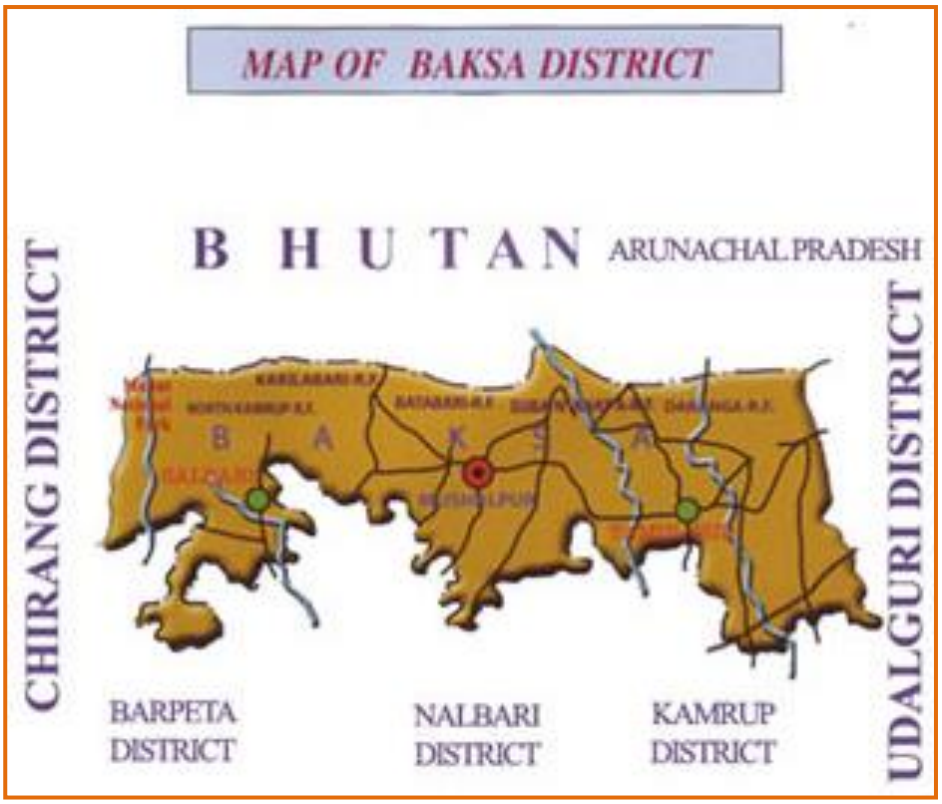
Technical Report Series: D

No:

Ground Water Information Booklet
Baksa District, Assam



Central Ground Water Board

North Eastern Region

Ministry of Water Resources

Guwahati

November 2013

GROUND WATER INFORMATION BOOKLET
BAKSA 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)	 2,007.50 9,53,773 2,971.6
2.	GEOMORPHOLOGY i) Major Physiographic Units ii) Major Drainages	 Flood plain & alluvial terrace, swamp. Mara Manas, Palla, Po-Mara, Kaldia, Tihu, Mora Pagladia, Burhadia, Pagladia, Nona, Baralia and Puthimari River.
3.	LAND USE (sq. km.) i) Forest Area ii) Net Area Sown iii) Total cropped area iv) Area sown more than once	 830.19 660.85 1276.19 615.34
4.	MAJOR SOIL TYPES	Newer alluvium, older alluvium, loamy & lateritic soil.
5.	AREA UNDER PRINCIPAL CROPS (sq.km.)	Not Available
6.	IRRIGATION BY DIFFERENT SOURCES (sq.km.)	65.85
7.	NUMBERS OF GROUND WATER MONITORING STATIONS OF CGWB (as on March 2013)	1
8.	PREDOMINANT GEOLOGICAL FORMATIONS	Alluvial formation
9.	HYDROGEOLOGY i) Major water Bearing Formations ii) Long term Water Level Trend in 20 yrs (1989 –2008) in m/yr	 Alluvial sediments of Quaternary age . Rise/Fall during Pre-monsoon (0.005/ 0.038) m/yr, Rise/Fall during Post-monsoon (0.014-0.43/ 0.00-0.00) m/yr.
10.	GROUND WATER EXPLORATION BY CGWB (as on 28.02.2013) i) No of Wells Drilled ii) Depth Range (m) iii) Discharge (m^3/hr) iv) Transmissivity (m^2/day)	 1 Exploratory Well & 1 Slim Hole 72-159.9 16.32 with drawdown of 0.43 m 958.0
11.	GROUND WATER QUALITY i) Presence of Chemical Constituents more than Permissible Limit (e.g. EC, F, Fe, As)	Except Fe problems in some parts of the district, other elements are within the permissible limit.

	ii) Type of Water	Good
12.	DYANMIC GROUND WATER RESOURCES (2009) in mcm. i) Annual Replenishable Ground Water Resources ii) Net Annual Ground Water Draft iii) Projected demand for Domestic and Industrial Use upto 2025 iv) Stage of Ground Water Development	NA (district was not formed in 2009)
13.	AWARENESS AND TRAINING ACTIVITY i) Mass Awareness Programmes Organized ii) Date iii) Place iv) No of Participants	Nil
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	Higher concentration of Fe in ground water in some parts of the district is observed.

GROUND WATER INFORMATION BOOKLET
BAKSA DISTRICT, ASSAM

1.0 Introduction

Baksa district covers an area of 2,007.50 sq. km. It is situated in the northern bank of the River Brahmaputra. It has the international and state boundaries with Bhutan on north. It is bounded by Chirang district in the west, Nalbari, Barpeta and Kamrup (Rural) district on the south and Udalguri district on the east.

Number of perennial streams flow through the district from north to south and join the Brahmaputra River. The major streams that drain the area are Mara Manas, Palla, Po-Mara, Kaldia, Tihu, Mora Pagladia, Burhadia, Pagladia, Nona, Baralia and Puthimari River.

2.0 Rainfall and Climate

The district enjoys a sub-tropical humid climate with a hot summer and moderate winter. January is the coldest month and July/August is the warmest month. The winter temperature drops to 10°C and summer temperature goes up to 35°C. South-West monsoon activates from June and continues up to September-October. The average annual rainfall of the district is 2,971.6 mm.

3.0 Geomorphology and Soil

The district forms a part of the vast alluvial plains of Brahmaputra River system and sub-basin of River Manas. Physiographically, it is characterized by the different land forms resulting from a) denudation structural hill and b) alluvial plain. The low mounds/hillocks are covered by a thick lateritic mantle and these are occupied by evergreen mixed forests. The alluvial plains comprise of Older and Newer alluvium. The Older alluvium occupies the piedmont zone towards the north of the district bordering Bhutan. The narrow zone at the Himalayan foothill is known as the Bhabar zone and it supports grow of dense forests. To the south of the Bhabar zone and parallel to it, the flat Terai zone lays where the ground remains damp and sometimes, spring oozes out. The Terai zone is covered by tall grass. The Newer alluvium includes sand, gravel, pebble with silt and clay.

Soil in greater parts of the district is sandy and silty loam, or clayey loam. The variation in composition is mainly due to the varying composition of the river borne

materials deposited at different times and under different conditions. The younger alluvial soil has a high phosphorous content whereas, in Older Alluvial soils, it is very low. In general, the soil is acidic to slightly alkaline in nature and is moderately permeable and characterized by the presence of low organic carbon and low soluble salts. Soils restricted to inselberg areas are more clayey, lateritic and less permeable and are highly acidic in nature. From agricultural point of view, the soils in major parts of the district are suitable for all sorts of crops.

4.0 Ground Water Scenario

4.1 Hydrogeology

The ground water conditions in the district can be described under two distinct hydrogeological units, i.e. conditions prevailing in the semi-consolidated formations and conditions prevailing in the unconsolidated formations.

i) **Semi-Consolidated Formations**: A very narrow belt of Upper Tertiary semi-consolidated rock formation engulf the northern fringe area of the district with Bhutan consisting mainly claystone/siltstone/sandstone and form low to moderate altitude denudation structural hills. The trend of hills is generally in E-W direction. These are characterized by high run off, low infiltration to groundwater and experience secondary porosity development through cracks/joints/bedding planes. Springs are developed in this belt.

ii) **Unconsolidated Formations**: Major parts of the district are underlain by unconsolidated formations represented by the alluvial deposits of Recent age. Bhabar formation comprises of the alluvial sediments at the foothill belt in the north and the valley covering the central and southern part. The behaviour of ground water in the piedmont sediments is naturally different from that in the alluvial areas occurring further south.

Bhabar-Terai Belt: This zone consists of the terrace deposits in the foot hill regions of the Himalayas composed of talus fans. The material is a heterogeneous admixture of boulders, pebbles, cobbles with the interstices filled by sand and silt. These sediments are highly permeable with low retentive capacity. Thus, the streams in this region are devoid of any appreciable surface flow, although, there are evidences of sub-surface flow. Behaviour of ground water in the further south is less erratic. Here, ground water occurs under water table conditions. The depth to water level is rather high.

Older Alluvium: Ground water occurs under water table conditions in the elevated flat-topped areas of Older alluvial sediments. These areas are usually forested. It comprises of sand, gravel and silt with higher proportion of clay. Ground water occurs under unconfined to confined conditions.

Newer Alluvium: The district is mostly covered by Newer alluvium and the formation comprises of sand, gravel and pebble with silt and clay. Ground water in this zone occurs under unconfined condition.

Based on the behaviour and occurrence of ground water, the regional ground water flow system of district has been described under following categories.

i. **Shallow Aquifer Group** occurring within 50 m depth.

ii. **Deeper Aquifer Group** beyond the depth of 50 m and down to 200 m bgl.

i. Shallow Aquifer Group:

It consists of a mixture of boulder, gravel, sand, silt and clay. The thickness of the aquifer varies from 15 to 40 m. Ground water in this aquifer generally occurs under water table to semi-confined conditions. The pebbles, boulders are restricted mostly to the northern parts of the district. They occur at the depth between GL to 50 m bgl.

The development of ground water from this aquifer is done by open well and shallow tube well for both the domestic and irrigation purposes.

The water level in the major parts of the district generally lies between 2 to 4 m bgl. The northern most parts occupied by the piedmont zones and the areas adjoining to the border area are having deeper water level. The movement of ground water is southerly towards Brahmaputra River. The water table contour follows the topography of the area and lies more or less parallel to the Brahmaputra River. The hydraulic gradient becomes gentler towards south.

ii. Deeper Aquifer Group:

It consists of coarse to medium sand with intercalation of clay. Ground water occurs under water table to confined conditions. Detailed hydrogeological surveys aided by exploratory drilling revealed the existence of two to three promising aquifer zones down to the depth of maximum 200 m bgl. Aquifer displays various degree of lateral and vertical variation of aquifer indicating various degree of depositional environment both in space and

time. The piezometric surface is highly variable and the movement of ground water is towards the south.

4.2 Ground Water Resource

Resources could not be computed for 2009 as the district was not formed at that time and was part of Darrang district

4.3 Ground Water Quality

The ground water of the district is acidic to slightly alkaline in nature. Ground water has low content of dissolved minerals. The iron content is generally high for use for drinking purpose in some areas. In most of the sources, it is within permissible limit as per BIS (1991) standard of 1.0 ppm and as such, it does not pose any serious health hazard. Except high iron content, the ground water of the district is suitable and safe for drinking and other uses.

Ground water of both shallow and deeper aquifers is suitable for irrigational and industrial purposes. Ground water having a little higher concentration of iron can be used after treatment.

5.0 Ground Water Management Strategy

Shallow ground water structures are congenial for construction in the district, as water resource and aquifer material are laterally persistent throughout the district. Dug wells and dug-cum-bore wells especially near the border area are beneficial. Deep tube well can be constructed preferably below the depth of 50 m tapping aquifer zone with an expected discharge of about 100 m^3/hr.

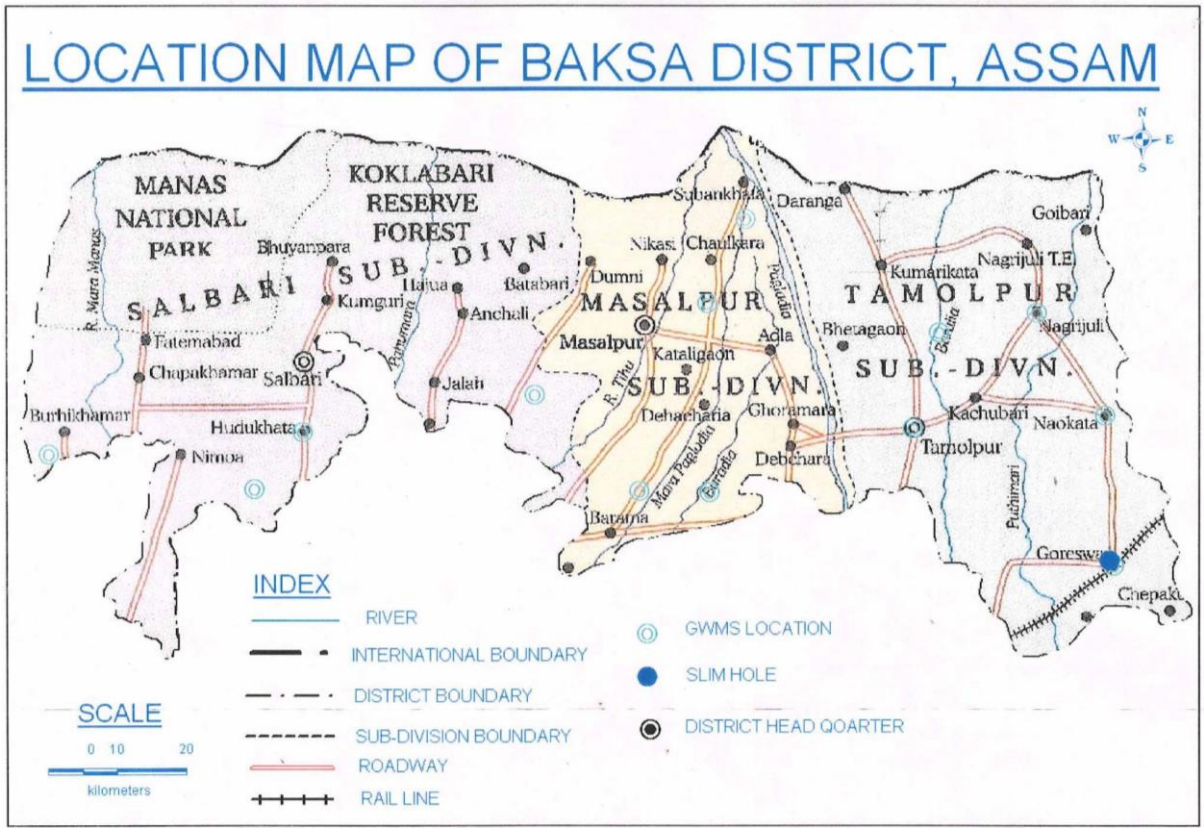
6.0 Ground Water Related Issues and Problems

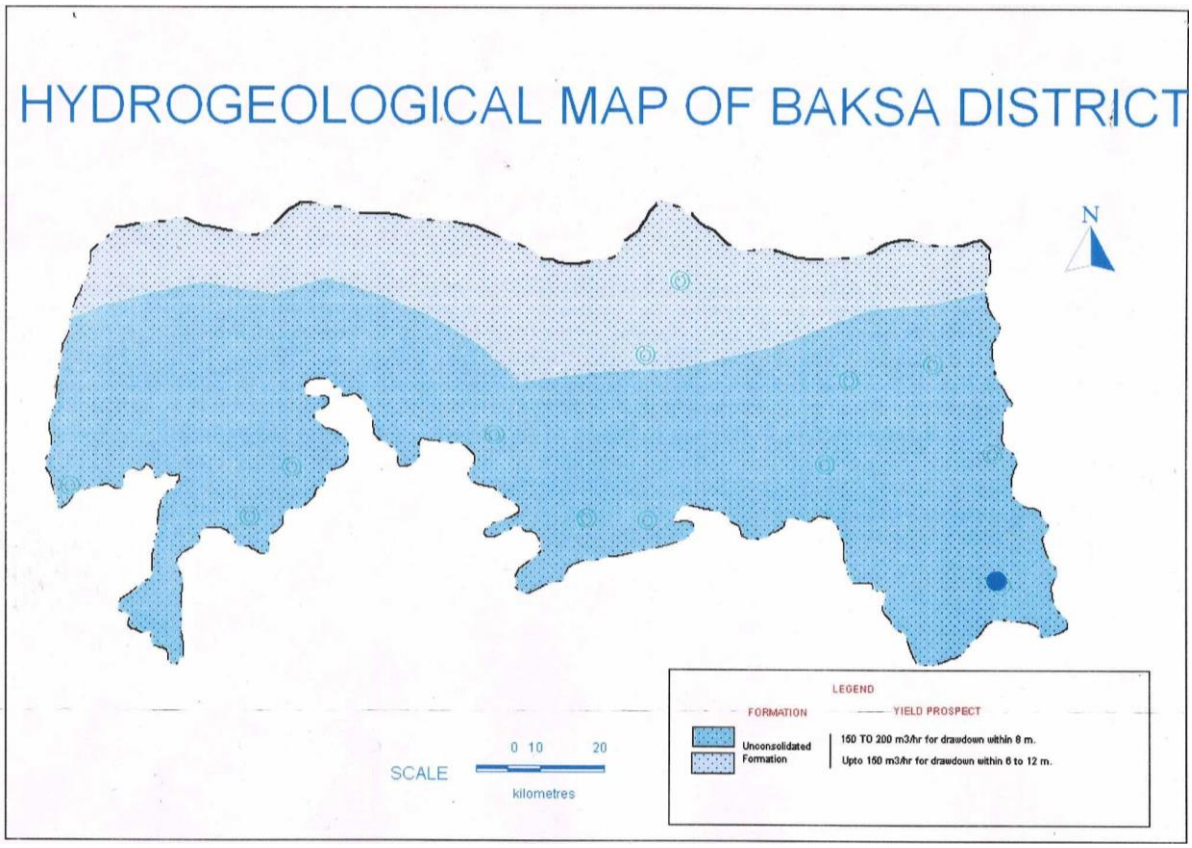
Floods devastate the district regularly during the monsoon season. Flood accompanied with soil erosion and sand deposition causes maximum damage to standing crops of the agricultural lands. Other than high Iron content in sporadic occurrences, most of the chemical constituents are within permissible limit.

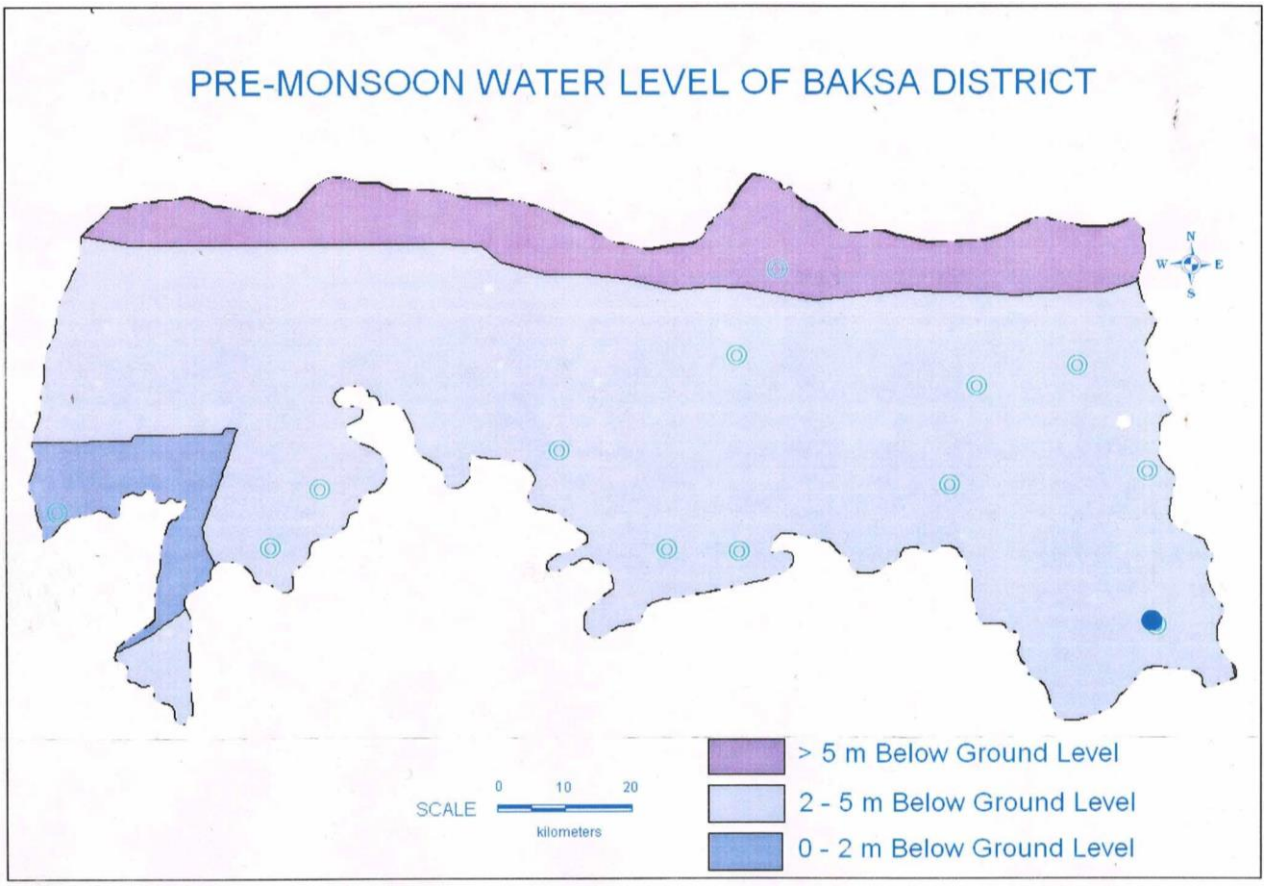
7.0 Recommendation

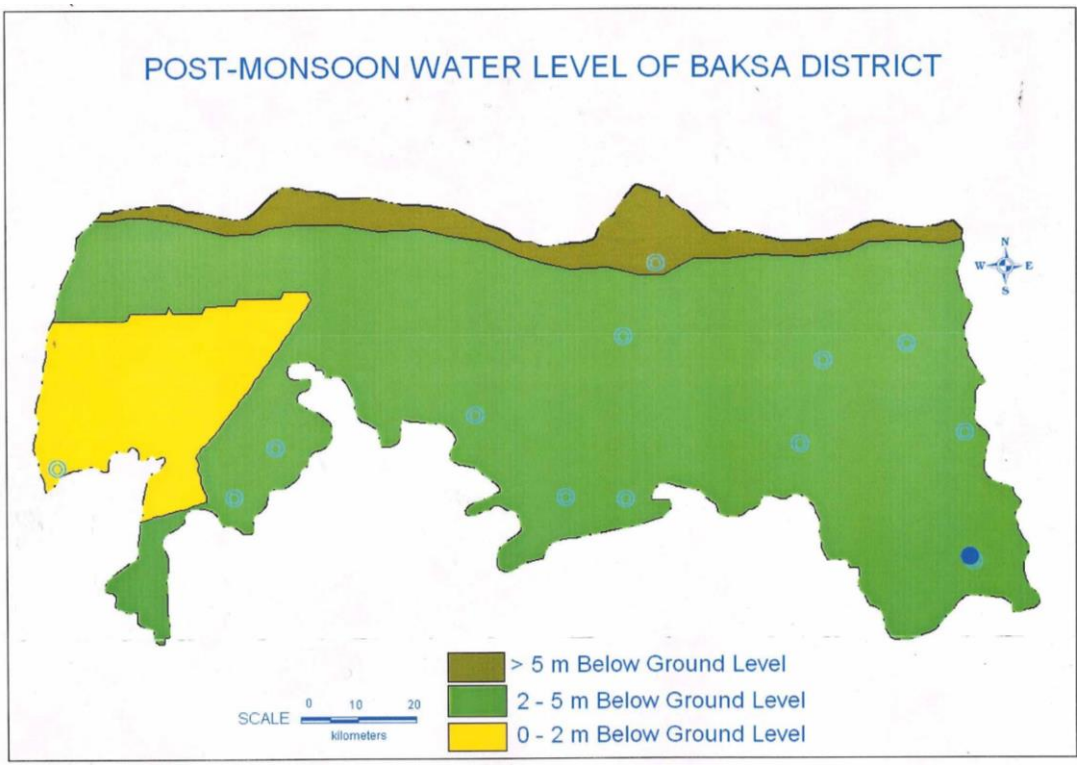
Existing hydrogeological set up and availability of huge ground water resources indicate that there is much scope for the development of ground water in a planned and

systematic way. Iron treatment plants need to be installed with water supply schemes before using for drinking purposes.




HYDROGEOLOGICAL MAP OF BAKSA DISTRICT
N
LEGEND
FORMATION
YIELD PROSPECT
Unconsolidated Formation
150 TO 200 m3/hr for drawdown within 8 m.
Upto 150 m3/hr for drawdown within 8 to 12 m.
SCALE
0 10 20
kilometres


PRE-MONSOON WATER LEVEL OF BAKSA DISTRICT
N
W
E
S
SCALE
0
10
20
kilometers
> 5 m Below Ground Level
2 - 5 m Below Ground Level
0 - 2 m Below Ground Level


POST-MONSOON WATER LEVEL OF BAKSA DISTRICT
N
W
E
S
SCALE
0
10
20
kilometers
> 5 m Below Ground Level
2 - 5 m Below Ground Level
0 - 2 m Below Ground Level