

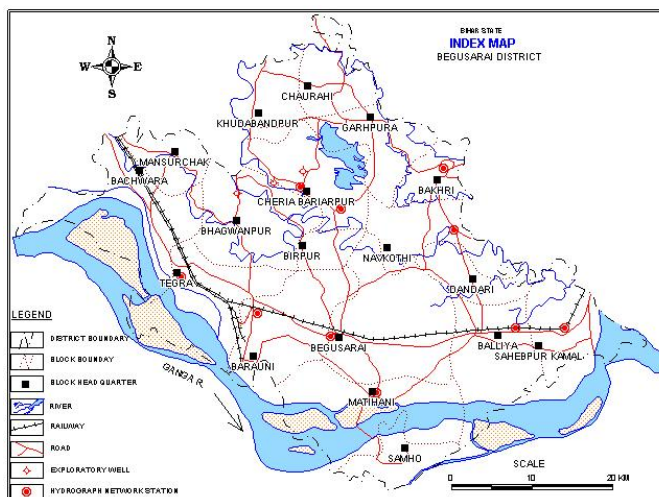


# भूजल सूचना पुस्तिका

## बेगुसराय जिला, बिहार

### Ground Water Information Booklet

#### Begusarai District, Bihar State



केन्द्रीय भूमिजल बोर्ड

जल संसाधन मंत्रालय

(भारत सरकार)

मध्य-पूर्वी क्षेत्र

पटना

Central Ground water  
Board

Ministry of Water Resources

(Govt. of India)

Mid-Eastern Region

Patna

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# Ground Water Information Booklet Begusarai District, Bihar State

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## BEGUSARAI DISTRICT AT A GLANCE

Sl. No.		Statistics
<b>1.</b>	<b>GENERAL INFORMATION</b>	
	<b>I Geographical Area (Sq. Km.)</b>	1918
	<b>II Administrative Divisions</b> No. of Panchayats/Villages Number of Tehsil/Block	5 257/1229 18
	<b>III Population (As per 2011 Census)</b>	Rural: 2400718 Urban: 569823
	<b>IV Average Annual Rainfall (mm)</b>	1104.7
<b>2</b>	<b>GEOMORPHOLOGY</b>	
	<b>Major Physiographic Units</b>	Thick unconsolidated alluvium
	<b>Major Drainages</b>	Burhi Gandak, Balan, Bainty, Baya, Chandrabhaga, Ganga and Bagmati
<b>3</b>	<b>LAND USE</b>	
	a) Forest Area	Nil
	b) Net Area Sown	1173.03 sq.km
	c) Cultivable Area	1790.56 sq. km
<b>4</b>	<b>MAJOR SOIL TYPES</b>	Vertisols, inceptisols, entisols.
<b>5</b>	<b>PRINCIPAL CROPS</b>	Paddy, wheat, cash crops
<b>6</b>	<b>IRRIGATION BY DIFFERENT SOURCES</b> (Area in hectares)	
	Dugwells	-
	Tubewells/Borewells (STW)	86000ha
	Tanks/ponds	-
	Canals	-
	Other Sources	-
	Net Irrigated Area	70,000 ha by tubewells
	Gross Irrigated Area	-
<b>7</b>	<b>NUMBER OF GROUND WATER MONITERING WELLS OF CGWB (2011)</b>	
	No. of Dugwells	11
	No. of Piezometers	Nil
<b>8</b>	<b>PREDOMINANT GEOLOGICAL FORMATIONS</b>	Alluvium
<b>9</b>	<b>HYDROGEOLOGY</b>	
	Major water bearing formations	Alluvium
	Pre-monsoon Depth to water level during 2011	6.7 – 9.5 m bgl

	<b>Post-monsoon Depth to water level during 2011</b>	2.85 – 6.1 m bgl
	<b>Long term water level trend in last 10 yrs(2002 – 2011) in m/yr</b>	No significant decline
<b>10</b>	<b>GROUND WATER EXPLORATION BY CGWB (As on 31-03-2013)</b>	
	<b>No. of well drilled (EW,OW, PZ, SH, Total)</b>	EW=8, OW=2, PZ=7
	<b>Depth Range (m)</b>	55 – 56 m bgl
	<b>Discharge (lps)</b>	23 – 50
	<b>Storativity (s)</b>	$9.2 \times 10^{-3}$ to $8.39 \times 10^{-5}$
	<b>Transmissivity (<math>m^2/day</math>)</b>	2300-12,000
<b>11</b>	<b>GROUND WATER QUALITY</b>	
	<b>Presence of Chemical constituents more than the permissible limit (e.g.EC, F, As, F)</b>	As.
	<b>Type of Water</b>	Potable
<b>12</b>	<b>DYNAMIC GROUND WATER RESOURCES (as on 31<sup>st</sup> March 2009) in mcm.</b>	
	<b>Annual Replenishable Ground Water Resources</b>	600.83
	<b>Net Annual Ground Water Draft</b>	351.5
	<b>Projected Demand for Domestic and Industrial Uses up to 2025</b>	76.11
	<b>Stage of Ground Water Development</b>	58.5%
<b>13</b>	<b>AWARENESS AND TRAINING ACTIVITY</b>	
	<b>One day Training Programme Organized</b>	Yet to organize MA / Training Programme
	<b>Date</b>	
	<b>Place</b>	
	<b>No. of Participants</b>	
<b>14</b>	<b>GROUND WATER CONTROL AND REGULATION</b>	
	<b>No. of OE Blocks</b>	Nil
	<b>No. of Critical Blocks</b>	Nil
	<b>No. of Blocks Notified</b>	Nil
<b>15</b>	<b>MAJOR GROUND WATER PROBLEMS AND ISSUES</b>	High Arsenic (As) at places along the bank of Ganga River. High Iron (Fe) concentration reported from few patches
	<b>Note: Latest available data may be incorporated</b>	

# **GROUND WATER INFORMATION BOOKLET**

## **BEGUSARAI DISTRICT, BIHAR STATE**

### **1.0 Introduction**

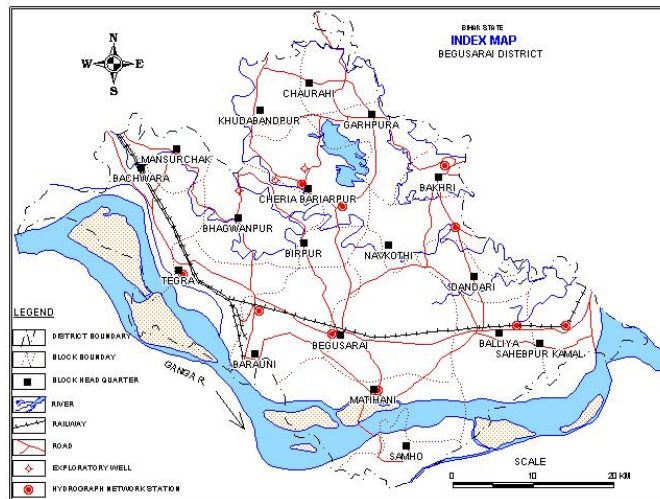
Begusarai district is one of the thirty-eight districts of Bihar. The name of the district apparently comes from "Begum" (queen) and "Sarai" (inn). The Begum of Bhagalpur used to visit "Simaria Ghat" (holy place on the banks of the Ganges) for a month of pilgrimage, which later took to the slang of Begusarai.[1] Begusarai was established in 1870 as a subdivision of Munger District. In 1972, it was given district status. Begusarai district having an area of 1918 sq.km. lies between  $25^{\circ} 15'$ ,  $25^{\circ} 45'$  and  $85^{\circ} 45'$ ;  $86^{\circ} 30'$  on the northern bank of river Ganga.

The district is bounded on the north and west by Samastipur district, on the west by Vaishali and some part of Muzaffarpur districts, on the south by the mighty river Ganges, and on the east by Khagaria districts.

The ground water information booklet of the district contains information, in brief, pertaining to administrative set-up, climate, irrigation practises, geomorphology, soils, hydrogeology and ground water potential.

### **1.1 Administration**

The district lies on the northern bank of river Ganga. The district is at present comprises of 5 sub-division, 18 community development blocks, and 1229 revenue villages and Begusarai town is the administrative headquarters of this district. The district headquarters is connected to all block headquarters by all weather roads. The district has direct train link with Patna, Kolkata, Delhi, and other places of importance. The total population of district is 2970541, out of which rural population is 2400718 and Urban population is 569823 (as per 2011 census). The district boundaries, administrative divisions, major roads, rivers, and HNS locations are presented in Fig 1.



**Fig. 1** Index map of Begusarai district

## 1.2 Basin/sub-basin, Drainage

Begusarai district is part of the middle Ganges plain. The river Ganga flows towards east parallel to the southern boundary of the district. The other rivers flowing in the district are the Burhi Gandak, Bagmati, Balan, Bainty, Baya and Chandrabhaga

## 1.3 Irrigation practices

Agriculture is the main source of sustenance for majority of population in the district. The main food crops of the district are wheat, maize and paddy. Sugar cane is main cash crop of the district. The other main cash crop of the district is chilli. The district is rich in ground water resource, which can be developed for irrigation purpose. The assured irrigation will increase the crop production and improve the economic condition of people inhabiting the district.

Irrigation in the district is provided by different sources like wells, tubewells, tanks, ponds, rivers i.e. by both surface and ground water. However rainwater is still major source of irrigation in most part of the district. The total cropped area is 179056 hectare and net sown area is 117303 hectare. The gross area under irrigation by tube wells/bore well is 87000 hectares. (Govt of Bihar).

## 1.4 Studies/Activities of CGWB

Central Ground Water Board has covered the district under systematic hydrogeological survey and the district has also been covered under ground water management study. District hydrogeological report and ground water management study report has been issued.

The district has drawn attention of the Board as at some places geogenic contamination of ground water of shallow aquifer with arsenic has been found. The concentration of arsenic is above permissible limit of 50 ppb (BIS 1991). Under the exploratory programme, CGWB has drilled 4 exploratory wells, 2 observation wells and 1 slim hole (fig - 4) to decipher the potential granular zones in Ganga basin. The exploratory drilling has been done down to a depth of 600 m indicating presence of 3 – 10 granular zones at different depth (Table-03). Central ground water board had also carried out exploratory drilling in geogenic-contaminated areas of the district tapping arsenic free aquifer disposed at deeper level. There are 11 Hydrograph Network Stations in the district, which monitored 4 times in a year to measure the water level of the phreatic aquifer.

## **2.0 Climate and Rainfall**

Being part of the Gangetic plains of the Indian subcontinent, the district experiences three climatic seasons – the summer season from March to mid June, the monsoon season from mid June to October and the winter season from November to February. The month of February & March fall in the transitional season from winter to summer described as [Spring](#) or “Basant”. Similarly the months of September & October falls in the transitional season from the monsoon season to the winter season and described as “Shishir”.

## **3.0 Geomorphology and Soil types**

Begusarai district is part of the middle Ganges plain. The district has a terraced alluvial landscape shaped Himalayan and sub Himalayan rivers Viz., Ganga, the Burhi gandak ,the Bagmati and small rivers like Balan.The general elevation of the district ranges between 41 – 48 m above MSL, though the Kabar tal (a lake) in Cheria Bariarpur block is having an elevation of 37 – 39 m above MSL.Geomorphologically , the district can be broadly divided into Ganga plain and diara plain, both constituting the depositional landscape.The important fluvial land forms in Ganga plain are natural levee, abandoned channel. The important fluvial land forms in diara plain are channel bar and point bar.

The District contains Asia's largest oxbow lake, kabar Taal and is situated near Manjhaul village.



## **Soil**

The soil of the district is generally alkaline and is characterised by deficiency in nitrogen, phosphoric acid and humus. It is most fertile soil and suitable for cultivation of rice, jute and sugarcane.

## **4.0 Ground Water Scenario**

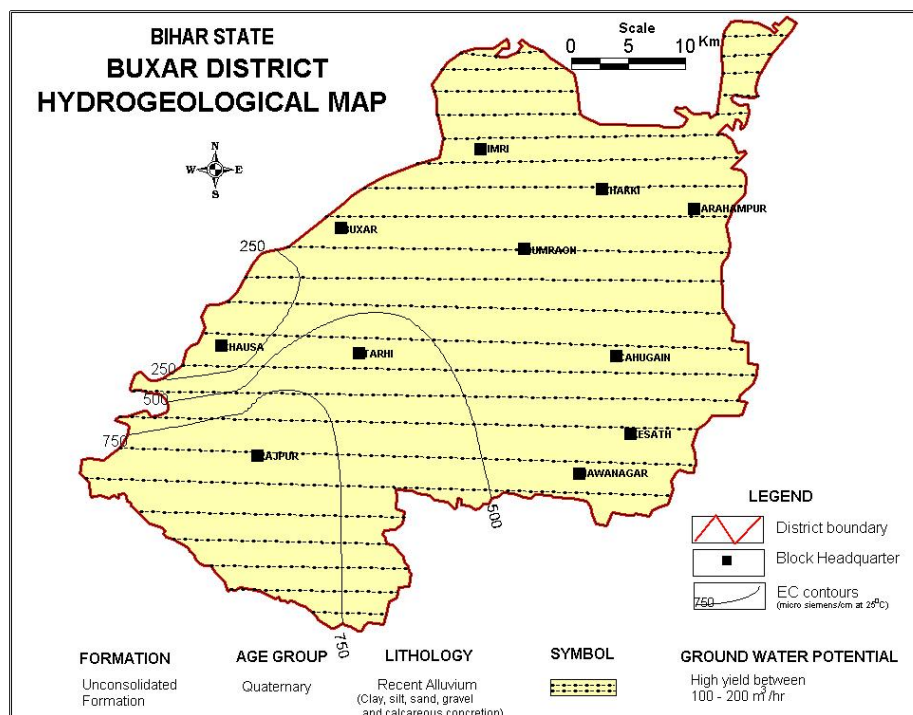
### **4.1 Hydrogeology**

Geological setup, distribution of rainfall and the ease of circulation of water through interconnected pores of the geological formations constituting the aquifer make the hydrogeological framework of the area. Based on the geological diversities and relative ground water potentialities in the aquifer belonging to different geological formation, the district can be subdivided broadly into two hydrogeological units- (a) Older alluvium (Ganga formation) and (b) Newer alluvium (Diara formation)

The alluvium of the Ganga plain is consisting of alterations of gravel, sand of various grades and clay beds. Gravel and sand constitute the prolific aquifers. The thickness of alluvium is more than 600m. In the diara plain, the alluvium consists of sand silt and clay.

### **Mode of Occurrence of Ground Water**

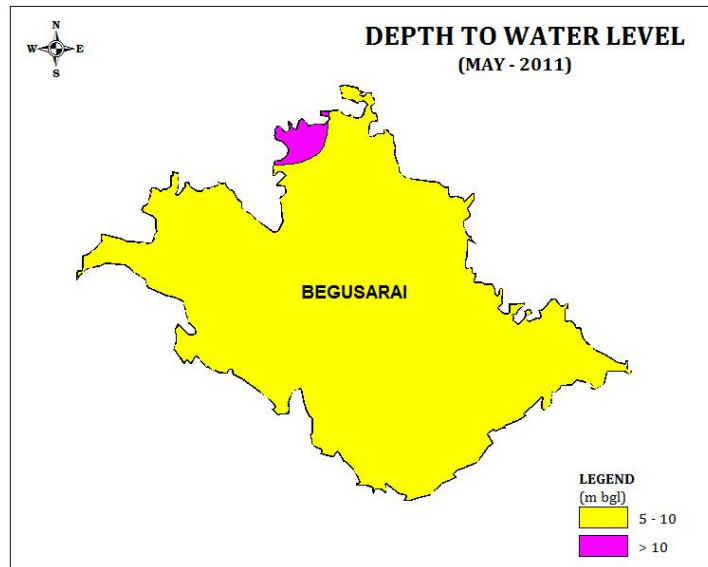
The ground water occurs under water table condition, semi confined to confined condition. The ground water in the phreatic aquifer occurs under water table conditions. The shallow phreatic aquifer is commonly tapped by dug-wells of depth ranges from 5 to 15 m bgl. The shallow tube-wells tap unconfined aquifer and disposed at a depth between 20 to 60 m. The deep tube-wells have been constructed tapping aquifers disposed at deeper levels. These aquifers are in semi-confined to confined condition. The hydrogeological map of the district along with Ec contour is shown in Fig. 2



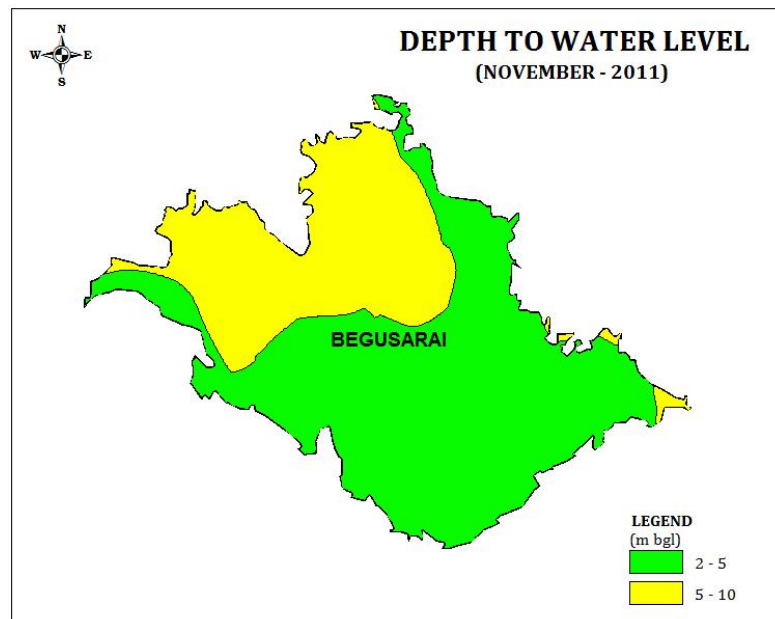
**Fig 2.** Hydrogeological map of Begusarai District

### Water Level Fluctuation

The water level is measured at 11 HNS stations in the district and it has been found that that the pre-monsoon (May 2011) depth to water level generally varies from 6.7 to 9.5 mbgl. It remains within 10m in major part of the district, (Fig. 3). The water level is beyond 10m only small patch in northern part of the district. The post-monsoon water level generally varies from 2.85 to 6.10 m bgl. However, It remain within 5 m in major part of the district (Fig. 4). The seasonal water level fluctuation from pre to post monsoon indicate rise of 1.15 to 5.35m.



**Fig 3.** Pre-monsoon (May 2011) water level map of Begusarai district



**Fig 4.** Post-monsoon (November 2011) water level map of Begusarai district

## Ground Water Hydraulics

The hydraulic characteristics of aquifer tapped by a deep exploratory well and the zones tapped by these wells are shown in table below. Pump test data of these wells reveal that the yield of tube wells ranges between 125 – 135 m<sup>3</sup>/hr. The aquifer test has revealed that the transmissivity value ranges between 3500 – 6000 m<sup>2</sup>/day whereas storativity ranges between 8.39X10<sup>-3</sup> to 1.75 X 10<sup>-4</sup>. The ground water in deeper aquifer occurs under confined to semi confined state. The piezometric heads of deeper aquifer ranges between 1 to 5 m bgl.

**Table 1** Exploratory wells drilled by CGWB in Begusarai district

Sl.No.	Location/ Block	Depth Drilled mbgl.	Granular/ Zone/ fracture Tapped m.	Discharge m <sup>3</sup> /hr.	Drawdown m.	Specific Capacity m <sup>3</sup> /hr./m.	Trans- missivity m <sup>2</sup> /day	Storativity
1	<b>KAROR/ Cheria- Bariarpur</b>	578.58	114.06-122.99	135.36	6.11	22.15	5931.9	-
			125.12-129.14					
			130.94-137.08					
			139.74-148.31					
2	<b>SEWRI/</b>	396	207.84-224.46	127.2	6.52	19.5	3528.16	8.39X10 <sup>-3</sup>
3	<b>BIKRAM- PUR/Cheria Bariarpur</b>	451.75	208.50-219.00	136.2	9.71	14.02	5460.61	1.75X10 <sup>-4</sup>
			224.00-240.00					
4	<b>TAJPUR/ Bhagwanpur</b>	545	142.50-150.50	125.32	8.18	15.38	3703.2	-
			160.50-172.50					
			190.50-196.50					
			200.50-227.50					
			245.50-256.50					
5	<b>NAREPUR (EW)</b>	138.75	55-61, 89-95, 122-128					
	PZ-1	278.75		84.25	5.23		11998	
	PZ-2	88						
	PZ-3	41.5						
	OW	57						
6	<b>BARAUNI FLAG (EW)</b>	252.5	154-160, 194- 200, 221-223	179.5	9.11		7888	9.2X10 <sup>-5</sup>
	OW	302.5						
	PZ	60						
7	<b>BIHAT (EW)</b>	<b>233.75</b>	140-146, 160- 166, 175-187	84	5.4		2380	
	PZ	33.7						

8	<b>TEGHRA (EW)</b>	182	125-127,146-154,170-178	211	5.61			
	PZ-1	33.75						
	PZ-2	146.25						

## 4.2 Ground Water Resources

The net annual replenishable ground water resource as on 31<sup>st</sup> March'09 works out to be 60083 ha m. The gross annual draft for all uses works out to be 35150 ha m. Allocation of ground water for domestic and industrial use for 25 years works out to be 7611ha m. The blockwise resource is given in Table 3.

**Table 2** Block-wise dynamic ground water resource of Begusarai district (As on 31<sup>st</sup> March 2009, in ha m)

Sl.No	Administrative 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 year 2025	Net Ground Water Availability for future irrigation development (9-10-13)	Stage of Ground Water Development (12/9)*100 (%)
1	2	9	10	11	12	13	14	15
1	Bachhawara	4663	2910	288	3199	531	1222	68.6
2	Bakhari	2381	1150	203	1354	374	857	56.8
3	Balia	4817	1810	278	2088	511	2495	43.4
4	Barauni	3837	2133	428	2561	787	917	66.7
5	Begusarai	7313	3890	792	4682	1477	1946	64.0
6	Bhagwanpur	3519	1749	246	1995	453	1317	56.7
7	Birpur	1766	1410	140	1550	258	99	87.7
8	Cheria Bariarpur	3273	1809	223	2031	410	1055	62.1
9	Chhaurahi	3288	1942	169	2111	312	1035	64.2
10	Dandari	2147	951	112	1063	206	990	49.5
11	Garhpura	1960	1160	157	1317	289	512	67.2
12	Khudabandpur	1774	1102	128	1229	235	437	69.3
13	Mansur Chowk	1302	731	122	853	224	347	65.5
14	Matihani	5364	2294	238	2533	439	2631	47.2
15	Naokothi	1733	1186	151	1337	278	269	77.2
16	Shamho	1897	492	51	543	94	1311	28.6
17	Sahebpur Kamal	4778	2594	291	2885	535	1649	60.4
18	Teghra	4268	1421	397	1818	730	2117	42.6
	<b>Total</b>	<b>60083</b>	<b>30735</b>	<b>4415</b>	<b>35150</b>	<b>7611</b>	<b>21737</b>	<b>58.5</b>

### 4.3 Chemical Quality of Ground Water

Ground water samples collected from HNS stations were collected and analyzed and it indicate that in general, ground water of phreatic aquifer is suitable for drinking and irrigation purposes. The ground water is mildly alkaline in nature with pH varying from 7.01 to 7.72 . Electrical conductivity (Ec) ranges from 560 micro seimens/cm at Barauni zero mile to 2200 micro seimens/cm at Bintoli. Chloride ranges from 11 mg/l to 362 mg/ l. All major parameters are within the permissible limit. The minimum , maximum and average value of parameter analysed are given below. Arsenic concentration above permissible limit of 50 ppb. has been found from analysis of ground water analyses at few places in Teghra, Bachwara, Sahebpur Kamal, and Barauni blocks. The arsenic contaminated water above regulatory limit of 50 ppb is hazardous for human health. Iron above permissible limit is also reported from from few places in the district.

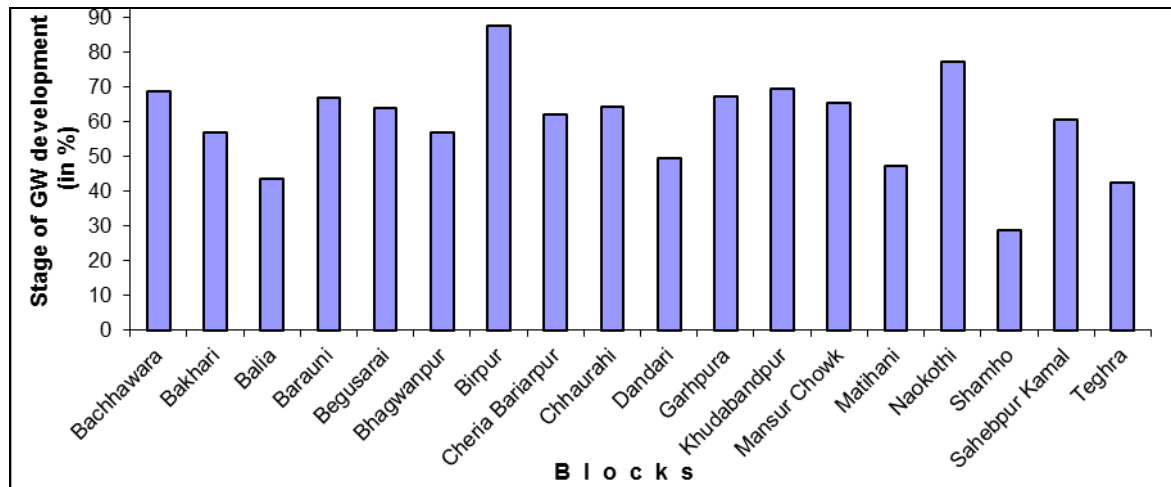
**Table 3** Range of different chemical constituents in ground water of Begusarai district

Parameter	Minimum	Maximum	Average
EC ( $\mu$ s at 25°C)	560	2200	1123.5
pH	7.07	7.71	7.42
HCO <sub>3</sub> <sup>-</sup> (mg/lit)	317	616	456
Cl <sup>-</sup> (mg/lit)	11	362	117
Ca <sup>+2</sup> (mg/lit)	40	88	64
Mg <sup>+2</sup> (mg/lit)	13	140	56
TH (mg/lit)	210	796	399
Na <sup>+</sup> (mg/lit)	23	170	72
K <sup>+</sup> (mg/lit)	2	7	4

### 4.4 Status of Ground Water Development

. The gross area under irrigation by tube wells/bore well is 87000 hectares. (Govt of Bihar). The stage of ground water development is 58.5%. The stage of ground water development is highest in Birpur 87.7% and lowest in the Shamho block (28.6%). All the

blocks are under safe category. Blockwise Stage of Ground Water of Begusarai District is depicted in Fig.5.



**Fig .5** Blockwise Stage of Ground Water Development of Begusarair district

## 5.0 Ground Water Management Strategy

There is need to adopt an integrated approach of development of ground water resources dovetailed with ground water augmentation to provide sustainability to ground water development

### 5.1 Ground Water Development

The younger and older alluvium of huge thickness covers the whole district. The multi-layer aquifers occur in the district. Rotary rig can be used for construction of tube wells in the district. The tube well can be constructed by using Johnson screen of 12-18 m for the slotted portion and M/S pipe for the blank portion. The tube-wells can be energised with the help of submersible or surface centrifugal pumps. In the district, The ground water is mostly developed by constructing shallow tube wells. shallow tubewell are feasible within 40 – 60 m depth ranges with a good discharge of 20 – 30 m<sup>3</sup>/hr whereas deep tube wells having depth range of 100-200m tapping the deeper aquifer can safely yield 100 – 200 m<sup>3</sup>/hr. Study of CGWB reveals few brackish water zones occurring at depth, which may be isolated while making ground water structures. The minor irrigation census shows 24162 shallow tubewell are in use for irrigation. Adequate power supply for energisation of pumpsets will be a key factor for ground water development

Arsenic is reported from the shallow aquifer. It is advisable to tap the aquifer below 80 m to get the arsenic free water in the Arsenic affected hemlets. The cement sealing of shallow aquifer is advisable to avoid vertical mixing of contaminated water with fresh water. In the Arsenic affected blocks ground water development by tapping deeper aquifer is essential to supply arsenic free water to the affected villagers.

## **5.2 Water Conservation and Artificial Recharge**

All the blocks of the district fall under the safe category. The artificial recharge structures like contouring bund and recharging ponds, may also be constructed in the blocks where high percentage of ground water draft has been observed.

## **6.0 Ground Water Related Issue and Problems**

The Arsenic contamination of ground water is the major problem in the parts of Teghra, Bachwara, sahebpur kamal blocks of the district. The arsenic contaminated water restricted with in the shallow aquifer (upto 60 m) in the region. It is necessary to make arrangement for pipe water to the villagers from the deep tube well in the affected area. The top 60 m must be sealed using latest techniques. The ground water resources should be judiciously used in the blocks where high percentage of ground water draft has been observed.

## **7.0 Mass Awareness and Training Activity**

Mass Awareness Programme (MAP) and Water Management Training Program (WMTP) yet to be organized in this district.

## **8.0 Area notified by CGWA / SGWA**

None of the blocks of the district has been notified under CGWA / SGWA as there is no over exploited blocks.

## **9.0 Recommendation**

1. The alluvium of the Ganga plain is consisting of alterations of gravel, sand of various grades and clay beds. Gravel and sand constitute the prolific aquifers. The thickness of alluvium is more than 600m. The aquifers of district has good yield prospect. Study of



CGWB reveals few brackish water zones occurring at depth, which may be isolated while making ground water structures.

2. Ground water resources should be judiciously used in the blocks where development is high.
3. The drinking water supply to the villagers of the arsenic affected blocks from the deep tube wells. The shallow aquifers must be sealed while constructing the deep tube wells in arsenic affected areas to get arsenic free water.
4. Diesel operated pump-sets enhances the lifting cost of tubewell water. In order to reduce financial burden, alternative low cost energy should be provided for the energisation of pumps.