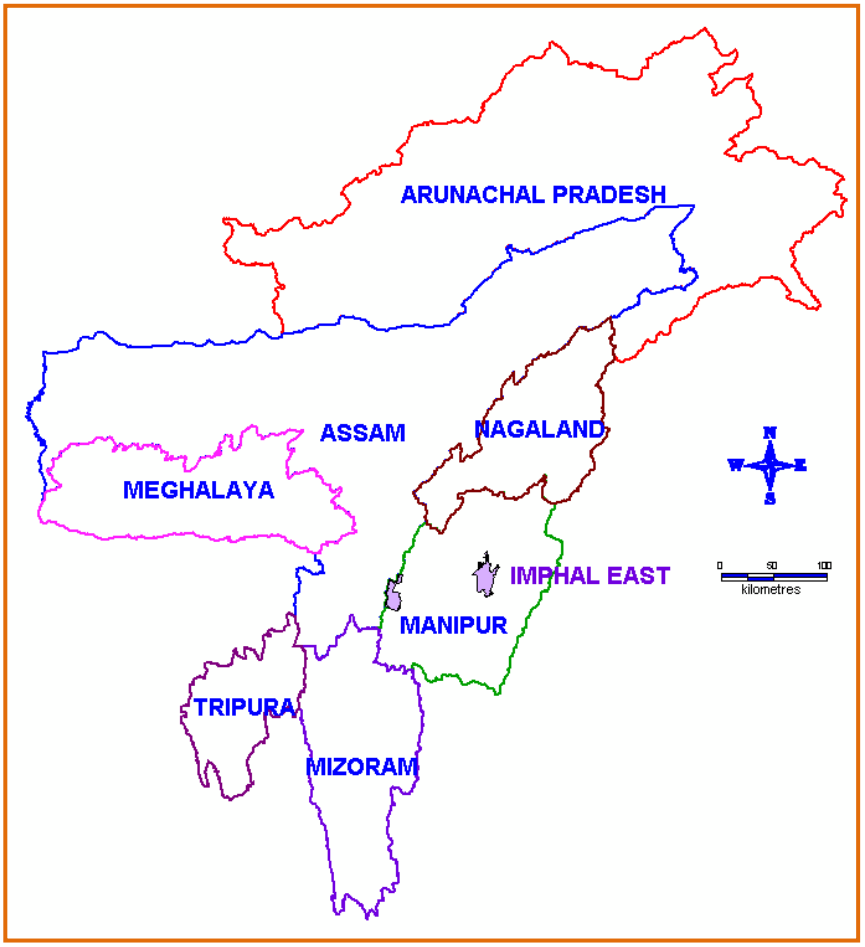
Technical Report Series: D

No: 07/2013-14

# Ground Water Information Booklet
## Imphal East District, Manipur




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

# Ground Water Information Booklet, Imphal East District, Manipur

## DISTRICT AT AGLANCE

| Sl. No. | ITEMS | STATISTICS |
|---|---|---|
| 1 | GENERAL INFORMATION | |
| | i) Geographical Area (in sq.km) | 709.00 |
| | ii) Administrative Division (as on 31 March 2013)<br>Number of Tehsil/CDBlock | 3 (including Jiribam C.D.Block)<br><br>56 |
| | iii) Population (as per 2011 Census) | 4,52,661 |
| | iv) Average Annual Rainfall (mm) | 967.20 |
| 2 | GEOMORPHOLOGY<br>i) Major Physiographic Units<br><br>ii) Major Drainages | Flat elongated southward tapering isolated Hills with intermountain valley.<br>North to south drainage tending drainage with two main river basins viz, the Barak river basin and Manipur river basin. |
| 3 | LAND USE (sq.km)<br>i) Forest Area<br>ii) Net Area Sown<br>iii) Cultivable Area | <br>223<br>Undivided Imphal District : 834.01<br>Undivided Imphal District : 861.91 |
| 4 | MAJOR SOIL TYPES | **Major:** Younger, Older alluvial soil and Red gravelly sandy and loamy soil.<br>**2 main types:** Residual & transported soils |
| 5 | AREA UNDER PRINCIPAL CROPS in sq.km (as on March 2011) | 325.38 |
| 6 | IRRIGATION BY DIFFERENT SOURCES<br>i) Dug Wells/STE<br>ii) Tube /Bore Wells/DTW<br>iii) Tanks/Ponds<br>iv) Canals/LIS<br>v) Other Sources<br>vi) Net Irrigated Area<br>vii) Gross Irrigated Area | No separate data |
| 7 | NUMBERS OF GROUND WATER MONITORING WELLS OF CGWB (as on 31-03-2013) –Dug wells | 1 NHNS monitoring at **Jiribam** is regularly monitored other GWMS at Imphal are not under observation |
| 8 | PREDOMINANT GEOLOGICAL FORMATIONS | Shale, siltstone & sandstone of the Disang & Barail Group of Upper Cretaceous to Eocene age. The valley fill of Plio-Quarternary age consists of clay, sand and gravel deposited in a fluvio lacustrine environment. |
| 9 | HYDROGEOLOGY<br>i).Major water Bearing Formations<br>ii) Pre-monsoon Depth to Water Level | Semi-consoliodated formation i.e. shale, siltstone, sandstone and conglomerate |

| | | | |
|---|---|---|---|
| | (existing DGWMS data)<br>iii) Post-monsoon Depth to Water<br>(existing DGWMS data)<br>iv) Long term Water Level Trend in 20 yrs (1988 –2007) in m/yr | 1.08 to 10.32 mbgl<br>0.01 magl to 6.2 mbgl<br>Pre-monsoon =80% rise, 20 % falls<br>Post-monsoon =60% rise, 40 % falls<br>No significance change is observed | |
| 10 | GROUND WATER EXPLORATION BY CGWB (as on 31-03-2013)<br>i) No of Wells Drilled<br>ii) Depth of construction(m) with zone<br><br>iii) Discharge (lpm) | No new exploration is carried out<br>Existing Exploratory Wells : 2 EWs<br>Sangaiprou<br>50 from 91.50mbgl & 11m zone tapped<br>2.0 | Pangei<br>40 from 43 mbgl & 12 m zone tapped<br>24.00 |
| 11 | GROUND WATER QUALITY<br>i) Presence of Chemical Constituents more than Permissible Limit (e.g. EC, F, Fe, As)<br>ii) Type of Water | Except Fe other elements are within the Permissible limit. Fe is more than Permissible limit both in shallow and deeper aquifers | |
| 12 | DYANMIC GROUND WATER RESOURCES ( as on March 2009 ) in mcm<br>i) Annual Replenishable Ground Water Resources<br>ii) Net Annual Ground Water Draft<br>iii) Projected demand for Domestic and Industrial Use up to 2025<br>iv) Stage of Ground Water Development | i) 128.70<br>ii) 0.42<br>iii) 11.64<br>iii) 0.36% | |
| 13 | AWARENESS AND TRAINING ACTIVITY<br>i)MassAwarenessProgrammes Organised<br>ii) Date<br>iv) Place<br>v) No of Participants | Nil | |
| 14 | EFFORTS OF ARTIFICIAL RECHARGE AND RAINWATER HARVESTING<br>i) Projects Completed by CGWB (No & amount spent)<br>ii) Projects Under technical Guidance of CGWB (Numbers) | Nil | |
| 15 | GROUND WATER CONTROL AND REGULATION<br>i) Number of OE Blocks<br>ii) Number of Critical Blocks<br>iii) Number of Blocks Notified | Nil | |
| 16 | MAJOR GROUND WATER PROBLEMS AND ISSUES | Higher concentration of Fe in ground water of the district is observed and scarcity in rural water supply sector, it is still in the primitive phase. | |

# Ground Water Information Booklet, Imphal East District, Manipur

## 1.0 Introduction

Imphal is the capital city of Manipur. Imphal East district is part of main Imphal city with its district head quarter at Porompat. It has almost all the facilities of a modern city. Imphal East and Imphal West are the two main districts of Imphal valley. Imphal East district covers an area of 709 sq.km lies 790 m a.m.s.l with a total population of 4, 52,661 (as per the records of 2011 census). Average rainfall recorded in the district is 993.50 mm.

There are four Revenue Sub-Divisions in the district namely: - (1) Porompat Sub-Division; (2) Sawombung Sub-Division; (3) Keirao Bitra Sub-Division and (4) Jiribam Sub-Division. The total number of SDC Revenue Circles in the district is 9 (nine). There are 237 Revenue villages in the district. The total number of urban local bodies is 4 (four) comprising of 2 (two) Municipalities and 2 (two) Nagar Panchayats. The 2 Municipalities are Imphal Municipal Council and Jiribam Municipal Council whereas the 2 (two) Nagar Panchayats are Andro Nagar Panchayat and Lamlai Nagar Panchayat.

There are 3 (three) C.D. Blocks in the district namely: - (1) Imphal East-I C.D. Block, Sawombung; (2) Imphal East-II C.D. Block, Keirao Bitra and (3) Jiribam C.D. Block. There is altogether 56 Gram Panchayats in the District.

**Table: 1. Administrative Sub-Divisions of Imphal East district, Manipur**

| **District** | Block | **Area in sq.km.** | **Sub-Division** | **Head Quarters** | **No. Of Villages** |
|---|---|---|---|---|---|
| Imphal East (Porompat is district HQ) | Imphal East-I | | Jiribam | Jiribam | 51 |
| | | | Sawombung<br>Porompat | Sawombung<br>Porompat | 67<br>50 |
| | Imphal East-II | | Keirao Bitra | Keirao Bitra | 36 |
| **Total** | | **709** | | | **204** |

***Source: Directorate of Economics & Statistics, Govt. of Manipur***

The district experienced sub-tropical to temperate climate. The temperature varies from $0^{o}$ to $40^{o}$ C. The area experiences the phenomenon influence of the South West Tropical monsoon. The maximum rainfall of monsoon period occurs between May and August. The total annual rainfall recorded is 1632.4 mm at Imphal. The Average annual rainfall of 16 years (1986 to 2001) of the state is 1473

mm of which 823 mm is monsoon rainfall and 650 mm is non- monsoon rainfall (*Sources IMD station at Imphal Airport).*

Agriculture being the main occupation of the people in the area, it has an important place in the economy of the district. Agriculture sector contributes a major share to the total state domestic product and provides employment to about 63.95% of the total working force in the area. In fact, the domestic product fluctuates depending on the performance of agricultural sector. Despite the crucial importance of this primary sector in the economy of the area, the irregular and erratic behaviour of monsoon accompanied by inadequate irrigation facilities have resulted in severe of fluctuations in agricultural production. Agriculture becomes points of employment and income; agriculture plays a very crucial role in the economy.

The area is in the form of a valley, which is flat, elongated and tapering towards south with isolated hills. It is an intermountain valley surrounded by hillocks about 1,500 - 2,000 m high. The western part of the valley is flanked by abruptly rising hills while by lying rolling hills bound the eastern side. The valley slopes down from north to south from an altitude of 880 to 770 m.a.m.sl.

The drainage pattern is from north to south. Manipur River is the main drainage, which ultimately flows to the south towards Myanmar and falls into Chindwin River. The major tributaries of Manipur river basin flowing in Imphal valley are Imphal, Iril, Nambul, and Sekmai rivers which are originates from the surrounding hills. Sekamai River at Sekmaijin and that falls into the Chindwin river of Myanmar. The other rivers of Manipur river basin either fall directly into or indirectly connect with the Imphal River through these lakes.

The Imphal Valley was formed in an elongated depression formed by the shale, siltstone and sandstone of the Disang Group and the Barail Group of Upper Cretaceous to Eocene age. It follows the tectonic strike of the general N 10 o folding direction of the Indo-Burmese range, and is limited on its western and eastern edges by reverse faults or over thrust. The valley fill of Plio-Quarternary age consists of clay, sand and gravel deposited in a fluvio lacustrine environment.

Ground water is present at various depths in a number of sand and gravel aquifers whose cumulative thickness varies from 15 to 45 m. In fact, there is a great variation in both vertical and lateral Lithology even over small distances. Sand and gravel layers have indefinite and largely undefined boundaries.

The ground water in the shallow aquifers is unconfined and the static water level is 3 to 5 mbgl. Ground water in deep layers is semi-confined to confine with static water level from 7 mbgl to 1.0 magl. The yield of tube wells varies widely from a few $m^3$/day to 50$m^3$/day(source: CGWB data).

Computation of Dynamic Ground Water Resources of Imphal East district has been carried out in the district as per GEC ’97 as on March 2011. **The Administrative district has been considered as the Assessment Unit due to**

**paucity of block –wise data.**

Annual Replenishable Ground Water Resources is 123.25 mcm. Net Annual Ground Water Draft is 0.42 mcm. Projected Demand for Domestic and Industrial Use up to 2025 is 11.63 mcm. Stage of Ground Water Development estimated is 0.36 which is under the 'Safe' category.

## 2.0 Rainfall and Climate

Imphal East district is characterized by low to moderate climate of sub-tropical monsoon type. The summer months are hot and wet while the winter months are cold and dry in the district. The rains of summer are provided by Bay of Bengal branch of Southwest monsoon. The cold and dry weather of the winter season is mainly due to anticyclonic control. The sunshine hours are limited upto 5 hours during rainy season.

The district is dominated by the following types of seasons

(i) The cold season (December, January, February)
(ii) The hot dry season (March, April)
(iii) The rainy season (May, June, July, August, September)
(iv) The Retreating monsoon season (October, November)

## 3.0 Geomorphology and Soil Types

### 3.1 Geomorphic Features and Landforms

The district is flat elongated and tapering towards south with isolated hills. It is an intermountain valley surrounded by hillocks about 1,500 - 2,000 meters high. The western part is flanked by abruptly rising hills while by low-lying rolling hills bound the eastern side. The district show an average trend of slope down from north to south from an altitude of 880 to 770 meters above MSL, which is common to Imphal valley.

### 3.2 Drainage and Morphometric Features

The drainage pattern in the area is from north to south. There are two main river basins viz, the Barak river basin and Manipur river basin. These two main rivers of are perennial. The Barak River originates from the hills of northern hills of Manipur in Senapati district. It flows through the southwestern hill ranges by passing the valley towards Cachar district in Assam. The main tributaries of the river are Jiri, Maku, Irang, Gwai rivers etc. The Manipur River basin is the main river system of Manipur valley and it originates from Sadar hills in Senapati district. The major tributaries of this basin that are flowing in the district are Imphal, Iril, and Thoubal Rivers etc. Manipur River is the main drainage of Manipur valley, which ultimately flows to the south towards

Myanmar and falls into Chindwin River.

### 3.3 Soil

Two major types of soils are found in the district- residual and transported, which cover both the hill and plain. The residual soils are either laterised or non- laterised. The laterised red soils covering an area of 2500 sq.km in the Barak drainage on the western slope of Manipur is also occupying in parts of Jiribam area. It contains rich portion of nitrogen and phosphate, a medium acidity and lesser amount of potash. The old alluvial is brought down by river Barrak basin and Jiri River and their tributaries from their lateritic water ship hills.

The transported soils are of two types – alluvial and organic. The alluvial soils cover 1600 sq.km is also representing the soils of Imphal East district. The soils have general clayey warm texture and grey to pale brown colour. They contain a good proportion of potash and phosphate, a fair quantity of nitrogen and organic matter and are less acidic. The organic soils cover the low lying areas of the valley. With dark grey colour and clayey loam texture, these peaty soils have high acidity, abundance of organic matter, a good amount of nitrogen and phosphorous but are poor in potash.

The soils in the area belong to 4 orders, 8 suborders, 13 great groups and 23 subgroups. It is observed that inceptisols are the dominant soils followed by Utisols, Entisols and Alfisols and occupy 38.4%, 36.4%, and 23.1% of the total geographical area of Manipur, respectively.

Main Soil classification in the valley, i.e. in parts of Imphal East district

:(i) Younger alluvial soil
(ii) Older alluvial soil
(iii) Red gravelly sandy and loamy soil.
(iv) Piety and saline soil.

## 4.0 Ground Water Scenario

### 4.1 Hydrogeology

The district is mostly occupied by Semi consolidated formations which covers almost
the entire area comprises shale, siltstone, sandstone and conglomerate.

These formations belong to Disang, Barail, Surma and Tipam group of rocks. In the western part of the study area unconsolidated alluvium of Quaternary age occurs in the valleys and topographical lows. Ground water is restricted to weathered residium of semi-consolidated rocks and intergranular pore spaces of alluvial deposits.

## AQUIFERS

Aquifer thickness ranges from 10 to 20 mbgl. The transmissivity and hydraulic conductivity ranges between 4.30 and 89 $m^2$/day and 0.67 to 16 m/day. The discharge of tube wells established is about 10-30 $m^3/hr$ at 10-15 m drawdown. In fact there is great variation in both vertical and lateral lithology, even over small distances. Sand and gravel layers have indefinite and largely undefined boundaries.

## OCCURRENCE

Ground water is found to occur under water table conditions in the shallow dug well horizons with depth to water table is found upto 22.35m below ground level during pre-monsoon period and it is upto 11.92 mbgl during post-monsoon period. Deeper depth to water level is observed in the northern foothill parts of the area.

Ground water in deeper layers is found to occur under semi confined to confined conditions. The piezometric head is generally found to lie between 20 mbgl to some extent upto ground level. The deepest piezometric head is found in the northeastern fringe of the district particularly in and around Yaingangpokpi of Imphal East district. The water level fluctuation is found to be high (i.e. about 12m). The high fluctuation is because of clayey and silty nature of the aquifer.

## GROUND WATER MOVEMENT

The ground water movement is essentially towards the central lower part from the peripheral higher elevation of the valley and finally results to the north to south hydrologic gradient during pre-monsoon and north to south west south (SWS) region during post-monsoon period in the study area. And the nature is radial from peripheral higher elevations to the lower levels of the central part of the valley. Since there are variations in the lithology and texture of the underlying formations there are great variations in the hydraulic gradient also in the study area especially in between Disang and Barail parts of the valley. The hydraulic gradient in the southwestern fringe area is 12 m/km while it is 3.6 m/km in the eastern fringe. The hydraulic gradient in the southern part is 4.4 m/km (along Iril River).

## YIELD POTENTIAL OF AQUIFERS

The fluvial depositional system in the Imphal valley has been of a complex nature in an otherwise gradual sinking lake in an episodic step like manner. Depending upon the degree of differential weathering between hilltops and valley floors, depression was formed and sediments were deposited, as channels and meander belts etc. The alluvial deposits in the valley plain occur down to 40 to 100 m depth below which consolidated Tertiary sediments are encountered.

The discharge ranges from 19.00 $m^3$/hr to 11o.oo $m^3$/hr in the study area. The highest discharge recorded is 110 $m^3$/hr by giving transmissivity 5.3 $m^2/s^3$ with a drawdown of 11m. And, the lowest recorded is with a yield of 19.00 $m^3$/hrs with a transmissivity of 0.1$m^2/s^3$. Transmissivity value of well ranges from 0.1 $m^2/s^3$ to 48 $m^2/s^3$ in the district.

Table 2: Summarised Hydrogeological data of EW of CGWB in Imphal East district

| Well Location | Depth of construction (m) | Aquifer ZoneTapped (m) | SWL (mbgl) | Discharge (LPM) | Draw Down (m) | Transmissivity ($m^2$/day) |
|---|---|---|---|---|---|---|
| Sangaiprou | 50 from 91.50 | 11.00 | 0.50 magl | 2.00 | 17.86 | 5.3 |
| Pangei | 40 from 43 | 12.00 | 2.1 | 24 | 4.33 | 17 |

*(N.B. The above wells are abandoned)*

## 4.2 Ground Water regime and depth to Water Analysis

District Ground Water Development and Management Studies (RHS) or Reappraisal Hydrogeological Studies were carried out in the 2,238 sq.km of Manipur Valley (Normal) i.e. Imphal East, Imphal West, Thoubal, Bishnupur districts and parts of Churachandpur districts with 712 sq.km (Tribal) of Manipur State, in order to appraise and assess the status of ground water regime during the AAP 2004-2005. The following well informations and water level data of 14 monitoring stations were incorporated by the study in area for the computation of depth to water level and water table of Imphal East district.

Depth to water level recorded during DGWM studies in the district ranges from 1.08 to 10.32 mbgl for pre-monsoon (2004) and it varies from 0.01 magl to 6.2 mbgl during post-monsoon (2004) period in the area. It is observed that the annual water level fluctuation in November 2004 with respect to April 2004 ranges from 1.83 to 7.35.

Table.3- Depth to Water level and Water table data for the District Ground Water Management Studies (DGWMS) well stations in Imphal East district, Manipur

| Location | Well Type | MSL (m) | Drill Depth (m) | MP (m,agl) | DTW Apr' 04 (mbgl) | Water table Apr'0 | DTW Nov' 04 | Water table Nov'04 | Aquifer Parameter | Basin |
|---|---|---|---|---|---|---|---|---|---|---|
| Thongju | TW | 782.614 | 94.00 | 0.49 | 2.54 | 780.074 | 3.30 | 779.314 | Sand ,medium | MAN - IPUR BASIN |
| Kambongpu | TW | 805.084 | 55.00 | 0.55 | 5.35 | 799.734 | 2.78 | 802.304 | Sand, coarse | |
| IPD-I, PHE | TW | 788.737 | 33.00 | 0.58 | 8.35 | 780.387 | 1.0 | 787.737 | Sand & Gravel | |
| Ningthou- | TW | 787.095 | 46.00 | 0.48 | 10.32 | 776.775 | 6.2 | 780.895 | Sand + gravel | |
| Kharasom | TW | 790.477 | 30.00 | 0.51 | 1.3 | 789.177 | -0.10 | 790.577 | Gravel + sand | |
| Itam Nungoi | TW | 794.122 | 64.00 | 0.38 | 2.25 | 791.872 | 2.2 | 791.922 | Coarse sand | |
| Keikol -I | TW | 795.738 | 31.00 | 0.43 | 3.87 | 791.868 | 3.00 | 792.738 | Gravel | |
| Tendongyan | TW | 807.033 | 23.00 | 0.35 | 5.33 | 801.703 | 4.25 | 802.783 | Gravel | |
| Keikol - II | TW | 796.528 | 27.50 | 0.69 | 6.26 | 790.268 | 4.7 | 791.828 | Grav, Sandy | |
| Keikol -III | STW | 797.757 | 20.67 | 0.51 | 5.32 | 792.437 | 4.9 | 792.857 | Sandy gravel | |
| Khonghamp | TW | 796.713 | 28.34 | 0.57 | 1.86 | 794.853 | -0.01 | 796.723 | Sand, gravel | |
| Maibakhun | TW | 793.036 | 33.00 | 0.54 | 2.67 | 790.366 | 1.0 | 792.036 | Sand, medium | |
| Pangei | TW | 797.217 | | 0.26 | 2.17 | 795.047 | 4.0 | 793.217 | Sand + gravel | |
| Keikol | TW | 797.00 | | 0.72 | 1.08 | 795.92 | 2.2 | 794.80 | Gravel, sandy | |

Long term fluctuation analysis have been attempted with the water level data of the permanent hydrograph stations at Jiribam GWM station to the western border of Assam for the period of 10 years from 1997 to 2006 which shows that no major change is observed in the water level over the period.

Water level analyses of GWM station at Jiribam is shown separately as permanent data of hydrograph station of Imphal East in the border area towards the western sector Assam State, since no regular water level monitoring works is carried out in the valley area of main Imphal city.

### 4.3 Water Level trend analysis:

The NHNS monitored data for the year 1998 period is compared with the year 2007 data in respect of pre-monsoon and post monsoon periods respectively at 2 NHNS locations in the Imphal valley area of the district.

## 4.4 Ground Water Resources

The district possesses moderate potentiality for ground water development. Computation of Dynamic Ground Water Resources of Imphal East district has been carried out in the district as per GEC '97 as on March 2009. **The Administrative district**

**has been considered as the Assessment Unit due to paucity of block –wise data.**

Computation of Dynamic Ground Water Resources has been carried out in the district as per GEC '97 as on March 2009. Annual Replenishable Ground Water Resources is 128.70 mcm. Net Annual Ground Water Draft is 0.42 mcm. Projected Demand for Domestic and Industrial Use up to 2025 is 11.64 mcm. Stage of Ground Water Development estimated is 0.36 which is under the 'Safe' category.

## 4.5 Ground Water Quality

The quality of water is measure of its chemical, physical, microbiological and radiological properties with respect to its purposed use. The chemical quality of ground water in Imphal East district showed high concentration iron (Fe). The concentration of iron ranges from 0.66 to 16.52 mg/l in the area. Majority of the iron concentration in the ground water of the district is found to be greater than 1.2 mg/l, which is greater than the prescribe limits of BIS and WHO.

Keeping in view this updated picture of chemical quality scenario of ground water in the district, it is advisable to test the potability of ground water before using it for drinking and cooking purpose. A long term environmental planning is also essential to blunt the danger from such pollution problems. The status of chemical quality of ground water regime and its utilized formulation for future ground water development programme and drinking water management strategy must assume a greater significance.

General chemical quality analysis of ground water samples were carried out by Standard Quantitative Methods and Advanced Instrumental analysis Techniques. Physical parameters, such as pH, EC, TDS and temperature were determined at the time of sample collection in the field itself. The general hydrochemical behavior of contaminats and water quality standards were properly followed in the determination of chemical quality data of ground water sample in the area. It is not possible to consider all of them at a time. Some of the more important contaminants of ground water, which have direct bearing on human health and environment, are highlighted for the purpose of study

In order to study the quality of ground water suitable for domestic, irrigation and industrial purpose, ground water samples were collected from dug wells, deep tube wells and hand pumps during the District Ground water Management Study period of 2004-05 in Imphal valley. The water samples are analysed in the Chemical laboratory of CGWB, NER, Guwahati. Detailed analyses report is discussed separately for shallow and deeper aquifers for the water samples collected during the said period in order compared the changes in the chemical quality.

### 4.5.1 Water Quality of Shallow Aquifer

Ground water in the shallow aquifers of the study area ranges within the permissible limits of BIS and WHO for both domestic uses and agricultural practices.

### 4.5.2 Water Quality for Deeper Aquifers

Deeper aquifer data are few in the study area except some tube wells of IPD wing, PHED, Govt. of Manipur. Water quality is within the prescribed limits.

### 4.5.3 Comparison of Ground Water Quality W.r.t. previous Study

The chemical quality in the area for the last two decades showed normal for domestic and drinking proposes except the higher concentration of sodium (Na) and chloride (Cl) in some pockects of Thoubal district. In recent study during the DGWMS/Reappraisal studies in Imphal valley there have been found concentration of iron (Fe) and arsenic (As) more than prescribed limits of BIS.

## 4.6 Status of Ground Water Development

### 4.6.1 Present Ground Water Development

Ground water is used for drinking and irrigation purpose only in the district. As there is no major industry in this district, ground water utilization for the same may be considered as negligible. Development of ground water in Imphal East district is discussed below

Exploitation of ground water for water supply of Imphal began in June 1996 in the Potsangbam well filed. The well field comprises ten production boreholes (total depth comprised between 45 m and 60 m, unit discharge of borehole ranges from 1,087 to 1,512 l/m.)

Table 4 Water Supply Situation of Imphal East district w.r.t Imphal City supply, Manipur

| Sources of Water | Production (in MLD) [1 MLD = 1000 $m^3$/day] |
|---|---|
| Surface Water | 64.20 |
| Ground Water | 7.80 |
| Total | 72.00 |
| *Water Demand* | *98.00* |
| *Deficit in Water Supply* | *26.00* |

*(Investigation and Planning Division, PHED, Govt of Manipur*

**i) Urban Water Supply Schemes:**

The Water demand of Imphal City and its Suburbs by the end of 2002 has been assessed at 109.00 MLD. The total installed capacity of the treatment plants for Imphal Water Supply at the beginning of the Ninth Plan (12997-98) was 59.02 MLD (against water demand of 79.45 MLD). The present water requirement is 100 MLD and the requirement by the end of 2011 is expected to be 140 MLD. The installed capacity of the existing to treatment plants is 83.03

MLD as on 1st April 2002. The Department has formulated a project report for augmentation of water supply for Imphal city Phase- I (capacity 29.50 MLD) to bridge the present gap of 17 MLD and also future gap between the ever increasing

demand and Supply

**ii) Rural Water Supply:**

Rural Water Supply facilities are provided to the people in rural areas under centrally sponsored Minimum Need Programme (MNP) and Accelerated Rural Water Supply Programme (ARWSP). During the ninth plan the rate of the target was to cover 593 habitations against which there is a shortfall of 43 inhabitants. By the end of 31st March 2001, 2461 habitations were fully provided with drinking water facilities. The rural population of the district covers under this scheme.

### 4.6.2 G r o u n d Water for Irrigation

Ground water irrigation is practiced in the valley under Minor Irrigation department. The importance of minor irrigation is high due to the existence of numerous small valleys in the study area. The main activities that carried out by Minor Irrigation. are construction of field elements, field drains, land leveling etc and conducting adaptive trials, training of farmers in irrigation, water management, enforcement warabandi for suitable distribution of irrigation water to the farmers field etc.

## 5.0 Ground Water Management Strategy

### 5.1 Ground Water Development

Based on the hydrogeological conditions, occurrence of potential aquifer horizons and their yield potential, prospects for ground water development in the study area are mainly confined to the valley only. The eastern and northern region are feasible for the development of ground water through shallow to moderately deep tube wells down to 75 m tapping about 10 to 30 m of cumulative thickness of granular horizon capable of yielding 20 to 40 $m^3$/hr for drawdown upto 12 m.

Owing to encounterance of boulder at shallow depth of 20 to 30 m in the northern part of the study area (in and around Sekmai area) tube wells may be limited to 25 to 30 m only, tapping 5 to10 m of the saturated horizons.

In the central part of the Imphal valley fine-grained granular horizons of cumulative thickness of 10 to 20 m are encountered up to 100 m. The area is suitable for the construction of tube wells for domestic supplies. In the eastern and southern part of the main central Imphal valley tube wells of moderate depth are considered to be feasible with discharges of 20 to 50 $m^3$/hr.

Ground water development prospects in the state exist in the valley areas where ring wells and shallow tube wells are the feasible structures. Apart from this, ground water sources in Manipur can be augmented through spring development.

### 5.2 Water Conservation and Artificial recharge

Method of making ground water abstraction structure, type, design, depth of wells, number and spacing between two wells depends on size of aquifer material, depth

range & hydraulic parameters of aquifer zones, which differ from place to place. Individual and community pond with the practice of roof top rain water harvesting *(old age method)* are also very common in the area for water conservation through artificial recharge. As per earlier reports and present study, following design criteria is recommended.

### 5.2.1 S h a l l o w Domestic Wells

Open wells and filter point wells are feasible in all area of the district. In unconsolidated sediments ring well may be constructed by excavating down to the saturated horizon. Cement or earthen rings from 0.60 to 0.90 placed one above another with weep holes in the bottom rings are likely to hold sufficient quantity of water. Depth may be range from 4 to 12 m depending upon the topographic elevation. Expected discharge will be 0.5 to 2.0 cubic meters per day.

Filter Point Wells with a total depth of 8 to 14 mbgl by providing galvanized iron or mild steel pipe and at bottom slotted pipe against aquifer zone either made from bamboo or MS pipe or P.V.C pipe are suitable. Bamboo as pipe and screen are very much within the reach of small and marginal farmers, as bamboo is locally available in the district. This type of well will be low cost and long lasting. Expected discharge will be 3 to 5 cubic meters per day.

### 5.2.2 Tube Well for Irrigation Purpose

Deep tube wells are feasible in most of the valley parts of the district. These tube wells are expected to tap the granular zones occurring beyond 20 mbgl. Diameter of casing pipe, when used as housing pipe, need to be decided base on the anticipated discharge. Housing pipe should be large enough to accommodate the pump. Based on the static water level, maximum draw down and seasonal fluctuation length of housing pipe should be range from 20 to 35 mbgl along foothill region and 20 to 30 mbgl towards central and south-eastern part. For avoiding corrosion and clogging of well screen, the entrance velocity should be less than 2 cm/sec.

## 6.0 Ground Water Related issues and problems

Prior to 1991 the chemical quality of ground water in Manipur Valley showed suitable for drinking and domestic purposes. But recent studies of ground water in parts of Imphal Valley shows concentration of some chemical quality like iron (Fe) and arsenic (As) more than the prescribed limits of drinking water. A close monitoring of affected area is also essential to restrict further spreading of quality affected ground water to such rural dominated poor state

Safe drinking water supply and human health and efficiency in Manipur for rural sector have remained as primitive as ever. A close monitoring of affected area is also essential to restrict further spreading of quality affected ground water to such rural dominated poor state.

## 7.0 Awareness and Training activity

### 7.1 Mass Awareness Programme and Water Management Programme by CGWB.

No such programme and activity is carried out in the district till date.

### 7.2 Participation in Exhibition, Mela, Fair etc.

Till date no such Exhibition, Mela, Fair etc were organized and participation by CGWB does not arise.

### 7.3 Presentation and Lecture delivered in Public forum/radio/T.V/Institution of repute/Grassroots associations/NGO/Academic institutions etc.

Till date CGWB is not involved in such programme in the district

## 8.0 Areas Notified by CGWA/SGWA

Nil.

## 9.0 Recommendations

Ground water is important in the rural areas for irrigation and domestic supply. Ground water is derived from varying depths but from a shallow (less than 25 m) aquifers and a deeper aquifer (30 - 120 m). With rapid urbanisation, population and industrial growth, problems related to ground water pollution needs immediate remedial measures. Regulations on withdrawal and enhancing the recharge through artificial means are the options left to keep a control on this problem.

Existing hydrogeological set up and availability of huge ground water resource indicate that there is some few scope for the development of ground water by way of constructing ground water abstraction structures in a planned way for profitable ground water development. In future ground water in the area can also be developed by means of tube wells or filter point wells and dug cum tube wells.

Proper rehabilitation of these sick wells in the entire area is to be carried out so as to mitigate water scarcity as reported from different village. A long-term environmental planning is also essential to blunt the danger from such pollution. The status of chemical quality of ground water regime and its utilised formulation for future ground water development programme and drinking water management strategy must assume a greater significance.

Water qualities as well as quantity are major concerns of the state. Biological contamination of drinking water supply combined with scanty quantity has been a major cause of most of the ill health. Because of the shortage of safe drinking water many people use the available surface water for drinking and domestic purposes from any source. The people illegally break the water pipe and tap inviting another problem of the hazard.

The development of infrastructures can not cope with the faster rate of population. Reckless disposal of human and animal wastes contributes to surface water pollution leading to the spread of water borne diseases.

Urbanisation is on the rise. While over-congestation is on the rise, drainage system remains fairly outdated and is unorganized. During rainy season most of the latrines both sanitary and non sanitary are over flooded contaminating the drinking water with biological agents. Because of shortage of safe drinking water there is also a number of unauthorized and unhygienic taping from pipes contributing to health hazards.

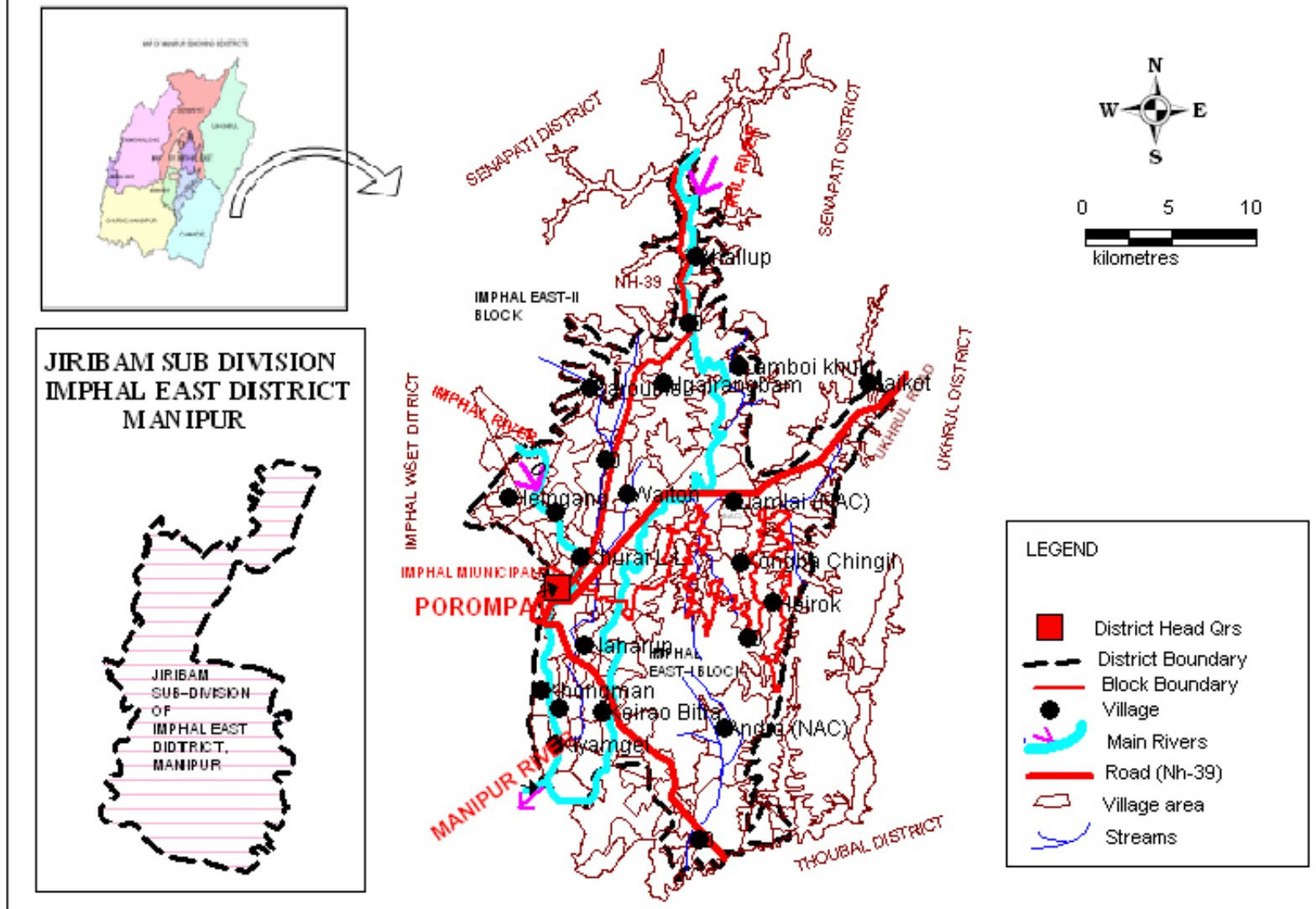



FIG.1. MAP SHOWING ADMINISTRATIVE SET UP OF IMPHAL EAST DISTRICT, MANIPUR

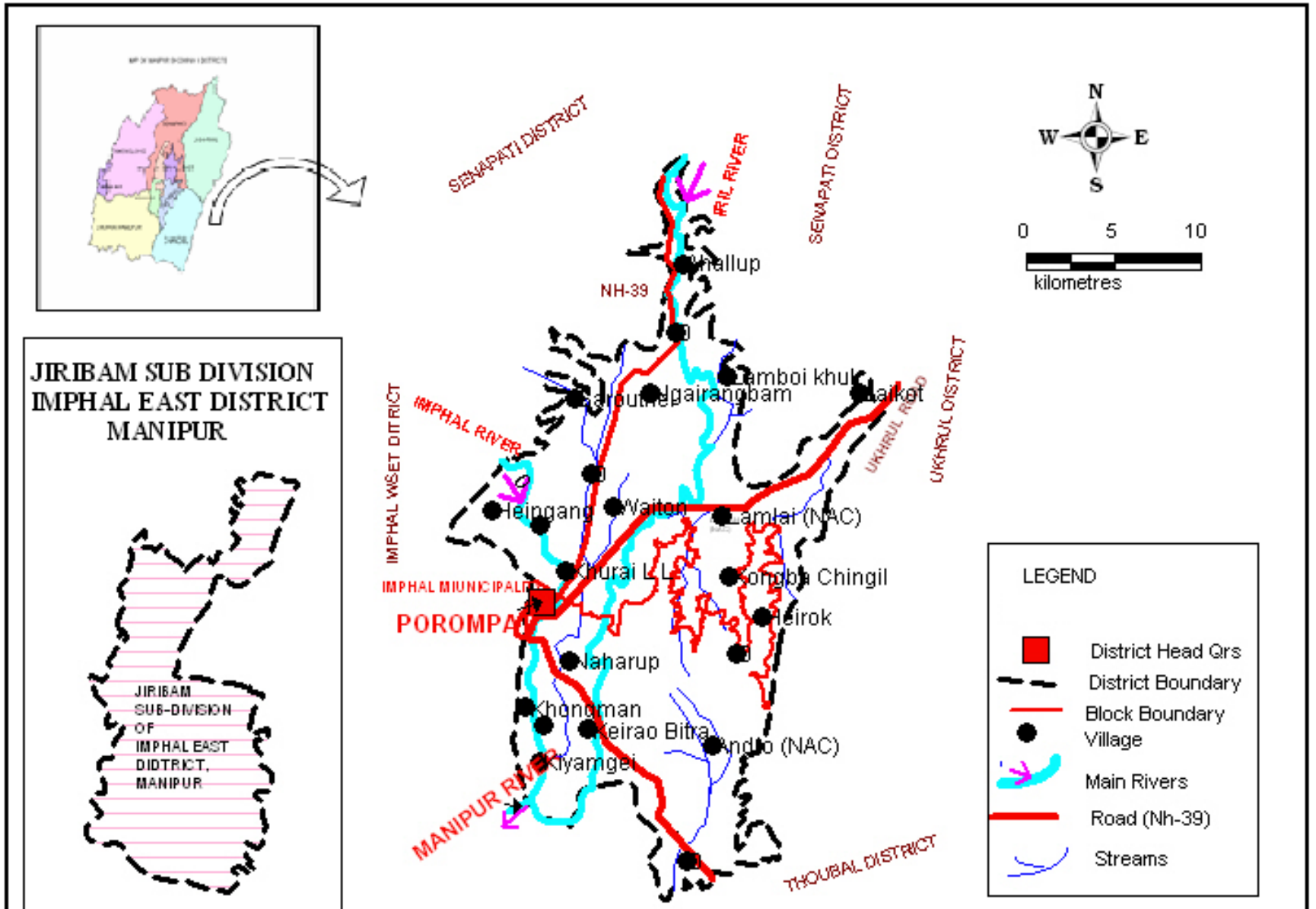



FIG.1 ▲ MAP SHOWING ADMINISTRATIVE SET UP OF IMPHAL EAST DISTRICT, MANIPUR

FIG.2 MAP SHOWING HYDROGEOLOGICAL SETUP OF IMPHAL EAST DISTRICT,MANIPUR

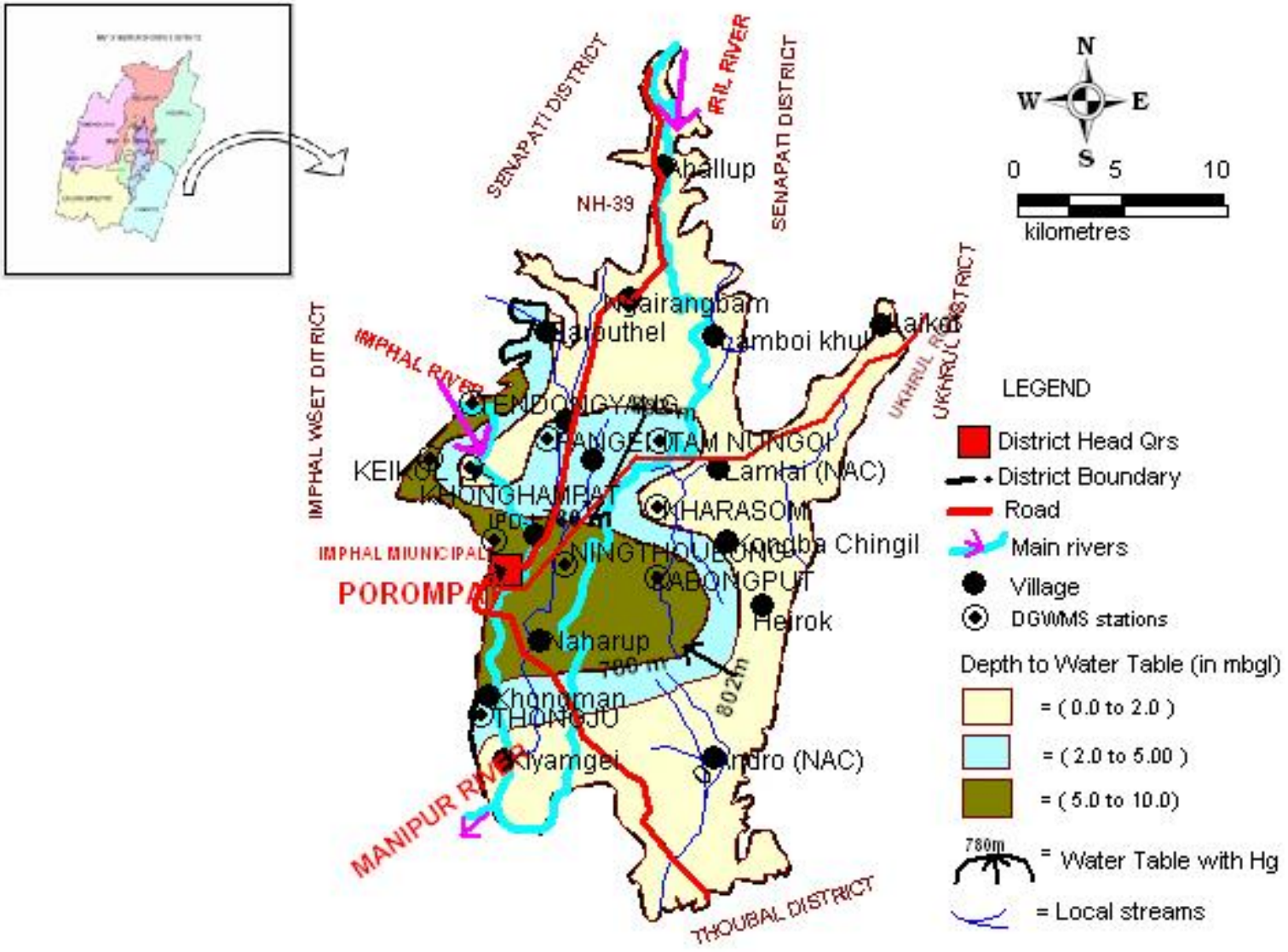


FIG.3a. PRE-MONSOON DEPTH WATER TABLE MAP FOR DGWMS WELSS IN IMPHAL EAST DITRICT,MANIPUR

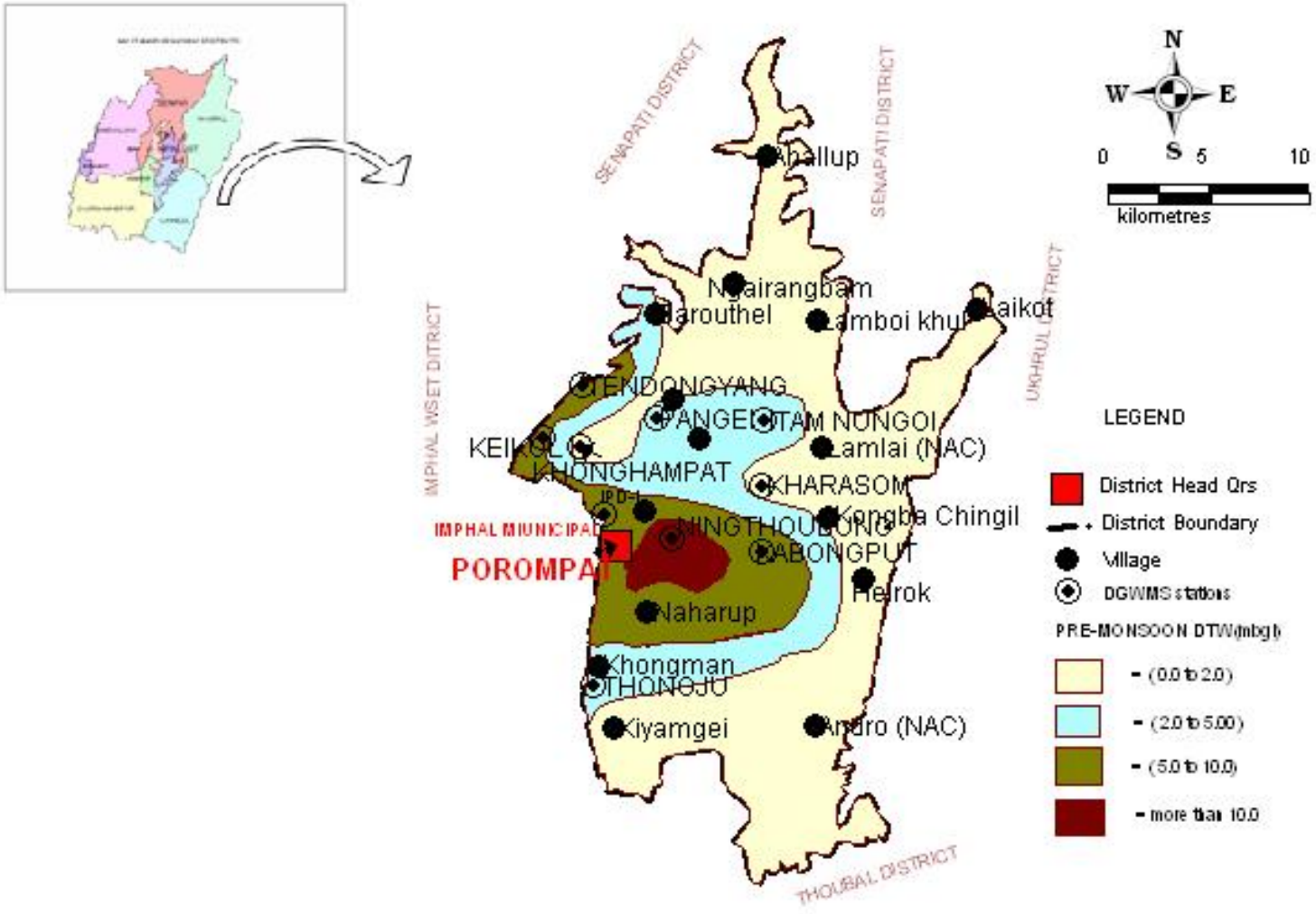
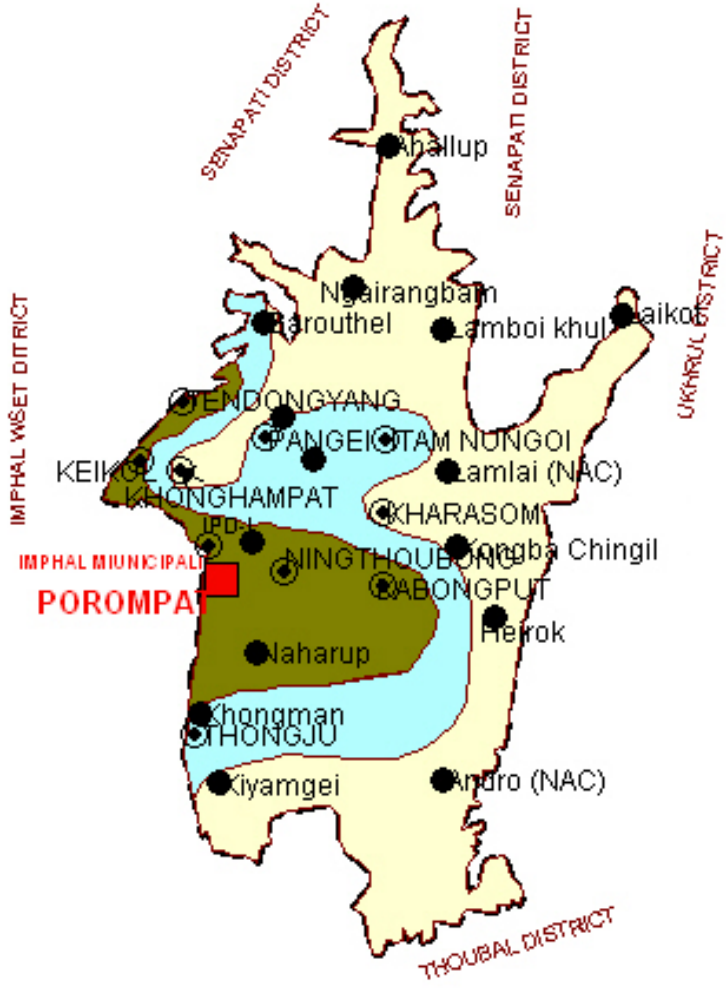
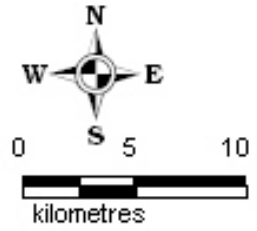


FIG.3b. POST-MONSOON DPETH TO WATER TABLE MAP FOR DGWMS WELLS IN IMPHAL EAST DISTRICT, MANIPUR




LEGEND

- District Head Qrs
- District Boundary
- Village
- DGWMS stations

POST-MONSOON DTW(mbgl)

- = ( 0.0 to 2.0 )
- = ( 2.0 to 5.00 )
- = ( 5.0 to 10.0)

FIG.4.MAP SHOWING IRON CONCENTRATION IN GROUND WATER OF IMPHAL EAST DISTRICT,MANIPUR