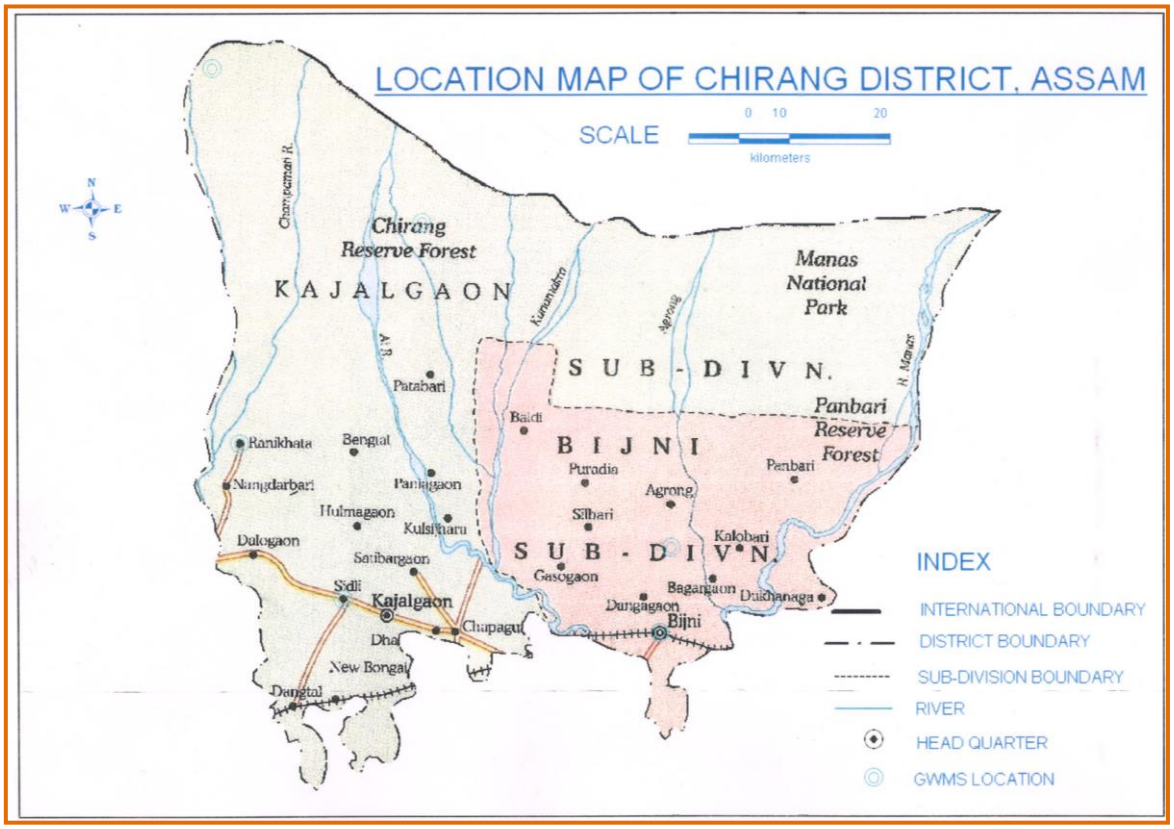
Technical Report Series: D **No:**

Ground Water Information Booklet
Chirang District, Assam



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

GROUND WATER INFORMATION BOOKLET
CHIRANG 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)	 1,974.80 48,1,818 3,330
2.	GEOMORPHOLOGY i) Major Physiographic Units ii) Major Drainages	 Flood plain & alluvial terrace, Inselberg, swamp. Champabati, Ai, Buri Ai, Manas, Kanamkara and Arang Rivers.
3.	LAND USE (sq. km.) i) Forest Area ii) Net Area Sown iii) Total cropped area iv) Area sown more than once	 410.37 467.67 888.70 420.13
4.	MAJOR SOIL TYPES	New alluvium, older alluvium, loamy & lateritic.
5.	AREA UNDER PRINCIPAL CROPS (sq.km/2006.)	Not Available
6.	IRRIGATION BY DIFFERENT SOURCES (sq.km.)	1,1.72
7.	NUMBERS OF GROUND WATER MONITORING STATIONS OF CGWB (as on March 2013)	6
8.	PREDOMINANT GEOLOGICAL FORMATIONS	Alluvial formation
9.	HYDROGEOLOGY i) Major water bearing formation ii) Long term water level trend in 20 yrs	 Alluvial sediment 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) v) Permeability (m/day)	 Nil
11.	GROUND WATER QUALITY i) Presence of Chemical Constituents beyond Permissible Limit (e.g. EC, F, Fe, As) ii) Type of water	 Fe Good, potable

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 (this district was earlier part of Bongaigoan district and formed in Later part of 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

GROUND WATER INFORMATION BOOKLET
CHIRANG DISTRICT, ASSAM

1.0 Introduction

Chirang district covers an area of 1,974.80 sq. km. It is situated in the northern bank of the River Brahmaputra. The district has an international and state boundary with Bhutan on the north. It is bounded by Kokrajhar district in the west, Bongaigaon and Barpeta district on the south and Baksa 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 Champabati, Ai, Buri Ai, Manas, Kanamkara and Arang Rivers.

The Irrigation Department has taken up 14 (fourteen) schemes in total both new as well as renovated/improved old schemes in Chirang District, out of which 13 (thirteen) schemes are directly related to supplying of irrigation water for cultivation and 1 (one) scheme is not irrigation oriented. Out of 13 (thirteen) schemes, 10 (ten) schemes have been completed and a total potential of 1,172 ha for Kharif Crops have been so far created through the achievement of these schemes. The remaining 3 (three) schemes are also in progress.

2.0 Rainfall and Climate

The district enjoys a sub-tropical humid climate with a hot summer and moderate winter. The maximum temperature is generally experienced in June, July and August every year. January is the coldest month and July/August is the warmest months. 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. South West monsoon activates from May and continues up to September - October. Most of the rainfall is received during monsoon season.

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 characterised by the different land forms a) inselbergs and b) alluvial plains.

The inselbergs are Archaean inliers occurring in the form of disconnected hillocks in the alluvial plains. They are found occurring in the south-eastern part of the district. The hillocks are covered by a thick lateritic mantle and are occupied by evergreen mixed forests. The alluvial plains are comprised of Older and Newer alluvium. The Older alluvium occupies the piedmont zone towards the north of the district bordering Bhutan. The high narrow zone at the Himalayan foothill is known as the Bhabar zone and supports dense forests. To the south of the Bhabar zone and parallel to it, there lies the flat Terai zone where the ground remains damp and sometimes springs oozes out. Tall grasses cover the Terai zone. The formation is comprised of sand, clay with mixtures of pebble, cobble and boulders. 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 soils of the alluvium are partly new or recent and partly old. The variation in composition is mainly a result of 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, the content is very low. In general, the soil is acidic to slightly alkalaine in nature and is moderately permeable and characterised 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 part of the district are suitable for all sorts of crops.

4.0 Ground Water Scenario

4.1 Hydrogeology

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

i) Consolidated formations: Precambrian gneissic complex projecting abruptly above the vast stretch of alluvium as isolated hills, referred in here as 'inselbergs' form consolidated formations in the district. These rock formations have been subjected to faulting and fracturing at several places, through which water percolates to facilitate weathering.

Occurrence of ground water is limited in these formations and is confined to topographic lows and weathered residuum. The movement of ground water is controlled by the presence of fractures and fissures. Extractions of ground water in these zones are possible through large diameter dug wells and bore wells in hydrogeologically suitable places. Ground water occurs under water table conditions in the weathered zone. There are at present no borewells in the inselberg zone. However, yield of dugwells is adequate to meet the domestic needs.

ii) Unconsolidated formations: More than 80% of the district is underlain by unconsolidated formations, represented by the alluvial deposits of Recent age. It comprises the alluvial sediments of the foot hill belt (Bhabar) 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 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 very 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 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 sand,

gravel and silt with more proportion of clay. Ground water in this zone occurs under unconfined to confined conditions.

Newer Alluvium: The district is mostly covered by Newer alluvium and the formation is comprised 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 a depth of 50 m and down to 200 m bgl.

i. Shallow Aquifer Group:

It constituted of a mixture of boulders, 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 development of ground water from this aquifer for both domestic and irrigation purposes is by open wells and shallow tube wells.

The boulders are restricted mostly to the northern parts of the district. They occur between GL to 50 m bgl and thickness varies from 20 - 30 m. The thickness increases from south to north.

The water level in the major part of the district generally lies between 2 to 4 m bgl. The northern most part occupied by the piedmont zones and the areas adjoining to the inselbergs 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 the south.

ii. Deeper Aquifer Group

It constituted of coarse to medium sand with intercalation of clay. Ground water occurs under water table to semi-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

Methodology adopted for ground water resource estimation of Chirang District of Assam is as per GEC 1997 Report, i.e. Ground Water Level Fluctuation and Rainfall infiltration factor Method.

This district was separated from Bongaigoan district in the later part of 2009 and hence dynamic resources was not computed for 2009

4.3 Ground Water Quality

The ground water of the district is both slightly acidic and alkalaine in nature with pH values ranging from 6.82 to 7.21. Ground water has low content of dissolved minerals. The iron content is generally high for drinking purposes in some areas, the range being from 1.02 - 3.0 ppm. But, 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 hazards. High iron concentration has been observed in and around Runikhata area. Except high iron content, the ground water of the district is suitable and safe for drinking and other uses. The water is soft and has low bi-carbonate content.

The formation water of both shallow and deep aquifers is suitable for most of the irrigational and industrial purposes. Ground water is having a little higher concentration of iron but can be used after treatment.

5.0 Ground Water Management Strategy

Shallow ground water structures are congenial for construction in the district, as water level and aquifer material are laterally persistent throughout the district. Dug wells and dug-cum-bore wells especially near the inselberg zone is very beneficial. Deep tube wells 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

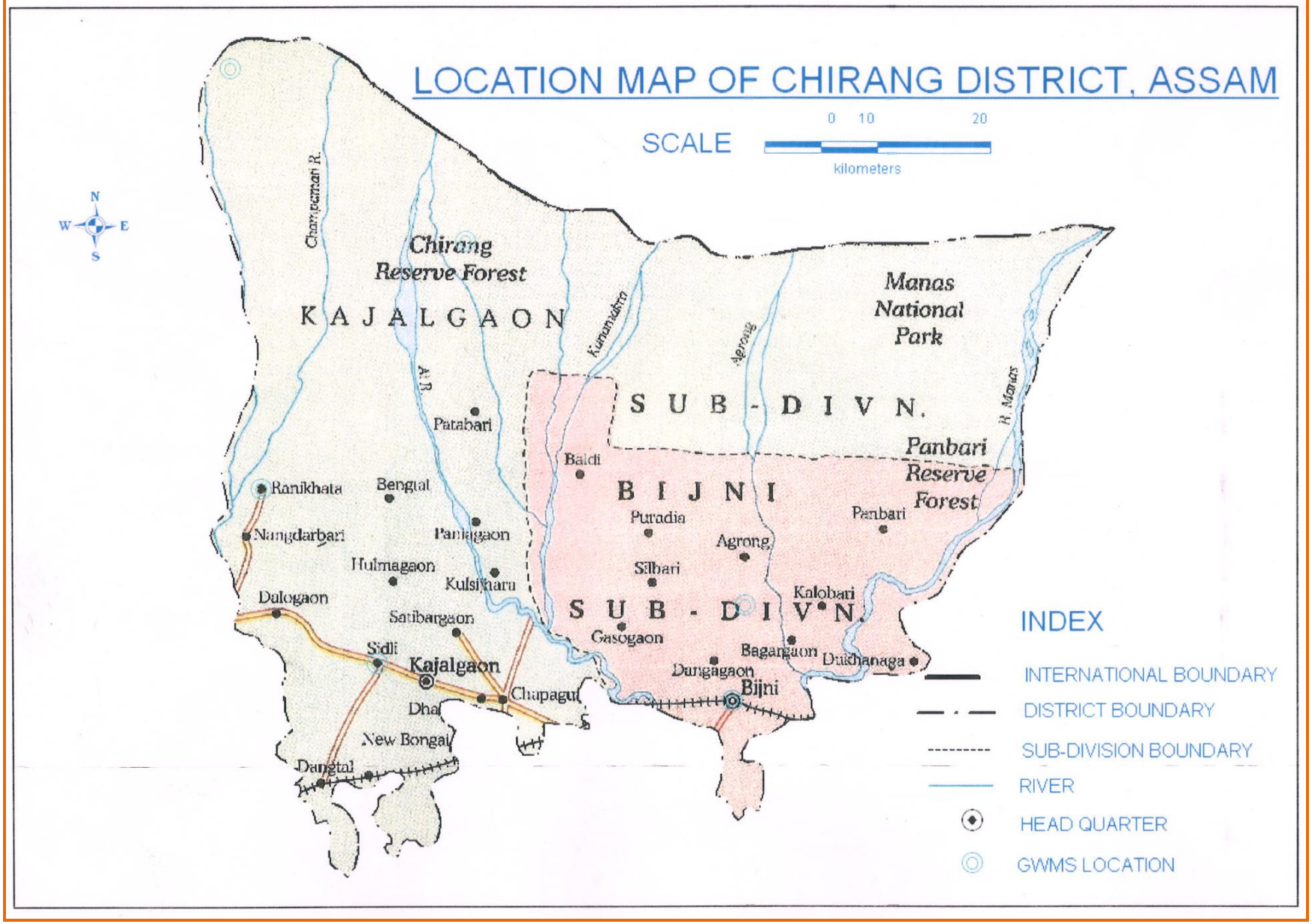
Floods devastate the district regularly during the monsoon season. Flood accompanied with soil erosion and sand deposition cause maximum damage to standing crops to the agricultural lands.

Other than sporadic occurrence of high Iron content, most of the chemical constituents in ground water are within permissible limit.

7.0 Recommendation

Existing hydrogeological set up and availability of huge ground water resource indicate that there is much scope for the development of ground water abstraction structures in a planned and systematic way.

Iron treatment plants need to be installed with PHED water supply schemes before using for drinking purpose.


LOCATION MAP OF CHIRANG DISTRICT, ASSAM
SCALE
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kilometers
N
W E
S
Champamati R.
Chirang
Reserve Forest
KAJALGAON
A.T.R.
Kumarikata
Agrang
Manas
National
Park
R. Manas
SUB-DIVN.
Panbari
Reserve
Forest
Patabari
Baldi
BIJNI
Puradia
Panbari
Agrang
Silbari
Kalobari
SUB-DIVN.
Gasogaon
Bagargaon
Duidhanaga
Dungagaon
Bijni
Ranikhata
Bengtal
Nangdarbari
Paniagaon
Hulmagaon
Kulsiharu
Dalogaon
Satibargaon
Sidli
Kajalgaon
Chapaguri
Dha
New Bongal
Dangtal
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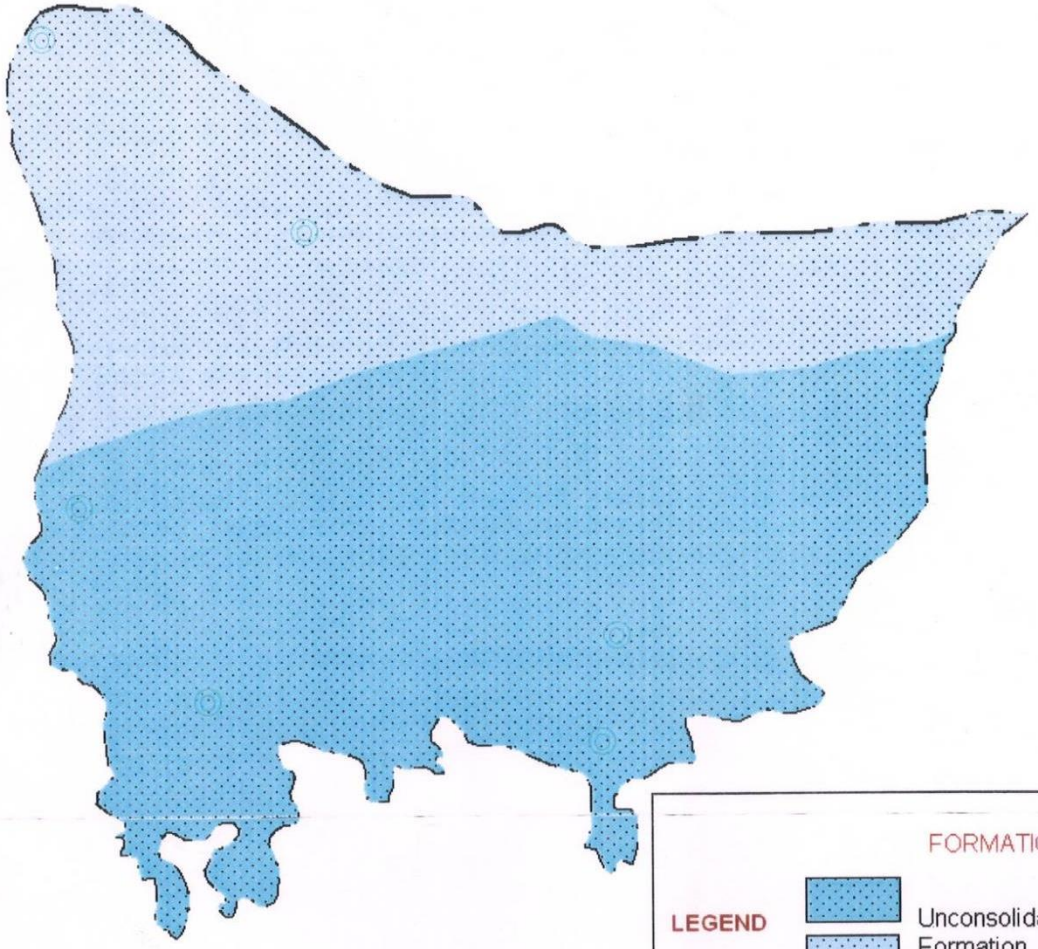
DISTRICT BOUNDARY
SUB-DIVISION BOUNDARY
RIVER
HEAD QUARTER
GWMS LOCATION

HYDROEOLOGICAL MAP OF CHIRANG DISTRICT

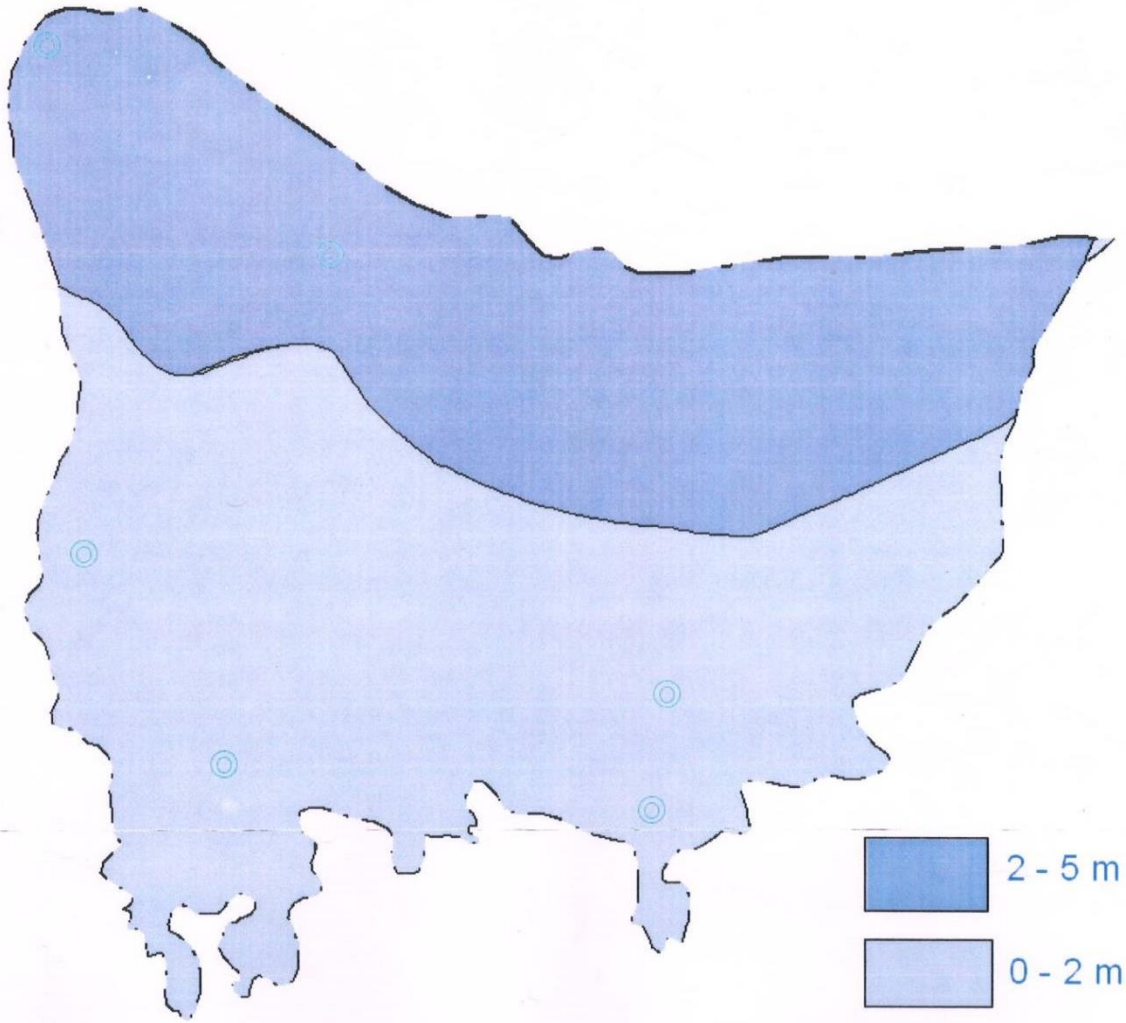


N

SCALE 0 10 20
kilometres

LEGEND	FORMATION	YIELD PROSPECT
	Unconsolidated Formation	150 TO 200 m3/hr for drawdown within 8 m.
		Upto 150 m3/hr for drawdown within 6 to 12 m

PRE-MONSOON WATER LEVEL OF CHIRANG DISTRICT



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W E
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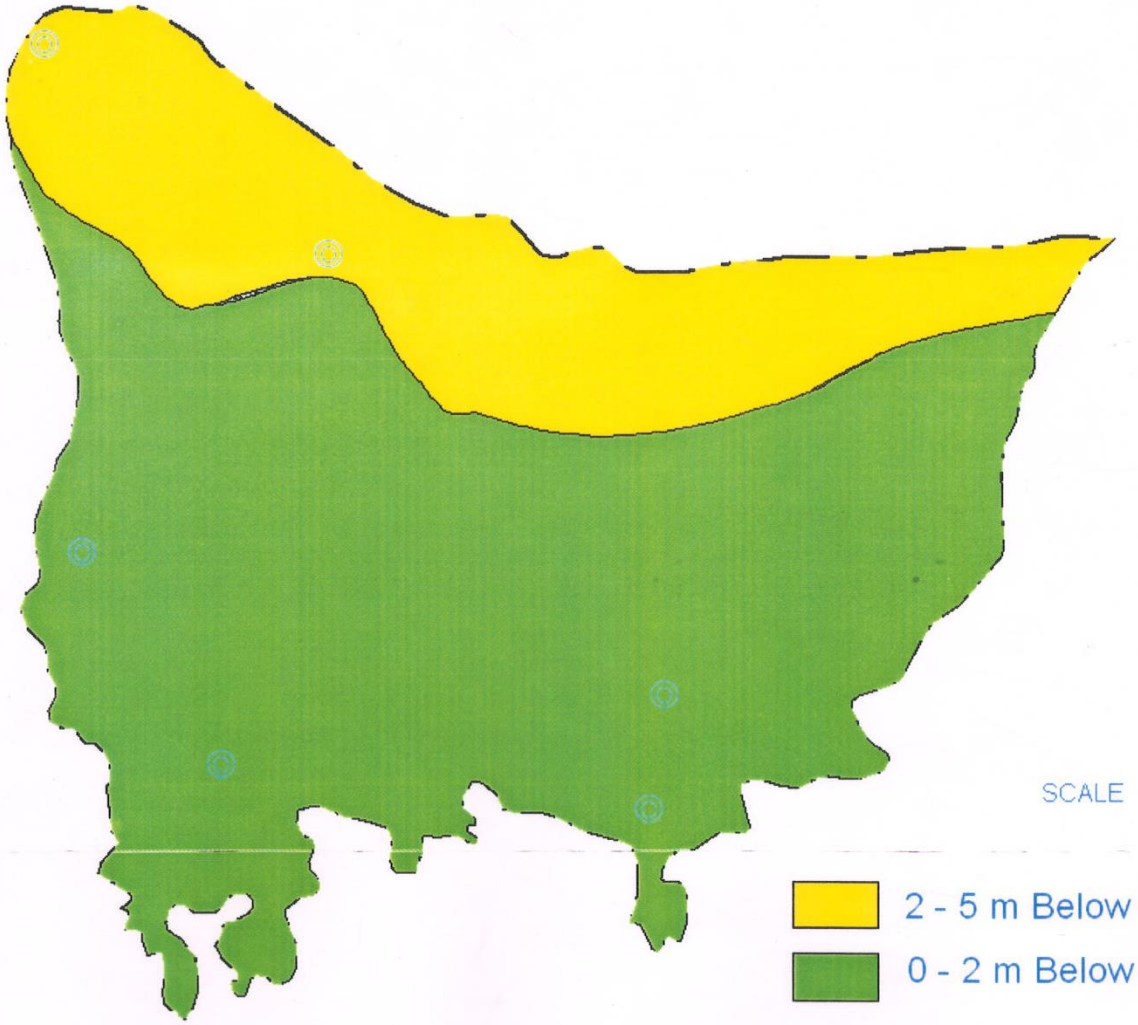
SCALE 0 10 20
kilometers

2 - 5 m Below Ground Level

0 - 2 m Below Ground Level

POST-MONSOON WATER LEVEL OF CHIRANG DISTRICT



N
W E
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SCALE 0 10 20
kilometers

2 - 5 m Below Ground Level

0 - 2 m Below Ground Level