

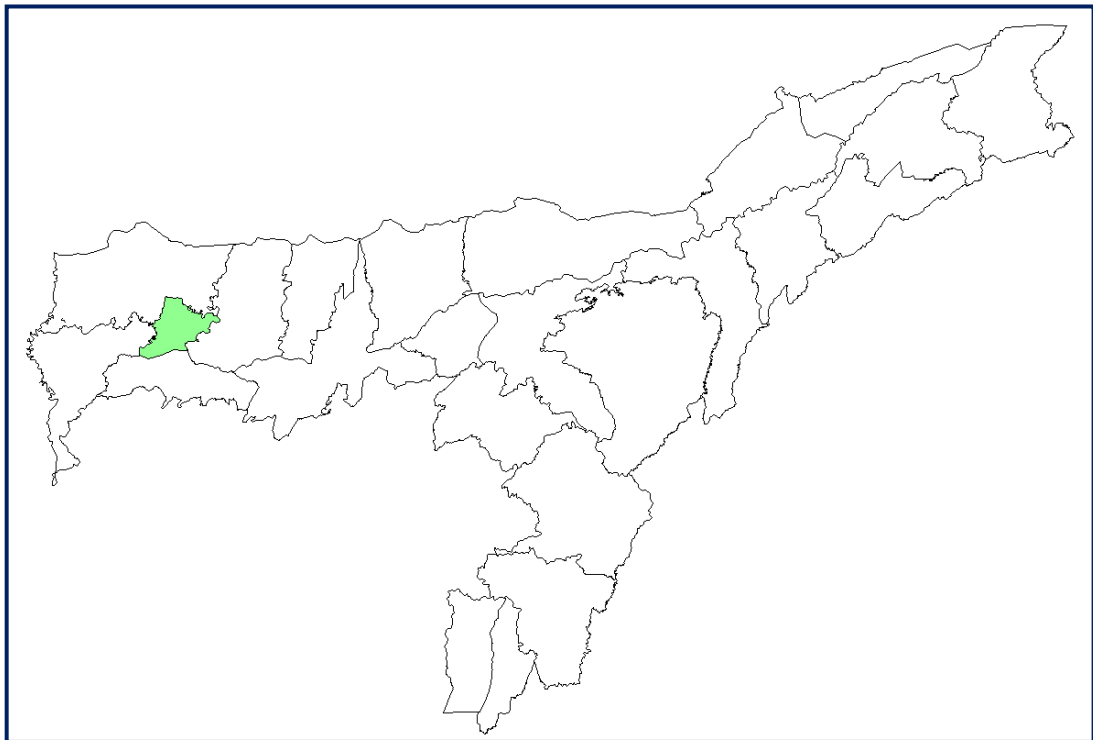
Technical Report Series: D

No:



Ground Water Information Booklet

Bongaigoan District, Assam



Central Ground Water Board
North Eastern Region
Ministry of Water Resources
Guwahati
September 2013

GROUND WATER INFORMATION BOOKLET
BONGAIGAON DISTRICT, ASSAM

DISTRICT AT A GLANCE

Sl. No.	ITEMS	STATISTICS
1.	GENERAL INFORMATION i) Geographical Area (sq.km.) ii) Population (as per 2011 Census) iii) Average Annual Rainfall (mm)	1,725.29 7,32,639 3,219.1
2.	GEOMORPHOLOGY i) Major Physiographic Units ii) Major Drainages	Denudation hills, older alluvium (Terai zones and younger alluvial sediments). Champabati River with its tributaries
3.	LAND USE (sq. km.) i) Forest Area ii) Net Area Sown iii) Total cropped area iv) Area sown more than once	0.44 676.35 1087.85 411.50
4.	MAJOR SOIL TYPES	Alluvial soil
5.	AREA UNDER PRINCIPAL CROPS (sq.km/2006.)	470.90
6.	IRRIGATION BY DIFFERENT SOURCES (sq.km.)	4.90
7.	NUMBERS OF GROUND WATER MONITORING STATIONS OF CGWB (as on March 2013)	11
8.	PREDOMINANT GEOLOGICAL	Vast alluvial formation (older and

	FORMATIONS	younger)
9.	<p>HYDROGEOLOGY</p> <p>i) Major water bearing formation</p> <p>ii) Pre-monsoon water level</p> <p>iii) Post-monsoon water level</p> <p>iv) Long term water level trend (1997-2007)</p>	<p>Sand, pebble, gravel formation</p> <p>3.44 m</p> <p>3.04 m</p> <p>No significant change in water level is observed.</p>
10.	<p>GROUND WATER EXPLORATION BY CGWB (as on 28.02.2013)</p> <p>i) No of Wells Drilled</p> <p>ii) Depth Range (m)</p> <p>iii) Discharge (m³/hr)</p> <p>iv) Transmissivity (m²/day)</p> <p>v) Permeability (m/day)</p>	<p>5 (3 EW & 2 OW)</p> <p>81.25-100.05</p> <p>11.80-12.92</p> <p>1,037-4,758</p> <p>1.76-13.73</p>
11.	<p>GROUND WATER QUALITY</p> <p>i) Presence of Chemical Constituents beyond Permissible Limit (e.g. EC, F, Fe, As)</p>	<p>E.C: 105-545 μS/cm at 250C</p> <p>F, Fe within permissible limit. As (not analyzed)</p>
12.	<p>DYANMIC GROUND WATER RESOURCES (2009) in mcm.</p> <p>i) Annual Replenishable Ground Water Resources</p> <p>ii) Net Annual Ground Water Draft</p> <p>iii) Projected demand for Domestic and Industrial Use upto 2025</p> <p>iv) Stage of Ground Water Development</p>	<p>1430.21</p> <p>577.66</p> <p>28.84</p> <p>43%</p>
13.	<p>AWARENESS AND TRAINING ACTIVITY</p> <p>i) Mass Awareness Programmes Organized</p>	<p>Not organized</p>

	ii) Date iii) Place iv) No of Participants	
14.	EFFORTS OF ARTIFICIAL RECHARGE AND RAINWATER HARVESTING i) Projects Completed by CGWB (No & amount spent) ii) Projects Under technical Guidance of CGWB (Numbers)	Nil
15.	GROUND WATER CONTROL AND REGULATION i) Number of OE Blocks ii) Number of Critical Blocks iii) Number of Blocks Notified	Nil
16.	MAJOR GROUND WATER PROBLEMS AND ISSUES	Chemical constituents are within permissible limit

Ground Water Information Booklet

Bongaigaon District, Assam

1.0 INTRODUCTION

Bongaigaon District is located in western part of Assam and in northern Bank of the River Brahmaputra between N Latitudes 26°09'52" and 26°30' 03" and E Longitudes 92°22'47" covering an area of 1,806 sq. km.

As per 2001 census, the population of the district is 7,32,639. The district has total 55,809 ha of forest land. Net area sown is 94,908 ha, current fallow of 7,011 ha and cultivable area of 99,941 ha. The total cropped area of the district is 1,56,397 ha.

The district receives heavy rainfall of 3219.1 mm in an average under the influence of south west monsoon. In general, the temperature of the atmosphere varies from 12 to 36°C throughout the year. Humidity is high ranging upto 90% during rainy season.

Physiographically, the district is more or less a flat terrain with general gradient towards south. The area is divided into three major units, i.e. hilly area represented by marshy lands represented by consolidated insurbergs, plain by alluvial sediments and the 'bils' etc.

A number of perennial streams flow through the district. These are Manas, Kujia, Champavati. They are all tributaries of River Brahmaputra.

Geologically, three groups of rocks namely Pre-cambrian Gneissic complex, older Alluvium and Newer Alluvial formation. The older and Newer Alluvium comprises clay, sand, gravel, cobble and pebble.

Ground water occurs under phreatic condition in shallow aquifer zones and under semi-confined condition in deeper aquifers. The major direction of ground water flow is from north to south while partially flow towards south-east and south-west. The pre-monsoon water level is 3.44 m while the post-monsoon water level is 3.04 m bgl. There are no significant changes observed in long term trend analysis.

From quality point of view, ground water is suitable for drinking and irrigation purposes except a little high content of iron are reported in pockets.

The present ground water utilization is for drinking, agriculture and industrial uses. The local government has installed a large number of shallow and deep tube wells for water supply in rural and urban areas. The state Irrigation and Agriculture Departments have created potential areas to the tune of 3052 ha for irrigation by construction of both the shallow and deep tube wells. The BRPL located at Dhaligaon has utilized ground water from deep tube wells for residential complex as well as industrial purposes.

2.0 RAINFALL AND CLIMATE

The climate of the district is characterized by high rainfall and sub-humid-climate. The annual rainfall of 3,219 mm is distributed throughout the year from the month of April to October. The maximum rainfall occurs during the month of July-August, December and January are the driest months generally. Humidity of air is very high observed during the month of July.

3.0. GEOMORPHOLOGY AND SOIL TYPE

Physiographically, the district is divided into three units. The Older alluvium is represented on northern border, followed by Younger alluvium in the middle part and the flood plain zones in the southern part along the courses of River Brahmaputra and River Manas. The northern piedmont zones attain the higher elevation while the flood plain or southern border attains the lowest elevation. The altitude difference between the inselbergs and the plain area is 20 - 460 m.

A number of perennial streams as tributaries of the River Brahmaputra flow through the district. The principal rivers are Manas, Kujia and Champavati. Among these tributaries, Manas is the largest tributary and forms eastern boundary and the river Champavati forms the western boundary of the district.

The soil of the district is broadly classified into three categories i.e. (1) Soil capping over older alluvium is sandy, highly permeable, grayish brown in colour, (2) Soil on inselberg zones are clayey, lateritic, yellowish to reddish in colour and (3) The soil of the flood plain are sandy to silty loam and clayey loam in nature.

The Characteristic of the soil are as follows.

- (a) Highly acidic to neutral, pH ranges from 4 to 7
- (b) Low in total soluble salt (0.1 to 0.61 ppm)
- (c) Low in organic carbon (0.7 to 3.00 ppm)
- (d) Low to medium phosphate content (9.8. to 158.8%)
- (e) Medium to high available potash content (45 to 365%)

4.0. GROUND WATER SCENARIO

4.1 Hydrogeology

Hydrogeologically, the entire area of sediments of Recent to Sub-Recent age. The groundwater conditions as described below. Bongaigaon district is dominated by alluvial different geomorphic units represent separate

The flood plain areas along the River Brahmaputra and River Manas are represented by different grades of sand, gravel and clay. Abandoned channel, natural levees, channel bars also represent the same constituents. Ground water occurs under semi-confined to water table condition within the depth range of 2 to 4 m bgl during pre-monsoon period. The younger alluvial plain comprising sand, gravel and clays occupies the central part in the district with similar ground water condition. The depth to water level ranges from 1.30 to 3.00 m bgl during post-monsoon period.

The older alluviurn occupies the northern and north western parts of the district and is located at higher elevation. It comprises unconsolidated to semi-consolidated formations comprising limonitic clay, unsorted boulders, pebbles, gravels and sands. Ground water occurs under water table to semi-confined condition and depth to water table varies from 0.50 to 2.53 m bgl.

The denudational hills with weathered top associated with pediment occur as isolated patches in north, west, east, amongst the older and younger alluvium. The thickness of the pediment varies from 5 to 15 m with depth to water level from 1 to 9 m bgl. The denudational hills are composed of gneissic rocks with pegmatite veins as intrusion; the water level is very deep.

Tube well data (CGWB and other agencies) reveal that the alluvium comprising of sand, gravel, pebble and boulders occur down to the depth of 150 m. Tube well tapping 3g m of aquifer zones yield 93 m³/hr for 12.58 m drawdown. Piezometric level of ground water varies from 1.71 to 6.50 m. Northern part of Bongaigaon town characterized by boulder and pebble represents the Terai belt with deeper water level of 13.1 m bgl. This Terai belt merges with the alluvium on southern part of Bongaigaon town. The deep tube well constructed at BRPL complex of Bongaigaon reveals the following aquifer characteristics.

The yield of tube wells varies from 32.70 to 179.6 m³/hr for a variable pumping heads of 14.33 m to 20.75 m. Transmissivity varies from 2110 to 4300 m²/day and permeability value ranges from 62 to 126.4 m/day.

Deep tube well at Panchania in flood plain area constructed down to the depth of 156.16 m yields 108.28 m³/hr for drawdown of 3.6 m. Jogighopa tube well at the fringe area yields 52.63 m³/hr for 2.72 m drawdown.

4.2. Ground Water Resources

The estimated gross annual replenishable ground water resources of the district are 1430.21 mcm against net annual ground water draft of 577.66 mcm. The projected demand for domestic and industrial uses up to 2025 is 28.84 mcm. The stage of ground water development in the district is 43%.

4.3 Ground Water Quality

Ground water as a whole is suitable for domestic, irrigation and industrial uses. The chemical analysis of ground water reveals that the chemical constituents except iron, all are within the permissible limit. The electrical conductivity varies from 67 to 687 micromhos/cm and it indicates the presence of minerals constituents in water. pH of the water varies from 6.40 to 8.35 indicating neutral nature of water. Calcium and Magnesium content in ground water determines its hardness and varies from 20 to 5g ppm indicating its soft nature.

The other constituents like sulphate and phosphate are very much within permissible limit. Low chloride content like 5 ppm indicates freshness of water. The present district has chloride concentration from 5 to 39 ppm which is very much within the permissible limit.

There are wide variations of the bicarbonate content of groundwater ranging from 21 to 244 ppm.

The iron content of ground water varies from 0.20 to 2.00 ppm against recommended value of 0.3 ppm. As the iron content in some places is higher than recommended value, special treatment for iron may be required in selected place.

4.4 Status of Ground Water Development

The district is very potential for ground water development. The state authority constructed more than 1673 STWs and 30 deep tube wells for irrigation creating a total draft of 47 .842 mcm. As mentioned above, the aquifer zones down to 50 m depth are very much feasible for construction of shallow tube well. Such well can yield 30 to 40 m³/hr with a reasonable drawdown.

The district is underlain by unconsolidated formation down to 200 m depth. At Abhayapuri, Panchania and Jogishopa area, intercalation of clay beds beyond 100 m exists. Deep tube well constructed down to a maximum depth of 165 m tapping 20 to 48 m of aquifer zones can yield 33 to 180 m³/hr with transmissivity value ranging from 2110 to 3800 m²/day.

The deep tube wells are feasible throughout the middle portion of the district in southern part of Bongaigaon. However, finer aquifer materials are likely to be encountered with confining clay bands.

Both shallow and deep tube well is feasible in the district for ground water development. Dug wells are also feasible in selected area particularly in older alluvial part and the pediment zones surrounding the hillocks.

There is enough scope for construction of shallow tube well for irrigation purpose throughout the district keeping in mind the vast resources of the district.

5.0 GROUND WATER MANAGEMENT STRATEGY

Ground water development prospect is very high in the district. Shallow and medium duty tube well may be constructed in northern and western parts keeping safe distance

between wells depending on the hydrogeological conditions of the down to 10 to 20 m are also feasible in the area. These well may yield area. Filter point wells 3 to 5 m³/hr.

Deep tube well with depth range of 160-200 m is also feasible in the southern part with possible discharge of 80-150 m³/hr.

6.0 GROUND WATER RELATED ISSUES AND PROBLEMS

The southern part of the district adjunct to the River Brahmaputra is generally affected by flood accompanied by erosion. The flood generally affects the ground water regime in southern part of the district resulting in rise of water table.

The excess iron content in ground water in some pockets is a problem and this can be removed with the help of iron removal plants.

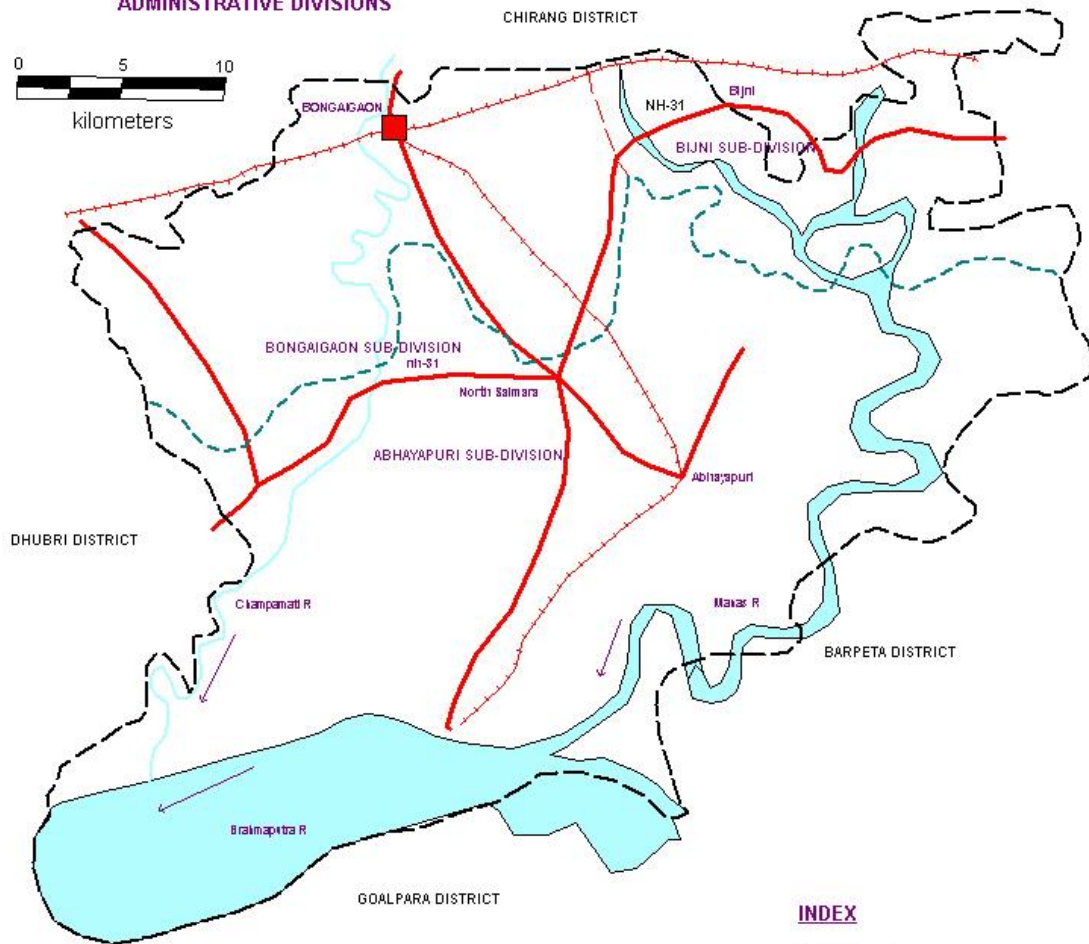
7.0 RECOMMENDATIONS

Ground water resources (dynamic) in the district are 980.85 mcm. The hydrogeological setup with huge ground water resources indicates an ample scope of ground water development in the district. It may be developed by construction of shallow and deep tube wells. Taking unit draft of 0.15 mcm for a shallow tube well and considering the discharge of 50 to 150 m³/hr for a deep tube well, a number of tube wells may be constructed with a gap of 1.5 km in between them.

Shallow and medium duty tube wells may also be constructed for drinking water supply in villages in suitable hydrogeological locales. Ground water in the district is found to be potable and can be used safely for drinking, irrigation and industrial purposes.

BONGAIGAON DISTRICT, ASSAM

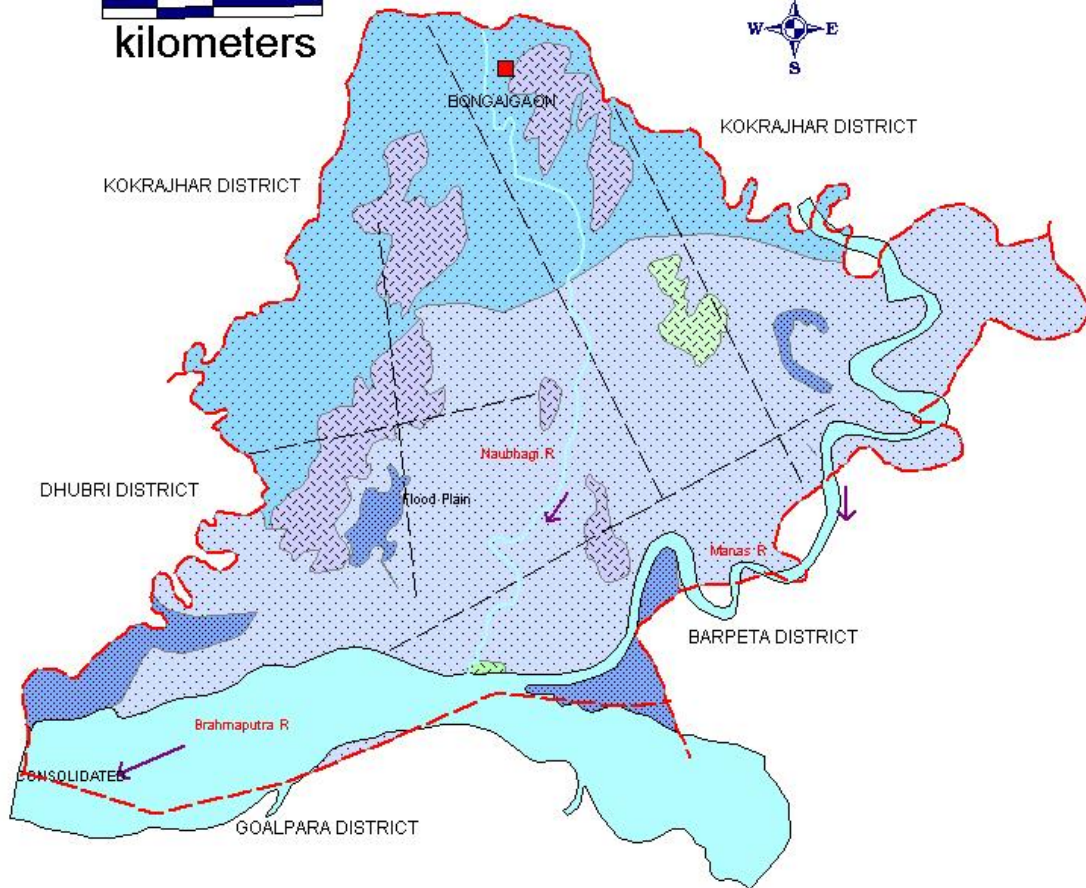
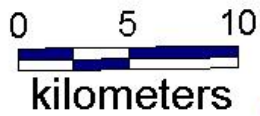
ADMINISTRATIVE DIVISIONS



INDEX

- District Boundary
- - - Sub-Divisional Boundary
- District Head Quarter
- Road
- + - + - Railway track
- ~ River

BONGAIGAON DISTRICT, ASSAM HYDROGEOLOGY



LEGEND

FORMATION	MAP UNIT	GEOLOGIC UNIT	DESCRIPTION	GROUND WATER PROSPECT
Unconsolidated		Flood Plain	Assorted mixture of gravel, sandstone and clay	Suitable for shallow and deep tubewells, yield prospect, 40-150 m ³ /hr
		Younger Alluvial Plain	Assorted mixture of gravel, pebble, sand, silt and clay	Suitable for shallow and deep tubewells, yield prospect, 30-150 m ³ /hr for 3 to 6m drawdown
		Older Alluvial Plain	Assorted mixture of pebbles, gravels, cobbles, sands, weathered limonitic clay	
		Pediment Complex	Assorted mixture of pebbles, gravels, cobbles, sands and silty clays derived from parent Precambrian Complex	Suitable for dug well, dug cum bore wells, of moderate discharge
Consolidated		Denudational Hills	Hornblende, biotite-gneiss, schists, amphibolites, granites, quartz veins	Restricted to joints, fractures, suitable for borewell at selected sites for poor to moderate discharge
		Drainage		
		Lineament		