भूजल सूचना पुस्तिका

पूर्बी सिंघभूम जिला, झारखंड

Ground Water Information Booklet

East Singhbhum District, Jharkhand State

AUTO FLOW BORE WELL LOCATED AT VILLAGE KUDADA

केन्द्रीय भूमिजल बोर्ड

जल संसाधन मंत्रालय

(भारत सरकार)

राज्य एकक कार्यालय, राँची

मध्य-पूर्वी क्षेत्र

पटना

Central Ground water Board

Ministry of Water Resources

(Govt. of India)

State Unit Office,Ranchi

Mid-Eastern Region

Patna

सितंबर 2013

September 2013

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GROUND WATER INFORMATION OF EAST SINGHBHUM DISTRICT, JHARKHAND STATE

Contents

List of Tables:

List of Figures:

DISTRICT AT A GALANCE
(EAST SINGHBHUM DISTRICT)

Sl No.	ITEMS	Statistics
1.	GENERAL INFORMATION	
	i) Geographical Area (Sq km.)	5566.90 Sq. km.
	(16) Administrative Divisions (As on 2012) Number of Block Number of Panchyat / Villages	 9 200/1788
	(ii) Population (As on 2011 Census)- in lakhs	22, 93, 919
	(iii) Average Annual Rainfall (mm)	1304 mm
2.	GEOMORPHOLOGY	
	Major Physiographic units	
	Major Drainages	Subarnarekha
3.	LAND USE (Sq Km.)	
	a) Forest area:	1228.2
	b) Net area sown:	832.8
	c) Cultivable area:	1479.5
4.	MAJOR SOIL TYPES	Alfisols (Mixed red &black soil ,Red gravelly & sandy soils)Light to medium texture Moderately Acidic Poor fertility
5.	AREA UNDER PRINCIPAL CROPS	Pulses – 7.12 Oilseed – 1.51 Paddy – 1608.54
6.	IRRIGATION BY DIFFERENT SOURCES (Areas and Number of Structures)	
	Dug well	No. 1019 Potential utilized 819 ha area
	Tube wells /Bore wells	No. 617 Potential utilized 1418 ha area
	Other Sources (Surface water)	Potential utilized 10572 ha area
7.	NUMBERS OF GROUND WATER MONITORING WELLS OF CGWB (As on 31-03- 2013) No of Dugwell No. of Piezometers	 15 Nil
10.	PREDOMINANT GEOLOGICAL FORMATIONS	CGG, Phyllite, schists, Quartzite, Metamorphosed, Lawa, Gray & Clay

11		
	➢ Major Water bearing formation ➢ (Pre-monsoon Depth to water level during 2012) ➢ Post-monsoon Depth to water level during 2012) ➢ Long term water level trend in 10 yrs (2003-2012) in m / yr. Pre monsoon Post monsoon All season	Weathered and fractured granite gneiss and metasediments 3.96 – 14.85 mbgl 1.10 – 13.85 mbgl Rise = 0.030 – 0.774 Fall = 0.083 – 0.386 Rise = 0.001 – 1.301 Fall = 0.024 – 0.712 Rise = 0.067 – 0.944 Fall = 0.006 – 0.820
12.	GROUND WATER EXPLORATION BY CGWB (As on 31-03-07)	
	No. of wells drilled (EW, OW, PZ, SH, Total	EW – 22 OW – 04 PZ - 02
	Depth Range (m)	9.48 – 300.88
	Discharge (m^3/hr)	2.7 - 78
	Storativity (S)	1.30×10^{-4} to 6.91×10^{-4}
	Transmissivity (m^2/day)	207.7 to 570.8
13.	GROUND WATWER QUALITY	Good
	Presence of Chemical constituents more than permissible limit (e.g. EC, F, As, Fe	EC 286 to 2400 micro mhos/cm at 25^0 C.
	Type of Water	
14.	DYNAMIC GROUND WATER RESOURCES (2009) in ham	217 mcm / year
	Net Annual Ground Water Availability	27155.60
	Gross Ground Water Draft for all uses	5633.00
	Projected Demand for Domestic and Industrial uses up to next 25 years	4965.99
	Stage of Ground Water Development	20.74 %
15.	AWARENESSS AND TRAINING ACTIVITY	
	Mass Awareness Programmes Organized Date Place No. of Participants	March 2010 (detail not available)

	Water Management Training Programmes Organized Date Place No. of Participants	1 (detail not available)
16.	EFFORTS OF ARTIFICIAL RECHARGE & RAINWATER HARVESTING	
	Projects completed by CGWB (No & Amount spent)	Nil
	Projects under technical guidance of CGWB (Numbers)	Nil
17	GROUND WATER CONTROL AND REGULATION	
	Number Of OE Blocks	1
	No. of Critical Block	Nil
	No. of Blocks notified	Nil
18.	MAJOR GROUND WATER PROBLEMS AND ISSUES	Nil

“Ground Water Information Booklet”
East Singhbhum district, Jharkhand state

1.0 Introduction

1.1 Introduction

East Singhbhum District is situated at the extreme corner of the southeast of Jharkhand. It has been formed after isolating 11blocks from greater Singhbhum on 16th January 1990. From the industrial growth and mining quarrying point of view district has a leading position in Jharkhand. Legendly it is said that in the past large number of lions were found in this area. Subsequently this geographical area has been named as Singhbhum "Land of Lions". Before independence the same area of this district was a part of old Manbhum District and Old Dhalbhum Estate. After independence it has been merged with the Greater Singhbhum.

`The nomenclature of East Singhbhum or Purbi Singhbum means 'Abode of Lions'. Occupying an area of 3533 sq. km and located in the Chotanagpur Plateau in Jharkahand, the district encompasses 86° 04' and 86° 54' East Longitudes and 22°12'and 23 °01' North latitudes. It falls under survey of India toposheet No. 73 J/01-03, J/05-12, J/14-16.

The district headquarter is at Jamashedpur. The district comprises of eleven blocks, 200 Gram Panchayat and 1788 villages. It has 11 developed blocks namely (1) Patamda, (2) Jamshedpur (3) Potka (4) Ghatshila, (5) Musabani, (6) Chakulia, (7) Dalbhumgarh, (8) Baharagora and (9) Dumaria (10)

Boram and (11) Gurbandha. The administrative division of the district is shown in figure 1.

1.2 Demography

As per census of 2011, the total population of the district was 2293919 persons. The total urban population is 1274591 persons where as the total rural population is 1019328 persons. The administrative division and population of the district is given in table – 1.

1.3 Physiography and Drainage: - About 53% of the total area of the district is covered by residual mountains and hills consisting granite, gneiss, schist and basalt rocks.Generally the height of the district is 213m. to 945 m above sea level. East Singhbhum district has large variation in slope. Five slope ranges are observed. It varies from 150-300 m/km.,80-150 m/km.,20-80 m/km,10-20m/km. and less than 10m/km. Dalma hill extends from North-west to south-east about 70 km. in length and 5km. in width. It has slope 150-300 m/km. Hilly area of Dumaria block also come under this category. Next slope range is between 80-150 m/km. This slope range is in Patamda, Jamshedpur sadar and Ghatsila blocks.20-80 m/km. slope is found in small patches of Mosabani and Chakulia blocks. Potka block, Dhalbhumgarh block,major portion of Chakulia block and Bahragora blocks are categorized between slope 10-20m/km. Easternmost portion of Chakulia and bahragora block has slope less than 10m/km.

The Subernarekha river flows from west to south-east direction. All the tributaries of this area meet with the Subernarekha river. Drainage pattern is dendritic in nature. Drainage of Patamda blocks do not meet in Subranrekha River. Kharkai River meets Subarnrekha river at Sonari near Jamshedpur. Major tributaries which meet Subarnrekha river from west to east are Sapnara nadi, Garra nadi, Dudh nadi, Chakdaha nadi**.** The drainage map of the district is shown in figure 2.

1.4 Irrigation: - Dug wells, ponds, tanks are the main sources of irrigation. Land distribution pattern of the district is such that major chunk of irrigated land is owned by some few farmers. As per the 4thMIP census data, there are 6220 dug wells irrigating 2376 ha of area. Irrigation from wells is confined to cultivation with the bari lands adjacent to the village site The different source wise irrigation in the district is given below

Source Wise Irrigation in East Singhbhum district (4th Minor Irrigation Census, 2006-07)

Name of Scheme	Number	Irrigation Potential Created (ha)	Irrigation Potential Utilized (ha)
Dug well	1019	1228	819
Shallow Tube Well	541	1600	1219
Deep Tube Well	76	233	199
Surface flow Schemes	1634	5760	3543
Surface lift Schemes	488	2799	1743

Source:- Directorate of Statistics, GOJ

1.5 Previous Studies: Central Ground Water Board has established a network of observation wells (15 nos.) under National Hydrograph Network programme to study the behavior of ground water level and quality of ground water in the district. The ground water management study has been carried out during the year 2009 – 10 of the district and field data was collected for the study of ground water conditions in respect of quality and quantity. The board has also carried out exploratory drilling in the district under different annual action plan from 1975 to till date and drilled 22 EW and 02 OW to know the sub – surface geology, depth and thickness of water bearing formation with their yield and determine the different aquifer parameters which are presented in table - 2. In addition 02 piezometers were drilled the district by Central Ground Water Board.

2.0 Climate and rainfall: The climate of this region may be considered as extreme, being intensely hot in summer and moderately cold in winter. The climate of the area is also characterized by a hot dry summer and well-distributed rains in the monsoon season. The cold season commences from December and lasts till the end of February. The hot season follows thereafter and continues till about the third week of June. The southwest monsoon season is from the middle/end of June to the end of September. The Climate of the district is temperate. Annual rainfall is 1200 mm to 1400 mm. This area comes under the path of south-west monsoon so sometimes it receives heavy rain during July to September. During the summer seasons maximum temperature goes up 40 ^{0}C - 45^0 C whereas in winter it has recorded a minimum of 8^0 C.

3.0 Soil: Five types of soils are found in the district

1. Red gravelly,
2. Red sandy,
3. Red loamy,
4. Red and Yellow
5. Lateritic soil.

Red gravelly soil is found in Chakulia block and parts of Bahragora blocks. Red sandy soil is observed in Mosabani,Parts of Jamshedpur and Dumaria blocks.Red loamy soil is found in parts of Bahragora,Dhalbhumgarh and Jamshedpur sadar blocks.Red and Yellow soil is found in Patamda and Potka blocks. Lateritic soil is found in small patch of Bahragora block.

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4.0 Geology: East Singhbhum district has remarkably unique geological history. From Beharagora in the South East up to East of Jamshedpur a major thrust zone is present which further enters in to Saraikela Kharsawan district. The shear zone separates a northern terrain of highly metamorphosed rocks and southern terrain of relatively less metamorphosed rocks. Sarkar and Saha (1977) have shown that this shear zone separates two Precambrian provinces of the Indian shield: an older province in the south which stabilized after the Iron ore orogenic cycle closing about 2900 million years ago and younger province in the north that underwent the Singhbhum orogenic cycle closing at about 850 million years ago.

The study area is situated in the south of this thrust zone and a general stratigraphic sequence of this area is given below-

Geology of East Singhbhum District

Age Group	**Lithology**
Tertiaries	Gravel bed, older alluvium
Dalma Volcanics Lower proterozoic	Epidiorite, Hornblende Schist, Volcanics tuffs,Quartzite,Carbon phyllite
Singhbhum group	Mica schist , phyllite,Quartzite Singhbhum granite

The rock succession of the tract in the south of the shear zone consists of a lower Archaean basement of older metamorphic group invaded by the Biotite tonalite gneiss. The iron ore group was deposited over lower Archaean basement. These rocks were folded about NNE to NNW trending fold axes and low grade metamorphism culminating in the emplacement of the Singhbhum Granite(iron ore orogeny) After a long period of erosion , rocks of Singhbhum and Gangpur group were laid down along the northern edge of the stabilized iron ore Craton. The proposed plant area is situated within the batholithic mass of Singhbhum granite. The batholiths consist of several domed up intrusive (Saha.1975) varying in composition from biotite granidiorite to adamalite and leuco granite. The main mass of Singhbhum granite shows a distinct N-S or NNE-SSW foliation in parallelism with the foliation of the host rocks of the iron ore group. The district is underlain by a variety of rock type ranging in age from Archean to Tertiary. Major part of the area is occupied by granites, granite-gneiss, phyllites, schists, quartzites, metabasics and basic lavas.

5.0 Ground Water Scenario

5.1 Hydrogeology: - The ground water occurrence and movement is basically controlled by the prevailing morphology and intensity of structural discontinuities. The intensity of joints, fractures, foliation planes are more along anticlinal or synclinal flexures. Therefore structure is another controlling factor for occurrence and movement of ground water over the area.

The rainfall is the main source groundwater recharge in the area. The inconsistency between fracture zone is complicated in nature. The ground water therefore moves slow and find its way through the fractures and open joints. the area is underlain by unconsolidated to semi-consolidated sediments of Tertiary age which are made up of coarse sand, gravel, fine to medium sand and clay.In hard rock ares, ground water occurs within the weathered zone (10-25 m thickness) and in the underlying fractures/joints. The ground water occurs both under unconfined condition and semi confined to confined condition. The unconfined condition exists in the weathered mantle portion of the rocks. Depth of weathered mantle varies from 15-34 m in general. Hydrogeological mapof the district is shown in figure 3.

5.1.1 Depth to Water Level: -

There are 16 National Hydrograph Stations (NHS) have been established by Central Ground Water Board for the study of behavior of the water level and their fluctuation.

Pre monsoon depth to water level: - On the basis of the depth to water level of the year 2012 - 13 (table – 2), the pre monsoon depth to water level was monitored between 3.96 to 14.85 mbgl. Majority of the wells (41.67%) fall in the water level range of 6 - 9 mbgl. Pre monsoon depth to water level map (May 2012) is prepared and shown in fig.-4.

Post monsoon depth to water level: - On the basis of the depth to water level of the year 2012 – 13, the post monsoon depth to water level ranges between 1.10 to 13.85 mbgl. About 50% of the wells fall in the water level ranges

between 3 – 6 mbgl. Post monsoon depth to water level map (Nov. 2012) is prepared and shown in figure 5.

5.1.2 Seasonal Fluctuation:- From the pre monsoon and post monsoon depth to water level data collected during May 2012 and November 2012 respectively, water level fluctuation were computed for all NHS of the district. The water level fluctuation between pre monsoon and post monsoon period of the district varies from 3.85 to 12.45 m.

5.1.3 Exploratory wells: To understand the sub – surface geology, identify the various water bearing horizons including their depth location and thickness and compute the hydraulic characteristics such as Transmissivity and Storativity of the aquifers, 22 exploratory and 2 observation wells have been drilled in the district under different exploratory drilling programme from annual action plan 1975 to 2003. The depth of exploratory wells ranges between 27.64 to 300.88 mbgl. The static water level of these exploratory wells varies from 1.60 to 35.22 mbgl. The exploratory wells are shown in hydrogeological map of the district (figure – 3)

5.1.4 Long term water level trend: - Water level depends upon the storage of ground water development and variation in rainfall over a long period. Central Ground Water Board has established eleven numbers of National Hyrdograph Stations (NHS) for the study of water level behavior in the district. The water level data of each station has been analyzed. The pre monsoon and post monsoon long term water level trend has been calculated for the period of 2003 – 2012 (Table 4). The long term water level trend is showing rising trend between 0.030 – 0.774, 0.001 – 1.301 and 0.067 – 0.944 m/ year for pre monsoon, post monsoon and all period respectively. Similarly, the long term water level trend is showing declining trend between 0.083 – 0.386, 0.024 – 0.712 and 0.006 – 0.820 m/ year for pre monsoon, post monsoon and all period respectively. About 41.67% of the wells showing declining trend for pre monsoon period, 41.67%

wells showing declining trend for post monsoon period and 58.33% wells showing declining trend for all the period.

5.2 Ground Water Resources: Based on the recommendation of the Ground Water Estimation Committee – 1997 (GEC – 1997), Block wise the ground water resource assessment has been evaluated (March 2009). The net annual ground water availability of the district is 27155 ham. The gross ground water draft for all uses of the district is 5633.00 ham. The net ground water availability for future irrigation development for the district is 19843.85 ham. Out of 9 blocks, one block falling under over exploited and rest of the eight blocks of the district falling under "Safe" category. The stage of ground water development varies from 6.84% to 131.39% (table – 6). Block wise (except new blocks) stage of ground water development is shown in figure- 6.

5.3 Ground Water Quality: To evaluate the quality of ground water, samples have been collected from representative NHS (dug wells) during the month of May 2011. These samples have been considered to assess the chemical quality of ground water and its suitability for drinking and irrigation purposes. The samples represent the quality of phreatic zone or the shallow zone. The ground water samples were analysed for major chemical constituents by using standard procedure at chemical laboratory in CGWB, MER, Patna. Analysed results are given in table 5.

The results of ground water samples were evaluated in accordance with the standard (ISI – 1993) for drinking purpose. In general the quality of ground water in the phreatic aquifer is acceptable except one sample chloride and four samples nitrate concentration more than permissible limit. The EC value ranges from 286 – 2400 micro Siemens/cm at 25^0c.

5.4 Status of Ground Water Development: The overall ground water development of the district is only 20.74%. Thus, there is sufficient scope for shallow as wells deep bore wells. State Govt. Agency has been constructed a

large number of bore wells to minimize the drinking water problem in the district. Central Ground Water Board has been drilled 22 exploratory bore wells and 02 observation bore wells in the district. The depth of bore wells ranges between 27.64 – 300.88 mbgl. The yield of bore wells ranges from 2.7 to 78 m^3/hr. The detail of exploratory bore wells drilled by Central Ground Water Board is given in table -2.

6.0. Ground Water Management Strategy

6.1. Ground Water Development: Dug wells and shallow to medium depth (upto 50 m) bore wells are the main ground water extraction structures in the area to meet the increasing demand of domestic water supply. The overall ground water development stage of the district is 20.74% only. Thus, there is sufficient scope for development of ground water through dug wells, shallow and medium depth bore wells.

Construction of dug cum bore well structure is also suitable for enhance the yield of dug wells in respect of cost beneficial and economical. The ground water development varies in different places depending on the availability of favorable locations. For the construction of ground water structures, knowledge of the local as well as regional hydrogeological condition of the area is necessary.

For potential available for the ground water development considering the ground water draft has been worked out as per norms of Ground Water Estimation Committee – 1997 (GEC – 1997) and the details of ground water recharge, net annual ground water availability, annual draft, net ground water balance and stage of ground water development has been assessed and presented in table -6.

6.2 Water Conservation and Artificial Recharge: In view of the increasing thrust on development of ground water resources, there is urgent need to augment the depleting ground water resources. This gets augmented through

natural recharge and can be augmented in an increased scale through artificial recharge. From hydrogeological point of view, rain water conservation is needed to arrest decline in ground water levels and to improve ground water quality by dilution. The construction of water conservation structures and artificial recharge structures depends on the topographic features, hydrological and hydrogeological conditions of the area. The artificial recharge through roof top rain water harvesting practice may be implemented in Giridih urban area to arrest decline in ground water level. About 58.33% of the wells showing declining trend for pre monsoon period, 58.33% wells showing declining trend for post monsoon period and 41.67% wells showing declining trend for all the period. Thus, all the blocks required for artificial recharge through ckeck dam, percolation tank, nala bandhara, gabion structures and contour bunding and trenching.

7.0 Ground Water Related Issue and Problems: As per the result of chemical analysis of water samples collected from NHS, the chloride concentration is found more than permissible limits in shallow aquifer in village Kalikapur. The long term water level trend of NHS is showing declining trend in more than 50% wells for pre monsoon period and post monsoon period. Similarly, the long term water level trend of NHS is showing declining trend in 41.67% well for all period.

8.0. Awareness and Training Activity

8.1 The Mass Awareness Programme (MAP) by CGWB: 1 (March 2010)

8.2 Participation in Exhibition, Mela, Fair etc. - Nil

8.3 Presentation and Lecture deliver in public forum / Radio / T.V / Institution of repute / Grassroots association / NGO / Academic institution etc. – Nil

9.0 Area Notified by CGWA / CGWB: As per the ground water resource assessment evaluated, all blocks of the district falling under the safe category. Thus, the authority has not been notified any blocks.

10.0 Recommendation: On the

1. As the district is dominated by small and marginal farmers. Dugwell and shallow borewell should be given importance for ground water development. It requires less capital investment and maintenance cost. Loans and subsidies should be provided to the small and marginal farmers for construction of ground water structure.
2. From observation, it is evident that few parts of Jamshedpur Sadar block have been contaminated by Fluoride concentration. As preventive measures, hand pumps contaminated with fluoride should be red marked. Chemical analysis on regular basis must be carried out to confirm any changes in its concentration.
3. Ground Water user association may be constituted for overall operational maintenance of the ground water structure.
4. The importance of water harvesting and artificial recharge is needed to be mention. Especially in Jamshedpur urban area, Baharagora and Chakulia blocks. Suitable artificial recharge structure like percolation tank, gully plugging and sub surface dykes should be constructed at carefully selected sites to enhance the local ground water potentiality and sustainability.
5. In certain patches the dug wells go dry during the summer. In such places the well should be deepened so that it taps the entire saturated thickness of weathered residuum.
6. Lineaments have proven their worth as good ground water storage and yielding zone. They should be carefully demarcated up to the finest level with the help of satellite imageries in large scale.

TABLE 1: ADMINISTRATIVE DIVISION AND POPULATION (CENSUS 2011) OF EAST SINGHBHUM DISTRICT, JHARKHAND

Sr. No.	Block	Rural population			Urban population		
		Male	Female	Total	Male	Female	Total
1	Patamda	41751	41125	82876	--	--	--
2	Boram	35142	33871	69013	--	--	--
3	Golmuri-Cum-Jugsalai (Jamshedpur)	52218	50405	102623	602229	555349	1157578
4	Ghatshila	45006	44275	89281	20912	19712	40624
5	Potka	94601	94526	189127	5317	5168	10485
6	Musabani	28662	28824	57486	25594	24004	49598
7	Dumaria	31043	31085	62128	--	--	--
8	Dhalbhumgarh	31309	30623	61932	--	--	--
9	Gurbandha	21703	21298	43001	--	--	--
10	Chakulia	54960	53850	108810	8352	7954	16306
11	Baharagora	78103	74948	153051	--	--	--
Total		514498	504830	1019328	662404	612187	1274591

TABLE 2: DETAILS OF EXPLORATORY WELLS DRILLED IN EAST SINGHBHU DISTRICT (As on March'2003)

Sl No	Location	Block	Co-ordinate	Depth Drilled (mbgl)	Length of Casing pipe (m)	Granular Zone / fracture Tapped (m)	Static Water level (m bgl)	Discharge (m^3/hr)	Drawdown (m)	Specific Capacity (m^3/hr/m)	T (m^2/day)	S
1	2	3	4	5	6	7	8	9	10	11	12	13
1	MANUSMURIA EW	Baharagora	$22^0$21'50" $86^0$46'40"	121	-	032.00-036.00 043.00-047.50	12.34	57	10.98	5.19	209	$1.30X10^{-4}$
2	BAHARAGORA EW	Baharagora	$22^0$16'10" $86^0$44'10"	99.26	-	050.00-054.00 071.00-078.00 020.00-025.00	3.63	78	14.44	5.4	570.8	-
3	KANIMAHULI EW	Potka	$22^0$40'30" $86^0$13'10"	27.64	-	061.00-073.00 ABANDONED	-	-	-	-	-	-
4	ULDA EW-1	Potka	$22^0$39'05" $86^0$10'20"	137.9	16.25	040.91-041.91 065.77-066.77 072.00-073.00	-	32.97 (A.C.)	-	-	-	-
	OW_1			171.49	13.5	034.00-035.00 094.00-097.00 146.00-147.00	-	27	-	-	-	-
	OW_2			113.82	13.62	028.00-030.00 043.00-045.00 058.00-068.00	-	89	-	-	-	-
	PZ_1			9.48	5.81	-	-	-	-	-	-	-
	PZ_2			18.11	12	-	-	-	-	-	-	-
5	HESEL EW_1	Potka	$22^0$27'30" $86^0$09'10"	204	3.86	039.00-040.00 057.00-060.00 083.00-084.00	2	13.24	45.84	0.29	4	-

						105.00-106.00 *131.00-132.00* *140.00-141.00*						
	EW_2			*300.81*	*23*	*040.00-041.00* *230.00-232.00*	*5.42*	*5.4*	*24.68*	*0.22*	*6*	*-*
	OW_1			*300.88*	*10*	*030.00-031.00*	*-*	*2.7*	*-*	*-*	*-*	*-*
6	***KUDADA*** *EW*	***Jamshedpur***	*$22^0$45'04"* *$86^0$12'23"*	*145.41*	*15.6*	*045.00-046.00* *105.00-106.00* *117.00-118.00*	*2.42*	*45.04*	*18.21*	*-*	*19*	*$6.91X10^{-4}$*
7	***Kalaphather*** *EW*	***Chakulia***	*$22^0$24'40"* *$86^0$46'23"*			*137.00-139.00*	*4.7*	*(Air comp)* *44*	*13.75*		*207.7*	
8	***Chakulia*** *EW*	***Chakulia***	*$22^0$29'20"* *$86^0$43'20"*				*23.04*	*18*	*13.64*			
9	***BARAJURI***	***Chakulia***	*$22^0$27'10"*	*198*					*5*			
	BHARAT SEWASHRAM SANGH *EW*	*$86^0$43'10"*										
10	***SABARNAGAR***	***Potka***	*$22^0$33'05"*	*138.82*					*49*			
	BHARAT SEWASHRAM SANGH *EW*	*$86^0$19'20"*										
11	***DABANKI***	***Potka***	*$22^0$37'15"*	*200.82*					*27*			
	BHARAT SEWASHRAM SANGH *EW*	*$86^0$16'30"*										
12	***KENDADIH***	***Mosabani***	*$22^0$36'30"*	*200.82*					*2.7*			
	GSI Camp *EW*		*$86^0$24'47"*									

13	***PATHARGORA*** *GSI Camp EW*	***Mosabani***	*$22^0$36'30" $86^0$24'47"*	*201*					*0.78*			
14	***SONARI BHARAT SEWASHRAM SANGH*** *EW*	***Jamshedpur*** *$86^0$10'05"*	*$22^0$50'20"*	*196.75*	*19.98*			*12.02*				*Granite gneiss*
15	***SHASTRINAGAR BLOCK 3***	***Jamshedpur***	*$22^0$42'04" $86^0$16'30"*	*196.75*	*12.85*			*2.7*				
16	*EW* ***Block office Potka***	***Potka***	*$22^0$37'15" $86^0$14'10"*	*196.75*	*19.98*			*12.02*				
17	*EW* ***SIDGORA*** *EW*	***Jamshedpur***	*$22^0$33'30" $86^0$26'28"*			*Abandoned*						
18	***PARSUDIH/ KALIMATI***	***Jamshedpur***	*$22^0$43'06" $86^0$14'06"*	*60*	*15*	*Abandoned*						

TABLE 3: DEPTH TO WATER LEVEL OF HYDROGRAPH NETWORK STATIONS LOCATED IN EAST SINGHBHUM DISTRICT (2012 - 13)

Sl No.	Location	May 2012	August 2012	November 2012	January 2013
1	Baharagora	14.80	2.91	5.75	12.60
2	Chakulia	--	5.90	13.85	15.25
3	Dhalbhumgarh	8.75	1.90	4.90	9.85
4	Galudih	14.85	1.58	2.40	3.70
5	Ghatsila	7.55	1.35	--	5.25
6	Jamshedpur	3.96	3.38	--	--
7	Paridih	9.50	2.91	3.45	5.05
8	Ramgarh	8.38	1.82	2.35	4.40
9	Sundarnagar	12.90	3.45	--	9.35
10	Mosabani	5.62	0.80	1.25	2.55
11	Hata	6.08	0.95	1.10	2.85
12	Kalikapur	6.45	0.95	1.25	3.20
13	Potka	9.15	2.60	3.10	5.60
14	Hana Bautia	--	--	3.95	7.15
15	Pithajudi	--	--	3.70	4.55

TABLE 4: LONG TERM WATER LEVEL TREND FOR EXISTING HYDROGRAPH NETWORK STATIONS OF EAST SINGHBHUM DISTRICT (2003 – 2012)

Sl No.	Location	Pre monsoon trend (m/year)		Post monsoon trend (m/year)		All period (m/year)	
		Rise	Fall	Rise	Fall	Rise	Fall
1	Baharagora	--	0.175	0.001	--	--	0.075
2	Chakulia	0.030	--	--	0.712	0.165	--
3	Dhalbhumgarh	--	0.083	--	0.033	--	0.169
4	Galudih	--	0.340	--	0.044	--	0.112
5	Ghatsila	0.058	--	0.150	--	--	0.006
6	Jamshedpur	0.774	--	1.301	--	0.944	--
7	Ramgarh	0.142	--	--	0.024	--	0.820
8	Sundarnagar	--	0.386	--	0.327	--	0.357
9	Mosabani	0.088	--	0.048	--	0.067	--
10	Hata	0.030	--	0.197	--	0.087	--
11	Kalikapur	0.262	--	0.068	--	0.264	--
12	Potka	--	0.083	0.126	--	--	0.008

TABLE 5: ANALYSIS OF WATER QUALITY PARAMETERS OBSERVED IN HYDROGRAPH NETWORK STATIONS OF EAST SINGHBHUM DISTRICT (2011)

Sl No.	Location	EC in micro siemens/cm at 25^0 c	pH	TH as $CaCO_3$	Ca	Mg	Na	K	HCO_3	Cl
					← mg / l →					
1	Ghatsila	945	8.26	320	80	29	56	2.5	396	92
2	Jamshedpur	533	8.32	170	36	19.44	38	2.6	147.6	88.62
3	Dalbhumgarh	286	8.39	90	24	7.3	21	2.2	67	50
4	Mosabani	896	8.51	315	74	32	52	15	244	99
5	Potka	582	8.56	245	38	36	27	0	293	39
6	Galudih	424	8.39	150	40	12	30	10	110	64
7	Kalikapur	2400	8.46	515	126	49	195	26	457	394
8	Hata	1588	8.13	420	126	25	145	1.2	543	213

TABLE 6: DETAILS OF GROUND WATER DEVELOPMENT AND STAGE OF GROUND WATER DEVELOPMENT OF EAST SINGHBHUM DISTRICTS AS ON 31ST MARCH 2009 (in hectare meters)

Sl. No.	Assessment Unit/ District	Net Annual Ground Water Availability	Gross Ground Water Draft for Irrigation	Gross Ground Water Draft for Domestic and Industrial water Supply	Gross Ground Water Draft for all Uses (10+11)	Allocation for Domestic and Industrial Requirement supply upto next 25 years	Net Ground Water Availability for future irrigation development (9 – 12 – 13)	Stage of Ground Water Development (12/9)*100 (%)	Categorization for future ground water development (safe/ critical/ over - exploited)
1	2	9	10	11	12	13	14	15	16
1	Bahragora	5295.31	1561.46	252.10	1813.56	381.56	3352.29	34.25	Safe
2	Chakulia	6843.24	296.20	171.56	467.76	259.60	6287.44	6.84	Safe
3	Dhalbhumgarh	1825.80	82.10	127.34	209.43	192.73	1550.98	11.47	Safe
4	Dumaria	1849.10	71.92	90.39	162.31	136.81	1640.36	8.78	Safe
5	Ghatsila	1945.84	38.51	162.70	201.21	246.09	1661.24	10.34	Safe
6	Jamshedpur	1969.54	6.96	1841.39	2587.69	2778.51	-815.93	131.39	Over- exploited
7	Musabani	1406.25	34.34	131.42	165.76	198.68	1173.23	11.79	Safe
8	Patamda	2126.01	158.22	222.34	380.57	336.52	1631.27	17.90	Safe
9	Potka	3894.50	96.05	287.72	383.77	435.48	3362.98	9.85	Safe
Total		**27155.60**	**2345.76**	**3286.97**	**5633.00**	**4965.99**	**19843.85**	**20.74**	

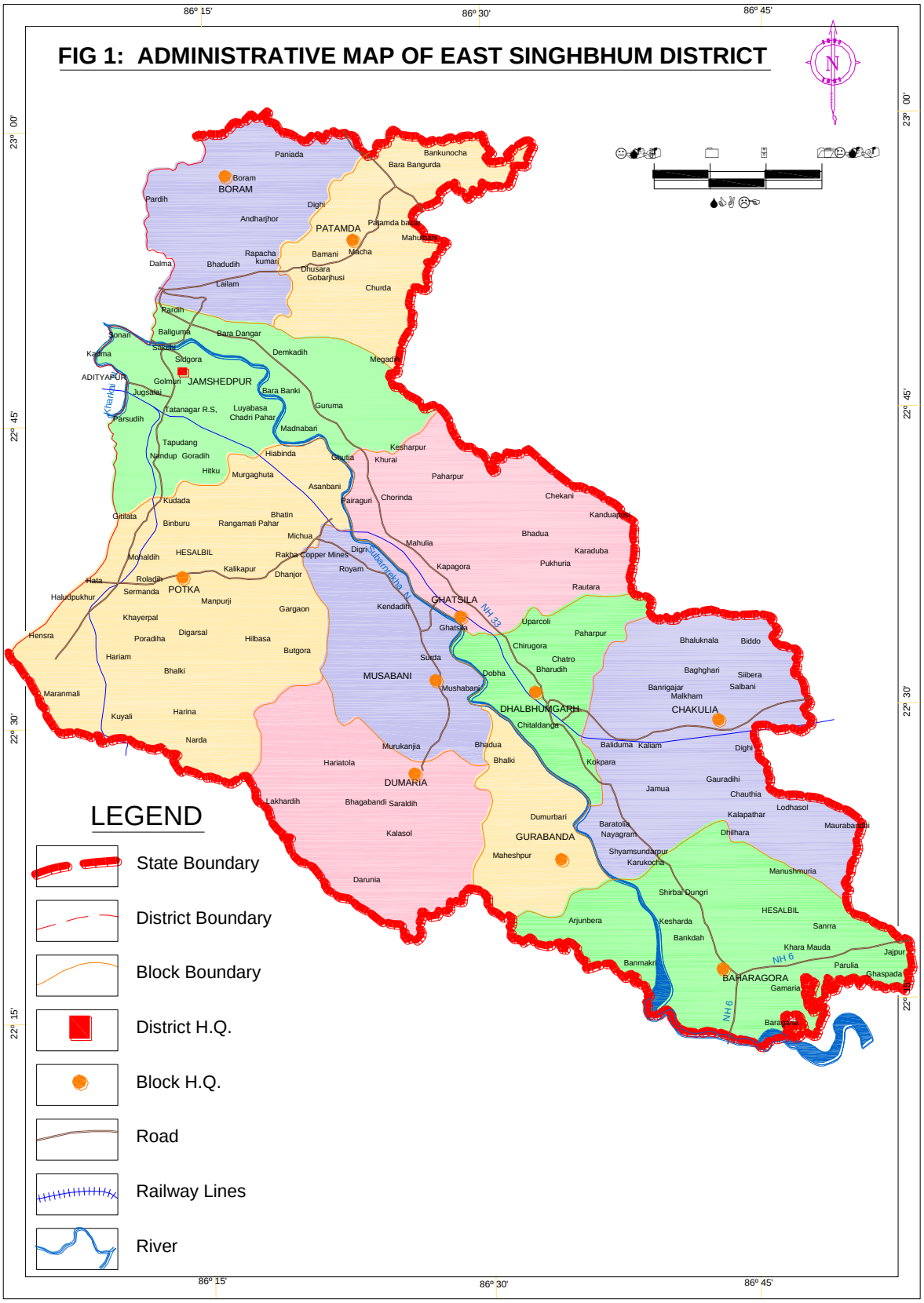
FIG 1: ADMINISTRATIVE MAP OF EAST SINGHBHUM DISTRICT
86° 15'
86° 30'
86° 45'
23° 00'
22° 45'
22° 30'
22° 15'
N
BORAM
PATAMDA
JAMSHEDPUR
POTKA
GHATSILA
MUSABANI
DHALBHUMGARH
CHAKULIA
DUMARIA
GURABANDA
BAHARAGORA
Paniada
Bankunocha
Bara Bangurda
Pardih
Andharjhor
Dighi
Dalma
Bhadudih
Rapacha kumari
Bamani
Macha
Dhusara
Gobarjhusi
Lailam
Churda
Rardih
Baliguma
Bara Dangar
Sonari
Kadma
Sakchi
Sidgora
Demkadih
Megadih
ADITYAPUR
Golmuri
Jugsalai
Bara Banki
Tatanagar R.S,
Luyabasa
Chadri Pahar
Guruma
Parsudih
Madnabari
Tapudang
Nandup
Goradih
Hiabinda
Ghutia
Kesharpur
Khurai
Hitku
Murgaghuta
Paharpur
Asanbani
Pairaguri
Chorinda
Chekani
Kudada
Binburu
Rangamati Pahar
Bhatin
Michua
Kanduadih
Bhadua
Mahulia
Digri
Karaduba
Mohaldih
HESALBIL
Rakha Copper Mines
Kalikapur
Royam
Kapagora
Pukhuria
Hata
Roladih
Dhanjor
Rautara
Haludpukhur
Sermanda
Manpurji
Gargaon
Kendadih
Uparcoli
Khayerpal
Digarsal
Paharpur
Hensra
Poradiha
Hilbasa
Chirugora
Bhaluknala
Biddo
Hariam
Butgora
Chatro
Bharudih
Baghghari
Siibera
Bhalki
Surda
Dobha
Banrigajar
Salbani
Maranmali
Mushabani
Malkham
Harina
Chitaldanga
Kuyali
Narda
Murukanjia
Bhadua
Baliduma
Kalam
Dighi
Hariatola
Bhalki
Kokpara
Gauradihi
Jamua
Chauthia
Lodhasol
Lakhardih
Bhagabandi
Saraldih
Kalapathar
Maurabandh
Dumurbari
Baratolia
Nayagram
Dhiihara
Kalasol
Shyamsundarpur
Karukocha
Maheshpur
Manushmuria
Darunia
Shirbai Dungri
HESALBIL
Arjunbera
Kesharda
Sanrra
Bankdah
Khara Mauda
Jajpur
Banmakri
Parulia
Ghaspada
Gamaria
Baranahal
Subarnarekha
Kharkai
NH 33
NH 6
LEGEND
State Boundary
District Boundary
Block Boundary
District H.Q.
Block H.Q.
Road
Railway Lines
River


FIG 2: DRAINAGE MAP OF EAST SINGHBHUM DISTRICT
86° 15'
86° 30'
86° 45'
23° 00'
22° 45'
22° 30'
22° 15'
N
BORAM
PATAMDA
JAMSHEDPUR
ADITYAPUR
POTKA
GHATSILA
MUSABANI
DHALBHUMGARH
CHAKULIA
DUMARIA
GURABANDA
BAHARAGORA
HESALBIL
Paniada
Bankunocha
Bara Bangurda
Baram
Pardih
Andharjhor
Digri
Patamda ba
Mahul
Macha
Rapacha kurmi
Bamani
Dhusara
Gobarjhusi
Churda
Dalma
Bhaludih
Lalam
Sonari
Baliguma
Bara Dangar
Sakchi
Kadma
Sidgora
Demkadih
Megad
Golmuri
Jugsalai
Khrkai
Luyabasa
Chadri Pahar
Guruma
Parsudih
Madnabani
Saphara N
Gurma N
Tapudang
Nandup
Goradih
Hiabinda
Kesharpur
Ghurda
Khurai
Hitku
Murgaghata
Asanbani
Paharpur
Kudada
Pairaguri
Chorinda
Chekani
Kanduai
Gitilata
Binburu
Bhatin
Rangamati Pahar
Garra N
Bhadua
Karaduba
Michua
Mahulia
Dugdh N
Mohaldih
HESALBIL
Rakha Copper Mines
Digri
Subarnrekha N
Pukhuria
Kalikapur
Royam
Kapagora
Chakdaha N
Hata
Roladih
Dhanjor
Rautara
Haludpukhur
Sermanda
Manpurji
Kendadih
Khayerpal
Gargaon
Uparcoli
Paharpur
Hensra
Poradiha
Digarsal
Hilbasa
Chirugora
Bhalukpala
Biddo
Hariam
Butgora
Surda
Chatro
Bharudih
Baghghari
Siibera
Bhalki
Dobha
Banrigajar
Salbani
Maranmali
Mushabani
Malkham
Harina
Kuyali
Chitaldanga
Narda
Murukanjia
Bhadua
Baliduma
Kaliam
Dighi
Hariatola
Bhalki
Kokpara
Gauradihi
Lakhardin
Bhagabandi
Saraidih
Jamua
Chauthia
Lodhasol
Dumurbari
Baratolia
Kalapathar
Kalasol
Nayagram
Dhilhara
Maheshpur
Shyamsundarpur
Karukocha
Darunia
Manushmuria
Shirbai Dungri
Arjunbera
Kesharda
Sanra
Bankdah
Khara Mauda
Jajpur
Parulia
Bahmakra
Ghaspada
Gamaria
LEGEND
State Boundary
District Boundary
Block Boundary
River

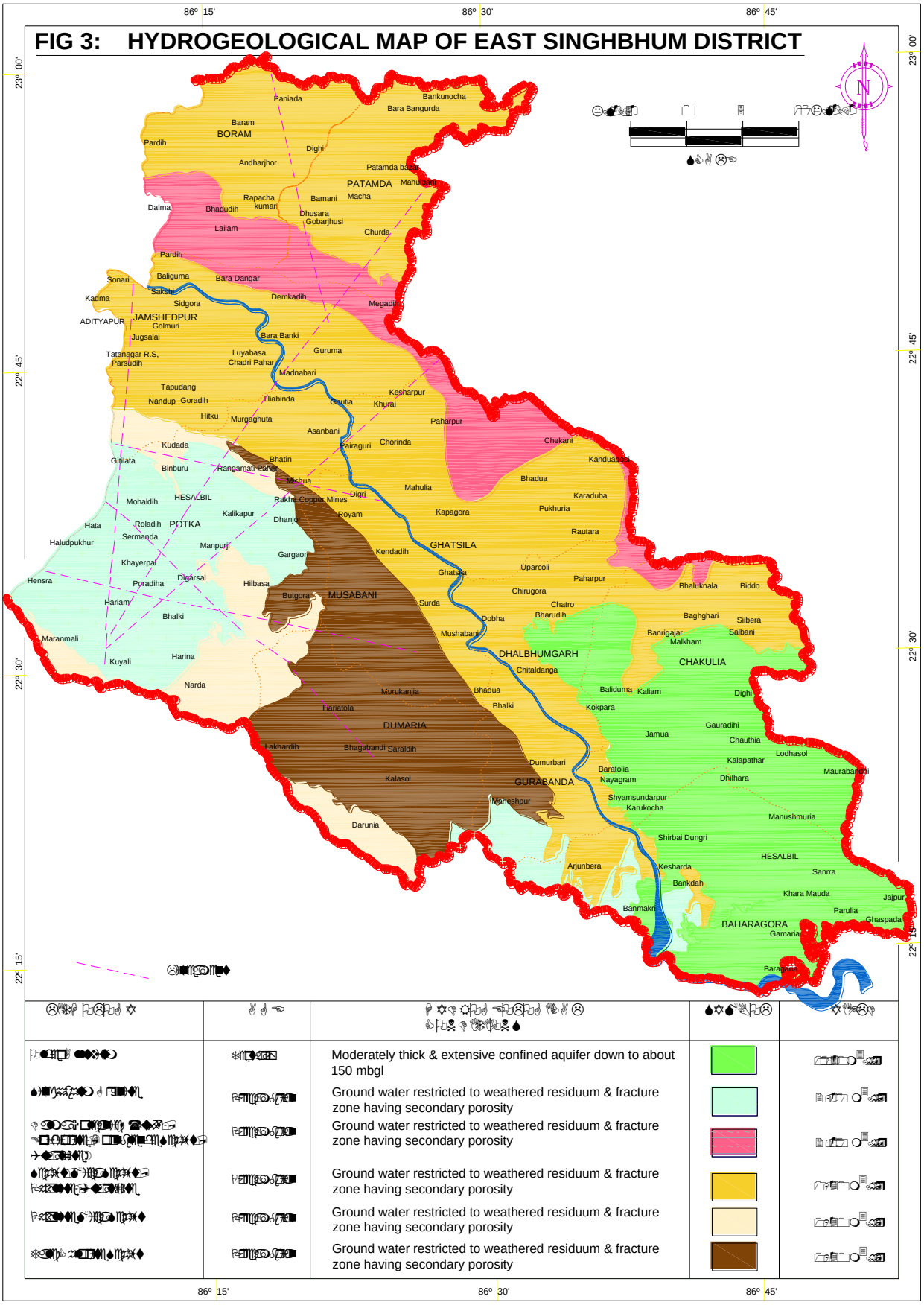
FIG 3: HYDROGEOLOGICAL MAP OF EAST SINGHBHUM DISTRICT
86° 15'
86° 30'
86° 45'
23° 00'
22° 45'
22° 30'
22° 15'
N
Paniada
Bankunocha
Bara Bangurda
Baram
BORAM
Pardih
Dighi
Andharjhor
Patamda bazar
PATAMDA
Mahulbani
Rapacha kumari
Bamani
Macha
Dalma
Bhadudih
Dhusara
Gobarjhusi
Lailam
Churda
Pardih
Sonari
Baliguma
Bara Dangar
Saketi
Demkadih
Megadih
Kadma
Sidgora
ADITYAPUR
JAMSHEDPUR
Golmuri
Jugsalai
Bara Banki
Tatanagar R.S.
Parsudih
Luyabasa
Chadri Pahar
Guruma
Madnabari
Tapudang
Nandup
Goradih
Hiabinda
Ghutia
Kesharpur
Khurai
Hitku
Murgaghuta
Paharpur
Asanbani
Kairaguri
Chorinda
Chekani
Kudada
Bhatin
Rangamati Pahar
Kanduaposi
Binburu
Mohua
Bhadua
Mahulia
Digri
Karaduba
Mohaldih
HESALBIL
Rakha Copper Mines
Pukhuria
Kalikapur
Royam
Kapagora
Hata
Roladih
POTKA
Dhanjor
Rautara
Haludpukhur
Sermanda
Manpuri
GHATSILA
Kendadih
Khayerpal
Gargaon
Uparcoli
Ghatsila
Hensra
Digarsal
Poradiha
Hilbasa
Paharpur
Chirugora
Bhaluknala
Biddo
Butgora
MUSABANI
Surda
Chatro
Hariam
Bharudih
Baghghari
Siibera
Bhalki
Dobha
Banrigajar
Salbani
Mushabani
Maranmali
Malkham
DHALBHUMGARH
CHAKULIA
Harina
Chitaldanga
Kuyali
Baliduma
Kaliam
Dighi
Narda
Murukanjia
Bhadua
Kokpara
Hariatola
Bhalki
Gauradihi
DUMARIA
Jamua
Chauthia
Lakhardih
Bhagabandi
Saraldih
Lodhasol
Kalapathar
Dumurbari
Baratolia
Maurabandh
Kalasol
Nayagram
Dhilhara
GURABANDA
Shyamsundarpur
Maheshpur
Karukocha
Manushmuria
Darunia
Shirbai Dungri
HESALBIL
Arjunbera
Kesharda
Sanrra
Bankdah
Khara Mauda
Jajpur
Banmakri
Parulia
Chaspada
BAHARAGORA
Gamaria
Barajamda
Moderately thick & extensive confined aquifer down to about 150 mbgl
Ground water restricted to weathered residuum & fracture zone having secondary porosity
Ground water restricted to weathered residuum & fracture zone having secondary porosity
Ground water restricted to weathered residuum & fracture zone having secondary porosity
Ground water restricted to weathered residuum & fracture zone having secondary porosity
Ground water restricted to weathered residuum & fracture zone having secondary porosity

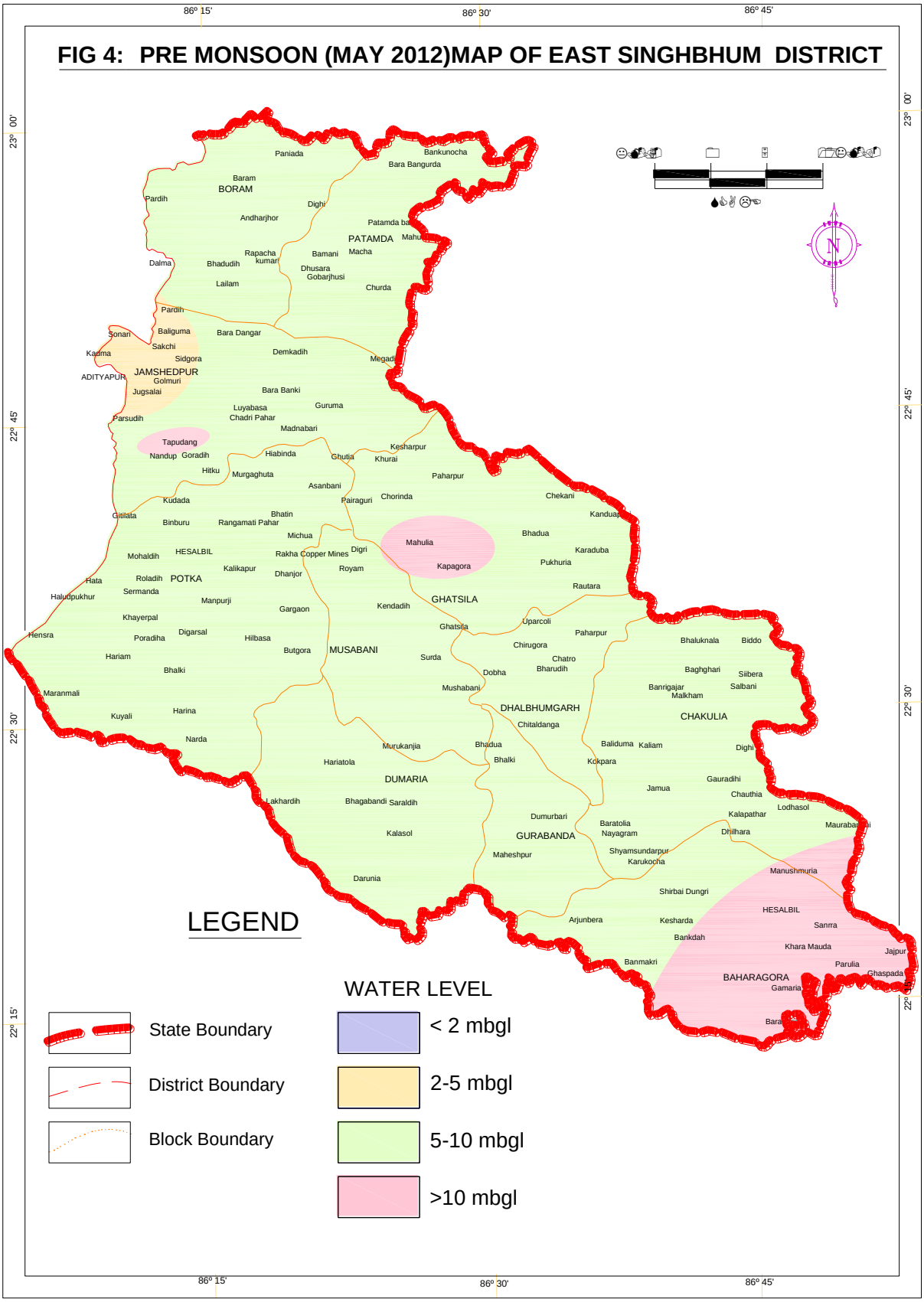
FIG 4: PRE MONSOON (MAY 2012)MAP OF EAST SINGHBHUM DISTRICT
86° 15'
86° 30'
86° 45'
23° 00'
22° 45'
22° 30'
22° 15'
BORAM
PATAMDA
JAMSHEDPUR
ADITYAPUR
POTKA
GHATSILA
MUSABANI
DUMARIA
DHALBHUMGARH
GURABANDA
CHAKULIA
BAHARAGORA
HESALBIL
Paniada
Bankunocha
Bara Bangurda
Baram
Pardih
Dighi
Andharjhor
Patamda
Mahu
Macha
Bamani
Rapacha kumari
Bhadudih
Dalma
Dhusara
Gobarjhusi
Lailam
Churda
Baliguma
Bara Dangar
Sonari
Sakchi
Sidgora
Kadma
Demkadih
Megadi
Golmuri
Jugsalai
Bara Banki
Luyabasa
Chadri Pahar
Guruma
Parsudih
Madnabari
Tapudang
Nandup
Goradih
Hiabinda
Ghutia
Kesharpur
Khurai
Hitku
Murgaghuta
Paharpur
Asanbani
Kudada
Pairaguri
Chorinda
Chekani
Kanduapal
Gitilata
Binburu
Bhatin
Rangamati Pahar
Michua
Bhadua
Mahulia
Mohaldih
Rakha Copper Mines
Digri
Karaduba
Kalikapur
Dhanjor
Royam
Kapagora
Pukhuria
Hata
Roladih
Sermanda
Haludpukhur
Manpurji
Rautara
Gargaon
Kendadih
Khayerpal
Uparcoli
Hensra
Poradiha
Digarsal
Hilbasa
Ghatsila
Paharpur
Chirugora
Bhaluknala
Biddo
Hariam
Butgora
Surda
Chatro
Bharudih
Bhalki
Dobha
Baghghari
Siibera
Maranmali
Mushabani
Banrigajar
Salbani
Malkham
Kuyali
Harina
Chitaldanga
Narda
Murukanjia
Bhadua
Baliduma
Kaliam
Dighi
Hariatola
Bhalki
Kokpara
Gauradihi
Jamua
Chauthia
Lodhasol
Lakhardih
Bhagabandi
Saraldih
Kalapathar
Dumurbari
Baratolia
Nayagram
Dhilhara
Kalasol
Shyamsundarpur
Karukocha
Maheshpur
Manushmuria
Darunia
Shirbai Dungri
Arjunbera
Kesharda
Sanra
Bankdah
Khara Mauda
Jajpur
Banmakri
Parulia
Ghaspada
Gamaria
LEGEND
WATER LEVEL
State Boundary
District Boundary
Block Boundary
< 2 mbgl
2-5 mbgl
5-10 mbgl
>10 mbgl

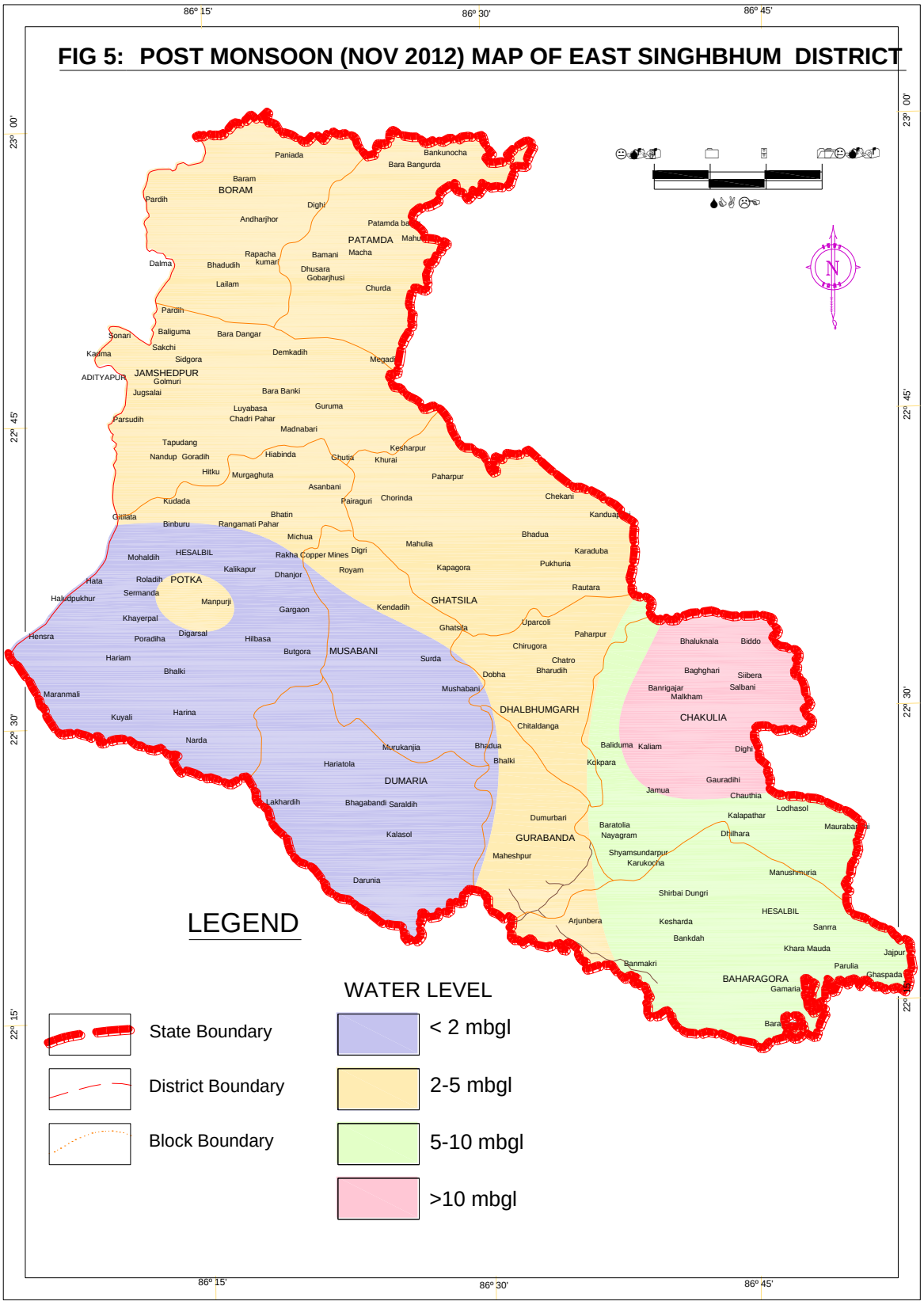
FIG 5: POST MONSOON (NOV 2012) MAP OF EAST SINGHBHUM DISTRICT
86° 15'
86° 30'
86° 45'
23° 00'
22° 45'
22° 30'
22° 15'
BORAM
PATAMDA
JAMSHEDPUR
ADITYAPUR
POTKA
MUSABANI
GHATSILA
DHALBHUMGARH
CHAKULIA
GURABANDA
DUMARIA
BAHARAGORA
HESALBIL
Paniada
Bankunocha
Bara Bangurda
Baram
Pardih
Dighi
Andharjhor
Patamda ba
Mahul
Rapacha kumari
Bamani
Macha
Dalma
Bhadudih
Dhusara
Gobarjhusi
Lailam
Churda
Pardih
Sonari
Baliguma
Bara Dangar
Sakchi
Kadma
Sidgora
Demkadih
Megad
Golmuri
Jugsalai
Bara Banki
Guruma
Luyabasa
Chadri Pahar
Parsudih
Madnabari
Tapudang
Nandup
Goradih
Hiabinda
Ghutia
Kesharpur
Khurai
Hitku
Murgaghuta
Paharpur
Asanbani
Kudada
Pairaguri
Chorinda
Chekani
Gidilata
Bhatin
Binburu
Rangamati Pahar
Kanduai
Michua
Bhadua
Mahulia
Digri
Karaduba
Mohaldih
Rakha Copper Mines
Pukhuria
Kalikapur
Dhanjor
Royam
Kapagora
Hata
Roladih
Rautara
Sermanda
Haludpukhur
Manpurji
Gargaon
Kendadih
Khayerpal
Ghatsila
Uparcoli
Hensra
Digarsal
Poradiha
Hilbasa
Paharpur
Butgora
Chirugora
Bhaluknala
Biddo
Hariam
Surda
Chatro
Bharudih
Baghghari
Siibera
Bhalki
Dobha
Banrigajar
Salbani
Maranmali
Mushabani
Malkham
Kuyali
Harina
Chitaldanga
Narda
Baliduma
Kaliam
Dighi
Murukanjia
Bhadua
Kokpara
Hariatola
Bhalki
Gauradihi
Jamua
Lakhardih
Bhagabandi
Saraldih
Chauthia
Lodhasol
Kalapathar
Dumurbari
Baratolia
Nayagram
Dhilhara
Kalasol
Shyamsundarpur
Karukocha
Maheshpur
Manushmuria
Darunia
Shirbai Dungri
Arjunbera
Kesharda
Sanrra
Bankdah
Khara Mauda
Jajpur
Banmakri
Parulia
Ghaspada
Gamaria
LEGEND
WATER LEVEL
State Boundary
District Boundary
Block Boundary
< 2 mbgl
2-5 mbgl
5-10 mbgl
>10 mbgl
N

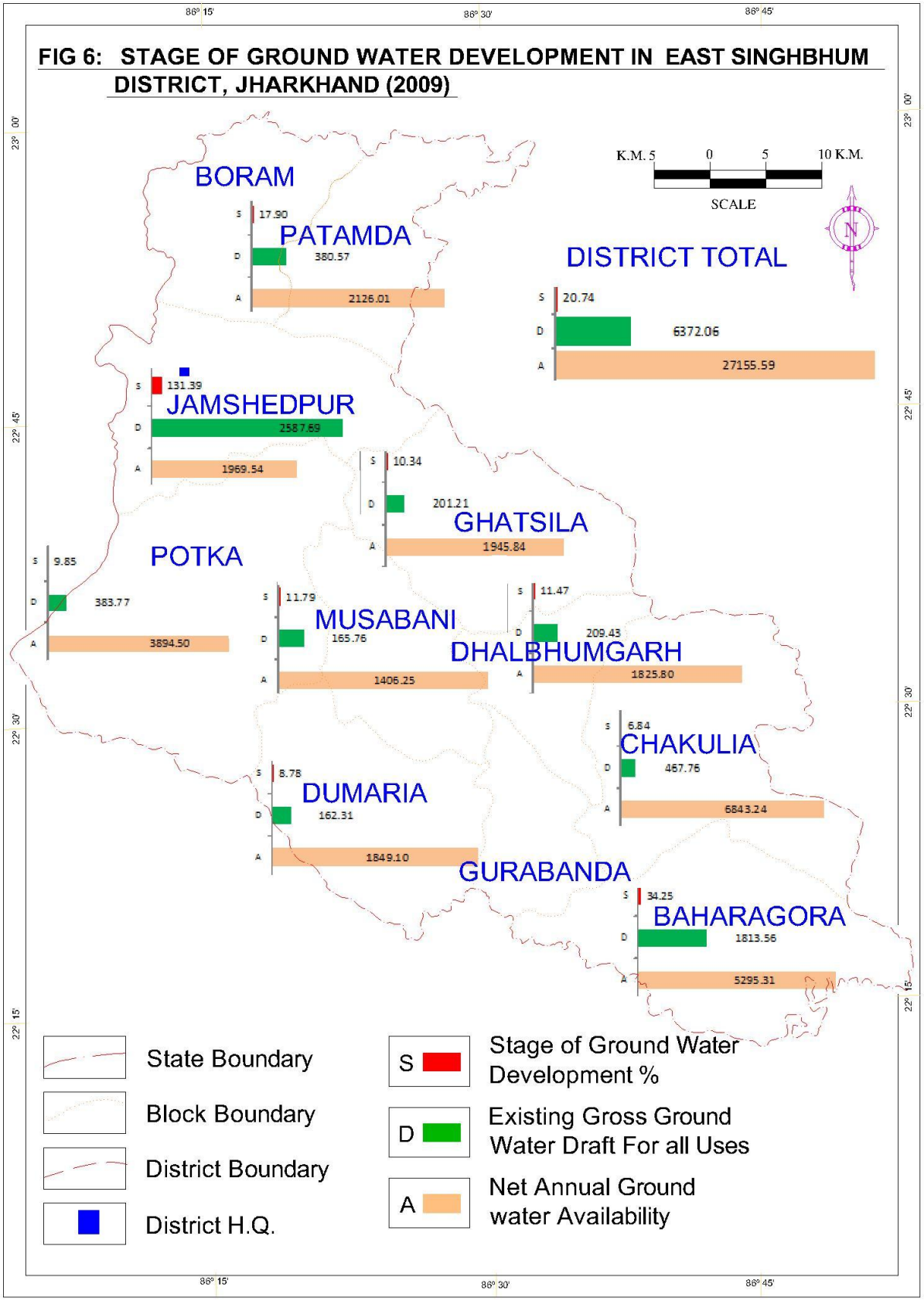
FIG 6: STAGE OF GROUND WATER DEVELOPMENT IN EAST SINGHBHUM DISTRICT, JHARKHAND (2009)
86° 15'
86° 30'
86° 45'
23° 00'
22° 45'
22° 30'
22° 15'
K.M. 5 0 5 10 K.M.
SCALE
N
BORAM
S 17.90
PATAMDA
D 380.57
A 2126.01
DISTRICT TOTAL
S 20.74
D 6372.06
A 27155.59
S 131.39
JAMSHEDPUR
D 2587.69
A 1969.54
S 10.34
D 201.21
GHATSILA
A 1945.84
POTKA
S 9.85
D 383.77
A 3894.50
S 11.79
MUSABANI
D 165.76
A 1406.25
S 11.47
D 209.43
DHALBHUMGARH
A 1825.80
S 6.84
CHAKULIA
D 457.76
A 6843.24
S 8.78
DUMARIA
D 162.31
A 1849.10
GURABANDA
S 34.25
BAHARAGORA
D 1813.56
A 5295.31
State Boundary
Block Boundary
District Boundary
District H.Q.
S Stage of Ground Water Development %
D Existing Gross Ground Water Draft For all Uses
A Net Annual Ground water Availability