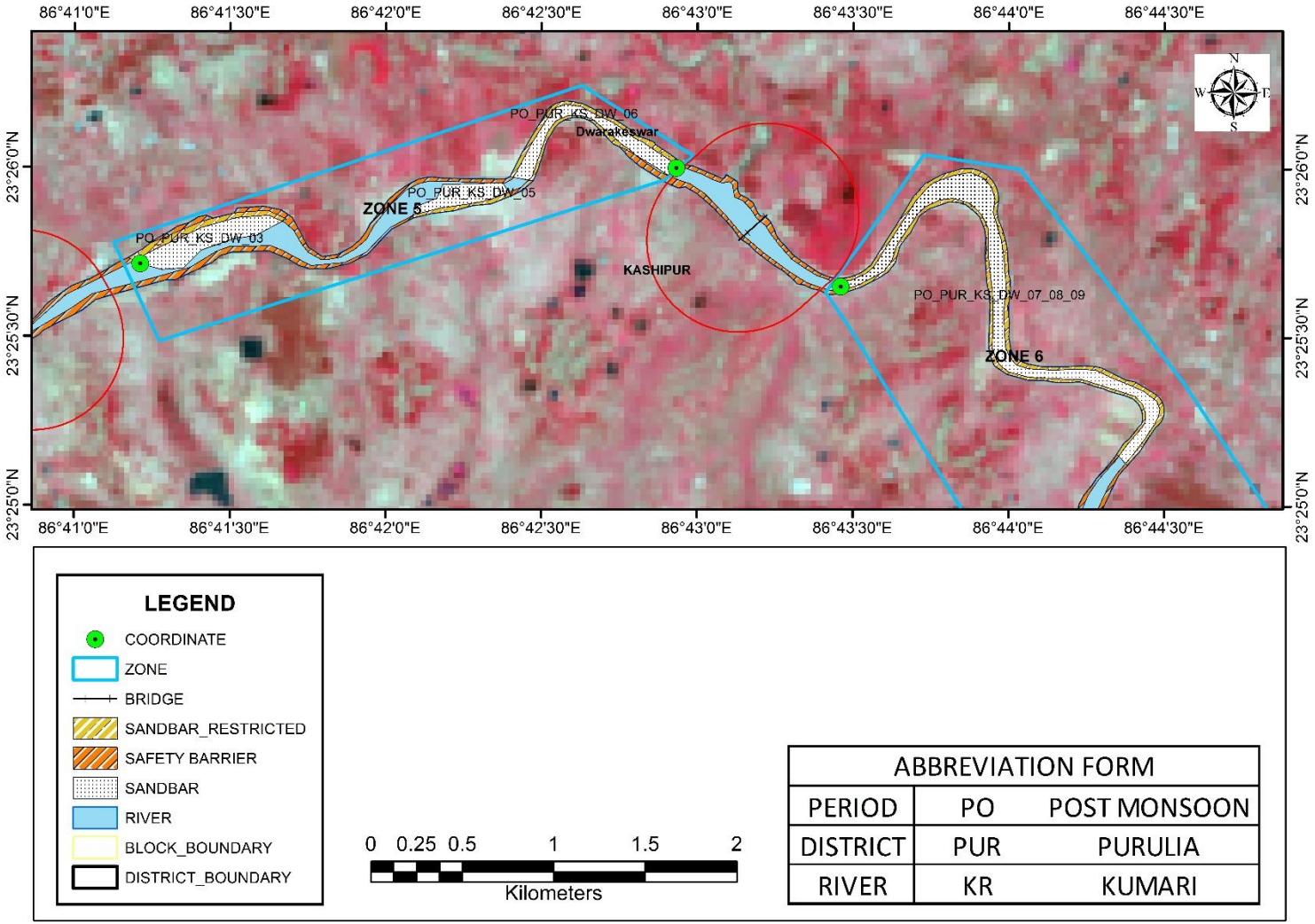


Plate 2B4: Distribution Map of Sand Bars with potential zones on Dwarkeswar River During Post-Monsoon Period of Purulia District *(Source: ISRO RESOURCE Sat 2 LISS III Sensor, 2020)*

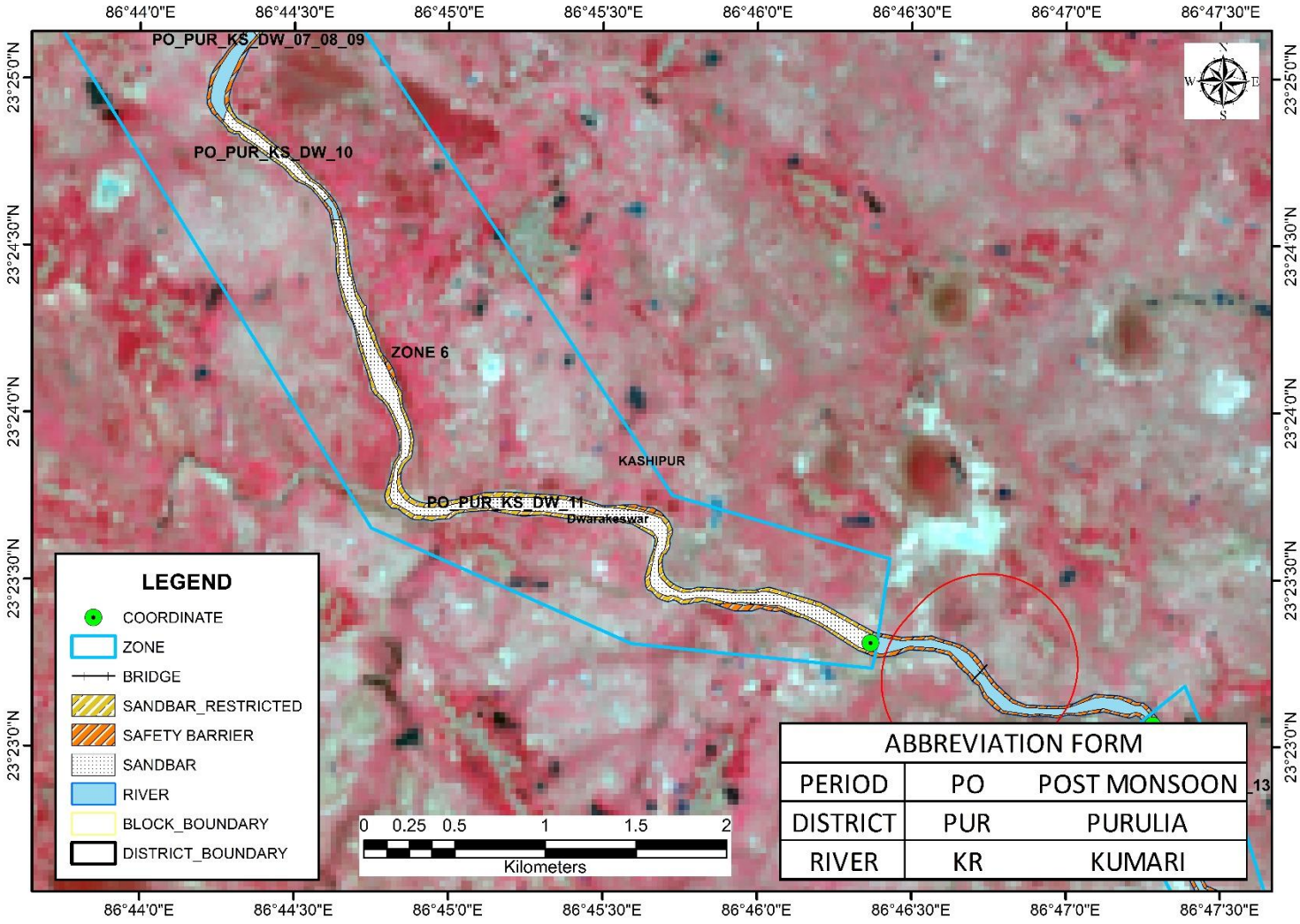


Plate 2B5: Distribution Map of Sand Bars with potential zones on Dwarkeswar River During Post-Monsoon Period of Purulia District *(Source: ISRO RESOURCE Sat 2 LISS III Sensor, 2020)*

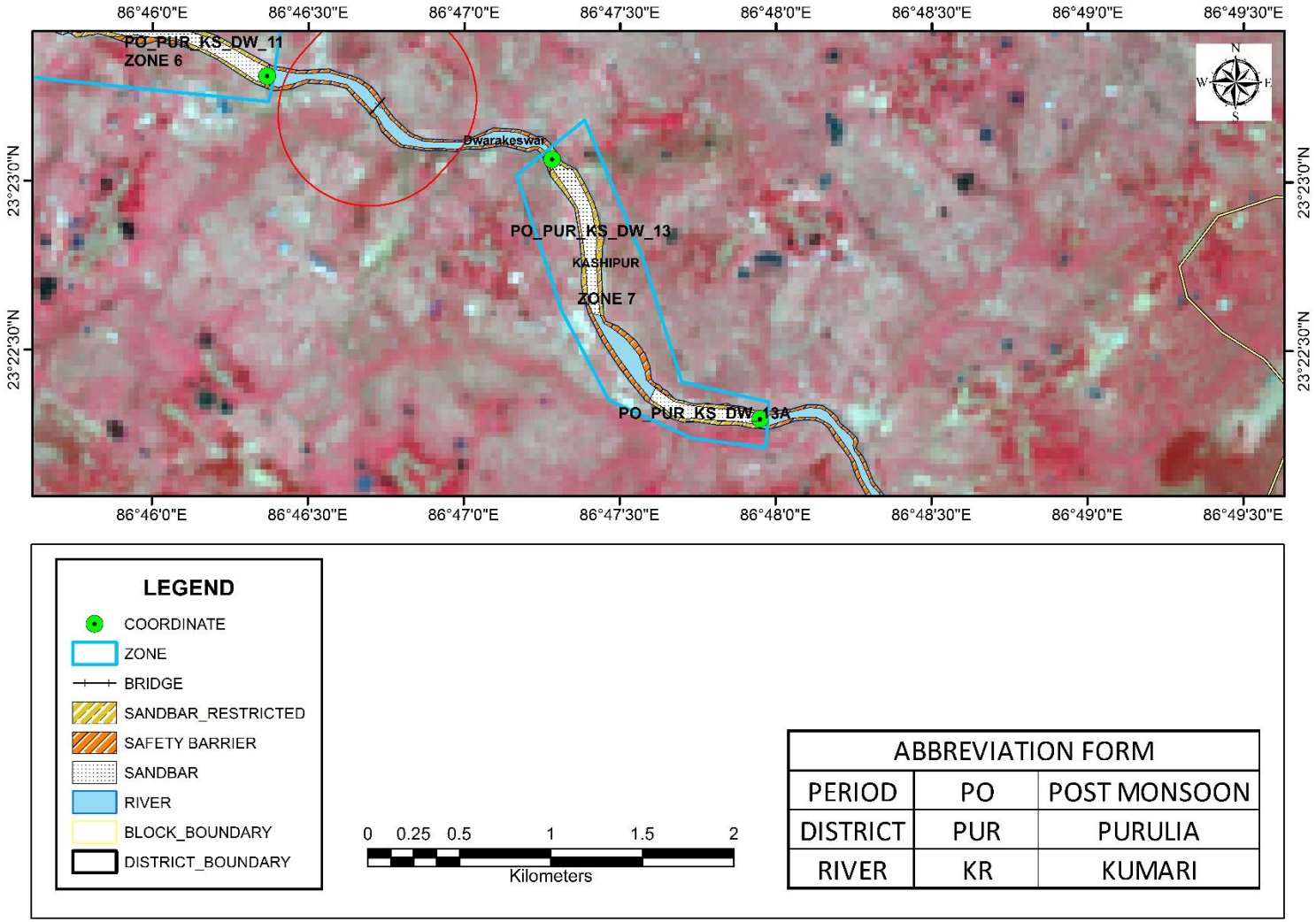


Plate 2B6: Distribution Map of Sand Bars with potential zones on Dwarkeswar River During Post-Monsoon Period of Purulia District *(Source: ISRO RESOURCE Sat 2 LISS III Sensor, 2020)*

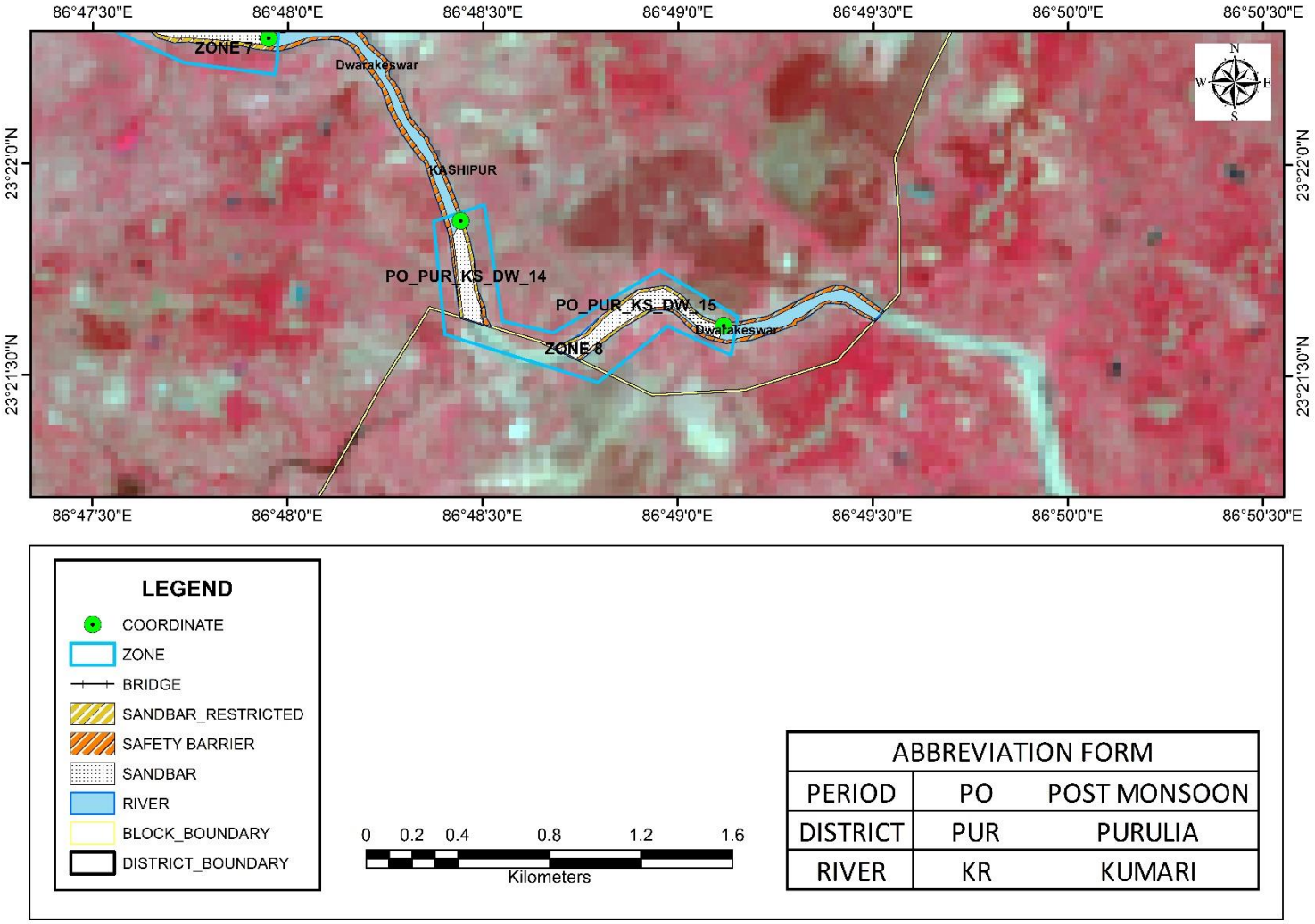


Plate 2B7: Distribution Map of Sand Bars with potential zones on Dwarkeswar River During Post-Monsoon Period of Purulia District *(Source: ISRO RESOURCE Sat 2 LISS III Sensor, 2020)*

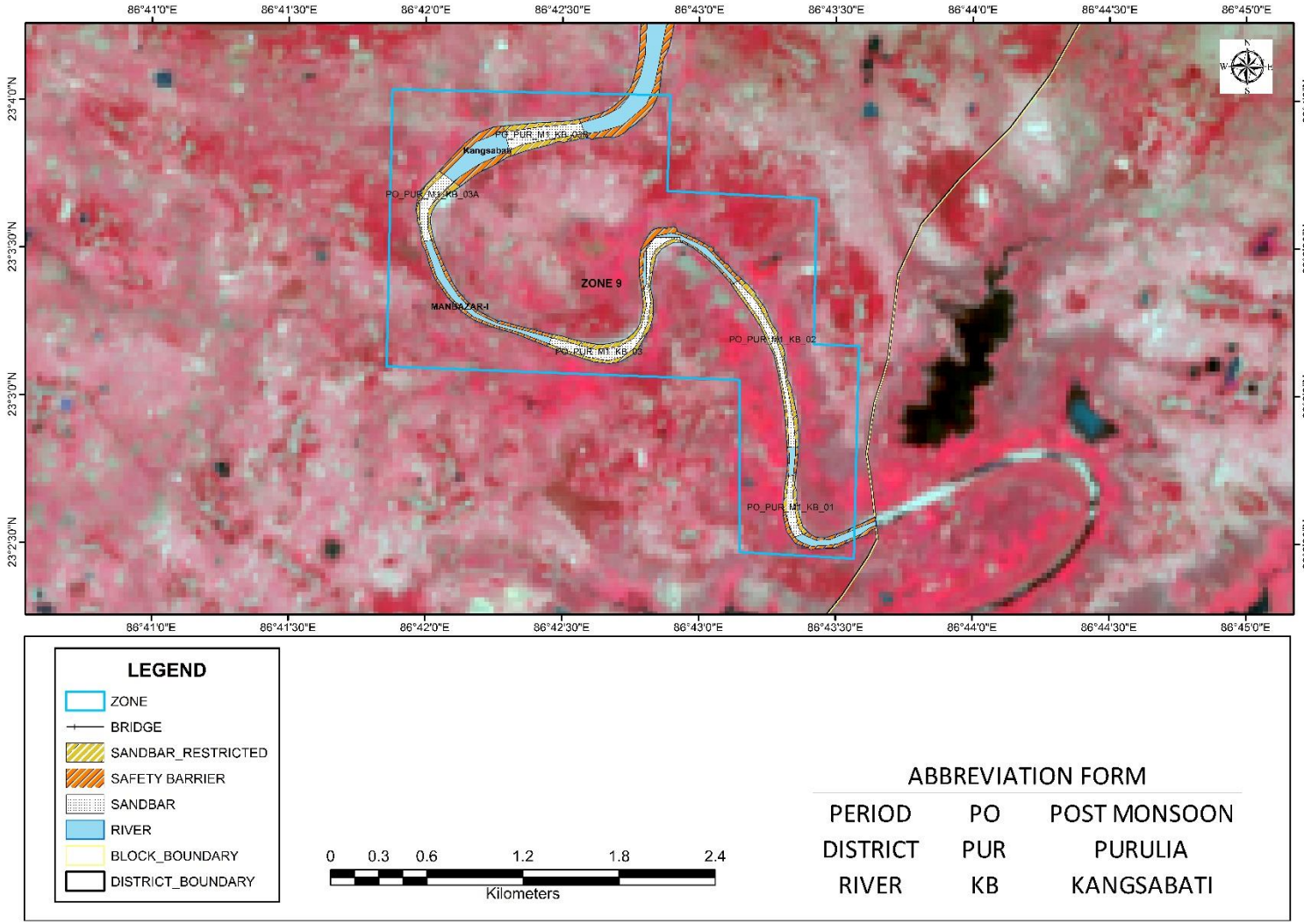


Plate 2B8: Distribution Map of Sand Bars with potential zones on Kangsabati River During Post-Monsoon Period of Purulia District *(Source: ISRO RESOURCE Sat 2 LISS III Sensor, 2020)*

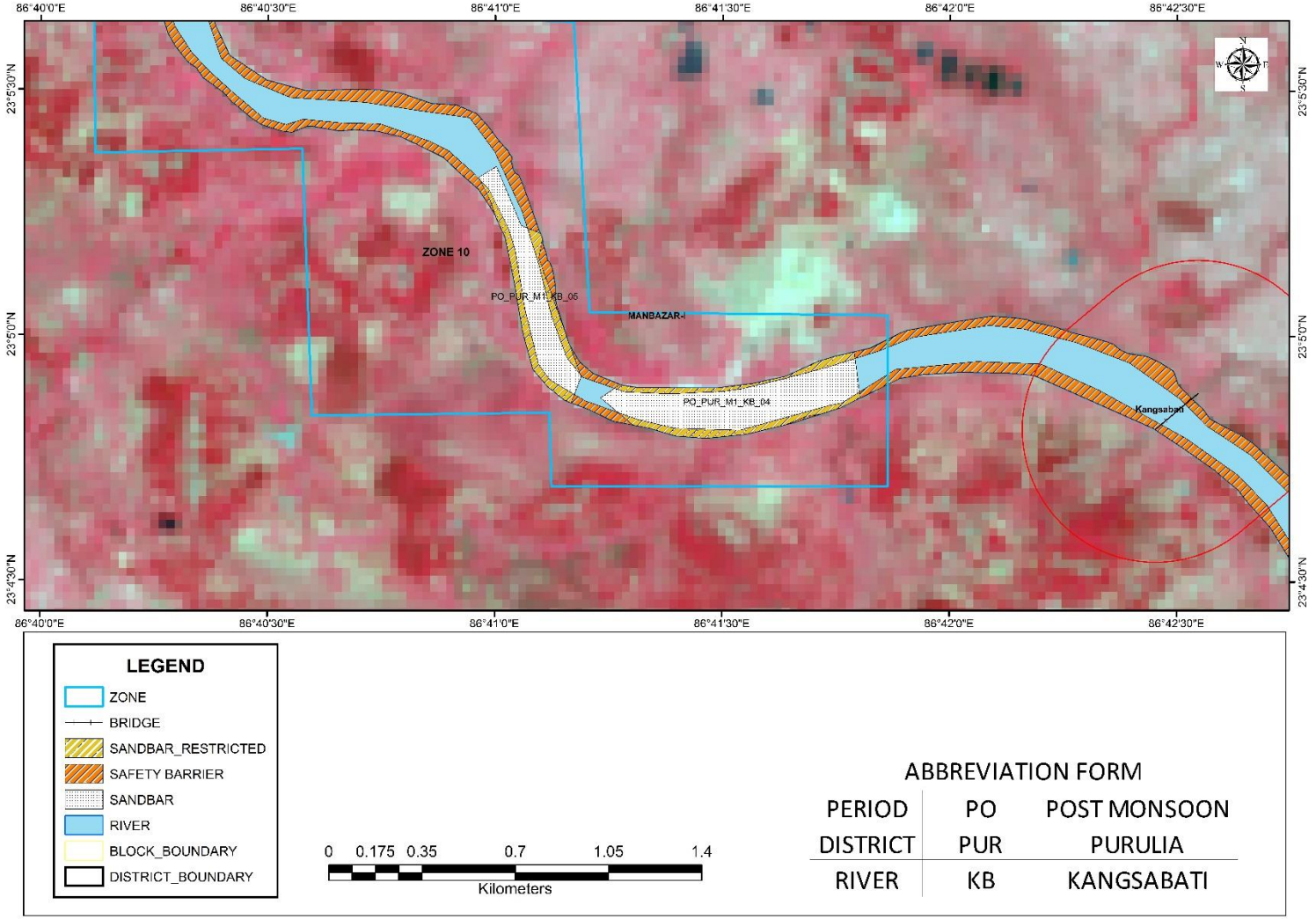


Plate 2B9: Distribution Map of Sand Bars with potential zones on Kangsabati River During Post-Monsoon Period of Purulia District *(Source: ISRO RESOURCE Sat 2 LISS III Sensor, 2020)*

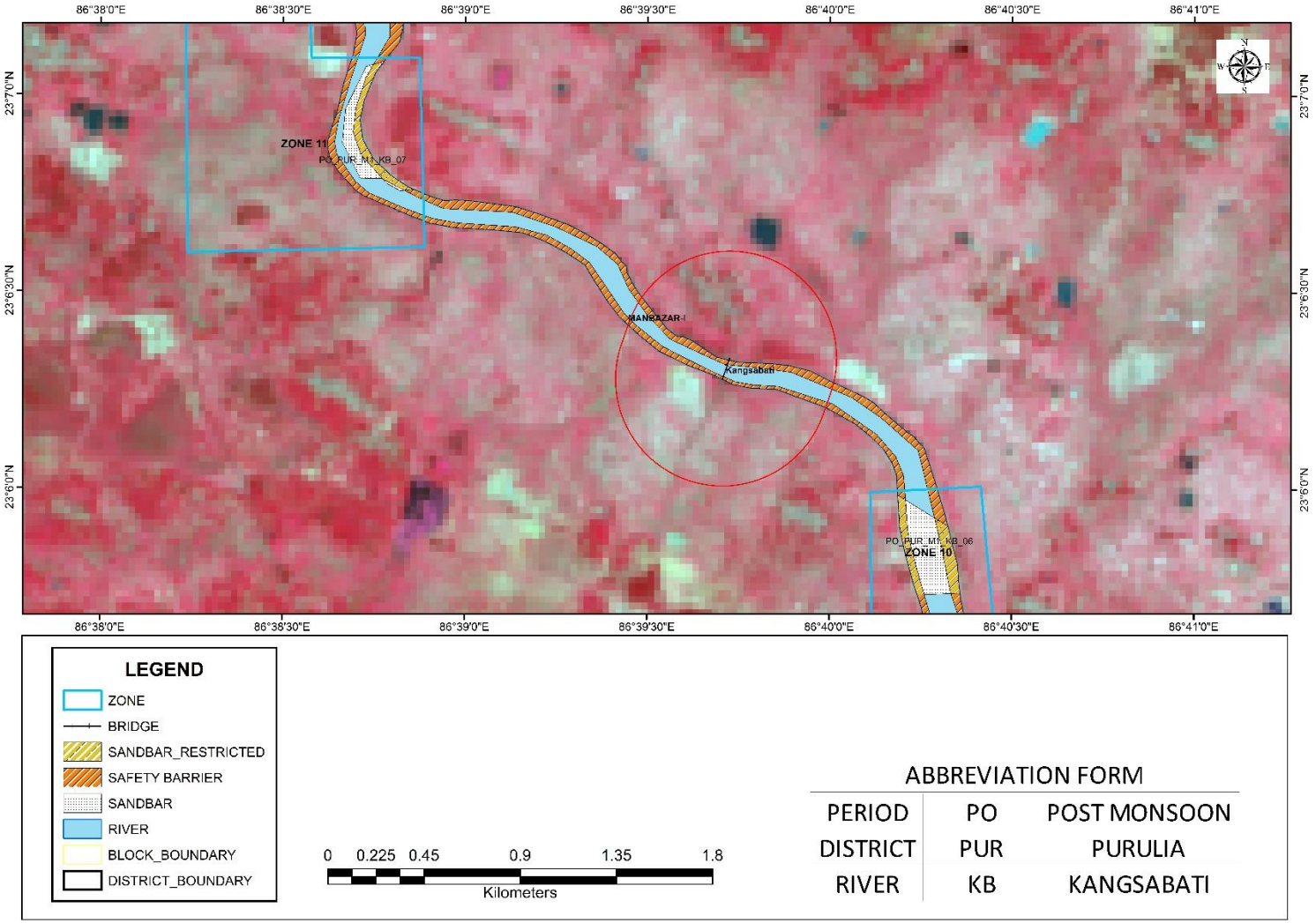


Plate 2B10: Distribution Map of Sand Bars with potential zones on Kangsabati River During Post-Monsoon Period of Purulia District *(Source: ISRO RESOURCE Sat 2 LISS III Sensor, 2020)*

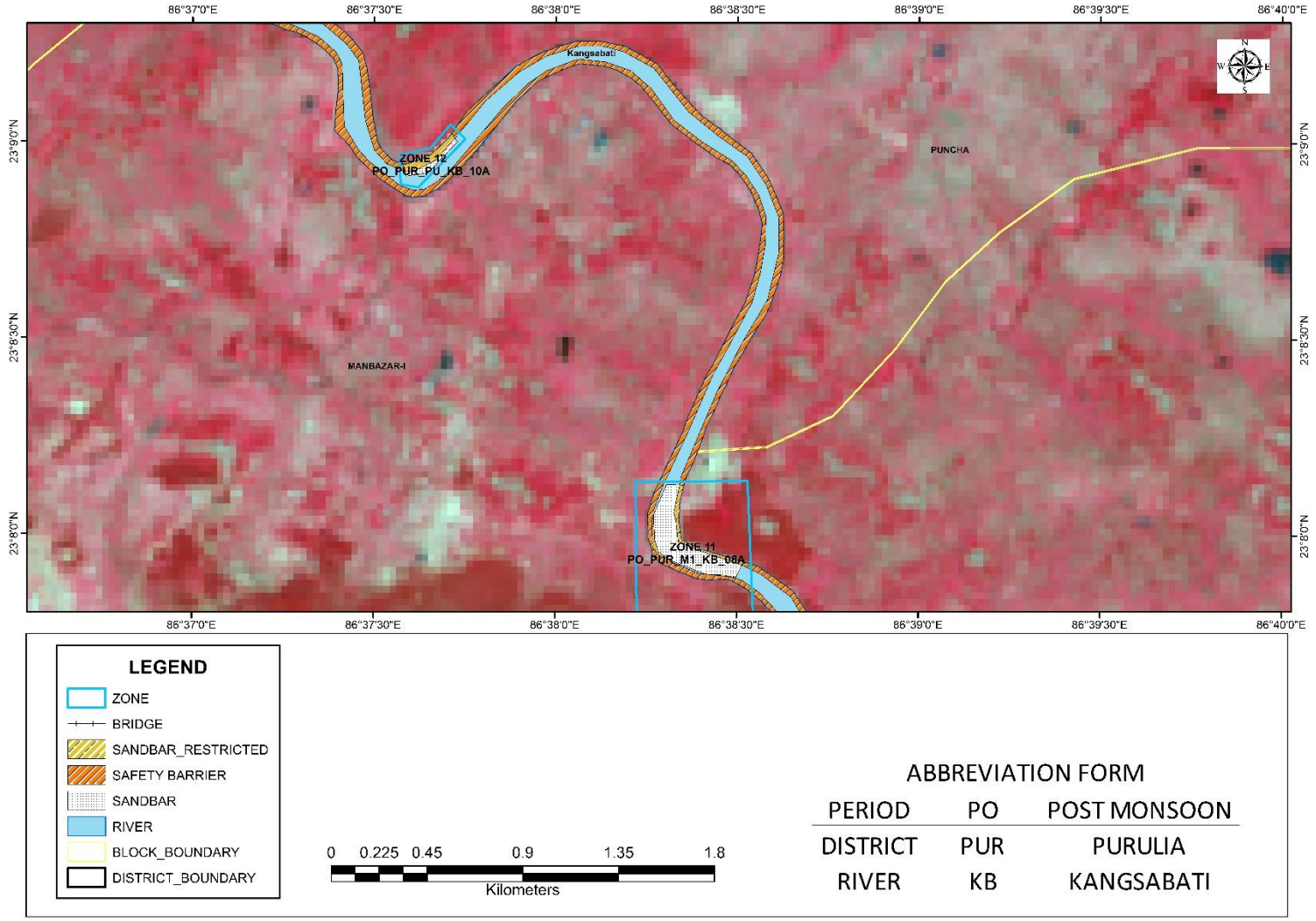


Plate 2B11: Distribution Map of Sand Bars with potential zones on Kangsabati River During Post-Monsoon Period of Purulia District *(Source: ISRO RESOURCE Sat 2 LISS III Sensor, 2020)*

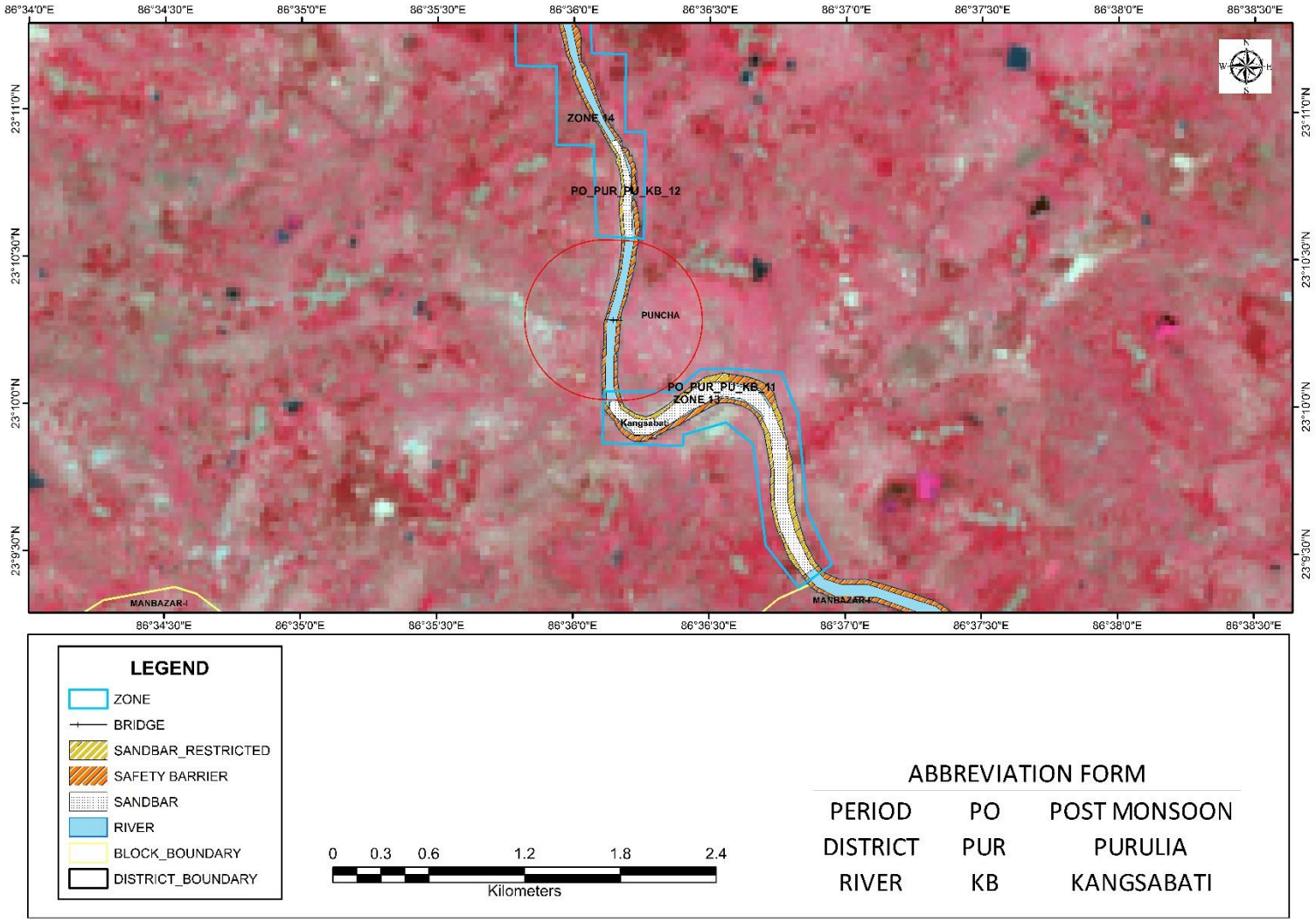


Plate 2B12: Distribution Map of Sand Bars with potential zones on Kangsabati River During Post-Monsoon Period of Purulia District *(Source: ISRO RESOURCE Sat 2 LISS III Sensor, 2020)*

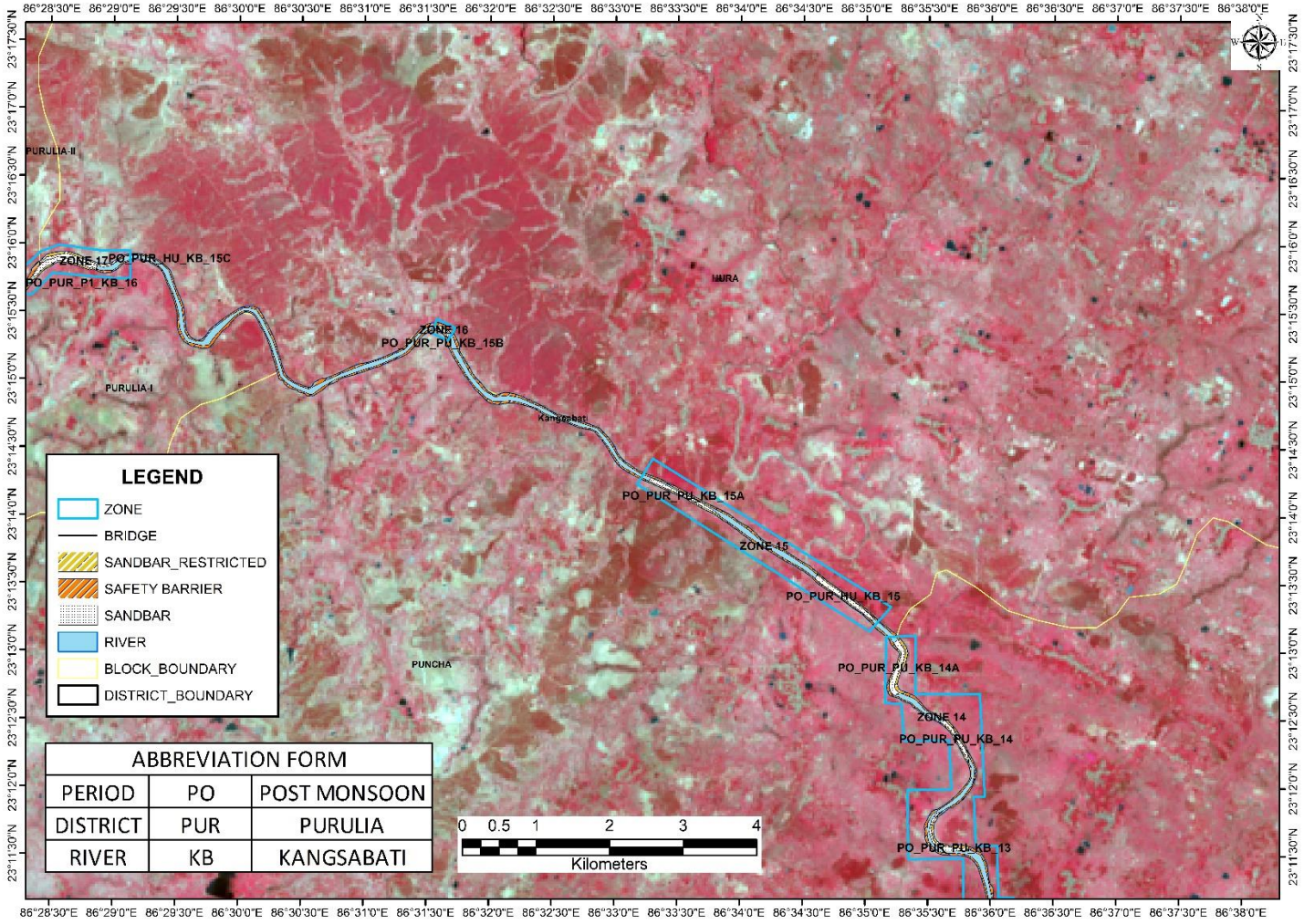


Plate 2B13: Distribution Map of Sand Bars with potential zones on Kangsabati River During Post-Monsoon Period of Purulia District *(Source: ISRO RESOURCE Sat 2 LISS III Sensor, 2020)*

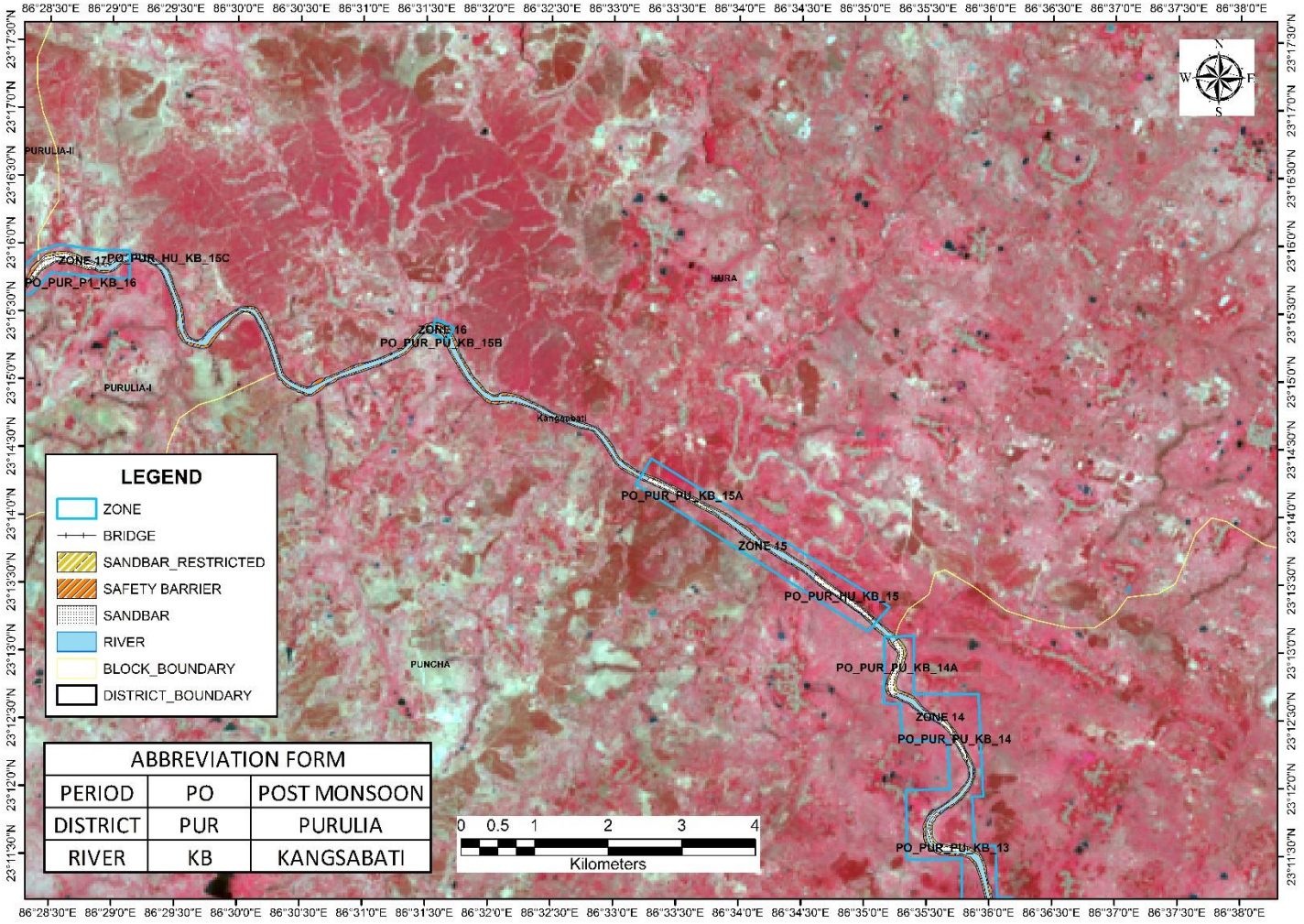


Plate 2B14: Distribution Map of Sand Bars with potential zones on Kangsabati River During Post-Monsoon Period of Purulia District *(Source: ISRO RESOURCE Sat 2 LISS III Sensor, 2020)*

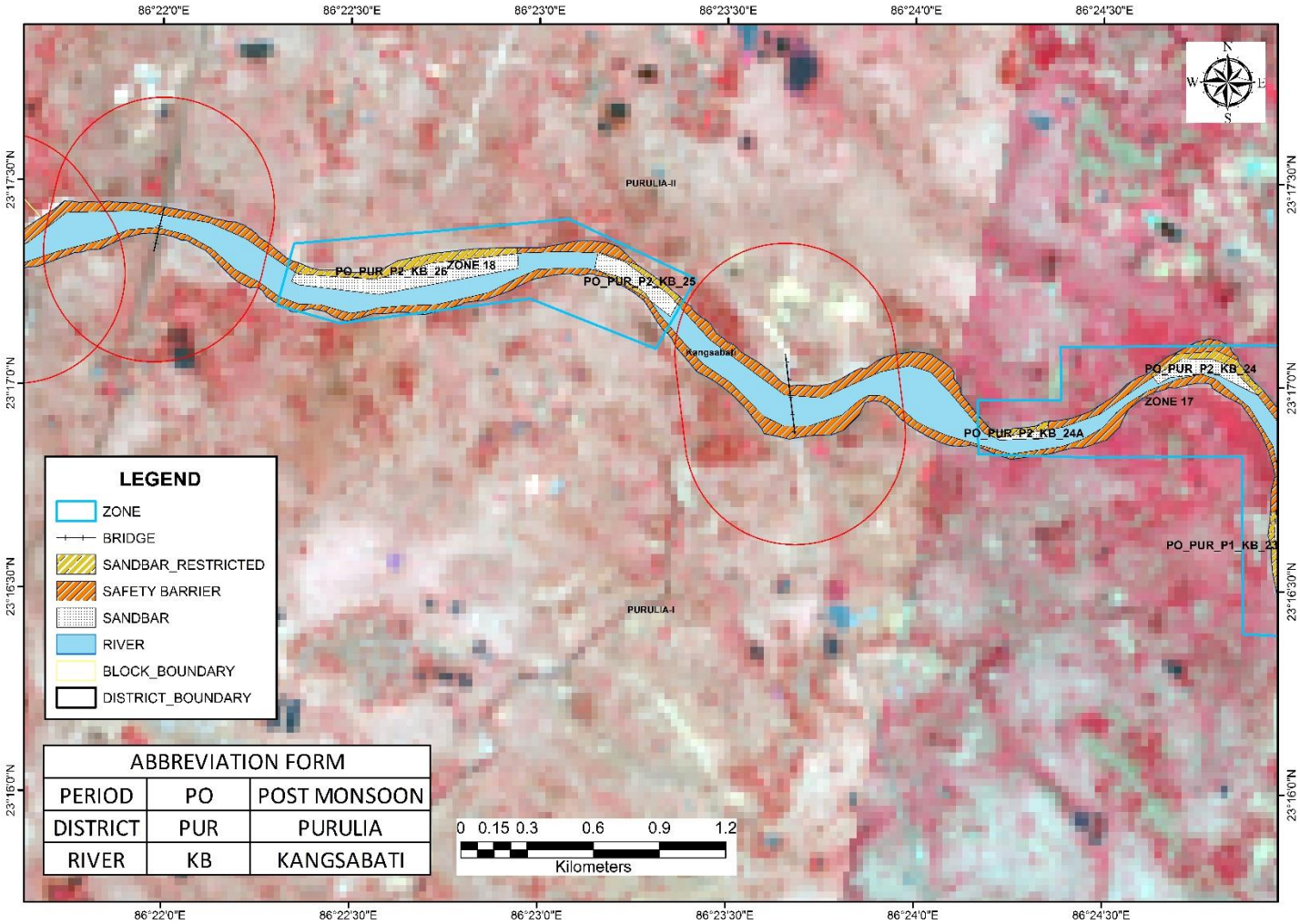


Plate 2B15: Distribution Map of Sand Bars with potential zones on Kangsabati River During Post-Monsoon Period of Purulia District *(Source: ISRO RESOURCE Sat 2 LISS III Sensor, 2020)*

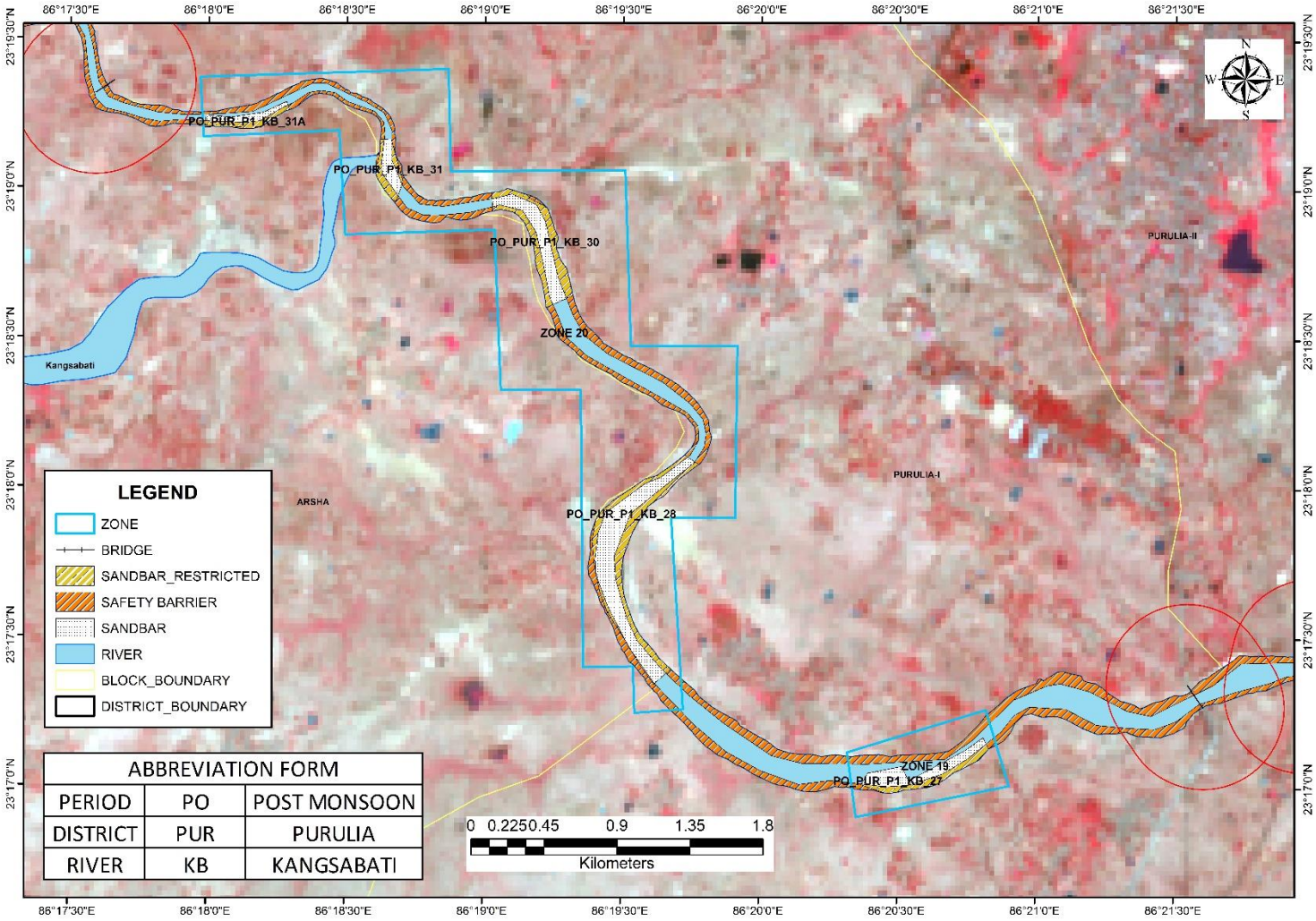


Plate 2B16: Distribution Map of Sand Bars with potential zones on Kangsabati River During Post-Monsoon Period of Purulia District *(Source: ISRO RESOURCE Sat 2 LISS III Sensor, 2020)*

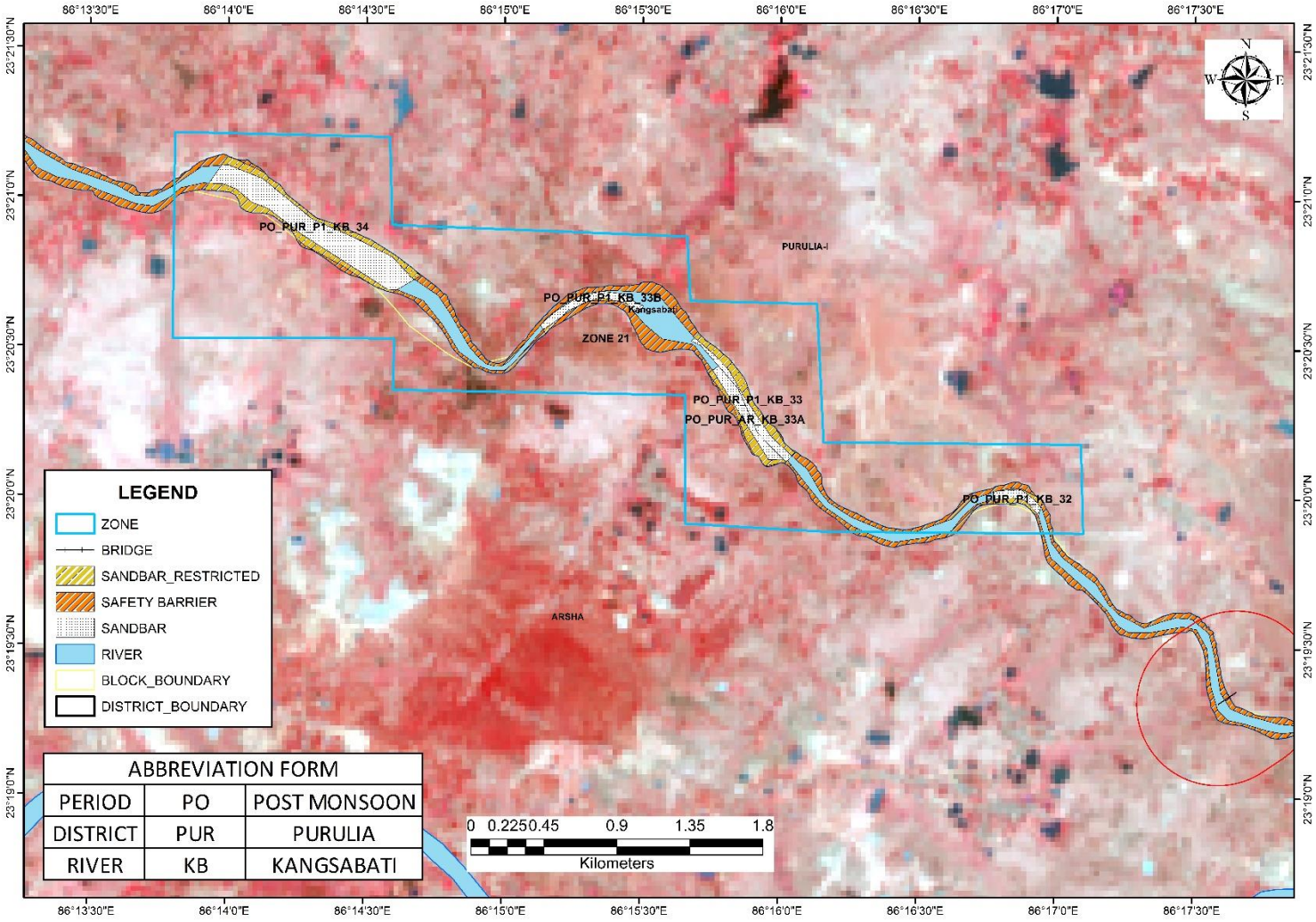


Plate 2B17: Distribution Map of Sand Bars with potential zones on Kangsabati River During Post-Monsoon Period of Purulia District *(Source: ISRO RESOURCE Sat 2 LISS III Sensor, 2020)*

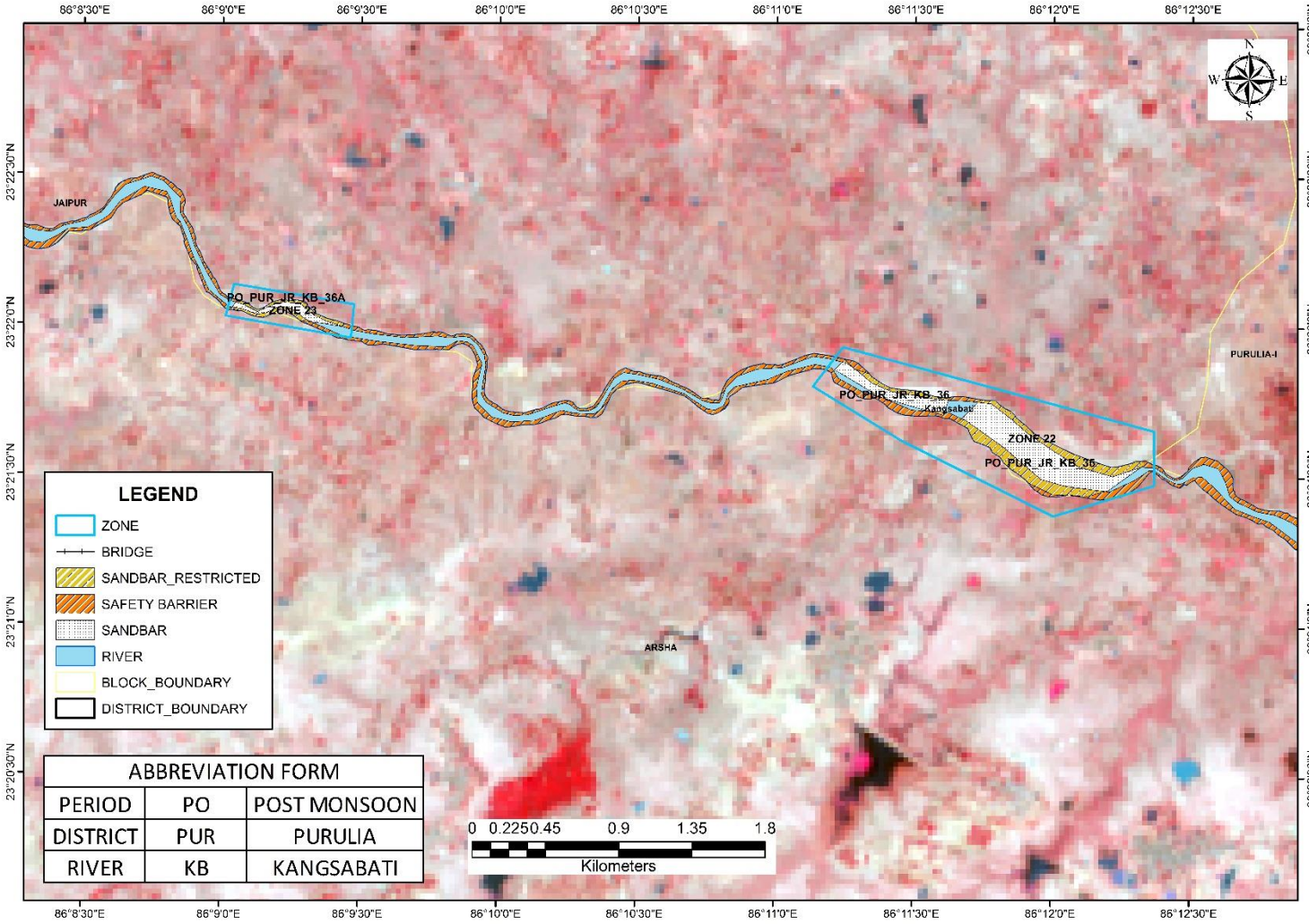


Plate 2B18: Distribution Map of Sand Bars with potential zones on Kangsabati River During Post-Monsoon Period of Purulia District *(Source: ISRO RESOURCE Sat 2 LISS III Sensor, 2020)*

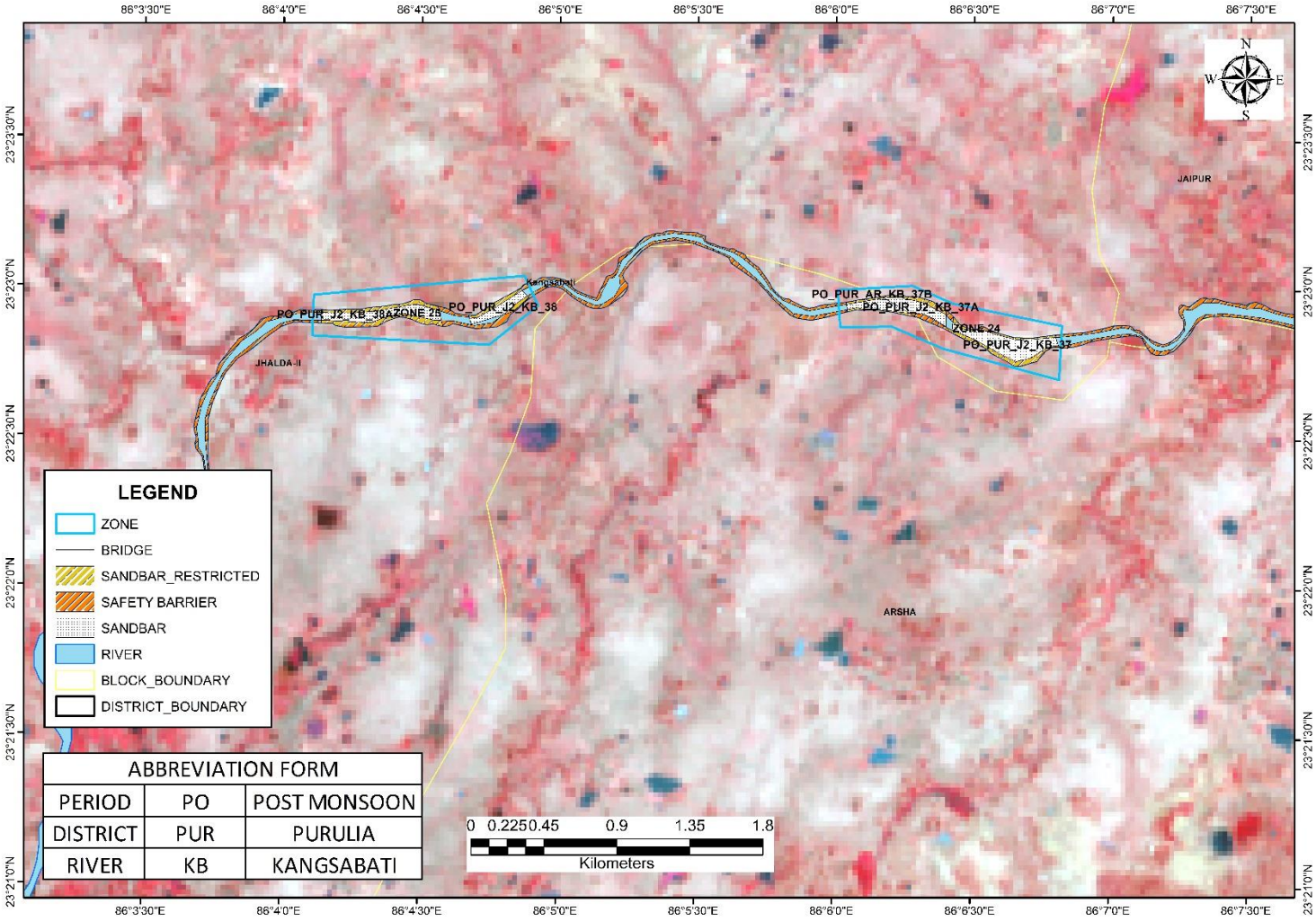


Plate 2B19: Distribution Map of Sand Bars with potential zones on Kangsabati River During Post-Monsoon Period of Purulia District *(Source: ISRO RESOURCE Sat 2 LISS III Sensor, 2020)*

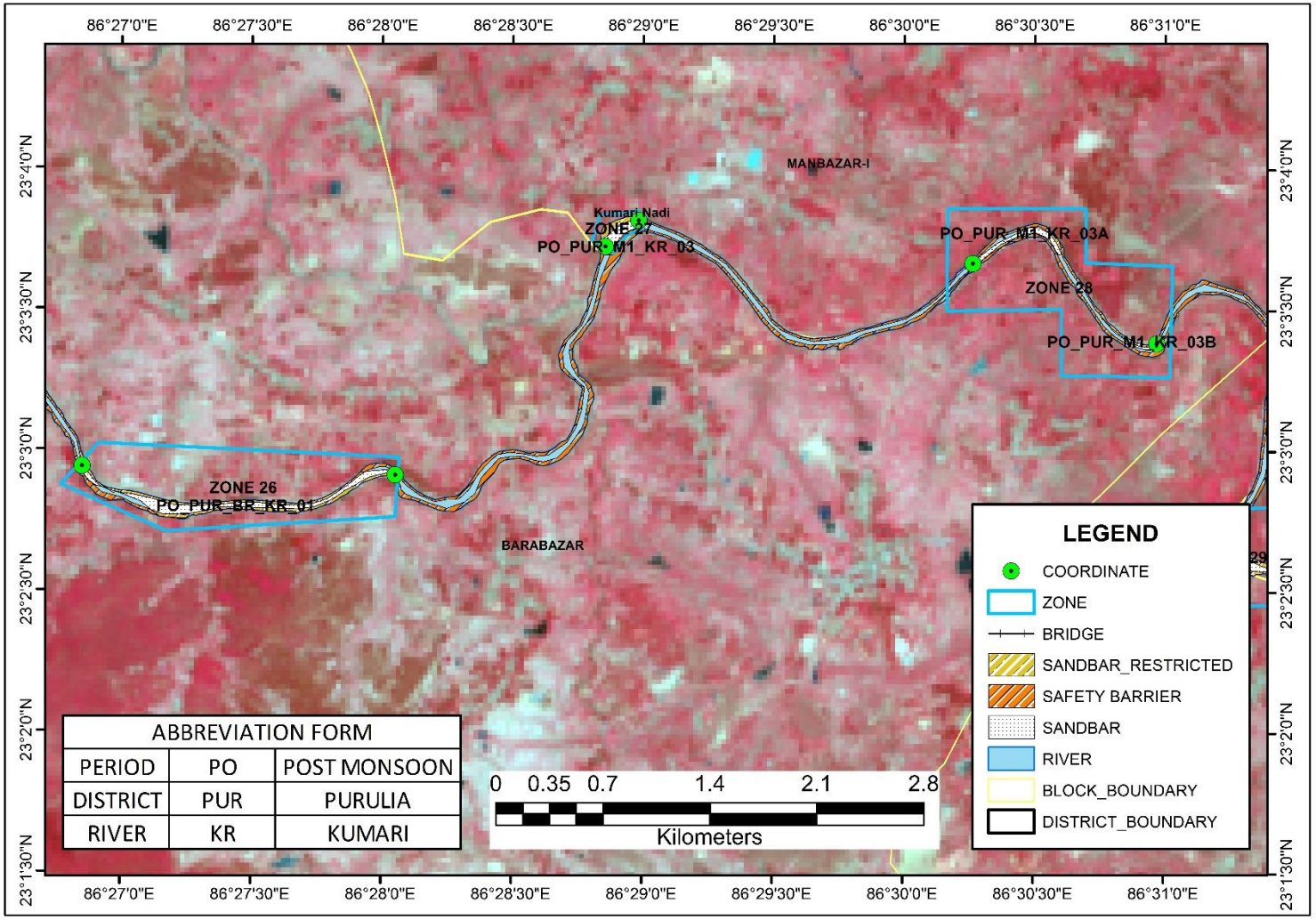


Plate 2B20: Distribution Map of Sand Bars with potential zones on Kumari River During Post-Monsoon Period of Purulia District *(Source: ISRO RESOURCE Sat 2 LISS III Sensor, 2020)*

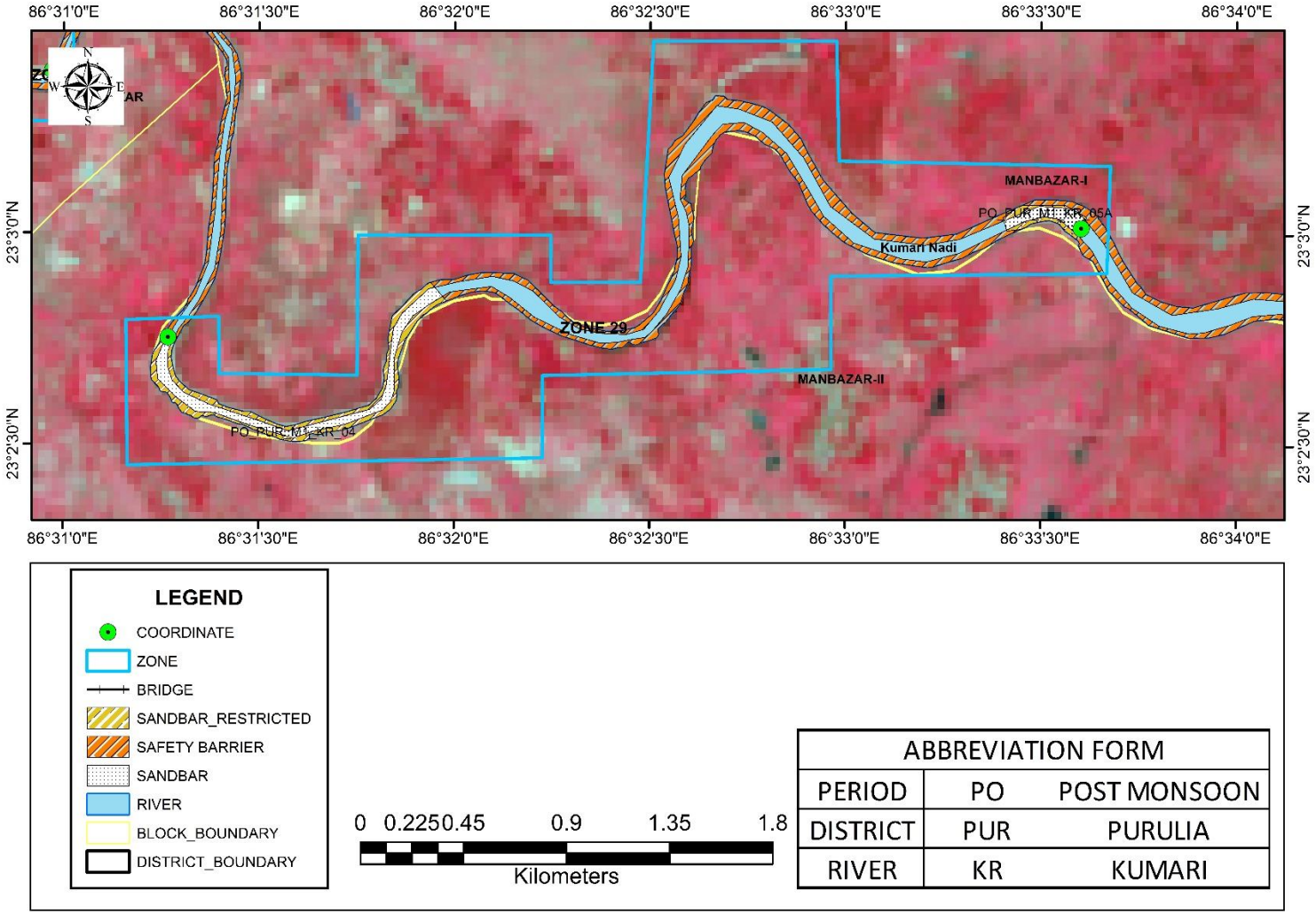


Plate 2B21: Distribution Map of Sand Bars with potential zones on Kumari River During Post-Monsoon Period of Purulia District *(Source: ISRO RESOURCE Sat 2 LISS III Sensor, 2020)*

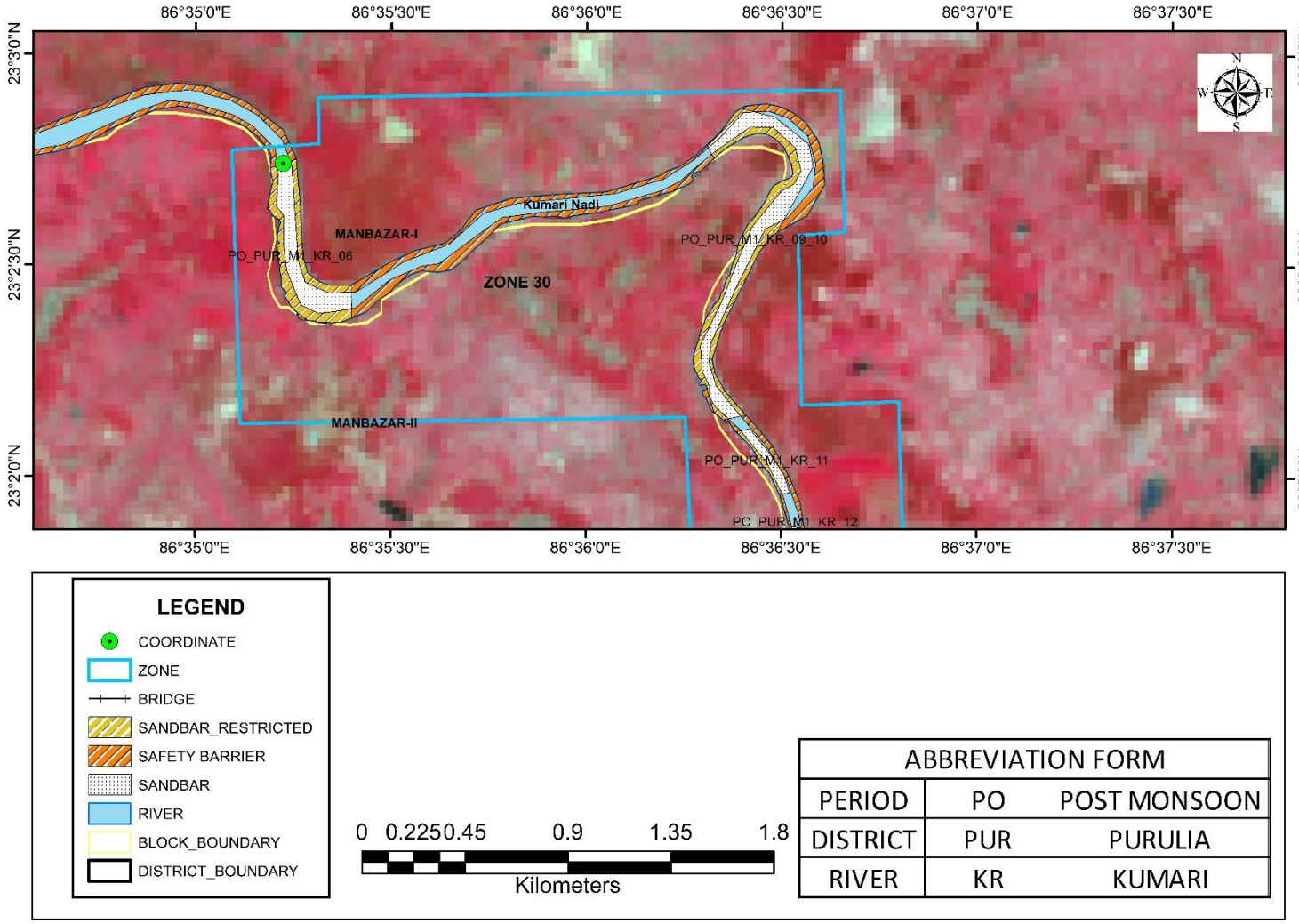


Plate 2B22: Distribution Map of Sand Bars with potential zones on Kumari River During Post-Monsoon Period of Purulia District *(Source: ISRO RESOURCE Sat 2 LISS III Sensor, 2020)*

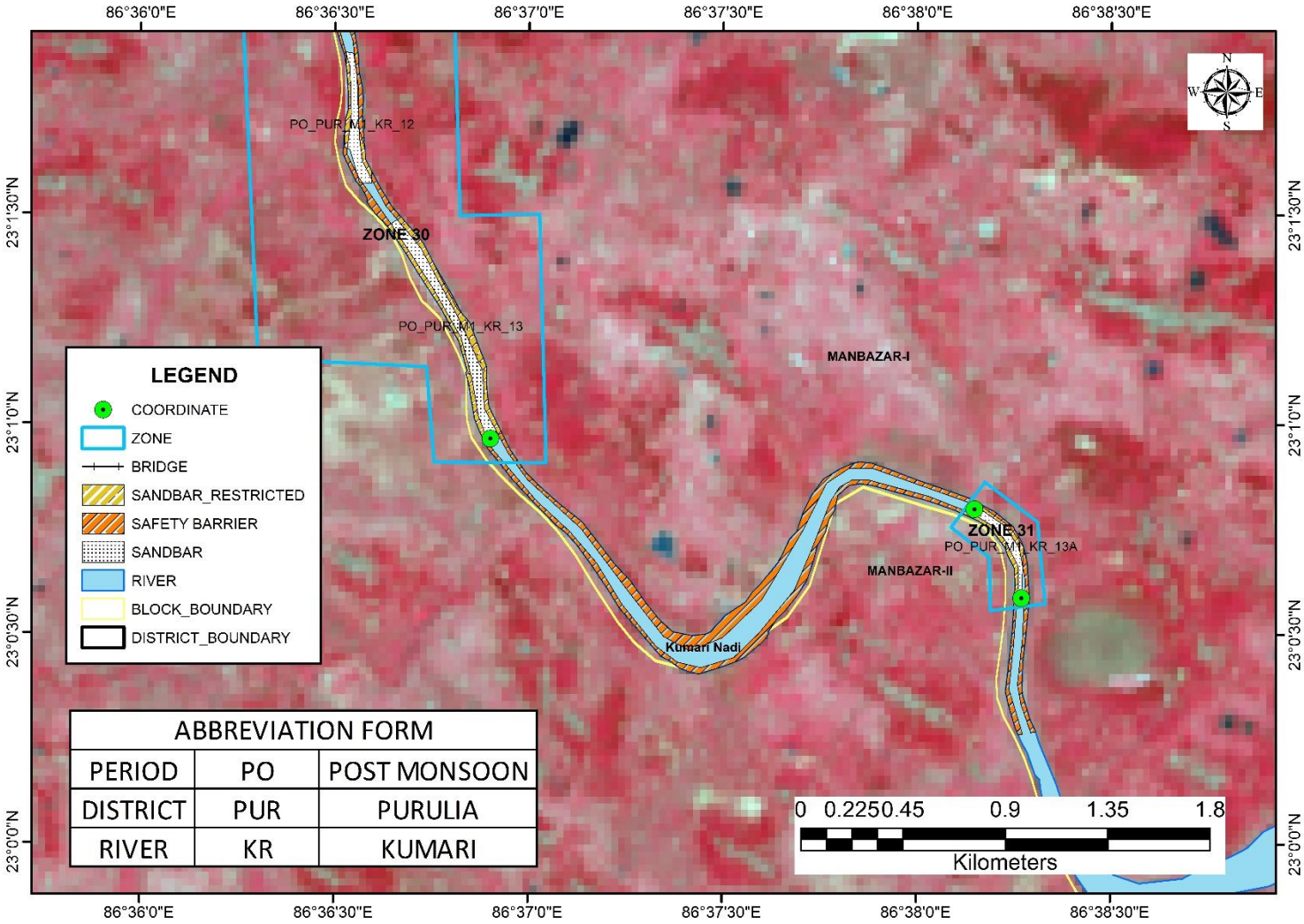


Plate 2B23: Distribution Map of Sand Bars with potential zones on Kumari River During Post-Monsoon Period of Purulia District *(Source: ISRO RESOURCE Sat 2 LISS III Sensor, 2020)*

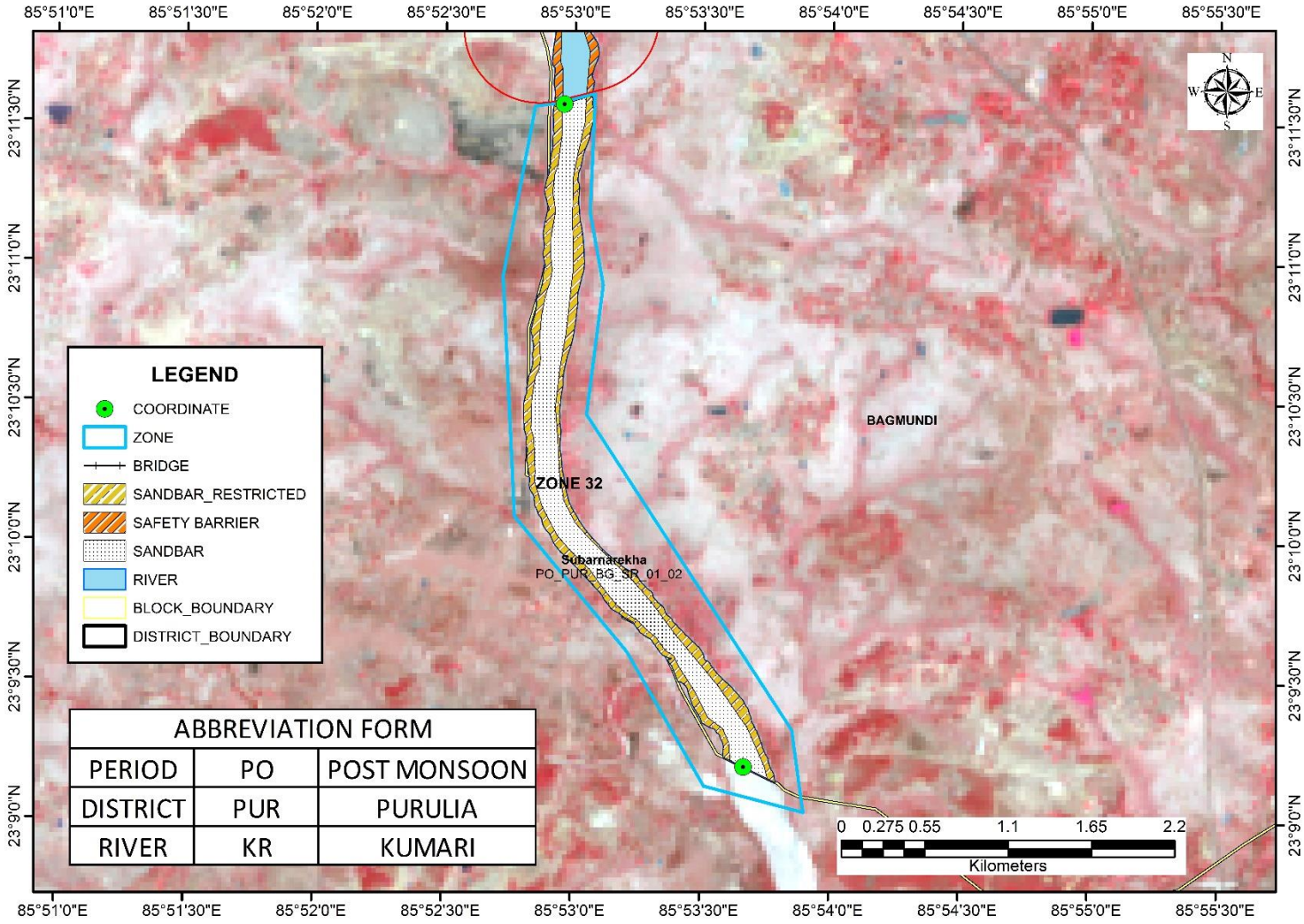


Plate 2B24: Distribution Map of Sand Bars with potential zones on Subarnarekha River During Post-Monsoon Period of Purulia District *(Source: ISRO RESOURCE Sat 2 LISS III Sensor, 2020)*

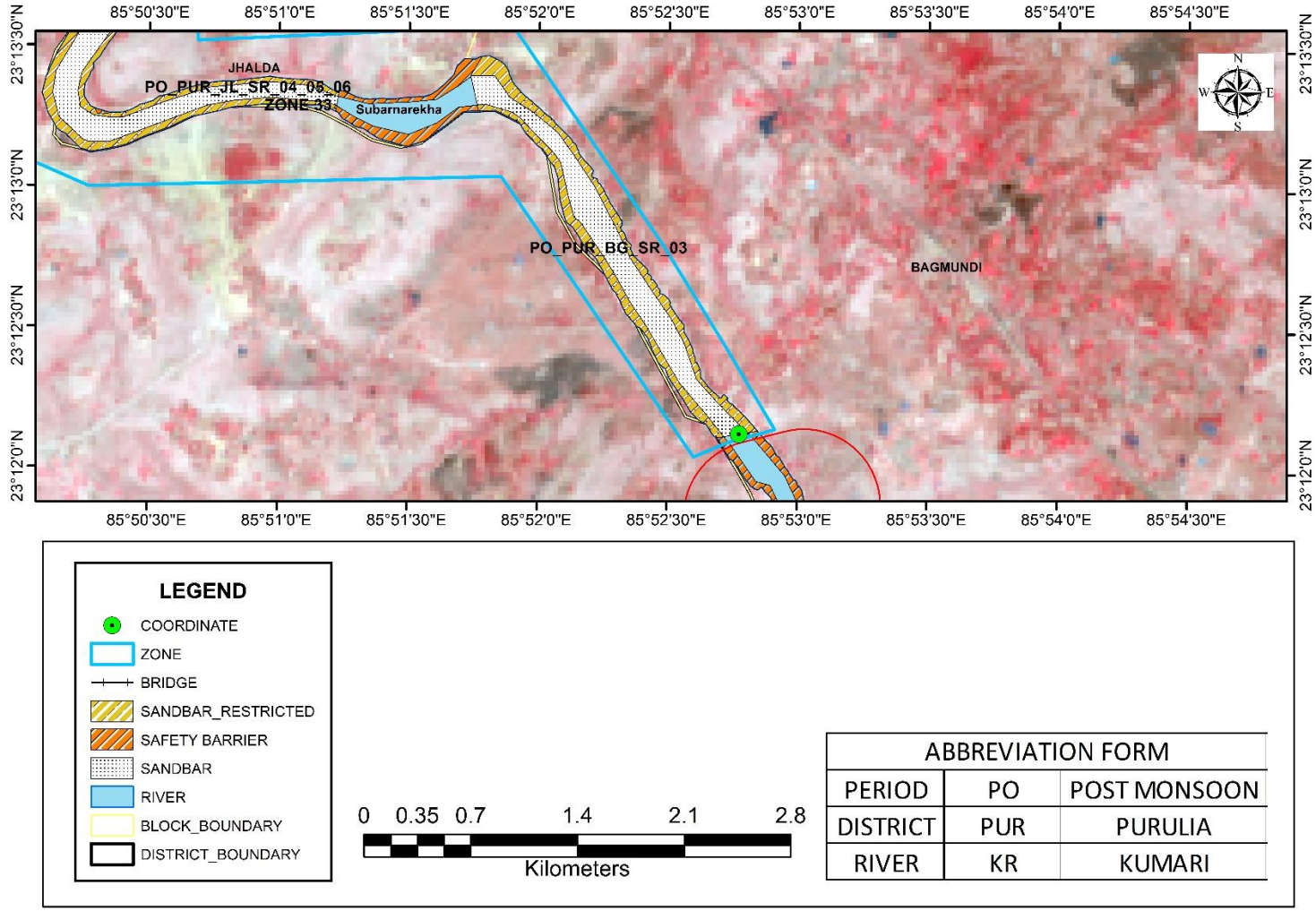


Plate 2B25: Distribution Map of Sand Bars with potential zones on Subarnarekha River During Post-Monsoon Period of Purulia District *(Source: ISRO RESOURCE Sat 2 LISS III Sensor, 2020)*

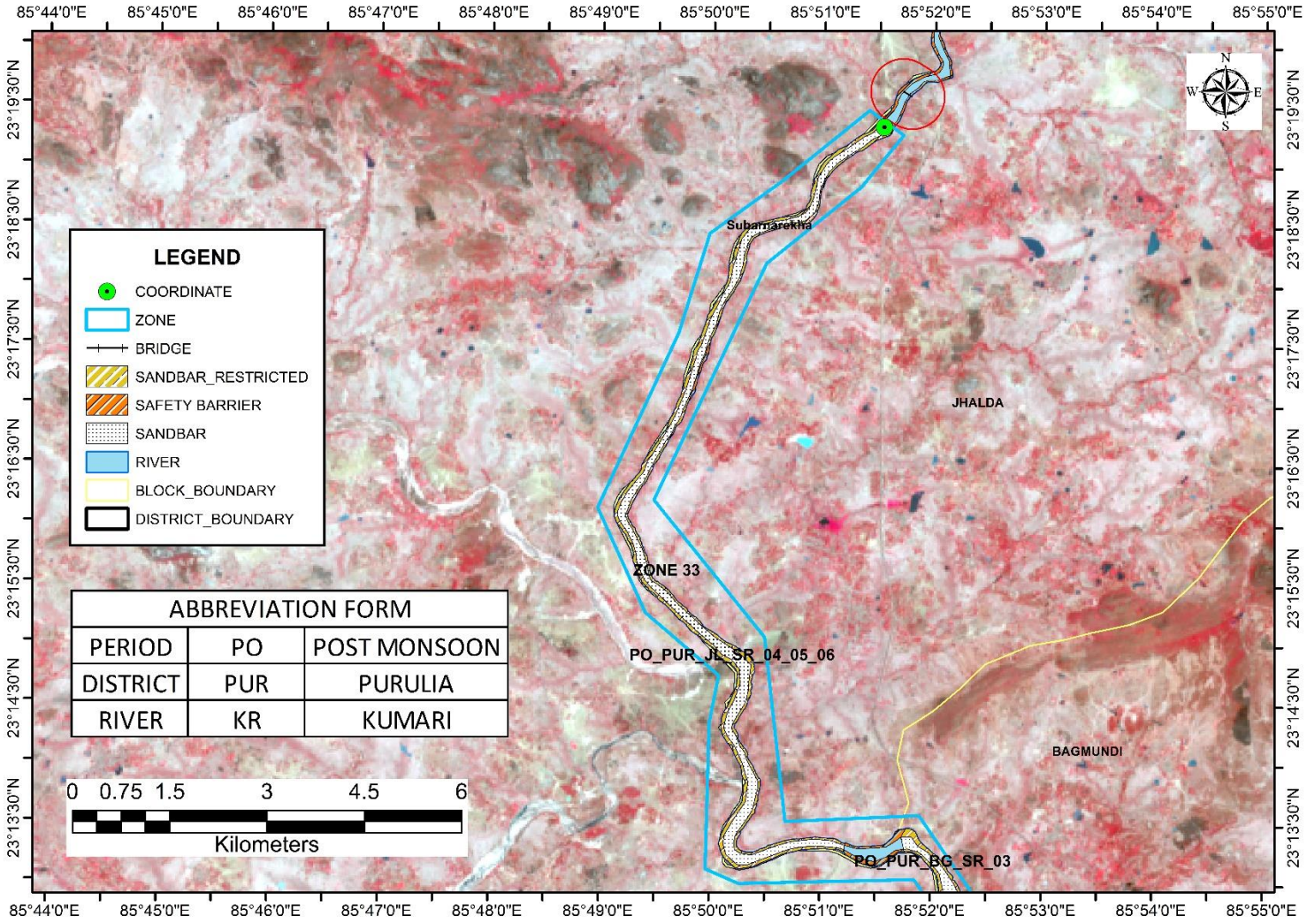


Plate 2B26: Distribution Map of Sand Bars with potential zones on Subarnarekha River During Post-Monsoon Period of Purulia District *(Source: ISRO RESOURCE Sat 2 LISS III Sensor, 2020)*

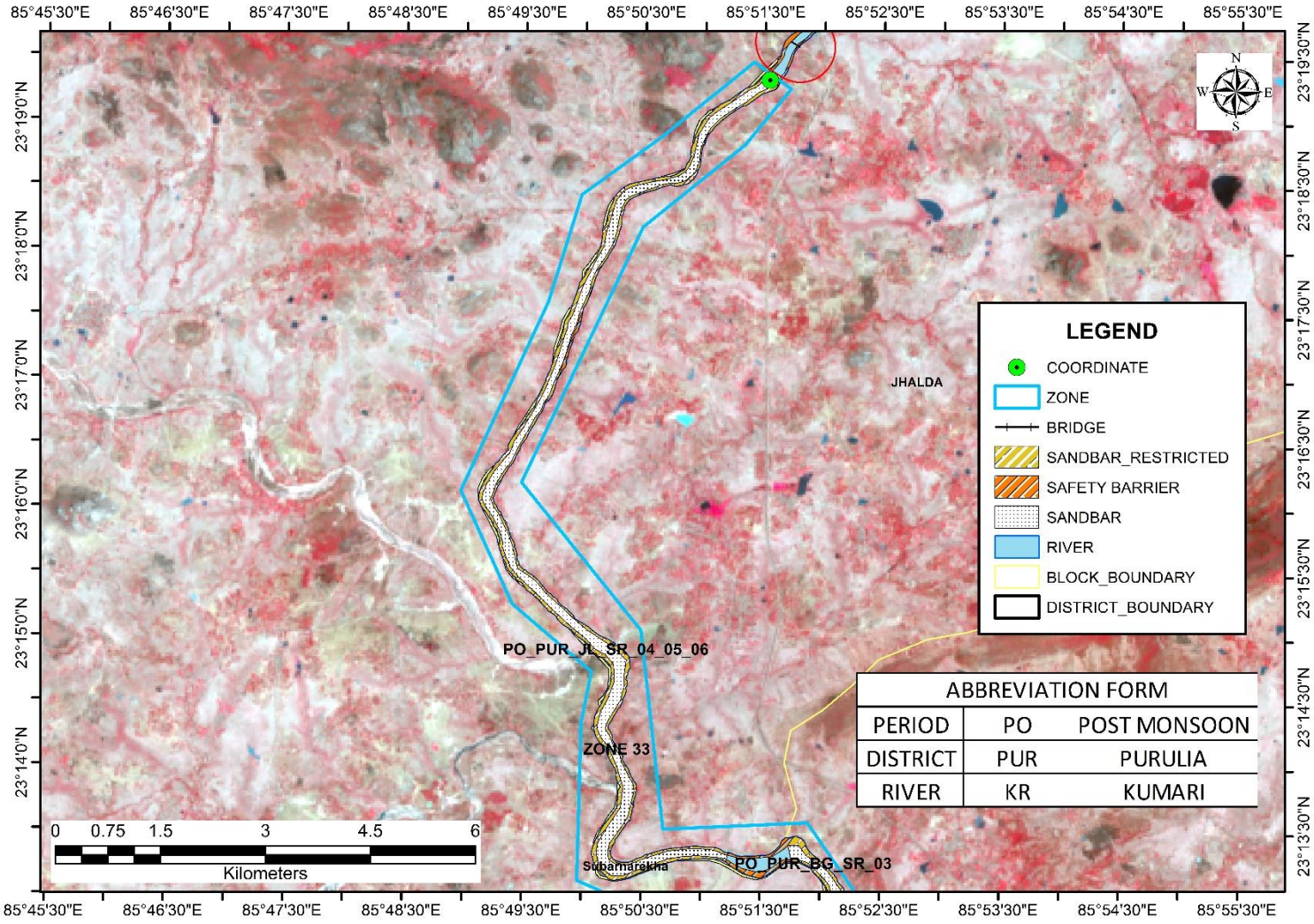


Plate 2B27: Distribution Map of Sand Bars with potential zones on Subarnarekha River During Post-Monsoon Period of Purulia District *(Source: ISRO RESOURCE Sat 2 LISS III Sensor, 2020)*

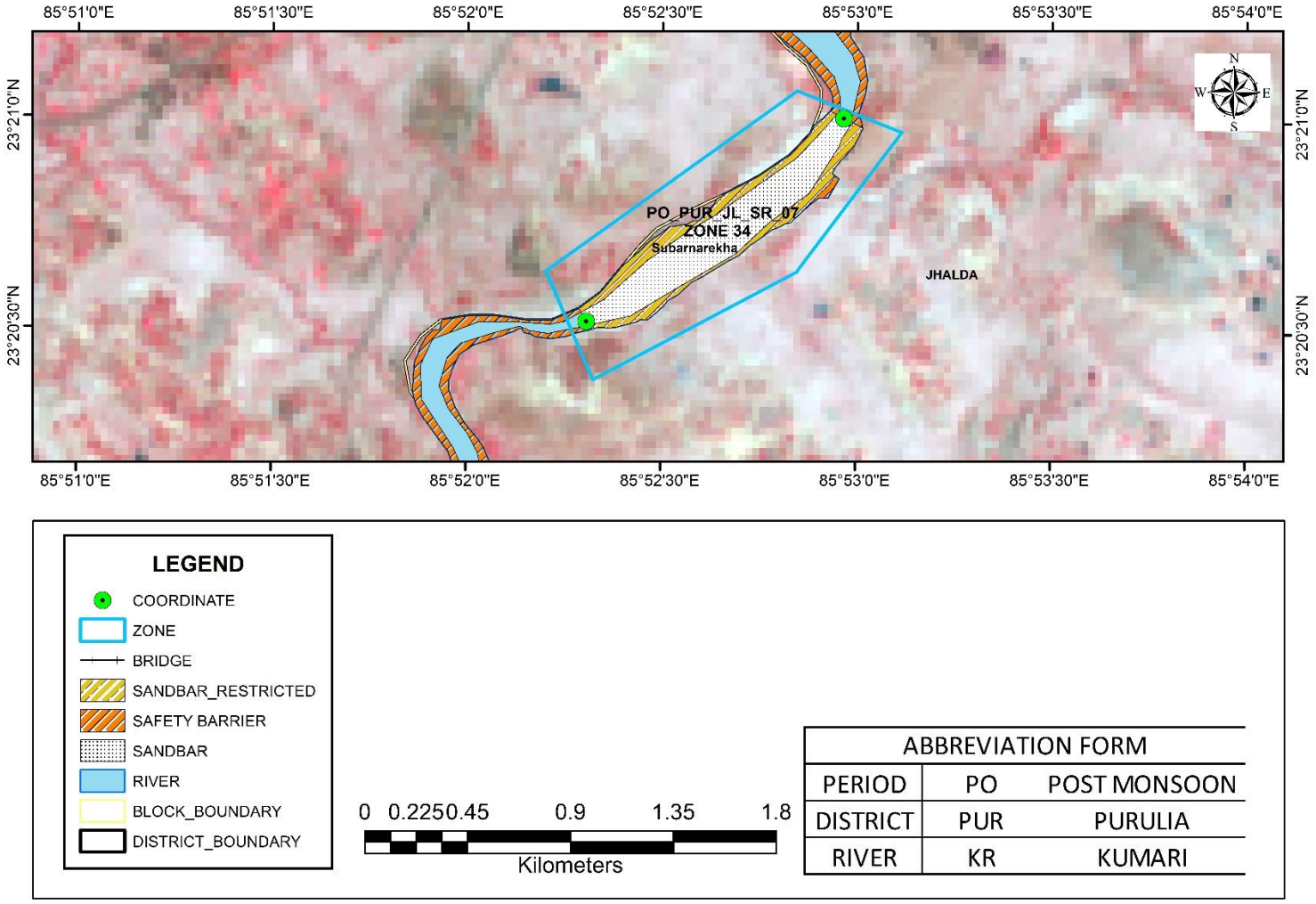


Plate 2B28: Distribution Map of Sand Bars with potential zones on Subarnarekha River During Post-Monsoon Period of Purulia District *(Source: ISRO RESOURCE Sat 2 LISS III Sensor, 2020)*

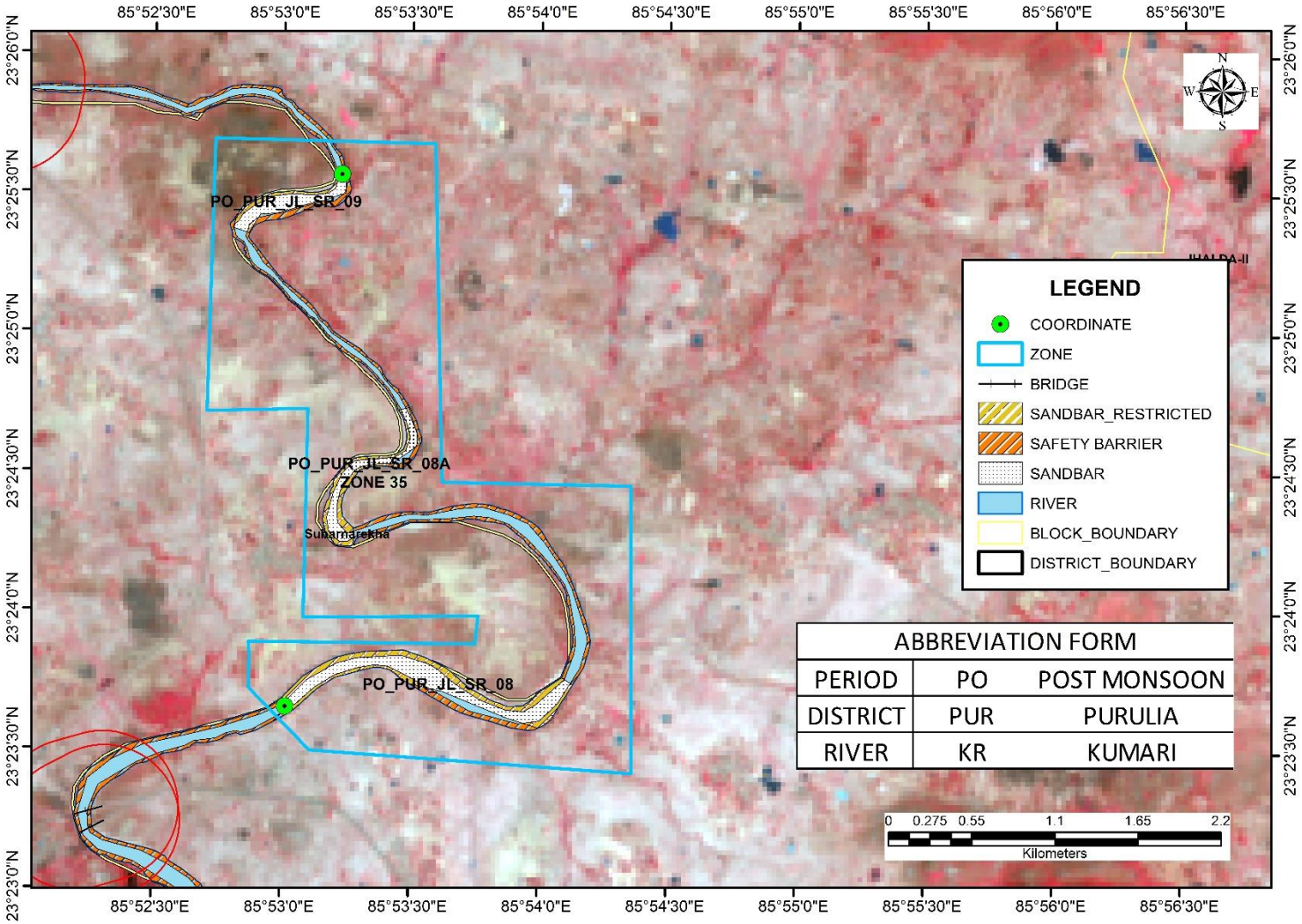


Plate 2B29: Distribution Map of Sand Bars with potential zones on Subarnarekha River During Post-Monsoon Period of Purulia District *(Source: ISRO RESOURCE Sat 2 LISS III Sensor, 2020)*

PLATE 3

WATERSHED MAP OF THE DISTRICT

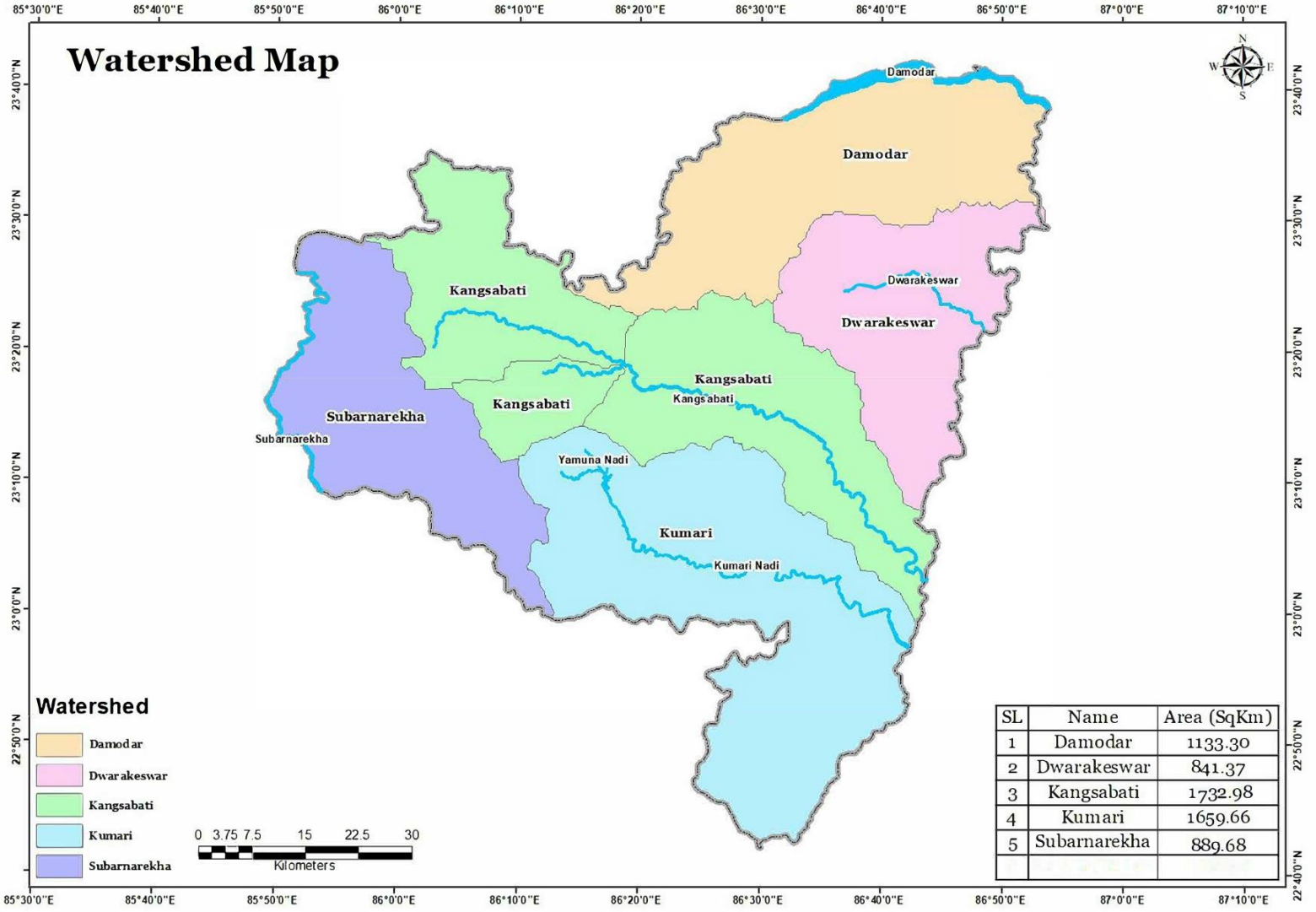
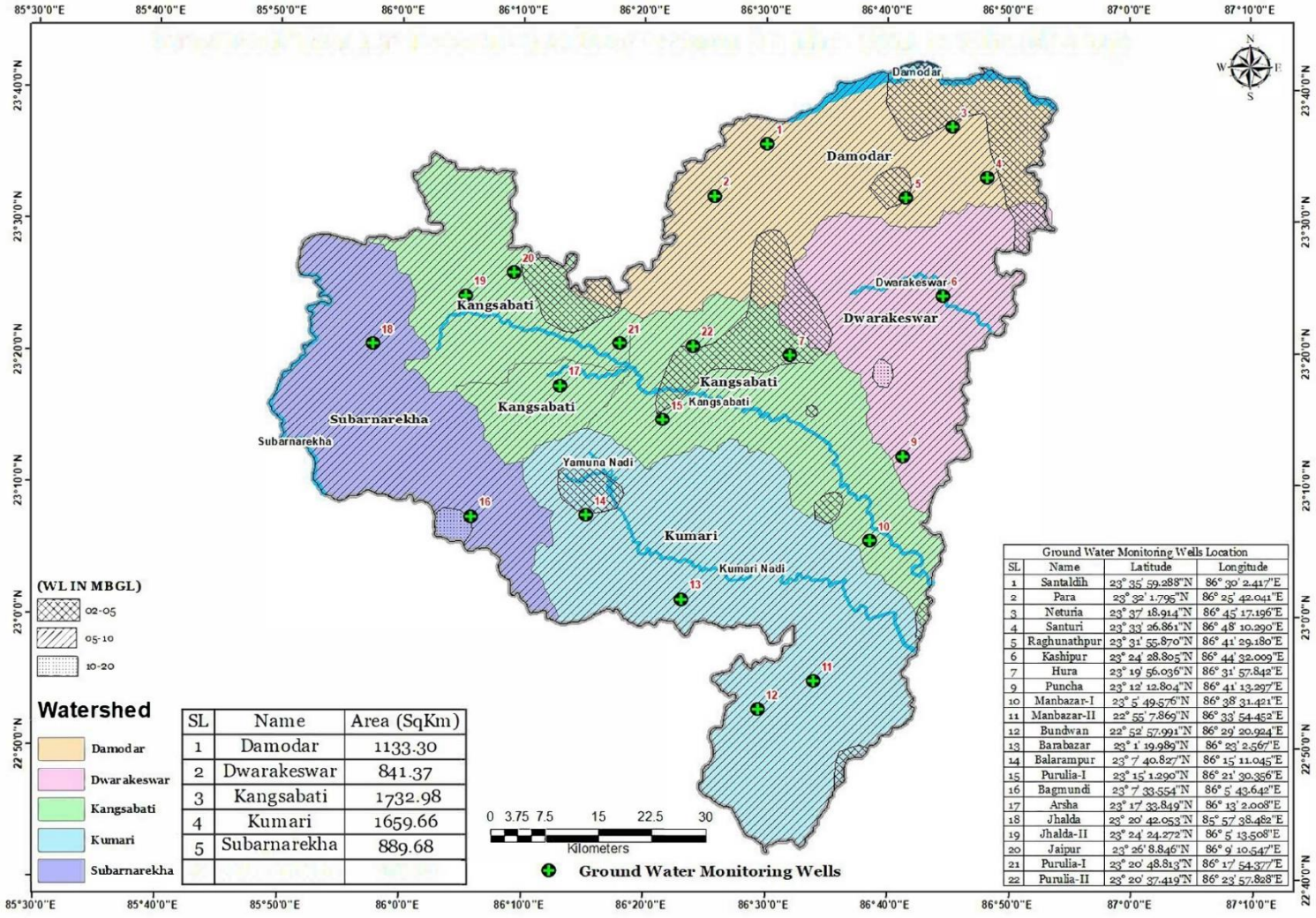


Plate 3A: Watershed Map of Purulia District *(Source: World Wild Fund for Nature)*

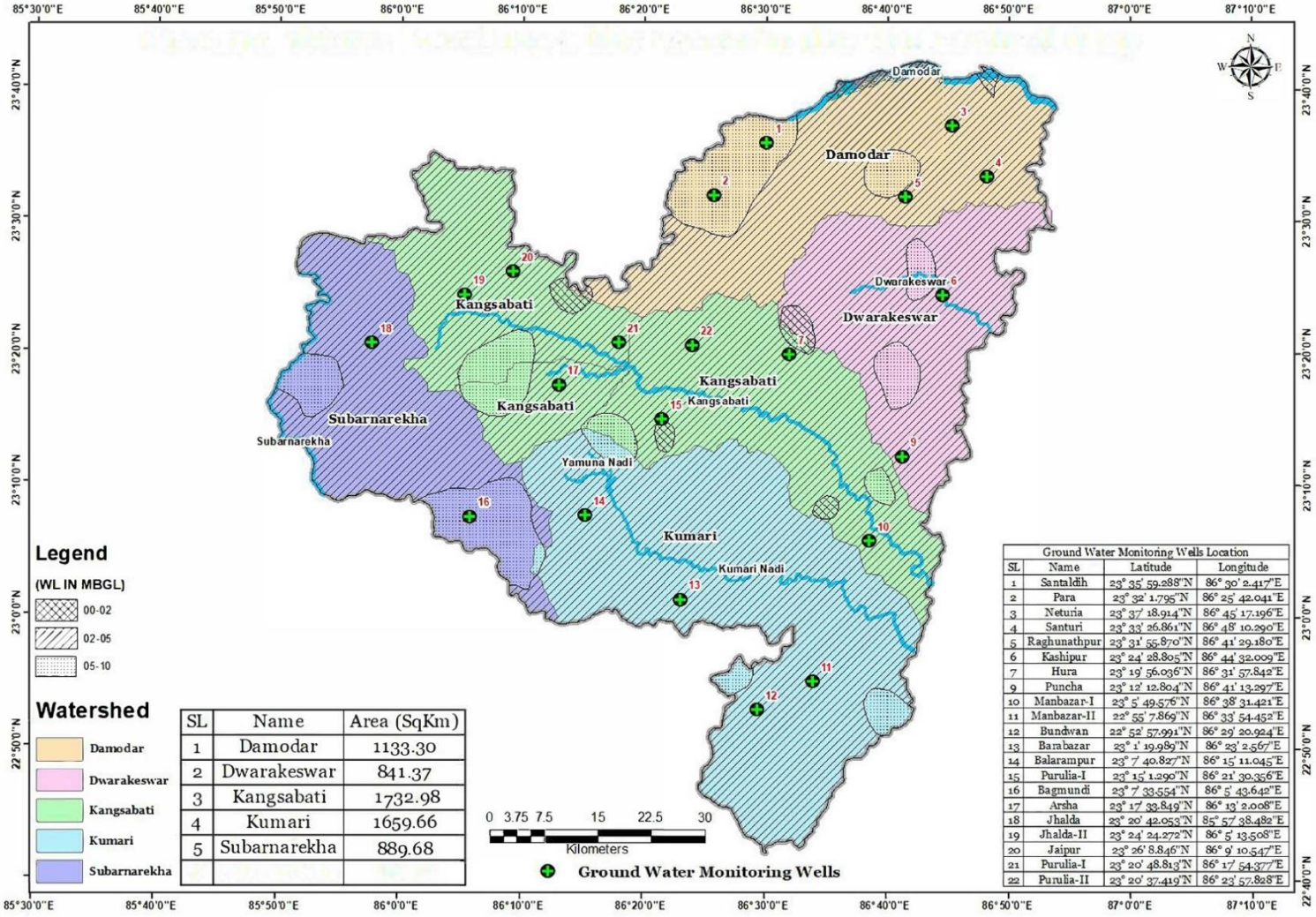


SL	Name	Area (SqKm)
1	Damodar	1133.30
2	Dwarakeswar	841.37
3	Kangsabati	1732.98
4	Kumari	1659.66
5	Subarnarekha	889.68

Ground Water Monitoring Wells Location

SL	Name	Latitude	Longitude
1	Santaldih	23° 35' 59.288"N	86° 30' 2.417"E
2	Para	23° 32' 1.795"N	86° 25' 42.041"E
3	Neturia	23° 37' 18.914"N	86° 45' 17.196"E
4	Santuri	23° 33' 26.861"N	86° 48' 10.290"E
5	Raghunathpur	23° 31' 55.870"N	86° 41' 29.180"E
6	Kashipur	23° 24' 28.805"N	86° 44' 32.009"E
7	Hura	23° 19' 56.036"N	86° 31' 57.842"E
9	Puncha	23° 12' 12.804"N	86° 41' 13.297"E
10	Manbazar-I	23° 5' 49.576"N	86° 38' 31.421"E
11	Manbazar-II	22° 55' 7.869"N	86° 33' 54.452"E
12	Bundwan	22° 52' 57.991"N	86° 29' 20.924"E
13	Barabazar	23° 1' 19.989"N	86° 23' 2.567"E
14	Balarampur	23° 7' 40.827"N	86° 15' 11.045"E
15	Purulia-I	23° 15' 1.290"N	86° 21' 30.356"E
16	Bagmundi	23° 7' 33.554"N	86° 5' 43.642"E
17	Arsha	23° 17' 33.849"N	86° 13' 2.008"E
18	Jhalda	23° 20' 42.053"N	85° 57' 38.482"E
19	Jhalda-II	23° 24' 24.272"N	86° 5' 13.508"E
20	Jaipur	23° 26' 8.846"N	86° 9' 10.547"E
21	Purulia-I	23° 20' 48.813"N	86° 17' 54.377"E
22	Purulia-II	23° 20' 37.419"N	86° 23' 57.828"E

Plate 3B: District Watershed map showing Ground Water level during Pre monsoon period *(Source: World Wild Fund for Nature)*



SL	Name	Area (SqKm)
1	Damodar	1133.30
2	Dwarakeswar	841.37
3	Kangsabati	1732.98
4	Kumari	1659.66
5	Subarnarekha	889.68

Ground Water Monitoring Wells Location

SL	Name	Latitude	Longitude
1	Santaldih	23° 35' 59.288"N	86° 30' 2.417"E
2	Para	23° 32' 1.795"N	86° 25' 42.041"E
3	Neturia	23° 37' 18.914"N	86° 45' 17.196"E
4	Santuri	23° 33' 26.861"N	86° 48' 10.290"E
5	Raghunathpur	23° 31' 55.870"N	86° 41' 29.180"E
6	Kashipur	23° 24' 28.805"N	86° 44' 32.009"E
7	Hura	23° 19' 56.036"N	86° 31' 57.842"E
9	Puncha	23° 12' 12.804"N	86° 41' 13.297"E
10	Manbazar-I	23° 5' 49.576"N	86° 38' 31.421"E
11	Manbazar-II	22° 55' 7.869"N	86° 33' 54.452"E
12	Bundwan	22° 52' 57.991"N	86° 29' 20.924"E
13	Barabazar	23° 1' 19.989"N	86° 23' 2.567"E
14	Balarampur	23° 7' 40.827"N	86° 15' 11.045"E
15	Purulia-I	23° 15' 1.290"N	86° 21' 30.356"E
16	Bagmundi	23° 7' 33.554"N	86° 5' 43.642"E
17	Arsha	23° 17' 33.849"N	86° 13' 2.008"E
18	Jhalda	23° 20' 42.053"N	85° 57' 38.482"E
19	Jhalda-II	23° 24' 24.272"N	86° 5' 13.508"E
20	Jaipur	23° 26' 8.846"N	86° 9' 10.547"E
21	Purulia-I	23° 20' 48.813"N	86° 17' 54.377"E
22	Purulia-II	23° 20' 37.419"N	86° 23' 57.828"E

Plate 3C: District Watershed map showing Ground Water level during Post monsoon period *(Source: World Wild Fund for Nature)*

PLATE 4

FIELD SURVEY PHOTOGRAPHS

	
4A: Picture of Kangsabati Riverbed deposit (Date: 22-11-21, Lat: 23° 22' 56" N and Long: 86° 4' 46" E)	**4B: Picture of Damodar Riverbed deposit (Date: 22-11-21, Lat: 23° 41' 9" N and Long: 86° 47' 27" E)**

PLATE 5

LONG TERM EROSION-ACCRETION MAP OF RIVER BANK

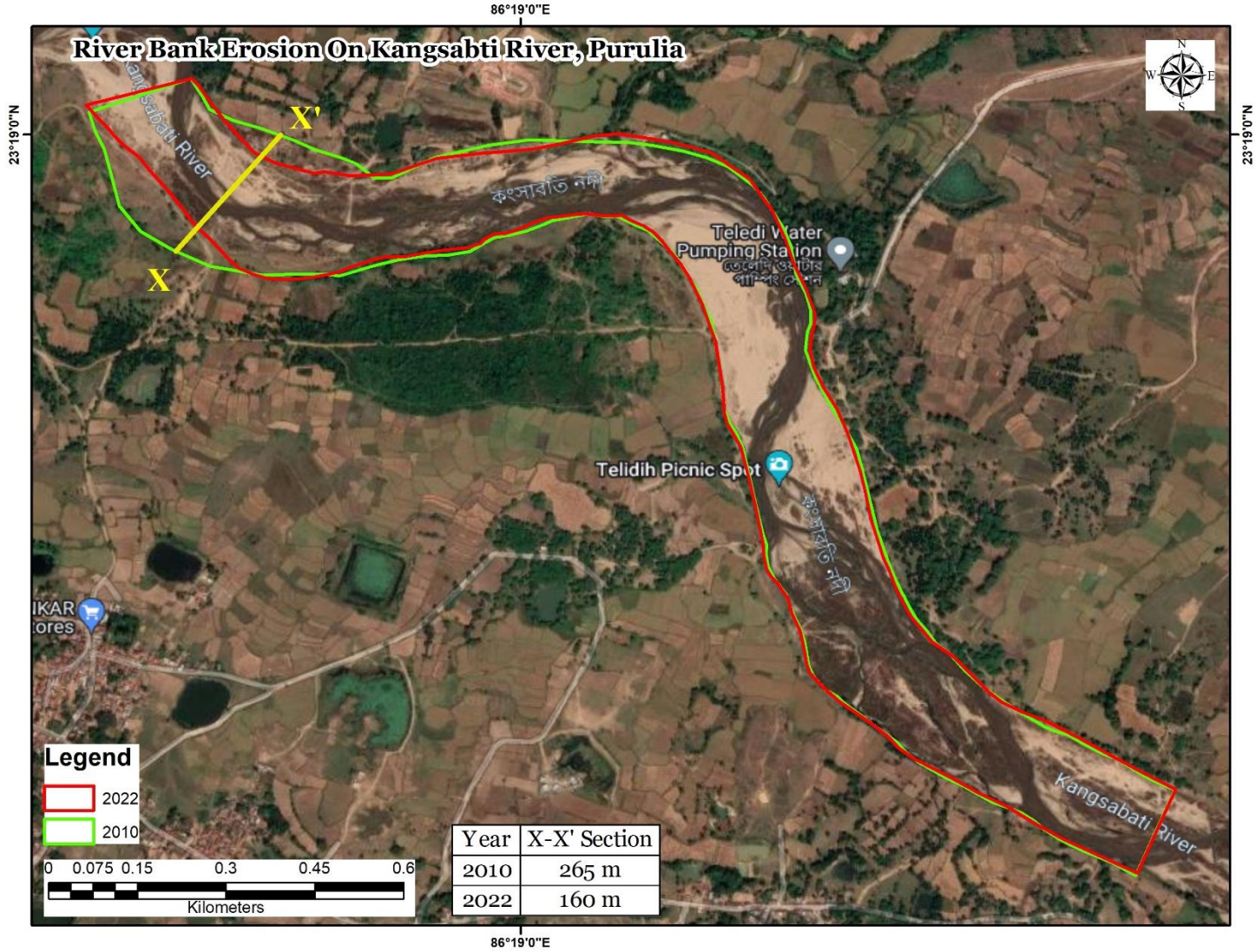


Plate 5: Map showing long-term (10-year or more) erosion-accretion areas on both the banks of Kangsabati River, Purulia *(Source: ISRO RESOURCE Sat 2 LISS III Sensor)*

PLATE 6

GEOLOGICAL MAP OF PURULIA

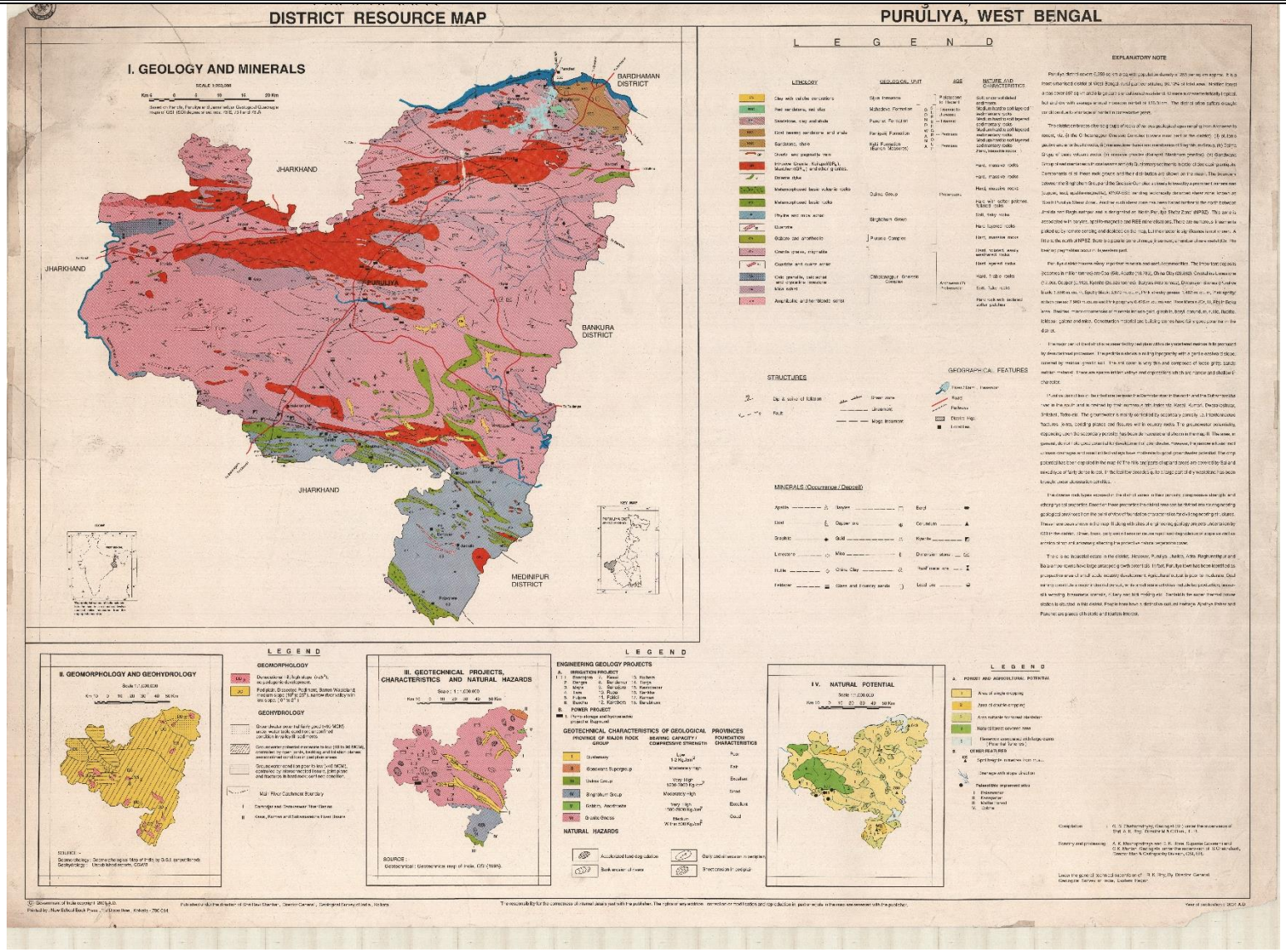


Plate 6: Geological Map of Purulia district (Source: GSI 2001)



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

Sl. No.	Particulars	Status
1	District Survey Report for sand mining shall be prepared before the auction/e-auction/grant of the mining lease/Letter of Intent (LoI) by Mining department or department dealing the mining activity in respective states.	Noted.
2	In order to make the inventory of River Bed Material, a detailed survey of the district needs to be carried out, to identify the source of River Bed Material and alternative source of sand (M-Sand). The source will include rivers, de-siltation of reservoir/dams, Patta lands/Khatedari Land, M-sand etc.	Complied with and explained in Chapter 7 pg no 56 to 100.
3	District Survey Report is to be prepared in such a way that it not only identifies the mineral-bearing area but also define the mining and no mining zones considering various environmental and social factors.	Complied with and furnished in pg no 84-86.
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 as Annexure-2.
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 7.15 pg 82 to 84.

Sl. No.	Particulars	Status
6	The permanent boundary pillars need to be erected after identification of an area of aggradation and deposition outside the bank of the river at a safe location for future surveying. The distance between boundary pillars on each side of the bank shall not be more than 100 meters.	Benchmark Pillars are established in strategic locations while boundary pillars will be fixed while fixation of the mining lease boundary subsequent to district level verification.
7	Identifying the mining and no mining zone shall follow with defining the area of sensitivity by ascertaining the distance of the mining area from the protected area, forest, bridges, important structures, habitation etc. and based on the sensitivity the area needs to be defined in sensitive and non-sensitive area.	Complied with and furnished in pg no 91-92.
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 16.
9	It is suggested that as far as possible the sensitive areas should be avoided for mining, unless local safety condition arises. Such deviation shall be temporary & shall not be a permanent feature.	Complied with and furnished in pg no 84-86.
10	Sand and gravel could be extracted from the downstream of the sand bar at river bends. Retaining the upstream one to two-thirds of the bar and riparian vegetation is accepted as a method to promote channel stability.	Noted. The DSR is compose of all the potential sand zones for defining the resources. In a subsequent phase blocking of potential zones shall be done in due consultation with the district level committee. The areas mentioned in the observation points shall be excluded while blocking of sand mining leases which are part of these potential zones marked in this DSR.
11	The final area selected for the mining should be then divided into mining lease as per the requirement of State Government. It is suggested the mining lease area should be so selected as to cover the entire deposition area. Dividing a large area of deposition/aggradation into smaller mining leases should be avoided as it leads to loss of mineral and indirectly promote illegal mining.	Shall be Complied with.
12	Cluster situation shall be examined. A cluster is formed when one mining lease of homogenous mineral is within 500 meters of the other mining lease. In order to reduce the cluster formation mining lease size should be defined in such a way that distance between any two clusters preferably should not be less than 2.5 Km. Mining lease should be defined in such a way that the total area of the mining leases in a cluster should not be more than 10 Ha.	Noted. Due care will be taken while distribution of mining leases either to prevent cluster situation or keeping the prescribed distance in between two mining clusters.
13	The number of a contiguous cluster needs to be ascertained. Contiguous cluster is formed when one cluster is at a distance of 2.5 Km from the other cluster.	Noted and shall be complied with.

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



Annexure 2

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

Abbreviation used in the table as below

ABBREVIATION FORM		
PERIOD	PR	PRE MONSOON
	PO	POST MONSOON
DISTRICT	PUR	PURULIA
BLOCK	NE	NETURIA
	KS	KASHIPUR
	M1	MANBAZAR-I
	PU	PUNCHA
	P1	PURULIA-I
	P2	PURULIA-II
	JR	JOYPUR
	BR	BARABAZAR
	BG	BAGMUNDI
	JL	JHALDA
	J2	JHALDA-II
RIVER	DMD	DAMODAR
	DW	DWARAKESWAR
	KB	KANGSABATI
	KR	KUMARI
	SR	SUBARNAREKHA

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 Damodar River											
1	PR_PUR_SN_DMD_1A	108.00	29409.09597	3.00	0.09	1	PO_PUR_SN_DMD_1A	108	57617.92	3.00	0.17
						2	PO_PUR_SN_DMD_1B	109	161043.84	3.00	0.48
2	PR_PUR_NE_DMD_1	110.00	521688.0624	3.00	1.57	3	PO_PUR_NE_DMD_01	110	878662.66	3.00	2.64
3	PR_PUR_NE_DMD_2	111.00	288417.3393	3.00	0.87	4	PO_PUR_NE_DMD_02	111	273111.35	3.00	0.82
						5	PO_PUR_NE_DMD_02A	114	205872.78	3.00	0.62
4	PR_PUR_NE_DMD_3	115.00	190480.3455	3.00	0.57	6	PO_PUR_NE_DMD_03	115	262272.23	3.00	0.79
5	PR_PUR_NE_DMD_4	115.00	403988.8425	3.00	1.21	7	PO_PUR_NE_DMD_04	115	373076.45	3.00	1.12
6	PR_PUR_NE_DMD_5	120.00	193578.919	3.00	0.58	8	PO_PUR_NE_DMD_05	120	277153.54	3.00	0.83

Pre monsoon						Post monsoon					
SL No	**Sand**	**RL**	**Area in**	**Sand**	**Sand**	**SL**	**Sand Bar_Code**	**RL**	**Area in**	**Sand**	**Sand**
7	PR_PUR_NE_DMD_6	122.00	365896.0595	3.00	1.10	9	PO_PUR_NE_DMD_06	122	373345.16	3.00	1.12
Estimation of Sand Resources in Pre monsoon period & Post monsoon period in sand bar regions of Dwarkeswar River											
1	PR_PUR_KS_DW_01	177.00	35359.36153	2.5	0.09	1	PO_PUR_KS_DW_01	177	58839.76	2.5	0.15
						2	PO_PUR_KS_DW_01A	176	28053.69	2.5	0.07
						3	PO_PUR_KS_DW_01B	170	36615.09	2.5	0.09
2	PR_PUR_KS_DW_02	170.00	29198.09106	2.5	0.07		-	-	-		
3	PR_PUR_KS_DW_03	164.00	106150.912	2.5	0.27	4	PO_PUR_KS_DW_03	164	113119.54	2.5	0.28
4	PR_PUR_KS_DW_04	165.00	31830.07887	2.5	0.08		-	-	-		
5	PR_PUR_KS_DW_05	165.00	44044.1676	2.5	0.11	5	PO_PUR_KS_DW_05	165	45968.82	2.5	0.11
6	PR_PUR_KS_DW_06	163.00	106140.2902	2.5	0.27	6	PO_PUR_KS_DW_06	163	110527.98	2.5	0.28
7	PR_PUR_KS_DW_07	154.00	100569.8863	2.5	0.25	7	PO_PUR_KS_DW_07_08_09	154	331721.25	2.5	0.83
8	PR_PUR_KS_DW_08	154.00	61699.97487	2.5	0.15						
9	PR_PUR_KS_DW_09	154.00	51478.8024	2.5	0.13						
10	PR_PUR_KS_DW_10	150.00	31152.72292	2.5	0.08	8	PO_PUR_KS_DW_10	150	52157.21	2.5	0.13
11	PR_PUR_KS_DW_11	145.00	256896.0395	2.5	0.64	9	PO_PUR_KS_DW_11	145	431709.38	2.5	1.08
12	PR_PUR_KS_DW_12	145.00	16704.85381	2.5	0.04		-	-	-		
13	PR_PUR_KS_DW_13	137.00	14649.70396	2.5	0.04	10	PO_PUR_KS_DW_13	137	87588.65	2.5	0.22
						11	PO_PUR_KS_DW_13A	135	58933.65	2.5	0.15
14	PR_PUR_KS_DW_14	132.00	31770.40048	2.5	0.08	12	PO_PUR_KS_DW_14	132	31642.04	2.5	0.08
15	PR_PUR_KS_DW_15	133.00	54195.02651	2.5	0.14	13	PO_PUR_KS_DW_15	133	51597.97	2.5	0.13
Estimation of Sand Resources in Pre monsoon period & Post monsoon period in sand bar regions of Kangsabati River											
1	PR_PUR_M1_KB_01	157.00	37107.63849	2	0.07	1	PO_PUR_M1_KB_01	157	26955.47	2	0.05
2	PR_PUR_M1_KB_02	154.00	27305.72462	2	0.05	2	PO_PUR_M1_KB_02	154	72397.74	2	0.14
3	PR_PUR_M1_KB_03	154.00	48177.15362	2	0.10	3	PO_PUR_M1_KB_03	154	101620.65	2	0.20
						4	PO_PUR_M1_KB_03A	155	47268.07	2	0.09
						5	PO_PUR_M1_KB_03B	157	70189.74	2	0.14
4	PR_PUR_M1_KB_04	158.00	221747.1651	2	0.44	6	PO_PUR_M1_KB_04	158	161100.08	2	0.32
5	PR_PUR_M1_KB_05	158.00	59740.92372	2	0.12	7	PO_PUR_M1_KB_05	158	104151.44	2	0.21
6	PR_PUR_M1_KB_06	160.00	104973.9272	2	0.21	8	PO_PUR_M1_KB_06	160	87524.24	2	0.18
7	PR_PUR_M1_KB_07	167.00	71884.45749	2	0.14	9	PO_PUR_M1_KB_07	167	52099.05	2	0.10
8	PR_PUR_M1_K	173.00	36866.76332	2	0.07	10	PO_PUR_M1_KB	173	68125.96	2	0.14

Pre monsoon						Post monsoon					
SL No	**Sand**	**RL**	**Area in**	**Sand**	**Sand**	**SL**	**Sand Bar_Code**	**RL**	**Area in**	**Sand**	**Sand**
	B_08						_08A				
9	PR_PUR_M1_KB_09	173.00	16174.76926	2	0.03		-	-	-		
10	PR_PUR_M1_KB_10	178.00	33089.19649	2	0.07	11	PO_PUR_PU_KB_10A	178	15454.65	2	0.03
11	PR_PUR_PU_KB_11	182.00	161998.8106	2	0.32	12	PO_PUR_PU_KB_11	182	261820.37	2	0.52
12	PR_PUR_PU_KB_12	183.00	83585.85557	2	0.17	13	PO_PUR_PU_KB_12	183	39307.77	2	0.08
13	PR_PUR_PU_KB_13	189.00	34283.92081	2	0.07	14	PO_PUR_PU_KB_13	189	57995.85	2	0.12
14	PR_PUR_PU_KB_14	189.00	50940.10607	2	0.10	15	PO_PUR_PU_KB_14	189	40213.73	2	0.08
						16	PO_PUR_PU_KB_14A	193	89619.61	2	0.18
15	PR_PUR_HU_KB_15	193.00	103411.8146	2	0.21	17	PO_PUR_HU_KB_15	193	70494.84	2	0.14
						18	PO_PUR_PU_KB_15A	195	57290.02	2	0.11
						19	PO_PUR_PU_KB_15B	196	12913.26	2	0.03
						20	PO_PUR_HU_KB_15C	197	62647.90	2	0.13
						21	PO_PUR_HU_KB_15D	208	53399.83	2	0.11
16	PR_PUR_P1_KB_16	209.00	25250.10126	2	0.05	22	PO_PUR_P1_KB_16	209	25334.74	2	0.05
						23	PO_PUR_P1_KB_16A	211	29307.24	2	0.06
17	PR_PUR_P1_KB_17	211.00	25099.68326	2	0.05	24	PO_PUR_P1_KB_17	211	57924.57	2	0.12
						25	PO_PUR_P1_KB_17A	212	29193.27	2	0.06
18	PR_PUR_P1_KB_18	213.00	20247.62993	2	0.04	26	PO_PUR_P1_KB_18	213	23746.81	2	0.05
19	PR_PUR_P1_KB_19	214.00	34097.31427	2	0.07	27	PO_PUR_P1_KB_19	214	38878.53	2	0.08
						28	PO_PUR_P2_KB_19A	214	26157.84	2	0.05
20	PR_PUR_P1_KB_21	217.00	34794.99361	2	0.07	29	PO_PUR_P1_KB_21	217	34633.00	2	0.07
21	PR_PUR_P2_KB_20	218.00	26554.92406	2	0.05	30	PO_PUR_P2_KB_20_22	219	86587.86	2	0.17
22	PR_PUR_P2_KB_22	219.00	49412.3006	2	0.10						
						31	PO_PUR_P1_KB_22A	219	18138.08	2	0.04
23	PR_PUR_P1_KB_23	219.00	32010.84114	2	0.06	32	PO_PUR_P1_KB_23	221	37053.37	2	0.07
						33	PO_PUR_P2_KB_23A	221	25253.56	2	0.05
24	PR_PUR_P2_KB_24	221.00	31532.17513	2	0.06	34	PO_PUR_P2_KB_24	223	43578.95	2	0.09
						35	PO_PUR_P2_KB_24A	224	12917.32	2	0.03
25	PR_PUR_P2_KB_25	224.00	41917.23101	2	0.08	36	PO_PUR_P2_KB_25	224	40783.78	2	0.08
26	PR_PUR_P2_KB_26	227.00	24667.72296	2	0.05	37	PO_PUR_P2_KB_26	227	104529.45	2	0.21
27	PR_PUR_P1_KB_27	231.00	55601.70558	2	0.11	38	PO_PUR_P1_KB_27	231	81672.11	2	0.16
28	PR_PUR_P1_KB_28	240.00	67165.54093	2	0.13	39	PO_PUR_P1_KB_28	240	241982.67	2	0.48

Pre monsoon						Post monsoon					
SL No	**Sand**	**RL**	**Area in**	**Sand**	**Sand**	**SL**	**Sand Bar_Code**	**RL**	**Area in**	**Sand**	**Sand**
29	PR_PUR_P1_KB_29	243.00	28605.49353	2	0.06		-	-	-		
30	PR_PUR_P1_KB_30	245.00	107857.2521	2	0.22	40	PO_PUR_P1_KB_30	245	127368.31	2	0.25
31	PR_PUR_P1_KB_31	245.00	20395.0349	2	0.04	41	PO_PUR_P1_KB_31	249	40408.65	2	0.08
						42	PO_PUR_P1_KB_31A	251	36103.36	2	0.07
32	PR_PUR_P1_KB_32	257.00	22497.043	2	0.04	43	PO_PUR_P1_KB_32	257	25724.82	2	0.05
33	PR_PUR_P1_KB_33	260.00	55315.46737	2	0.11	44	PO_PUR_P1_KB_33	258	67778.21	2	0.14
						45	PO_PUR_AR_KB_33A	260	61451.52	2	0.12
						46	PO_PUR_P1_KB_33B	263	34770.36	2	0.07
34	PR_PUR_P1_KB_34	265.00	185592.3222	2	0.37	47	PO_PUR_P1_KB_34	265	282390.78	2	0.56
35	PR_PUR_JR_KB_35	267.00	224773.6939	2	0.45	48	PO_PUR_JR_KB_35	272	260474.73	2	0.52
36	PR_PUR_JR_KB_36	275.00	27401.83141	2	0.05	49	PO_PUR_JR_KB_36	275	61271.38	2	0.12
						50	PO_PUR_JR_KB_36A	275	41913.73	2	0.08
37	PR_PUR_J2_KB_37	295.00	38962.42109	2	0.08	51	PO_PUR_J2_KB_37	284	78343.37	2	0.16
						52	PO_PUR_J2_KB_37A	295	32364.20	2	0.06
						53	PO_PUR_AR_KB_37B	295	23290.54	2	0.05
38	PR_PUR_J2_KB_38	305.00	18834.1673	2	0.04	54	PO_PUR_J2_KB_38	303	29481.09	2	0.06
						55	PO_PUR_J2_KB_38A	305	75484.22	2	0.15
Estimation of Sand Resources in Pre monsoon period & Post monsoon period in sand bar regions of Kumari River											
1	PR_PUR_BR_KR_01	195.00	14653.39754	1.5	0.02	1	PO_PUR_BR_KR_01	195	123090.61	1.5	0.18
2	PR_PUR_BR_KR_02	195.00	10683.25794	1.5	0.02		-	-	-		
3	PR_PUR_M1_KR_03	187.00	14462.71004	1.5	0.02	2	PO_PUR_M1_KR_03	187	29880.98	1.5	0.04
						3	PO_PUR_M1_KR_03A	185	25763.92	1.5	0.04
						4	PO_PUR_M1_KR_03B	186	9984.77	1.5	0.01
4	PR_PUR_M1_KR_04	186.00	88274.97245	1.5	0.13	5	PO_PUR_M1_KR_03C	186	8072.95	1.5	0.01
5	PR_PUR_M1_KR_05	185.00	21508.79404	1.5	0.03	6	PO_PUR_M1_KR_04	185	133503.79	1.5	0.20
6	PR_PUR_M1_KR_06	178.00	95556.88065	1.5	0.14	7	PO_PUR_M1_KR_05A	178	30031.22	1.5	0.05
7	PR_PUR_M1_KR_07	170.00	23832.5596	1.5	0.04	8	PO_PUR_M1_KR_06	170	104586.32	1.5	0.16
8	PR_PUR_M1_KR_08	168.00	6561.783649	1.5	0.01		-	-	-		
9	PR_PUR_M1_KR_09	167.00	42813.49904	1.5	0.06		-	-	-		
10	PR_PUR_M1_KR_10	167.00	65486.478	1.5	0.10	9	PO_PUR_M1_KR_09_10	167	152564.40	1.5	0.23
11	PR_PUR_M1_K	166.00	13856.77955	1.5	0.02						

Pre monsoon						Post monsoon					
SL No	**Sand**	**RL**	**Area in**	**Sand**	**Sand**	**SL**	**Sand Bar_Code**	**RL**	**Area in**	**Sand**	**Sand**
	R_11										
12	PR_PUR_M1_KR_12	166.00	20485.63457	1.5	0.03	10	PO_PUR_M1_KR_11	166	16821.71	1.5	0.03
13	PR_PUR_M1_KR_13	165.00	46874.9048	1.5	0.07	11	PO_PUR_M1_KR_12	165	31221.76	1.5	0.05
						12	PO_PUR_M1_KR_13	165	80213.99	1.5	0.12
						13	PO_PUR_M1_KR_13A	160	25456.62	1.5	0.04
Estimation of Sand Resources in Pre monsoon period & Post monsoon period in sand bar regions of Subarnarekha River											
1	PR_PUR_BG_SR_01	217.00	141696.1164	1.5	0.21	1	PO_PUR_BG_SR_01_02	217	520510.92	1.5	0.78
2	PR_PUR_BG_SR_02	217.00	250496.9478	1.5	0.38						
3	PR_PUR_BG_SR_03	219.00	378105.8185	1.5	0.57	2	PO_PUR_BG_SR_03	219	381567.03	1.5	0.57
4	PR_PUR_JL_SR_04	230.00	523428.4926	1.5	0.79	3	PO_PUR_JL_SR_04_05_06	230	1433740.78	1.5	2.15
5	PR_PUR_JL_SR_05	230.00	745227.587	1.5	1.12						
6	PR_PUR_JL_SR_06	230.00	41307.19558	1.5	0.06						
7	PR_PUR_JL_SR_07	260.00	152831.0165	1.5	0.23	4	PO_PUR_JL_SR_07	260	225669.33	1.5	0.34
8	PR_PUR_JL_SR_08	269.00	109508.5248	1.5	0.16	5	PO_PUR_JL_SR_08	269	84874.35	1.5	0.13
						6	PO_PUR_JL_SR_08A	269	55194.14	1.5	0.08
9	PR_PUR_JL_SR_09	270.00	9302.240085	1.5	0.01	7	PO_PUR_JL_SR_09	270	21647.04	1.5	0.03

Annexure 3
Boundary Coordinates of Potential Blocks of Purulia District

ABBREVIATION USED IN THE TABLE AS BELOW

ABBREVIATION FORM		
PERIOD	PR	PRE MONSOON
	PO	POST MONSOON
DISTRICT	PUR	PURULIA
BLOCK	NE	NETURIA
	KS	KASHIPUR
	M1	MANBAZAR-I
	PU	PUNCHA
	P1	PURULIA-I
	P2	PURULIA-II
	JR	JOYPUR
	BR	BARABAZAR
	BG	BAGMUNDI
	JL	JHALDA
	J2	JHALDA-II
RIVER	DMD	DAMODAR
	DW	DWARAKESWAR
	KB	KANGSABATI
	KR	KUMARI
	SR	SUBARNAREKHA

COORDINATES OF POTENTIAL BLOCK OF PURULIA DISTRICT

SANDBAR CODE	POINT NO.	LATITUDE	LONGITUDE
PUR_NE_DMD_01	1	23° 40' 33.304" N	86° 51' 6.273" E
	2	23° 40' 17.049" N	86° 51' 12.923" E
	3	23° 40' 19.106" N	86° 51' 24.783" E
	4	23° 40' 15.380" N	86° 51' 24.301" E
	5	23° 40' 10.012" N	86° 51' 24.681" E
	6	23° 39' 59.638" N	86° 51' 28.526" E
	7	23° 39' 55.638" N	86° 51' 17.315" E
	8	23° 40' 16.426" N	86° 51' 8.213" E
	9	23° 40' 23.485" N	86° 51' 4.874" E
	10	23° 40' 35.796" N	86° 50' 55.145" E
	11	23° 40' 44.196" N	86° 50' 44.857" E
	12	23° 40' 45.620" N	86° 50' 36.749" E
	13	23° 40' 50.124" N	86° 50' 26.435" E
	14	23° 40' 49.970" N	86° 50' 20.965" E
	15	23° 40' 52.617" N	86° 50' 21.223" E
	16	23° 40' 54.431" N	86° 50' 28.040" E
	17	23° 40' 55.130" N	86° 50' 38.969" E
	18	23° 40' 56.339" N	86° 50' 42.175" E
	19	23° 40' 55.870" N	86° 50' 45.709" E
	20	23° 40' 54.545" N	86° 50' 49.028" E
	21	23° 40' 53.621" N	86° 50' 50.479" E
	22	23° 40' 52.795" N	86° 50' 51.364" E
PUR_NE_DMD_02	1	23° 40' 50.619" N	86° 50' 3.079" E
	2	23° 40' 51.710" N	86° 49' 56.409" E
	3	23° 40' 58.005" N	86° 49' 58.669" E
	4	23° 40' 57.416" N	86° 50' 26.998" E
PUR_NE_DMD_02A	1	23° 41' 4.663" N	86° 48' 46.684" E
	2	23° 41' 5.347" N	86° 48' 43.204" E
	3	23° 41' 8.797" N	86° 48' 46.753" E
	4	23° 41' 10.369" N	86° 48' 48.718" E
PUR_NE_DMD_03	1	23° 41' 2.119" N	86° 47' 58.776" E
	2	23° 41' 5.540" N	86° 47' 46.225" E
	3	23° 41' 8.215" N	86° 47' 39.233" E
	4	23° 41' 7.556" N	86° 47' 33.103" E
	5	23° 41' 8.277" N	86° 47' 32.832" E
	6	23° 41' 11.526" N	86° 47' 39.956" E
	7	23° 41' 11.863" N	86° 47' 44.619" E
	8	23° 41' 9.996" N	86° 48' 0.802" E
	10	23° 40' 58.476" N	86° 48' 9.182" E
	9	23° 40' 58.007" N	86° 48' 13.555" E
PUR_NE_DMD_04	1	23° 40' 44.421" N	86° 46' 56.383" E
	2	23° 40' 45.570" N	86° 46' 32.326" E

SANDBAR CODE	POINT NO.	LATITUDE	LONGITUDE
	3	23° 40' 48.185" N	86° 46' 28.785" E
	4	23° 40' 49.619" N	86° 46' 43.193" E
	5	23° 40' 52.009" N	86° 46' 46.806" E
	6	23° 40' 54.724" N	86° 47' 3.680" E
	7	23° 41' 0.071" N	86° 47' 12.453" E
	8	23° 41' 8.752" N	86° 47' 18.605" E
	9	23° 41' 11.352" N	86° 47' 25.611" E
	10	23° 41' 9.629" N	86° 47' 27.170" E
	11	23° 40' 54.980" N	86° 47' 10.729" E
PUR_NE_DMD_05	1	23° 40' 39.382" N	86° 46' 6.422" E
	2	23° 40' 41.200" N	86° 46' 2.757" E
	3	23° 40' 41.256" N	86° 46' 1.440" E
	4	23° 40' 42.175" N	86° 46' 1.808" E
	5	23° 40' 43.003" N	86° 46' 15.736" E
	6	23° 40' 42.344" N	86° 46' 29.272" E
	7	23° 40' 40.581" N	86° 46' 51.123" E
	10	23° 40' 35.456" N	86° 46' 24.312" E
	9	23° 40' 37.033" N	86° 46' 43.590" E
	8	23° 40' 40.266" N	86° 46' 51.788" E
PUR_KS_DW_01	1	23° 25' 5.831" N	86° 38' 25.485" E
	2	23° 25' 5.932" N	86° 38' 26.137" E
	3	23° 25' 5.923" N	86° 38' 29.227" E
	4	23° 25' 3.214" N	86° 38' 30.318" E
	5	23° 25' 3.021" N	86° 38' 29.074" E
	6	23° 25' 3.386" N	86° 38' 23.144" E
	7	23° 25' 4.514" N	86° 38' 19.747" E
	8	23° 25' 5.231" N	86° 38' 18.634" E
	9	23° 25' 6.406" N	86° 38' 17.795" E
	10	23° 25' 7.171" N	86° 38' 16.432" E
	11	23° 25' 8.521" N	86° 38' 15.877" E
	12	23° 25' 7.582" N	86° 38' 19.018" E
	13	23° 25' 5.908" N	86° 38' 24.225" E
PUR_KS_DW_03	1	23° 25' 44.270" N	86° 41' 23.330" E
	2	23° 25' 48.850" N	86° 41' 20.525" E
	3	23° 25' 50.109" N	86° 41' 23.842" E
	4	23° 25' 50.410" N	86° 41' 25.427" E
	5	23° 25' 50.900" N	86° 41' 29.209" E
	6	23° 25' 52.150" N	86° 41' 33.690" E
	7	23° 25' 52.027" N	86° 41' 38.126" E
	8	23° 25' 50.848" N	86° 41' 40.871" E
	9	23° 25' 47.939" N	86° 41' 34.956" E
	10	23° 25' 47.311" N	86° 41' 30.631" E
	11	23° 25' 45.303" N	86° 41' 24.444" E
PUR_KS_DW_05	1	23° 25' 52.480" N	86° 42' 5.405" E

SANDBAR CODE	POINT NO.	LATITUDE	LONGITUDE
	2	23° 25' 52.954" N	86° 42' 5.453" E
	3	23° 25' 54.597" N	86° 42' 9.832" E
	4	23° 25' 57.008" N	86° 42' 10.945" E
	5	23° 25' 57.374" N	86° 42' 22.506" E
	6	23° 25' 55.843" N	86° 42' 23.585" E
PUR_KS_DW_06	1	23° 26' 9.252" N	86° 42' 41.877" E
	2	23° 26' 7.982" N	86° 42' 40.720" E
	3	23° 26' 8.648" N	86° 42' 39.871" E
	4	23° 26' 9.332" N	86° 42' 37.687" E
	5	23° 26' 9.379" N	86° 42' 35.188" E
	6	23° 26' 8.417" N	86° 42' 32.725" E
	7	23° 26' 6.306" N	86° 42' 31.075" E
	8	23° 25' 58.385" N	86° 42' 28.108" E
	9	23° 25' 57.846" N	86° 42' 27.479" E
	10	23° 25' 58.359" N	86° 42' 24.379" E
	11	23° 26' 9.378" N	86° 42' 31.284" E
	12	23° 26' 10.749" N	86° 42' 32.484" E
	13	23° 26' 11.502" N	86° 42' 35.056" E
	14	23° 26' 11.119" N	86° 42' 37.518" E
PUR_KS_DW_07_08_09	1	23° 25' 54.672" N	86° 43' 57.325" E
	2	23° 25' 52.289" N	86° 43' 56.987" E
	3	23° 25' 49.794" N	86° 43' 57.770" E
	4	23° 25' 47.380" N	86° 43' 58.747" E
	5	23° 25' 39.530" N	86° 43' 59.602" E
	6	23° 25' 34.841" N	86° 43' 59.332" E
	7	23° 25' 28.410" N	86° 43' 59.624" E
	8	23° 25' 26.841" N	86° 44' 0.234" E
	9	23° 25' 25.681" N	86° 44' 1.215" E
	10	23° 25' 24.782" N	86° 44' 3.827" E
	11	23° 25' 24.374" N	86° 44' 7.536" E
	12	23° 25' 24.440" N	86° 44' 16.787" E
	13	23° 25' 21.952" N	86° 44' 22.810" E
	14	23° 25' 21.626" N	86° 44' 24.400" E
	15	23° 25' 19.016" N	86° 44' 28.756" E
	16	23° 25' 17.941" N	86° 44' 29.201" E
	17	23° 25' 16.586" N	86° 44' 29.383" E
	18	23° 25' 15.905" N	86° 44' 29.248" E
	19	23° 25' 14.311" N	86° 44' 28.097" E
	20	23° 25' 7.613" N	86° 44' 22.604" E
	21	23° 25' 8.955" N	86° 44' 21.264" E
	22	23° 25' 13.938" N	86° 44' 25.641" E
	23	23° 25' 14.937" N	86° 44' 26.310" E
	24	23° 25' 16.486" N	86° 44' 26.419" E
	25	23° 25' 18.119" N	86° 44' 25.856" E

SANDBAR CODE	POINT NO.	LATITUDE	LONGITUDE
	26	23° 25' 19.597" N	86° 44' 24.399" E
	27	23° 25' 20.487" N	86° 44' 21.395" E
	28	23° 25' 22.557" N	86° 44' 14.230" E
	29	23° 25' 22.995" N	86° 44' 3.820" E
	30	23° 25' 23.940" N	86° 43' 59.975" E
	31	23° 25' 24.750" N	86° 43' 58.818" E
	32	23° 25' 25.850" N	86° 43' 57.702" E
	33	23° 25' 28.189" N	86° 43' 56.877" E
	34	23° 25' 37.997" N	86° 43' 56.895" E
	35	23° 25' 44.254" N	86° 43' 56.089" E
	36	23° 25' 46.938" N	86° 43' 56.099" E
	37	23° 25' 49.301" N	86° 43' 56.107" E
	38	23° 25' 51.846" N	86° 43' 54.797" E
	39	23° 25' 53.924" N	86° 43' 52.387" E
	40	23° 25' 54.745" N	86° 43' 49.237" E
	41	23° 25' 54.630" N	86° 43' 48.270" E
	42	23° 25' 58.263" N	86° 43' 47.642" E
	43	23° 25' 58.857" N	86° 43' 49.455" E
	44	23° 25' 59.344" N	86° 43' 52.631" E
	45	23° 25' 58.357" N	86° 43' 55.065" E
	46	23° 25' 56.887" N	86° 43' 56.620" E
PUR_KS_DW_10	1	23° 24' 37.898" N	86° 44' 35.776" E
	2	23° 24' 40.396" N	86° 44' 33.483" E
	3	23° 24' 41.905" N	86° 44' 30.644" E
	4	23° 24' 50.335" N	86° 44' 19.291" E
	5	23° 24' 50.385" N	86° 44' 18.452" E
	6	23° 24' 50.831" N	86° 44' 17.519" E
	7	23° 24' 52.354" N	86° 44' 16.069" E
	8	23° 24' 54.471" N	86° 44' 16.876" E
	9	23° 24' 52.003" N	86° 44' 19.040" E
	10	23° 24' 40.426" N	86° 44' 34.937" E
	11	23° 24' 38.646" N	86° 44' 36.739" E
PUR_KS_DW_11	1	23° 23' 43.219" N	86° 44' 55.985" E
	2	23° 23' 45.091" N	86° 45' 6.944" E
	3	23° 23' 45.437" N	86° 45' 13.893" E
	4	23° 23' 45.059" N	86° 45' 19.613" E
	5	23° 23' 42.995" N	86° 45' 29.945" E
	6	23° 23' 42.848" N	86° 45' 34.731" E
	7	23° 23' 42.888" N	86° 45' 36.086" E
	8	23° 23' 41.667" N	86° 45' 40.856" E
	9	23° 23' 40.576" N	86° 45' 42.196" E
	10	23° 23' 39.375" N	86° 45' 42.730" E
	11	23° 23' 37.961" N	86° 45' 42.834" E
	12	23° 23' 35.103" N	86° 45' 42.056" E



SANDBAR CODE	POINT NO.	LATITUDE	LONGITUDE
	13	23° 23' 34.672" N	86° 45' 41.535" E
	14	23° 23' 31.884" N	86° 45' 40.999" E
	15	23° 23' 30.044" N	86° 45' 41.842" E
	16	23° 23' 28.618" N	86° 45' 43.559" E
	17	23° 23' 27.849" N	86° 45' 46.599" E
	18	23° 23' 28.127" N	86° 45' 48.594" E
	19	23° 23' 27.546" N	86° 45' 56.538" E
	20	23° 23' 27.882" N	86° 45' 59.867" E
	21	23° 23' 26.988" N	86° 46' 7.000" E
	22	23° 23' 25.903" N	86° 46' 10.021" E
	23	23° 23' 24.671" N	86° 46' 13.451" E
	24	23° 23' 22.011" N	86° 46' 18.414" E
	25	23° 23' 19.876" N	86° 46' 22.330" E
	26	23° 23' 17.252" N	86° 46' 21.725" E
	27	23° 23' 17.836" N	86° 46' 19.927" E
	28	23° 23' 22.368" N	86° 46' 12.138" E
	29	23° 23' 23.567" N	86° 46' 9.360" E
	30	23° 23' 23.704" N	86° 46' 8.092" E
	31	23° 23' 24.938" N	86° 46' 4.548" E
	32	23° 23' 25.950" N	86° 45' 57.019" E
	33	23° 23' 25.684" N	86° 45' 53.086" E
	34	23° 23' 26.593" N	86° 45' 49.342" E
	35	23° 23' 26.410" N	86° 45' 47.860" E
	36	23° 23' 26.200" N	86° 45' 45.400" E
	37	23° 23' 26.817" N	86° 45' 43.888" E
	38	23° 23' 26.737" N	86° 45' 42.406" E
	39	23° 23' 27.097" N	86° 45' 41.175" E
	40	23° 23' 28.849" N	86° 45' 39.019" E
	41	23° 23' 30.062" N	86° 45' 38.821" E
	42	23° 23' 31.249" N	86° 45' 38.959" E
	43	23° 23' 33.976" N	86° 45' 39.864" E
	44	23° 23' 37.203" N	86° 45' 40.643" E
	45	23° 23' 37.660" N	86° 45' 40.477" E
	46	23° 23' 38.831" N	86° 45' 39.337" E
	47	23° 23' 40.303" N	86° 45' 35.886" E
	48	23° 23' 41.107" N	86° 45' 31.209" E
	49	23° 23' 41.406" N	86° 45' 23.126" E
	50	23° 23' 42.152" N	86° 45' 18.731" E
	51	23° 23' 42.078" N	86° 45' 12.778" E
	52	23° 23' 42.500" N	86° 45' 10.024" E
	53	23° 23' 42.858" N	86° 45' 8.159" E
	54	23° 23' 42.406" N	86° 45' 1.675" E
	55	23° 23' 41.554" N	86° 44' 59.720" E
	56	23° 23' 41.107" N	86° 44' 56.956" E

SANDBAR CODE	POINT NO.	LATITUDE	LONGITUDE
	57	23° 23' 41.337" N	86° 44' 53.437" E
	58	23° 23' 43.139" N	86° 44' 50.532" E
	59	23° 23' 43.353" N	86° 44' 49.285" E
	60	23° 23' 43.718" N	86° 44' 48.818" E
	61	23° 23' 44.964" N	86° 44' 48.350" E
	62	23° 23' 50.520" N	86° 44' 49.688" E
	63	23° 23' 52.105" N	86° 44' 50.673" E
	64	23° 23' 56.820" N	86° 44' 50.776" E
	65	23° 24' 1.342" N	86° 44' 48.381" E
	66	23° 24' 3.868" N	86° 44' 45.915" E
	67	23° 24' 23.058" N	86° 44' 38.967" E
	68	23° 24' 34.520" N	86° 44' 37.509" E
	69	23° 24' 34.563" N	86° 44' 38.873" E
	70	23° 24' 22.016" N	86° 44' 41.511" E
	71	23° 24' 7.373" N	86° 44' 48.265" E
	72	23° 24' 3.845" N	86° 44' 50.020" E
	73	23° 24' 1.277" N	86° 44' 50.536" E
	74	23° 23' 55.003" N	86° 44' 52.736" E
	75	23° 23' 52.389" N	86° 44' 52.286" E
	76	23° 23' 50.346" N	86° 44' 50.698" E
	77	23° 23' 48.205" N	86° 44' 50.265" E
	78	23° 23' 45.742" N	86° 44' 50.931" E
	79	23° 23' 43.612" N	86° 44' 53.457" E
PUR_KS_DW_13	1	23° 22' 36.453" N	86° 47' 24.847" E
	2	23° 22' 37.351" N	86° 47' 24.329" E
	3	23° 22' 39.160" N	86° 47' 23.645" E
	4	23° 22' 41.809" N	86° 47' 23.230" E
	5	23° 22' 55.362" N	86° 47' 21.801" E
	6	23° 23' 1.909" N	86° 47' 16.677" E
	7	23° 23' 4.747" N	86° 47' 17.762" E
	8	23° 23' 3.092" N	86° 47' 19.231" E
	9	23° 23' 2.199" N	86° 47' 20.817" E
	10	23° 22' 55.527" N	86° 47' 24.146" E
	11	23° 22' 53.550" N	86° 47' 24.935" E
	12	23° 22' 52.110" N	86° 47' 25.660" E
	13	23° 22' 50.218" N	86° 47' 26.269" E
	14	23° 22' 43.940" N	86° 47' 25.510" E
	15	23° 22' 36.268" N	86° 47' 25.829" E
PUR_KS_DW_13A	1	23° 22' 18.726" N	86° 47' 57.035" E
	2	23° 22' 16.600" N	86° 47' 57.003" E
	3	23° 22' 17.855" N	86° 47' 49.577" E
	4	23° 22' 17.336" N	86° 47' 47.285" E
	5	23° 22' 18.407" N	86° 47' 40.020" E
	6	23° 22' 19.395" N	86° 47' 38.924" E

SANDBAR CODE	POINT NO.	LATITUDE	LONGITUDE
	7	23° 22' 21.190" N	86° 47' 35.728" E
	8	23° 22' 23.471" N	86° 47' 36.982" E
	9	23° 22' 20.938" N	86° 47' 40.486" E
PUR_KS_DW_14	1	23° 21' 37.241" N	86° 48' 30.168" E
	2	23° 21' 38.002" N	86° 48' 27.448" E
	3	23° 21' 46.347" N	86° 48' 26.130" E
	4	23° 21' 49.988" N	86° 48' 25.551" E
	5	23° 21' 52.087" N	86° 48' 26.686" E
	6	23° 21' 46.092" N	86° 48' 28.259" E
	7	23° 21' 40.331" N	86° 48' 29.594" E
PUR_KS_DW_15	1	23° 21' 41.545" N	86° 48' 59.406" E
	2	23° 21' 39.723" N	86° 48' 57.284" E
	3	23° 21' 39.547" N	86° 48' 55.735" E
	4	23° 21' 32.373" N	86° 48' 44.441" E
	5	23° 21' 33.796" N	86° 48' 41.209" E
	6	23° 21' 41.083" N	86° 48' 53.039" E
	7	23° 21' 42.155" N	86° 48' 58.216" E
PUR_M1_KB_01	1	23° 2' 31.280" N	86° 43' 20.924" E
	2	23° 2' 34.402" N	86° 43' 19.678" E
	3	23° 2' 37.523" N	86° 43' 19.189" E
	4	23° 2' 41.696" N	86° 43' 19.506" E
	5	23° 2' 43.781" N	86° 43' 20.052" E
	6	23° 2' 44.005" N	86° 43' 21.317" E
	7	23° 2' 41.817" N	86° 43' 20.985" E
	8	23° 2' 38.049" N	86° 43' 21.299" E
	9	23° 2' 33.069" N	86° 43' 22.760" E
	10	23° 2' 32.203" N	86° 43' 23.700" E
PUR_M1_KB_02	1	23° 2' 49.499" N	86° 43' 21.577" E
	2	23° 2' 49.631" N	86° 43' 19.764" E
	3	23° 2' 54.883" N	86° 43' 19.734" E
	4	23° 2' 56.668" N	86° 43' 19.475" E
	5	23° 2' 59.205" N	86° 43' 18.703" E
	6	23° 3' 8.774" N	86° 43' 16.917" E
	7	23° 3' 14.791" N	86° 43' 13.650" E
	8	23° 3' 17.798" N	86° 43' 11.482" E
	9	23° 3' 22.675" N	86° 43' 7.361" E
	10	23° 3' 23.554" N	86° 43' 9.052" E
	11	23° 3' 19.077" N	86° 43' 13.442" E
	12	23° 3' 14.193" N	86° 43' 16.223" E
	13	23° 3' 12.682" N	86° 43' 16.988" E
	14	23° 3' 12.088" N	86° 43' 17.073" E
	15	23° 3' 9.406" N	86° 43' 18.362" E
	16	23° 3' 7.367" N	86° 43' 18.673" E
	17	23° 3' 3.884" N	86° 43' 19.294" E

SANDBAR CODE	POINT NO.	LATITUDE	LONGITUDE
	18	23° 3' 3.254" N	86° 43' 19.462" E
	19	23° 3' 1.459" N	86° 43' 20.163" E
	20	23° 2' 59.833" N	86° 43' 20.390" E
	21	23° 2' 54.724" N	86° 43' 21.627" E
	22	23° 2' 50.336" N	86° 43' 21.748" E
PUR_M1_KB_03	1	23° 3' 31.321" N	86° 42' 55.957" E
	2	23° 3' 31.340" N	86° 42' 53.903" E
	3	23° 3' 29.959" N	86° 42' 51.512" E
	4	23° 3' 28.451" N	86° 42' 50.260" E
	5	23° 3' 22.761" N	86° 42' 49.395" E
	6	23° 3' 22.222" N	86° 42' 49.297" E
	7	23° 3' 21.126" N	86° 42' 49.544" E
	8	23° 3' 16.082" N	86° 42' 49.914" E
	9	23° 3' 14.102" N	86° 42' 49.314" E
	10	23° 3' 9.278" N	86° 42' 46.000" E
	11	23° 3' 7.379" N	86° 42' 43.006" E
	12	23° 3' 6.815" N	86° 42' 40.473" E
	13	23° 3' 7.111" N	86° 42' 37.311" E
	14	23° 3' 10.238" N	86° 42' 27.068" E
	15	23° 3' 12.117" N	86° 42' 27.831" E
	16	23° 3' 10.148" N	86° 42' 36.083" E
	17	23° 3' 10.115" N	86° 42' 41.615" E
	18	23° 3' 12.102" N	86° 42' 46.027" E
	19	23° 3' 14.643" N	86° 42' 47.695" E
	20	23° 3' 21.837" N	86° 42' 48.058" E
	21	23° 3' 22.504" N	86° 42' 48.357" E
	22	23° 3' 30.076" N	86° 42' 48.434" E
	23	23° 3' 32.144" N	86° 42' 50.196" E
	24	23° 3' 32.154" N	86° 42' 55.775" E
PUR_M1_KB_03A	1	23° 3' 31.208" N	86° 41' 59.494" E
	2	23° 3' 33.721" N	86° 41' 59.184" E
	3	23° 3' 35.338" N	86° 41' 58.548" E
	4	23° 3' 37.815" N	86° 41' 58.208" E
	5	23° 3' 42.017" N	86° 41' 59.760" E
	6	23° 3' 45.274" N	86° 42' 3.367" E
	7	23° 3' 42.907" N	86° 42' 6.775" E
	8	23° 3' 40.718" N	86° 42' 3.612" E
	9	23° 3' 36.712" N	86° 42' 0.785" E
	10	23° 3' 34.948" N	86° 42' 0.603" E
	11	23° 3' 31.490" N	86° 42' 1.555" E
PUR_M1_KB_03B	1	23° 3' 48.955" N	86° 42' 18.657" E
	2	23° 3' 54.195" N	86° 42' 17.118" E
	3	23° 3' 54.896" N	86° 42' 21.900" E
	4	23° 3' 55.513" N	86° 42' 28.116" E

SANDBAR CODE	POINT NO.	LATITUDE	LONGITUDE
	5	23° 3' 55.840" N	86° 42' 33.813" E
	6	23° 3' 52.681" N	86° 42' 35.111" E
	7	23° 3' 51.734" N	86° 42' 27.764" E
PUR_M1_KB_04	1	23° 4' 50.991" N	86° 41' 43.388" E
	2	23° 4' 48.668" N	86° 41' 34.615" E
	3	23° 4' 48.035" N	86° 41' 27.251" E
	4	23° 4' 49.505" N	86° 41' 17.674" E
	5	23° 4' 52.368" N	86° 41' 13.967" E
	6	23° 4' 53.636" N	86° 41' 15.984" E
	7	23° 4' 52.877" N	86° 41' 25.183" E
	8	23° 4' 53.651" N	86° 41' 34.022" E
	9	23° 4' 54.610" N	86° 41' 38.182" E
	10	23° 4' 56.224" N	86° 41' 43.357" E
	11	23° 4' 57.249" N	86° 41' 47.568" E
	12	23° 4' 53.019" N	86° 41' 48.153" E
PUR_M1_KB_05	1	23° 4' 52.069" N	86° 41' 10.244" E
	2	23° 4' 55.873" N	86° 41' 5.508" E
	3	23° 5' 0.964" N	86° 41' 4.083" E
	4	23° 5' 9.702" N	86° 41' 2.351" E
	5	23° 5' 12.627" N	86° 41' 1.786" E
	6	23° 5' 16.337" N	86° 40' 59.412" E
	7	23° 5' 19.285" N	86° 40' 57.843" E
	8	23° 5' 20.627" N	86° 41' 0.183" E
	9	23° 5' 13.427" N	86° 41' 3.455" E
	10	23° 5' 12.652" N	86° 41' 5.464" E
	11	23° 5' 10.689" N	86° 41' 6.048" E
	12	23° 5' 9.453" N	86° 41' 5.790" E
	13	23° 5' 4.560" N	86° 41' 7.683" E
	14	23° 5' 2.522" N	86° 41' 8.049" E
	15	23° 4' 56.612" N	86° 41' 10.758" E
	16	23° 4' 54.944" N	86° 41' 11.403" E
PUR_M1_KB_06	1	23° 5' 43.906" N	86° 40' 15.303" E
	2	23° 5' 54.101" N	86° 40' 12.394" E
	3	23° 5' 58.656" N	86° 40' 12.007" E
	4	23° 5' 54.956" N	86° 40' 18.487" E
	5	23° 5' 48.759" N	86° 40' 20.181" E
	6	23° 5' 44.110" N	86° 40' 20.725" E
PUR_M1_KB_07	1	23° 6' 45.452" N	86° 38' 50.707" E
	2	23° 6' 45.272" N	86° 38' 49.308" E
	3	23° 6' 47.192" N	86° 38' 46.252" E
	4	23° 6' 47.116" N	86° 38' 42.754" E
	5	23° 6' 51.897" N	86° 38' 39.709" E
	6	23° 6' 57.779" N	86° 38' 40.270" E
	7	23° 7' 4.257" N	86° 38' 43.677" E

SANDBAR CODE	POINT NO.	LATITUDE	LONGITUDE
	8	23° 7' 4.806" N	86° 38' 45.876" E
	9	23° 6' 55.745" N	86° 38' 42.206" E
	10	23° 6' 52.348" N	86° 38' 42.913" E
	11	23° 6' 49.512" N	86° 38' 44.548" E
PUR_M1_KB_08A	1	23° 7' 53.565" N	86° 38' 29.955" E
	2	23° 7' 54.026" N	86° 38' 24.898" E
	3	23° 7' 55.981" N	86° 38' 19.537" E
	4	23° 7' 57.679" N	86° 38' 16.953" E
	5	23° 7' 59.978" N	86° 38' 16.120" E
	6	23° 8' 2.516" N	86° 38' 16.050" E
	7	23° 8' 7.718" N	86° 38' 18.440" E
	8	23° 8' 7.617" N	86° 38' 20.746" E
	9	23° 8' 4.424" N	86° 38' 19.874" E
	10	23° 7' 59.332" N	86° 38' 20.409" E
	11	23° 7' 56.680" N	86° 38' 26.732" E
	12	23° 7' 55.535" N	86° 38' 30.947" E
PUR_PU_KB_10A	1	23° 8' 55.380" N	86° 37' 39.067" E
	2	23° 8' 54.780" N	86° 37' 35.383" E
	3	23° 8' 56.027" N	86° 37' 34.950" E
	4	23° 8' 55.957" N	86° 37' 36.006" E
	5	23° 8' 57.826" N	86° 37' 40.318" E
	6	23° 9' 0.831" N	86° 37' 43.176" E
	7	23° 9' 0.071" N	86° 37' 43.758" E
PUR_PU_KB_11	1	23° 9' 59.622" N	86° 36' 43.278" E
	2	23° 10' 0.815" N	86° 36' 44.108" E
	3	23° 9' 53.141" N	86° 36' 46.749" E
	4	23° 9' 49.323" N	86° 36' 47.395" E
	5	23° 9' 38.588" N	86° 36' 48.543" E
	6	23° 9' 28.822" N	86° 36' 52.218" E
	7	23° 9' 27.070" N	86° 36' 53.708" E
	8	23° 9' 25.464" N	86° 36' 50.961" E
	9	23° 9' 29.703" N	86° 36' 47.786" E
	10	23° 9' 37.387" N	86° 36' 45.280" E
	11	23° 9' 42.910" N	86° 36' 44.361" E
	12	23° 9' 52.027" N	86° 36' 43.032" E
	13	23° 9' 54.655" N	86° 36' 42.085" E
	14	23° 9' 56.721" N	86° 36' 41.236" E
	15	23° 9' 57.684" N	86° 36' 41.914" E
	16	23° 9' 58.474" N	86° 36' 41.450" E
	17	23° 9' 59.709" N	86° 36' 39.883" E
	18	23° 10' 2.329" N	86° 36' 41.538" E
PUR_PU_KB_12	1	23° 10' 49.995" N	86° 36' 11.304" E
	2	23° 10' 50.045" N	86° 36' 9.920" E
	3	23° 10' 53.484" N	86° 36' 7.829" E

SANDBAR CODE	POINT NO.	LATITUDE	LONGITUDE
	4	23° 10' 54.275" N	86° 36' 9.847" E
PUR_PU_KB_13	1	23° 11' 33.898" N	86° 35' 42.116" E
	2	23° 11' 33.692" N	86° 35' 49.628" E
	3	23° 11' 32.240" N	86° 35' 49.723" E
	4	23° 11' 31.952" N	86° 35' 38.090" E
	5	23° 11' 35.723" N	86° 35' 32.494" E
	6	23° 11' 40.623" N	86° 35' 30.711" E
	7	23° 11' 46.047" N	86° 35' 31.997" E
	8	23° 11' 49.323" N	86° 35' 34.687" E
	9	23° 11' 48.947" N	86° 35' 36.499" E
	10	23° 11' 42.649" N	86° 35' 32.261" E
	11	23° 11' 37.128" N	86° 35' 33.338" E
	12	23° 11' 35.429" N	86° 35' 35.075" E
PUR_PU_KB_14	1	23° 12' 11.540" N	86° 35' 49.205" E
	2	23° 12' 16.570" N	86° 35' 46.356" E
	3	23° 12' 21.724" N	86° 35' 43.026" E
	4	23° 12' 26.293" N	86° 35' 39.773" E
	5	23° 12' 28.591" N	86° 35' 36.568" E
	6	23° 12' 29.986" N	86° 35' 37.968" E
	7	23° 12' 27.014" N	86° 35' 42.010" E
	8	23° 12' 23.782" N	86° 35' 43.002" E
	9	23° 12' 17.199" N	86° 35' 48.255" E
	10	23° 12' 16.037" N	86° 35' 48.866" E
	11	23° 12' 11.754" N	86° 35' 49.740" E
PUR_PU_KB_14A	1	23° 12' 41.140" N	86° 35' 13.526" E
	2	23° 12' 41.592" N	86° 35' 12.425" E
	3	23° 12' 44.264" N	86° 35' 11.627" E
	4	23° 12' 47.454" N	86° 35' 11.461" E
	5	23° 12' 54.209" N	86° 35' 15.039" E
	6	23° 12' 59.720" N	86° 35' 16.735" E
	7	23° 13' 1.164" N	86° 35' 16.432" E
	8	23° 13' 3.471" N	86° 35' 14.199" E
	9	23° 13' 4.323" N	86° 35' 13.707" E
	10	23° 13' 5.822" N	86° 35' 16.300" E
	11	23° 13' 2.477" N	86° 35' 18.948" E
	12	23° 12' 59.124" N	86° 35' 19.908" E
	13	23° 12' 53.027" N	86° 35' 17.804" E
	14	23° 12' 51.320" N	86° 35' 16.581" E
	15	23° 12' 45.637" N	86° 35' 14.811" E
	16	23° 12' 43.934" N	86° 35' 15.095" E
	17	23° 12' 41.901" N	86° 35' 18.056" E
PUR_HU_KB_15	1	23° 13' 13.993" N	86° 35' 3.376" E
	2	23° 13' 17.079" N	86° 34' 58.573" E
	3	23° 13' 26.333" N	86° 34' 44.531" E

SANDBAR CODE	POINT NO.	LATITUDE	LONGITUDE
	4	23° 13' 32.291" N	86° 34' 35.795" E
	5	23° 13' 34.694" N	86° 34' 36.860" E
	6	23° 13' 33.423" N	86° 34' 38.761" E
	7	23° 13' 25.533" N	86° 34' 50.384" E
	8	23° 13' 17.867" N	86° 35' 0.859" E
	9	23° 13' 14.815" N	86° 35' 4.223" E
PUR_PU_KB_15A	1	23° 13' 59.654" N	86° 33' 50.085" E
	2	23° 14' 4.232" N	86° 33' 41.161" E
	3	23° 14' 9.434" N	86° 33' 30.717" E
	4	23° 14' 15.282" N	86° 33' 15.890" E
	5	23° 14' 16.951" N	86° 33' 17.247" E
	6	23° 14' 6.214" N	86° 33' 40.880" E
	7	23° 14' 2.768" N	86° 33' 46.931" E
	8	23° 14' 0.304" N	86° 33' 50.565" E
PUR_HU_KB_15C	1	23° 15' 50.634" N	86° 28' 49.379" E
	2	23° 15' 52.113" N	86° 28' 42.669" E
	3	23° 15' 53.804" N	86° 28' 32.930" E
	4	23° 15' 52.005" N	86° 28' 27.020" E
	5	23° 15' 49.895" N	86° 28' 24.434" E
	6	23° 15' 51.101" N	86° 28' 24.434" E
	7	23° 15' 53.828" N	86° 28' 27.912" E
	8	23° 15' 54.819" N	86° 28' 30.758" E
	9	23° 15' 55.564" N	86° 28' 37.627" E
	10	23° 15' 54.547" N	86° 28' 42.213" E
	11	23° 15' 50.351" N	86° 28' 53.237" E
	12	23° 15' 50.207" N	86° 28' 56.534" E
	13	23° 15' 51.042" N	86° 28' 59.986" E
	14	23° 15' 49.951" N	86° 28' 58.614" E
	15	23° 15' 49.349" N	86° 28' 54.945" E
	16	23° 15' 50.005" N	86° 28' 52.105" E
PUR_HU_KB_15D	1	23° 15' 50.005" N	86° 28' 52.105" E
	2	23° 15' 48.348" N	86° 28' 51.514" E
	3	23° 15' 48.955" N	86° 28' 49.960" E
	4	23° 15' 49.186" N	86° 28' 49.040" E
	5	23° 15' 50.371" N	86° 28' 45.533" E
	6	23° 15' 51.936" N	86° 28' 42.250" E
	7	23° 15' 52.119" N	86° 28' 41.375" E
	8	23° 15' 52.074" N	86° 28' 39.798" E
	9	23° 15' 51.999" N	86° 28' 32.860" E
	10	23° 15' 47.989" N	86° 28' 25.545" E
	11	23° 15' 44.138" N	86° 28' 22.245" E
	12	23° 15' 46.213" N	86° 28' 21.109" E
	13	23° 15' 49.895" N	86° 28' 24.434" E
	14	23° 15' 52.005" N	86° 28' 27.020" E

SANDBAR CODE	POINT NO.	LATITUDE	LONGITUDE
	15	23° 15' 53.804" N	86° 28' 32.930" E
	16	23° 15' 52.113" N	86° 28' 42.669" E
	17	23° 15' 50.634" N	86° 28' 49.379" E
PUR_P1_KB_16	1	23° 15' 39.945" N	86° 28' 13.440" E
	2	23° 15' 40.881" N	86° 28' 15.559" E
	3	23° 15' 43.010" N	86° 28' 17.992" E
	4	23° 15' 41.961" N	86° 28' 18.618" E
	5	23° 15' 38.585" N	86° 28' 12.597" E
	6	23° 15' 38.679" N	86° 28' 9.915" E
	7	23° 15' 41.349" N	86° 28' 5.770" E
	8	23° 15' 44.626" N	86° 28' 5.637" E
	9	23° 15' 42.579" N	86° 28' 8.220" E
	10	23° 15' 40.350" N	86° 28' 11.147" E
PUR_P1_KB_16A	1	23° 15' 51.802" N	86° 28' 6.627" E
	2	23° 15' 52.300" N	86° 28' 5.010" E
	3	23° 15' 56.841" N	86° 28' 7.220" E
	4	23° 16' 0.904" N	86° 28' 7.726" E
	5	23° 16' 3.788" N	86° 28' 5.814" E
	6	23° 16' 5.783" N	86° 28' 0.637" E
	7	23° 16' 5.934" N	86° 28' 2.639" E
	8	23° 16' 4.114" N	86° 28' 6.922" E
	9	23° 16' 0.152" N	86° 28' 9.813" E
	10	23° 15' 56.619" N	86° 28' 9.706" E
	11	23° 15' 52.978" N	86° 28' 7.029" E
PUR_P1_KB_17	1	23° 15' 58.359" N	86° 27' 43.092" E
	2	23° 15' 58.144" N	86° 27' 30.614" E
	3	23° 16' 0.460" N	86° 27' 22.832" E
	4	23° 16' 2.615" N	86° 27' 23.449" E
	5	23° 16' 2.081" N	86° 27' 25.299" E
	6	23° 16' 1.346" N	86° 27' 29.943" E
	7	23° 16' 0.747" N	86° 27' 33.726" E
	8	23° 16' 0.364" N	86° 27' 36.146" E
	9	23° 16' 0.380" N	86° 27' 41.007" E
	10	23° 16' 3.162" N	86° 27' 47.283" E
	11	23° 16' 2.126" N	86° 27' 47.435" E
PUR_P1_KB_17A	1	23° 16' 3.032" N	86° 27' 22.103" E
	2	23° 16' 5.399" N	86° 27' 14.455" E
	3	23° 16' 10.432" N	86° 27' 9.958" E
	4	23° 16' 11.526" N	86° 27' 9.696" E
	5	23° 16' 16.142" N	86° 27' 7.398" E
	6	23° 16' 17.248" N	86° 27' 7.138" E
	7	23° 16' 17.865" N	86° 27' 9.107" E
	8	23° 16' 9.727" N	86° 27' 12.026" E
	9	23° 16' 5.406" N	86° 27' 16.402" E

SANDBAR CODE	POINT NO.	LATITUDE	LONGITUDE
	10	23° 16' 3.263" N	86° 27' 22.138" E
PUR_P1_KB_18	1	23° 16' 25.256" N	86° 27' 3.526" E
	2	23° 16' 22.857" N	86° 27' 5.821" E
	3	23° 16' 19.139" N	86° 27' 6.694" E
	4	23° 16' 18.578" N	86° 27' 5.962" E
	5	23° 16' 21.200" N	86° 27' 5.249" E
	6	23° 16' 23.648" N	86° 27' 3.985" E
	7	23° 16' 25.348" N	86° 26' 59.078" E
	8	23° 16' 23.802" N	86° 26' 53.694" E
	9	23° 16' 24.887" N	86° 26' 53.361" E
	10	23° 16' 26.195" N	86° 26' 55.911" E
	11	23° 16' 26.387" N	86° 27' 1.401" E
PUR_P1_KB_19	1	23° 16' 19.599" N	86° 26' 29.724" E
	2	23° 16' 18.481" N	86° 26' 29.331" E
	3	23° 16' 19.341" N	86° 26' 25.956" E
	4	23° 16' 19.522" N	86° 26' 23.697" E
	5	23° 16' 20.369" N	86° 26' 21.762" E
	6	23° 16' 23.156" N	86° 26' 19.189" E
	7	23° 16' 28.703" N	86° 26' 17.482" E
	8	23° 16' 32.494" N	86° 26' 18.847" E
	9	23° 16' 28.206" N	86° 26' 19.953" E
	10	23° 16' 22.317" N	86° 26' 23.808" E
PUR_P2_KB_19A	1	23° 16' 22.317" N	86° 26' 23.808" E
	2	23° 16' 28.206" N	86° 26' 19.953" E
	3	23° 16' 32.494" N	86° 26' 18.847" E
	4	23° 16' 32.818" N	86° 26' 20.153" E
	5	23° 16' 25.825" N	86° 26' 23.036" E
	6	23° 16' 23.731" N	86° 26' 24.535" E
	7	23° 16' 20.764" N	86° 26' 28.721" E
	8	23° 16' 19.599" N	86° 26' 29.724" E
PUR_P1_KB_21	1	23° 16' 15.937" N	86° 25' 50.404" E
	2	23° 16' 17.072" N	86° 25' 43.089" E
	3	23° 16' 19.166" N	86° 25' 39.355" E
	4	23° 16' 23.563" N	86° 25' 36.870" E
	5	23° 16' 24.708" N	86° 25' 36.490" E
	6	23° 16' 29.652" N	86° 25' 36.469" E
	7	23° 16' 30.283" N	86° 25' 37.752" E
	8	23° 16' 25.678" N	86° 25' 38.840" E
	9	23° 16' 20.497" N	86° 25' 40.871" E
	10	23° 16' 17.713" N	86° 25' 46.117" E
	11	23° 16' 17.225" N	86° 25' 50.261" E
PUR_P2_KB_20_22	1	23° 16' 17.225" N	86° 25' 50.261" E
	2	23° 16' 17.713" N	86° 25' 46.117" E
	3	23° 16' 20.497" N	86° 25' 40.871" E

SANDBAR CODE	POINT NO.	LATITUDE	LONGITUDE
	4	23° 16' 25.678" N	86° 25' 38.840" E
	5	23° 16' 30.283" N	86° 25' 37.752" E
	6	23° 16' 37.200" N	86° 25' 36.373" E
	7	23° 16' 38.700" N	86° 25' 32.412" E
	8	23° 16' 38.378" N	86° 25' 26.522" E
	9	23° 16' 34.510" N	86° 25' 19.620" E
	10	23° 16' 36.197" N	86° 25' 18.859" E
	11	23° 16' 41.568" N	86° 25' 30.183" E
	12	23° 16' 41.680" N	86° 25' 32.566" E
	13	23° 16' 41.123" N	86° 25' 35.173" E
	14	23° 16' 39.567" N	86° 25' 37.211" E
	15	23° 16' 36.991" N	86° 25' 38.852" E
	16	23° 16' 34.488" N	86° 25' 39.541" E
	17	23° 16' 31.584" N	86° 25' 38.533" E
	18	23° 16' 29.967" N	86° 25' 38.689" E
	19	23° 16' 23.642" N	86° 25' 40.727" E
	20	23° 16' 21.719" N	86° 25' 42.039" E
	21	23° 16' 19.011" N	86° 25' 44.919" E
	22	23° 16' 18.128" N	86° 25' 48.127" E
	23	23° 16' 18.014" N	86° 25' 50.438" E
PUR_P1_KB_22A	1	23° 16' 30.979" N	86° 25' 10.930" E
	2	23° 16' 28.582" N	86° 25' 11.811" E
	3	23° 16' 26.972" N	86° 25' 9.136" E
	4	23° 16' 27.004" N	86° 25' 3.939" E
	5	23° 16' 28.419" N	86° 25' 3.205" E
	6	23° 16' 28.808" N	86° 25' 4.385" E
	7	23° 16' 28.745" N	86° 25' 6.061" E
	8	23° 16' 30.032" N	86° 25' 9.557" E
PUR_P1_KB_23	1	23° 16' 29.726" N	86° 24' 58.393" E
	2	23° 16' 33.508" N	86° 24' 57.609" E
	3	23° 16' 38.737" N	86° 24' 57.213" E
	4	23° 16' 41.835" N	86° 24' 57.681" E
	5	23° 16' 42.019" N	86° 25' 0.444" E
	6	23° 16' 34.119" N	86° 24' 59.951" E
	7	23° 16' 30.418" N	86° 25' 2.064" E
PUR_P2_KB_23A	1	23° 16' 42.545" N	86° 25' 2.761" E
	2	23° 16' 42.588" N	86° 25' 0.480" E
	3	23° 16' 45.084" N	86° 25' 0.636" E
	4	23° 16' 51.373" N	86° 24' 59.715" E
	5	23° 16' 51.289" N	86° 25' 2.778" E
	6	23° 16' 49.579" N	86° 25' 3.475" E
	7	23° 16' 45.509" N	86° 25' 3.656" E
PUR_P2_KB_24	1	23° 16' 59.288" N	86° 24' 55.104" E
	2	23° 16' 58.961" N	86° 24' 54.640" E

SANDBAR CODE	POINT NO.	LATITUDE	LONGITUDE
	3	23° 17' 2.216" N	86° 24' 47.615" E
	4	23° 17' 1.531" N	86° 24' 40.763" E
	5	23° 17' 0.577" N	86° 24' 38.785" E
	6	23° 17' 1.950" N	86° 24' 37.650" E
	7	23° 17' 5.001" N	86° 24' 42.318" E
	8	23° 17' 5.412" N	86° 24' 48.204" E
	9	23° 17' 4.552" N	86° 24' 50.273" E
PUR_P2_KB_24A	1	23° 16' 52.317" N	86° 24' 16.354" E
	2	23° 16' 53.551" N	86° 24' 16.321" E
	3	23° 16' 54.313" N	86° 24' 21.329" E
	4	23° 16' 52.536" N	86° 24' 21.403" E
PUR_P2_KB_25	1	23° 17' 16.766" N	86° 23' 9.864" E
	2	23° 17' 17.147" N	86° 23' 8.846" E
	3	23° 17' 19.657" N	86° 23' 9.380" E
	4	23° 17' 19.084" N	86° 23' 11.522" E
PUR_P2_KB_26	1	23° 17' 12.612" N	86° 22' 36.850" E
	2	23° 17' 13.266" N	86° 22' 34.499" E
	3	23° 17' 13.377" N	86° 22' 33.468" E
	4	23° 17' 15.730" N	86° 22' 34.093" E
	5	23° 17' 16.252" N	86° 22' 35.836" E
	6	23° 17' 17.973" N	86° 22' 45.453" E
	7	23° 17' 18.673" N	86° 22' 51.277" E
	8	23° 17' 18.961" N	86° 22' 52.055" E
	9	23° 17' 19.478" N	86° 22' 56.556" E
	10	23° 17' 17.216" N	86° 22' 56.713" E
	11	23° 17' 15.774" N	86° 22' 53.242" E
	12	23° 17' 15.049" N	86° 22' 47.434" E
	13	23° 17' 13.760" N	86° 22' 45.338" E
	14	23° 17' 12.881" N	86° 22' 42.258" E
PUR_P1_KB_27	1	23° 17' 0.638" N	86° 20' 36.665" E
	2	23° 17' 0.049" N	86° 20' 31.489" E
	3	23° 16' 59.953" N	86° 20' 25.119" E
	4	23° 16' 59.966" N	86° 20' 24.220" E
	5	23° 17' 0.578" N	86° 20' 22.267" E
	6	23° 17' 2.907" N	86° 20' 23.653" E
	7	23° 17' 4.315" N	86° 20' 31.097" E
	8	23° 17' 1.396" N	86° 20' 32.508" E
	9	23° 17' 7.642" N	86° 20' 44.958" E
	10	23° 17' 10.153" N	86° 20' 48.671" E
	11	23° 17' 8.294" N	86° 20' 49.656" E
	12	23° 17' 5.618" N	86° 20' 46.550" E
	13	23° 17' 2.980" N	86° 20' 41.180" E
PUR_P1_KB_28	1	23° 17' 20.581" N	86° 19' 37.173" E
	2	23° 17' 24.583" N	86° 19' 34.004" E

SANDBAR CODE	POINT NO.	LATITUDE	LONGITUDE
	3	23° 17' 34.192" N	86° 19' 27.613" E
	4	23° 17' 39.172" N	86° 19' 25.315" E
	5	23° 17' 44.759" N	86° 19' 24.123" E
	6	23° 17' 47.201" N	86° 19' 23.859" E
	7	23° 17' 51.160" N	86° 19' 24.118" E
	8	23° 17' 54.367" N	86° 19' 25.518" E
	9	23° 17' 57.134" N	86° 19' 28.726" E
	10	23° 18' 0.702" N	86° 19' 34.260" E
	11	23° 18' 2.455" N	86° 19' 37.604" E
	12	23° 18' 6.612" N	86° 19' 43.699" E
	13	23° 18' 5.027" N	86° 19' 46.253" E
	14	23° 17' 55.763" N	86° 19' 34.753" E
	15	23° 17' 44.865" N	86° 19' 29.555" E
	16	23° 17' 38.433" N	86° 19' 30.183" E
	17	23° 17' 32.316" N	86° 19' 32.375" E
	18	23° 17' 28.302" N	86° 19' 35.152" E
	19	23° 17' 23.347" N	86° 19' 40.427" E
PUR_P1_KB_30	1	23° 18' 56.099" N	86° 19' 12.576" E
	2	23° 18' 50.396" N	86° 19' 14.878" E
	3	23° 18' 46.956" N	86° 19' 15.082" E
	4	23° 18' 43.179" N	86° 19' 17.150" E
	5	23° 18' 38.325" N	86° 19' 18.708" E
	6	23° 18' 36.409" N	86° 19' 14.189" E
	7	23° 18' 41.358" N	86° 19' 13.189" E
	8	23° 18' 43.007" N	86° 19' 12.398" E
	9	23° 18' 48.886" N	86° 19' 11.101" E
	10	23° 18' 53.660" N	86° 19' 8.971" E
	11	23° 18' 55.678" N	86° 19' 6.129" E
	12	23° 18' 56.183" N	86° 19' 3.481" E
	13	23° 18' 55.772" N	86° 19' 1.721" E
	14	23° 18' 58.541" N	86° 19' 1.512" E
	15	23° 18' 59.098" N	86° 19' 5.704" E
	16	23° 18' 58.013" N	86° 19' 9.660" E
PUR_P1_KB_31A	1	23° 19' 13.415" N	86° 18' 12.328" E
	2	23° 19' 15.455" N	86° 18' 12.746" E
	3	23° 19' 17.239" N	86° 18' 16.945" E
	4	23° 19' 15.955" N	86° 18' 17.421" E
	5	23° 19' 15.505" N	86° 18' 16.243" E
	6	23° 19' 14.273" N	86° 18' 13.808" E
PUR_P1_KB_32	1	23° 19' 58.687" N	86° 16' 56.910" E
	2	23° 19' 56.724" N	86° 16' 56.370" E
	3	23° 19' 56.955" N	86° 16' 55.820" E
	4	23° 19' 59.600" N	86° 16' 52.566" E
	5	23° 19' 59.378" N	86° 16' 46.570" E

SANDBAR CODE	POINT NO.	LATITUDE	LONGITUDE
	6	23° 20' 1.551" N	86° 16' 46.503" E
	7	23° 20' 1.990" N	86° 16' 52.726" E
	8	23° 20' 1.001" N	86° 16' 54.827" E
PUR_P1_KB_33	1	23° 20' 7.199" N	86° 16' 1.477" E
	2	23° 20' 12.999" N	86° 15' 55.294" E
	3	23° 20' 21.908" N	86° 15' 51.011" E
	4	23° 20' 26.429" N	86° 15' 46.715" E
	5	23° 20' 30.512" N	86° 15' 42.834" E
	6	23° 20' 31.398" N	86° 15' 40.840" E
	7	23° 20' 32.521" N	86° 15' 42.052" E
	8	23° 20' 26.825" N	86° 15' 49.218" E
	9	23° 20' 24.562" N	86° 15' 51.056" E
	10	23° 20' 19.412" N	86° 15' 53.545" E
	11	23° 20' 14.748" N	86° 15' 57.111" E
	12	23° 20' 13.345" N	86° 15' 58.833" E
	13	23° 20' 8.878" N	86° 16' 3.132" E
PUR_AR_KB_33A	1	23° 20' 7.169" N	86° 16' 1.315" E
	2	23° 20' 7.319" N	86° 16' 0.932" E
	3	23° 20' 7.137" N	86° 15' 58.929" E
	4	23° 20' 7.195" N	86° 15' 57.532" E
	5	23° 20' 8.842" N	86° 15' 55.566" E
	6	23° 20' 11.584" N	86° 15' 53.128" E
	7	23° 20' 16.267" N	86° 15' 50.839" E
	8	23° 20' 18.218" N	86° 15' 50.027" E
	9	23° 20' 21.353" N	86° 15' 47.407" E
	10	23° 20' 22.803" N	86° 15' 46.708" E
	11	23° 20' 25.300" N	86° 15' 45.025" E
	12	23° 20' 26.429" N	86° 15' 46.715" E
	13	23° 20' 21.908" N	86° 15' 51.011" E
	14	23° 20' 12.999" N	86° 15' 55.294" E
	15	23° 20' 7.199" N	86° 16' 1.477" E
PUR_P1_KB_33B	1	23° 20' 38.598" N	86° 15' 29.602" E
	2	23° 20' 38.468" N	86° 15' 30.377" E
	3	23° 20' 36.899" N	86° 15' 29.306" E
	4	23° 20' 39.383" N	86° 15' 24.885" E
	5	23° 20' 39.383" N	86° 15' 18.888" E
	6	23° 20' 37.413" N	86° 15' 14.006" E
	7	23° 20' 33.921" N	86° 15' 9.982" E
	8	23° 20' 33.064" N	86° 15' 8.931" E
	9	23° 20' 34.461" N	86° 15' 7.961" E
	10	23° 20' 35.056" N	86° 15' 8.564" E
	11	23° 20' 37.307" N	86° 15' 11.347" E
	12	23° 20' 40.256" N	86° 15' 16.362" E
	13	23° 20' 41.313" N	86° 15' 21.574" E

SANDBAR CODE	POINT NO.	LATITUDE	LONGITUDE
	14	23° 20' 40.816" N	86° 15' 25.676" E
PUR_P1_KB_34	1	23° 20' 44.039" N	86° 14' 41.538" E
	2	23° 20' 41.334" N	86° 14' 36.685" E
	3	23° 20' 42.539" N	86° 14' 32.663" E
	4	23° 20' 45.433" N	86° 14' 26.427" E
	5	23° 20' 46.889" N	86° 14' 23.489" E
	6	23° 20' 48.504" N	86° 14' 20.888" E
	7	23° 20' 51.061" N	86° 14' 16.005" E
	8	23° 20' 52.819" N	86° 14' 14.761" E
	9	23° 20' 55.408" N	86° 14' 11.950" E
	10	23° 20' 57.219" N	86° 14' 8.423" E
	11	23° 20' 57.993" N	86° 14' 4.039" E
	12	23° 21' 1.037" N	86° 14' 1.832" E
	13	23° 21' 1.831" N	86° 13' 55.264" E
	14	23° 21' 7.358" N	86° 13' 59.423" E
	15	23° 21' 5.492" N	86° 14' 5.760" E
	16	23° 21' 0.703" N	86° 14' 11.639" E
	17	23° 20' 55.370" N	86° 14' 18.974" E
	18	23° 20' 52.277" N	86° 14' 26.931" E
PUR_JR_KB_35	1	23° 21' 31.530" N	86° 12' 13.478" E
	2	23° 21' 32.970" N	86° 12' 18.438" E
	3	23° 21' 33.027" N	86° 12' 19.770" E
	4	23° 21' 27.496" N	86° 12' 12.178" E
	5	23° 21' 26.473" N	86° 12' 8.303" E
	6	23° 21' 27.287" N	86° 12' 3.429" E
	7	23° 21' 27.796" N	86° 11' 57.672" E
	8	23° 21' 28.563" N	86° 11' 56.293" E
	9	23° 21' 33.158" N	86° 11' 50.557" E
	10	23° 21' 36.088" N	86° 11' 47.302" E
	11	23° 21' 38.005" N	86° 11' 43.726" E
	12	23° 21' 40.083" N	86° 11' 42.036" E
	13	23° 21' 41.284" N	86° 11' 39.760" E
	14	23° 21' 45.101" N	86° 11' 44.015" E
	15	23° 21' 44.672" N	86° 11' 46.549" E
	16	23° 21' 42.628" N	86° 11' 50.546" E
	17	23° 21' 34.827" N	86° 12' 2.052" E
PUR_JR_KB_36	1	23° 21' 45.578" N	86° 11' 37.506" E
	2	23° 21' 42.398" N	86° 11' 36.328" E
	3	23° 21' 46.142" N	86° 11' 21.509" E
	4	23° 21' 51.308" N	86° 11' 12.691" E
	5	23° 21' 53.267" N	86° 11' 14.696" E
	6	23° 21' 51.506" N	86° 11' 17.025" E
	7	23° 21' 50.848" N	86° 11' 19.482" E
	8	23° 21' 47.401" N	86° 11' 25.193" E

SANDBAR CODE	POINT NO.	LATITUDE	LONGITUDE
	9	23° 21' 46.865" N	86° 11' 29.669" E
PUR_JR_KB_36A	1	23° 22' 2.525" N	86° 9' 7.761" E
	2	23° 22' 3.636" N	86° 9' 10.340" E
	3	23° 22' 4.296" N	86° 9' 13.131" E
	4	23° 22' 4.317" N	86° 9' 17.068" E
	5	23° 22' 3.871" N	86° 9' 17.980" E
	6	23° 22' 2.009" N	86° 9' 19.785" E
	7	23° 21' 59.867" N	86° 9' 26.362" E
	8	23° 21' 59.482" N	86° 9' 25.967" E
	9	23° 22' 0.593" N	86° 9' 17.583" E
	10	23° 22' 3.045" N	86° 9' 13.560" E
	11	23° 22' 3.040" N	86° 9' 12.651" E
	12	23° 22' 1.428" N	86° 9' 8.934" E
	13	23° 22' 1.950" N	86° 9' 6.088" E
	14	23° 22' 2.736" N	86° 9' 4.289" E
	15	23° 22' 2.997" N	86° 9' 2.113" E
	16	23° 22' 4.365" N	86° 9' 3.019" E
PUR_J2_KB_37	1	23° 22' 51.697" N	86° 6' 29.940" E
	2	23° 22' 51.938" N	86° 6' 31.469" E
	3	23° 22' 51.612" N	86° 6' 33.895" E
	4	23° 22' 50.029" N	86° 6' 39.271" E
	5	23° 22' 50.312" N	86° 6' 45.208" E
	6	23° 22' 50.679" N	86° 6' 47.899" E
	7	23° 22' 48.962" N	86° 6' 48.505" E
	8	23° 22' 48.776" N	86° 6' 46.923" E
	9	23° 22' 47.972" N	86° 6' 45.484" E
	10	23° 22' 45.957" N	86° 6' 42.934" E
	11	23° 22' 45.460" N	86° 6' 38.697" E
	12	23° 22' 48.886" N	86° 6' 32.243" E
	13	23° 22' 51.652" N	86° 6' 25.420" E
	14	23° 22' 54.255" N	86° 6' 25.666" E
	15	23° 22' 52.820" N	86° 6' 27.043" E
PUR_J2_KB_37A	1	23° 22' 58.321" N	86° 6' 10.523" E
	2	23° 22' 58.496" N	86° 6' 11.487" E
	3	23° 22' 58.274" N	86° 6' 17.780" E
	4	23° 22' 55.536" N	86° 6' 24.119" E
	5	23° 22' 52.496" N	86° 6' 24.204" E
	6	23° 22' 54.193" N	86° 6' 21.352" E
	7	23° 22' 55.171" N	86° 6' 18.908" E
	8	23° 22' 55.276" N	86° 6' 16.105" E
PUR_AR_KB_37B	1	23° 22' 55.276" N	86° 6' 16.105" E
	2	23° 22' 55.086" N	86° 6' 16.454" E
	3	23° 22' 56.067" N	86° 6' 9.105" E
	4	23° 22' 56.128" N	86° 6' 4.771" E

SANDBAR CODE	POINT NO.	LATITUDE	LONGITUDE
	5	23° 22' 55.653" N	86° 6' 2.695" E
	6	23° 22' 56.492" N	86° 6' 2.603" E
	7	23° 22' 57.173" N	86° 6' 2.932" E
	8	23° 22' 57.576" N	86° 6' 4.993" E
	9	23° 22' 58.321" N	86° 6' 10.523" E
PUR_J2_KB_38	1	23° 22' 52.452" N	86° 4' 41.036" E
	2	23° 22' 54.075" N	86° 4' 40.457" E
	3	23° 22' 54.062" N	86° 4' 42.255" E
	4	23° 22' 59.458" N	86° 4' 51.933" E
	5	23° 22' 57.946" N	86° 4' 53.439" E
	6	23° 22' 54.949" N	86° 4' 49.687" E
PUR_J2_KB_38A	1	23° 22' 52.325" N	86° 4' 34.797" E
	2	23° 22' 52.835" N	86° 4' 32.535" E
	3	23° 22' 52.903" N	86° 4' 31.011" E
	4	23° 22' 54.161" N	86° 4' 25.452" E
	5	23° 22' 52.299" N	86° 4' 20.432" E
	6	23° 22' 52.378" N	86° 4' 12.044" E
	7	23° 22' 52.759" N	86° 4' 11.048" E
	8	23° 22' 52.841" N	86° 4' 8.422" E
	9	23° 22' 54.809" N	86° 4' 8.566" E
	10	23° 22' 55.553" N	86° 4' 21.508" E
	11	23° 22' 56.717" N	86° 4' 29.282" E
	12	23° 22' 55.704" N	86° 4' 33.903" E
PUR_BR_KR_01	1	23° 2' 50.657" N	86° 27' 4.009" E
	2	23° 2' 49.798" N	86° 27' 7.294" E
	3	23° 2' 48.520" N	86° 27' 11.196" E
	4	23° 2' 48.297" N	86° 27' 14.069" E
	5	23° 2' 48.363" N	86° 27' 15.790" E
	6	23° 2' 48.480" N	86° 27' 21.514" E
	7	23° 2' 48.355" N	86° 27' 23.162" E
	8	23° 2' 48.785" N	86° 27' 28.237" E
	9	23° 2' 48.870" N	86° 27' 30.384" E
	10	23° 2' 48.398" N	86° 27' 35.853" E
	11	23° 2' 48.161" N	86° 27' 42.073" E
	12	23° 2' 49.313" N	86° 27' 46.810" E
	13	23° 2' 51.573" N	86° 27' 50.902" E
	14	23° 2' 53.440" N	86° 27' 53.628" E
	15	23° 2' 55.119" N	86° 27' 55.587" E
	16	23° 2' 55.772" N	86° 28' 2.845" E
	17	23° 2' 54.569" N	86° 28' 3.222" E
	18	23° 2' 54.249" N	86° 28' 2.188" E
	19	23° 2' 54.733" N	86° 28' 0.795" E
	20	23° 2' 54.418" N	86° 27' 59.141" E
	21	23° 2' 52.562" N	86° 27' 54.909" E

SANDBAR CODE	POINT NO.	LATITUDE	LONGITUDE
	22	23° 2' 51.195" N	86° 27' 52.646" E
	23	23° 2' 49.914" N	86° 27' 50.512" E
	24	23° 2' 48.512" N	86° 27' 47.970" E
	25	23° 2' 47.434" N	86° 27' 44.702" E
	26	23° 2' 46.783" N	86° 27' 40.484" E
	27	23° 2' 46.968" N	86° 27' 39.126" E
	28	23° 2' 46.783" N	86° 27' 35.407" E
	29	23° 2' 47.392" N	86° 27' 27.465" E
	30	23° 2' 47.344" N	86° 27' 23.523" E
	31	23° 2' 46.957" N	86° 27' 21.033" E
	32	23° 2' 46.149" N	86° 27' 16.313" E
	33	23° 2' 45.367" N	86° 27' 13.899" E
	34	23° 2' 45.722" N	86° 27' 12.057" E
	35	23° 2' 45.766" N	86° 27' 10.049" E
	36	23° 2' 46.183" N	86° 27' 8.153" E
	37	23° 2' 48.861" N	86° 27' 4.578" E
	38	23° 2' 50.883" N	86° 26' 58.963" E
	39	23° 2' 50.634" N	86° 26' 58.394" E
	40	23° 2' 50.787" N	86° 26' 57.863" E
	41	23° 2' 51.671" N	86° 26' 56.745" E
	42	23° 2' 52.158" N	86° 26' 54.319" E
	43	23° 2' 53.122" N	86° 26' 52.660" E
	44	23° 2' 56.125" N	86° 26' 50.324" E
	45	23° 2' 56.528" N	86° 26' 51.969" E
	46	23° 2' 53.257" N	86° 26' 54.305" E
	47	23° 2' 52.596" N	86° 26' 55.109" E
	48	23° 2' 51.706" N	86° 26' 56.775" E
	49	23° 2' 51.646" N	86° 26' 57.090" E
	50	23° 2' 51.289" N	86° 26' 58.354" E
	51	23° 2' 51.257" N	86° 26' 59.123" E
	52	23° 2' 51.097" N	86° 26' 59.957" E
	53	23° 2' 51.022" N	86° 27' 2.021" E
PUR_M1_KR_03A	1	23° 3' 46.055" N	86° 30' 34.281" E
	2	23° 3' 44.202" N	86° 30' 35.855" E
	3	23° 3' 42.092" N	86° 30' 36.439" E
	4	23° 3' 41.857" N	86° 30' 35.471" E
	5	23° 3' 45.184" N	86° 30' 33.452" E
	6	23° 3' 46.486" N	86° 30' 29.957" E
	7	23° 3' 44.979" N	86° 30' 24.886" E
	8	23° 3' 44.172" N	86° 30' 23.521" E
	9	23° 3' 43.945" N	86° 30' 22.792" E
	10	23° 3' 42.897" N	86° 30' 21.362" E
	11	23° 3' 39.421" N	86° 30' 16.398" E
	12	23° 3' 40.272" N	86° 30' 15.636" E

SANDBAR CODE	POINT NO.	LATITUDE	LONGITUDE
	13	23° 3' 44.369" N	86° 30' 21.590" E
	14	23° 3' 47.852" N	86° 30' 29.221" E
	15	23° 3' 47.858" N	86° 30' 31.341" E
PUR_M1_KR_03B	1	23° 3' 22.473" N	86° 30' 56.023" E
	2	23° 3' 23.040" N	86° 30' 58.257" E
	3	23° 3' 22.326" N	86° 30' 58.512" E
	4	23° 3' 21.948" N	86° 30' 58.055" E
	5	23° 3' 21.695" N	86° 30' 55.855" E
	6	23° 3' 22.205" N	86° 30' 53.578" E
	7	23° 3' 25.284" N	86° 30' 48.653" E
	8	23° 3' 28.287" N	86° 30' 45.643" E
	9	23° 3' 29.177" N	86° 30' 45.238" E
	10	23° 3' 29.427" N	86° 30' 45.744" E
	11	23° 3' 27.607" N	86° 30' 46.800" E
	12	23° 3' 25.385" N	86° 30' 49.665" E
	13	23° 3' 23.081" N	86° 30' 54.080" E
PUR_M1_KR_04	1	23° 2' 31.718" N	86° 31' 40.202" E
	2	23° 2' 31.626" N	86° 31' 38.343" E
	3	23° 2' 30.900" N	86° 31' 37.230" E
	4	23° 2' 30.719" N	86° 31' 34.423" E
	5	23° 2' 33.005" N	86° 31' 27.665" E
	6	23° 2' 34.351" N	86° 31' 23.328" E
	7	23° 2' 34.170" N	86° 31' 20.149" E
	8	23° 2' 35.797" N	86° 31' 17.745" E
	9	23° 2' 37.410" N	86° 31' 16.251" E
	10	23° 2' 37.889" N	86° 31' 15.245" E
	11	23° 2' 39.434" N	86° 31' 13.864" E
	12	23° 2' 41.774" N	86° 31' 13.819" E
	13	23° 2' 43.497" N	86° 31' 14.463" E
	14	23° 2' 45.180" N	86° 31' 15.625" E
	15	23° 2' 45.184" N	86° 31' 17.471" E
	16	23° 2' 43.895" N	86° 31' 16.634" E
	17	23° 2' 42.655" N	86° 31' 16.303" E
	18	23° 2' 39.972" N	86° 31' 16.815" E
	19	23° 2' 37.424" N	86° 31' 19.167" E
	20	23° 2' 35.837" N	86° 31' 23.877" E
	21	23° 2' 35.170" N	86° 31' 25.401" E
	22	23° 2' 34.770" N	86° 31' 27.275" E
	23	23° 2' 33.735" N	86° 31' 30.721" E
	24	23° 2' 32.492" N	86° 31' 34.224" E
	25	23° 2' 32.566" N	86° 31' 34.691" E
	26	23° 2' 32.519" N	86° 31' 36.058" E
	27	23° 2' 35.211" N	86° 31' 47.177" E
	28	23° 2' 37.927" N	86° 31' 49.371" E

SANDBAR CODE	POINT NO.	LATITUDE	LONGITUDE
	29	23° 2' 44.306" N	86° 31' 50.270" E
	30	23° 2' 44.976" N	86° 31' 50.128" E
	31	23° 2' 49.060" N	86° 31' 51.759" E
	32	23° 2' 51.234" N	86° 31' 53.927" E
	33	23° 2' 52.778" N	86° 31' 56.676" E
	34	23° 2' 50.685" N	86° 31' 58.570" E
	35	23° 2' 50.112" N	86° 31' 57.115" E
	36	23° 2' 47.987" N	86° 31' 54.333" E
	37	23° 2' 43.918" N	86° 31' 51.818" E
	38	23° 2' 40.772" N	86° 31' 51.410" E
	39	23° 2' 37.338" N	86° 31' 51.219" E
	40	23° 2' 36.431" N	86° 31' 51.082" E
	41	23° 2' 35.224" N	86° 31' 50.398" E
	42	23° 2' 34.412" N	86° 31' 49.285" E
	43	23° 2' 33.718" N	86° 31' 47.521" E
PUR_M1_KR_06	1	23° 2' 26.445" N	86° 35' 23.054" E
	2	23° 2' 26.819" N	86° 35' 23.967" E
	3	23° 2' 23.041" N	86° 35' 24.012" E
	4	23° 2' 22.494" N	86° 35' 22.318" E
	5	23° 2' 22.403" N	86° 35' 20.329" E
	6	23° 2' 23.013" N	86° 35' 16.869" E
	7	23° 2' 25.021" N	86° 35' 14.799" E
	8	23° 2' 27.840" N	86° 35' 13.582" E
	9	23° 2' 29.801" N	86° 35' 13.278" E
	10	23° 2' 32.399" N	86° 35' 12.991" E
	11	23° 2' 34.172" N	86° 35' 13.042" E
	12	23° 2' 35.790" N	86° 35' 13.390" E
	13	23° 2' 36.323" N	86° 35' 13.333" E
	14	23° 2' 38.023" N	86° 35' 11.914" E
	15	23° 2' 39.778" N	86° 35' 11.779" E
	16	23° 2' 41.930" N	86° 35' 12.237" E
	17	23° 2' 43.968" N	86° 35' 11.942" E
	18	23° 2' 45.006" N	86° 35' 15.277" E
	19	23° 2' 44.357" N	86° 35' 15.494" E
	20	23° 2' 28.993" N	86° 35' 16.768" E
	21	23° 2' 27.687" N	86° 35' 17.590" E
	22	23° 2' 26.523" N	86° 35' 19.800" E
PUR_M1_KR_09_10	1	23° 2' 47.373" N	86° 36' 34.171" E
	2	23° 2' 44.277" N	86° 36' 34.831" E
	3	23° 2' 35.257" N	86° 36' 29.546" E
	4	23° 2' 34.526" N	86° 36' 28.203" E
	5	23° 2' 31.940" N	86° 36' 26.072" E
	6	23° 2' 21.128" N	86° 36' 20.525" E
	7	23° 2' 17.382" N	86° 36' 19.235" E

SANDBAR CODE	POINT NO.	LATITUDE	LONGITUDE
	8	23° 2' 15.833" N	86° 36' 19.286" E
	9	23° 2' 14.113" N	86° 36' 19.802" E
	10	23° 2' 8.809" N	86° 36' 24.362" E
	11	23° 2' 8.332" N	86° 36' 21.886" E
	12	23° 2' 10.312" N	86° 36' 19.347" E
	13	23° 2' 12.864" N	86° 36' 18.603" E
	14	23° 2' 13.292" N	86° 36' 18.276" E
	15	23° 2' 13.911" N	86° 36' 17.976" E
	16	23° 2' 16.438" N	86° 36' 16.760" E
	17	23° 2' 17.212" N	86° 36' 16.814" E
	18	23° 2' 19.692" N	86° 36' 17.532" E
	19	23° 2' 23.172" N	86° 36' 19.046" E
	20	23° 2' 28.497" N	86° 36' 22.155" E
	21	23° 2' 34.250" N	86° 36' 24.313" E
	22	23° 2' 36.181" N	86° 36' 25.795" E
	23	23° 2' 39.026" N	86° 36' 27.925" E
	24	23° 2' 41.284" N	86° 36' 29.518" E
	25	23° 2' 42.132" N	86° 36' 31.542" E
	26	23° 2' 42.632" N	86° 36' 32.024" E
	27	23° 2' 43.631" N	86° 36' 32.096" E
	28	23° 2' 46.279" N	86° 36' 31.344" E
	29	23° 2' 48.374" N	86° 36' 29.683" E
	30	23° 2' 49.385" N	86° 36' 27.784" E
	31	23° 2' 49.502" N	86° 36' 26.482" E
	32	23° 2' 47.046" N	86° 36' 21.450" E
	33	23° 2' 45.377" N	86° 36' 19.576" E
	34	23° 2' 46.889" N	86° 36' 18.697" E
	35	23° 2' 51.818" N	86° 36' 24.164" E
	36	23° 2' 52.178" N	86° 36' 24.907" E
	37	23° 2' 51.232" N	86° 36' 28.953" E
PUR_M1_KR_11	1	23° 1' 57.727" N	86° 36' 30.001" E
	2	23° 2' 1.133" N	86° 36' 28.128" E
	3	23° 2' 1.803" N	86° 36' 27.475" E
	4	23° 2' 4.500" N	86° 36' 25.608" E
	5	23° 2' 6.579" N	86° 36' 23.374" E
	6	23° 2' 6.896" N	86° 36' 25.229" E
	7	23° 2' 3.891" N	86° 36' 27.887" E
	8	23° 2' 0.499" N	86° 36' 30.454" E
	9	23° 1' 57.834" N	86° 36' 31.344" E
PUR_M1_KR_12	1	23° 1' 34.342" N	86° 36' 35.749" E
	2	23° 1' 34.406" N	86° 36' 33.815" E
	3	23° 1' 39.117" N	86° 36' 32.351" E
	4	23° 1' 39.353" N	86° 36' 31.724" E
	5	23° 1' 43.367" N	86° 36' 31.972" E

SANDBAR CODE	POINT NO.	LATITUDE	LONGITUDE
	6	23° 1' 44.744" N	86° 36' 32.396" E
	7	23° 1' 52.659" N	86° 36' 31.741" E
	8	23° 1' 53.089" N	86° 36' 31.642" E
	9	23° 1' 52.885" N	86° 36' 32.907" E
	10	23° 1' 47.518" N	86° 36' 33.703" E
	11	23° 1' 42.046" N	86° 36' 33.719" E
	12	23° 1' 40.551" N	86° 36' 34.216" E
	13	23° 1' 37.367" N	86° 36' 34.457" E
	14	23° 1' 35.431" N	86° 36' 35.722" E
PUR_M1_KR_13	1	23° 0' 57.545" N	86° 36' 53.513" E
	2	23° 1' 0.378" N	86° 36' 52.156" E
	3	23° 1' 7.344" N	86° 36' 50.797" E
	4	23° 1' 12.056" N	86° 36' 49.408" E
	5	23° 1' 17.898" N	86° 36' 45.841" E
	6	23° 1' 26.676" N	86° 36' 39.680" E
	7	23° 1' 28.241" N	86° 36' 38.250" E
	8	23° 1' 29.325" N	86° 36' 39.992" E
	9	23° 1' 25.043" N	86° 36' 43.742" E
	10	23° 1' 13.358" N	86° 36' 50.840" E
	11	23° 1' 10.909" N	86° 36' 52.149" E
	12	23° 1' 5.362" N	86° 36' 53.326" E
	13	23° 1' 2.136" N	86° 36' 53.614" E
	14	23° 0' 58.515" N	86° 36' 55.644" E
PUR_M1_KR_13A	1	23° 0' 35.103" N	86° 38' 15.437" E
	2	23° 0' 39.529" N	86° 38' 15.405" E
	3	23° 0' 42.502" N	86° 38' 14.022" E
	4	23° 0' 45.182" N	86° 38' 11.839" E
	5	23° 0' 47.002" N	86° 38' 8.284" E
	6	23° 0' 48.220" N	86° 38' 9.249" E
	7	23° 0' 46.320" N	86° 38' 12.900" E
	8	23° 0' 44.919" N	86° 38' 14.759" E
	9	23° 0' 41.655" N	86° 38' 16.536" E
	10	23° 0' 35.189" N	86° 38' 16.256" E
PUR_BG_SR_01_02	1	23° 11' 19.211" N	85° 53' 0.361" E
	2	23° 11' 17.447" N	85° 53' 0.073" E
	3	23° 11' 15.880" N	85° 53' 0.384" E
	4	23° 11' 12.108" N	85° 53' 0.266" E
	5	23° 11' 8.306" N	85° 53' 0.652" E
	6	23° 11' 5.178" N	85° 53' 1.307" E
	7	23° 10' 59.675" N	85° 53' 1.536" E
	8	23° 10' 52.478" N	85° 53' 0.042" E
	9	23° 10' 41.193" N	85° 52' 58.323" E
	10	23° 10' 24.617" N	85° 52' 56.134" E
	11	23° 10' 23.161" N	85° 52' 56.474" E

SANDBAR CODE	POINT NO.	LATITUDE	LONGITUDE
	12	23° 10' 19.003" N	85° 52' 56.360" E
	13	23° 10' 14.656" N	85° 52' 56.783" E
	14	23° 10' 7.045" N	85° 52' 58.871" E
	15	23° 9' 59.816" N	85° 53' 4.380" E
	16	23° 9' 52.042" N	85° 53' 14.478" E
	17	23° 9' 48.789" N	85° 53' 17.720" E
	18	23° 9' 36.455" N	85° 53' 29.464" E
	19	23° 9' 34.123" N	85° 53' 30.525" E
	20	23° 9' 28.138" N	85° 53' 36.856" E
	21	23° 9' 18.396" N	85° 53' 42.514" E
	22	23° 9' 18.462" N	85° 53' 40.352" E
	23	23° 9' 24.444" N	85° 53' 36.011" E
	24	23° 9' 44.632" N	85° 53' 18.066" E
	25	23° 9' 58.725" N	85° 53' 2.528" E
	26	23° 10' 5.730" N	85° 52' 56.885" E
	27	23° 10' 12.931" N	85° 52' 53.669" E
	28	23° 10' 23.398" N	85° 52' 53.159" E
	29	23° 10' 33.946" N	85° 52' 53.546" E
	30	23° 10' 46.656" N	85° 52' 56.149" E
	31	23° 10' 48.012" N	85° 52' 56.209" E
	32	23° 10' 57.059" N	85° 52' 57.468" E
	33	23° 11' 5.072" N	85° 52' 57.873" E
	34	23° 11' 16.465" N	85° 52' 57.328" E
	35	23° 11' 18.939" N	85° 52' 57.133" E
PUR_BG_SR_03	1	23° 13' 26.455" N	85° 51' 45.703" E
	2	23° 13' 25.194" N	85° 51' 51.385" E
	3	23° 13' 20.784" N	85° 51' 54.461" E
	4	23° 13' 8.796" N	85° 52' 8.056" E
	5	23° 13' 6.410" N	85° 52' 9.297" E
	6	23° 13' 4.059" N	85° 52' 11.580" E
	7	23° 13' 2.711" N	85° 52' 11.741" E
	8	23° 12' 53.150" N	85° 52' 18.195" E
	9	23° 12' 51.252" N	85° 52' 18.390" E
	10	23° 12' 45.163" N	85° 52' 21.568" E
	11	23° 12' 43.498" N	85° 52' 23.578" E
	12	23° 12' 35.256" N	85° 52' 29.783" E
	13	23° 12' 30.982" N	85° 52' 32.618" E
	14	23° 12' 19.343" N	85° 52' 37.436" E
	15	23° 12' 18.095" N	85° 52' 35.347" E
	16	23° 12' 31.735" N	85° 52' 27.878" E
	17	23° 12' 36.822" N	85° 52' 24.132" E
	18	23° 12' 41.487" N	85° 52' 19.226" E
	19	23° 12' 46.281" N	85° 52' 16.394" E
	20	23° 12' 53.026" N	85° 52' 12.578" E

SANDBAR CODE	POINT NO.	LATITUDE	LONGITUDE
	21	23° 12' 59.901" N	85° 52' 9.219" E
	22	23° 13' 6.290" N	85° 52' 5.779" E
	23	23° 13' 15.325" N	85° 51' 57.875" E
	24	23° 13' 20.574" N	85° 51' 49.732" E
	25	23° 13' 21.101" N	85° 51' 44.879" E
	26	23° 13' 24.047" N	85° 51' 44.156" E
PUR_JL_SR_04_05_06	1	23° 15' 8.119" N	85° 49' 56.175" E
	2	23° 15' 4.304" N	85° 50' 2.993" E
	3	23° 15' 1.630" N	85° 50' 6.204" E
	4	23° 14' 58.454" N	85° 50' 12.339" E
	5	23° 14' 54.973" N	85° 50' 18.119" E
	6	23° 14' 51.040" N	85° 50' 22.354" E
	7	23° 14' 46.117" N	85° 50' 22.873" E
	8	23° 14' 40.984" N	85° 50' 21.249" E
	9	23° 14' 39.530" N	85° 50' 21.888" E
	10	23° 14' 36.608" N	85° 50' 21.347" E
	11	23° 14' 34.735" N	85° 50' 21.184" E
	12	23° 14' 29.682" N	85° 50' 19.143" E
	13	23° 14' 19.142" N	85° 50' 12.594" E
	14	23° 14' 17.850" N	85° 50' 12.512" E
	15	23° 14' 13.957" N	85° 50' 14.691" E
	16	23° 14' 12.389" N	85° 50' 14.854" E
	17	23° 14' 10.744" N	85° 50' 15.821" E
	18	23° 14' 6.732" N	85° 50' 18.942" E
	19	23° 14' 6.147" N	85° 50' 19.585" E
	20	23° 14' 4.829" N	85° 50' 20.043" E
	21	23° 14' 3.752" N	85° 50' 19.724" E
	21	23° 13' 59.595" N	85° 50' 22.290" E
	22	23° 13' 57.167" N	85° 50' 23.781" E
	23	23° 13' 55.139" N	85° 50' 24.700" E
	24	23° 13' 51.446" N	85° 50' 26.980" E
	25	23° 13' 49.713" N	85° 50' 27.085" E
	26	23° 13' 43.508" N	85° 50' 25.619" E
	27	23° 13' 41.883" N	85° 50' 25.514" E
	28	23° 13' 36.256" N	85° 50' 24.014" E
	29	23° 13' 33.762" N	85° 50' 21.801" E
	30	23° 13' 26.591" N	85° 50' 16.263" E
	31	23° 13' 24.826" N	85° 50' 15.831" E
	32	23° 13' 21.647" N	85° 50' 14.131" E
	33	23° 13' 18.508" N	85° 50' 13.980" E
	34	23° 13' 16.480" N	85° 50' 15.278" E
	35	23° 13' 15.448" N	85° 50' 17.164" E
	36	23° 13' 14.698" N	85° 50' 19.911" E
	37	23° 13' 14.509" N	85° 50' 23.674" E

SANDBAR CODE	POINT NO.	LATITUDE	LONGITUDE
	38	23° 13' 18.108" N	85° 50' 31.897" E
	39	23° 13' 21.772" N	85° 50' 46.062" E
	40	23° 13' 21.970" N	85° 50' 50.498" E
	41	23° 13' 22.989" N	85° 50' 58.115" E
	42	23° 13' 22.130" N	85° 51' 8.548" E
	43	23° 13' 20.094" N	85° 51' 12.557" E
	44	23° 13' 20.085" N	85° 51' 13.771" E
	45	23° 13' 18.684" N	85° 51' 13.524" E
	46	23° 13' 20.261" N	85° 51' 7.473" E
	47	23° 13' 20.423" N	85° 51' 4.852" E
	48	23° 13' 19.884" N	85° 50' 53.721" E
	49	23° 13' 19.152" N	85° 50' 47.548" E
	50	23° 13' 19.233" N	85° 50' 46.704" E
	51	23° 13' 19.093" N	85° 50' 45.852" E
	52	23° 13' 16.581" N	85° 50' 32.812" E
	53	23° 13' 12.483" N	85° 50' 24.723" E
	54	23° 13' 11.669" N	85° 50' 20.344" E
	55	23° 13' 11.847" N	85° 50' 14.400" E
	56	23° 13' 13.894" N	85° 50' 11.691" E
	57	23° 13' 16.559" N	85° 50' 10.952" E
	58	23° 13' 21.582" N	85° 50' 11.267" E
	59	23° 13' 30.311" N	85° 50' 15.749" E
	60	23° 13' 39.040" N	85° 50' 20.935" E
	61	23° 13' 47.460" N	85° 50' 22.885" E
	62	23° 13' 51.393" N	85° 50' 22.620" E
	63	23° 13' 58.235" N	85° 50' 19.944" E
	64	23° 14' 12.601" N	85° 50' 12.237" E
	65	23° 14' 13.739" N	85° 50' 11.762" E
	66	23° 14' 15.022" N	85° 50' 10.917" E
	67	23° 14' 18.875" N	85° 50' 10.406" E
	68	23° 14' 27.132" N	85° 50' 12.848" E
	69	23° 14' 36.560" N	85° 50' 17.489" E
	70	23° 14' 45.191" N	85° 50' 19.580" E
	71	23° 14' 48.604" N	85° 50' 18.980" E
	72	23° 14' 55.883" N	85° 50' 10.395" E
	73	23° 14' 57.443" N	85° 50' 7.386" E
	74	23° 15' 2.397" N	85° 50' 0.384" E
	75	23° 15' 6.841" N	85° 49' 54.867" E
PUR_JL_SR_04_05_06_A	1	23° 19' 10.529" N	85° 51' 23.315" E
	2	23° 19' 8.360" N	85° 51' 20.002" E
	3	23° 19' 7.233" N	85° 51' 16.569" E
	4	23° 18' 58.279" N	85° 51' 4.260" E
	5	23° 18' 54.058" N	85° 51' 0.321" E
	6	23° 18' 47.672" N	85° 50' 57.656" E

SANDBAR CODE	POINT NO.	LATITUDE	LONGITUDE
	7	23° 18' 40.026" N	85° 50' 56.790" E
	8	23° 18' 38.428" N	85° 50' 56.032" E
	9	23° 18' 36.334" N	85° 50' 55.369" E
	10	23° 18' 31.558" N	85° 50' 50.716" E
	11	23° 18' 31.339" N	85° 50' 49.108" E
	12	23° 18' 30.482" N	85° 50' 44.846" E
	13	23° 18' 31.049" N	85° 50' 43.343" E
	14	23° 18' 23.159" N	85° 50' 20.521" E
	15	23° 18' 21.106" N	85° 50' 19.354" E
	16	23° 18' 15.248" N	85° 50' 17.370" E
	17	23° 18' 12.028" N	85° 50' 17.443" E
	18	23° 18' 8.716" N	85° 50' 16.220" E
	19	23° 18' 2.465" N	85° 50' 14.106" E
	20	23° 17' 58.979" N	85° 50' 11.767" E
	21	23° 17' 56.845" N	85° 50' 10.780" E
	22	23° 17' 52.109" N	85° 50' 6.954" E
	23	23° 17' 49.890" N	85° 50' 5.947" E
	24	23° 17' 35.313" N	85° 50' 0.104" E
	25	23° 17' 33.238" N	85° 49' 58.647" E
	26	23° 17' 29.334" N	85° 49' 57.766" E
	27	23° 17' 27.092" N	85° 49' 56.807" E
	28	23° 17' 24.772" N	85° 49' 56.158" E
	29	23° 17' 20.239" N	85° 49' 53.870" E
	30	23° 17' 3.365" N	85° 49' 47.900" E
	31	23° 16' 59.790" N	85° 49' 45.646" E
	32	23° 16' 49.746" N	85° 49' 40.668" E
	33	23° 16' 48.735" N	85° 49' 39.828" E
	34	23° 16' 45.076" N	85° 49' 38.340" E
	35	23° 16' 42.583" N	85° 49' 36.216" E
	36	23° 16' 41.134" N	85° 49' 35.708" E
	37	23° 16' 35.514" N	85° 49' 31.955" E
	38	23° 16' 30.273" N	85° 49' 28.338" E
	39	23° 16' 20.310" N	85° 49' 23.122" E
	40	23° 16' 19.420" N	85° 49' 21.863" E
	41	23° 16' 4.617" N	85° 49' 13.829" E
	42	23° 16' 0.264" N	85° 49' 15.880" E
	43	23° 15' 59.034" N	85° 49' 13.354" E
	44	23° 16' 5.232" N	85° 49' 10.825" E
	45	23° 16' 7.979" N	85° 49' 10.982" E
	46	23° 16' 21.392" N	85° 49' 20.863" E
	47	23° 16' 29.845" N	85° 49' 25.223" E
	48	23° 16' 56.213" N	85° 49' 43.070" E
	49	23° 17' 21.961" N	85° 49' 53.108" E
	50	23° 17' 44.783" N	85° 50' 1.000" E

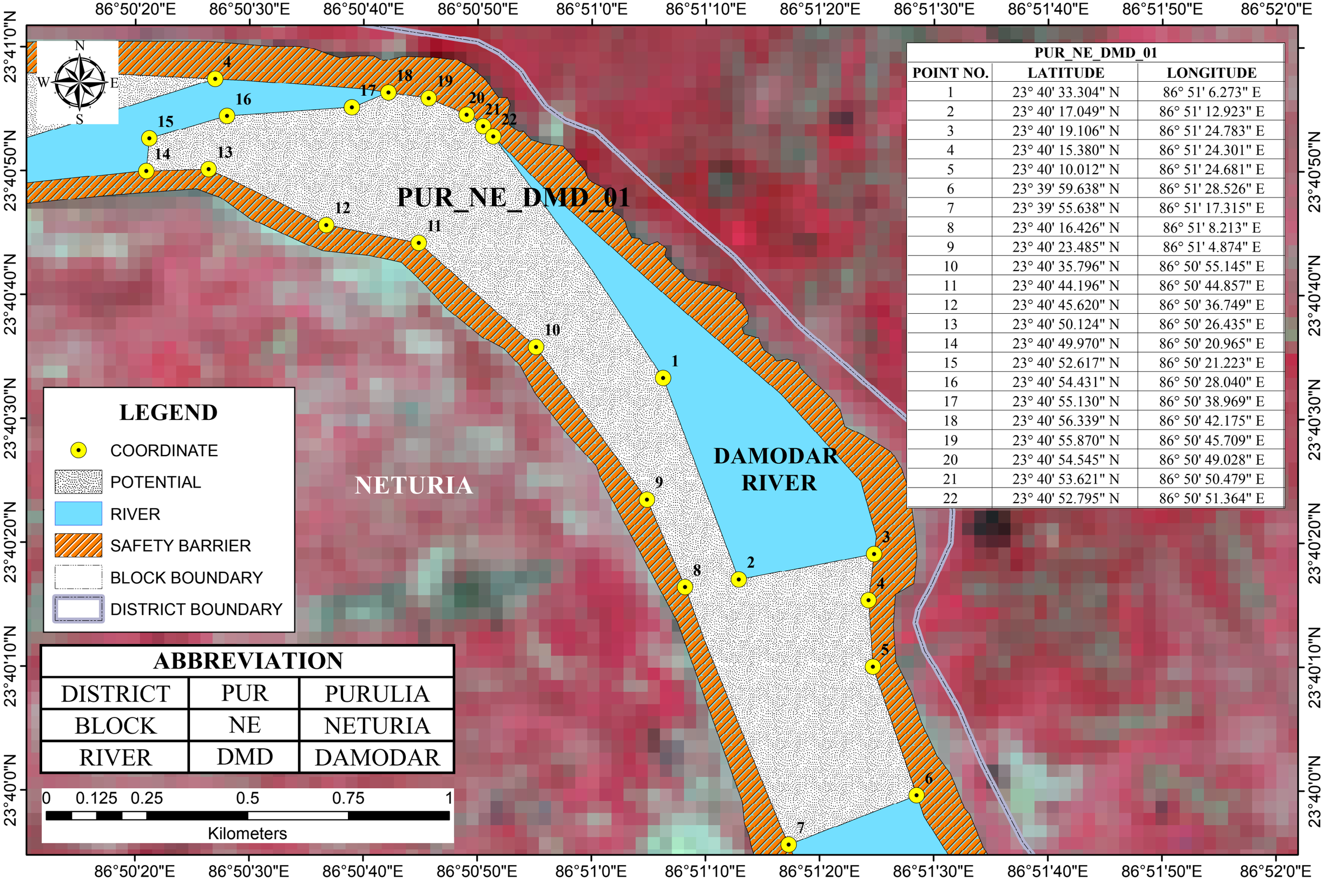
SANDBAR CODE	POINT NO.	LATITUDE	LONGITUDE
	51	23° 18' 4.517" N	85° 50' 11.886" E
	52	23° 18' 12.043" N	85° 50' 13.820" E
	53	23° 18' 23.389" N	85° 50' 18.181" E
	54	23° 18' 26.055" N	85° 50' 20.415" E
	55	23° 18' 28.560" N	85° 50' 29.318" E
	56	23° 18' 31.845" N	85° 50' 38.292" E
	57	23° 18' 34.887" N	85° 50' 50.909" E
	58	23° 18' 39.763" N	85° 50' 54.111" E
	59	23° 18' 46.850" N	85° 50' 56.097" E
	60	23° 18' 54.636" N	85° 50' 59.017" E
	61	23° 18' 59.902" N	85° 51' 2.483" E
	62	23° 19' 12.098" N	85° 51' 20.702" E
PUR_JL_SR_07	1	23° 20' 32.125" N	85° 52' 17.933" E
	2	23° 20' 32.748" N	85° 52' 21.304" E
	3	23° 20' 35.267" N	85° 52' 24.596" E
	4	23° 20' 36.829" N	85° 52' 25.462" E
	5	23° 20' 54.185" N	85° 52' 50.300" E
	6	23° 20' 58.867" N	85° 52' 56.821" E
	7	23° 21' 0.459" N	85° 52' 57.803" E
	8	23° 20' 59.410" N	85° 53' 0.052" E
	9	23° 20' 56.789" N	85° 52' 58.742" E
	10	23° 20' 54.100" N	85° 52' 56.082" E
	11	23° 20' 49.703" N	85° 52' 53.286" E
	12	23° 20' 46.205" N	85° 52' 49.201" E
	13	23° 20' 44.864" N	85° 52' 46.410" E
	14	23° 20' 43.193" N	85° 52' 43.710" E
	15	23° 20' 41.556" N	85° 52' 41.965" E
	16	23° 20' 37.260" N	85° 52' 34.056" E
	17	23° 20' 34.428" N	85° 52' 30.297" E
	18	23° 20' 32.189" N	85° 52' 27.577" E
	19	23° 20' 31.005" N	85° 52' 23.152" E
	20	23° 20' 30.616" N	85° 52' 18.870" E
PUR_JL_SR_08	1	23° 23' 39.412" N	85° 53' 0.739" E
	2	23° 23' 41.217" N	85° 53' 2.820" E
	3	23° 23' 44.565" N	85° 53' 7.980" E
	4	23° 23' 47.263" N	85° 53' 13.668" E
	5	23° 23' 48.254" N	85° 53' 17.989" E
	6	23° 23' 48.165" N	85° 53' 21.838" E
	7	23° 23' 47.936" N	85° 53' 23.112" E
	8	23° 23' 47.343" N	85° 53' 26.417" E
	9	23° 23' 45.815" N	85° 53' 30.396" E
	10	23° 23' 42.994" N	85° 53' 35.496" E
	11	23° 23' 36.864" N	85° 53' 52.861" E
	12	23° 23' 36.796" N	85° 53' 54.774" E

SANDBAR CODE	POINT NO.	LATITUDE	LONGITUDE
	13	23° 23' 41.975" N	85° 54' 2.567" E
	14	23° 23' 43.958" N	85° 54' 5.121" E
	15	23° 23' 45.323" N	85° 54' 6.095" E
	16	23° 23' 44.399" N	85° 54' 7.680" E
	17	23° 23' 39.663" N	85° 54' 4.224" E
	18	23° 23' 36.451" N	85° 54' 2.498" E
	19	23° 23' 35.060" N	85° 54' 0.422" E
	20	23° 23' 34.955" N	85° 53' 59.576" E
	21	23° 23' 43.250" N	85° 53' 34.317" E
	22	23° 23' 46.292" N	85° 53' 27.776" E
	23	23° 23' 47.525" N	85° 53' 25.402" E
	24	23° 23' 47.876" N	85° 53' 21.170" E
	25	23° 23' 45.696" N	85° 53' 12.240" E
	26	23° 23' 43.171" N	85° 53' 7.955" E
	27	23° 23' 38.296" N	85° 53' 2.049" E
PUR_JL_SR_08A	1	23° 24' 24.748" N	85° 53' 14.020" E
	2	23° 24' 20.167" N	85° 53' 13.425" E
	3	23° 24' 18.064" N	85° 53' 15.232" E
	4	23° 24' 17.394" N	85° 53' 16.751" E
	5	23° 24' 15.550" N	85° 53' 16.767" E
	6	23° 24' 15.023" N	85° 53' 14.004" E
	7	23° 24' 15.608" N	85° 53' 12.825" E
	8	23° 24' 16.567" N	85° 53' 12.226" E
	9	23° 24' 24.856" N	85° 53' 12.508" E
	10	23° 24' 29.277" N	85° 53' 15.009" E
	11	23° 24' 30.690" N	85° 53' 18.074" E
	12	23° 24' 30.796" N	85° 53' 19.018" E
	25	23° 24' 30.384" N	85° 53' 17.776" E
	21	23° 24' 43.587" N	85° 53' 29.368" E
	22	23° 24' 36.274" N	85° 53' 32.026" E
	23	23° 24' 35.567" N	85° 53' 31.762" E
	24	23° 24' 31.140" N	85° 53' 24.817" E
	13	23° 24' 31.283" N	85° 53' 23.344" E
	14	23° 24' 31.324" N	85° 53' 23.709" E
	15	23° 24' 32.738" N	85° 53' 26.932" E
	16	23° 24' 34.639" N	85° 53' 28.870" E
	17	23° 24' 35.480" N	85° 53' 28.986" E
	18	23° 24' 37.391" N	85° 53' 29.431" E
	19	23° 24' 41.287" N	85° 53' 28.459" E
	20	23° 24' 43.139" N	85° 53' 27.320" E
PUR_JL_SR_09	1	23° 25' 21.899" N	85° 52' 49.048" E
	2	23° 25' 22.360" N	85° 52' 49.053" E
	3	23° 25' 24.603" N	85° 52' 51.607" E
	4	23° 25' 25.365" N	85° 52' 55.763" E

SANDBAR CODE	POINT NO.	LATITUDE	LONGITUDE
	5	23° 25' 25.329" N	85° 52' 58.926" E
	6	23° 25' 25.016" N	85° 52' 54.539" E
	14	23° 25' 23.473" N	85° 52' 53.500" E
	15	23° 25' 22.269" N	85° 52' 52.183" E
	16	23° 25' 21.154" N	85° 52' 51.612" E
	12	23° 25' 33.763" N	85° 53' 14.341" E
	13	23° 25' 29.742" N	85° 53' 14.472" E
	6	23° 25' 27.731" N	85° 53' 8.165" E
	7	23° 25' 29.315" N	85° 53' 11.263" E
	8	23° 25' 30.485" N	85° 53' 11.879" E
	9	23° 25' 31.170" N	85° 53' 11.818" E
	10	23° 25' 31.901" N	85° 53' 12.197" E
	11	23° 25' 33.913" N	85° 53' 12.326" E

Annexure 4
Map showing of Potential Blocks of Purulia District

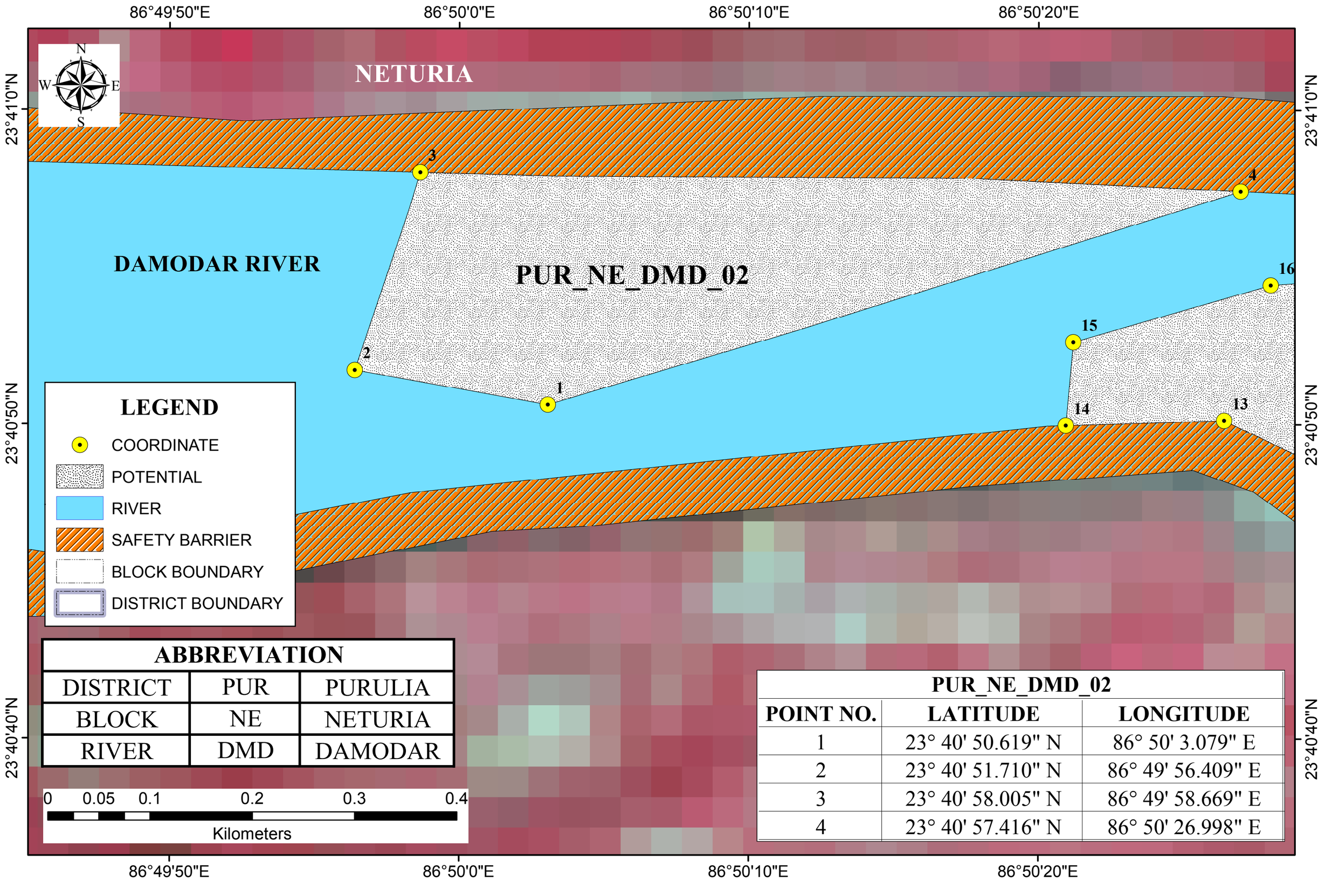
POTENTIAL BLOCK PUR_NE_DMD_01 OF DAMODAR RIVER



PUR_NE_DMD_01		
POINT NO.	LATITUDE	LONGITUDE
1	23° 40' 33.304" N	86° 51' 6.273" E
2	23° 40' 17.049" N	86° 51' 12.923" E
3	23° 40' 19.106" N	86° 51' 24.783" E
4	23° 40' 15.380" N	86° 51' 24.301" E
5	23° 40' 10.012" N	86° 51' 24.681" E
6	23° 39' 59.638" N	86° 51' 28.526" E
7	23° 39' 55.638" N	86° 51' 17.315" E
8	23° 40' 16.426" N	86° 51' 8.213" E
9	23° 40' 23.485" N	86° 51' 4.874" E
10	23° 40' 35.796" N	86° 50' 55.145" E
11	23° 40' 44.196" N	86° 50' 44.857" E
12	23° 40' 45.620" N	86° 50' 36.749" E
13	23° 40' 50.124" N	86° 50' 26.435" E
14	23° 40' 49.970" N	86° 50' 20.965" E
15	23° 40' 52.617" N	86° 50' 21.223" E
16	23° 40' 54.431" N	86° 50' 28.040" E
17	23° 40' 55.130" N	86° 50' 38.969" E
18	23° 40' 56.339" N	86° 50' 42.175" E
19	23° 40' 55.870" N	86° 50' 45.709" E
20	23° 40' 54.545" N	86° 50' 49.028" E
21	23° 40' 53.621" N	86° 50' 50.479" E
22	23° 40' 52.795" N	86° 50' 51.364" E

ABBREVIATION		
DISTRICT	PUR	PURULIA
BLOCK	NE	NETURIA
RIVER	DMD	DAMODAR

POTENTIAL BLOCK PUR_NE_DMD_02 OF DAMODAR RIVER



ABBREVIATION		
DISTRICT	PUR	PURULIA
BLOCK	NE	NETURIA
RIVER	DMD	DAMODAR

PUR_NE_DMD_02		
POINT NO.	LATITUDE	LONGITUDE
1	23° 40' 50.619" N	86° 50' 3.079" E
2	23° 40' 51.710" N	86° 49' 56.409" E
3	23° 40' 58.005" N	86° 49' 58.669" E
4	23° 40' 57.416" N	86° 50' 26.998" E

POTENTIAL BLOCK PUR_NE_DMD_02A OF DAMODAR RIVER

86°48'40"E

86°48'50"E

23°41'10"N

23°41'10"N

N

W

E

S

NETURIA

DAMODAR RIVER

4

3

2

1

LEGEND

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

ABBREVIATION		
DISTRICT	PUR	PURULIA
BLOCK	NE	NETURIA
RIVER	DMD	DAMODAR

0 0.0175 0.035 0.07 0.105 0.14

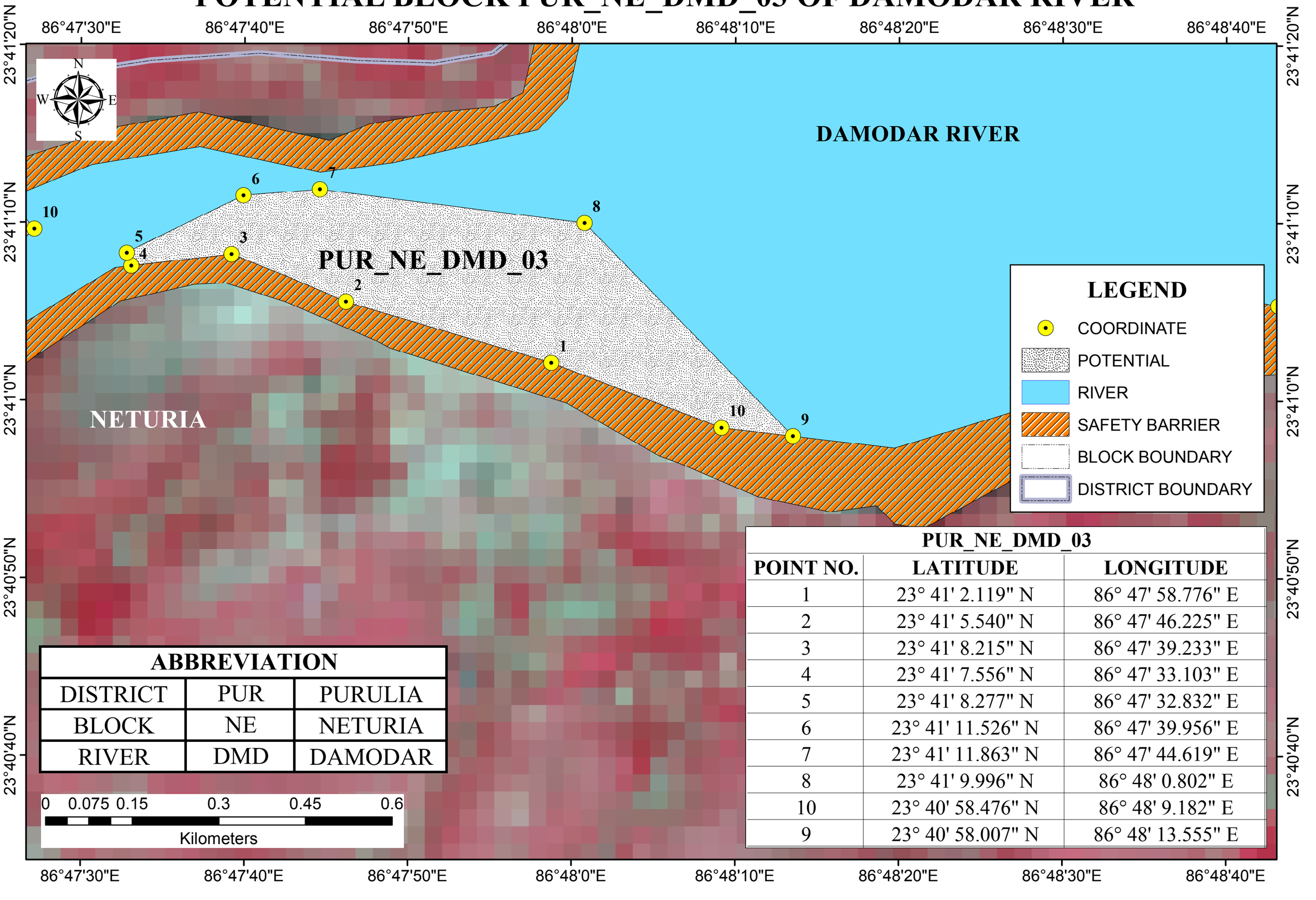
Kilometers

PUR_NE_DMD_02A		
POINT NO.	LATITUDE	LONGITUDE
1	23° 41' 4.663" N	86° 48' 46.684" E
2	23° 41' 5.347" N	86° 48' 43.204" E
3	23° 41' 8.797" N	86° 48' 46.753" E
4	23° 41' 10.369" N	86° 48' 48.718" E

86°48'40"E

86°48'50"E

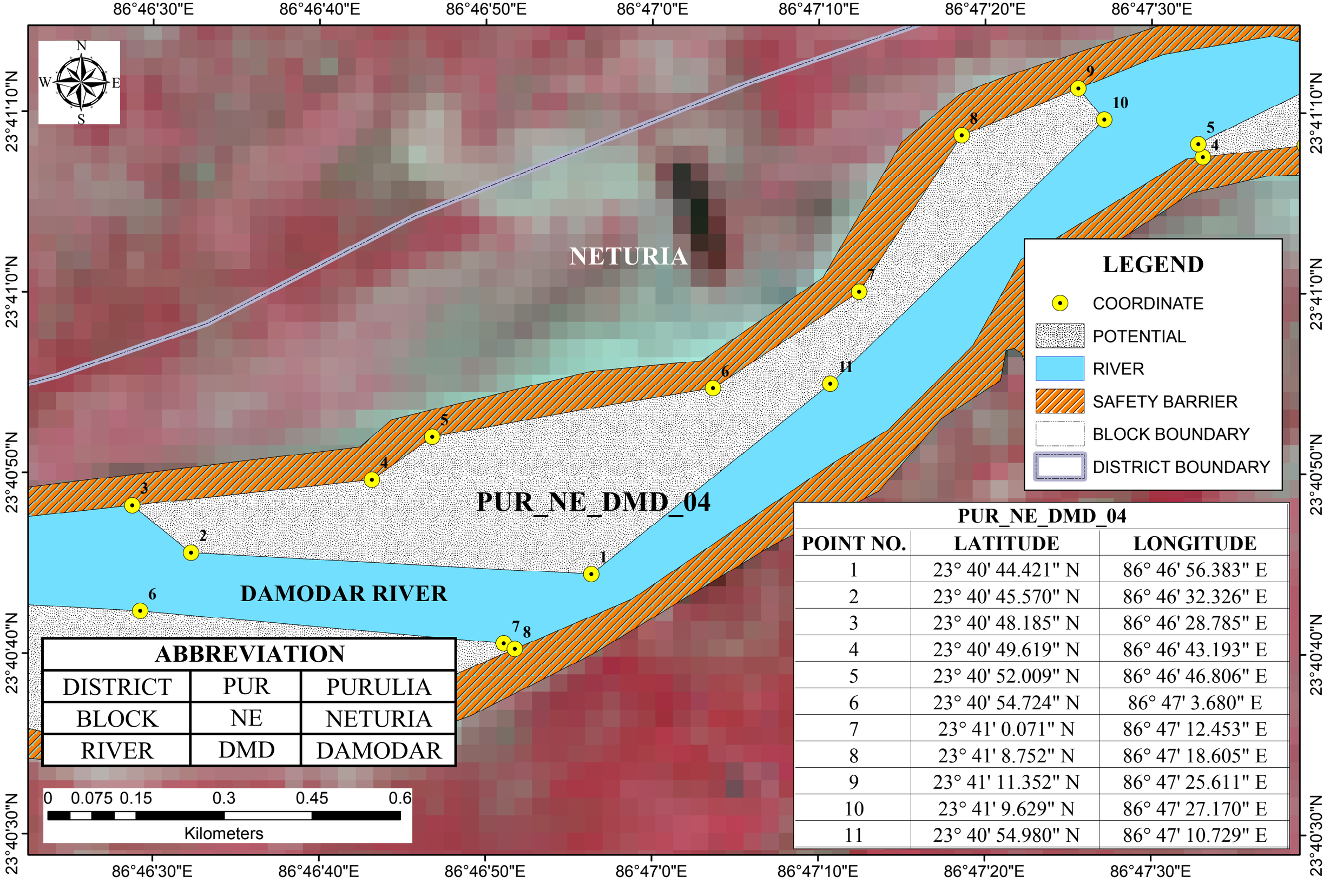
POTENTIAL BLOCK PUR_NE_DMD_03 OF DAMODAR RIVER



ABBREVIATION		
DISTRICT	PUR	PURULIA
BLOCK	NE	NETURIA
RIVER	DMD	DAMODAR

PUR_NE_DMD_03		
POINT NO.	LATITUDE	LONGITUDE
1	23° 41' 2.119" N	86° 47' 58.776" E
2	23° 41' 5.540" N	86° 47' 46.225" E
3	23° 41' 8.215" N	86° 47' 39.233" E
4	23° 41' 7.556" N	86° 47' 33.103" E
5	23° 41' 8.277" N	86° 47' 32.832" E
6	23° 41' 11.526" N	86° 47' 39.956" E
7	23° 41' 11.863" N	86° 47' 44.619" E
8	23° 41' 9.996" N	86° 48' 0.802" E
10	23° 40' 58.476" N	86° 48' 9.182" E
9	23° 40' 58.007" N	86° 48' 13.555" E

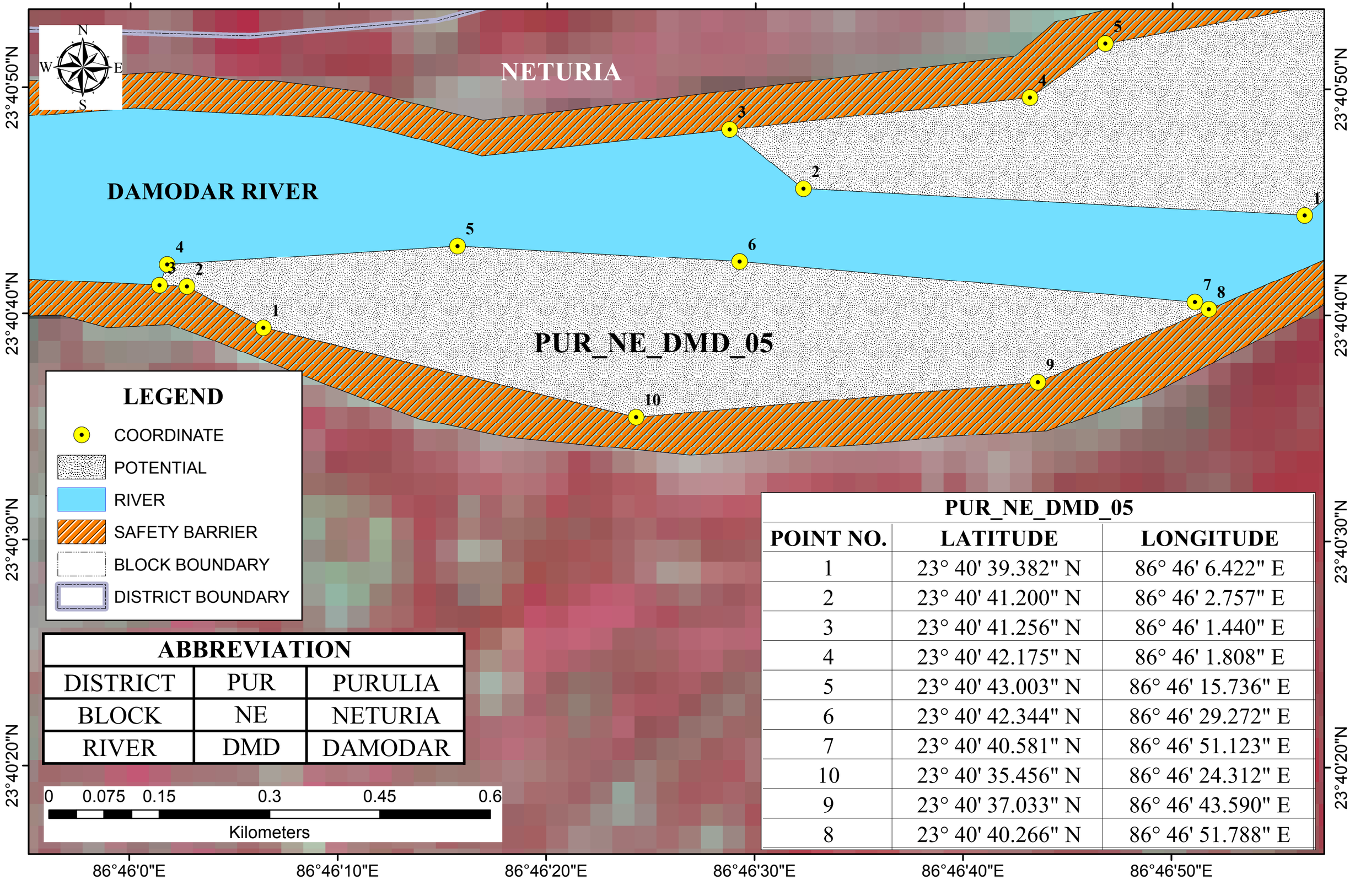
POTENTIAL BLOCK PUR_NE_DMD_04 OF DAMODAR RIVER



ABBREVIATION		
DISTRICT	PUR	PURULIA
BLOCK	NE	NETURIA
RIVER	DMD	DAMODAR

PUR_NE_DMD_04		
POINT NO.	LATITUDE	LONGITUDE
1	23° 40' 44.421" N	86° 46' 56.383" E
2	23° 40' 45.570" N	86° 46' 32.326" E
3	23° 40' 48.185" N	86° 46' 28.785" E
4	23° 40' 49.619" N	86° 46' 43.193" E
5	23° 40' 52.009" N	86° 46' 46.806" E
6	23° 40' 54.724" N	86° 47' 3.680" E
7	23° 41' 0.071" N	86° 47' 12.453" E
8	23° 41' 8.752" N	86° 47' 18.605" E
9	23° 41' 11.352" N	86° 47' 25.611" E
10	23° 41' 9.629" N	86° 47' 27.170" E
11	23° 40' 54.980" N	86° 47' 10.729" E

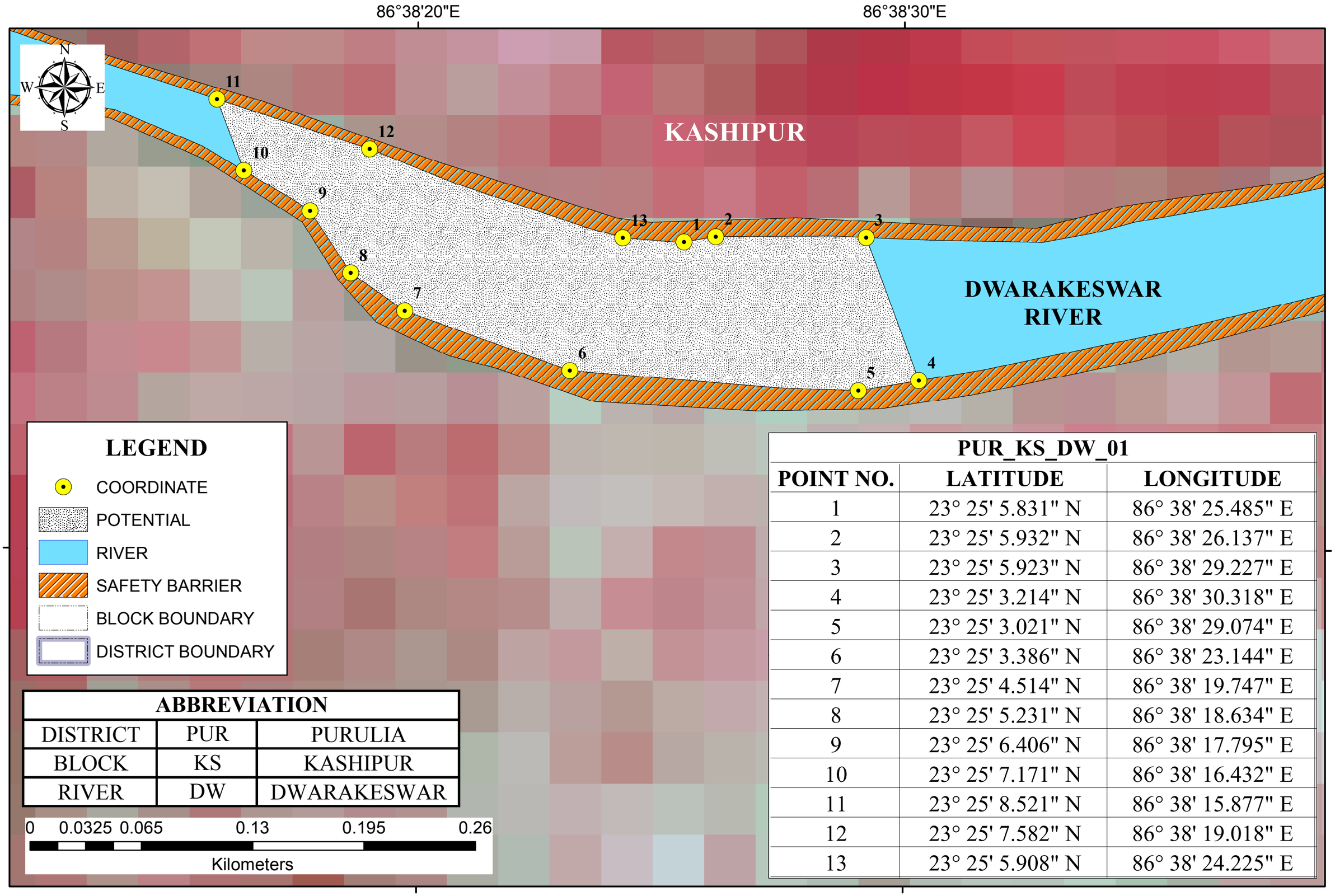
POTENTIAL BLOCK PUR_NE_DMD_05 OF DAMODAR RIVER



ABBREVIATION		
DISTRICT	PUR	PURULIA
BLOCK	NE	NETURIA
RIVER	DMD	DAMODAR

PUR_NE_DMD_05		
POINT NO.	LATITUDE	LONGITUDE
1	23° 40' 39.382" N	86° 46' 6.422" E
2	23° 40' 41.200" N	86° 46' 2.757" E
3	23° 40' 41.256" N	86° 46' 1.440" E
4	23° 40' 42.175" N	86° 46' 1.808" E
5	23° 40' 43.003" N	86° 46' 15.736" E
6	23° 40' 42.344" N	86° 46' 29.272" E
7	23° 40' 40.581" N	86° 46' 51.123" E
10	23° 40' 35.456" N	86° 46' 24.312" E
9	23° 40' 37.033" N	86° 46' 43.590" E
8	23° 40' 40.266" N	86° 46' 51.788" E

POTENTIAL BLOCK PUR_KS_DW_01 OF DWARAKESWAR RIVER



LEGEND

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

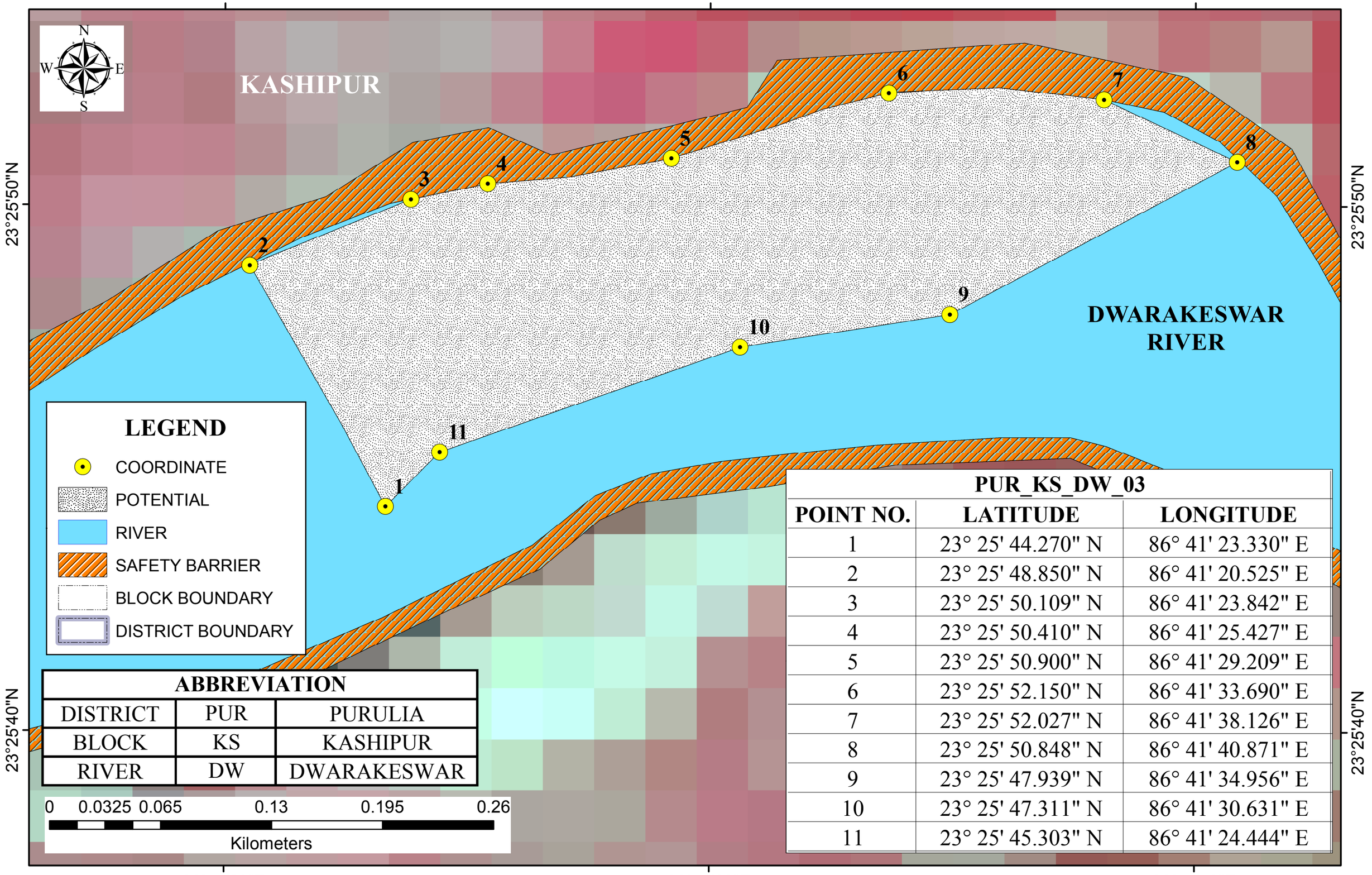
ABBREVIATION		
DISTRICT	PUR	PURULIA
BLOCK	KS	KASHIPUR
RIVER	DW	DWARAKESWAR

0 0.0325 0.065 0.13 0.195 0.26

Kilometers

PUR_KS_DW_01		
POINT NO.	LATITUDE	LONGITUDE
1	23° 25' 5.831" N	86° 38' 25.485" E
2	23° 25' 5.932" N	86° 38' 26.137" E
3	23° 25' 5.923" N	86° 38' 29.227" E
4	23° 25' 3.214" N	86° 38' 30.318" E
5	23° 25' 3.021" N	86° 38' 29.074" E
6	23° 25' 3.386" N	86° 38' 23.144" E
7	23° 25' 4.514" N	86° 38' 19.747" E
8	23° 25' 5.231" N	86° 38' 18.634" E
9	23° 25' 6.406" N	86° 38' 17.795" E
10	23° 25' 7.171" N	86° 38' 16.432" E
11	23° 25' 8.521" N	86° 38' 15.877" E
12	23° 25' 7.582" N	86° 38' 19.018" E
13	23° 25' 5.908" N	86° 38' 24.225" E

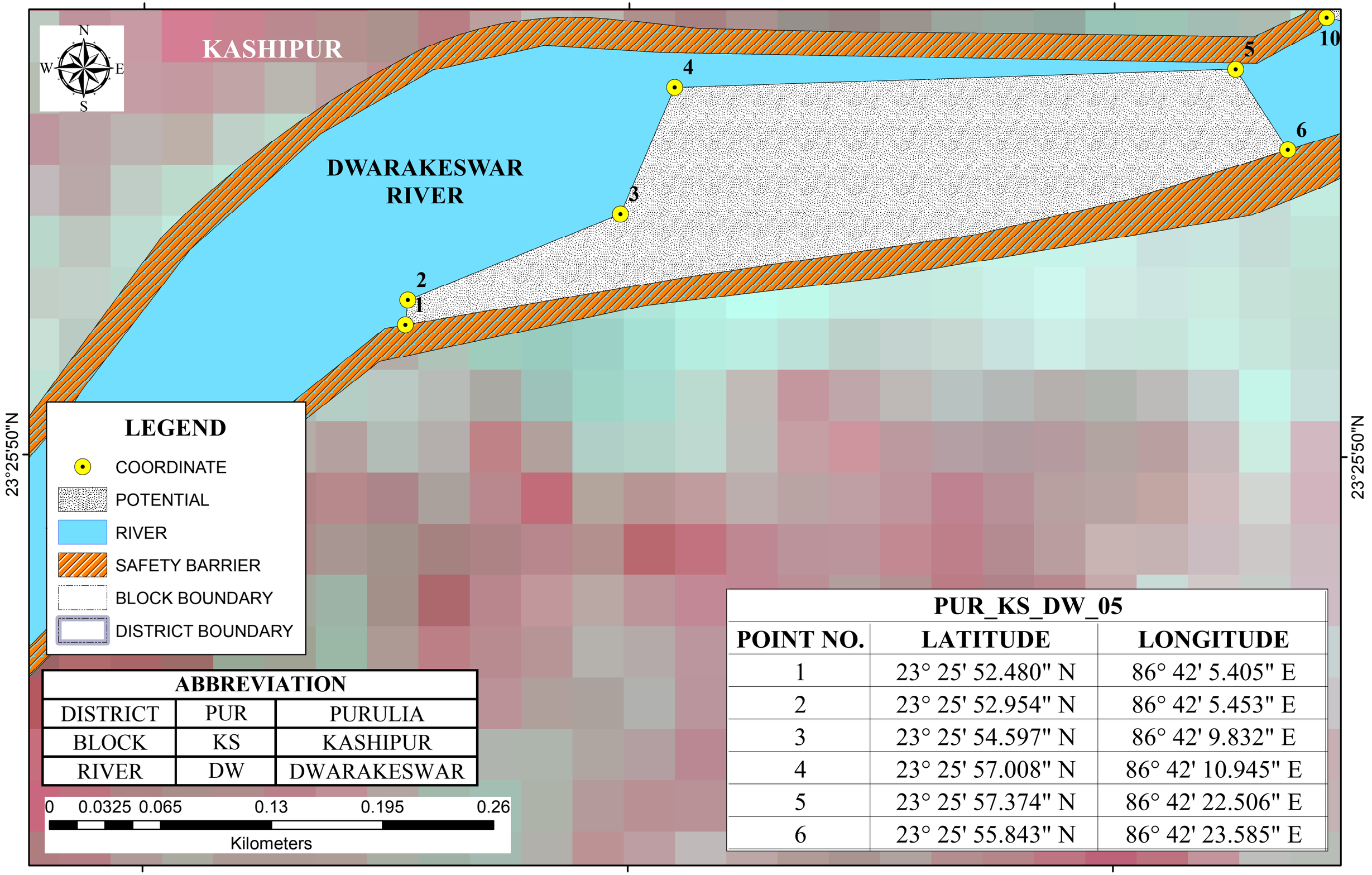
POTENTIAL BLOCK PUR_KS_DW_03 OF DWARAKESWAR RIVER



ABBREVIATION		
DISTRICT	PUR	PURULIA
BLOCK	KS	KASHIPUR
RIVER	DW	DWARAKESWAR

PUR_KS_DW_03		
POINT NO.	LATITUDE	LONGITUDE
1	23° 25' 44.270" N	86° 41' 23.330" E
2	23° 25' 48.850" N	86° 41' 20.525" E
3	23° 25' 50.109" N	86° 41' 23.842" E
4	23° 25' 50.410" N	86° 41' 25.427" E
5	23° 25' 50.900" N	86° 41' 29.209" E
6	23° 25' 52.150" N	86° 41' 33.690" E
7	23° 25' 52.027" N	86° 41' 38.126" E
8	23° 25' 50.848" N	86° 41' 40.871" E
9	23° 25' 47.939" N	86° 41' 34.956" E
10	23° 25' 47.311" N	86° 41' 30.631" E
11	23° 25' 45.303" N	86° 41' 24.444" E

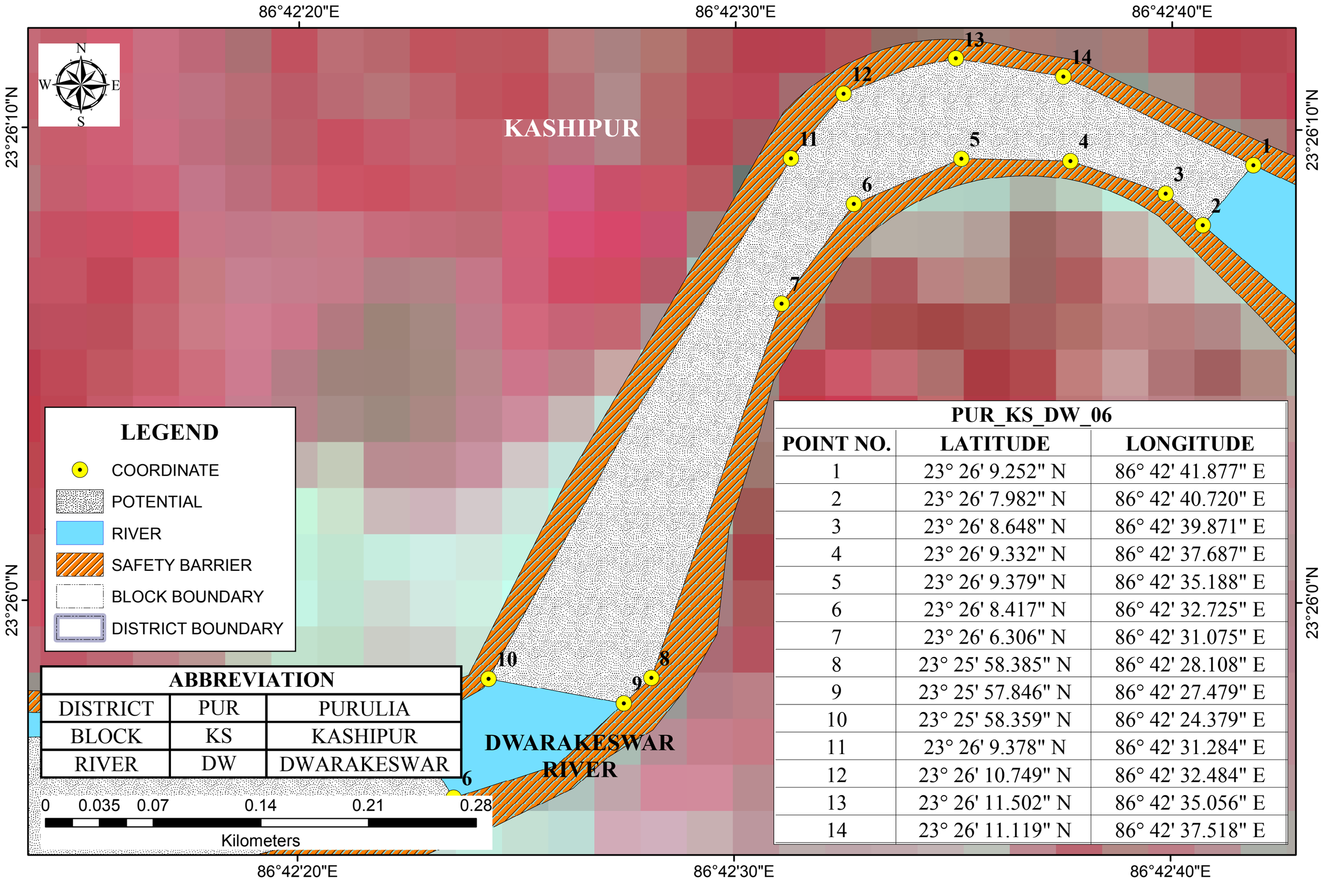
POTENTIAL BLOCK PUR_KS_DW_05 OF DWARAKESWAR RIVER



ABBREVIATION		
DISTRICT	PUR	PURULIA
BLOCK	KS	KASHIPUR
RIVER	DW	DWARAKESWAR

PUR_KS_DW_05		
POINT NO.	LATITUDE	LONGITUDE
1	23° 25' 52.480" N	86° 42' 5.405" E
2	23° 25' 52.954" N	86° 42' 5.453" E
3	23° 25' 54.597" N	86° 42' 9.832" E
4	23° 25' 57.008" N	86° 42' 10.945" E
5	23° 25' 57.374" N	86° 42' 22.506" E
6	23° 25' 55.843" N	86° 42' 23.585" E

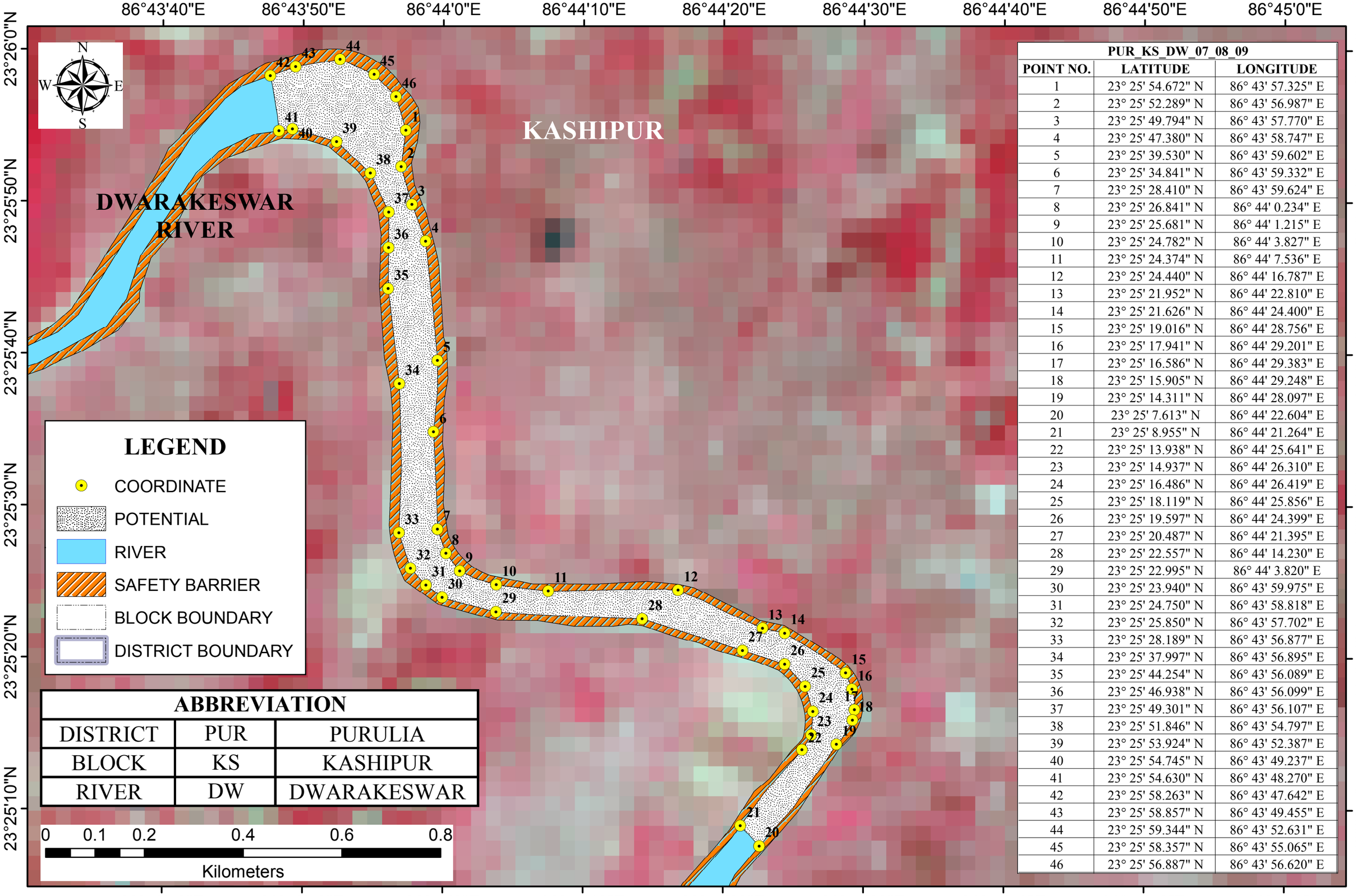
POTENTIAL BLOCK PUR_KS_DW_06 OF DWARAKESWAR RIVER



ABBREVIATION		
DISTRICT	PUR	PURULIA
BLOCK	KS	KASHIPUR
RIVER	DW	DWARAKESWAR

PUR_KS_DW_06		
POINT NO.	LATITUDE	LONGITUDE
1	23° 26' 9.252" N	86° 42' 41.877" E
2	23° 26' 7.982" N	86° 42' 40.720" E
3	23° 26' 8.648" N	86° 42' 39.871" E
4	23° 26' 9.332" N	86° 42' 37.687" E
5	23° 26' 9.379" N	86° 42' 35.188" E
6	23° 26' 8.417" N	86° 42' 32.725" E
7	23° 26' 6.306" N	86° 42' 31.075" E
8	23° 25' 58.385" N	86° 42' 28.108" E
9	23° 25' 57.846" N	86° 42' 27.479" E
10	23° 25' 58.359" N	86° 42' 24.379" E
11	23° 26' 9.378" N	86° 42' 31.284" E
12	23° 26' 10.749" N	86° 42' 32.484" E
13	23° 26' 11.502" N	86° 42' 35.056" E
14	23° 26' 11.119" N	86° 42' 37.518" E

POTENTIAL BLOCK PUR_KS_DW_07_08_09 OF DWARAKESWAR RIVER



ABBREVIATION		
DISTRICT	PUR	PURULIA
BLOCK	KS	KASHIPUR
RIVER	DW	DWARAKESWAR

PUR_KS_DW_07_08_09		
POINT NO.	LATITUDE	LONGITUDE
1	23° 25' 54.672" N	86° 43' 57.325" E
2	23° 25' 52.289" N	86° 43' 56.987" E
3	23° 25' 49.794" N	86° 43' 57.770" E
4	23° 25' 47.380" N	86° 43' 58.747" E
5	23° 25' 39.530" N	86° 43' 59.602" E
6	23° 25' 34.841" N	86° 43' 59.332" E
7	23° 25' 28.410" N	86° 43' 59.624" E
8	23° 25' 26.841" N	86° 44' 0.234" E
9	23° 25' 25.681" N	86° 44' 1.215" E
10	23° 25' 24.782" N	86° 44' 3.827" E
11	23° 25' 24.374" N	86° 44' 7.536" E
12	23° 25' 24.440" N	86° 44' 16.787" E
13	23° 25' 21.952" N	86° 44' 22.810" E
14	23° 25' 21.626" N	86° 44' 24.400" E
15	23° 25' 19.016" N	86° 44' 28.756" E
16	23° 25' 17.941" N	86° 44' 29.201" E
17	23° 25' 16.586" N	86° 44' 29.383" E
18	23° 25' 15.905" N	86° 44' 29.248" E
19	23° 25' 14.311" N	86° 44' 28.097" E
20	23° 25' 7.613" N	86° 44' 22.604" E
21	23° 25' 8.955" N	86° 44' 21.264" E
22	23° 25' 13.938" N	86° 44' 25.641" E
23	23° 25' 14.937" N	86° 44' 26.310" E
24	23° 25' 16.486" N	86° 44' 26.419" E
25	23° 25' 18.119" N	86° 44' 25.856" E
26	23° 25' 19.597" N	86° 44' 24.399" E
27	23° 25' 20.487" N	86° 44' 21.395" E
28	23° 25' 22.557" N	86° 44' 14.230" E
29	23° 25' 22.995" N	86° 44' 3.820" E
30	23° 25' 23.940" N	86° 43' 59.975" E
31	23° 25' 24.750" N	86° 43' 58.818" E
32	23° 25' 25.850" N	86° 43' 57.702" E
33	23° 25' 28.189" N	86° 43' 56.877" E
34	23° 25' 37.997" N	86° 43' 56.895" E
35	23° 25' 44.254" N	86° 43' 56.089" E
36	23° 25' 46.938" N	86° 43' 56.099" E
37	23° 25' 49.301" N	86° 43' 56.107" E
38	23° 25' 51.846" N	86° 43' 54.797" E
39	23° 25' 53.924" N	86° 43' 52.387" E
40	23° 25' 54.745" N	86° 43' 49.237" E
41	23° 25' 54.630" N	86° 43' 48.270" E
42	23° 25' 58.263" N	86° 43' 47.642" E
43	23° 25' 58.857" N	86° 43' 49.455" E
44	23° 25' 59.344" N	86° 43' 52.631" E
45	23° 25' 58.357" N	86° 43' 55.065" E
46	23° 25' 56.887" N	86° 43' 56.620" E

POTENTIAL BLOCK PUR_KS_DW_10 OF DWARAKESWAR RIVER

86°44'20"E 86°44'30"E 86°44'40"E

23°24'50"N

23°24'40"N

N W E S

DWARAKESWAR RIVER

KASHIPUR

PUR_KS_DW_10		
POINT NO.	LATITUDE	LONGITUDE
1	23° 24' 37.898" N	86° 44' 35.776" E
2	23° 24' 40.396" N	86° 44' 33.483" E
3	23° 24' 41.905" N	86° 44' 30.644" E
4	23° 24' 50.335" N	86° 44' 19.291" E
5	23° 24' 50.385" N	86° 44' 18.452" E
6	23° 24' 50.831" N	86° 44' 17.519" E
7	23° 24' 52.354" N	86° 44' 16.069" E
8	23° 24' 54.471" N	86° 44' 16.876" E
9	23° 24' 52.003" N	86° 44' 19.040" E
10	23° 24' 40.426" N	86° 44' 34.937" E
11	23° 24' 38.646" N	86° 44' 36.739" E

LEGEND

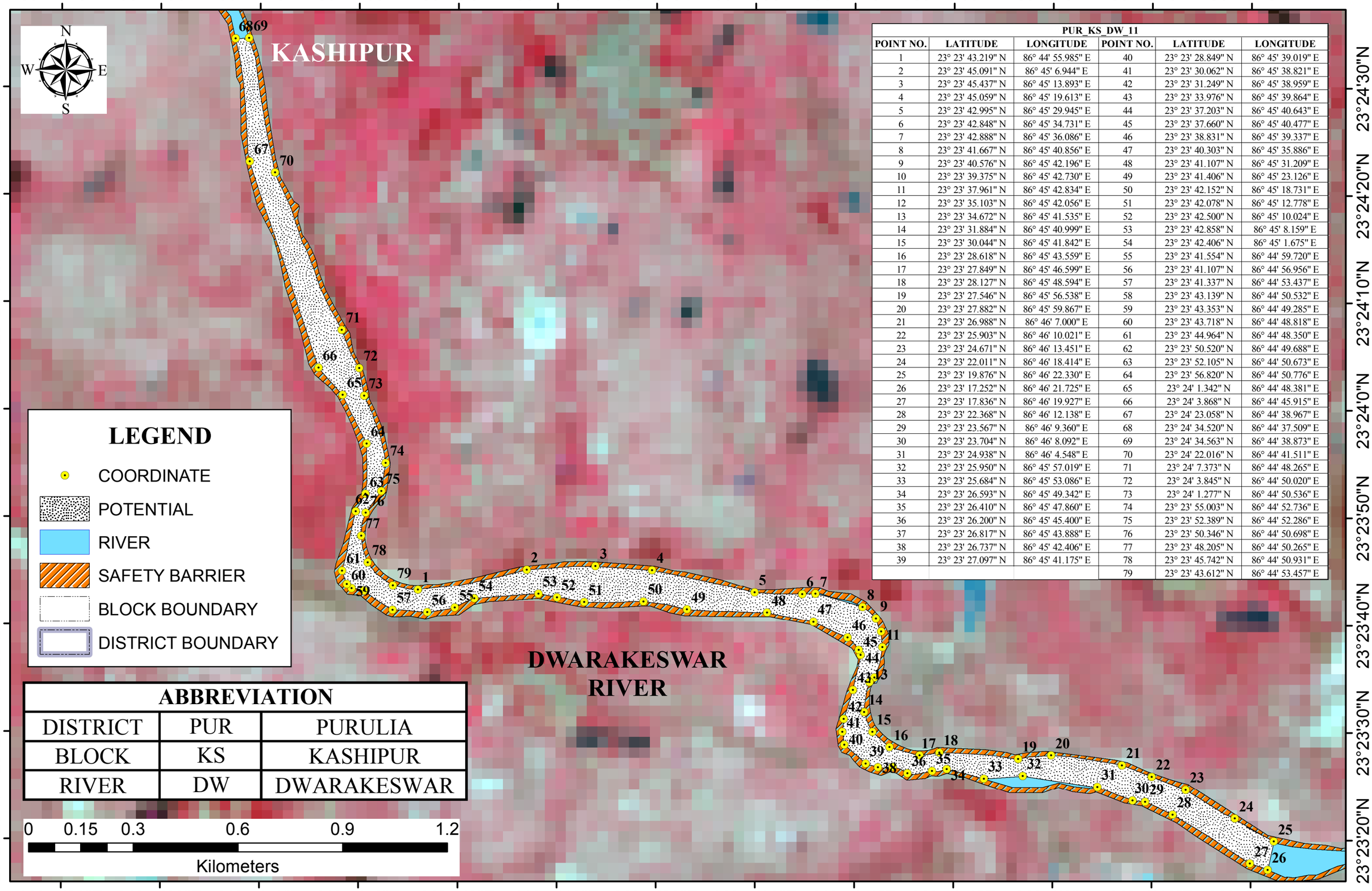
- COORDINATE
- POTENTIAL
- RIVER
- SAFETY BARRIER
- BLOCK BOUNDARY
- DISTRICT BOUNDARY

ABBREVIATION		
DISTRICT	PUR	PURULIA
BLOCK	KS	KASHIPUR
RIVER	DW	DWARAKESWAR

0 0.0425 0.085 0.17 0.255 0.34

Kilometers

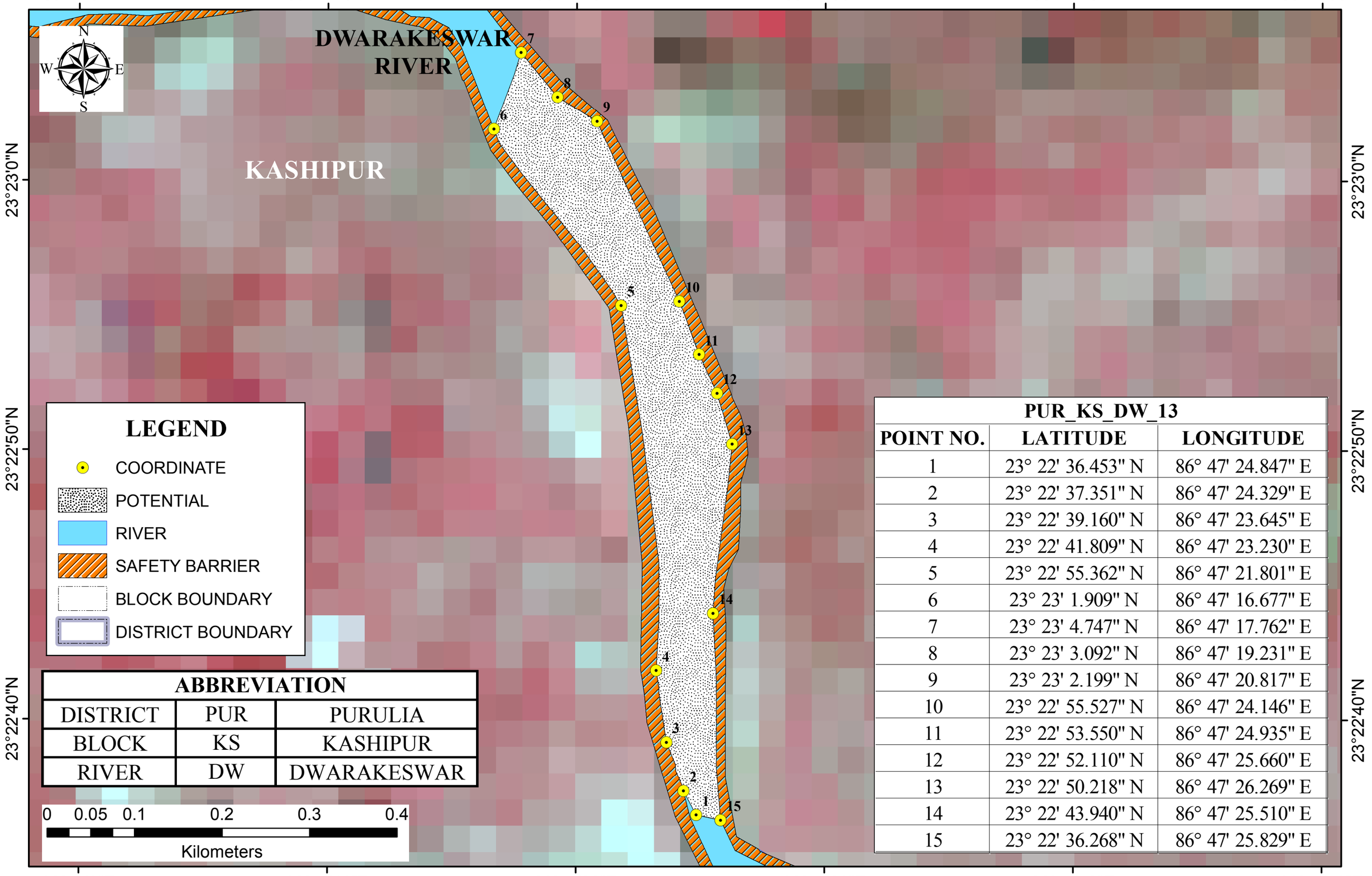
POTENTIAL BLOCK PUR_KS_DW_11 OF DWARAKESWAR RIVER



PUR_KS_DW_11					
POINT NO.	LATITUDE	LONGITUDE	POINT NO.	LATITUDE	LONGITUDE
1	23° 23' 43.219" N	86° 44' 55.985" E	40	23° 23' 28.849" N	86° 45' 39.019" E
2	23° 23' 45.091" N	86° 45' 6.944" E	41	23° 23' 30.062" N	86° 45' 38.821" E
3	23° 23' 45.437" N	86° 45' 13.893" E	42	23° 23' 31.249" N	86° 45' 38.959" E
4	23° 23' 45.059" N	86° 45' 19.613" E	43	23° 23' 33.976" N	86° 45' 39.864" E
5	23° 23' 42.995" N	86° 45' 29.945" E	44	23° 23' 37.203" N	86° 45' 40.643" E
6	23° 23' 42.848" N	86° 45' 34.731" E	45	23° 23' 37.660" N	86° 45' 40.477" E
7	23° 23' 42.888" N	86° 45' 36.086" E	46	23° 23' 38.831" N	86° 45' 39.337" E
8	23° 23' 41.667" N	86° 45' 40.856" E	47	23° 23' 40.303" N	86° 45' 35.886" E
9	23° 23' 40.576" N	86° 45' 42.196" E	48	23° 23' 41.107" N	86° 45' 31.209" E
10	23° 23' 39.375" N	86° 45' 42.730" E	49	23° 23' 41.406" N	86° 45' 23.126" E
11	23° 23' 37.961" N	86° 45' 42.834" E	50	23° 23' 42.152" N	86° 45' 18.731" E
12	23° 23' 35.103" N	86° 45' 42.056" E	51	23° 23' 42.078" N	86° 45' 12.778" E
13	23° 23' 34.672" N	86° 45' 41.535" E	52	23° 23' 42.500" N	86° 45' 10.024" E
14	23° 23' 31.884" N	86° 45' 40.999" E	53	23° 23' 42.858" N	86° 45' 8.159" E
15	23° 23' 30.044" N	86° 45' 41.842" E	54	23° 23' 42.406" N	86° 45' 1.675" E
16	23° 23' 28.618" N	86° 45' 43.559" E	55	23° 23' 41.554" N	86° 44' 59.720" E
17	23° 23' 27.849" N	86° 45' 46.599" E	56	23° 23' 41.107" N	86° 44' 56.956" E
18	23° 23' 28.127" N	86° 45' 48.594" E	57	23° 23' 41.337" N	86° 44' 53.437" E
19	23° 23' 27.546" N	86° 45' 56.538" E	58	23° 23' 43.139" N	86° 44' 50.532" E
20	23° 23' 27.882" N	86° 45' 59.867" E	59	23° 23' 43.353" N	86° 44' 49.285" E
21	23° 23' 26.988" N	86° 46' 7.000" E	60	23° 23' 43.718" N	86° 44' 48.818" E
22	23° 23' 25.903" N	86° 46' 10.021" E	61	23° 23' 44.964" N	86° 44' 48.350" E
23	23° 23' 24.671" N	86° 46' 13.451" E	62	23° 23' 50.520" N	86° 44' 49.688" E
24	23° 23' 22.011" N	86° 46' 18.414" E	63	23° 23' 52.105" N	86° 44' 50.673" E
25	23° 23' 19.876" N	86° 46' 22.330" E	64	23° 23' 56.820" N	86° 44' 50.776" E
26	23° 23' 17.252" N	86° 46' 21.725" E	65	23° 24' 1.342" N	86° 44' 48.381" E
27	23° 23' 17.836" N	86° 46' 19.927" E	66	23° 24' 3.868" N	86° 44' 45.915" E
28	23° 23' 22.368" N	86° 46' 12.138" E	67	23° 24' 23.058" N	86° 44' 38.967" E
29	23° 23' 23.567" N	86° 46' 9.360" E	68	23° 24' 34.520" N	86° 44' 37.509" E
30	23° 23' 23.704" N	86° 46' 8.092" E	69	23° 24' 34.563" N	86° 44' 38.873" E
31	23° 23' 24.938" N	86° 46' 4.548" E	70	23° 24' 22.016" N	86° 44' 41.511" E
32	23° 23' 25.950" N	86° 45' 57.019" E	71	23° 24' 7.373" N	86° 44' 48.265" E
33	23° 23' 25.684" N	86° 45' 53.086" E	72	23° 24' 3.845" N	86° 44' 50.020" E
34	23° 23' 26.593" N	86° 45' 49.342" E	73	23° 24' 1.277" N	86° 44' 50.536" E
35	23° 23' 26.410" N	86° 45' 47.860" E	74	23° 23' 55.003" N	86° 44' 52.736" E
36	23° 23' 26.200" N	86° 45' 45.400" E	75	23° 23' 52.389" N	86° 44' 52.286" E
37	23° 23' 26.817" N	86° 45' 43.888" E	76	23° 23' 50.346" N	86° 44' 50.698" E
38	23° 23' 26.737" N	86° 45' 42.406" E	77	23° 23' 48.205" N	86° 44' 50.265" E
39	23° 23' 27.097" N	86° 45' 41.175" E	78	23° 23' 45.742" N	86° 44' 50.931" E
			79	23° 23' 43.612" N	86° 44' 53.457" E

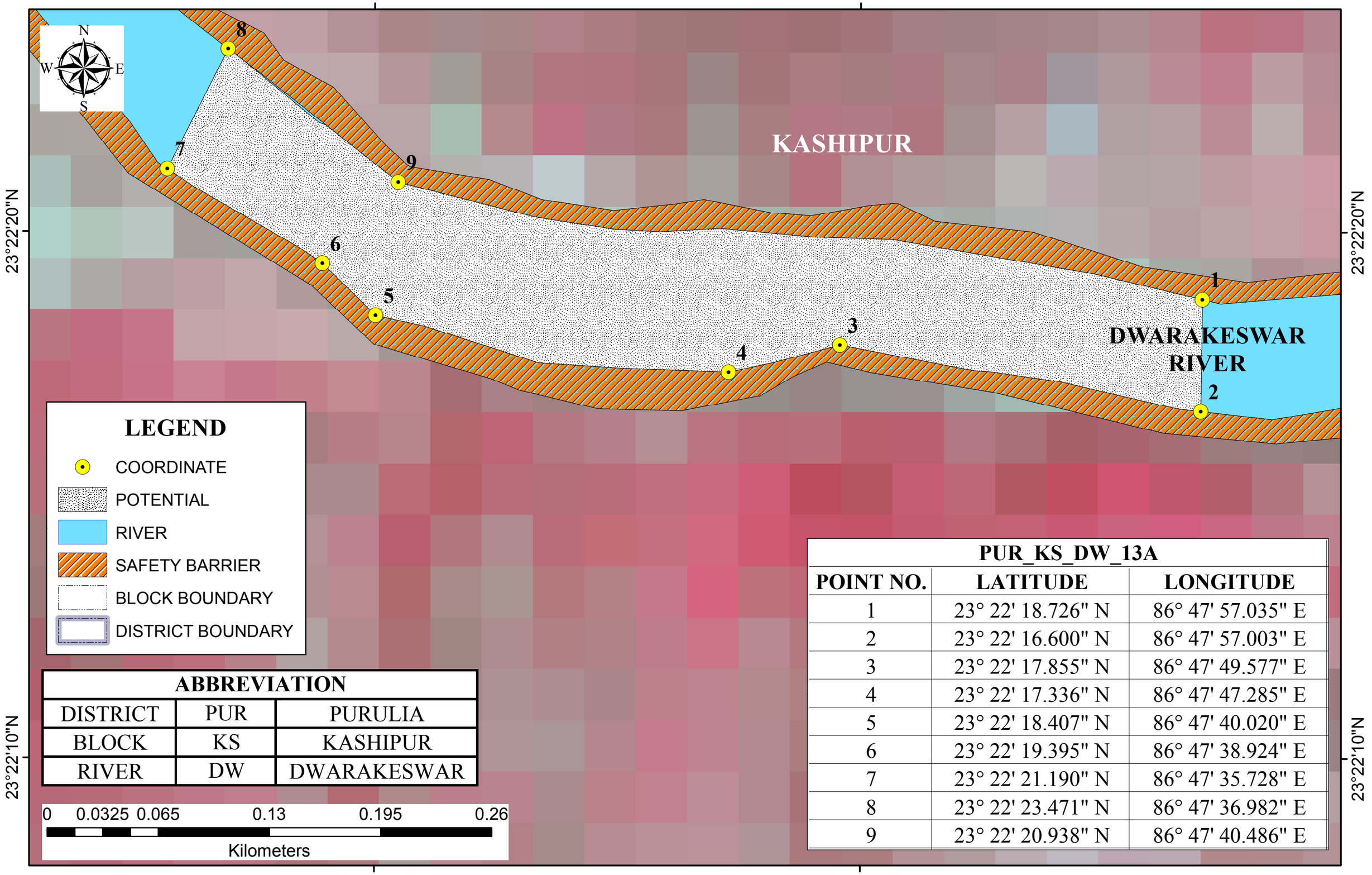
ABBREVIATION		
DISTRICT	PUR	PURULIA
BLOCK	KS	KASHIPUR
RIVER	DW	DWARAKESWAR

POTENTIAL BLOCK PUR_KS_DW_13 OF DWARAKESWAR RIVER



PUR_KS_DW_13		
POINT NO.	LATITUDE	LONGITUDE
1	23° 22' 36.453" N	86° 47' 24.847" E
2	23° 22' 37.351" N	86° 47' 24.329" E
3	23° 22' 39.160" N	86° 47' 23.645" E
4	23° 22' 41.809" N	86° 47' 23.230" E
5	23° 22' 55.362" N	86° 47' 21.801" E
6	23° 23' 1.909" N	86° 47' 16.677" E
7	23° 23' 4.747" N	86° 47' 17.762" E
8	23° 23' 3.092" N	86° 47' 19.231" E
9	23° 23' 2.199" N	86° 47' 20.817" E
10	23° 22' 55.527" N	86° 47' 24.146" E
11	23° 22' 53.550" N	86° 47' 24.935" E
12	23° 22' 52.110" N	86° 47' 25.660" E
13	23° 22' 50.218" N	86° 47' 26.269" E
14	23° 22' 43.940" N	86° 47' 25.510" E
15	23° 22' 36.268" N	86° 47' 25.829" E

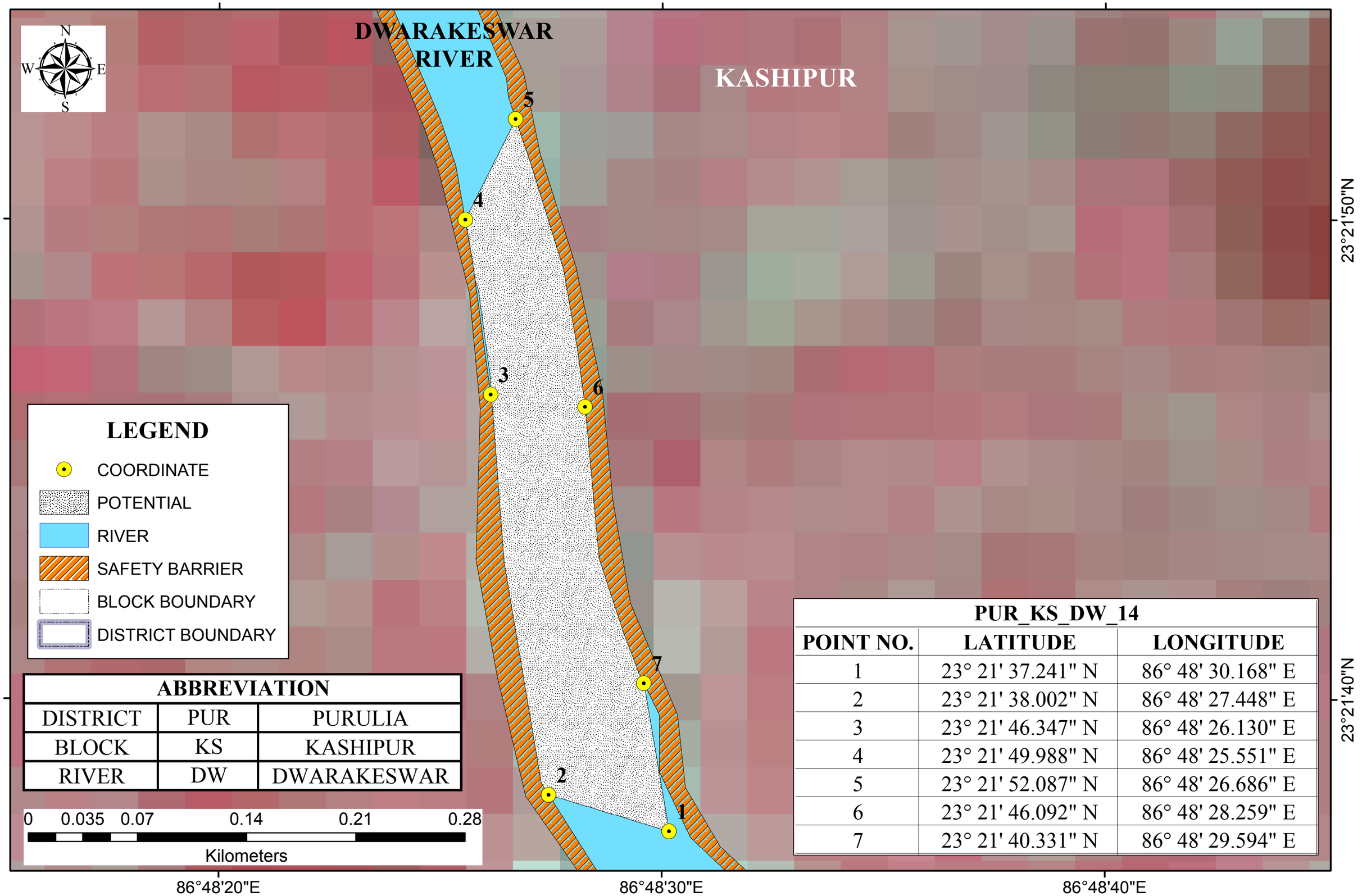
POTENTIAL BLOCK PUR_KS_DW_13A OF DWARAKESWAR RIVER



ABBREVIATION		
DISTRICT	PUR	PURULIA
BLOCK	KS	KASHIPUR
RIVER	DW	DWARAKESWAR

PUR_KS_DW_13A		
POINT NO.	LATITUDE	LONGITUDE
1	23° 22' 18.726" N	86° 47' 57.035" E
2	23° 22' 16.600" N	86° 47' 57.003" E
3	23° 22' 17.855" N	86° 47' 49.577" E
4	23° 22' 17.336" N	86° 47' 47.285" E
5	23° 22' 18.407" N	86° 47' 40.020" E
6	23° 22' 19.395" N	86° 47' 38.924" E
7	23° 22' 21.190" N	86° 47' 35.728" E
8	23° 22' 23.471" N	86° 47' 36.982" E
9	23° 22' 20.938" N	86° 47' 40.486" E

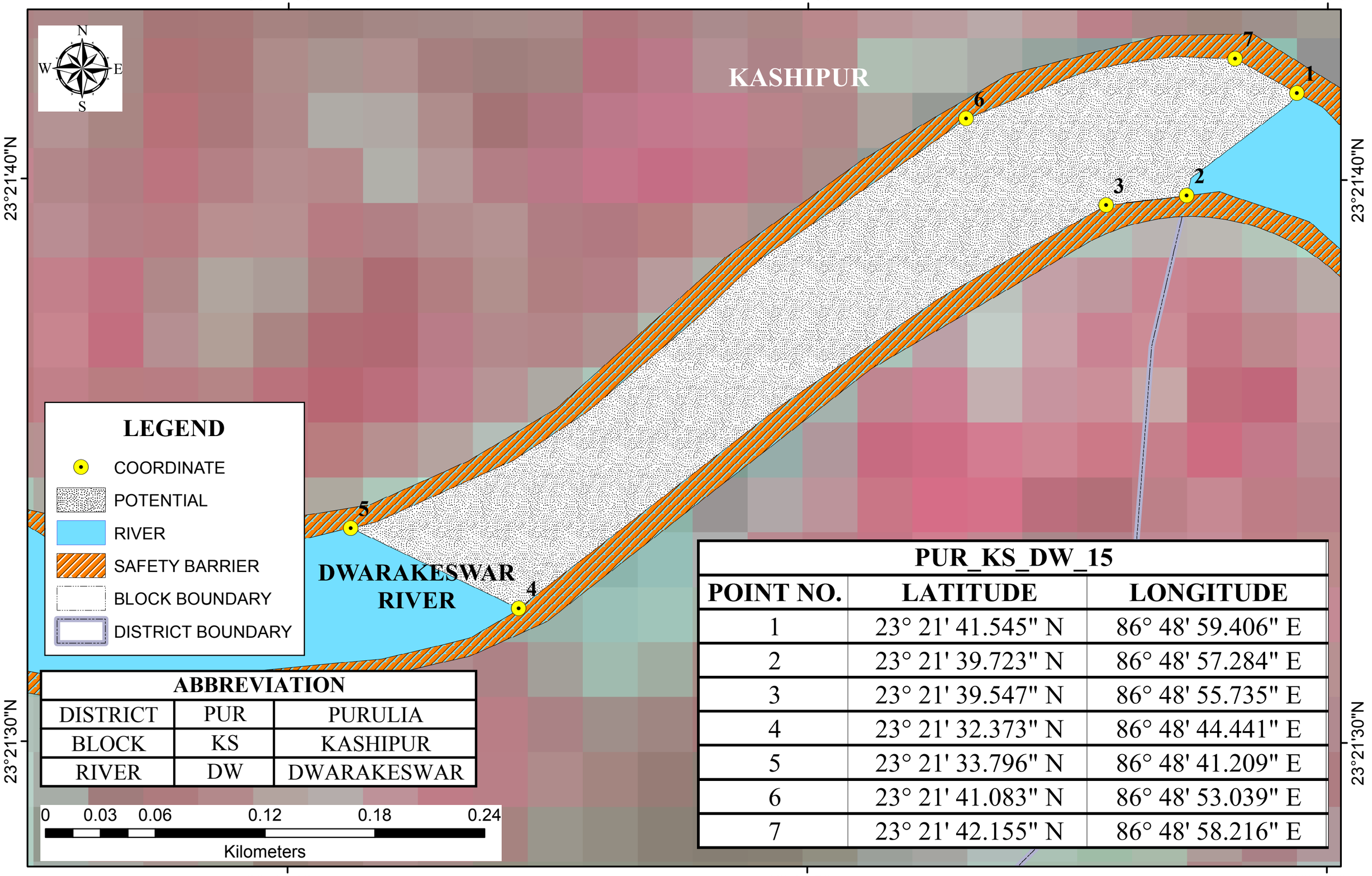
POTENTIAL BLOCK PUR_KS_DW_14 OF DWARAKESWAR RIVER



ABBREVIATION		
DISTRICT	PUR	PURULIA
BLOCK	KS	KASHIPUR
RIVER	DW	DWARAKESWAR

PUR_KS_DW_14		
POINT NO.	LATITUDE	LONGITUDE
1	23° 21' 37.241" N	86° 48' 30.168" E
2	23° 21' 38.002" N	86° 48' 27.448" E
3	23° 21' 46.347" N	86° 48' 26.130" E
4	23° 21' 49.988" N	86° 48' 25.551" E
5	23° 21' 52.087" N	86° 48' 26.686" E
6	23° 21' 46.092" N	86° 48' 28.259" E
7	23° 21' 40.331" N	86° 48' 29.594" E

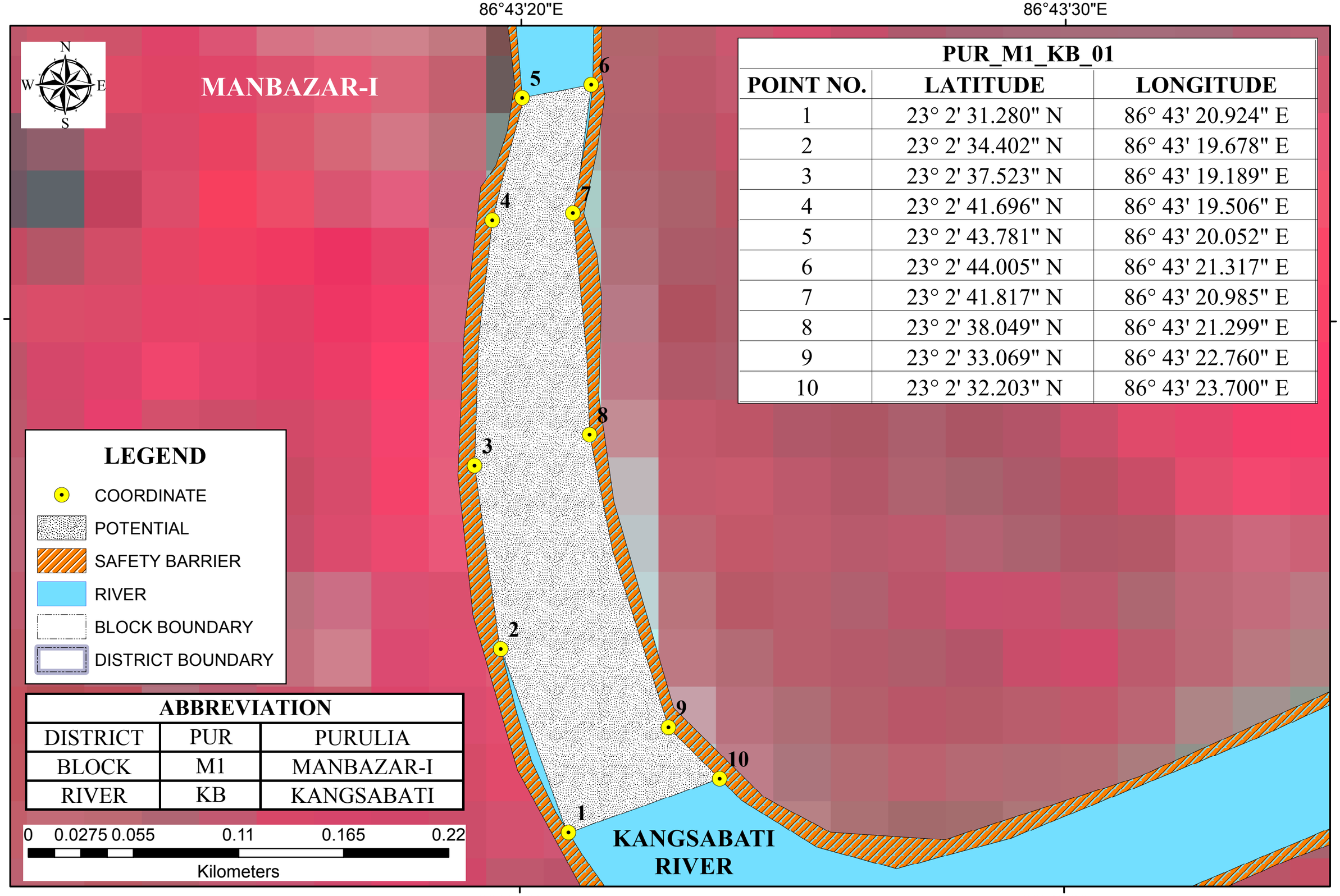
POTENTIAL BLOCK PUR_KS_DW_15 OF DWARAKESWAR RIVER



ABBREVIATION		
DISTRICT	PUR	PURULIA
BLOCK	KS	KASHIPUR
RIVER	DW	DWARAKESWAR

PUR_KS_DW_15		
POINT NO.	LATITUDE	LONGITUDE
1	23° 21' 41.545" N	86° 48' 59.406" E
2	23° 21' 39.723" N	86° 48' 57.284" E
3	23° 21' 39.547" N	86° 48' 55.735" E
4	23° 21' 32.373" N	86° 48' 44.441" E
5	23° 21' 33.796" N	86° 48' 41.209" E
6	23° 21' 41.083" N	86° 48' 53.039" E
7	23° 21' 42.155" N	86° 48' 58.216" E

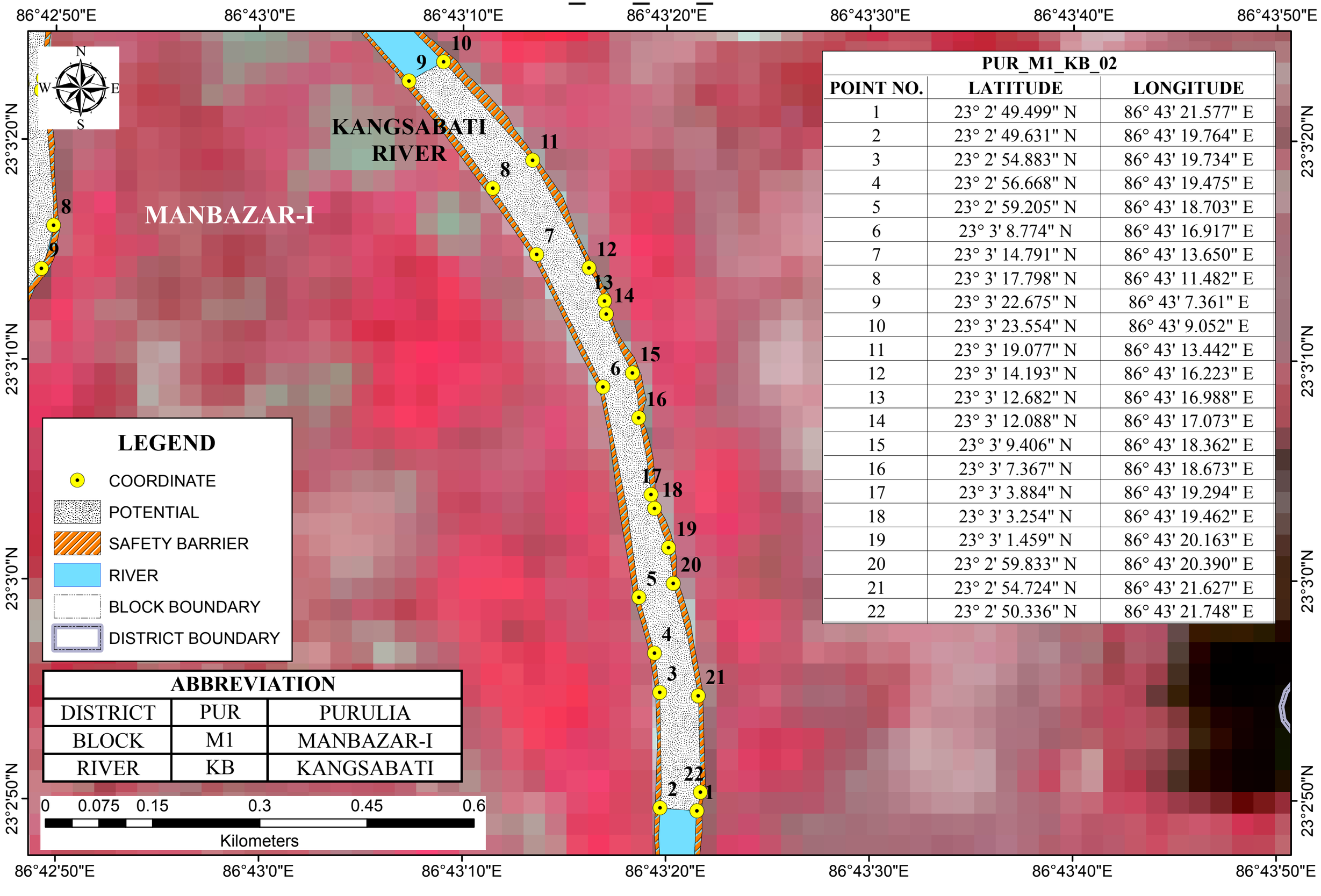
POTENTIAL BLOCK PUR_M1_KB_01 OF KANGSABATI RIVER



PUR_M1_KB_01		
POINT NO.	LATITUDE	LONGITUDE
1	23° 2' 31.280" N	86° 43' 20.924" E
2	23° 2' 34.402" N	86° 43' 19.678" E
3	23° 2' 37.523" N	86° 43' 19.189" E
4	23° 2' 41.696" N	86° 43' 19.506" E
5	23° 2' 43.781" N	86° 43' 20.052" E
6	23° 2' 44.005" N	86° 43' 21.317" E
7	23° 2' 41.817" N	86° 43' 20.985" E
8	23° 2' 38.049" N	86° 43' 21.299" E
9	23° 2' 33.069" N	86° 43' 22.760" E
10	23° 2' 32.203" N	86° 43' 23.700" E

ABBREVIATION		
DISTRICT	PUR	PURULIA
BLOCK	M1	MANBAZAR-I
RIVER	KB	KANGSABATI

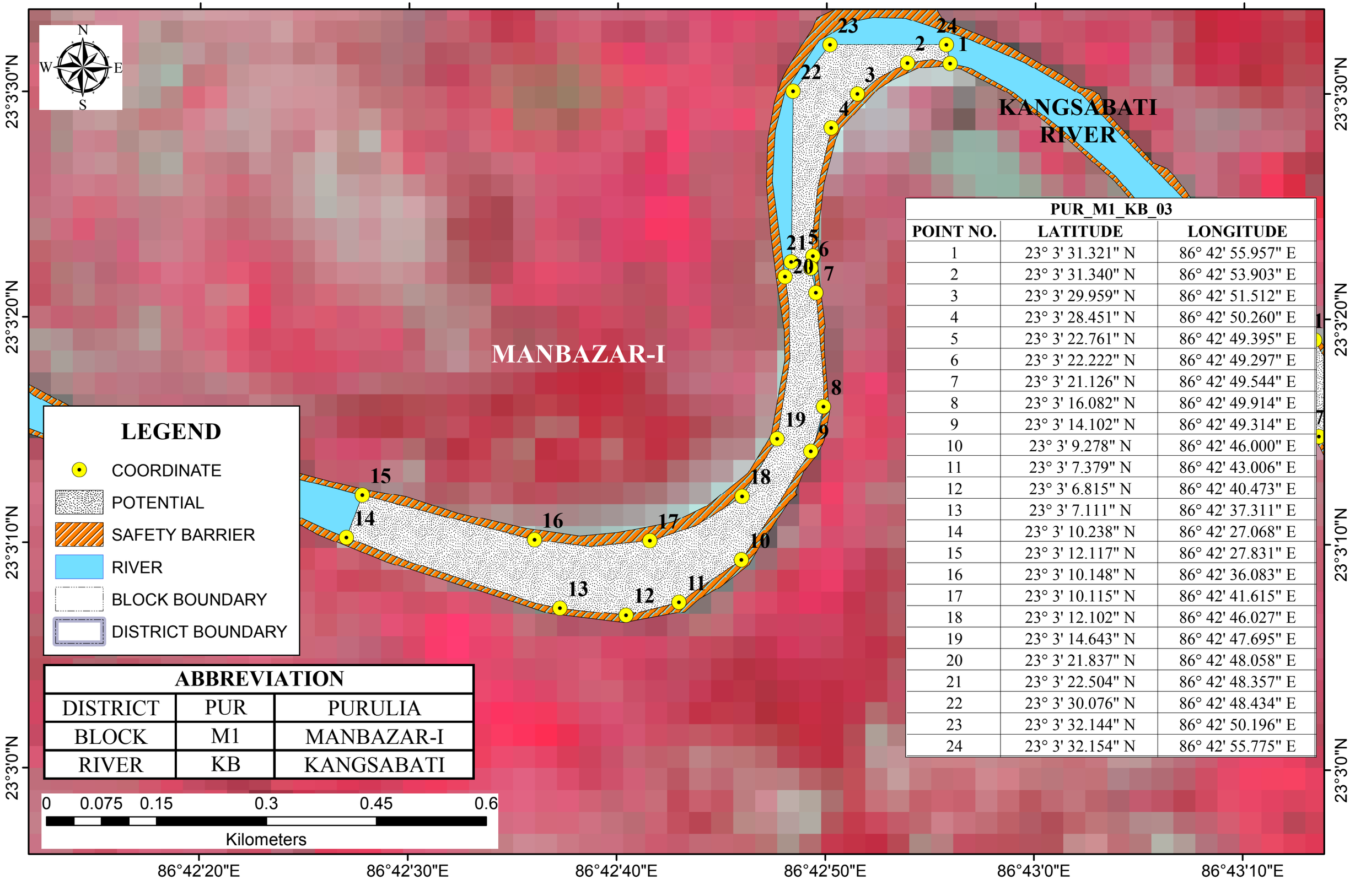
POTENTIAL BLOCK PUR_M1_KB_02 OF KANGSABATI RIVER



PUR_M1_KB_02		
POINT NO.	LATITUDE	LONGITUDE
1	23° 2' 49.499" N	86° 43' 21.577" E
2	23° 2' 49.631" N	86° 43' 19.764" E
3	23° 2' 54.883" N	86° 43' 19.734" E
4	23° 2' 56.668" N	86° 43' 19.475" E
5	23° 2' 59.205" N	86° 43' 18.703" E
6	23° 3' 8.774" N	86° 43' 16.917" E
7	23° 3' 14.791" N	86° 43' 13.650" E
8	23° 3' 17.798" N	86° 43' 11.482" E
9	23° 3' 22.675" N	86° 43' 7.361" E
10	23° 3' 23.554" N	86° 43' 9.052" E
11	23° 3' 19.077" N	86° 43' 13.442" E
12	23° 3' 14.193" N	86° 43' 16.223" E
13	23° 3' 12.682" N	86° 43' 16.988" E
14	23° 3' 12.088" N	86° 43' 17.073" E
15	23° 3' 9.406" N	86° 43' 18.362" E
16	23° 3' 7.367" N	86° 43' 18.673" E
17	23° 3' 3.884" N	86° 43' 19.294" E
18	23° 3' 3.254" N	86° 43' 19.462" E
19	23° 3' 1.459" N	86° 43' 20.163" E
20	23° 2' 59.833" N	86° 43' 20.390" E
21	23° 2' 54.724" N	86° 43' 21.627" E
22	23° 2' 50.336" N	86° 43' 21.748" E

ABBREVIATION		
DISTRICT	PUR	PURULIA
BLOCK	M1	MANBAZAR-I
RIVER	KB	KANGSABATI

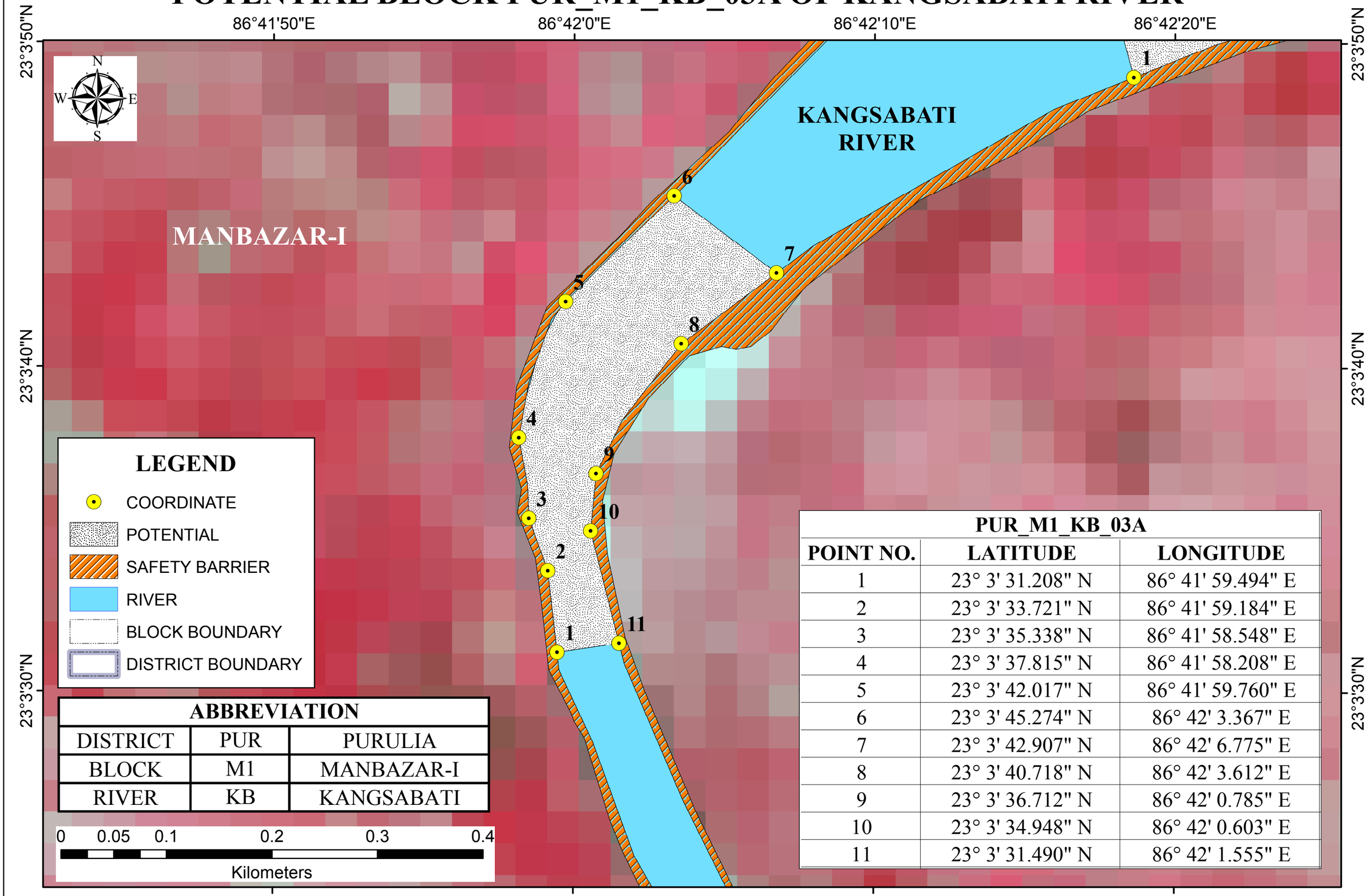
POTENTIAL BLOCK PUR_M1_KB_03 OF KANGSABATI RIVER



PUR_M1_KB_03		
POINT NO.	LATITUDE	LONGITUDE
1	23° 3' 31.321" N	86° 42' 55.957" E
2	23° 3' 31.340" N	86° 42' 53.903" E
3	23° 3' 29.959" N	86° 42' 51.512" E
4	23° 3' 28.451" N	86° 42' 50.260" E
5	23° 3' 22.761" N	86° 42' 49.395" E
6	23° 3' 22.222" N	86° 42' 49.297" E
7	23° 3' 21.126" N	86° 42' 49.544" E
8	23° 3' 16.082" N	86° 42' 49.914" E
9	23° 3' 14.102" N	86° 42' 49.314" E
10	23° 3' 9.278" N	86° 42' 46.000" E
11	23° 3' 7.379" N	86° 42' 43.006" E
12	23° 3' 6.815" N	86° 42' 40.473" E
13	23° 3' 7.111" N	86° 42' 37.311" E
14	23° 3' 10.238" N	86° 42' 27.068" E
15	23° 3' 12.117" N	86° 42' 27.831" E
16	23° 3' 10.148" N	86° 42' 36.083" E
17	23° 3' 10.115" N	86° 42' 41.615" E
18	23° 3' 12.102" N	86° 42' 46.027" E
19	23° 3' 14.643" N	86° 42' 47.695" E
20	23° 3' 21.837" N	86° 42' 48.058" E
21	23° 3' 22.504" N	86° 42' 48.357" E
22	23° 3' 30.076" N	86° 42' 48.434" E
23	23° 3' 32.144" N	86° 42' 50.196" E
24	23° 3' 32.154" N	86° 42' 55.775" E

ABBREVIATION		
DISTRICT	PUR	PURULIA
BLOCK	M1	MANBAZAR-I
RIVER	KB	KANGSABATI

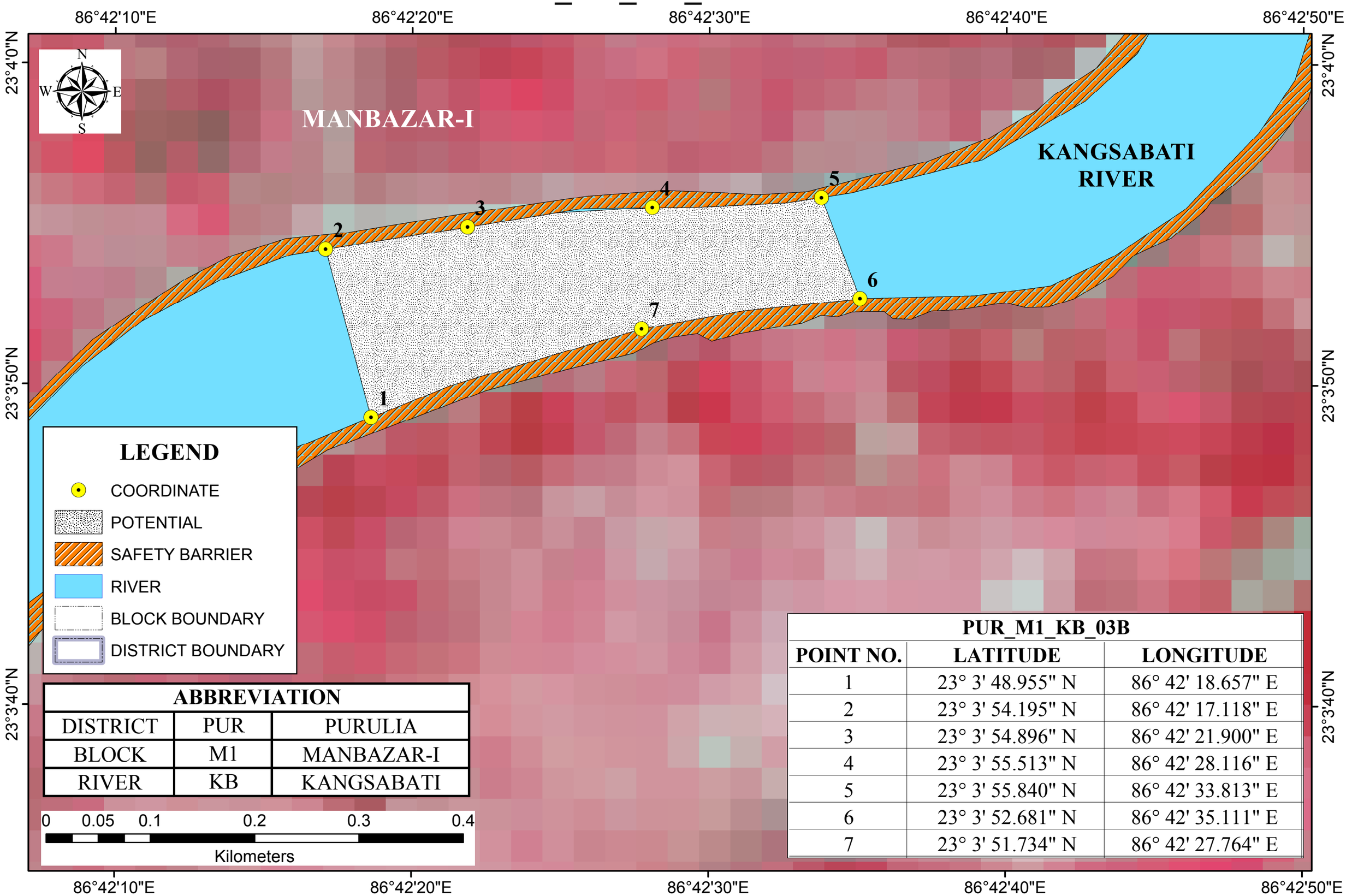
POTENTIAL BLOCK PUR_M1_KB_03A OF KANGSABATI RIVER



ABBREVIATION		
DISTRICT	PUR	PURULIA
BLOCK	M1	MANBAZAR-I
RIVER	KB	KANGSABATI

PUR_M1_KB_03A		
POINT NO.	LATITUDE	LONGITUDE
1	23° 3' 31.208" N	86° 41' 59.494" E
2	23° 3' 33.721" N	86° 41' 59.184" E
3	23° 3' 35.338" N	86° 41' 58.548" E
4	23° 3' 37.815" N	86° 41' 58.208" E
5	23° 3' 42.017" N	86° 41' 59.760" E
6	23° 3' 45.274" N	86° 42' 3.367" E
7	23° 3' 42.907" N	86° 42' 6.775" E
8	23° 3' 40.718" N	86° 42' 3.612" E
9	23° 3' 36.712" N	86° 42' 0.785" E
10	23° 3' 34.948" N	86° 42' 0.603" E
11	23° 3' 31.490" N	86° 42' 1.555" E

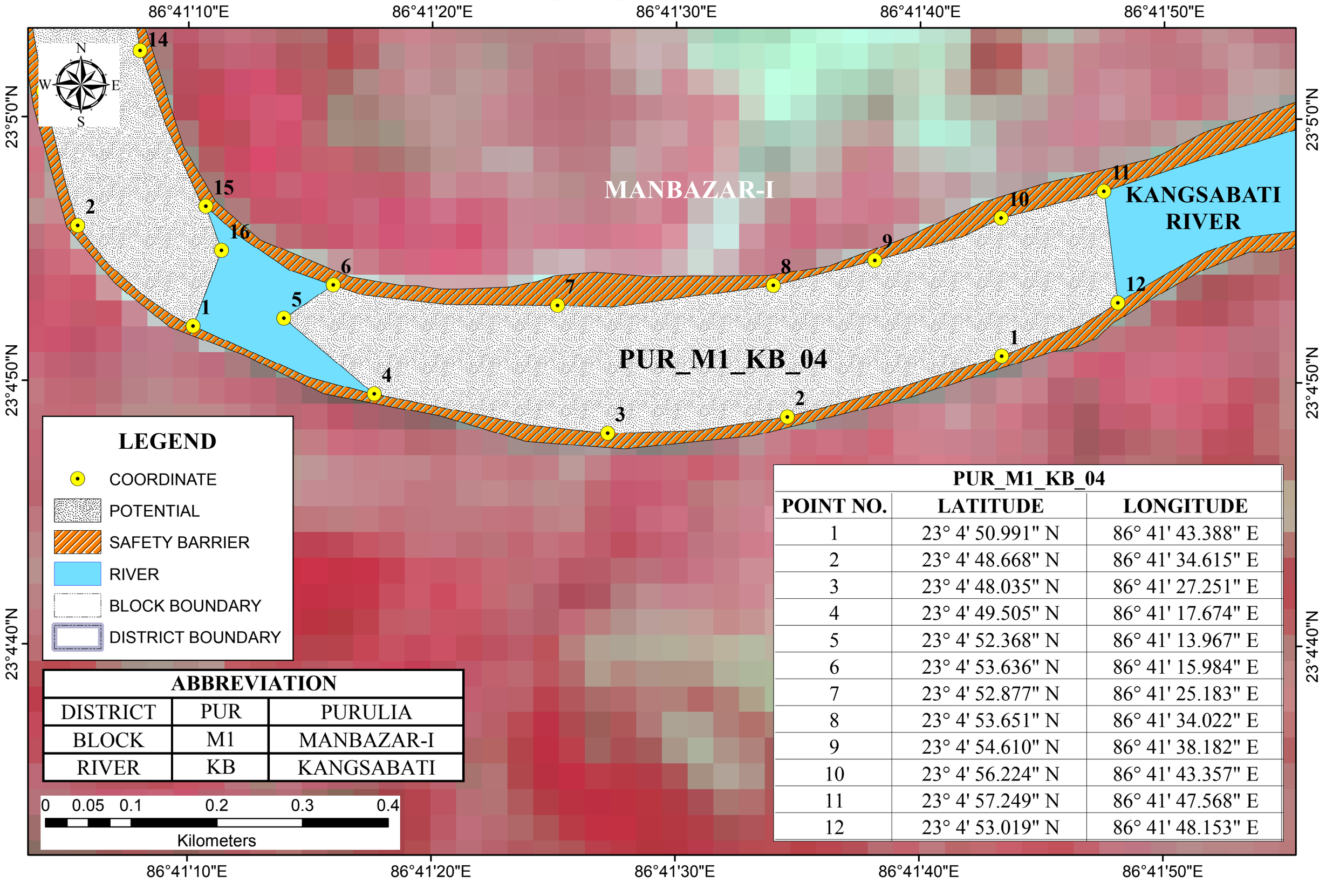
POTENTIAL BLOCK PUR_M1_KB_03B OF KANGSABATI RIVER



ABBREVIATION		
DISTRICT	PUR	PURULIA
BLOCK	M1	MANBAZAR-I
RIVER	KB	KANGSABATI

PUR_M1_KB_03B		
POINT NO.	LATITUDE	LONGITUDE
1	23° 3' 48.955" N	86° 42' 18.657" E
2	23° 3' 54.195" N	86° 42' 17.118" E
3	23° 3' 54.896" N	86° 42' 21.900" E
4	23° 3' 55.513" N	86° 42' 28.116" E
5	23° 3' 55.840" N	86° 42' 33.813" E
6	23° 3' 52.681" N	86° 42' 35.111" E
7	23° 3' 51.734" N	86° 42' 27.764" E

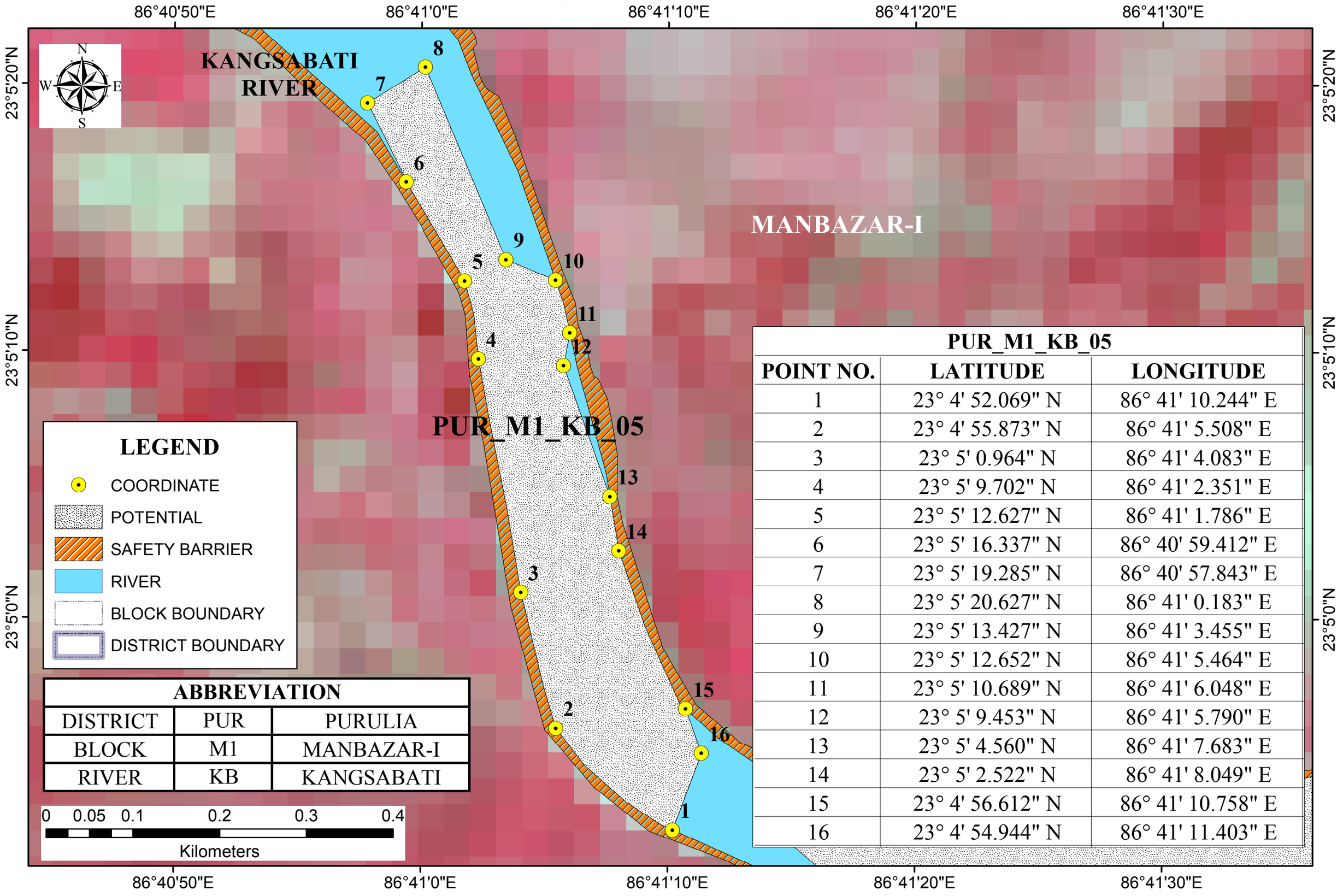
POTENTIAL BLOCK PUR_M1_KB_04 OF KANGSABATI RIVER



ABBREVIATION		
DISTRICT	PUR	PURULIA
BLOCK	M1	MANBAZAR-I
RIVER	KB	KANGSABATI

PUR_M1_KB_04		
POINT NO.	LATITUDE	LONGITUDE
1	23° 4' 50.991" N	86° 41' 43.388" E
2	23° 4' 48.668" N	86° 41' 34.615" E
3	23° 4' 48.035" N	86° 41' 27.251" E
4	23° 4' 49.505" N	86° 41' 17.674" E
5	23° 4' 52.368" N	86° 41' 13.967" E
6	23° 4' 53.636" N	86° 41' 15.984" E
7	23° 4' 52.877" N	86° 41' 25.183" E
8	23° 4' 53.651" N	86° 41' 34.022" E
9	23° 4' 54.610" N	86° 41' 38.182" E
10	23° 4' 56.224" N	86° 41' 43.357" E
11	23° 4' 57.249" N	86° 41' 47.568" E
12	23° 4' 53.019" N	86° 41' 48.153" E

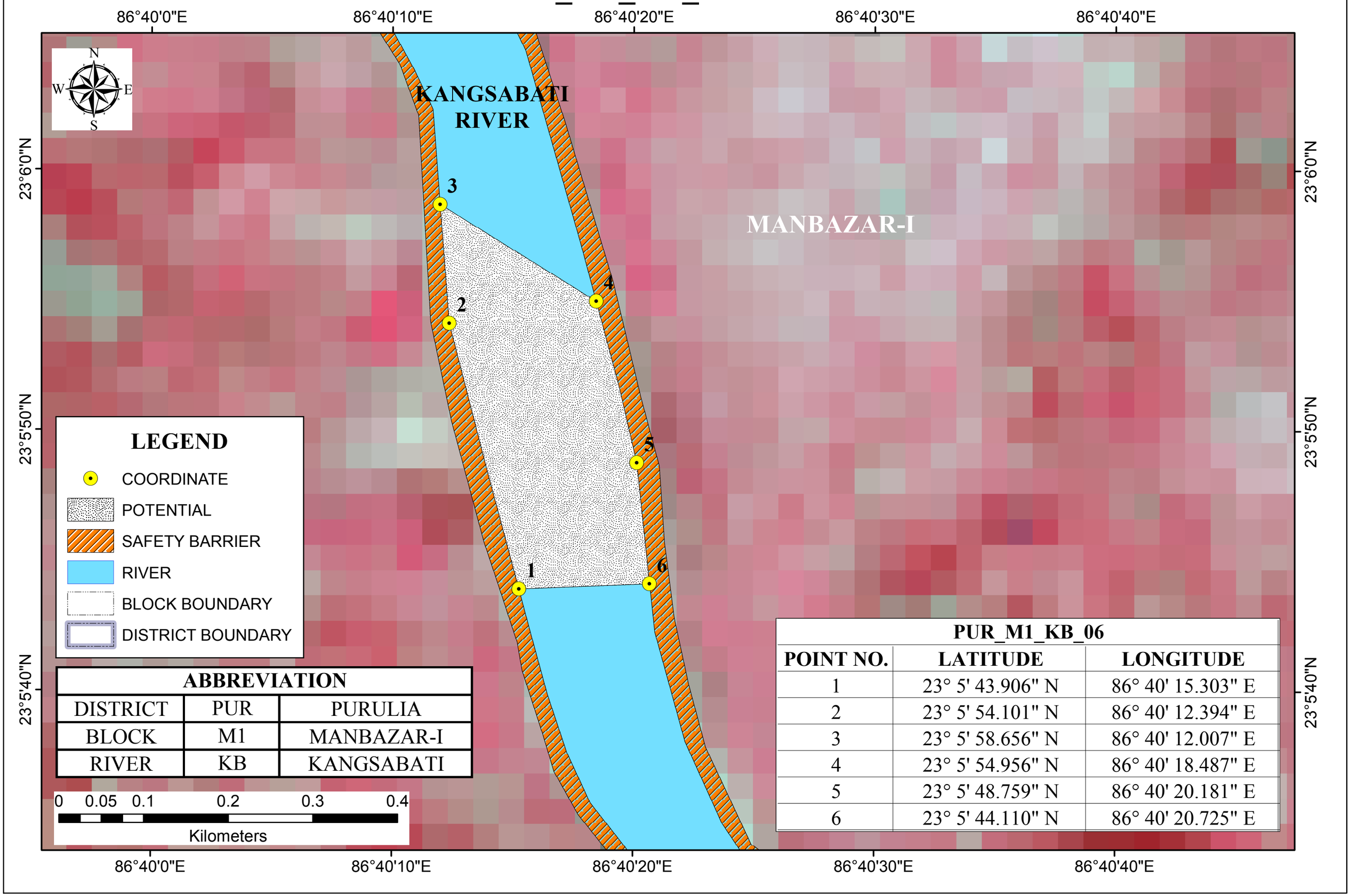
POTENTIAL BLOCK PUR_M1_KB_05 OF KANGSABATI RIVER



ABBREVIATION		
DISTRICT	PUR	PURULIA
BLOCK	M1	MANBAZAR-I
RIVER	KB	KANGSABATI

PUR_M1_KB_05		
POINT NO.	LATITUDE	LONGITUDE
1	23° 4' 52.069" N	86° 41' 10.244" E
2	23° 4' 55.873" N	86° 41' 5.508" E
3	23° 5' 0.964" N	86° 41' 4.083" E
4	23° 5' 9.702" N	86° 41' 2.351" E
5	23° 5' 12.627" N	86° 41' 1.786" E
6	23° 5' 16.337" N	86° 40' 59.412" E
7	23° 5' 19.285" N	86° 40' 57.843" E
8	23° 5' 20.627" N	86° 41' 0.183" E
9	23° 5' 13.427" N	86° 41' 3.455" E
10	23° 5' 12.652" N	86° 41' 5.464" E
11	23° 5' 10.689" N	86° 41' 6.048" E
12	23° 5' 9.453" N	86° 41' 5.790" E
13	23° 5' 4.560" N	86° 41' 7.683" E
14	23° 5' 2.522" N	86° 41' 8.049" E
15	23° 4' 56.612" N	86° 41' 10.758" E
16	23° 4' 54.944" N	86° 41' 11.403" E

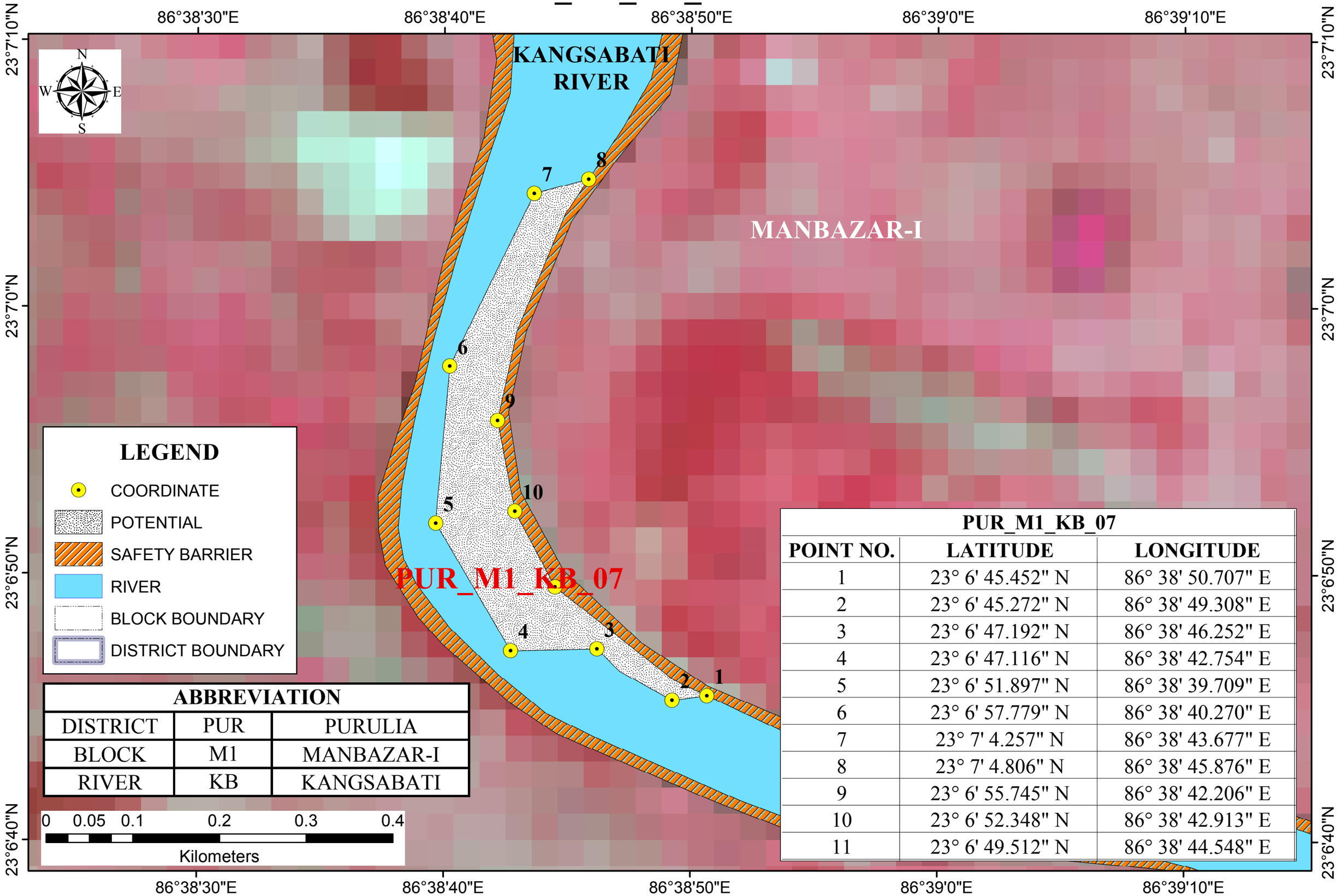
POTENTIAL BLOCK PUR_M1_KB_06 OF KANGSABATI RIVER



ABBREVIATION		
DISTRICT	PUR	PURULIA
BLOCK	M1	MANBAZAR-I
RIVER	KB	KANGSABATI

PUR_M1_KB_06		
POINT NO.	LATITUDE	LONGITUDE
1	23° 5' 43.906" N	86° 40' 15.303" E
2	23° 5' 54.101" N	86° 40' 12.394" E
3	23° 5' 58.656" N	86° 40' 12.007" E
4	23° 5' 54.956" N	86° 40' 18.487" E
5	23° 5' 48.759" N	86° 40' 20.181" E
6	23° 5' 44.110" N	86° 40' 20.725" E

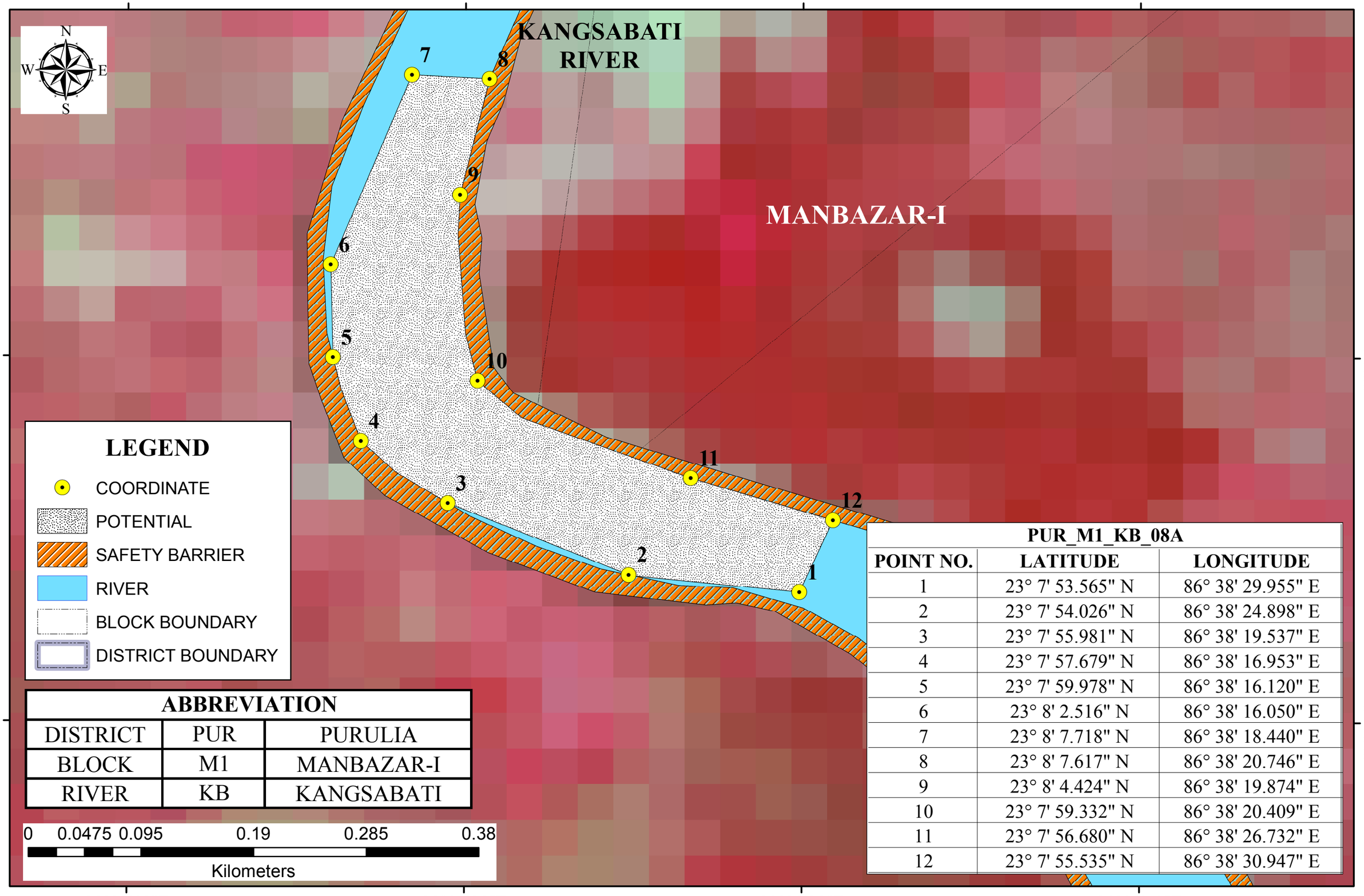
POTENTIAL BLOCK PUR_M1_KB_07 OF KANGSABATI RIVER



ABBREVIATION		
DISTRICT	PUR	PURULIA
BLOCK	M1	MANBAZAR-I
RIVER	KB	KANGSABATI

PUR_M1_KB_07		
POINT NO.	LATITUDE	LONGITUDE
1	23° 6' 45.452" N	86° 38' 50.707" E
2	23° 6' 45.272" N	86° 38' 49.308" E
3	23° 6' 47.192" N	86° 38' 46.252" E
4	23° 6' 47.116" N	86° 38' 42.754" E
5	23° 6' 51.897" N	86° 38' 39.709" E
6	23° 6' 57.779" N	86° 38' 40.270" E
7	23° 7' 4.257" N	86° 38' 43.677" E
8	23° 7' 4.806" N	86° 38' 45.876" E
9	23° 6' 55.745" N	86° 38' 42.206" E
10	23° 6' 52.348" N	86° 38' 42.913" E
11	23° 6' 49.512" N	86° 38' 44.548" E

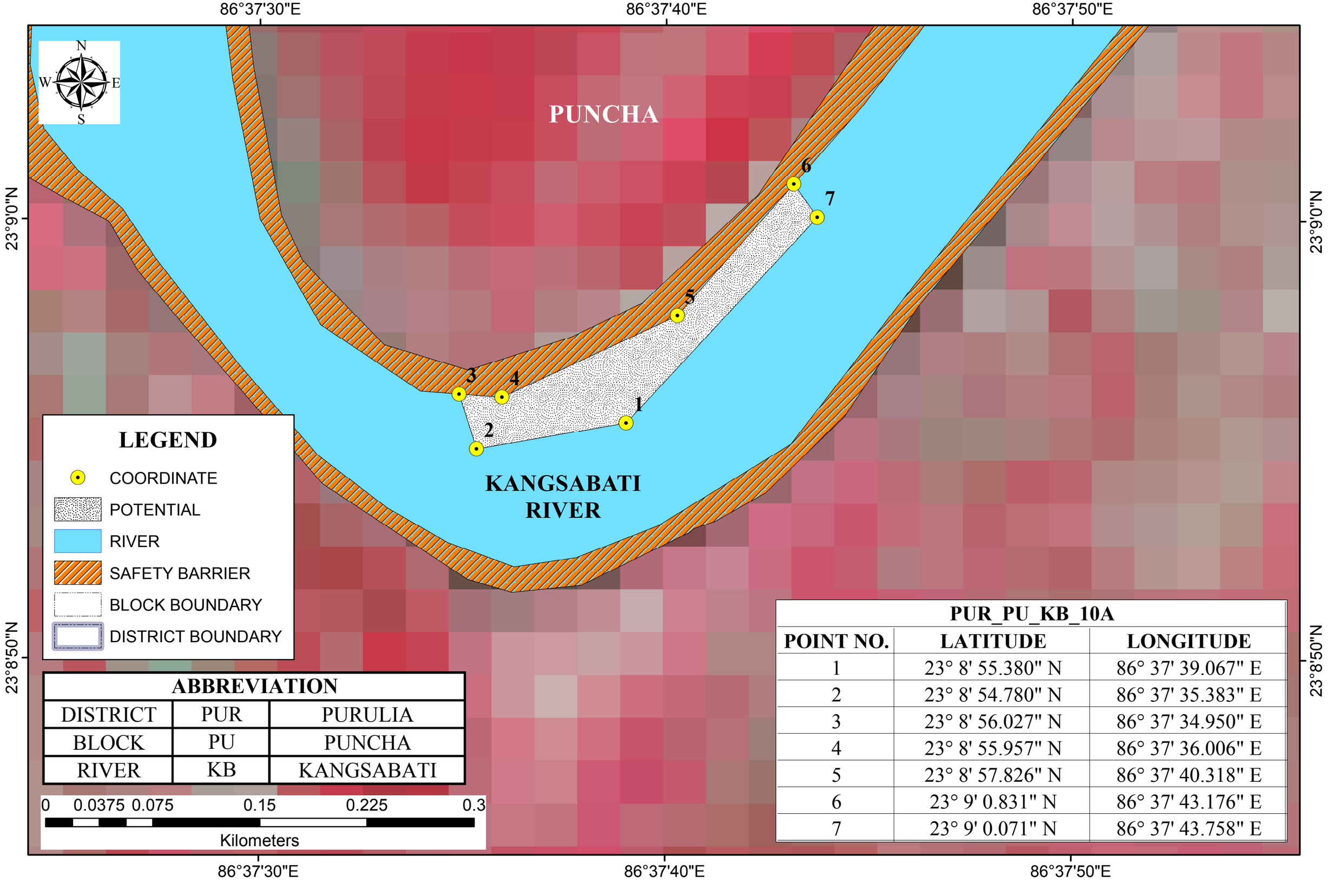
POTENTIAL BLOCK PUR_M1_KB_08A OF KANGSABATI RIVER



ABBREVIATION		
DISTRICT	PUR	PURULIA
BLOCK	M1	MANBAZAR-I
RIVER	KB	KANGSABATI

PUR_M1_KB_08A		
POINT NO.	LATITUDE	LONGITUDE
1	23° 7' 53.565" N	86° 38' 29.955" E
2	23° 7' 54.026" N	86° 38' 24.898" E
3	23° 7' 55.981" N	86° 38' 19.537" E
4	23° 7' 57.679" N	86° 38' 16.953" E
5	23° 7' 59.978" N	86° 38' 16.120" E
6	23° 8' 2.516" N	86° 38' 16.050" E
7	23° 8' 7.718" N	86° 38' 18.440" E
8	23° 8' 7.617" N	86° 38' 20.746" E
9	23° 8' 4.424" N	86° 38' 19.874" E
10	23° 7' 59.332" N	86° 38' 20.409" E
11	23° 7' 56.680" N	86° 38' 26.732" E
12	23° 7' 55.535" N	86° 38' 30.947" E

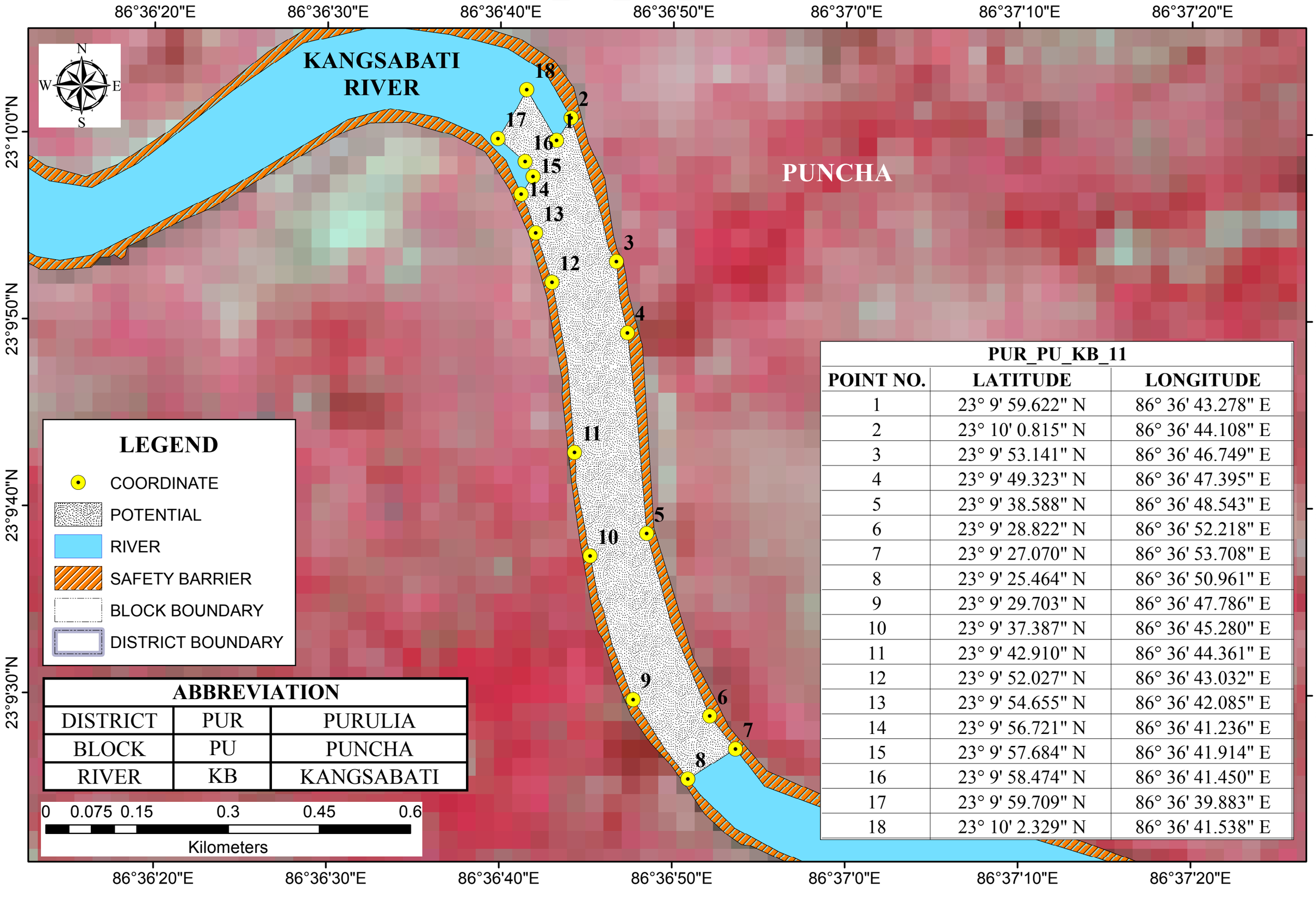
POTENTIAL BLOCK PUR_PU_KB_10A OF KANGSABATI RIVER



ABBREVIATION		
DISTRICT	PUR	PURULIA
BLOCK	PU	PUNCHA
RIVER	KB	KANGSABATI

PUR_PU_KB_10A		
POINT NO.	LATITUDE	LONGITUDE
1	23° 8' 55.380" N	86° 37' 39.067" E
2	23° 8' 54.780" N	86° 37' 35.383" E
3	23° 8' 56.027" N	86° 37' 34.950" E
4	23° 8' 55.957" N	86° 37' 36.006" E
5	23° 8' 57.826" N	86° 37' 40.318" E
6	23° 9' 0.831" N	86° 37' 43.176" E
7	23° 9' 0.071" N	86° 37' 43.758" E

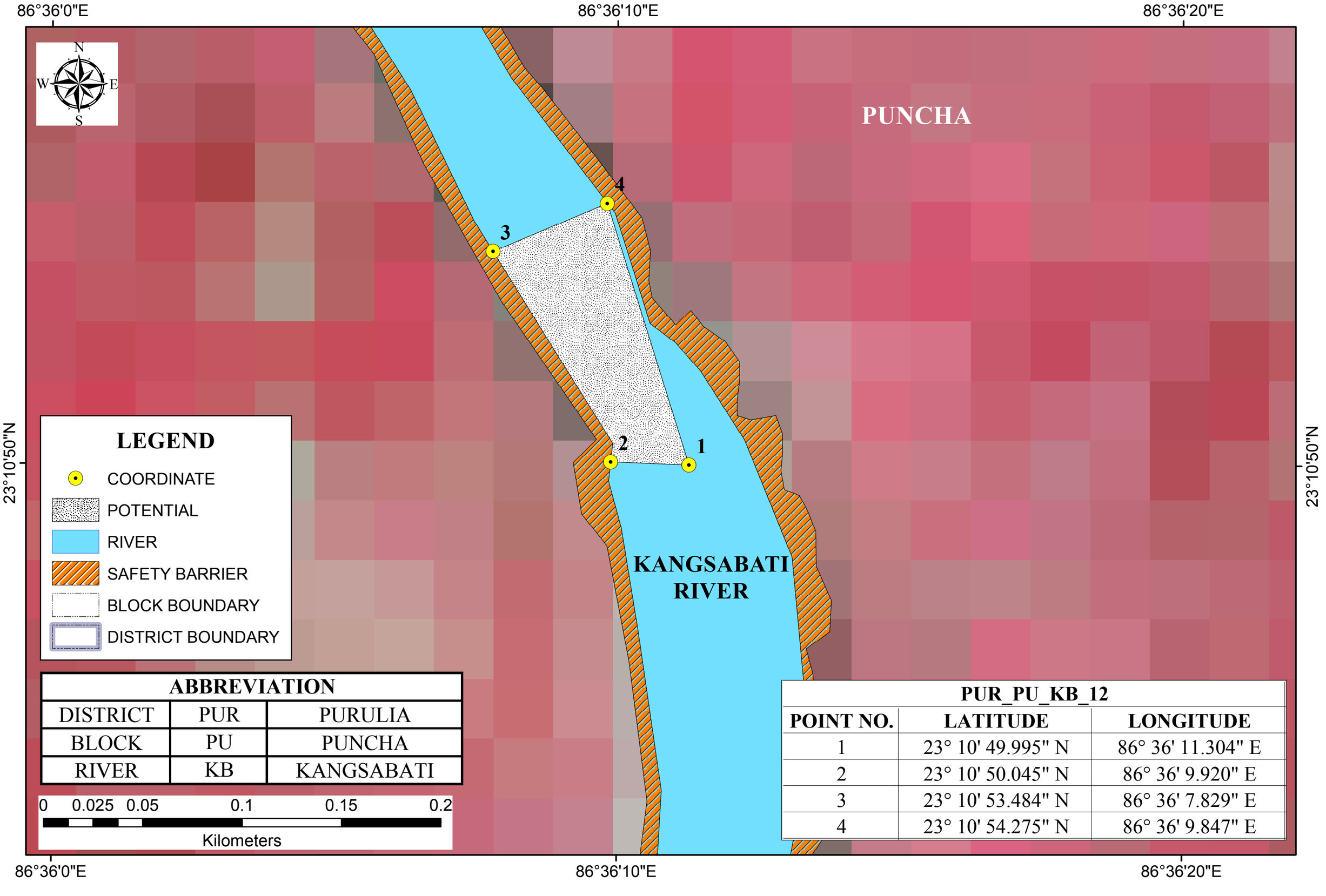
POTENTIAL BLOCK PUR_PU_KB_11 OF KANGSABATI RIVER



ABBREVIATION		
DISTRICT	PUR	PURULIA
BLOCK	PU	PUNCHA
RIVER	KB	KANGSABATI

PUR_PU_KB_11		
POINT NO.	LATITUDE	LONGITUDE
1	23° 9' 59.622" N	86° 36' 43.278" E
2	23° 10' 0.815" N	86° 36' 44.108" E
3	23° 9' 53.141" N	86° 36' 46.749" E
4	23° 9' 49.323" N	86° 36' 47.395" E
5	23° 9' 38.588" N	86° 36' 48.543" E
6	23° 9' 28.822" N	86° 36' 52.218" E
7	23° 9' 27.070" N	86° 36' 53.708" E
8	23° 9' 25.464" N	86° 36' 50.961" E
9	23° 9' 29.703" N	86° 36' 47.786" E
10	23° 9' 37.387" N	86° 36' 45.280" E
11	23° 9' 42.910" N	86° 36' 44.361" E
12	23° 9' 52.027" N	86° 36' 43.032" E
13	23° 9' 54.655" N	86° 36' 42.085" E
14	23° 9' 56.721" N	86° 36' 41.236" E
15	23° 9' 57.684" N	86° 36' 41.914" E
16	23° 9' 58.474" N	86° 36' 41.450" E
17	23° 9' 59.709" N	86° 36' 39.883" E
18	23° 10' 2.329" N	86° 36' 41.538" E

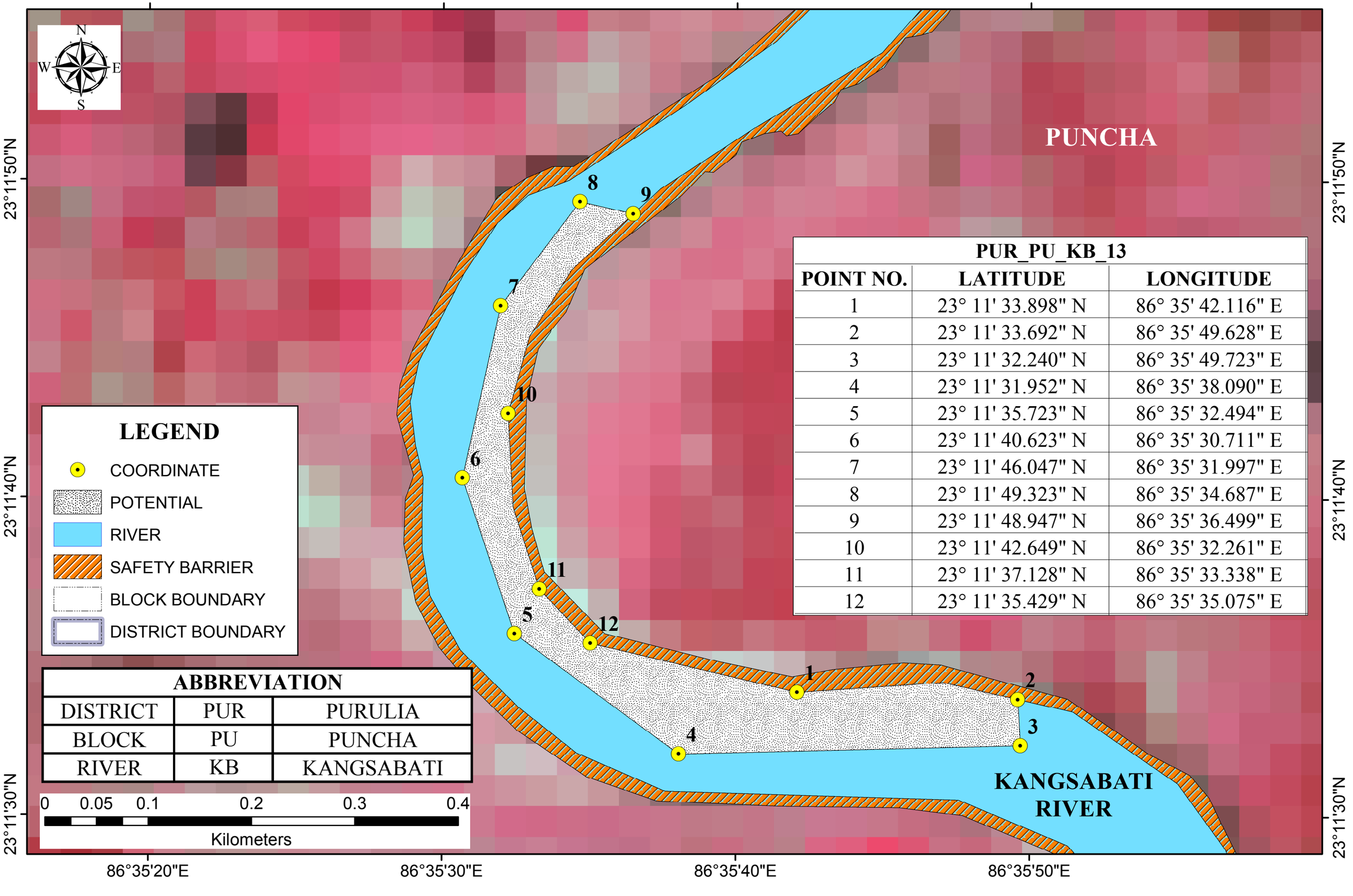
POTENTIAL BLOCK PUR_PU_KB_12 OF KANGSABATI RIVER



ABBREVIATION		
DISTRICT	PUR	PURULIA
BLOCK	PU	PUNCHA
RIVER	KB	KANGSABATI

PUR_PU_KB_12		
POINT NO.	LATITUDE	LONGITUDE
1	23° 10' 49.995" N	86° 36' 11.304" E
2	23° 10' 50.045" N	86° 36' 9.920" E
3	23° 10' 53.484" N	86° 36' 7.829" E
4	23° 10' 54.275" N	86° 36' 9.847" E

POTENTIAL BLOCK PUR_PU_KB_13 OF KANGSABATI RIVER



PUR_PU_KB_13		
POINT NO.	LATITUDE	LONGITUDE
1	23° 11' 33.898" N	86° 35' 42.116" E
2	23° 11' 33.692" N	86° 35' 49.628" E
3	23° 11' 32.240" N	86° 35' 49.723" E
4	23° 11' 31.952" N	86° 35' 38.090" E
5	23° 11' 35.723" N	86° 35' 32.494" E
6	23° 11' 40.623" N	86° 35' 30.711" E
7	23° 11' 46.047" N	86° 35' 31.997" E
8	23° 11' 49.323" N	86° 35' 34.687" E
9	23° 11' 48.947" N	86° 35' 36.499" E
10	23° 11' 42.649" N	86° 35' 32.261" E
11	23° 11' 37.128" N	86° 35' 33.338" E
12	23° 11' 35.429" N	86° 35' 35.075" E

ABBREVIATION		
DISTRICT	PUR	PURULIA
BLOCK	PU	PUNCHA
RIVER	KB	KANGSABATI

POTENTIAL BLOCK PUR_PU_KB_14 OF KANGSABATI RIVER

86°35'30"E 86°35'40"E 86°35'50"E 86°36'0"E

23°12'30"N

23°12'20"N

KANGSABATI RIVER

PUNCHA

N W E S

1 2 3 4 5 6 7 8 9 10 11

PUR_PU_KB_14		
POINT NO.	LATITUDE	LONGITUDE
1	23° 12' 11.540" N	86° 35' 49.205" E
2	23° 12' 16.570" N	86° 35' 46.356" E
3	23° 12' 21.724" N	86° 35' 43.026" E
4	23° 12' 26.293" N	86° 35' 39.773" E
5	23° 12' 28.591" N	86° 35' 36.568" E
6	23° 12' 29.986" N	86° 35' 37.968" E
7	23° 12' 27.014" N	86° 35' 42.010" E
8	23° 12' 23.782" N	86° 35' 43.002" E
9	23° 12' 17.199" N	86° 35' 48.255" E
10	23° 12' 16.037" N	86° 35' 48.866" E
11	23° 12' 11.754" N	86° 35' 49.740" E

LEGEND

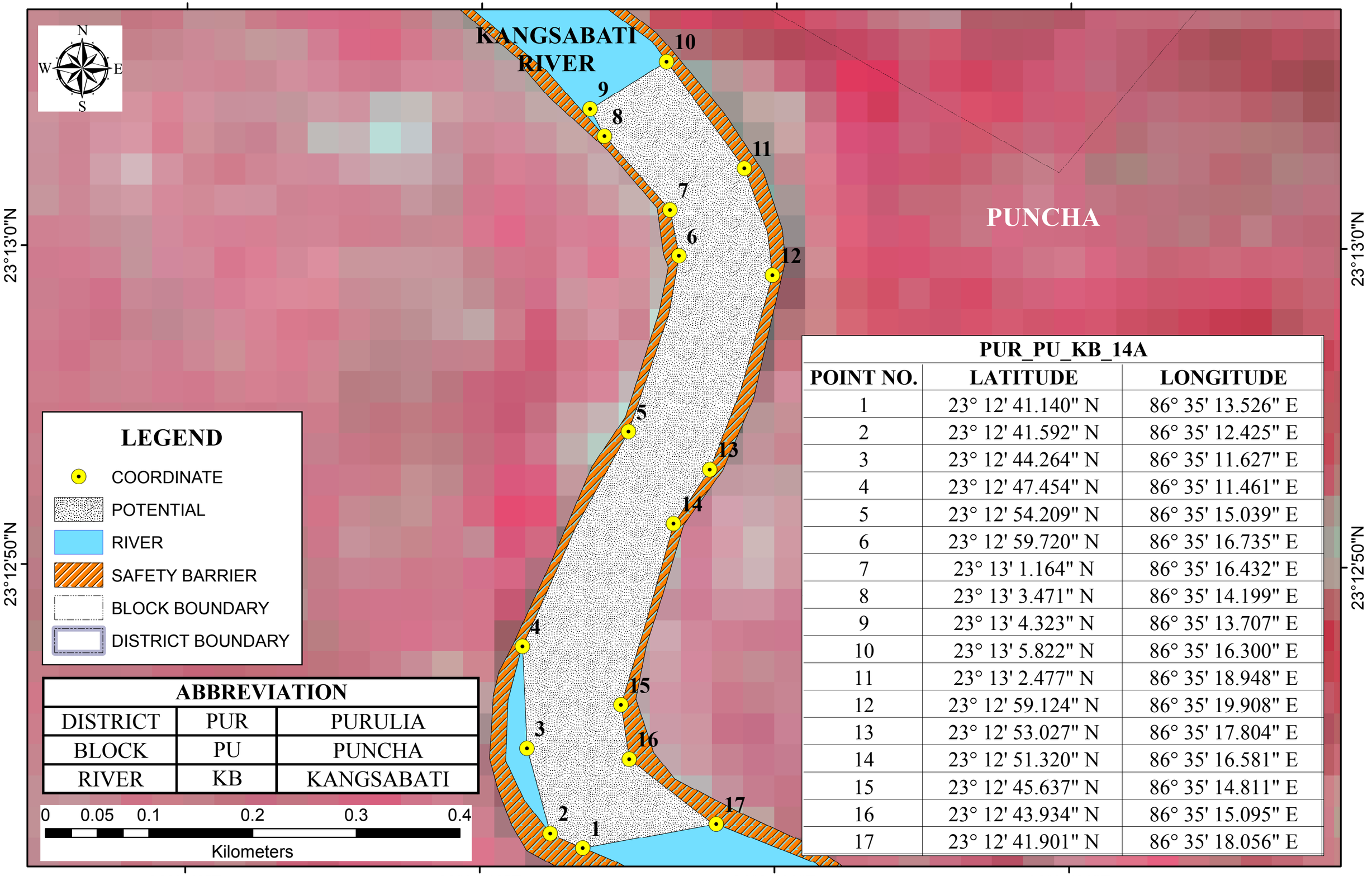
- COORDINATE
- POTENTIAL
- RIVER
- SAFETY BARRIER
- BLOCK BOUNDARY
- DISTRICT BOUNDARY

ABBREVIATION		
DISTRICT	PUR	PURULIA
BLOCK	PU	PUNCHA
RIVER	KB	KANGSABATI

0 0.0425 0.085 0.17 0.255 0.34

Kilometers

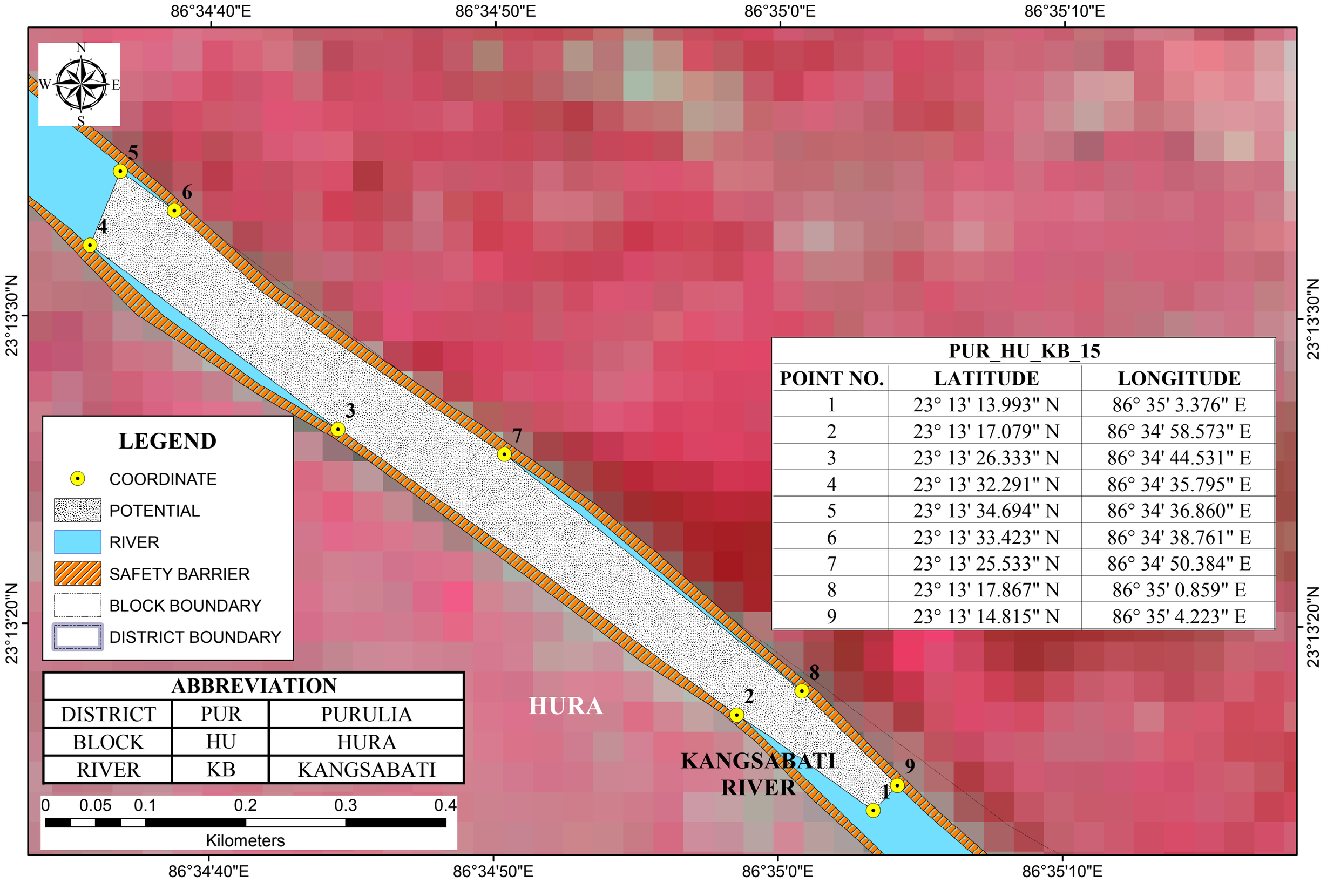
POTENTIAL BLOCK PUR_PU_KB_14A OF KANGSABATI RIVER



ABBREVIATION		
DISTRICT	PUR	PURULIA
BLOCK	PU	PUNCHA
RIVER	KB	KANGSABATI

PUR_PU_KB_14A		
POINT NO.	LATITUDE	LONGITUDE
1	23° 12' 41.140" N	86° 35' 13.526" E
2	23° 12' 41.592" N	86° 35' 12.425" E
3	23° 12' 44.264" N	86° 35' 11.627" E
4	23° 12' 47.454" N	86° 35' 11.461" E
5	23° 12' 54.209" N	86° 35' 15.039" E
6	23° 12' 59.720" N	86° 35' 16.735" E
7	23° 13' 1.164" N	86° 35' 16.432" E
8	23° 13' 3.471" N	86° 35' 14.199" E
9	23° 13' 4.323" N	86° 35' 13.707" E
10	23° 13' 5.822" N	86° 35' 16.300" E
11	23° 13' 2.477" N	86° 35' 18.948" E
12	23° 12' 59.124" N	86° 35' 19.908" E
13	23° 12' 53.027" N	86° 35' 17.804" E
14	23° 12' 51.320" N	86° 35' 16.581" E
15	23° 12' 45.637" N	86° 35' 14.811" E
16	23° 12' 43.934" N	86° 35' 15.095" E
17	23° 12' 41.901" N	86° 35' 18.056" E

POTENTIAL BLOCK PUR_HU_KB_15 OF KANGSABATI RIVER



PUR_HU_KB_15		
POINT NO.	LATITUDE	LONGITUDE
1	23° 13' 13.993" N	86° 35' 3.376" E
2	23° 13' 17.079" N	86° 34' 58.573" E
3	23° 13' 26.333" N	86° 34' 44.531" E
4	23° 13' 32.291" N	86° 34' 35.795" E
5	23° 13' 34.694" N	86° 34' 36.860" E
6	23° 13' 33.423" N	86° 34' 38.761" E
7	23° 13' 25.533" N	86° 34' 50.384" E
8	23° 13' 17.867" N	86° 35' 0.859" E
9	23° 13' 14.815" N	86° 35' 4.223" E

ABBREVIATION		
DISTRICT	PUR	PURULIA
BLOCK	HU	HURA
RIVER	KB	KANGSABATI

POTENTIAL BLOCK PUR_PU_KB_15A OF KANGSABATI RIVER

86°33'20"E 86°33'30"E 86°33'40"E 86°33'50"E

23°14'20"N 23°14'10"N 23°14'0"N

N W E S

PUNCHA

KANGSABATI RIVER

PUR_PU_KB_15A		
POINT NO.	LATITUDE	LONGITUDE
1	23° 13' 59.654" N	86° 33' 50.085" E
2	23° 14' 4.232" N	86° 33' 41.161" E
3	23° 14' 9.434" N	86° 33' 30.717" E
4	23° 14' 15.282" N	86° 33' 15.890" E
5	23° 14' 16.951" N	86° 33' 17.247" E
6	23° 14' 6.214" N	86° 33' 40.880" E
7	23° 14' 2.768" N	86° 33' 46.931" E
8	23° 14' 0.304" N	86° 33' 50.565" E

LEGEND

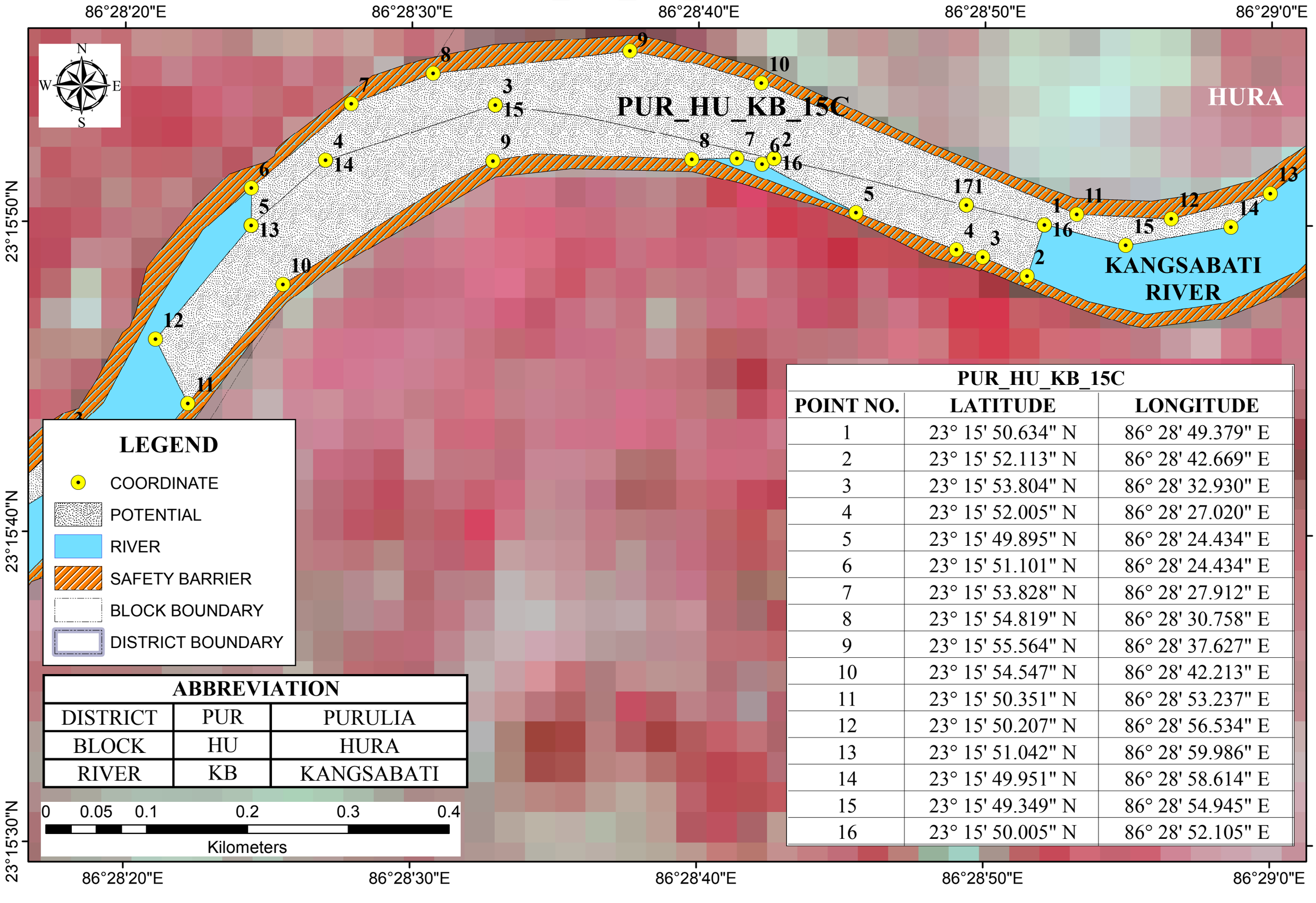
- COORDINATE
- POTENTIAL
- RIVER
- SAFETY BARRIER
- BLOCK BOUNDARY
- DISTRICT BOUNDARY

ABBREVIATION		
DISTRICT	PUR	PURULIA
BLOCK	PU	PUNCHA
RIVER	KB	KANGSABATI

0 0.05 0.1 0.2 0.3 0.4

Kilometers

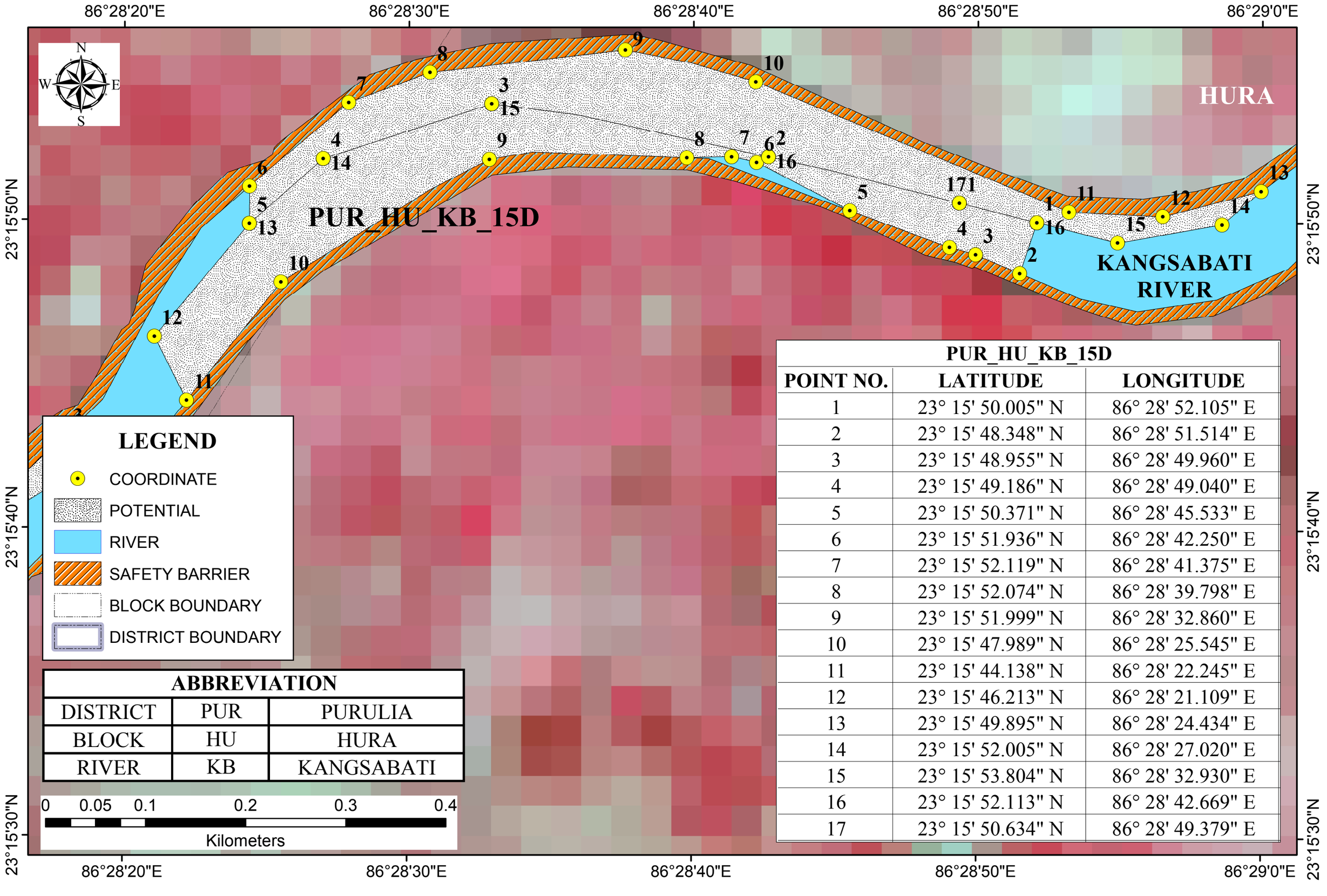
POTENTIAL BLOCK PUR_HU_KB_15C OF KANGSABATI RIVER



ABBREVIATION		
DISTRICT	PUR	PURULIA
BLOCK	HU	HURA
RIVER	KB	KANGSABATI

PUR_HU_KB_15C		
POINT NO.	LATITUDE	LONGITUDE
1	23° 15' 50.634" N	86° 28' 49.379" E
2	23° 15' 52.113" N	86° 28' 42.669" E
3	23° 15' 53.804" N	86° 28' 32.930" E
4	23° 15' 52.005" N	86° 28' 27.020" E
5	23° 15' 49.895" N	86° 28' 24.434" E
6	23° 15' 51.101" N	86° 28' 24.434" E
7	23° 15' 53.828" N	86° 28' 27.912" E
8	23° 15' 54.819" N	86° 28' 30.758" E
9	23° 15' 55.564" N	86° 28' 37.627" E
10	23° 15' 54.547" N	86° 28' 42.213" E
11	23° 15' 50.351" N	86° 28' 53.237" E
12	23° 15' 50.207" N	86° 28' 56.534" E
13	23° 15' 51.042" N	86° 28' 59.986" E
14	23° 15' 49.951" N	86° 28' 58.614" E
15	23° 15' 49.349" N	86° 28' 54.945" E
16	23° 15' 50.005" N	86° 28' 52.105" E

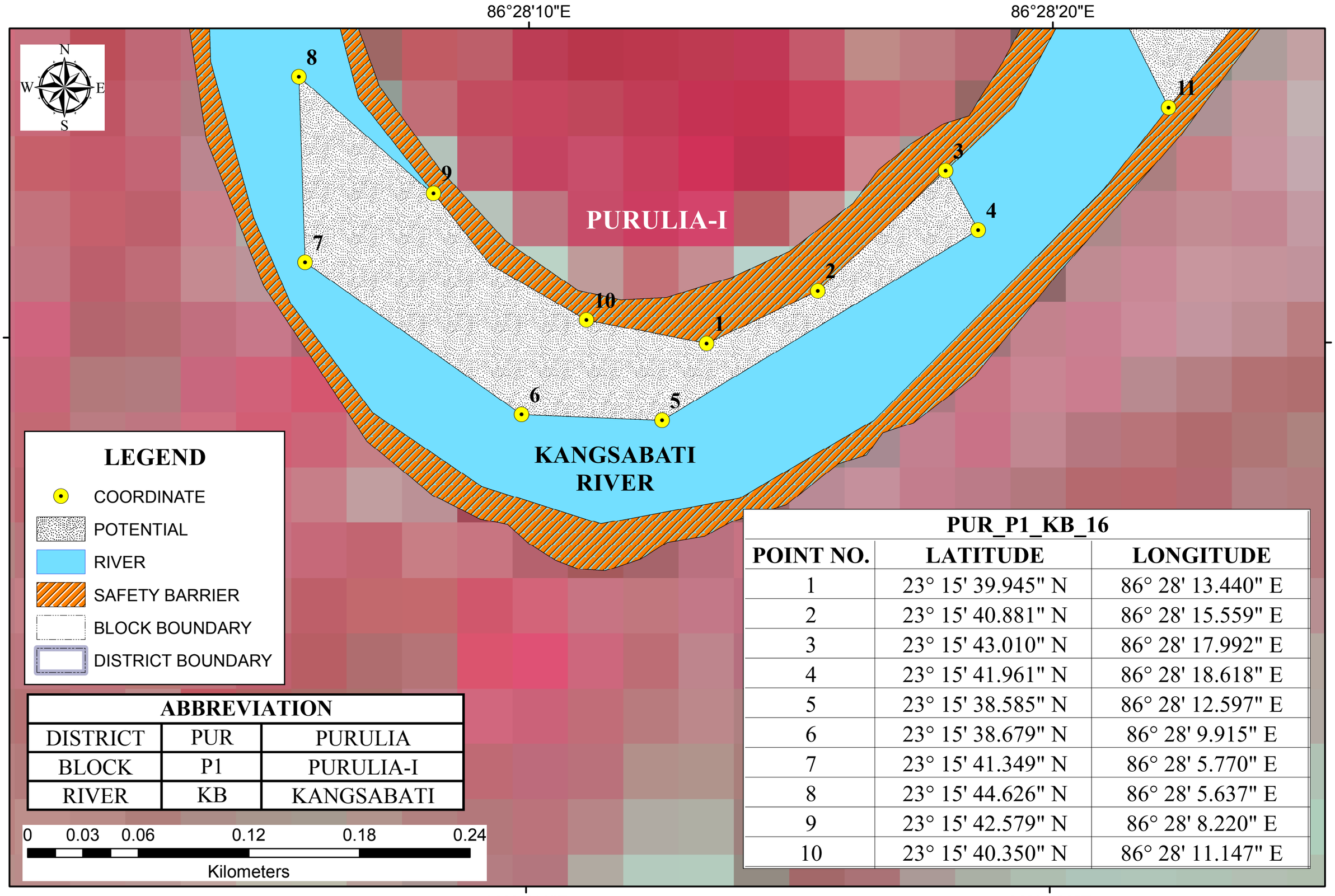
POTENTIAL BLOCK PUR_HU_KB_15D OF KANGSABATI RIVER



ABBREVIATION		
DISTRICT	PUR	PURULIA
BLOCK	HU	HURA
RIVER	KB	KANGSABATI

PUR_HU_KB_15D		
POINT NO.	LATITUDE	LONGITUDE
1	23° 15' 50.005" N	86° 28' 52.105" E
2	23° 15' 48.348" N	86° 28' 51.514" E
3	23° 15' 48.955" N	86° 28' 49.960" E
4	23° 15' 49.186" N	86° 28' 49.040" E
5	23° 15' 50.371" N	86° 28' 45.533" E
6	23° 15' 51.936" N	86° 28' 42.250" E
7	23° 15' 52.119" N	86° 28' 41.375" E
8	23° 15' 52.074" N	86° 28' 39.798" E
9	23° 15' 51.999" N	86° 28' 32.860" E
10	23° 15' 47.989" N	86° 28' 25.545" E
11	23° 15' 44.138" N	86° 28' 22.245" E
12	23° 15' 46.213" N	86° 28' 21.109" E
13	23° 15' 49.895" N	86° 28' 24.434" E
14	23° 15' 52.005" N	86° 28' 27.020" E
15	23° 15' 53.804" N	86° 28' 32.930" E
16	23° 15' 52.113" N	86° 28' 42.669" E
17	23° 15' 50.634" N	86° 28' 49.379" E

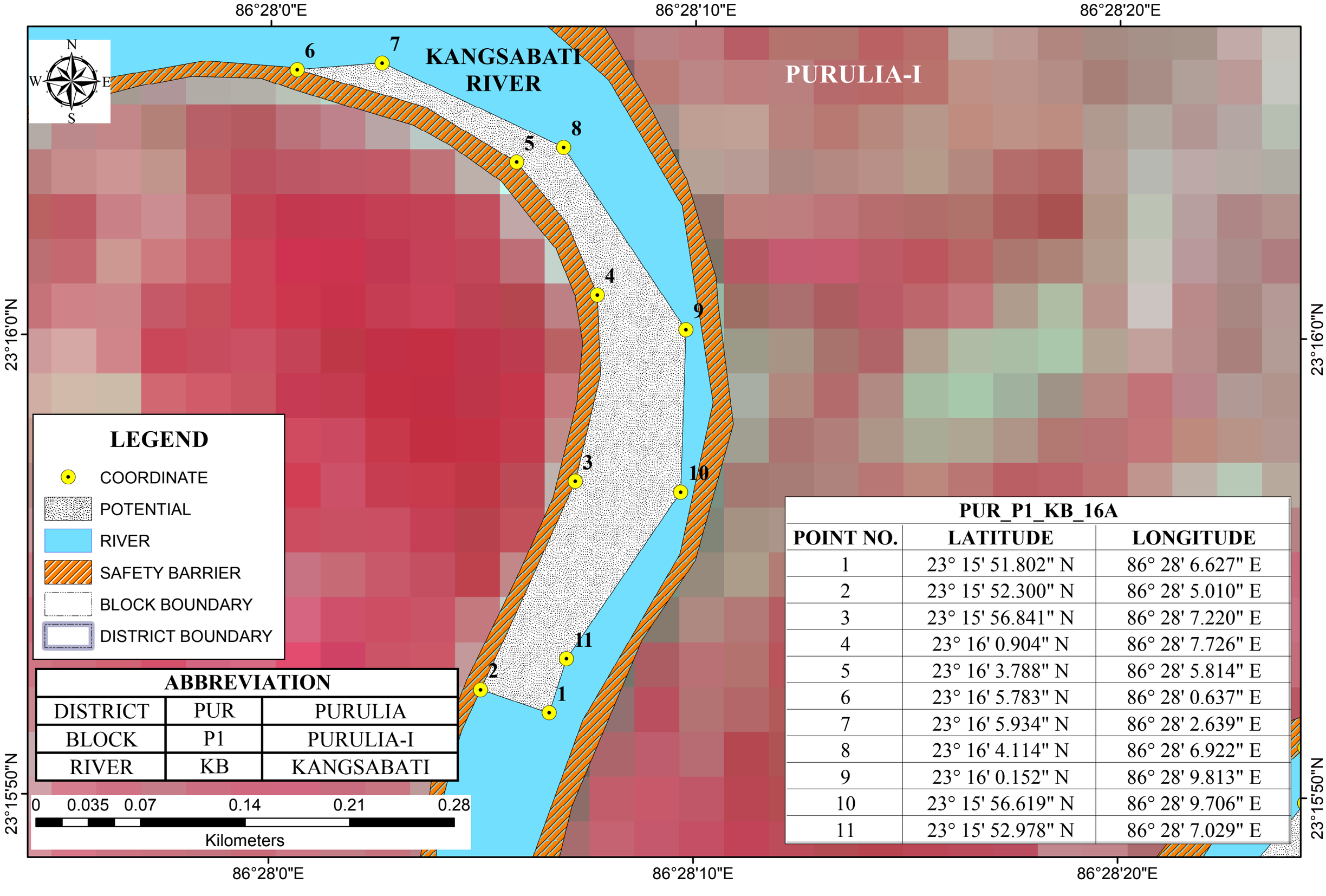
POTENTIAL BLOCK PUR_P1_KB_16 OF KANGSABATI RIVER



ABBREVIATION		
DISTRICT	PUR	PURULIA
BLOCK	P1	PURULIA-I
RIVER	KB	KANGSABATI

PUR_P1_KB_16		
POINT NO.	LATITUDE	LONGITUDE
1	23° 15' 39.945" N	86° 28' 13.440" E
2	23° 15' 40.881" N	86° 28' 15.559" E
3	23° 15' 43.010" N	86° 28' 17.992" E
4	23° 15' 41.961" N	86° 28' 18.618" E
5	23° 15' 38.585" N	86° 28' 12.597" E
6	23° 15' 38.679" N	86° 28' 9.915" E
7	23° 15' 41.349" N	86° 28' 5.770" E
8	23° 15' 44.626" N	86° 28' 5.637" E
9	23° 15' 42.579" N	86° 28' 8.220" E
10	23° 15' 40.350" N	86° 28' 11.147" E

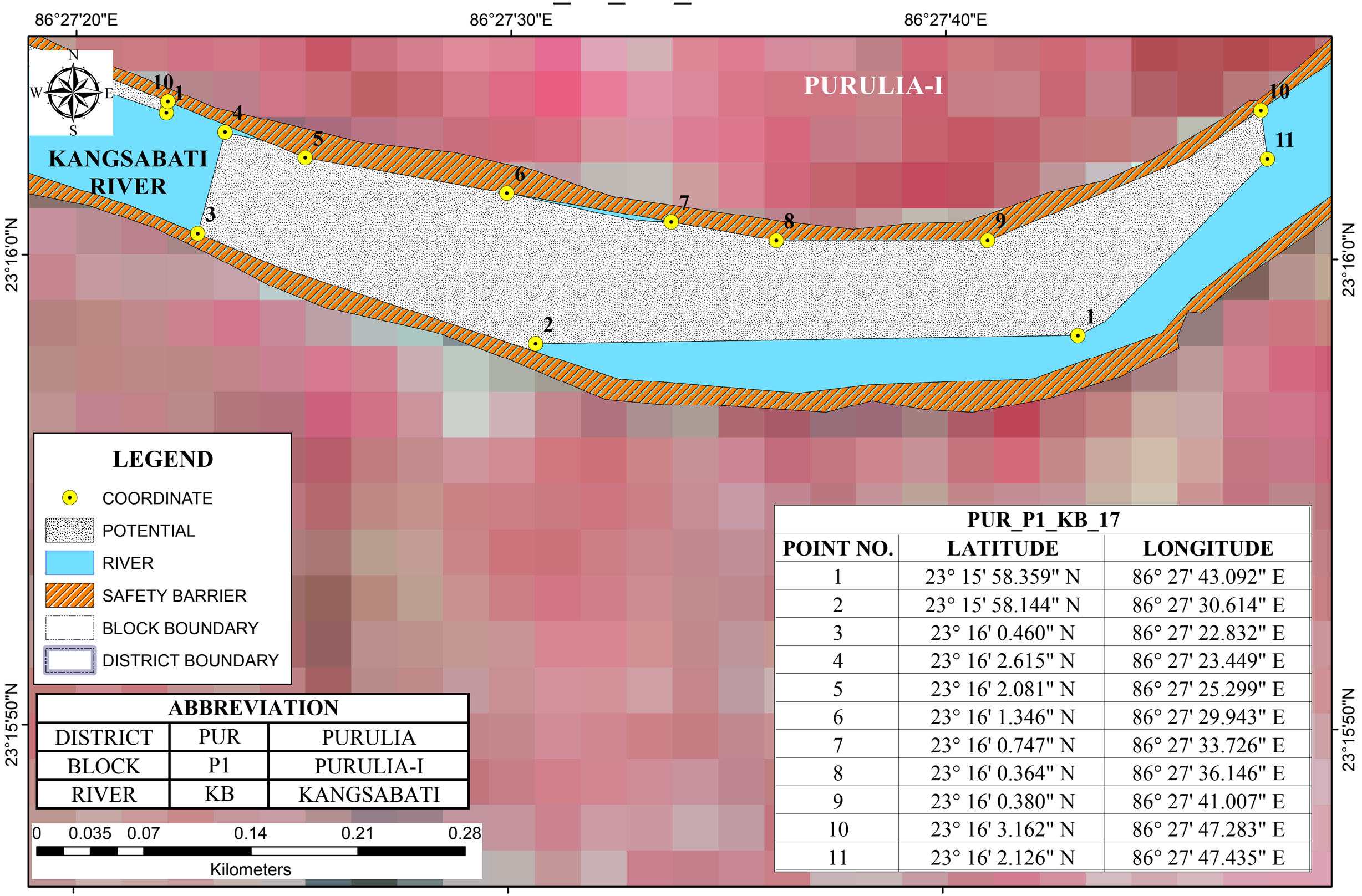
POTENTIAL BLOCK PUR_P1_KB_16A OF KANGSABATI RIVER



ABBREVIATION		
DISTRICT	PUR	PURULIA
BLOCK	P1	PURULIA-I
RIVER	KB	KANGSABATI

PUR_P1_KB_16A		
POINT NO.	LATITUDE	LONGITUDE
1	23° 15' 51.802" N	86° 28' 6.627" E
2	23° 15' 52.300" N	86° 28' 5.010" E
3	23° 15' 56.841" N	86° 28' 7.220" E
4	23° 16' 0.904" N	86° 28' 7.726" E
5	23° 16' 3.788" N	86° 28' 5.814" E
6	23° 16' 5.783" N	86° 28' 0.637" E
7	23° 16' 5.934" N	86° 28' 2.639" E
8	23° 16' 4.114" N	86° 28' 6.922" E
9	23° 16' 0.152" N	86° 28' 9.813" E
10	23° 15' 56.619" N	86° 28' 9.706" E
11	23° 15' 52.978" N	86° 28' 7.029" E

POTENTIAL BLOCK PUR_P1_KB_17 OF KANGSABATI RIVER



ABBREVIATION		
DISTRICT	PUR	PURULIA
BLOCK	P1	PURULIA-I
RIVER	KB	KANGSABATI

PUR_P1_KB_17		
POINT NO.	LATITUDE	LONGITUDE
1	23° 15' 58.359" N	86° 27' 43.092" E
2	23° 15' 58.144" N	86° 27' 30.614" E
3	23° 16' 0.460" N	86° 27' 22.832" E
4	23° 16' 2.615" N	86° 27' 23.449" E
5	23° 16' 2.081" N	86° 27' 25.299" E
6	23° 16' 1.346" N	86° 27' 29.943" E
7	23° 16' 0.747" N	86° 27' 33.726" E
8	23° 16' 0.364" N	86° 27' 36.146" E
9	23° 16' 0.380" N	86° 27' 41.007" E
10	23° 16' 3.162" N	86° 27' 47.283" E
11	23° 16' 2.126" N	86° 27' 47.435" E

POTENTIAL BLOCK PUR_P1_KB_17A OF KANGSABATI RIVER

86°27'10"E 86°27'20"E 86°27'30"E

23°16'10"N

PURULIA-I

KANGSABATI RIVER

PUR_P1_KB_17A		
POINT NO.	LATITUDE	LONGITUDE
1	23° 16' 3.032" N	86° 27' 22.103" E
2	23° 16' 5.399" N	86° 27' 14.455" E
3	23° 16' 10.432" N	86° 27' 9.958" E
4	23° 16' 11.526" N	86° 27' 9.696" E
5	23° 16' 16.142" N	86° 27' 7.398" E
6	23° 16' 17.248" N	86° 27' 7.138" E
7	23° 16' 17.865" N	86° 27' 9.107" E
8	23° 16' 9.727" N	86° 27' 12.026" E
9	23° 16' 5.406" N	86° 27' 16.402" E
10	23° 16' 3.263" N	86° 27' 22.138" E

LEGEND

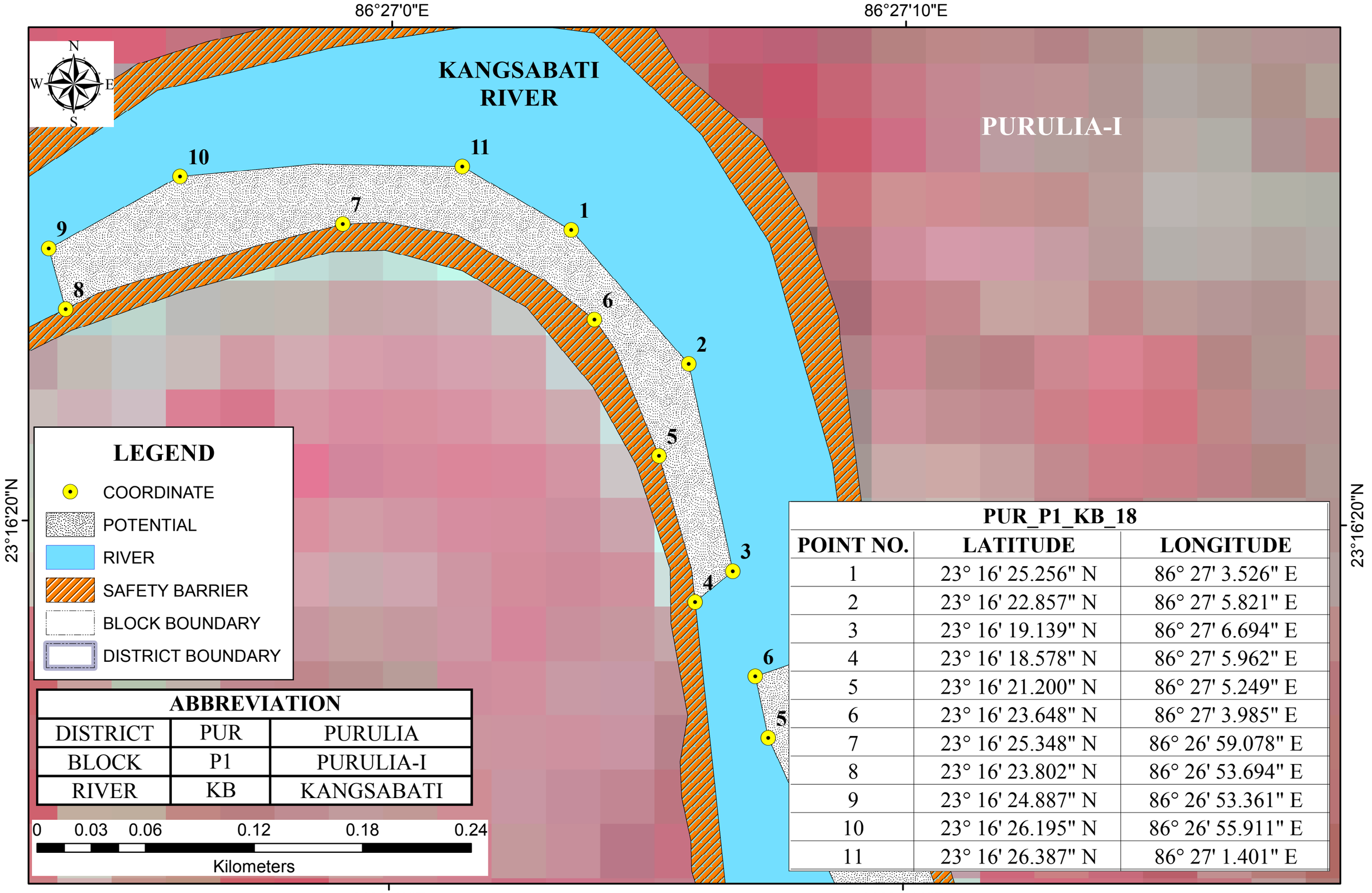
- COORDINATE
- POTENTIAL
- RIVER
- SAFETY BARRIER
- BLOCK BOUNDARY
- DISTRICT BOUNDARY

ABBREVIATION		
DISTRICT	PUR	PURULIA
BLOCK	P1	PURULIA-I
RIVER	KB	KANGSABATI

0 0.035 0.07 0.14 0.21 0.28

Kilometers

POTENTIAL BLOCK PUR_P1_KB_18 OF KANGSABATI RIVER



ABBREVIATION		
DISTRICT	PUR	PURULIA
BLOCK	P1	PURULIA-I
RIVER	KB	KANGSABATI

PUR_P1_KB_18		
POINT NO.	LATITUDE	LONGITUDE
1	23° 16' 25.256" N	86° 27' 3.526" E
2	23° 16' 22.857" N	86° 27' 5.821" E
3	23° 16' 19.139" N	86° 27' 6.694" E
4	23° 16' 18.578" N	86° 27' 5.962" E
5	23° 16' 21.200" N	86° 27' 5.249" E
6	23° 16' 23.648" N	86° 27' 3.985" E
7	23° 16' 25.348" N	86° 26' 59.078" E
8	23° 16' 23.802" N	86° 26' 53.694" E
9	23° 16' 24.887" N	86° 26' 53.361" E
10	23° 16' 26.195" N	86° 26' 55.911" E
11	23° 16' 26.387" N	86° 27' 1.401" E

POTENTIAL BLOCK PUR_P1_KB_19 OF KANGSABATI RIVER

86°26'20"E

86°26'30"E

23°16'30"N

23°16'20"N

N

W

E

S

PURULIA-I

PUR_P1_KB_19

KANGSABATI RIVER

PUR_P1_KB_19		
POINT NO.	LATITUDE	LONGITUDE
1	23° 16' 19.599" N	86° 26' 29.724" E
2	23° 16' 18.481" N	86° 26' 29.331" E
3	23° 16' 19.341" N	86° 26' 25.956" E
4	23° 16' 19.522" N	86° 26' 23.697" E
5	23° 16' 20.369" N	86° 26' 21.762" E
6	23° 16' 23.156" N	86° 26' 19.189" E
7	23° 16' 28.703" N	86° 26' 17.482" E
8	23° 16' 32.494" N	86° 26' 18.847" E
9	23° 16' 28.206" N	86° 26' 19.953" E
10	23° 16' 22.317" N	86° 26' 23.808" E

LEGEND

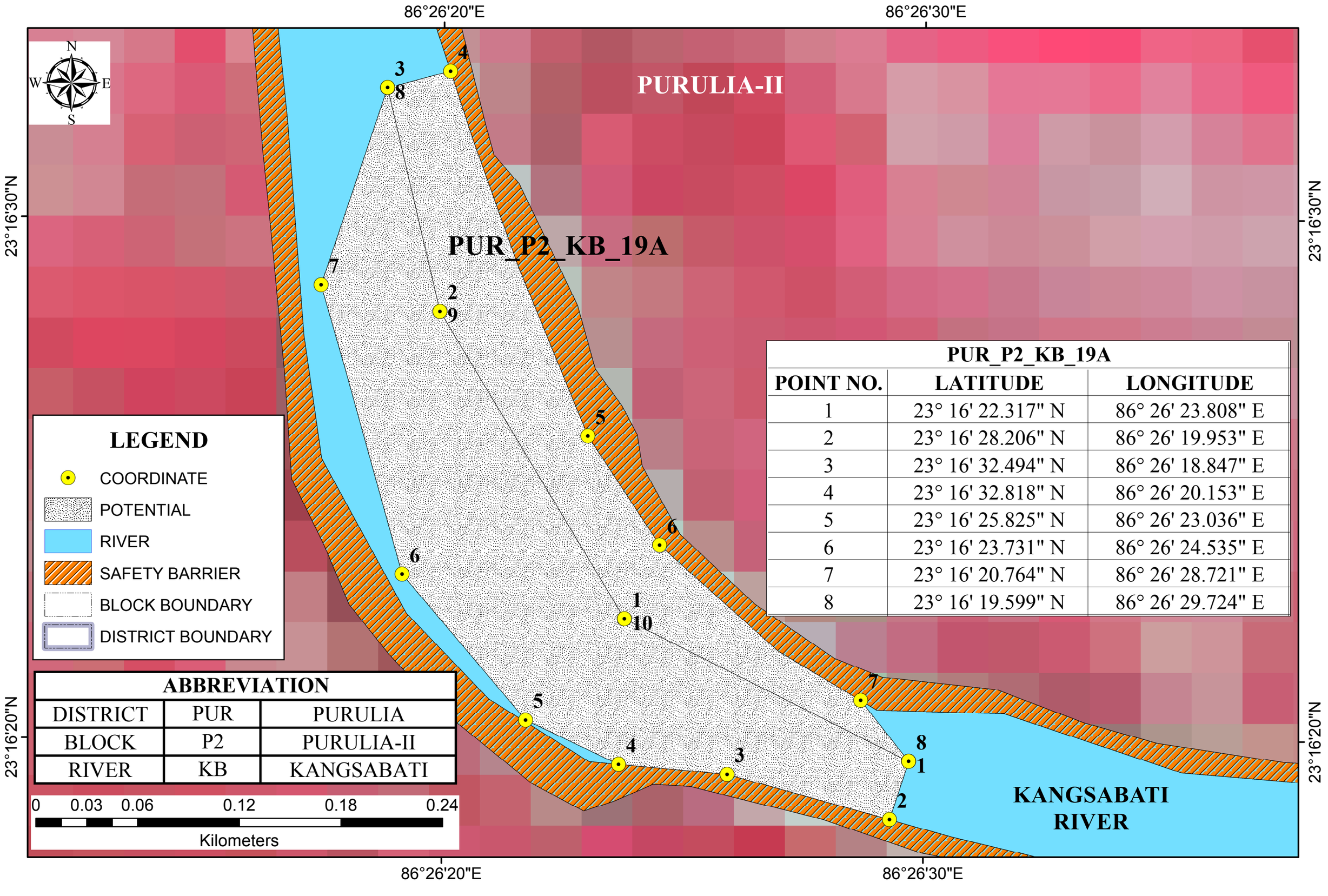
- COORDINATE
- POTENTIAL
- RIVER
- SAFETY BARRIER
- BLOCK BOUNDARY
- DISTRICT BOUNDARY

ABBREVIATION		
DISTRICT	PUR	PURULIA
BLOCK	P1	PURULIA-I
RIVER	KB	KANGSABATI

0 0.03 0.06 0.12 0.18 0.24

Kilometers

POTENTIAL BLOCK PUR_P2_KB_19A OF KANGSABATI RIVER



PUR_P2_KB_19A		
POINT NO.	LATITUDE	LONGITUDE
1	23° 16' 22.317" N	86° 26' 23.808" E
2	23° 16' 28.206" N	86° 26' 19.953" E
3	23° 16' 32.494" N	86° 26' 18.847" E
4	23° 16' 32.818" N	86° 26' 20.153" E
5	23° 16' 25.825" N	86° 26' 23.036" E
6	23° 16' 23.731" N	86° 26' 24.535" E
7	23° 16' 20.764" N	86° 26' 28.721" E
8	23° 16' 19.599" N	86° 26' 29.724" E

POTENTIAL BLOCK PUR_P1_KB_21 OF KANGSABATI RIVER

86°25'30"E 86°25'40"E 86°25'50"E

23°16'30"N 23°16'20"N

N W E S

PUR_P1_KB_21

PURULIA-I

KANGSABATI RIVER

PUR_P1_KB_21		
POINT NO.	LATITUDE	LONGITUDE
1	23° 16' 15.937" N	86° 25' 50.404" E
2	23° 16' 17.072" N	86° 25' 43.089" E
3	23° 16' 19.166" N	86° 25' 39.355" E
4	23° 16' 23.563" N	86° 25' 36.870" E
5	23° 16' 24.708" N	86° 25' 36.490" E
6	23° 16' 29.652" N	86° 25' 36.469" E
7	23° 16' 30.283" N	86° 25' 37.752" E
8	23° 16' 25.678" N	86° 25' 38.840" E
9	23° 16' 20.497" N	86° 25' 40.871" E
10	23° 16' 17.713" N	86° 25' 46.117" E
11	23° 16' 17.225" N	86° 25' 50.261" E

LEGEND

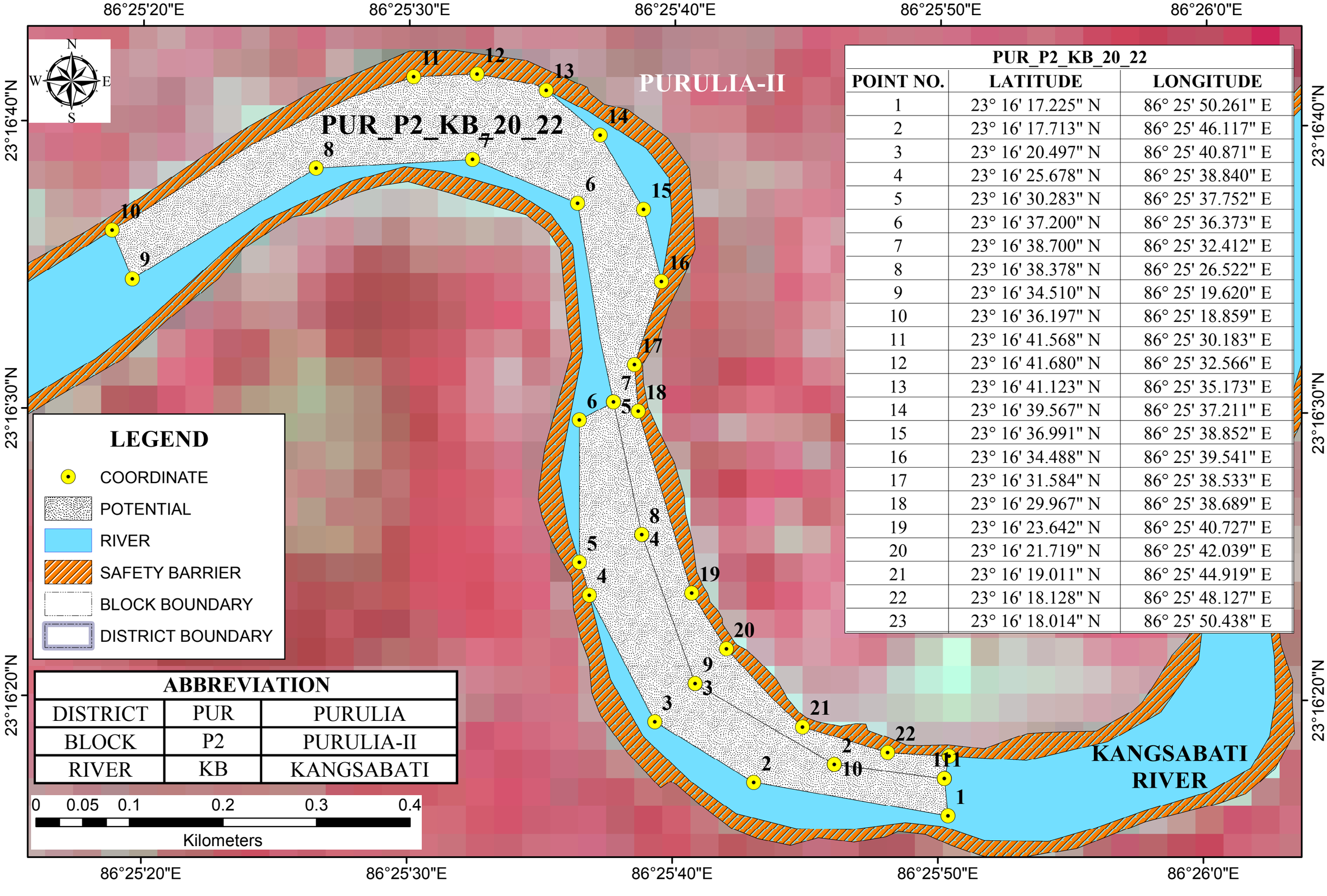
- COORDINATE
- POTENTIAL
- RIVER
- SAFETY BARRIER
- BLOCK BOUNDARY
- DISTRICT BOUNDARY

ABBREVIATION		
DISTRICT	PUR	PURULIA
BLOCK	P1	PURULIA-I
RIVER	KB	KANGSABATI

0 0.0325 0.065 0.13 0.195 0.26

Kilometers

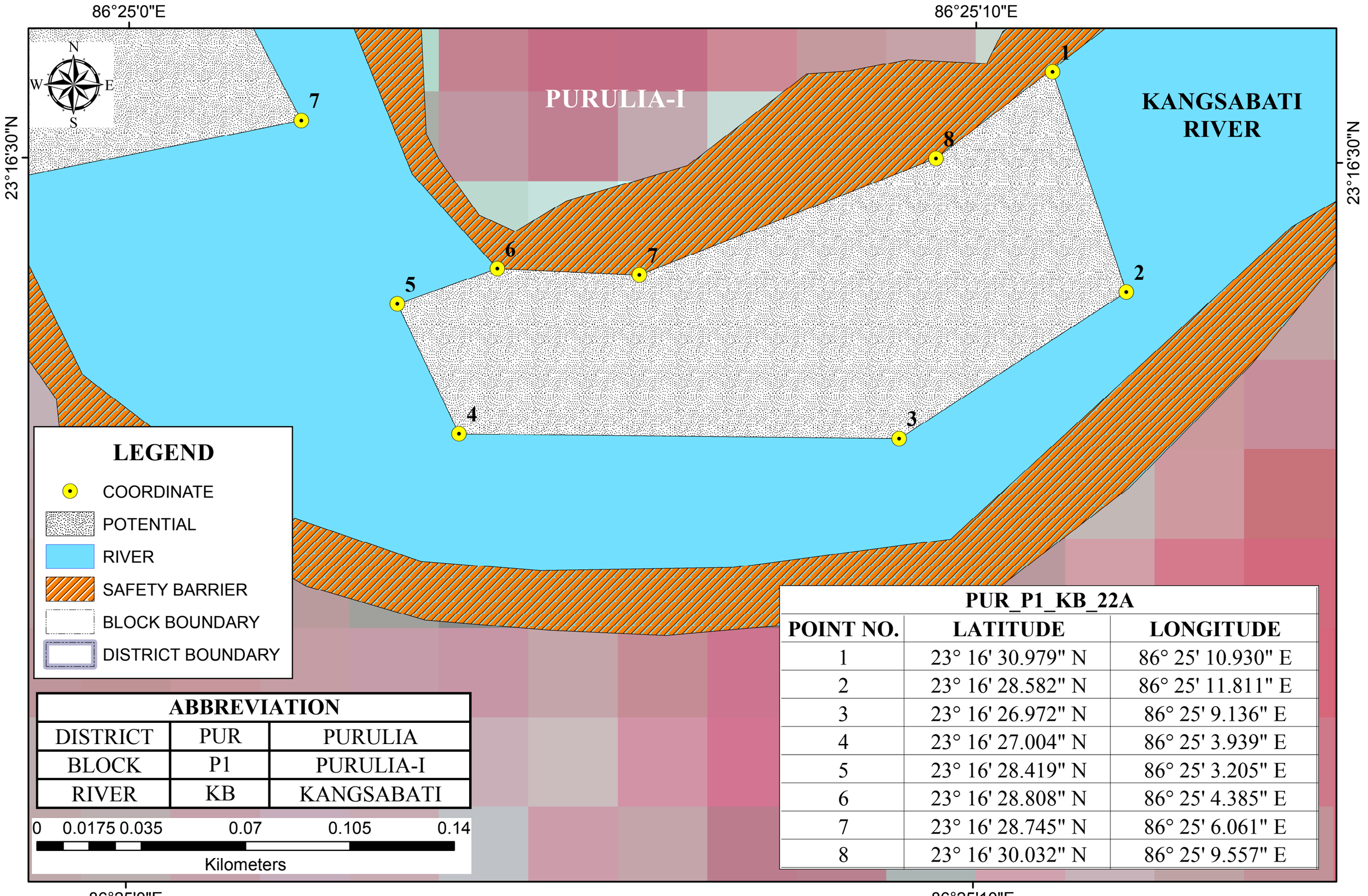
POTENTIAL BLOCK PUR_P2_KB_20_22 OF KANGSABATI RIVER



PUR_P2_KB_20_22		
POINT NO.	LATITUDE	LONGITUDE
1	23° 16' 17.225" N	86° 25' 50.261" E
2	23° 16' 17.713" N	86° 25' 46.117" E
3	23° 16' 20.497" N	86° 25' 40.871" E
4	23° 16' 25.678" N	86° 25' 38.840" E
5	23° 16' 30.283" N	86° 25' 37.752" E
6	23° 16' 37.200" N	86° 25' 36.373" E
7	23° 16' 38.700" N	86° 25' 32.412" E
8	23° 16' 38.378" N	86° 25' 26.522" E
9	23° 16' 34.510" N	86° 25' 19.620" E
10	23° 16' 36.197" N	86° 25' 18.859" E
11	23° 16' 41.568" N	86° 25' 30.183" E
12	23° 16' 41.680" N	86° 25' 32.566" E
13	23° 16' 41.123" N	86° 25' 35.173" E
14	23° 16' 39.567" N	86° 25' 37.211" E
15	23° 16' 36.991" N	86° 25' 38.852" E
16	23° 16' 34.488" N	86° 25' 39.541" E
17	23° 16' 31.584" N	86° 25' 38.533" E
18	23° 16' 29.967" N	86° 25' 38.689" E
19	23° 16' 23.642" N	86° 25' 40.727" E
20	23° 16' 21.719" N	86° 25' 42.039" E
21	23° 16' 19.011" N	86° 25' 44.919" E
22	23° 16' 18.128" N	86° 25' 48.127" E
23	23° 16' 18.014" N	86° 25' 50.438" E

ABBREVIATION		
DISTRICT	PUR	PURULIA
BLOCK	P2	PURULIA-II
RIVER	KB	KANGSABATI

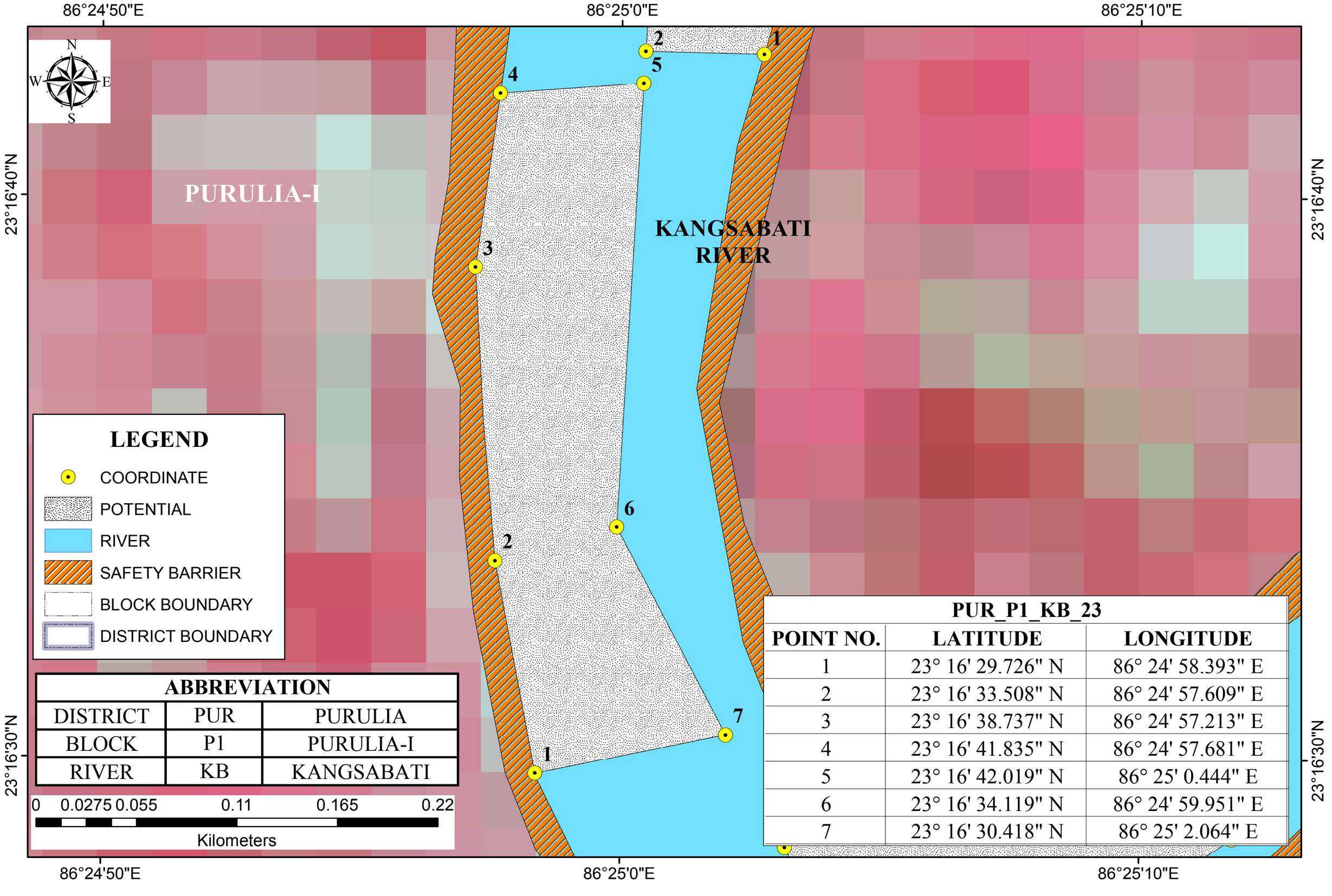
POTENTIAL BLOCK PUR_P1_KB_22A OF KANGSABATI RIVER



ABBREVIATION		
DISTRICT	PUR	PURULIA
BLOCK	P1	PURULIA-I
RIVER	KB	KANGSABATI

PUR_P1_KB_22A		
POINT NO.	LATITUDE	LONGITUDE
1	23° 16' 30.979" N	86° 25' 10.930" E
2	23° 16' 28.582" N	86° 25' 11.811" E
3	23° 16' 26.972" N	86° 25' 9.136" E
4	23° 16' 27.004" N	86° 25' 3.939" E
5	23° 16' 28.419" N	86° 25' 3.205" E
6	23° 16' 28.808" N	86° 25' 4.385" E
7	23° 16' 28.745" N	86° 25' 6.061" E
8	23° 16' 30.032" N	86° 25' 9.557" E

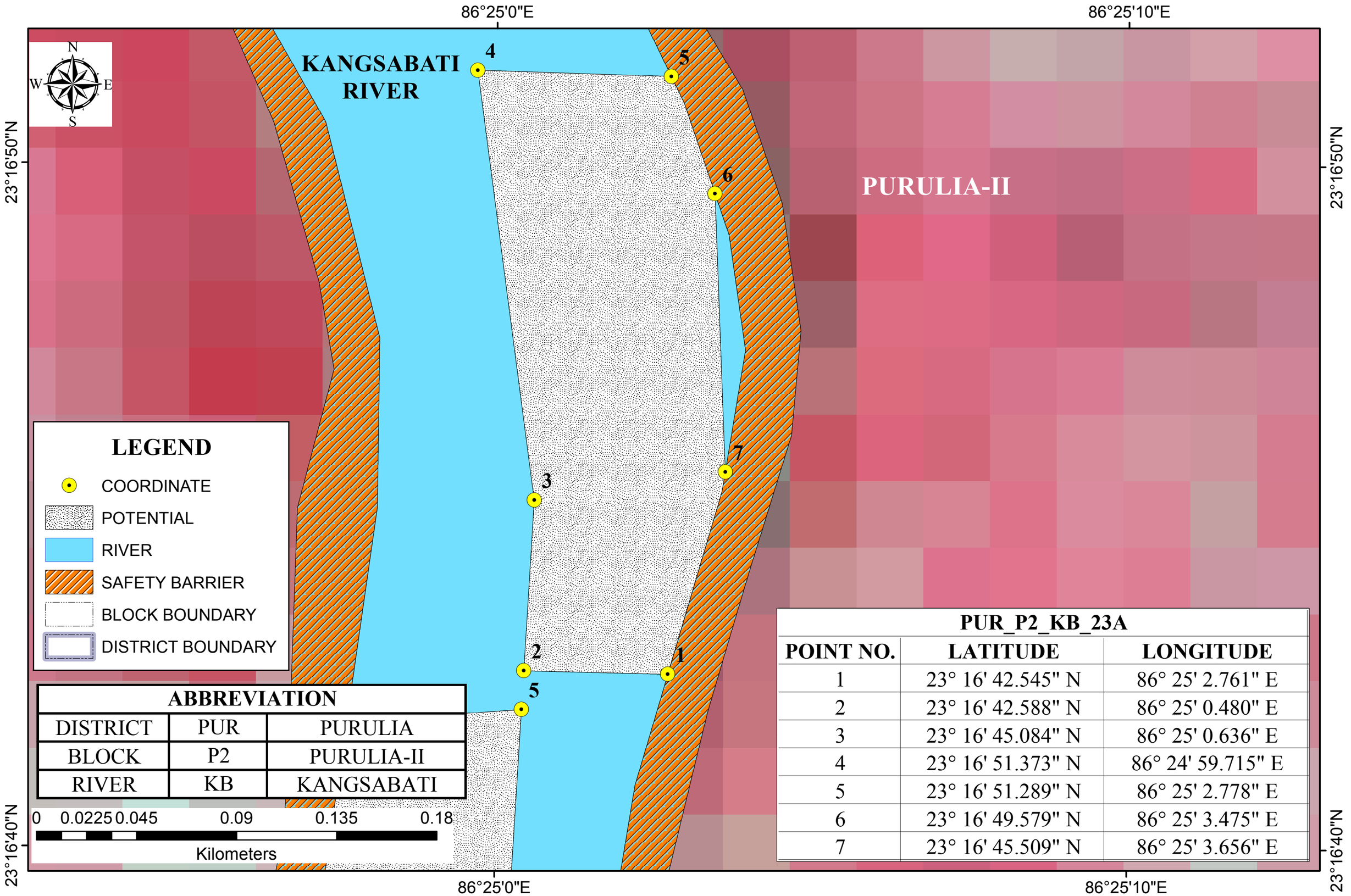
POTENTIAL BLOCK PUR_P1_KB_23 OF KANGSABATI RIVER



ABBREVIATION		
DISTRICT	PUR	PURULIA
BLOCK	P1	PURULIA-I
RIVER	KB	KANGSABATI

PUR_P1_KB_23		
POINT NO.	LATITUDE	LONGITUDE
1	23° 16' 29.726" N	86° 24' 58.393" E
2	23° 16' 33.508" N	86° 24' 57.609" E
3	23° 16' 38.737" N	86° 24' 57.213" E
4	23° 16' 41.835" N	86° 24' 57.681" E
5	23° 16' 42.019" N	86° 25' 0.444" E
6	23° 16' 34.119" N	86° 24' 59.951" E
7	23° 16' 30.418" N	86° 25' 2.064" E

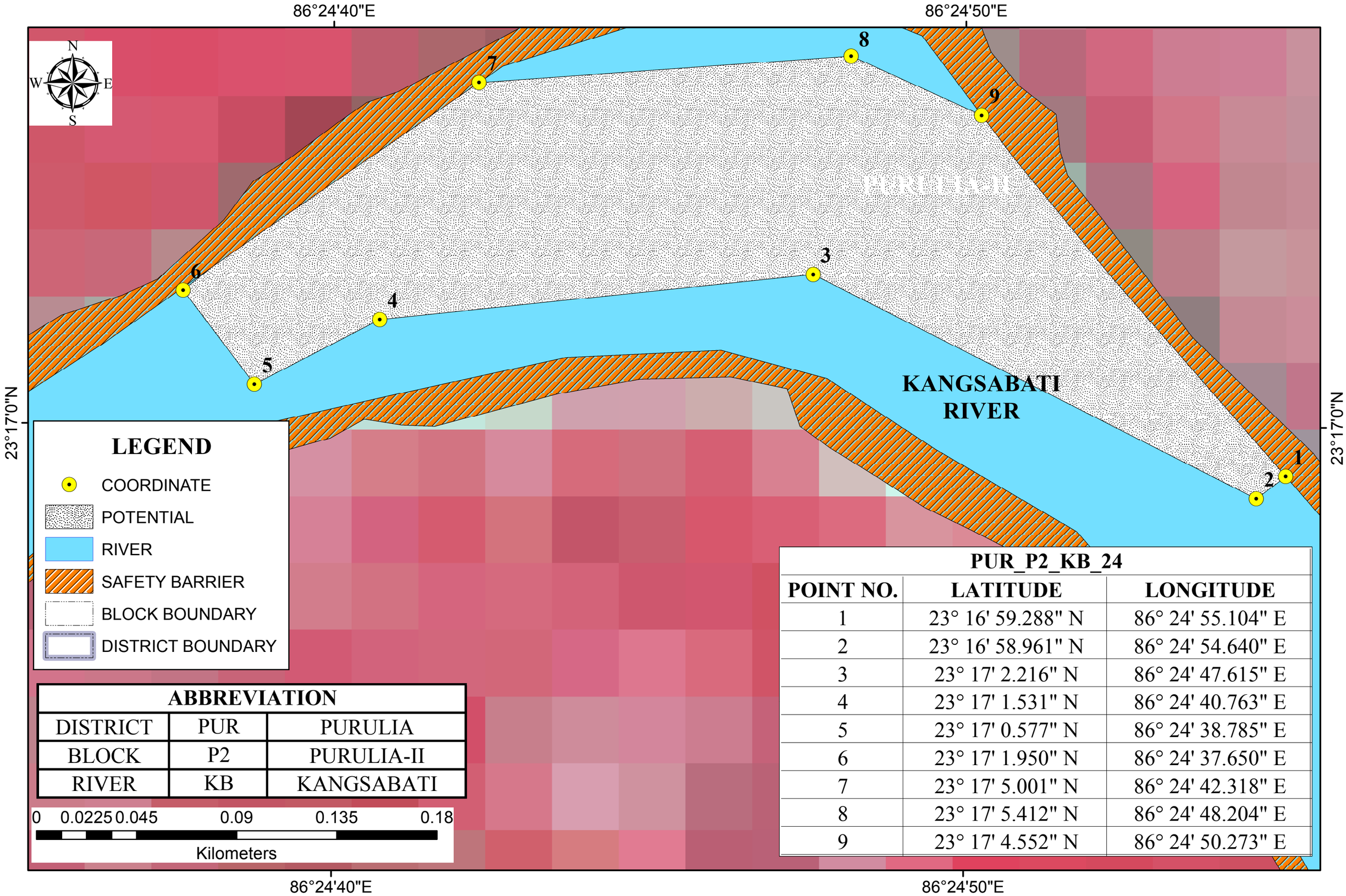
POTENTIAL BLOCK PUR_P2_KB_23A OF KANGSABATI RIVER



ABBREVIATION		
DISTRICT	PUR	PURULIA
BLOCK	P2	PURULIA-II
RIVER	KB	KANGSABATI

PUR_P2_KB_23A		
POINT NO.	LATITUDE	LONGITUDE
1	23° 16' 42.545" N	86° 25' 2.761" E
2	23° 16' 42.588" N	86° 25' 0.480" E
3	23° 16' 45.084" N	86° 25' 0.636" E
4	23° 16' 51.373" N	86° 24' 59.715" E
5	23° 16' 51.289" N	86° 25' 2.778" E
6	23° 16' 49.579" N	86° 25' 3.475" E
7	23° 16' 45.509" N	86° 25' 3.656" E

POTENTIAL BLOCK PUR_P2_KB_24 OF KANGSABATI RIVER



ABBREVIATION		
DISTRICT	PUR	PURULIA
BLOCK	P2	PURULIA-II
RIVER	KB	KANGSABATI

PUR_P2_KB_24		
POINT NO.	LATITUDE	LONGITUDE
1	23° 16' 59.288" N	86° 24' 55.104" E
2	23° 16' 58.961" N	86° 24' 54.640" E
3	23° 17' 2.216" N	86° 24' 47.615" E
4	23° 17' 1.531" N	86° 24' 40.763" E
5	23° 17' 0.577" N	86° 24' 38.785" E
6	23° 17' 1.950" N	86° 24' 37.650" E
7	23° 17' 5.001" N	86° 24' 42.318" E
8	23° 17' 5.412" N	86° 24' 48.204" E
9	23° 17' 4.552" N	86° 24' 50.273" E

POTENTIAL BLOCK PUR_P2_KB_24A OF KANGSABATI RIVER

86°24'20"E

N
W
E
S

PURULIA-II

KANGSABATI
RIVER

1
2
3
4

23°16'50"N

23°16'50"N

86°24'20"E

LEGEND

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

ABBREVIATION		
DISTRICT	PUR	PURULIA
BLOCK	P2	PURULIA-II
RIVER	KB	KANGSABATI

0 0.01250.025 0.05 0.075 0.1

Kilometers

PUR_P2_KB_24A		
POINT NO.	LATITUDE	LONGITUDE
1	23° 16' 52.317" N	86° 24' 16.354" E
2	23° 16' 53.551" N	86° 24' 16.321" E
3	23° 16' 54.313" N	86° 24' 21.329" E
4	23° 16' 52.536" N	86° 24' 21.403" E

POTENTIAL BLOCK PUR_P2_KB_25 OF KANGSABATI RIVER

86°23'10"E

23°17'20"N



PURULIA-II

KANGSABATI RIVER

3

4

2

1

LEGEND

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

ABBREVIATION		
DISTRICT	PUR	PURULIA
BLOCK	P2	PURULIA-II
RIVER	KB	KANGSABATI

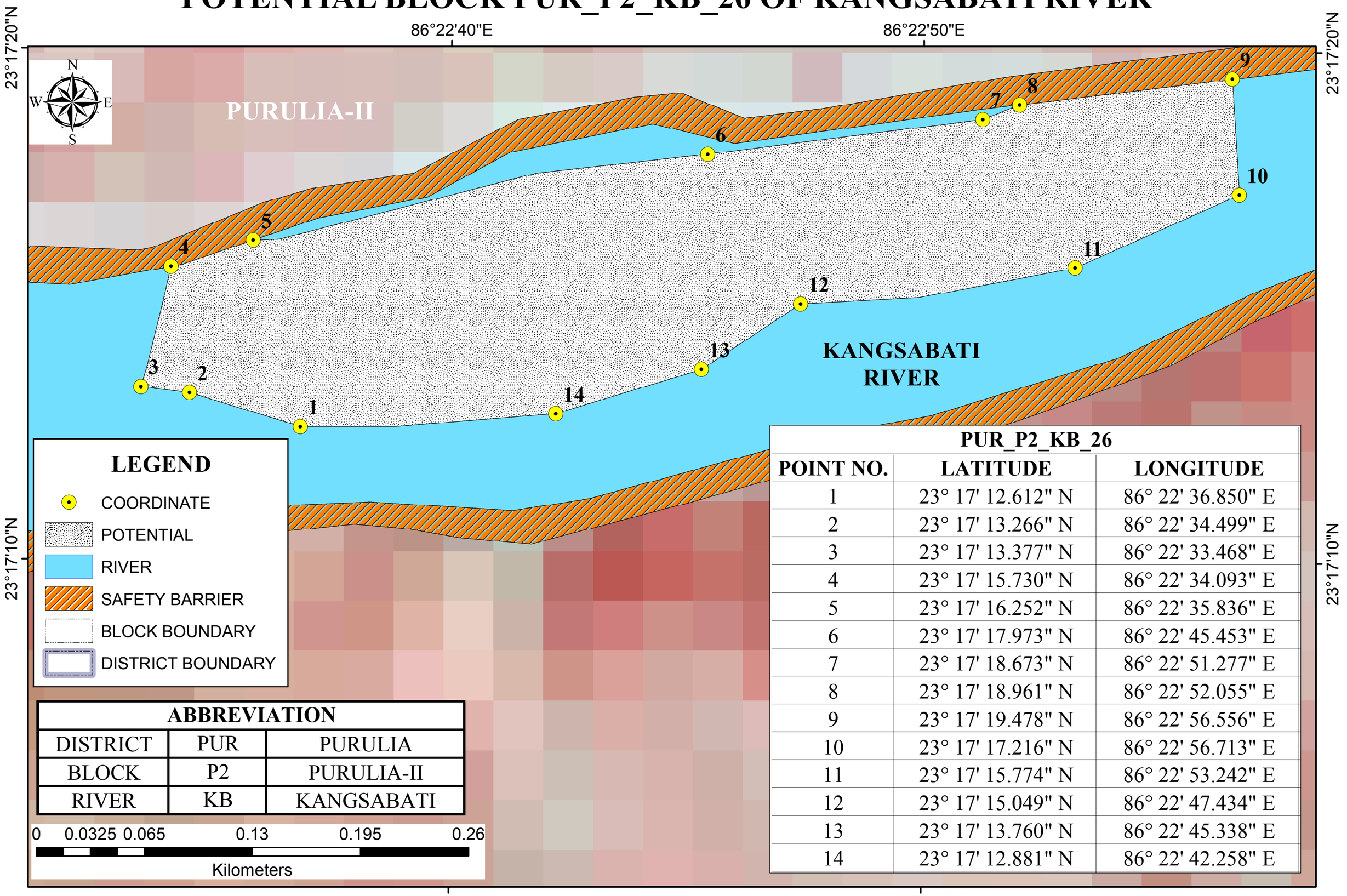
0 0.01250.025 0.05 0.075 0.1

Kilometers

PUR_P2_KB_25		
POINT NO.	LATITUDE	LONGITUDE
1	23° 17' 16.766" N	86° 23' 9.864" E
2	23° 17' 17.147" N	86° 23' 8.846" E
3	23° 17' 19.657" N	86° 23' 9.380" E
4	23° 17' 19.084" N	86° 23' 11.522" E

86°23'10"E

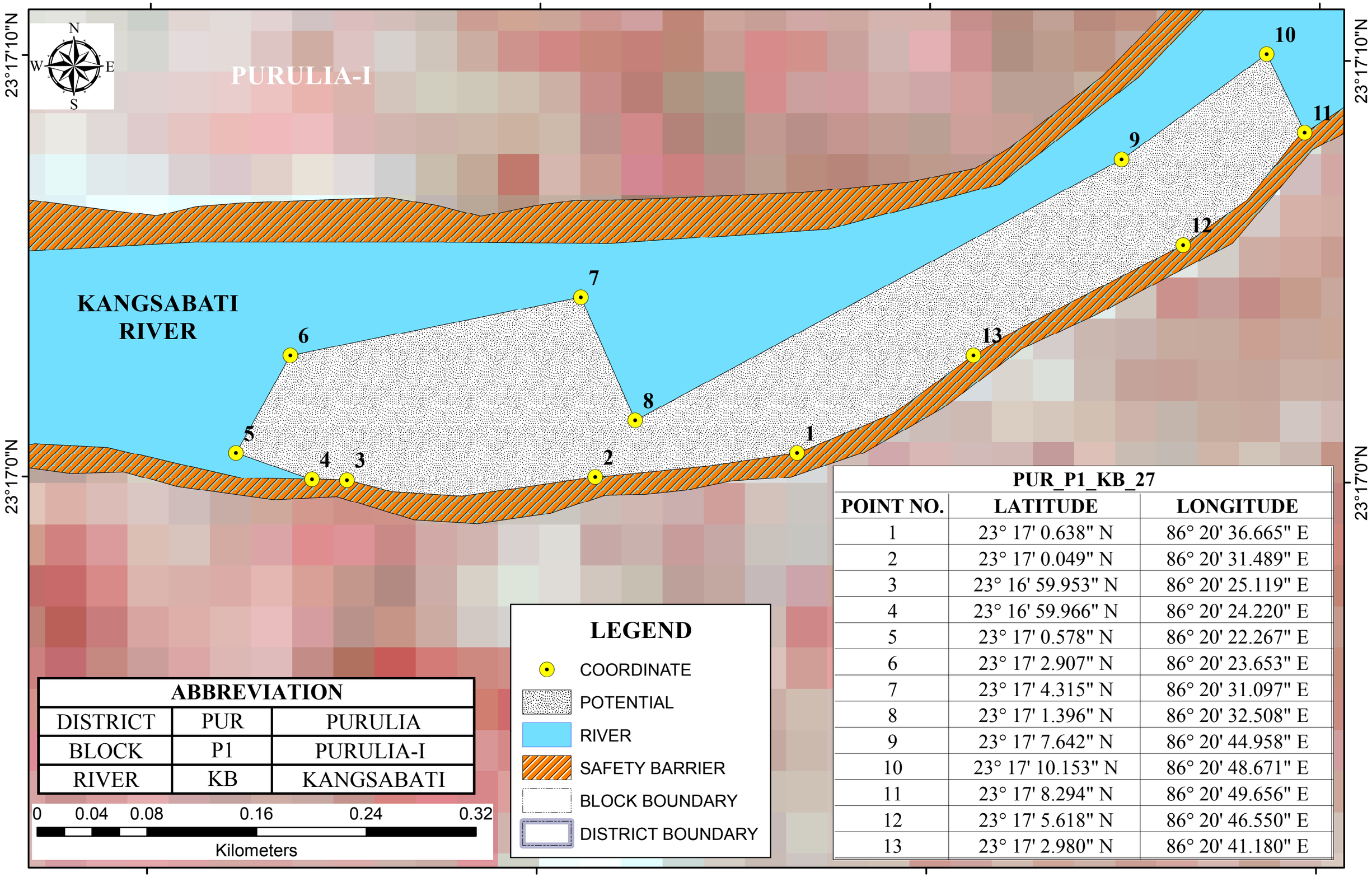
POTENTIAL BLOCK PUR_P2_KB_26 OF KANGSABATI RIVER



ABBREVIATION		
DISTRICT	PUR	PURULIA
BLOCK	P2	PURULIA-II
RIVER	KB	KANGSABATI

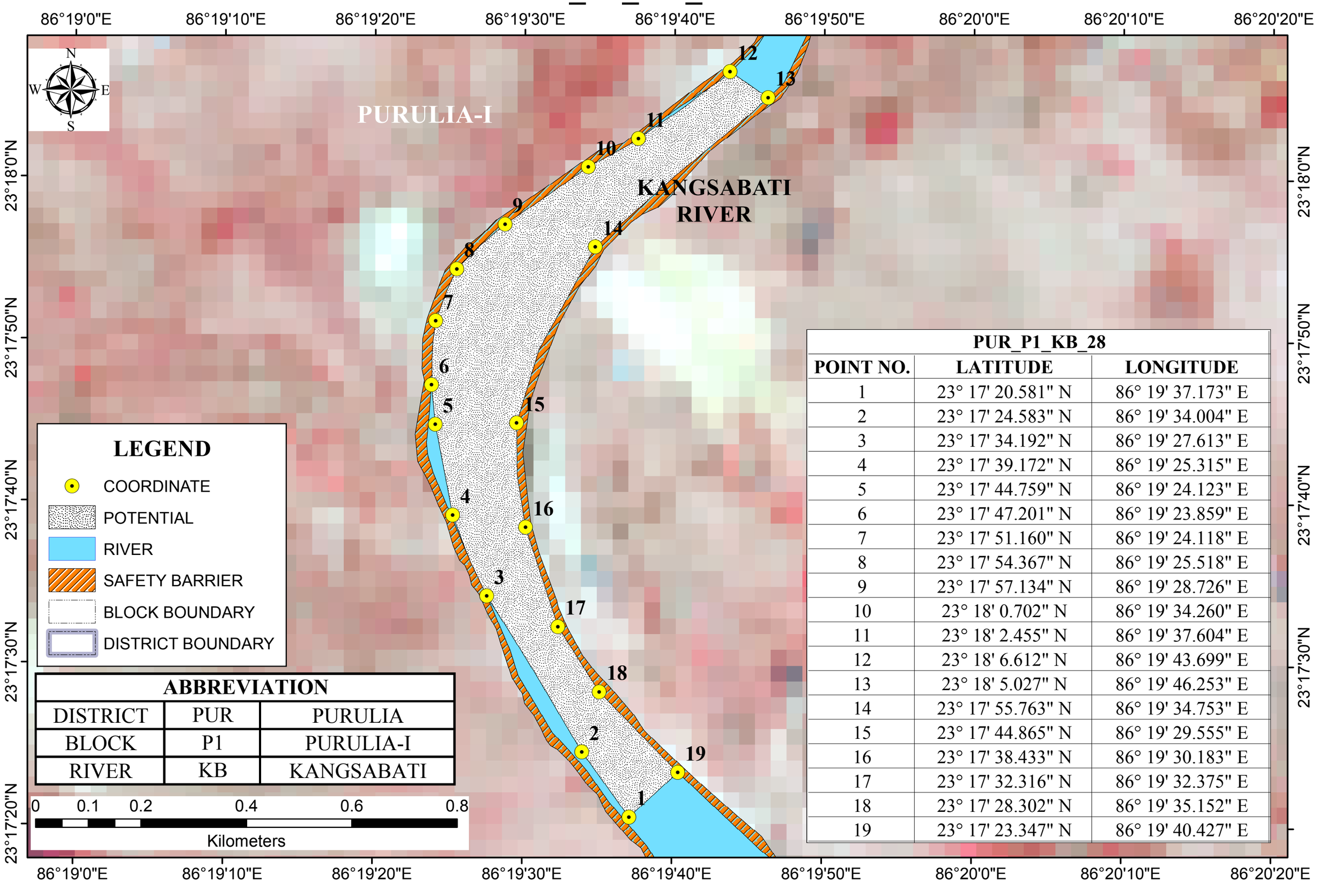
PUR_P2_KB_26		
POINT NO.	LATITUDE	LONGITUDE
1	23° 17' 12.612" N	86° 22' 36.850" E
2	23° 17' 13.266" N	86° 22' 34.499" E
3	23° 17' 13.377" N	86° 22' 33.468" E
4	23° 17' 15.730" N	86° 22' 34.093" E
5	23° 17' 16.252" N	86° 22' 35.836" E
6	23° 17' 17.973" N	86° 22' 45.453" E
7	23° 17' 18.673" N	86° 22' 51.277" E
8	23° 17' 18.961" N	86° 22' 52.055" E
9	23° 17' 19.478" N	86° 22' 56.556" E
10	23° 17' 17.216" N	86° 22' 56.713" E
11	23° 17' 15.774" N	86° 22' 53.242" E
12	23° 17' 15.049" N	86° 22' 47.434" E
13	23° 17' 13.760" N	86° 22' 45.338" E
14	23° 17' 12.881" N	86° 22' 42.258" E

POTENTIAL BLOCK PUR_P1_KB_27 OF KANGSABATI RIVER



PUR_P1_KB_27		
POINT NO.	LATITUDE	LONGITUDE
1	23° 17' 0.638" N	86° 20' 36.665" E
2	23° 17' 0.049" N	86° 20' 31.489" E
3	23° 16' 59.953" N	86° 20' 25.119" E
4	23° 16' 59.966" N	86° 20' 24.220" E
5	23° 17' 0.578" N	86° 20' 22.267" E
6	23° 17' 2.907" N	86° 20' 23.653" E
7	23° 17' 4.315" N	86° 20' 31.097" E
8	23° 17' 1.396" N	86° 20' 32.508" E
9	23° 17' 7.642" N	86° 20' 44.958" E
10	23° 17' 10.153" N	86° 20' 48.671" E
11	23° 17' 8.294" N	86° 20' 49.656" E
12	23° 17' 5.618" N	86° 20' 46.550" E
13	23° 17' 2.980" N	86° 20' 41.180" E

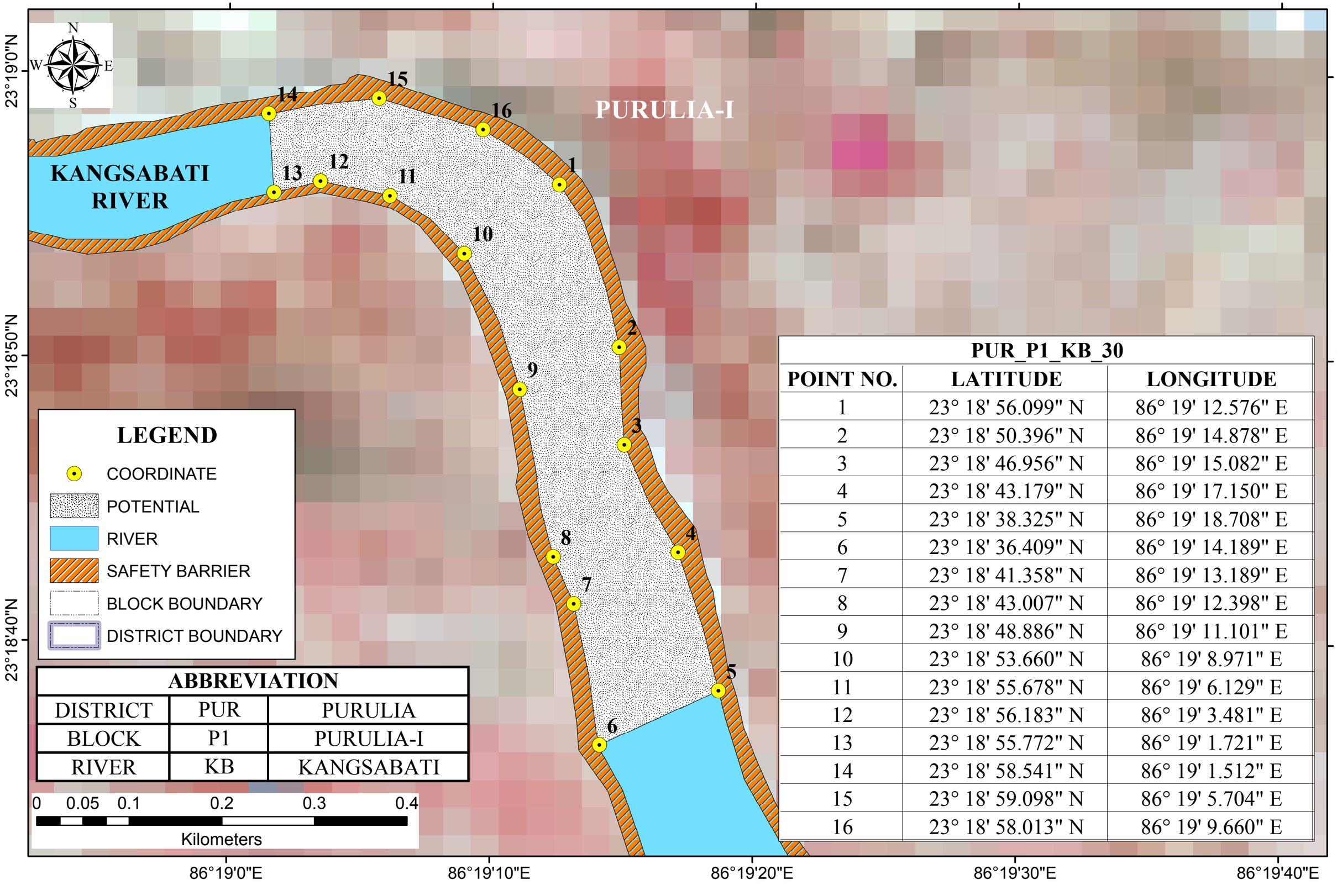
POTENTIAL BLOCK PUR_P1_KB_28 OF KANGSABATI RIVER



ABBREVIATION		
DISTRICT	PUR	PURULIA
BLOCK	P1	PURULIA-I
RIVER	KB	KANGSABATI

PUR_P1_KB_28		
POINT NO.	LATITUDE	LONGITUDE
1	23° 17' 20.581" N	86° 19' 37.173" E
2	23° 17' 24.583" N	86° 19' 34.004" E
3	23° 17' 34.192" N	86° 19' 27.613" E
4	23° 17' 39.172" N	86° 19' 25.315" E
5	23° 17' 44.759" N	86° 19' 24.123" E
6	23° 17' 47.201" N	86° 19' 23.859" E
7	23° 17' 51.160" N	86° 19' 24.118" E
8	23° 17' 54.367" N	86° 19' 25.518" E
9	23° 17' 57.134" N	86° 19' 28.726" E
10	23° 18' 0.702" N	86° 19' 34.260" E
11	23° 18' 2.455" N	86° 19' 37.604" E
12	23° 18' 6.612" N	86° 19' 43.699" E
13	23° 18' 5.027" N	86° 19' 46.253" E
14	23° 17' 55.763" N	86° 19' 34.753" E
15	23° 17' 44.865" N	86° 19' 29.555" E
16	23° 17' 38.433" N	86° 19' 30.183" E
17	23° 17' 32.316" N	86° 19' 32.375" E
18	23° 17' 28.302" N	86° 19' 35.152" E
19	23° 17' 23.347" N	86° 19' 40.427" E

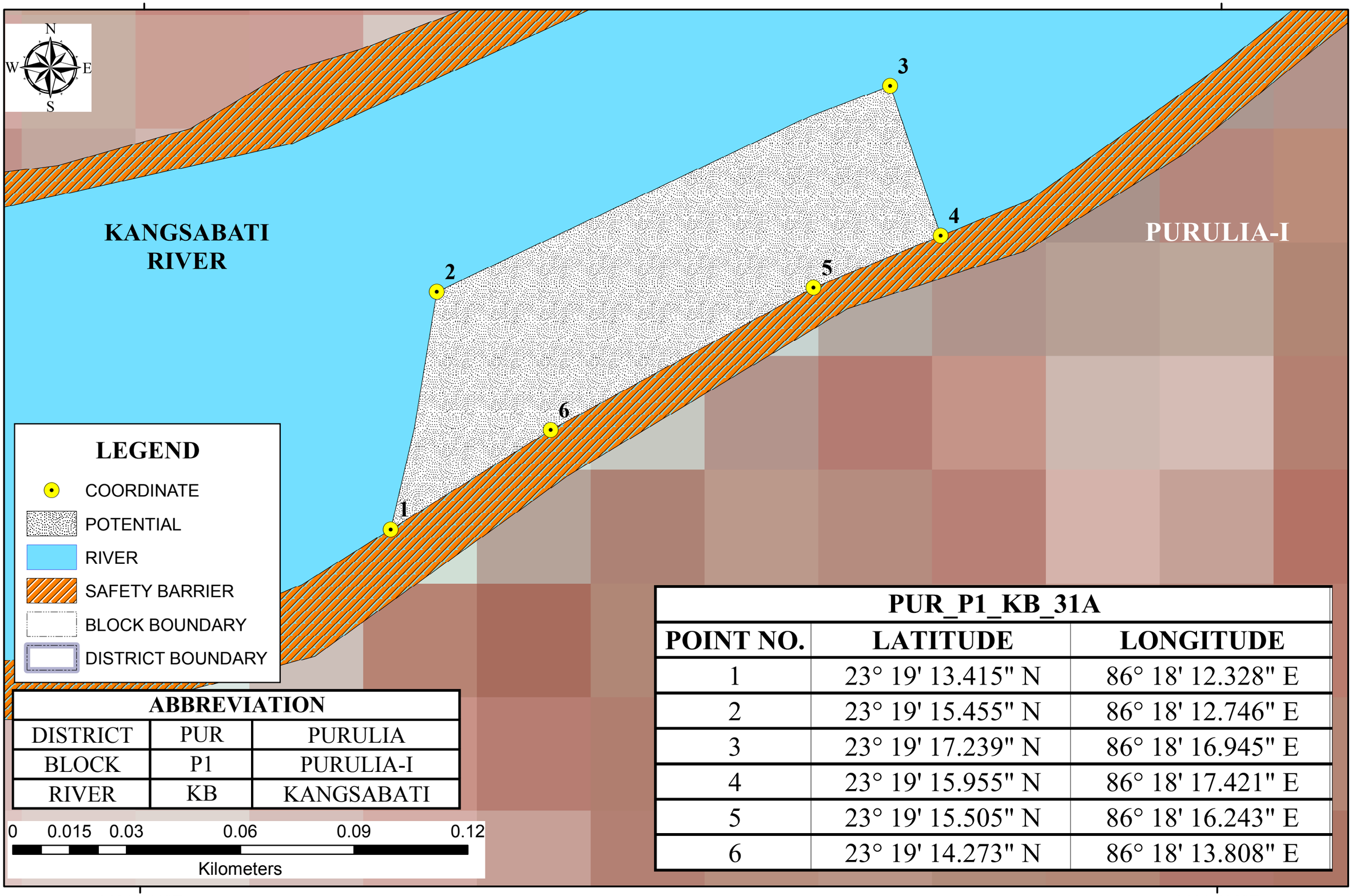
POTENTIAL BLOCK PUR_P1_KB_30 OF KANGSABATI RIVER



ABBREVIATION		
DISTRICT	PUR	PURULIA
BLOCK	P1	PURULIA-I
RIVER	KB	KANGSABATI

PUR_P1_KB_30		
POINT NO.	LATITUDE	LONGITUDE
1	23° 18' 56.099" N	86° 19' 12.576" E
2	23° 18' 50.396" N	86° 19' 14.878" E
3	23° 18' 46.956" N	86° 19' 15.082" E
4	23° 18' 43.179" N	86° 19' 17.150" E
5	23° 18' 38.325" N	86° 19' 18.708" E
6	23° 18' 36.409" N	86° 19' 14.189" E
7	23° 18' 41.358" N	86° 19' 13.189" E
8	23° 18' 43.007" N	86° 19' 12.398" E
9	23° 18' 48.886" N	86° 19' 11.101" E
10	23° 18' 53.660" N	86° 19' 8.971" E
11	23° 18' 55.678" N	86° 19' 6.129" E
12	23° 18' 56.183" N	86° 19' 3.481" E
13	23° 18' 55.772" N	86° 19' 1.721" E
14	23° 18' 58.541" N	86° 19' 1.512" E
15	23° 18' 59.098" N	86° 19' 5.704" E
16	23° 18' 58.013" N	86° 19' 9.660" E

POTENTIAL BLOCK PUR_P1_KB_31A OF KANGSABATI RIVER



ABBREVIATION		
DISTRICT	PUR	PURULIA
BLOCK	P1	PURULIA-I
RIVER	KB	KANGSABATI

PUR_P1_KB_31A		
POINT NO.	LATITUDE	LONGITUDE
1	23° 19' 13.415" N	86° 18' 12.328" E
2	23° 19' 15.455" N	86° 18' 12.746" E
3	23° 19' 17.239" N	86° 18' 16.945" E
4	23° 19' 15.955" N	86° 18' 17.421" E
5	23° 19' 15.505" N	86° 18' 16.243" E
6	23° 19' 14.273" N	86° 18' 13.808" E

POTENTIAL BLOCK PUR_P1_KB_32 OF KANGSABATI RIVER

86°16'50"E

86°17'0"E

23°20'0"N

N
W
E
S

PURULIA-I

KANGSABATI RIVER

1
2
3
4
5
6
7
8

LEGEND

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

ABBREVIATION		
DISTRICT	PUR	PURULIA
BLOCK	P1	PURULIA-I
RIVER	KB	KANGSABATI

0 0.0225 0.045 0.09 0.135 0.18

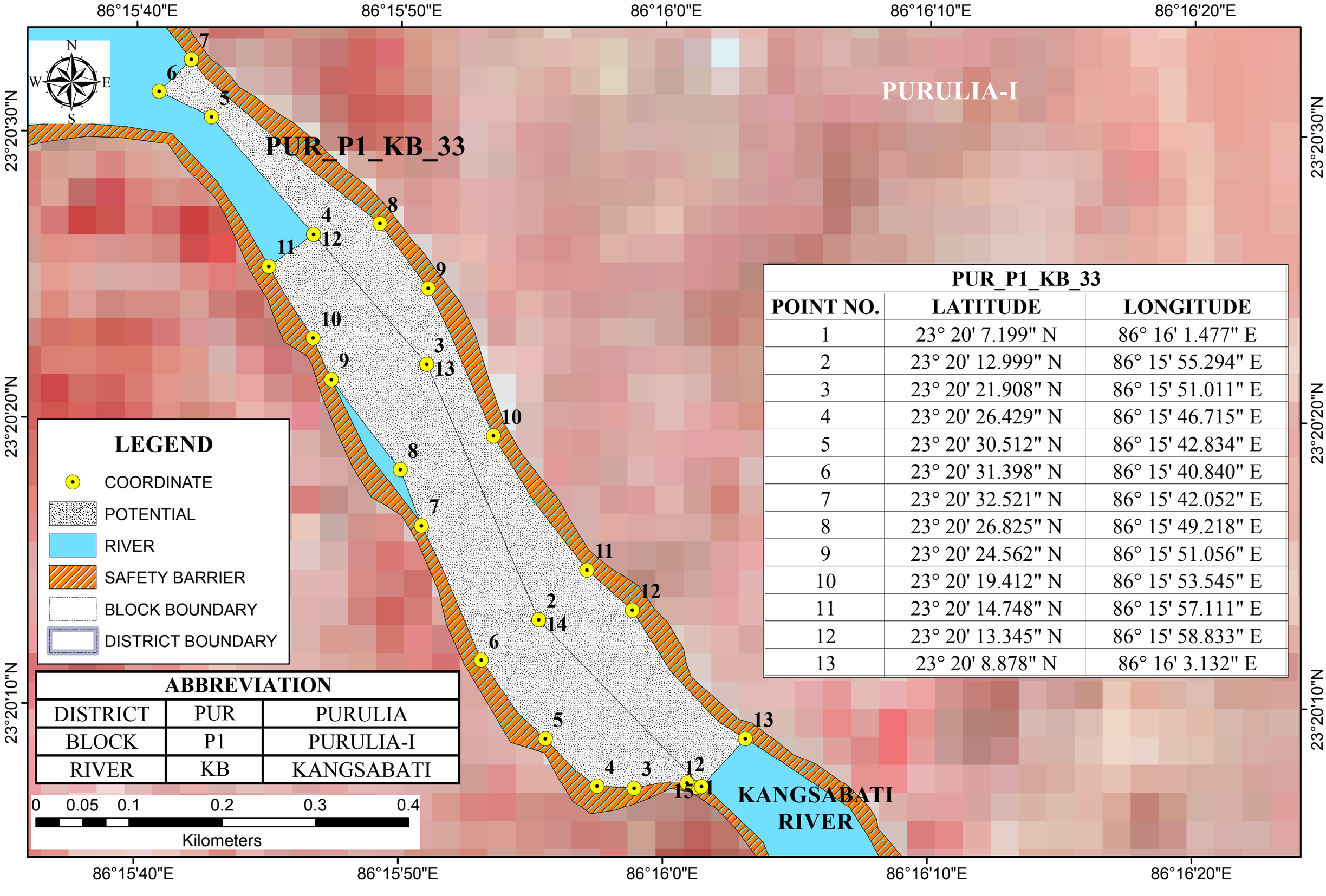
Kilometers

PUR_P1_KB_32		
POINT NO.	LATITUDE	LONGITUDE
1	23° 19' 58.687" N	86° 16' 56.910" E
2	23° 19' 56.724" N	86° 16' 56.370" E
3	23° 19' 56.955" N	86° 16' 55.820" E
4	23° 19' 59.600" N	86° 16' 52.566" E
5	23° 19' 59.378" N	86° 16' 46.570" E
6	23° 20' 1.551" N	86° 16' 46.503" E
7	23° 20' 1.990" N	86° 16' 52.726" E
8	23° 20' 1.001" N	86° 16' 54.827" E

86°16'50"E

86°17'0"E

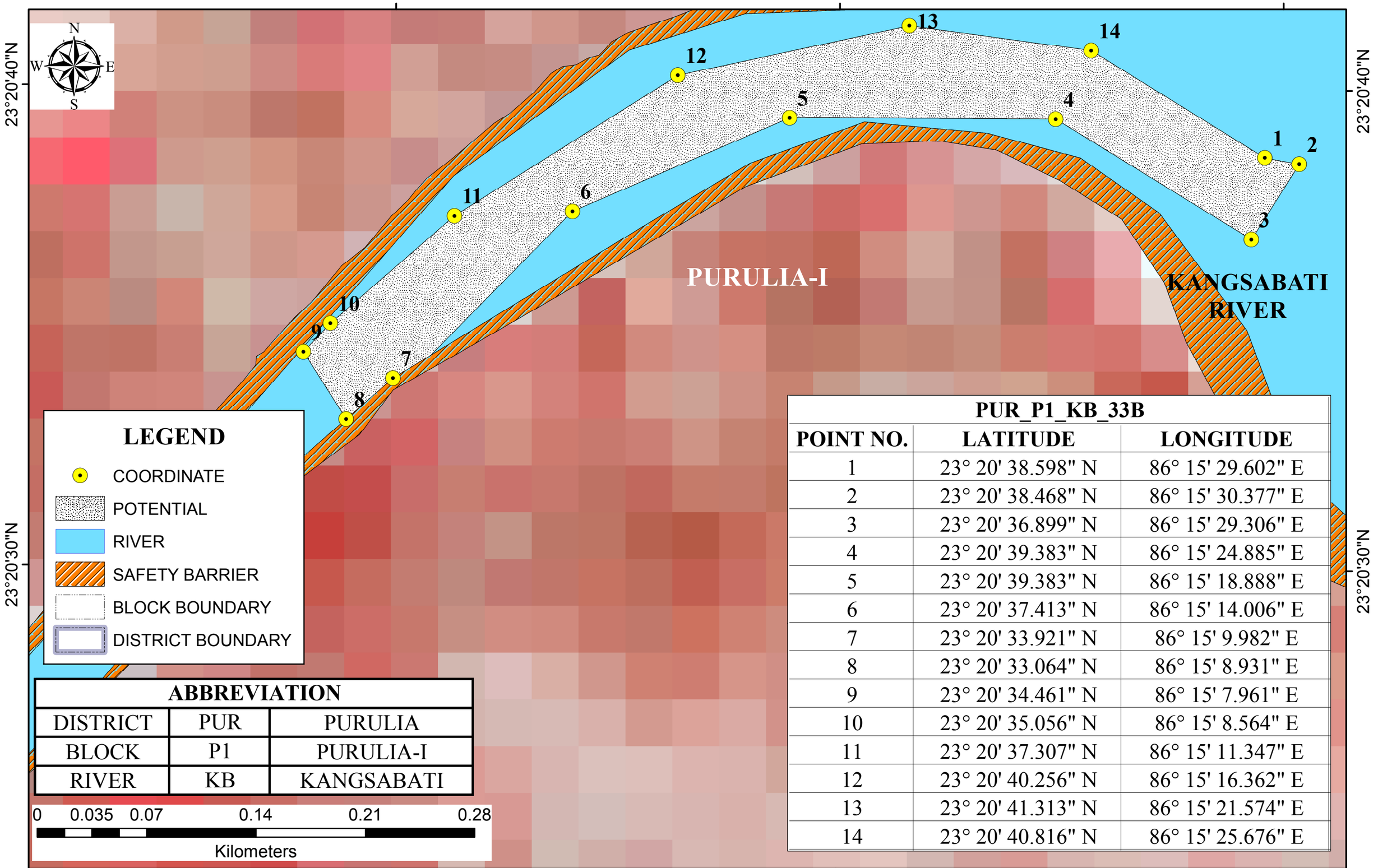
POTENTIAL BLOCK PUR_P1_KB_33 OF KANGSABATI RIVER



PUR_P1_KB_33		
POINT NO.	**LATITUDE**	**LONGITUDE**
1	23° 20' 7.199" N	86° 16' 1.477" E
2	23° 20' 12.999" N	86° 15' 55.294" E
3	23° 20' 21.908" N	86° 15' 51.011" E
4	23° 20' 26.429" N	86° 15' 46.715" E
5	23° 20' 30.512" N	86° 15' 42.834" E
6	23° 20' 31.398" N	86° 15' 40.840" E
7	23° 20' 32.521" N	86° 15' 42.052" E
8	23° 20' 26.825" N	86° 15' 49.218" E
9	23° 20' 24.562" N	86° 15' 51.056" E
10	23° 20' 19.412" N	86° 15' 53.545" E
11	23° 20' 14.748" N	86° 15' 57.111" E
12	23° 20' 13.345" N	86° 15' 58.833" E
13	23° 20' 8.878" N	86° 16' 3.132" E

ABBREVIATION		
DISTRICT	PUR	PURULIA
BLOCK	P1	PURULIA-I
RIVER	KB	KANGSABATI

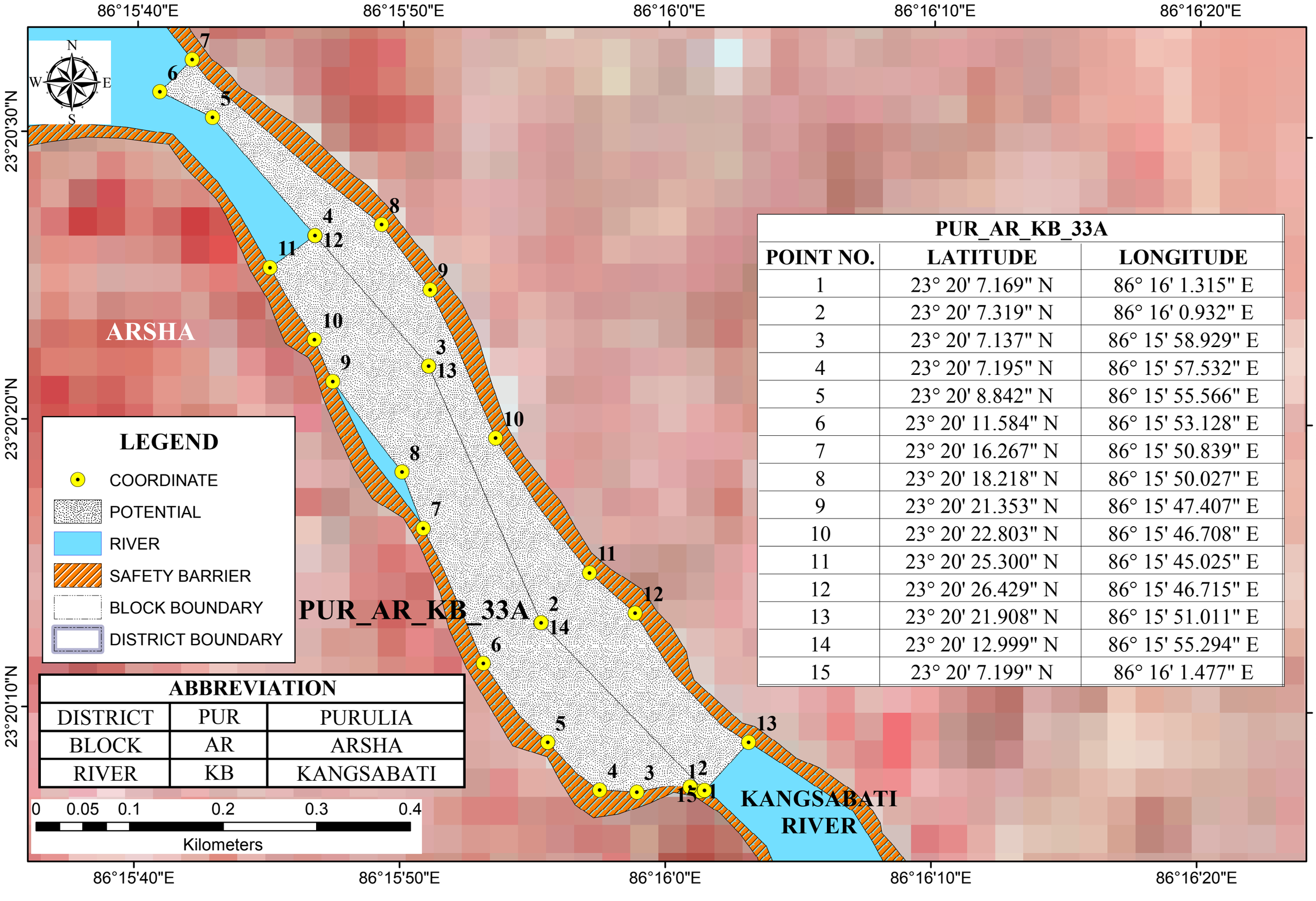
POTENTIAL BLOCK PUR_P1_KB_33B OF KANGSABATI RIVER



ABBREVIATION		
DISTRICT	PUR	PURULIA
BLOCK	P1	PURULIA-I
RIVER	KB	KANGSABATI

PUR_P1_KB_33B		
POINT NO.	LATITUDE	LONGITUDE
1	23° 20' 38.598" N	86° 15' 29.602" E
2	23° 20' 38.468" N	86° 15' 30.377" E
3	23° 20' 36.899" N	86° 15' 29.306" E
4	23° 20' 39.383" N	86° 15' 24.885" E
5	23° 20' 39.383" N	86° 15' 18.888" E
6	23° 20' 37.413" N	86° 15' 14.006" E
7	23° 20' 33.921" N	86° 15' 9.982" E
8	23° 20' 33.064" N	86° 15' 8.931" E
9	23° 20' 34.461" N	86° 15' 7.961" E
10	23° 20' 35.056" N	86° 15' 8.564" E
11	23° 20' 37.307" N	86° 15' 11.347" E
12	23° 20' 40.256" N	86° 15' 16.362" E
13	23° 20' 41.313" N	86° 15' 21.574" E
14	23° 20' 40.816" N	86° 15' 25.676" E

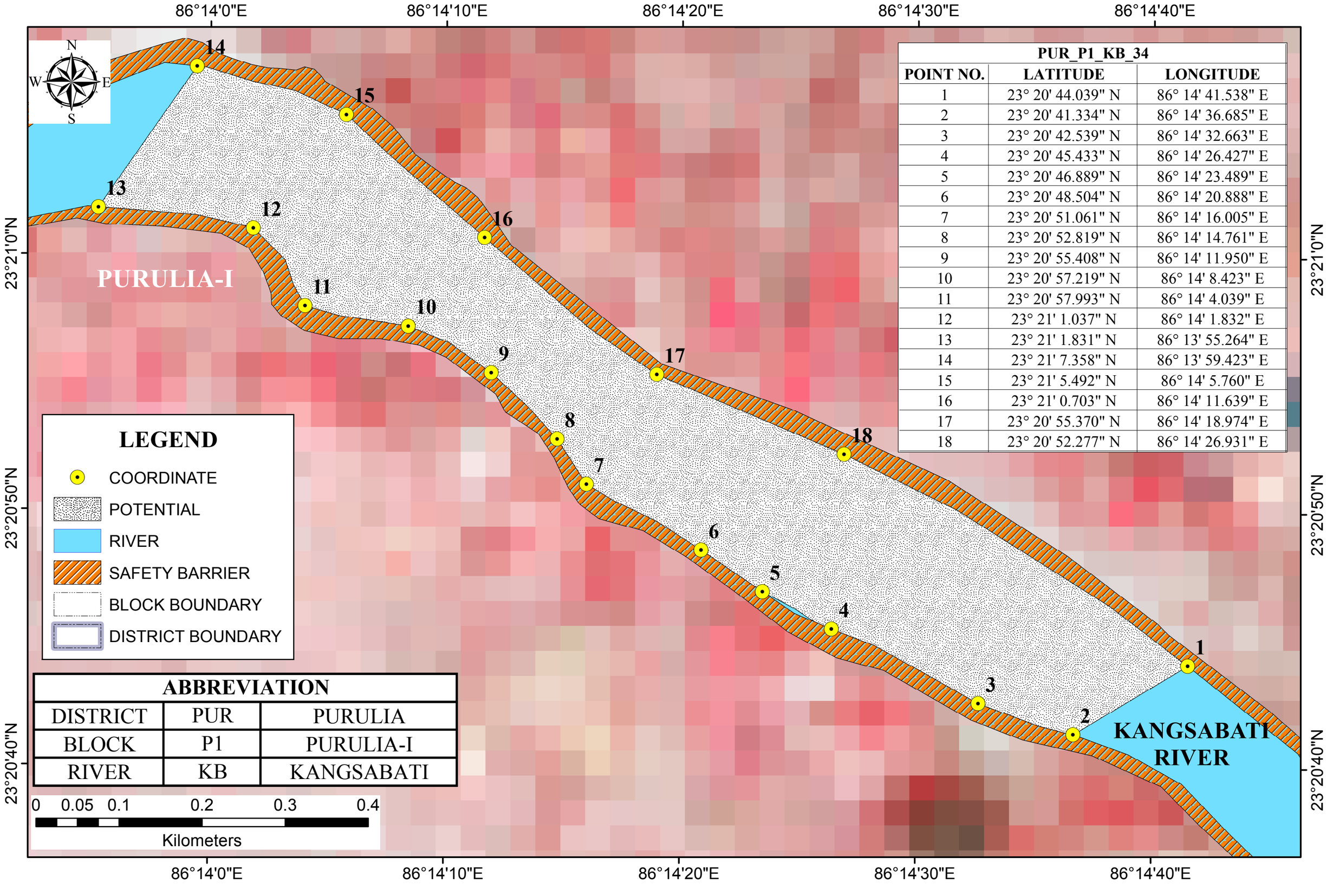
POTENTIAL BLOCK PUR_AR_KB_33A OF KANGSABATI RIVER



PUR_AR_KB_33A		
POINT NO.	LATITUDE	LONGITUDE
1	23° 20' 7.169" N	86° 16' 1.315" E
2	23° 20' 7.319" N	86° 16' 0.932" E
3	23° 20' 7.137" N	86° 15' 58.929" E
4	23° 20' 7.195" N	86° 15' 57.532" E
5	23° 20' 8.842" N	86° 15' 55.566" E
6	23° 20' 11.584" N	86° 15' 53.128" E
7	23° 20' 16.267" N	86° 15' 50.839" E
8	23° 20' 18.218" N	86° 15' 50.027" E
9	23° 20' 21.353" N	86° 15' 47.407" E
10	23° 20' 22.803" N	86° 15' 46.708" E
11	23° 20' 25.300" N	86° 15' 45.025" E
12	23° 20' 26.429" N	86° 15' 46.715" E
13	23° 20' 21.908" N	86° 15' 51.011" E
14	23° 20' 12.999" N	86° 15' 55.294" E
15	23° 20' 7.199" N	86° 16' 1.477" E

ABBREVIATION		
DISTRICT	PUR	PURULIA
BLOCK	AR	ARSHA
RIVER	KB	KANGSABATI

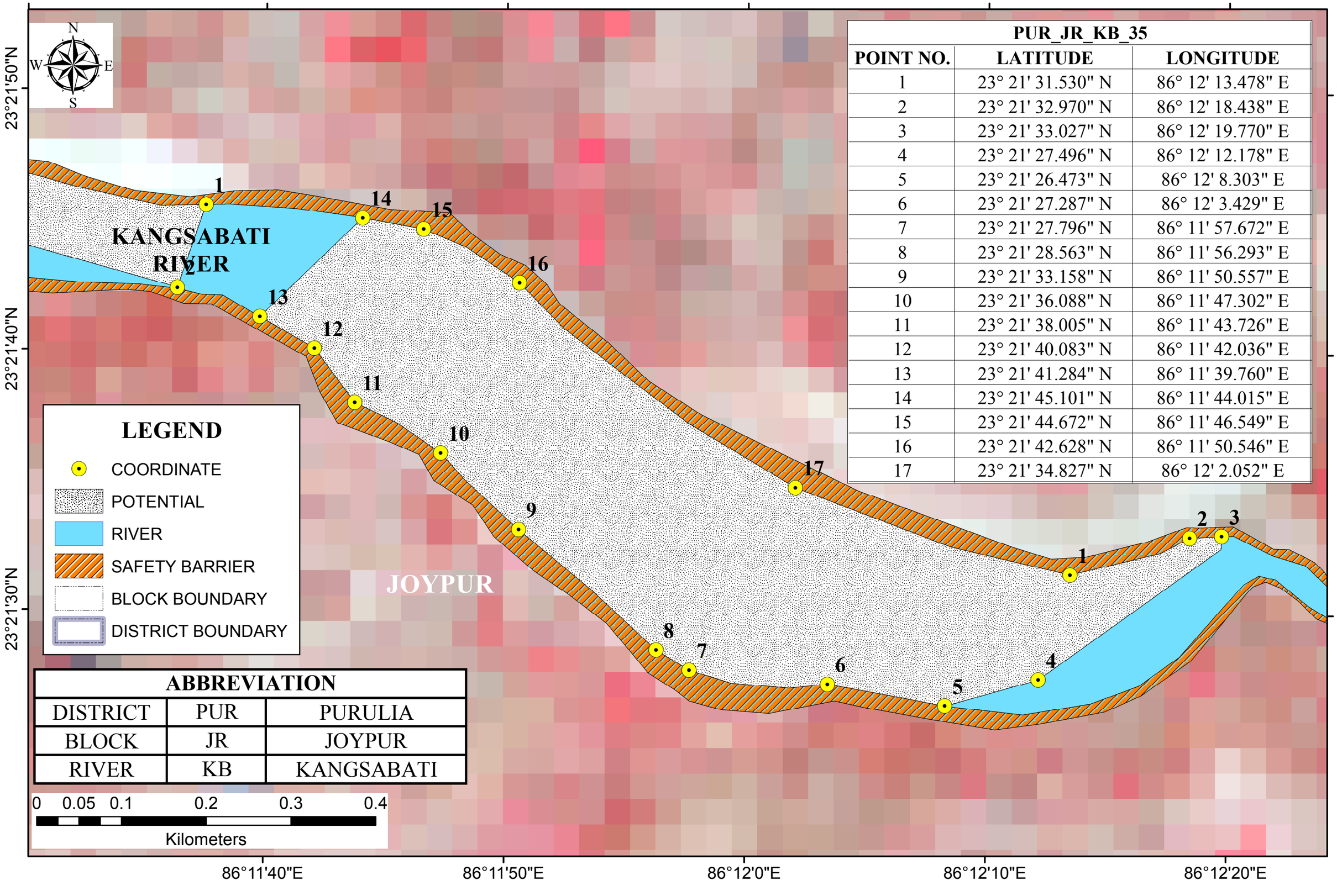
POTENTIAL BLOCK PUR_P1_KB_34 OF KANGSABATI RIVER



PUR_P1_KB_34		
POINT NO.	LATITUDE	LONGITUDE
1	23° 20' 44.039" N	86° 14' 41.538" E
2	23° 20' 41.334" N	86° 14' 36.685" E
3	23° 20' 42.539" N	86° 14' 32.663" E
4	23° 20' 45.433" N	86° 14' 26.427" E
5	23° 20' 46.889" N	86° 14' 23.489" E
6	23° 20' 48.504" N	86° 14' 20.888" E
7	23° 20' 51.061" N	86° 14' 16.005" E
8	23° 20' 52.819" N	86° 14' 14.761" E
9	23° 20' 55.408" N	86° 14' 11.950" E
10	23° 20' 57.219" N	86° 14' 8.423" E
11	23° 20' 57.993" N	86° 14' 4.039" E
12	23° 21' 1.037" N	86° 14' 1.832" E
13	23° 21' 1.831" N	86° 13' 55.264" E
14	23° 21' 7.358" N	86° 13' 59.423" E
15	23° 21' 5.492" N	86° 14' 5.760" E
16	23° 21' 0.703" N	86° 14' 11.639" E
17	23° 20' 55.370" N	86° 14' 18.974" E
18	23° 20' 52.277" N	86° 14' 26.931" E

ABBREVIATION		
DISTRICT	PUR	PURULIA
BLOCK	P1	PURULIA-I
RIVER	KB	KANGSABATI

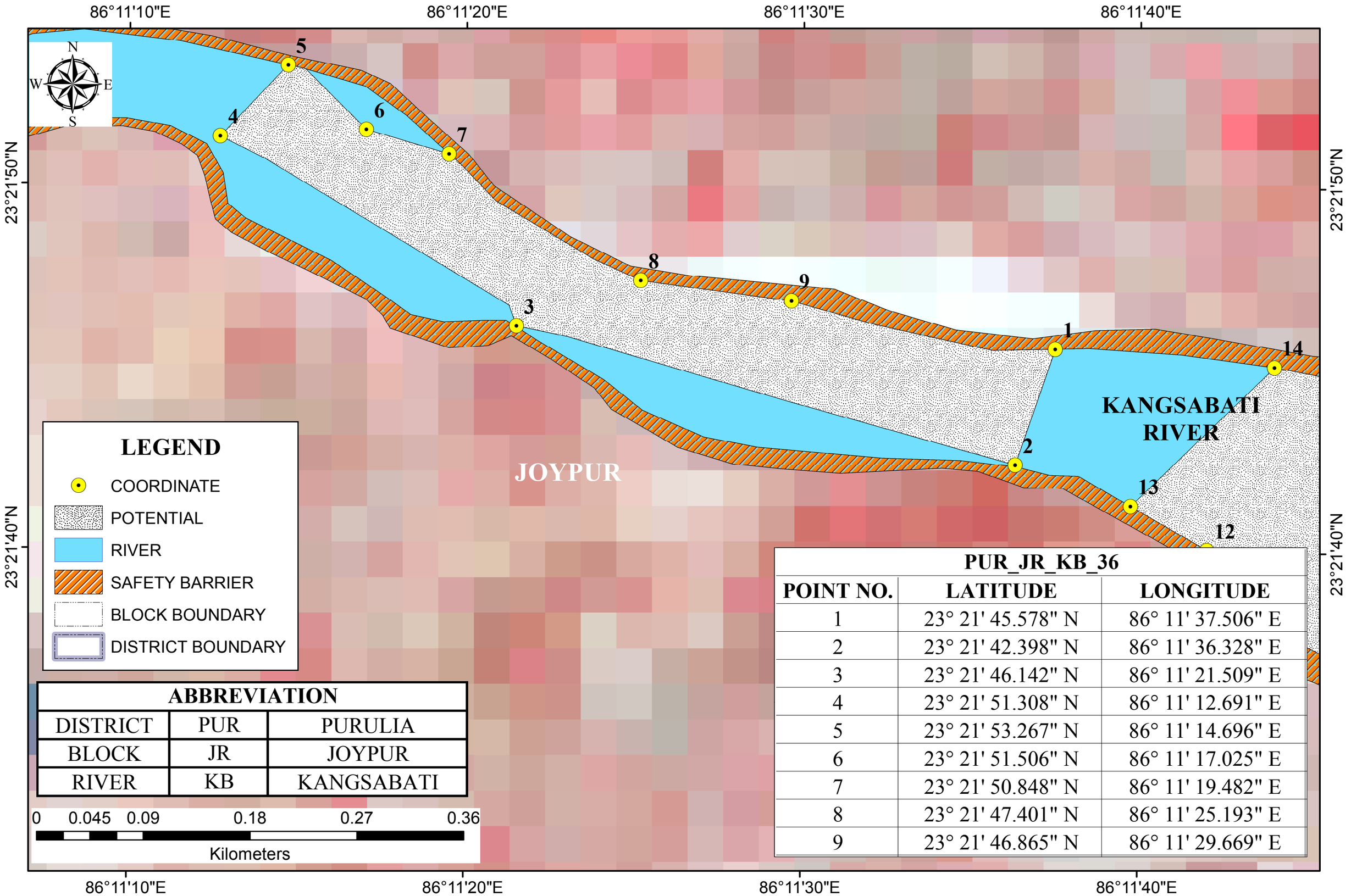
POTENTIAL BLOCK PUR_JR_KB_35 OF KANGSABATI RIVER



PUR_JR_KB_35		
POINT NO.	LATITUDE	LONGITUDE
1	23° 21' 31.530" N	86° 12' 13.478" E
2	23° 21' 32.970" N	86° 12' 18.438" E
3	23° 21' 33.027" N	86° 12' 19.770" E
4	23° 21' 27.496" N	86° 12' 12.178" E
5	23° 21' 26.473" N	86° 12' 8.303" E
6	23° 21' 27.287" N	86° 12' 3.429" E
7	23° 21' 27.796" N	86° 11' 57.672" E
8	23° 21' 28.563" N	86° 11' 56.293" E
9	23° 21' 33.158" N	86° 11' 50.557" E
10	23° 21' 36.088" N	86° 11' 47.302" E
11	23° 21' 38.005" N	86° 11' 43.726" E
12	23° 21' 40.083" N	86° 11' 42.036" E
13	23° 21' 41.284" N	86° 11' 39.760" E
14	23° 21' 45.101" N	86° 11' 44.015" E
15	23° 21' 44.672" N	86° 11' 46.549" E
16	23° 21' 42.628" N	86° 11' 50.546" E
17	23° 21' 34.827" N	86° 12' 2.052" E

ABBREVIATION		
DISTRICT	PUR	PURULIA
BLOCK	JR	JOYPUR
RIVER	KB	KANGSABATI

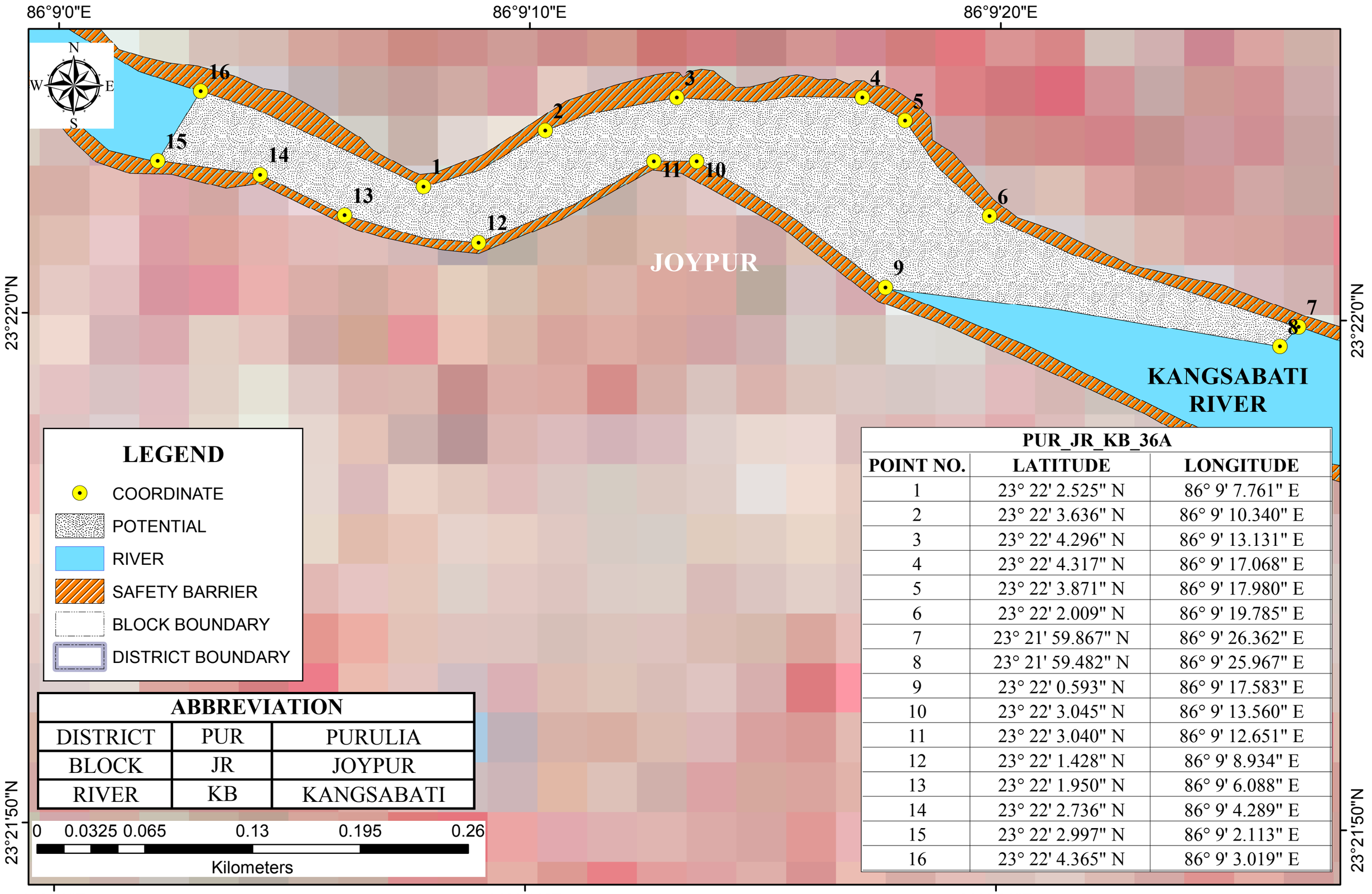
POTENTIAL BLOCK PUR_JR_KB_36 OF KANGSABATI RIVER



ABBREVIATION		
DISTRICT	PUR	PURULIA
BLOCK	JR	JOYPUR
RIVER	KB	KANGSABATI

PUR_JR_KB_36		
POINT NO.	LATITUDE	LONGITUDE
1	23° 21' 45.578" N	86° 11' 37.506" E
2	23° 21' 42.398" N	86° 11' 36.328" E
3	23° 21' 46.142" N	86° 11' 21.509" E
4	23° 21' 51.308" N	86° 11' 12.691" E
5	23° 21' 53.267" N	86° 11' 14.696" E
6	23° 21' 51.506" N	86° 11' 17.025" E
7	23° 21' 50.848" N	86° 11' 19.482" E
8	23° 21' 47.401" N	86° 11' 25.193" E
9	23° 21' 46.865" N	86° 11' 29.669" E

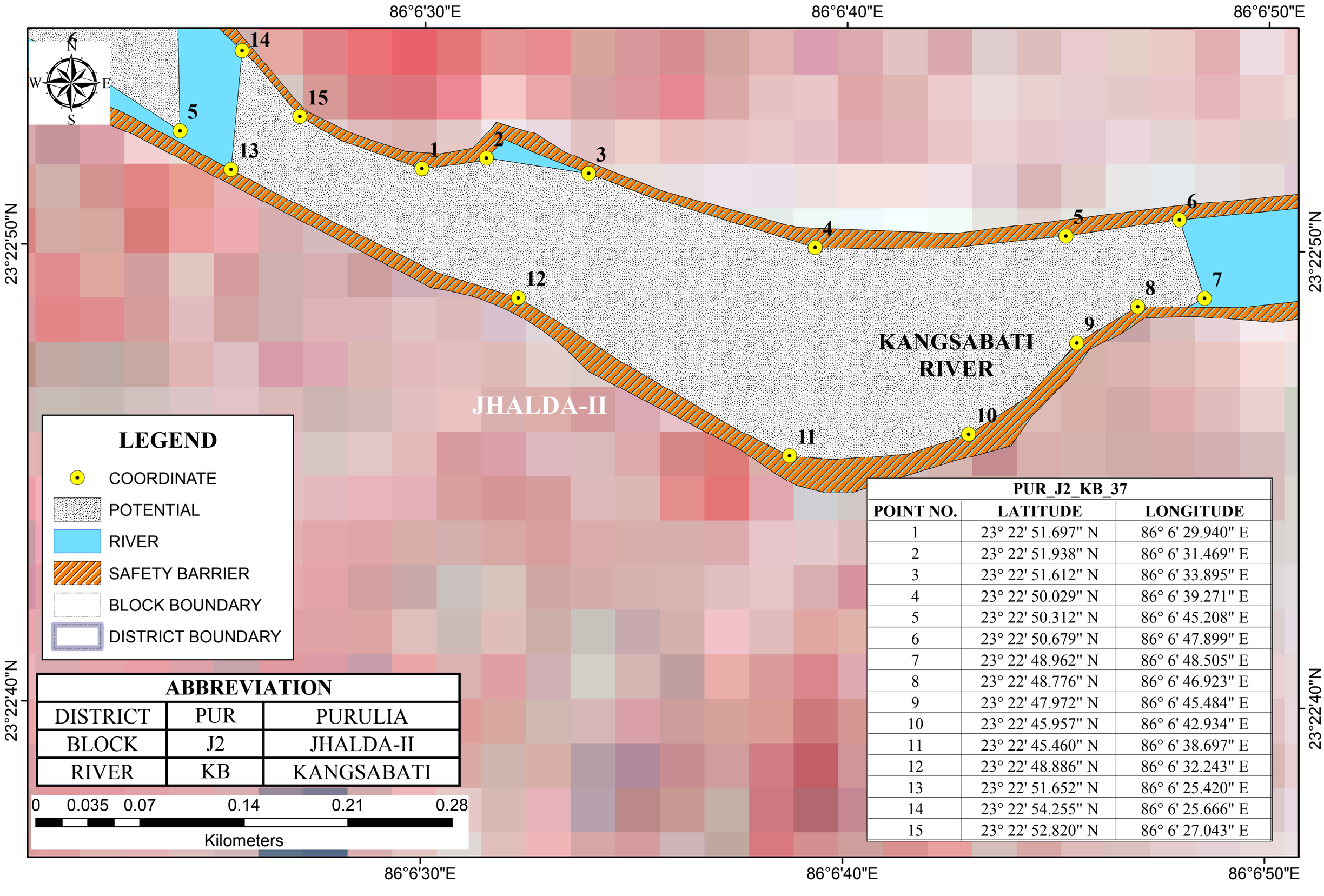
POTENTIAL BLOCK PUR_JR_KB_36A OF KANGSABATI RIVER



ABBREVIATION		
DISTRICT	PUR	PURULIA
BLOCK	JR	JOYPUR
RIVER	KB	KANGSABATI

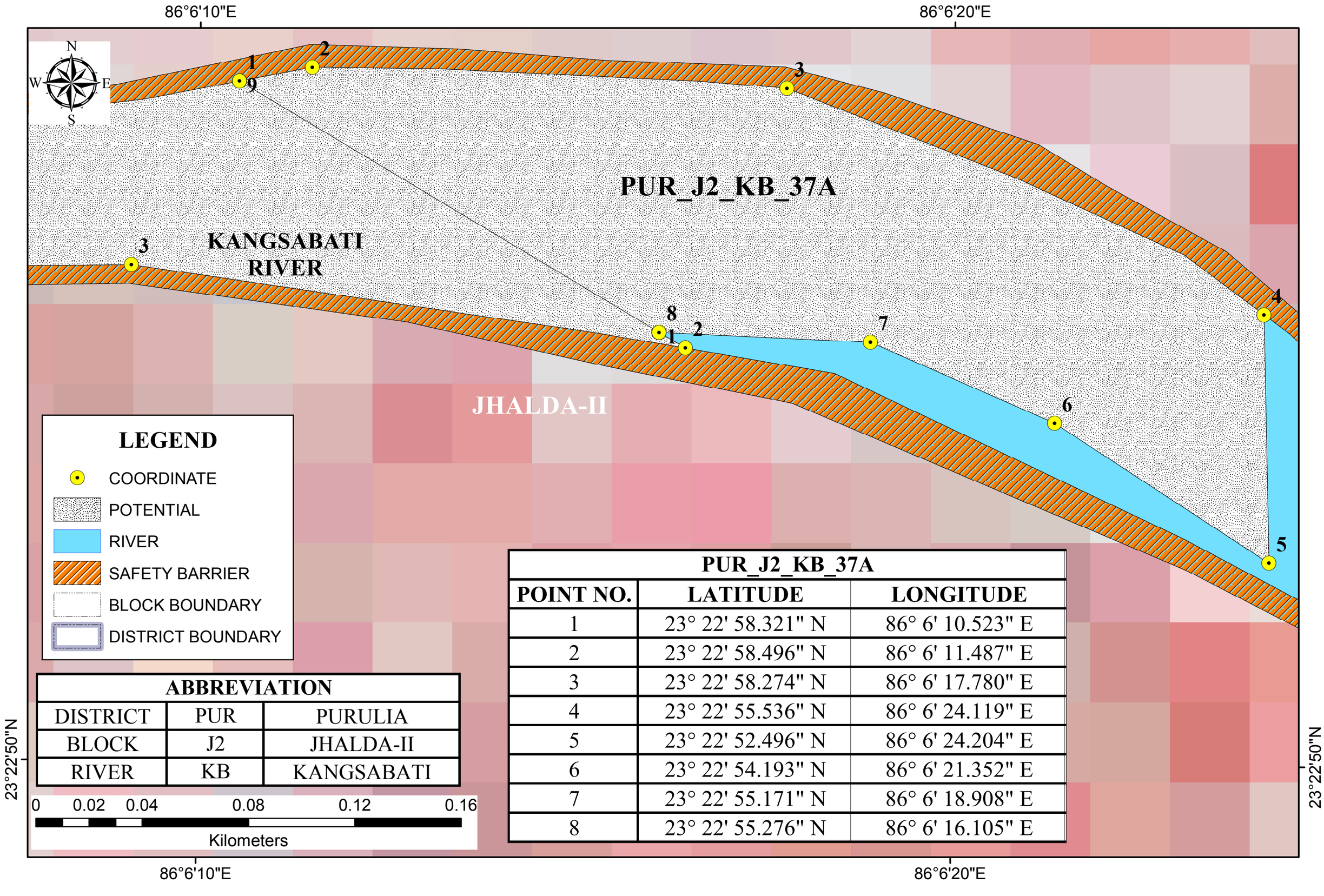
PUR_JR_KB_36A		
POINT NO.	LATITUDE	LONGITUDE
1	23° 22' 2.525" N	86° 9' 7.761" E
2	23° 22' 3.636" N	86° 9' 10.340" E
3	23° 22' 4.296" N	86° 9' 13.131" E
4	23° 22' 4.317" N	86° 9' 17.068" E
5	23° 22' 3.871" N	86° 9' 17.980" E
6	23° 22' 2.009" N	86° 9' 19.785" E
7	23° 21' 59.867" N	86° 9' 26.362" E
8	23° 21' 59.482" N	86° 9' 25.967" E
9	23° 22' 0.593" N	86° 9' 17.583" E
10	23° 22' 3.045" N	86° 9' 13.560" E
11	23° 22' 3.040" N	86° 9' 12.651" E
12	23° 22' 1.428" N	86° 9' 8.934" E
13	23° 22' 1.950" N	86° 9' 6.088" E
14	23° 22' 2.736" N	86° 9' 4.289" E
15	23° 22' 2.997" N	86° 9' 2.113" E
16	23° 22' 4.365" N	86° 9' 3.019" E

POTENTIAL BLOCK PUR_J2_KB_37 OF KANGSABATI RIVER



PUR_J2_KB_37		
POINT NO.	LATITUDE	LONGITUDE
1	23° 22' 51.697" N	86° 6' 29.940" E
2	23° 22' 51.938" N	86° 6' 31.469" E
3	23° 22' 51.612" N	86° 6' 33.895" E
4	23° 22' 50.029" N	86° 6' 39.271" E
5	23° 22' 50.312" N	86° 6' 45.208" E
6	23° 22' 50.679" N	86° 6' 47.899" E
7	23° 22' 48.962" N	86° 6' 48.505" E
8	23° 22' 48.776" N	86° 6' 46.923" E
9	23° 22' 47.972" N	86° 6' 45.484" E
10	23° 22' 45.957" N	86° 6' 42.934" E
11	23° 22' 45.460" N	86° 6' 38.697" E
12	23° 22' 48.886" N	86° 6' 32.243" E
13	23° 22' 51.652" N	86° 6' 25.420" E
14	23° 22' 54.255" N	86° 6' 25.666" E
15	23° 22' 52.820" N	86° 6' 27.043" E

POTENTIAL BLOCK PUR_J2_KB_37A OF KANGSABATI RIVER



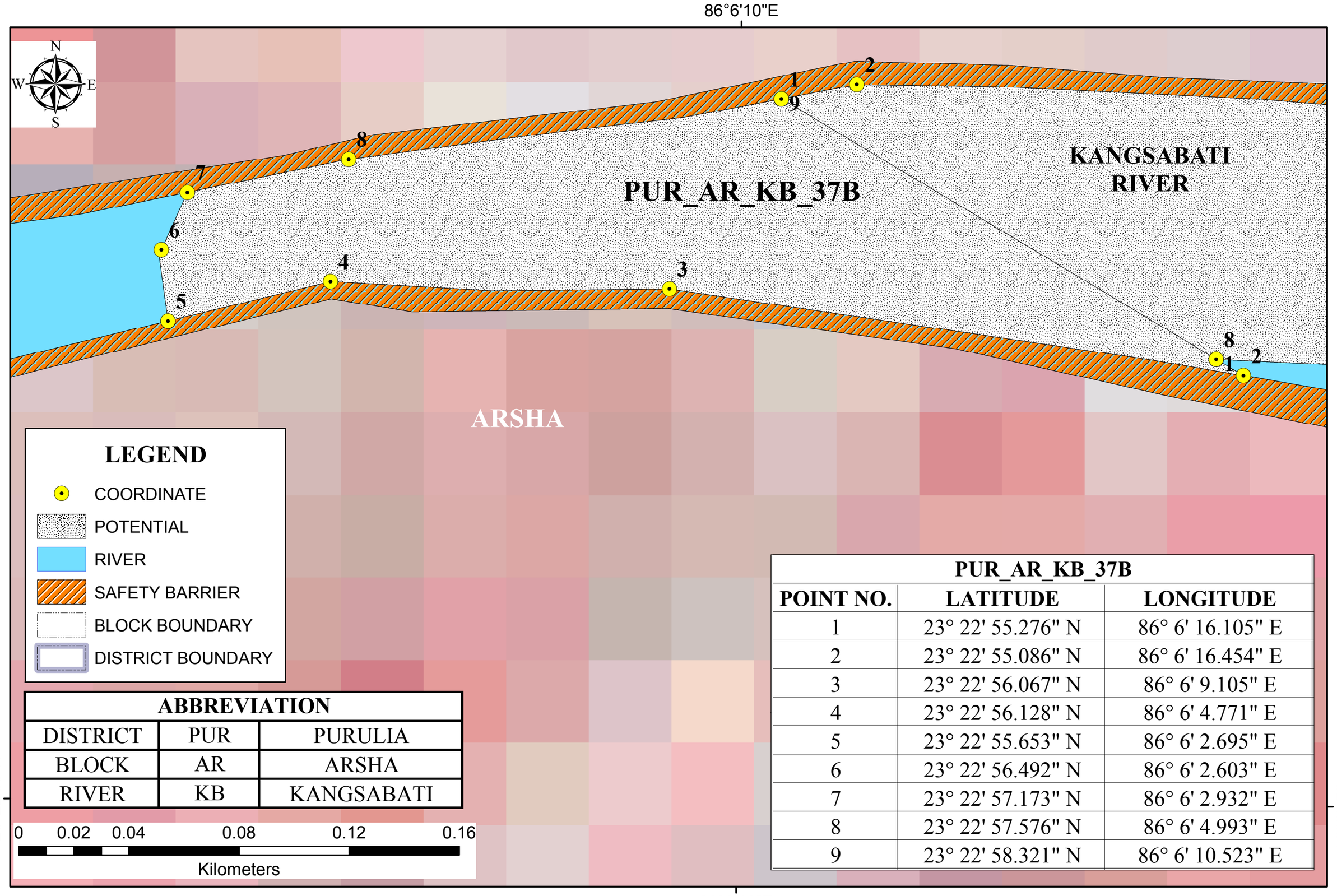
LEGEND

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

ABBREVIATION		
DISTRICT	PUR	PURULIA
BLOCK	J2	JHALDA-II
RIVER	KB	KANGSABATI

PUR_J2_KB_37A		
POINT NO.	LATITUDE	LONGITUDE
1	23° 22' 58.321" N	86° 6' 10.523" E
2	23° 22' 58.496" N	86° 6' 11.487" E
3	23° 22' 58.274" N	86° 6' 17.780" E
4	23° 22' 55.536" N	86° 6' 24.119" E
5	23° 22' 52.496" N	86° 6' 24.204" E
6	23° 22' 54.193" N	86° 6' 21.352" E
7	23° 22' 55.171" N	86° 6' 18.908" E
8	23° 22' 55.276" N	86° 6' 16.105" E

POTENTIAL BLOCK PUR_AR_KB_37B OF KANGSABATI RIVER



ABBREVIATION		
DISTRICT	PUR	PURULIA
BLOCK	AR	ARSHA
RIVER	KB	KANGSABATI

PUR_AR_KB_37B		
POINT NO.	LATITUDE	LONGITUDE
1	23° 22' 55.276" N	86° 6' 16.105" E
2	23° 22' 55.086" N	86° 6' 16.454" E
3	23° 22' 56.067" N	86° 6' 9.105" E
4	23° 22' 56.128" N	86° 6' 4.771" E
5	23° 22' 55.653" N	86° 6' 2.695" E
6	23° 22' 56.492" N	86° 6' 2.603" E
7	23° 22' 57.173" N	86° 6' 2.932" E
8	23° 22' 57.576" N	86° 6' 4.993" E
9	23° 22' 58.321" N	86° 6' 10.523" E

POTENTIAL BLOCK PUR_J2_KB_38 OF KANGSABATI RIVER

86°4'40"E

86°4'50"E

23°22'50"N

JHALDA-II

KANGSABATI RIVER

LEGEND

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

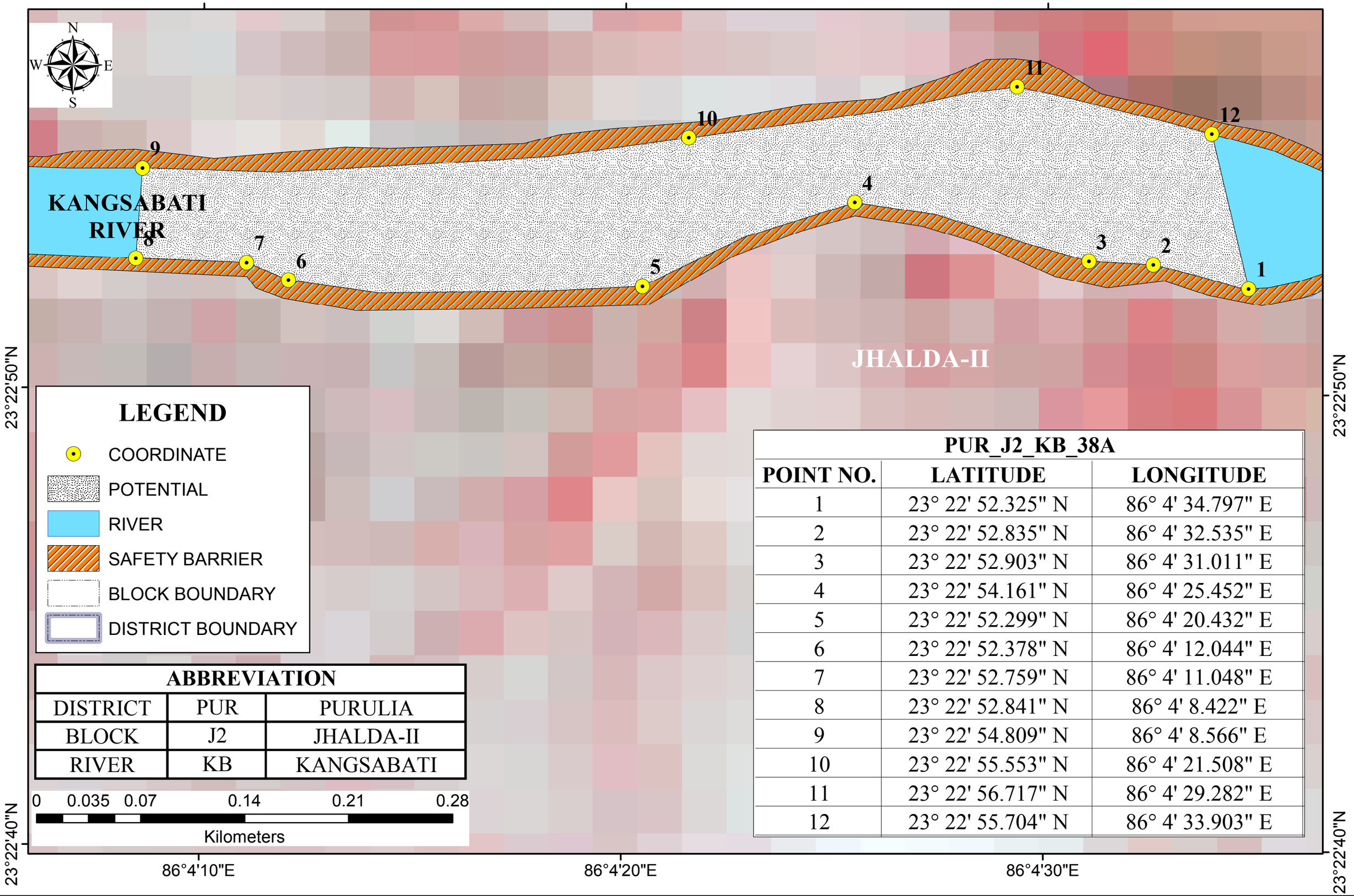
ABBREVIATION		
DISTRICT	PUR	PURULIA
BLOCK	J2	JHALDA-II
RIVER	KB	KANGSABATI

0 0.02 0.04 0.08 0.12 0.16

Kilometers

PUR_J2_KB_38		
POINT NO.	LATITUDE	LONGITUDE
1	23° 22' 52.452" N	86° 4' 41.036" E
2	23° 22' 54.075" N	86° 4' 40.457" E
3	23° 22' 54.062" N	86° 4' 42.255" E
4	23° 22' 59.458" N	86° 4' 51.933" E
5	23° 22' 57.946" N	86° 4' 53.439" E
6	23° 22' 54.949" N	86° 4' 49.687" E

POTENTIAL BLOCK PUR_J2_KB_38A OF KANGSABATI RIVER



LEGEND

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

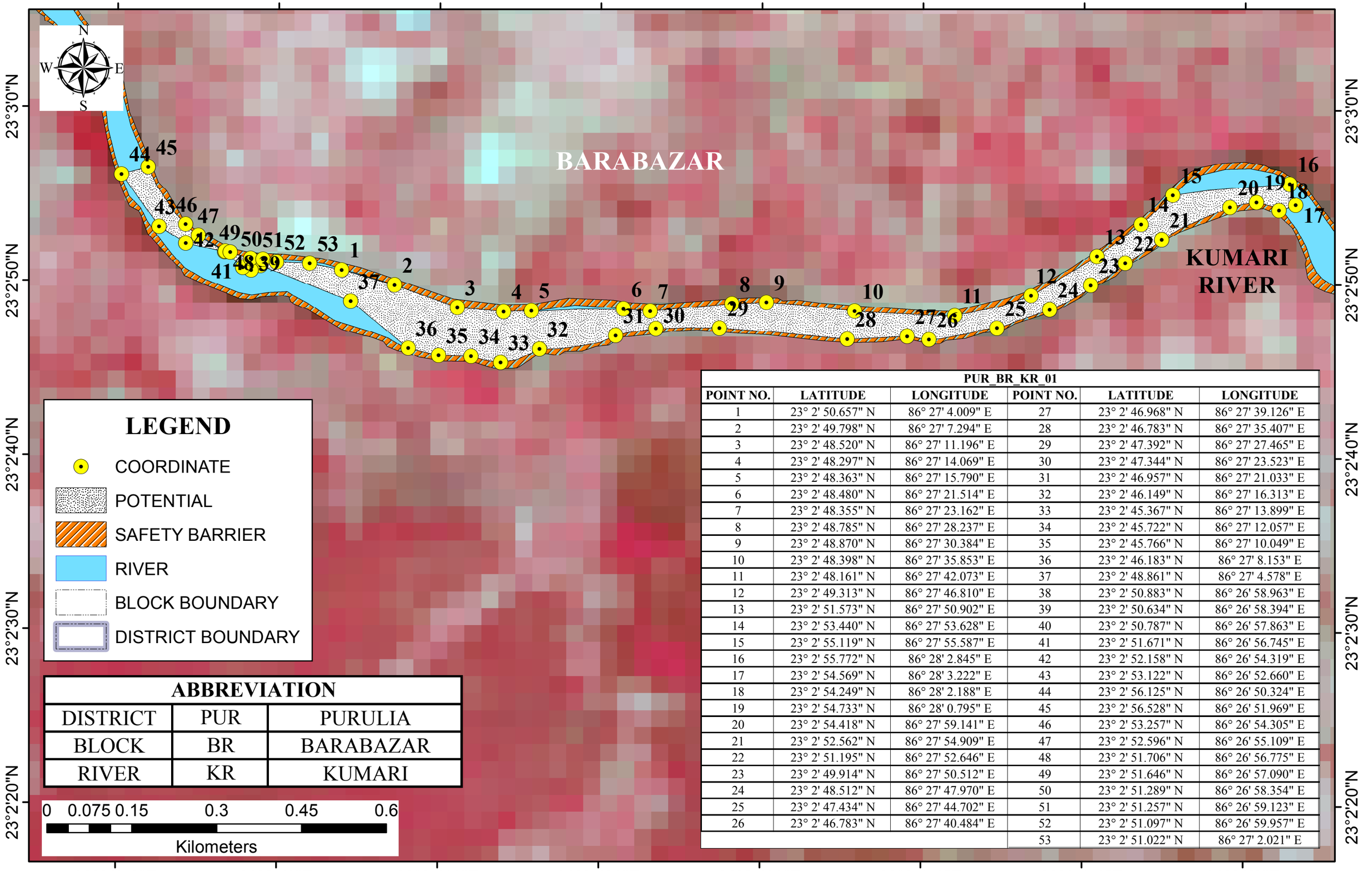
ABBREVIATION		
DISTRICT	PUR	PURULIA
BLOCK	J2	JHALDA-II
RIVER	KB	KANGSABATI

0 0.035 0.07 0.14 0.21 0.28

Kilometers

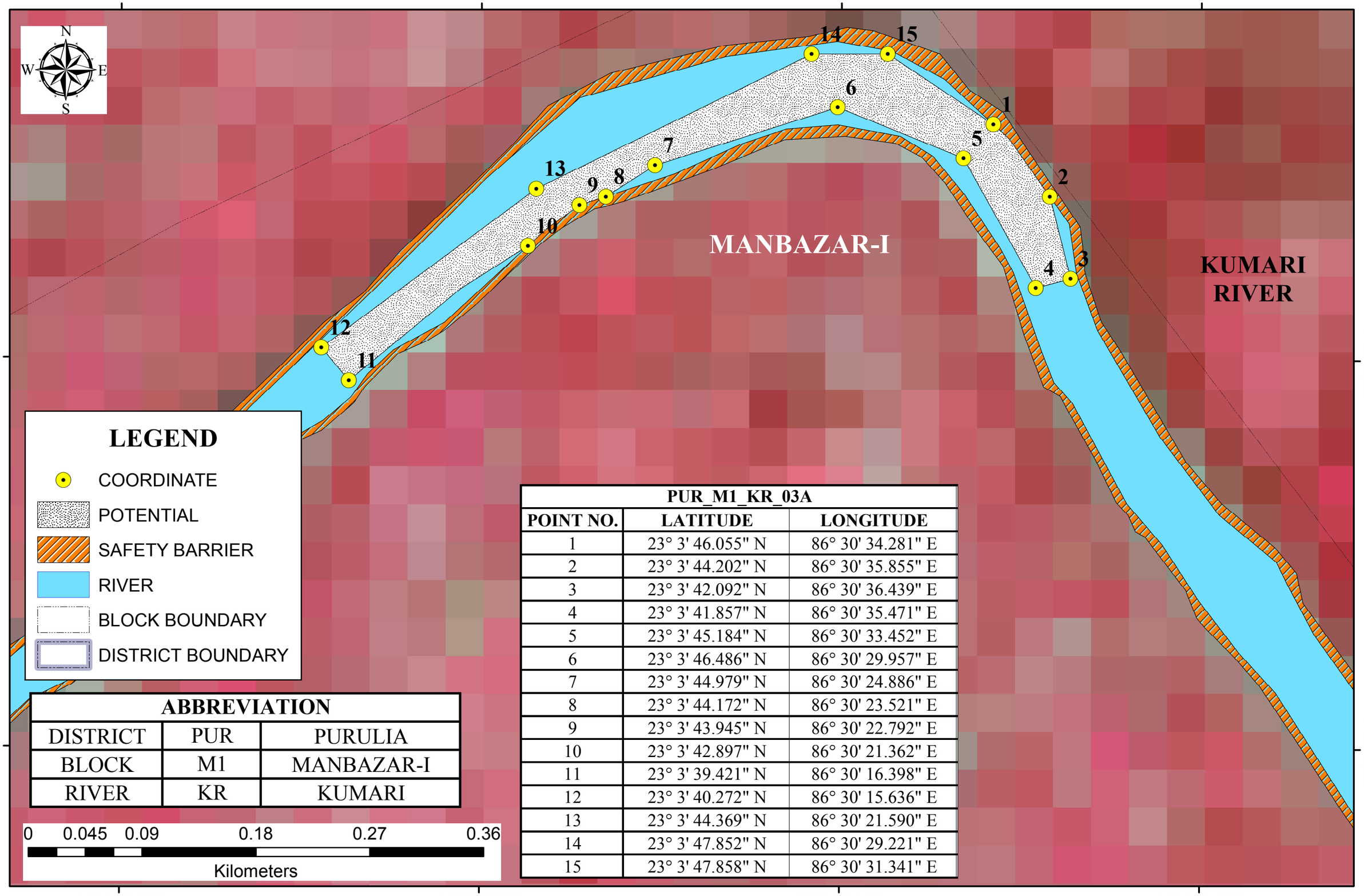
PUR_J2_KB_38A		
POINT NO.	LATITUDE	LONGITUDE
1	23° 22' 52.325" N	86° 4' 34.797" E
2	23° 22' 52.835" N	86° 4' 32.535" E
3	23° 22' 52.903" N	86° 4' 31.011" E
4	23° 22' 54.161" N	86° 4' 25.452" E
5	23° 22' 52.299" N	86° 4' 20.432" E
6	23° 22' 52.378" N	86° 4' 12.044" E
7	23° 22' 52.759" N	86° 4' 11.048" E
8	23° 22' 52.841" N	86° 4' 8.422" E
9	23° 22' 54.809" N	86° 4' 8.566" E
10	23° 22' 55.553" N	86° 4' 21.508" E
11	23° 22' 56.717" N	86° 4' 29.282" E
12	23° 22' 55.704" N	86° 4' 33.903" E

POTENTIAL BLOCK PUR_BR_KR_01 OF KUMARI RIVER



PUR_BR_KR_01					
POINT NO.	LATITUDE	LONGITUDE	POINT NO.	LATITUDE	LONGITUDE
1	23° 2' 50.657" N	86° 27' 4.009" E	27	23° 2' 46.968" N	86° 27' 39.126" E
2	23° 2' 49.798" N	86° 27' 7.294" E	28	23° 2' 46.783" N	86° 27' 35.407" E
3	23° 2' 48.520" N	86° 27' 11.196" E	29	23° 2' 47.392" N	86° 27' 27.465" E
4	23° 2' 48.297" N	86° 27' 14.069" E	30	23° 2' 47.344" N	86° 27' 23.523" E
5	23° 2' 48.363" N	86° 27' 15.790" E	31	23° 2' 46.957" N	86° 27' 21.033" E
6	23° 2' 48.480" N	86° 27' 21.514" E	32	23° 2' 46.149" N	86° 27' 16.313" E
7	23° 2' 48.355" N	86° 27' 23.162" E	33	23° 2' 45.367" N	86° 27' 13.899" E
8	23° 2' 48.785" N	86° 27' 28.237" E	34	23° 2' 45.722" N	86° 27' 12.057" E
9	23° 2' 48.870" N	86° 27' 30.384" E	35	23° 2' 45.766" N	86° 27' 10.049" E
10	23° 2' 48.398" N	86° 27' 35.853" E	36	23° 2' 46.183" N	86° 27' 8.153" E
11	23° 2' 48.161" N	86° 27' 42.073" E	37	23° 2' 48.861" N	86° 27' 4.578" E
12	23° 2' 49.313" N	86° 27' 46.810" E	38	23° 2' 50.883" N	86° 26' 58.963" E
13	23° 2' 51.573" N	86° 27' 50.902" E	39	23° 2' 50.634" N	86° 26' 58.394" E
14	23° 2' 53.440" N	86° 27' 53.628" E	40	23° 2' 50.787" N	86° 26' 57.863" E
15	23° 2' 55.119" N	86° 27' 55.587" E	41	23° 2' 51.671" N	86° 26' 56.745" E
16	23° 2' 55.772" N	86° 28' 2.845" E	42	23° 2' 52.158" N	86° 26' 54.319" E
17	23° 2' 54.569" N	86° 28' 3.222" E	43	23° 2' 53.122" N	86° 26' 52.660" E
18	23° 2' 54.249" N	86° 28' 2.188" E	44	23° 2' 56.125" N	86° 26' 50.324" E
19	23° 2' 54.733" N	86° 28' 0.795" E	45	23° 2' 56.528" N	86° 26' 51.969" E
20	23° 2' 54.418" N	86° 27' 59.141" E	46	23° 2' 53.257" N	86° 26' 54.305" E
21	23° 2' 52.562" N	86° 27' 54.909" E	47	23° 2' 52.596" N	86° 26' 55.109" E
22	23° 2' 51.195" N	86° 27' 52.646" E	48	23° 2' 51.706" N	86° 26' 56.775" E
23	23° 2' 49.914" N	86° 27' 50.512" E	49	23° 2' 51.646" N	86° 26' 57.090" E
24	23° 2' 48.512" N	86° 27' 47.970" E	50	23° 2' 51.289" N	86° 26' 58.354" E
25	23° 2' 47.434" N	86° 27' 44.702" E	51	23° 2' 51.257" N	86° 26' 59.123" E
26	23° 2' 46.783" N	86° 27' 40.484" E	52	23° 2' 51.097" N	86° 26' 59.957" E
			53	23° 2' 51.022" N	86° 27' 2.021" E

POTENTIAL BLOCK PUR_M1_KR_03A OF KUMARI RIVER



ABBREVIATION		
DISTRICT	PUR	PURULIA
BLOCK	M1	MANBAZAR-I
RIVER	KR	KUMARI

PUR_M1_KR_03A		
POINT NO.	LATITUDE	LONGITUDE
1	23° 3' 46.055" N	86° 30' 34.281" E
2	23° 3' 44.202" N	86° 30' 35.855" E
3	23° 3' 42.092" N	86° 30' 36.439" E
4	23° 3' 41.857" N	86° 30' 35.471" E
5	23° 3' 45.184" N	86° 30' 33.452" E
6	23° 3' 46.486" N	86° 30' 29.957" E
7	23° 3' 44.979" N	86° 30' 24.886" E
8	23° 3' 44.172" N	86° 30' 23.521" E
9	23° 3' 43.945" N	86° 30' 22.792" E
10	23° 3' 42.897" N	86° 30' 21.362" E
11	23° 3' 39.421" N	86° 30' 16.398" E
12	23° 3' 40.272" N	86° 30' 15.636" E
13	23° 3' 44.369" N	86° 30' 21.590" E
14	23° 3' 47.852" N	86° 30' 29.221" E
15	23° 3' 47.858" N	86° 30' 31.341" E

POTENTIAL BLOCK PUR_M1_KR_03B OF KUMARI RIVER

86°30'50"E 86°31'0"E

23°3'30"N

PUR_M1_KR_03B		
POINT NO.	LATITUDE	LONGITUDE
1	23° 3' 22.473" N	86° 30' 56.023" E
2	23° 3' 23.040" N	86° 30' 58.257" E
3	23° 3' 22.326" N	86° 30' 58.512" E
4	23° 3' 21.948" N	86° 30' 58.055" E
5	23° 3' 21.695" N	86° 30' 55.855" E
6	23° 3' 22.205" N	86° 30' 53.578" E
7	23° 3' 25.284" N	86° 30' 48.653" E
8	23° 3' 28.287" N	86° 30' 45.643" E
9	23° 3' 29.177" N	86° 30' 45.238" E
10	23° 3' 29.427" N	86° 30' 45.744" E
11	23° 3' 27.607" N	86° 30' 46.800" E
12	23° 3' 25.385" N	86° 30' 49.665" E
13	23° 3' 23.081" N	86° 30' 54.080" E

MANBAZAR-I

LEGEND

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

ABBREVIATION		
DISTRICT	PUR	PURULIA
BLOCK	M1	MANBAZAR-I
RIVER	KR	KUMARI

0 0.0225 0.045 0.09 0.135 0.18

Kilometers

23°3'20"N

86°30'50"E 86°31'0"E

POTENTIAL BLOCK PUR_M1_KR_04 OF KUMARI RIVER

86°31'20"E 86°31'30"E 86°31'40"E 86°31'50"E 86°32'0"E

23°2'50"N 23°2'40"N 23°2'30"N

N W E S

PUR_M1_KR_04

POINT NO.	LATITUDE	LONGITUDE	POINT NO.	LATITUDE	LONGITUDE
1	23° 2' 31.718" N	86° 31' 40.202" E	22	23° 2' 34.770" N	86° 31' 27.275" E
2	23° 2' 31.626" N	86° 31' 38.343" E	23	23° 2' 33.735" N	86° 31' 30.721" E
3	23° 2' 30.900" N	86° 31' 37.230" E	24	23° 2' 32.492" N	86° 31' 34.224" E
4	23° 2' 30.719" N	86° 31' 34.423" E	25	23° 2' 32.566" N	86° 31' 34.691" E
5	23° 2' 33.005" N	86° 31' 27.665" E	26	23° 2' 32.519" N	86° 31' 36.058" E
6	23° 2' 34.351" N	86° 31' 23.328" E	27	23° 2' 35.211" N	86° 31' 47.177" E
7	23° 2' 34.170" N	86° 31' 20.149" E	28	23° 2' 37.927" N	86° 31' 49.371" E
8	23° 2' 35.797" N	86° 31' 17.745" E	29	23° 2' 44.306" N	86° 31' 50.270" E
9	23° 2' 37.410" N	86° 31' 16.251" E	30	23° 2' 44.976" N	86° 31' 50.128" E
10	23° 2' 37.889" N	86° 31' 15.245" E	31	23° 2' 49.060" N	86° 31' 51.759" E
11	23° 2' 39.434" N	86° 31' 13.864" E	32	23° 2' 51.234" N	86° 31' 53.927" E
12	23° 2' 41.774" N	86° 31' 13.819" E	33	23° 2' 52.778" N	86° 31' 56.676" E
13	23° 2' 43.497" N	86° 31' 14.463" E	34	23° 2' 50.685" N	86° 31' 58.570" E
14	23° 2' 45.180" N	86° 31' 15.625" E	35	23° 2' 50.112" N	86° 31' 57.115" E
15	23° 2' 45.184" N	86° 31' 17.471" E	36	23° 2' 47.987" N	86° 31' 54.333" E
16	23° 2' 43.895" N	86° 31' 16.634" E	37	23° 2' 43.918" N	86° 31' 51.818" E
17	23° 2' 42.655" N	86° 31' 16.303" E	38	23° 2' 40.772" N	86° 31' 51.410" E
18	23° 2' 39.972" N	86° 31' 16.815" E	39	23° 2' 37.338" N	86° 31' 51.219" E
19	23° 2' 37.424" N	86° 31' 19.167" E	40	23° 2' 36.431" N	86° 31' 51.082" E
20	23° 2' 35.837" N	86° 31' 23.877" E	41	23° 2' 35.224" N	86° 31' 50.398" E
21	23° 2' 35.170" N	86° 31' 25.401" E	42	23° 2' 34.412" N	86° 31' 49.285" E
			43	23° 2' 33.718" N	86° 31' 47.521" E

KUMARI RIVER

MANBAZAR-I

ABBREVIATION		
DISTRICT	PUR	PURULIA
BLOCK	M1	MANBAZAR-I
RIVER	KR	KUMARI

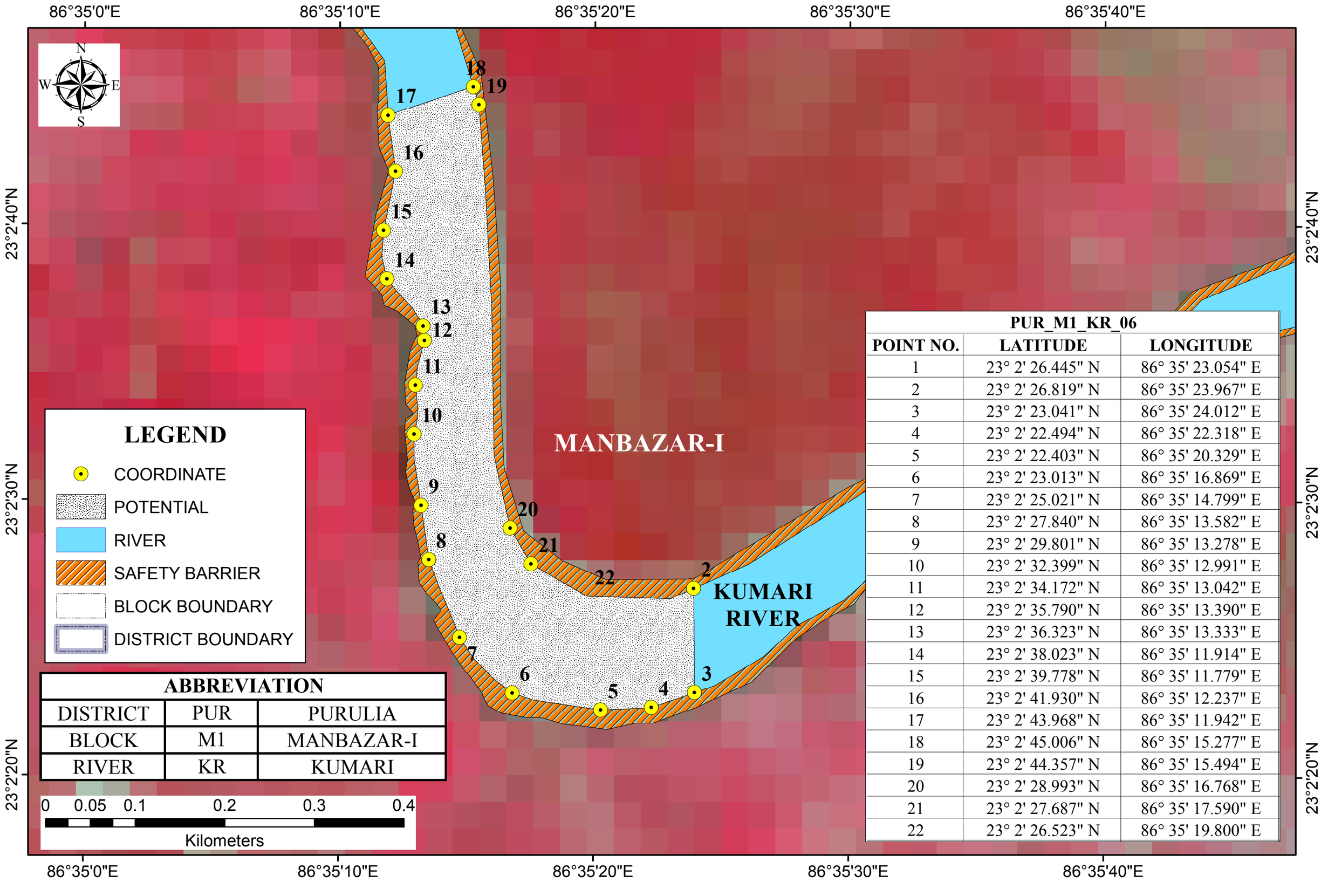
0 0.05 0.1 0.2 0.3 0.4

Kilometers

LEGEND

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

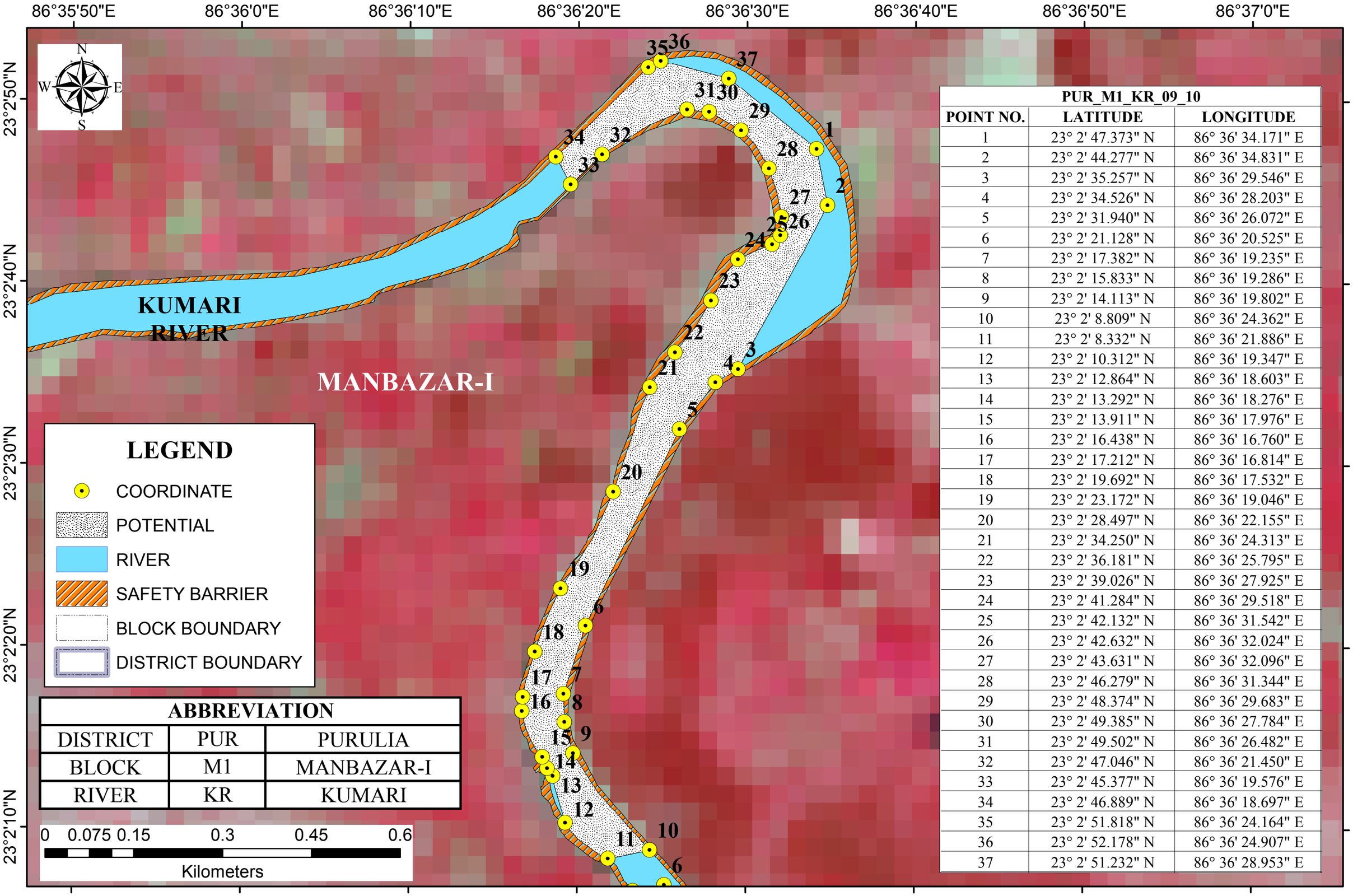
POTENTIAL BLOCK PUR_M1_KR_06 OF KUMARI RIVER



ABBREVIATION		
DISTRICT	PUR	PURULIA
BLOCK	M1	MANBAZAR-I
RIVER	KR	KUMARI

PUR_M1_KR_06		
POINT NO.	LATITUDE	LONGITUDE
1	23° 2' 26.445" N	86° 35' 23.054" E
2	23° 2' 26.819" N	86° 35' 23.967" E
3	23° 2' 23.041" N	86° 35' 24.012" E
4	23° 2' 22.494" N	86° 35' 22.318" E
5	23° 2' 22.403" N	86° 35' 20.329" E
6	23° 2' 23.013" N	86° 35' 16.869" E
7	23° 2' 25.021" N	86° 35' 14.799" E
8	23° 2' 27.840" N	86° 35' 13.582" E
9	23° 2' 29.801" N	86° 35' 13.278" E
10	23° 2' 32.399" N	86° 35' 12.991" E
11	23° 2' 34.172" N	86° 35' 13.042" E
12	23° 2' 35.790" N	86° 35' 13.390" E
13	23° 2' 36.323" N	86° 35' 13.333" E
14	23° 2' 38.023" N	86° 35' 11.914" E
15	23° 2' 39.778" N	86° 35' 11.779" E
16	23° 2' 41.930" N	86° 35' 12.237" E
17	23° 2' 43.968" N	86° 35' 11.942" E
18	23° 2' 45.006" N	86° 35' 15.277" E
19	23° 2' 44.357" N	86° 35' 15.494" E
20	23° 2' 28.993" N	86° 35' 16.768" E
21	23° 2' 27.687" N	86° 35' 17.590" E
22	23° 2' 26.523" N	86° 35' 19.800" E

POTENTIAL BLOCK PUR_M1_KR_09_10 OF KUMARI RIVER



LEGEND

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

ABBREVIATION		
DISTRICT	PUR	PURULIA
BLOCK	M1	MANBAZAR-I
RIVER	KR	KUMARI

0 0.075 0.15 0.3 0.45 0.6

Kilometers

PUR_M1_KR_09_10		
POINT NO.	LATITUDE	LONGITUDE
1	23° 2' 47.373" N	86° 36' 34.171" E
2	23° 2' 44.277" N	86° 36' 34.831" E
3	23° 2' 35.257" N	86° 36' 29.546" E
4	23° 2' 34.526" N	86° 36' 28.203" E
5	23° 2' 31.940" N	86° 36' 26.072" E
6	23° 2' 21.128" N	86° 36' 20.525" E
7	23° 2' 17.382" N	86° 36' 19.235" E
8	23° 2' 15.833" N	86° 36' 19.286" E
9	23° 2' 14.113" N	86° 36' 19.802" E
10	23° 2' 8.809" N	86° 36' 24.362" E
11	23° 2' 8.332" N	86° 36' 21.886" E
12	23° 2' 10.312" N	86° 36' 19.347" E
13	23° 2' 12.864" N	86° 36' 18.603" E
14	23° 2' 13.292" N	86° 36' 18.276" E
15	23° 2' 13.911" N	86° 36' 17.976" E
16	23° 2' 16.438" N	86° 36' 16.760" E
17	23° 2' 17.212" N	86° 36' 16.814" E
18	23° 2' 19.692" N	86° 36' 17.532" E
19	23° 2' 23.172" N	86° 36' 19.046" E
20	23° 2' 28.497" N	86° 36' 22.155" E
21	23° 2' 34.250" N	86° 36' 24.313" E
22	23° 2' 36.181" N	86° 36' 25.795" E
23	23° 2' 39.026" N	86° 36' 27.925" E
24	23° 2' 41.284" N	86° 36' 29.518" E
25	23° 2' 42.132" N	86° 36' 31.542" E
26	23° 2' 42.632" N	86° 36' 32.024" E
27	23° 2' 43.631" N	86° 36' 32.096" E
28	23° 2' 46.279" N	86° 36' 31.344" E
29	23° 2' 48.374" N	86° 36' 29.683" E
30	23° 2' 49.385" N	86° 36' 27.784" E
31	23° 2' 49.502" N	86° 36' 26.482" E
32	23° 2' 47.046" N	86° 36' 21.450" E
33	23° 2' 45.377" N	86° 36' 19.576" E
34	23° 2' 46.889" N	86° 36' 18.697" E
35	23° 2' 51.818" N	86° 36' 24.164" E
36	23° 2' 52.178" N	86° 36' 24.907" E
37	23° 2' 51.232" N	86° 36' 28.953" E

POTENTIAL BLOCK PUR_M1_KR_11 OF KUMARI RIVER

86°36'20"E 86°36'30"E 86°36'40"E

23°2'0"N

PUR_M1_KR_11		
POINT NO.	LATITUDE	LONGITUDE
1	23° 1' 57.727" N	86° 36' 30.001" E
2	23° 2' 1.133" N	86° 36' 28.128" E
3	23° 2' 1.803" N	86° 36' 27.475" E
4	23° 2' 4.500" N	86° 36' 25.608" E
5	23° 2' 6.579" N	86° 36' 23.374" E
6	23° 2' 6.896" N	86° 36' 25.229" E
7	23° 2' 3.891" N	86° 36' 27.887" E
8	23° 2' 0.499" N	86° 36' 30.454" E
9	23° 1' 57.834" N	86° 36' 31.344" E

MANBAZAR-I

KUMARI RIVER

LEGEND

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

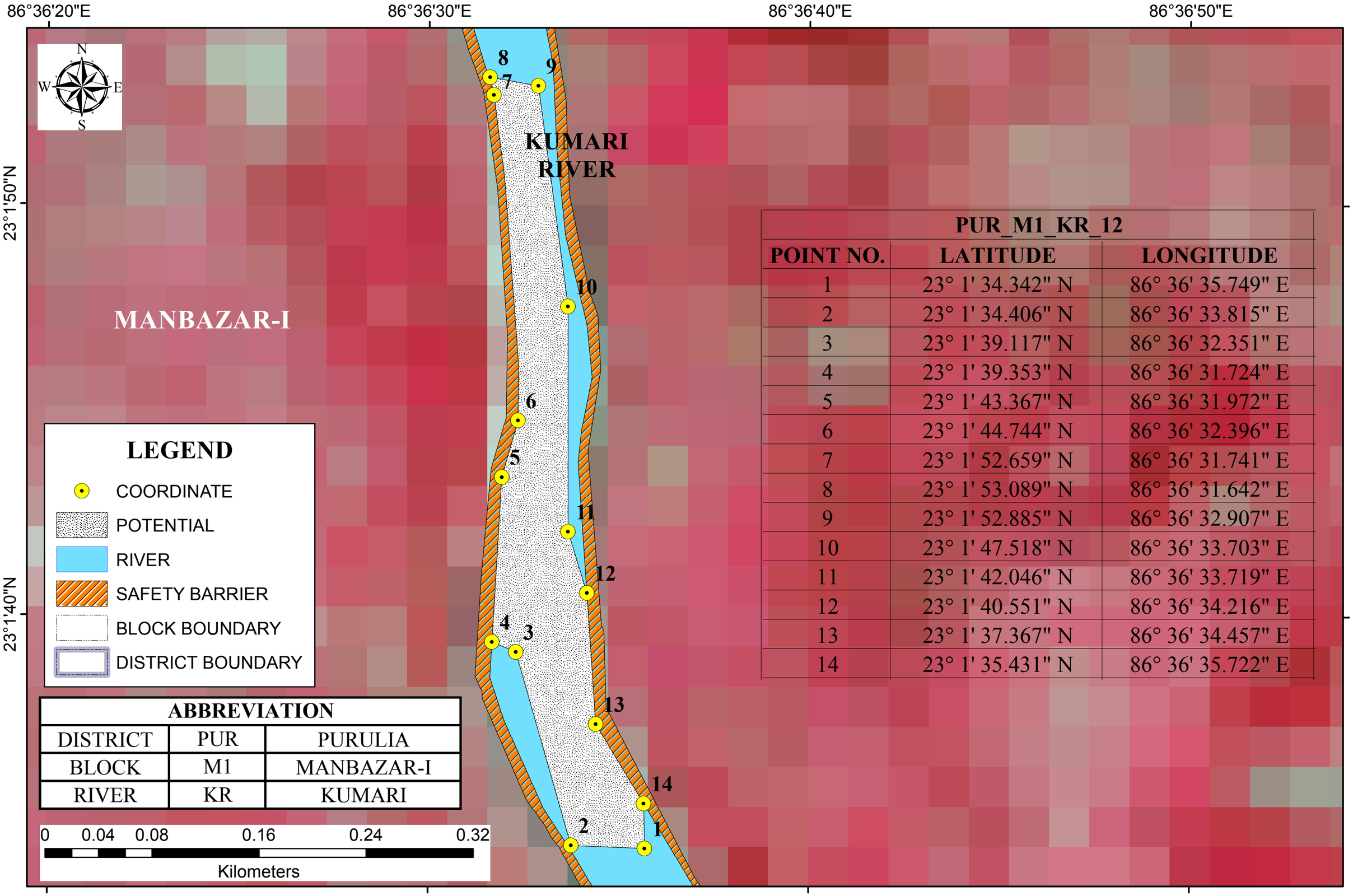
ABBREVIATION		
DISTRICT	PUR	PURULIA
BLOCK	M1	MANBAZAR-I
RIVER	KR	KUMARI

0 0.0275 0.055 0.11 0.165 0.22

Kilometers

86°36'20"E 86°36'30"E 86°36'40"E

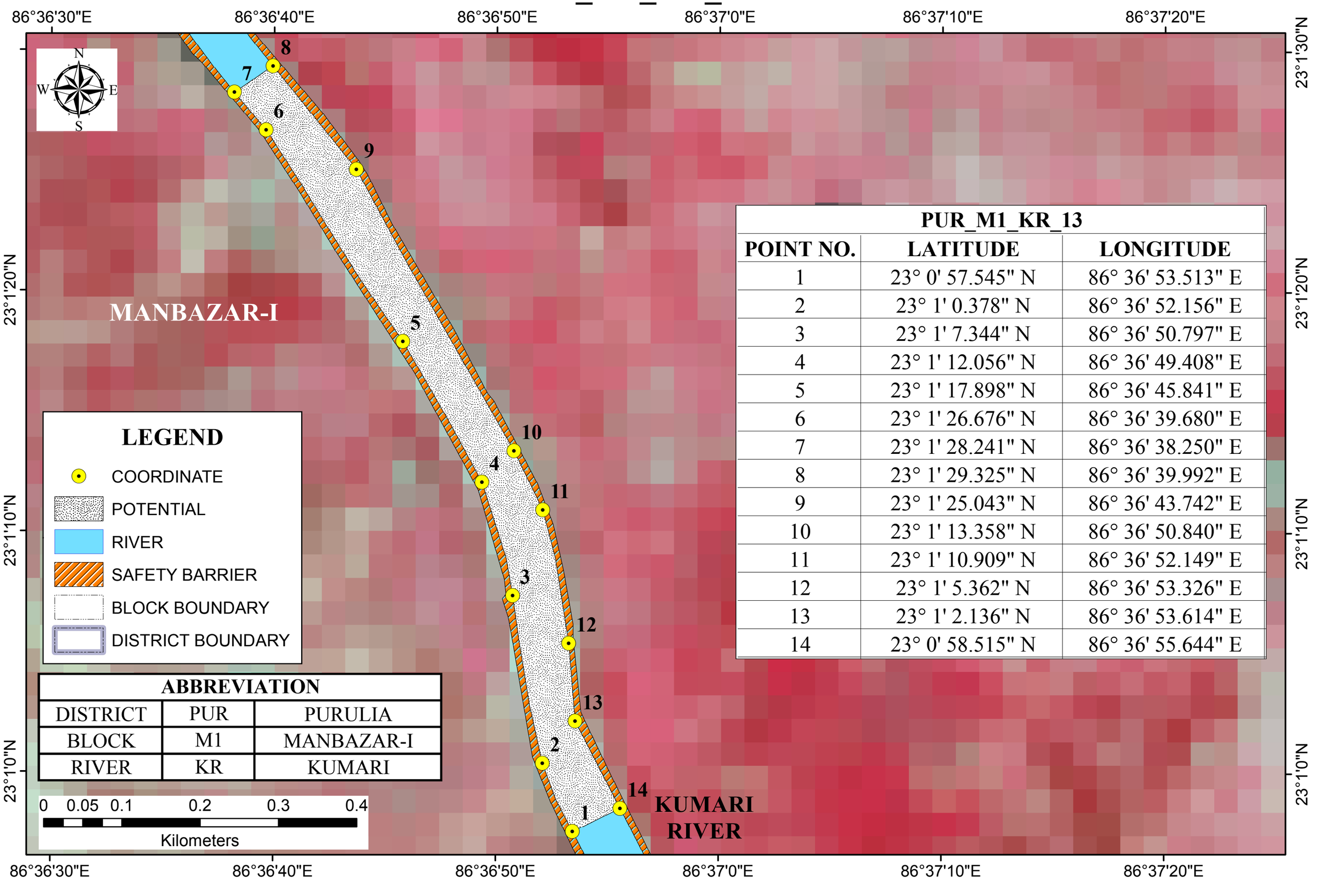
POTENTIAL BLOCK PUR_M1_KR_12 OF KUMARI RIVER



PUR_M1_KR_12		
POINT NO.	LATITUDE	LONGITUDE
1	23° 1' 34.342" N	86° 36' 35.749" E
2	23° 1' 34.406" N	86° 36' 33.815" E
3	23° 1' 39.117" N	86° 36' 32.351" E
4	23° 1' 39.353" N	86° 36' 31.724" E
5	23° 1' 43.367" N	86° 36' 31.972" E
6	23° 1' 44.744" N	86° 36' 32.396" E
7	23° 1' 52.659" N	86° 36' 31.741" E
8	23° 1' 53.089" N	86° 36' 31.642" E
9	23° 1' 52.885" N	86° 36' 32.907" E
10	23° 1' 47.518" N	86° 36' 33.703" E
11	23° 1' 42.046" N	86° 36' 33.719" E
12	23° 1' 40.551" N	86° 36' 34.216" E
13	23° 1' 37.367" N	86° 36' 34.457" E
14	23° 1' 35.431" N	86° 36' 35.722" E

ABBREVIATION		
DISTRICT	PUR	PURULIA
BLOCK	M1	MANBAZAR-I
RIVER	KR	KUMARI

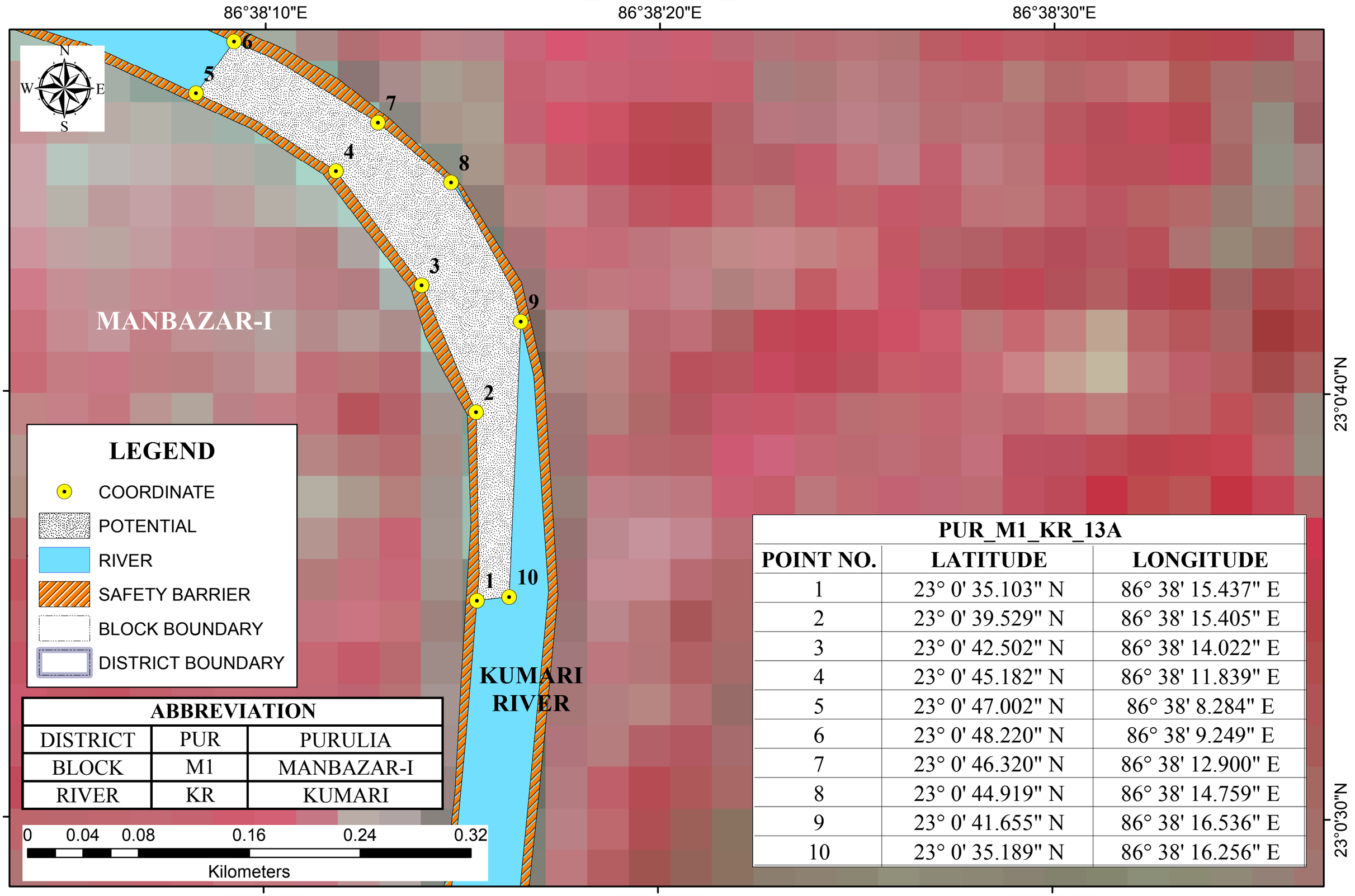
POTENTIAL BLOCK PUR_M1_KR_13 OF KUMARI RIVER



PUR_M1_KR_13		
POINT NO.	**LATITUDE**	**LONGITUDE**
1	23° 0' 57.545" N	86° 36' 53.513" E
2	23° 1' 0.378" N	86° 36' 52.156" E
3	23° 1' 7.344" N	86° 36' 50.797" E
4	23° 1' 12.056" N	86° 36' 49.408" E
5	23° 1' 17.898" N	86° 36' 45.841" E
6	23° 1' 26.676" N	86° 36' 39.680" E
7	23° 1' 28.241" N	86° 36' 38.250" E
8	23° 1' 29.325" N	86° 36' 39.992" E
9	23° 1' 25.043" N	86° 36' 43.742" E
10	23° 1' 13.358" N	86° 36' 50.840" E
11	23° 1' 10.909" N	86° 36' 52.149" E
12	23° 1' 5.362" N	86° 36' 53.326" E
13	23° 1' 2.136" N	86° 36' 53.614" E
14	23° 0' 58.515" N	86° 36' 55.644" E

ABBREVIATION		
DISTRICT	PUR	PURULIA
BLOCK	M1	MANBAZAR-I
RIVER	KR	KUMARI

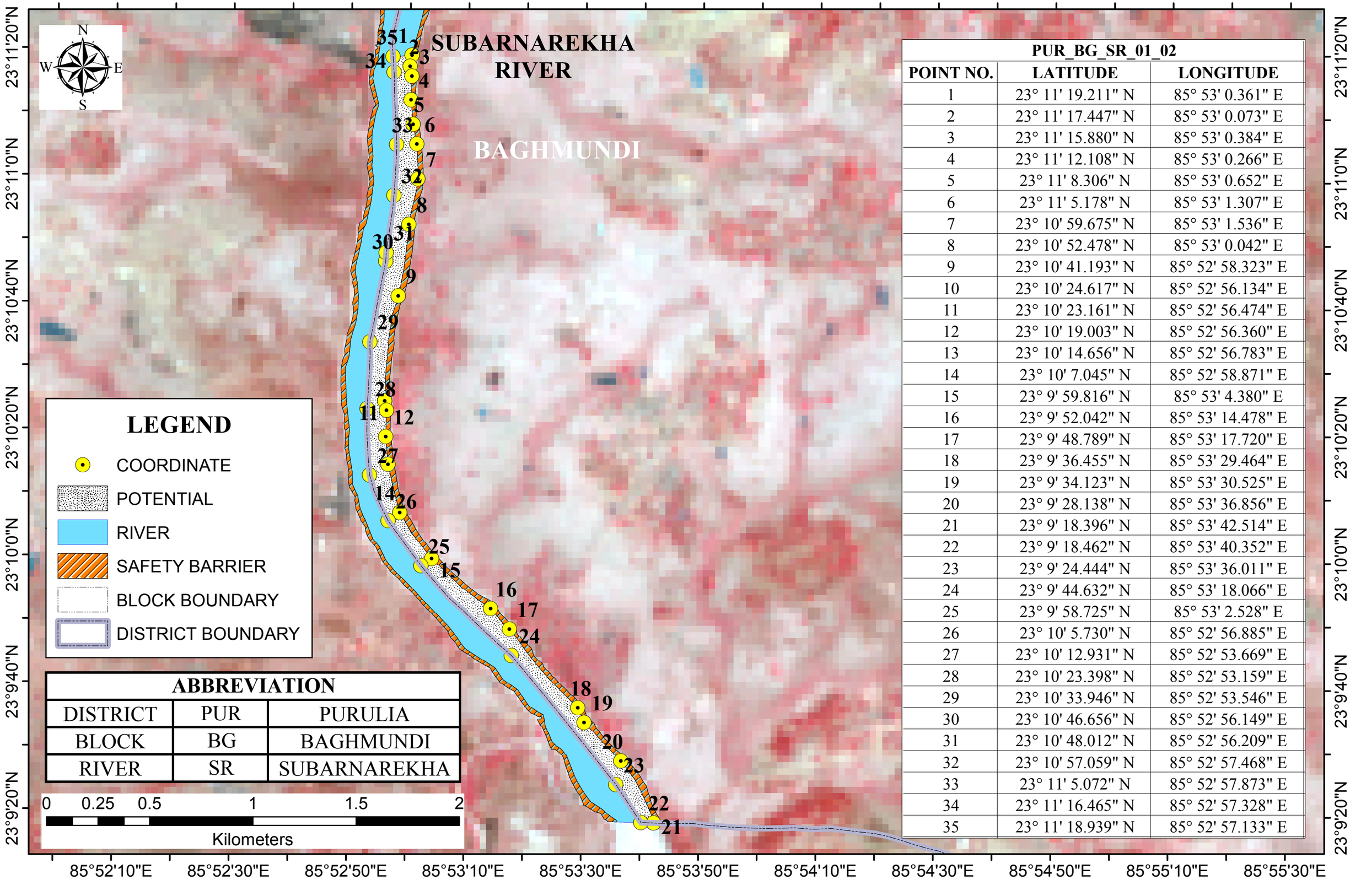
POTENTIAL BLOCK PUR_M1_KR_13A OF KUMARI RIVER



ABBREVIATION		
DISTRICT	PUR	PURULIA
BLOCK	M1	MANBAZAR-I
RIVER	KR	KUMARI

PUR_M1_KR_13A		
POINT NO.	LATITUDE	LONGITUDE
1	23° 0' 35.103" N	86° 38' 15.437" E
2	23° 0' 39.529" N	86° 38' 15.405" E
3	23° 0' 42.502" N	86° 38' 14.022" E
4	23° 0' 45.182" N	86° 38' 11.839" E
5	23° 0' 47.002" N	86° 38' 8.284" E
6	23° 0' 48.220" N	86° 38' 9.249" E
7	23° 0' 46.320" N	86° 38' 12.900" E
8	23° 0' 44.919" N	86° 38' 14.759" E
9	23° 0' 41.655" N	86° 38' 16.536" E
10	23° 0' 35.189" N	86° 38' 16.256" E

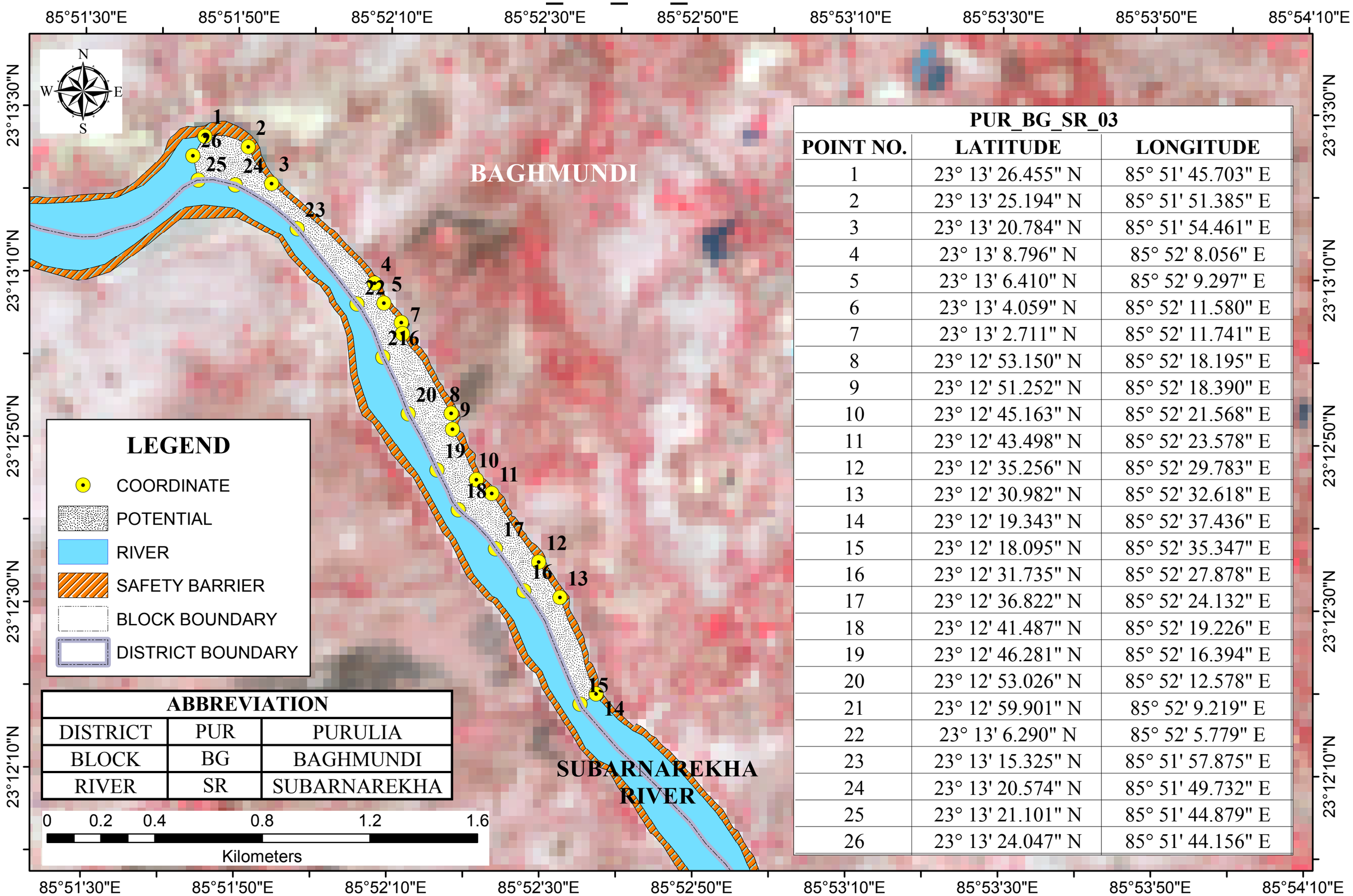
POTENTIAL BLOCK PUR_BG_SR_01_02 OF SUBARNAREKHA RIVER



ABBREVIATION		
DISTRICT	PUR	PURULIA
BLOCK	BG	BAGHMUNDI
RIVER	SR	SUBARNAREKHA

PUR_BG_SR_01_02		
POINT NO.	LATITUDE	LONGITUDE
1	23° 11' 19.211" N	85° 53' 0.361" E
2	23° 11' 17.447" N	85° 53' 0.073" E
3	23° 11' 15.880" N	85° 53' 0.384" E
4	23° 11' 12.108" N	85° 53' 0.266" E
5	23° 11' 8.306" N	85° 53' 0.652" E
6	23° 11' 5.178" N	85° 53' 1.307" E
7	23° 10' 59.675" N	85° 53' 1.536" E
8	23° 10' 52.478" N	85° 53' 0.042" E
9	23° 10' 41.193" N	85° 52' 58.323" E
10	23° 10' 24.617" N	85° 52' 56.134" E
11	23° 10' 23.161" N	85° 52' 56.474" E
12	23° 10' 19.003" N	85° 52' 56.360" E
13	23° 10' 14.656" N	85° 52' 56.783" E
14	23° 10' 7.045" N	85° 52' 58.871" E
15	23° 9' 59.816" N	85° 53' 4.380" E
16	23° 9' 52.042" N	85° 53' 14.478" E
17	23° 9' 48.789" N	85° 53' 17.720" E
18	23° 9' 36.455" N	85° 53' 29.464" E
19	23° 9' 34.123" N	85° 53' 30.525" E
20	23° 9' 28.138" N	85° 53' 36.856" E
21	23° 9' 18.396" N	85° 53' 42.514" E
22	23° 9' 18.462" N	85° 53' 40.352" E
23	23° 9' 24.444" N	85° 53' 36.011" E
24	23° 9' 44.632" N	85° 53' 18.066" E
25	23° 9' 58.725" N	85° 53' 2.528" E
26	23° 10' 5.730" N	85° 52' 56.885" E
27	23° 10' 12.931" N	85° 52' 53.669" E
28	23° 10' 23.398" N	85° 52' 53.159" E
29	23° 10' 33.946" N	85° 52' 53.546" E
30	23° 10' 46.656" N	85° 52' 56.149" E
31	23° 10' 48.012" N	85° 52' 56.209" E
32	23° 10' 57.059" N	85° 52' 57.468" E
33	23° 11' 5.072" N	85° 52' 57.873" E
34	23° 11' 16.465" N	85° 52' 57.328" E
35	23° 11' 18.939" N	85° 52' 57.133" E

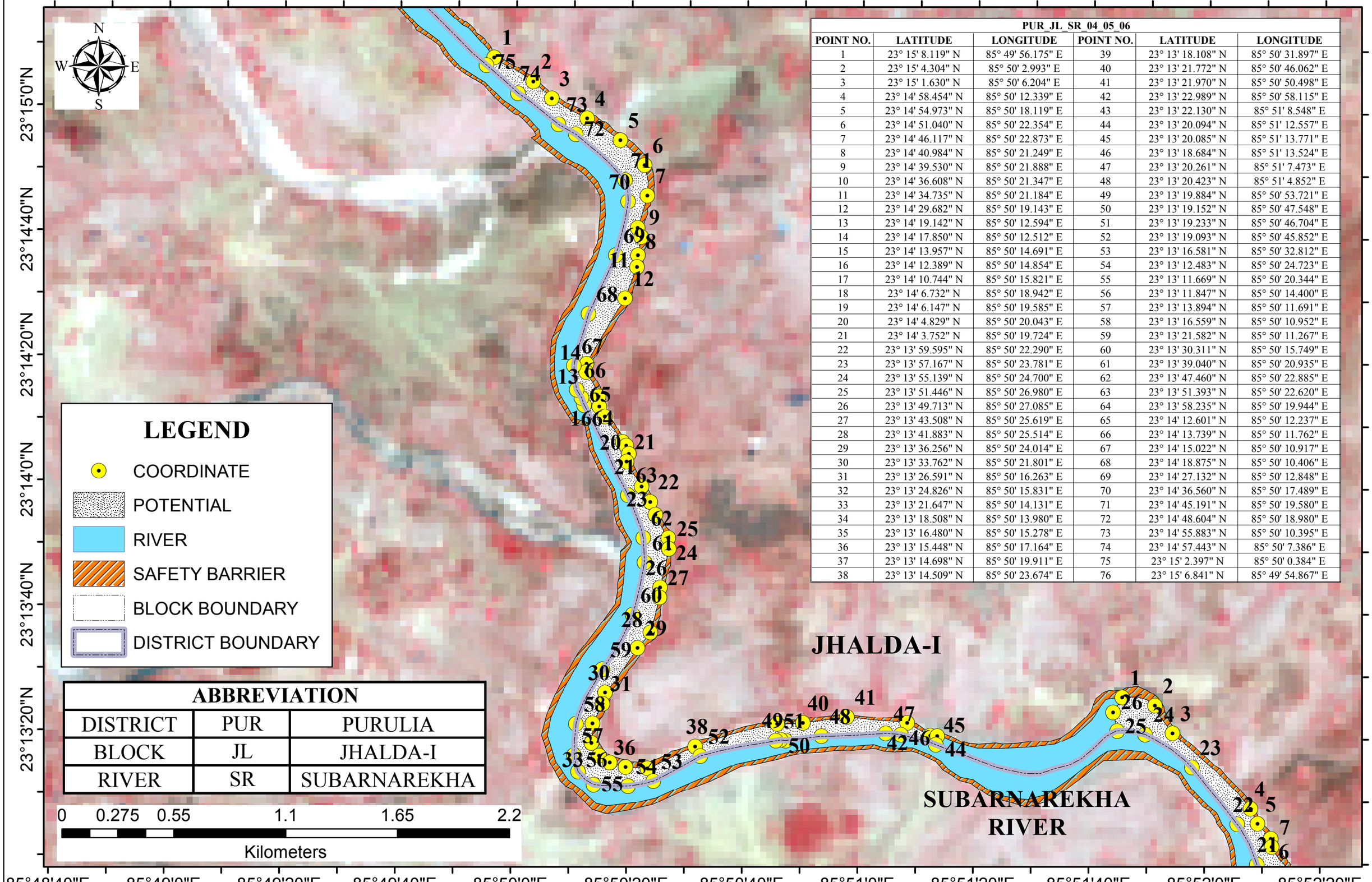
POTENTIAL BLOCK PUR_BG_SR_03 OF SUBARNAREKHA RIVER



ABBREVIATION		
DISTRICT	PUR	PURULIA
BLOCK	BG	BAGHMUNDI
RIVER	SR	SUBARNAREKHA

PUR_BG_SR_03		
POINT NO.	LATITUDE	LONGITUDE
1	23° 13' 26.455" N	85° 51' 45.703" E
2	23° 13' 25.194" N	85° 51' 51.385" E
3	23° 13' 20.784" N	85° 51' 54.461" E
4	23° 13' 8.796" N	85° 52' 8.056" E
5	23° 13' 6.410" N	85° 52' 9.297" E
6	23° 13' 4.059" N	85° 52' 11.580" E
7	23° 13' 2.711" N	85° 52' 11.741" E
8	23° 12' 53.150" N	85° 52' 18.195" E
9	23° 12' 51.252" N	85° 52' 18.390" E
10	23° 12' 45.163" N	85° 52' 21.568" E
11	23° 12' 43.498" N	85° 52' 23.578" E
12	23° 12' 35.256" N	85° 52' 29.783" E
13	23° 12' 30.982" N	85° 52' 32.618" E
14	23° 12' 19.343" N	85° 52' 37.436" E
15	23° 12' 18.095" N	85° 52' 35.347" E
16	23° 12' 31.735" N	85° 52' 27.878" E
17	23° 12' 36.822" N	85° 52' 24.132" E
18	23° 12' 41.487" N	85° 52' 19.226" E
19	23° 12' 46.281" N	85° 52' 16.394" E
20	23° 12' 53.026" N	85° 52' 12.578" E
21	23° 12' 59.901" N	85° 52' 9.219" E
22	23° 13' 6.290" N	85° 52' 5.779" E
23	23° 13' 15.325" N	85° 51' 57.875" E
24	23° 13' 20.574" N	85° 51' 49.732" E
25	23° 13' 21.101" N	85° 51' 44.879" E
26	23° 13' 24.047" N	85° 51' 44.156" E

POTENTIAL BLOCK PUR_JL_SR_04_05_06 OF SUBARNAREKHA RIVER



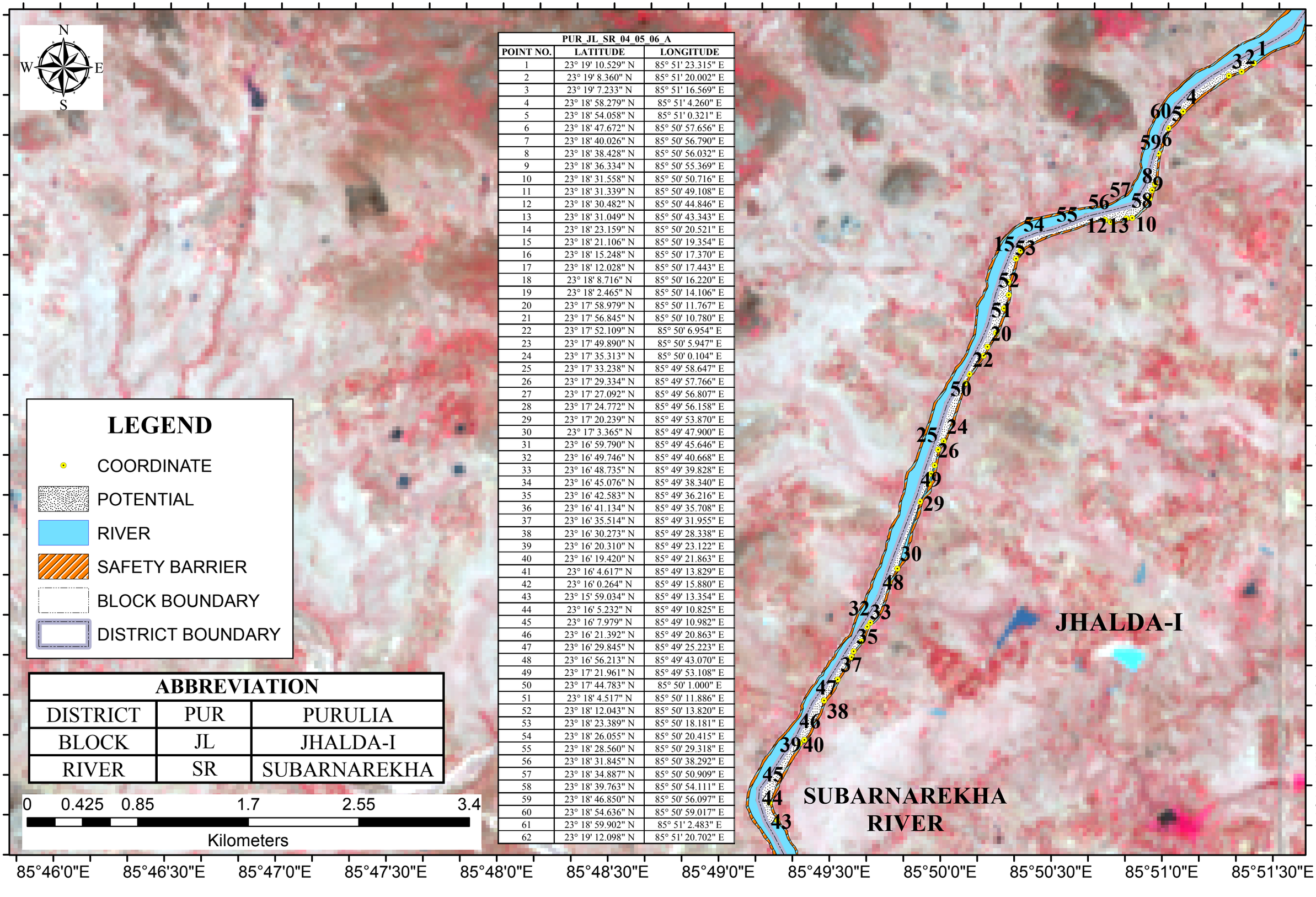
LEGEND

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

ABBREVIATION		
DISTRICT	PUR	PURULIA
BLOCK	JL	JHALDA-I
RIVER	SR	SUBARNAREKHA

PUR_JL_SR_04_05_06					
POINT NO.	LATITUDE	LONGITUDE	POINT NO.	LATITUDE	LONGITUDE
1	23° 15' 8.119" N	85° 49' 56.175" E	39	23° 13' 18.108" N	85° 50' 31.897" E
2	23° 15' 4.304" N	85° 50' 2.993" E	40	23° 13' 21.772" N	85° 50' 46.062" E
3	23° 15' 1.630" N	85° 50' 6.204" E	41	23° 13' 21.970" N	85° 50' 50.498" E
4	23° 14' 58.454" N	85° 50' 12.339" E	42	23° 13' 22.989" N	85° 50' 58.115" E
5	23° 14' 54.973" N	85° 50' 18.119" E	43	23° 13' 22.130" N	85° 51' 8.548" E
6	23° 14' 51.040" N	85° 50' 22.354" E	44	23° 13' 20.094" N	85° 51' 12.557" E
7	23° 14' 46.117" N	85° 50' 22.873" E	45	23° 13' 20.085" N	85° 51' 13.771" E
8	23° 14' 40.984" N	85° 50' 21.249" E	46	23° 13' 18.684" N	85° 51' 13.524" E
9	23° 14' 39.530" N	85° 50' 21.888" E	47	23° 13' 20.261" N	85° 51' 7.473" E
10	23° 14' 36.608" N	85° 50' 21.347" E	48	23° 13' 20.423" N	85° 51' 4.852" E
11	23° 14' 34.735" N	85° 50' 21.184" E	49	23° 13' 19.884" N	85° 50' 53.721" E
12	23° 14' 29.682" N	85° 50' 19.143" E	50	23° 13' 19.152" N	85° 50' 47.548" E
13	23° 14' 19.142" N	85° 50' 12.594" E	51	23° 13' 19.233" N	85° 50' 46.704" E
14	23° 14' 17.850" N	85° 50' 12.512" E	52	23° 13' 19.093" N	85° 50' 45.852" E
15	23° 14' 13.957" N	85° 50' 14.691" E	53	23° 13' 16.581" N	85° 50' 32.812" E
16	23° 14' 12.389" N	85° 50' 14.854" E	54	23° 13' 12.483" N	85° 50' 24.723" E
17	23° 14' 10.744" N	85° 50' 15.821" E	55	23° 13' 11.669" N	85° 50' 20.344" E
18	23° 14' 6.732" N	85° 50' 18.942" E	56	23° 13' 11.847" N	85° 50' 14.400" E
19	23° 14' 6.147" N	85° 50' 19.585" E	57	23° 13' 13.894" N	85° 50' 11.691" E
20	23° 14' 4.829" N	85° 50' 20.043" E	58	23° 13' 16.559" N	85° 50' 10.952" E
21	23° 14' 3.752" N	85° 50' 19.724" E	59	23° 13' 21.582" N	85° 50' 11.267" E
22	23° 13' 59.595" N	85° 50' 22.290" E	60	23° 13' 30.311" N	85° 50' 15.749" E
23	23° 13' 57.167" N	85° 50' 23.781" E	61	23° 13' 39.040" N	85° 50' 20.935" E
24	23° 13' 55.139" N	85° 50' 24.700" E	62	23° 13' 47.460" N	85° 50' 22.885" E
25	23° 13' 51.446" N	85° 50' 26.980" E	63	23° 13' 51.393" N	85° 50' 22.620" E
26	23° 13' 49.713" N	85° 50' 27.085" E	64	23° 13' 58.235" N	85° 50' 19.944" E
27	23° 13' 43.508" N	85° 50' 25.619" E	65	23° 14' 12.601" N	85° 50' 12.237" E
28	23° 13' 41.883" N	85° 50' 25.514" E	66	23° 14' 13.739" N	85° 50' 11.762" E
29	23° 13' 36.256" N	85° 50' 24.014" E	67	23° 14' 15.022" N	85° 50' 10.917" E
30	23° 13' 33.762" N	85° 50' 21.801" E	68	23° 14' 18.875" N	85° 50' 10.406" E
31	23° 13' 26.591" N	85° 50' 16.263" E	69	23° 14' 27.132" N	85° 50' 12.848" E
32	23° 13' 24.826" N	85° 50' 15.831" E	70	23° 14' 36.560" N	85° 50' 17.489" E
33	23° 13' 21.647" N	85° 50' 14.131" E	71	23° 14' 45.191" N	85° 50' 19.580" E
34	23° 13' 18.508" N	85° 50' 13.980" E	72	23° 14' 48.604" N	85° 50' 18.980" E
35	23° 13' 16.480" N	85° 50' 15.278" E	73	23° 14' 55.883" N	85° 50' 10.395" E
36	23° 13' 15.448" N	85° 50' 17.164" E	74	23° 14' 57.443" N	85° 50' 7.386" E
37	23° 13' 14.698" N	85° 50' 19.911" E	75	23° 15' 2.397" N	85° 50' 0.384" E
38	23° 13' 14.509" N	85° 50' 23.674" E	76	23° 15' 6.841" N	85° 49' 54.867" E

POTENTIAL BLOCK PUR_JL_SR_04_05_06_A OF SUBARNAREKHA RIVER



LEGEND

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

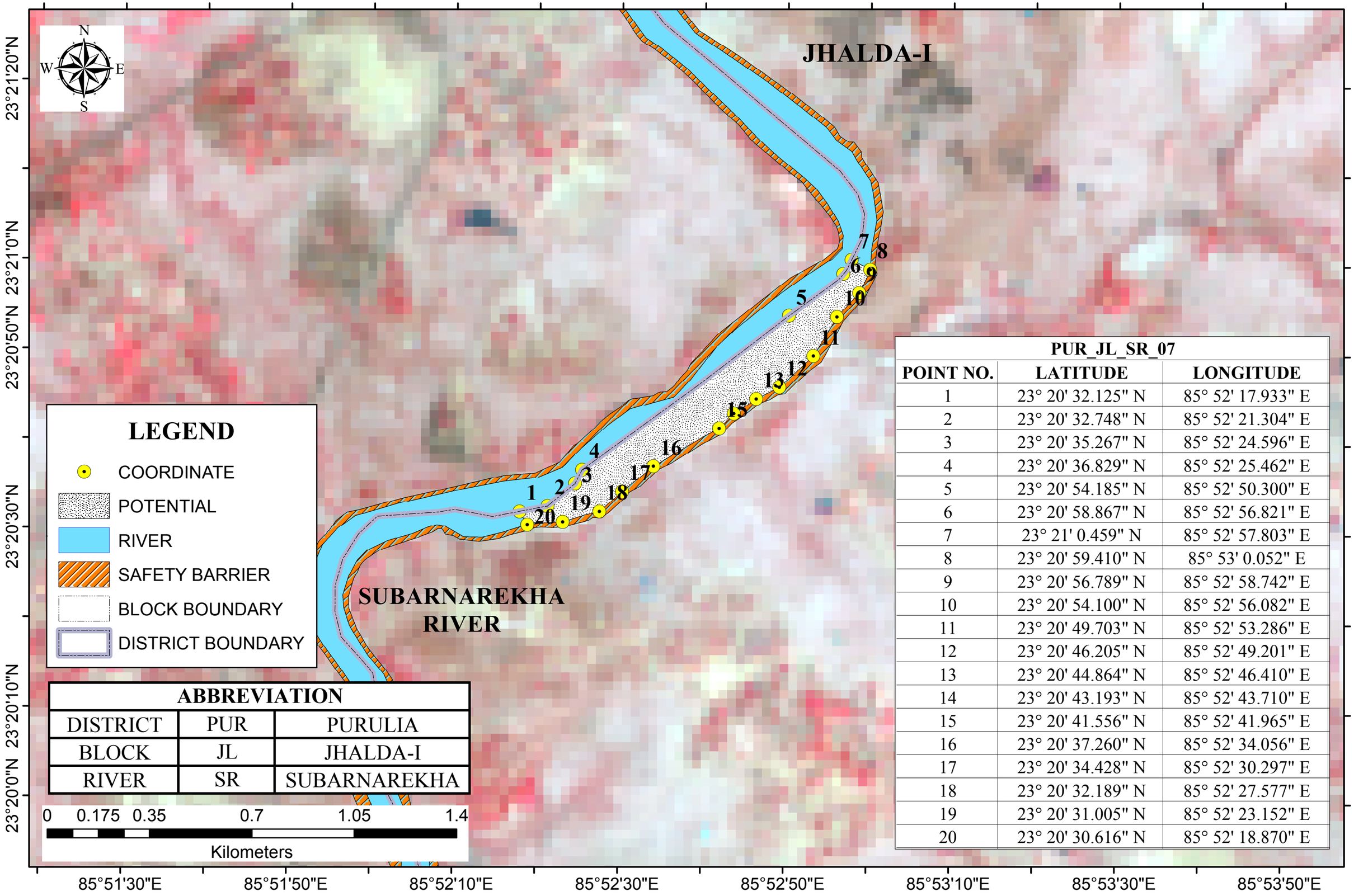
ABBREVIATION		
DISTRICT	PUR	PURULIA
BLOCK	JL	JHALDA-I
RIVER	SR	SUBARNAREKHA

0 0.425 0.85 1.7 2.55 3.4

Kilometers

PUR_JL_SR_04_05_06_A		
POINT NO.	LATITUDE	LONGITUDE
1	23° 19' 10.529" N	85° 51' 23.315" E
2	23° 19' 8.360" N	85° 51' 20.002" E
3	23° 19' 7.233" N	85° 51' 16.569" E
4	23° 18' 58.279" N	85° 51' 4.260" E
5	23° 18' 54.058" N	85° 51' 0.321" E
6	23° 18' 47.672" N	85° 50' 57.656" E
7	23° 18' 40.026" N	85° 50' 56.790" E
8	23° 18' 38.428" N	85° 50' 56.032" E
9	23° 18' 36.334" N	85° 50' 55.369" E
10	23° 18' 31.558" N	85° 50' 50.716" E
11	23° 18' 31.339" N	85° 50' 49.108" E
12	23° 18' 30.482" N	85° 50' 44.846" E
13	23° 18' 31.049" N	85° 50' 43.343" E
14	23° 18' 23.159" N	85° 50' 20.521" E
15	23° 18' 21.106" N	85° 50' 19.354" E
16	23° 18' 15.248" N	85° 50' 17.370" E
17	23° 18' 12.028" N	85° 50' 17.443" E
18	23° 18' 8.716" N	85° 50' 16.220" E
19	23° 18' 2.465" N	85° 50' 14.106" E
20	23° 17' 58.979" N	85° 50' 11.767" E
21	23° 17' 56.845" N	85° 50' 10.780" E
22	23° 17' 52.109" N	85° 50' 6.954" E
23	23° 17' 49.890" N	85° 50' 5.947" E
24	23° 17' 35.313" N	85° 50' 0.104" E
25	23° 17' 33.238" N	85° 49' 58.647" E
26	23° 17' 29.334" N	85° 49' 57.766" E
27	23° 17' 27.092" N	85° 49' 56.807" E
28	23° 17' 24.772" N	85° 49' 56.158" E
29	23° 17' 20.239" N	85° 49' 53.870" E
30	23° 17' 3.365" N	85° 49' 47.900" E
31	23° 16' 59.790" N	85° 49' 45.646" E
32	23° 16' 49.746" N	85° 49' 40.668" E
33	23° 16' 48.735" N	85° 49' 39.828" E
34	23° 16' 45.076" N	85° 49' 38.340" E
35	23° 16' 42.583" N	85° 49' 36.216" E
36	23° 16' 41.134" N	85° 49' 35.708" E
37	23° 16' 35.514" N	85° 49' 31.955" E
38	23° 16' 30.273" N	85° 49' 28.338" E
39	23° 16' 20.310" N	85° 49' 23.122" E
40	23° 16' 19.420" N	85° 49' 21.863" E
41	23° 16' 4.617" N	85° 49' 13.829" E
42	23° 16' 0.264" N	85° 49' 15.880" E
43	23° 15' 59.034" N	85° 49' 13.354" E
44	23° 16' 5.232" N	85° 49' 10.825" E
45	23° 16' 7.979" N	85° 49' 10.982" E
46	23° 16' 21.392" N	85° 49' 20.863" E
47	23° 16' 29.845" N	85° 49' 25.223" E
48	23° 16' 56.213" N	85° 49' 43.070" E
49	23° 17' 21.961" N	85° 49' 53.108" E
50	23° 17' 44.783" N	85° 50' 1.000" E
51	23° 18' 4.517" N	85° 50' 11.886" E
52	23° 18' 12.043" N	85° 50' 13.820" E
53	23° 18' 23.389" N	85° 50' 18.181" E
54	23° 18' 26.055" N	85° 50' 20.415" E
55	23° 18' 28.560" N	85° 50' 29.318" E
56	23° 18' 31.845" N	85° 50' 38.292" E
57	23° 18' 34.887" N	85° 50' 50.909" E
58	23° 18' 39.763" N	85° 50' 54.111" E
59	23° 18' 46.850" N	85° 50' 56.097" E
60	23° 18' 54.636" N	85° 50' 59.017" E
61	23° 18' 59.902" N	85° 51' 2.483" E
62	23° 19' 12.098" N	85° 51' 20.702" E

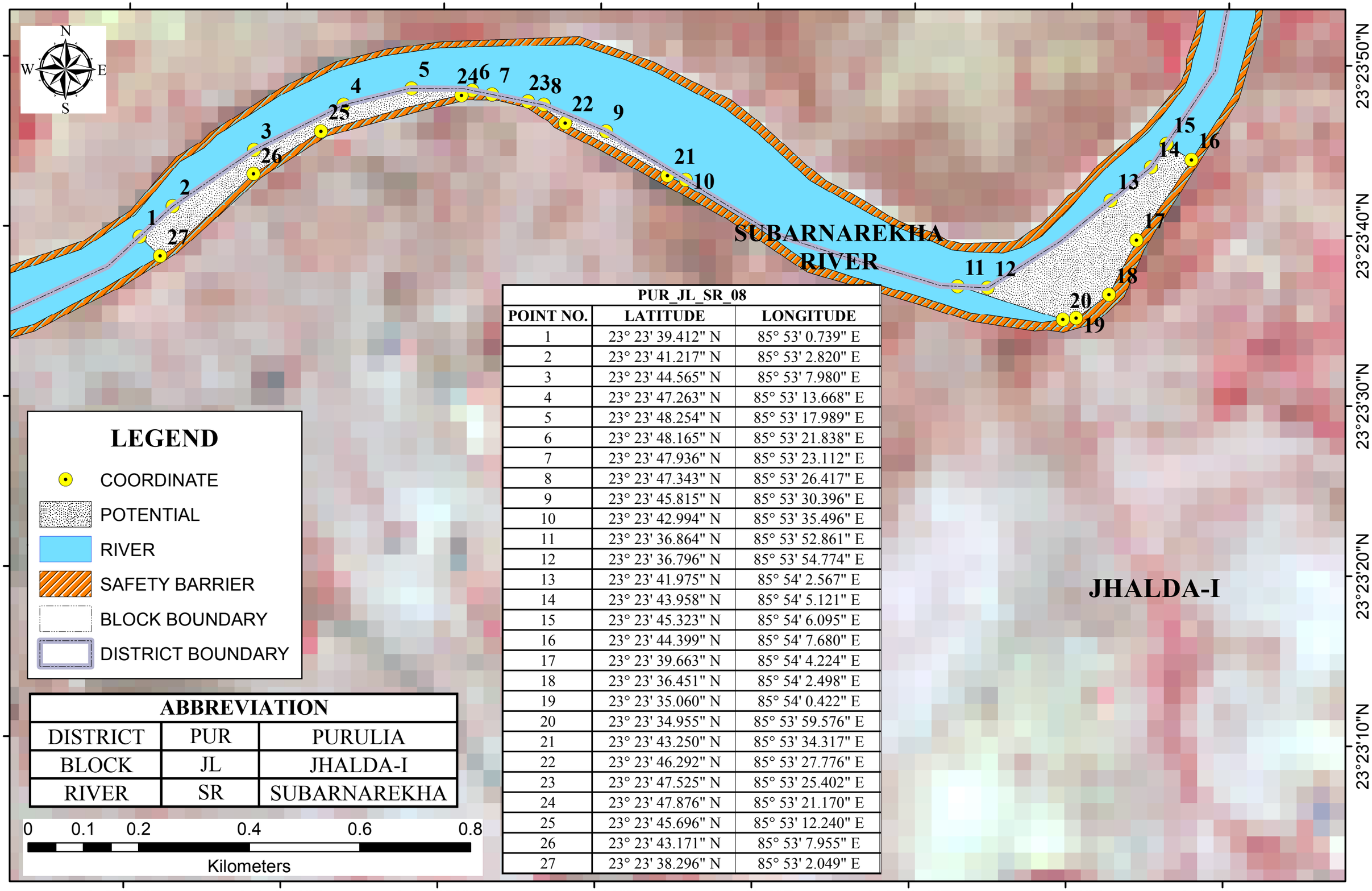
POTENTIAL BLOCK PUR_JL_SR_07 OF SUBARNAREKHA RIVER



ABBREVIATION		
DISTRICT	PUR	PURULIA
BLOCK	JL	JHALDA-I
RIVER	SR	SUBARNAREKHA

PUR_JL_SR_07		
POINT NO.	LATITUDE	LONGITUDE
1	23° 20' 32.125" N	85° 52' 17.933" E
2	23° 20' 32.748" N	85° 52' 21.304" E
3	23° 20' 35.267" N	85° 52' 24.596" E
4	23° 20' 36.829" N	85° 52' 25.462" E
5	23° 20' 54.185" N	85° 52' 50.300" E
6	23° 20' 58.867" N	85° 52' 56.821" E
7	23° 21' 0.459" N	85° 52' 57.803" E
8	23° 20' 59.410" N	85° 53' 0.052" E
9	23° 20' 56.789" N	85° 52' 58.742" E
10	23° 20' 54.100" N	85° 52' 56.082" E
11	23° 20' 49.703" N	85° 52' 53.286" E
12	23° 20' 46.205" N	85° 52' 49.201" E
13	23° 20' 44.864" N	85° 52' 46.410" E
14	23° 20' 43.193" N	85° 52' 43.710" E
15	23° 20' 41.556" N	85° 52' 41.965" E
16	23° 20' 37.260" N	85° 52' 34.056" E
17	23° 20' 34.428" N	85° 52' 30.297" E
18	23° 20' 32.189" N	85° 52' 27.577" E
19	23° 20' 31.005" N	85° 52' 23.152" E
20	23° 20' 30.616" N	85° 52' 18.870" E

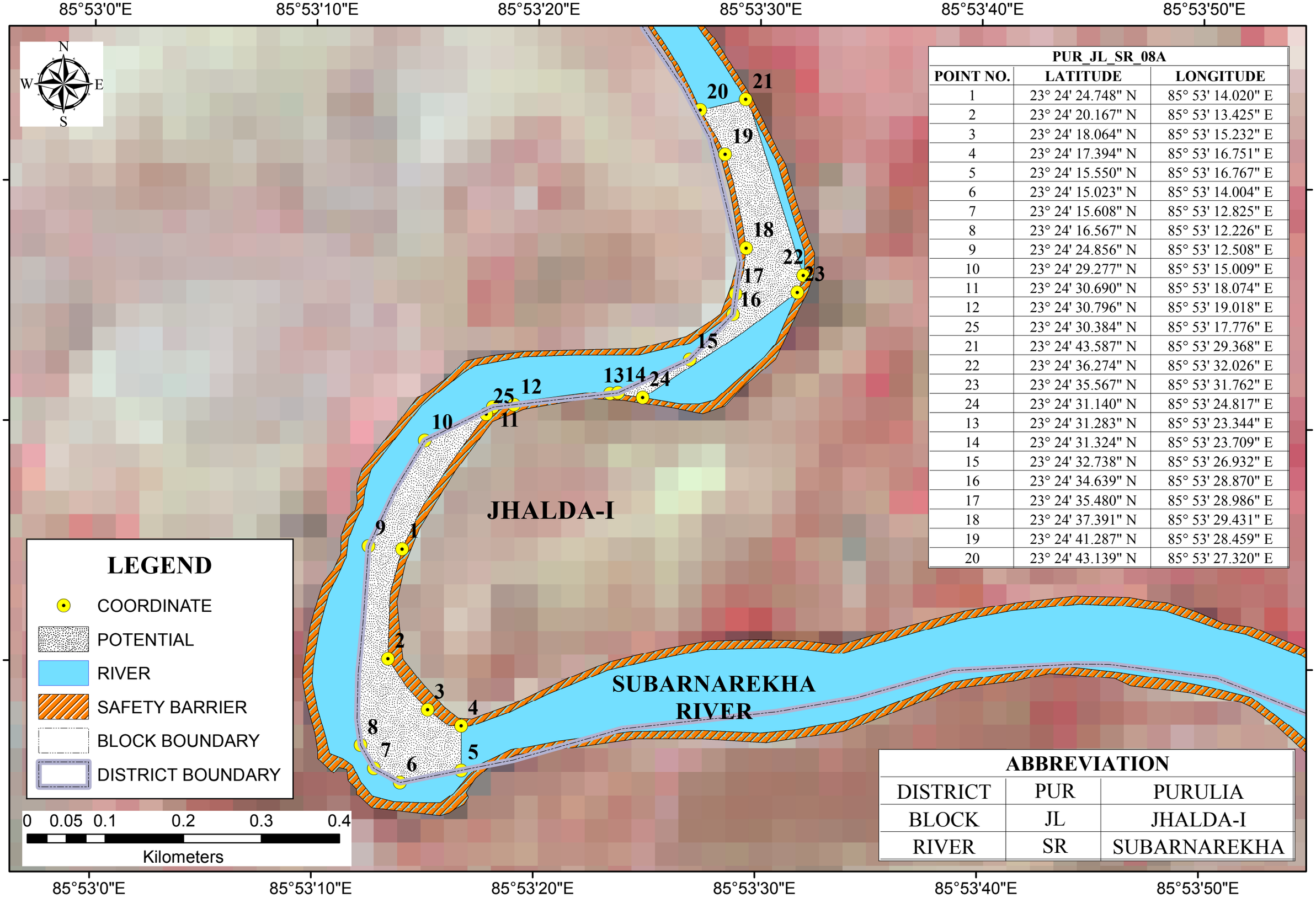
POTENTIAL BLOCK PUR_JL_SR_08 OF SUBARNAREKHA RIVER



PUR_JL_SR_08		
POINT NO.	LATITUDE	LONGITUDE
1	23° 23' 39.412" N	85° 53' 0.739" E
2	23° 23' 41.217" N	85° 53' 2.820" E
3	23° 23' 44.565" N	85° 53' 7.980" E
4	23° 23' 47.263" N	85° 53' 13.668" E
5	23° 23' 48.254" N	85° 53' 17.989" E
6	23° 23' 48.165" N	85° 53' 21.838" E
7	23° 23' 47.936" N	85° 53' 23.112" E
8	23° 23' 47.343" N	85° 53' 26.417" E
9	23° 23' 45.815" N	85° 53' 30.396" E
10	23° 23' 42.994" N	85° 53' 35.496" E
11	23° 23' 36.864" N	85° 53' 52.861" E
12	23° 23' 36.796" N	85° 53' 54.774" E
13	23° 23' 41.975" N	85° 54' 2.567" E
14	23° 23' 43.958" N	85° 54' 5.121" E
15	23° 23' 45.323" N	85° 54' 6.095" E
16	23° 23' 44.399" N	85° 54' 7.680" E
17	23° 23' 39.663" N	85° 54' 4.224" E
18	23° 23' 36.451" N	85° 54' 2.498" E
19	23° 23' 35.060" N	85° 54' 0.422" E
20	23° 23' 34.955" N	85° 53' 59.576" E
21	23° 23' 43.250" N	85° 53' 34.317" E
22	23° 23' 46.292" N	85° 53' 27.776" E
23	23° 23' 47.525" N	85° 53' 25.402" E
24	23° 23' 47.876" N	85° 53' 21.170" E
25	23° 23' 45.696" N	85° 53' 12.240" E
26	23° 23' 43.171" N	85° 53' 7.955" E
27	23° 23' 38.296" N	85° 53' 2.049" E

ABBREVIATION		
DISTRICT	PUR	PURULIA
BLOCK	JL	JHALDA-I
RIVER	SR	SUBARNAREKHA

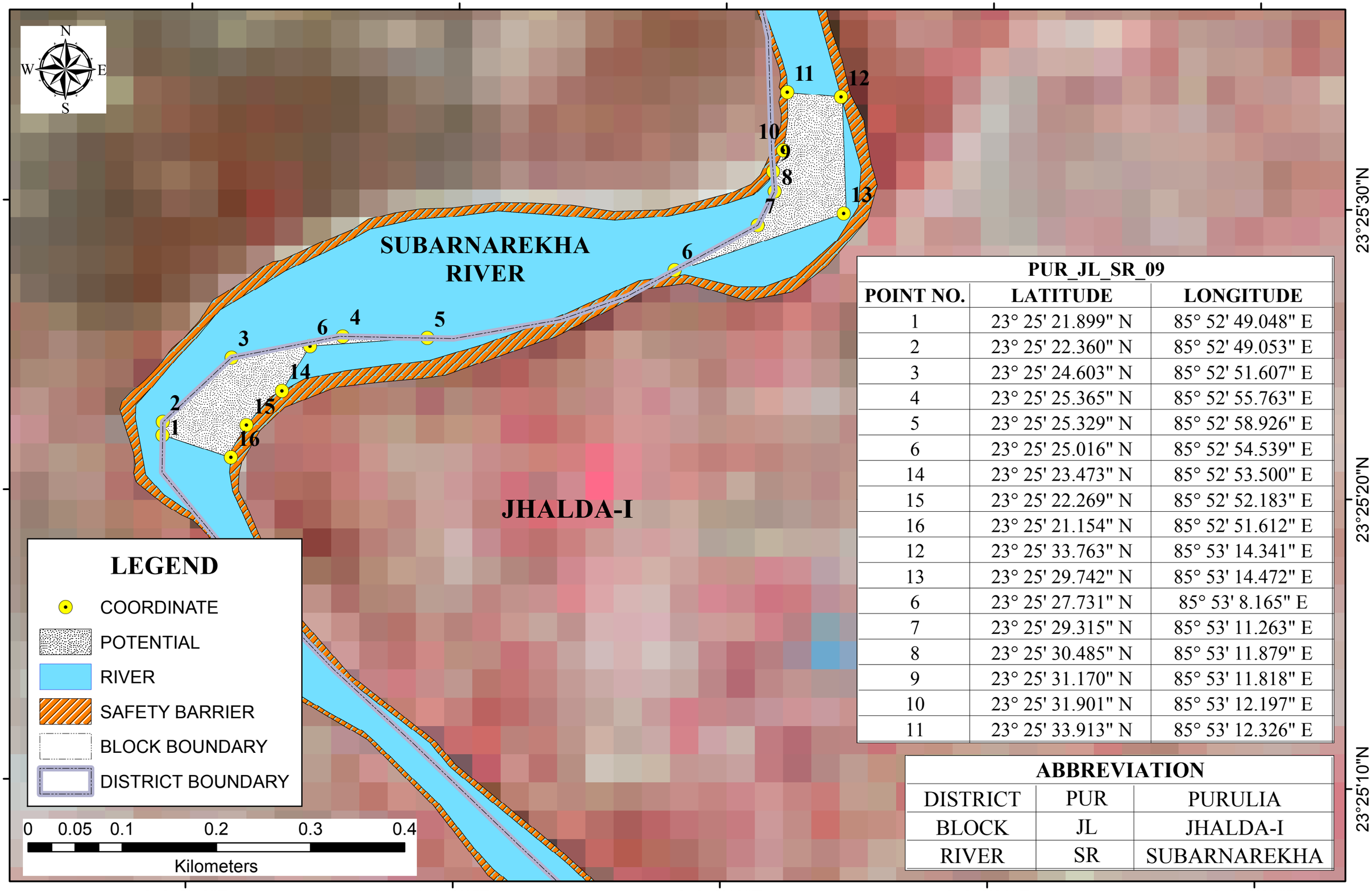
POTENTIAL BLOCK PUR_JL_SR_08A OF SUBARNAREKHA RIVER



PUR_JL_SR_08A		
POINT NO.	LATITUDE	LONGITUDE
1	23° 24' 24.748" N	85° 53' 14.020" E
2	23° 24' 20.167" N	85° 53' 13.425" E
3	23° 24' 18.064" N	85° 53' 15.232" E
4	23° 24' 17.394" N	85° 53' 16.751" E
5	23° 24' 15.550" N	85° 53' 16.767" E
6	23° 24' 15.023" N	85° 53' 14.004" E
7	23° 24' 15.608" N	85° 53' 12.825" E
8	23° 24' 16.567" N	85° 53' 12.226" E
9	23° 24' 24.856" N	85° 53' 12.508" E
10	23° 24' 29.277" N	85° 53' 15.009" E
11	23° 24' 30.690" N	85° 53' 18.074" E
12	23° 24' 30.796" N	85° 53' 19.018" E
25	23° 24' 30.384" N	85° 53' 17.776" E
21	23° 24' 43.587" N	85° 53' 29.368" E
22	23° 24' 36.274" N	85° 53' 32.026" E
23	23° 24' 35.567" N	85° 53' 31.762" E
24	23° 24' 31.140" N	85° 53' 24.817" E
13	23° 24' 31.283" N	85° 53' 23.344" E
14	23° 24' 31.324" N	85° 53' 23.709" E
15	23° 24' 32.738" N	85° 53' 26.932" E
16	23° 24' 34.639" N	85° 53' 28.870" E
17	23° 24' 35.480" N	85° 53' 28.986" E
18	23° 24' 37.391" N	85° 53' 29.431" E
19	23° 24' 41.287" N	85° 53' 28.459" E
20	23° 24' 43.139" N	85° 53' 27.320" E

ABBREVIATION		
DISTRICT	PUR	PURULIA
BLOCK	JL	JHALDA-I
RIVER	SR	SUBARNAREKHA

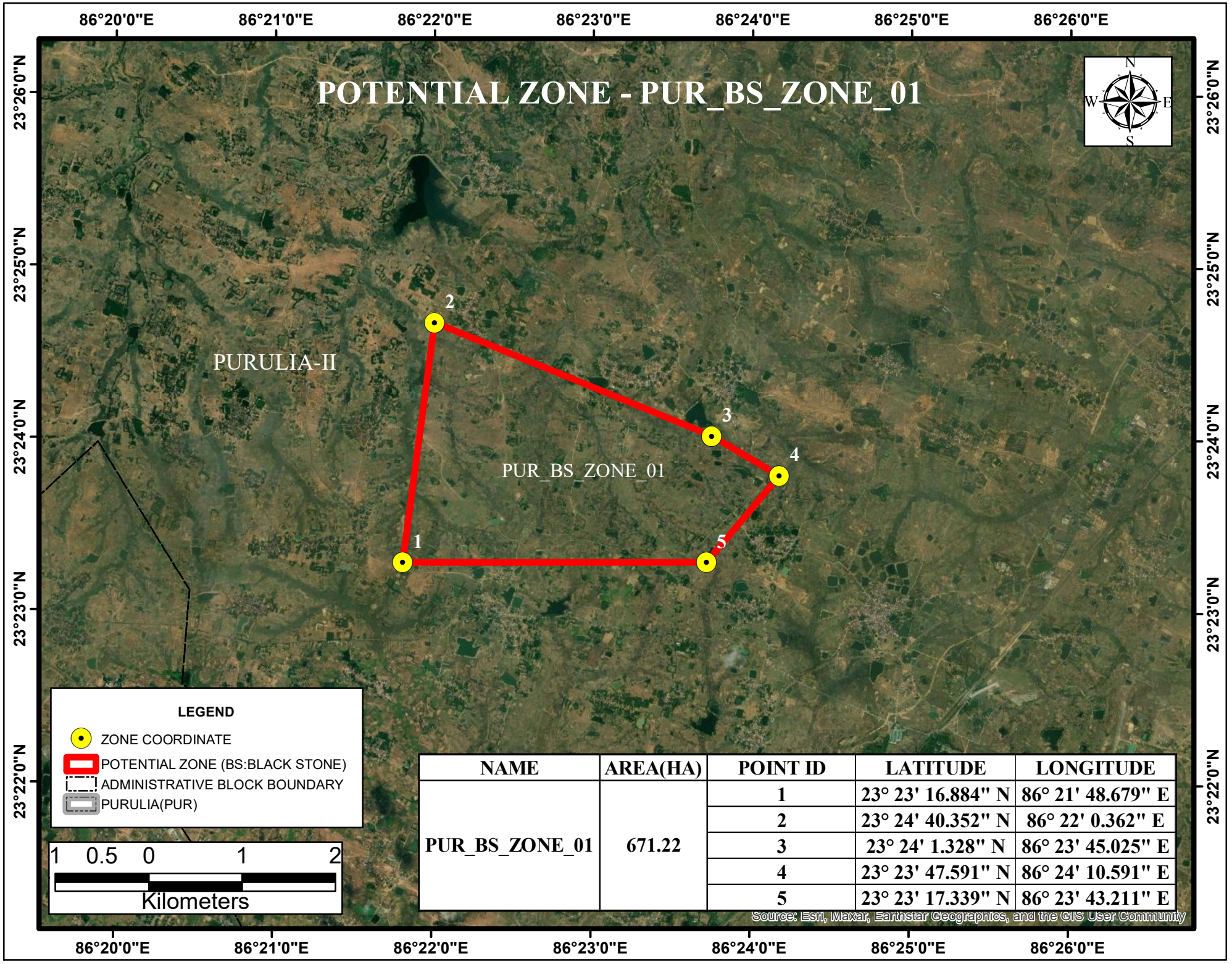
POTENTIAL BLOCK PUR_JL_SR_09 OF SUBARNAREKHA RIVER



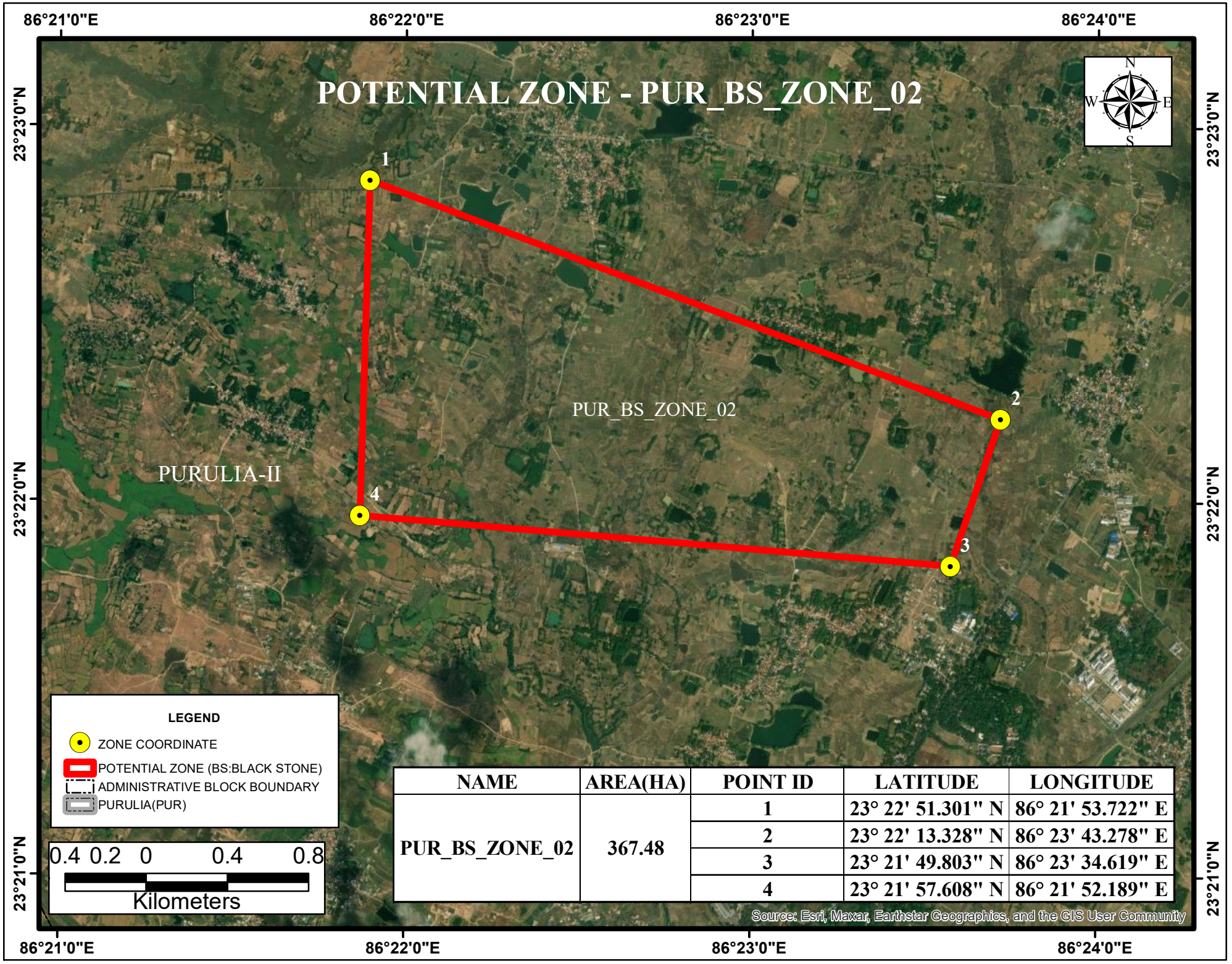
PUR_JL_SR_09		
POINT NO.	LATITUDE	LONGITUDE
1	23° 25' 21.899" N	85° 52' 49.048" E
2	23° 25' 22.360" N	85° 52' 49.053" E
3	23° 25' 24.603" N	85° 52' 51.607" E
4	23° 25' 25.365" N	85° 52' 55.763" E
5	23° 25' 25.329" N	85° 52' 58.926" E
6	23° 25' 25.016" N	85° 52' 54.539" E
14	23° 25' 23.473" N	85° 52' 53.500" E
15	23° 25' 22.269" N	85° 52' 52.183" E
16	23° 25' 21.154" N	85° 52' 51.612" E
12	23° 25' 33.763" N	85° 53' 14.341" E
13	23° 25' 29.742" N	85° 53' 14.472" E
6	23° 25' 27.731" N	85° 53' 8.165" E
7	23° 25' 29.315" N	85° 53' 11.263" E
8	23° 25' 30.485" N	85° 53' 11.879" E
9	23° 25' 31.170" N	85° 53' 11.818" E
10	23° 25' 31.901" N	85° 53' 12.197" E
11	23° 25' 33.913" N	85° 53' 12.326" E

ABBREVIATION		
DISTRICT	PUR	PURULIA
BLOCK	JL	JHALDA-I
RIVER	SR	SUBARNAREKHA

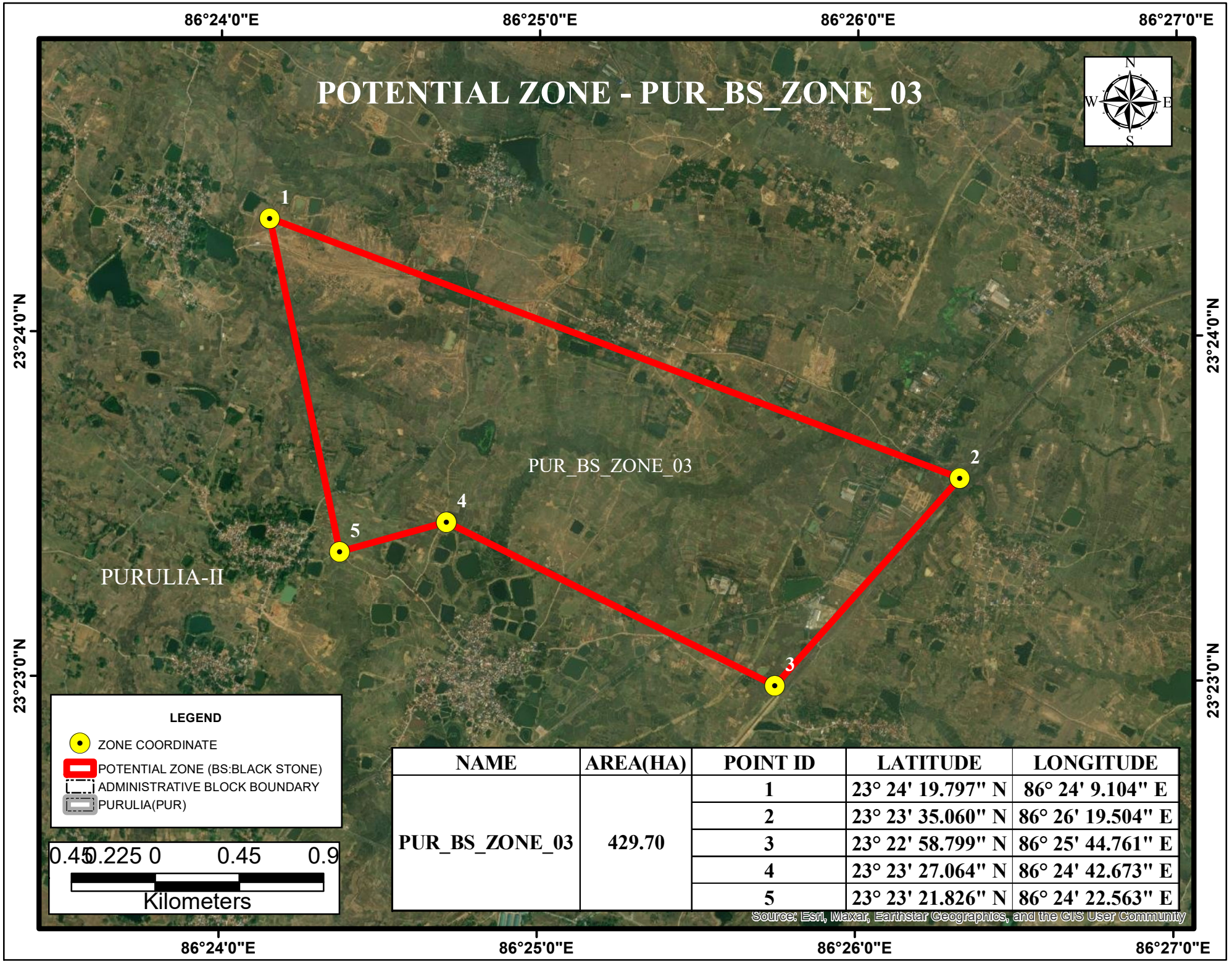
Annexure 5
Map showing of Potential In-situ mineral Blocks of Purulia District



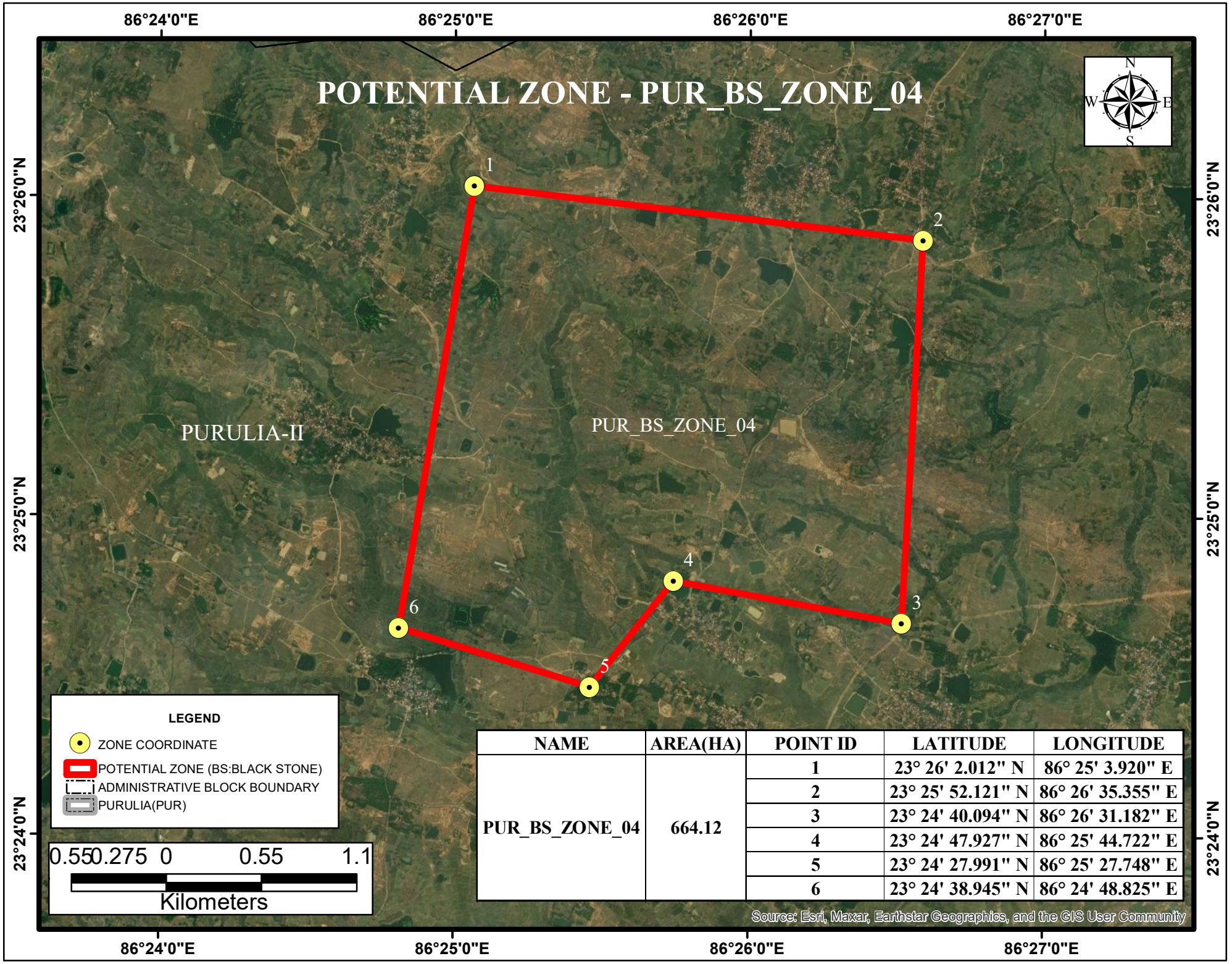
NAME	AREA(HA)	POINT ID	LATITUDE	LONGITUDE
PUR_BS_ZONE_01	671.22	1	23° 23' 16.884" N	86° 21' 48.679" E
		2	23° 24' 40.352" N	86° 22' 0.362" E
		3	23° 24' 1.328" N	86° 23' 45.025" E
		4	23° 23' 47.591" N	86° 24' 10.591" E
		5	23° 23' 17.339" N	86° 23' 43.211" E



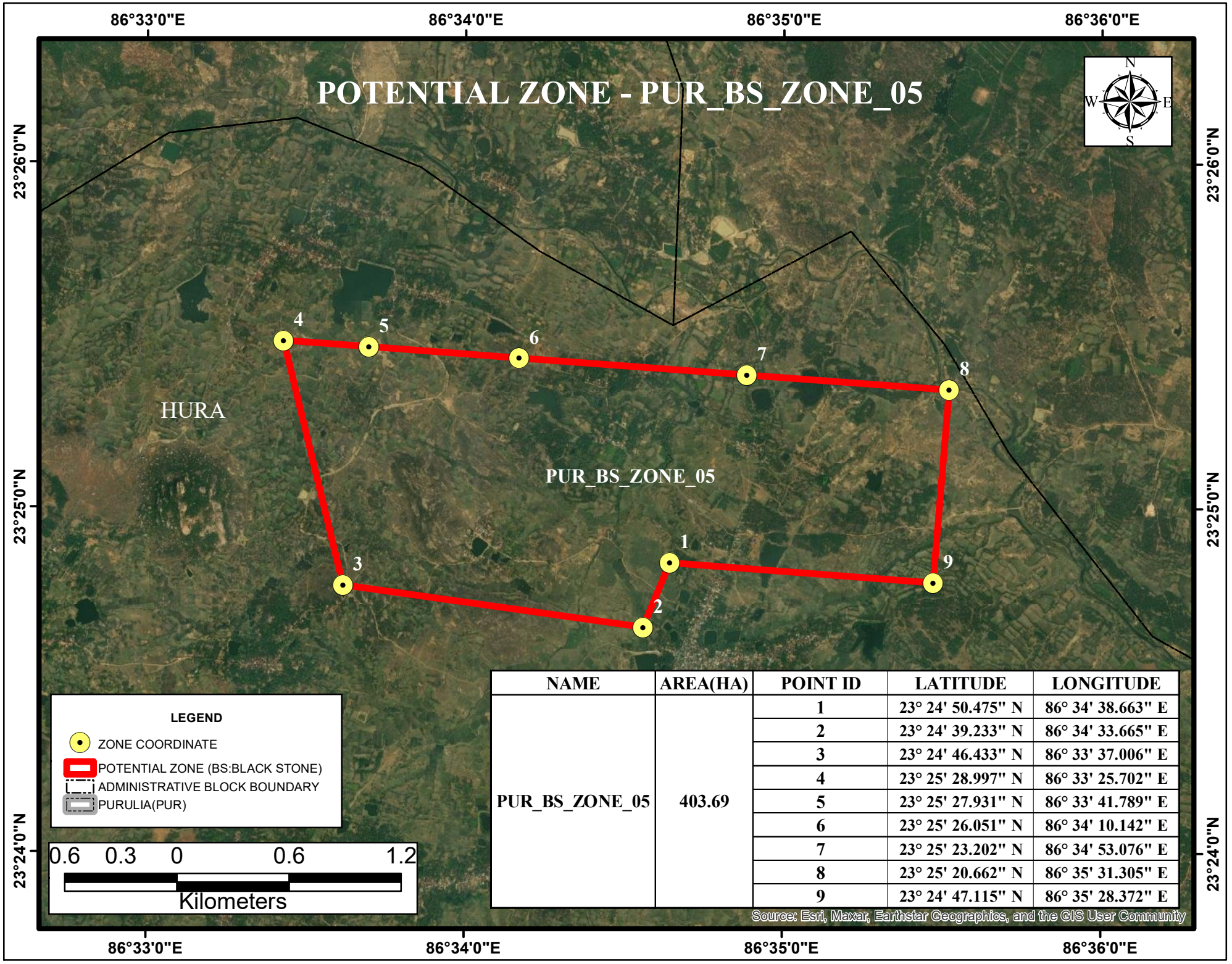
NAME	AREA(HA)	POINT ID	LATITUDE	LONGITUDE
PUR_BS_ZONE_02	367.48	1	23° 22' 51.301" N	86° 21' 53.722" E
		2	23° 22' 13.328" N	86° 23' 43.278" E
		3	23° 21' 49.803" N	86° 23' 34.619" E
		4	23° 21' 57.608" N	86° 21' 52.189" E



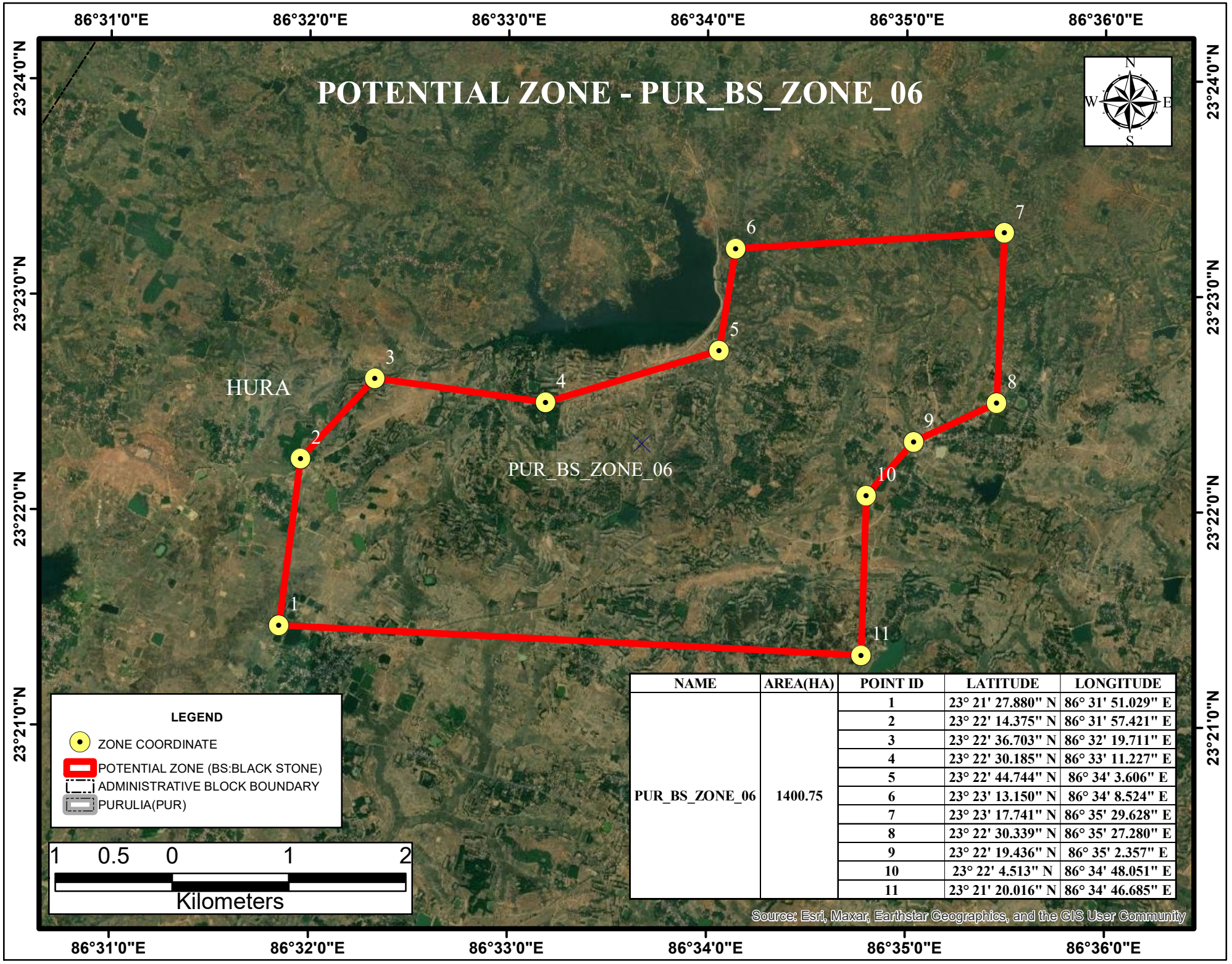
NAME	AREA(HA)	POINT ID	LATITUDE	LONGITUDE
PUR_BS_ZONE_03	429.70	1	23° 24' 19.797" N	86° 24' 9.104" E
		2	23° 23' 35.060" N	86° 26' 19.504" E
		3	23° 22' 58.799" N	86° 25' 44.761" E
		4	23° 23' 27.064" N	86° 24' 42.673" E
		5	23° 23' 21.826" N	86° 24' 22.563" E



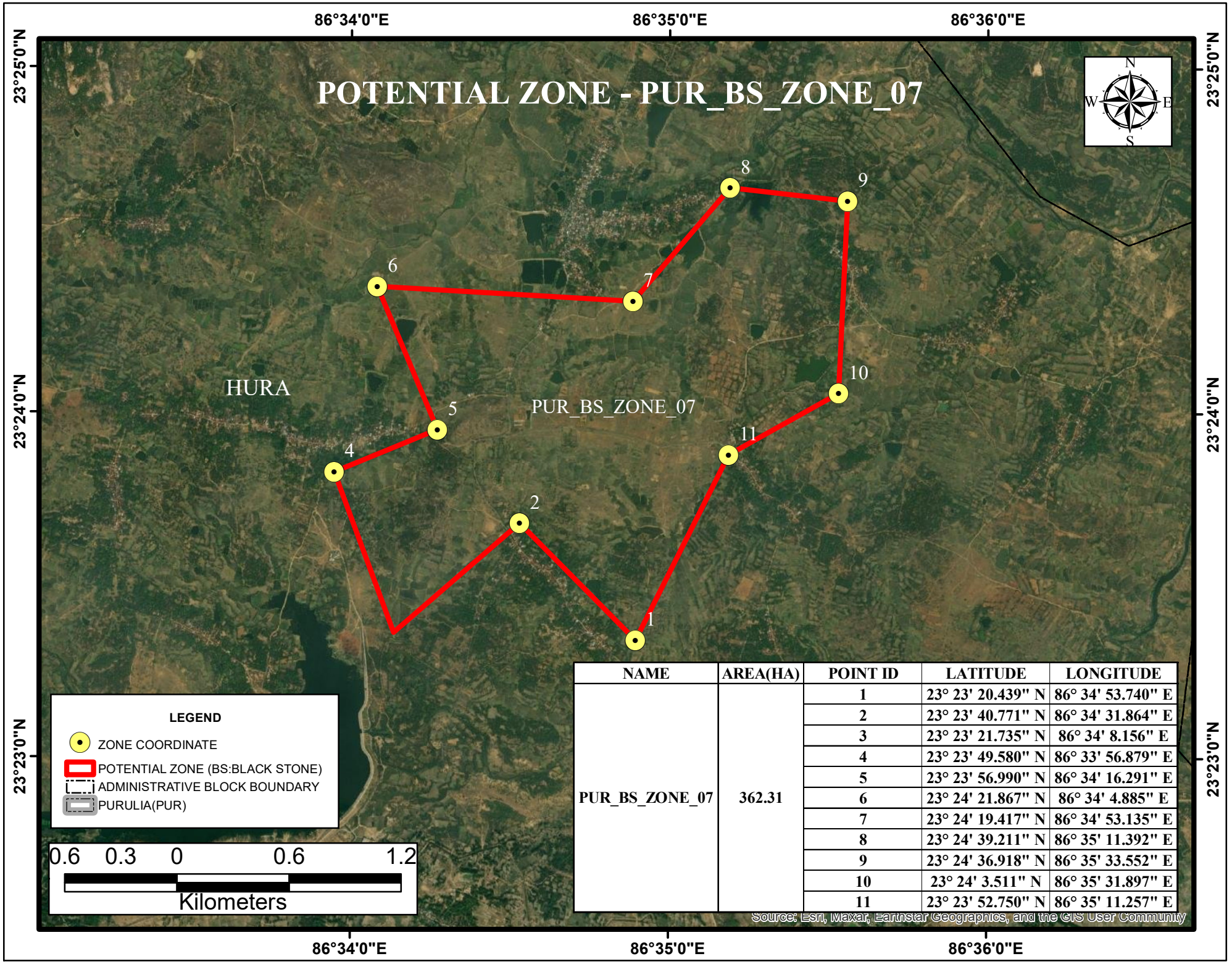
NAME	AREA(HA)	POINT ID	LATITUDE	LONGITUDE
PUR_BS_ZONE_04	664.12	1	23° 26' 2.012" N	86° 25' 3.920" E
		2	23° 25' 52.121" N	86° 26' 35.355" E
		3	23° 24' 40.094" N	86° 26' 31.182" E
		4	23° 24' 47.927" N	86° 25' 44.722" E
		5	23° 24' 27.991" N	86° 25' 27.748" E
		6	23° 24' 38.945" N	86° 24' 48.825" E



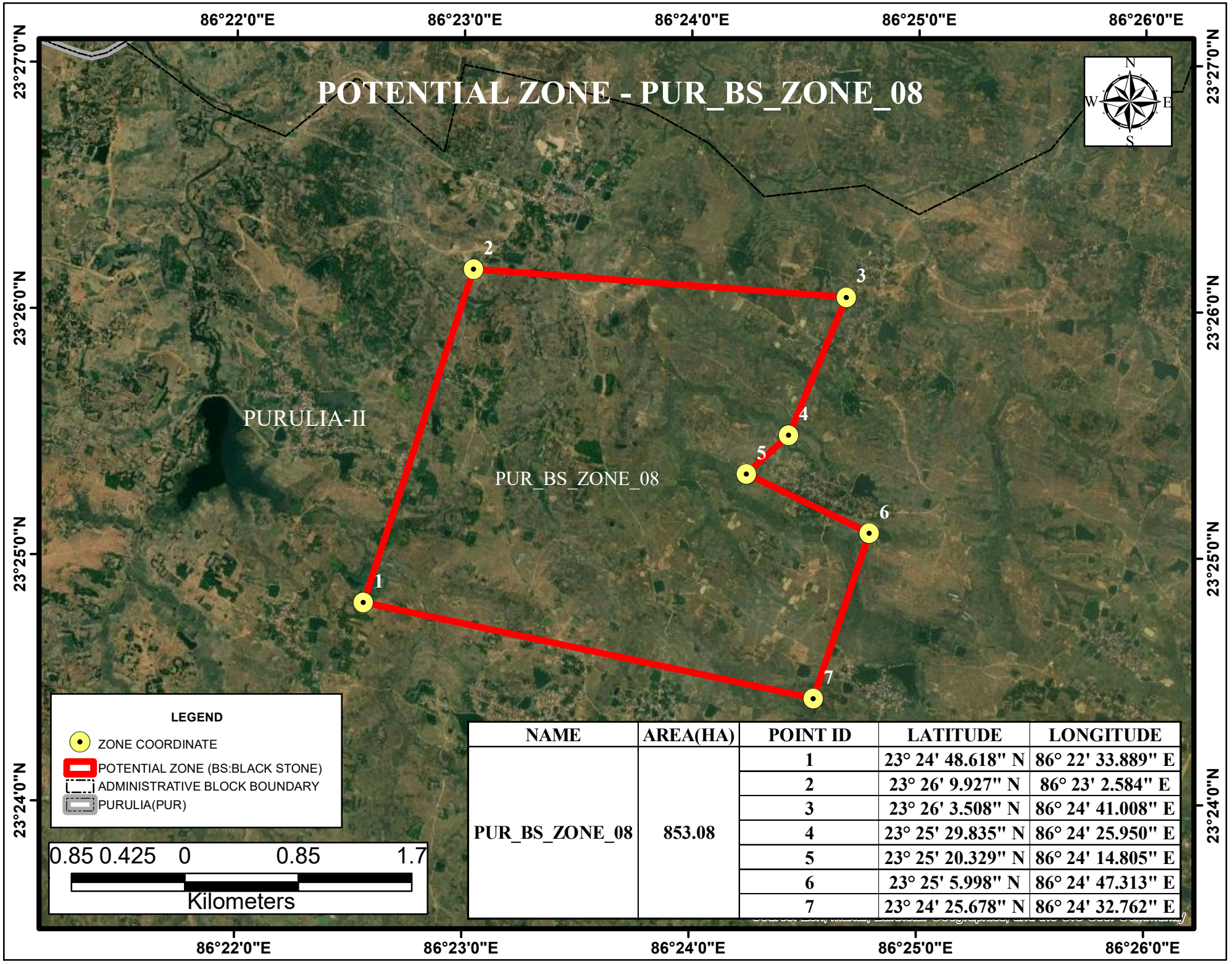
NAME	AREA(HA)	POINT ID	LATITUDE	LONGITUDE
PUR_BS_ZONE_05	403.69	1	23° 24' 50.475" N	86° 34' 38.663" E
		2	23° 24' 39.233" N	86° 34' 33.665" E
		3	23° 24' 46.433" N	86° 33' 37.006" E
		4	23° 25' 28.997" N	86° 33' 25.702" E
		5	23° 25' 27.931" N	86° 33' 41.789" E
		6	23° 25' 26.051" N	86° 34' 10.142" E
		7	23° 25' 23.202" N	86° 34' 53.076" E
		8	23° 25' 20.662" N	86° 35' 31.305" E
		9	23° 24' 47.115" N	86° 35' 28.372" E



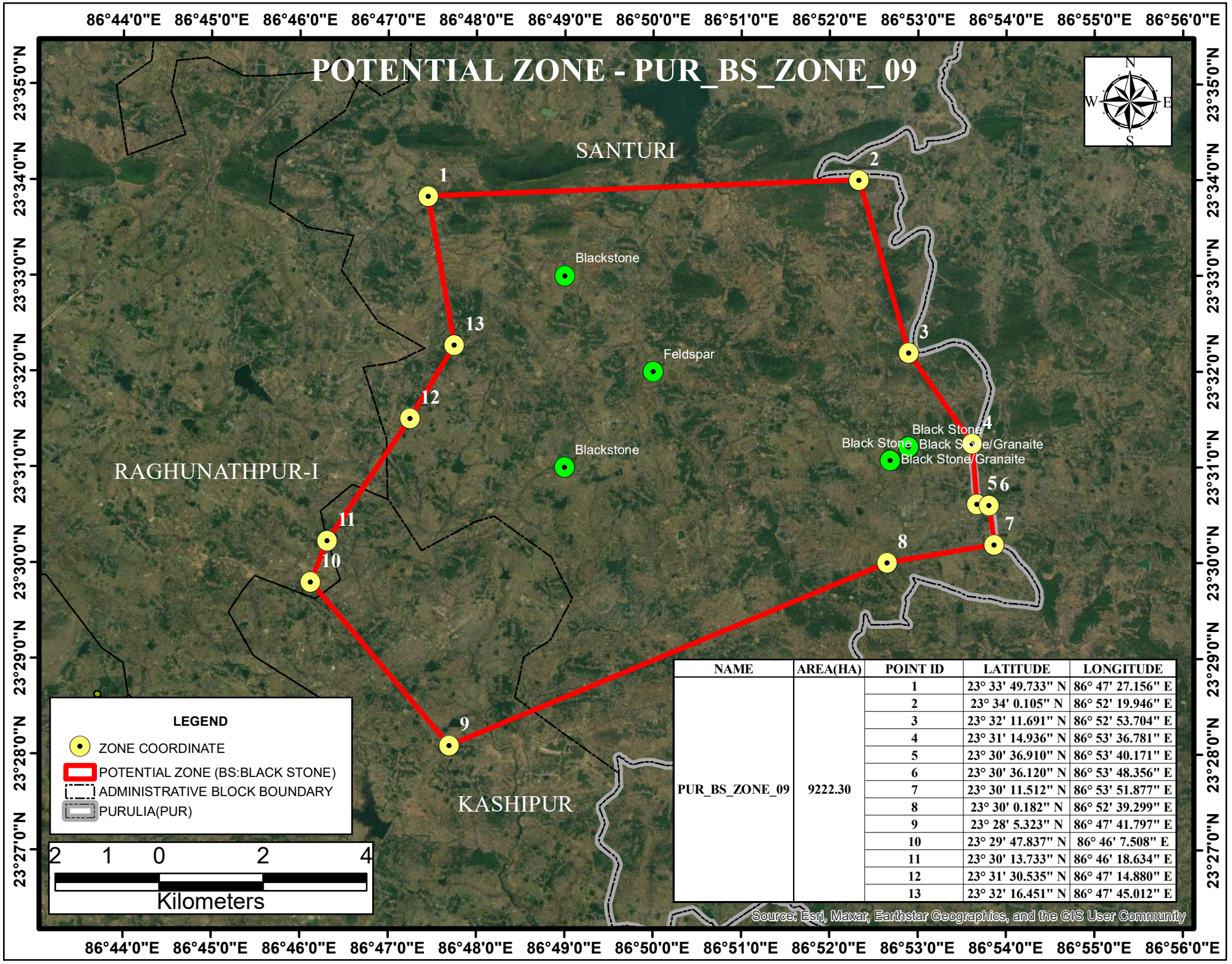
NAME	AREA(HA)	POINT ID	LATITUDE	LONGITUDE
PUR_BS_ZONE_06	1400.75	1	23° 21' 27.880" N	86° 31' 51.029" E
		2	23° 22' 14.375" N	86° 31' 57.421" E
		3	23° 22' 36.703" N	86° 32' 19.711" E
		4	23° 22' 30.185" N	86° 33' 11.227" E
		5	23° 22' 44.744" N	86° 34' 3.606" E
		6	23° 23' 13.150" N	86° 34' 8.524" E
		7	23° 23' 17.741" N	86° 35' 29.628" E
		8	23° 22' 30.339" N	86° 35' 27.280" E
		9	23° 22' 19.436" N	86° 35' 2.357" E
		10	23° 22' 4.513" N	86° 34' 48.051" E
		11	23° 21' 20.016" N	86° 34' 46.685" E



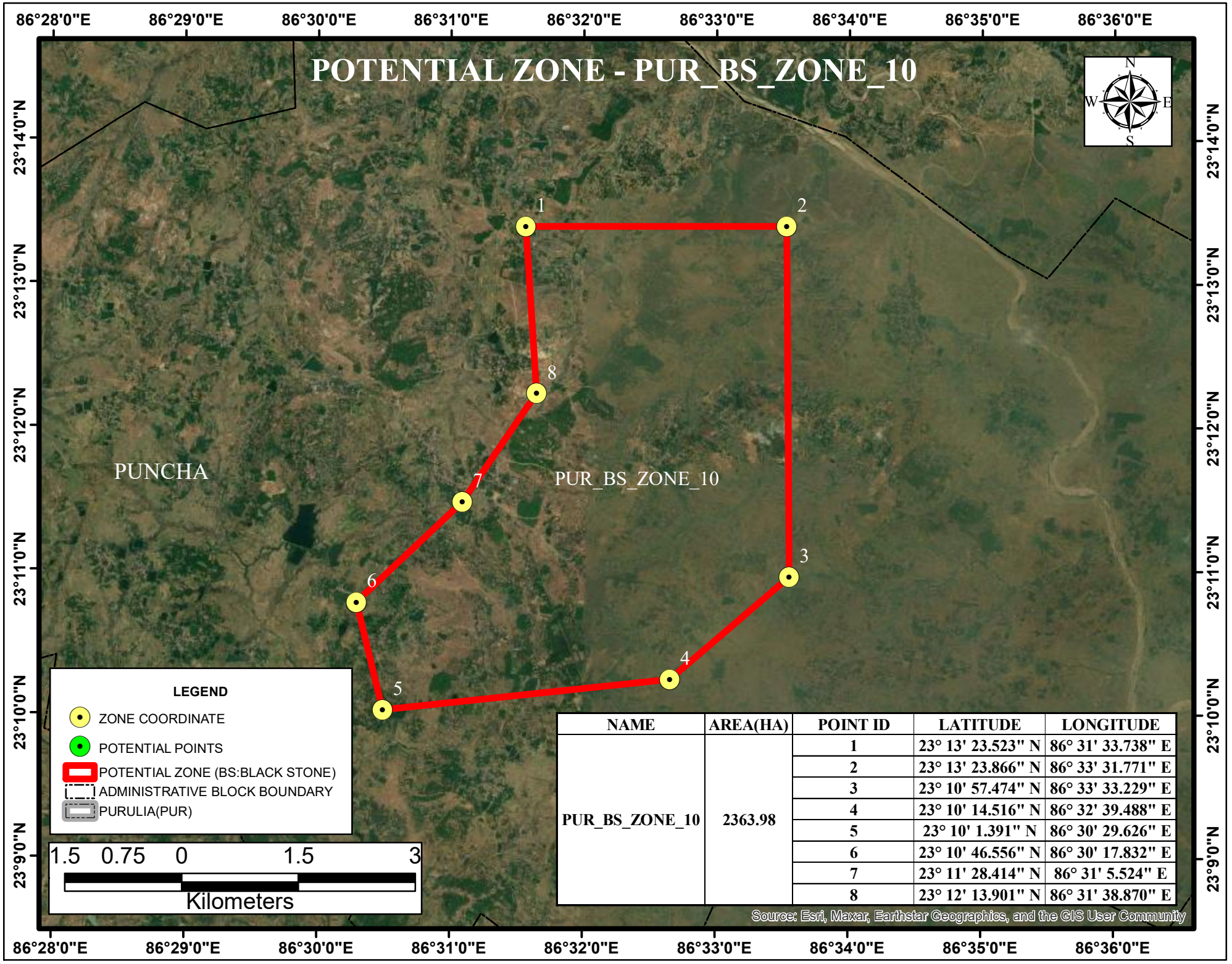
NAME	AREA(HA)	POINT ID	LATITUDE	LONGITUDE
PUR_BS_ZONE_07	362.31	1	23° 23' 20.439" N	86° 34' 53.740" E
		2	23° 23' 40.771" N	86° 34' 31.864" E
		3	23° 23' 21.735" N	86° 34' 8.156" E
		4	23° 23' 49.580" N	86° 33' 56.879" E
		5	23° 23' 56.990" N	86° 34' 16.291" E
		6	23° 24' 21.867" N	86° 34' 4.885" E
		7	23° 24' 19.417" N	86° 34' 53.135" E
		8	23° 24' 39.211" N	86° 35' 11.392" E
		9	23° 24' 36.918" N	86° 35' 33.552" E
		10	23° 24' 3.511" N	86° 35' 31.897" E
		11	23° 23' 52.750" N	86° 35' 11.257" E



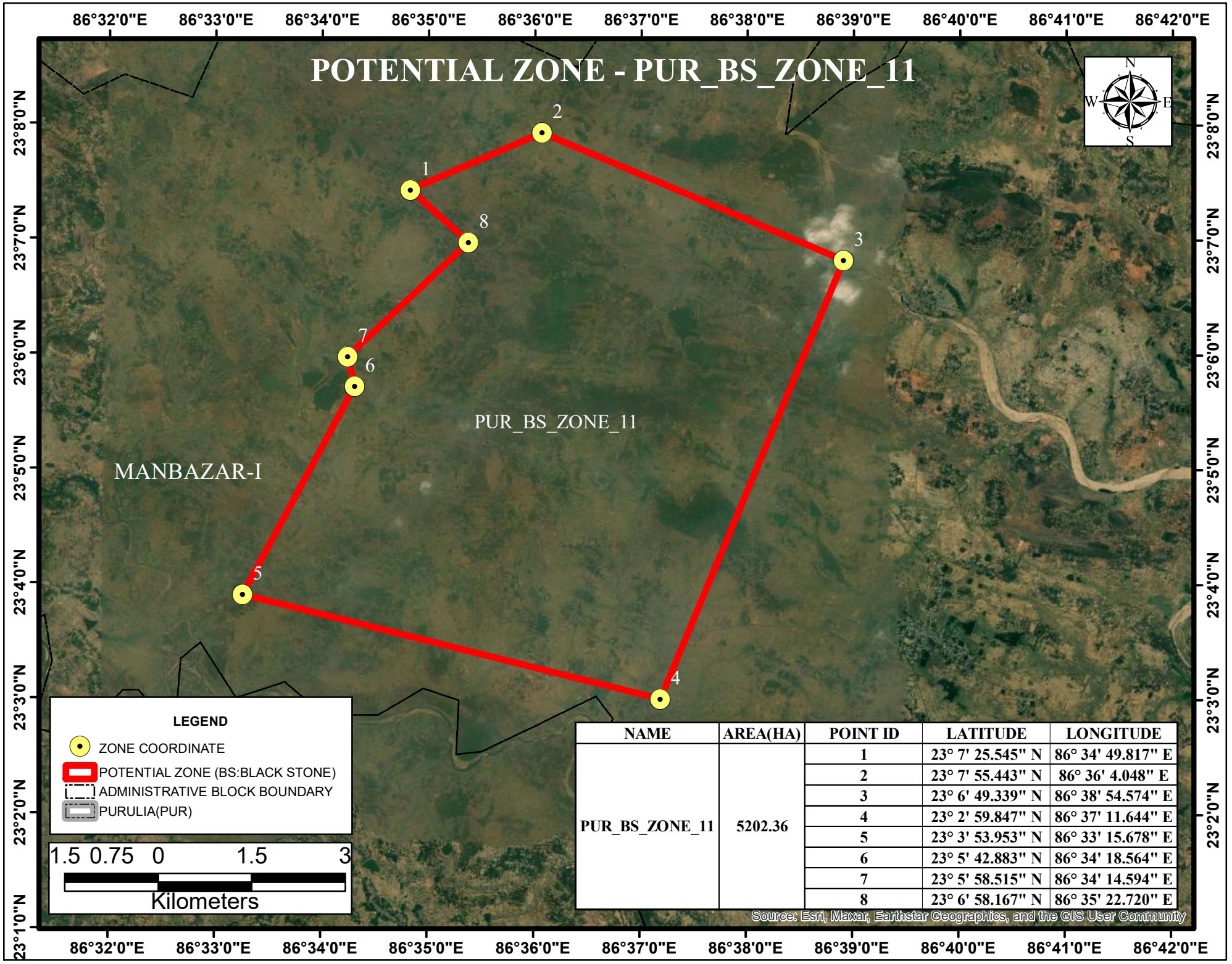
NAME	AREA(HA)	POINT ID	LATITUDE	LONGITUDE
PUR_BS_ZONE_08	853.08	1	23° 24' 48.618" N	86° 22' 33.889" E
		2	23° 26' 9.927" N	86° 23' 2.584" E
		3	23° 26' 3.508" N	86° 24' 41.008" E
		4	23° 25' 29.835" N	86° 24' 25.950" E
		5	23° 25' 20.329" N	86° 24' 14.805" E
		6	23° 25' 5.998" N	86° 24' 47.313" E
		7	23° 24' 25.678" N	86° 24' 32.762" E



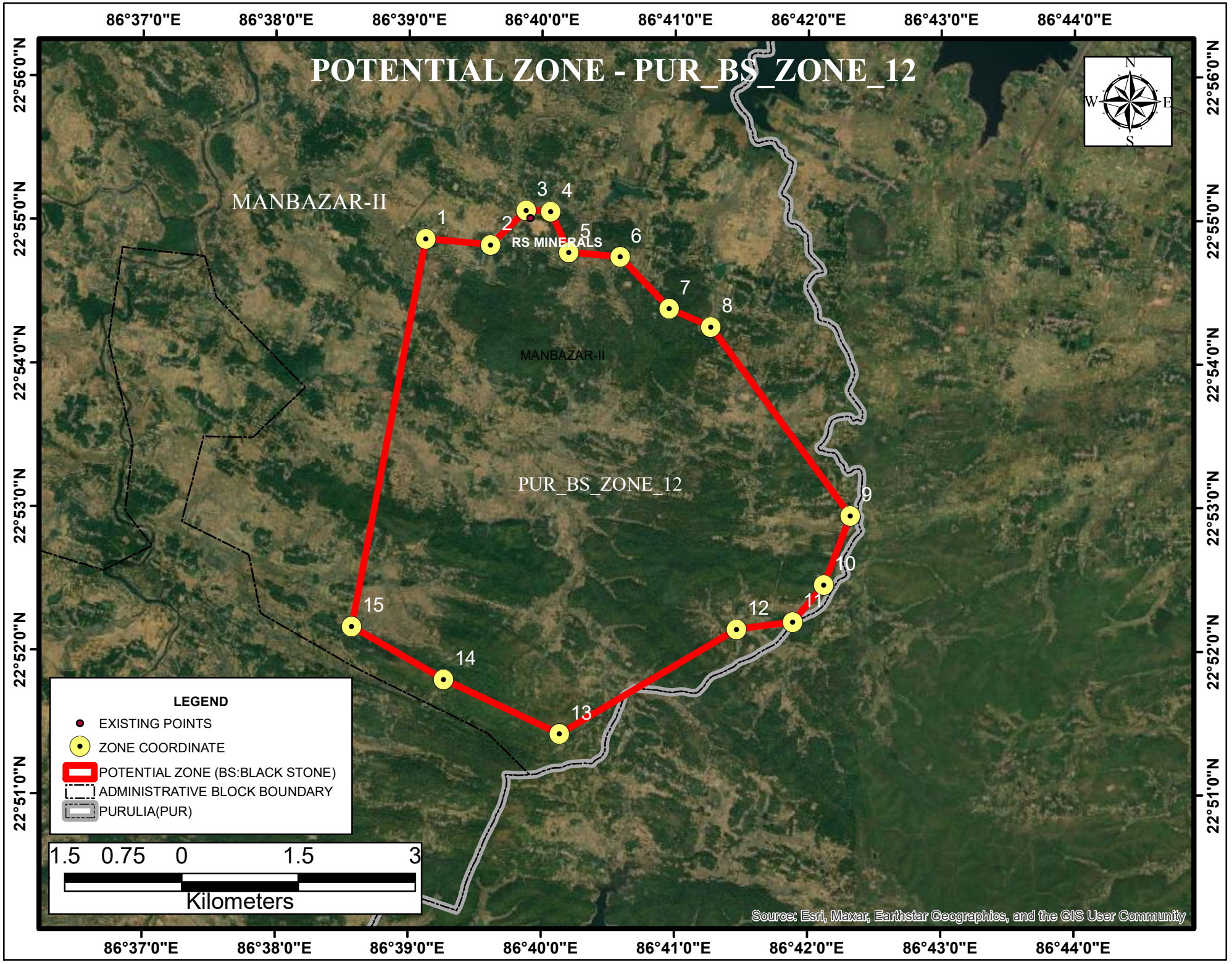
NAME	AREA(HA)	POINT ID	LATITUDE	LONGITUDE
PUR_BS_ZONE_09	9222.30	1	23° 33' 49.733" N	86° 47' 27.156" E
		2	23° 34' 0.105" N	86° 52' 19.946" E
		3	23° 32' 11.691" N	86° 52' 53.704" E
		4	23° 31' 14.936" N	86° 53' 36.781" E
		5	23° 30' 36.910" N	86° 53' 40.171" E
		6	23° 30' 36.120" N	86° 53' 48.356" E
		7	23° 30' 11.512" N	86° 53' 51.877" E
		8	23° 30' 0.182" N	86° 52' 39.299" E
		9	23° 28' 5.323" N	86° 47' 41.797" E
		10	23° 29' 47.837" N	86° 46' 7.508" E
		11	23° 30' 13.733" N	86° 46' 18.634" E
		12	23° 31' 30.535" N	86° 47' 14.880" E
		13	23° 32' 16.451" N	86° 47' 45.012" E



NAME	AREA(HA)	POINT ID	LATITUDE	LONGITUDE
PUR_BS_ZONE_10	2363.98	1	23° 13' 23.523" N	86° 31' 33.738" E
		2	23° 13' 23.866" N	86° 33' 31.771" E
		3	23° 10' 57.474" N	86° 33' 33.229" E
		4	23° 10' 14.516" N	86° 32' 39.488" E
		5	23° 10' 1.391" N	86° 30' 29.626" E
		6	23° 10' 46.556" N	86° 30' 17.832" E
		7	23° 11' 28.414" N	86° 31' 5.524" E
		8	23° 12' 13.901" N	86° 31' 38.870" E



NAME	AREA(HA)	POINT ID	LATITUDE	LONGITUDE
PUR_BS_ZONE_11	5202.36	1	23° 7' 25.545" N	86° 34' 49.817" E
		2	23° 7' 55.443" N	86° 36' 4.048" E
		3	23° 6' 49.339" N	86° 38' 54.574" E
		4	23° 2' 59.847" N	86° 37' 11.644" E
		5	23° 3' 53.953" N	86° 33' 15.678" E
		6	23° 5' 42.883" N	86° 34' 18.564" E
		7	23° 5' 58.515" N	86° 34' 14.594" E
		8	23° 6' 58.167" N	86° 35' 22.720" E


POTENTIAL ZONE - PUR_BS_ZONE_12
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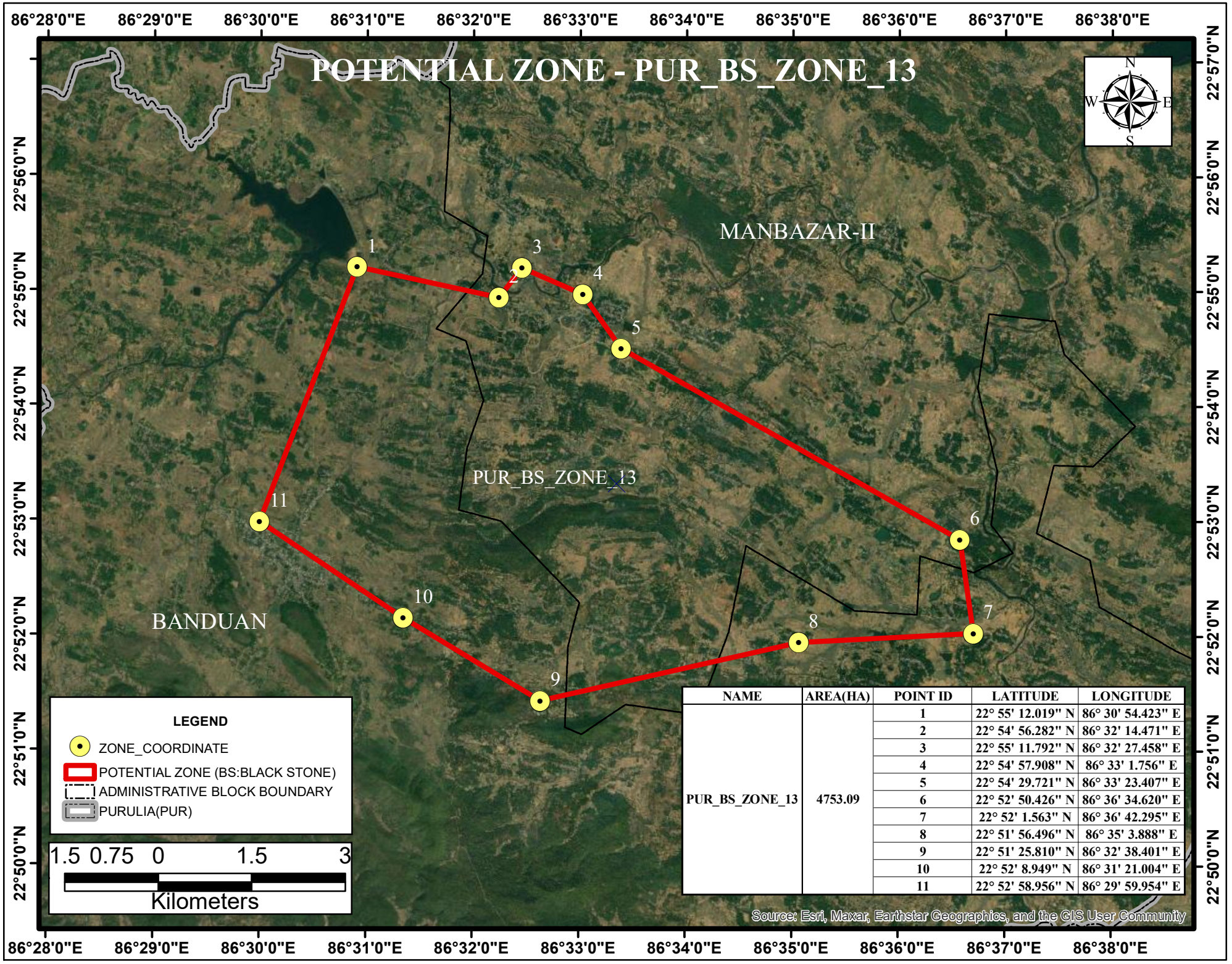
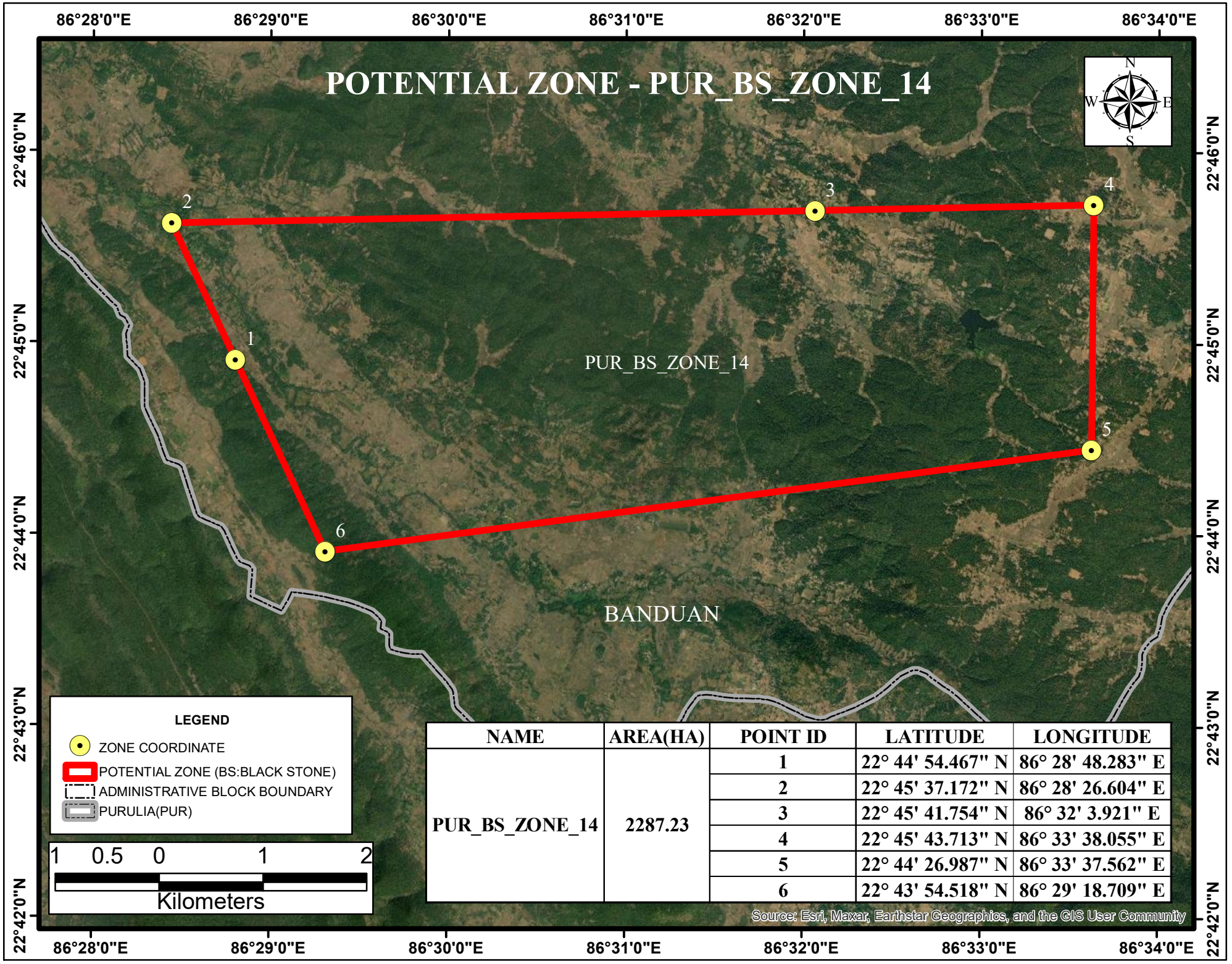
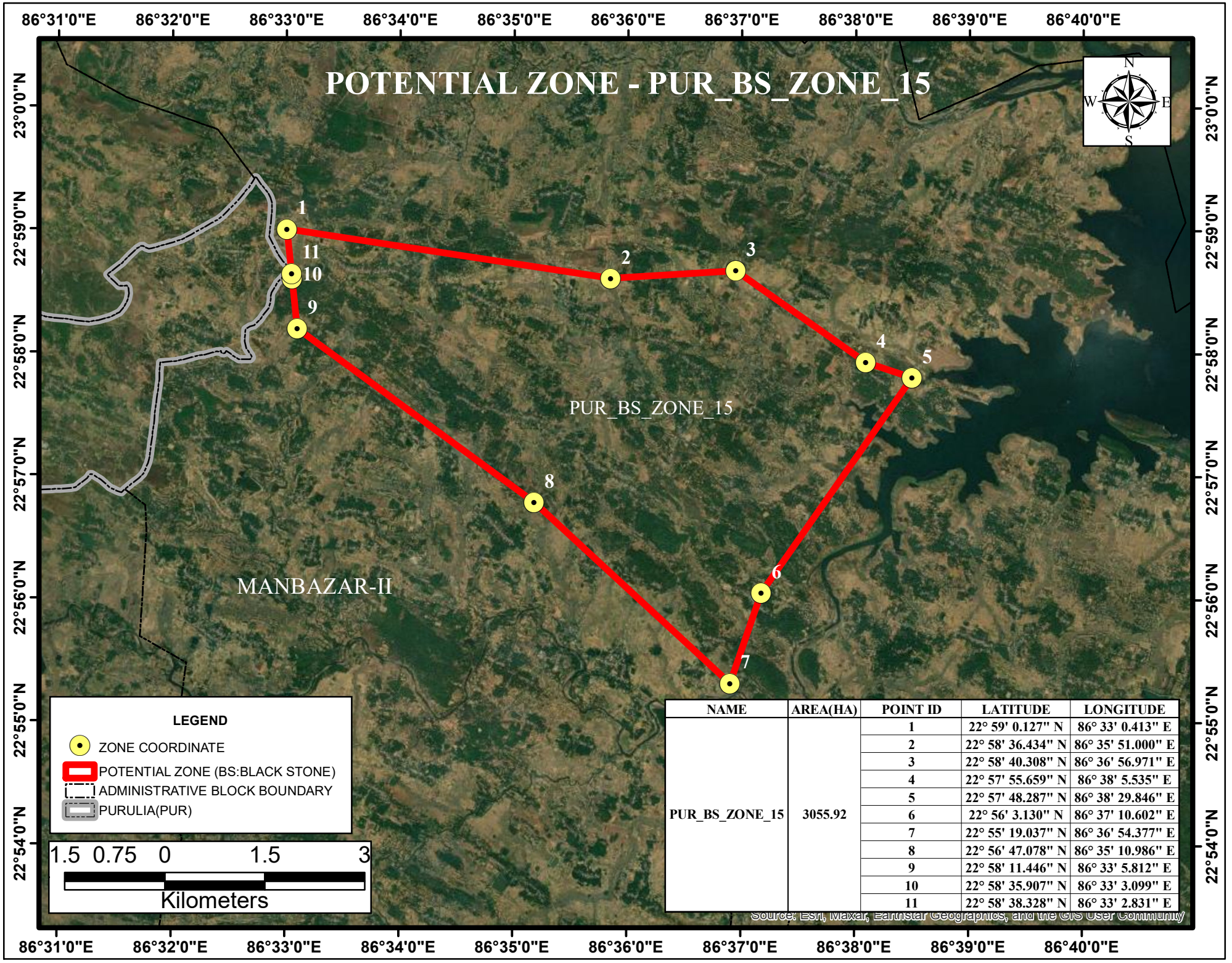
86°38'0"E
86°39'0"E
86°40'0"E
86°41'0"E
86°42'0"E
86°43'0"E
86°44'0"E
22°56'0"N
22°55'0"N
22°54'0"N
22°53'0"N
22°52'0"N
22°51'0"N
N
S
E
W
MANBAZAR-II
RS MINERALS
MANBAZAR-II
PUR_BS_ZONE_12
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
LEGEND
EXISTING POINTS
ZONE COORDINATE
POTENTIAL ZONE (BS:BLACK STONE)
ADMINISTRATIVE BLOCK BOUNDARY
PURULIA(PUR)
1.5 0.75 0 1.5 3
Kilometers
Source: Esri, Maxar, Earthstar Geographics, and the GIS User Community



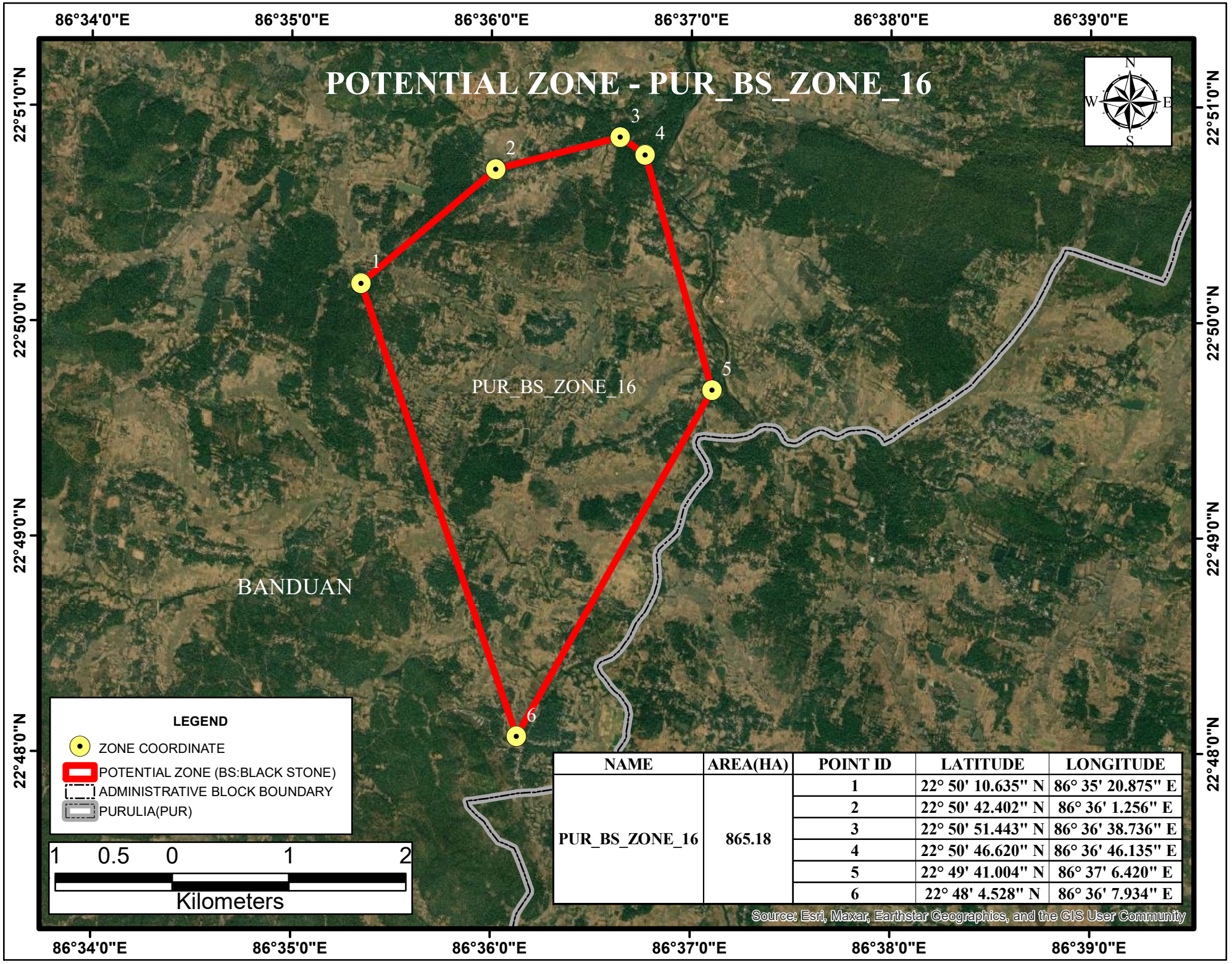
NAME	AREA(HA)	POINT ID	LATITUDE	LONGITUDE
PUR_BS_ZONE_13	4753.09	1	22° 55' 12.019" N	86° 30' 54.423" E
		2	22° 54' 56.282" N	86° 32' 14.471" E
		3	22° 55' 11.792" N	86° 32' 27.458" E
		4	22° 54' 57.908" N	86° 33' 1.756" E
		5	22° 54' 29.721" N	86° 33' 23.407" E
		6	22° 52' 50.426" N	86° 36' 34.620" E
		7	22° 52' 1.563" N	86° 36' 42.295" E
		8	22° 51' 56.496" N	86° 35' 3.888" E
		9	22° 51' 25.810" N	86° 32' 38.401" E
		10	22° 52' 8.949" N	86° 31' 21.004" E
		11	22° 52' 58.956" N	86° 29' 59.954" E



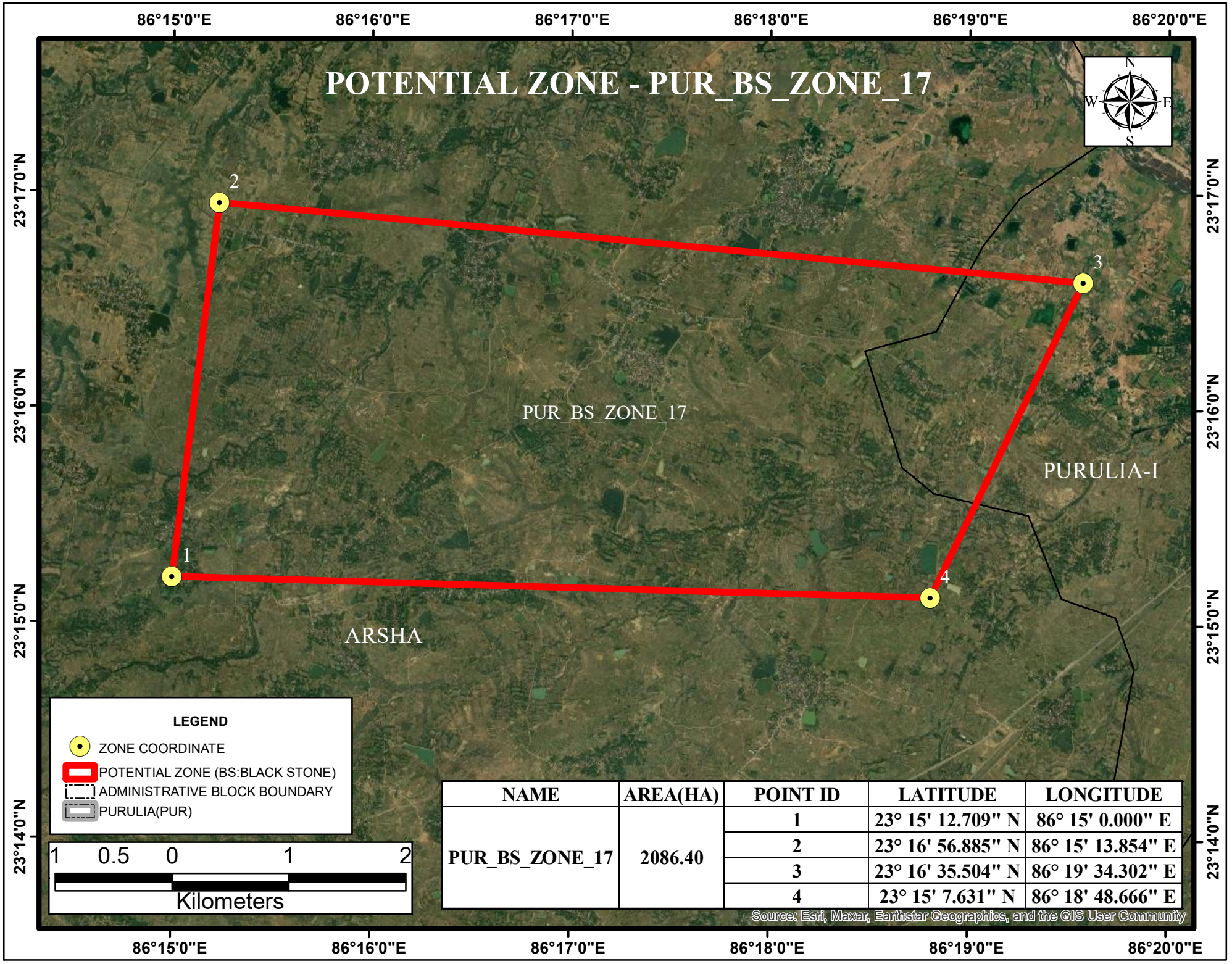
NAME	AREA(HA)	POINT ID	LATITUDE	LONGITUDE
PUR_BS_ZONE_14	2287.23	1	22° 44' 54.467" N	86° 28' 48.283" E
		2	22° 45' 37.172" N	86° 28' 26.604" E
		3	22° 45' 41.754" N	86° 32' 3.921" E
		4	22° 45' 43.713" N	86° 33' 38.055" E
		5	22° 44' 26.987" N	86° 33' 37.562" E
		6	22° 43' 54.518" N	86° 29' 18.709" E



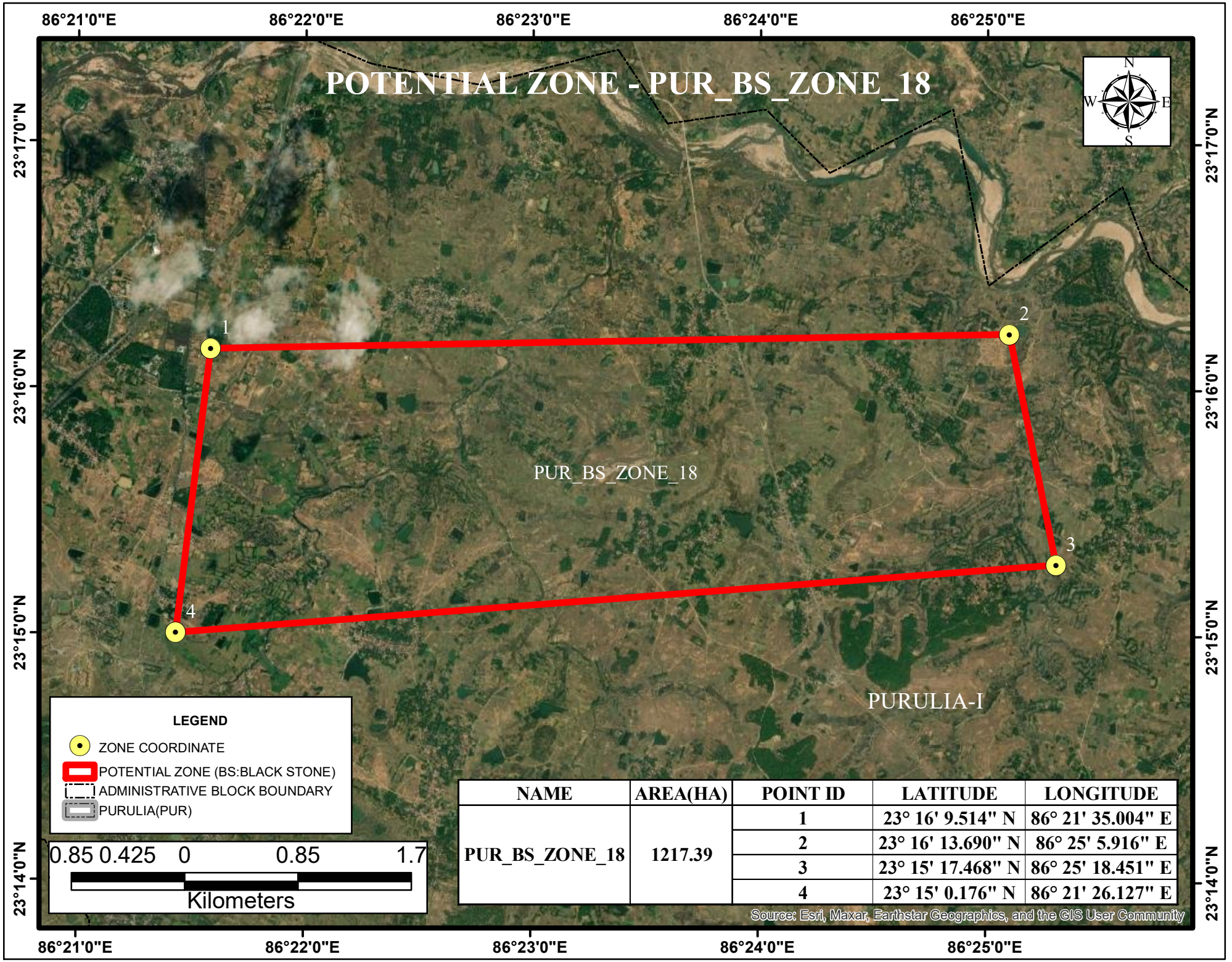
NAME	AREA(HA)	POINT ID	LATITUDE	LONGITUDE
PUR_BS_ZONE_15	3055.92	1	22° 59' 0.127" N	86° 33' 0.413" E
		2	22° 58' 36.434" N	86° 35' 51.000" E
		3	22° 58' 40.308" N	86° 36' 56.971" E
		4	22° 57' 55.659" N	86° 38' 5.535" E
		5	22° 57' 48.287" N	86° 38' 29.846" E
		6	22° 56' 3.130" N	86° 37' 10.602" E
		7	22° 55' 19.037" N	86° 36' 54.377" E
		8	22° 56' 47.078" N	86° 35' 10.986" E
		9	22° 58' 11.446" N	86° 33' 5.812" E
		10	22° 58' 35.907" N	86° 33' 3.099" E
		11	22° 58' 38.328" N	86° 33' 2.831" E



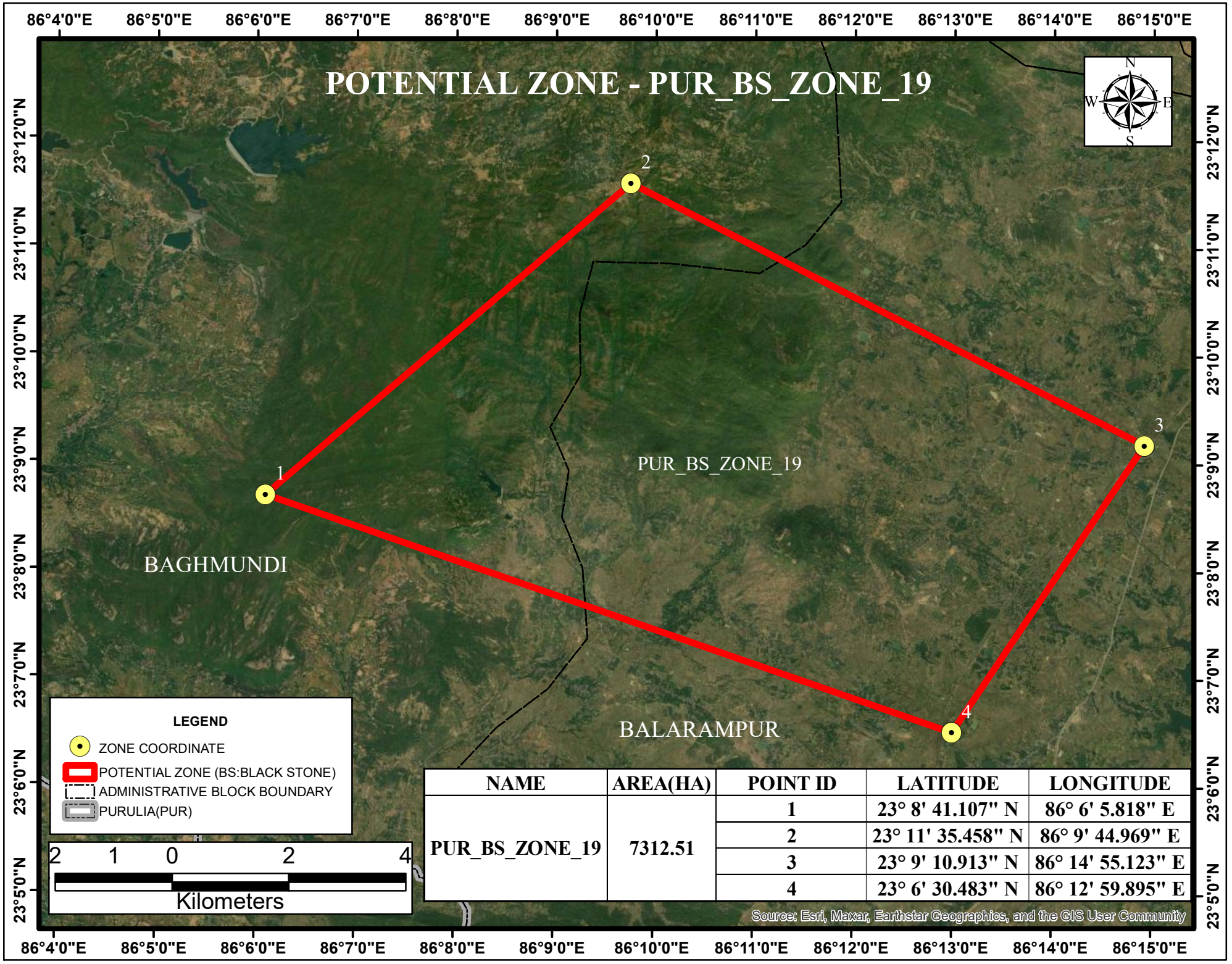
NAME	AREA(HA)	POINT ID	LATITUDE	LONGITUDE
PUR_BS_ZONE_16	865.18	1	22° 50' 10.635" N	86° 35' 20.875" E
		2	22° 50' 42.402" N	86° 36' 1.256" E
		3	22° 50' 51.443" N	86° 36' 38.736" E
		4	22° 50' 46.620" N	86° 36' 46.135" E
		5	22° 49' 41.004" N	86° 37' 6.420" E
		6	22° 48' 4.528" N	86° 36' 7.934" E



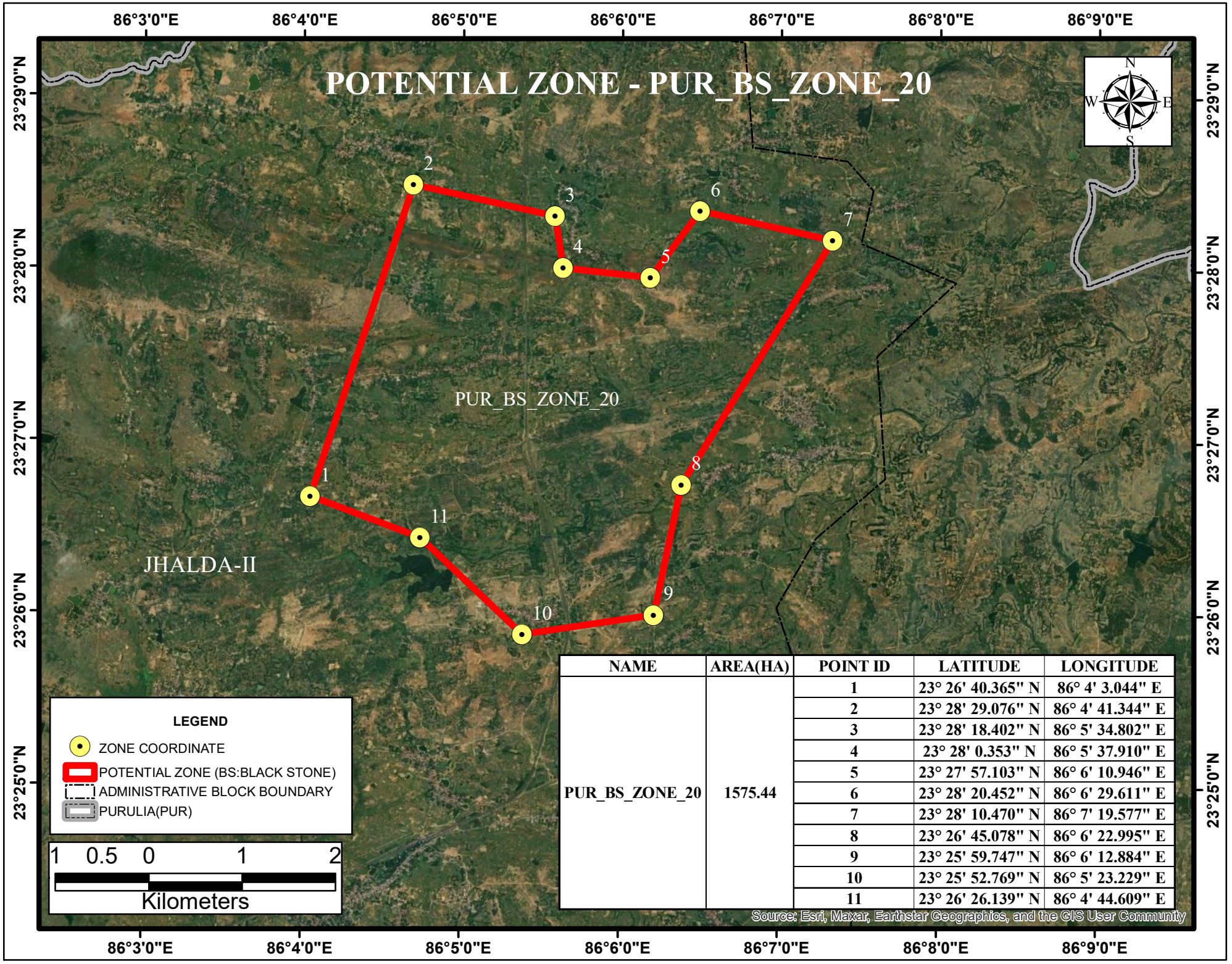
NAME	AREA(HA)	POINT ID	LATITUDE	LONGITUDE
PUR_BS_ZONE_17	2086.40	1	23° 15' 12.709" N	86° 15' 0.000" E
		2	23° 16' 56.885" N	86° 15' 13.854" E
		3	23° 16' 35.504" N	86° 19' 34.302" E
		4	23° 15' 7.631" N	86° 18' 48.666" E



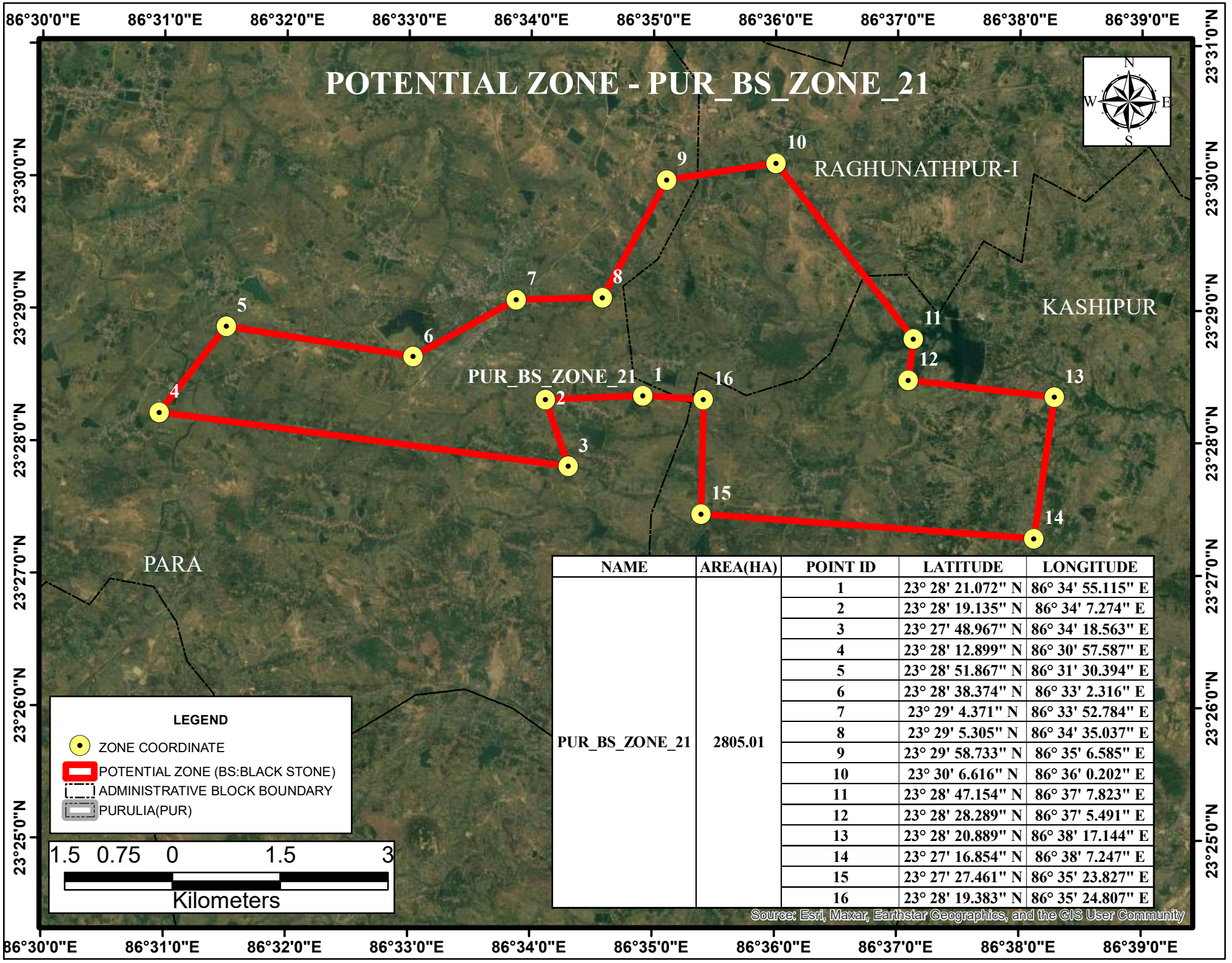
NAME	AREA(HA)	POINT ID	LATITUDE	LONGITUDE
PUR_BS_ZONE_18	1217.39	1	23° 16' 9.514" N	86° 21' 35.004" E
		2	23° 16' 13.690" N	86° 25' 5.916" E
		3	23° 15' 17.468" N	86° 25' 18.451" E
		4	23° 15' 0.176" N	86° 21' 26.127" E



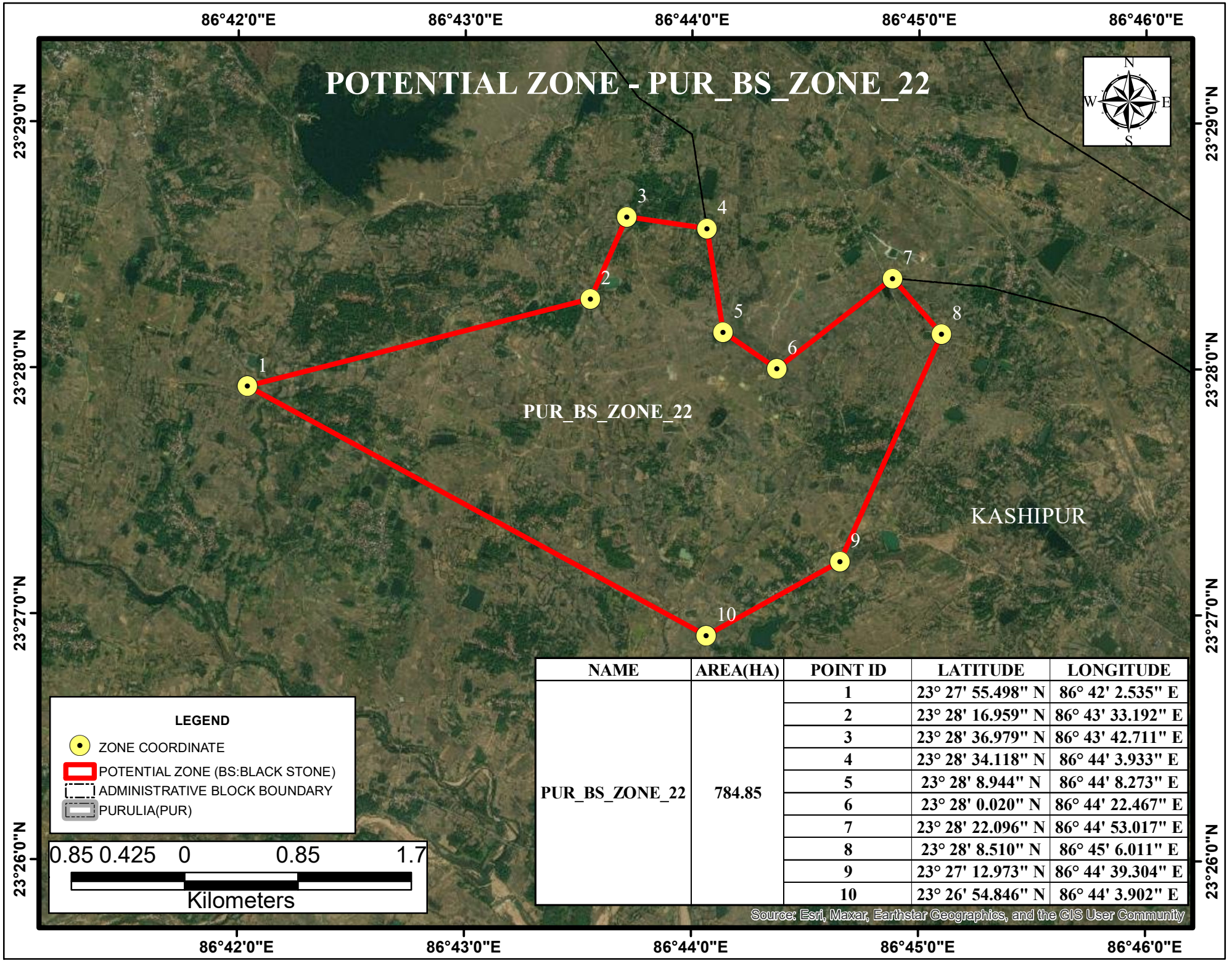
NAME	AREA(HA)	POINT ID	LATITUDE	LONGITUDE
PUR_BS_ZONE_19	7312.51	1	23° 8' 41.107" N	86° 6' 5.818" E
		2	23° 11' 35.458" N	86° 9' 44.969" E
		3	23° 9' 10.913" N	86° 14' 55.123" E
		4	23° 6' 30.483" N	86° 12' 59.895" E



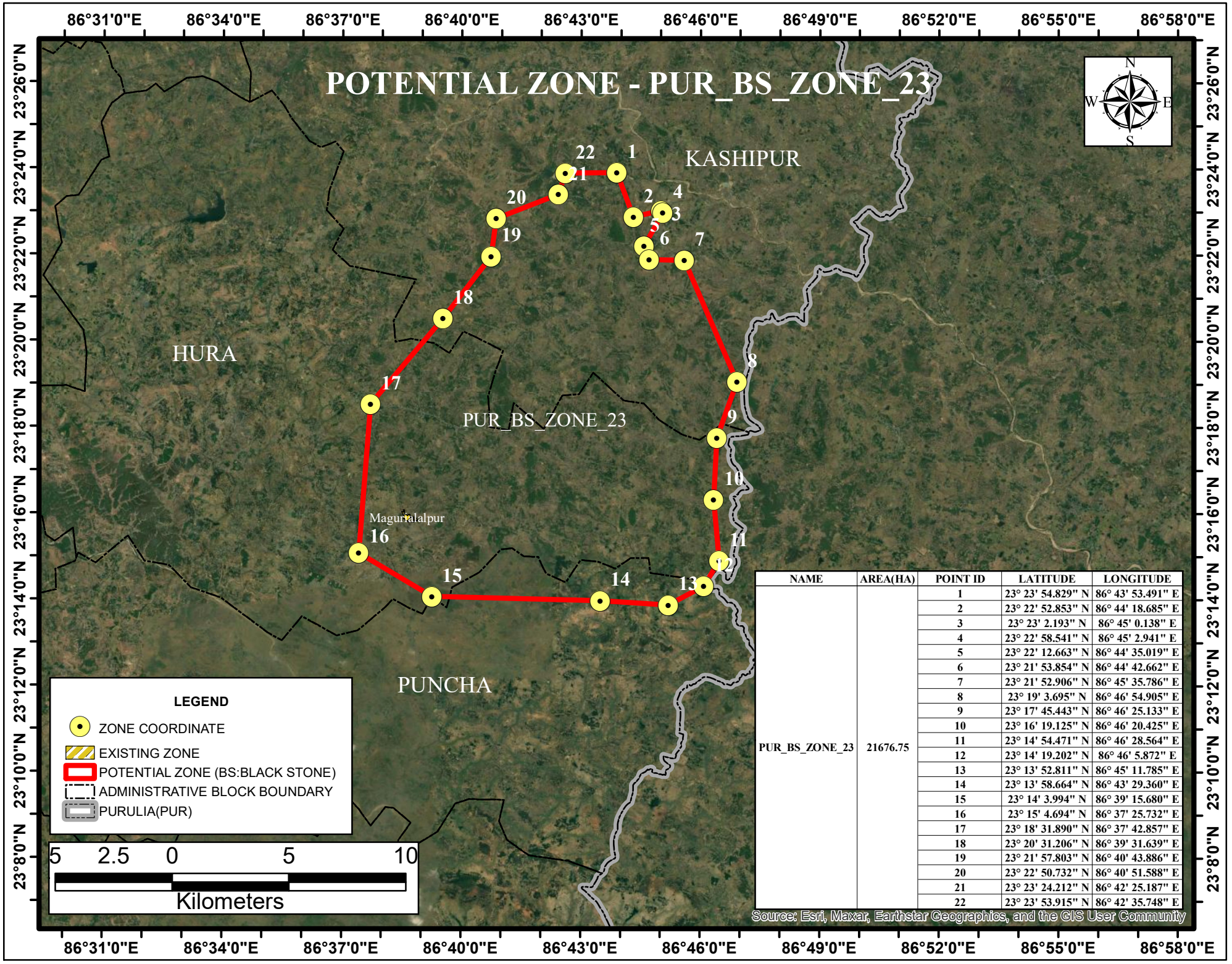
NAME	AREA(HA)	POINT ID	LATITUDE	LONGITUDE
PUR_BS_ZONE_20	1575.44	1	23° 26' 40.365" N	86° 4' 3.044" E
		2	23° 28' 29.076" N	86° 4' 41.344" E
		3	23° 28' 18.402" N	86° 5' 34.802" E
		4	23° 28' 0.353" N	86° 5' 37.910" E
		5	23° 27' 57.103" N	86° 6' 10.946" E
		6	23° 28' 20.452" N	86° 6' 29.611" E
		7	23° 28' 10.470" N	86° 7' 19.577" E
		8	23° 26' 45.078" N	86° 6' 22.995" E
		9	23° 25' 59.747" N	86° 6' 12.884" E
		10	23° 25' 52.769" N	86° 5' 23.229" E
		11	23° 26' 26.139" N	86° 4' 44.609" E



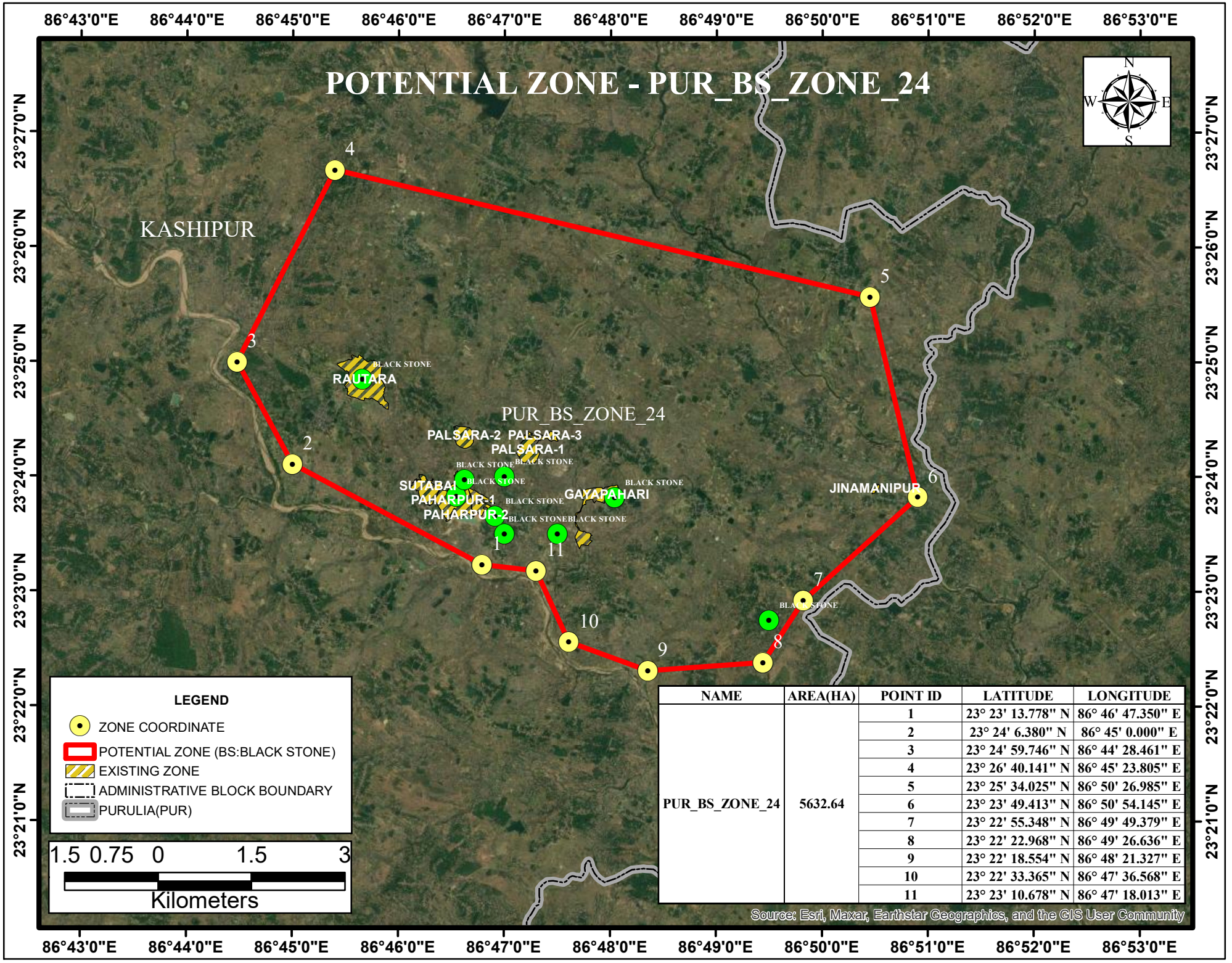
NAME	AREA(HA)	POINT ID	LATITUDE	LONGITUDE
PUR_BS_ZONE_21	2805.01	1	23° 28' 21.072" N	86° 34' 55.115" E
		2	23° 28' 19.135" N	86° 34' 7.274" E
		3	23° 27' 48.967" N	86° 34' 18.563" E
		4	23° 28' 12.899" N	86° 30' 57.587" E
		5	23° 28' 51.867" N	86° 31' 30.394" E
		6	23° 28' 38.374" N	86° 33' 2.316" E
		7	23° 29' 4.371" N	86° 33' 52.784" E
		8	23° 29' 5.305" N	86° 34' 35.037" E
		9	23° 29' 58.733" N	86° 35' 6.585" E
		10	23° 30' 6.616" N	86° 36' 0.202" E
		11	23° 28' 47.154" N	86° 37' 7.823" E
		12	23° 28' 28.289" N	86° 37' 5.491" E
		13	23° 28' 20.889" N	86° 38' 17.144" E
		14	23° 27' 16.854" N	86° 38' 7.247" E
		15	23° 27' 27.461" N	86° 35' 23.827" E
		16	23° 28' 19.383" N	86° 35' 24.807" E



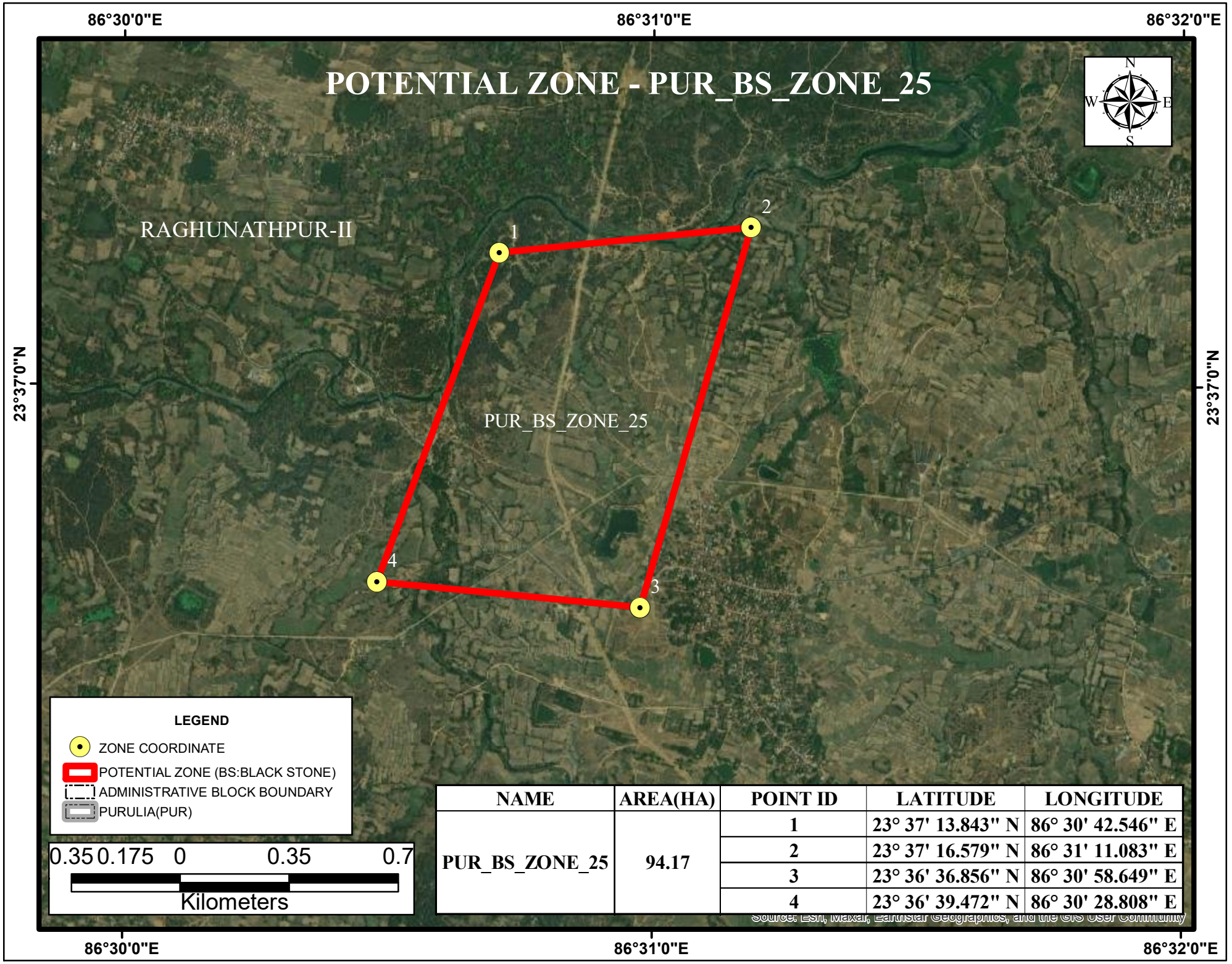
NAME	AREA(HA)	POINT ID	LATITUDE	LONGITUDE
PUR_BS_ZONE_22	784.85	1	23° 27' 55.498" N	86° 42' 2.535" E
		2	23° 28' 16.959" N	86° 43' 33.192" E
		3	23° 28' 36.979" N	86° 43' 42.711" E
		4	23° 28' 34.118" N	86° 44' 3.933" E
		5	23° 28' 8.944" N	86° 44' 8.273" E
		6	23° 28' 0.020" N	86° 44' 22.467" E
		7	23° 28' 22.096" N	86° 44' 53.017" E
		8	23° 28' 8.510" N	86° 45' 6.011" E
		9	23° 27' 12.973" N	86° 44' 39.304" E
		10	23° 26' 54.846" N	86° 44' 3.902" E



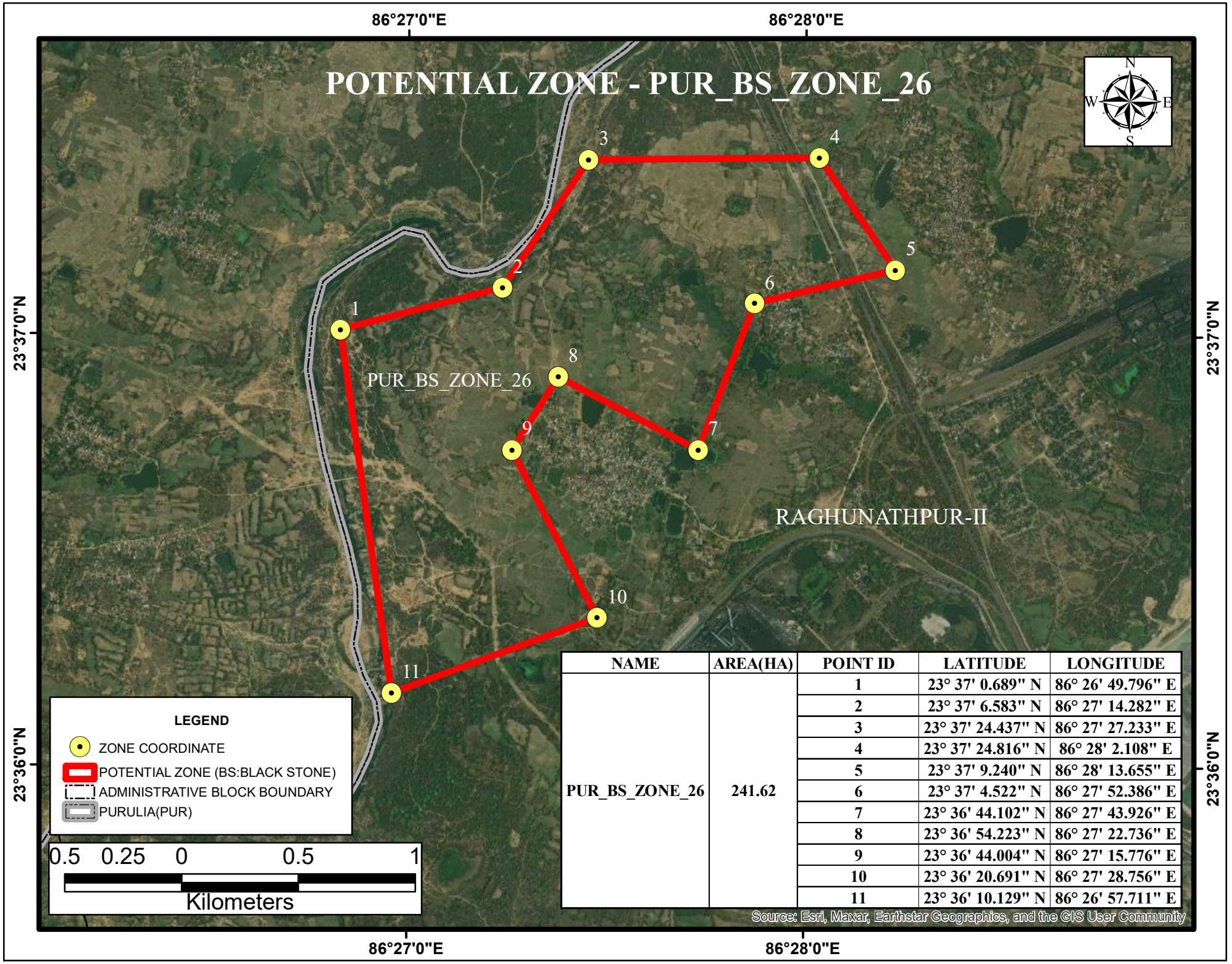
NAME	AREA(HA)	POINT ID	LATITUDE	LONGITUDE
PUR_BS_ZONE_23	21676.75	1	23° 23' 54.829" N	86° 43' 53.491" E
		2	23° 22' 52.853" N	86° 44' 18.685" E
		3	23° 23' 2.193" N	86° 45' 0.138" E
		4	23° 22' 58.541" N	86° 45' 2.941" E
		5	23° 22' 12.663" N	86° 44' 35.019" E
		6	23° 21' 53.854" N	86° 44' 42.662" E
		7	23° 21' 52.906" N	86° 45' 35.786" E
		8	23° 19' 3.695" N	86° 46' 54.905" E
		9	23° 17' 45.443" N	86° 46' 25.133" E
		10	23° 16' 19.125" N	86° 46' 20.425" E
		11	23° 14' 54.471" N	86° 46' 28.564" E
		12	23° 14' 19.202" N	86° 46' 5.872" E
		13	23° 13' 52.811" N	86° 45' 11.785" E
		14	23° 13' 58.664" N	86° 43' 29.360" E
		15	23° 14' 3.994" N	86° 39' 15.680" E
		16	23° 15' 4.694" N	86° 37' 25.732" E
		17	23° 18' 31.890" N	86° 37' 42.857" E
		18	23° 20' 31.206" N	86° 39' 31.639" E
		19	23° 21' 57.803" N	86° 40' 43.886" E
		20	23° 22' 50.732" N	86° 40' 51.588" E
		21	23° 23' 24.212" N	86° 42' 25.187" E
		22	23° 23' 53.915" N	86° 42' 35.748" E



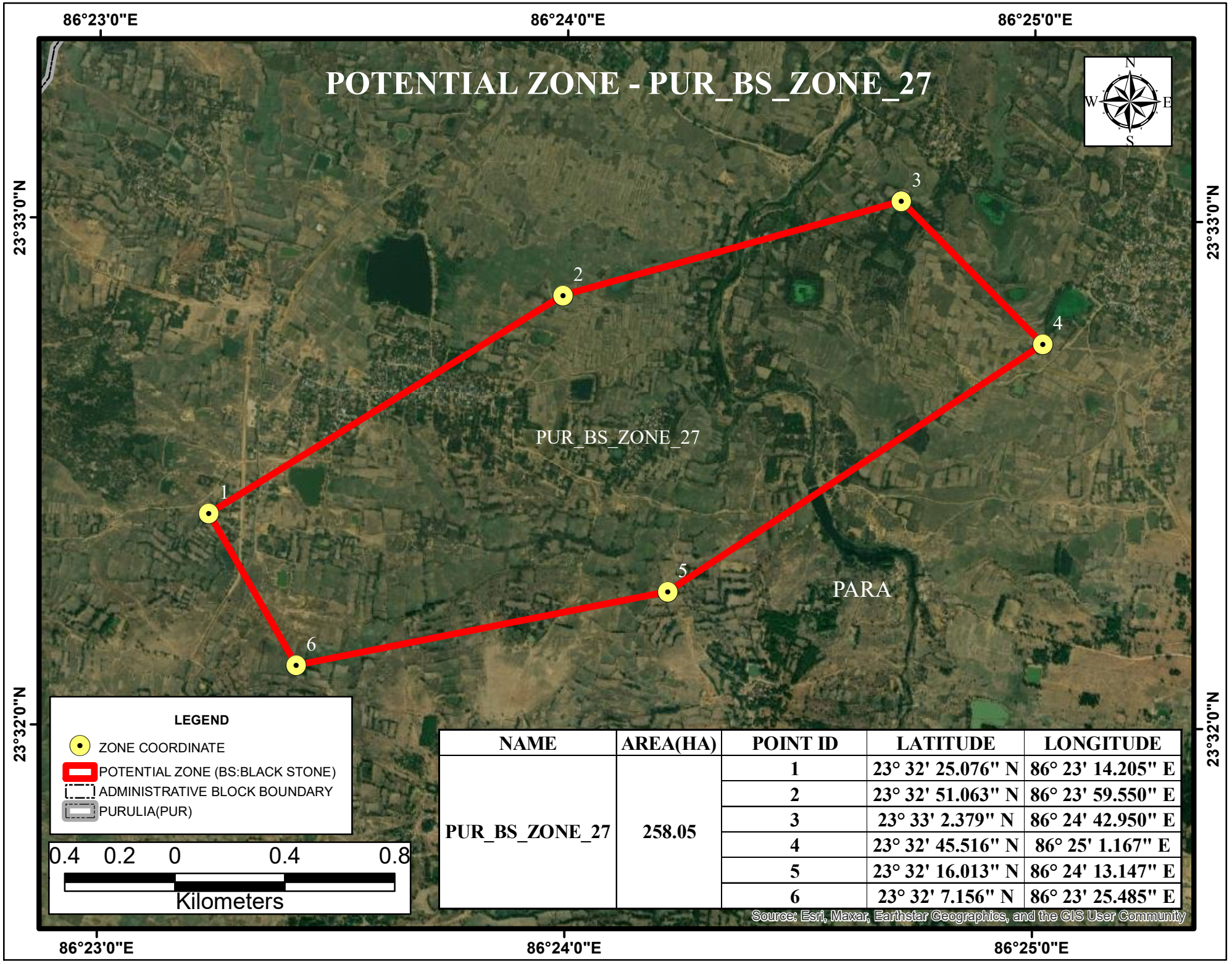
NAME	AREA(HA)	POINT ID	LATITUDE	LONGITUDE
PUR_BS_ZONE_24	5632.64	1	23° 23' 13.778" N	86° 46' 47.350" E
		2	23° 24' 6.380" N	86° 45' 0.000" E
		3	23° 24' 59.746" N	86° 44' 28.461" E
		4	23° 26' 40.141" N	86° 45' 23.805" E
		5	23° 25' 34.025" N	86° 50' 26.985" E
		6	23° 23' 49.413" N	86° 50' 54.145" E
		7	23° 22' 55.348" N	86° 49' 49.379" E
		8	23° 22' 22.968" N	86° 49' 26.636" E
		9	23° 22' 18.554" N	86° 48' 21.327" E
		10	23° 22' 33.365" N	86° 47' 36.568" E
		11	23° 23' 10.678" N	86° 47' 18.013" E



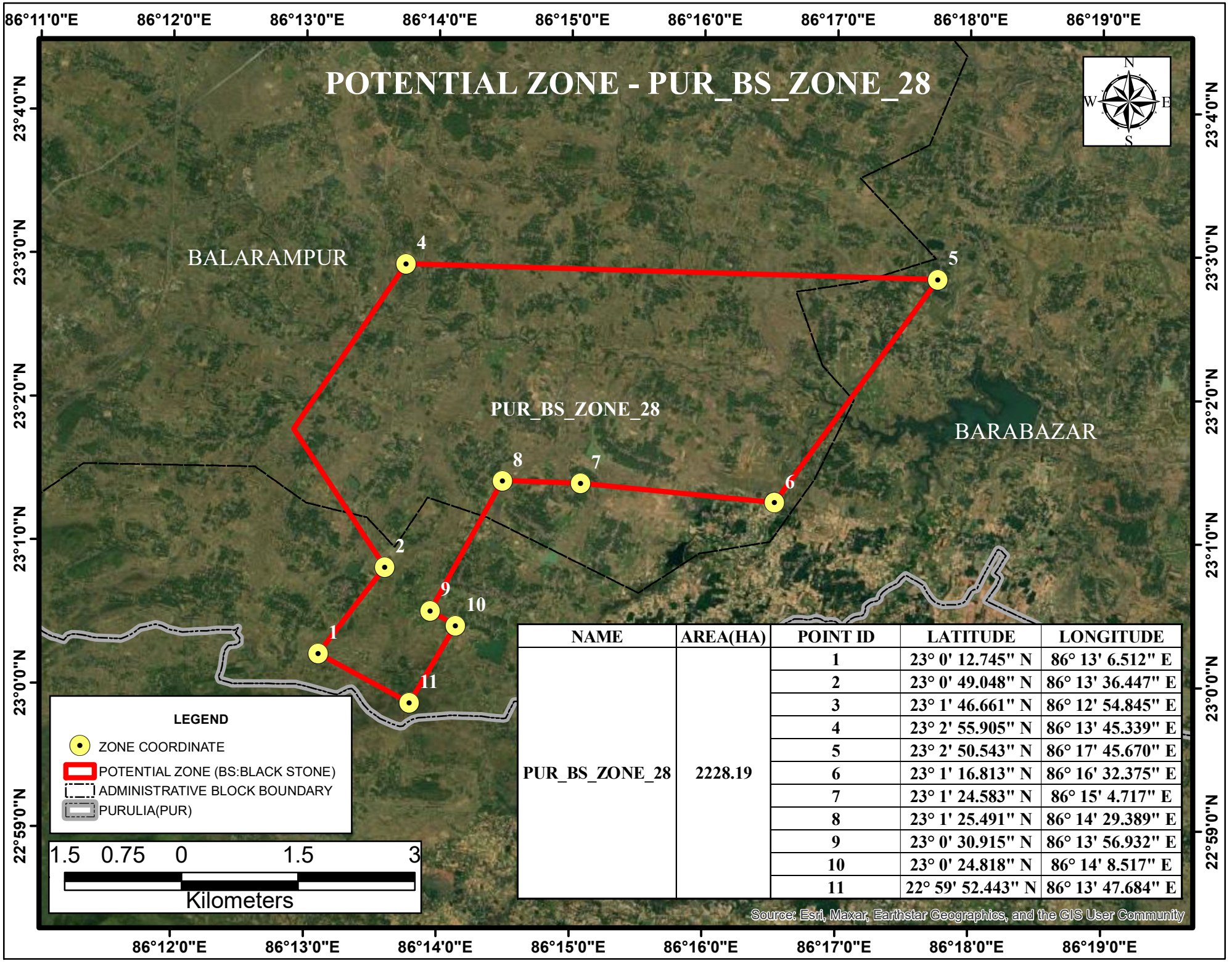
NAME	AREA(HA)	POINT ID	LATITUDE	LONGITUDE
PUR_BS_ZONE_25	94.17	1	23° 37' 13.843" N	86° 30' 42.546" E
		2	23° 37' 16.579" N	86° 31' 11.083" E
		3	23° 36' 36.856" N	86° 30' 58.649" E
		4	23° 36' 39.472" N	86° 30' 28.808" E



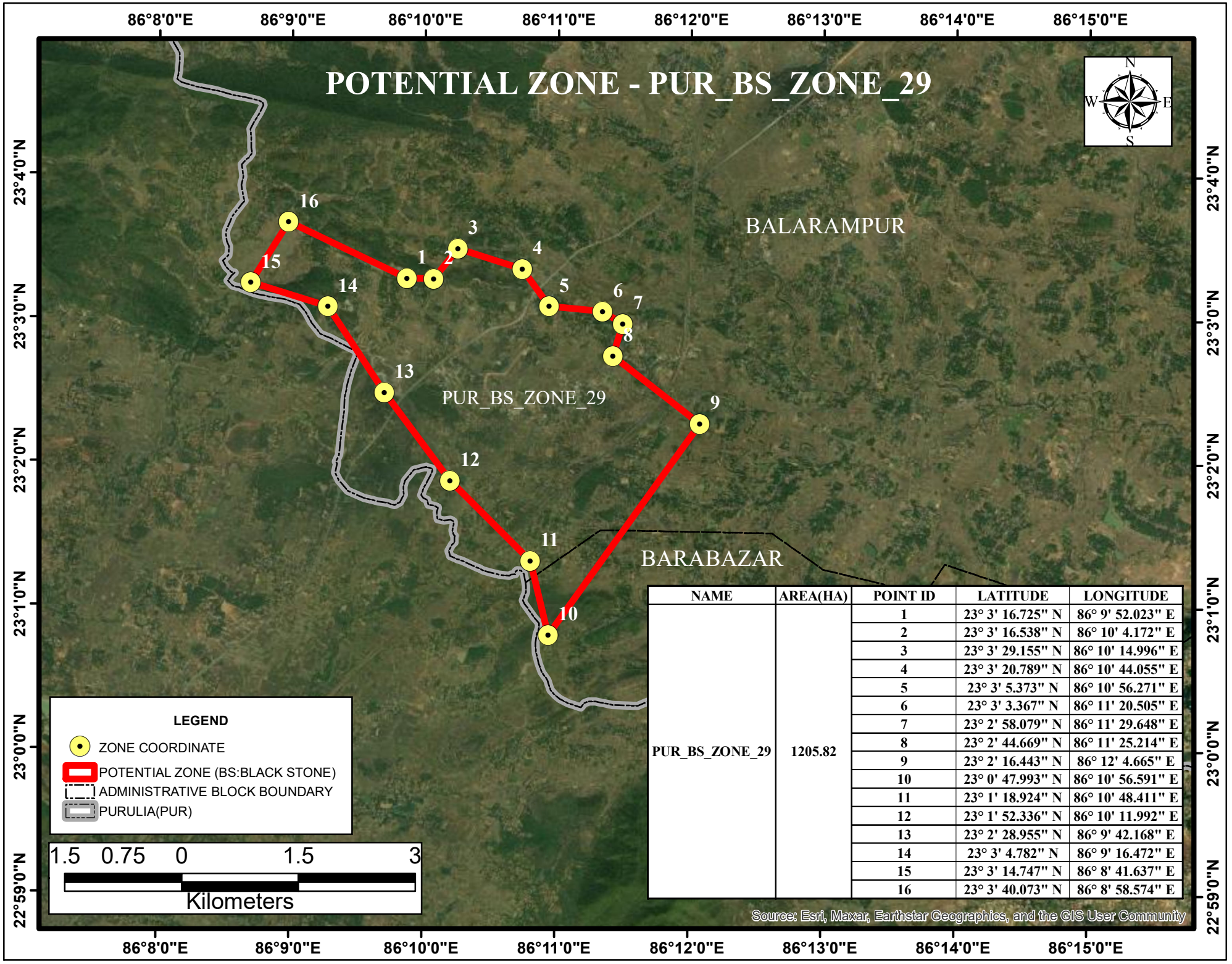
NAME	AREA(HA)	POINT ID	LATITUDE	LONGITUDE
PUR_BS_ZONE_26	241.62	1	23° 37' 0.689" N	86° 26' 49.796" E
		2	23° 37' 6.583" N	86° 27' 14.282" E
		3	23° 37' 24.437" N	86° 27' 27.233" E
		4	23° 37' 24.816" N	86° 28' 2.108" E
		5	23° 37' 9.240" N	86° 28' 13.655" E
		6	23° 37' 4.522" N	86° 27' 52.386" E
		7	23° 36' 44.102" N	86° 27' 43.926" E
		8	23° 36' 54.223" N	86° 27' 22.736" E
		9	23° 36' 44.004" N	86° 27' 15.776" E
		10	23° 36' 20.691" N	86° 27' 28.756" E
		11	23° 36' 10.129" N	86° 26' 57.711" E



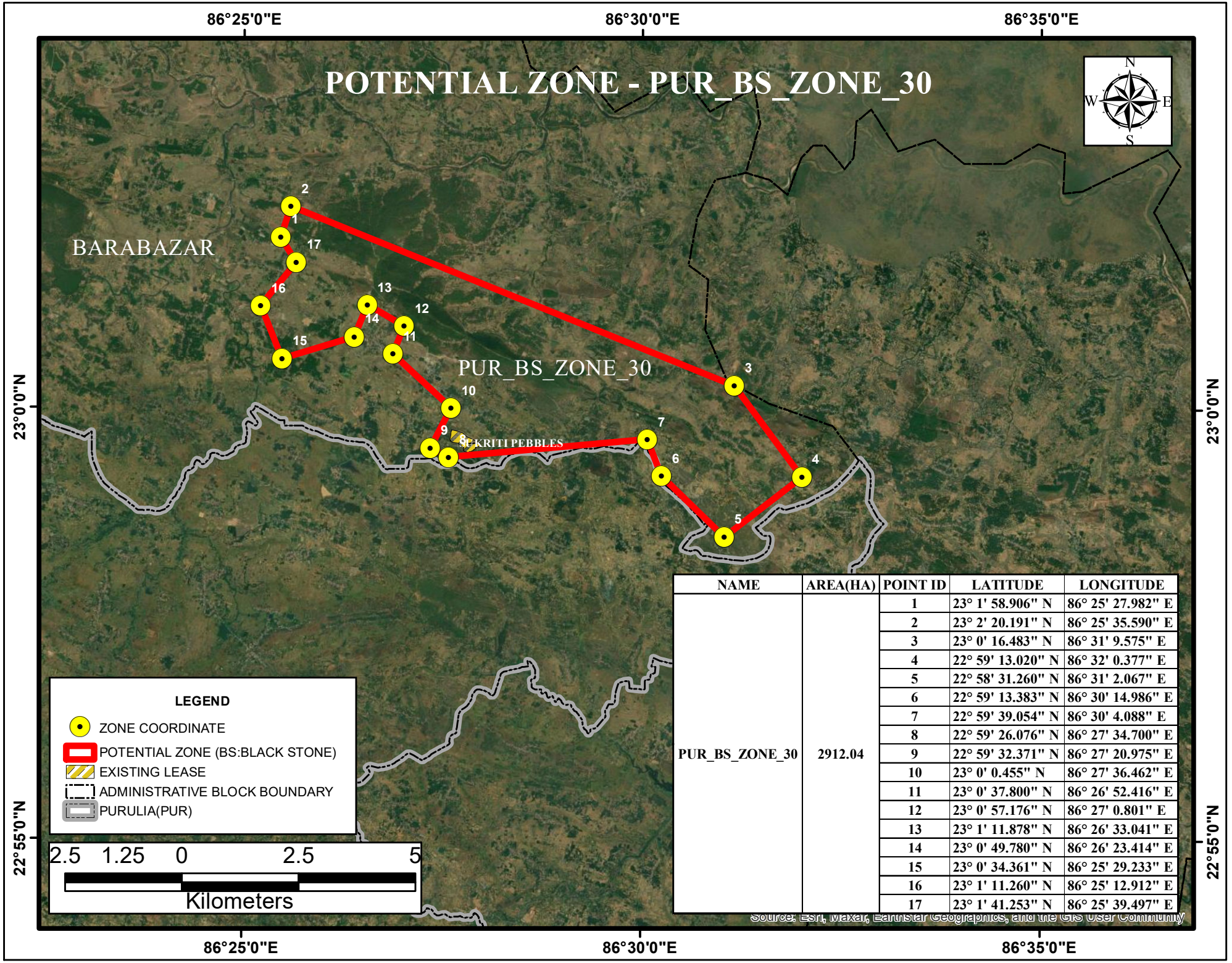
NAME	AREA(HA)	POINT ID	LATITUDE	LONGITUDE
PUR_BS_ZONE_27	258.05	1	23° 32' 25.076" N	86° 23' 14.205" E
		2	23° 32' 51.063" N	86° 23' 59.550" E
		3	23° 33' 2.379" N	86° 24' 42.950" E
		4	23° 32' 45.516" N	86° 25' 1.167" E
		5	23° 32' 16.013" N	86° 24' 13.147" E
		6	23° 32' 7.156" N	86° 23' 25.485" E



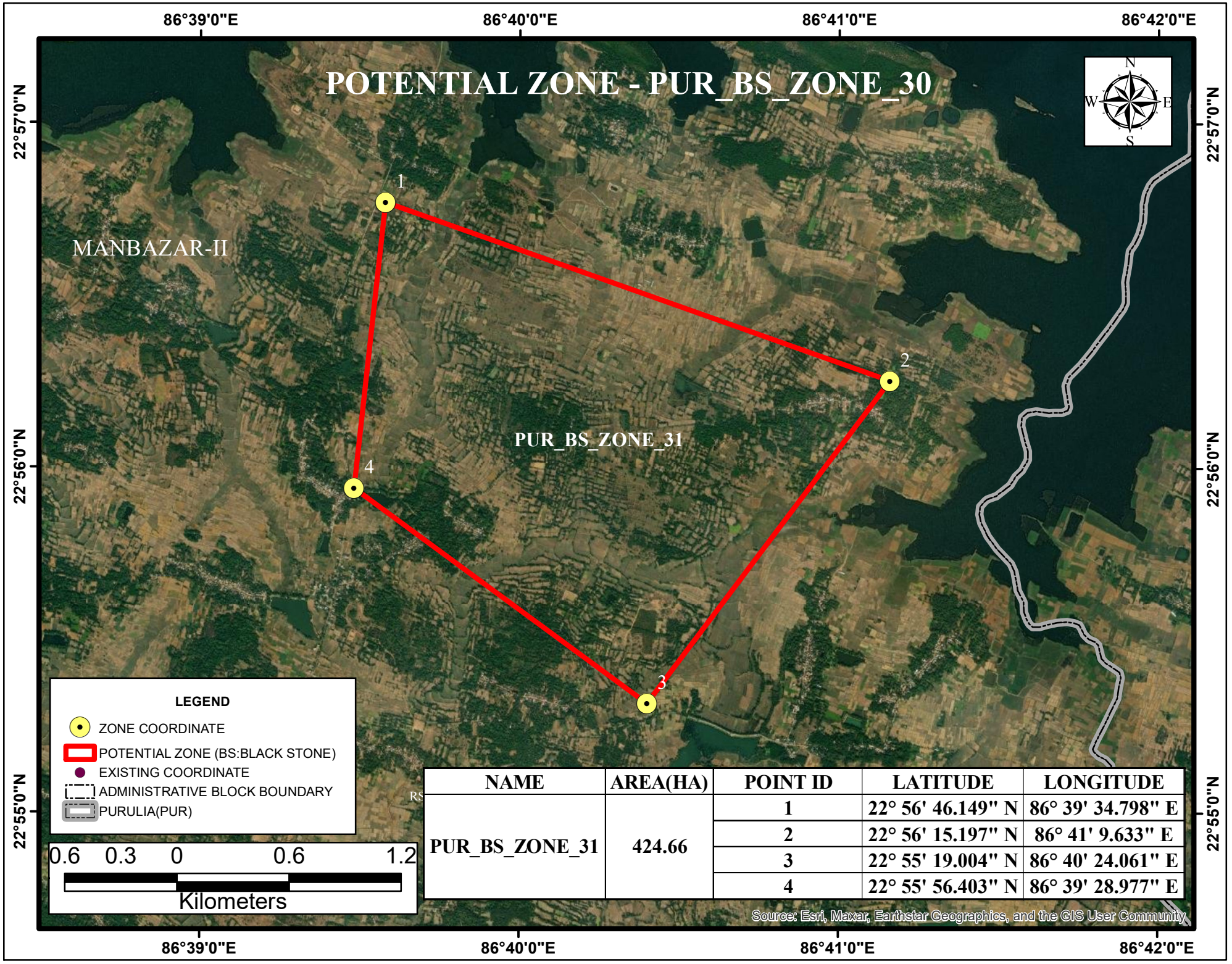
NAME	AREA(HA)	POINT ID	LATITUDE	LONGITUDE
PUR_BS_ZONE_28	2228.19	1	23° 0' 12.745" N	86° 13' 6.512" E
		2	23° 0' 49.048" N	86° 13' 36.447" E
		3	23° 1' 46.661" N	86° 12' 54.845" E
		4	23° 2' 55.905" N	86° 13' 45.339" E
		5	23° 2' 50.543" N	86° 17' 45.670" E
		6	23° 1' 16.813" N	86° 16' 32.375" E
		7	23° 1' 24.583" N	86° 15' 4.717" E
		8	23° 1' 25.491" N	86° 14' 29.389" E
		9	23° 0' 30.915" N	86° 13' 56.932" E
		10	23° 0' 24.818" N	86° 14' 8.517" E
		11	22° 59' 52.443" N	86° 13' 47.684" E



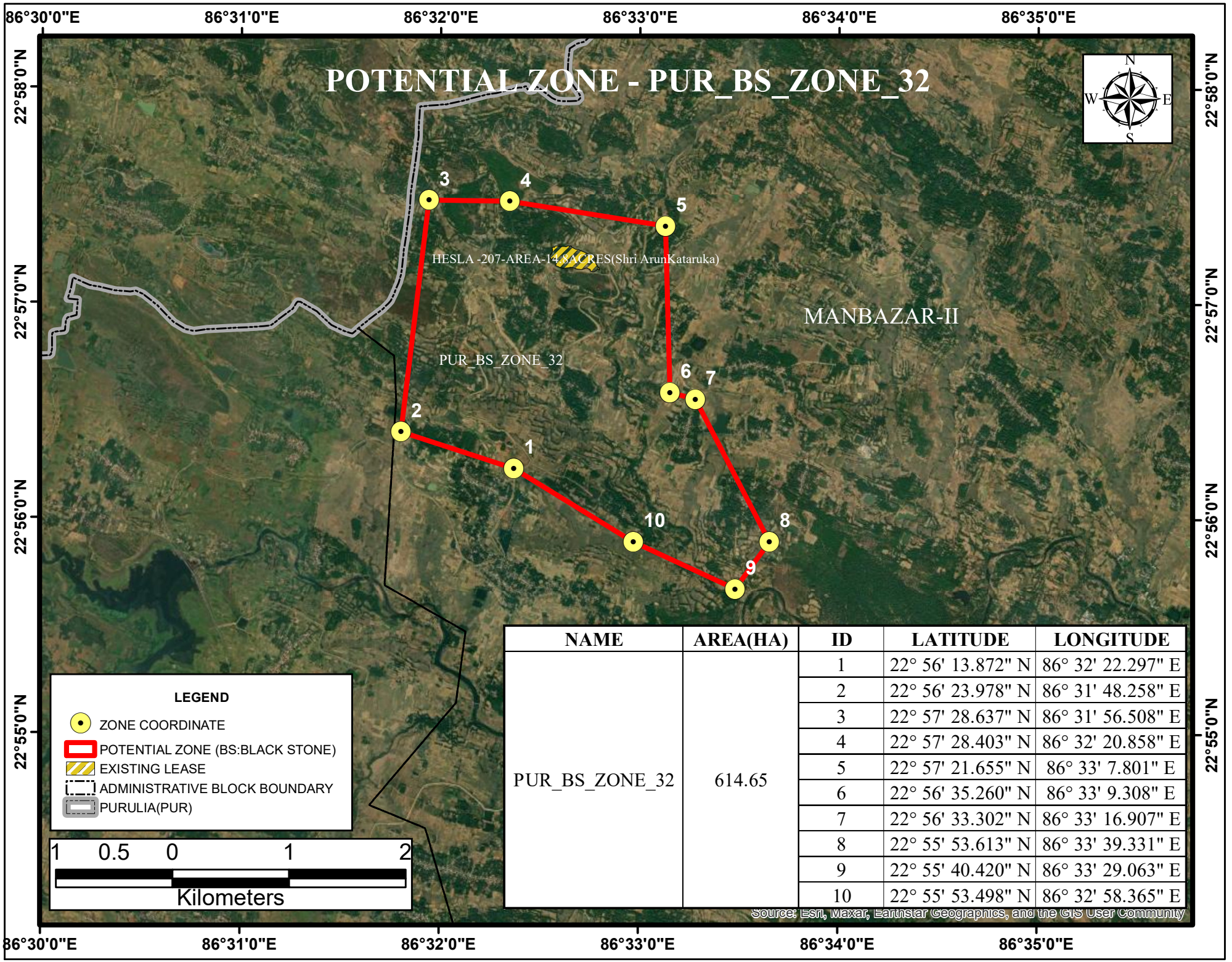
NAME	AREA(HA)	POINT ID	LATITUDE	LONGITUDE
PUR_BS_ZONE_29	1205.82	1	23° 3' 16.725" N	86° 9' 52.023" E
		2	23° 3' 16.538" N	86° 10' 4.172" E
		3	23° 3' 29.155" N	86° 10' 14.996" E
		4	23° 3' 20.789" N	86° 10' 44.055" E
		5	23° 3' 5.373" N	86° 10' 56.271" E
		6	23° 3' 3.367" N	86° 11' 20.505" E
		7	23° 2' 58.079" N	86° 11' 29.648" E
		8	23° 2' 44.669" N	86° 11' 25.214" E
		9	23° 2' 16.443" N	86° 12' 4.665" E
		10	23° 0' 47.993" N	86° 10' 56.591" E
		11	23° 1' 18.924" N	86° 10' 48.411" E
		12	23° 1' 52.336" N	86° 10' 11.992" E
		13	23° 2' 28.955" N	86° 9' 42.168" E
		14	23° 3' 4.782" N	86° 9' 16.472" E
		15	23° 3' 14.747" N	86° 8' 41.637" E
		16	23° 3' 40.073" N	86° 8' 58.574" E



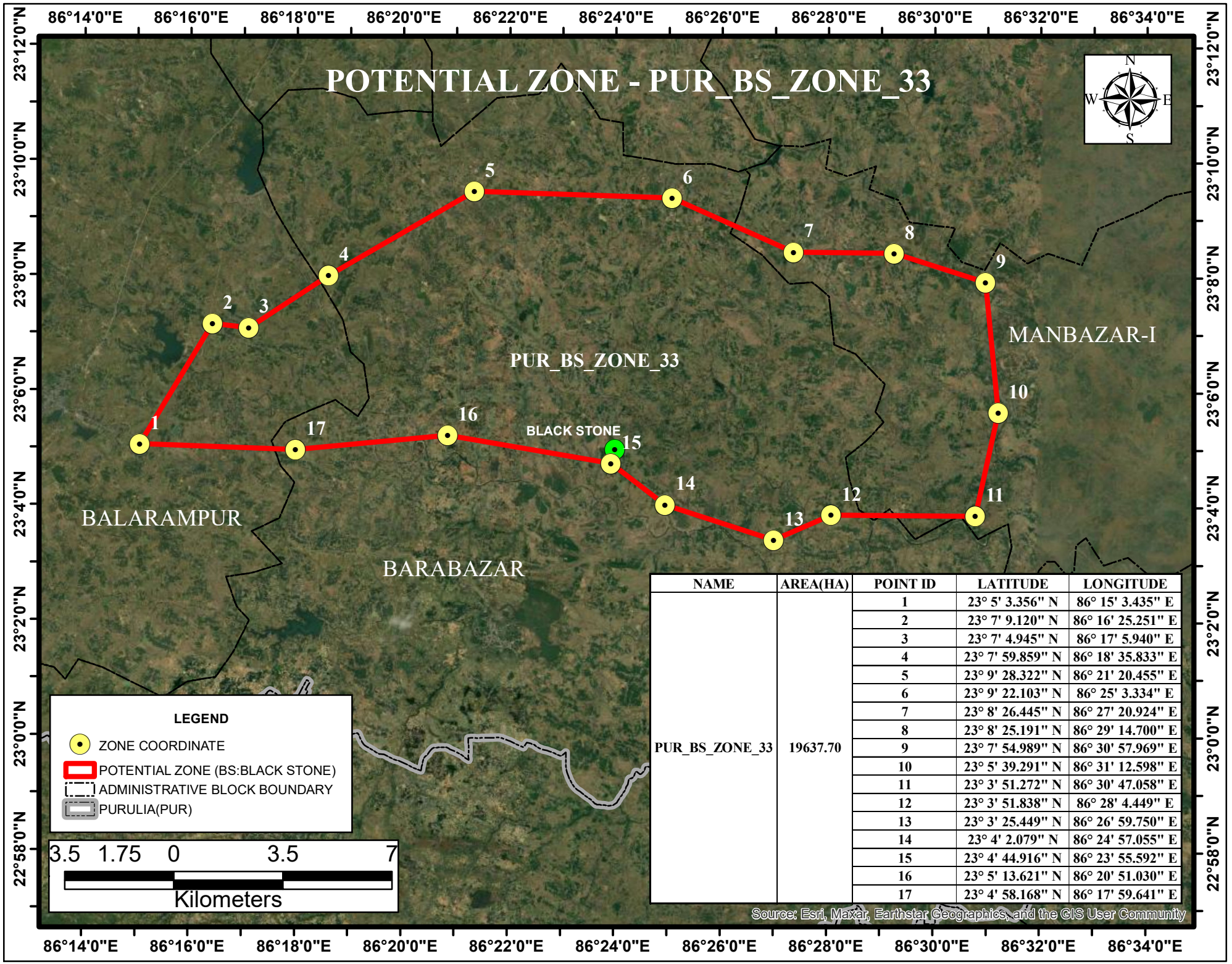
NAME	AREA(HA)	POINT ID	LATITUDE	LONGITUDE
PUR_BS_ZONE_30	2912.04	1	23° 1' 58.906" N	86° 25' 27.982" E
		2	23° 2' 20.191" N	86° 25' 35.590" E
		3	23° 0' 16.483" N	86° 31' 9.575" E
		4	22° 59' 13.020" N	86° 32' 0.377" E
		5	22° 58' 31.260" N	86° 31' 2.067" E
		6	22° 59' 13.383" N	86° 30' 14.986" E
		7	22° 59' 39.054" N	86° 30' 4.088" E
		8	22° 59' 26.076" N	86° 27' 34.700" E
		9	22° 59' 32.371" N	86° 27' 20.975" E
		10	23° 0' 0.455" N	86° 27' 36.462" E
		11	23° 0' 37.800" N	86° 26' 52.416" E
		12	23° 0' 57.176" N	86° 27' 0.801" E
		13	23° 1' 11.878" N	86° 26' 33.041" E
		14	23° 0' 49.780" N	86° 26' 23.414" E
		15	23° 0' 34.361" N	86° 25' 29.233" E
		16	23° 1' 11.260" N	86° 25' 12.912" E
		17	23° 1' 41.253" N	86° 25' 39.497" E



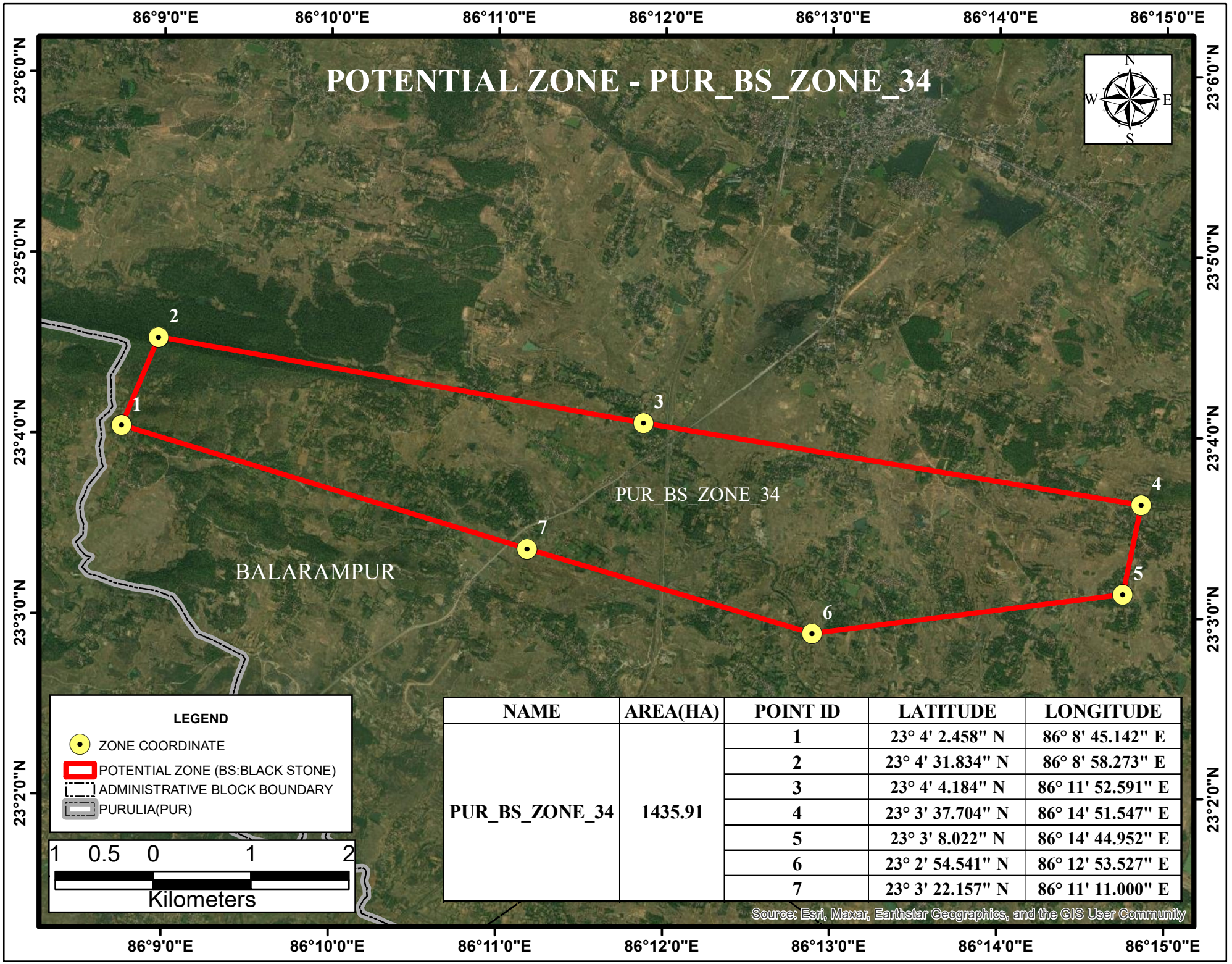
NAME	AREA(HA)	POINT ID	LATITUDE	LONGITUDE
PUR_BS_ZONE_31	424.66	1	22° 56' 46.149" N	86° 39' 34.798" E
		2	22° 56' 15.197" N	86° 41' 9.633" E
		3	22° 55' 19.004" N	86° 40' 24.061" E
		4	22° 55' 56.403" N	86° 39' 28.977" E



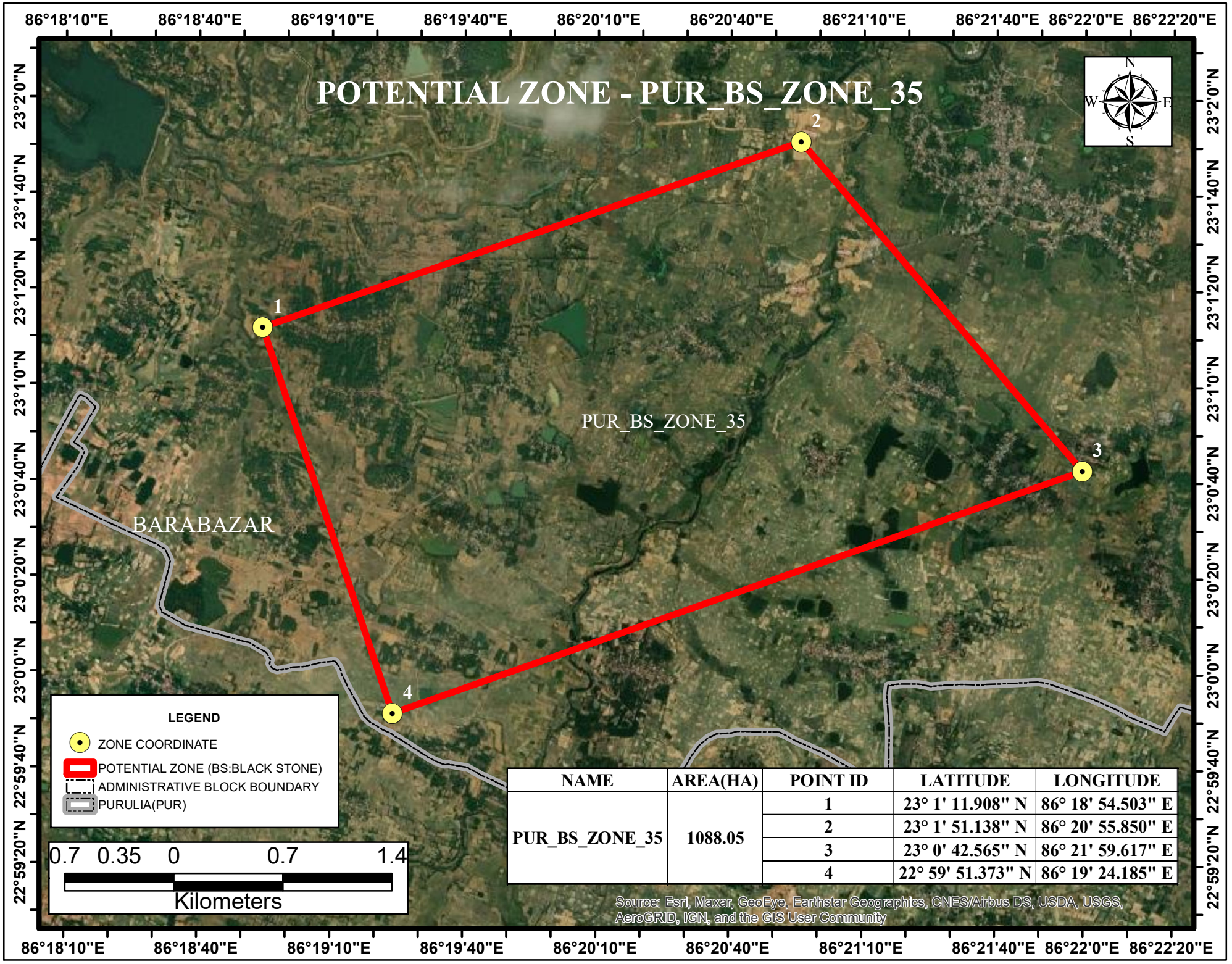
NAME	AREA(HA)	ID	LATITUDE	LONGITUDE
PUR_BS_ZONE_32	614.65	1	22° 56' 13.872" N	86° 32' 22.297" E
		2	22° 56' 23.978" N	86° 31' 48.258" E
		3	22° 57' 28.637" N	86° 31' 56.508" E
		4	22° 57' 28.403" N	86° 32' 20.858" E
		5	22° 57' 21.655" N	86° 33' 7.801" E
		6	22° 56' 35.260" N	86° 33' 9.308" E
		7	22° 56' 33.302" N	86° 33' 16.907" E
		8	22° 55' 53.613" N	86° 33' 39.331" E
		9	22° 55' 40.420" N	86° 33' 29.063" E
		10	22° 55' 53.498" N	86° 32' 58.365" E



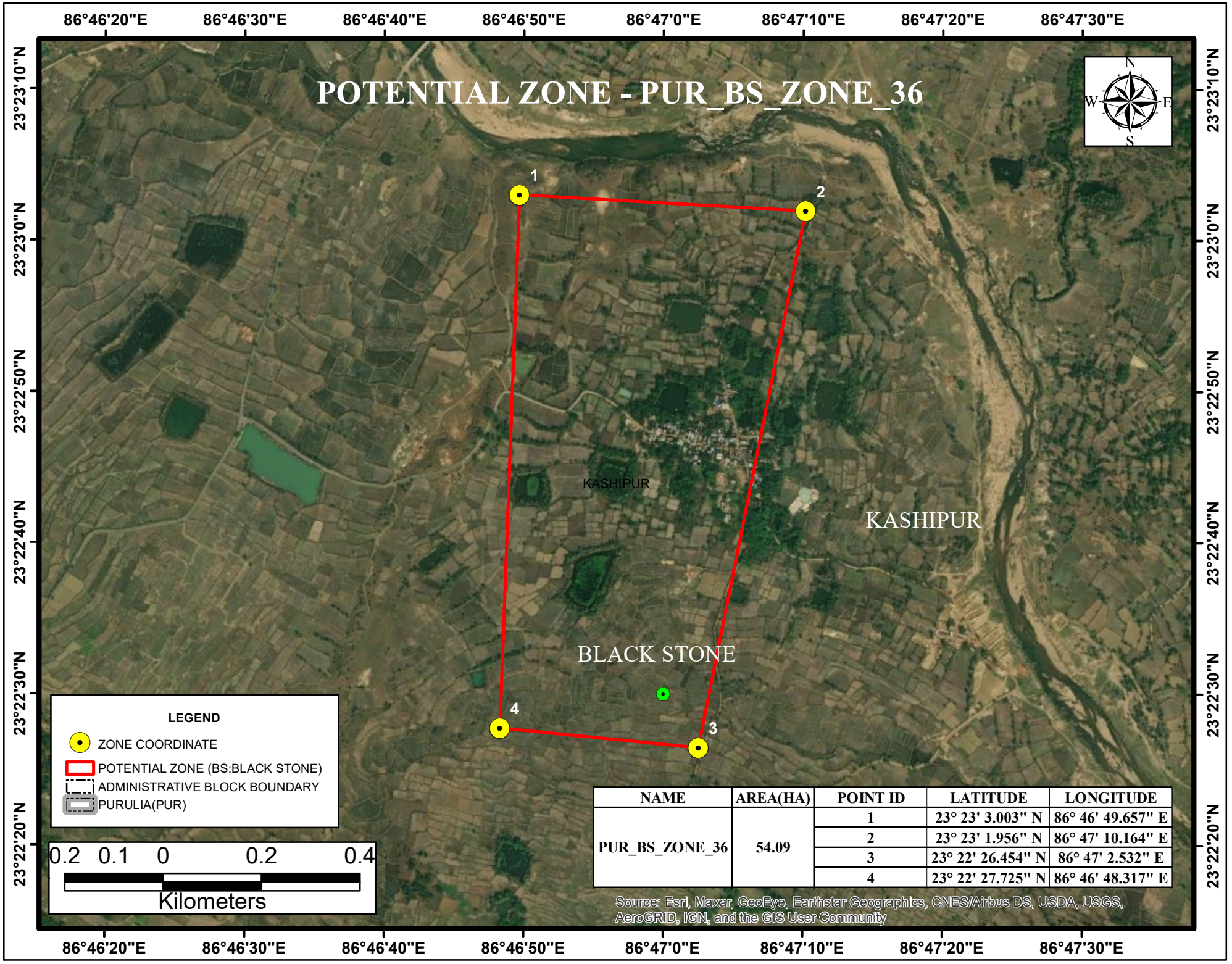
NAME	AREA(HA)	POINT ID	LATITUDE	LONGITUDE
PUR_BS_ZONE_33	19637.70	1	23° 5' 3.356" N	86° 15' 3.435" E
		2	23° 7' 9.120" N	86° 16' 25.251" E
		3	23° 7' 4.945" N	86° 17' 5.940" E
		4	23° 7' 59.859" N	86° 18' 35.833" E
		5	23° 9' 28.322" N	86° 21' 20.455" E
		6	23° 9' 22.103" N	86° 25' 3.334" E
		7	23° 8' 26.445" N	86° 27' 20.924" E
		8	23° 8' 25.191" N	86° 29' 14.700" E
		9	23° 7' 54.989" N	86° 30' 57.969" E
		10	23° 5' 39.291" N	86° 31' 12.598" E
		11	23° 3' 51.272" N	86° 30' 47.058" E
		12	23° 3' 51.838" N	86° 28' 4.449" E
		13	23° 3' 25.449" N	86° 26' 59.750" E
		14	23° 4' 2.079" N	86° 24' 57.055" E
		15	23° 4' 44.916" N	86° 23' 55.592" E
		16	23° 5' 13.621" N	86° 20' 51.030" E
		17	23° 4' 58.168" N	86° 17' 59.641" E



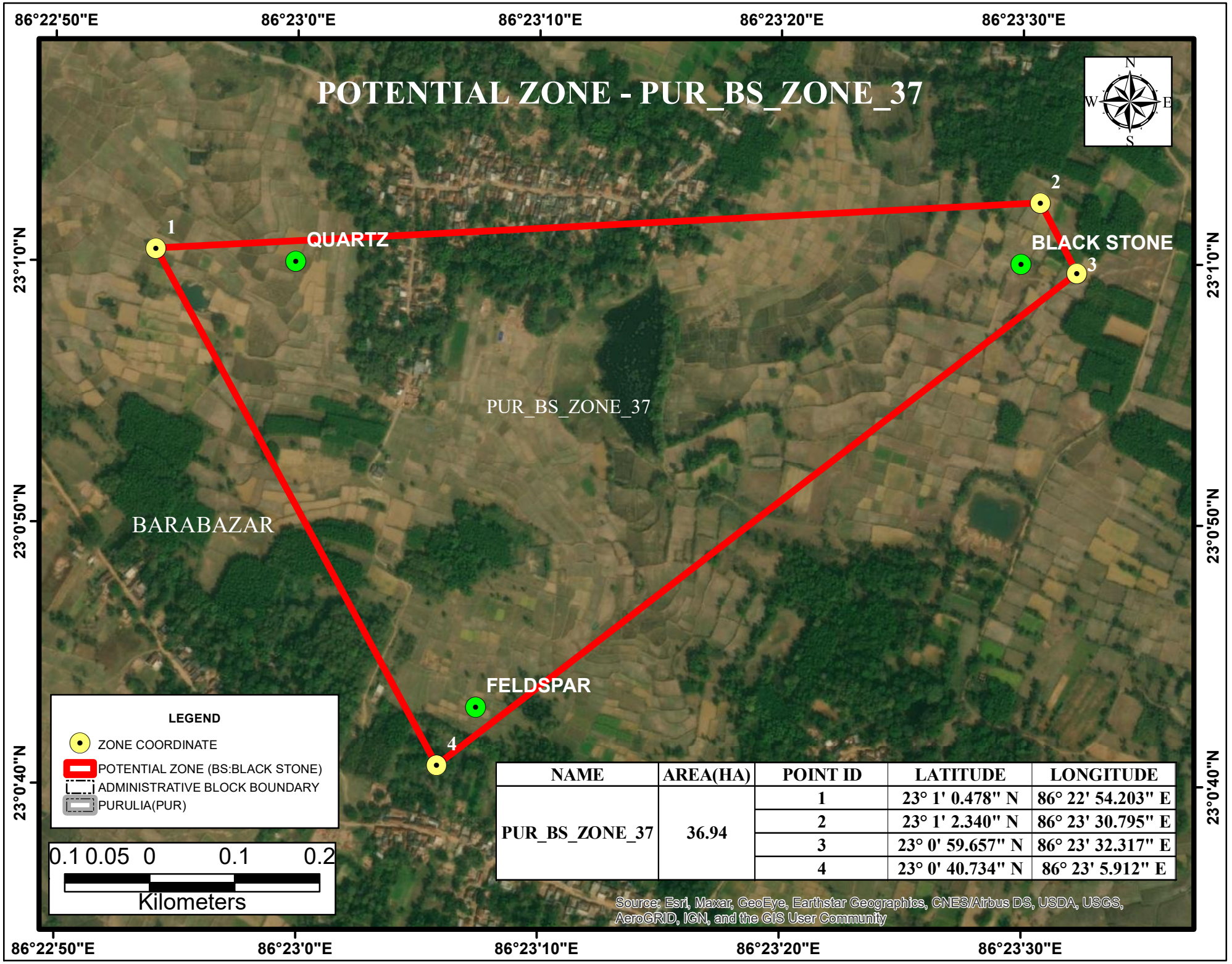
NAME	AREA(HA)	POINT ID	LATITUDE	LONGITUDE
PUR_BS_ZONE_34	1435.91	1	23° 4' 2.458" N	86° 8' 45.142" E
		2	23° 4' 31.834" N	86° 8' 58.273" E
		3	23° 4' 4.184" N	86° 11' 52.591" E
		4	23° 3' 37.704" N	86° 14' 51.547" E
		5	23° 3' 8.022" N	86° 14' 44.952" E
		6	23° 2' 54.541" N	86° 12' 53.527" E
		7	23° 3' 22.157" N	86° 11' 11.000" E



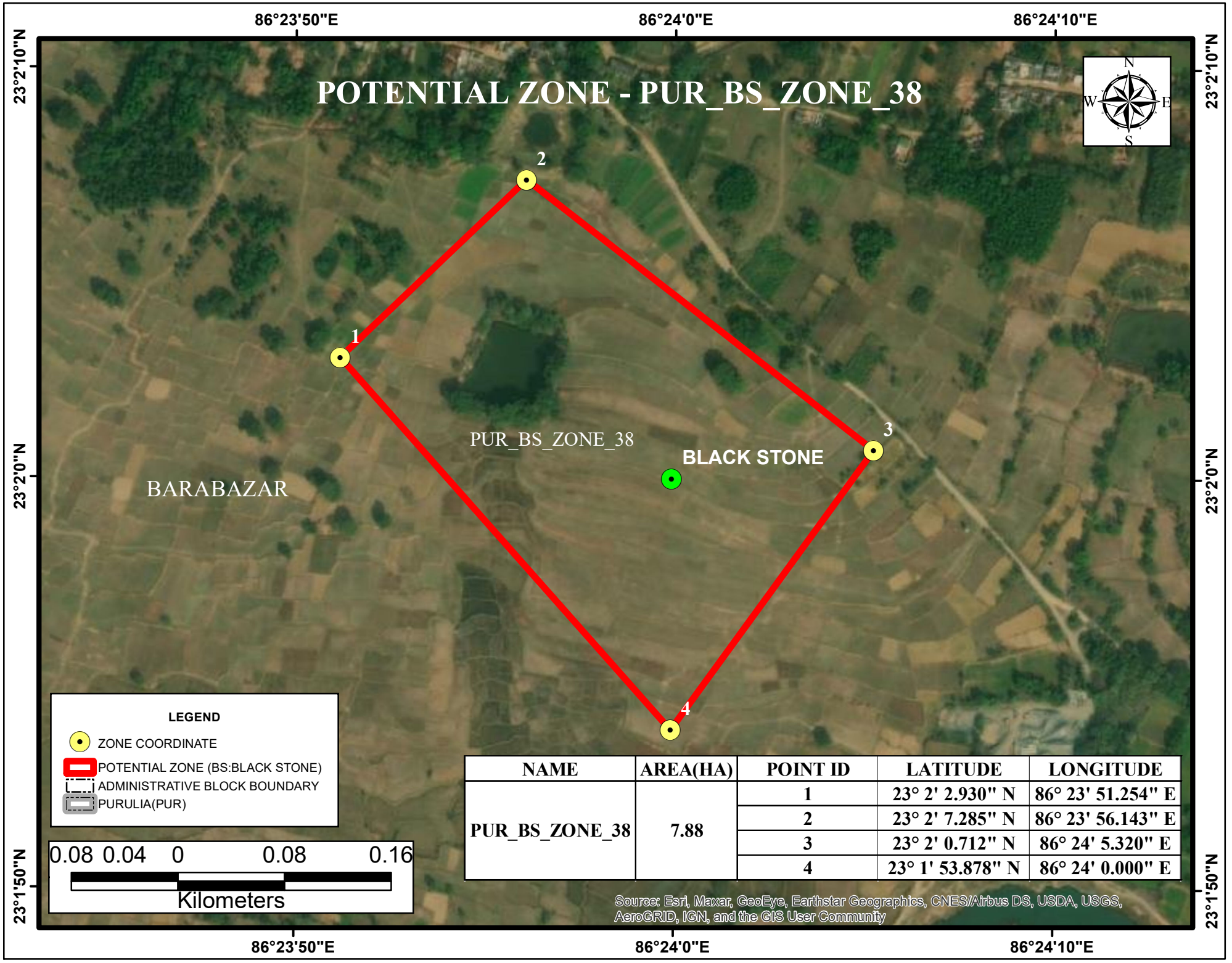
NAME	AREA(HA)	POINT ID	LATITUDE	LONGITUDE
PUR_BS_ZONE_35	1088.05	1	23° 1' 11.908" N	86° 18' 54.503" E
		2	23° 1' 51.138" N	86° 20' 55.850" E
		3	23° 0' 42.565" N	86° 21' 59.617" E
		4	22° 59' 51.373" N	86° 19' 24.185" E



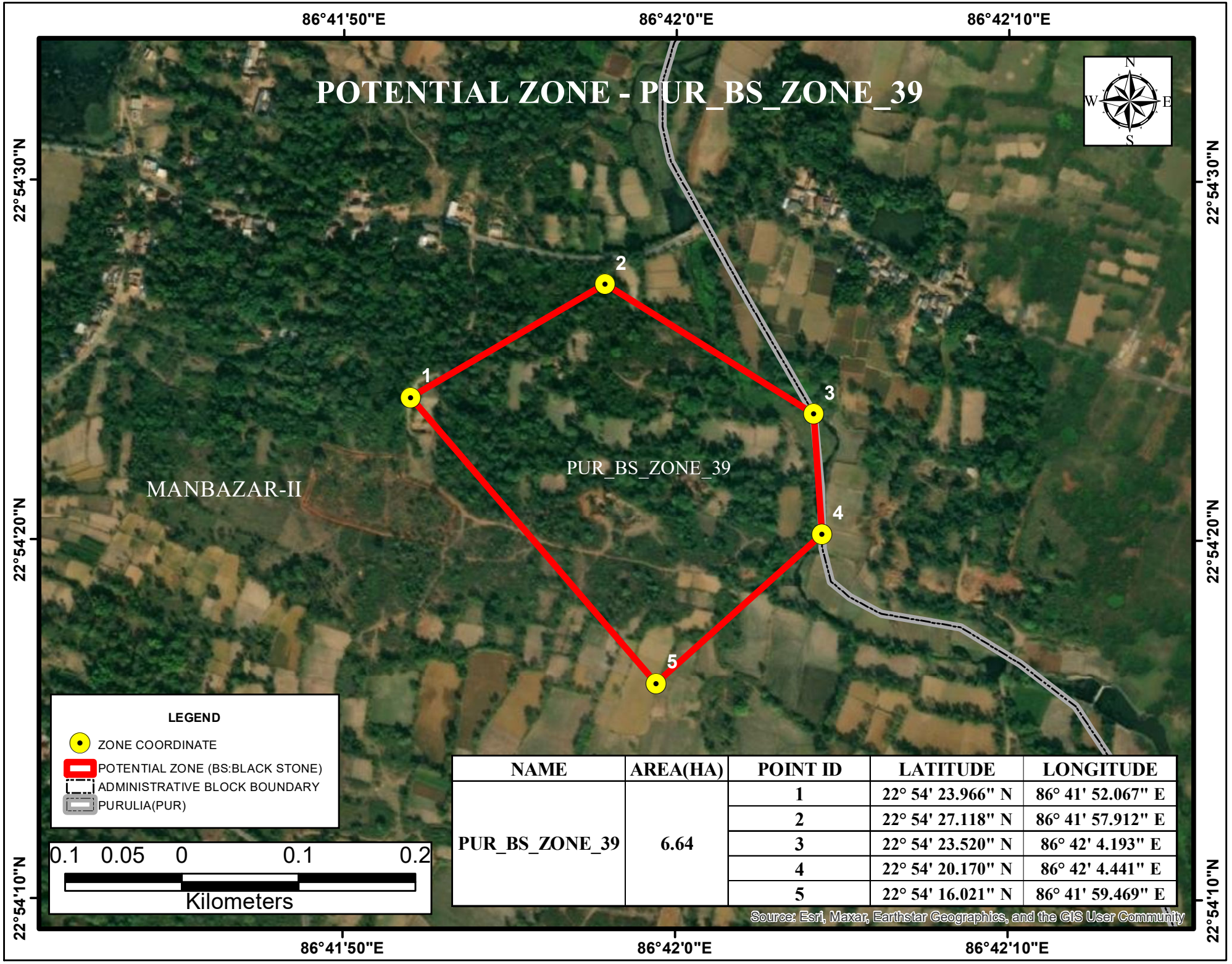
NAME	AREA(HA)	POINT ID	LATITUDE	LONGITUDE
PUR_BS_ZONE_36	54.09	1	23° 23' 3.003" N	86° 46' 49.657" E
		2	23° 23' 1.956" N	86° 47' 10.164" E
		3	23° 22' 26.454" N	86° 47' 2.532" E
		4	23° 22' 27.725" N	86° 46' 48.317" E



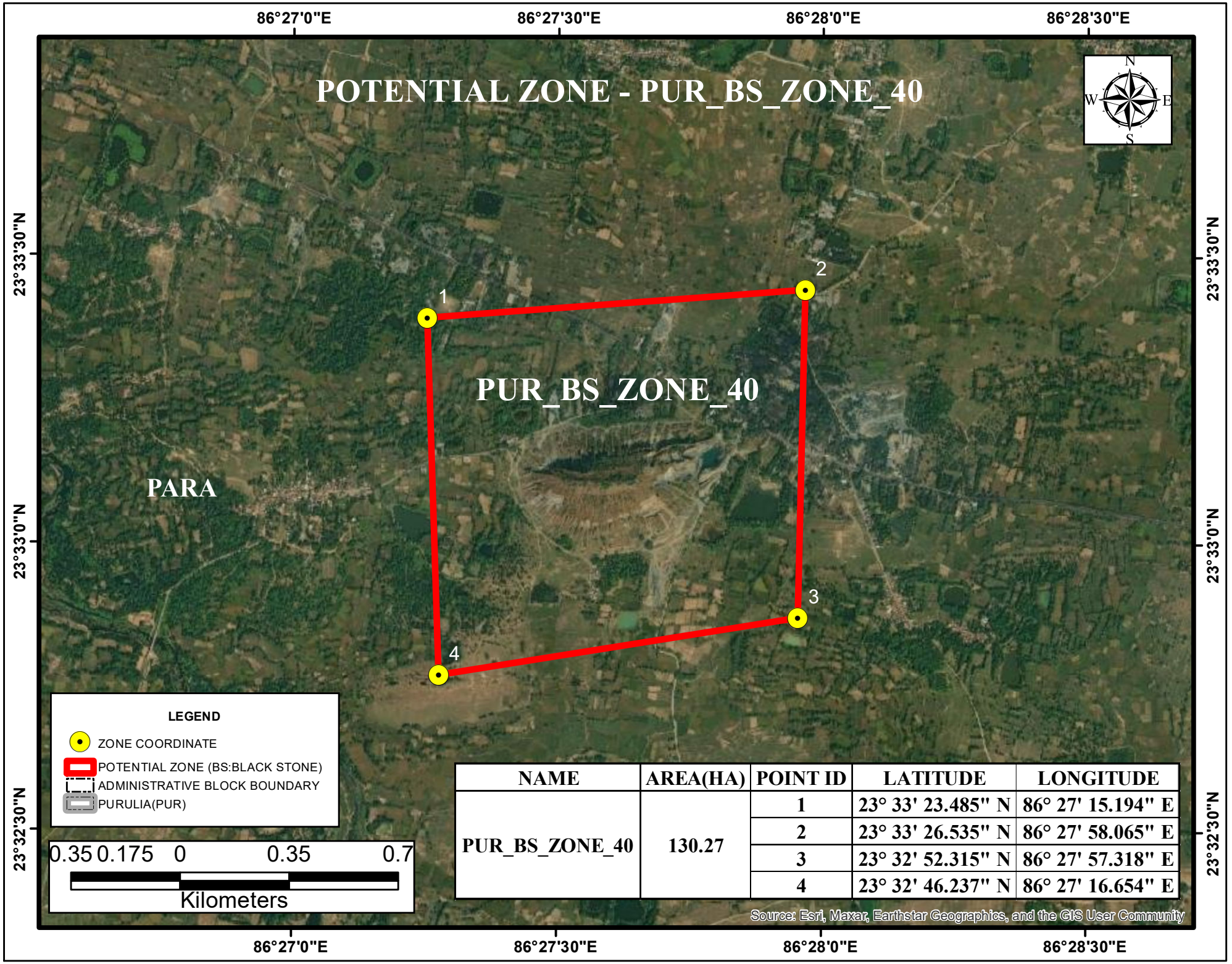
NAME	AREA(HA)	POINT ID	LATITUDE	LONGITUDE
PUR_BS_ZONE_37	36.94	1	23° 1' 0.478" N	86° 22' 54.203" E
		2	23° 1' 2.340" N	86° 23' 30.795" E
		3	23° 0' 59.657" N	86° 23' 32.317" E
		4	23° 0' 40.734" N	86° 23' 5.912" E



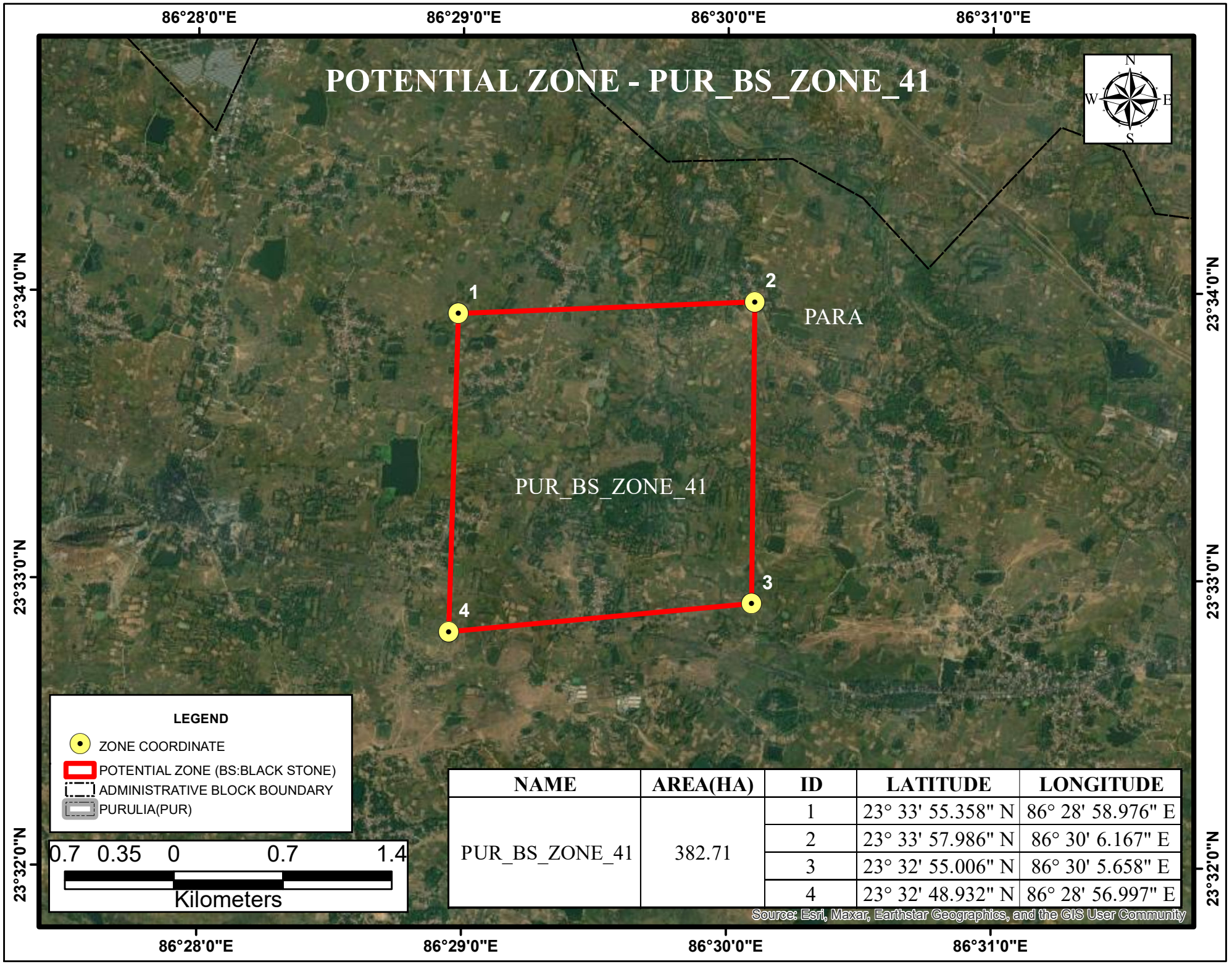
NAME	AREA(HA)	POINT ID	LATITUDE	LONGITUDE
PUR_BS_ZONE_38	7.88	1	23° 2' 2.930" N	86° 23' 51.254" E
		2	23° 2' 7.285" N	86° 23' 56.143" E
		3	23° 2' 0.712" N	86° 24' 5.320" E
		4	23° 1' 53.878" N	86° 24' 0.000" E



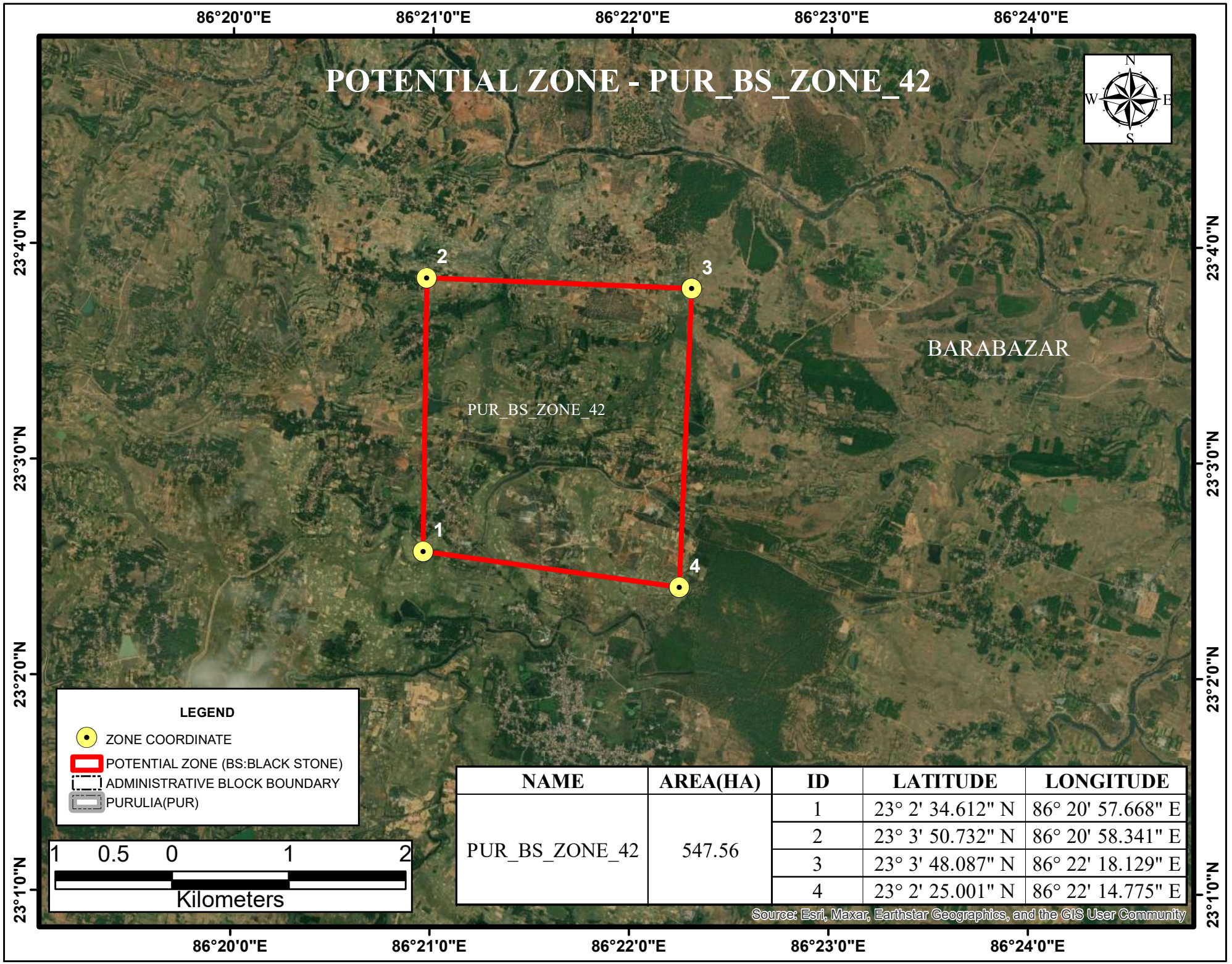
NAME	AREA(HA)	POINT ID	LATITUDE	LONGITUDE
PUR_BS_ZONE_39	6.64	1	22° 54' 23.966" N	86° 41' 52.067" E
		2	22° 54' 27.118" N	86° 41' 57.912" E
		3	22° 54' 23.520" N	86° 42' 4.193" E
		4	22° 54' 20.170" N	86° 42' 4.441" E
		5	22° 54' 16.021" N	86° 41' 59.469" E



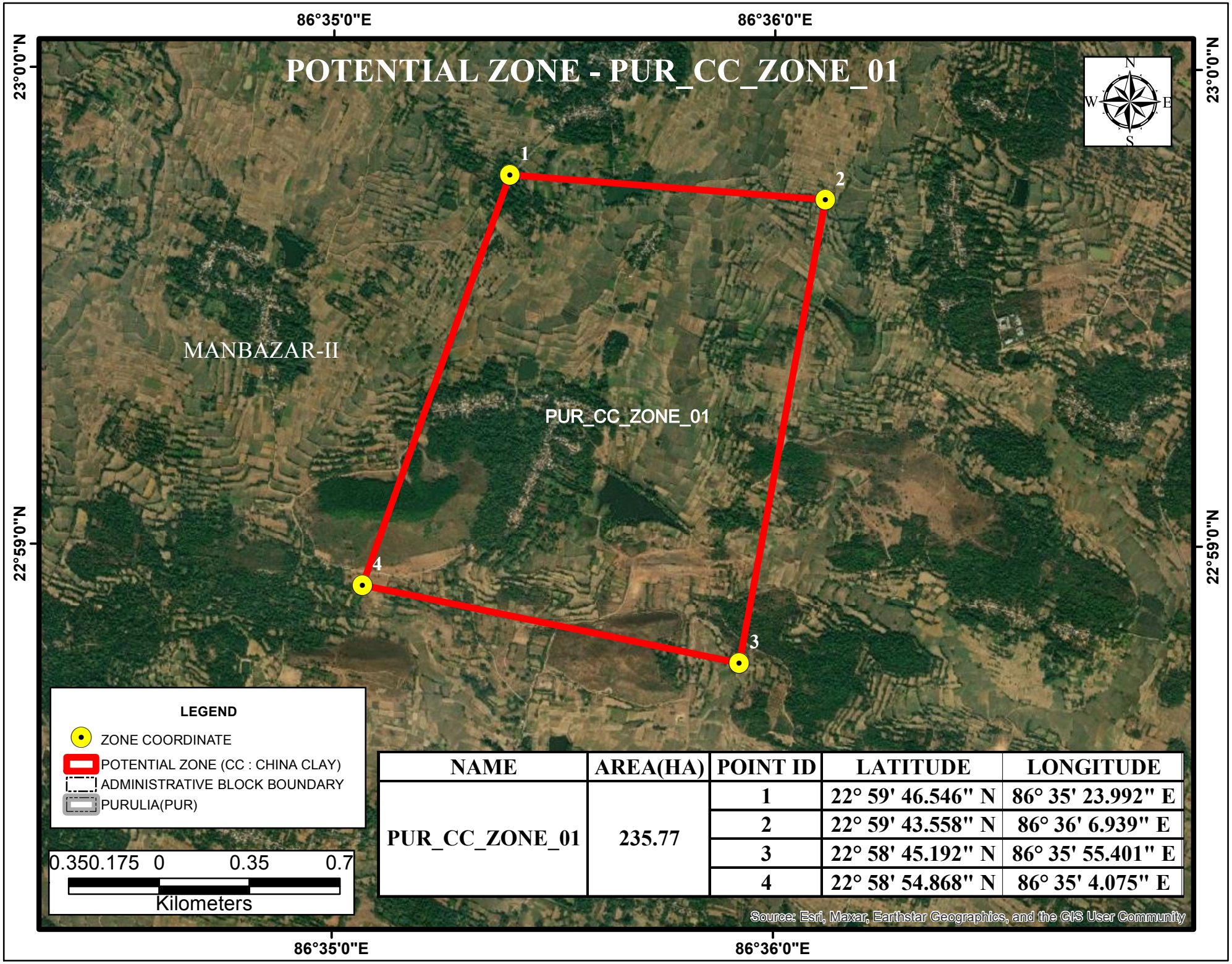
NAME	AREA(HA)	POINT ID	LATITUDE	LONGITUDE
PUR_BS_ZONE_40	130.27	1	23° 33' 23.485" N	86° 27' 15.194" E
		2	23° 33' 26.535" N	86° 27' 58.065" E
		3	23° 32' 52.315" N	86° 27' 57.318" E
		4	23° 32' 46.237" N	86° 27' 16.654" E



NAME	AREA(HA)	ID	LATITUDE	LONGITUDE
PUR_BS_ZONE_41	382.71	1	23° 33' 55.358" N	86° 28' 58.976" E
		2	23° 33' 57.986" N	86° 30' 6.167" E
		3	23° 32' 55.006" N	86° 30' 5.658" E
		4	23° 32' 48.932" N	86° 28' 56.997" E

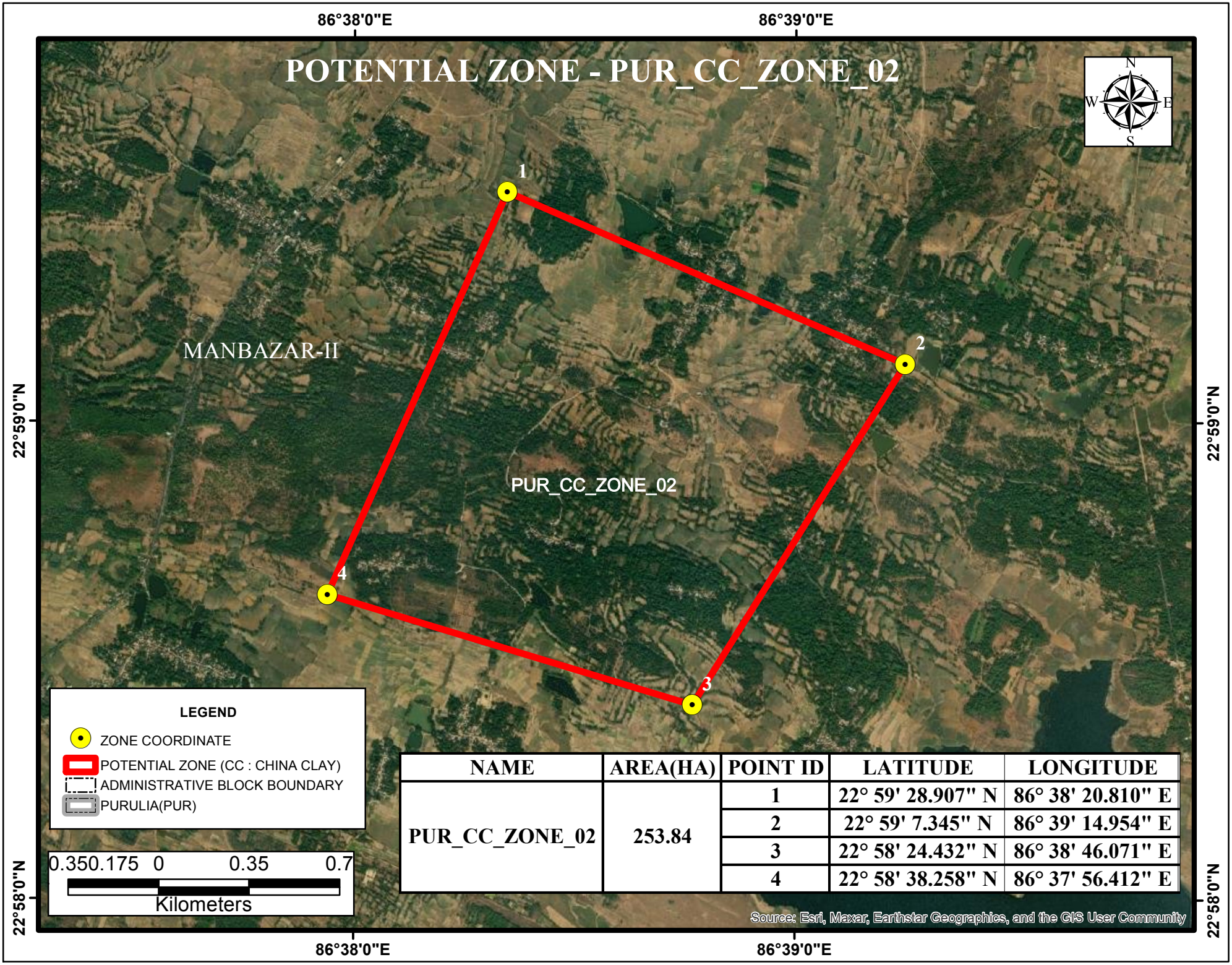


NAME	AREA(HA)	ID	LATITUDE	LONGITUDE
PUR_BS_ZONE_42	547.56	1	23° 2' 34.612" N	86° 20' 57.668" E
		2	23° 3' 50.732" N	86° 20' 58.341" E
		3	23° 3' 48.087" N	86° 22' 18.129" E
		4	23° 2' 25.001" N	86° 22' 14.775" E

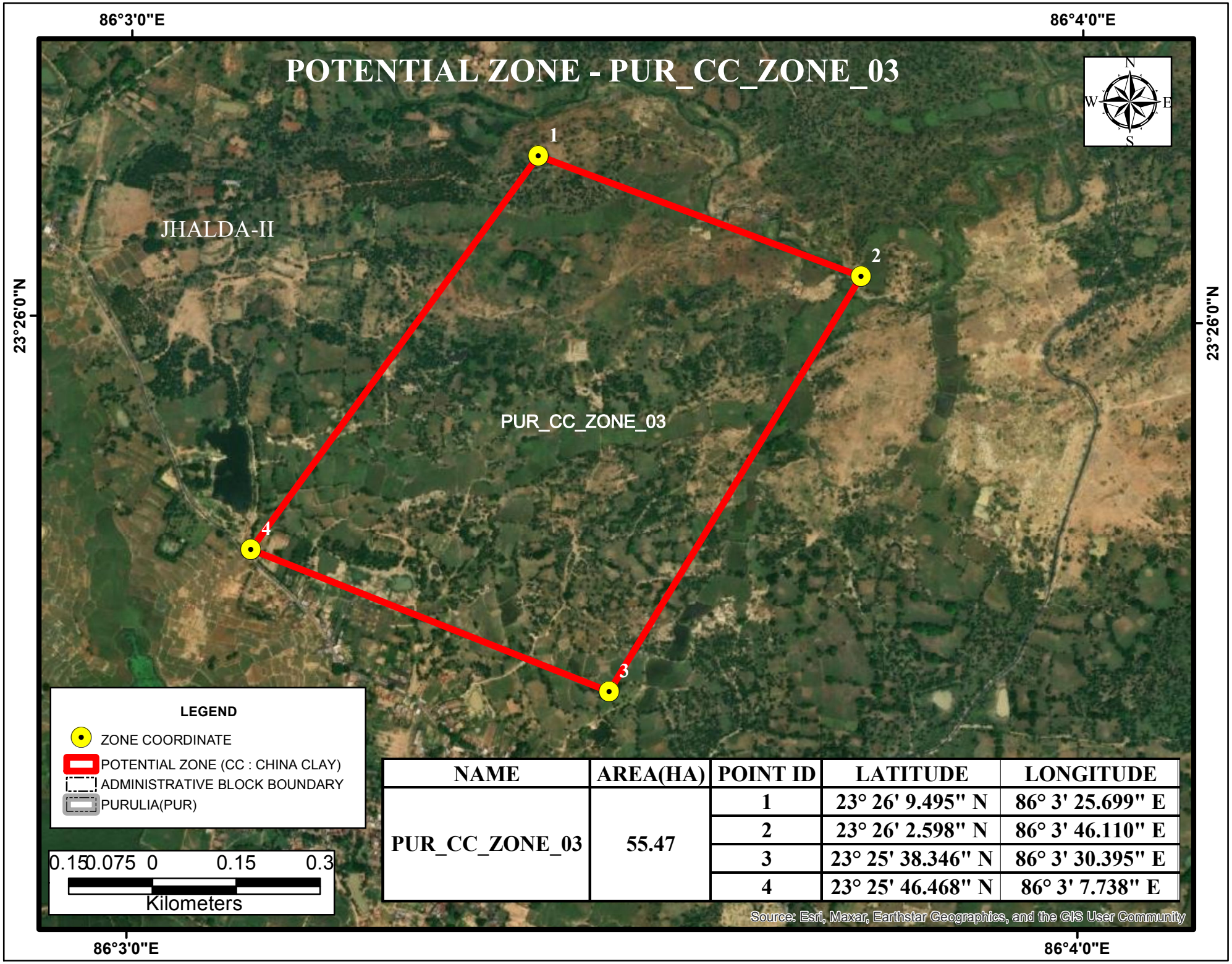


NAME	AREA(HA)	POINT ID	LATITUDE	LONGITUDE
PUR_CC_ZONE_01	235.77	1	22° 59' 46.546" N	86° 35' 23.992" E
		2	22° 59' 43.558" N	86° 36' 6.939" E
		3	22° 58' 45.192" N	86° 35' 55.401" E
		4	22° 58' 54.868" N	86° 35' 4.075" E

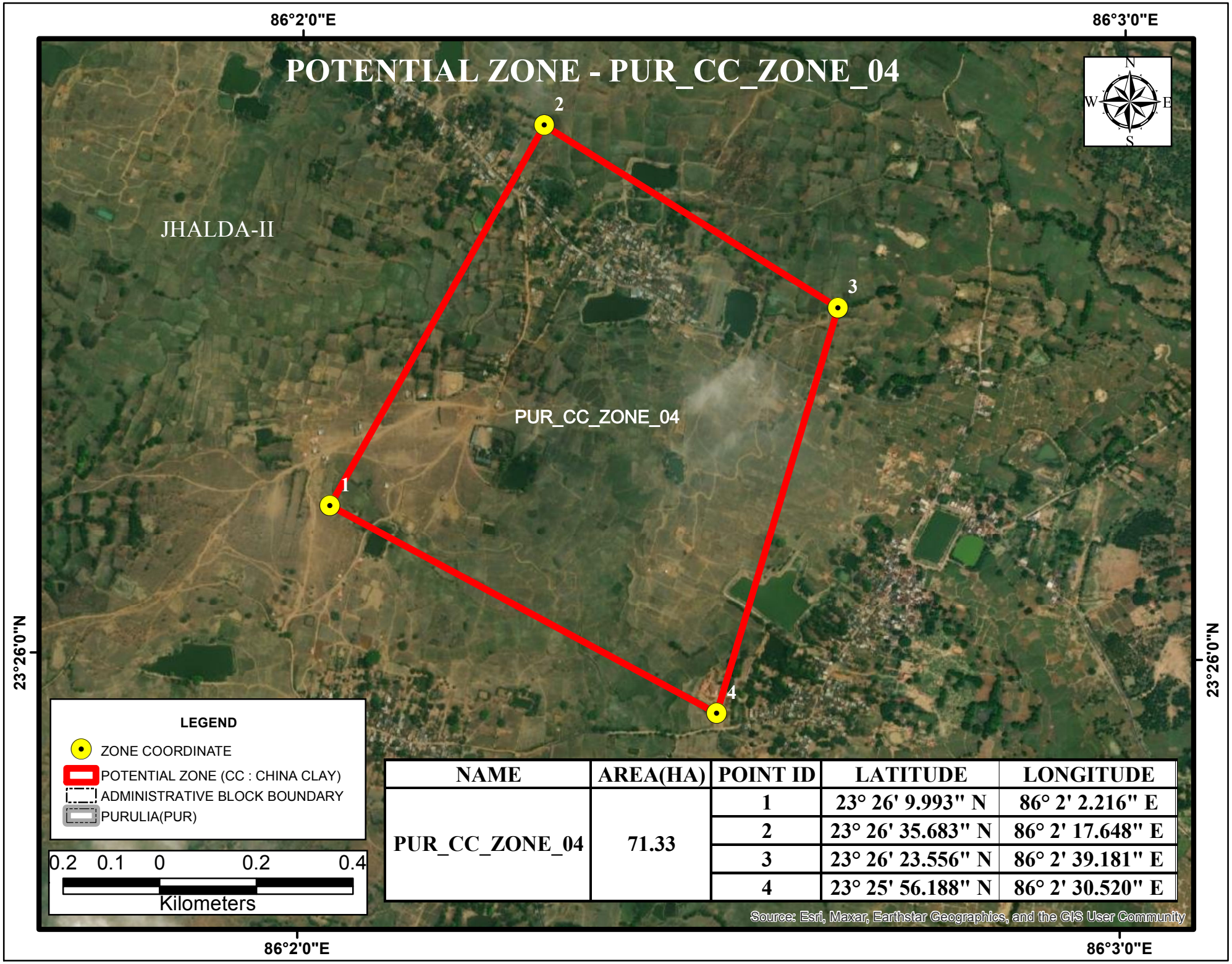
POTENTIAL ZONE - PUR_CC_ZONE_02



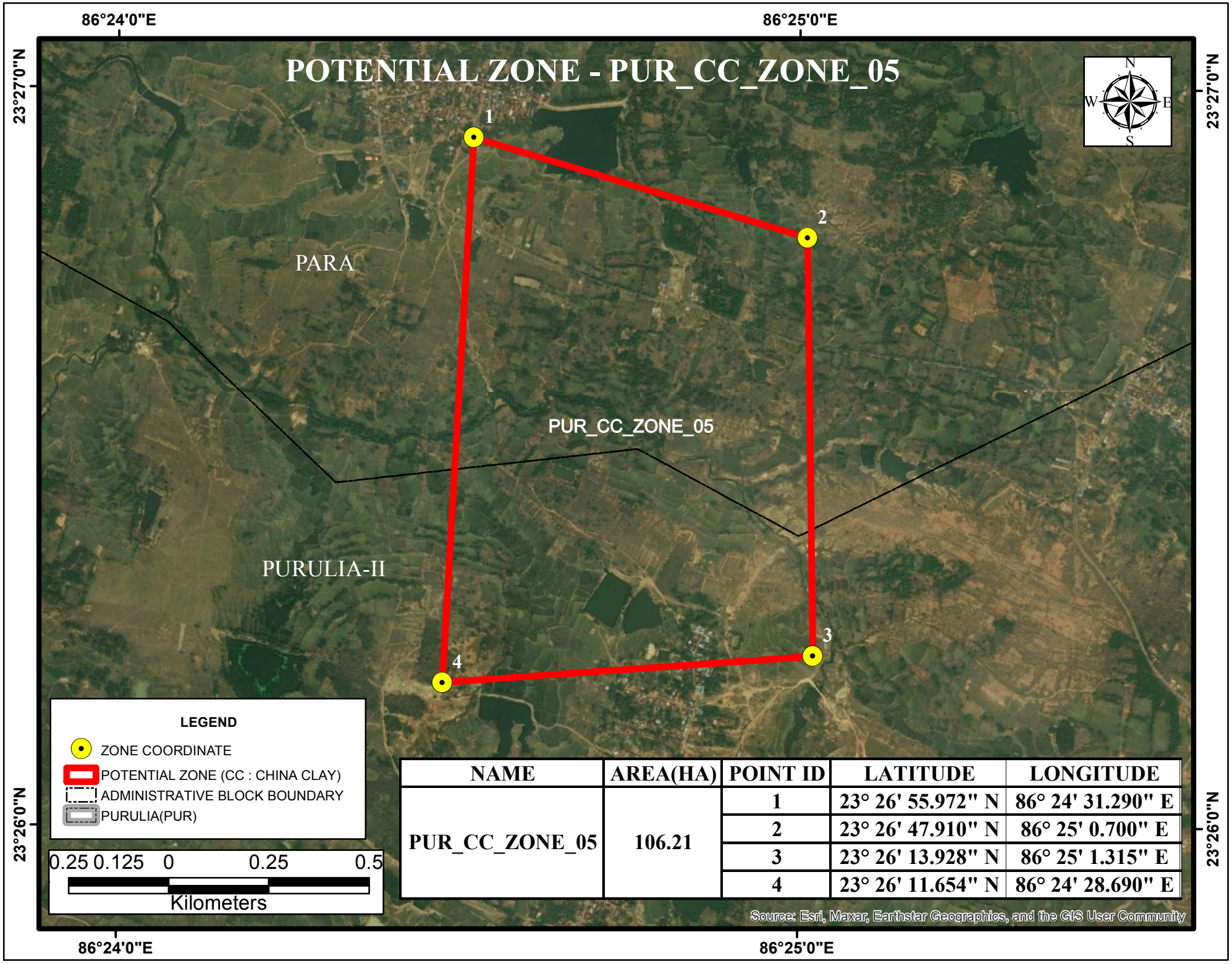
NAME	AREA(HA)	POINT ID	LATITUDE	LONGITUDE
PUR_CC_ZONE_02	253.84	1	22° 59' 28.907" N	86° 38' 20.810" E
		2	22° 59' 7.345" N	86° 39' 14.954" E
		3	22° 58' 24.432" N	86° 38' 46.071" E
		4	22° 58' 38.258" N	86° 37' 56.412" E



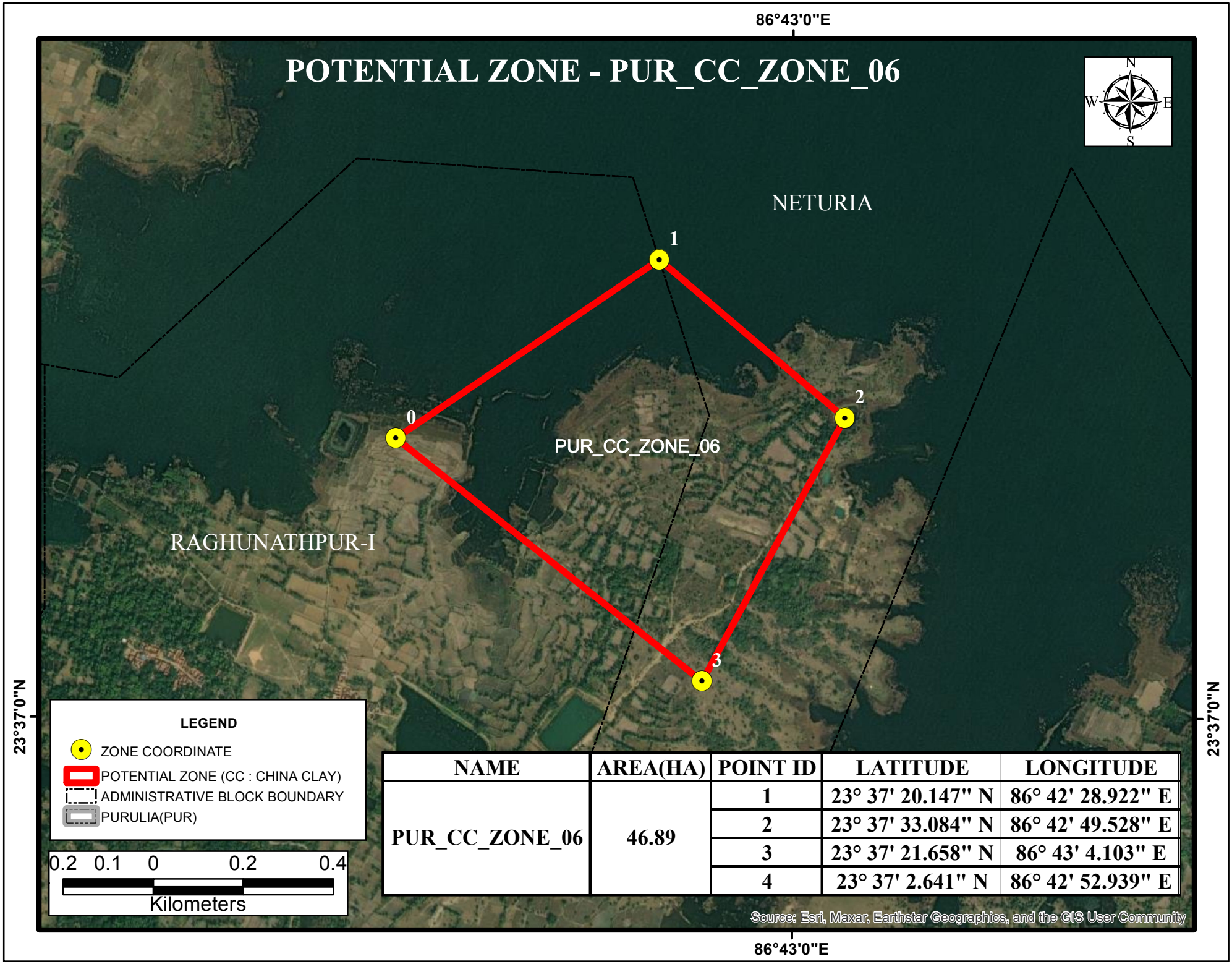
NAME	AREA(HA)	POINT ID	LATITUDE	LONGITUDE
PUR_CC_ZONE_03	55.47	1	23° 26' 9.495" N	86° 3' 25.699" E
		2	23° 26' 2.598" N	86° 3' 46.110" E
		3	23° 25' 38.346" N	86° 3' 30.395" E
		4	23° 25' 46.468" N	86° 3' 7.738" E



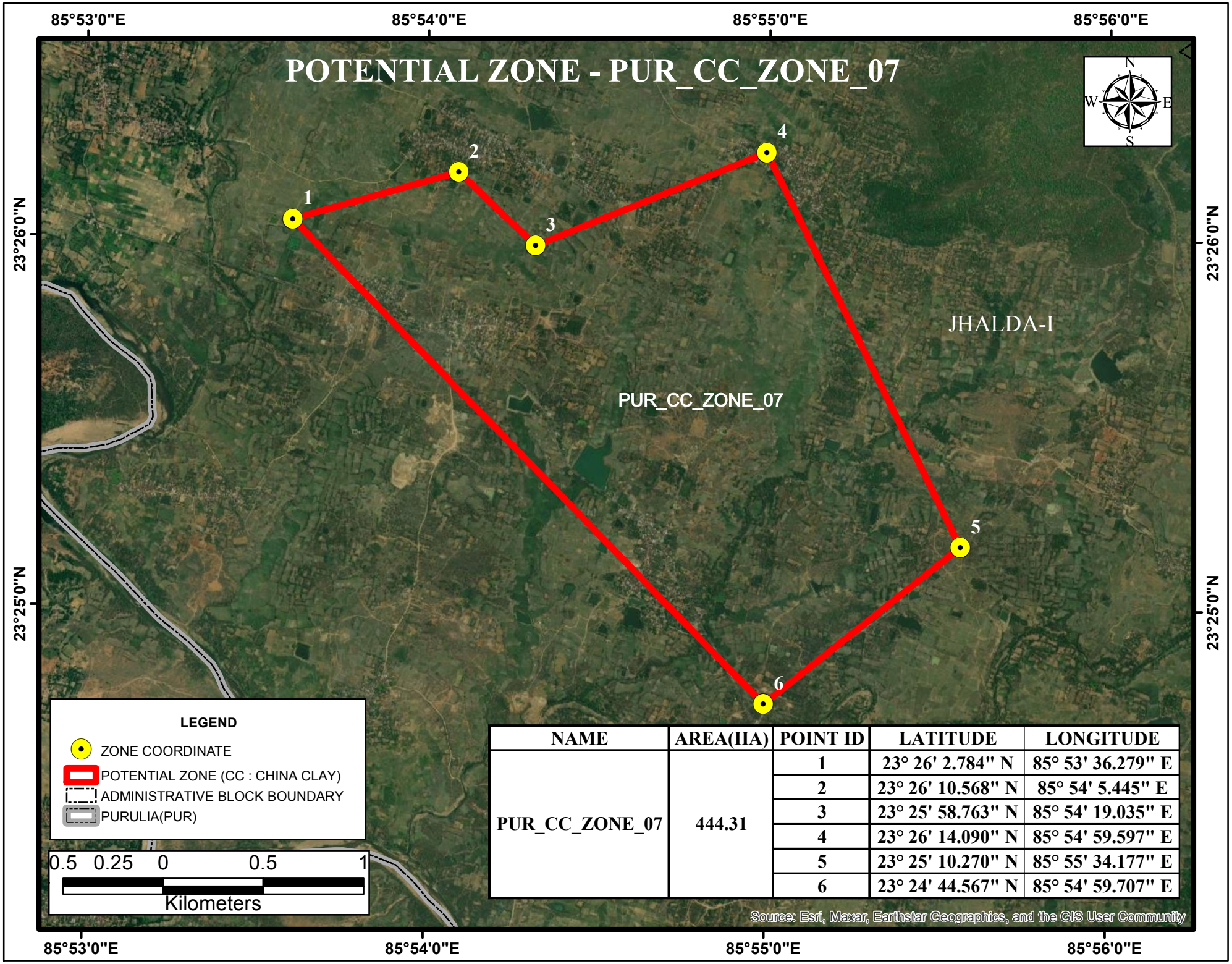
NAME	AREA(HA)	POINT ID	LATITUDE	LONGITUDE
PUR_CC_ZONE_04	71.33	1	23° 26' 9.993" N	86° 2' 2.216" E
		2	23° 26' 35.683" N	86° 2' 17.648" E
		3	23° 26' 23.556" N	86° 2' 39.181" E
		4	23° 25' 56.188" N	86° 2' 30.520" E



NAME	AREA(HA)	POINT ID	LATITUDE	LONGITUDE
PUR_CC_ZONE_05	106.21	1	23° 26' 55.972" N	86° 24' 31.290" E
		2	23° 26' 47.910" N	86° 25' 0.700" E
		3	23° 26' 13.928" N	86° 25' 1.315" E
		4	23° 26' 11.654" N	86° 24' 28.690" E

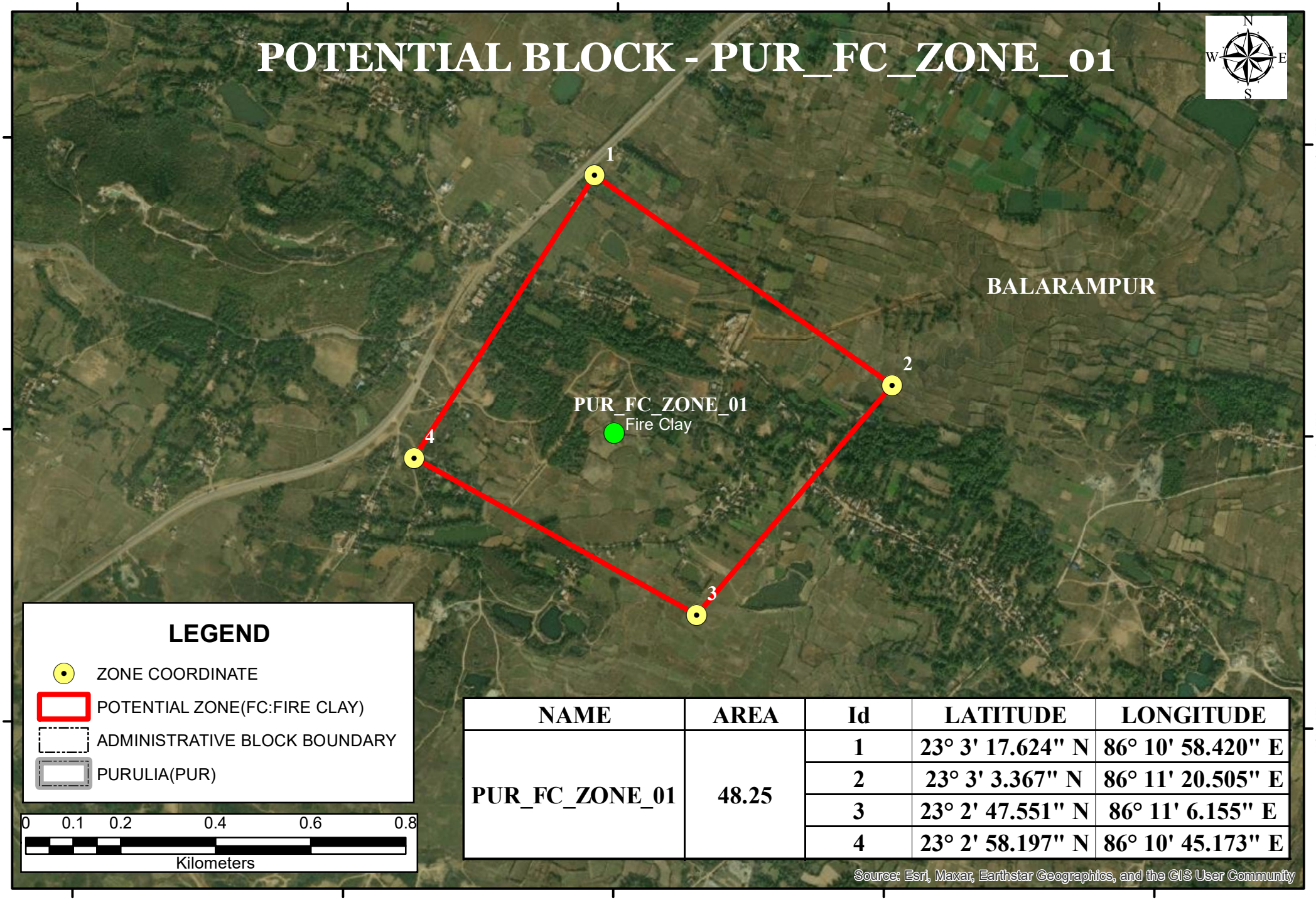


NAME	AREA(HA)	POINT ID	LATITUDE	LONGITUDE
PUR_CC_ZONE_06	46.89	1	23° 37' 20.147" N	86° 42' 28.922" E
		2	23° 37' 33.084" N	86° 42' 49.528" E
		3	23° 37' 21.658" N	86° 43' 4.103" E
		4	23° 37' 2.641" N	86° 42' 52.939" E



NAME	AREA(HA)	POINT ID	LATITUDE	LONGITUDE
PUR_CC_ZONE_07	444.31	1	23° 26' 2.784" N	85° 53' 36.279" E
		2	23° 26' 10.568" N	85° 54' 5.445" E
		3	23° 25' 58.763" N	85° 54' 19.035" E
		4	23° 26' 14.090" N	85° 54' 59.597" E
		5	23° 25' 10.270" N	85° 55' 34.177" E
		6	23° 24' 44.567" N	85° 54' 59.707" E

POTENTIAL BLOCK - PUR_FC_ZONE_01



LEGEND

- ZONE COORDINATE
- POTENTIAL ZONE(FC:FIRE CLAY)
- ADMINISTRATIVE BLOCK BOUNDARY
- PURULIA(PUR)

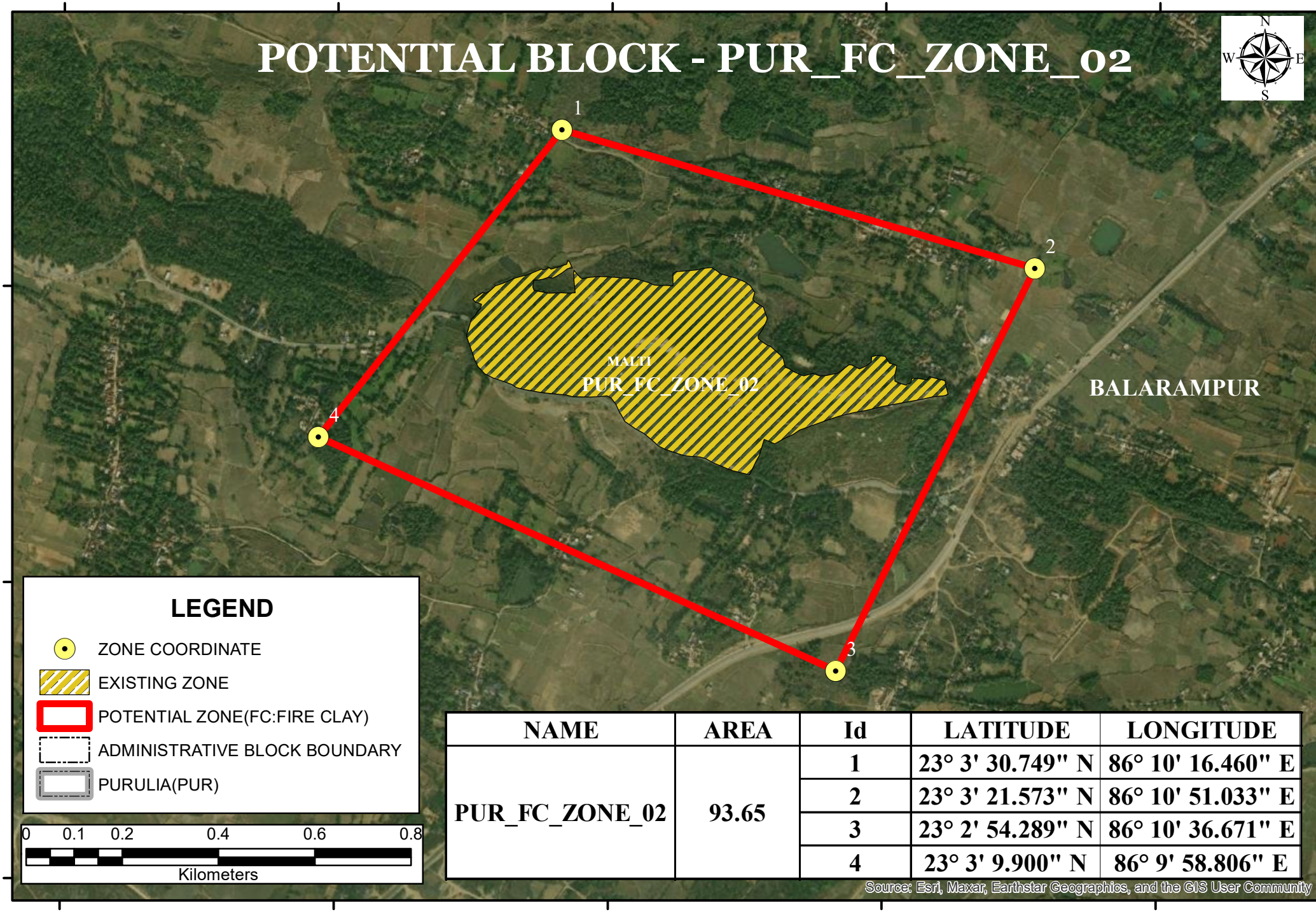
0 0.1 0.2 0.4 0.6 0.8

Kilometers

NAME	AREA	Id	LATITUDE	LONGITUDE
PUR_FC_ZONE_01	48.25	1	23° 3' 17.624" N	86° 10' 58.420" E
		2	23° 3' 3.367" N	86° 11' 20.505" E
		3	23° 2' 47.551" N	86° 11' 6.155" E
		4	23° 2' 58.197" N	86° 10' 45.173" E

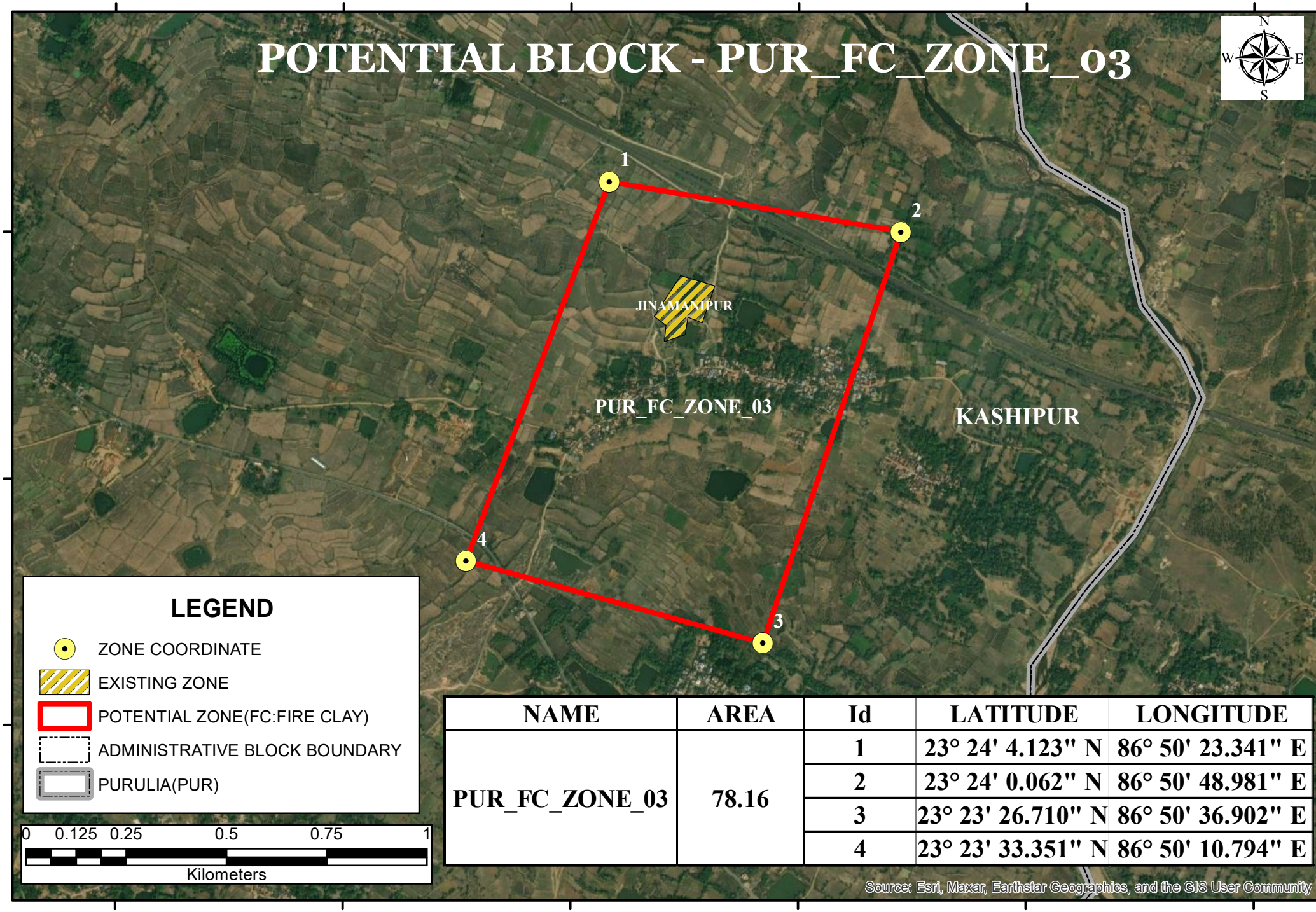
Source: Esri, Maxar, Earthstar Geographics, and the GIS User Community

POTENTIAL BLOCK - PUR_FC_ZONE_02

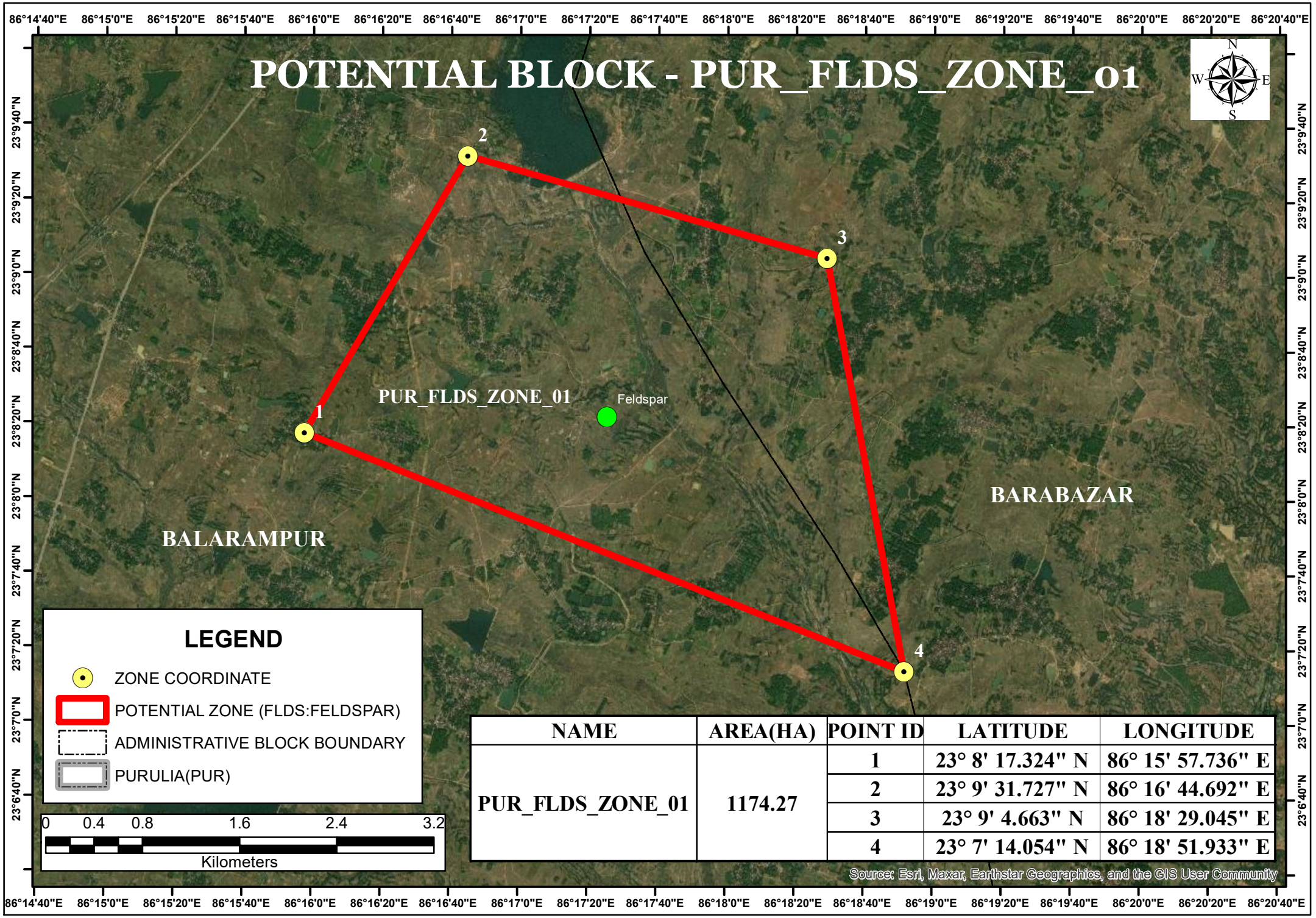


NAME	AREA	Id	LATITUDE	LONGITUDE
PUR_FC_ZONE_02	93.65	1	23° 3' 30.749" N	86° 10' 16.460" E
		2	23° 3' 21.573" N	86° 10' 51.033" E
		3	23° 2' 54.289" N	86° 10' 36.671" E
		4	23° 3' 9.900" N	86° 9' 58.806" E

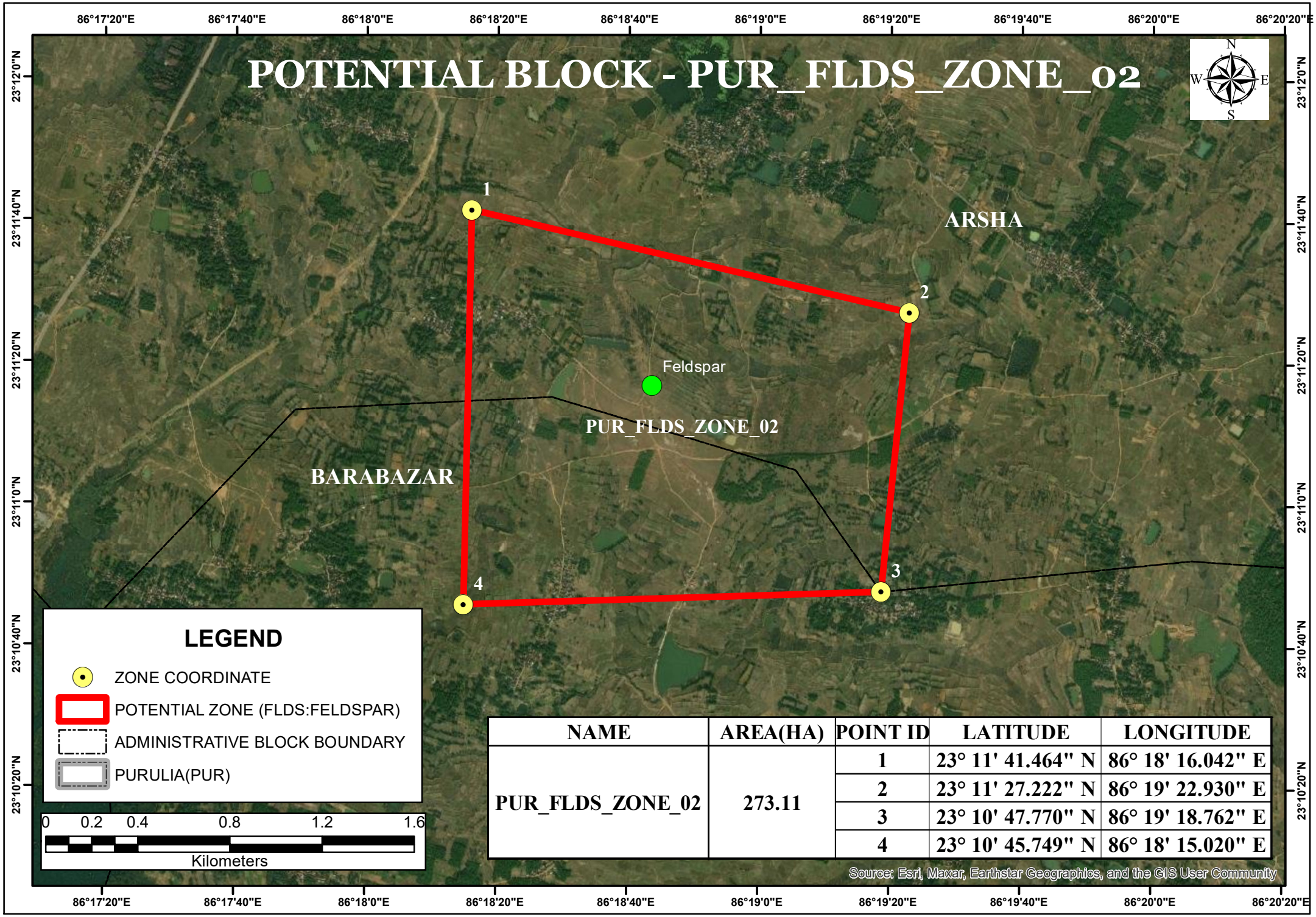
POTENTIAL BLOCK - PUR_FC_ZONE_03



NAME	AREA	Id	LATITUDE	LONGITUDE
PUR_FC_ZONE_03	78.16	1	23° 24' 4.123" N	86° 50' 23.341" E
		2	23° 24' 0.062" N	86° 50' 48.981" E
		3	23° 23' 26.710" N	86° 50' 36.902" E
		4	23° 23' 33.351" N	86° 50' 10.794" E

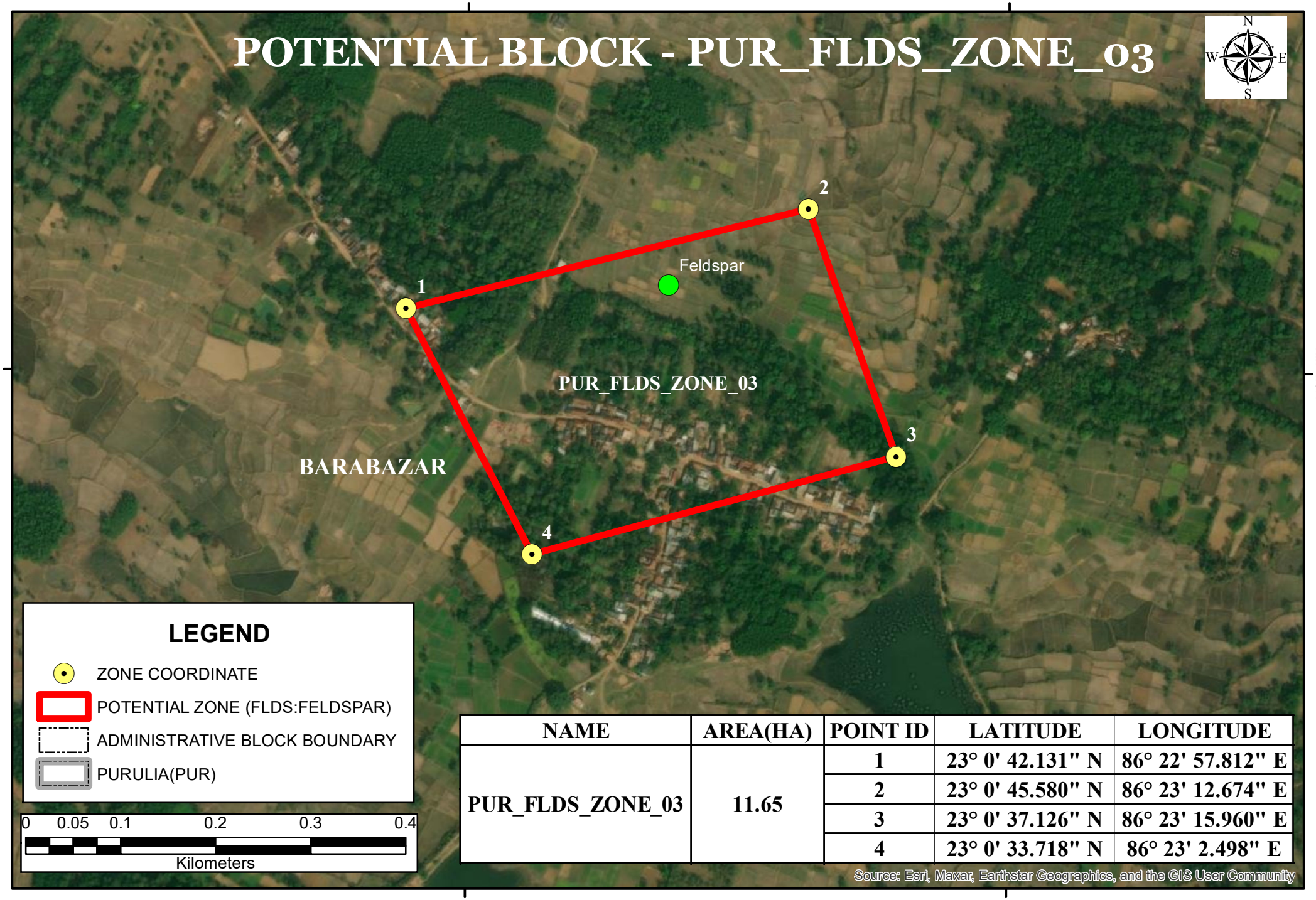


NAME	AREA(HA)	POINT ID	LATITUDE	LONGITUDE
PUR_FLDS_ZONE_01	1174.27	1	23° 8' 17.324" N	86° 15' 57.736" E
		2	23° 9' 31.727" N	86° 16' 44.692" E
		3	23° 9' 4.663" N	86° 18' 29.045" E
		4	23° 7' 14.054" N	86° 18' 51.933" E



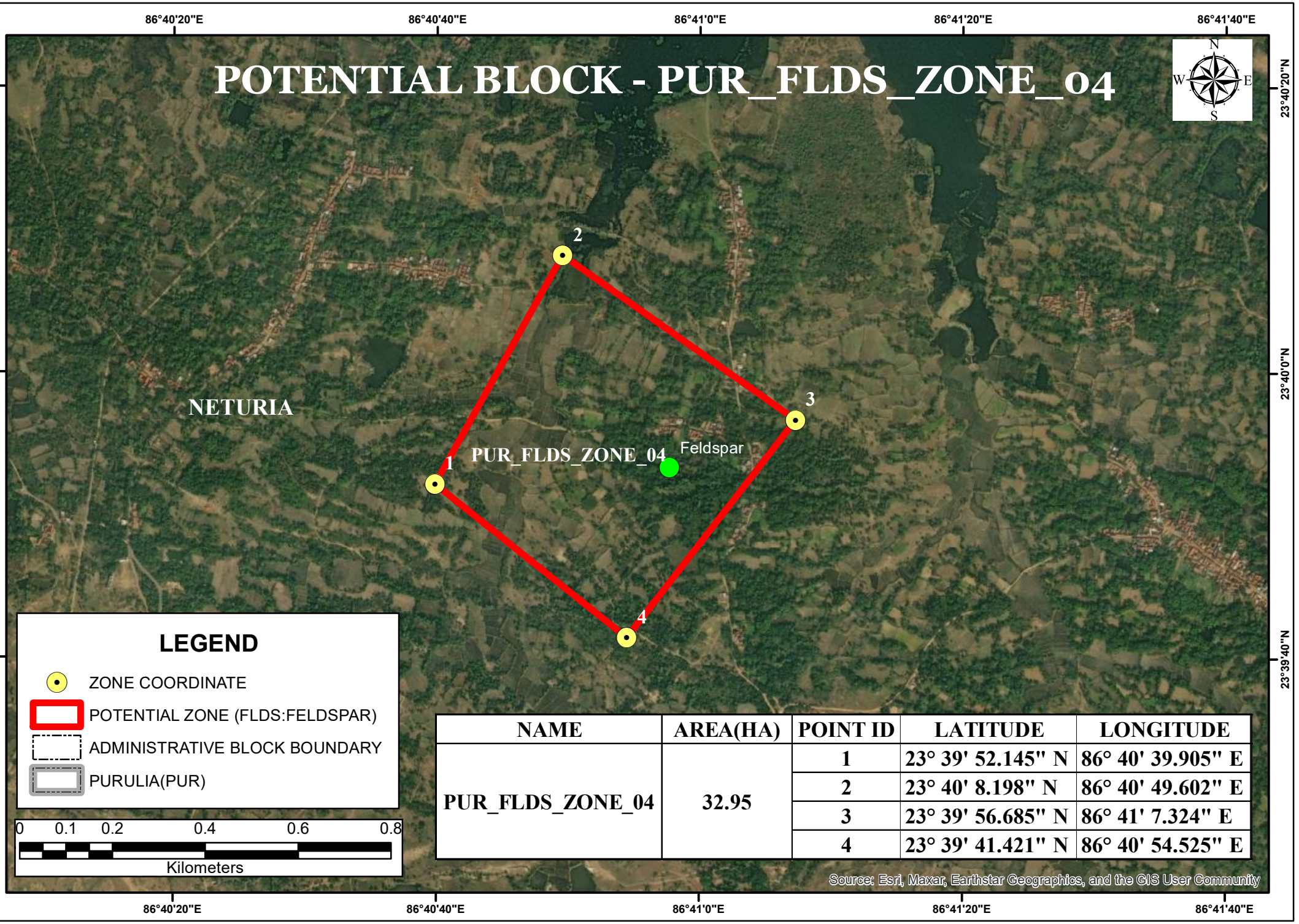
NAME	AREA(HA)	POINT ID	LATITUDE	LONGITUDE
PUR_FLDS_ZONE_02	273.11	1	23° 11' 41.464" N	86° 18' 16.042" E
		2	23° 11' 27.222" N	86° 19' 22.930" E
		3	23° 10' 47.770" N	86° 19' 18.762" E
		4	23° 10' 45.749" N	86° 18' 15.020" E

POTENTIAL BLOCK - PUR_FLDS_ZONE_03



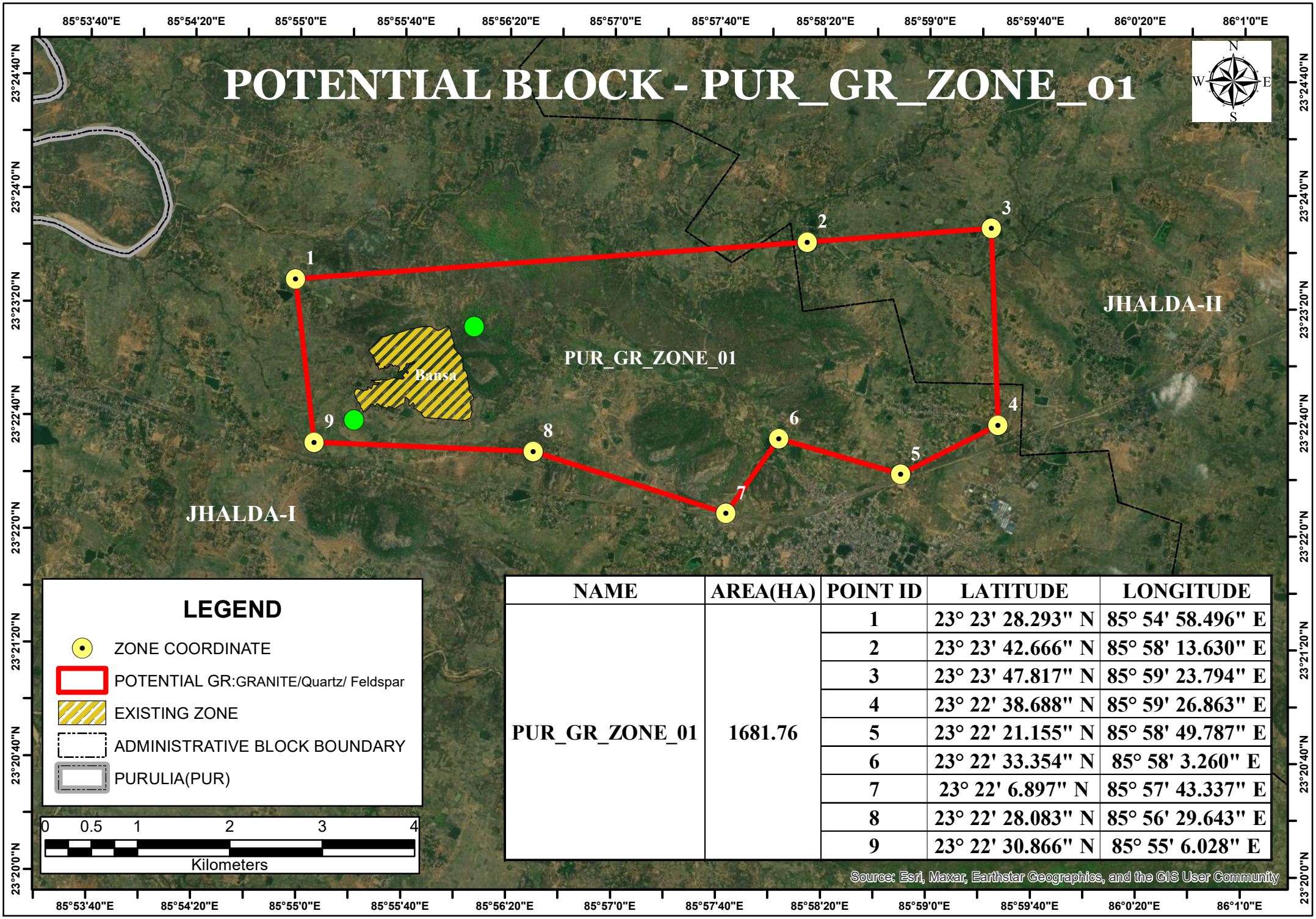
NAME	AREA(HA)	POINT ID	LATITUDE	LONGITUDE
PUR_FLDS_ZONE_03	11.65	1	23° 0' 42.131" N	86° 22' 57.812" E
		2	23° 0' 45.580" N	86° 23' 12.674" E
		3	23° 0' 37.126" N	86° 23' 15.960" E
		4	23° 0' 33.718" N	86° 23' 2.498" E

POTENTIAL BLOCK - PUR_FLDS_ZONE_04



NAME	AREA(HA)	POINT ID	LATITUDE	LONGITUDE
PUR_FLDS_ZONE_04	32.95	1	23° 39' 52.145" N	86° 40' 39.905" E
		2	23° 40' 8.198" N	86° 40' 49.602" E
		3	23° 39' 56.685" N	86° 41' 7.324" E
		4	23° 39' 41.421" N	86° 40' 54.525" E

POTENTIAL BLOCK - PUR_GR_ZONE_01



LEGEND

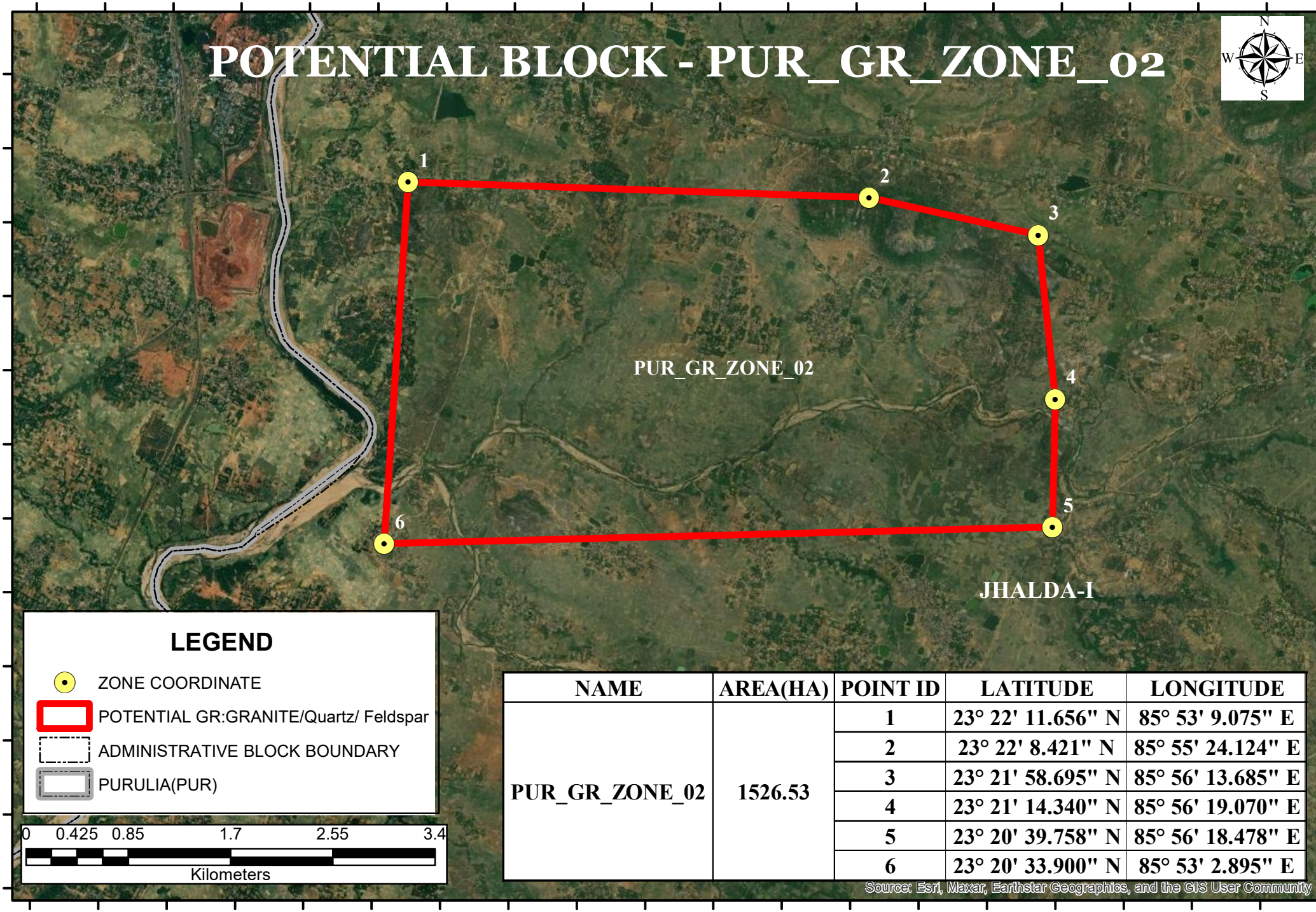
- ZONE COORDINATE
- POTENTIAL GR:GRANITE/Quartz/ Feldspar
- EXISTING ZONE
- ADMINISTRATIVE BLOCK BOUNDARY
- PURULIA(PUR)

0 0.5 1 2 3 4
Kilometers

NAME	AREA(HA)	POINT ID	LATITUDE	LONGITUDE
PUR_GR_ZONE_01	1681.76	1	23° 23' 28.293" N	85° 54' 58.496" E
		2	23° 23' 42.666" N	85° 58' 13.630" E
		3	23° 23' 47.817" N	85° 59' 23.794" E
		4	23° 22' 38.688" N	85° 59' 26.863" E
		5	23° 22' 21.155" N	85° 58' 49.787" E
		6	23° 22' 33.354" N	85° 58' 3.260" E
		7	23° 22' 6.897" N	85° 57' 43.337" E
		8	23° 22' 28.083" N	85° 56' 29.643" E
		9	23° 22' 30.866" N	85° 55' 6.028" E

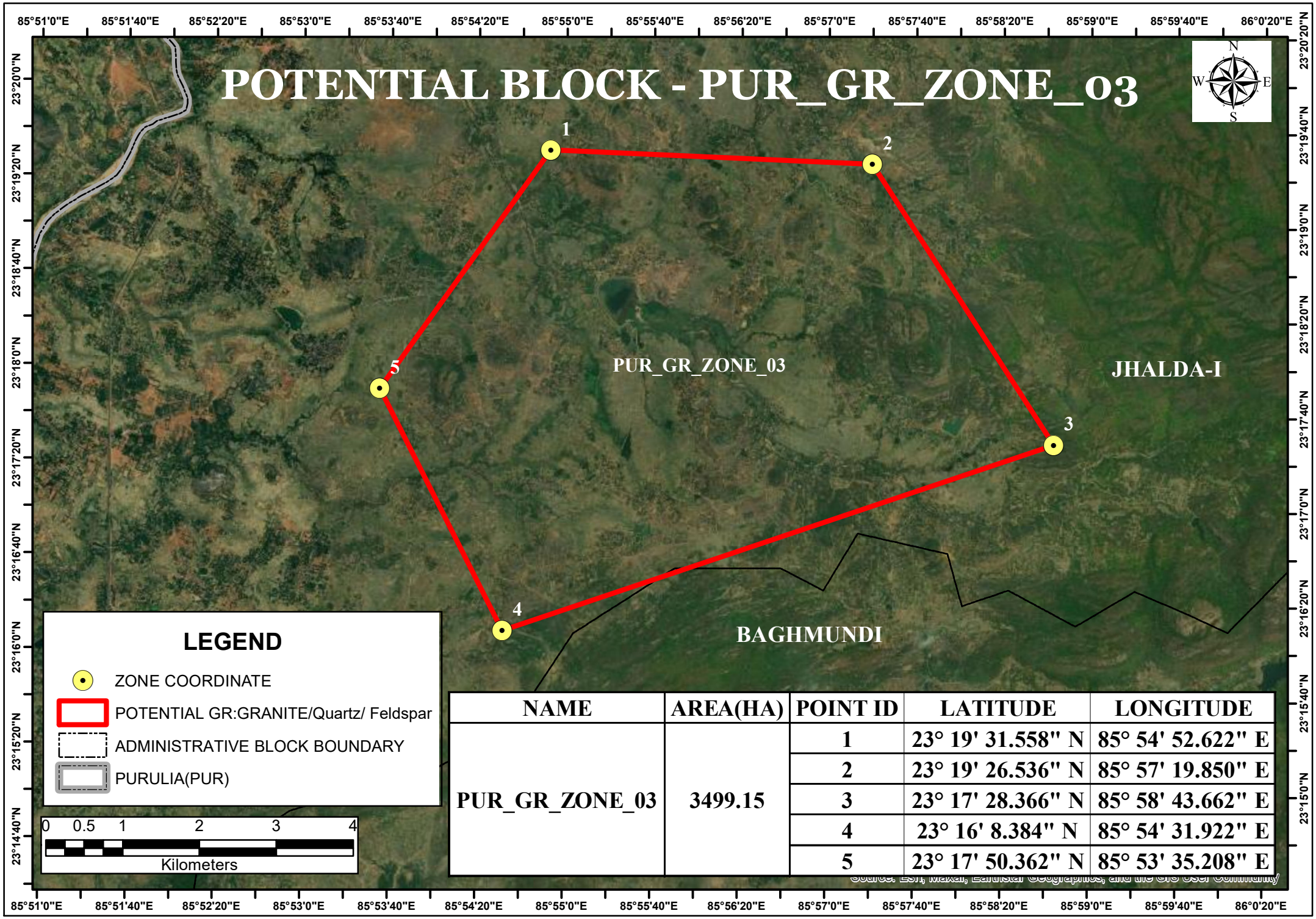
Source: Esri, Maxar, Earthstar Geographics, and the GIS User Community

POTENTIAL BLOCK - PUR_GR_ZONE_02



NAME	AREA(HA)	POINT ID	LATITUDE	LONGITUDE
PUR_GR_ZONE_02	1526.53	1	23° 22' 11.656" N	85° 53' 9.075" E
		2	23° 22' 8.421" N	85° 55' 24.124" E
		3	23° 21' 58.695" N	85° 56' 13.685" E
		4	23° 21' 14.340" N	85° 56' 19.070" E
		5	23° 20' 39.758" N	85° 56' 18.478" E
		6	23° 20' 33.900" N	85° 53' 2.895" E

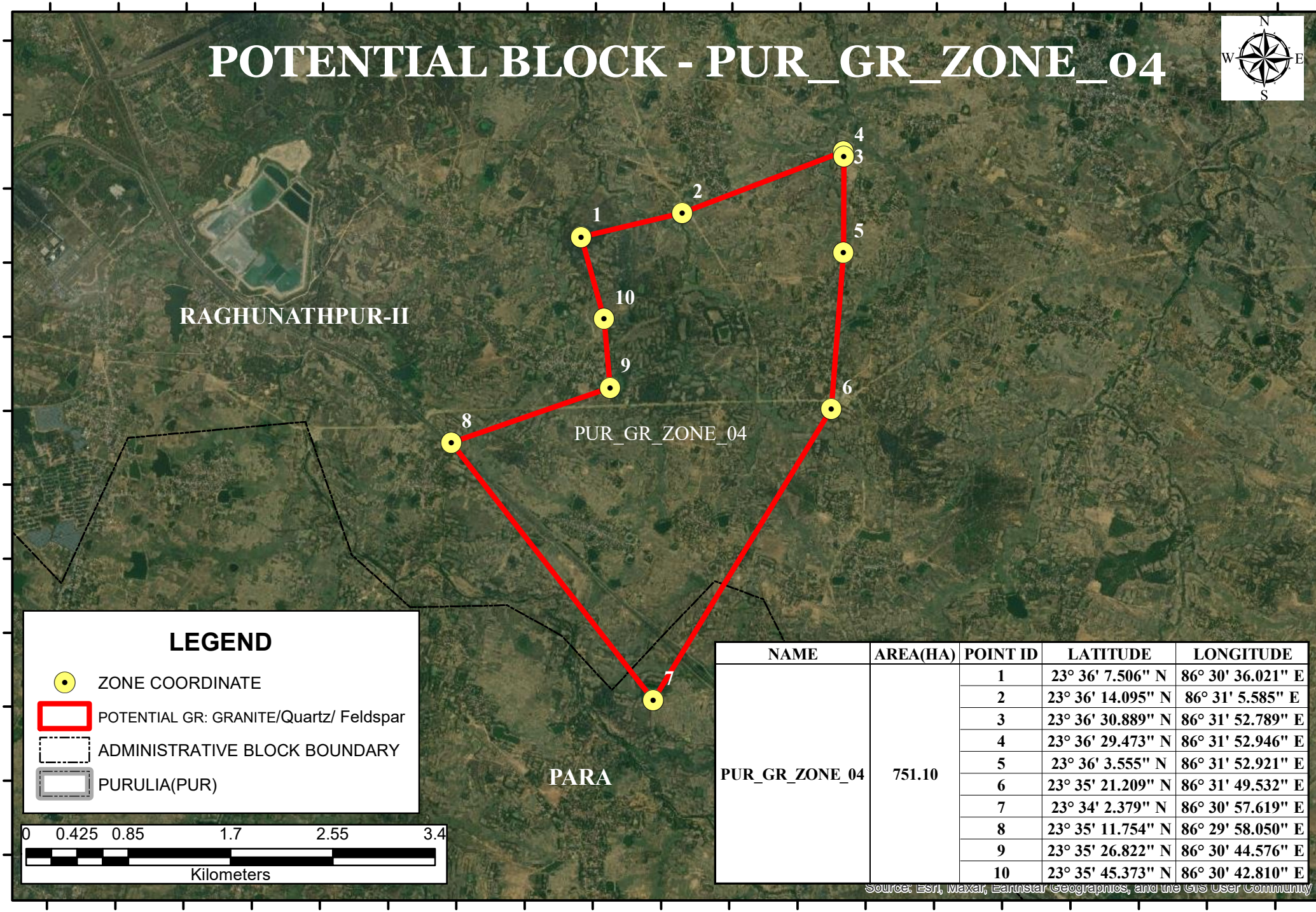
POTENTIAL BLOCK - PUR_GR_ZONE_03



NAME	AREA(HA)	POINT ID	LATITUDE	LONGITUDE
PUR_GR_ZONE_03	3499.15	1	23° 19' 31.558" N	85° 54' 52.622" E
		2	23° 19' 26.536" N	85° 57' 19.850" E
		3	23° 17' 28.366" N	85° 58' 43.662" E
		4	23° 16' 8.384" N	85° 54' 31.922" E
		5	23° 17' 50.362" N	85° 53' 35.208" E

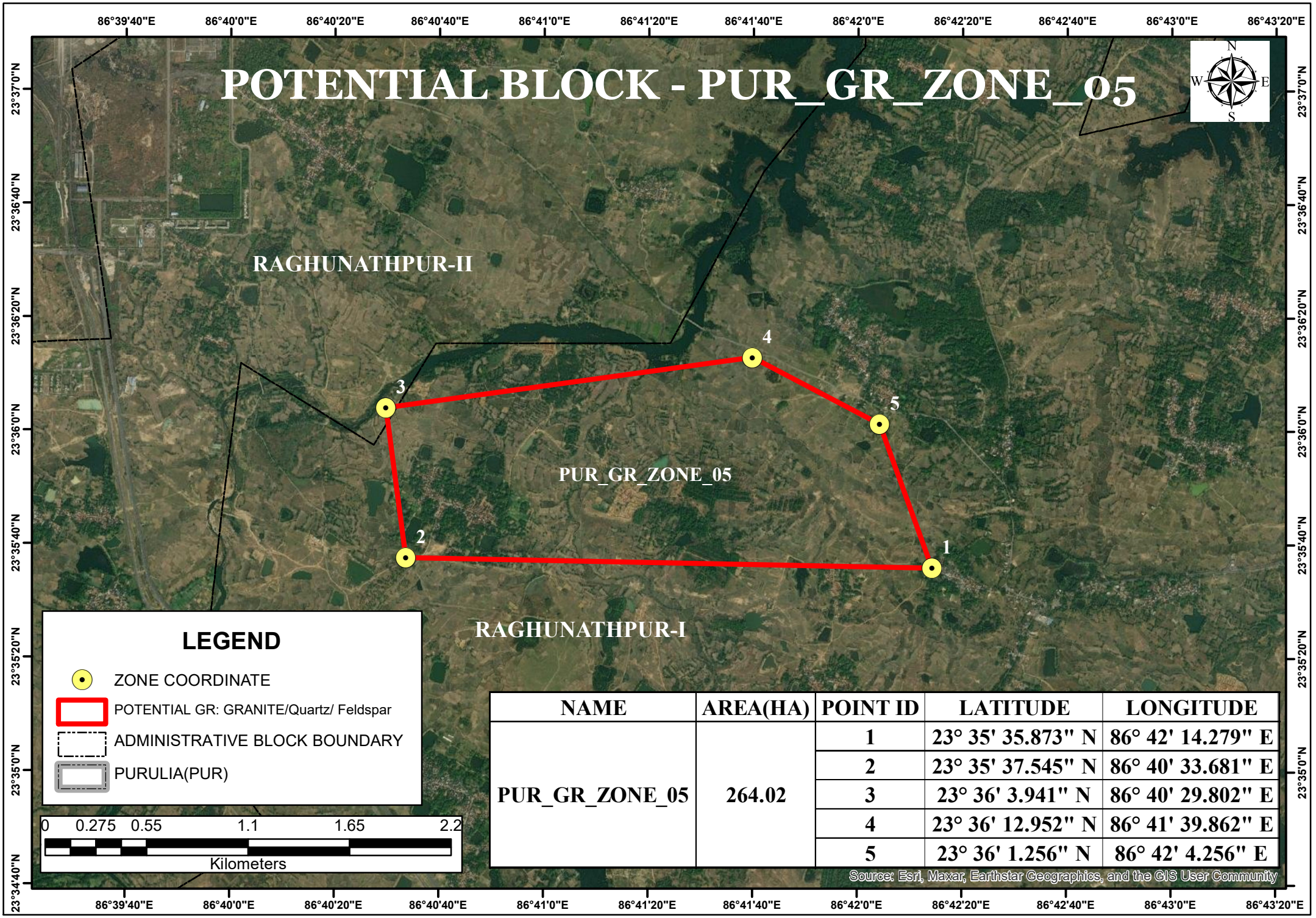
Source: Esri, Maxar, Earthstar Geographics, and the GIS User Community

POTENTIAL BLOCK - PUR_GR_ZONE_04



NAME	AREA(HA)	POINT ID	LATITUDE	LONGITUDE
PUR_GR_ZONE_04	751.10	1	23° 36' 7.506" N	86° 30' 36.021" E
		2	23° 36' 14.095" N	86° 31' 5.585" E
		3	23° 36' 30.889" N	86° 31' 52.789" E
		4	23° 36' 29.473" N	86° 31' 52.946" E
		5	23° 36' 3.555" N	86° 31' 52.921" E
		6	23° 35' 21.209" N	86° 31' 49.532" E
		7	23° 34' 2.379" N	86° 30' 57.619" E
		8	23° 35' 11.754" N	86° 29' 58.050" E
		9	23° 35' 26.822" N	86° 30' 44.576" E
		10	23° 35' 45.373" N	86° 30' 42.810" E

POTENTIAL BLOCK - PUR_GR_ZONE_05



LEGEND

- ZONE COORDINATE
- POTENTIAL GR: GRANITE/Quartz/ Feldspar
- ADMINISTRATIVE BLOCK BOUNDARY
- PURULIA(PUR)

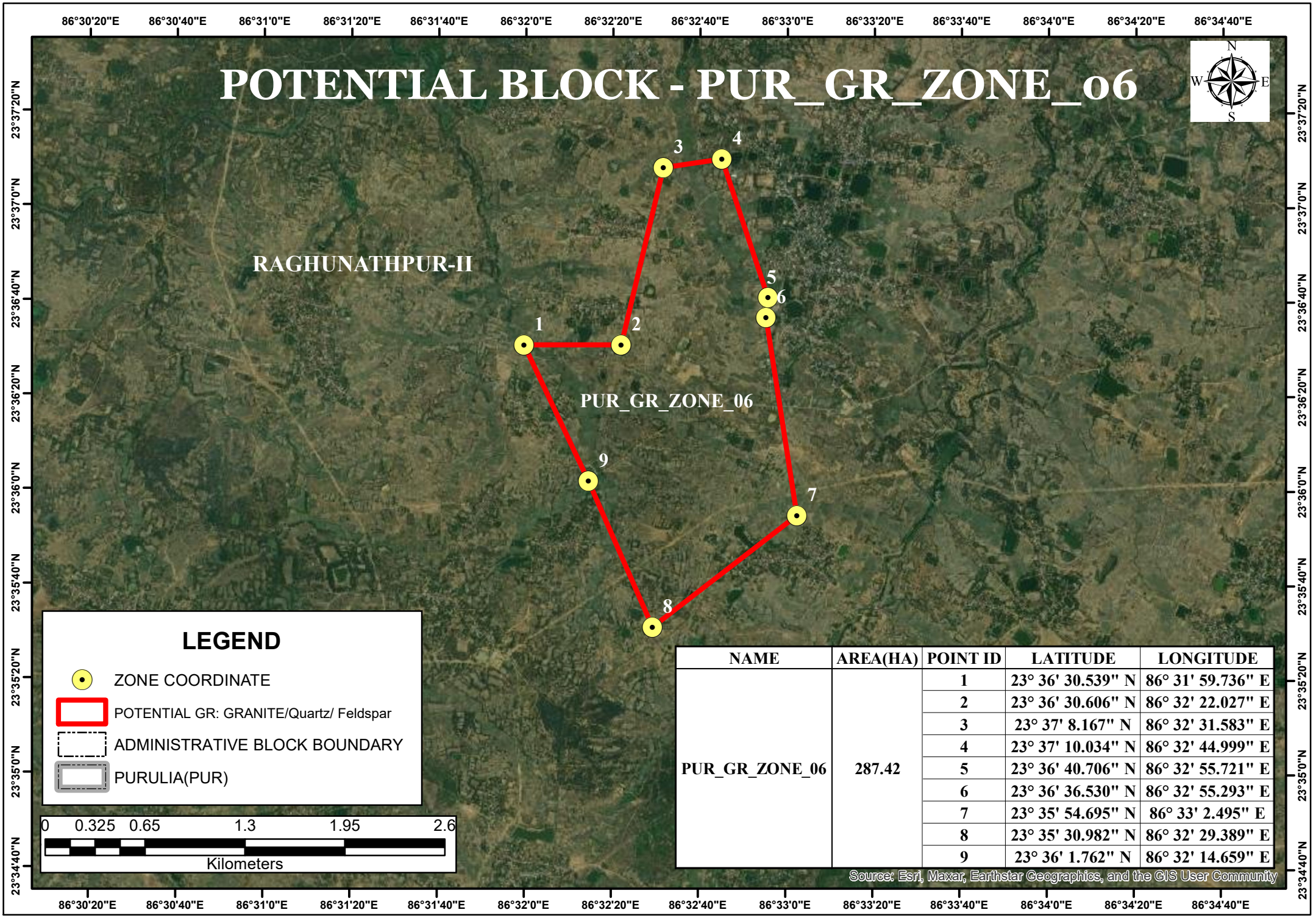
0 0.275 0.55 1.1 1.65 2.2

Kilometers

NAME	AREA(HA)	POINT ID	LATITUDE	LONGITUDE
PUR_GR_ZONE_05	264.02	1	23° 35' 35.873" N	86° 42' 14.279" E
		2	23° 35' 37.545" N	86° 40' 33.681" E
		3	23° 36' 3.941" N	86° 40' 29.802" E
		4	23° 36' 12.952" N	86° 41' 39.862" E
		5	23° 36' 1.256" N	86° 42' 4.256" E

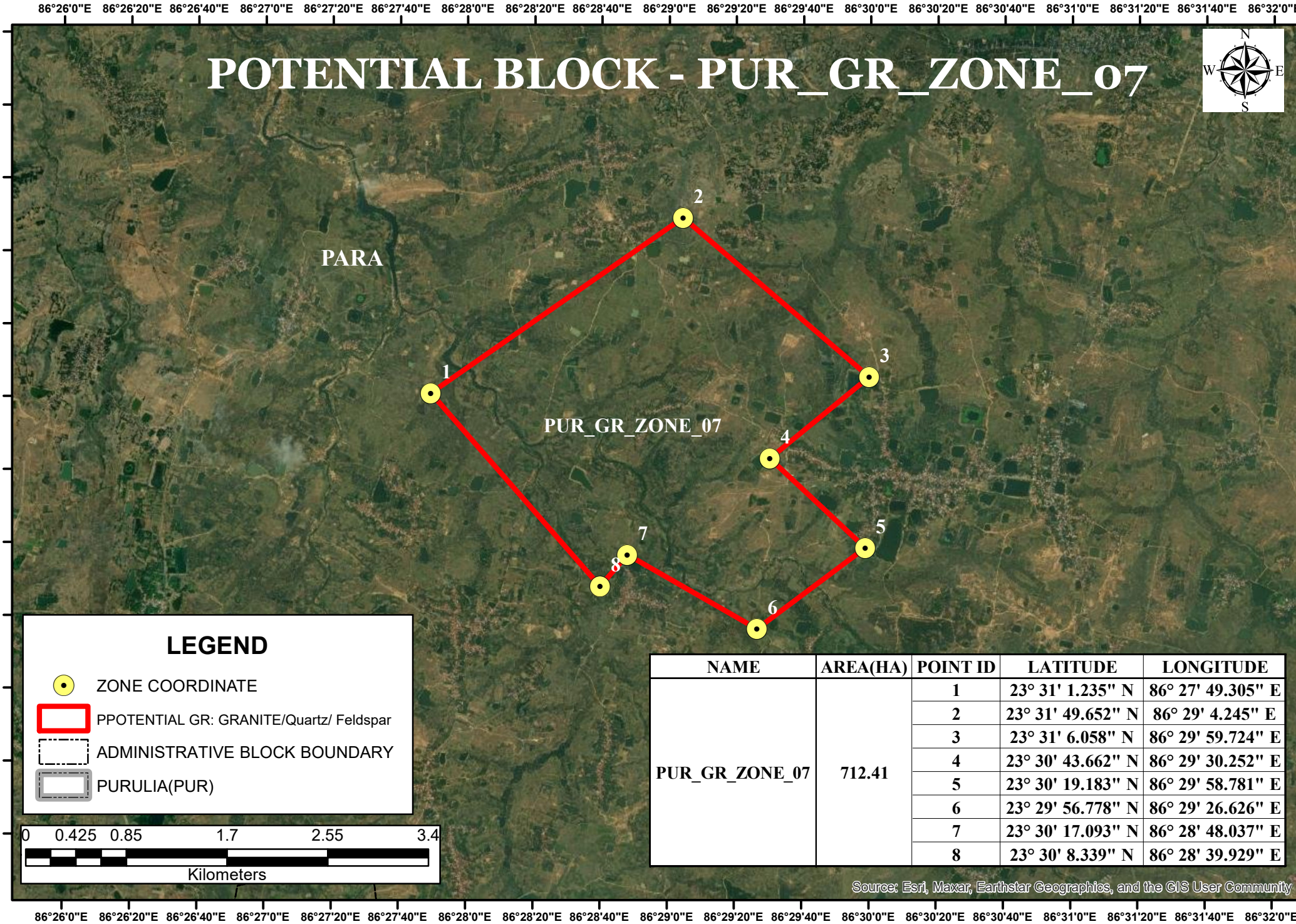
Source: Esri, Maxar, Earthstar Geographics, and the GIS User Community

POTENTIAL BLOCK - PUR_GR_ZONE_06



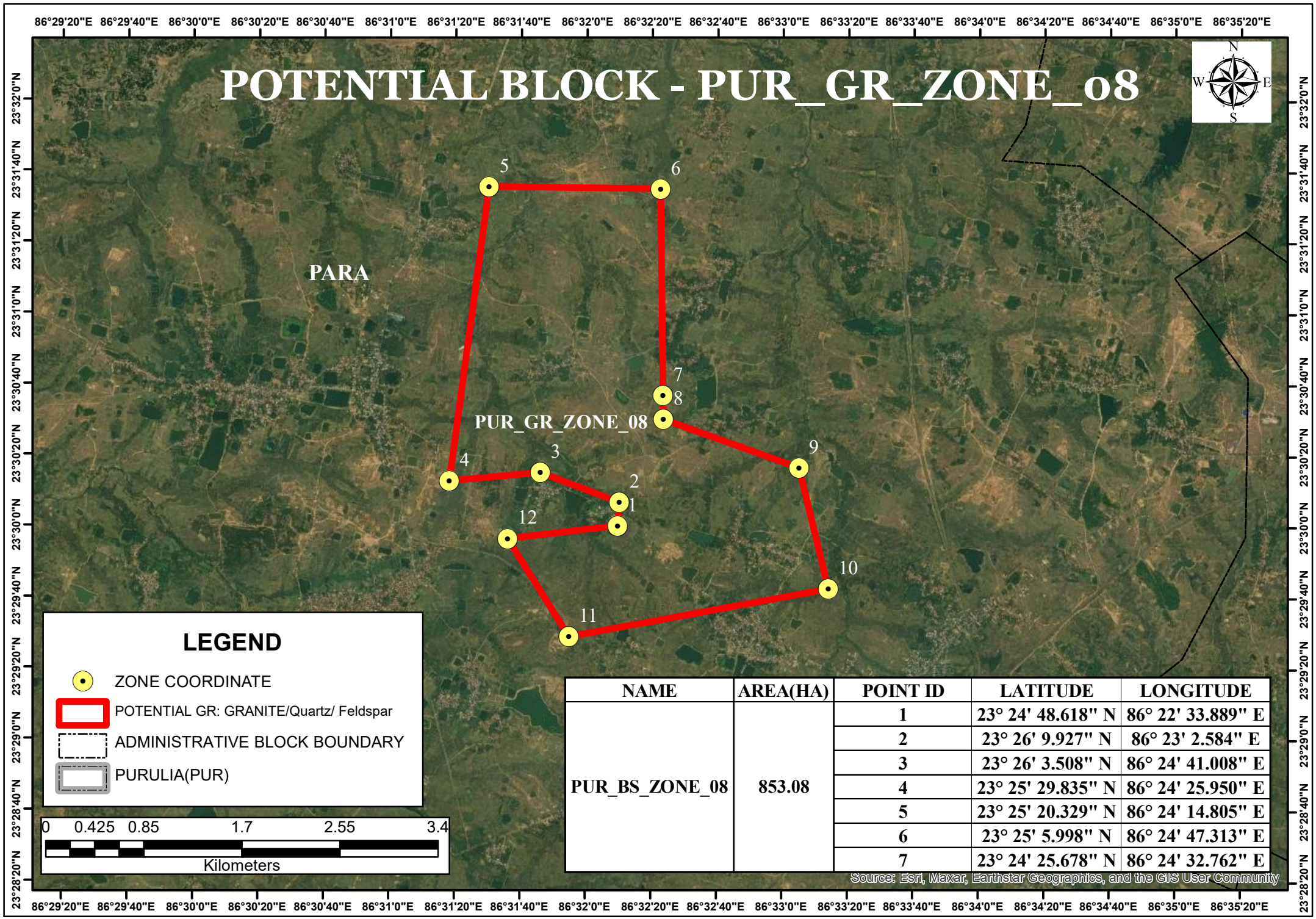
NAME	AREA(HA)	POINT ID	LATITUDE	LONGITUDE
PUR_GR_ZONE_06	287.42	1	23° 36' 30.539" N	86° 31' 59.736" E
		2	23° 36' 30.606" N	86° 32' 22.027" E
		3	23° 37' 8.167" N	86° 32' 31.583" E
		4	23° 37' 10.034" N	86° 32' 44.999" E
		5	23° 36' 40.706" N	86° 32' 55.721" E
		6	23° 36' 36.530" N	86° 32' 55.293" E
		7	23° 35' 54.695" N	86° 33' 2.495" E
		8	23° 35' 30.982" N	86° 32' 29.389" E
		9	23° 36' 1.762" N	86° 32' 14.659" E

POTENTIAL BLOCK - PUR_GR_ZONE_07



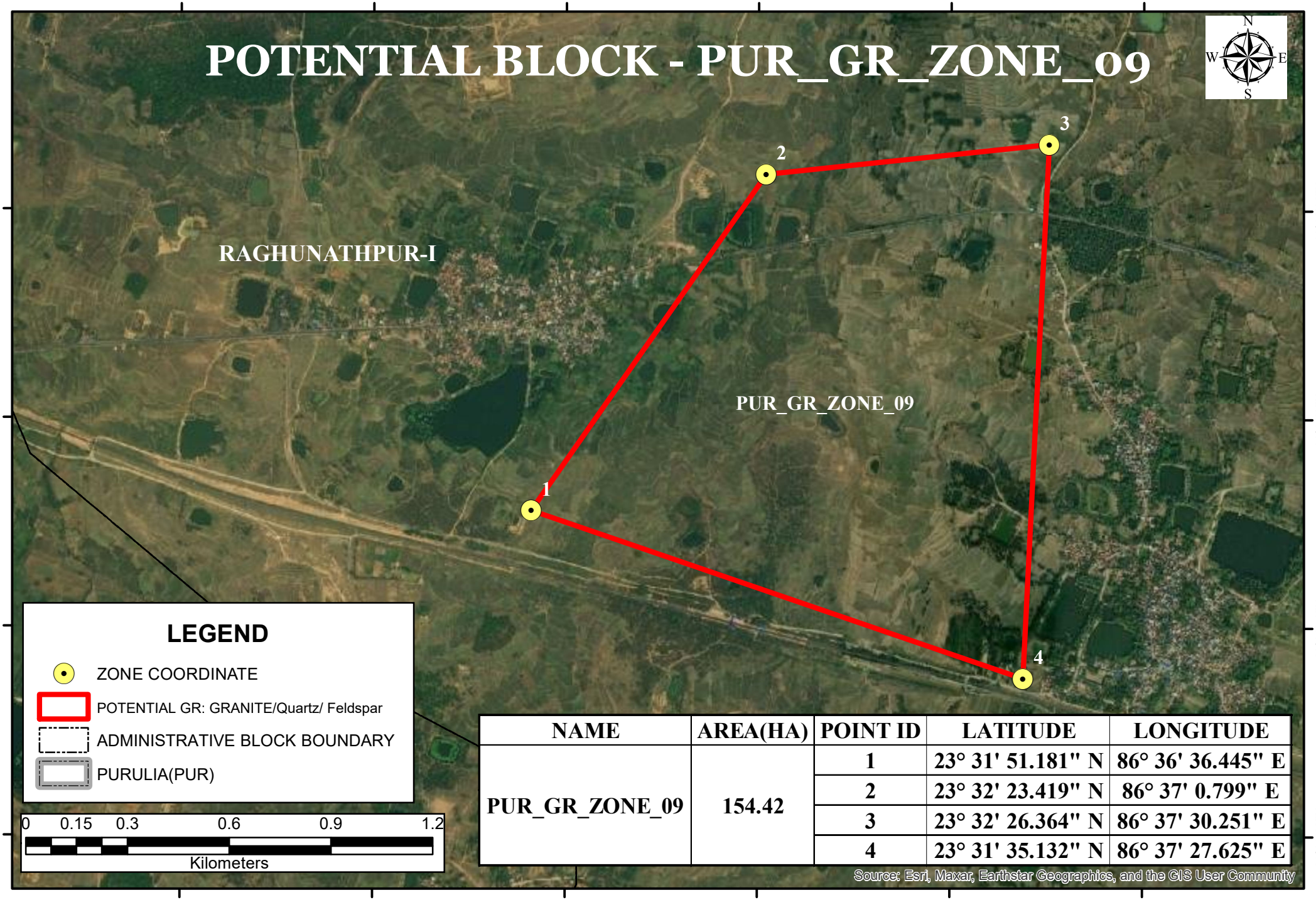
NAME	AREA(HA)	POINT ID	LATITUDE	LONGITUDE
PUR_GR_ZONE_07	712.41	1	23° 31' 1.235" N	86° 27' 49.305" E
		2	23° 31' 49.652" N	86° 29' 4.245" E
		3	23° 31' 6.058" N	86° 29' 59.724" E
		4	23° 30' 43.662" N	86° 29' 30.252" E
		5	23° 30' 19.183" N	86° 29' 58.781" E
		6	23° 29' 56.778" N	86° 29' 26.626" E
		7	23° 30' 17.093" N	86° 28' 48.037" E
		8	23° 30' 8.339" N	86° 28' 39.929" E

POTENTIAL BLOCK - PUR_GR_ZONE_08



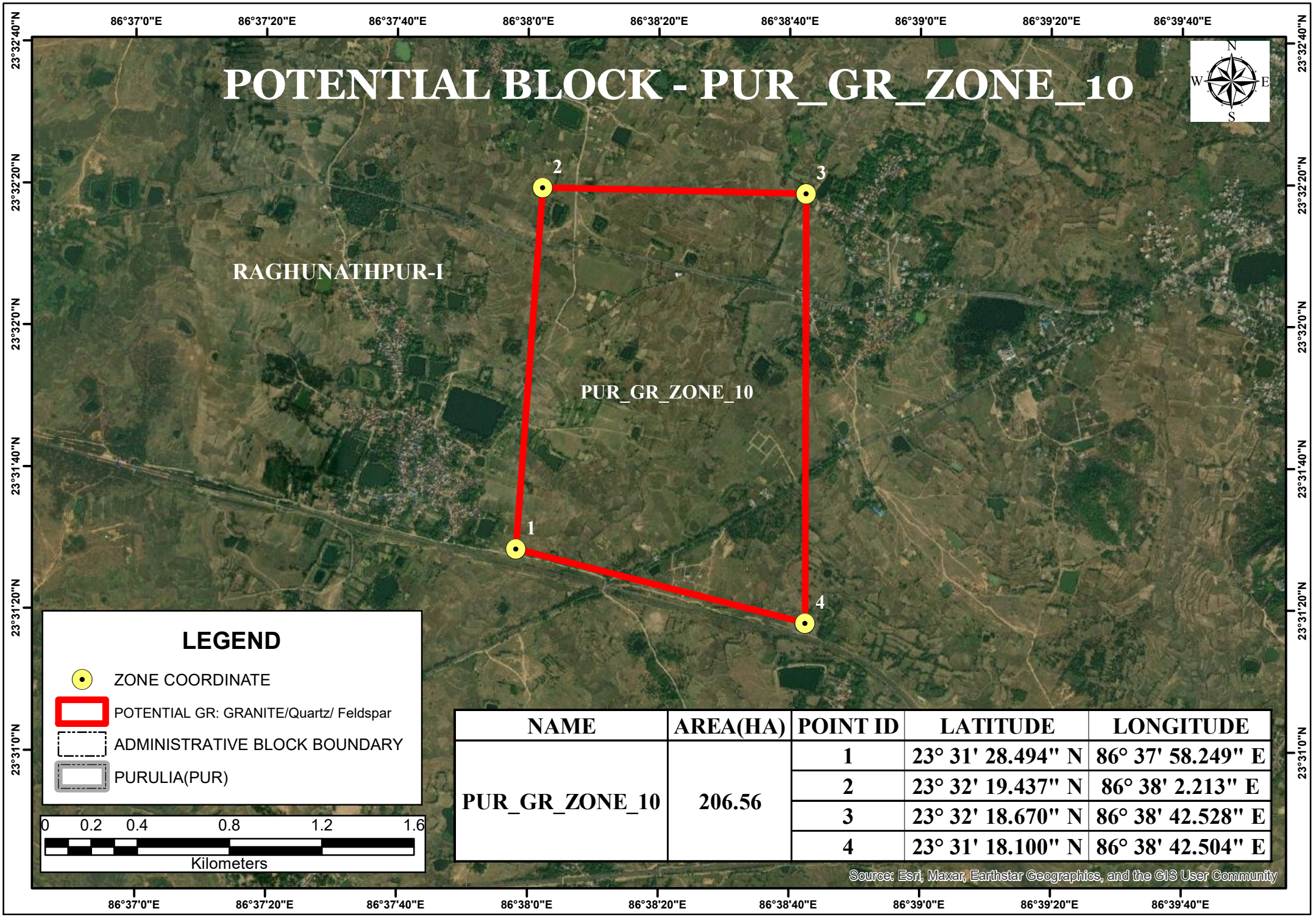
NAME	AREA(HA)	POINT ID	LATITUDE	LONGITUDE
PUR_BS_ZONE_08	853.08	1	23° 24' 48.618" N	86° 22' 33.889" E
		2	23° 26' 9.927" N	86° 23' 2.584" E
		3	23° 26' 3.508" N	86° 24' 41.008" E
		4	23° 25' 29.835" N	86° 24' 25.950" E
		5	23° 25' 20.329" N	86° 24' 14.805" E
		6	23° 25' 5.998" N	86° 24' 47.313" E
		7	23° 24' 25.678" N	86° 24' 32.762" E

POTENTIAL BLOCK - PUR_GR_ZONE_09



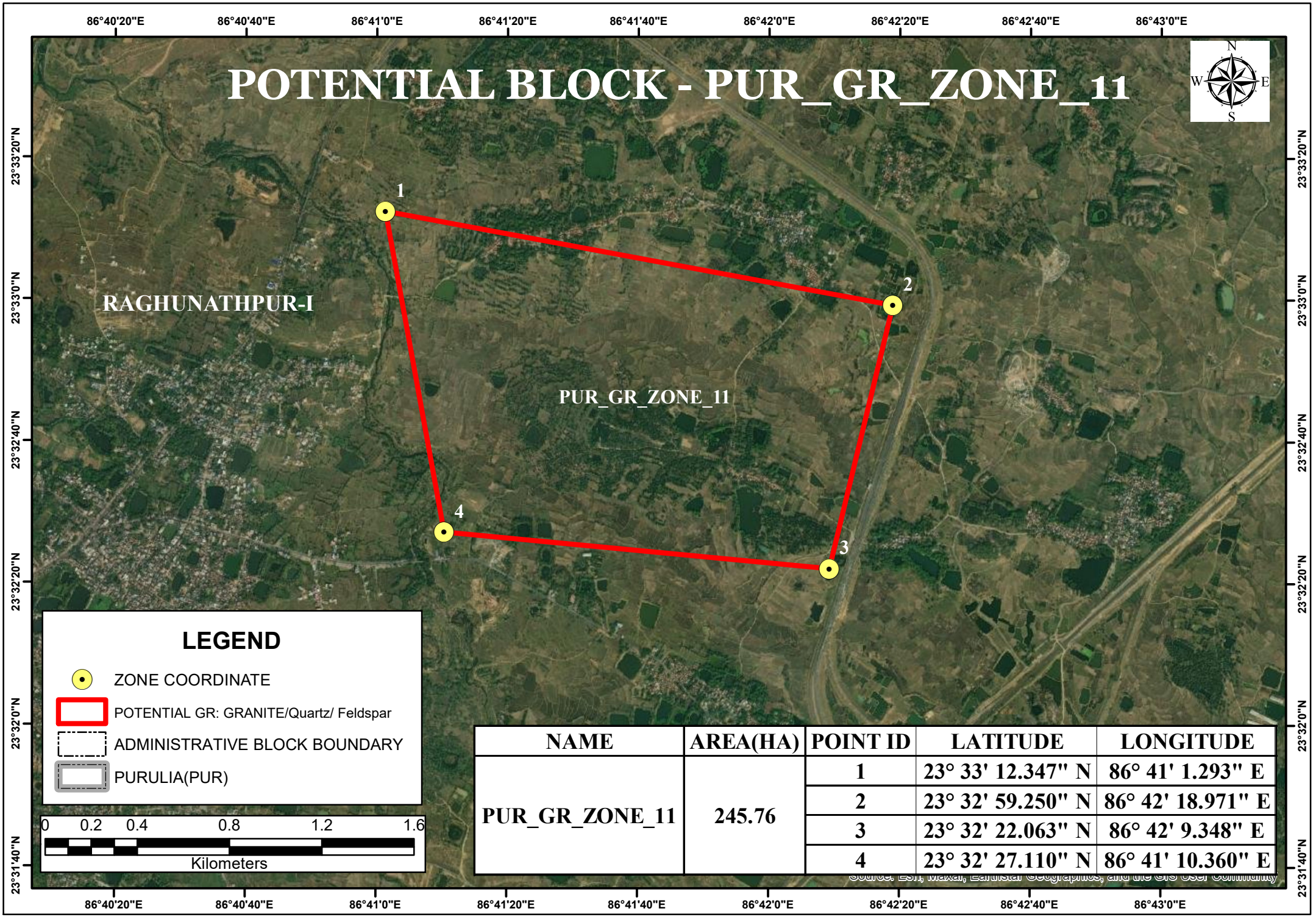
NAME	AREA(HA)	POINT ID	LATITUDE	LONGITUDE
PUR_GR_ZONE_09	154.42	1	23° 31' 51.181" N	86° 36' 36.445" E
		2	23° 32' 23.419" N	86° 37' 0.799" E
		3	23° 32' 26.364" N	86° 37' 30.251" E
		4	23° 31' 35.132" N	86° 37' 27.625" E

POTENTIAL BLOCK - PUR_GR_ZONE_10



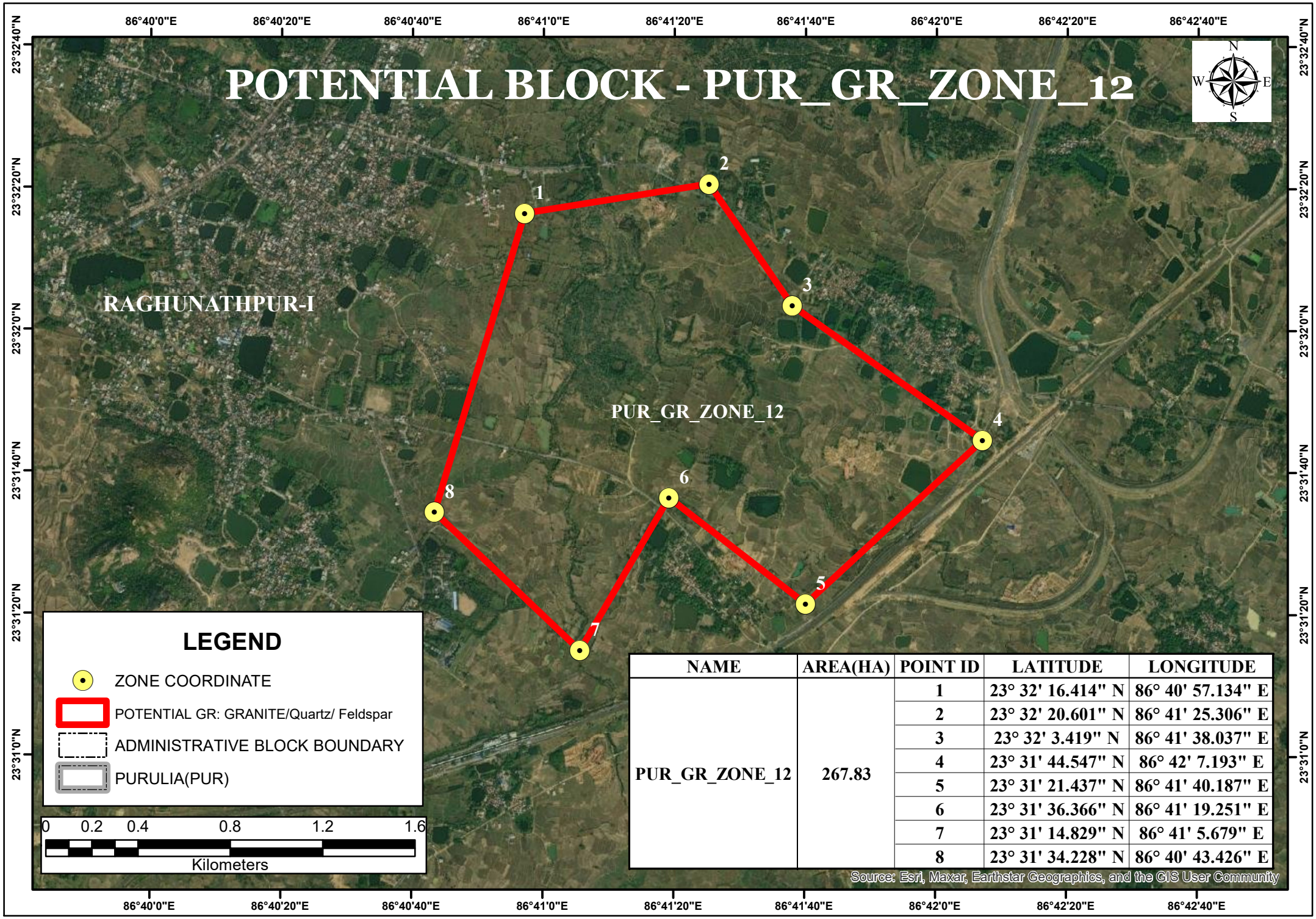
NAME	AREA(HA)	POINT ID	LATITUDE	LONGITUDE
PUR_GR_ZONE_10	206.56	1	23° 31' 28.494" N	86° 37' 58.249" E
		2	23° 32' 19.437" N	86° 38' 2.213" E
		3	23° 32' 18.670" N	86° 38' 42.528" E
		4	23° 31' 18.100" N	86° 38' 42.504" E

POTENTIAL BLOCK - PUR_GR_ZONE_11



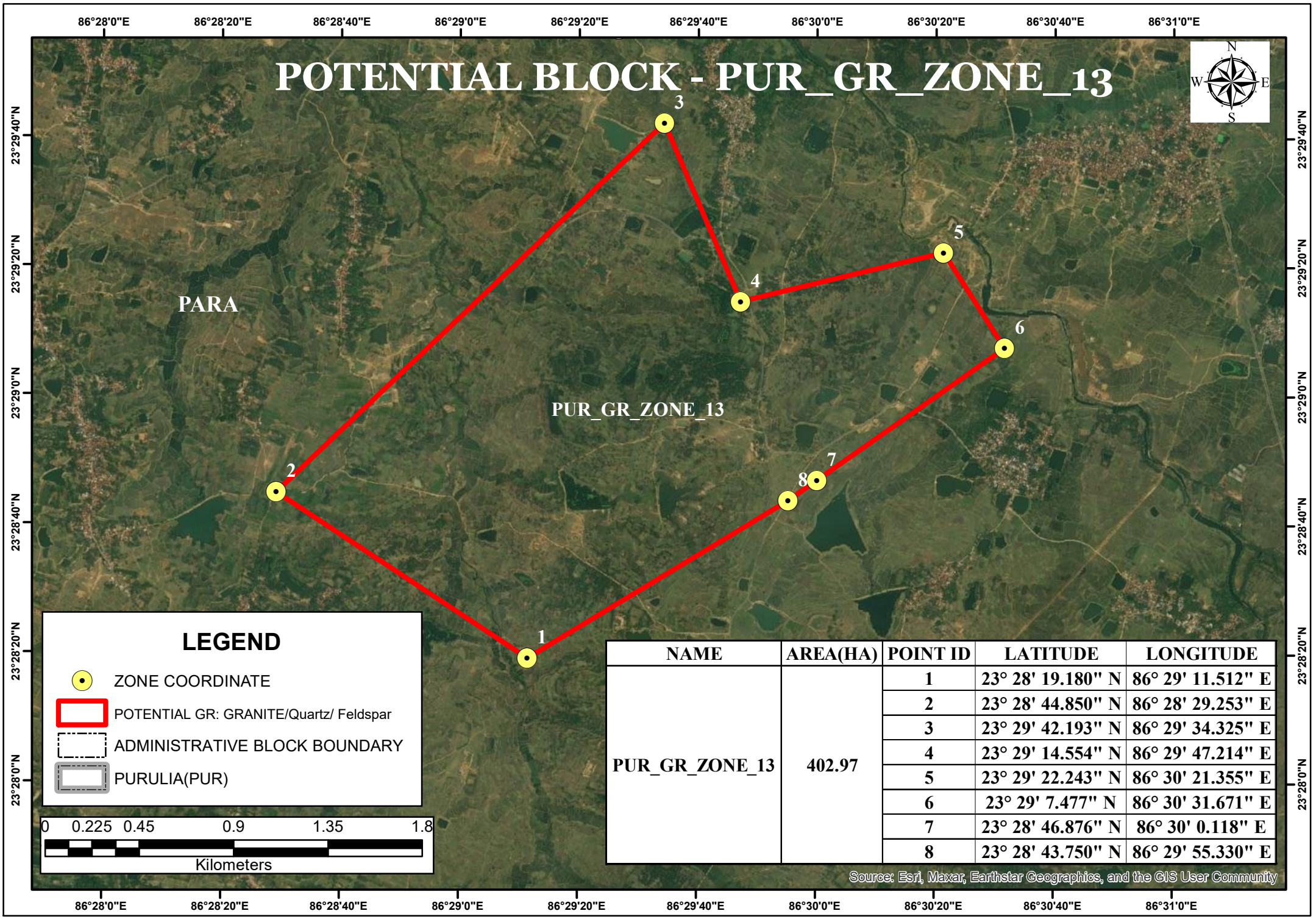
NAME	AREA(HA)	POINT ID	LATITUDE	LONGITUDE
PUR_GR_ZONE_11	245.76	1	23° 33' 12.347" N	86° 41' 1.293" E
		2	23° 32' 59.250" N	86° 42' 18.971" E
		3	23° 32' 22.063" N	86° 42' 9.348" E
		4	23° 32' 27.110" N	86° 41' 10.360" E

Source: Esri, Maxar, Earthstar Geographics, and the GIS User Community

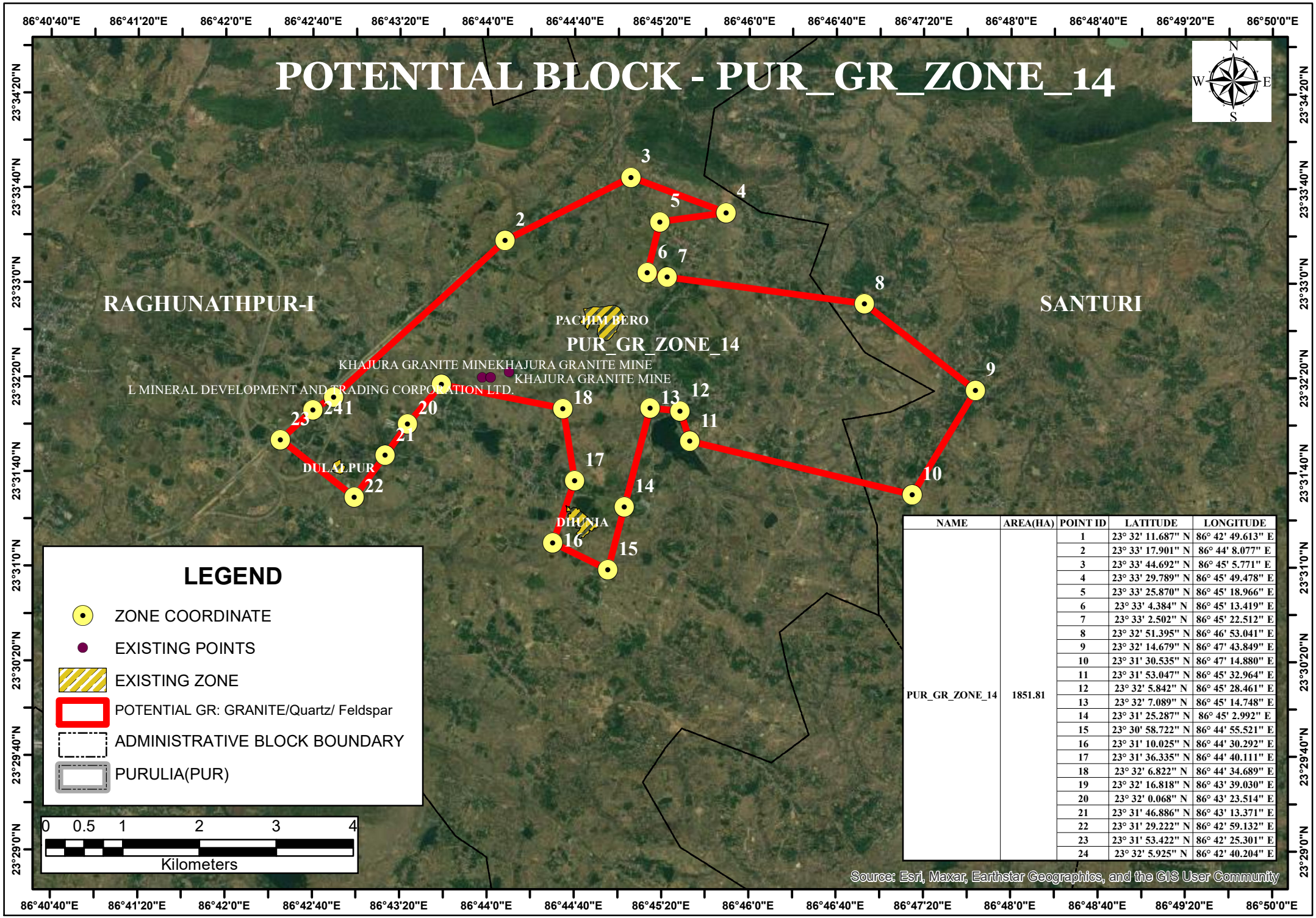


NAME	AREA(HA)	POINT ID	LATITUDE	LONGITUDE
PUR_GR_ZONE_12	267.83	1	23° 32' 16.414" N	86° 40' 57.134" E
		2	23° 32' 20.601" N	86° 41' 25.306" E
		3	23° 32' 3.419" N	86° 41' 38.037" E
		4	23° 31' 44.547" N	86° 42' 7.193" E
		5	23° 31' 21.437" N	86° 41' 40.187" E
		6	23° 31' 36.366" N	86° 41' 19.251" E
		7	23° 31' 14.829" N	86° 41' 5.679" E
		8	23° 31' 34.228" N	86° 40' 43.426" E

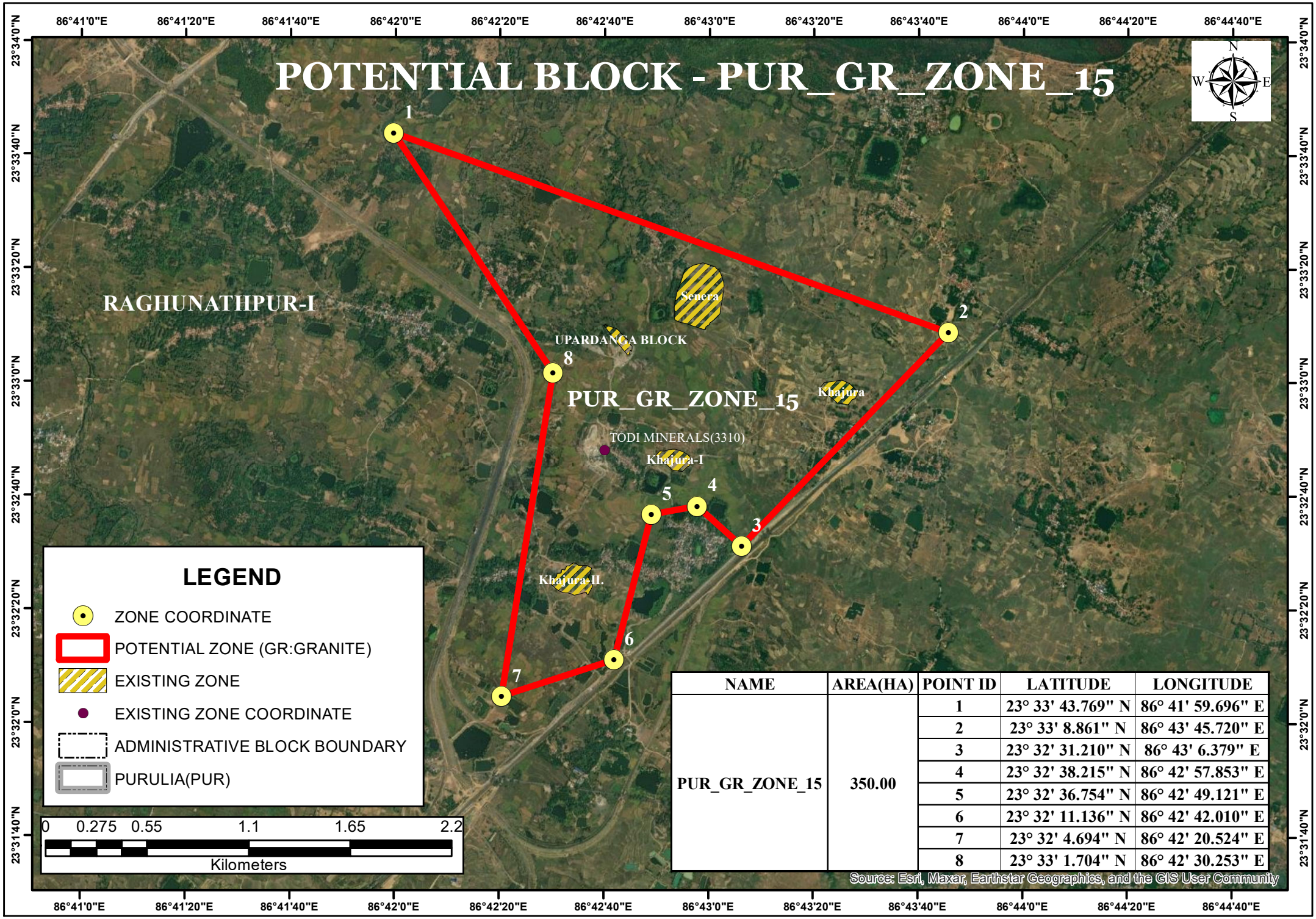
POTENTIAL BLOCK - PUR_GR_ZONE_13



NAME	AREA(HA)	POINT ID	LATITUDE	LONGITUDE
PUR_GR_ZONE_13	402.97	1	23° 28' 19.180" N	86° 29' 11.512" E
		2	23° 28' 44.850" N	86° 28' 29.253" E
		3	23° 29' 42.193" N	86° 29' 34.325" E
		4	23° 29' 14.554" N	86° 29' 47.214" E
		5	23° 29' 22.243" N	86° 30' 21.355" E
		6	23° 29' 7.477" N	86° 30' 31.671" E
		7	23° 28' 46.876" N	86° 30' 0.118" E
		8	23° 28' 43.750" N	86° 29' 55.330" E

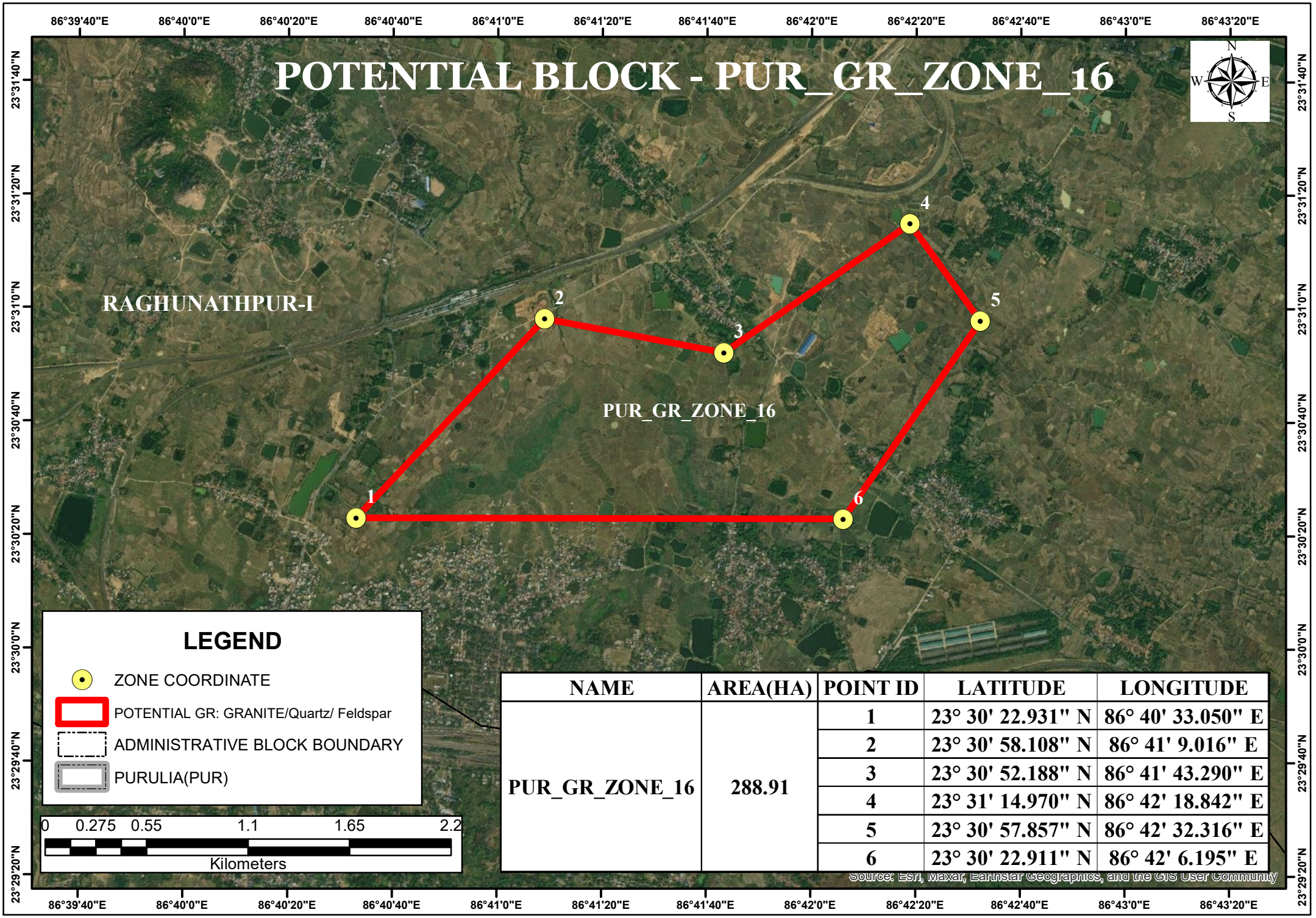


NAME	AREA(HA)	POINT ID	LATITUDE	LONGITUDE
PUR_GR_ZONE_14	1851.81	1	23° 32' 11.687" N	86° 42' 49.613" E
		2	23° 33' 17.901" N	86° 44' 8.077" E
		3	23° 33' 44.692" N	86° 45' 5.771" E
		4	23° 33' 29.789" N	86° 45' 49.478" E
		5	23° 33' 25.870" N	86° 45' 18.966" E
		6	23° 33' 4.384" N	86° 45' 13.419" E
		7	23° 33' 2.502" N	86° 45' 22.512" E
		8	23° 32' 51.395" N	86° 46' 53.041" E
		9	23° 32' 14.679" N	86° 47' 43.849" E
		10	23° 31' 30.535" N	86° 47' 14.880" E
		11	23° 31' 53.047" N	86° 45' 32.964" E
		12	23° 32' 5.842" N	86° 45' 28.461" E
		13	23° 32' 7.089" N	86° 45' 14.748" E
		14	23° 31' 25.287" N	86° 45' 2.992" E
		15	23° 30' 58.722" N	86° 44' 55.521" E
		16	23° 31' 10.025" N	86° 44' 30.292" E
		17	23° 31' 36.335" N	86° 44' 40.111" E
		18	23° 32' 6.822" N	86° 44' 34.689" E
		19	23° 32' 16.818" N	86° 43' 39.030" E
		20	23° 32' 0.068" N	86° 43' 23.514" E
		21	23° 31' 46.886" N	86° 43' 13.371" E
		22	23° 31' 29.222" N	86° 42' 59.132" E
		23	23° 31' 53.422" N	86° 42' 25.301" E
		24	23° 32' 5.925" N	86° 42' 40.204" E



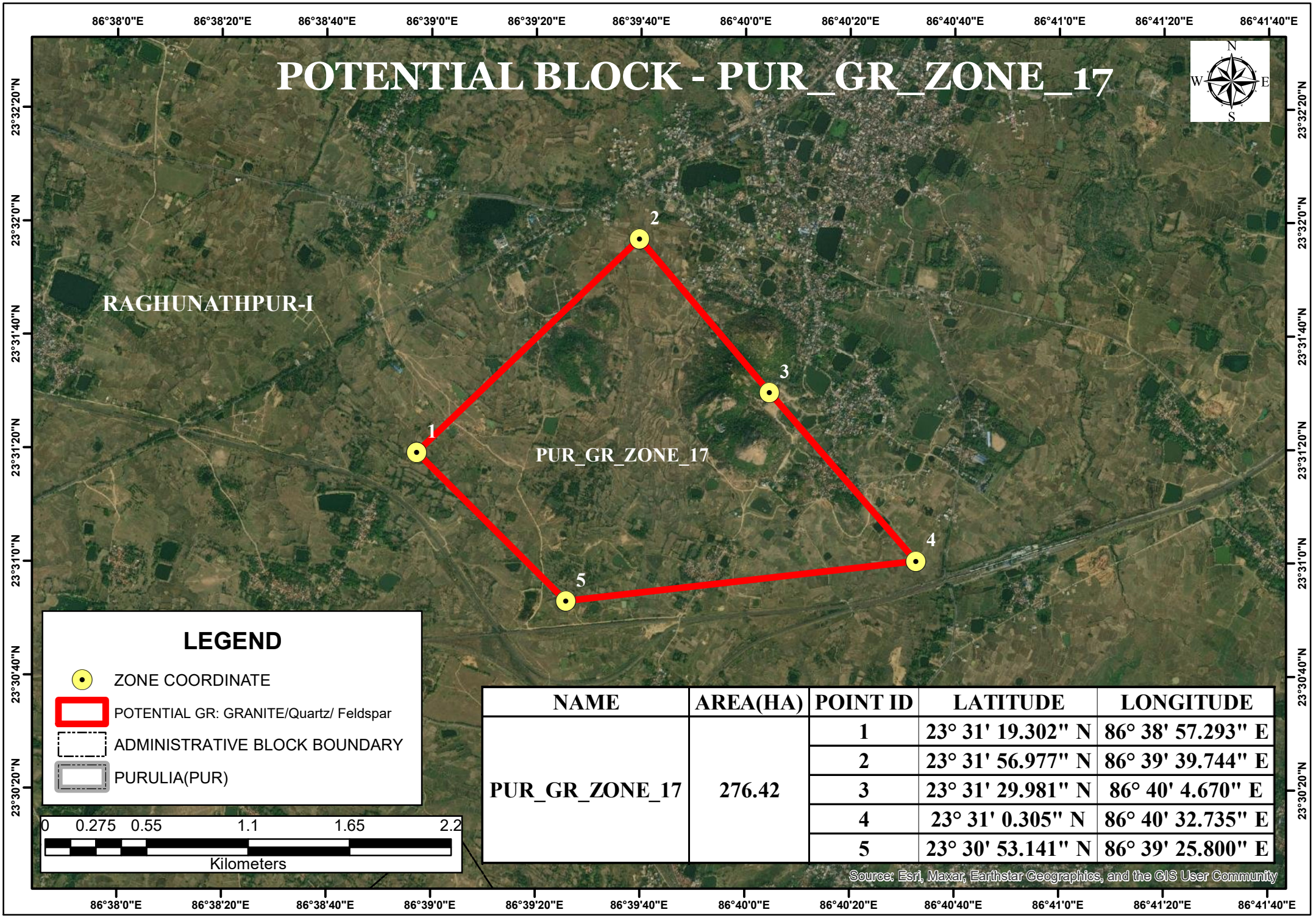
NAME	AREA(HA)	POINT ID	LATITUDE	LONGITUDE
PUR_GR_ZONE_15	350.00	1	23° 33' 43.769" N	86° 41' 59.696" E
		2	23° 33' 8.861" N	86° 43' 45.720" E
		3	23° 32' 31.210" N	86° 43' 6.379" E
		4	23° 32' 38.215" N	86° 42' 57.853" E
		5	23° 32' 36.754" N	86° 42' 49.121" E
		6	23° 32' 11.136" N	86° 42' 42.010" E
		7	23° 32' 4.694" N	86° 42' 20.524" E
		8	23° 33' 1.704" N	86° 42' 30.253" E

POTENTIAL BLOCK - PUR_GR_ZONE_16



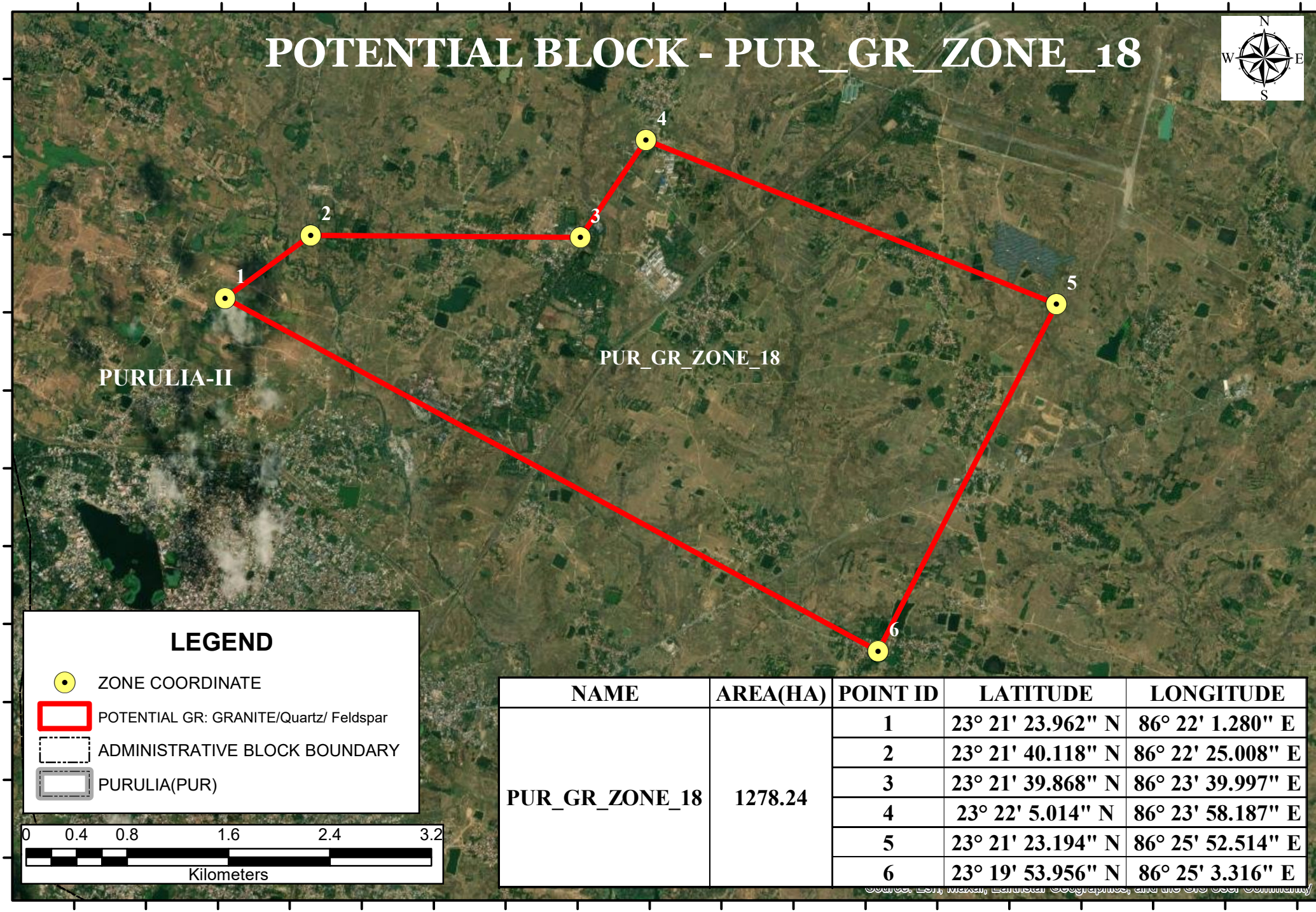
NAME	AREA(HA)	POINT ID	LATITUDE	LONGITUDE
PUR_GR_ZONE_16	288.91	1	23° 30' 22.931" N	86° 40' 33.050" E
		2	23° 30' 58.108" N	86° 41' 9.016" E
		3	23° 30' 52.188" N	86° 41' 43.290" E
		4	23° 31' 14.970" N	86° 42' 18.842" E
		5	23° 30' 57.857" N	86° 42' 32.316" E
		6	23° 30' 22.911" N	86° 42' 6.195" E

POTENTIAL BLOCK - PUR_GR_ZONE_17



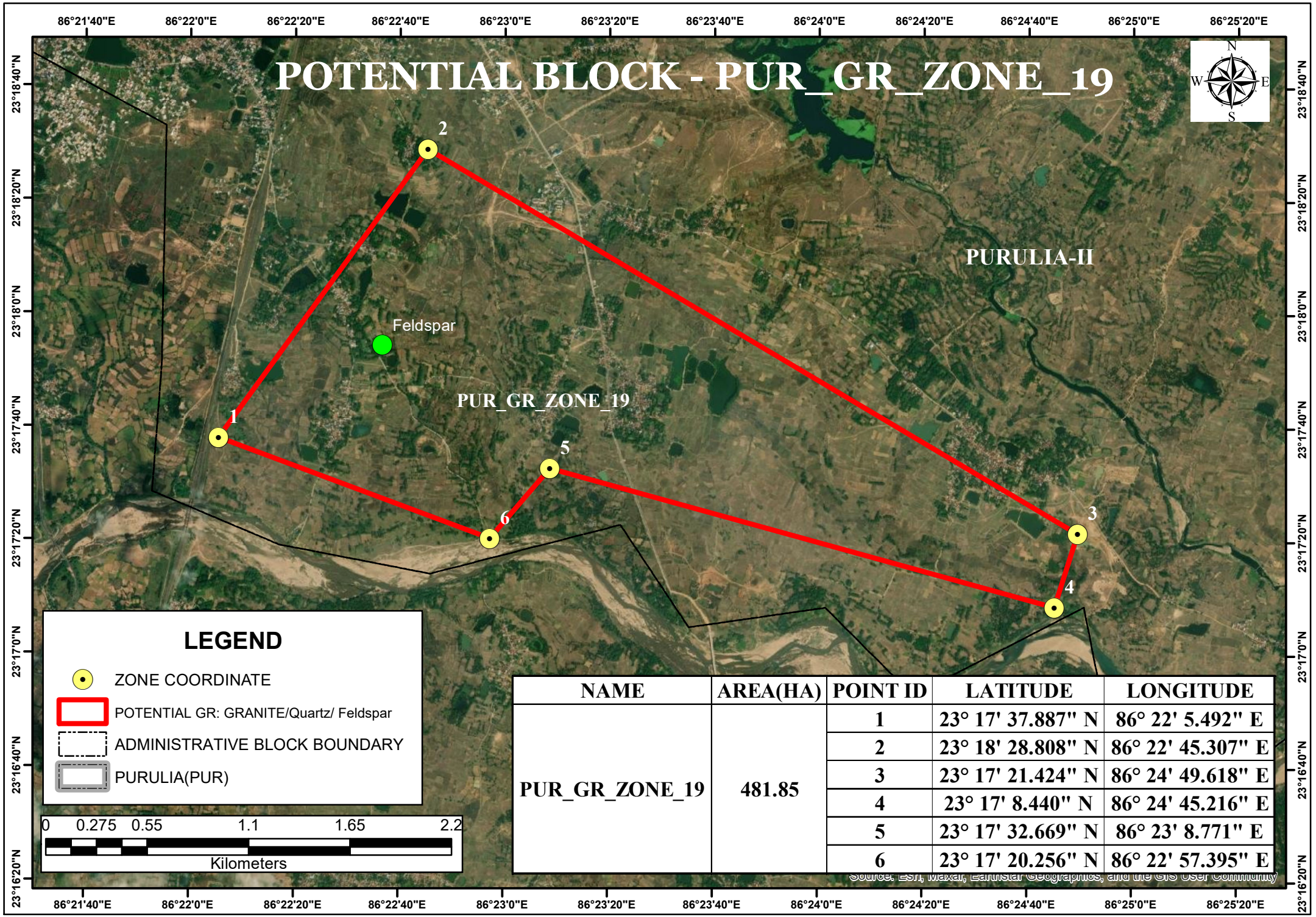
NAME	AREA(HA)	POINT ID	LATITUDE	LONGITUDE
PUR_GR_ZONE_17	276.42	1	23° 31' 19.302" N	86° 38' 57.293" E
		2	23° 31' 56.977" N	86° 39' 39.744" E
		3	23° 31' 29.981" N	86° 40' 4.670" E
		4	23° 31' 0.305" N	86° 40' 32.735" E
		5	23° 30' 53.141" N	86° 39' 25.800" E

POTENTIAL BLOCK - PUR_GR_ZONE_18

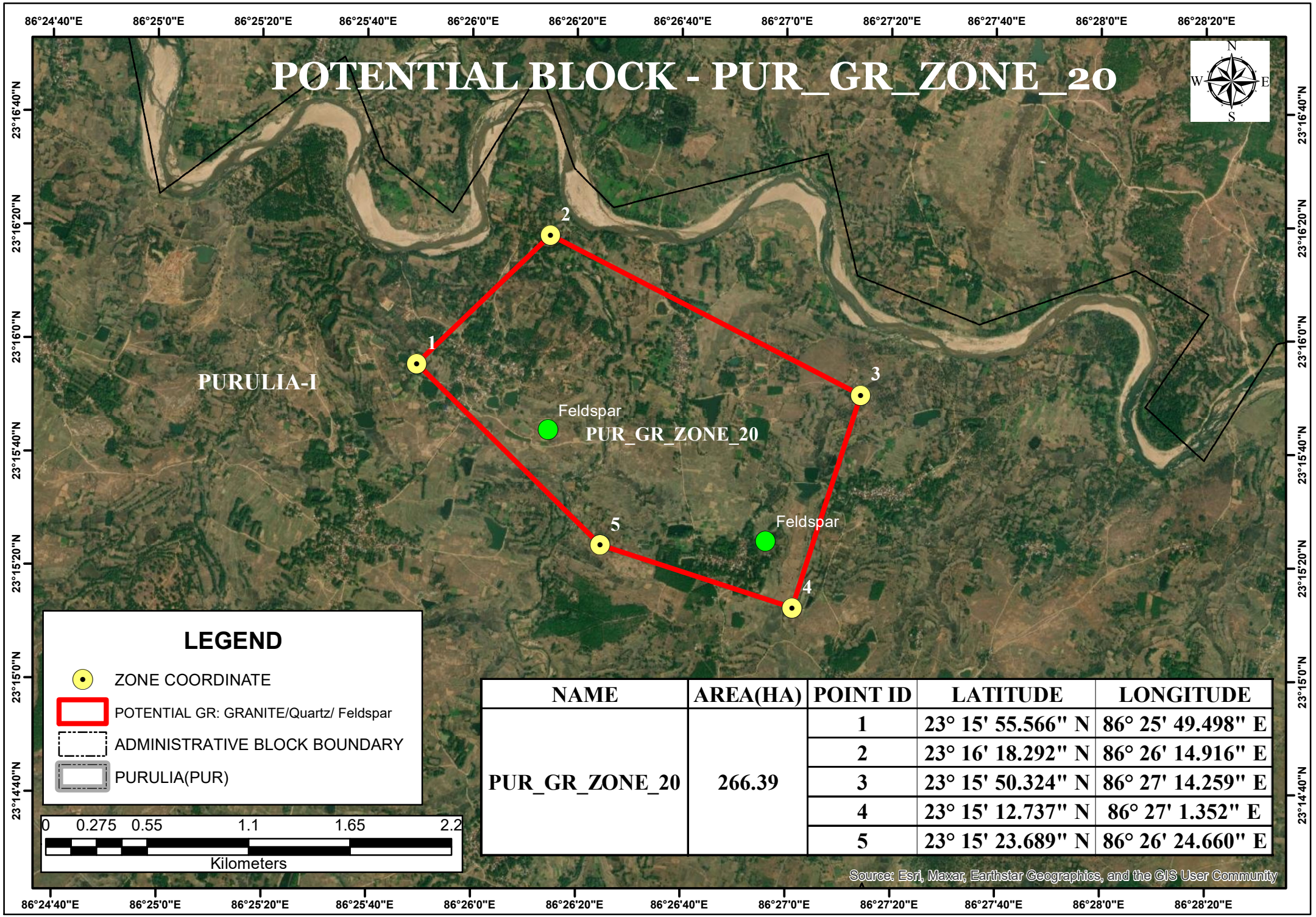


NAME	AREA(HA)	POINT ID	LATITUDE	LONGITUDE
PUR_GR_ZONE_18	1278.24	1	23° 21' 23.962" N	86° 22' 1.280" E
		2	23° 21' 40.118" N	86° 22' 25.008" E
		3	23° 21' 39.868" N	86° 23' 39.997" E
		4	23° 22' 5.014" N	86° 23' 58.187" E
		5	23° 21' 23.194" N	86° 25' 52.514" E
		6	23° 19' 53.956" N	86° 25' 3.316" E

Source: Esri, Maxar, Earthstar Geographics, and the GIS User Community

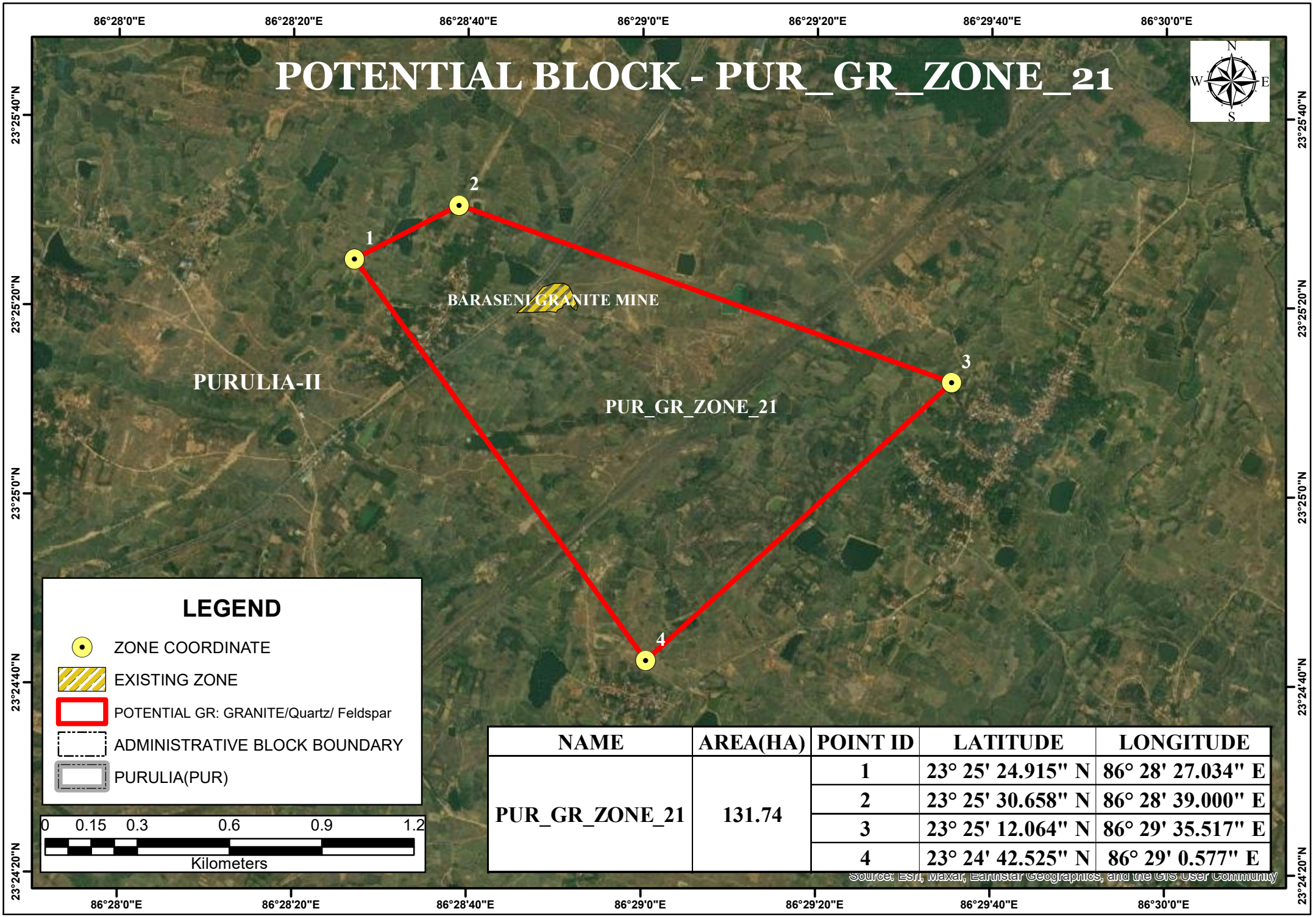


NAME	AREA(HA)	POINT ID	LATITUDE	LONGITUDE
PUR_GR_ZONE_19	481.85	1	23° 17' 37.887" N	86° 22' 5.492" E
		2	23° 18' 28.808" N	86° 22' 45.307" E
		3	23° 17' 21.424" N	86° 24' 49.618" E
		4	23° 17' 8.440" N	86° 24' 45.216" E
		5	23° 17' 32.669" N	86° 23' 8.771" E
		6	23° 17' 20.256" N	86° 22' 57.395" E



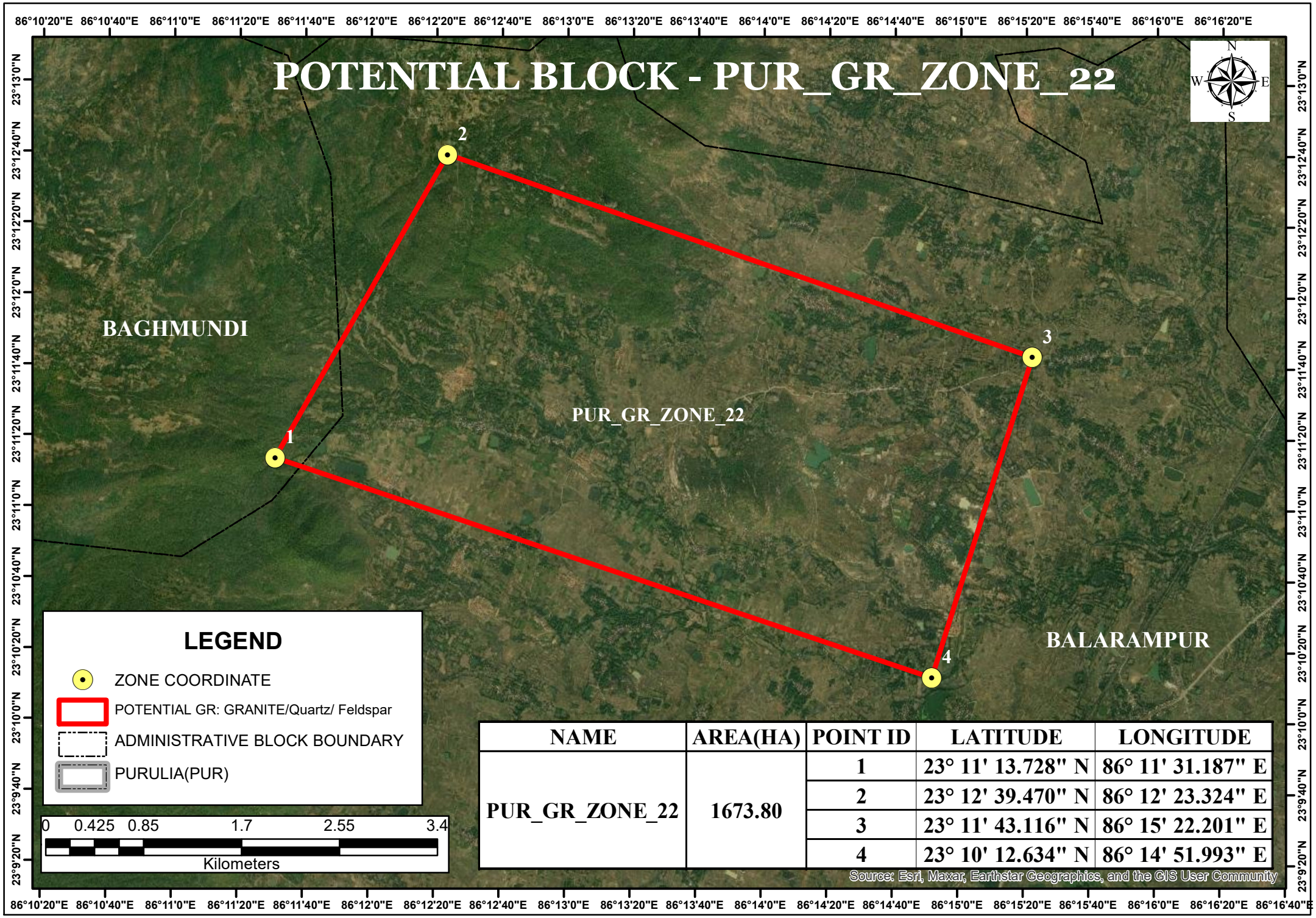
NAME	AREA(HA)	POINT ID	LATITUDE	LONGITUDE
PUR_GR_ZONE_20	266.39	1	23° 15' 55.566" N	86° 25' 49.498" E
		2	23° 16' 18.292" N	86° 26' 14.916" E
		3	23° 15' 50.324" N	86° 27' 14.259" E
		4	23° 15' 12.737" N	86° 27' 1.352" E
		5	23° 15' 23.689" N	86° 26' 24.660" E

POTENTIAL BLOCK - PUR_GR_ZONE_21



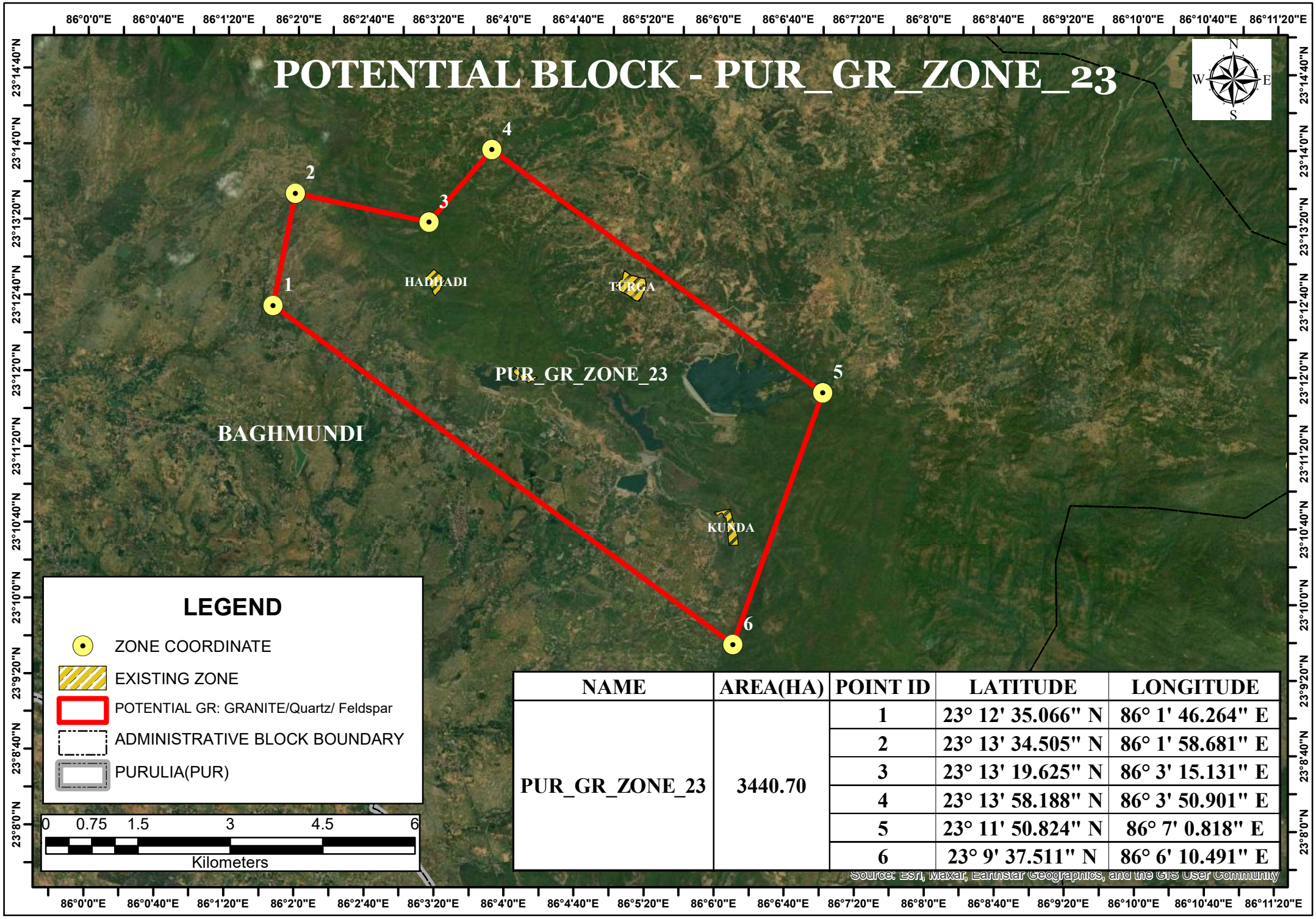
NAME	AREA(HA)	POINT ID	LATITUDE	LONGITUDE
PUR_GR_ZONE_21	131.74	1	23° 25' 24.915" N	86° 28' 27.034" E
		2	23° 25' 30.658" N	86° 28' 39.000" E
		3	23° 25' 12.064" N	86° 29' 35.517" E
		4	23° 24' 42.525" N	86° 29' 0.577" E

POTENTIAL BLOCK - PUR_GR_ZONE_22



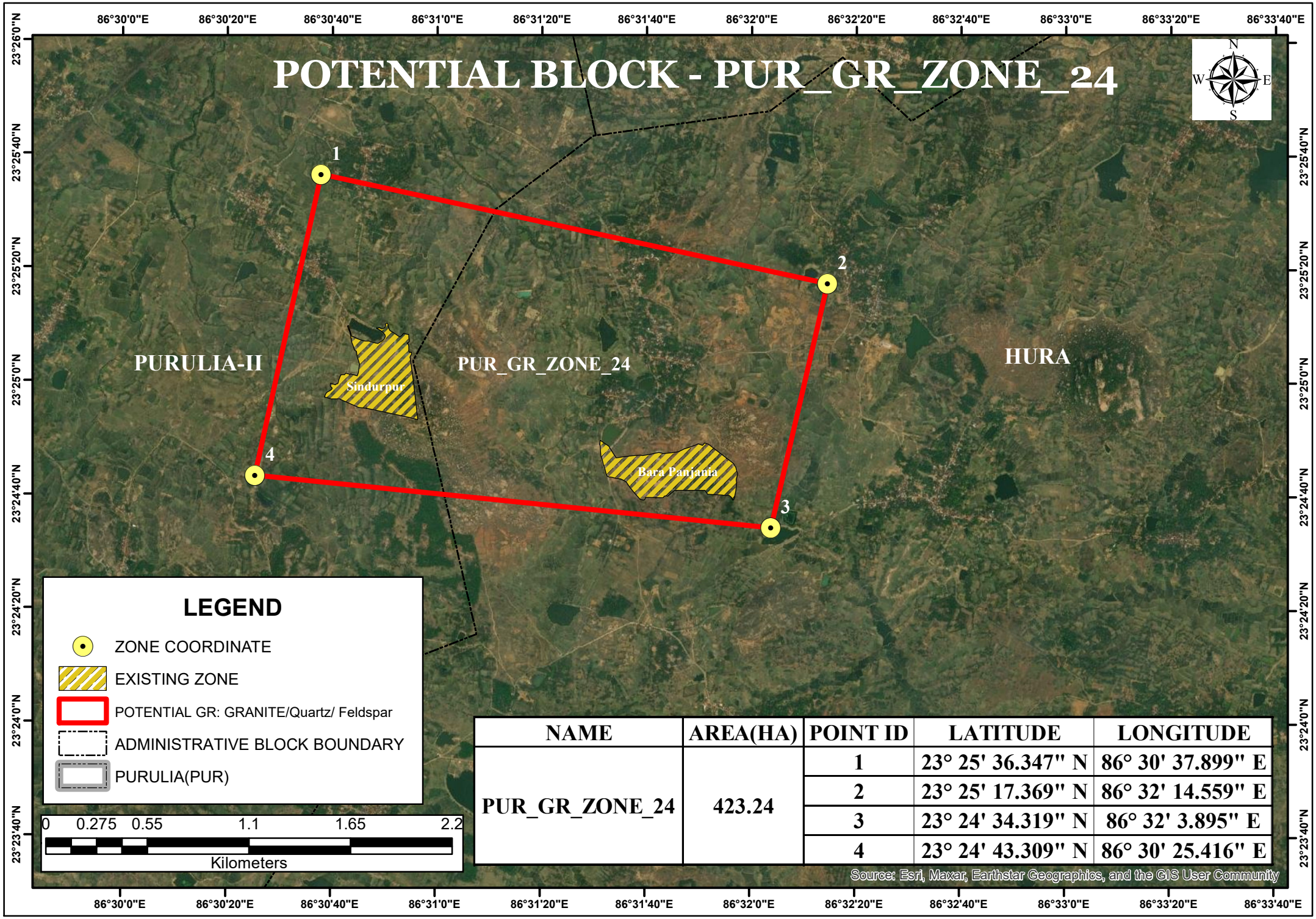
NAME	AREA(HA)	POINT ID	LATITUDE	LONGITUDE
PUR_GR_ZONE_22	1673.80	1	23° 11' 13.728" N	86° 11' 31.187" E
		2	23° 12' 39.470" N	86° 12' 23.324" E
		3	23° 11' 43.116" N	86° 15' 22.201" E
		4	23° 10' 12.634" N	86° 14' 51.993" E

POTENTIAL BLOCK - PUR_GR_ZONE_23



NAME	AREA(HA)	POINT ID	LATITUDE	LONGITUDE
PUR_GR_ZONE_23	3440.70	1	23° 12' 35.066" N	86° 1' 46.264" E
		2	23° 13' 34.505" N	86° 1' 58.681" E
		3	23° 13' 19.625" N	86° 3' 15.131" E
		4	23° 13' 58.188" N	86° 3' 50.901" E
		5	23° 11' 50.824" N	86° 7' 0.818" E
		6	23° 9' 37.511" N	86° 6' 10.491" E

POTENTIAL BLOCK - PUR_GR_ZONE_24



LEGEND

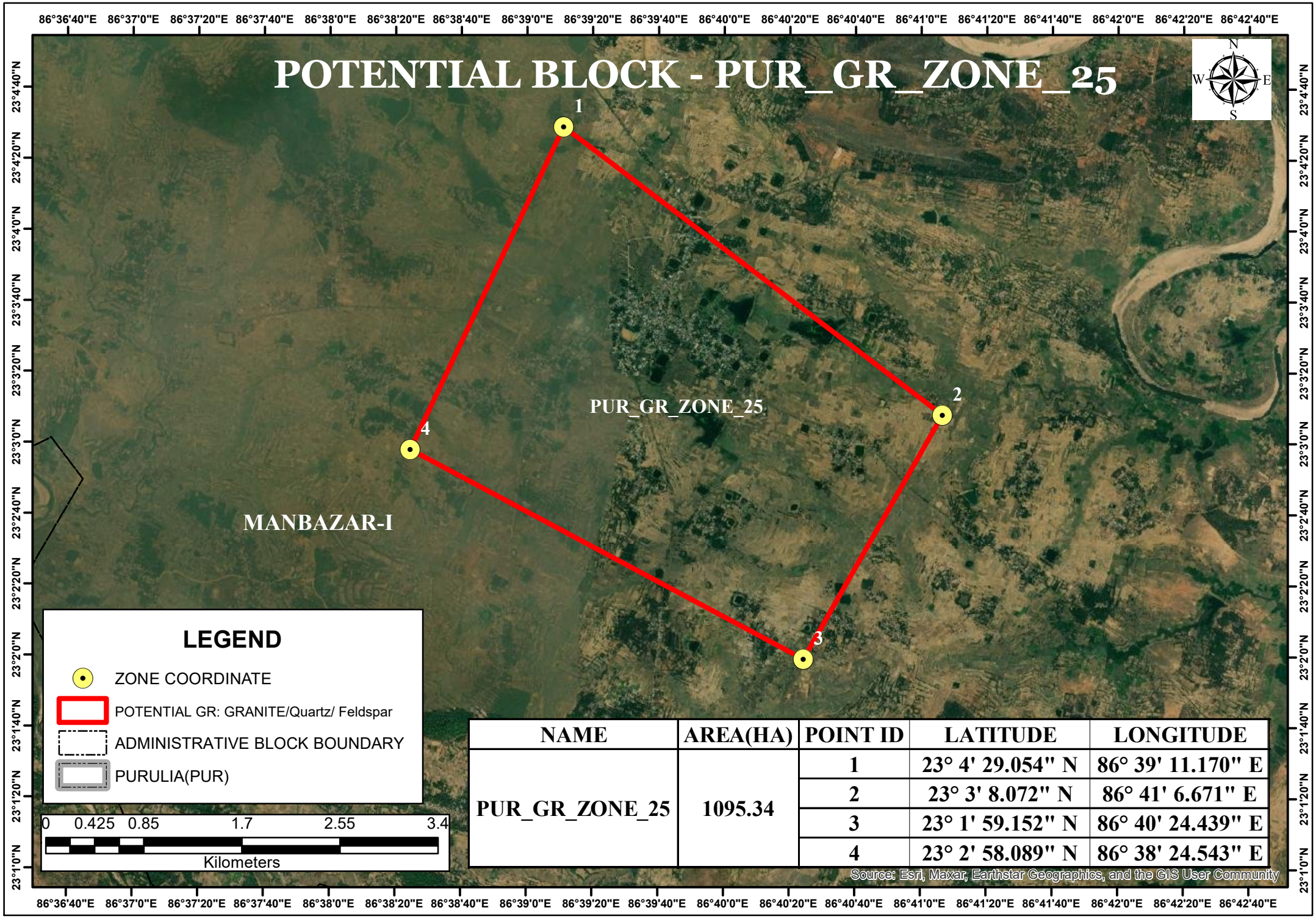
- ZONE COORDINATE
- EXISTING ZONE
- POTENTIAL GR: GRANITE/Quartz/ Feldspar
- ADMINISTRATIVE BLOCK BOUNDARY
- PURULIA(PUR)

0 0.275 0.55 1.1 1.65 2.2

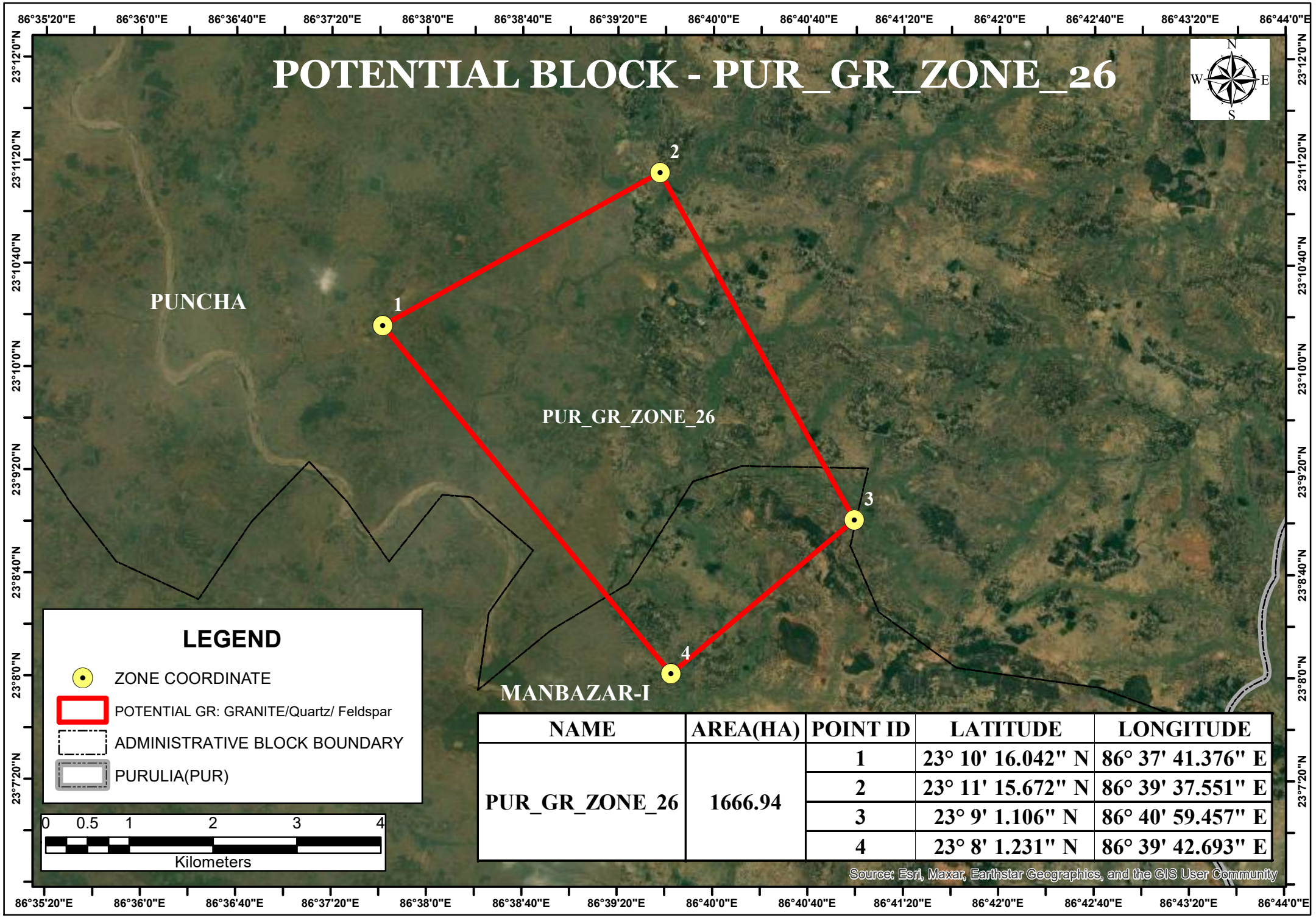
Kilometers

NAME	AREA(HA)	POINT ID	LATITUDE	LONGITUDE
PUR_GR_ZONE_24	423.24	1	23° 25' 36.347" N	86° 30' 37.899" E
		2	23° 25' 17.369" N	86° 32' 14.559" E
		3	23° 24' 34.319" N	86° 32' 3.895" E
		4	23° 24' 43.309" N	86° 30' 25.416" E

Source: Esri, Maxar, Earthstar Geographics, and the GIS User Community

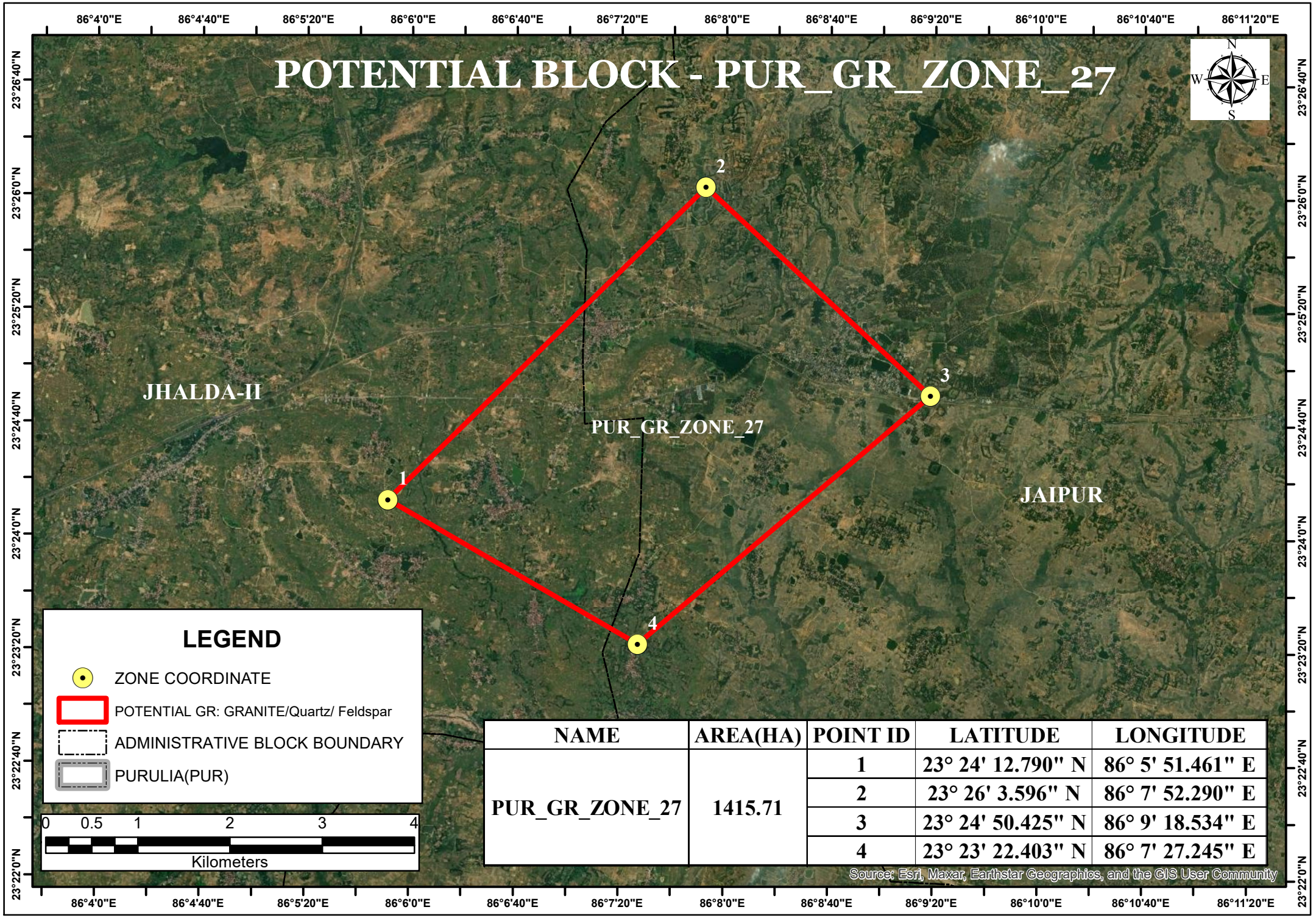


NAME	AREA(HA)	POINT ID	LATITUDE	LONGITUDE
PUR_GR_ZONE_25	1095.34	1	23° 4' 29.054" N	86° 39' 11.170" E
		2	23° 3' 8.072" N	86° 41' 6.671" E
		3	23° 1' 59.152" N	86° 40' 24.439" E
		4	23° 2' 58.089" N	86° 38' 24.543" E



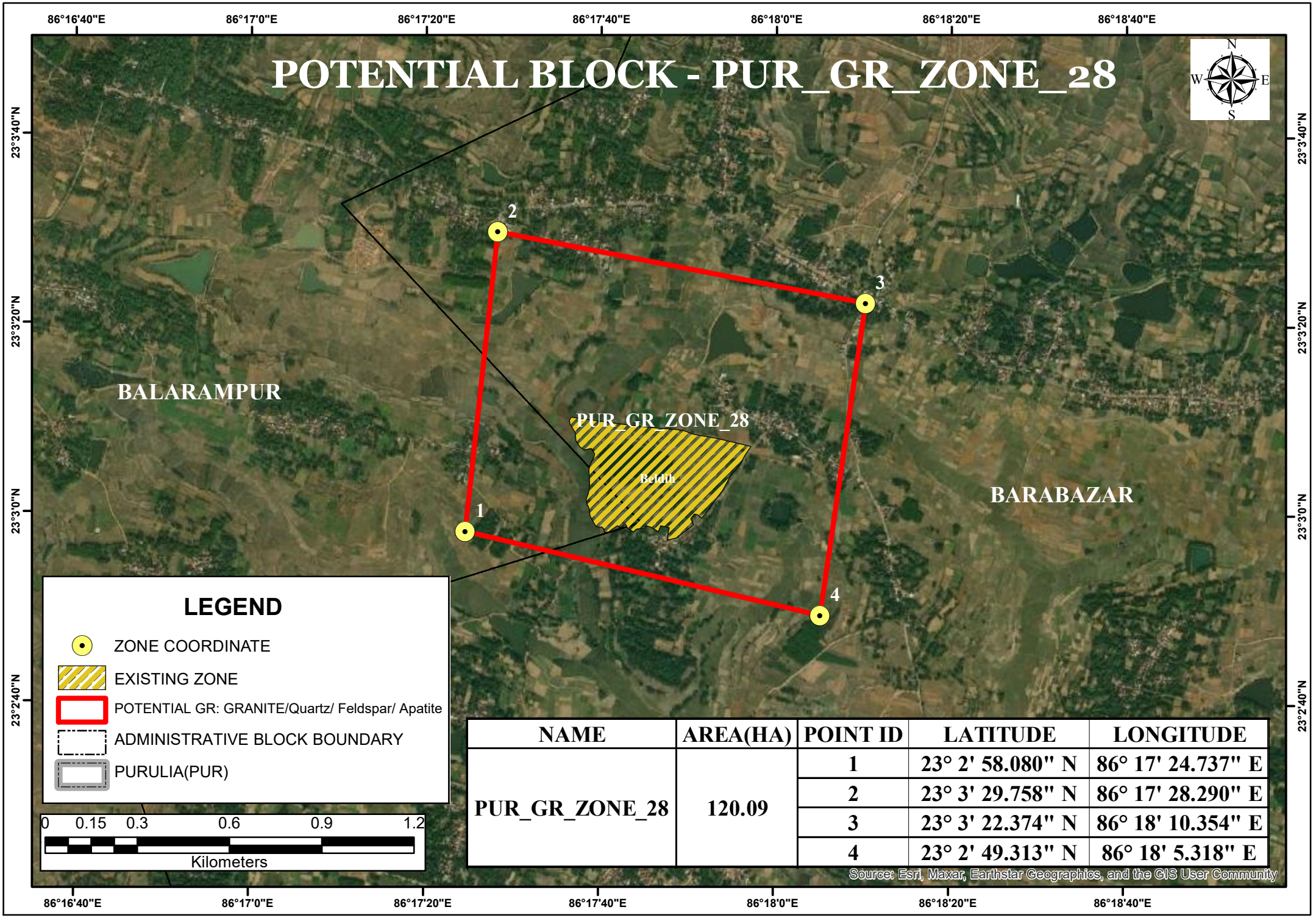
NAME	AREA(HA)	POINT ID	LATITUDE	LONGITUDE
PUR_GR_ZONE_26	1666.94	1	23° 10' 16.042" N	86° 37' 41.376" E
		2	23° 11' 15.672" N	86° 39' 37.551" E
		3	23° 9' 1.106" N	86° 40' 59.457" E
		4	23° 8' 1.231" N	86° 39' 42.693" E

POTENTIAL BLOCK - PUR_GR_ZONE_27

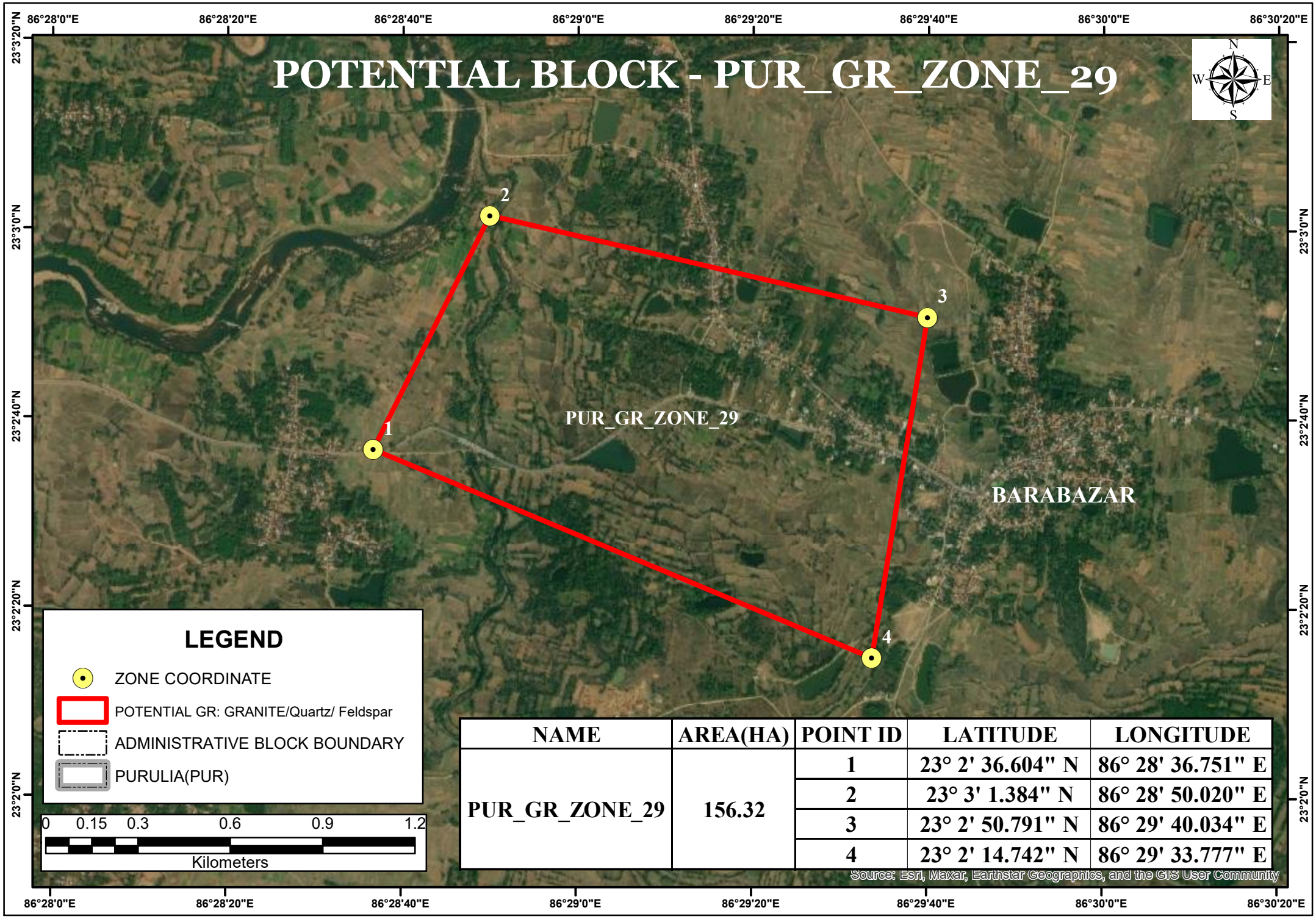


NAME	AREA(HA)	POINT ID	LATITUDE	LONGITUDE
PUR_GR_ZONE_27	1415.71	1	23° 24' 12.790" N	86° 5' 51.461" E
		2	23° 26' 3.596" N	86° 7' 52.290" E
		3	23° 24' 50.425" N	86° 9' 18.534" E
		4	23° 23' 22.403" N	86° 7' 27.245" E

POTENTIAL BLOCK - PUR_GR_ZONE_28

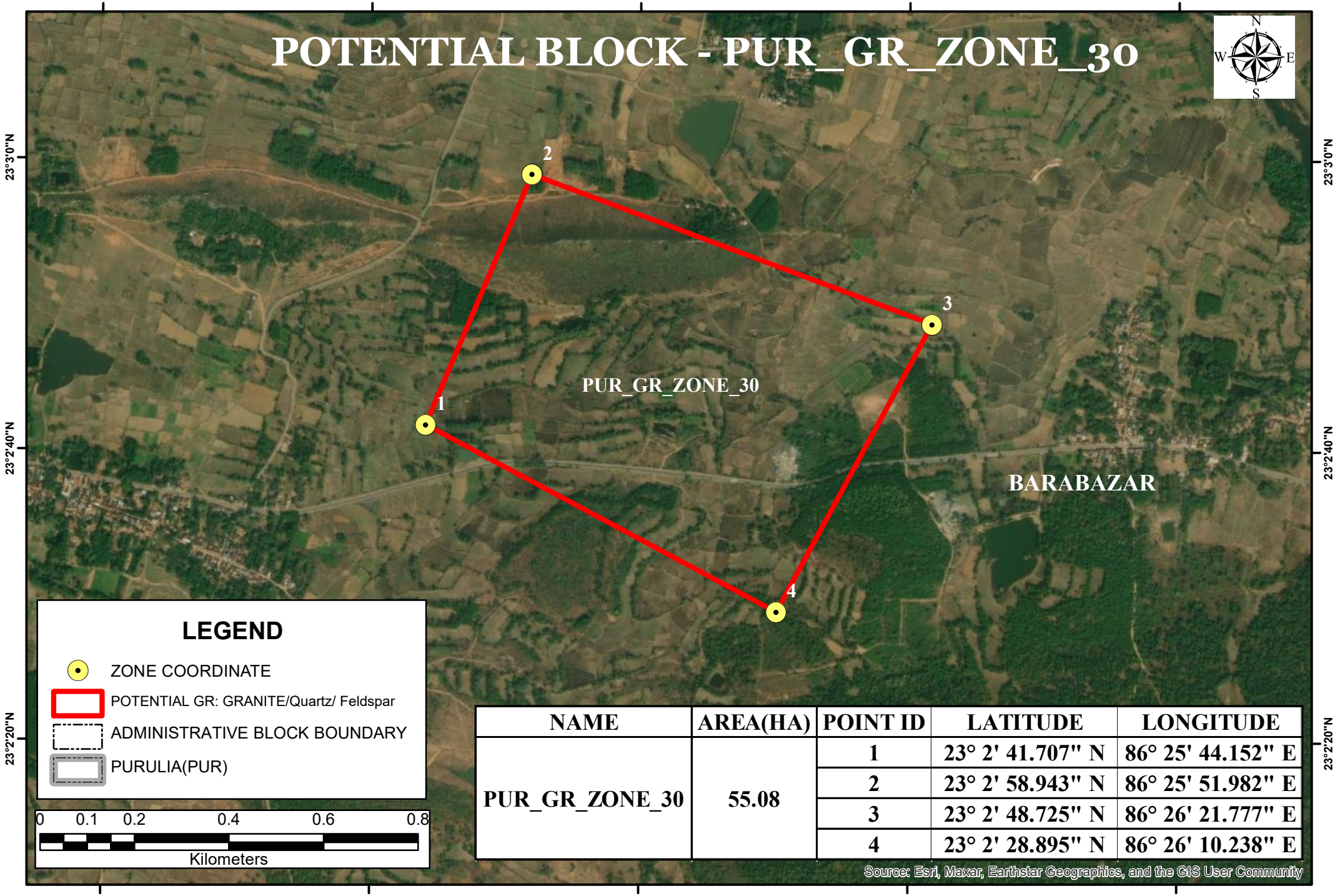


NAME	AREA(HA)	POINT ID	LATITUDE	LONGITUDE
PUR_GR_ZONE_28	120.09	1	23° 2' 58.080" N	86° 17' 24.737" E
		2	23° 3' 29.758" N	86° 17' 28.290" E
		3	23° 3' 22.374" N	86° 18' 10.354" E
		4	23° 2' 49.313" N	86° 18' 5.318" E



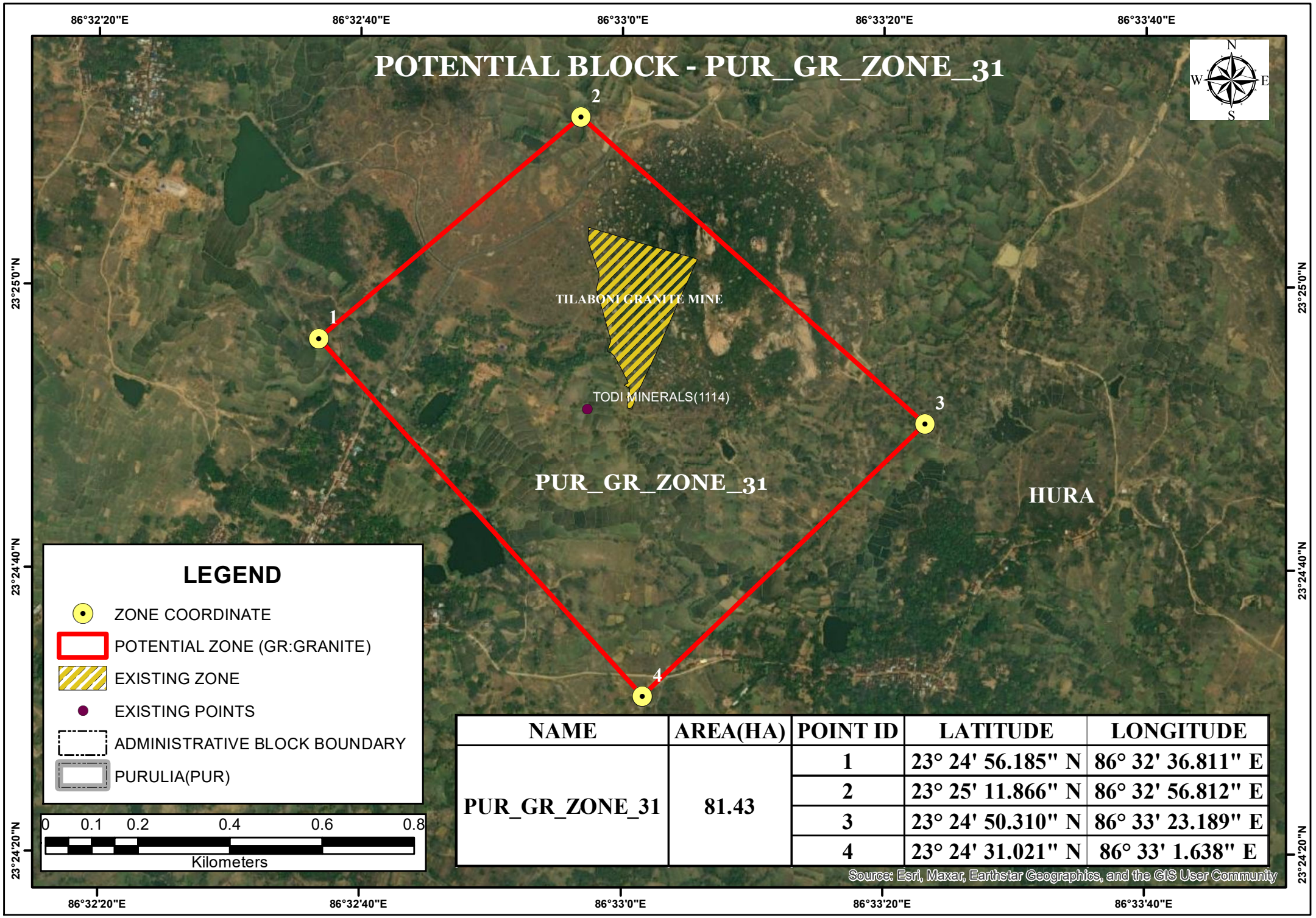
NAME	AREA(HA)	POINT ID	LATITUDE	LONGITUDE
PUR_GR_ZONE_29	156.32	1	23° 2' 36.604" N	86° 28' 36.751" E
		2	23° 3' 1.384" N	86° 28' 50.020" E
		3	23° 2' 50.791" N	86° 29' 40.034" E
		4	23° 2' 14.742" N	86° 29' 33.777" E

POTENTIAL BLOCK - PUR_GR_ZONE_30

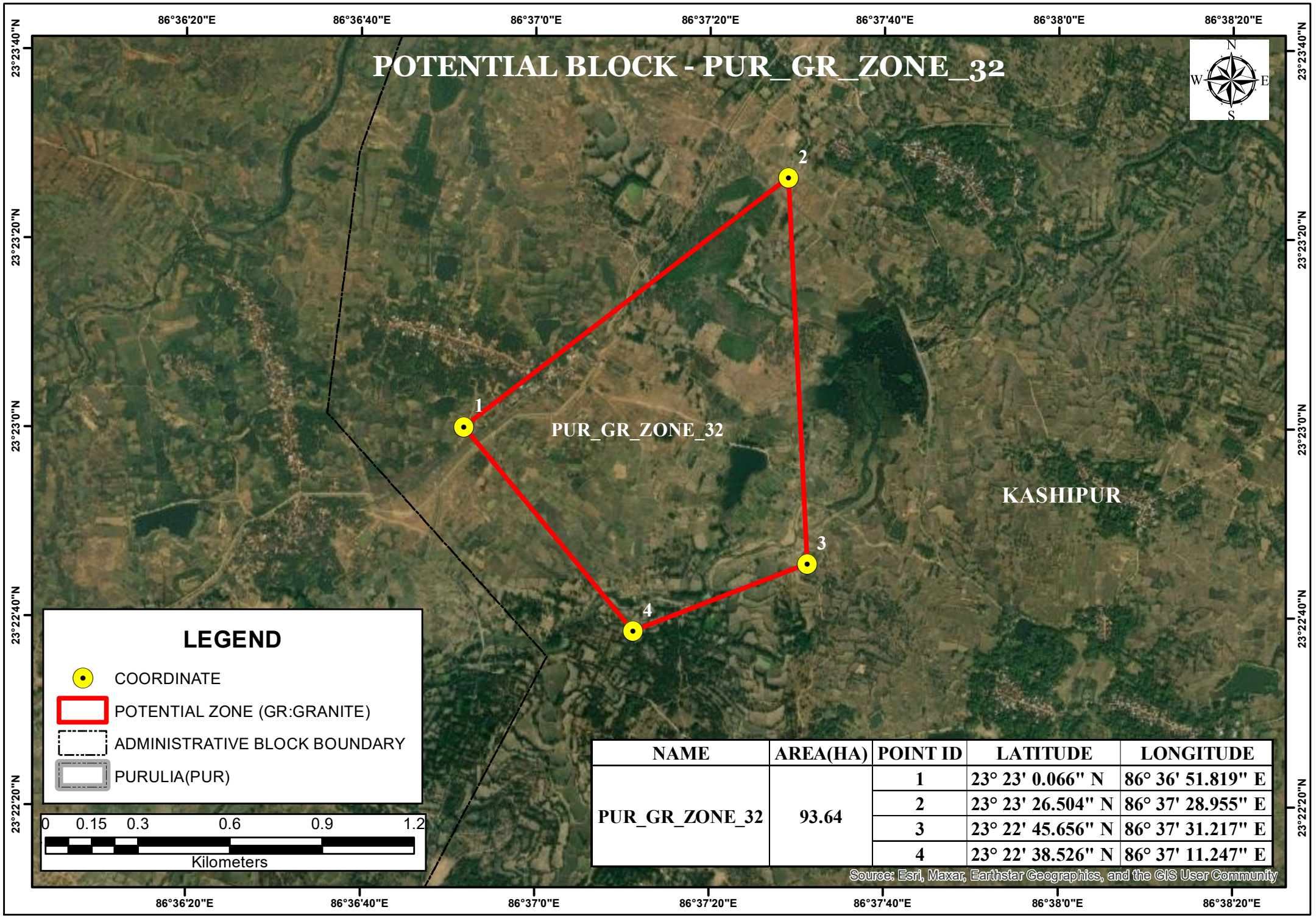


NAME	AREA(HA)	POINT ID	LATITUDE	LONGITUDE
PUR_GR_ZONE_30	55.08	1	23° 2' 41.707" N	86° 25' 44.152" E
		2	23° 2' 58.943" N	86° 25' 51.982" E
		3	23° 2' 48.725" N	86° 26' 21.777" E
		4	23° 2' 28.895" N	86° 26' 10.238" E

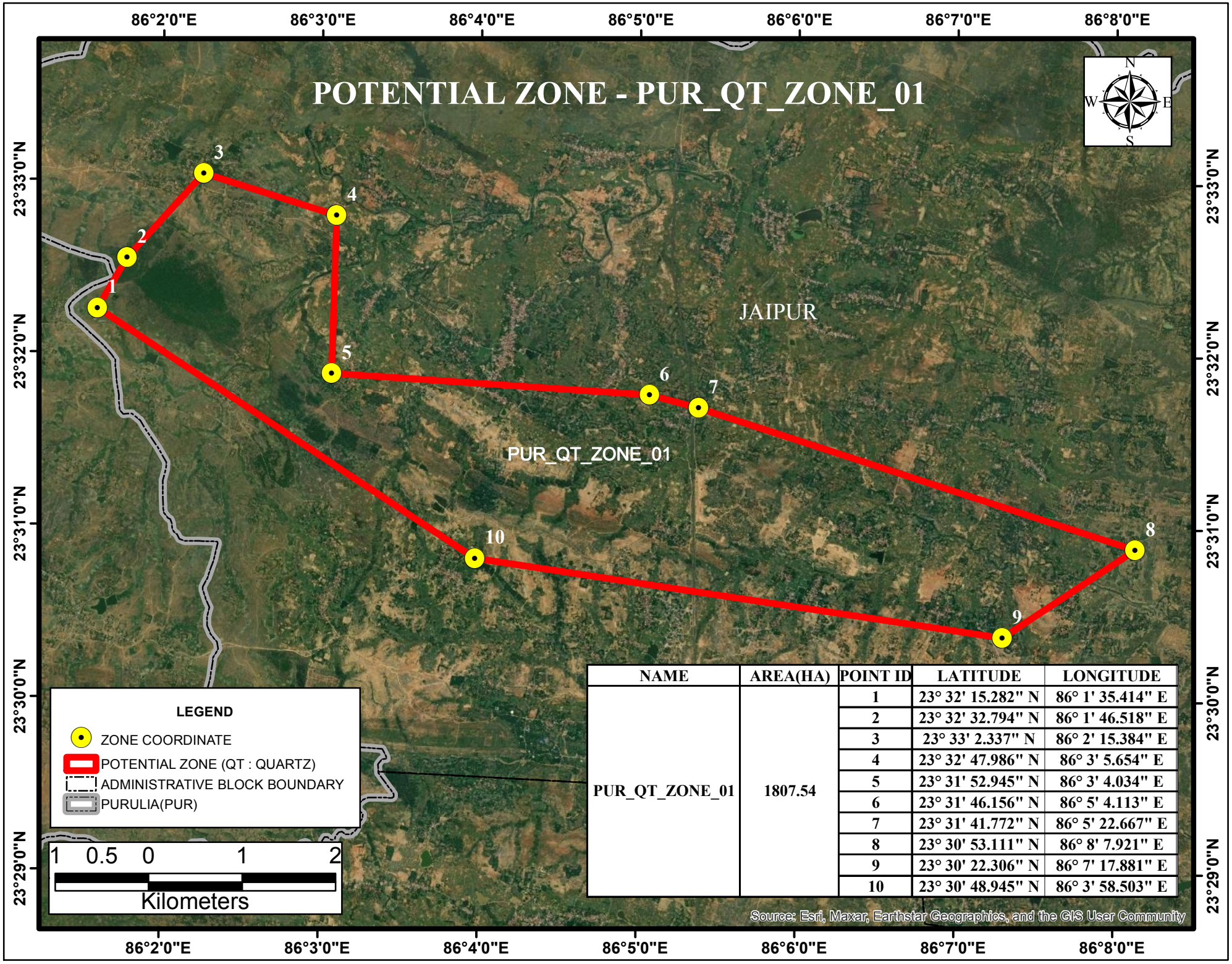
POTENTIAL BLOCK - PUR_GR_ZONE_31



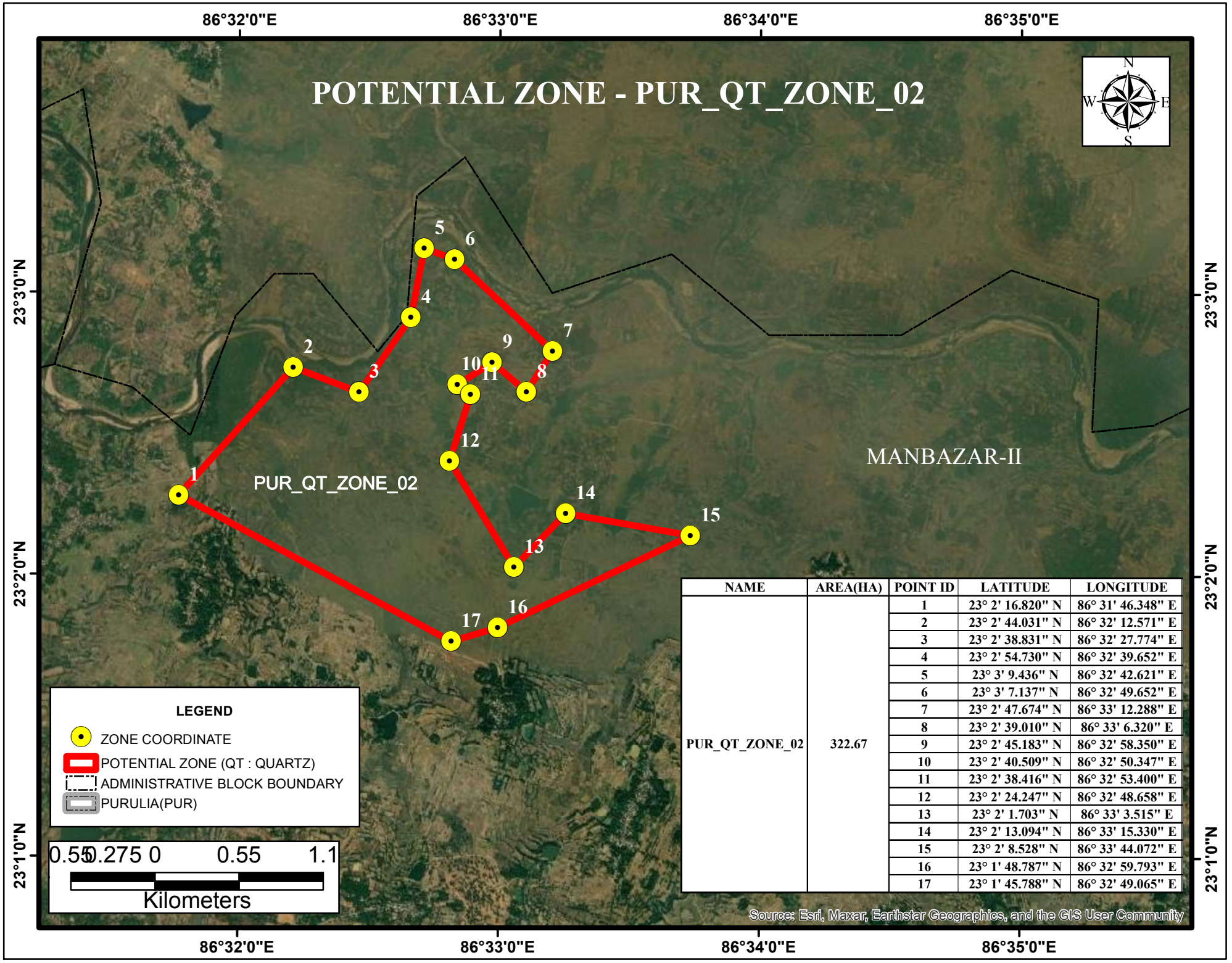
NAME	AREA(HA)	POINT ID	LATITUDE	LONGITUDE
PUR_GR_ZONE_31	81.43	1	23° 24' 56.185" N	86° 32' 36.811" E
		2	23° 25' 11.866" N	86° 32' 56.812" E
		3	23° 24' 50.310" N	86° 33' 23.189" E
		4	23° 24' 31.021" N	86° 33' 1.638" E



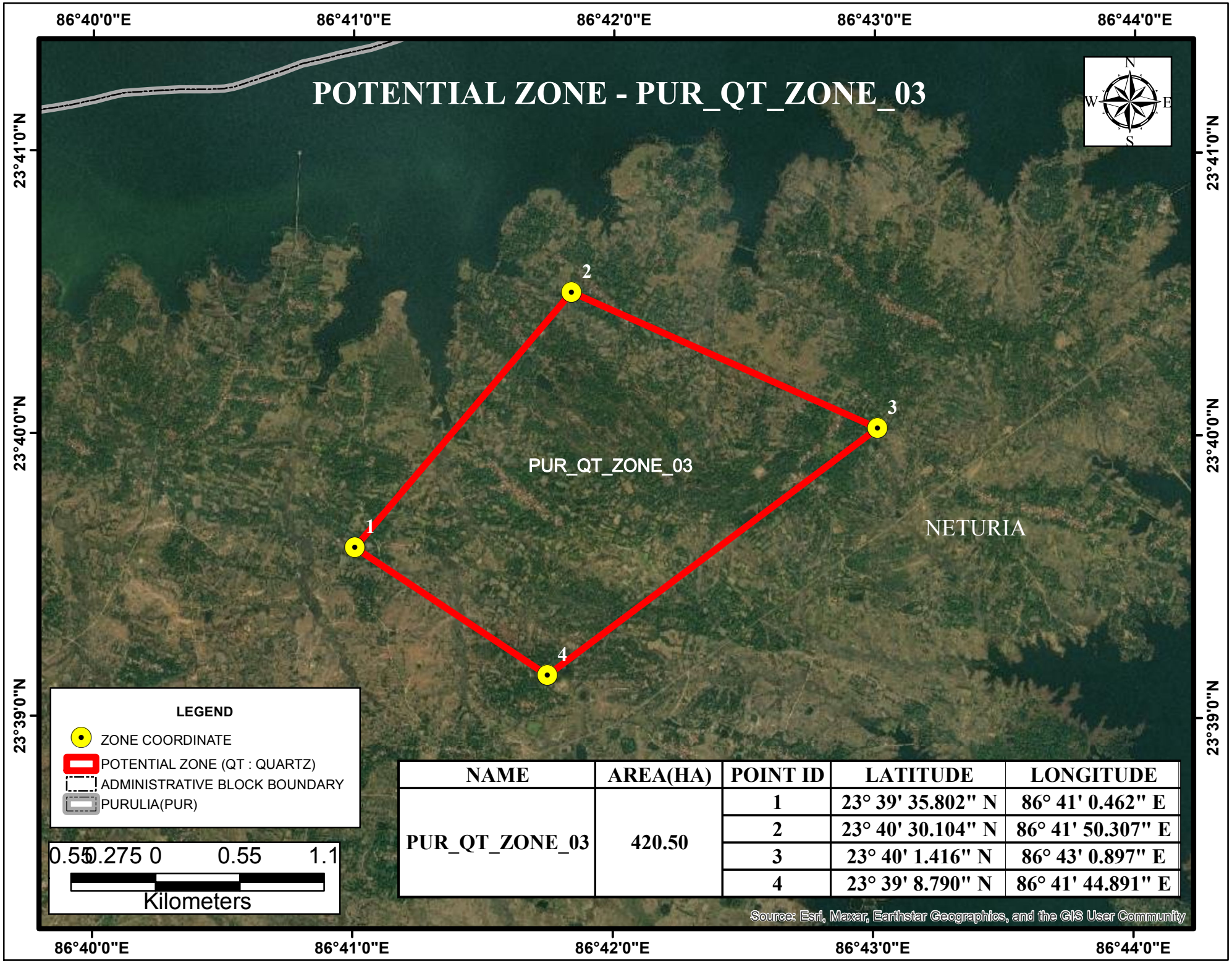
NAME	AREA(HA)	POINT ID	LATITUDE	LONGITUDE
PUR_GR_ZONE_32	93.64	1	23° 23' 0.066" N	86° 36' 51.819" E
		2	23° 23' 26.504" N	86° 37' 28.955" E
		3	23° 22' 45.656" N	86° 37' 31.217" E
		4	23° 22' 38.526" N	86° 37' 11.247" E



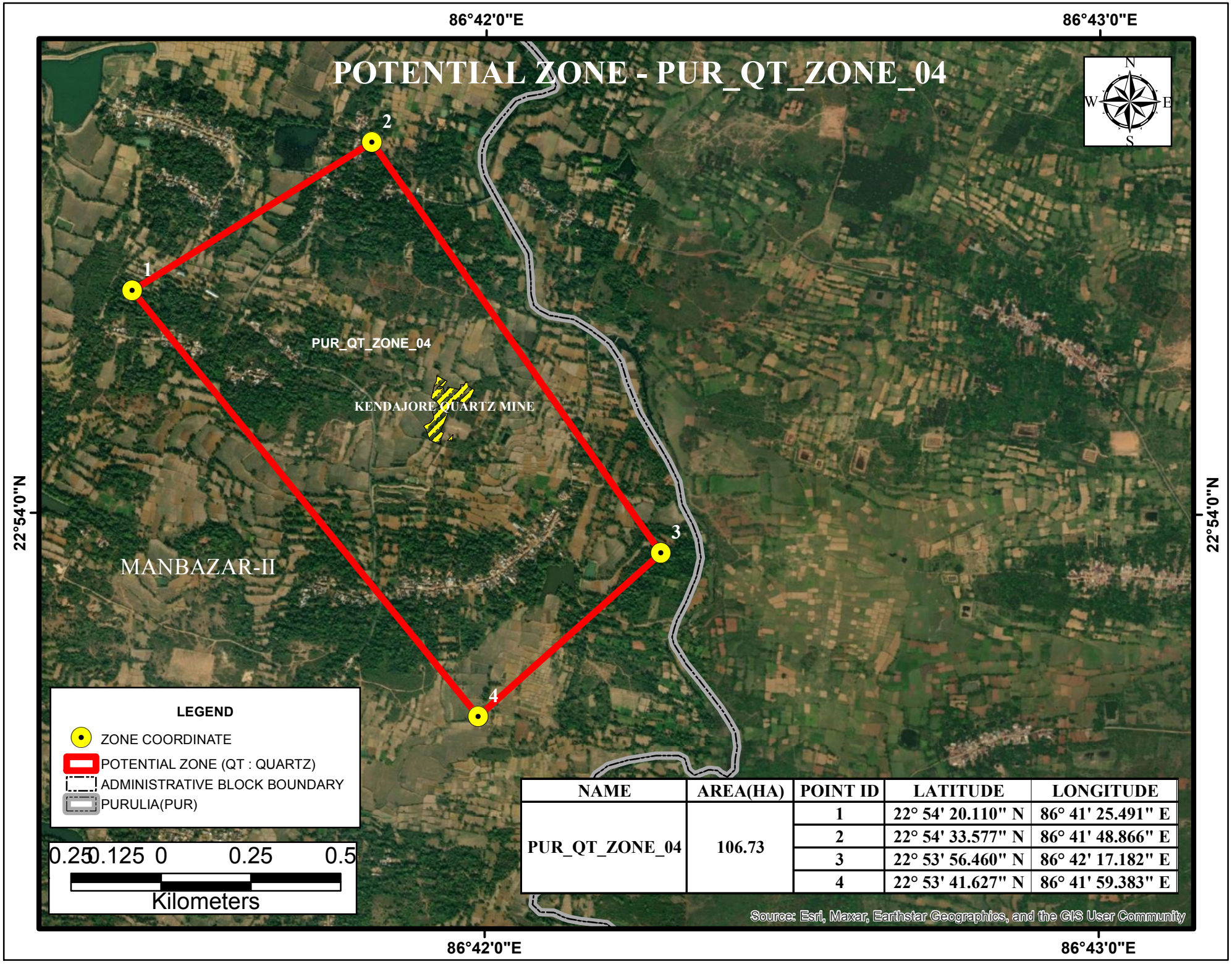
NAME	AREA(HA)	POINT ID	LATITUDE	LONGITUDE
PUR_QT_ZONE_01	1807.54	1	23° 32' 15.282" N	86° 1' 35.414" E
		2	23° 32' 32.794" N	86° 1' 46.518" E
		3	23° 33' 2.337" N	86° 2' 15.384" E
		4	23° 32' 47.986" N	86° 3' 5.654" E
		5	23° 31' 52.945" N	86° 3' 4.034" E
		6	23° 31' 46.156" N	86° 5' 4.113" E
		7	23° 31' 41.772" N	86° 5' 22.667" E
		8	23° 30' 53.111" N	86° 8' 7.921" E
		9	23° 30' 22.306" N	86° 7' 17.881" E
		10	23° 30' 48.945" N	86° 3' 58.503" E



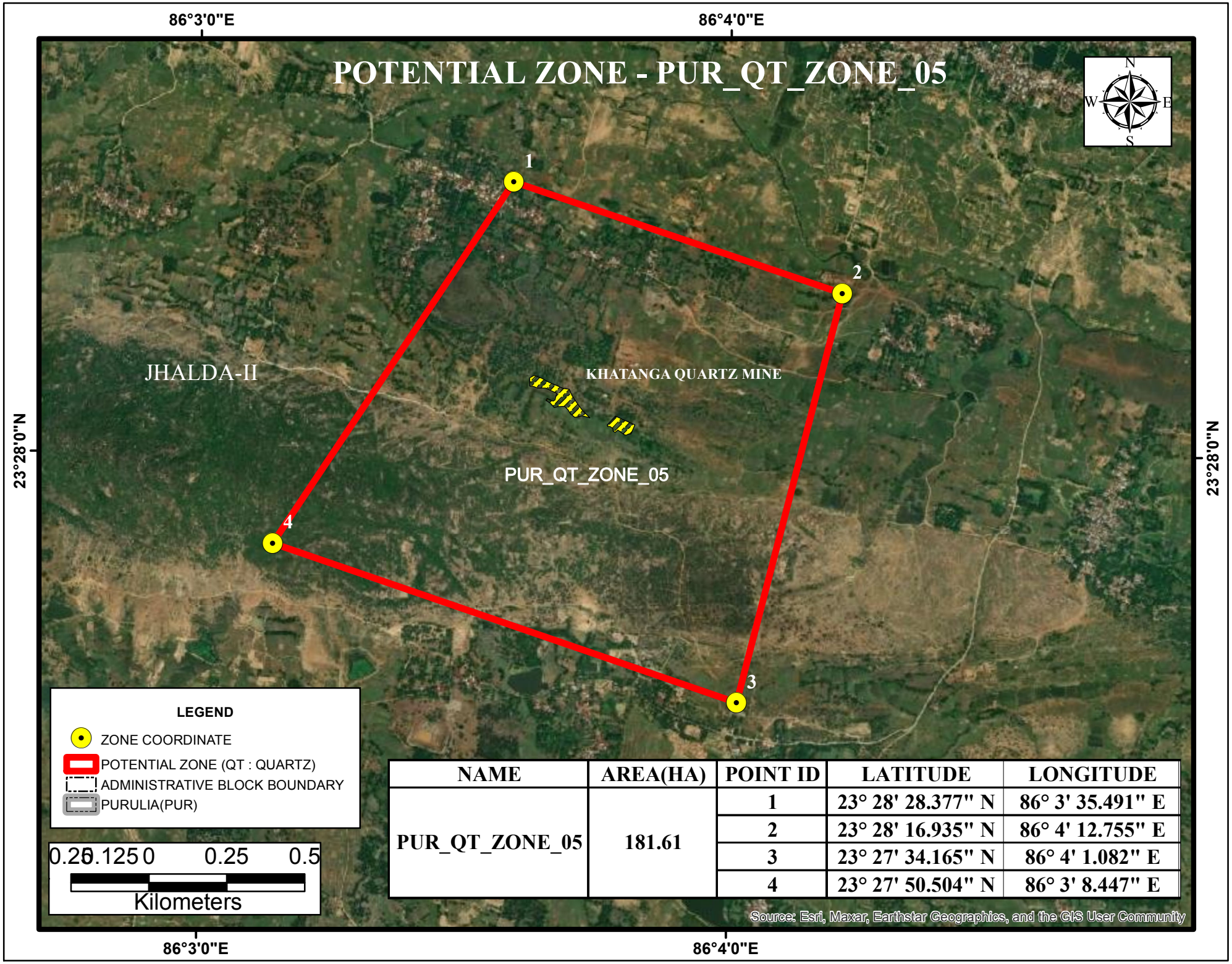
NAME	AREA(HA)	POINT ID	LATITUDE	LONGITUDE
PUR_QT_ZONE_02	322.67	1	23° 2' 16.820" N	86° 31' 46.348" E
		2	23° 2' 44.031" N	86° 32' 12.571" E
		3	23° 2' 38.831" N	86° 32' 27.774" E
		4	23° 2' 54.730" N	86° 32' 39.652" E
		5	23° 3' 9.436" N	86° 32' 42.621" E
		6	23° 3' 7.137" N	86° 32' 49.652" E
		7	23° 2' 47.674" N	86° 33' 12.288" E
		8	23° 2' 39.010" N	86° 33' 6.320" E
		9	23° 2' 45.183" N	86° 32' 58.350" E
		10	23° 2' 40.509" N	86° 32' 50.347" E
		11	23° 2' 38.416" N	86° 32' 53.400" E
		12	23° 2' 24.247" N	86° 32' 48.658" E
		13	23° 2' 1.703" N	86° 33' 3.515" E
		14	23° 2' 13.094" N	86° 33' 15.330" E
		15	23° 2' 8.528" N	86° 33' 44.072" E
		16	23° 1' 48.787" N	86° 32' 59.793" E
		17	23° 1' 45.788" N	86° 32' 49.065" E



NAME	AREA(HA)	POINT ID	LATITUDE	LONGITUDE
PUR_QT_ZONE_03	420.50	1	23° 39' 35.802" N	86° 41' 0.462" E
		2	23° 40' 30.104" N	86° 41' 50.307" E
		3	23° 40' 1.416" N	86° 43' 0.897" E
		4	23° 39' 8.790" N	86° 41' 44.891" E

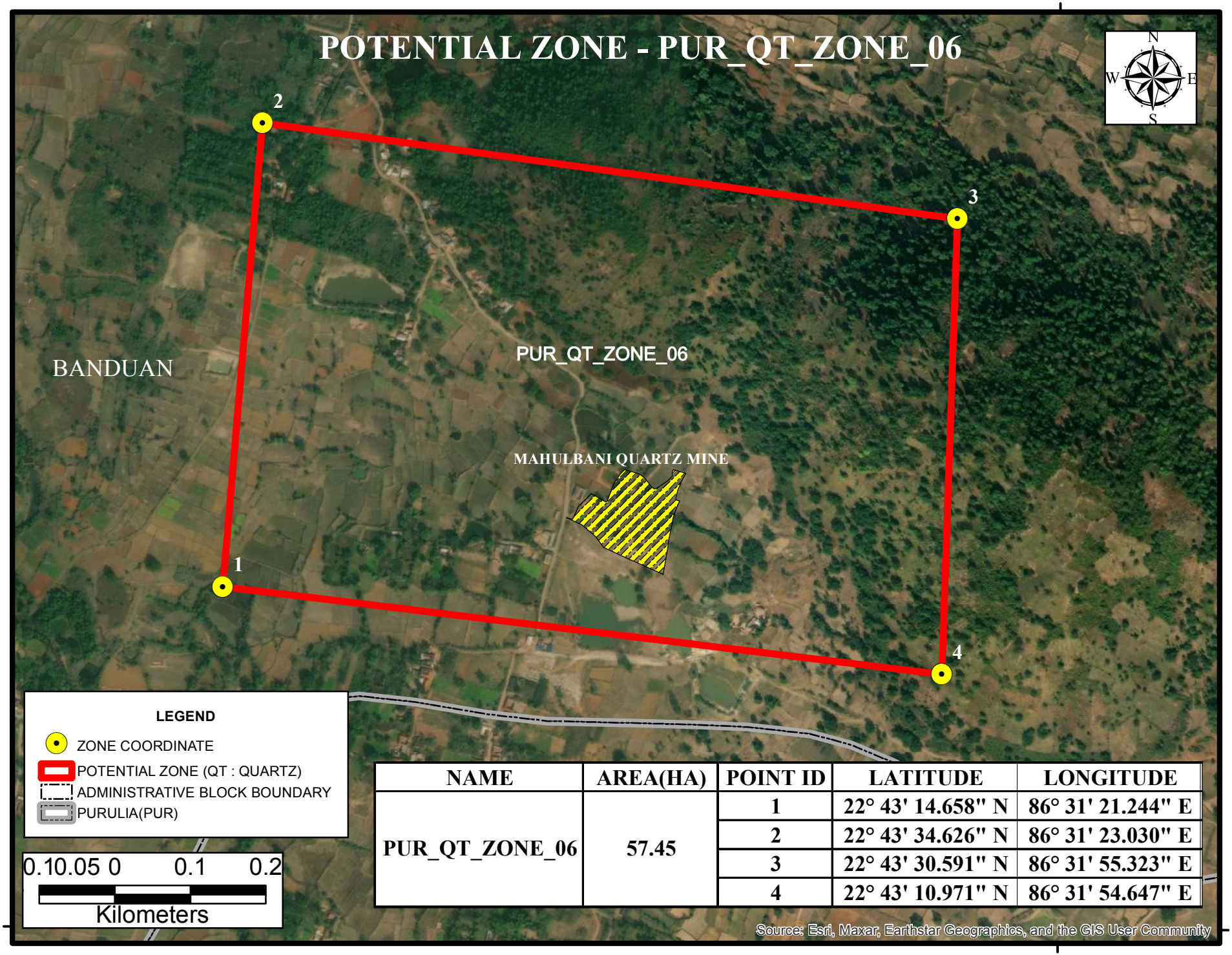


NAME	AREA(HA)	POINT ID	LATITUDE	LONGITUDE
PUR_QT_ZONE_04	106.73	1	22° 54' 20.110" N	86° 41' 25.491" E
		2	22° 54' 33.577" N	86° 41' 48.866" E
		3	22° 53' 56.460" N	86° 42' 17.182" E
		4	22° 53' 41.627" N	86° 41' 59.383" E



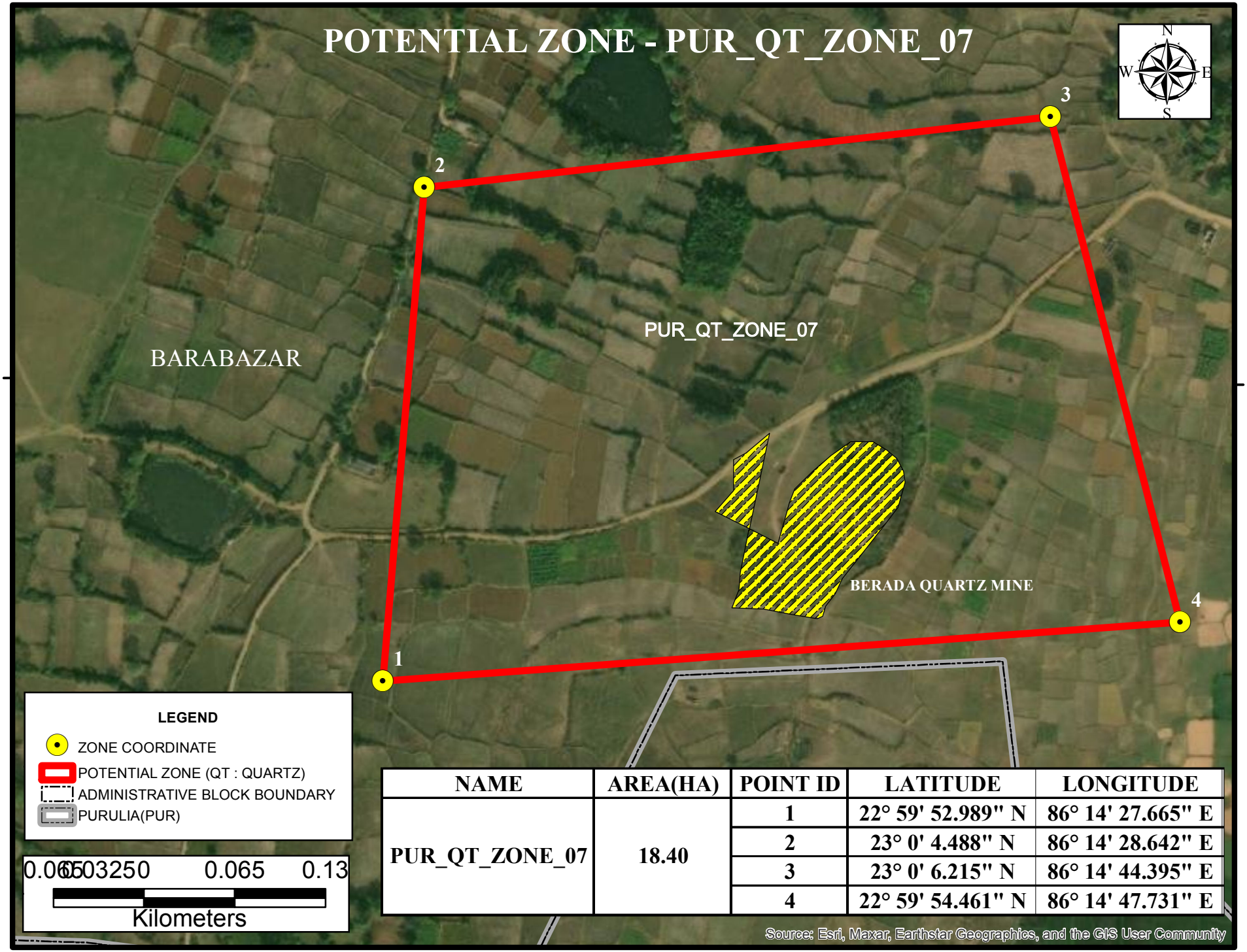
NAME	AREA(HA)	POINT ID	LATITUDE	LONGITUDE
PUR_QT_ZONE_05	181.61	1	23° 28' 28.377" N	86° 3' 35.491" E
		2	23° 28' 16.935" N	86° 4' 12.755" E
		3	23° 27' 34.165" N	86° 4' 1.082" E
		4	23° 27' 50.504" N	86° 3' 8.447" E

POTENTIAL ZONE - PUR_QT_ZONE_06

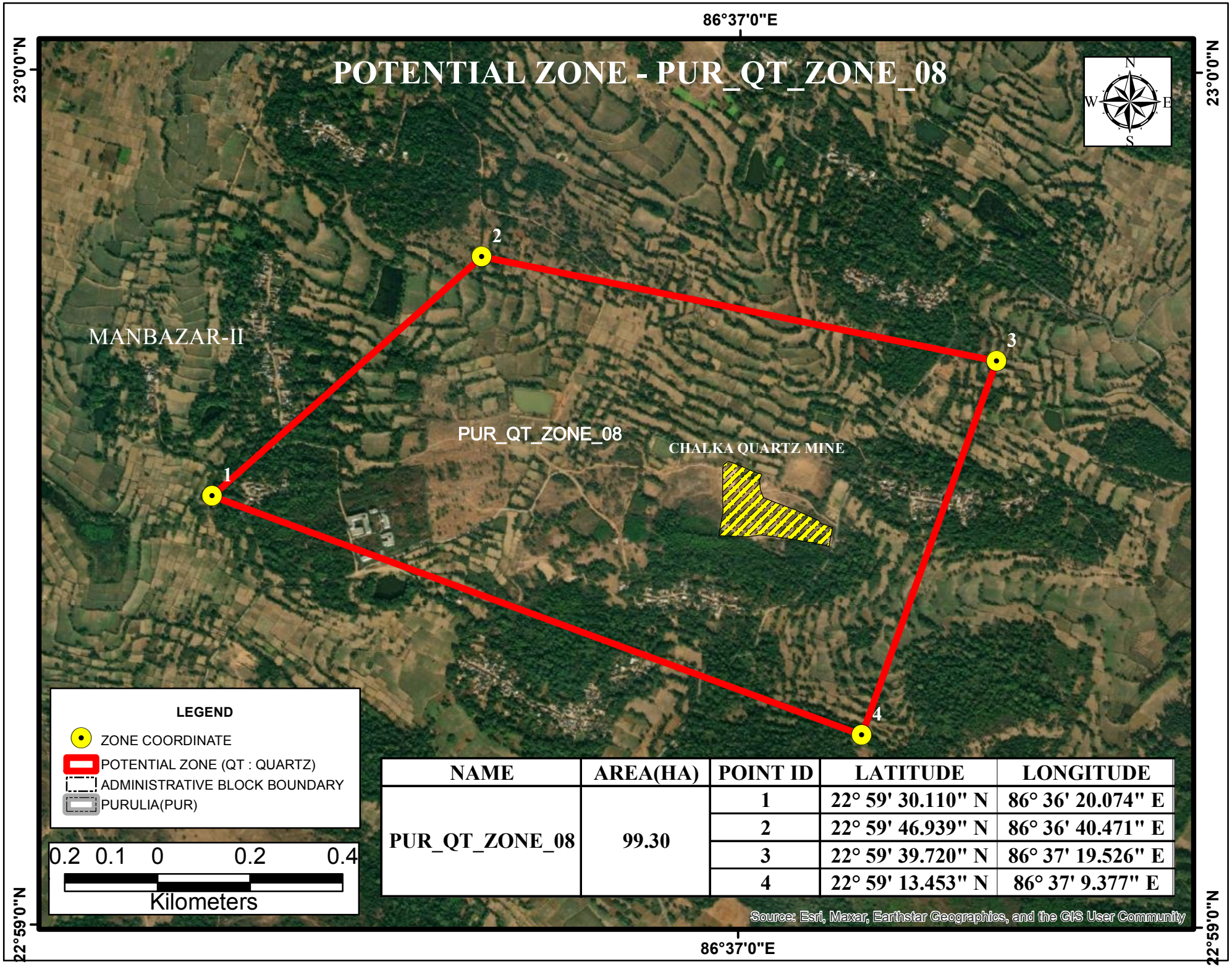


NAME	AREA(HA)	POINT ID	LATITUDE	LONGITUDE
PUR_QT_ZONE_06	57.45	1	22° 43' 14.658" N	86° 31' 21.244" E
		2	22° 43' 34.626" N	86° 31' 23.030" E
		3	22° 43' 30.591" N	86° 31' 55.323" E
		4	22° 43' 10.971" N	86° 31' 54.647" E

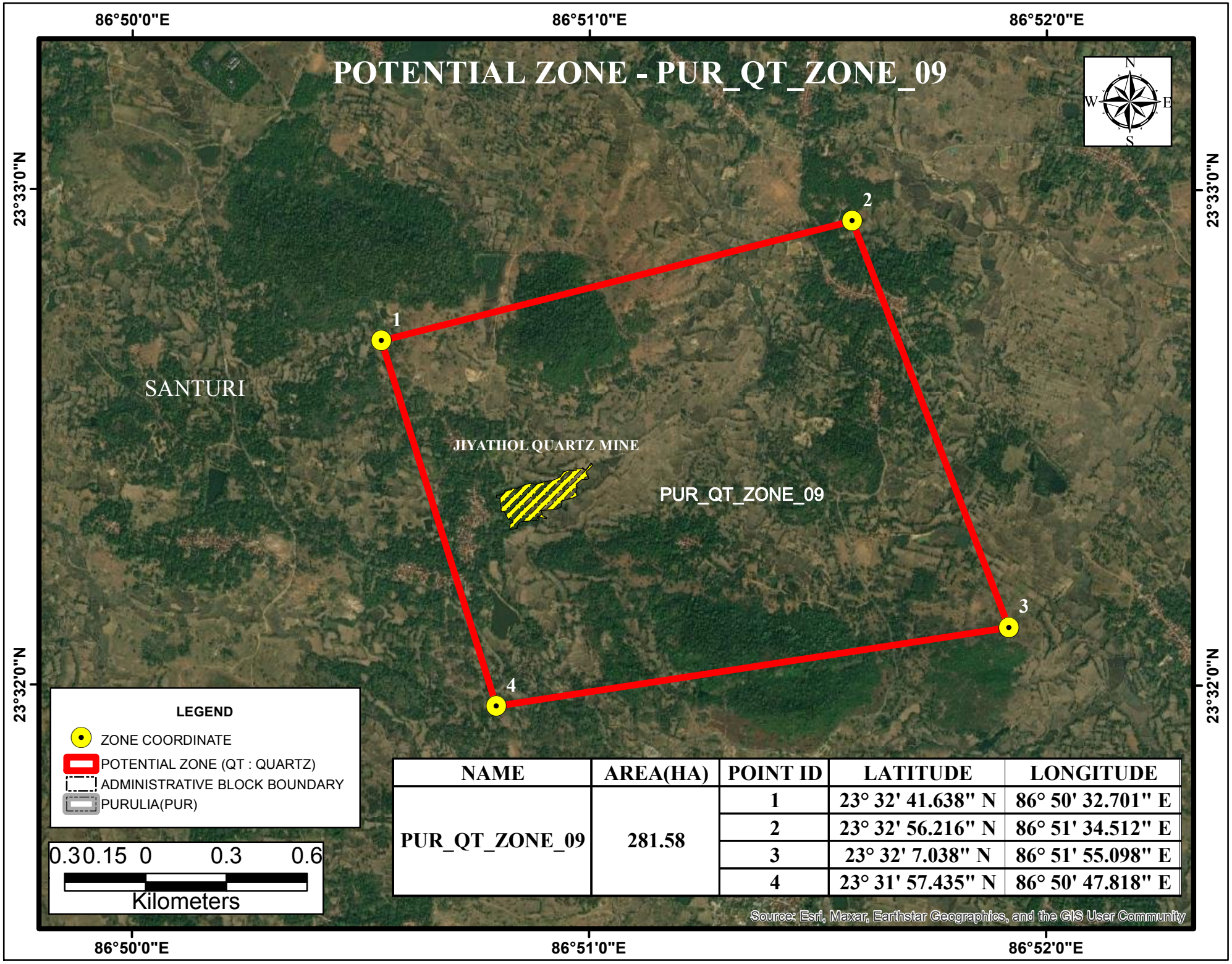
POTENTIAL ZONE - PUR_QT_ZONE_07



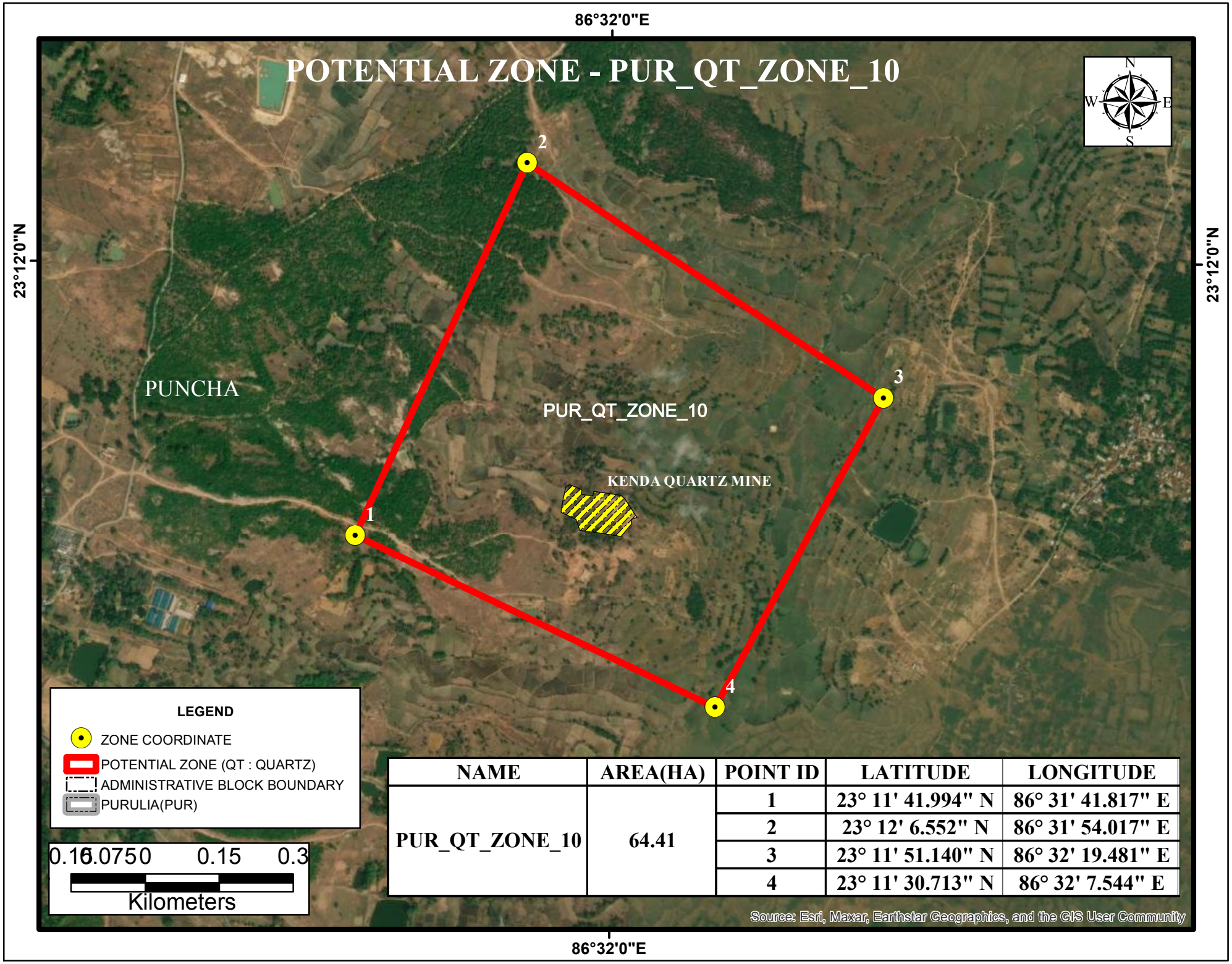
NAME	AREA(HA)	POINT ID	LATITUDE	LONGITUDE
PUR_QT_ZONE_07	18.40	1	22° 59' 52.989" N	86° 14' 27.665" E
		2	23° 0' 4.488" N	86° 14' 28.642" E
		3	23° 0' 6.215" N	86° 14' 44.395" E
		4	22° 59' 54.461" N	86° 14' 47.731" E



NAME	AREA(HA)	POINT ID	LATITUDE	LONGITUDE
PUR_QT_ZONE_08	99.30	1	22° 59' 30.110" N	86° 36' 20.074" E
		2	22° 59' 46.939" N	86° 36' 40.471" E
		3	22° 59' 39.720" N	86° 37' 19.526" E
		4	22° 59' 13.453" N	86° 37' 9.377" E

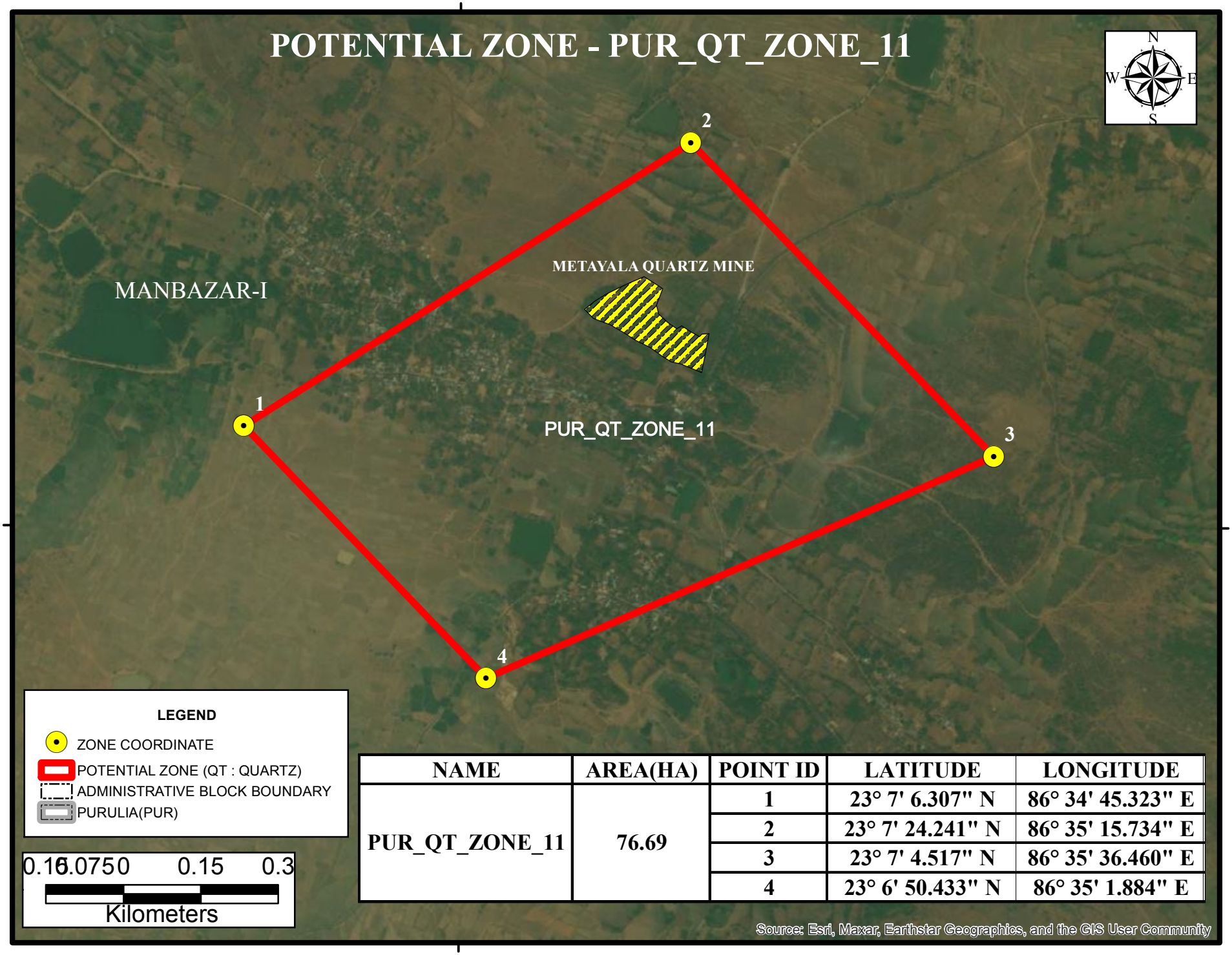


NAME	AREA(HA)	POINT ID	LATITUDE	LONGITUDE
PUR_QT_ZONE_09	281.58	1	23° 32' 41.638" N	86° 50' 32.701" E
		2	23° 32' 56.216" N	86° 51' 34.512" E
		3	23° 32' 7.038" N	86° 51' 55.098" E
		4	23° 31' 57.435" N	86° 50' 47.818" E

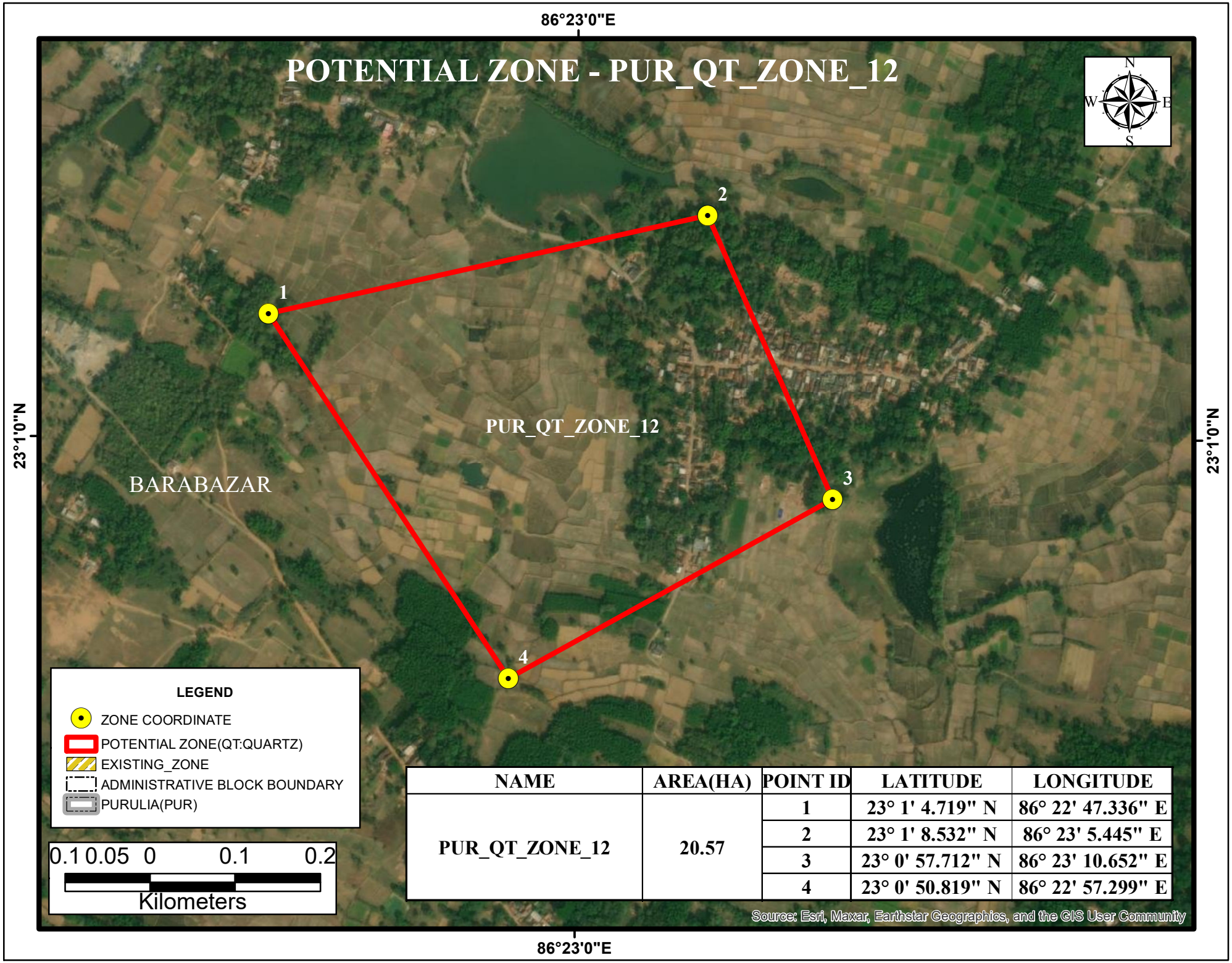


NAME	AREA(HA)	POINT ID	LATITUDE	LONGITUDE
PUR_QT_ZONE_10	64.41	1	23° 11' 41.994" N	86° 31' 41.817" E
		2	23° 12' 6.552" N	86° 31' 54.017" E
		3	23° 11' 51.140" N	86° 32' 19.481" E
		4	23° 11' 30.713" N	86° 32' 7.544" E

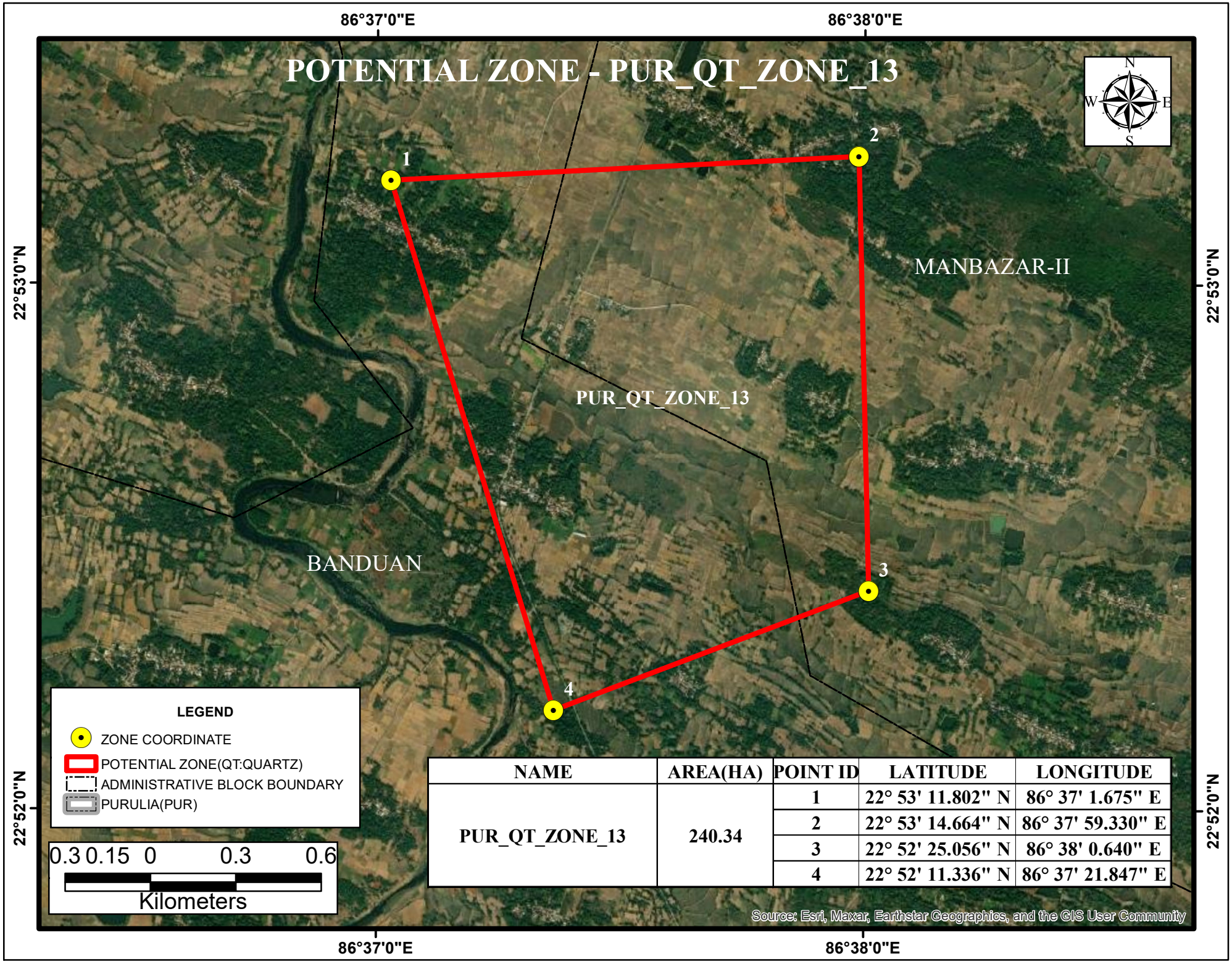
POTENTIAL ZONE - PUR_QT_ZONE_11



NAME	AREA(HA)	POINT ID	LATITUDE	LONGITUDE
PUR_QT_ZONE_11	76.69	1	23° 7' 6.307" N	86° 34' 45.323" E
		2	23° 7' 24.241" N	86° 35' 15.734" E
		3	23° 7' 4.517" N	86° 35' 36.460" E
		4	23° 6' 50.433" N	86° 35' 1.884" E

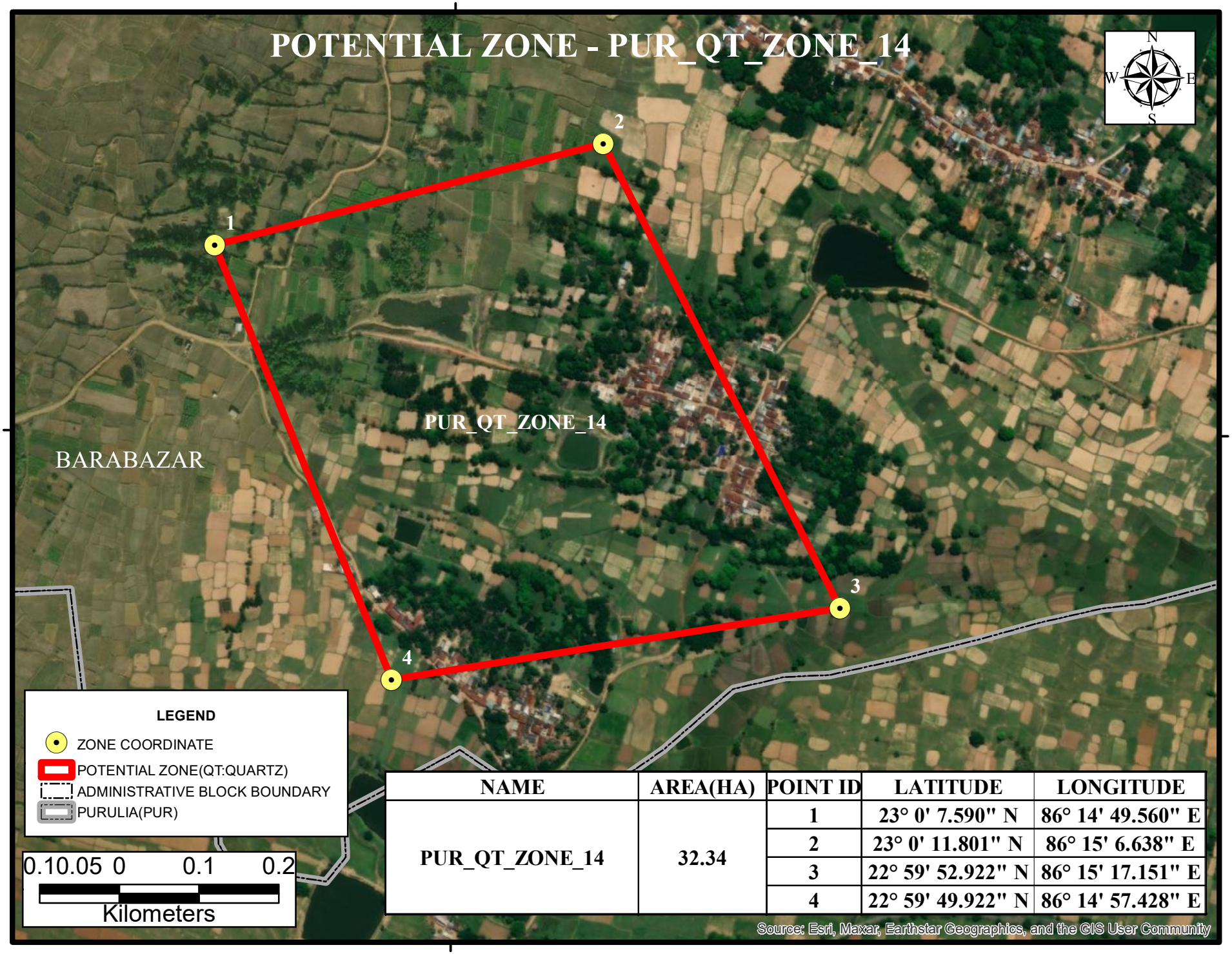


NAME	AREA(HA)	POINT ID	LATITUDE	LONGITUDE
PUR_QT_ZONE_12	20.57	1	23° 1' 4.719" N	86° 22' 47.336" E
		2	23° 1' 8.532" N	86° 23' 5.445" E
		3	23° 0' 57.712" N	86° 23' 10.652" E
		4	23° 0' 50.819" N	86° 22' 57.299" E

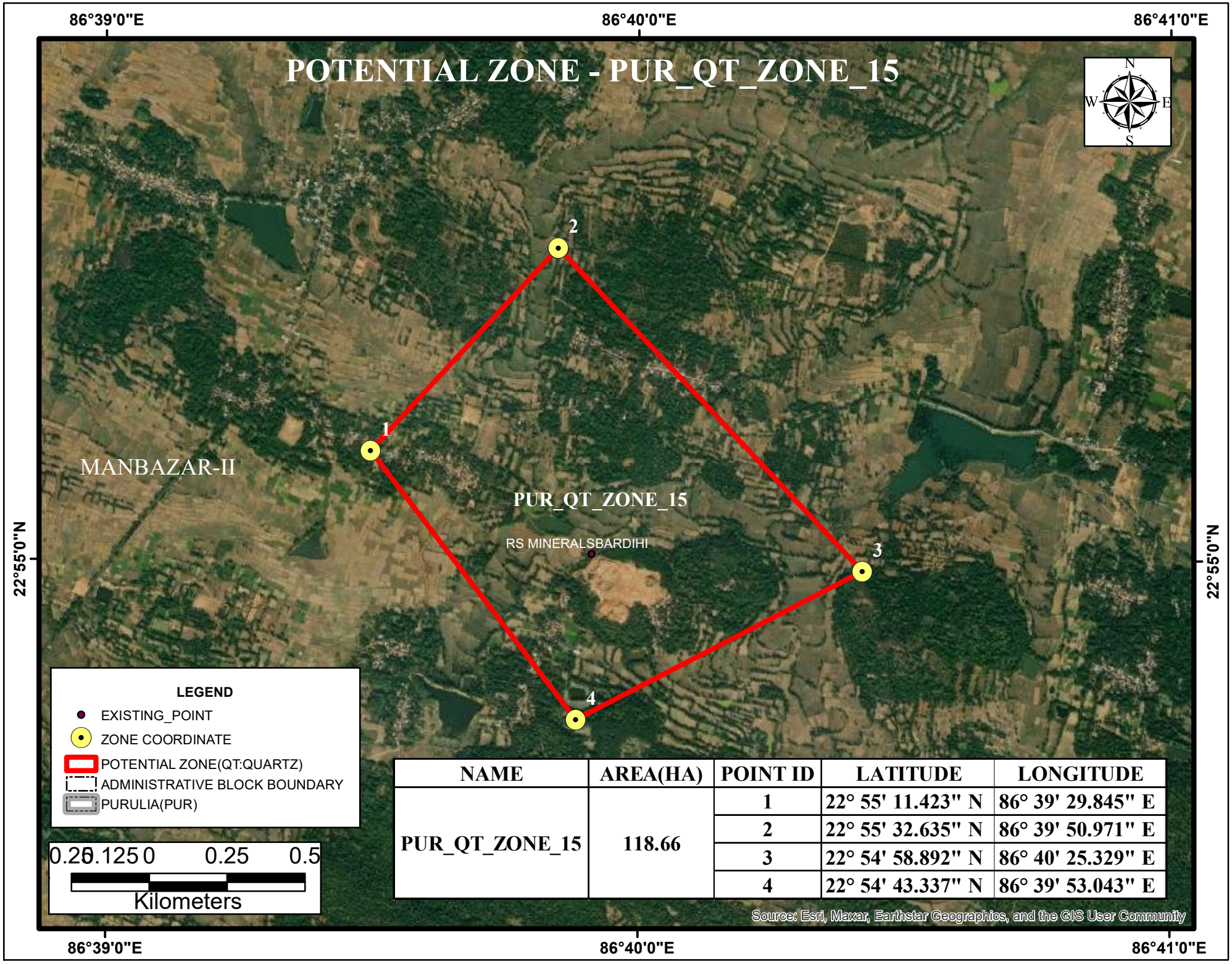


NAME	AREA(HA)	POINT ID	LATITUDE	LONGITUDE
PUR_QT_ZONE_13	240.34	1	22° 53' 11.802" N	86° 37' 1.675" E
		2	22° 53' 14.664" N	86° 37' 59.330" E
		3	22° 52' 25.056" N	86° 38' 0.640" E
		4	22° 52' 11.336" N	86° 37' 21.847" E

POTENTIAL ZONE - PUR_QT_ZONE_14

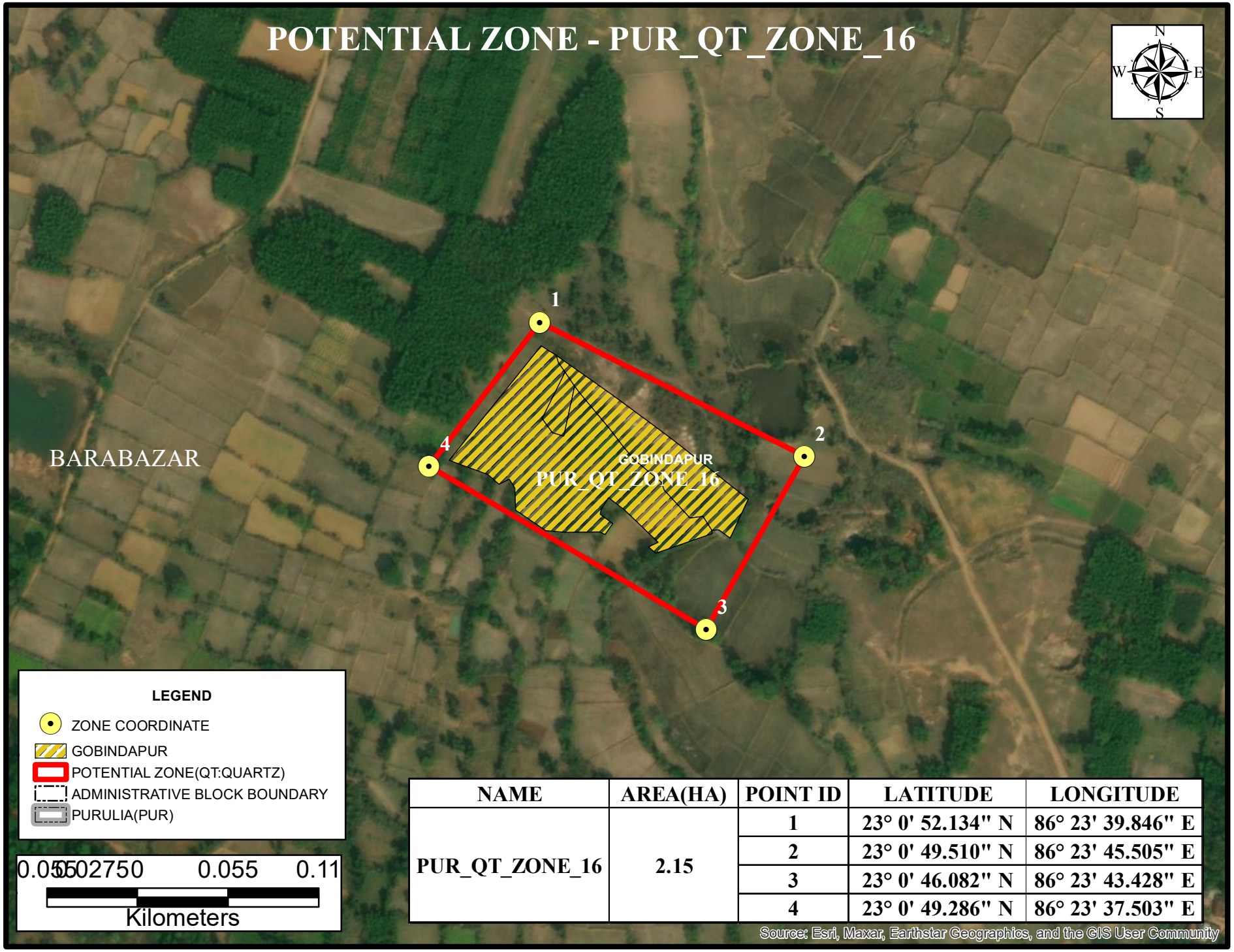


NAME	AREA(HA)	POINT ID	LATITUDE	LONGITUDE
PUR_QT_ZONE_14	32.34	1	23° 0' 7.590" N	86° 14' 49.560" E
		2	23° 0' 11.801" N	86° 15' 6.638" E
		3	22° 59' 52.922" N	86° 15' 17.151" E
		4	22° 59' 49.922" N	86° 14' 57.428" E



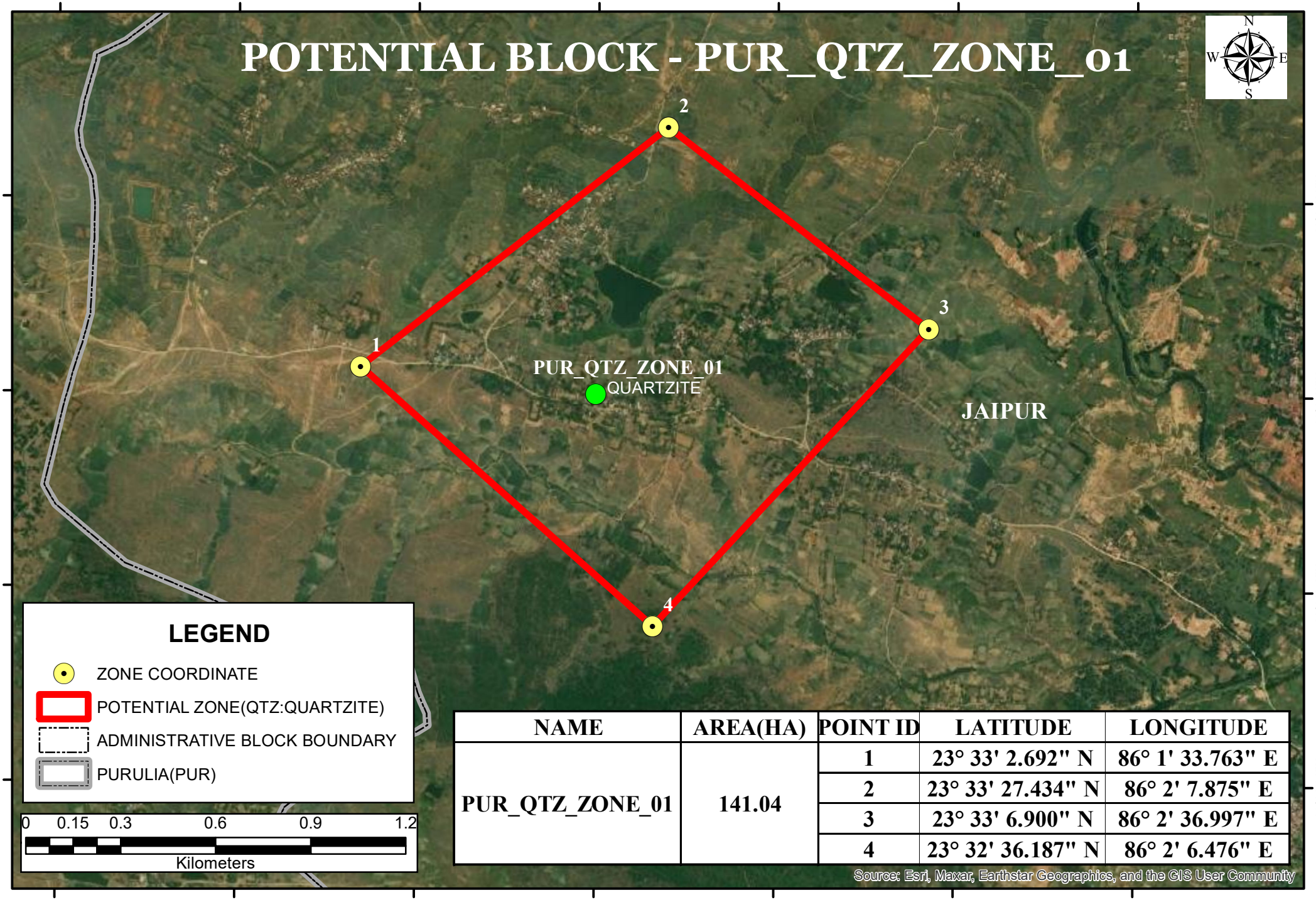
NAME	AREA(HA)	POINT ID	LATITUDE	LONGITUDE
PUR_QT_ZONE_15	118.66	1	22° 55' 11.423" N	86° 39' 29.845" E
		2	22° 55' 32.635" N	86° 39' 50.971" E
		3	22° 54' 58.892" N	86° 40' 25.329" E
		4	22° 54' 43.337" N	86° 39' 53.043" E

POTENTIAL ZONE - PUR_QT_ZONE_16

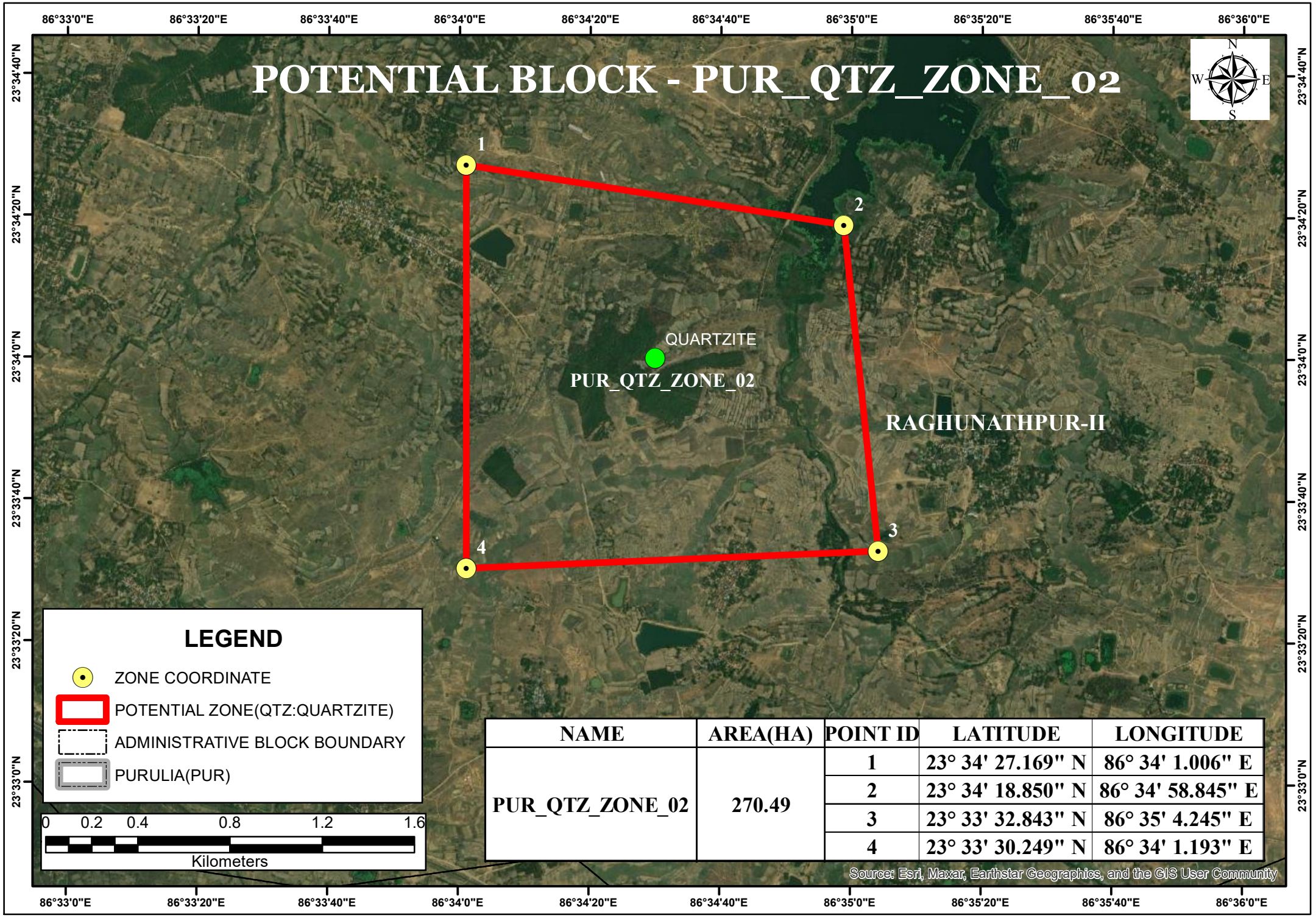


NAME	AREA(HA)	POINT ID	LATITUDE	LONGITUDE
PUR_QT_ZONE_16	2.15	1	23° 0' 52.134" N	86° 23' 39.846" E
		2	23° 0' 49.510" N	86° 23' 45.505" E
		3	23° 0' 46.082" N	86° 23' 43.428" E
		4	23° 0' 49.286" N	86° 23' 37.503" E

POTENTIAL BLOCK - PUR_QTZ_ZONE_01

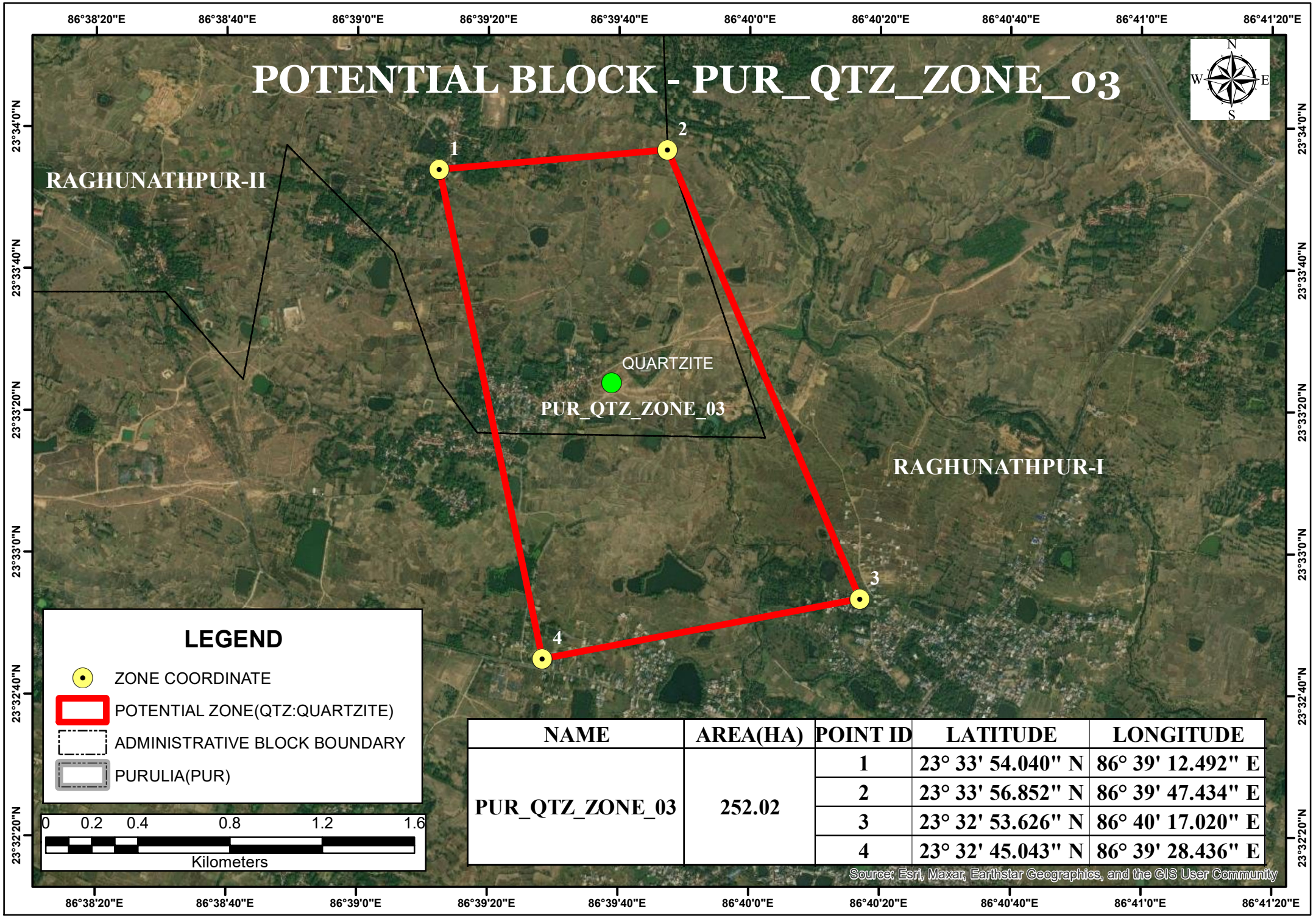


NAME	AREA(HA)	POINT ID	LATITUDE	LONGITUDE
PUR_QTZ_ZONE_01	141.04	1	23° 33' 2.692" N	86° 1' 33.763" E
		2	23° 33' 27.434" N	86° 2' 7.875" E
		3	23° 33' 6.900" N	86° 2' 36.997" E
		4	23° 32' 36.187" N	86° 2' 6.476" E

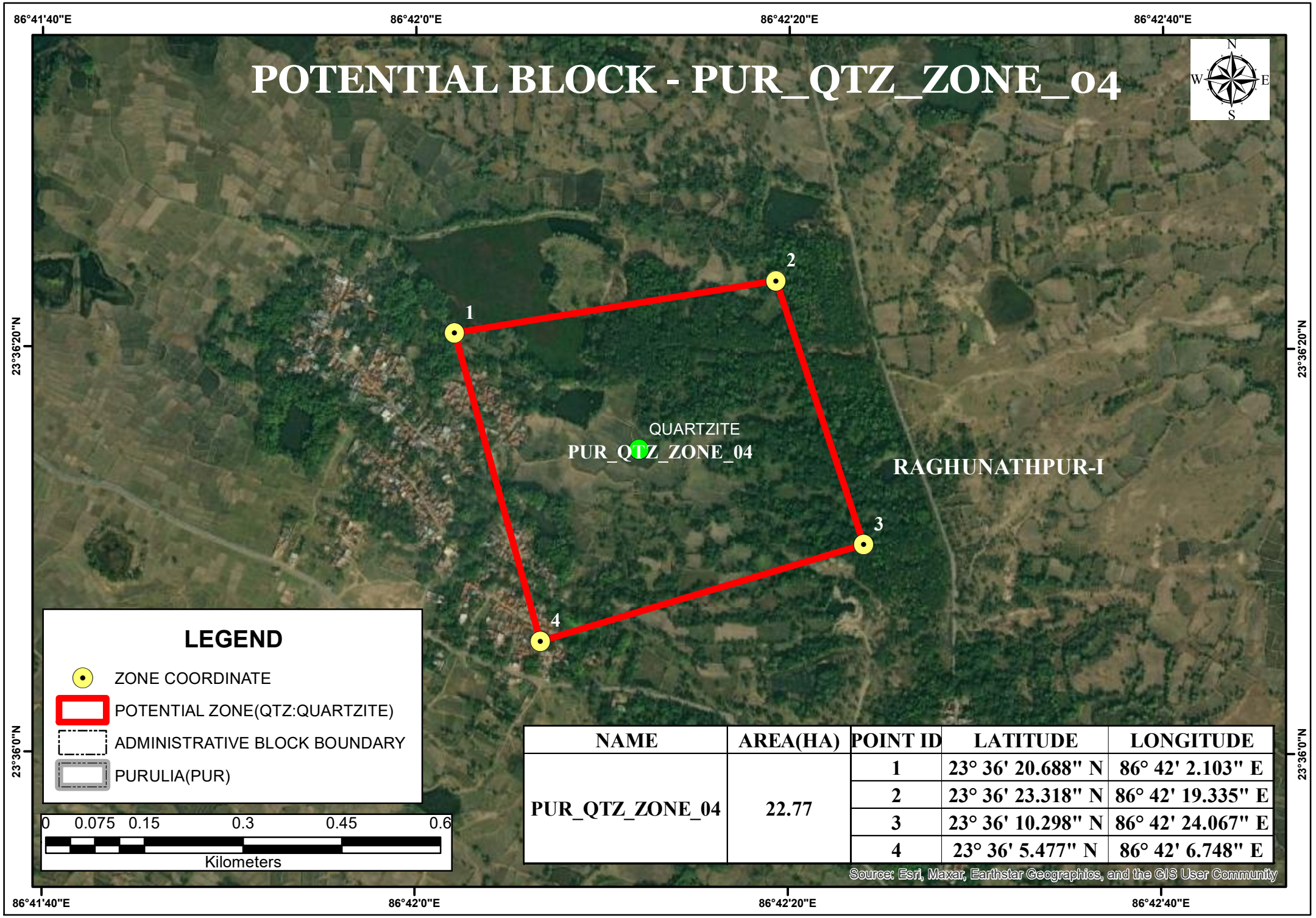


NAME	AREA(HA)	POINT ID	LATITUDE	LONGITUDE
PUR_QTZ_ZONE_02	270.49	1	23° 34' 27.169" N	86° 34' 1.006" E
		2	23° 34' 18.850" N	86° 34' 58.845" E
		3	23° 33' 32.843" N	86° 35' 4.245" E
		4	23° 33' 30.249" N	86° 34' 1.193" E

POTENTIAL BLOCK - PUR_QTZ_ZONE_03

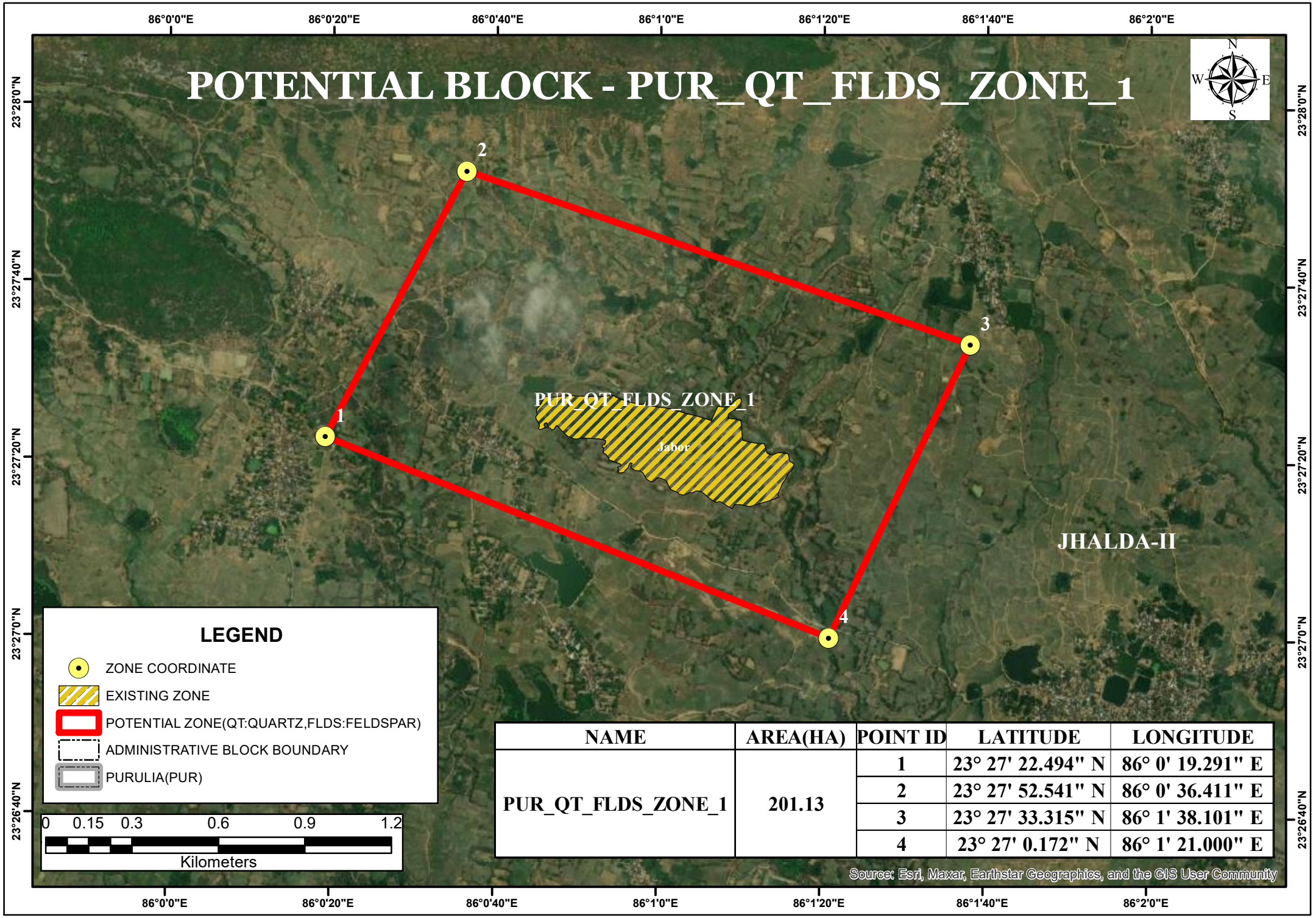


NAME	AREA(HA)	POINT ID	LATITUDE	LONGITUDE
PUR_QTZ_ZONE_03	252.02	1	23° 33' 54.040" N	86° 39' 12.492" E
		2	23° 33' 56.852" N	86° 39' 47.434" E
		3	23° 32' 53.626" N	86° 40' 17.020" E
		4	23° 32' 45.043" N	86° 39' 28.436" E



NAME	AREA(HA)	POINT ID	LATITUDE	LONGITUDE
PUR_QTZ_ZONE_04	22.77	1	23° 36' 20.688" N	86° 42' 2.103" E
		2	23° 36' 23.318" N	86° 42' 19.335" E
		3	23° 36' 10.298" N	86° 42' 24.067" E
		4	23° 36' 5.477" N	86° 42' 6.748" E

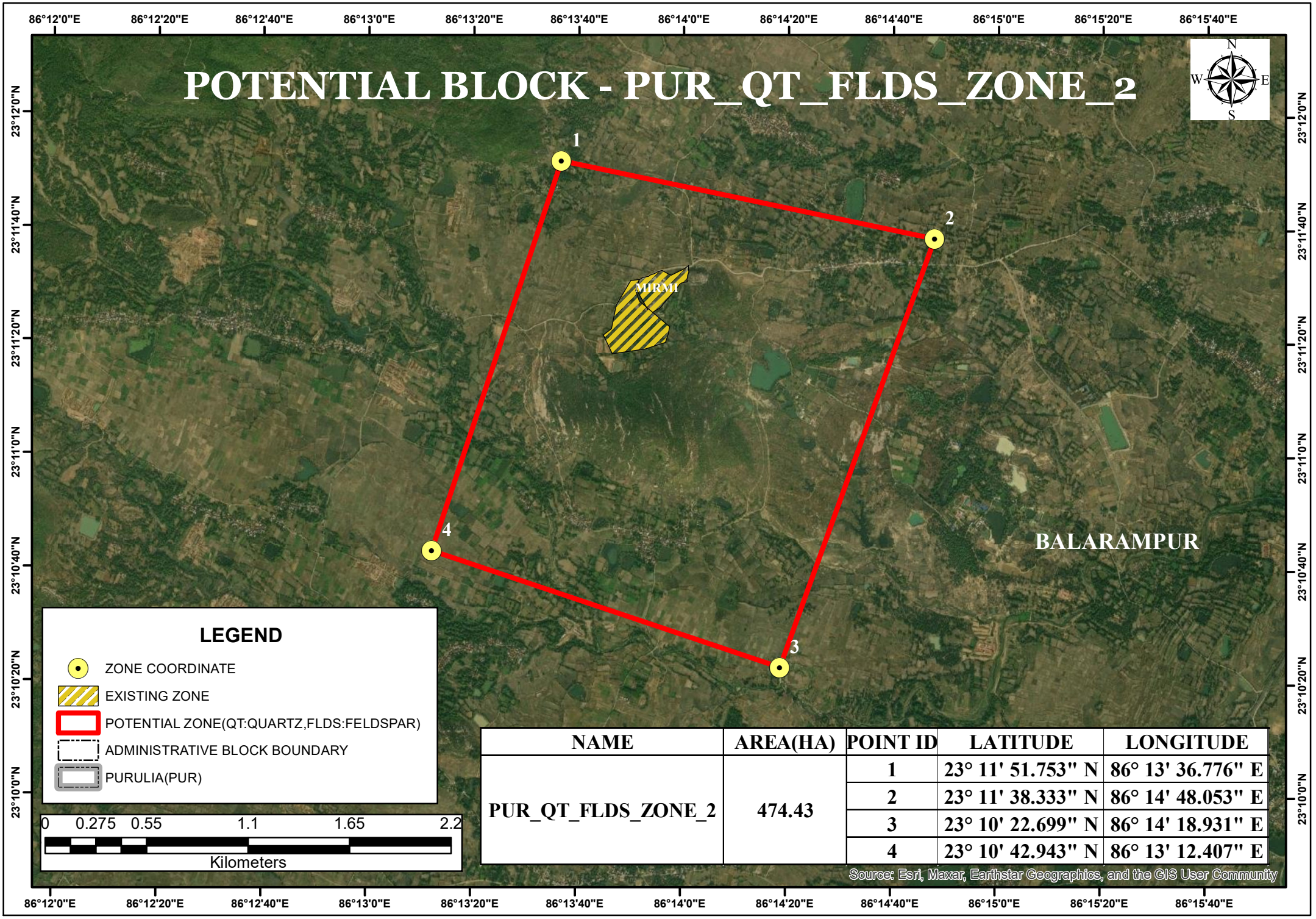
POTENTIAL BLOCK - PUR_QT_FLDS_ZONE_1



NAME	AREA(HA)	POINT ID	LATITUDE	LONGITUDE
PUR_QT_FLDS_ZONE_1	201.13	1	23° 27' 22.494" N	86° 0' 19.291" E
		2	23° 27' 52.541" N	86° 0' 36.411" E
		3	23° 27' 33.315" N	86° 1' 38.101" E
		4	23° 27' 0.172" N	86° 1' 21.000" E

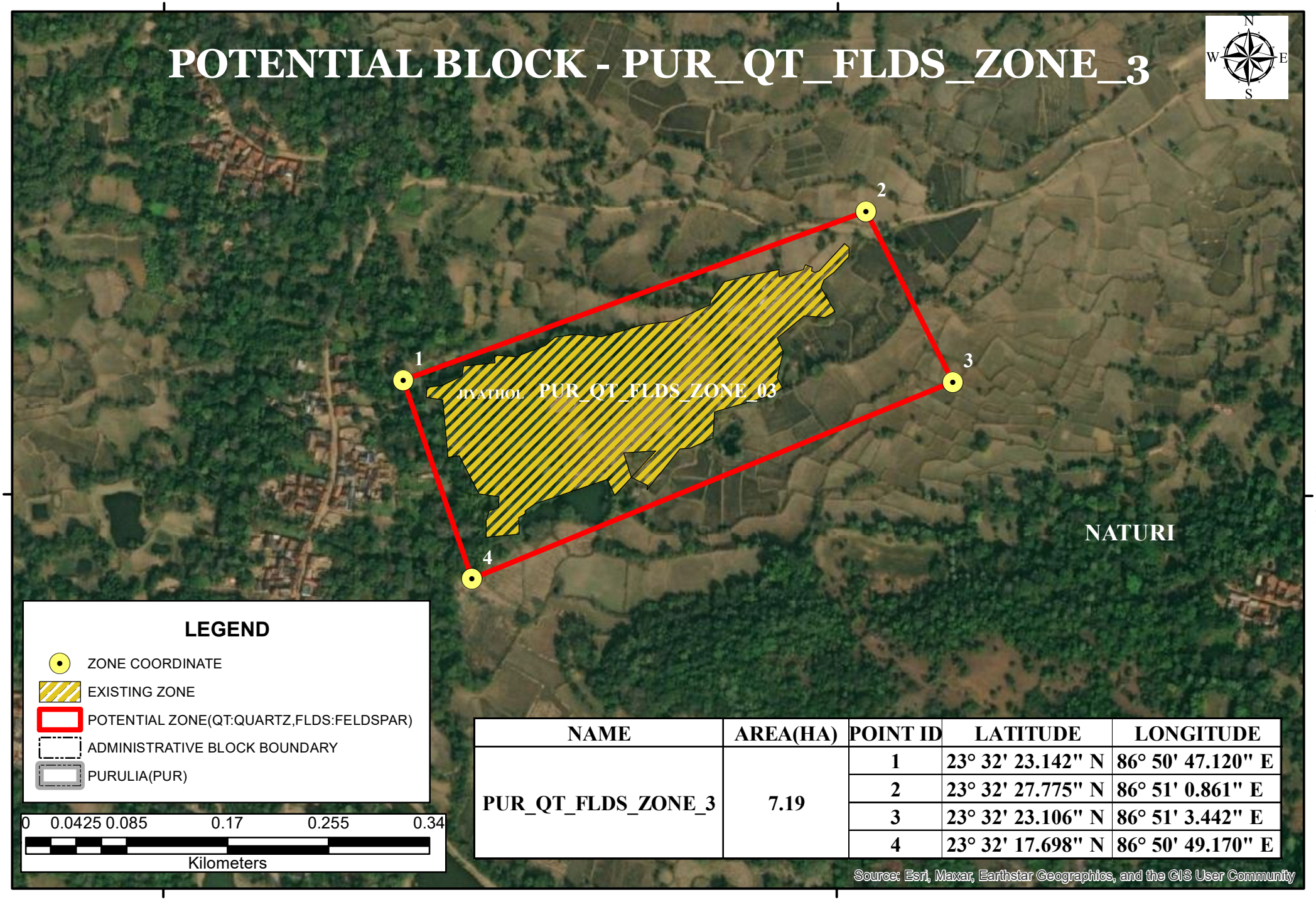
Source: Esri, Maxar, Earthstar Geographics, and the GIS User Community

POTENTIAL BLOCK - PUR_QT_FLDS_ZONE_2



NAME	AREA(HA)	POINT ID	LATITUDE	LONGITUDE
PUR_QT_FLDS_ZONE_2	474.43	1	23° 11' 51.753" N	86° 13' 36.776" E
		2	23° 11' 38.333" N	86° 14' 48.053" E
		3	23° 10' 22.699" N	86° 14' 18.931" E
		4	23° 10' 42.943" N	86° 13' 12.407" E

POTENTIAL BLOCK - PUR_QT_FLDS_ZONE_3



NAME	AREA(HA)	POINT ID	LATITUDE	LONGITUDE
PUR_QT_FLDS_ZONE_3	7.19	1	23° 32' 23.142" N	86° 50' 47.120" E
		2	23° 32' 27.775" N	86° 51' 0.861" E
		3	23° 32' 23.106" N	86° 51' 3.442" E
		4	23° 32' 17.698" N	86° 50' 49.170" E



Annexure 6
SEIAA 77th Meeting (14th October, 2022) Minutes of Meeting

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

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Subject:- 77th meeting of SEIAA

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

From :- 14 October 2022

To :- 14 October 2022

1. Proposal No. :- **SIA/WB/IND2/42446/2018** File No- **EN/T-II-1/071/2019** Proposed Grain based Distillery plant capacity of 120 KLD and 4 MW Co-generation power plant located in Dag Nos. 18, 18/328, 21, 22, 23, 38, 39, 41, 42, 49, 51, 51/318, 52, 56, 57, 58, 61, 62, 64, 65, 67, 69, 70, 71, 72, 73, 75, 120, 88, 89, 119, 121, 122, 24 and 60 of Mouza Kulepairi, P.S Bagnan, District - Howrah, West Bengal by **M/s. Tandhan Biochemicals Private Limited.**	Type-**EC**

INTRODUCTION

The proponent made online application vide proposal no. **SIA/WB/IND2/42446/2018** dated **07 Sep 2019** along with copies of EIA/EMP seeking environment clearance under the provisions of the EIA Notification, 2006 for the above mentioned project. The proposed project activity is listed at SL.No. **5(g) Distilleries** under Category "**B1**" of EIA Notification 2006 and the proposal is appraised at State level.

The project proponent obtained ToR vide No. No. IA-J-11011/80/2018-IA-II(I) dated 05.04.2018 from MoEF&CC.

The project proponent (PP) was requested to appear before SEIAA for hearing in the 49th meeting of SEIAA held on 22.02.2022. The PP gave a presentation before SEIAA. SEIAA considered the presentation and decided that the PP should submit additional submission.

Now the PP has uploaded their submission in PARIVESH Portal on 16.09.2022.

PROJECT DETAILS

The project of M/s **TANDHAN BIOCHEMICALS PRIVATE LIMITED** located in as follows :

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

The production details / project configuration is as follows :

Project configuration/product details						
S. No.	**Project configuration/product details**	**Quantity**	**Unit**	**Other Unit**	**Mode of Transport/Transmission of Product**	**Other Mode of Transport**
(1.)	DISTILLERY	120	4		Road	

submitted that they want to withdraw their present application for ToR as there has been some discrepancies in the Form-I, Form-IA and Conceptual Plan and resubmit it again with corrective measures.

PROJECT DETAILS

The project of M/s **ANUJ GUPTA** located in as follows :

State of the project			
S. No.	**State**	**District**	**Tehsil**
(1.)	West Bengal	Howrah	Domjur

Town/Village : **Baltikuri/Howrah**

The salient features of the project submitted by the project proponent is available at Report under online proposal no. **SIA/WB/MIS/79640/2022**

DELIBERATION IN SEIAA

SEIAA considered the recommendation of SEAC and since the PP has not withdrawn their proposal till date, SEIAA decided to reject the project proposal.

RECOMMENDATIONS OF SEIAA

Rejected the ToR application.

Conclusion

Rejected

MISCELLANEOUS

1. Discussion on draft DSR of **Purulia**.

   DSR of Purulia is approved.

2. Inspection report of WBPCB and reply to show cause notice by Godrej Properties Limited with respect to 'Godrej Prakriti' at 187, B. T. Road, Sodepur, Ward No. 14, Panihati, PIN : 700115, Dist. – North 24 Parganas of M/s. Godrej Properties Pvt. Ltd.

   SEIAA considered the reply dated 23.08.2022 to the show cause notice submitted by the project proponent and also the inspection report dated 21.03.2022 submitted by the WBPCB and decided to intimate the project proponent to be present for a hearing before SEIAA. Representatives of the WBPCB who had conducted the site inspection are also requested to be present during the hearing. MS, SEIAA is requested to inform all concern.

3. Letter from Additional District Magistrate & District Land & Land Reforms Officer, Bankura regarding cancellation of Environmental Clearance vide Memo No. 56/1533/DLEIAA/SC dated 28.12.2016 accorded by District Level Environment Impact Assessment Authority (DEIAA) to M/s. DEAL Construction.

   SEIAA considered the above and observed that a suitable action including cancellation of the mining lease may be done by the office of the ADM (LR), Bankura in the event of violation of EC conditions and illegal mining. Action taken report should be forwarded to SEIAA.

सत्यमेव जयते

Government of India
Ministry of Environment, Forest and Climate Change
(Issued by the State Environment Impact Assessment Authority (SEIAA), WEST BENGAL)
***

Minutes of 33rd meeting of SEIAA (Reconstituted on 17.05.2023) State Environmen t Impact Assessment Authority meeting held from 23/02/2024 to 23/02/2024 **Date:** 06/03/2024

MoM ID:	EC/MOM/SEIAA/450004/2/2024
Agenda ID:	EC/AGENDA/SEIAA/450004/2/2024
Meeting Venue:	Conference Room of Environment Department, Prani Sampad Bhavan, 5th Floor, LB Block, Sector III, Salt Lake, Kolkata 700106.
Meeting Mode:	Physical
Date & Time:	

23/02/2024	02:30 PM	05:30 PM

1. Opening remarks

SEIAA members greeted each other and started discussion point wise as per the agenda.

2. Confirmation of the minutes of previous meeting

Minutes of meeting of 32nd Meeting of SEIAA, WB is uploaded in the PARIVESH 1.0 Portal.

3. Details of proposals considered by the committee

Day 1 -23/02/2024

3.1. Agenda Item No 1:

3.1.1. Details of the proposal

Environmental Clearance of existing Rolling Mill for production of 1500 Ton per month Re-rolled M.S. Items (Fl ats, Angles, Channels etc.) at Dhulagori Industrial Park, Vill - Jala Dhulagori, P.O & P.S - Sankrail, Howrah - 71 1302 by M/s. Giriraj Ispat Pvt. Ltd. (Unit - 1) by **GIRIRAJ ISPAT PRIVATE LIMITED** located at **HOWRAH,W EST BENGAL**

Proposal For		Fresh ToR	
Proposal No	**File No**	**Submission Date**	**Activity (Schedule Item)**
SIA/WB/IND1/457825/20	2N-36/2024(E)	11/01/2024	Metallurgical Industries (ferrous a

	slag.
1.	100 % dolo char generated in the plant shall be used to generate power.
1.	Fourth Hole fume extraction system shall be provided for SAF.WHR system shall be installed to recover sensible heat from flue gases of EAF. Provision for installation of jigging and briquetting plant to utilise the fines generated in the process.
1.	No tailing pond is permitted for Iron ore slimes. Dewatering and filtration system shall be provided.
1.	Action plan for the stock piles with impervious floor, provision of garland drains and catch pits to trap run off material shall be submitted.

4. Any Other Item(s)

4.1.1. Details of the proposal

MISCELLANEOUS 1. Revised DSR of Purulia district. located at **N/A,N/A,N/A**		
Proposal For		N/A
Proposal No	**File No**	
N/A	N/A	

4.1.2. Project Salient Features

null

4.1.3. Deliberations by the EAC in current meetings

Revised DSR of Purulia district is approved.

4.1.4. Recommendation of EAC

Approved

5. List of Attendees

Sr. No.	Name	Designation	Email ID	Remarks
1	Shri Dharmdeo Rai IFS	Member Secretary, SEIAA	env**********@gmail.com	
2	Dr Ashit Kumar Mukherjee	Chairman, SEIAA	ash**********@yaho	
3	Dr Nilangshu Bhusan Basu	SEIAA Member	nb**********@gma	

Validity unknown
Digitally Signed by : Shri Dharmdeo Rai IFS
Member Secretary, SEIAA
Date: 14/03/2024

Annexure 7

Reasons For DSR Modification

DSR AMENDMENT STATEMENT

Objectives for DSR Modification

- The primary need for Modification of DSR is to include in-situ minor mineral potential zones of the district. The government of West Bengal implemented a Policy of Mining of Minor Minerals in Private/ Raiyati Land in West Bengal. The minor mineral (Sand/ other than Sand) mining can only be possible if the potentiality is mentioned in the approved DSR, and then only environmental clearance of the mining block will be granted.
- Also, to in-corporate district boundary revision based on Survey of India database instead of district portal information.

Modifications:

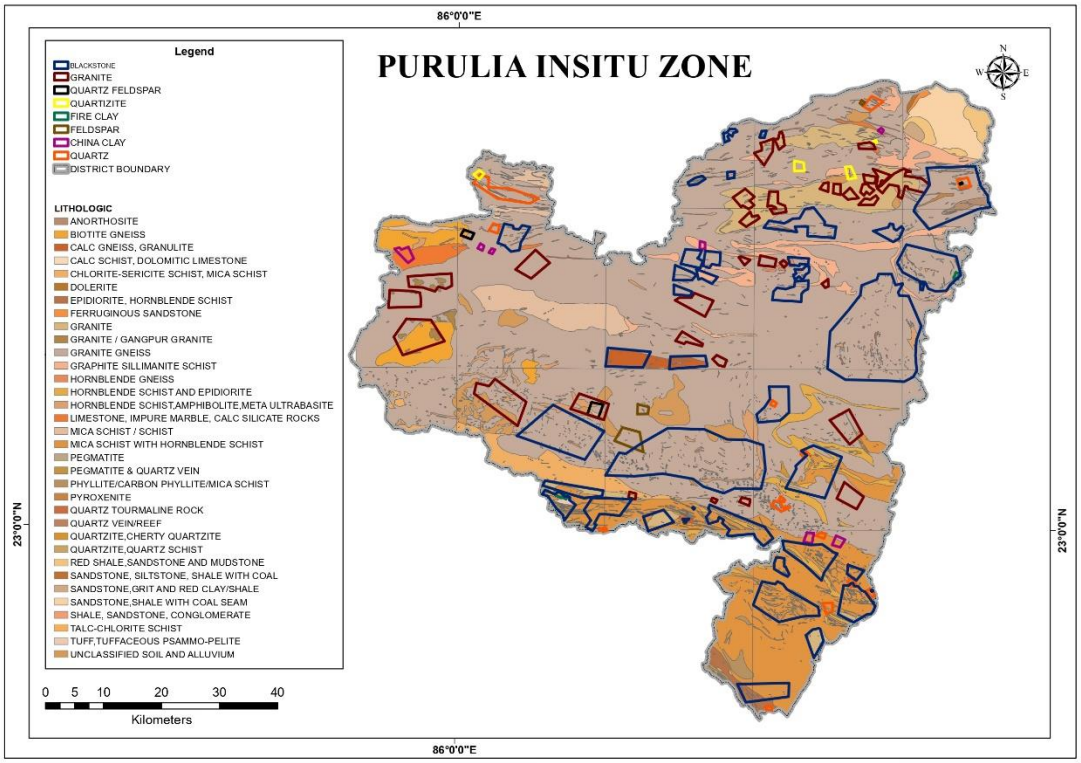
1. Modified text part (Chapters) of the DSR to include both Sand and Other than Sand minerals resources of the district. Amendment DSR contain chapters in following manners.

Table 1: Distribution of chapters in the DSR

GENERAL PART	PART A- RIVERBED DEPOSITS	PART B- INSITU MINOR MINERAL DEPOSITS
General Profile of the District	Overview of mineral resources	In-situ Minerals Reserve and potentiality
Physiography of the District	Sand and other riverbed minerals	Mineral Development Prospect of the district
Land Use Pattern of The District	Drainage System	Existing Minor Mineral Leases of the District
Geology	Annual deposition of riverbed minerals	Exploration Requirement of the district
	Replenishment Study as per EMGSM guidelines 2020	Remedial measure to mitigate the impact of Mining
	Total potential of minor mineral in the river bed	Suggested reclamation plan for already mined out areas
	Overview Of Mining Activity in The District	Risk assessment & disaster management plan
	Details Of Revenue Generated from Mineral Sector During Last Five Years	

2. Modification in In-situ minor mineral potential resources. In-situ potential zones are demarcated based on the available Geological information from GSI and DMM. Wherever possible, potential blocks are also identified based on the LOI issued to various mine owners under West Bengal Raiyati policy. A total 111 potential zone has been demarcated, previously it was 82 nos.

A



B

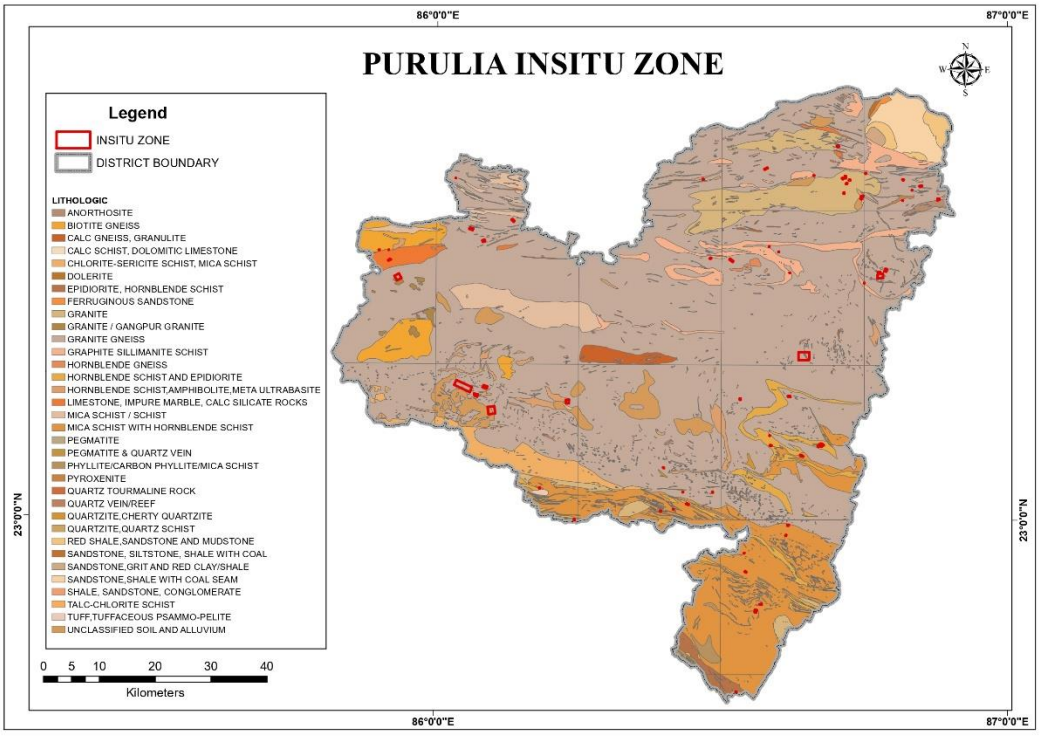


Figure 1: *Map of Insitu potential zones marked on Geological map of Purulia; A: as per amendment DSR and B: as per approved DSR.*

3. Modification/ addition of potential in-situ zones in the DSR is the dynamic process and will be updated on regular basis due effectiveness of Raiyati Policy under which Raiyat are applying for mining leases. Therefore, the changes/ amendment will be made in the DSR on regular intervals to includes mining leases approved by authority.
4. District boundary modified in the amended DSR. Prevoisly district boundary was collected from district portal and in the present DSR boundary was collected from Survey of India and it's verified from district authority for any modification.
5. Hyperlink of District boundary modification

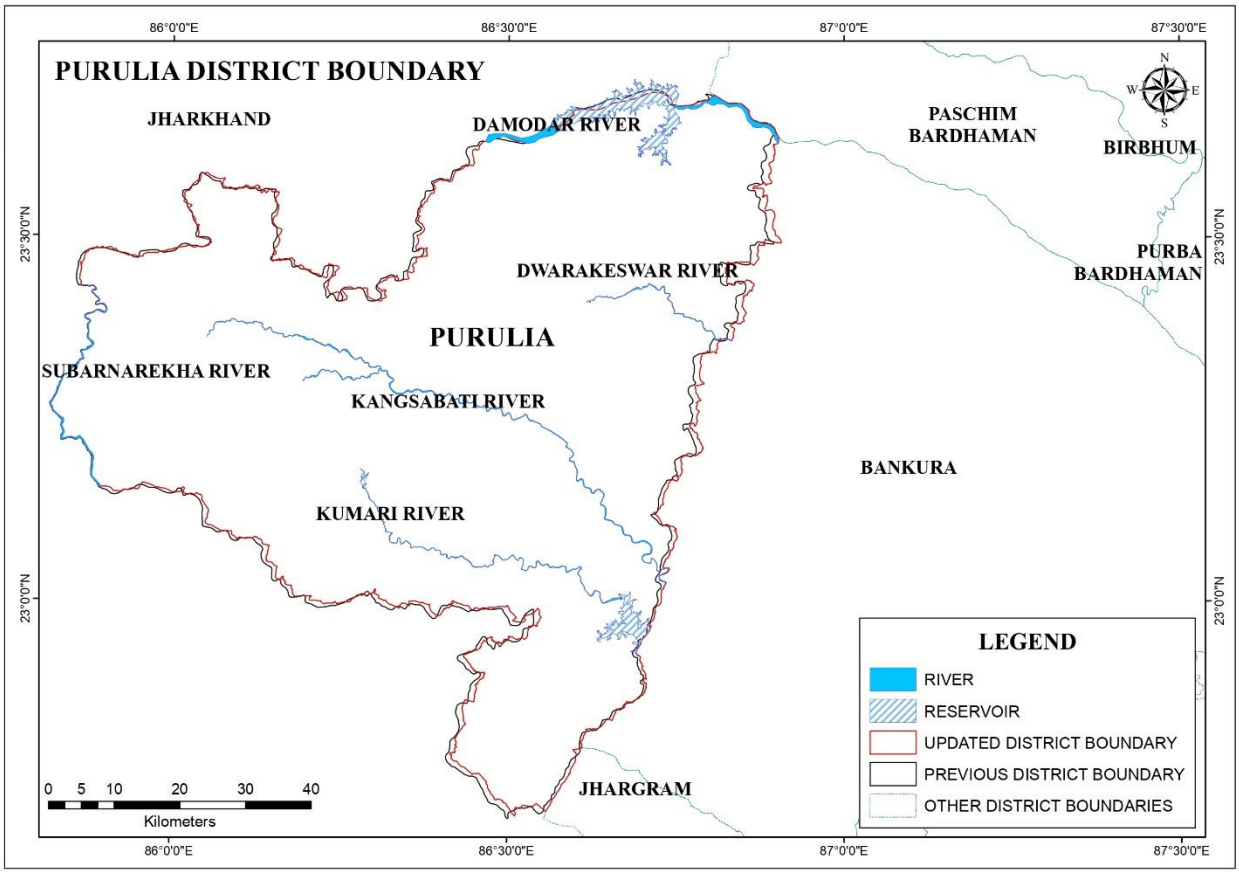
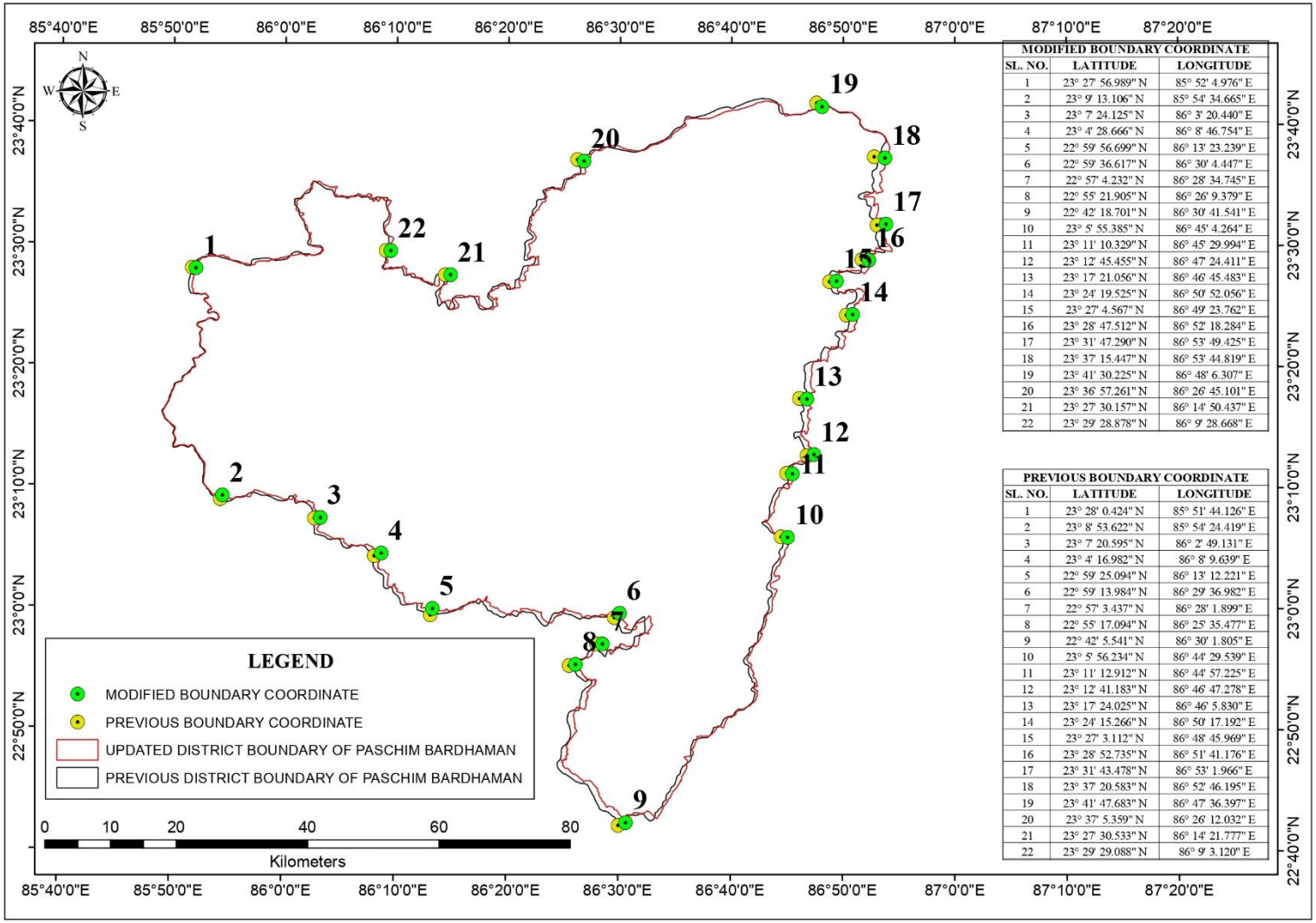


Figure 2: Map showing changes in district boundary



MODIFIED BOUNDARY COORDINATE

SL. NO.	LATITUDE	LONGITUDE
1	23° 27' 56.989" N	85° 52' 4.976" E
2	23° 9' 13.106" N	85° 54' 34.665" E
3	23° 7' 24.125" N	86° 3' 20.440" E
4	23° 4' 28.666" N	86° 8' 46.754" E
5	22° 59' 56.699" N	86° 13' 23.239" E
6	22° 59' 36.617" N	86° 30' 4.447" E
7	22° 57' 4.232" N	86° 28' 34.745" E
8	22° 55' 21.905" N	86° 26' 9.379" E
9	22° 42' 18.701" N	86° 30' 41.541" E
10	23° 5' 55.385" N	86° 45' 4.264" E
11	23° 11' 10.329" N	86° 45' 29.994" E
12	23° 12' 45.455" N	86° 47' 24.411" E
13	23° 17' 21.056" N	86° 46' 45.483" E
14	23° 24' 19.525" N	86° 50' 52.056" E
15	23° 27' 4.567" N	86° 49' 23.762" E
16	23° 28' 47.512" N	86° 52' 18.284" E
17	23° 31' 47.290" N	86° 53' 49.425" E
18	23° 37' 15.447" N	86° 53' 44.819" E
19	23° 41' 30.225" N	86° 48' 6.307" E
20	23° 36' 57.261" N	86° 26' 45.101" E
21	23° 27' 30.157" N	86° 14' 50.437" E
22	23° 29' 28.878" N	86° 9' 28.668" E

PREVIOUS BOUNDARY COORDINATE

SL. NO.	LATITUDE	LONGITUDE
1	23° 28' 0.424" N	85° 51' 44.126" E
2	23° 8' 53.622" N	85° 54' 24.419" E
3	23° 7' 20.595" N	86° 2' 49.131" E
4	23° 4' 16.982" N	86° 8' 9.639" E
5	22° 59' 25.094" N	86° 13' 12.221" E
6	22° 59' 13.984" N	86° 29' 36.982" E
7	22° 57' 3.437" N	86° 28' 1.899" E
8	22° 55' 17.094" N	86° 25' 35.477" E
9	22° 42' 5.541" N	86° 30' 1.805" E
10	23° 5' 56.234" N	86° 44' 29.539" E
11	23° 11' 12.912" N	86° 44' 57.225" E
12	23° 12' 41.183" N	86° 46' 47.278" E
13	23° 17' 24.025" N	86° 46' 5.830" E
14	23° 24' 15.266" N	86° 50' 17.192" E
15	23° 27' 3.112" N	86° 48' 45.969" E
16	23° 28' 52.735" N	86° 51' 41.176" E
17	23° 31' 43.478" N	86° 53' 1.966" E
18	23° 37' 20.583" N	86° 52' 46.195" E
19	23° 41' 47.683" N	86° 47' 36.397" E
20	23° 37' 5.359" N	86° 26' 12.032" E
21	23° 27' 30.533" N	86° 14' 21.777" E
22	23° 29' 29.088" N	86° 9' 3.120" E

Figure 3: Map showing major shifting in district boundary

6. Due to district boundary modification, potential sand bars also changed, and, in some cases, new sandbar added with respect to 2022 satellite images. Changes in sand resources are tabulated below.

Sl. No.	River or Stream	Considered Thickness (m)	Area recommended for mineral potential (as per approve DSR) (sq.km)	Mineable mineral potential (As per approve DSR) (million cubic meter)	Area recommended for mineral potential (as per modified DSR) (sq.km)	Mineable mineral potential (As per Modified DSR) (million cubic meter)	Resource modification (million cubic meter)
1	Damodar	3	1.95	3.51	1.43	2.57	-0.94
2	Dwarakeswar	2.5	0.97	1.46	0.84	1.26	-0.2
3	Kangsabati	2	2.43	2.92	2.94	3.53	0.61
4	Kumari	1.5	0.43	0.38	0.58	0.52	0.14
5	Subarnarekha	1.5	3.38	3.05	1.92	1.3	-1.75

7. Sandbar addition/deletion are highlighted below:

SANDBAR AS PER MODIFIED DSR	SANDBAR AS PAER APPROVED DSR	REMARKS
DAMODAR RIVER		
PUR_NE_DMD_01	PUR_NE_DMD_01	No changes
PUR_NE_DMD_02	PUR_NE_DMD_02	No changes
PUR_NE_DMD_02A	PUR_NE_DMD_02A	No changes
PUR_NE_DMD_03	PUR_NE_DMD_03	No changes
PUR_NE_DMD_04	PUR_NE_DMD_04	No changes
PUR_NE_DMD_05	PUR_NE_DMD_05	No changes
-	PUR_NE_DMD_06	Due to 1000 m buffer around major bridge
DWARAKESWAR RIVER		
PUR_KS_DW_01	PUR_KS_DW_01	No changes
-	PUR_KS_DW_01A	Due to 1000 m buffer around major bridge
-	PUR_KS_DW_01B	Due to 1000 m buffer around major bridge
PUR_KS_DW_03	PUR_KS_DW_03	No changes
PUR_KS_DW_05	PUR_KS_DW_05	No changes
PUR_KS_DW_06	PUR_KS_DW_06	No changes
PUR_KS_DW_07_08_09	PUR_KS_DW_07_08_09	No changes
PUR_KS_DW_10	PUR_KS_DW_10	No changes
PUR_KS_DW_11	PUR_KS_DW_11	No changes
PUR_KS_DW_13	PUR_KS_DW_13	No changes
PUR_KS_DW_13A	PUR_KS_DW_13A	No changes
PUR_KS_DW_14	PUR_KS_DW_14	No changes
PUR_KS_DW_15	PUR_KS_DW_15	No changes
KANGSABATI RIVER		
PUR_M1_KB_01	PUR_M1_KB_01	No changes
PUR_M1_KB_02	PUR_M1_KB_02	No changes
PUR_M1_KB_03	PUR_M1_KB_03	No changes
PUR_M1_KB_03A	PUR_M1_KB_03A	No changes

SANDBAR AS PER MODIFIED DSR	SANDBAR AS PAER APPROVED DSR	REMARKS
PUR_M1_KB_03B	PUR_M1_KB_03B	No changes
PUR_M1_KB_04	PUR_M1_KB_04	No changes
PUR_M1_KB_05	PUR_M1_KB_05	No changes
PUR_M1_KB_06	PUR_M1_KB_06	No changes
PUR_M1_KB_07	PUR_M1_KB_07	No changes
PUR_M1_KB_08A	PUR_M1_KB_08A	No changes
PUR_PU_KB_10A	PUR_PU_KB_10A	No changes
PUR_PU_KB_11	PUR_PU_KB_11	No changes
PUR_PU_KB_12	PUR_PU_KB_12	No changes
PUR_PU_KB_13	PUR_PU_KB_13	No changes
PUR_PU_KB_14	PUR_PU_KB_14	No changes
PUR_PU_KB_14A	PUR_PU_KB_14A	No changes
PUR_HU_KB_15	PUR_HU_KB_15	No changes
PUR_PU_KB_15A	PUR_PU_KB_15A	No changes
-	PUR_PU_KB_15B	Due to 1000 m buffer around major bridge and concave convex zone
PUR_HU_KB_15C	PUR_HU_KB_15C	No changes
PUR_HU_KB_15D	PUR_HU_KB_15D	No changes
PUR_P1_KB_16	PUR_P1_KB_16	No changes
PUR_P1_KB_16A	PUR_P1_KB_16A	No changes
PUR_P1_KB_17	PUR_P1_KB_17	No changes
PUR_P1_KB_17A	PUR_P1_KB_17A	No changes
PUR_P1_KB_18	PUR_P1_KB_18	No changes
PUR_P1_KB_19	PUR_P1_KB_19	No changes
PUR_P2_KB_19A	PUR_P2_KB_19A	No changes
PUR_P2_KB_20_22	PUR_P2_KB_20_22	No changes
PUR_P1_KB_21	PUR_P1_KB_21	No changes
PUR_P1_KB_22A	PUR_P1_KB_22A	No changes
PUR_P1_KB_23	PUR_P1_KB_23	No changes
PUR_P2_KB_23A	PUR_P2_KB_23A	No changes
PUR_P2_KB_24	PUR_P2_KB_24	No changes
PUR_P2_KB_24A	PUR_P2_KB_24A	No changes
PUR_P2_KB_25	PUR_P2_KB_25	No changes
PUR_P2_KB_26	PUR_P2_KB_26	No changes
PUR_P1_KB_27	PUR_P1_KB_27	No changes
PUR_P1_KB_28	PUR_P1_KB_28	No changes
PUR_P1_KB_30	PUR_P1_KB_30	No changes
PUR_P1_KB_31	PUR_P1_KB_31	No changes
PUR_P1_KB_31A	PUR_P1_KB_31A	No changes
PUR_P1_KB_32	PUR_P1_KB_32	No changes
PUR_P1_KB_33	PUR_P1_KB_33	No changes
PUR_AR_KB_33A	PUR_AR_KB_33A	No changes
PUR_P1_KB_33B	PUR_P1_KB_33B	No changes
PUR_P1_KB_34	PUR_P1_KB_34	No changes
PUR_JR_KB_35	PUR_JR_KB_35	No changes
PUR_JR_KB_36	PUR_JR_KB_36	No changes
PUR_JR_KB_36A	PUR_JR_KB_36A	No changes
PUR_J2_KB_37	PUR_J2_KB_37	No changes
PUR_J2_KB_37A	PUR_J2_KB_37A	No changes

SANDBAR AS PER MODIFIED DSR	SANDBAR AS PAER APPROVED DSR	REMARKS
PUR_AR_KB_37B	PUR_AR_KB_37B	No changes
PUR_J2_KB_38	PUR_J2_KB_38	No changes
PUR_J2_KB_38A	PUR_J2_KB_38A	No changes
KUMARI RIVER		
PUR_BR_KR_01	PUR_BR_KR_01	
	PUR_M1_KR_03	Due to 1000 m buffer around major bridge and concave convex zone
PUR_M1_KR_03A	PUR_M1_KR_03A	No changes
PUR_M1_KR_03B	PUR_M1_KR_03B	No changes
PUR_M1_KR_04	PUR_M1_KR_04	No changes
	PUR_M1_KR_05A	Due to 1000 m buffer around major bridge and concave convex zone
PUR_M1_KR_06	PUR_M1_KR_06	No changes
PUR_M1_KR_09_10	PUR_M1_KR_09_10	No changes
PUR_M1_KR_11	PUR_M1_KR_11	No changes
PUR_M1_KR_12	PUR_M1_KR_12	No changes
PUR_M1_KR_13	PUR_M1_KR_13	No changes
PUR_M1_KR_13A	PUR_M1_KR_13A	No changes
SUBARNAREKHA RIVER		
PUR_BG_SR_01_02	PUR_BG_SR_01_02	No changes
PUR_BG_SR_03	PUR_BG_SR_03	No changes
PUR_JL_SR_04_05_06	PUR_JL_SR_04_05_06	PUR_JL_SR_04_05_06 breaks into PUR_JL_SR_04_05_06 and PUR_JL_SR_04_05_06A due to bridge buffer area
PUR_JL_SR_04_05_06_A		
PUR_JL_SR_07	PUR_JL_SR_07	No changes
PUR_JL_SR_08	PUR_JL_SR_08	No changes
PUR_JL_SR_08A	PUR_JL_SR_08A	No changes
PUR_JL_SR_09	PUR_JL_SR_09	No changes