



भूजल सूचना पुस्तिका
पश्चिमी सिंहभूम जिला, झारखंड
Ground Water Information Booklet
West Singhbhum District, Jharkhand State



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

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Ground Water Information Booklet
West Singhbhum District, Jharkhand State

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WEST SINGHBHUM– DISTRICT AT A GLANCE

Sl No.	ITEMS	Statistics
1.	GENERAL INFORMATION	
		5351
	Administrative Divisions (As on 2011)	
	Number of Block	18
	Number of Panchyat	216
	Number of villages	1792
	(ii) Population (As on 2011 Census)-	15,01,619
	(iii) Average Annual Rainfall (mm)	1422 mm
2.	GEOMORPHOLOGY	
	Major Physiographic units	Buried pediments, pediplain, Valley, Structural ridges and dykes
	Major Drainages	Karo, South Koel and Kharkari river
3.	LAND USE (Sq Km.)	
	a) Forest area:	2275.4
	b) Net area sown:	1479.0
	c) Cultivable area:	1631.0
4.	MAJOR SOIL TYPES	Rocky soil-Uncultivable soil, Red soil-Sandy&loamy soil,Black soil-Low land soil loamy&clayey very fertile.
5.	AREA UNDER PRINCIPAL CROPS (2011-12)	Pulses 1808 ha Oilseeds – 2788 ha Paddy – 163288 ha Maize – 325 ha Wheat-522 ha
6.	IRRIGATION BY DIFFERENT SOURCES (Areas and Number of Structures)	Area Structures (Ha)
	Dug wells	1894 966
	Tube wells /Bore wells	10 4
	Tanks / Ponds	
	Surface flow scheme	19039 3425
	Other Sources	
	Net irrigated area	-- ---
	Gross irrigated area	-- ---
7.	NUMBERS OF GROUND WATER MONITORING WELLS OF CGWB (As on 31-03-13)	
	No of Dugwell	13
	No. of Piezometers	
8.	PREDOMINANT GEOLOGICAL FORMATIONS	Chotanagpur granitic complex,Singhbhum Granite, Dolerite dyke,Older metamorphics Sandstone,Shale,Schist,Older alluvium and Laterite

9.	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 Pre mosoon Post monsoon	Granite-gneiss, Quartzite and older Alluvium 3.0-9.07 m.bgl 2.52-7.10 m.bgl Rise 0.05-0.45 0.07-0.17	Fall 0.01-1.17 0'007-0.63
10.	GROUND WATER EXPLORATION BY CGWB (As on 31-03-13)		
	No. of wells drilled (EW, OW, PZ, SH, Total)	EW -06, OW -04, Pz -0 10	
	Depth Range (m)	99.0-209.42 m.bgl	
	Discharge (m ³ /hr)	2.52-3.0	
11.	GROUND WATWER QUALITY	Good	
	Presence of Chemical constituents more than permissible limit (e.g. EC, F, As, Fe)	EC 269 to 1634 micro mhos /cm at 25 ⁰ C.	
	Type of Water	Calcium Bicarbonate	
12.	DYNAMIC GROUND WATER RESOURCES (2009) ha-m		
	Annual replenishable Ground Water Resources	33108.00	
	Gross Annual Ground Water Draft	2885.19	
	Projected Demand for Domestic and Industrial uses up to 2034	2561.53	
	Stage of Ground Water Development	8.71%	
13.	AWARENESSS AND TRAINING ACTIVITY		
	Mass Awareness Programs Organized Date Place No. of Participants	NIL	
	Water Management Training Programs Organized Date Place No. of Participants	One Feb 2007, Town Hall, Chaibasa, Westsinghbhum, Jharkhand 75	
14.	EFFORTS OF ARTIFICIAL RECHARGE & RAINWATER HARVESTING		
	Projects completed by CGWB (No & Amount spent)		

	Projects under technical guidance of CGWB (Numbers)	---
15	GROUND WATER CONTROL AND REGULATION	
	Number of OE Blocks	Nil
	No. of Critical Block	Nil
	No. of Semi-critical block	Nil
	No. of Blocks notified	Nil
16.	MAJOR GROUND WATER PROBLEMS AND ISSUES	1.Locating suitable drilling site 2.Drilling problem in Limestone terrain 3.Caving Problem in Barajamda area

WEST SINGHBHUM DISTRICT

1.0-Introduction-West Singhbhum district forms the Southern part of the newly created Jharkhand State and is the largest district in the State. The district spread over 21° 58' and 23° 36' north latitude and 85° 00' & 86° 54' East Longitude. The district is situated at a height of 244 Meter above the sea level and has an area of 5351.41 Sq. Kilometers. The district is bounded on the North by the district of Khunti, on the East by Saraikela-Kharsawan district, on the South by Keonjhar, Mayurbhanj and Sundargarh districts of Orissa and on the West by the district of Simdega and Sundargarh (in Orissa)

1.1-Administration--West Singhbhum district came into existence when the old Singhbhum District bifurcated in 1990 With 9 Community Development Blocks Eastern part became the East Singhbhum with Jamshedpur as its district Headquarter and with remaining 23 C.D. Blocks West Singhbhum with Chaibasa as its district Hq. In 2001 West Singhbhum was again divided in two parts. With 8 Blocks Saraikela-Kharsawan district came into existence. At present West Singhbhum district consists of 19 blocks and two administrative Sub-divisions. Name of the blocks are Majhgaon, Kumardungi, Jagannathpur, Hatgamhariya, Manjhari, Tantnagar, Chaibasa, Jhinkpani, Khuntpani, Tonto, Noamundi, Chakradharpur, Sonua, Goeilkeria, Manoharpur, Anandpur, Gudri, Bero and Bandgaon.

1.2Drainage--The district is full of hills alternating with valleys, steep mountains, and deep forests on the mountain slopes. The district contains one of the best Sal forests and the SARANDA (seven hundred hills) forest area is known world over. Some of the important Rivers flowing in the district are: South Koel, Karo-koina, Kharkai, Sanjay, Raro, Deo and Baitarni.

1.3-Landuse,Soil-The soil of the district has been classified into three groups Rocky Soil, Red Soil and Black Soil. Rocky soil is found mostly in the Southern, Western & North-Western portions of the district. It remains practically uncultivated. Red soil is spread throughout the district. It is sandy and loamy and has poor fertility. Black soil is mostly found in the lowlands of Kolhan. The texture of soil is loamy and clayey and is very fertile. Rice is the main crop of the district.

1.4-Previous Studies-Hydrogeological and Geophysical studies were carried out during Kasai-Subarnrekha Project studies. Altogether Eight exploratory drilling were done in the district.

2.0 CLIMATIC CONDITION

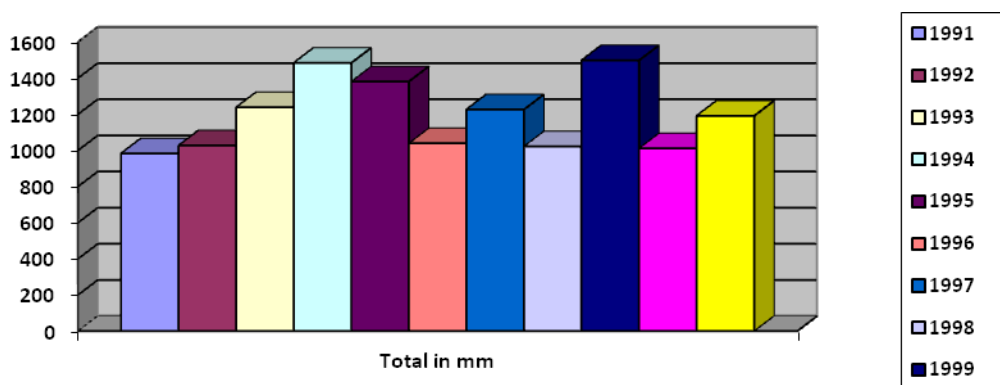
The year may be divided into three seasons; the winter from NOV-FEB, the summer from MAR-MAY, and the rainy season from JUN-OCT. The cold season is delightful while it is unpleasantly hot in the summer season with hot westerly winds prevailing. On account of the barrier of hills in the southeast, the atmosphere is generally dry. The Rainfall is the highest in July and August. The annual avg. rainfall in the district is about 1422 mm Monsoon generally breaks in the second week of June. December-January are the coldest months while April-May are the hottest.

RAINFALL

The average annual rainfall of past ten years in West Singhbhum district recorded is 1191 mm. On an average 80 % of rainfall was received during the monsoon season (i.e. July to September). Annual rainfall recorded during past ten years i.e. 1991 to 2000 are as follows:

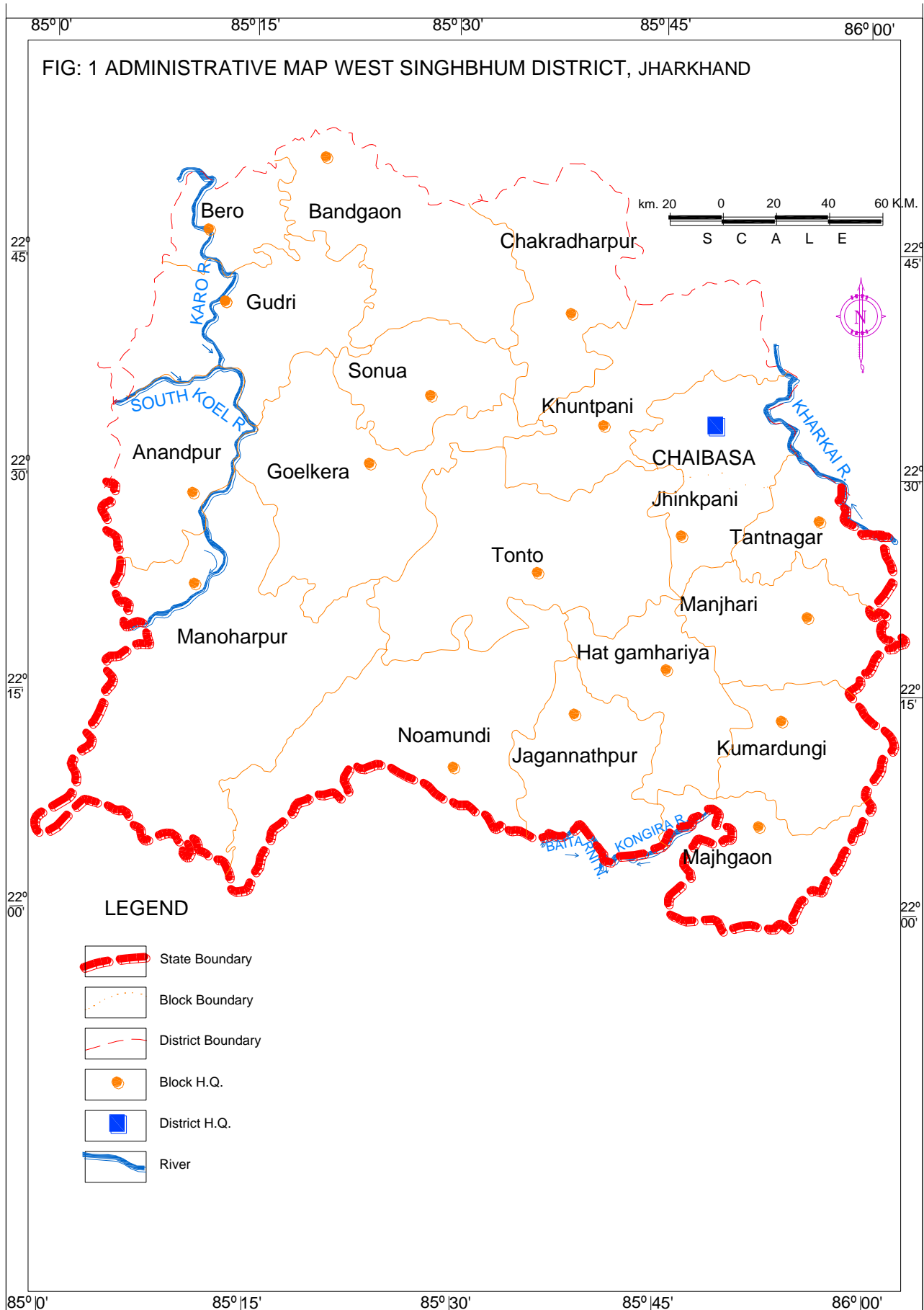
Annual Rainfalls of the last ten years (1991-2000) in West Singhbhum district

Year	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	Average
Total in mm	983	1027	1238	1484	1381	1039	1226	1022	1498	1011	1191









3.0-Physiography and Drainage-This area is dominated by hilly ranges, valleys and plateaus. Hilly and steep sloping areas provide dense forest cover. The plain areas have the elevation about 300 metres but the hilly areas have about 300 to 500 metres. There are few hills having elevation of 650 m. Important ridges are Desbar, Dalma, Chandri Pahar, Raisindri, etc. Important rivers in the area are South Koel, Sanjay Baitarni, Roso, Brahamini, Deo, Koyana, Kharkai etc.

FIG: 1 ADMINISTRATIVE MAP WEST SINGHBHUM DISTRICT, JHARKHAND

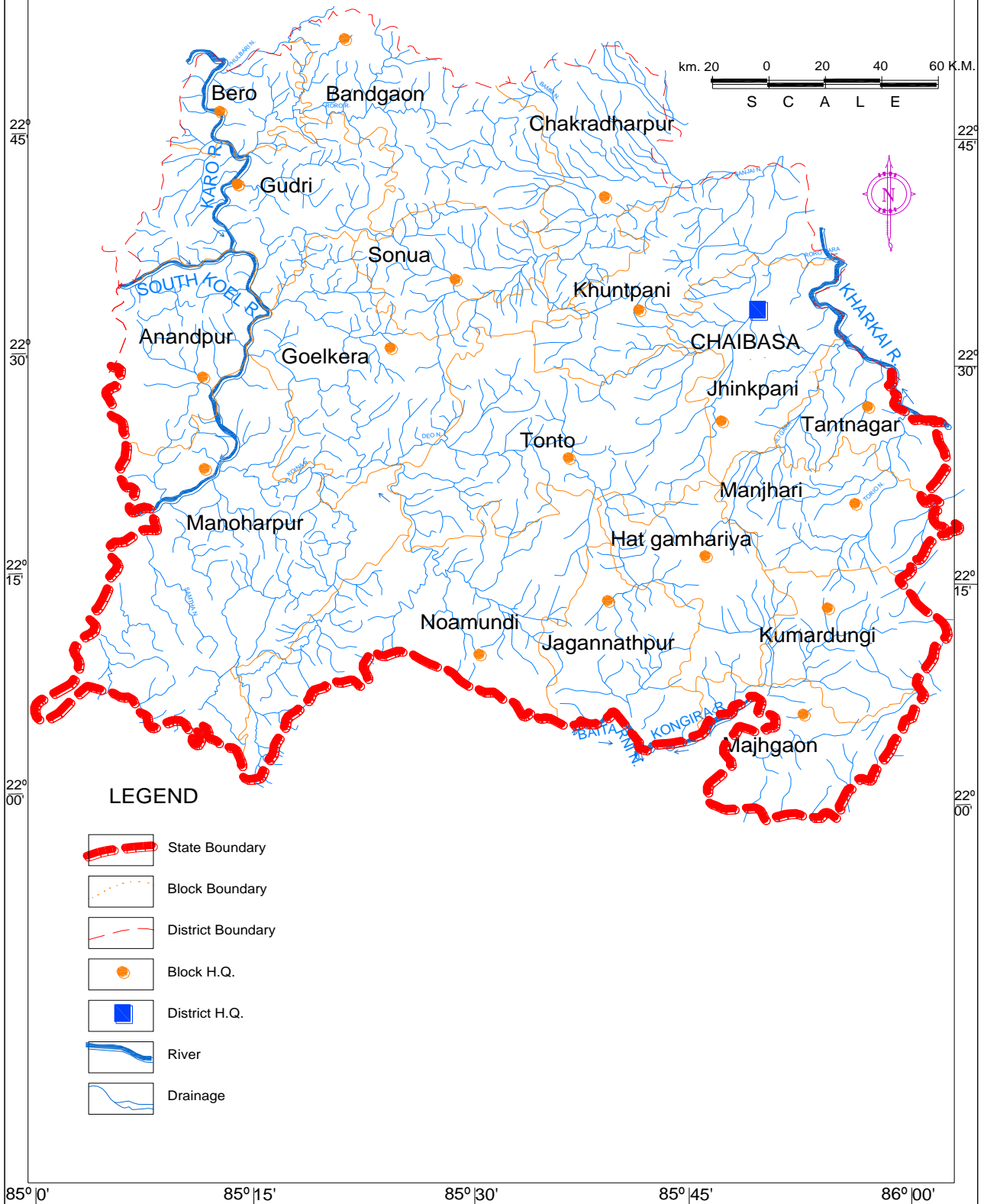


LEGEND

-  State Boundary
-  Block Boundary
-  District Boundary
-  Block H.Q.
-  District H.Q.
-  River

85° 0' 85° 15' 85° 30' 85° 45' 86° 00'

FIG: 2 DRAINAGE MAP WEST SINGHBHUM DISTRICT, JHARKHAND



4.0-REGIONAL GEOLOGY

The district of West Singhbhum is one of the main mineralised district of Jharkhand. Geologically the area falls under the Archean group of formation. Chotanagpur granite gneiss, Singhbhum granite, ultrabasic rock, Arkasani granophyres and Newer dolerite are intrusive into iron-ore series.

According to Dunn, the stratigraphic sequence of Singhbhum is as follows-



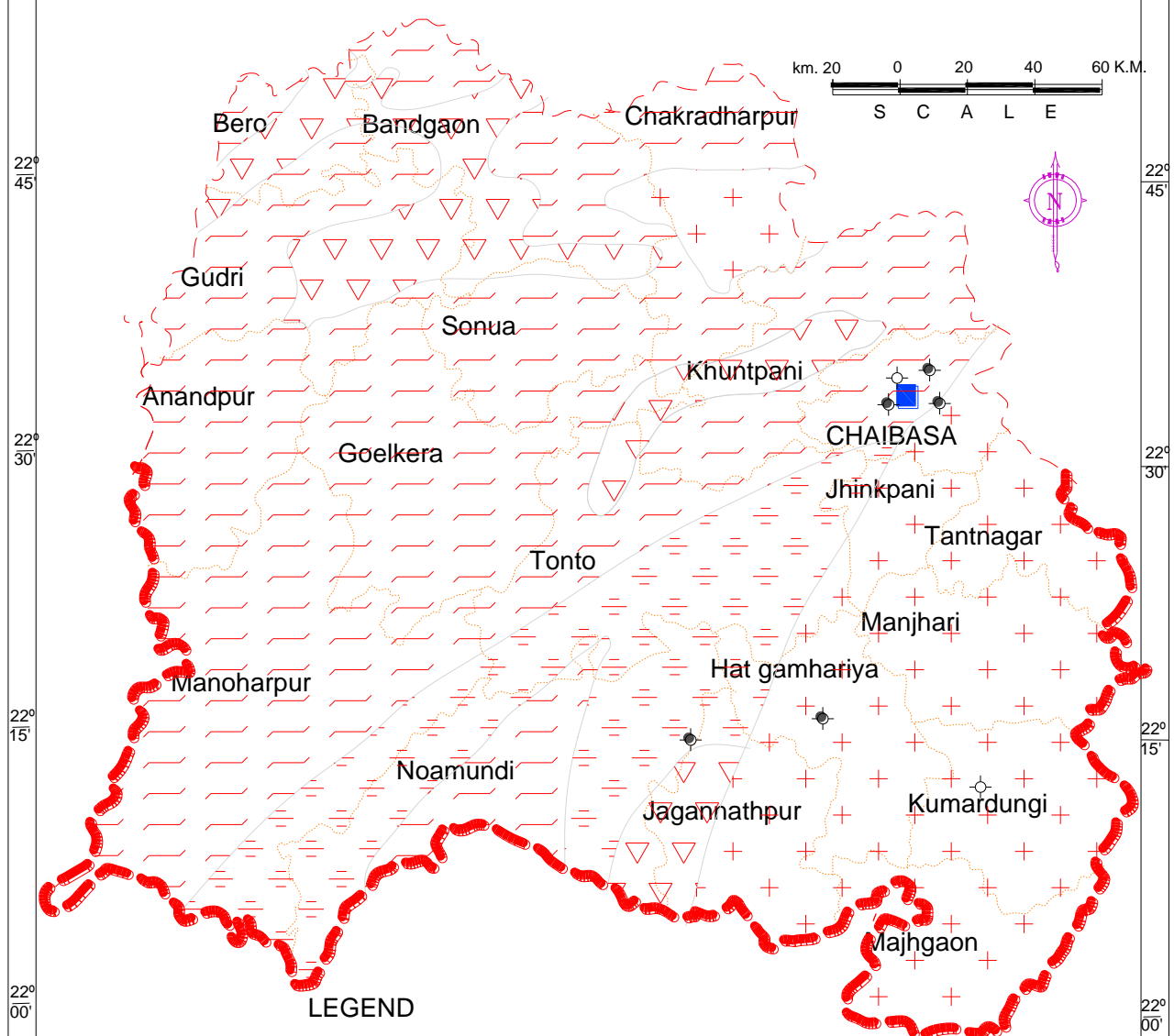
The Singhbhum granite is essentially a coarse to medium grained, highly felspathic granite. This granite country rock has been intruded by a number of quartz veins and later by dolerite dyke. A regional study of belt indicates that the degree of weathering and alteration giving rise to kaolin and china clay. China clay is found to occur in a long belt from karanjiya to Andhari - Gondkida area of 25 km long and 6 km width through Singhbhum Granite belt. In this part granite is rich in feldspar. China clay has been formed due to prolonged weathering and decomposition of felspathic granite

4.1-Aquifer parameters--

All together 8 exploratory wells were drilled in the district to know the aquifer disposition, potential of aquifers and thickness of formations. Three wells were drilled by Departmental rigs and five wells were drilled by outsourcing. Depth of drilling varies from 107m -227m Thickness of weathered formation varies from 8-22mbgl. Piezometric head varies from 6-9mbgl. Highest discharge was observed at Kumardungi block campus (30 m³/hr) with drawdown of about 3m Transmissivity value varies between 2-67 m² / day while Storativity of Kumardungi area is 5.6 x10⁻¹.

85° 0' 85° 15' 85° 30' 85° 45' 86° 00'

FIG: 3 HYDROGEOLOGICAL MAP WEST SINGHBHUM DISTRICT, JHARKHAND



LEGEND

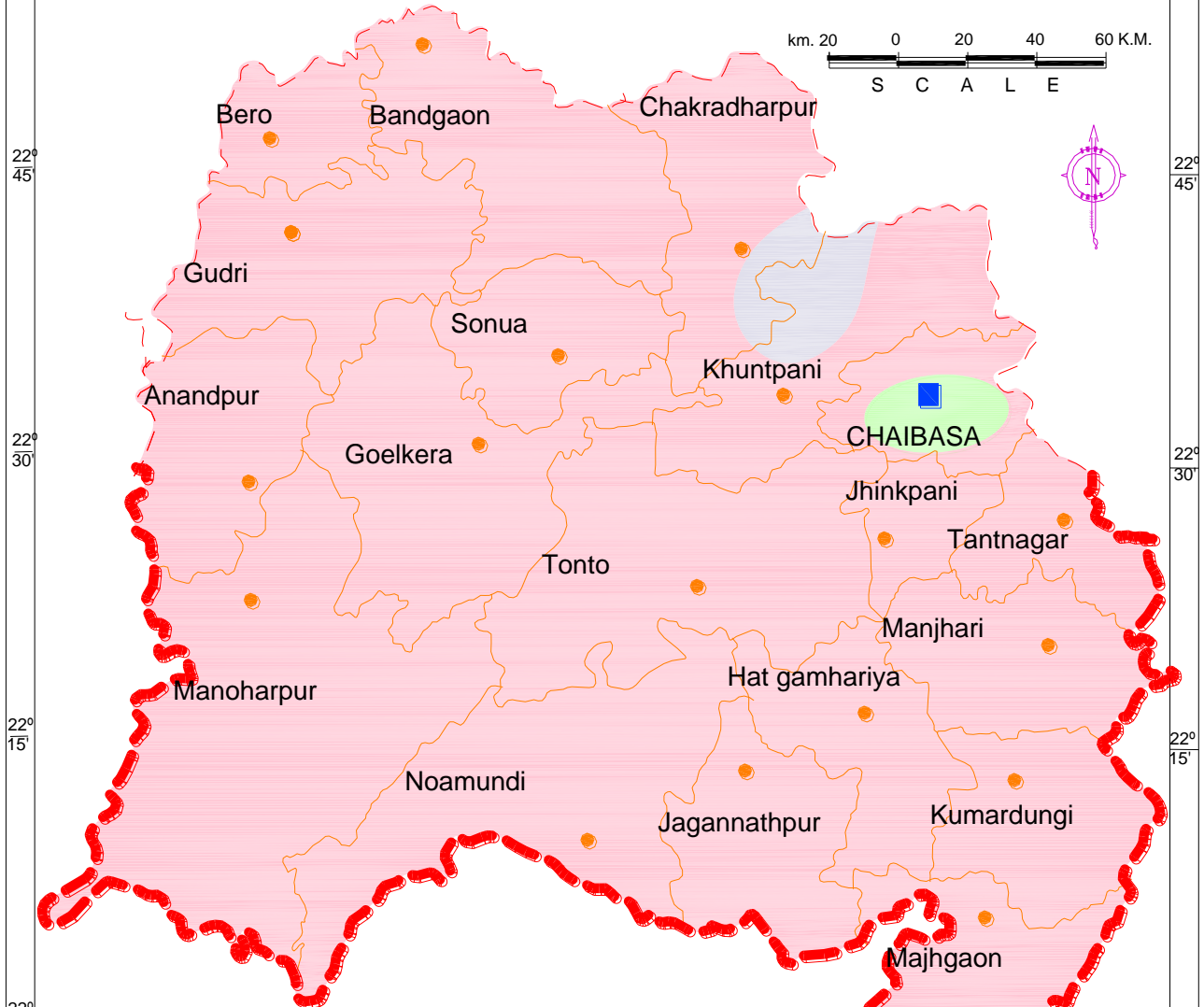
- State Boundary
- District H.Q.
- Block Boundary
- Departmental Exploratory wells
- District Boundary
- Outsourcing Exploratory wells

Formation	Age	Symbol	Hydrogeological condition	Ground water prospects
Siltstone, Claystone, Grit, Sandstone, Shale, Conglomerate, Limestone including intrusive	Upper Tertiary		Moderately thick (Unconfined to confined)	Limited yield prospects (4-10m ³ /hr.)
Basalt with Intertrappean clay			—	—
Slate, Quartzite, Phyllite, Schist, Gneiss, Marble	Archean		Ground water restricted to weathered residuum & secondary porosity	Limited yield prospects (1-10 m ³ /hr.)
Gneissic Complex and associated intrusive	Archean		Ground water restricted to weathered residuum & secondary porosity	Moderate yield prospects upto 25m ³ /hr.










85° 0' 85° 15' 85° 30' 85° 45' 86° 00'

85° 0' 85° 15' 85° 30' 85° 45' 86° 00'

FIG: 4 PRE MONSOON DEPTH TO WATER LEVEL (2012) MAP OF WEST SINGHBHUM DISTRICT, JHARKHAND



LEGEND

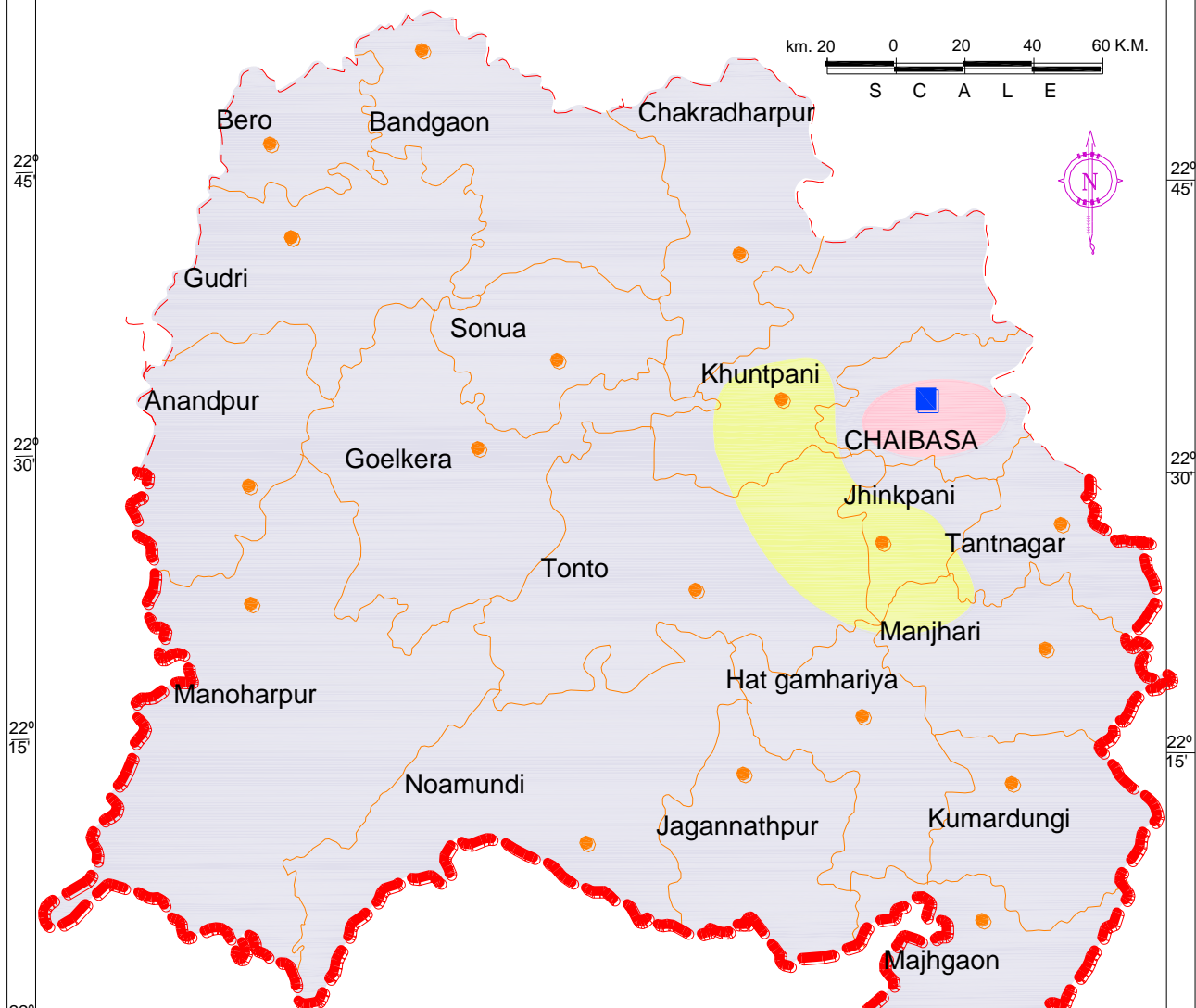
	State Boundary		District H.Q.		< 2
	Block Boundary		Block H.Q.		2-5
	District Boundary				5 -10
					>10

Water Level (m.bgl.)

85° 0' 85° 15' 85° 30' 85° 45' 86° 00'










85° 0' 85° 15' 85° 30' 85° 45' 86° 00'

FIG: 5 POST MONSOON DEPTH TO WATER LEVEL (2012) MAP OF WEST SINGHBHUM DISTRICT, JHARKHAND



22° 45' 22° 30' 22° 15' 22° 00'

LEGEND

- | | | |
|---|---|--|
|  State Boundary |  District H.Q. |  < 2 |
|  Block Boundary |  Block H.Q. |  2-5 |
|  District Boundary | |  5-10 |
| | |  >10 |

85° 0' 85° 15' 85° 30' 85° 45' 86° 00'

TABLE-1 DETAILS OF EXPLORATORY WELLS DRILLED BY CGWB IN WEST SINGHBHUM DISTRICT

Sl No	Location	Block	Co-ordinate	Depth Drilled	Length of Casing pipe	Granular Zone / fracture Tapped	Static Water level	Discharge	Draw down	Specific Capacity	Transmissivity	Storage	Dia. of assembly	Formation	Year
				mbgl.	m	m	m bgl.	m ³ /hr	m	m ³ /hr/m	m ² /day		mm		
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
EXPLORATORY WELLS DRILLED BY DEPARTMENTAL RIGS															
1	CHAKRADHARPUR E.W. OW ₁ OW ₂	Chakradharpur	22°41'00" 85°37'00"	209.42 99.81 107.43	11.5 12.6 8.1	012.61-025.61 176.94-179.94 014.00-023.00 033.32-035.47 008.00-023.60	6.93 6.9 -	4.3 30.6 -	34.46 17.85 -	0.124 1.71 -	2 28 -	- - -	203 203 203	CHAKRA-DHARPUR GRANITE -do-	Sep-87
2	NARSANDA EW	Chaibasa	22°34'00" 85°47'00"										203	Kolhan series	Jun-05
3	KUMARDUNGI EW OW 1, OW 2	Kumardungi	22°12'00" 85°53'30"										203	Granite gneiss	Dec-05
EXPLORATORY WELLS DRILLED BY OUTSOURCED RIGS															
4	MAHULSAI EW	Chaibasa	22°33'30" 85°48'30"	150	20		7.08	dry					203	Granite gneiss	Jul-05
5	P.M COLLEGE, GANDHINAGAR, EW	Chaibasa	22°33'00" 85°48'28"	150	12.25		6.5	2.52	18				203	Granite gneiss	Mar-05
6	HIGH SCHOOL CAMPUS EW	Hat Gamharia	22°16'00" 85°45'00"	150	22		6.2	1.4					203	Granite gneiss	Mar-05
7	SILDAURI, MIDDLE SCHOOL CAMPUS EW	Noamundi	22°14'50" 85°36'45"	150	15.24		9.75	16.2	15.1				203	Granite gneiss	Mar-05
8	DVC CAMPUS, NIMDIH, EW	Chaibasa	22°32'50" 85°47'30"	126.25	15.75		6.32	16.2	17.5				203	Granite gneiss	Mar-05

4.2 Ground water Resources---

The ground water assessment has been done based on the recommendation of the GEC-1997. The ground water assessment has been carried on block wise basis during 2009 and the assessment varies between Tantnagar (1379ha-m) and manoharpur (3905 ha-m). All blocks are in safe category. The net annual replenishable ground water resources of the district is 33108 ha-m. The gross ground water draft for all uses is 2885 ha-m and allocation for domestic and Industrial requirement up to year 2034 is 2561 ha-m. The present stage of ground water development of the district as on 31st march 2009 is 9%. At present maximum ground water development is in Chaibasa block (18%) and minimum ground water development is in tonto block(4%). Details of ground water development and stage of ground water development of all the blocks are given in **(Table 2)**.

Table-2 Block wise Ground Water Resources (as on 2009) of West Singhbhum District

Sl. No	Assessment Unit/Block	Net Annual Ground water Availability	Existing Gross Ground Water Draft for Irrigation	Existing Gross Ground water Draft for Domestic and Industrial Water Supply	Existing 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 (%)
1	2	9	10	11	12	13	14	15
1	Bandgaon	1938	48	111	158	147	1743	8.17
2	Chaibasa	1282	53	176	230	235	994	17.92
3	Chakradharpur	2205	18	239	257	318	1869	11.66
4	Jagannathpur	1925	71	138	210	184	1669	10.89
5	Jhinkpani	1894	36	113	149	151	1707	7.86
6	Khuntpani	1553	46	107	153	143	1364	9.86
7	Kumardungi	2887	78	112	190	150	2660	6.60
8	Majhgaon	2157	122	96	218	127	1907	10.09
9	Manjhari	2417	122	91	213	122	2173	8.82
10	Manoharpur	3905	103	171	274	228	3574	7.02
11	Noamundi	1752	50	126	175	168	1535	10.01
12	Sonua	2260	62	138	200	184	2014	8.85
13	Tantnagar	1380	10	83	93	110	1259	6.73
14	Tonto	2683	11	91	102	121	2551	3.79
15	Goilkeri	2869	134	129	263	172	2562	9.18
	TOTAL	33108	964	1921	2885	2562	29582	8.71

4.3 GROUND WATER QUALITY

Quality of ground water is just as important as its quantity. This is well-recognized part and accepted fact in present day world. Quality of ground water in nature mostly depends on the geological formations holding it i.e. Aquifers. All ground water contains salts in solution that are derived from the locations, and rocks through which it moves. In addition ground water contamination is caused by discharge containing pollutants, which get mixed with them. Quality of ground water is described with reference to the needs i.e., drinking, industrial and irrigation to assess the quality of ground water for different purposes. The physical and chemical constituents are determined and are compared with the standard ones, recommended each for the drinking, industrial and irrigations requirements.

CHEMICAL QUALITY--Ground water quality in general is potable and found as per specification of Bureau of Indian standards

GENERAL RANGE OF CHEMICAL PARAMETER OF WEST SINGHBHUM DISTRICT

- 1) Electrical conductivity: of ground water of parts of West Singhbhum District ranges between 269 to 1118 micro siemens /cm. at 25^oC.
- 2) PH: Ground water of the parts of districts are slightly alkaline in nature where PH varies between 8.11 to 8.68.
- 3) Chloride: concentration of chloride varies 14 to 394 between mg/l.
- 4) Bicarbonate: concentration of bicarbonate is between 98 to 390 mg/l.
- 5) Calcium: Calcium is found between 24 to 92 mg/l in study area.
- 6) Magnesium: It occurs between 11 to 58 mg/l.
- 7) Sodium and Potassium: concentration of sodium is between 14 to 147 mg/l while potassium occurs between 0.4 to 19 mg/l.

**TABLE-3 BLOCK WISE RESULTS OF CHEMICAL ANALYSIS OF WATER
SAMPLES OF WEST SINGHBHUM DISTRICT (2011)**

Location	Well no.	E.C.	pH	CO ₃	HCO ₃	Cl	Ca	Mg	Total hard Hardness (CaCO ₃)	Na	K
Chakradhar pur	BSM-1	1118	8.28	ND	311	163	92	47	425	58	2.1
Chaibasa	BSM-7	727	8.56	ND	299	67	56	29	260	44	5.5
Khuntpani	BSM-17	811	8.53	ND	390	50	36	56	320	34	1.2
Kereikala	BSM- 22A	587	8.11	ND	129	95.7	38	25.51	200	37	2.2
Bandgaon.	BSM-23	1634	8.26	ND	104	394	72	58	420	147	19
Kokcho	BSM-26	356	8.68	ND	98	39	34	11	130	14	0.4
Pandrasalai	BSM-27	694	8.42	ND	209	95.7	24	25.51	165	76	1.8
Hesadih	BSM- 30A	269	8.5	12	152	14	24	13	115	12	1.1

4.4 Status of ground water development—

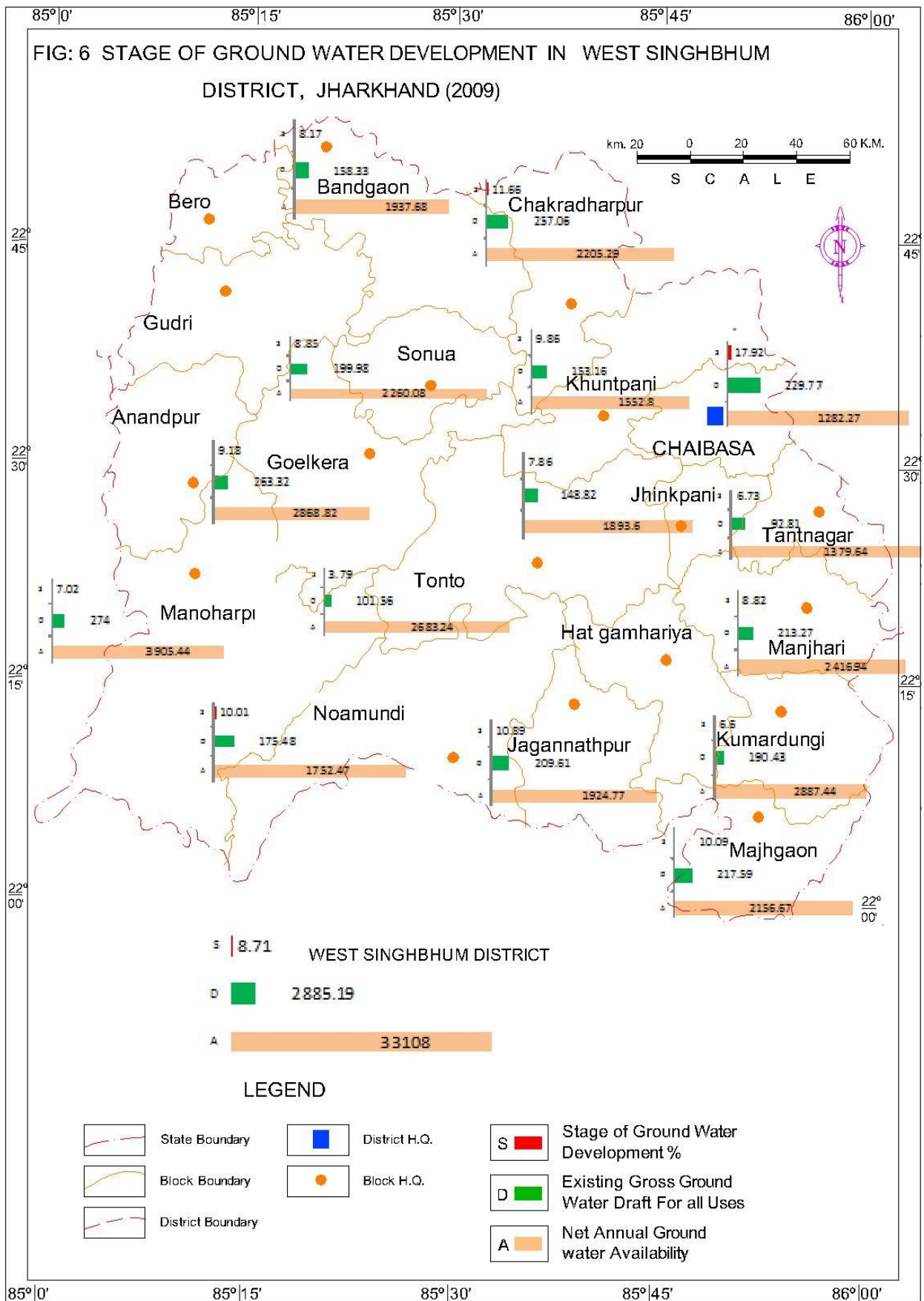
The ground water is mainly utilized for domestic needs and for irrigation purposes. The ground water abstraction is mainly through dug wells, bore wells. The mode of lifting of water for domestic purpose from dug wells is mainly through rope and bucket. The bore wells / tube wells are fitted with hand pump or submersible power pump. The stage of ground water development is 9% in general. The low development of ground water resources is mainly attributed to lithology of the area, Tribal and backward population, erratic electricity supply, lack of scientific input (adoption of proper drilling and design), inefficient irrigation practices and cropping pattern. In most of the blocks, only one crop is grown-Paddy in Kharif season, which is mostly rainfed.

5.0 Ground water management strategy:

Areas Suitable for artificial Recharge

Rainwater harvesting is the technique of collection and storage of rainwater at surface or in sub-surface aquifer before it is lost as surface runoff. Artificial recharge to ground water is a process by which the ground water reservoir is augmented at a rate exceeding that under natural condition of replenishment.

Identification of area --- Chaibasa urban area and Chakradharpur urban area has deeper water level and roof top rain water harvesting must be adopted for maintaining sustainable water level.



6.0 Ground water related issues –

Pin pointing of sites for Bore wells in Singhbhum Granite, Low discharge in Kolhan formations, drilling problem in Lime stone terrain and Collapsing of borewells in Barajamda area are ground water issues.

7.0 Awareness and Training activity

7.1 Mass awareness program and training activity---

Altogether one number of Training programme was organised at Town hall chaibasa during 2007. In the function representatives from different govt. departments, universities, N.G.O.s and builders participated.

7.2 Participation in exhibition, Mela .fair etc

NIL

7.3 Presentation & lectures delivered in Public forum/Radio/Television/Institute of repute/grass root association/NGO/academic institutes--- S.N.Sinha and T.B.N.singh delivered lectures at All India Radio-Chaibasa Kendra

8.0 Area notified by CGWA/SGWA

From the ground water point of view, all the blocks of the district are under safe category. So far no blocks have been notified by C.G.W.A.

9.0 Recommendations

1. The region being hilly and undulating, the drainage is very intensely developed. The construction of Rain water harvesting structures such as gully plugging, contour bunding, gabion structures, check dams and Percolation tanks would increase the storage in surface which will in turn recharge the ground water in these areas.
2. Chakradharpur and Chaibasa urban areas have deeper water level so Roof top rain water harvesting must be adopted with proper design.
3. Combination drilling rigs should be employed in Limestone Terrain of Jhinkpani and Iron ore area of Barajamda.
5. Hydrogeological studies coupled with resistivity surveys can delineate potential Aquifers. Fractures located upto 150 m.bgl are potential ground Water Aquifers in the district.