

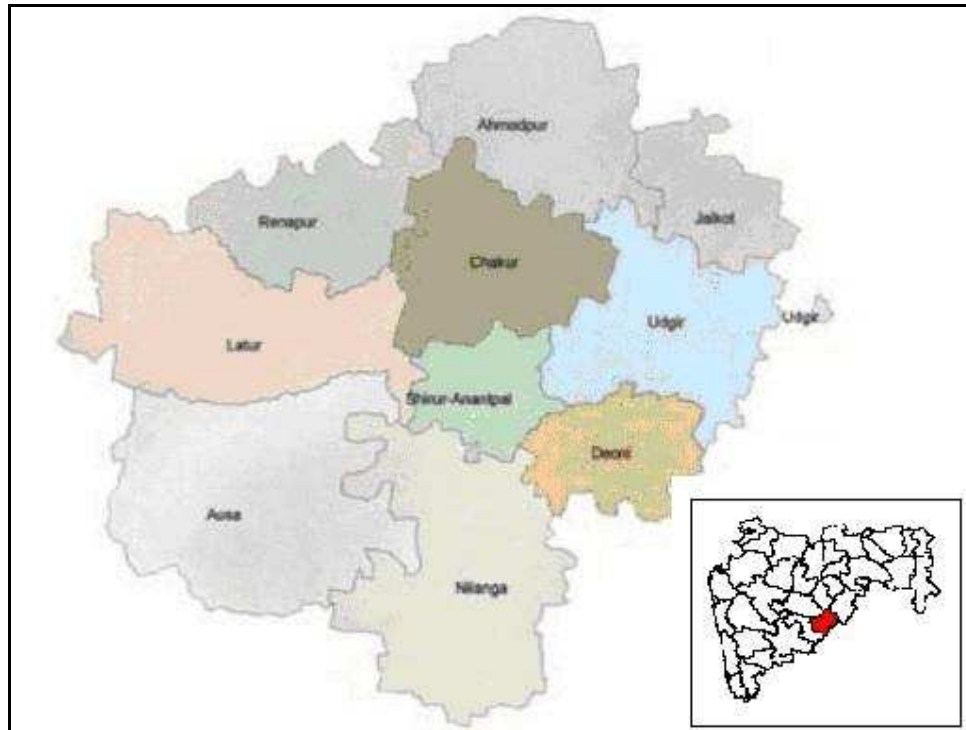


भारत सरकार
जल संसाधन मंत्रालय
केंद्रीय भूजल बोर्ड

GOVERNMENT OF INDIA
MINISTRY OF WATER RESOURCES
CENTRAL GROUND WATER BOARD

महाराष्ट्र राज्य के अंतर्गत लातूर जिले की
भूजल विज्ञान जानकारी

GROUND WATER INFORMATION
LATUR DISTRICT
MAHARASHTRA



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नागपुर
CENTRAL REGION
NAGPUR
2009

LATUR DISTRICT AT A GLANCE

1. GENERAL INFORMATION

Geographical Area	: 7157 sq. km.
Administrative Divisions (As on 31/03/2007)	: 10 talukas; Latur, Ahmedpur, Udgir, Nilanga, AUSA, Renapur, Chakur, Shirur-Anantpal, Deoni and Jalkot.
Villages	: 945
Population (2001)	: 20,80,285
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 (2000-2001)-

Nos./Potential Created (ha)

Dugwells	: 27943/70283
Tubewells	: 11455/27299
Tanks	: 1025/2139
Other Minor Surface Sources	: 3950/9240
Net Irrigated Area	: 99467 ha

7. GROUND WATER MONITORING WELLS (As on 31/03/2008)

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
Premonsoon Depth to Water Level (May-2007)	: 1.85 to 30.40 m bgl
Postmonsoon Depth to Water Level (Nov.-2007)	: 1.05 to 50.00 m bgl
Premonsoon Water Level Trend (1998-2007)	: Rise: Negligible to 0.99 m/year Fall: Negligible to 1.54 m/year

Postmonsoon Water Level Trend : Rise: Negligible to 0.22 m/year
(1998-2007) Fall: 0.03 to 0.99 m/year

10. GROUND WATER EXPLORATION (As on 31/03/08)

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 m²/day
Storativity : 8.68 x 10⁻³ to 4.7 x 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-HCO₃ in majority of samples

12. DYNAMIC GROUND WATER RESOURCES- (As on 31/03/2004)

Net Annual Ground Water : 1136.34 MCM

Availability

Annual Ground Water Draft : 830.06 MCM

(Irrigation + Domestic)

Allocation for Domestic and : 26.20 MCM

Industrial requirement up to next
25 years

Stage of Ground Water : 73.05%

Development

13. GROUND WATER CONTROL & REGULATION

Over-Exploited Taluka : None

Critical Taluka : None

Semi-Critical : 2; Renapur and 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 talukas categorised as "Semi-Critical" viz., Latur and Renapur 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. Ground water quality is adversely affected by nitrate contamination.

Ground Water Information Latur District

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Ground Water Information

Latur District

1.0 Introduction

Latur is one of the drought district 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 Richter'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, and at the border of 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 20,80,285 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 in the district 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 Peizometers and monitoring wells is presented as **Figure-1**.

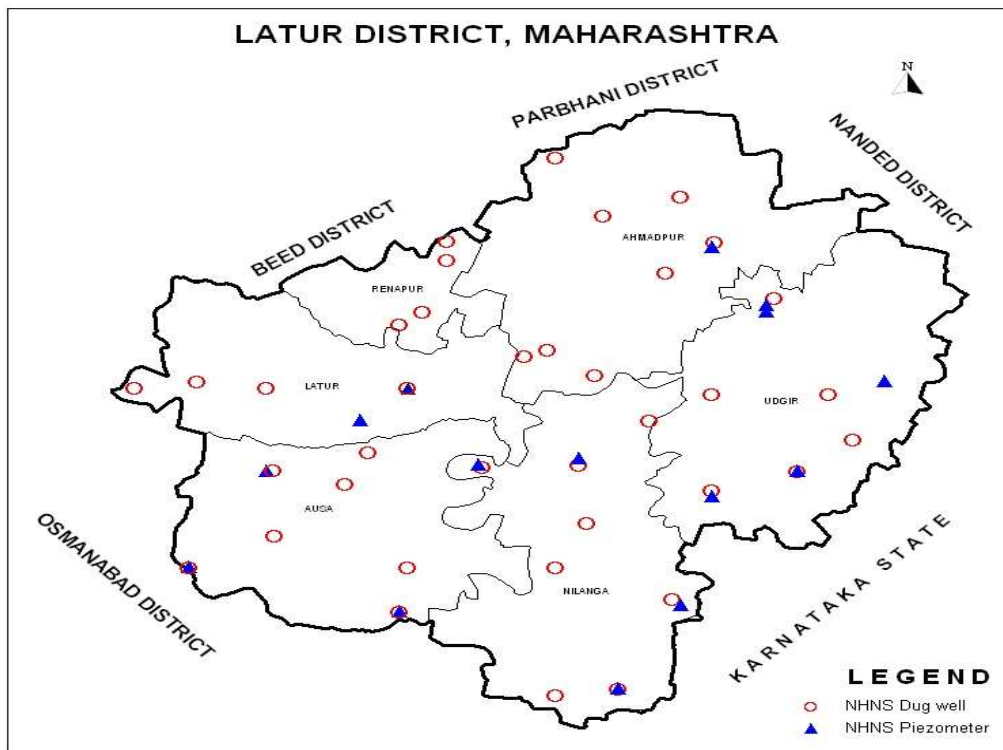


Figure-1: Location.

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 33 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 mm 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 study of negative departures of the annual rainfall over normal reveals that entire district experienced moderate, severe and acute

drought conditions for more than 20% of years. Hence the entire district can be categorized as drought area. The annual rainfall for 2007 ranges from about 398 mm (Shirur- Anantpal) to 810 mm (Latur) and same is presented in Table–3.

Table 3: Annual Rainfall (2007).

S. No.	Taluka	Year- 2007	
		No. of Rainy Days	Rainfall (mm)
1.	Latur	41	810
2.	Renapur	36	525
3.	Ahmedpur	34	670
4.	Jalkot	26	399
5.	Chakur	40	744
6.	Shirur- Anantpal	37	398
7.	Ausa	37	426
8.	Nilanga	32	581
9.	Deoni	27	475
10.	Udgir	35	582

(Source- District Socio-Economic Review, Latur District, 2006-07)

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 shows dendritic and rectangular drainage pattern.

The district can be divided into the following two zones based on soil characteristics i.e., the first zone which occurs in eastern part of the district comprises 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**.

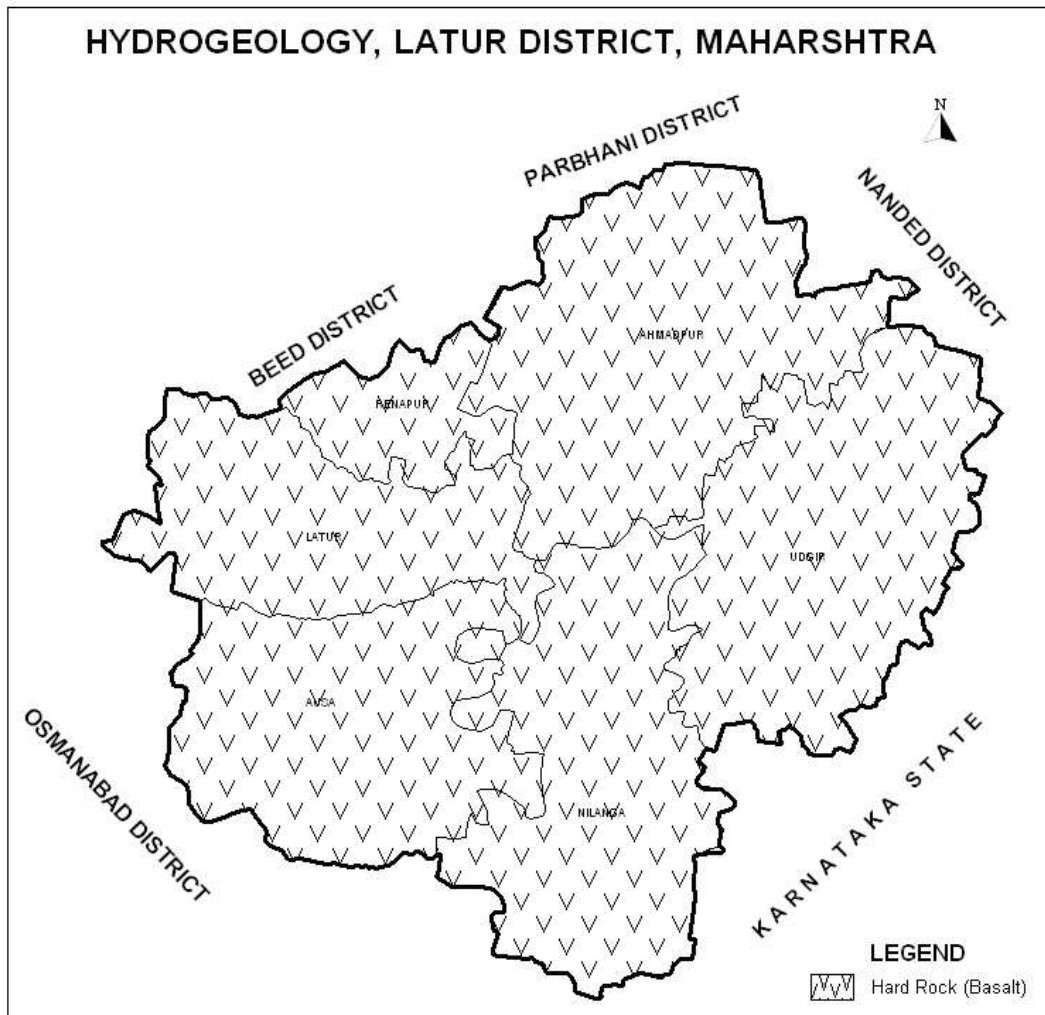


Figure-2: Hydrogeology

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 m³/day, whereas that of borewells varies form 0.50 to 52.00 m³/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 39 National Hydrograph Network Stations (NHNS), four times a year i.e., in January, May (Premonsoon), August and November (Postmonsoon).

4.2.1 Depth to Water Level – Premonsoon (May-2007)

The depth to water levels in the district during May 2007 ranges between 1.85 (Udgir) and 23.75 m bgl (Kingaon) in dugwells, whereas it ranges between 9.30 (Sukhni2) and 30.40 m bgl (Deoni) in Peizometers. Depth to water levels during premonsoon (May 2006) has been depicted in **Figure-3**. In major part of the district moderately deep water levels in the range of 10 to 20 m bgl are observed in north eastern, northern, southern, south eastern and central-western parts occupying parts of udgir, Ahmedpur, Nilanga, AUSA, Latur and Renapur talukas. The next most dominant range is 5 to 10 m bgl observed in central and western fringe areas, occupying parts of Udgir, Nilanga, Latur and AUSA talukas. The deeper water levels of more than 20 m bgl are observed in few small isolated patches in southeastern and northern fringe areas, however they reflect the water levels of deeper aquifer.

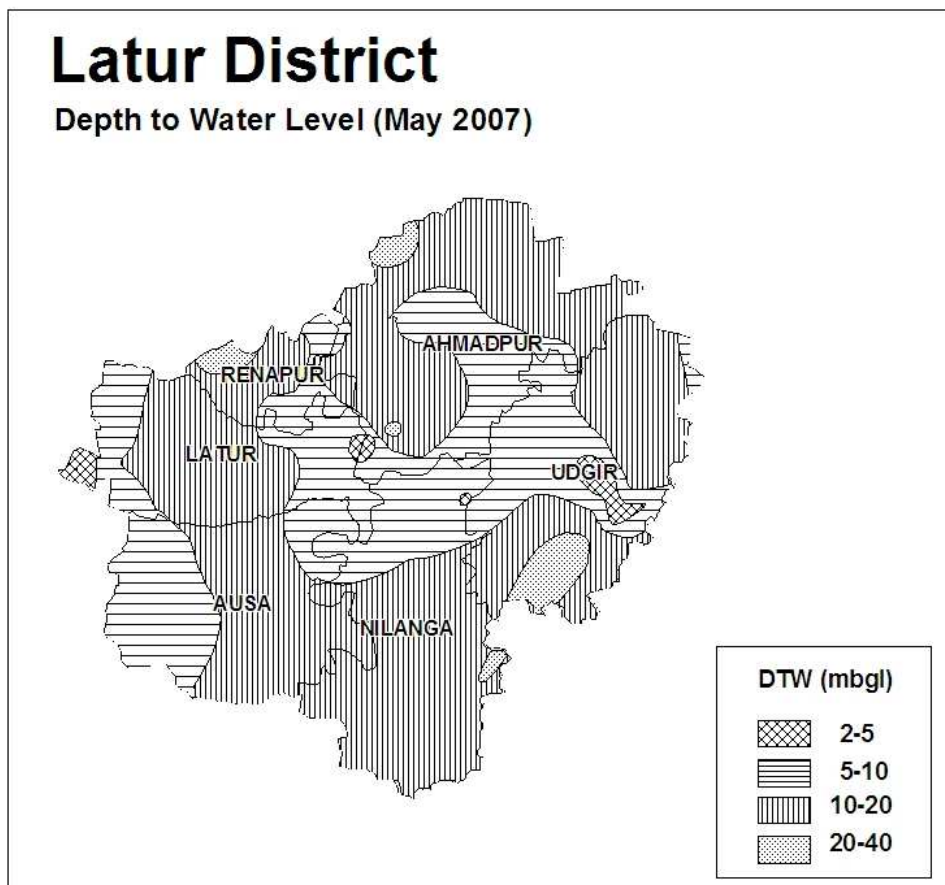


Figure-3: Depth to Water Level (Premonsoon- May 2007).

4.2.2 Depth to Water Level – Postmonsoon (Nov.-2007)

The depth to water levels during Nov. 2007 ranges between 1.05 (Udgir) and 19.15 m bgl in dugwells, whereas in Piezometers it varies from 1.80 (Latur) to 50.00 m bgl (Nagalgaon). Spatial variation in postmonsoon depth to water levels is shown in **Figure-4**. The water levels in the range of 5 to 10 m bgl is the most dominant range followed by 2 to 5 m bgl range, thus in almost entire district the water levels are shallow i.e., within 10 m bgl. The deeper water levels of more than 20 m bgl are observed in few isolated patches, with the most prominent being located in north eastern part of Udgir taluka, however it reflects the water levels of deeper aquifer.

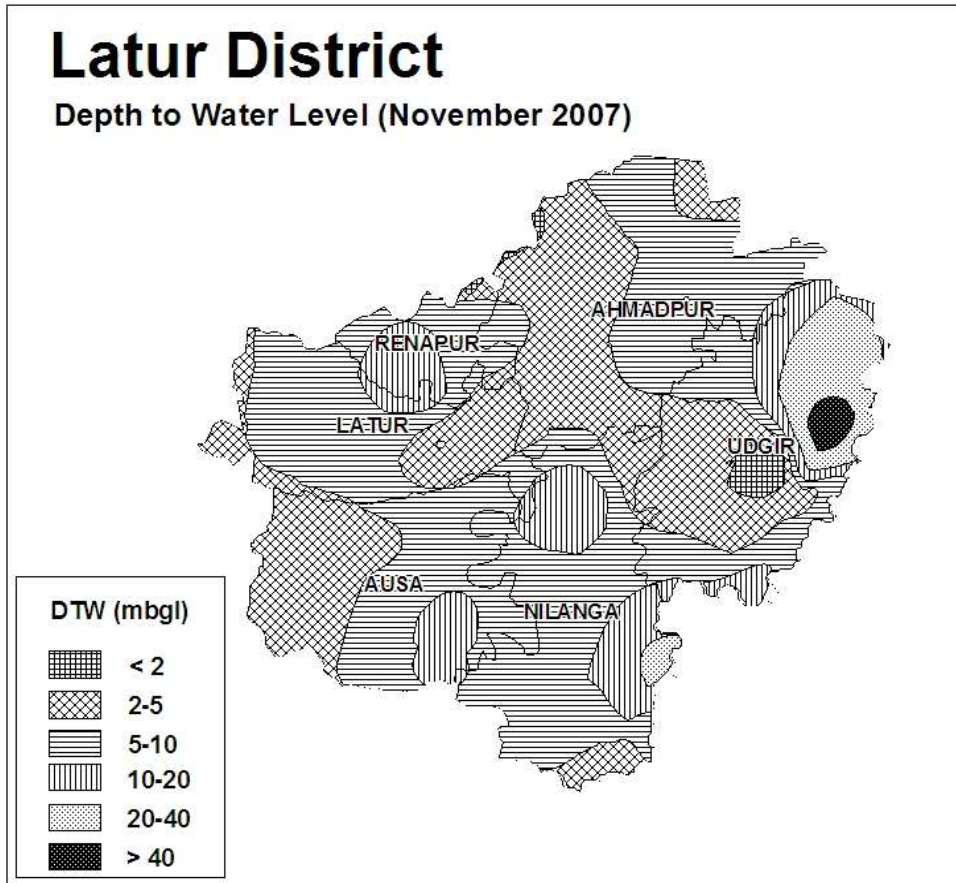


Figure-4: Depth to Water Level (Postmonsoon- Nov.2007).

4.2.3 Seasonal Water Level Fluctuation– (May to Nov. 2007)

Seasonal water level fluctuation between premonsoon and postmonsoon of 2007 have been computed. The rise in water levels in the range of 0.80 (Udgir) to 28.10 m (Deoni) are observed. However, fall in water levels ranging from 0.10 m (Patroli and Mogha) to 31.90 m (Nagalgaon) have been observed at few places. In major part of the district rise of more than 4 m is observed in southern, western and northern parts of the district occupying major parts of Udgir, Nilanga, Ausa, Latur and Ahmedpur. The fall in water levels have been observed in 2 patches, one occurring in north eastern part of Udgir taluka and another small one in central part of Renapur taluka.

4.2.4 Water Level Trend (1998-2007)

Trend of water levels for premonsoon and postmonsoon periods for last ten years (1998-2007) have been computed for 39 NHNS. Analysis of long term water level trend data indicates that during premonsoon period, rise in water levels has been recorded at 8 stations and it ranges between negligible and 0.99 m/year (Jalkot). Fall in water levels has been observed at 18 stations ranging from negligible to 1.54 m/year (Deoni). During postmonsoon period, rise in water levels has been recorded at 6 stations and it ranges from negligible to 0.22 m/year (Murud), whereas at 20 stations, fall in water levels ranging between 0.03 m/year (Borgaon Kale) and 0.99 m/year (Killari) is observed. Thus in major part of the district, both during pre and postmonsoon periods declining trend of water levels has been observed.

The premonsoon trend map was also prepared and the same is presented in **Figure-5**. It shows that the fall in water level trend of up to 20 cm/year is observed in major parts of the district, occupying southern, south eastern, west central, northwestern and northern parts of the district in almost entire Nilanga, Ausa, Latur and Renapur talukas and northern part of Ahmadpur and southern part of Udgir taluka. The rising trend of water levels up to 20 cm/year is observed in northern part of Udgir taluka and southern part of Ahmadpur taluka and western fringe areas of Latur and Ausa talukas. The perusal of premonsoon depth to water level and trend maps indicates that the areas of shallow water levels and rising trends as well as deeper water levels and falling/declining trend coincide. Thus it is imperative that these areas are prioritised for taking up future artificial recharge and water conservation structures.

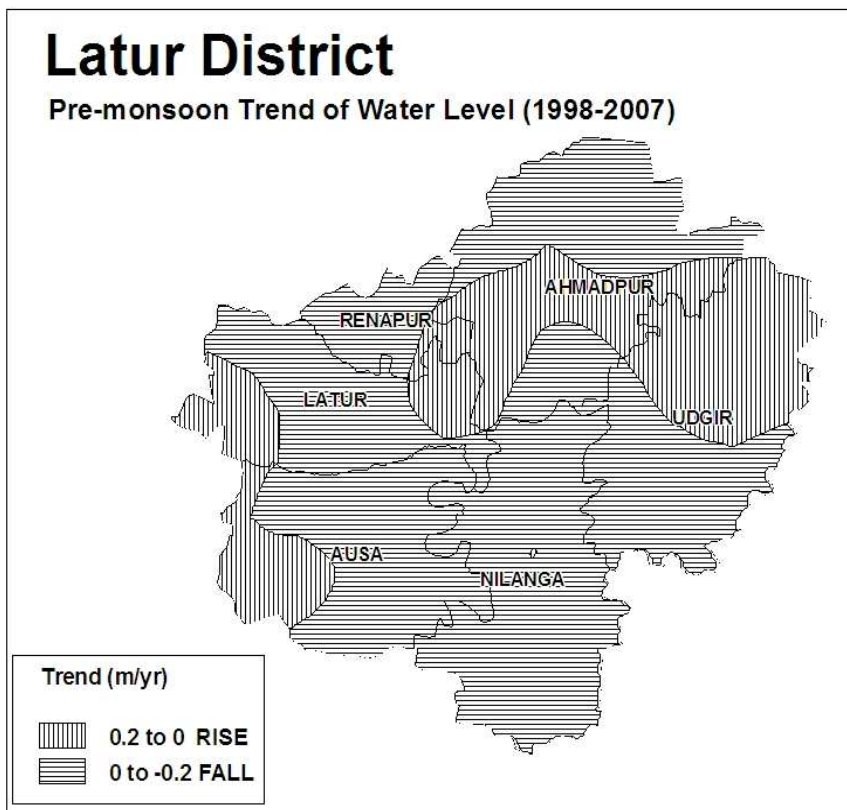


Figure-5: Water Level Trend (Premonsoon- 1998-2007).

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 type 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 m³/day during winter season and during summer season it varies from 25 to 100 m³/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 from 0.50 to 52.00 m³/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 m²/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 2004. The same are presented in Table-5. Ground water resources estimation was carried out for an area of 663548 ha out of which 44924 ha is under command and 618624 ha is non-command.

As per the estimation the total annual ground water recharge is 1203.63 MCM with the natural discharge of 67.29 MCM, thus the net annual ground water availability comes to be 1136.34 MCM. The total gross draft for all uses is estimated at 830.06 MCM with irrigation sector being the major consumer having a draft of 813.73 MCM. The draft for domestic and industrial sectors is worked at 16.33 MCM. The net annual ground water availability for future irrigation is 333.43 MCM, whereas the allocation for domestic and industrial requirements is

26.20 MCM. Stage of ground water development varies from 49.87% (Ahmedpur) to 90.38% (Renapur), whereas the overall stage of ground water development for the district is 73.05% which is quite high. Out of 7 talukas, 5 talukas have been categorised as “Safe” and 2 talukas i.e., Latur and Renapur have been categorised as “Semi-Critical”, however in 3 of the “Safe” talukas i.e., Ausa, Nilanga and Chakur, the stage of ground water development is about 70% or more. Similarly, the ground water resources were also assessed for all 39 watersheds, out of which 23 watersheds have been categorised as “Safe”, 10 watersheds (GV 96B, MR 16B, MR 20, MR 21B, MR 24, MR 25, MR26, MR 32B, MR 34, and MR 44) have been categorised as “Semi Critical”, and 6 watersheds (GV 97C, MR 15, MR 19, MR 33, MR 39 and MR 43) have been categorised as “Over-Exploited”.

In all these “Semi-Critical”, “Critical”, “Over-Exploited” watersheds and 2 “Semi-Critical” talukas viz., Latur and Renapur and Ausa, Nilanga and Chakur, talukas where the stage of ground water development is about 70% or more 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.

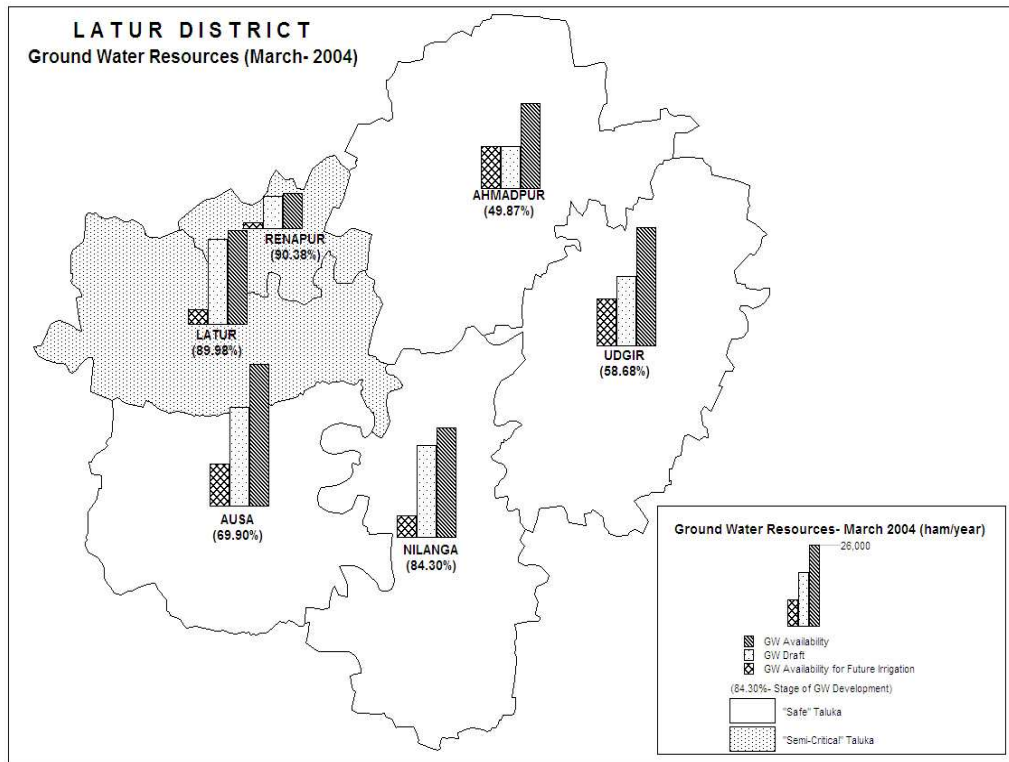


Figure-6: Ground Water Resources (March 2004).

Table 5:- Ground Water Resources (March 2004).

Taluka	Area type	Net annual ground water availability (ham/yr.)	Annual ground water draft (ham/yr.)			Allocation for domestic & industrial requirement supply up to next 25 years (ham/yr.)	Ground water availability for future irrigation (ham/yr.)	Stage of ground water development (%)	Category
			Irrigation	Domestic & industrial uses	Total				
Latur	Command	2781.22	3011.45	79.19	3090.65	69.77	424.68	111.13	Semi-Critical
	Non Command	14387.77	12166.16	191.91	12358.06	281.32	2224.17	85.89	
	Total	17168.98	15177.61	271.10	15448.71	351.09	2648.85	89.98	
Ausa	Command	1642.57	1520.84	25.48	1546.33	22.06	279.18	94.14	Safe
	Non Command	23959.94	16113.70	236.23	16349.93	472.46	7373.78	68.24	
	Total	25602.51	17634.54	261.71	17896.25	494.52	7652.96	69.90	
Udgir	Command	1714.99	876.17	50.99	927.16	98.50	740.33	54.06	Safe
	Non Command	19656.12	11389.34	224.37	11613.71	448.74	7818.03	59.08	
	Total	21371.11	12265.51	275.36	12540.87	547.24	8558.36	58.68	
Ahmedpur	Command	549.75	439.50	41.02	480.52	32.82	157.77	87.41	Safe
	Non Command	14948.13	7042.69	205.47	7248.17	374.45	7595.75	48.49	
	Total	15497.87	7482.19	246.50	7728.68	407.27	7753.52	49.87	
Nilanga	Command	980.84	760.05	24.24	784.29	37.51	225.79	79.96	Safe
	Non Command	18869.08	15639.49	309.02	15948.52	547.07	3764.44	84.52	
	Total	19849.92	16399.54	333.26	16732.80	584.58	3990.23	84.30	
Chakur	Command	685.92	347.67	8.85	356.52	11.78	353.37	51.98	Safe
	Non Command	6849.77	6207.05	122.98	6330.04	78.60	1273.32	92.41	
	Total	7535.69	6554.73	131.83	6686.56	90.38	1626.69	88.73	
Renapur	Command	1808.71	1852.30	23.49	1875.79	12.40	224.17	103.71	Semi-Critical
	Non Command	4798.85	4006.18	89.87	4096.05	133.03	888.59	85.35	
	Total	6607.56	5858.48	113.36	5971.84	145.43	1112.76	90.38	
District total	Command	10164.00	8807.98	253.27	9061.25	284.84	2405.29	89.15	
	Non Command	103469.65	72564.61	1379.86	73944.47	2335.67	30938.08	71.46	
	Total	113633.65	81372.59	1633.13	83005.72	2620.51	33343.37	73.05	

4.6 Ground Water Quality

In the district, 14 water samples were collected during May 2007. The geochemical classification of ground water samples is given in Table-6, whereas the Piper Diagram is presented in Figure-7.

Table 6: Geochemical Classification of Ground Water Samples.

Sr. No.	Classification	Type	No. of Samples	% of Samples
1	Alkaline earths exceeds alkali metals and weak acids exceeds strong acids	Ca-HCO ₃	10	72
2	Alkaline earths exceeds alkali metals and strong acids exceeds weak acids.	Ca-Cl	3	21
3	Alkaline earths, alkali metal, strong acids and weak acids = 50%.	Mixed Type	1	7
	Total		14	100

As all the samples are from Basaltic aquifer, the type of water present in these samples should be of Ca-HCO₃ type. But the perusal of Table-6 and Figure- 7 shows that 3 samples are having Ca-Cl type of water and indicating that the type of water in 3 samples has been changed from Ca-HCO₃ type to Ca-Cl type. This may be because of percolation of waste and wastewater containing high concentration of strong acid ions (Cl+NO₃+SO₄) to ground water. It also shows that the one sample is of mixed type, which was collected from the well located at Chapoli.

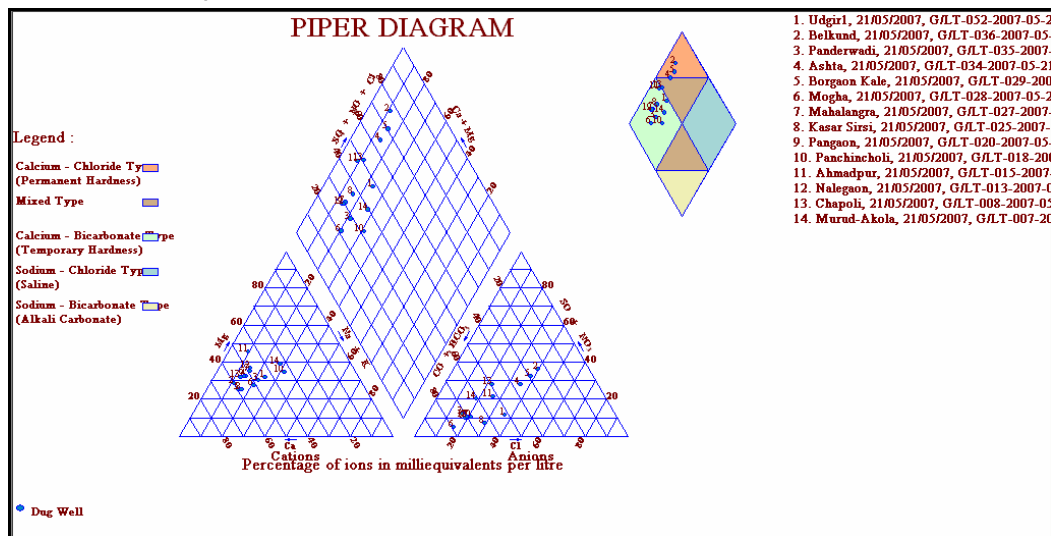


Figure 6: Piper Diagram.

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., TDS, TH, Ca, Mg, Cl, SO₄ and NO₃ prescribed in the standards and is given in **Table-7**.

Table 7: 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
TDS (mg/L)	500	2000	5	9	0
TH (mg/L)	300	600	2	9	3
Ca (mg/L)	75	200	5	9	0
Mg (mg/L)	30	100	5	9	0
Cl (mg/L)	250	1000	14	0	0
SO ₄ (mg/L)	200	400	14	0	0
NO ₃ (mg/L)	45	No relaxation	9	0	5
F (mg/L)	1.0	1.5	13	1	0

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

The perusal of **Table-7** shows that out of the 14 ground water samples, 3 samples (21.43 %) have TH concentration more than MPL (>600 mg/L), and 5 samples (35.71 %) have NO₃ concentration more than MPL (>45 mg/L), while the concentration of all the other parameters is less than MPL. This indicates that the potability of ground water is mainly affected due to NO₃ and TH.

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. Sodium Absorption Ratio (SAR) and Residual Sodium Carbonate (RSC) are the most important quality criteria, which influence the water quality and its suitability for irrigation.

4.6.2.1 Sodium Absorption Ratio (SAR)

Sodium Absorption Ratio (SAR) is an expression pertaining to cation make up of water and soil solution and is used for characterising the sodium hazard of irrigation water.

SAR value is used to calculate the degree to which irrigation water tends to enter into cation exchange section in the soil. The main problem with high sodium concentration is its effect on soil permeability. Sodium also contributes directly to the total salinity of the water and may be toxic to sensitive crops such as fruit trees. The higher value of SAR indicates soil structure damage.

4.6.2.2 Residual Sodium Carbonate (RSC)

Residual Sodium Carbonate (RSC) is considered to be superior to SAR as a measure of sodicity particularly at low salinity levels. The classification of ground water samples based on SAR and RSC values for its suitability for irrigation purpose is shown in Table-8. The perusal of Table-8 shows that the ground water samples from all the wells have SAR values less than 10. Similarly,

RSC values of all the samples are also below 1.25. Overall, the ground water quality in the wells monitored is good for irrigation purpose and there is a less possibility of developing sodium hazard.

Table 8: Classification of Ground Water for Irrigation based on SAR and RSC.

SAR	<10		10-18		18-26		>26	
Category	Good		Good to Permissible		Doubtful		Unsuitable	
Total Samples	No. of Samples	%	No. of Samples	%	No. of Samples	%	No. of Samples	%
14	14	100	Nil	Nil	Nil	Nil	Nil	Nil
RSC	<1.25		1.25-2.50		>2.50			
Category	Good		Doubtful		Unsuitable			
Total Samples	No. of Samples	%	No. of Samples	%	No. of Samples		%	
14	14	100	Nil	Nil	Nil		Nil	

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 1992-93, area irrigated by surface water is 52.75 sq.km., whereas ground water accounts for 252.18 sq.km. and the net irrigated area is 304.93 sq.km. However recent data (Minor Irrigation Census, 2000-01) indicates gigantic increase of about 3.5 times in the area irrigated by ground water, which is 868.58 sq.km., whereas surface water is accounting for 126.09 sq.km. of area and the net irrigated area stands at 994.67 sq.km. Thus it is clear that ground water is the major source of irrigation as it accounts for about 87.32% of net irrigated area. The district had 27943 irrigation dugwells, which create an irrigation potential of about 703 sq.km., out of which 611 sq.km. of irrigation potential is utilised. In addition to this 273 sq.km. of irrigation potential is created through 11455 shallow and deep borewells/tubewells out of which about 247 sq.km. of irrigation potential is utilised during 2000-01.

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 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 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 and Renapur talukas 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 m³/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 favourable 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 favourable, 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 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 and Renapur 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 36% of the samples collected in May 2007. Continues intake of high nitrate concentration water causes infant methaemoglobinemia, 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.

Till March 2008, MAP and WMTP have been not 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 2 talukas viz., Latur and Renapur 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 73%. 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 and Renapur as well as Ausa, Nilanga and Chakur, talukas where the stage of ground water development has already reached about 70% 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 and Renapur talukas 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 m³/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 36% of the samples collected in May 2007. 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.