

HAVERI DISTRICT



FIG.17 HAVERI DISTRICT

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1. Location

Haveri district is located in the northern part of Karnataka State with geographical area of 4851 sq. km. The district is bounded by Davanagere district on eastern and southeastern side, Gadag and Dharwad district on northern side, Uttara Kannada district on western side and Shimoga district on the southwestern side. It lies between 14° 16' to 15° 10' N Latitude and 75° 01' to 75° 50' E Longitude.

2. Demography

As per the 1991 census, Haveri district has a population of 1,269,213. The total number of villages / habitations in the district are 630. Haveri district has 7 taluks viz. Byadgi, Hanagal, Haveri, Hirekerur, Ranibennur, Savanur and Shiggaon.

3. Climate, Drainage and Soil

Haveri district forms part of the maidan area and receives an annual rainfall between 450-700 mm. The rainfall is confined to the monsoon period with most of the precipitation occurring between June and September. Tungabhadra and Varada rivers drain the district and Tungabhadra forms the boundary between Haveri and Bellary districts. Haveri district experiences temperature variation between 18^o to 38^o C. Red and medium black soils cover the district.

4. Geology and Groundwater occurrence

In general, major portion of the district consists of greywackes which are hard and compact rocks lacking primary porosity. Deeper fractures are seldom present because of compactness. Groundwater occurrence is confined to the weathered mantle only. As such limited quantity of water of poorer quality occurs in these rocks. Quartz-chlorite schist, metavolcanics and iron formations are also exposed. From the groundwater point of view, the schistose rocks are poor aquifers and yield very less quantity of water of poorer quality. The joint pattern controls movement of water in the metavolcanic rocks and normally yields better quality water. Groundwater occurs in the water table conditions mainly in the weathered mantle and rarely under semi-confined conditions.

5. Groundwater quality characterization

To understand and gather information on groundwater quality, 3519 samples collected from 728 villages / habitations in Haveri district have been analysed by RDED.

The water samples have been analysed for only 14 parameters 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, 502 samples covering 197 villages have shown higher turbidity ranging between 10.1 and 120 JTU. The samples showing higher turbidity are from Hanagal (415 out of 843 samples) and Haveri (87 out of 439 samples) taluks. No abnormal turbidity is recorded from the Byadgi, Hirekerur, Ranibennur, Savanur and Shiggaon taluks.

Colour

No abnormality in colour intensity is reported in the entire district.

Electrical Conductivity (EC)

The range of EC values in the different taluks are: Byadgi 228 to 4347 mmhos/cm, Hanagal 200 to 7000 mmhos/cm, Haveri 800 to 9500 mmhos/cm, Hirekerur 8 to 9872 mmhos/cm, Ranibennur 13 to 7258 mmhos/cm, Savanur 185 to 14230 mmhos/cm and Shiggaon 1032 to 2330 mmhos/cm.

Hydrogen Ion Concentration (pH)

About 122 samples covering 65 villages have shown the pH value in the range of 8.51 to 9.13 (all are basic in nature) with highest (9.13) being reported from Choudal village of Savanur taluk. The range of pH values recorded in the other taluks are Byadgi 8.6 to 8.7 (2 samples), Hirekerur 8.6 to 8.9 (12 samples), Ranibennur 8.6 to 9 (18 samples) and Savanur 8.51 to 9.13 (90 samples). No abnormal pH values have been recorded from Hanagal, Haveri and Shiggaon taluks.

5.2 Chemical characters

Total Dissolved Salts (TDS)

Fifty-eight samples covering 41 villages / habitations have higher content of TDS in the range of 2017 to 5430 ppm. The ranges of abnormal TDS content in different taluks are Byadgi 2231 to 2347 ppm (3 samples), Hirekerur 2037 to 5430 ppm (10 samples), Ranibennur 2280 to 3992 ppm (8 samples) and Shiggaon 2017 to 4564 ppm (37 samples). The highest value of 5430 ppm is reported from Kachavi village in Hirekerur taluk. Hanagal, Haveri and Savanur taluks have recorded TDS content within the permissible limit.

Total Hardness (TH)

There are 661 samples spread across 265 villages indicating higher TH value and it ranges from 604 to 4320 ppm. The ranges of TH values in different taluks are Byadgi 604 to 2264 ppm (59 samples), Hirekerur 604 to 2508 ppm (142 samples), Ranibennur 604 to 4320 ppm (190 samples), Savanur 604 to 1880 ppm

(142 samples) and Shiggaon 604 to 2040 ppm (128 samples). The maximum TH content (4320-ppm) is reported from Nandihalli village in Ranibennur taluk.

Calcium Hardness (CaH)

There are 354 samples spread across 169 villages having CaH above the standard limit ranging from 201 to 1424 ppm. The maximum abnormal samples are from Byadgi (143 samples with CaH 204 to 1424 ppm), Shiggaon (65 samples with CaH 201 to 744 ppm), Ranibennur (60 samples with CaH 202 to 845 ppm), Hirekerur (51 samples with CaH 203 to 608 ppm), Savanur (15 samples with CaH 205 to 1159 ppm), Hanagal (12 samples with CaH 203 to 278 ppm) and Haveri (8 samples with CaH 221 to 324 ppm) taluks.

Chloride (Cl)

Only 28 samples analysed from 25 villages / habitations have shown Cl content beyond the permissible limit ranging from 1008 to 3750 ppm. The abnormal Cl content noted in other taluks are Byadgi 1064 to 1946 ppm (6 samples), Hirekerur 1016 to 3750 ppm (7 samples), Ranibennur 1028 to 2806 ppm (12 samples) and Shiggaon 1008 to 1250 ppm (3 samples). Highest Cl content of 3750 ppm is reported from Kachavi village of Hirekerur taluk. Hanagal, Haveri and Savanur taluks have shown the Chloride content to be within the permissible limit.

Sulphate (SO₄)

In the entire district, only 9 samples from Shiggaon taluk have shown the higher Sulphate content ranging between 462 to 596 ppm. Byadgi, Hanagal, Haveri, Hirekerur, Ranibennur and Savanur taluks have Sulphate content within permissible limit.

Fluoride (F)

The analytical data has revealed that, 145 samples from 77 villages / habitations have shown abnormal Fluoride content in the range of 1.52 to 10.8 ppm. The concentrational variations in different taluks are Byadgi 1.56 to 1.57 ppm (2 samples), Hanagal 10.8 ppm (the lone sample), Hirekerur 1.52 to 2.64 ppm (54 samples), Ranibennur 1.53 to 3.04 ppm (65 samples) and Savanur 1.6 to 2.7 ppm (23 samples). Highest concentration of Fluoride (10.8 ppm) is reported from Neragal village in Hanagal taluk. Haveri and Shiggaon taluks have Fluoride content within the permissible limit.

Nitrate (NO₃)

Only 36 samples covering 13 villages / habitations have analysed NO₃ content beyond the permissible limit ranging from 100.65 to 2104 ppm. These samples are from Hirekerur 108 to 124 ppm (5 samples), Savanur 100.65 to 301.42 ppm (29 samples) and Shiggaon 1128 to 2104 ppm (2 samples). Byadgi, Hanagal, Haveri and Ranibennur taluks have Nitrate content within the permissible limit.

Alkalinity (Alk)

Only 14 samples in the entire district have analysed alkalinity in excess of the permissible limit ranging from 604 to 11025 ppm. They are from Hirekerur 648 ppm (3 samples), Ranibennur 604 to 768 ppm (9 samples), Savanur 611 ppm (the lone sample) and Shiggaon 11025 ppm (the lone sample). Byadgi, Hanagal and Haveri taluks have shown the Alkalinity content to be within the permissible limit.

Iron (Fe)

Quite a good number, 478 samples from 198 villages have analysed iron in excess of the permissible limit in the range of 1.2 to 5 ppm. These samples are from Haveri (117 samples) and Hangal (361 samples) taluks. The other taluks viz. Byadgi, Hirekerur, Ranibennur, Savanur and Shiggaon have shown iron content to be within the permissible limit.

Bacteria (*E.coli*)

There are 339 samples covering 212 villages showing the presence of Bacteria. The bacterial count in the district cannot be given since the analytical data has not specified the number of bacteria in particular samples. Except Hirekerur taluk, all the other taluks of the district have shown the incidence of Bacteria.

5.3 Spatial Variation

Bacteria (*E.coli*)

The map indicates that, bacteria are more commonly seen in the analysed water samples. While Hirekerur taluk is completely devoid of bacterial incidence, Savanur taluk is most affected in the district.

Fluoride (F)

The isoconcentration map (Fig.17A) depicts that, generally fluoride concentration is fairly constant and within the permissible limit. However, few isolated patches having higher fluoride content are seen in the southeastern and northern portions of the district covering Ranibennur, Hirekerur and Savanur taluks respectively.

Total Dissolved Salts (TDS)

The isoconcentration map generated (Fig.17B) shows that, excepting two patches in the southeastern portion, generally the TDS content is within the permissible limit.

Total Hardness (TH)

Total Hardness isoconcentration map (Fig.17C) reveals that, the higher content of TH in the form of ovoidal and lensoidal patches are confined to northern portion

comprising Shiggaon and Savanur taluks and southern portion encompassing Ranibennur, Byadgi and Hirekerur taluks.

Iron (Fe)

The spatial variation map (Fig.17D) shows that, isolated patch of abnormal concentration of iron is localised to western part of the district comprising of Hangal taluk. Few isolated patches are seen in Haveri taluk also.

6. Conclusion

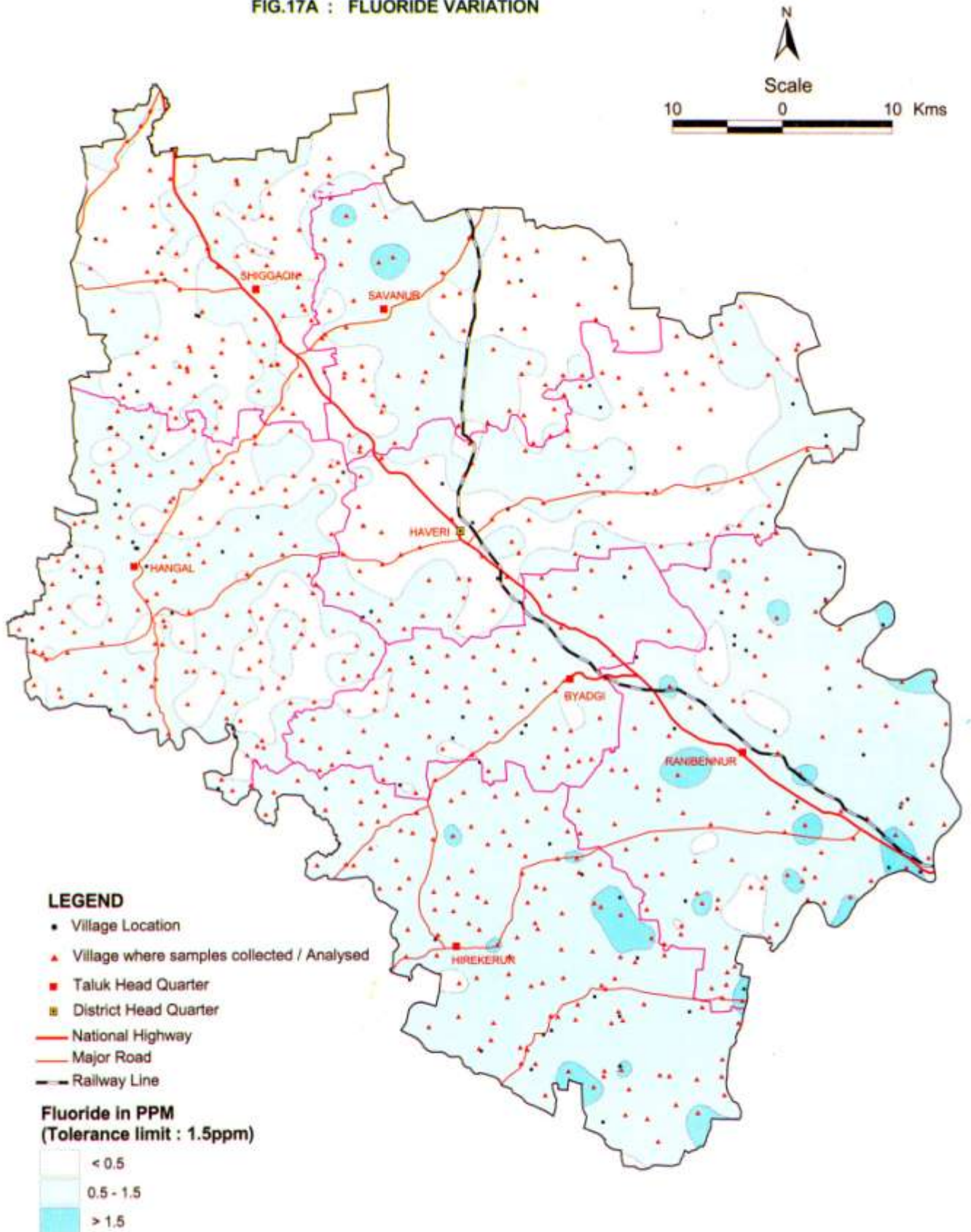
The water quality data of Haveri district has reflected the presence of excess Total Hardness, Calcium Hardness, Iron and the Bacteria. Hardness can be reduced by conventional methods. In case of Fluoride, utmost care has to be taken, since many samples have analyzed excess Fluoride. Though a little 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. The organisms might 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.

Table: Comprehensive analysis of water quality data of Haveri District

Sl. NO.	Name of the taluks	Number of villages/habitations	Number of sampled villages	Number of samples analysed	Water quality scenario	Bact (cfu/100 ml)>0	Tur (10) JTU	Color (23) HU	Cond – mmhos /cm	pH (6.5-8.5)	TDS (2000) ppm	TH (600) ppm	CaH (200) ppm	Cl (1000) ppm	SO ₄ (400) ppm	F (1.5) ppm	NO ₃ (100) ppm	Alk (600) ppm	Fe (1) ppm	As (0.05) ppm
1	Biyadgi	70	62	210	No. of samples beyond permissible limit No. of Village affected	10 1-3	-	-	-	2 2	3 3	59 32	143 54	6 6	-	2	-	-	-	-
2	Hanagal	173	175	843	No. of samples beyond permissible limit No. of Village affected	110 68	415 146	-	228-4437 200-7000	8.6-8.7 -	2231-2347 -	604-2264 -	204-1424 7	1064-1945 -	-	1.56-1.57 1	-	-	361 137	-
3	Haveri	101	92	439	No. of samples beyond permissible limit No. of Village affected	53 40	87 51	-	200-7000 800-9500	-	-	-	8 8	-	-	-	-	-	117 61	-
4	Hirekour	138	124	582	No. of samples beyond permissible limit No. of Village affected	-	-	-	-	12 8	10 10	142 63	51 28	7 7	-	54 23	5 4	3 3	-	
5	Ranbenur	124	114	426	No. of samples beyond permissible limit No. of Village affected	5 5	-	-	8-9872 -	8.6-8.9 18	2037-5430 8	604-2508 190	203-608 60	1016-3750 12	-	1.52-2.64 65	108-124 -	648 9	-	
6	Savanur	64	63	375	No. of samples beyond permissible limit No. of Village affected	146 56	-	-	13-7258 -	90 41	2280-3992 -	604-4320 142	202-845 15	1028-2806 -	-	1.53-3.04 23	29 7	1 1	26 11	
7	Shiggaon	101	98	644	No. of samples beyond permissible limit No. of Village affected	15 15	-	-	185-14230 -	8.51-9.13 -	37 22	128 46	65 29	3 3	9 9	-	2 2	1 1	-	
Total		771	728	3519	No. of samples beyond permissible limit No. of villages affected	339 212	502 197	-	1032-2330 -	122 65	58 41	661 265	354 169	28 25	9 9	145 77	36 13	14 11	478 198	26 11

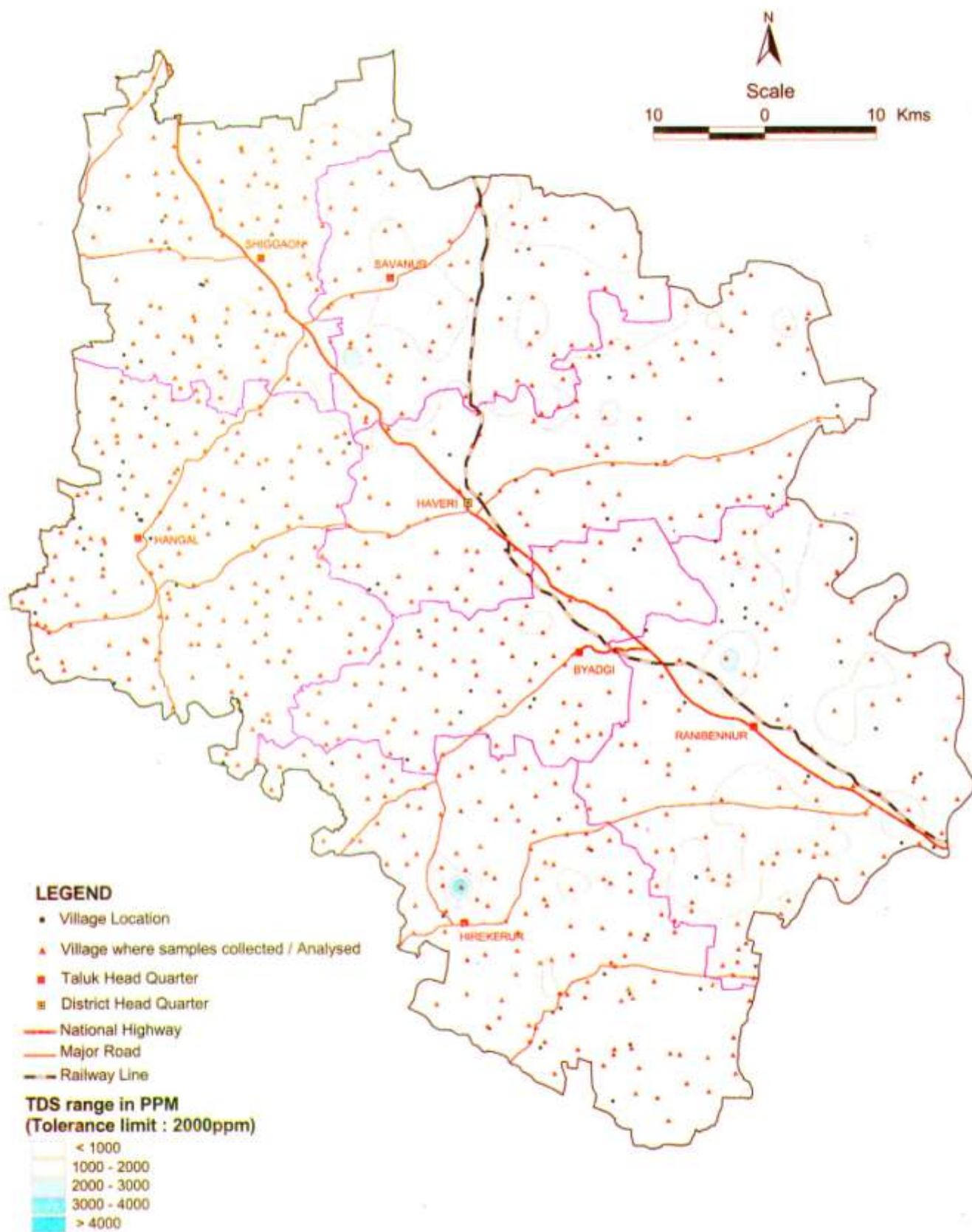
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FIG.17A : FLUORIDE VARIATION



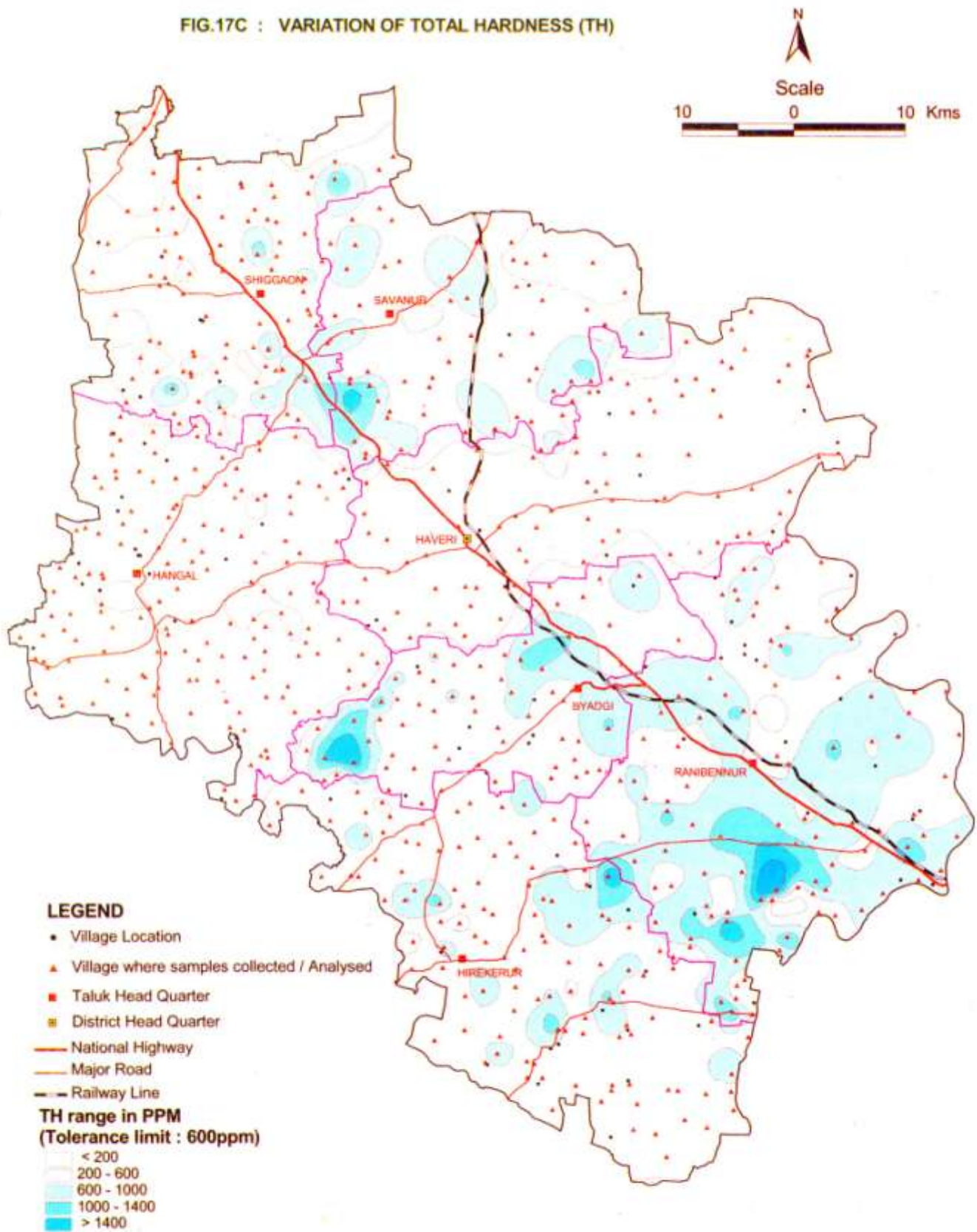
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FIG.17B : VARIATION OF TOTAL DISSOLVED SALTS (TDS)



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FIG.17C : VARIATION OF TOTAL HARDNESS (TH)



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FIG.17D : IRON VARIATION

