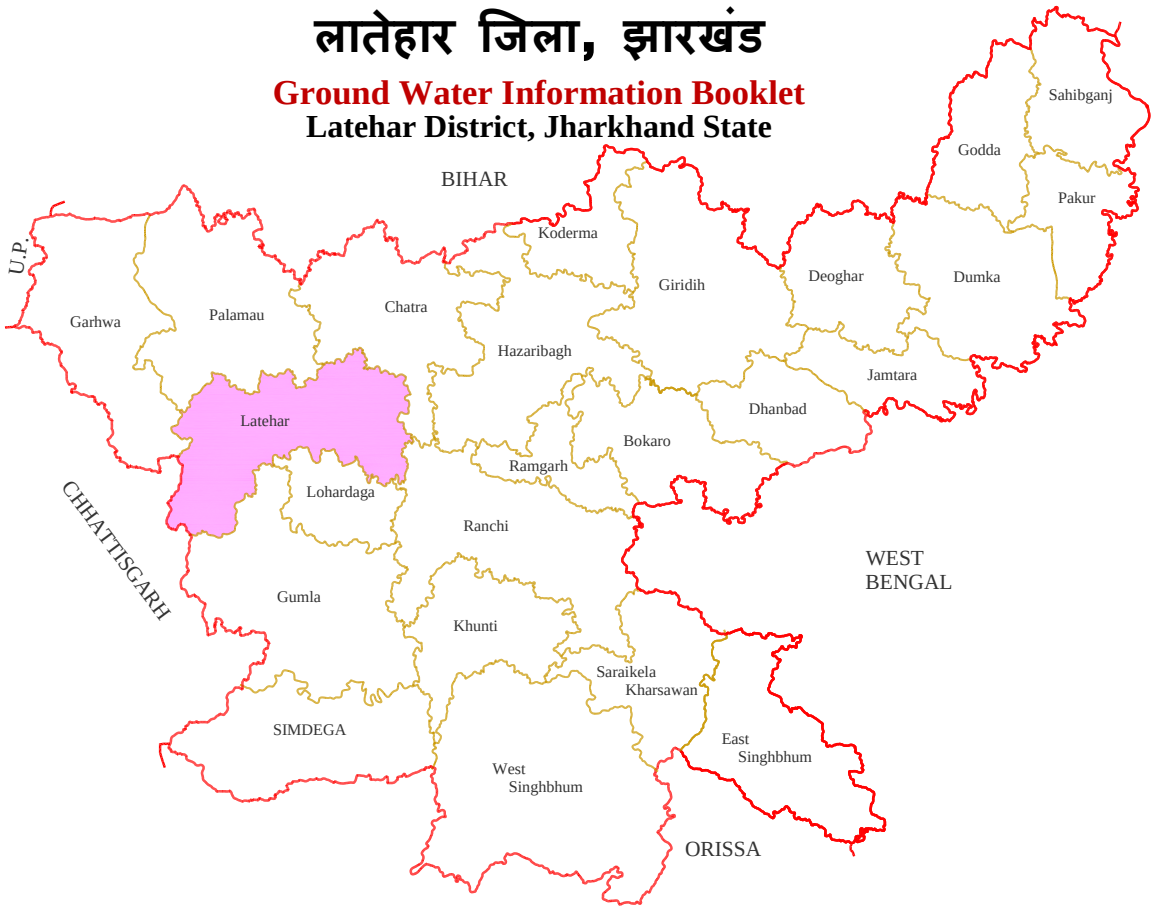
भूजल सूचना पुस्तिका

लातेहार जिला, झारखंड

Ground Water Information Booklet

Latehar 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

सितंबर 2013

September 2013

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GROUND WATER INFORMATION BOOKLET OF LATEHAR DISTRICT JHARKHAND STATE

List of Figures :

LATEHAR – DISTRICT AT A GLANCE

Sl No.	ITEMS	Statistics	
1.	GENERAL INFORMATION		
	i) Geographical Area (Sq km.)	3659.59 Sq. km.	
	(16) Administrative Divisions (As on 2011) Number of Block Number of Panchyat / Villages	 7 115/ 773	
	(ii) Population (As on 2011 Census)-	726978	
	(iii) Average Annual Rainfall (mm)	1300	
2.	GEOMORPHOLOGY		
	Major Physiographic units	Chotanagpur plateau	
	Major Drainages	North Koel	
3.	LAND USE (Sq Km.)		
	a) Forest area:	1627.45	
	b) Net area sown:	541.58	
	c) Cultivable waste area:	65.19	
4.	MAJOR SOIL TYPES	Ultisols (Lateritic soil, red and yellow soils) red sandy soil	
5.	AREA UNDER PRINCIPAL CROPS	Rabi – 289.65 Kharif – 577.22	
6.	IRRIGATION BY DIFFERENT SOURCES(4th MI census)	No	Area (in Ha)
	Dugwell	4231	7046
	Tube wells /Bore wells	7/1	18/1
	Surface water	3033	16797
7.	NUMBERS OF GROUND WATER MONITORING WELLS OF CGWB (As on 31-03-13) No of Dugwell No. of Piezometers	 8 Nil	
8.	PREDOMINANT GEOLOGICAL FORMATIONS	Chotanagpur Granite Gneiss, Laterites	
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 in 10 yrs (2003-2012) in m / yr. (Pre – monsoon)	Granite gneiss 5.7 to 11.7 mbgl 2.5 to 9.5 mbgl Rise: 0.02 – 0.08 Fall: 0.16 – 0. 51	
10.	GROUND WATER EXPLORATION BY CGWB (As on 31-03-13)		
	No. of wells drilled (EW, OW, PZ, SH, Total	EW – 6	
	Depth Range (m)	85.45– 199.12 mbgl	
	Discharge (m^3/hr.)	1.50 – 3.3	
11.	GROUND WATER QUALITY	Good	

	Presence of Chemical constituents more than permissible limit (e.g. EC, F, As, Fe)	EC 113 o 1460 micro mhos/cm at 25^0 C.
	Type of Water	Potable
12.	DYNAMIC GROUND WATER RESOURCES (2009) in mcm.	
	Net Annual Ground Water Resources	25256.47
	Net Annual Ground Water Draft	6685.57
	Projected Demand for Domestic and Industrial uses up to 2034	1288.19
	Stage of Ground Water Development	26.47 %
13.	AWARENESSS AND TRAINING ACTIVITY	
	Mass Awareness Programmes Organized Date Place No. of Participants	NIL
14.	EFFORTS OF ARTIFICIAL RECHARGE & RAINWATER HARVESTING	
	Projects completed by CGWB (No & Amount spent)	Nil
	Projects under technical guidance of CGWB (Numbers)	Nil
15.	GROUND WATER CONTROL AND REGULATION	
	Number Of OE Blocks	Nil
	No. of Critical Block	Nil
	No. of Blocks notified	Nil
16.	MAJOR GROUND WATER PROBLEMS AND ISSUES	67% of NHNS showing declining trend of water level for pre monsoon and post monsoon period

Ground Water Information Booklet
Latehar District, Jharkhand

1.0 INTRODUCTION

Latehar is one of the chronically drought affected district of Jharkhand with a geographical area 3,659.59 sq. Km. The district is bounded by North Latitude $20^0$43' & $21^0$49' and East Longitude $82^0$39' & $83^0$55'. The district falls in Survey of India degree sheet no. 73A. It is bounded by Palamu and Chatra districts in the north , in the south by Gumla and Lohardaga districts, in the east by Chatra and Ranchi districts and in the west by Garhwa district and Chhattisgarh State. The district headquarter is Latehar. There are 9 Development Blocks, namely Latehar, Chandwa, Balumath, Manika, Barwadih, Garu, Mahuda, Bariyatu and Herhanj.

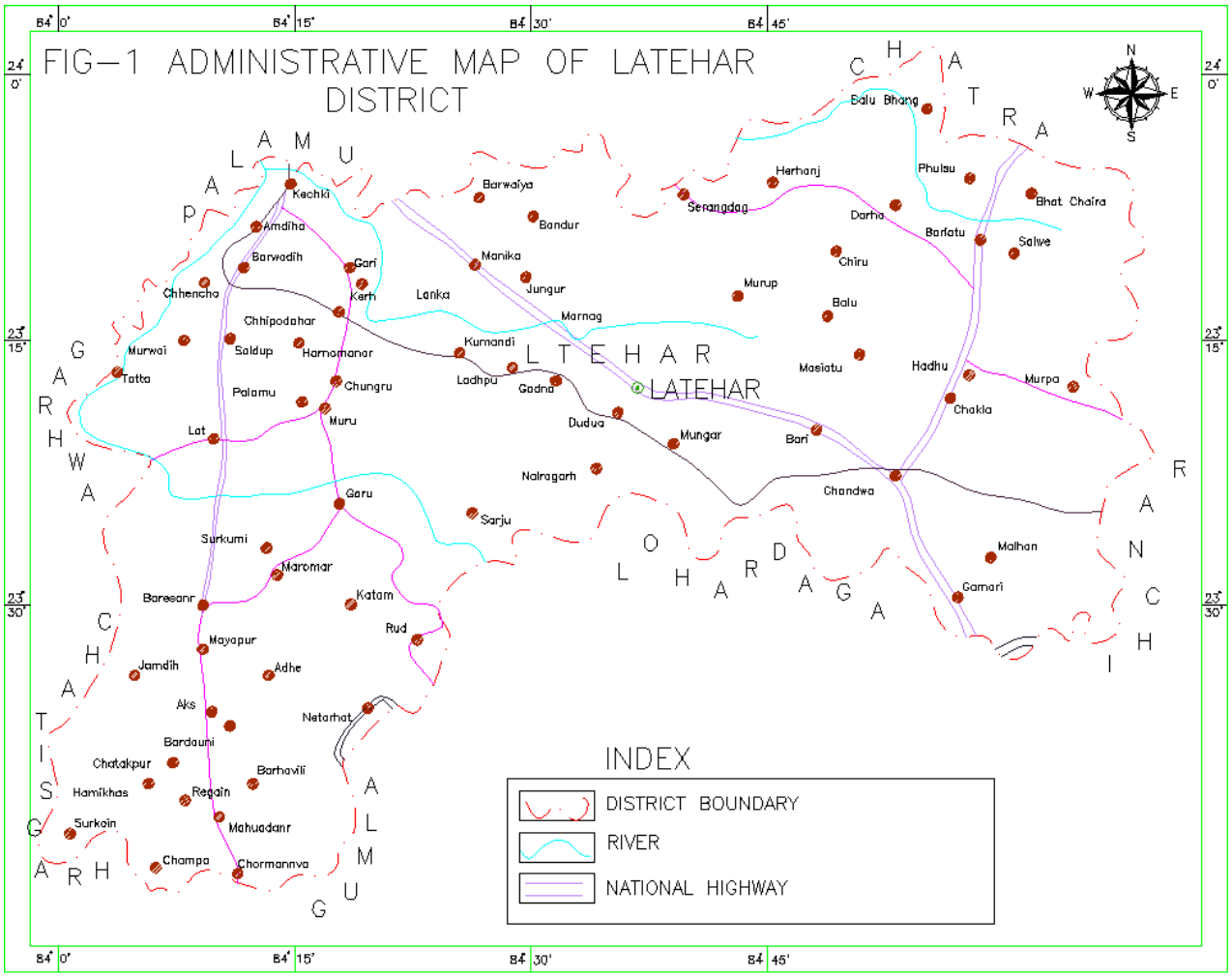
1.1 ADMIINISTRATIVE DIVISIONS & POPULATION

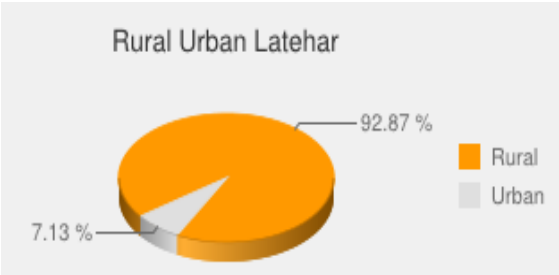
It has seven administrative blocks namely, Barwadih, Garu, Latehar, Chandwa, Mahudanr, Manika and Balumath. The area of the district is 3622.4 sq. km. According to 2011 census, the total population of the district is 7,26,978 constituting 2.2 percent of the total population of Jharkhand State. It is the 20^{th} largest district in the state by Population . But 11^{th} largest district in the state By Area. The rural and urban populations are 6,75,120 and 51,858 respectively. The Rural population constitutes 93 % of the total population. There was change of 29.61 percent in the population compared to population as per 2001. The initial provisional data released by census India 2011, shows that density of Latehar district for 2011 is 169 people per sq. km. The administrative map has been shown in figure – 1. Graphical presentation of population is shown in figure – 1A. The administrative division and population of the district is given in table – 1.

1.2 DRAINAGE

The general drainage flow direction in the district is from South to North. The principal rivers of the district are the North Koel ,the Auranga and their tributaries. The Koel and Auranga have the upper reaches characterized by

rocky bed while the lower reaches by sandy beds. North Koel river receives the water from several of its tributaries. The Auranga originates from the eastern part of the district. The drainage map has been shown in figure – 2.





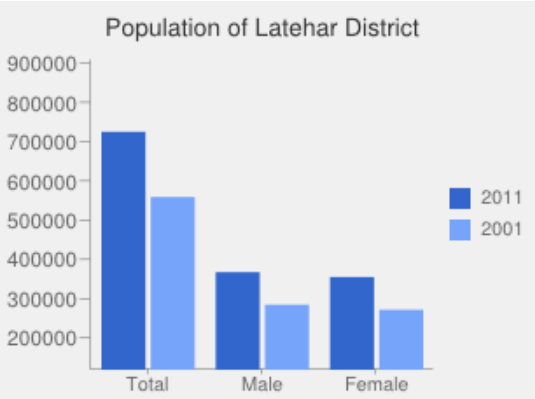


Fig 1A- Graphical presentation of population

TABLE 1: ADMINISTRATIVE DIVISION AND POPULATION OF LATEHAR DISTRICT (2011)

Sr. No.	Block	Area (Sq. km) (2011)	Rural population			Urban population		
			Male	Female	Total	Male	Female	Total
1	Balumath	946	45313	43699	89012	--	--	--
2	Barwadih	341	46396	44708	91104	4160	3728	7888
3	Chandwa	593	45380	44284	89664	8788	8201	16989
4	Garu	228	15227	15047	30274			
5	Latehar	464	59281	58233	117514	14152	12829	26981
6	Mahuadanr	643	37915	36817	74732	--	--	--
7	Manika	445	44923	43172	88095	--	--	--
8	Bariyatu	NA	30359	29736	60095			
9	Herhanj	NA	17772	16858	34630			
	Total	3660	342566	332554	675120	27100	24758	51858

1.3 LAND USE

The land use pattern is closely related to the geomorphological and climatic conditions of the area. The Latehar district is represented hilly , undulating and deeply rugged terrain. The deep forest covers more than half of the area of the district. Among the blocks of the district, the Balumath block is having maximum forest area is 33%. The net area sown minimum of 4.72%. Latehar district has varied agro climate conditions. Rainfall in the district is moderately high but the irrigation facilities are inadequate. The cultivable area of the district is 541.58 Sq.km.Land use data

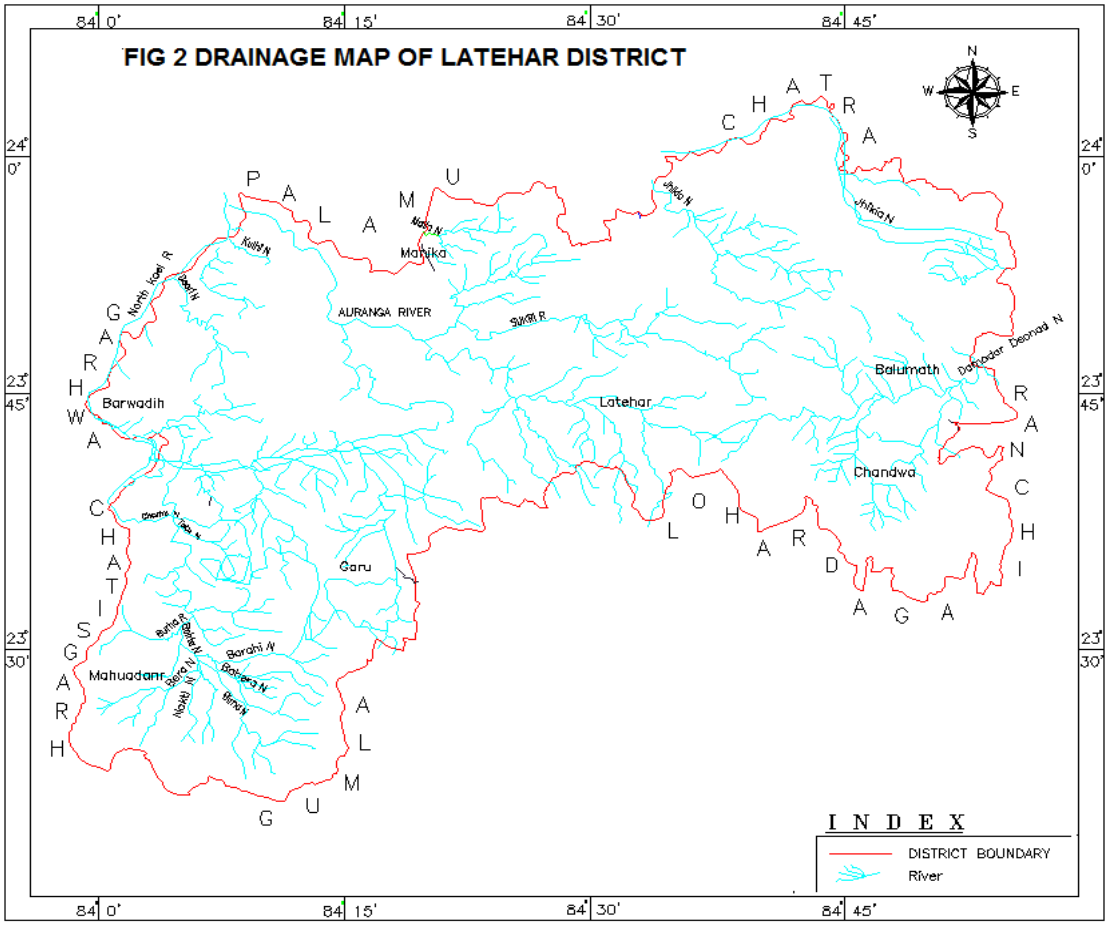
TABLE 2: LAND USE DATA OF LATEHAR DISTRICT

Sl.No.	Particulars	Latehar	Garu	Mahuadanr	Barwadih	Manika	Balumath	Chandwa	Total
A	Net Cultivated Area	130.6	18.09	113.52	39.94	56.22	71.07	112.14	541.58
B	Current Fallow Land	73.04	20.68	99.84	75.85	4.03	124.86	59.72	458.02
C	Barren Non Cultivable	45.85	8.45	58.3	24.08	29.56	58.43	32.54	247.21
D	Forest	195.24	162.4	258.38	241.67	190.12	542.59	337.1	1627.45
E	Land Put To Non Agrl.								
I	Land Area	10.83	8.88	34.24	21.22	7.39	11.98	14.63	110.17
II	Water Area								
	Permanent	4.8	0.5	1.84	1.89	1.5	4.93	0.64	16.1
	Seasonal	1.92		3	1.39	0.92	1.91	1.41	10.55
F	Cultivated Waste Land	7.36	3.94	2.6	8.54	6.26	17.48	19.11	65.19
G	Permanent Pasture &Other Grazing Land	1.43		7.66	0.78	0.06	2.49		12.42
H	Micl. Trees & Tree Crops Not Involved In (A)	2.37		9.78	1.52	2.8	47.93	0.75	65.15
I	Other Fallow Land	44.05	14.33	70.07	38.6	28.04	100.88	37.15	333.15

Source: Official website of Latehar district(Latehar.nic.in)

1.4 STUDIES / ACTIVITIES CARRIED OUT BY CGWB

CGWB has established National Hydrograph stations for monitoring ground water regime behavior and quality of groundwater in the district. The Board has also carried out exploratory drilling to identify the potential fractures in the area. The exploratory wells constructed at Balumath, Chandwa ,Latehar and Manika. Systematic and Reappraisal hydrogeological survey has been carried by CGWB in the district.



2.0 RAINFALL & CLIMATE.

2.1 CLIMATE

The district is characterized by humid and subtropical climate with three distinct seasons - hot and dry summer, cold winter and rainy season. The cold season extends from November to March, it is followed by summer season from April to middle of June and rainy season from mid June to middle of October.

2.2 RAINFALL

The rainfall in the district is mainly received from the south west monsoon. The average annual rainfall is 1300 mm. About 90% of the total annual rainfall is received during the monsoon period. Maximum rainfall has been observed from June to October months.

3.0. GEOMORPHOLOGY & SOILS

3.1. GEOMORPHOLOGY

The topography of Latehar district is characterized by a hilly rugged landscape with green forest all over the area. The elevation of the hill ranges in southern part of the district varies from 300 to 1100 m above msl. Physiographically, the district can be divided into three parts:

(i) East – West trending hill ranges consisting of metamorphic rocks in the southern part.

(ii) Flat type hill in the south – eastern parts.

(iii) The narrow valleys along the course of rivers in south – west of the district.

3.2 SOIL

The district is characterized by great heterogeneity in soil development. It can be attributed to uneven topography, non uniform rainfall distribution and variation within composition of the parent material. High relief plateau of Netarhat, Chandwa and Garu are in mature stage, where the soil developments in low relief areas are of recent type. Soils of Netarhat region are laterite type derived from weathered basalt and granite rocks. Major part of the district is occupied by red sandy soil, The red and yellow soil are occupying the northern part of the district.

4. 0 GROUND WATER SCENARIO

4.1. 1 HYDROGEOLOGY

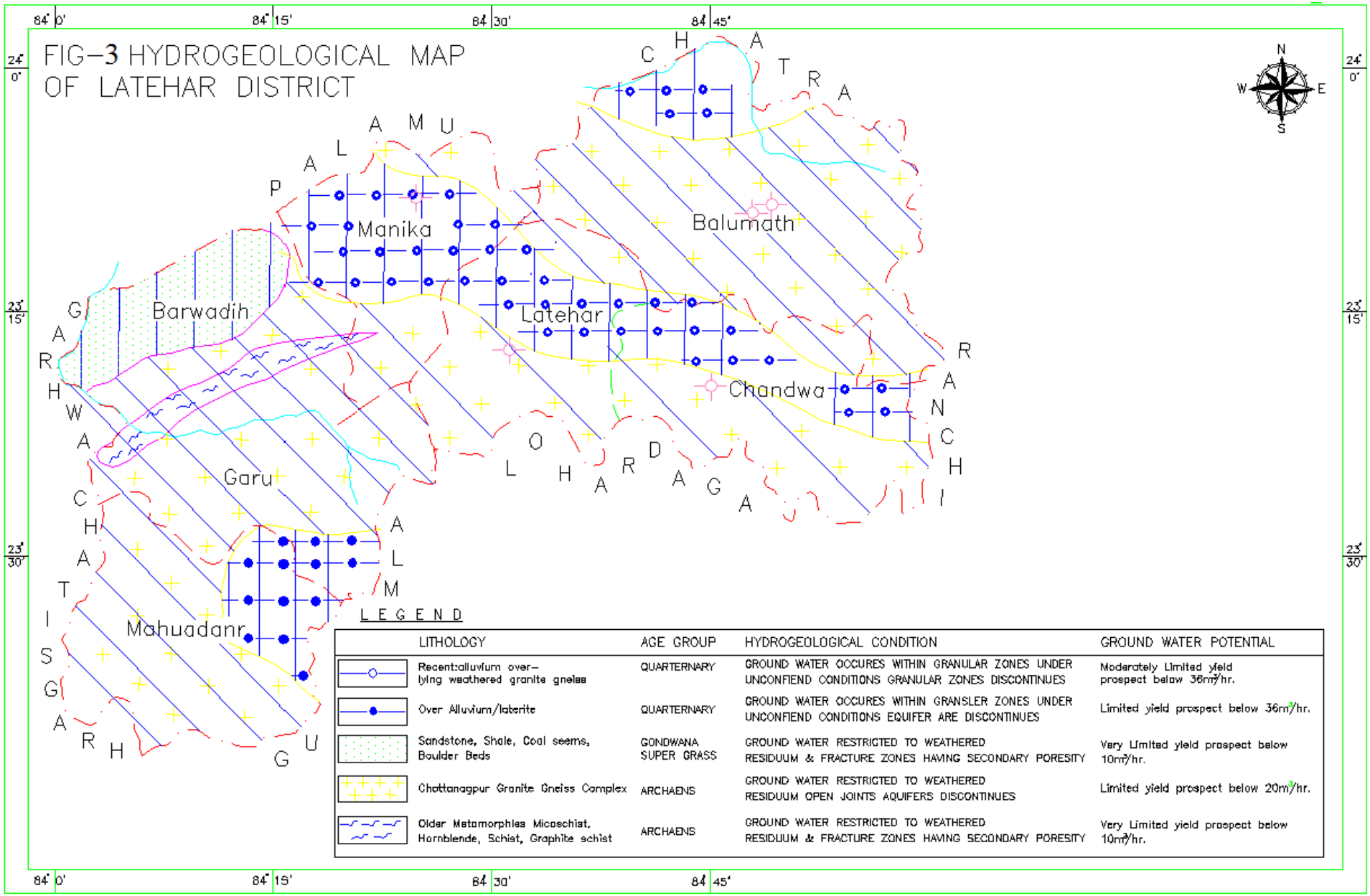
In the district, the area is rugged and highly undulated and the following hydrogeological formations are found :

(i) Consolidated formations

(ii)Semi consolidated formations and

(iii) Un consolidated formations.

Rainfall, climate, topography, soil conditions and land use are the factors controlling ground water potentials of the area. Ground water in the hard rock areas occur in the weathered mantle and fracture zones of under lying rocks. It also occurs in unconsolidated sedimentary deposits along the major river valleys. (Fig-3)


84° 0'
84° 15'
84° 30'
84° 45'
24° 0'
23° 15'
23° 30'
FIG–3 HYDROGEOLOGICAL MAP OF LATEHAR DISTRICT
N
S
E
W
CHATRA
PALAMU
GARHWA
CHATISGARH
LOHARDAGA
Manika
Barwadih
Latehar
Balumath
Chandwa
Garu
Mahuadanr
LEGEND
LITHOLOGY
AGE GROUP
HYDROGEOLOGICAL CONDITION
GROUND WATER POTENTIAL
Recent:alluvium over–lying weathered granite gneiss
QUARTERNARY
GROUND WATER OCCURES WITHIN GRANULAR ZONES UNDER UNCONFIEND CONDITIONS GRANULAR ZONES DISCONTINUES
Moderately Limited yield prospect below 36m³/hr.
Over Alluvium/laterite
QUARTERNARY
GROUND WATER OCCURES WITHIN GRANSLER ZONES UNDER UNCONFIEND CONDITIONS EQUIFER ARE DISCONTINUES
Limited yield prospect below 36m³/hr.
Sandstone, Shale, Coal seems, Boulder Beds
GONDWANA SUPER GRASS
GROUND WATER RESTRICTED TO WEATHERED RESIDUUM & FRACTURE ZONES HAVING SECONDARY POROSITY
Very Limited yield prospect below 10m³/hr.
Chottanagpur Granite Gneiss Complex
ARCHAENS
GROUND WATER RESTRICTED TO WEATHERED RESIDUUM OPEN JOINTS AQUIFERS DISCONTINUES
Limited yield prospect below 20m³/hr.
Older Metamorphiss Micaschist, Hornblende, Schist, Graphite schist
ARCHAENS
GROUND WATER RESTRICTED TO WEATHERED RESIDUUM & FRACTURE ZONES HAVING SECONDARY POROSITY
Very Limited yield prospect below 10m³/hr.

4.1.2 EXPLORATORY WELLS

6 (six) numbers of exploratory wells were drilled in the district of Latehar and the drill depth varies from 85.24mbgl to 199.56 mbgl. 2 to 8 fractures zones were encountered at the depth of 199.56 mbgl. The static water level varies from 4.45 m to 5.7 mbgl. The analysis of pumping test data conducted for exploratory wells drilled by CGWB shows that the discharge varies from 1.5 m^3/hr to 3.3 m^3/hr. (Table – 2).

TABLE 3: DETAILS OF EXPLORATORY WELLS IN LATEHAR DISTRICT

Sl No.	Location	Depth Drilled (m)	Length of Casing (m)	Fracture Tapped (m)	SWL (m)	Discharge (m^3/hr)
1	LETEHAR (EW – I)	85.45	23.16	45.00 – 47.14 73.00 – 74.00	4.45	3.06
2	LETEHAR (EW – II)	85.24	17.66	35.00 – 47.00 63.00 – 64.00 83.00 – 84.00	4.78	3.3
3	Manika	198.94	7.94	47.42 – 48.42 132.00 – 133.00	5.7	0.9
4	Balumath (EW – I)	199.56	5.73	11.00 – 12.00 33.00 – 34.00 70.00 – 71.00 100.00 – 101.00 123.00 – 124.00 146.00 – 147.00 167.00 – 169.00 182.00 – 184.00	3.3	1.5
5	Balumath (EW – II)	199.12	14.38	15.00 – 16.00 30.00 – 31.00	5.7	1.5
6	Chandwa	191.46	--	--	--	--

4.1.3 DEPTH TO WATER LEVEL

CGWB has established a network of observation wells under National Hydrograph Network Stations (NHNS) programme to study water level behavior and quality of ground water in the district. Eight NHS monitoring stations were established and being monitored every year regularly during January, May, August and November.

During pre monsoon season, the minimum and maximum water levels were observed as 6.15 mbgl. and 11.02 mbgl respectively. About 55% wells have the water level in the range of 6 – 8 mbgl . The water level in eastern part of district ranges from 10 mbgl to 12 mbgl, while the southern and middle part is having the water level in the range 8 – 10 mbgl.(Fig-4)

The water level during post monsoon season ranges from 2.0 mbgl to 8.05 mbgl. About 25% the wells have the water level in the range of 0 – 3 mbgl. In majority of the wells (around 62.5%), the water levels lie in the range of 3 – 6 mbgl. In and around Balumath block, the water level is more than 6 mbgl. .(Fig-5)

TABLE 4: DEPTH TO WATER LEVEL OF HYDROGRAPH NETWORK STATIONS LOCATED IN LATEHAR DISTRICT (2012-13)

Sl No.	Location	May 2012	August 2012	November 2012	January 2013
1	Balumath	11.7	8.4	9.5	10.45
2	Barjatu	8.47	4.87	6.9	7.57
3	Barwadih	9.31	0.42	3.65	-
4	Chandwa	9.95	3.2	4.15	5.7
5	Latehar	5.7	2.2	3.02	4.38
6	Manika	6.52	0.92	2.5	3.84

4.1.4 WATER LEVEL TREND

Water level depends upon the storage of ground water development and variation in rainfall over a long period. The water level data of each station has been analysed. 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 declining trend between 0.16 – 0.26, 0.13 – 0.41and 0.05 – 0.27 m/ year for pre monsoon, post monsoon and all period respectively.

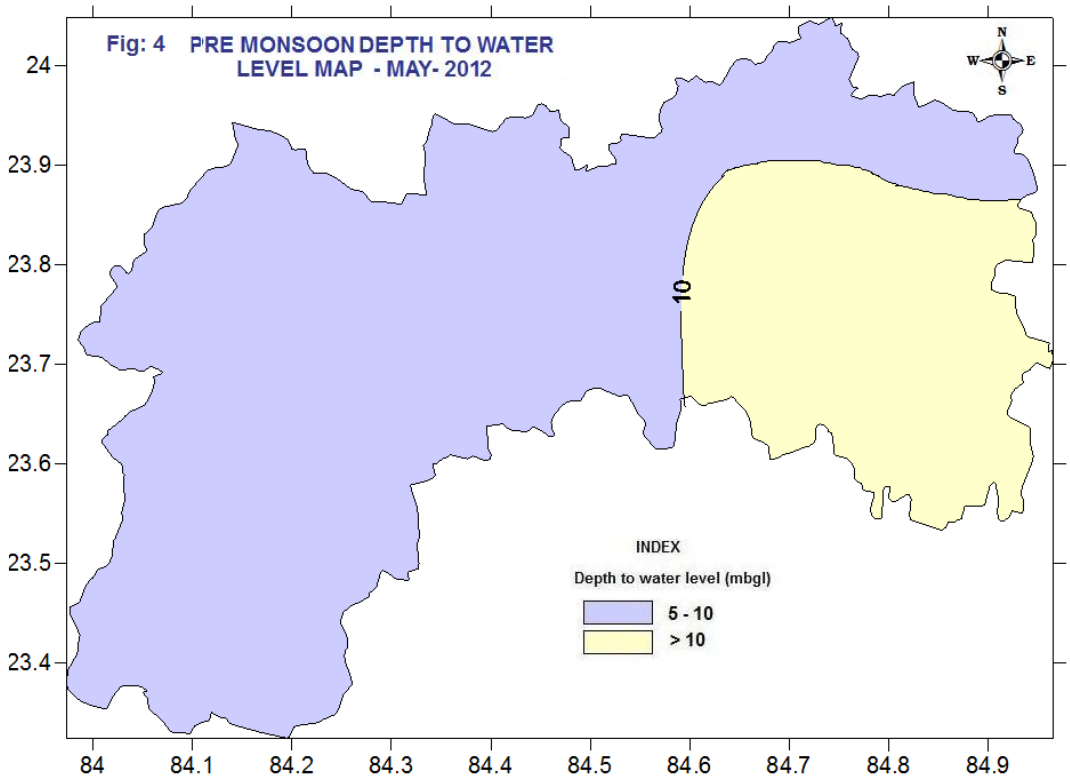


Fig: 4 PRE MONSOON DEPTH TO WATER LEVEL MAP - MAY- 2012
N
W
E
S
10
INDEX
Depth to water level (mbgl)
5 - 10
> 10
24
23.9
23.8
23.7
23.6
23.5
23.4
84
84.1
84.2
84.3
84.4
84.5
84.6
84.7
84.8
84.9

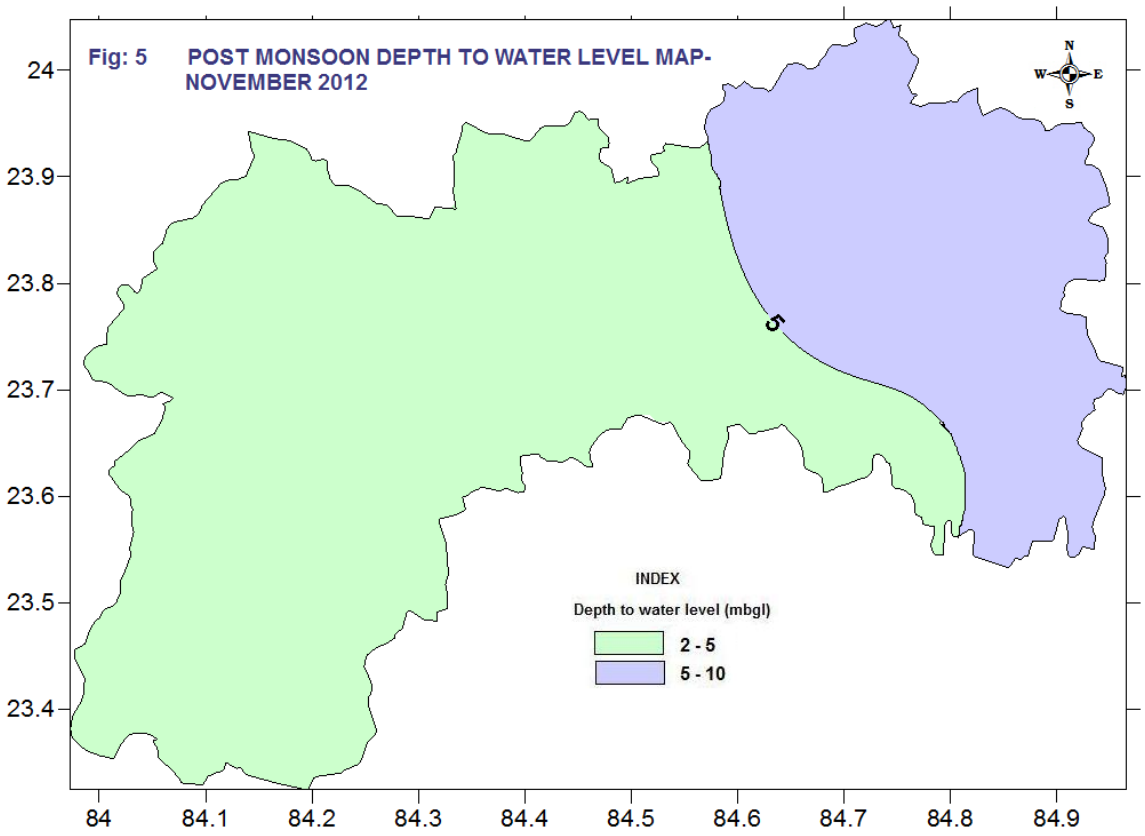


Fig: 5 POST MONSOON DEPTH TO WATER LEVEL MAP- NOVEMBER 2012
N
W
E
S
5
INDEX
Depth to water level (mbgl)
2 - 5
5 - 10
24
23.9
23.8
23.7
23.6
23.5
23.4
84
84.1
84.2
84.3
84.4
84.5
84.6
84.7
84.8
84.9

TABLE 5: LONG TERM WATER LEVEL TREND FOR EXISTING HYDROGRAPH NETWORK STATIONS IN LATEHAR 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	Balumath	-	0.5133	-	0.407394	-	0.272315
2	Barjatu	-	0.1633	-	0.1395	-	0.15919
3	Barwadih	-	0.247353	0.722647	-	0.308587	-
4	Chandwa	-	0.165333	-	0.188848	-	0.050414
5	Latehar	0.086554	-	-	0.137542	0.045736	-
6	Manika	0.023758	-	0.04329	-	0.009362	-

4.1.5 GROUND WATER RESOURCES

The ground water resource assessment has been assessed based on the recommendations of the Ground Water Estimation Committee – 1997 (GEC – 1997). The ground water assessment has been carried out on blockwise basis. Latehar district is having adequate ground water resource potential and only a small part of it is being utilized. The net ground water availability is 25256.47 ham. Gross draft for all uses is 6685.57 ham. Net ground water availability for future irrigation has estimated to be 18206.47 ham. Stage of ground water development varies from 16.34% at Mahuadanr to 60.09% in Latehar. All the blocks in the district fall under Safe category. Stage of Development is shown in Fig-6.

4.1.6 GROUND WATER QUALITY

The chemical quality of ground water is very important as it controls the suitability of the ground water for domestic, irrigation and industrial uses. For analysis of ground water quality, the following parameters are considered for analysis of water samples collected during May 2011 from 5 hydrograph network stations of the district.

The EC ranges from 113 to 1460 micro siemens/cm at 25^0c with the average being 577.6 micro siemens/cm at 25^oc. Except one well, EC is within 1000 micro siemens/cm in the district. Analysed results are given in table 6. For consideration of suitability of ground water for drinking purpose, ISI norms have been adopted. All the constituents are under permissible limit , so the ground water is suitable for both drinking and agricultural purposes.

4.1.7 STATUS OF GROUND WATER DEVELOPMENT

In the district, there is vast scope for further development of the ground water resources. However the main problem associated with the ground water development in the district is that the ground water is not occurring in isotropic and homogeneous strata. The exploratory well drilled depth varies from 85.24 mbgl to 199.56 mbgl. The thickness of fracture zones vary from 1m to 6m. The well at Latehar having the highest discharge of 3.3 m^3/hr. The minimum SWL at Balumath is 3.3 mbgl. The yield of bore well ranges from 0.9 - 3.3 m^3/hr.

5.0 GROUND WARER MANAGEMENT STRATEGY :

5.1 GROUND WATER DEVELOPMENT

Dug wells, tube wells and dug cum bore wells are the main ground water extraction structure in the district to meet the increasing demand of domestic water supply and irrigation. North-East part of the district is more suitable for ground water development depending upon the availability of favorable locations. The overall ground water development in the district is 26.47%,The ground water draft has been worked out as per norms of Ground Water Estimation Committee- 1997 for potential available in the district. The details of recharge , net annual ground water availability , net ground water balance and annual draft has been evaluated (Table - 5).

TABLE 6: DETAILS OF GROUND WATER RESOURCES AND STAGE OF GROUND WATER DEVELOPMENT IN LATEHAR DISTRICT AS ON 31ST MARCH 2009 (in hectare meters)

Sl.No	Assessment Unit/District	Net Annual Ground water Availability	Existing Gross Ground Water Draft for Irrigation	Existing Gross Ground water Draft for Domestic and Industrial Water Suply	Existing Gross Ground Water Draft For all Uses (10+11)	Allocation for Domestic and Industrial Requirement suply upto next 25 years	Net Ground Water Availability for future irrigation development (9-12-13)	Stage of Ground Water Development (12/9)*100 (%)
1	**Balumath**	7821.71	1505.68	229.57	1735.25	281.39	6034.64	22.19
2	**Barwadih**	2565.74	704.35	126.36	830.72	197.68	1663.71	32.38
3	**Chandwa**	4715.09	779.06	137.97	917.02	169.11	3766.92	19.45
4	**Garu**	1145.71	442.98	43.02	486.00	52.73	650.00	42.42
5	**Latehar**	2196.15	1154.90	164.73	1319.62	315.04	726.22	60.09
6	**Mahuadanr**	4852.52	680.22	112.44	792.66	137.82	4034.48	16.34
7	**Manika**	1959.55	494.62	109.67	604.29	134.42	1330.51	30.84
	TOTAL	**25256.47**	**5761.81**	**923.75**	**6685.57**	**1288.19**	**18206.47**	**26.47**

TABLE 7: RESULTS OF CHEMICAL ANALYSIS OF WATER SAMPLES COLLECTED FROM HYDROGRAPH NETWORK STATIONS OF LATEHAR DISTRICT(May 2011)

District	Block	Location	E.C. micro	pH	CO3	HCO3	Cl	Ca	Mg	TH as	Na	K
			Siemens/cm							CaCO3		
			at 25o C		mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l
LATEHAR	CHANDWA	Chandwa	303	8.7	36	85	14	28	8.5	105	15	14
	LATEHAR	Latehar	440	8.4	12	55	60	44	6	135	28	7.3
	MANIKA	Manika	1460	8.2	ND	323	223	124	47	505	46	4.9
	BALUMATH	Balumath	113	7.9	0	37	18	12	2.4	40	19	2.4
	BALUMATH	Bariatu	572	8.28	0	79	64	44	21	195	45	1

5.2 WATER CONSERVATION & ARTIFICIAL RECHARGE

The major schemes like artificial recharge & rain water harvesting are lacking in the district. Rain water harvesting and artificial recharge is necessary for ground water augmentation in different part of the district. There should be a plan to arrest the decline of ground water storage and ensuring sustainable and economic utilization of ground water resources. The artificial recharge can be taken up in Latehar and Chandwa Township as well as other block headquarter in the district. There are lot of watersheds in the area. The artificial recharge structure like percolation tank ,gully plugging ,subsurface dyke can be constructed to maintain the ground water potentiality and sustainability.

6.0 GROUND WATER RELATED ISSUES AND PROBLEMS

Some areas of the district is highly drought prone. The deeper ground water level is the major problem in the district.

7.0 AWARENESS AND TRAINING ACTIVITY

7.1 Awareness of Training Activity

No mass awareness programme or Water Management Programme has been organized in the district till date

7.2 Participation in Exhibition, Mela, Fair etc.

Nil

7.3 Presentation & Lectures delivered in public forum/Radio/TV/Institute of repute/Grassroots association/NGO/ Academic institutions etc.

Nil

8.0 Areas Notified by CGWB/SGWA

From the ground water point of view, all blocks of the district are under safe category. So no block has been notified by the Authority.

9.0 RECOMMENDATION

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1. In certain patches, the dug well goes dry during the summer. In such places the wells should be deepen so that it taps the entire saturated thickness of weathered residuum.

2. Lineaments should be carefully demarcated and pin pointed by Geophysical investigations for construction of bore wells.
3. The springs should be developed and used for local water supply in the district.
4. In the district under geological condition deeper fracture and other secondary porosity are proved their yielding and storage capacity. The district head quarter Latehar and other block headquarters are suitable for rainwater harvesting and artificial recharge of ground water.
5. The artificial recharge structure like percolation tank ,gully plugging , subsurface dyke can be constructed to maintain the ground water potentiality and sustainability.

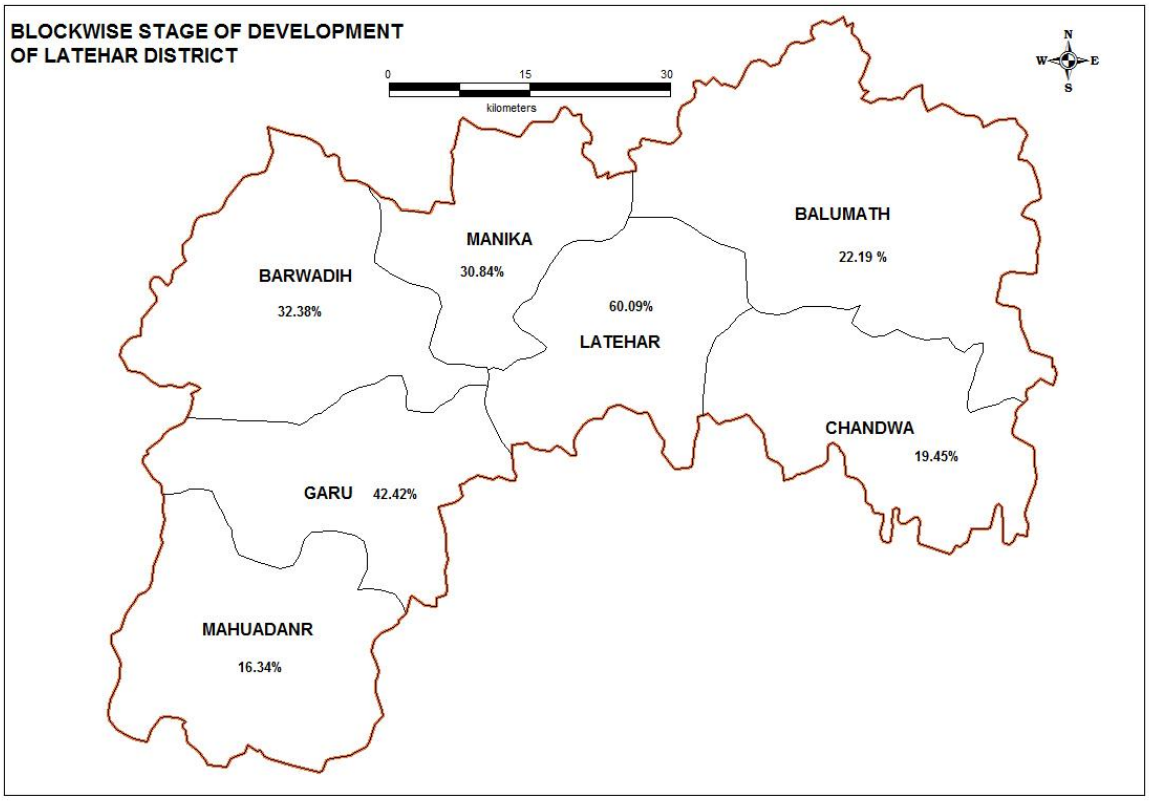

Fig:6- Stage of Development map of Latehar District