

GULBARGA DISTRICT



FIG.15 GULBARGA DISTRICT

Sl.No.	CONTENTS	Page		Page
1)	Location	215	TABLE: COMPREHENSIVE ANALYSIS OF WATER QUALITY DATA	221
2)	Demography	215		
3)	Climate, Drainage and soil	215		
4)	Geology and Groundwater occurrence	215		
5)	Groundwater quality Characterization	216		
5.1	Physical characters	216	LIST OF FIGURES	
5.2	Chemical characters	217	FIG.15A FLUORIDE VARIATION (F)	222
5.3	Spatial variation	219	FIG.15B VARIATION OF TOTAL DISSOLVED SALTS (TDS)	223
6)	Conclusion	220	FIG.15C VARIATION OF TOTAL HARDNESS (TH)	224
			FIG.15D IRON VARIATION (Fe)	225

1. Location

Gulbarga district is located in the northern part of Karnataka State and has geographical area of 16224 sq. km. It is bounded by Bidar district of Karnataka and Sholapur district of Maharashtra State in the north, Hyderabad and Mehaboobnagar districts of Andhra Pradesh State in the east, Raichur district in the south and Bijapur district in the west. It lies between 76° 04' to 77° 32' E Longitude and 16° 10' to 17° 46' N Latitude.

2. Demography

According to the 1991 census, Gulbarga district has a total population of 2,582,169. There are as many 2,296 habitations / villages. Gulbarga is the district Head quarter and is the only major city in the district. It is also the Divisional Head quarter for the northern division of Karnataka. Gulbarga district has ten taluks viz: Afzalpur, Aland, Chincholi, Chitapur Gulbarga, Jevargi, Sedam, Shahapur, Shorapur and Yadgir.

3. Climate, Drainage and soil

Gulbarga district forms part of the northern Maidan region of Karnataka. It is drained by Krishna river system. The annual rainfall in the district varies from 450 to 1500 mm with an annual average of 700 mm. Majority of the rainfall is received during southwest monsoon season with 30-40 rainy days annually. Winter season is usually dry with lowest temperature of around 22°C. The hottest period is between March and June with maximum temperature reaching upto 43°C during May. The district has lateritic soils in the northeastern extremes, deep black soils in the central and southwestern extremes and rest of the area is covered by medium black soils.

4. Geology and Groundwater occurrence

The Peninsular gneisses and the younger granites of Closepet age are exposed in the southeastern part of the district. The granitoid masses, from the groundwater point of view, are classified as crystalline formations. The fracture / fissure system developed along with joints and faults traversing the rocks facilitate groundwater circulation and hold moderate quantity of water. The quality of groundwater is governed by the mineralogical composition of the rocks. The meta-sedimentary sequence representing Bhima series and consisting of Limestones, shales and slates are exposed in the central part of the district. The bedding planes, folds, faults and the fractures act as conduits for water movement as well as repository of groundwater. The open spaces such as subsurface caverns/solution channels in these areas, specifically in the limestone country, are the characteristic features that have been developed into potential irrigation sources. The structural features control the quantity and the lithological composition of the area governs the quality. The northern half of the district is covered by massive flood basalts called the "Deccan Traps" and the groundwater within these rocks occurs in upper weathered zone and permeable zones between the flows. The size and inter connectivity of the

vesicles, joint pattern, faults / fractures and intertrappean beds control the occurrence and movement of groundwater within the basalts. Basalts normally yield better quality water. Laterite capping seen generally act as shallow aquifers. Groundwater occurs generally in the water table conditions in the weathered and decomposed mantle and also under semi-confined conditions in the deeper fractures.

5. Groundwater quality characterization

To understand and gather information on groundwater quality, 5672 groundwater samples collected from 885 villages/habitations in Gulbarga district have been analysed by RDED.

The water samples have been analysed for 14 parameters only such as Turbidity, Colour, Conductivity, Hydrogen ion concentration (pH), Total Dissolved Salts (TDS), Total Hardness (TH), Calcium Hardness (CaH), Chloride (Cl), Sulphate (SO₄), Fluoride (F), Nitrate (NO₃), Alkalinity (Alk), Iron (Fe) and Bacteria. The data is presented in the Table.

5.1 Physical Characters

Turbidity

In the district, 196 samples show higher turbidity and it ranges between 10.5-150 JTU. The samples showing higher turbidity are from; Aland taluk (30 out of 665 samples), Jevargi (23 out of 477 samples), Sedam (21 out of 493 samples), Shorapur (22 out of 546 samples), Chincholi (22 out of 556 samples), Shahapur (15 out of 854 samples), Gulbarga (17 out of 494 samples), Chitapur (16 out of 321 samples), Afzalpur (19 out of 460 samples) and Yadgir (11 out of 843 samples). The water with highest turbidity is from Yadgir taluk.

Colour

In the total 42 samples covering 35 villages / habitations show the colour intensity more than desired in the range of 27 to 200 HU. Higher colour intensities recorded in different taluks are; Chitapur 30-200 HU (5 samples) followed by Yadgir 50-150 HU (6 samples), Shorapur 40-50 HU (4 samples), Afzalpur 30-80 HU (4 samples), Chincholi 35-75 HU (7 samples), Sedam 50 HU (One sample), Aland 30-50 HU (7 samples), Shahapur 30 HU (the lone sample), Gulbarga 27-70 HU (7 samples) and Jevargi has not reported any abnormal colour intensity.

Electrical Conductivity (EC)

In Gulbarga district, the EC value ranges from 100-623000 mmhos / cm. The range of EC value noted in the other taluks are; Afzalpur 110-404000 mmhos/cm, Aland 340-3140 mmhos/cm, Chincholi 270-61000 mmhos/cm, Chitapur 520-3430 mmhos/cm, Gulbarga 420-2870 mmhos/cm, Jevargi 400-86000 mmhos/cm, Sedam 460-3180 mmhos/cm, Shorapur 110-30980 mmhos/cm and Yadgir 100-

7030 mmhos/cm. The maximum value recorded is from Shahpur taluk (623000 mmhos/cm) while the minimum value is recorded from Yadgir taluk.

Hydrogen ion concentration (pH)

Only 81 samples covering 53 villages have shown the fluctuation in pH values from acidic to basic in the range of 5.98 to 9.53 with least (5.98) reported from Yadgir and highest (9.53) being reported from Shorapur. The range in pH values in other taluks are: Afzalpur (6.31 – 9.5, 7 samples), Aland (8.6 – 8.9, 9 samples), Chincholi (6.14-8.9, 10 samples), Gulbarga (6.4 – 8.9, 5 samples), Jevargi (6.36-8.84, 4 samples), Shahapur (6.32 – 8.9, 14 samples), Shorapur (6.31 – 9.53, 2 samples) and Yadgir (5.98 – 8.9, 29 samples).

5.2 Chemical Characters

Total Dissolved Salts (TDS)

Only 50 samples covering 48 villages / habitations have higher content of TDS in the range of 2008 to 8667 ppm. The ranges of abnormal TDS content in different taluks of the district are; Afzalpur (2075 – 8667 ppm, 11 samples), Aland (2200 ppm, the lone sample), Chitapur (2229 ppm, the lone sample), Jevargi (2142 ppm, the lone sample), Shahapur (2010-2450 ppm, 9 samples), Shorapur (2008 – 2477 ppm, 5 samples) and Yadgir (2134-3869 ppm, 22 samples). The highest value of 8667 ppm is reported from Afzalpur taluk.

Total Hardness (TH)

There are 1194 samples spread across 551 villages have indicated TH value in the range of 602-2990 ppm. The range of TH values above the permissible limit in taluks are: Afzalpur (611 – 2372 ppm, 45 samples), Aland (608 – 1364 ppm, 84 samples), Chincholi (603 – 1390 ppm, 42 samples), Chitapur (604 – 1282 ppm, 49 samples), Gulbarga (608 – 2736 ppm, 66 samples), Jevargi (604 – 1608 ppm, 103 samples), Sedam (602 – 1346 ppm, 100 samples), Shahapur (603-1902 ppm, 278 samples), Shorapur (602-1880 ppm, 137 samples) and Yadgir (602-2990 ppm, 290 samples). The maximum TH content (2990 ppm) is reported from Yadgir

Calcium Hardness (CaH)

There are as many as 772 samples spreading across 376 villages having higher CaH ranging from 201-1530 ppm. The maximum abnormal samples are from Shahapur (206 samples with CaH 201-844) taluk followed by Yadgir (199 samples with CaH 201-1530 ppm), Gulbarga (28 samples with CaH 202-380 ppm), Shorapur (85 samples with CaH 202-590 ppm), Jevargi (76 samples with CaH 201-416 ppm), Afzalpur (32 samples with CaH 201-562 ppm), Sedam (64 samples with CaH 202-360 ppm), Aland (46 samples with CaH 202-400 ppm), Chincholi (23 samples with CaH 202-354 ppm) and Chitapur (13 samples with CaH 201 – 308 ppm) taluks.

Chloride (Cl)

Only a few samples (10 No.s) have shown Cl content beyond the permissible limit ranging from 1037 and 1540 ppm. Four samples from Yadgir taluk have shown abnormality followed by 3 samples from Shahapur, 2 samples from Afzalpur and 1 sample from Chitapur taluk.

Sulphate (SO₄)

In the entire district, 131 samples covering 92 villages / habitations have (SO₄) content more than the permissible limit and ranges from 402-2118 ppm. Majority of these abnormal samples are from Afzalpur (24 samples), Shahapur (42 samples) followed by Shorapur (24 samples), Gulbarga, Jevargi, Yadgir (9 samples in each taluk), Sedam (7 samples) and Aland (6 samples) taluks. The highest SO₄ content of 2118 ppm is reported from Shahapur taluk.

Fluoride (F)

The analytical data has revealed that significant number of samples (1929) collected from 450 villages / habitations have shown higher fluoride content in the range of 1.6 to 16.3 ppm. Highest concentrations of fluoride (16.3 ppm) are reported from Shahapur taluk followed by Yadgir taluk (10.5 ppm). Rest of the taluks has the abnormality ranging between 1.6 to 7.6 ppm. The abnormal variation of Fluoride content reported from different taluks of Gulbarga district are; 3-7 ppm in Afzalpur (310 out of 460 samples), 3-7.6 ppm in Aland (469 out of 665 samples), 2-8 ppm in Chincholi (412 out of 556 samples), 2-7.5 ppm in Chitapur (217 out of 321 samples), 2-7 ppm Gulbarga (164 out of 494 samples), 1.6-7 ppm in Jevargi (175 out of 477 samples), 3-4 ppm Sedam (18 out of 493 samples), 1.7-16.3 ppm in Shahapur (65 out of 854 samples), 1.6-3 ppm in Shorapur (9 out of 546 samples) and 3-10.5 ppm in Yadgir (90 out of 843 samples). The concentration and presence of Fluoride in Shorapur and Sedam taluks is less significant when compared to the other taluks.

The mineralogical and lithological setup of the terrain is essentially devoid of fluoride bearing minerals, which can release Fluoride to groundwater system. Hence, the concentration of fluoride reported from the analysed samples is puzzling and needs through investigation with regard to its source.

Nitrate (NO₃)

Only 4 samples in the entire district have analysed NO₃ beyond the permissible limit in the range of 261-520 ppm. These samples are from Chincholi, Gulbarga, Shahapur and Yadgir (one sample in each taluk).

Alkalinity (Alk)

There are 88 samples in the district with excess Alkalinity in the range of 610-1244 ppm. The highest Alkalinity is reported from Afzalpur taluk. The ranges of

abnormality recorded in the different taluks are: Afzalpur 628–1244 ppm (12 samples), Gulbarga 612-644 ppm (4 samples), Jevargi 612 ppm (1 sample), Sedam 612–670 ppm (7 samples), Shahapur 610-880 ppm (21 samples), Shorapur 612-960 ppm (5 samples) and Yadgir 610 – 900 ppm (38 samples).

Iron (Fe)

As many as 872 samples spreading across 409 villages / habitations belonging to all the ten taluks of the district have shown excess concentration of iron in the range of 1.2 – 20.2 ppm. The highest Fe upto 20.2 ppm is reported from Afzalpur taluk (56 samples), followed by Shahapur taluk (108 samples) upto 11.2 ppm, Aland upto 10.2 ppm(123 samples) and upto 6 ppm in Jevargi taluk (95 samples). Chitapur (51 samples), Sedam (104 samples), Chincholi (76 samples), Gulbarga (73 samples) and Shorapur (66 samples) taluks have analysed upto 4 ppm and Yadgir taluk (121 samples) has analysed upto 3 ppm iron.

Bacteria (*E.coli*)

In total, 1919 samples covering 564 villages / habitations have shown the presence of hazardous organism *E.coli* in drinking water. The Bacterial count generally varies between 1-10 No.s per 100 ml of water. But, in case of Yadgir taluk, the maximum count has gone upto 52 Nos. per 100 ml of water.

5.3 Spatial Variation

Bacteria (*E.coli*)

A perusal of the bacterial incidence indicates that the bacterial incidence is a common phenomenon in the district.

Fluoride (F)

The map (Fig.15A) reveals that, excepting the southern most taluks of Shorapur, Shahapur, Yadgir and Sedam (barring few isolated patches), rest of the districts is having higher concentration of fluoride.

Total Dissolved Salts (TDS)

The isoconcentration map (Fig.15B) shows that, except for a very few small, isolated patches spread across the district; no major higher concentration is reported.

Total Hardness (TH)

The map (Fig.15C) depicts that, major portion of the district is having lower TH content and isolated patches of higher content are spread all over the district.

Iron (Fe)

The spatial variation map (Fig.15D) shows isolated patches of abnormal concentration of iron spreading unevenly throughout district. Major portion of the district is having iron concentration below the permissible limit.

6. Conclusion

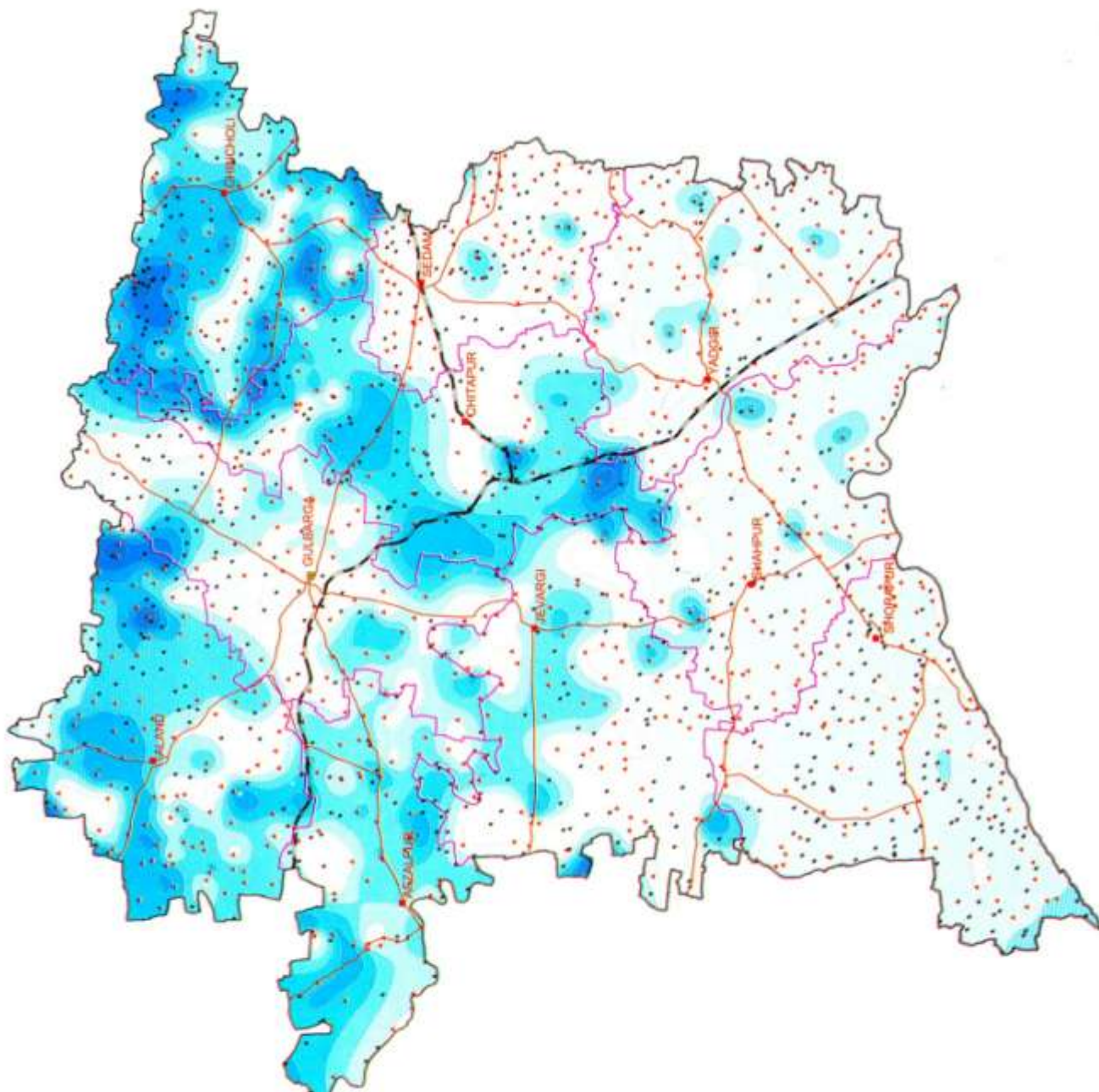
The water quality data of Gulbarga district has reflected the presence of excess Total Hardness, Fluoride, Iron and the Bacterial content. Hardness can be reduced by some conventional methods. In case of Fluoride, utmost care has to be taken, since many samples have analyzed excess of Fluoride. Though a little amount of Fluoride is essential for the bone development in the infants, excess consumption of Fluoride will induce physical disabilities and Dental Fluorosis. Therefore, it is very essential to treat the water to the desirable standard before it is supplied for the drinking purpose. Proper development of the source and usage of galvanised iron or PVC pipes and proper casing can reduce the iron content. The most important component, which is much more harmful, is the presence of Bacteria viz., *E. coli* in drinking water. The consumption of such water may cause the diseases such as Malaria, Diarrhea etc. Probably, these organisms have been introduced into the groundwater regime by anthropogenic activities. This clearly indicates non-hygienic / poor sanitation condition prevailing at village levels. To overcome this both the user and the administrator must be trained properly and awareness has to be created regarding hygienic aspects.

In the case of Gulbarga district, flood basalts cover vast area. The basalts consist of horizontal flows of varying hydrogeological properties. Generally, horizontal transmissivity will be higher than the vertical transmissivity in these flows and due to this characteristic there is more possibility of lateral migration of the pathogens. Hence, maximum care has to be taken at the point source itself to avoid pollution of the water source.

Table: Comprehensive analysis of water quality data of Gulbarga District

SL NO.	Name of the taluks	Number of villages/habitations	Number of sampled villages	Number of samples analysed	Water quality scenario	Bact (c/100 ml)-0	Tur (10 JTU)	Color (25 HU)	Cond – miminos /cm	pH (6.5-8.5)	TDS (2000 ppm)	TH (600 ppm)	Ca/H (200 ppm)	Cl (1000 ppm)	SO ₄ (400 ppm)	F (1.5 ppm)	NO ₃ (100 ppm)	AlK (600 ppm)	Fe (1) ppm	
1	Alzajpur	106	64	460	No. of samples beyond permissible limit	65	19	4	-	7	11	45	32	2	24	310	-	12	55	
					No. of Village affected	33	14	4	-	6	21	121	78	1	41	56	-	6	29	1.2-20.2
					Range	1-3	10.5-66.3	30-80	110-404000	6.31-9.5	2075-8667	611-2372	201-562	1037-1193	405.4-1186	3.7	-	628-1244	-	-
2	Aland	159	108	665	No. of samples beyond permissible limit	50	30	7	-	9	1	84	46	-	6	469	-	-	123	
					No. of Village affected	38	26	6	-	8	1	40	23	-	3	92	-	-	53	1.2-10.2
					Range	1-2	11.77	30-50	340-3140	8.6-8.9	2200	608-1364	202-400	-	402-435	3-7.6	-	-	-	-
3	Chuncholi	203	108	556	No. of samples beyond permissible limit	72	22	7	-	10	-	42	23	-	1	412	1	-	76	
					No. of Village affected	1-8	12.3-128	30-75	270-61000	6.14-8.9	-	603-1390	202-354	-	1298	2-8	408	-	1.1-3	
					Range	1-43	16	5	-	1	1	49	13	1	-	217	-	-	51	
4	Chitapur	166	50	321	No. of samples beyond permissible limit	35	9	3	-	1	1	24	9	1	-	41	-	-	27	
					No. of Village affected	1-8	11-43	30-200	520-3430	6.48	2229	604-1282	201-308	1279	-	2.7-5	-	-	1.2-6	
					Range	1-85	17	7	-	5	-	66	28	-	9	164	1	4	73	
5	Gulbarga	132	73	494	No. of samples beyond permissible limit	64	12	6	-	4	-	35	17	-	6	54	1	3	33	
					No. of Village affected	1-8	11-95	27-70	420-2870	6.4-8.9	-	608-2736	202-380	-	416-593	2-7	261	612-644	1.2-3	
					Range	1-112	23	-	-	4	1	103	76	-	9	175	-	1	95	
6	Jevargi	149	83	477	No. of samples beyond permissible limit	43	17	-	-	3	1	50	37	-	8	37	-	-	44	
					No. of Village affected	1-6	11-1.94	-	400-86000	6.36-8.84	2142	604-1608	201-416	-	410-574	1.6-7	-	612	1.2-6	
					Range	1-153	21	1	-	-	-	100	64	-	7	18	-	7	104	
7	Sedam	126	70	493	No. of samples beyond permissible limit	45	15	1	-	-	-	31	23	-	4	8	-	-	38	
					No. of Village affected	1-6	11-77	50	460-3180	-	-	602-1346	202-360	-	407-955	3-4	-	612-670	1.2-4	
					Range	1-153	15	1	-	14	9	278	206	3	42	85	1	21	108	
8	Shajapur	161	122	854	No. of samples beyond permissible limit	84	11	1	-	7	7	79	67	2	14	29	1	11	46	
					No. of Village affected	1-10	12-59	30	130-623000	6.32-8.9	2010-2450	603-1902	201-844	1046-1540	1.7-16.3	436	610-880	1.2-11.2		
					Range	1-123	22	4	-	2	5	137	85	-	24	9	-	5	66	
9	Shorapur	215	95	546	No. of samples beyond permissible limit	53	17	3	-	2	4	59	41	-	12	8	-	-	36	
					No. of Village affected	1-8	11-92	40-50	110-30980	6.31-9.53	2008-2477	602-1880	202-590	-	415-856	3	-	612-960	1.1-4	
					Range	1-490	11	6	-	29	22	290	199	4	9	90	1	38	121	
10	Yadgir	145	112	843	No. of samples beyond permissible limit	97	9	6	-	15	13	89	72	3	3	34	1	22	59	
					No. of Village affected	1-52	17-150	50-150	100-7030	5.98-8.9	2134-3869	602-2990	201-1530	1020-1286	435-1040	3-10.5	520	610-900	1.2-3	
					Range	1-1919	196	42	-	81	50	1194	772	10	131	1929	4	88	872	
Total		1562	885	5709	No. of samples beyond permissible limit	564	150	35	-	53	48	551	376	7	92	450	4	52	409	
					No. of villages affected	1-52	11-150	27-200	100-623000	5.98-9.53	2008-8667	602-2990	201-1530	1037-1540	1.6-16.3	261-520	610-1244	1.2-20.2		
					Range	1-152	11-150	27-200	100-623000	5.98-9.53	2008-8667	602-2990	201-1530	1037-1540	1.6-16.3	261-520	610-1244	1.2-20.2		

GULBARGA DISTRICT
FIG.15A : FLUORIDE VARIATION



LEGEND

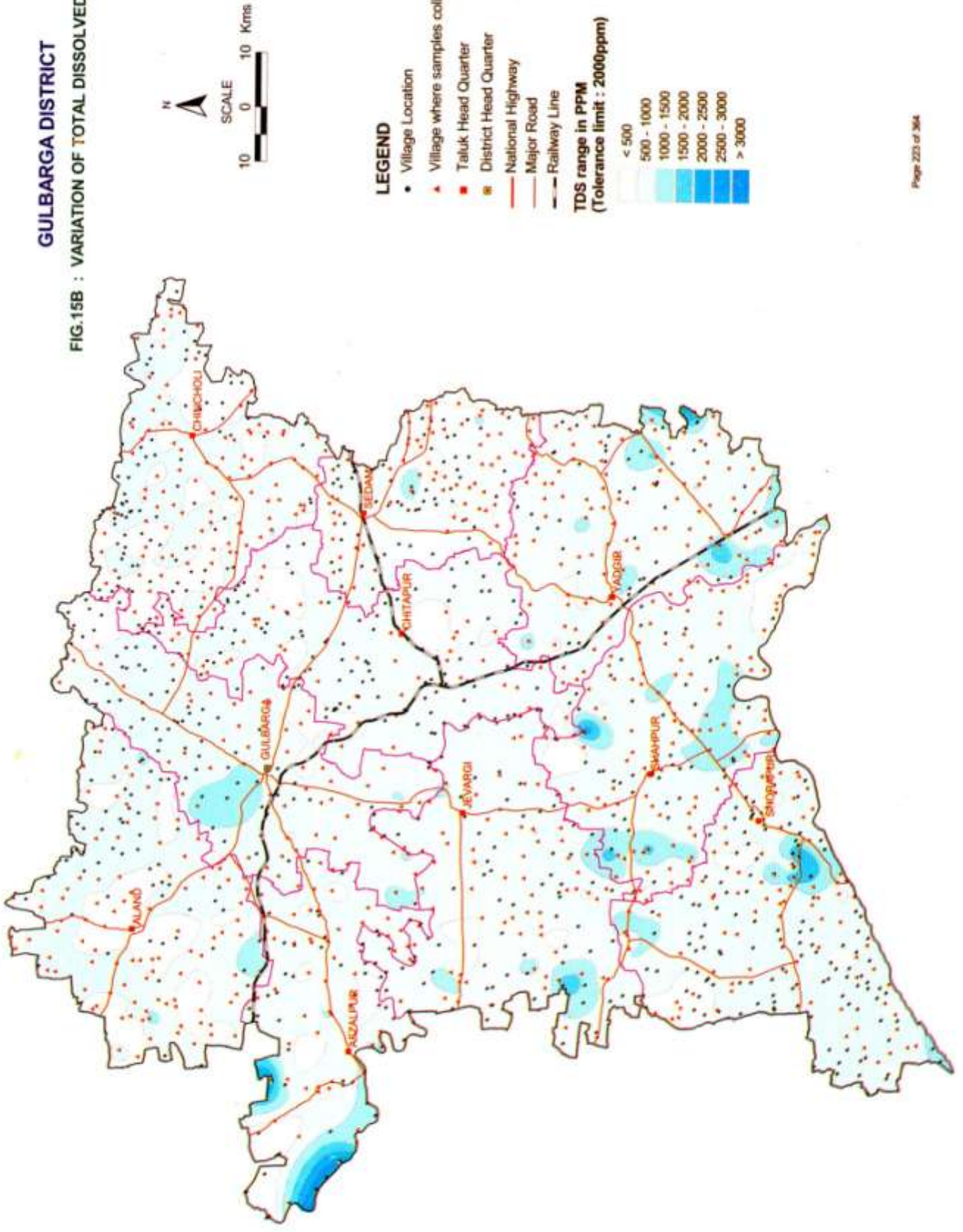
- Village Location
- ▲ Village where samples collected / Analysed
- Taluk Head Quarter
- District Head Quarter
- National Highway
- Major Road
- Railway Line

Fluoride in PPM
(Tolerance limit : 1.5ppm)



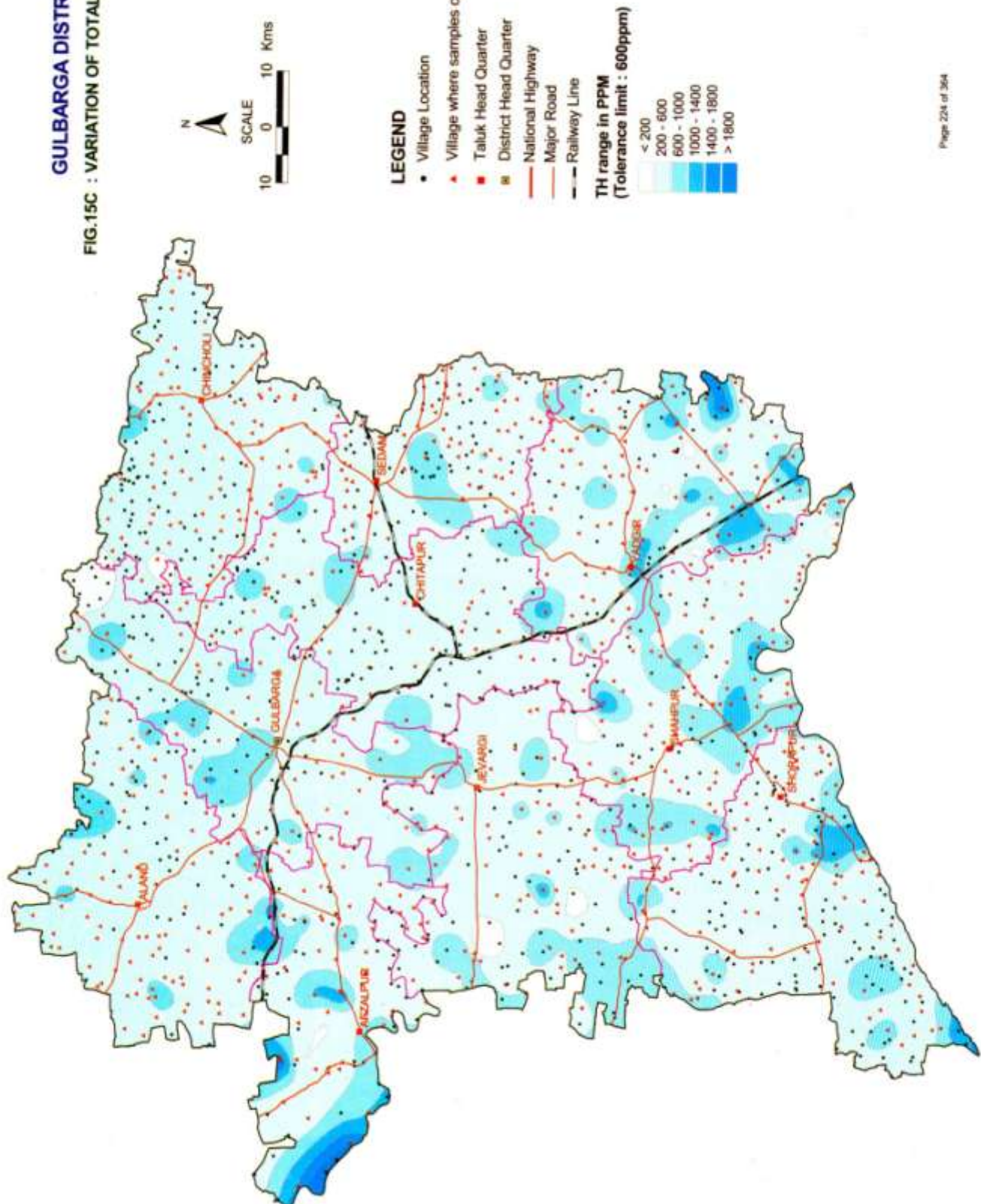
GULBARGA DISTRICT

FIG.15B : VARIATION OF TOTAL DISSOLVED SALTS (TDS)



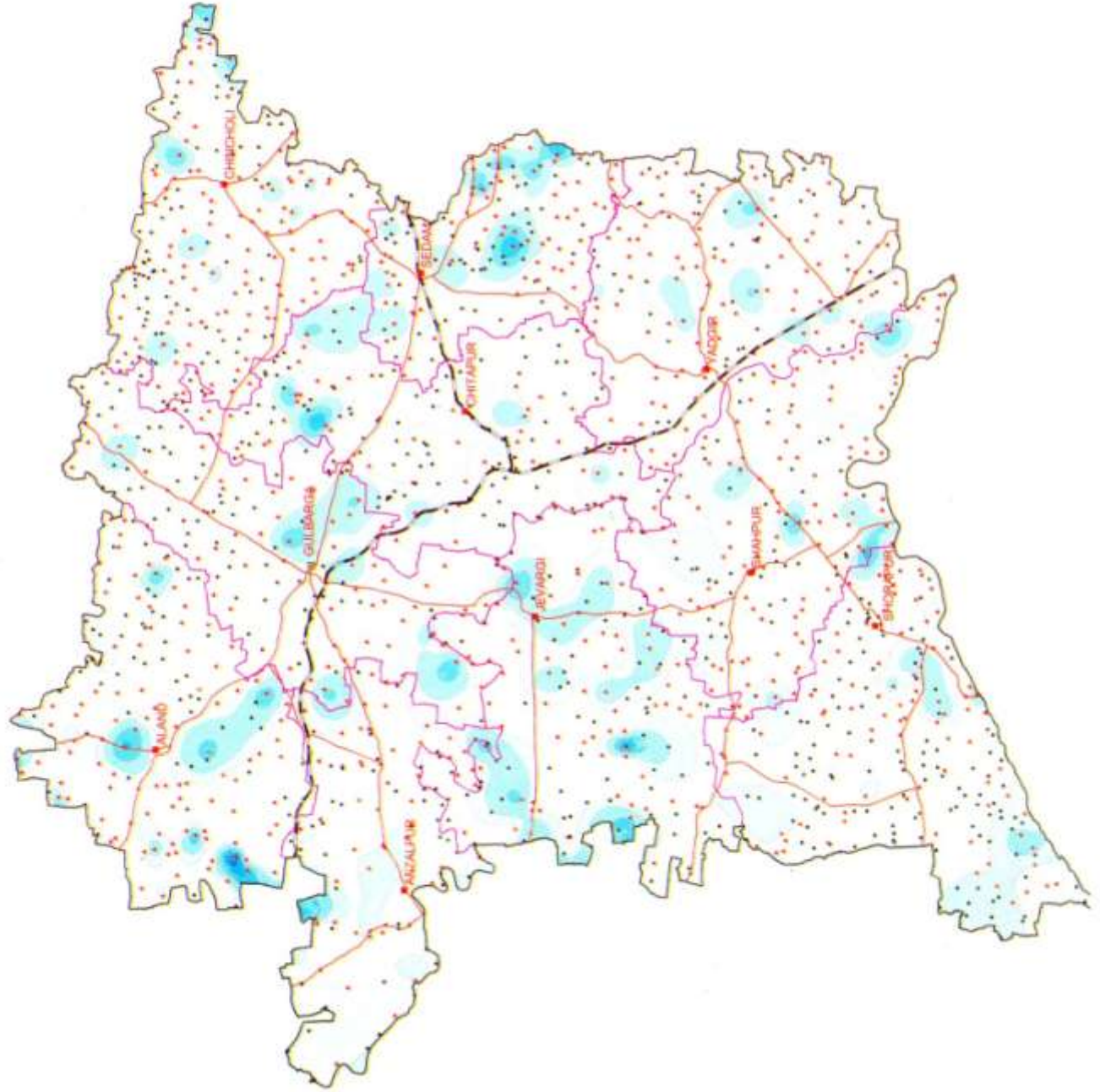
GULBARGA DISTRICT

FIG.15C : VARIATION OF TOTAL HARDNESS (TH)



GULBARGA DISTRICT

FIG.15D : IRON VARIATION



LEGEND

- Village Location
 - Village where samples collected / Analysed
 - Taluk Head Quarter
 - District Head Quarter
 - National Highway
 - Major Road
 - Railway Line
- Fe range in PPM (Tolerance limit : 1ppm)**

