1792/DBR/2013

# भारत सरकार

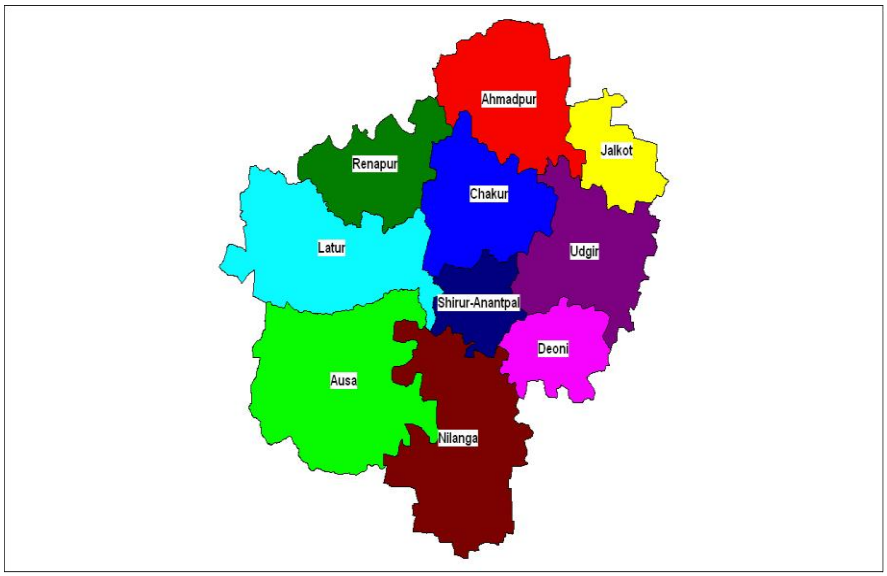
# जल संसाधन मंत्रालय

# केंद्रीय भूजल बोर्ड

**GOVERNMENT OF INDIA**
**MINISTRY OF WATER RESOURCES**
**CENTRAL GROUND WATER BOARD**

# महाराष्ट्र राज्य के अंतर्गत लातुर जिले की भूजल विज्ञान जानकारी

**GROUND WATER INFORMATION**
**LATUR DISTRICT, MAHARASHTRA**




By

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*मध्य क्षेत्र, नागपुर*
**CENTRAL REGION**
**NAGPUR**
**2013**

# LATUR DISTRICT AT A GLANCE

**1. GENERAL INFORMATION**

| | | |
|---|---|---|
| Geographical Area | : | 7157 sq. km. |
| Administrative Divisions (As on 31/03/2013) | : | 10 talukas; Latur, Ahmedpur, Udgir, Nilanga, Ausa, Renapur, Chakur, Shirur-Anantpal, Deoni and Jalkot. |
| Villages | : | 945 |
| Population (2011) | : | 24,55,543 |
| Normal Annual Rainfall | : | 650 mm to 800 mm |

**2. GEOMORPHOLOGY**

| | | |
|---|---|---|
| Major Physiographic unit | : | One; Balaghat Plateau |
| Major Drainage | : | One; Manjra |

**3. LAND USE** (2000-01)

| | | |
|---|---|---|
| Forest | : | 35 sq. km. |
| Cultivable Area | : | 6423 sq. km. |
| Net Area Sown | : | 5610 sq. km. |

**4. SOIL TYPE**

Three; Light and medium soil of inferior type (eastern part), deep black soil (western part) and Lateritic type (in parts of Nilanga taluka)

**5. PRINCIPAL CROPS** (1999-2000)

| | | |
|---|---|---|
| Jowar | : | 1370 sq. km. |
| Sugarcane | : | 290 sq. km. |
| Wheat | : | 97 sq. km. |
| Pulses | : | 40 sq. km. |
| Oil Seeds | : | 30 sq. km. |

**6. IRRIGATION BY DIFFERENT SOURCES** (2006-2007)

**Nos./Potential Created (ha)**

| | | |
|---|---|---|
| Dugwells | : | 38253/84272 |
| Tubewells | : | 15531/32048 |
| Tanks | : | 1025/2139 |
| Other Minor Surface Sources | : | 6794/14341 |
| Net Irrigated Area | : | 130635 ha |

**7. GROUND WATER MONITORING WELLS** (As on 31/03/2012)

| | | |
|---|---|---|
| Dug wells | : | 28 |
| Piezometers | : | 11 |

**8. GEOLOGY**

| | | |
|---|---|---|
| Recent | : | Alluvium |
| Upper Cretaceous-Lower Eocene | : | Deccan Trap Basalt |

**9. HYDROGEOLOGY**

| | | |
|---|---|---|
| Water Bearing Formation | : | Basalt- Weathered/fractured/ jointed, vesicular/massive, under. phreatic and semi-confined to confined conditions |
| Pre-monsoon Depth to Water Level (May-2011) | : | 1.85 to 30.40 m bgl |
| Post-monsoon Depth to Water Level (Nov.-2011) | : | 1.05 to 50.00 m bgl |
| Pre-monsoon Water Level Trend (2001-2010) | : | Rise: Negligible 0.08 – 0.79 m/year<br>Fall: 0.03 – 2.48 m/year |
| Post-monsoon Water Level Trend (2001-2010) | : | Rise: 0.06-1.29 m/year<br>Fall: 0.04 to 0.27 m/year |

**10. GROUND WATER EXPLORATION** (As on 31/03/2012)

| | | |
|---|---|---|
| Wells Drilled | : | EW-35, OW-13, PZ-14 |
| Depth Range | : | 29.00 to 203.00 m bgl |
| Discharge | : | Traces to 12.24 lps |
| Transmissivity | : | 6.15 to 83.53 $m^2$/day |
| Storativity | : | $8.68 \times 10^{-3}$ to $4.7 \times 10^{-4}$ |

**11. GROUND WATER QUALITY**

Good and suitable for drinking and irrigation purpose, however localized nitrate and total hardness contamination is observed.

| | | |
|---|---|---|
| Type of Water | : | Ca-$HCO_3$ in majority of samples |

**12. DYNAMIC GROUND WATER RESOURCES-** (As on 31/03/2009)

| | | |
|---|---|---|
| Net Annual Ground Water Availability | : | 119520 ha.m |
| Annual Ground Water Draft (Irrigation + Domestic) | : | 93702 ha.m |
| Allocation for Domestic and Industrial requirement up to next 25 years | : | 3801 ha.m |
| Stage of Ground Water Development | : | 78 % |

**13. GROUND WATER CONTROL & REGULATION**

| | | |
|---|---|---|
| Over-Exploited Taluka | : | None |
| Critical Taluka | : | None |
| Semi-Critical | : | 1 - Latur |
| Notified Taluka | : | None |

**16. MAJOR GROUND WATER PROBLEMS AND ISSUES**

The entire district comes under "drought area". In major parts of the district, falling/declining water level trends have been observed in almost entire Nilanga, Ausa, Latur and Renapur talukas and northern part of Ahmadpur and southern part of Udgir taluka. These areas also coincide with deeper premonsoon water levels in the range of 10 to 20 m bgl. The taluka categorised as "Semi-Critical" viz., Latur as well as Ausa, Nilanga, Chakur and Renapur, talukas where the stage of ground water development has already reached about 70% or more also coincide with the deeper water level and declining trend areas. Ground water quality is adversely affected by nitrate contamination.

# Ground Water Information
# Latur District

## Contents



## List of Figures



## List of Tables

# Ground Water Information
# Latur District

## 1.0 Introduction

Latur is one of the drought districts of Marathwada Region of Maharashtra State. It suddenly became famous after it was worst hit by an earthquake on 30/09/1993 at 0355 hrs with an intensity of 6.0-6.5 on Rictcher's scale, causing an enormous damage to the area in the loss of human life, livestock standing crops and property. It is situated in the south-eastern part of the State borderring Maharashtra and Karnataka States. It lies between north latitudes 17°55'00'' and 18°50'00'' and east longitude 76°15'00'' and 77°15'00'' and falls in parts of Survey of India degree sheets 56 B, 56 C and 56 F. The district has a geographical area of 7157 sq. km. out of which only 35 sq.km. is covered by forest, whereas cultivable area is 6423 sq. km. and net sown area is 5610 sq. km. The district forms part of Godavari basin. Manjra River is the main river flowing through the district.

The district headquarters is located at Latur town. For administrative convenience, the district is divided in 10 talukas viz, Latur, Ahmedpur, Udgir, Nilanga, Ausa, Renapur, Chakur, Shirur-Anantpal, Deoni and Jalkot. It has a population of 24,55,543 as per 2001 census. The district has 5 Nagar Parishads, 10 Panchayat Samitis and 786 Gram Panchayats.

Central Ground Water Board has taken up several studies like Systematic Hydrogeological Surveys (SHS) and Reappraisal Hydrogeological Studies (RHS) in the district. A list of studies conducted in the district is presented in Table-1.

**Table 1: Studies undertaken by CGWB.**

| S. No. | Officer S/Shri | AAP | Type of Survey/Study | Area Covered in the district |
|---|---|---|---|---|
| 1. | Verma, S.K. | 1985-86 | SHS | Toposheet No. 56-C/10 |
| 2. | Singh, R. P. | 1985-86 | SHS | Toposheet No. 56-B/7, 56-B/11 and 56-B/15 |
| 3. | Anand, AVVS | 1989-90 | SHS | 56-B/6 and 56-B/10 |
| 4. | Marwaha, S. | 1989-90 | SHS | 56-B/13 and 56-B/14 |
| 5. | Jain, S.K. and Marwah, S. | 1993-94 | Hydrogeological Investigation | Earthquake affected areas of Latur and Osmanabad districts |
| 6. | Ramaiah, S.N. | 1994-95 | RHS | Watersheds- MR 13, MR 26, MR 27, MR 31A, MR 32A, MR 33, MR 37, MR 38, MR 39, MR 40, MR 41, MR 46B, MR 47, MR 48, MR 51, MR 53, MR 54, MR 55, MR 56, GV 56B &GV 97B. |
| 7. | Venkateswaran, D. | 1995-96 | RHS | Watersheds- MR 15, MR 16, MR 20, MR 21, 28, 29, MR 34, MR 35, MR 42, MR 43, MR 44 & MR 45. |

In addition to the above, a report on "Ground Water Resources and Development Potential of Latur District, Maharashtra" was issued during year 1998.

Ground water exploration in the district was undertaken during 1994 to 2001 in phases. Since 1994, 35 Exploratory Wells (EW), 13 Observation Wells (OW) and 14 Piezometers (PZ) were drilled at 49 sites (35 EW sites and 14 PZ sites). Pumping tests, to determine aquifer parameters, were also conducted at 10 sites. The taluka wise salient features of ground water exploration are given in Table-2. A map of the district showing the taluka boundaries, taluka headquarters, physical features and location of Piezometers and monitoring wells is presented as **Figure-1**.

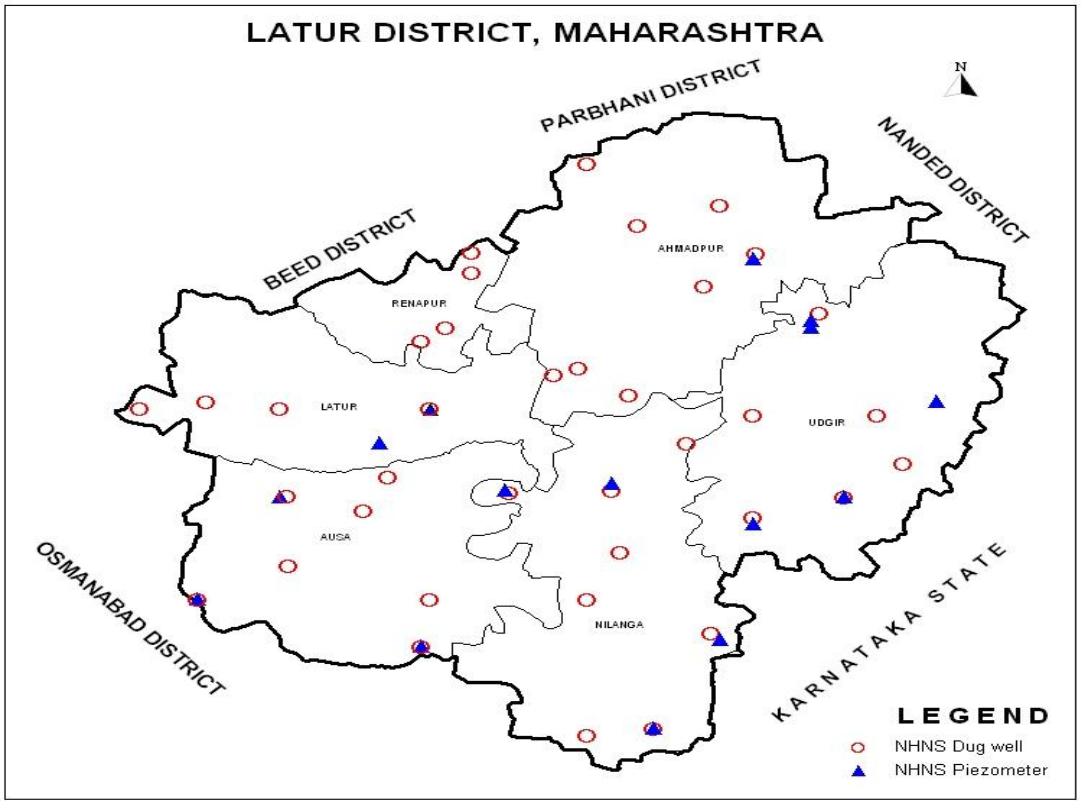


**Figure-1: Location.**

The perusal of Table-2 indicates that the depth of the wells varies from 29.00 to 203.00 metres below ground level (m bgl), while the depth of casing varies from 2.20 m bgl (Hanegaon) to 63.80 m bgl (Killar wadi) and both the EW are located in Ausa taluka.

**Table 2: Salient Features of Ground Water Exploration.**

| S. No. | Taluka | Wells | | | Depth (mbgl) | Casing (m bgl) | SWL (m bgl) | Dis-charge (lps) | Zones (m bgl) |
|---|---|---|---|---|---|---|---|---|---|
| | | EW | OW | PZ | | | | | |
| 1. | Udgir | 7 | 3 | 5 | 30.00-195.20 | 4.80-11.70 | 12.55-66.30 | 1.37-12.24 | 5.60-165.00 |
| 2. | Chakur | 3 | 2 | - | 81.00-202.00 | 7.40-18.40 | 5.23-80.10 | 1.37-12.18 | 7.00-193.00 |
| 3. | Ahmadpur | 5 | 3 | 1 | 29.00-201.00 | 3.00-14.50 | 1.48-55.80 | 1.37-7.76 | 9.00-193.00 |
| 4. | Latur | 5 | 2 | 1 | 172.00-202.00 | 5.62-19.60 | 5.36-53.05 | 1.05-5.94 | 6.10-181.50 |
| 5. | Renapur | 2 | 1 | - | 142.00-200.00 | 6.10-14.50 | 10.90-24.30 | 1.05-4.43 | 19.90-142.00 |
| 6. | Ausa | 11 | 1 | 3 | 30.00-203.00 | 6.00-63.80 | 1.85-100.00 | Traces - 5.15 | 6.00-193.70 |
| 7. | Nilanga | 2 | 1 | 4 | 30.00-172.40 | 5.40-5.70 | 9.20-35.42 | 2.16-3.17 | 11.00-145.00 |
| **8.** | **Total** | **35** | **13** | **14** | **29.00 - 203.00** | **2.20 - 63.80** | **1.48 - 100.00** | **Traces - 12.24** | **5.60 - 193.70** |

The discharge of the wells varies between traces and 12.24 litres per second (lps). Some of wells in the district are dry, whereas the highest yielding EW was located at Wadona (Bk) with discharge of 12.24 lps. Out of 35 exploratory wells drilled in the district, 13 exploratory wells (about 40%) are high yielding with discharge of more than 3 lps. The depth to water level varies from 1.48 m bgl (Kajal Hipparpa) to 100.00 m bgl (Belkund). The depth to water levels was found even more than 50.00 m bgl at Talni, Lohara, Latur road, Shirur Tajband, Kingaon, Chinchalirao Wadi, Belkund and Ausa exploratory wells. The aquifer zones were encountered in the depth range of 5.60 m bgl (Deoni) to 193.70 m bgl (Ausa), thus indicating the presence of water bearing zones even at deeper depths beyond 100 m bgl.

## 2.0 Climate and Rainfall

There is no meteorological observatory located in the district. The nearby meteorological observatory has been taken as representative for the district. The winter season commences by the end of November when night temperature decreases rapidly. December is generally the coldest month with the mean daily maximum temperature at 29.5°C and the mean daily minimum temperature at about 15°C. On some occasions the minimum temperature drops down to 4 or 5°C due to western disturbances. May is generally the hottest month with temperature at 40°C and mean daily minimum temperature 27 °C. In

summer the humidity is less than 25%.

The normal annual rainfall over the district varies from 650 to 800mm and it increases from southwest to northeast. It is minimum in the southern part of the district around Nilanga and increases towards north east and reaches a maximum around Udgir. The average annual rainfall for 2008-2011is about 761 mm and same is presented in Table–3.

**Table 3: Annual Rainfall (2008-2011).**

| | 2008 | 2009 | 2010 | 2011 | **AVERAGE** |
|---|---|---|---|---|---|
| | **Rain (in mm.)** | **Rain (in mm.)** | **Rain (in mm.)** | **Rain (in mm.)** | **(2008-11)** |
| Latur | 785.5 | 720.2 | 1054.4 | 726 | 821.53 |
| Ausa | 711.45 | 560.9 | 896.4 | 541.7 | 677.61 |
| Ahmedpur | 542.18 | 466.9 | 1096.6 | 679.2 | 696.22 |
| Nilanga | 644.61 | 607 | 1243.2 | 725 | 804.95 |
| Udgir | 769.42 | 527.8 | 1209.6 | 790.1 | 824.23 |
| Chakur | 756.58 | 541.7 | 983.7 | 749.3 | 757.82 |
| Renapur | 766.12 | 571.9 | 956.9 | 722.6 | 754.38 |
| Davani | 718.95 | 463.8 | 1076 | 856.2 | 778.74 |
| Shirur Anantmal | 754.5 | 658 | 1028.4 | 606.2 | 761.78 |
| Jalkot | 753 | 501 | 971.3 | 703 | 732.08 |
| AVERAGE | 712.98 | 544.33 | 1051.34 | 708.14 | 760.93 |

(Source-website of Maharashtra Government: *mahaagri.gov.in*)

## 3.0 Geomorphology and Soil Types

Geomorphologically, Balaghat plateau running eastwards is the main geomorphological unit. In general the area of the district shows uneven topography with residual hills belonging to Balaghat ranges. The altitude of the area ranges between 500 to 715 m above mean sea level (m amsl). Physiographically, the district can be divided into two parts i.e., Higher Elevated Plateaus, which occurs in the western and southern parts of the district in Latur, Ausa, and Nilanga talukas and Lower Elevated River Valleys, which comprises valley plains of Manyar and Lendi rivers in Ahmedpur and Udgir talukas and valley plains of Manjra and Tawarja rivers and plains of Terna River and its tributaries. The district forms a part of Godavari basin. Manjra River, a tributary of Godavari River flowing south-easterly is the major river in the district. Tawarja and Terna rivers are the main easterly flowing tributaries while Gharni and Rena rivers are southerly flowing tributaries of Manjra River. The rivers show dendritic and rectangular drainage pattern.

The district can be divided into the two zones based on soil characteristics i.e., the first zone which occurs in eastern part of the district comprising of Ahmedpur, Udgir and

parts of Latur and Ausa talukas. It consists of light and light medium soil of inferior type. They are not retentive of moisture and are therefore suitable for the cultivation of Kharif crops only. The soil in some parts of Nilanga taluka is of Lateritic type and the second zone which occurs in western part of the district comprising parts of Latur and Ausa talukas. They are heavy deep black cotton soils. Owing to the peculiarity of the soil, both Kharif and Rabi crops are cultivated in this zone.

# 4.0 Ground Water Scenario

## 4.1 Hydrogeology

Almost entire district is underlain by the Basaltic lava flows of upper Cretaceous to lower Eocene age. The shallow Alluvial formation of Recent age also occur as narrow stretch along the banks of major rivers flowing in the area but it does not form potential aquifer. A map depicting the hydrogeological features is shown in **Figure-2**.

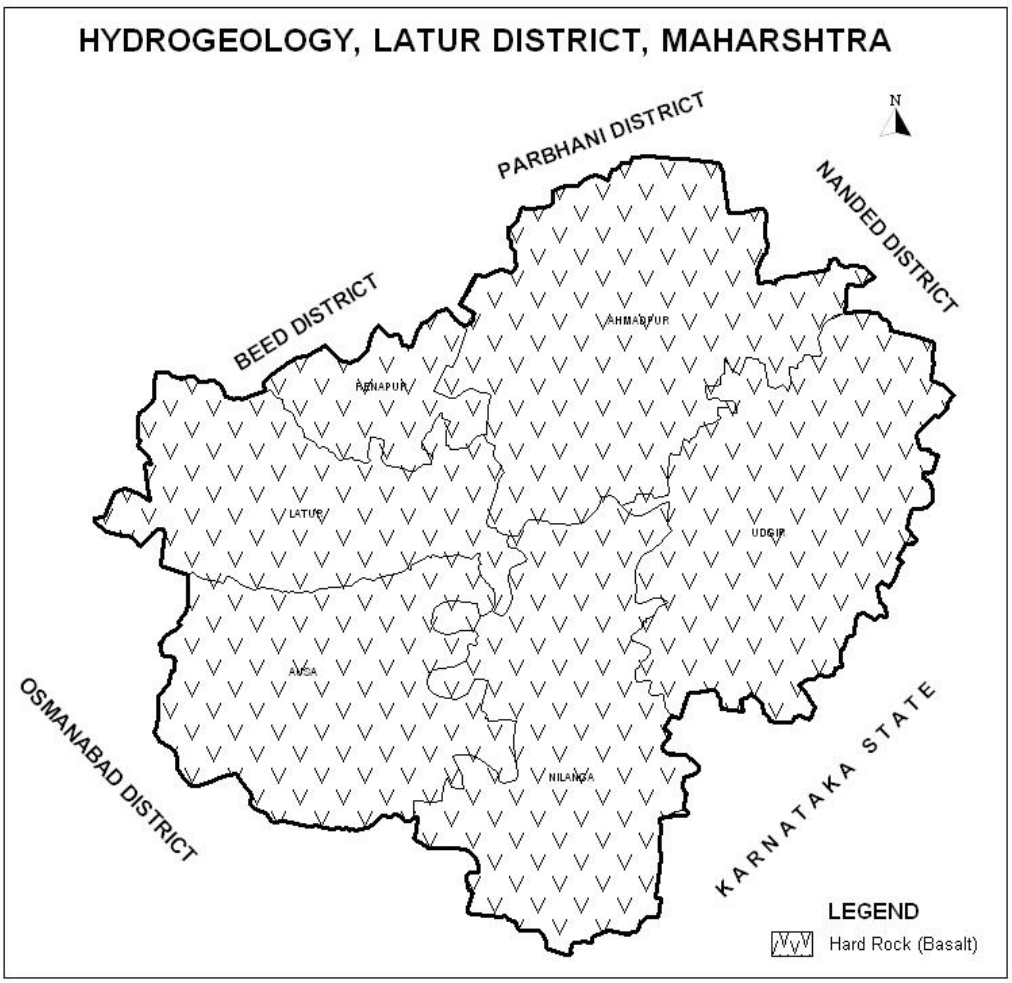


**Figure-2: Hydrogeology**

### 4.1.1 Deccan Trap Basalt

Deccan Traps occurs as Basaltic lava flows, which are normally horizontally disposed

over a wide stretch and give rise to tableland type of topography on weathering also known as plateau. These flows occur in layered sequence ranging in thickness from few metres to 50 m. Flows are represented by massive portion at bottom and vesicular portion at top and are separated from each other by marker bed known as bole bed

Ground water in Deccan Trap Basalt occurs under phreatic conditions at shallow depths upto 15 to 20 m. At deeper levels, the ground water occurs under semi-confined to confined conditions. The weathered and fractured trap occurring in topographic lows, form the main aquifer in the district. The vesicular portion of different lava flow varies in thickness from 15 to 25 m and forms the potential zones. The yield of dugwells tapping upper phreatic aquifer ranges between 25 to 250 $m^3$/day, whereas that of borewells varies form 0.50 to 52.00 $m^3$/day depending upon the local hydrogeological conditions. The exploration data of CGWB and borewell data of Groundwater Surveys and Development Agency (GSDA) reveals the presence of promising deeper confined aquifers even below 100 m.

## 4.2 Water Level Scenario

Central Ground Water Board periodically monitors 28 National Hydrograph Network Stations (NHNS), four times a year i.e., in January, May (Pre-monsoon), August and November (Post-monsoon).

### 4.2.1 Depth to Water Level – Pre-monsoon (May-2011)

During the pre-monsoon period of May 2011, in most part of the district, depth to water levels is less than 20 m bgl. Deeper water levels between 20-40 m are observed in Nilanga, Deoni, Udgir and Jalkot tehsils of Latur district. Depth to water level between 2-5 m bgl is observed in part of Udgir and Shirur-Anantpal talukas of the district. Groundwater levels between 5 and 10 m is observed in Renapur, Ahmedpur, Latur, Ausa, Nilanga, Udgir, Shirur and Deoni tehsils. Deeper water levels between 10 to 20 m is observed in almost all the talukas of the district. The depth to water level map for May 2011 is shown in figure 3.

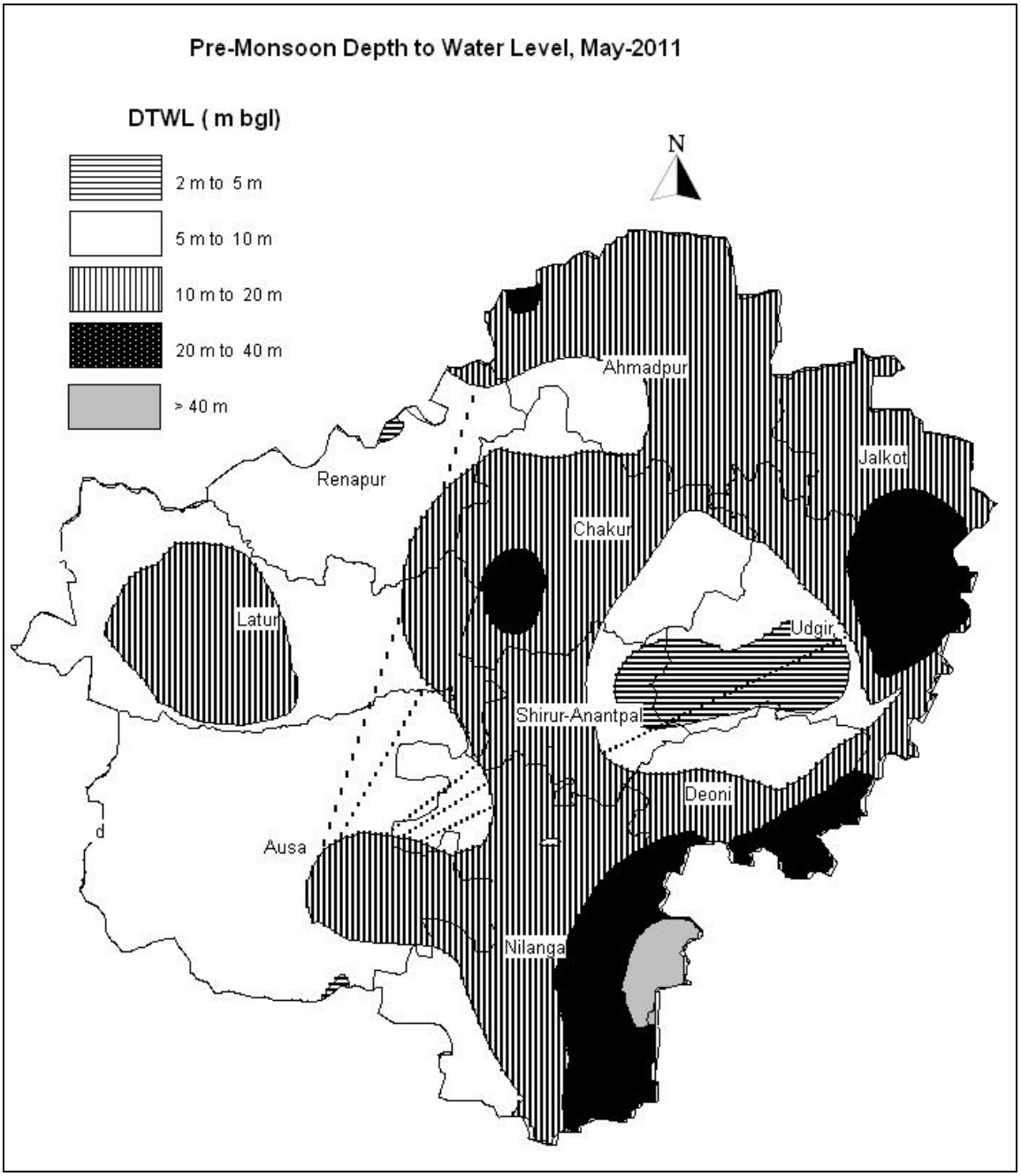


**Figure-3: Depth to Water Level (Pre-monsoon- May 2011).**

### 4.2.2 Depth to Water Level – Post-monsoon (Nov -2011)

During the post-monsoon period of 2011, depth to water level observed in major part of the district is less than 10 m bgl. Deeper water level between 20 to 40 m bgl is observed in Nilanga taluka of the district. A very shallow water level of less than 2 m bgl is observed in parts of Udgir, Shirur, Deoni, Latur, Chakur and Renapur talukas.The water level map for the post-monsoon period is shown in Figure 4.

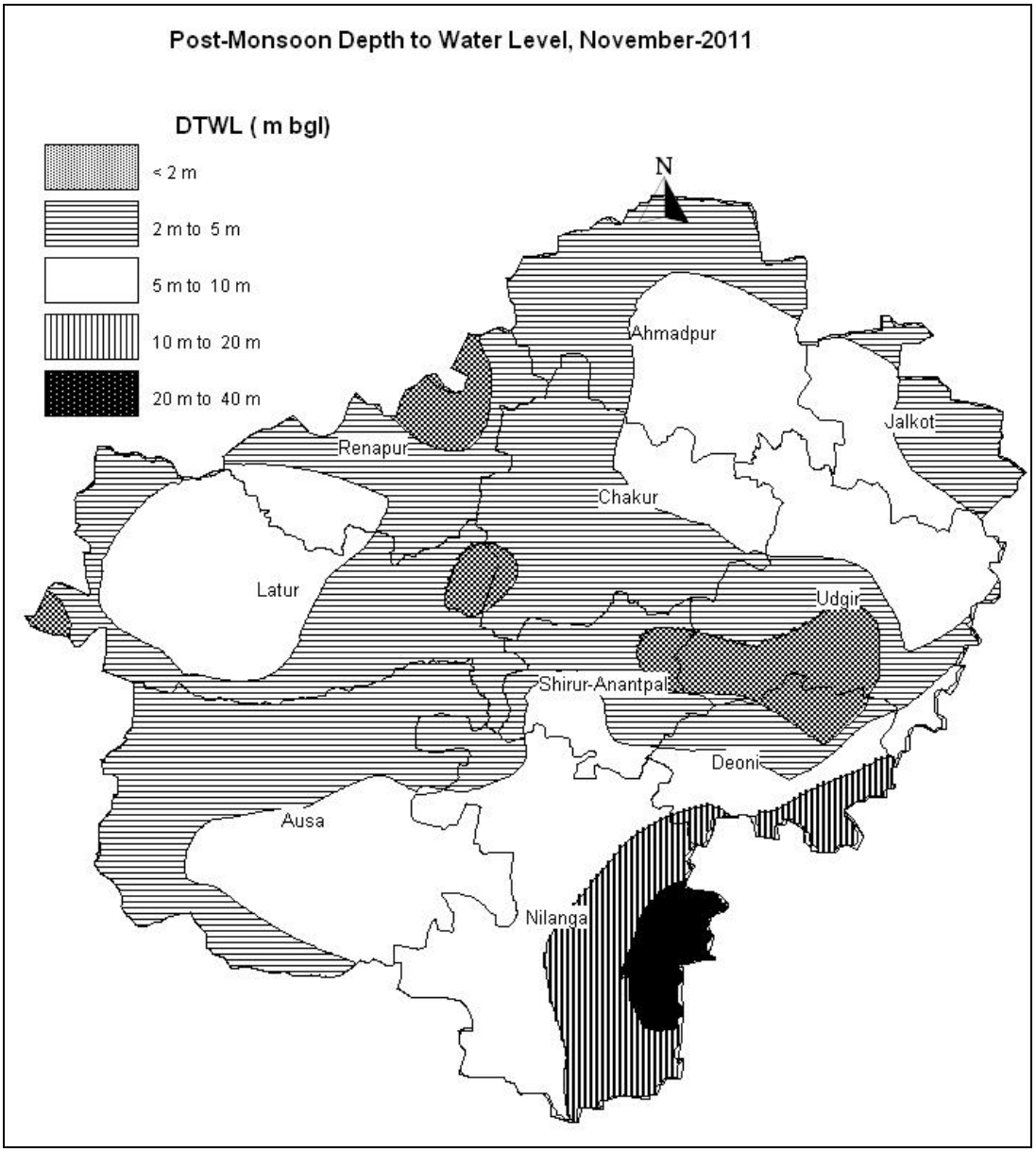


**Figure-4: Depth to Water Level (Post-monsoon- Nov.2011).**

### 4.2.3 Seasonal Water Level Fluctuation– (May to Nov. 2011)

The seasonal water level fluctuation between pre-monsoon and post-monsoon of 2011 is shown in Figure 5. The water level fluctuation map reveals that in major part of the Latur district, the rise of more than 4 m is observed during the post-monsoon period. Less than 2 m rise of water level is observed in pockets in Ausa, Nilanga and Udgir talukas. Fall in water level of less than 2 m is also observed in Ausa talukal of Latur district.

### 4.2.4 Water Level Trend

Trend of water levels for pre and post monsoon period for 10 years (2001-10) have been computed for NHNS located in the district. It is observed that during pre monsoon period, rise of water level has been observed in the range of 0.08 to 0.79m/year whereas, fall

in water level has been observed in the range of 0.03 to 0.25 m/Year.

During postmonsoon period, rise of water level has been observed in the range of 0.061 to 1.29m/year. Fall in water level has been observed in the range of 0.04 to 0.27 m/Year

### 4.3 Yield of Wells

The yields of wells are functions of the permeability and transmissivity of aquifer encountered and vary with location, diameter and depth etc. Ground water in the area is being developed by two types of abstraction structures i.e., borewells and dugwells. However, dugwells are the main ground water abstraction structures in the district for domestic and irrigation use. The yield of dugwells varies from 75 to 250 $m^3$/day during winter season and during summer season it varies from 25 to 100 $m^3$/day. High yielding dugwells are generally located in weathered and fractured basalt occurring in physiographic depressions. The yield of borewells as per CGWB and GSDA data varies form 0.50 to 52.00 $m^3$/day. The majority of high yielding borewells of GSDA are located in the vicinity of lineaments in western, southwestern and north eastern parts of the district in the depth range of 50 to 80 m bgl tapping semi-confined to confined aquifers.

### 4.4 Aquifer Parameters

The aquifer parameters of phreatic aquifer are available from previous studies conducted by CGWB. In Deccan Trap Basalt, the specific capacity of dugwells ranges from 17.61 to 429.94 lpm/m of drawdown. While the permeability ranges from 5.47 to 50.56 m/day. The transmissivity and storativity of deeper aquifer as obtained from pumping tests conducted on exploratory wells ranges from 6.15 to 83.53 $m^2$/day and 8.68 x $10^{-3}$ to 4.7 x $10^{-4}$ respectively. The aquifer parameters of phreatic and deeper aquifers are presented in Table-4.

**Table 4: Aquifer Parameters.**

| S. No. | Aquifer/ Formation | Transmissivity ($m^2$/day) | Storativity | Permeability (m/day) | Specific Capacity (lpm/m of dd) |
|---|---|---|---|---|---|
| 1. | Shallow/Phreatic Aquifer | | | | |
| a | Massive Basalt | - | - | 5.47 to 16.33 | 41.14 to 332.88 |
| b | Vesicular Basalt | - | - | 9.24 to 50.56 | 17.61 to 429.94 |
| 2. | Deeper Aquifer (Basalt) | 6.15 to 83.53 | 8.68 x $10^{-3}$ to 4.7 x $10^{-4}$ | - | - |

## 4.5 Ground Water Resources

Central Ground Water Board and GSDA have jointly estimated the ground water resources of Latur district based on GEC-97 methodology as on March 2009. The same are presented in Table-5. A graphical representation is given in figure 5.

As per the estimation the annual replenishable groundwater resource is 126264 ha.m with the natural discharge of 6744 ha. m, thus the net annual ground water availability comes to be 119520 ha.m. The total gross draft for all uses is estimated at 93702 ha.m with irrigation sector being the major consumer having a draft of 91637 ha.m. The draft for domestic and industrial sectors is worked at 2065 ha.m. The overall stage of ground water development for the district is 78% which is quite high. Out of 10 talukas, Latur taluka has been categorised as "Semi-Critical", all the remaining watersheds falls in "Safe" category. Similarly, the ground water resources were also assessed for all 39 watersheds, out of which 23 watersheds have been categorised as "Safe", 4 watersheds (GV 96B, MR 16B, MR 24, MR 26) have been categorised as "Semi Critical", and 7 watersheds (GV 97C, MR 15, MR 19, MR 33, MR 39, MR 43 and MR 44) have been categorised as "Over-Exploited".

In all these, "Semi-Critical" and "Over-Exploited" watersheds and "Semi-Critical" taluka of Latur, future ground water development is not recommended without adhering to the precautionary measures i.e., artificial recharge to augment the ground water resources and adoption of ground water management practices.

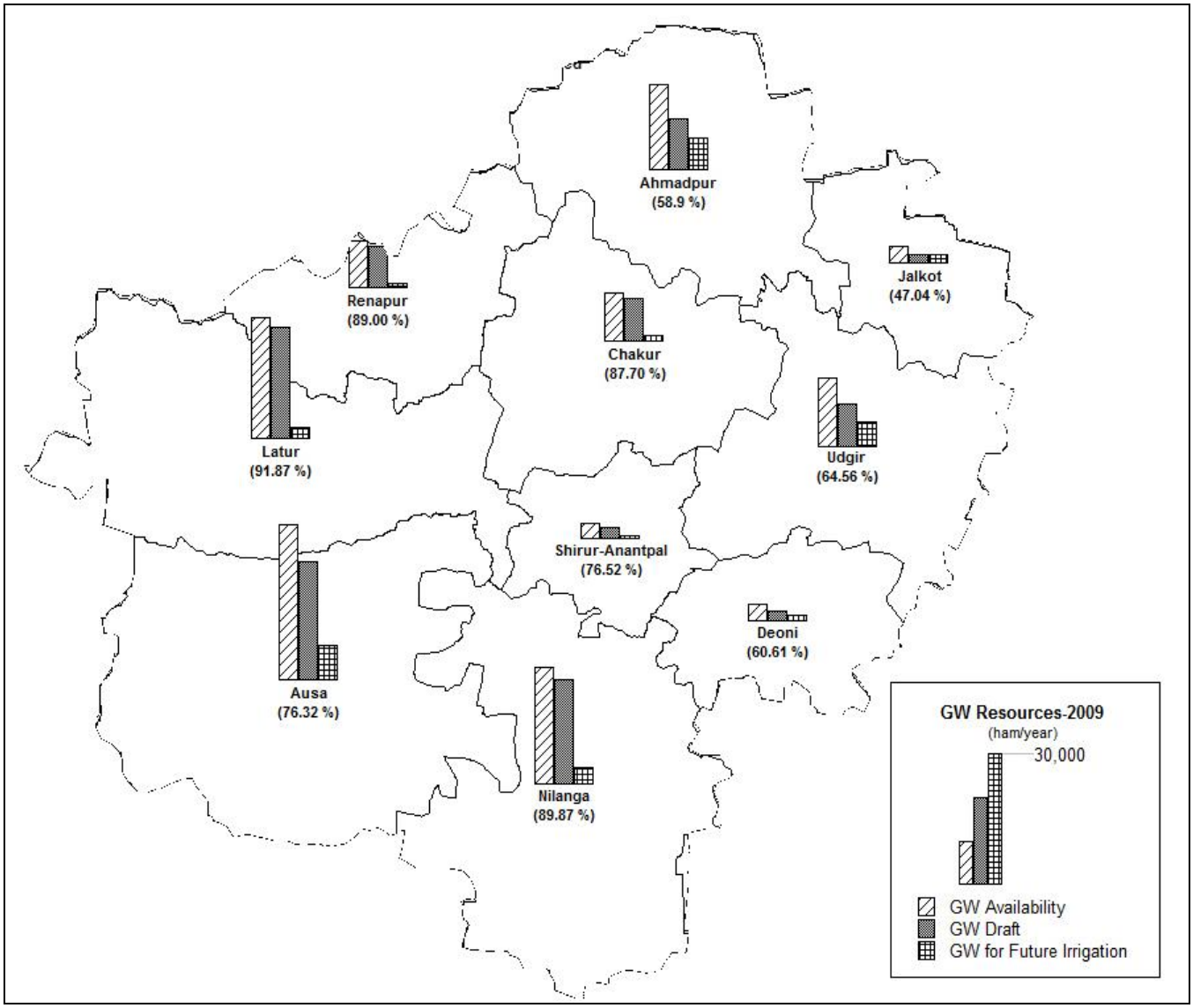


**Figure-5: Ground Water Resources (March 2009).**

**Table 5:- Ground Water Resources (March 2009).** **Figures in HAM**

| Sl No. | Administrative Unit | Command / Non-Command / Total | Net Annual Ground Water Availability | Existing Gross Ground Water Draft for irrigation | Existing Gross Ground Water Draft for domestic and industrial water supply | Existing Gross Ground Water Draft for All uses | Provision for domestic and industrial requirement supply to 2025 | Net Ground Water Availability for future irrigation development | Stage of Ground Water Development {13/10 * 100}% |
|---|---|---|---|---|---|---|---|---|---|
| 1 | Ahmedpur | Command | 341.79 | 518.95 | 52.87 | 571.82 | | | |
| | Ahmedpur | Non Command | 14359.86 | 7835.99 | 251.49 | 8087.48 | | | |
| | Ahmedpur | Total | 14701.65 | 8354.94 | 304.36 | 8659.30 | 600.57 | 5656.66 | 58.90 |
| 2 | Anantpal Sh | Command | | | | | | | |
| | Anantpal Sh | Non Command | 2846.15 | 2125.76 | 52.21 | 2177.97 | | | |
| | Anantpal Sh | Total | 2846.15 | 2125.76 | 52.21 | 2177.97 | 140.92 | 541.53 | 76.52 |
| 3 | Ausa | Command | 1921.28 | 2824.50 | 40.54 | 2865.03 | | | |
| | Ausa | Non Command | 24705.39 | 17164.28 | 291.79 | 17456.06 | | | |
| | Ausa | Total | 26626.66 | 19988.77 | 332.32 | 20321.09 | 657.27 | 5988.82 | 76.32 |
| 4 | Chakur | Command | 385.89 | 486.22 | 15.36 | 501.57 | | | |
| | Chakur | Non Command | 8069.61 | 6766.83 | 146.83 | 6913.66 | | | |
| | Chakur | Total | 8455.50 | 7253.05 | 162.19 | 7415.23 | 240.95 | 1338.98 | 87.70 |
| 5 | Devani | Command | | | | | | | |
| | Devani | Non Command | 3259.86 | 1911.34 | 64.60 | 1975.94 | | | |
| | Devani | Total | 3259.86 | 1911.34 | 64.60 | 1975.94 | 140.65 | 1212.95 | 60.61 |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 6 | Jalkot | Command | | | | | | | |
| | Jalkot | Non Command | 3257.91 | 1496.22 | 36.29 | 1532.51 | | | |
| | Jalkot | Total | 3257.91 | 1496.22 | 36.29 | 1532.51 | 96.41 | 1494.10 | 47.04 |
| 7 | Latur | Command | 3028.46 | 4379.94 | 108.55 | 4488.49 | | | |
| | Latur | Non Command | 17624.22 | 14258.60 | 226.30 | 14484.90 | | | |
| | Latur | Total | 20652.68 | 18638.54 | 334.85 | 18973.39 | 594.72 | 2262.81 | 91.87 |
| 8 | Nilanga | Command | 1197.68 | 1633.08 | 68.53 | 1701.61 | | | |
| | Nilanga | Non Command | 18679.66 | 15809.03 | 353.55 | 16162.58 | | | |
| | Nilanga | Total | 19877.34 | 17442.11 | 422.08 | 17864.19 | 715.67 | 2987.18 | 89.87 |
| 9 | Renapur | Command | 1484.15 | 2037.53 | 30.75 | 2068.28 | | | |
| | Renapur | Non Command | 6587.21 | 5011.00 | 104.03 | 5115.03 | | | |
| | Renapur | Total | 8071.37 | 7048.53 | 134.78 | 7183.31 | 220.38 | 1075.43 | 89.00 |
| 10 | Udgir | Command | 1058.38 | 989.40 | 64.87 | 1054.27 | | | |
| | Udgir | Non Command | 10712.65 | 6388.48 | 156.23 | 6544.71 | | | |
| | Udgir | Total | 11771.03 | 7377.88 | 221.10 | 7598.98 | 393.78 | 4309.31 | 64.56 |
| | **District Total** | | **119520.20** | **91637.14** | **2064.78** | **93701.91** | **3801.32** | **26867.77** | **78** |

## 4.6 Ground Water Quality

CGWB is monitoring the ground water quality of the Latur district since the last four decades through its established monitoring wells. The objectives behind the monitoring are to develop an overall picture of the ground water quality of the district. During the year 2011, the Board has carried out the ground water quality monitoring

Of 21 monitoring wells. These wells mainly consist of the dug wells representing the shallow aquifer. The sampling of ground water from these wells was carried out in the month of May 2011 (pre-monsoon period). The water samples after collection were immediately subjected for the analysis of various parameters in the Regional Chemical Laboratory of the Board at Nagpur. The parameters analysed, include pH, Electrical Conductivity (EC), Total Alkalinity (TA), Total Hardness (TH), Nitrate ($NO_3$) and Fluoride (F). The sample collection, preservation, storage, transportation and analysis were carried out as per the standard methods given in the manual of American Public Health Association for the Examination of Water and Wastewater (APHA, 1998). The ground water quality data thus generated was first checked for completeness and then the validation of data was carried out using standard checks. Subsequently, the interpretation of data was carried out to develop the overall picture of ground water quality in the district in the year 2011.

### 4.6.1 Suitability of Ground Water for Drinking Purpose

The suitability of ground water for drinking purpose is determined keeping in view the effects of various chemical constituents in water on the biological system of human being. Though many ions are very essential for the growth of human, but when present in excess, have an adverse effect on human body. The standards proposed by the Bureau of Indian Standards (BIS) for drinking water (IS-10500-91, Revised 2003) were used to decide the suitability of ground water. The classification of ground water samples was carried out based on the desirable and maximum permissible limits for the parameters viz., TA, TH, $NO_3$ and F prescribed in the standards and is given in **Table-6**.

**Table-6: Classification of Ground Water Samples for Drinking based on BIS Drinking Water Standards (IS-10500-91, Revised 2003)**

| Parameters | DL | MPL | Samples with conc. < DL | Samples with conc. in DL-MPL | Samples with conc. >MPL |
|---|---|---|---|---|---|
| TA (mg/L) | 200 | 600 | 12 | 9 | - |
| TH (mg/L) | 300 | 600 | 7 | 14 | - |
| $NO_3$ (mg/L) | 45 | No relaxation | 8 | - | 13 |
| F (mg/L) | 1.0 | 1.5 | 21 | - | - |

(Here, DL- Desirable Limit, MPL- Maximum Permissible Limit)

The perusal of **Table-6** shows that the concentrations of all the parameters except nitrate in most of the samples are above the maximum permissible limit of the BIS standards. It is also seen from the **Table-6** that the potability of ground water in the wells is mainly affected due to the Nitrate ($NO_3$) as its concentration exceeds more than MPL in 62% of samples. Overall, it can be concluded that the ground water quality in the wells monitored in the district is affected because of high $NO_3$ concentrations.

**4.6.2 Suitability of Ground Water for Irrigation Purpose**

The water used for irrigation is an important factor in productivity of crop, its yield and quality of irrigated crops. The quality of irrigation water depends primarily on the presence of dissolved salts and their concentrations. Electrical Conductivity (EC) and Residual Sodium Carbonate (RSC) are the most important quality criteria, which influence the water quality and its suitability for irrigation.

**Electrical Conductivity (EC)**

The amount of dissolved ions in the water is best represented by the parameter electrical conductivity. The classification of water for irrigation based on the EC values is as follows.

**Low Salinity Water (EC: 100-250 µS/cm):** This water can be used for irrigation with most crops on most soils with little likelihood that salinity will develop.

**Medium Salinity Water (EC: 250 – 750 µS/cm):** This water can be used if moderate amount of leaching occurs. Plants with moderate salt tolerance can be grown in most cases without special practices for salinity control.

**High Salinity Water (EC: 750 – 2250 µS/cm):** This water cannot be used on soils with restricted drainage. Even with adequate drainage, special management for salinity control may be required and plants with good salt tolerance should be selected.

**Very High Salinity Water (EC: >2250 µS/cm):** This water is not suitable for

irrigation under ordinary condition. The soils must be permeable, drainage must be adequate, irrigation water must be applied in excess to provide considerable leaching and very salt tolerant crops should be selected.

The classification of ground water samples collected from monitoring wells for irrigation purpose was carried out and given below in **Table-7**.

It is clear from the **Table-7** that maximum number of samples (76%) falls under the category of high salinity water while nearly 19% of samples fall in medium salinity water category. This shows that the ground water in the pre-monsoon season from shallow aquifer in the district should be used for irrigation with proper soil and crop management practices..

**Table-7: Classification of Ground Water for Irrigation based on EC.**

| Type | EC (µS/cm) | No. of Samples | % of Samples |
|---|---|---|---|
| Low Salinity Water | <250 | Nil | Nil |
| Medium Salinity Water | 250-750 | 4 | 19 |
| High Salinity Water | 750-2250 | 16 | 76 |
| Very High Salinity Water | >2250 | 1 | 5 |
| **Total** | | **21** | **100.0** |

**Residual Sodium Carbonate (RSC)**

Residual Sodium Carbonate (RSC) is considered to be superior to EC as a measure of sodicity particularly at low salinity levels. The classification of ground water samples based on RSC values for its suitability for irrigation purpose is shown below in **Table-8**.

**Table-8: Classification of Ground Water for Irrigation based on RSC.**

| Type | RSC | No. of Samples | % of Samples |
|---|---|---|---|
| Good | <1.25 | 21 | 100 |
| Doubtful | 1.25-2.50 | - | - |
| Unsuitable | >2.50 | - | - |
| **Total** | | **21** | **100** |

A perusal of **Table-8** shows that the RSC values of ground water samples collected from the wells is less than 1.25 in about 100% of wells, which reflects that the overall quality of ground water in the monitoring wells is good for irrigation purpose.

## 4.7 Status of Ground Water Development

Ground water development depends on many factors viz., availability, crop water requirement, socio-economic fabric and on the yield of the aquifers existing in that area.

Ground water is predominantly used for irrigation, as it is the major ground water utilising sector. As per the data available for year 2006-07, The total number of dugwells are 38253 and area irrigated by dugwell is 84272 hectares. Similarly the total number of tubewells is 15531 and the area brought under irrigation by tubewells is 32048 hectares. An area of 2139 hectares is under irrigation by 1025 tanks in the district. Similarly the area brought under irrigation by other minor surface water sources 6794 in no. has brought an area of 14341 hectares under irrigation . The Net irrigated area is 130635 hectares.

State Government agencies have drilled number of borewells fitted with hand pumps and electric motors for rural drinking water purposes in the district. In all till March 2008, GSDA, Government of Maharashtra has drilled 6758 successful borewells for rural water supply under various schemes in the district, out of which 1682 bore wells are fitted with electric pumps and the rest 5072 are fitted with hand pumps. Talukawise distribution of successful borewells is given in Table 9.

**Table 9: Status of Successful Borewells Drilled by GSDA (March-2008).**

| S No. | Taluka | Successful Borewells | Borewells fitted with Hand Pump | Borewells fitted with Electric Pump |
|---|---|---|---|---|
| 1 | Latur | 1086 | 790 | 296 |
| 2 | Renapur | 838 | 677 | 160 |
| 3 | Ahmedpur | 655 | 530 | 125 |
| 4 | Jalkot | 219 | 176 | 43 |
| 5 | Chakur | 684 | 524 | 160 |
| 6 | Shirur Anantpal | 363 | 271 | 92 |
| 7 | Ausa | 1042 | 739 | 302 |
| 8 | Nilanga | 970 | 669 | 301 |
| 9 | Devni | 268 | 203 | 65 |
| 10 | Udgir | 631 | 493 | 138 |
| Total Borewells | | 6756 | 5072 | 1682 |

## 5.0 Ground Water Management Strategy

Ground water has special significance for agricultural development in the district. The ground water development in major parts of the district has reached a critical stage resulting in decline of ground water levels over a period of time. There is thus a need to adopt an integrated approach of development of ground water resources dovetailed with ground water augmentation to provide sustainability to ground water development.

### 5.1 Ground Water Development

Entire district is underlain by Deccan Trap Basalt. The eastern, extreme southern and

western parts of the district comprising parts of Ahmedpur, Nilanga, Latur and Ausa talukas have low ground water development potential. The areas with medium ground water development potential are observed in northern, central and southern part of the district comprising entire Shirur-Anantpur taluka and parts of Renapur, Udgir, Nilanga, Ausa and Latur taluksa. The entire Deoni taluka, northern parts of Chakur, southern parts of Renapur and Udgir, eastern parts of Latur and extreme south-western part of district have high ground water development potential. In these areas, the ground water can be developed through dugwells, dug-cum-bored wells (DCB) and borewells. However, the sites for borewell need to be selected only after proper scientific investigation and they should only be used for drinking water supply and not for irrigation. Also in Latur taluka categorised as "Semi-Critical", the ground water development needs to be carried out with proper care and planning. The yield of dugwells in the district may be expected to range from 75 to 250 $m^3$/day, depending on the local hydrogeological conditions. The nature and yield potential of the aquifers occurring in different talukas is given in Table 10.

**Table 10: Nature and Yield Potential of Aquifers.**

| Sr. No. | Taluka | Main Aquifer | Yield Potential | Type of Wells Suitable |
|---|---|---|---|---|
| 1. | Latur | Basalt | Low to High | Dugwell, DCB and Borewells |
| 2. | Renapur | Basalt | Medium to High | Dugwell, DCB and Borewells |
| 3. | Ahmedpur | Basalt | Low to High | Dugwell, DCB and Borewells |
| 4. | Jalkot | Basalt | Low to Medium | Dugwell and DCB |
| 5. | Chakur | Basalt | Low to High | Dugwell, DCB and Borewells |
| 6. | Shirur Anantpal | Basalt | Medium | Dugwell and DCB |
| 7. | Ausa | Basalt | Low to High | Dugwell, DCB and Borewells |
| 8. | Nilanga | Basalt | Low to High | Dugwell, DCB and Borewells |
| 9. | Devni | Basalt | High | Dugwell, DCB and Borewells |
| 10. | Udgir | Basalt | Low to High | Dugwell, DCB and Borewells |

## 5.2 Water Conservation and Artificial Recharge

In Basaltic area, the artificial recharge structures feasible are check dams, gully plugs, percolation tanks, nalla bunds, etc. The structures like gully plugs, contour bunds are most favorable in the hilly area. Existing dugwells can also be used for artificial recharge; however, the source water should be properly filtered before being put in the wells.

These sites need to be located where the hydrogeological conditions are favorable, i.e., where sufficient thickness of unsaturated/de-saturated aquifer exists and water levels are more than 5 m deep. The postmonsoon depth to water level map and premonsoon water level

trend map gives a good idea of areas suitable for artificial recharge of ground water and they are located in major parts of Nilanga, Ausa, Latur, Renapur and Ahmedpur talukas, where water levels are deep and falling water level trends are also observed.

## 6.0 Ground Water Related Issues and Problems

The rainfall data analyses for the period 1901-1995 indicates that the probabilities of occurrence of moderate drought varies from 18% at Latur to 30% at Ausa. The entire district comes under "drought area". In major parts of the district, falling/declining water level trends have been observed in almost entire Nilanga, Ausa, Latur and Renapur talukas and northern part of Ahmadpur and southern part of Udgir taluka. These areas also coincide with deeper premonsoon water levels in the range of 10 to 20 m bgl. The talukas categorised as "Semi-Critical" viz., Latur as well as Ausa, Nilanga and Chakur, talukas where the stage of ground water development has already reached about 70% or more also coincide with the deeper water level and declining trend areas. Thus future water conservation and artificial recharge structures in the district may be prioritised in this part of the district. Also future ground water development is not recommended without adhering to the precautionary measures i.e., artificial recharge to augment the ground water resources and adoption of ground water management practices.

Ground water quality is adversely affected by nitrate contamination in 62% of the samples collected in May 2011. Continues intake of high nitrate concentration water causes infant methaemoglobinamea, popularly known as Blue Babies disease. Thus all the wells used for water supply should be first analysed for nitrate contents and if the nitrate content is found beyond permissible limit the ground water may be used for other purposes than drinking. Adequate sanitary protection to the wells may be provided to control the nitrate contamination.

## 7.0 Mass Awareness and Training Activities

### *7.1 M.A.P. and W.M.T.P.*

No Mass Awareness Programme (MAP) and Water Management Training Programme (WMTP) have been organised in Latur district. However, it is recommended that such programmes should be organized in large scale by district administration, so as to educate the user regarding yielding capacity of aquifer and declining trend of water levels in the district. Similarly farmer should also be encouraged to adopt appropriate crop planning

and irrigation practices.

## 8.0 Areas Notified by CGWA/SGWA

As per ground water resource estimation 1 taluka viz., Latur have been categorised as "Semi Critical". However, so far none of the taluka has been notified either by CGWA or SGWA.

## 9.0 Recommendations

1 The entire district is underlain by the Deccan Trap Basalt where only dugwells are most feasible structures for ground water development. The sites for borewell need to be selected only after proper scientific investigation.

2 Borewells generally tap deeper fractures, which may not be sustainable. Besides, the borewells should only be used for drinking water supply and not for irrigation.

3 The overall stage of ground water development for the district is has already reached 64.56%. Therefore, future development of ground water resources should be carried out with proper care and planning.

4 The talukas categorised as "Semi-Critical" viz., Latur where the stage of ground water development has already reached about 91% or more coincide with the deeper water levels and declining water level trends. Thus future water conservation and artificial recharge structures in the district may be prioritised in these parts of the district. Also future ground water development is not recommended without adhering to the precautionary measures i.e., artificial recharge to augment the ground water resources and adoption of ground water management practices in these talukas.

5 The entire Deoni taluka, northern parts Chakur, southern part of Renapur and Udgir, eastern part of Latur and extreme south-western part of district have high ground water development potential. In these areas the ground water can be developed through dugwells, dug-cum-bored wells (DCB) and borewells. However, in Latur taluka categorised as "Semi-Critical", the ground water development needs to be carried out with proper care and planning. The yield of dugwells in the district may be expected from 75 to 250 $m^3$/day, depending on the local hydrogeological conditions.

6 The scope exists for constructing of suitable artificial recharge structures in the district. The structures recommended for the hilly-basaltic area are: contour bunds, gully plugs,

nala bunds and check dams. For other Basaltic areas, particularly in Nilanga, Ausa, Latur, Renapur and Ahmedpur talukas, where water levels are deep and falling water level trends are also observed, the nala bunds, check dams and KT weirs are suggested. The existing dugwells may also be used for artificial recharge of ground water provided source water is free of silt and dissolved impurities.

7 The existing village ponds need to be rejuvenated to act both as water conservation and artificial recharge structures.

8 Ground water quality is adversely affected by nitrate contamination in 62% of the samples collected in May 2011. Thus all the wells used for water supply should be first analysed for nitrate contents and if the nitrate content is found beyond permissible limit the ground water may be used for purposes other than drinking. Adequate sanitary protection to the wells may be provided to control the nitrate contamination.

9 To enhance the ground water resources and for sustainable development, mass awareness programmes should be organized in large scale by district administration. Such programmes are necessary so as to educate the user regarding yielding capacity of aquifer and declining trend of water levels in the district. Similarly farmer should also be encouraged to adopt appropriate crop planning and irrigation practices.