

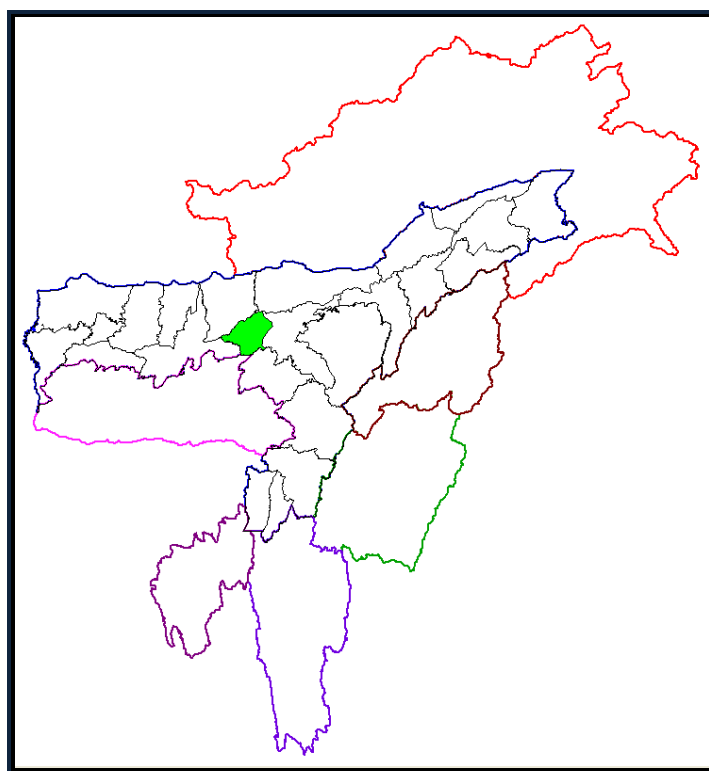
Technical Report Series: D

No:



Ground Water Information Booklet

Morigaon District, Assam



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

GROUND WATER INFORMATION BOOKLET

MORIGAON DISTRICT, ASSAM

DISTRICT AT A GLANCE

I. GENERAL PARTICULARS

- i) Location – North Latitude : 26°03'00" and 26°30'00"
East Longitude: 91°58'30" and 92°34'00"
- ii) Geographical area : 1551 sq. km.
iii) Block : 5 Nos.
iv) Villages : 632Nos.
v) **Population** : **957853**
Rural : 93% SC : 13.78%
Urban : 7% ST : 15.40%
Decadal variation : 50.90%
Density : 618/sq.km.
Literacy : 56.17% (male) 39.19% (Female)

II. LAND USE PATTERN

- i) Geographical area : 155100 hectares
ii) Tea Estate : 248.19 hect
iii) Barren : 3537 hect
iv) Forest : 13207 hect
v) Non-agricultural : 10,843.82 “
vi) Cultivable waste : 960 hect
vii) Fallow : 8363 hect
viii) Net sown : 92011 hect
ix) Sown more than once : 29902 hect
x) Irrigated -
Total irrigated area 934 hect

III. CLIMATOLOGY

- i) Average Annual Rainfall : 1770 mm
ii) Maximum temperature : 29.5⁰c (August)
iii) Minimum temperature : 17.5 (January)

IV. HYDROGEOLOGY

- i) Phreatic level elevation (2011) : 50-60 m amsl
- ii) Hydraulic gradient (2011) : 0.53 m/km
- iii) Fluctuations : (2011)
 - Annual – Rise - : < 1 m (65% area)
1 – 2 m (30 % area)
> 2 m (5% area)
 - Decadal – Rise - : 20% area
 - Fall - : 80% area
 - < 1 m (68% area)
 - > 1 m (12 % area)
- iv) Yield of Aquifer = 150 m³/hr (down to 200 m depth)
 - kD = 500 – 6000 m²/day
 - S = 3.27 to 3.39 x 10⁻³
 - Specific yield = 26%

V. GROUND WATER QUALITY

- i) Type of ground water : Ca, Mg – HCO₃
- ii) TDS : 169 – 940 ppm
- iii) Total Hardness (as CaCO₃) : 80 – 570 ppm
- iv) Salinity class : C3S1, C2S1, C1S1
- v) SAR : 0.27 – 220 ppm
- vi) Iron : 0.1 – 2.5 ppm
- vii) Fluoride : 0.1 – 0.7 ppm
- viii) Nitrate (as NO₃ – N) : 0.1 – 15.9 ppm
- ix) Phosphate : 0.1 – 13.5 ppm

VI. GROUND WATER RESOURCES as on 2009

- i) Net Annual ground water availability : 691.06mcm
- ii) Annual draft : 281.89 mcm “
- iii) Project demand for domestic
and Industrial use upto 2025 : 29.75 mcm
- iv) Stage of development : 41%

v) Critical Block	:	Kapili
vi) Semi-critical Block	:	Lahorighat
vii) Safe	:	Bhurbandha and Mayang Blocks
viii) No. of CGWB Expl. Wells	:	Total 28 Nos. (Ex-12,OW-9,SH-2, Dw-5)
ix) Irrigation potential	:	20,130 hectares

VII. DESIGN OF GROUND WATER EXTRACTION STRUCTURES

i) Design of discharge	:	6 – 8 lps
ii) Depth of dug wells	:	10 m
iii) Depth of shallow wells	:	25 – 30 m
iv) Dia of dug wells	:	1.50 m
v) Dia of shallow wells	:	0.80 m
vi) Dia of deep tubewells	:	204 mm
vii) Thickness of aquifer to be tapped	:	24 – 30 m
viii) Command area of well	:	1.5 – 3.5 hectares
ix) H.P. of pump	:	3 – 6

VIII. AWARENES AND TRAINING ACTIVITY

i) Mass awareness proramme organized	:	Nil
ii) Water Management Training Programme organized	:	Nil

IX. EFFORTS OF ARTIFICIAL RECHARGE AND RAINWATER HARVESTING

i) Project completed by CGWB (No. and amount spend)	:	Nil
ii) Project under technical guidance of CGWB (Nos.)	:	Nil

X. GRUND WATER CONTROL AND REGULATION

i) Nos. of OE Block	:	Nil
ii) Nos. of Critical Block	:	1
iii) Nos. of blocks notified	:	Nil

XI. MAJOR GROUND WATER PROBLEMS AND ISSUES

Higher concentration of iron (Fe) is observed in few pockets in shallow and deep aquifers of the district.

1.0 INTRODUCTION

The present Morigaon district of Assam lies in the Central part of Assam on the southern bank of the Brahmaputra River. It is bounded on south by Karbi Anglong and West Khasi Hills district, on east by Nagaon district and on west by Kamrup district, Assam.

The district occupies part of the Brahmaputra valley and the mighty river Brahmaputra flows on westerly direction along its northern boundary. The district is drained by several perennial rivers flowing from south to north. Rivers Kalong and Kopili are two most important rivers.

The district comprises 5 numbers of C.D. Blocks. They are – Batadrawa, Bhurbandha, Dolonghat, Lahorighat and Mayang with 89 Gaon Panchayats.

The total population as per 2011 Census is 957853, out of which 1,28,075 are farmer families. The density of population is 618/sq. km.

The district has total geographical area of 1551 sq. km. out of which 3174.87 hectares occupied by forest. Gross cropped area is 1516.42 hectares and net area sown 9201 hectares. The irrigated land is 14,425 hectares including flow, lift and private Shallow Tube wells.

2.0 RAINFALL AND CLIMATE

The average annual rainfall of the district is 1770 mm out of which monsoon contribution is 83%. The maximum temperature is 29.5°C (average) while minimum temperature is 17.5°C (average). The numbers of rainy days is 24 from May to September.

Morigaon district has sub-tropical and humid type of climate. The humidity data reveal that the air is humid throughout the year. It has the value of 67 to 79 % during dry period.

3.0 AGRICULTURE AND IRRIGATION

The mainstay of the population of the district is the agriculture. The farmers adopt the indigenous methods of irrigation due to uneven distribution of rainfall. The crops are irrigated under surface and ground water schemes run by Govt. of Assam and shallow tube wells installed through private and Govt. and semi-govt. organizations. The irrigation potential created by flow

irrigation scheme is 31.00 hectares and by lift irrigation is 2945 hectares. The lift irrigation by Govt. scheme from ground water is 214 hectares excluding private shallow tube wells.

The soil of the district is very suitable for production of all seasonal paddy and other Rabi and Horticultural crops. Production of summer paddy, autumn paddy and winter paddy is very high and are cultivated on 39,355 hectares, 28,014 hectares and 45,853 hectares respectively. Among the crops, various food crops, fibre crops, pulse, oil seeds, spices, horticultural crops and almost all types of vegetables are produced in the district. The soil of the district has been classified on the basis of chemical composition as follows:-

1. Strongly acidic to alkaline
2. Low to medium content of total soluble salts
3. Medium to high phosphate
4. Low to medium inorganic carbon percentage
5. Medium to high in Potash content

4. GEOLOGICAL SETTING

Geologically, the district comprises two distinct Geological formations. The oldest Archaean rocks comprising Biotite-Hornblende gneisses and schist are intruded by granite with pegmatite veins. The rocks mass forms remnant hills highly weathered and isolated hills among the alluvial sediments as inselbergs. The unconsolidated alluvial sediments occupies the major part of the district. On northern part along the river Brahmaputra, the sediments comprise fine grained nature with occasional gravel beds with pebbles and represent its silty nature. It represents younger alluvial sediments. They comprise sands of various grades with bands of silt and clay along the river Kalong and Kopili representing older alluvial sediments.

Central Ground Water Board had explored the area down to the depth of 300 m and reveals the existence of several good aquifer zones with yielding capacity of maximum 200 m³/hr. More or less, the sub-surface strata represent mono-aquifer system at Bhuragaon area on north and the intercalation of clay beds are observed towards south on the older alluvial.

5. GROUND WATER SCENARIO

5.1 : Hydrogeology

The distinct hydro geological set-ups prevail in the Morigaon district – the older alluvium and younger alluvium. The first set up is older alluvium surrounding inselbergs and along the foot hill part on south. It comprises clay, silt and various grades of sand.

The second set up is younger alluvium with freshness in colour and grain size covers major part of the district on north. It consists of sand, fine to coarse grained in texture with intermixed gravels and pebbles along with clay and silt.

The depth to ground water level is less than 1 m in the valley portion of Gerua, Lalijan, pakaria and Sonai river in the north-eastern part of the district. This area is chronically water logged. In 53 per cent valley side area, the depth to ground water level is 1 – 2 metres. In and around the inselbergs and the upland areas comprising 26 per cent of the district area, the water level is around 2 meters and more. Central Ground Water Board has established 13 numbers of National Hydrographic Network Stations to monitor the rise and fall of the water level in the district throughout the year.

5.2: Ground water resources

The recharge to the ground water body mainly takes place through infiltration of rainfall and to a lesser extent from surface water sources. The range of fluctuation in water level between dry and wet seasons and infiltration rate, permeability and aquifer geometry are the important factors which controls the ground water recharge.

The ground water resources of Morigaon district is worked out and presented in the following table - I

The annual dynamic ground water resource of the district is 767.85MCM and the net annual ground water draft from all sources is 281.89 mcm. The stage of ground water development is 41%.

5.3 Ground water quality

The quality of ground water as a whole is suitable for both drinking and irrigation purposes. The relationship between total dissolved solids (TDS) with major cations, anions and minor anions was studied with increase in TDS of ground water, there is progressive increase in HCO_3 , SO_4 and chloride. In general, with increase in TDS, there is progressive increase in Ca, Mg, Na and K, but sometimes there is decreasing trend also. The change in Nitrate and phosphate with TDS does not follow any regular trend and can be attributed to local effects.

Perusal of the findings indicates that mostly ground water of Morigaon district can be grouped as Ca-mg Bicarbonate type.

As per the chemical quality of ground water, the ground water of Morigaon district is classified under C1S1, C2S1 and C3S1.

5.4 Status of Ground Water Development

Development of ground water resource in the district is moderate. The stage of development is 25%. Apart from the ground water using for drinking purposes, additional 23,998

hectares of land can be irrigated by construction of shallow ground water structures constructed down to the depth of 50 m throughout the district.

6. GROUND WATER MANAGEMENT STRATEGY

Thick and extensive alluvial deposits forming rich aquifer system covering the almost entire district is very much suitable for ground water development through ground water abstraction structures.

The stage of groundwater development is safe and attains only 25% except Kapili Block. The balanced ground water resource is enough for development mostly through shallow tubewells down to 50 m. Such a shallow tube well tapping at least 15 m of aquifer zone can yield 15 – 20 m³/hr. An agriculture land of 1.5 hectare can be easily irrigated using electricity/diesel operated vertical turbine pump henceforth initiating multiple cropping with increasing population.

In regard to fresh drinking water supply, deep tube wells/shallow tube wells down to 150 – 200 m and tapping 20 – 25 m of aquifer zone will be useful. The quality of ground water is also suitable for drinking with some filtration e.g., for iron.

7. GROUND WATER RELATED ISSUES AND PROBLEMS

Ground water in the district is primarily used for drinking and irrigation. For irrigation purpose, the ground water is very much suitable and can be used safely in the present climatic conditions.

The quality of ground water depends on various chemical constituents of the geological formation acting as an aquifer. It may also be attributed due to anthropogenic activities. All the chemical constituents are within permissible limit in comparison to Bureau of Indian Standards limits.

Among the chemical constituents Nitrites and Nitrates and phosphate are derived mainly from the fertilizer used and decayed vegetables etc. The concentration of fluoride in ground water of Morigaon district is well with the permissible limit.

8. AWARENES SAND TRAINING ACTIVITY

No such awareness and training programme has been conducted in the district.

9. RECOMMENDATION

Detailed hydrogeological survey followed by 12` numbers of exploratory drilling by Central Ground Water Board , NER, Guwahati has revealed existence of rich aquifer zones down to 300 m depth with yielding capacity of 150 m³/hr. Shallow tubewells down to 50 m depth have ample yielding capacity upto 25 m³/hr if properly constructed.

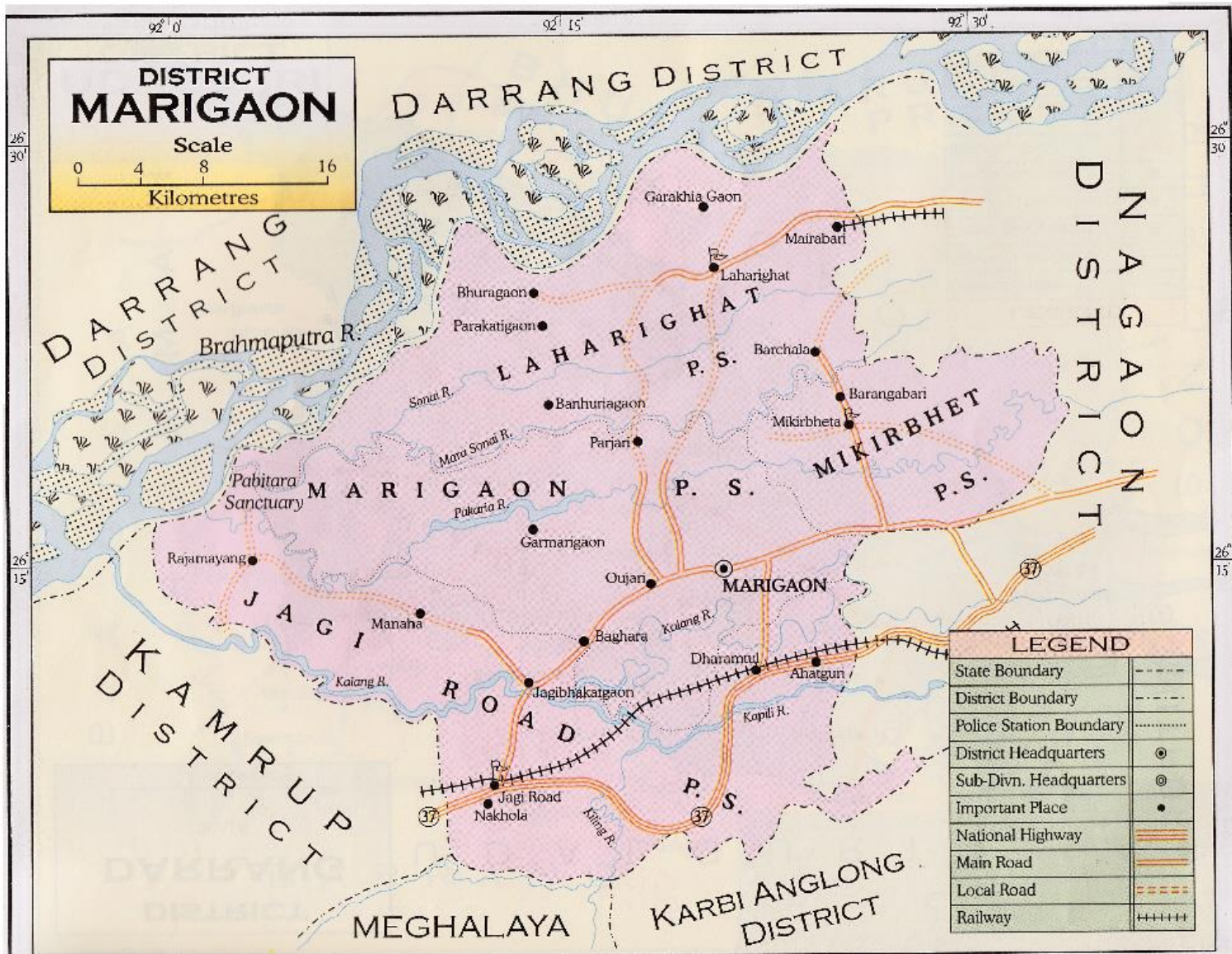
Dug wells constructed beneath the superficial clay zone have high yielding capacity both for irrigation and drinking purposes.

Considering the hydro geological set up and availability of huge ground water resources, the present resource can fully be utilized in irrigation of the cultivable land available for multiple cropping in the soil of the district which is very fertile an can withstand such development.

TABLE-I

ASSESSMENT OF DYNAMIC GROUND WATER RESOURCES OF MORIGAON DISTRICT OF ASSAM (as on 2009).(in ham)

Sl No	Assessment unit/District	Non Com mand	Net Annual Ground water availability	Existing gross ground water draft for irrigation	Existing gross ground water draft for domestic & industrial water supply	Existing gross ground water draft for all uses	Provision for domestic & industrial requirement to 2025	Net ground water availability for future irrigation development	Stage of development %
1	Morigaon	155100	96106	26166	2023	28189	2975	39965	41

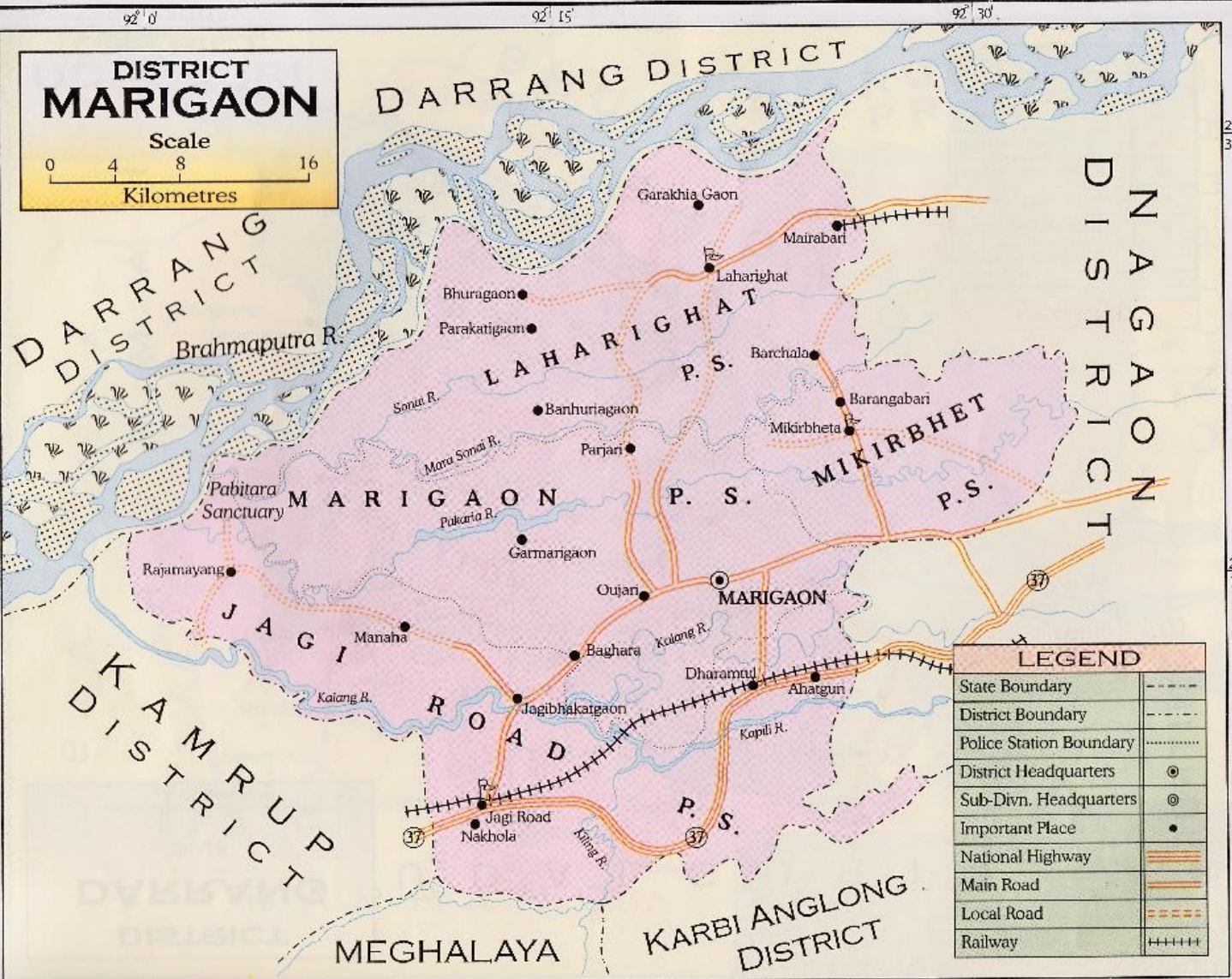


DISTRICT MARIGAON

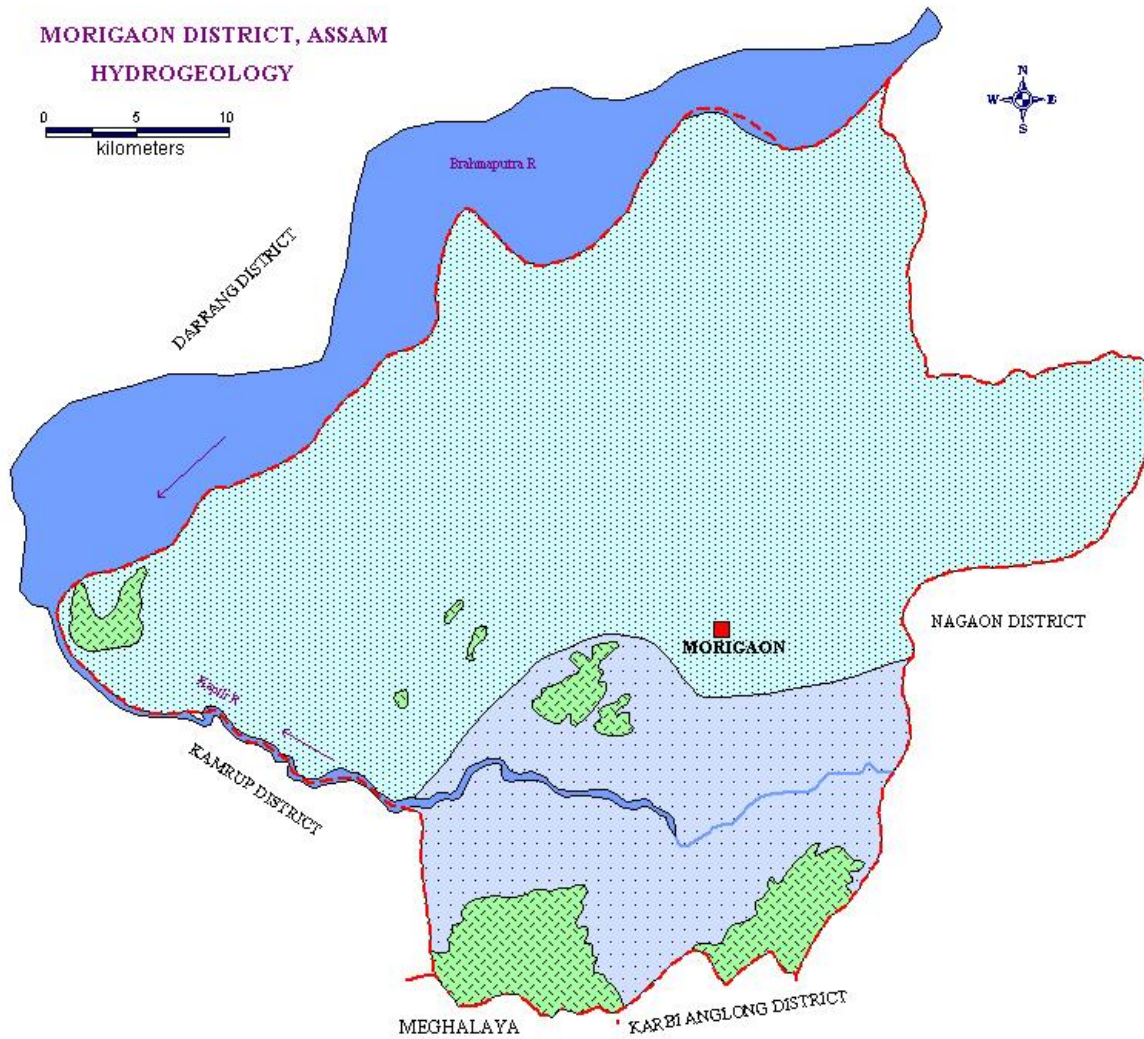
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LEGEND


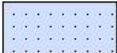





State Boundary	-----
District Boundary	- - - - -
Police Station Boundary
District Headquarters	⊙
Sub-Div. Headquarters	⊙
Important Place	•
National Highway	====
Main Road	=====
Local Road	-----
Railway	+++++



MORIGAON DISTRICT, ASSAM
HYDROGEOLOGY



L E G E N D

MAP UNIT	FORMATION	LITHOLOGY	AQUIFER DISPOSITION	GROUND WATER PROSPECT
	Recent/Newer Alluvium	Sands of various grades, gravel, pebble, silt & clay	Fairly thick and extensive. Unconfined to semiconfined, thickness 200-300m	Suitable for shallow tube wells of 30-40m depth with yield 15-30m ³ /hr. Deep tube well of 200-300m deep with yield 140-220m ³ /hr for 2-6 m drawdown
	Older/ High level Alluvium	Silt, clay, sand fine to medium grained.	Restrict around inselbergs & in southern part, semi-confined to confined, thickness 20-200m	Suitable for shallow tube wells of 40-50m depth, yield upto 15m ³ /hr. Deep tube wells of 80-200m depth, yield 30-140m ³ /hr for drawdown upto 8m
	Gneissic Complex	Gneiss and granite, fissured	Weathered residuum, joints, fractures having secondary porosity	Not suitable. Very low yield
	State boundary			
	District Boundary			
	Drainage			
	District Head Quarter			