



# केन्द्रीय भूमिजल बोर्ड

जल शक्ति मंत्रालय, जल संसाधन, नदी विकास और गंगा संरक्षण विभाग  
भारत सरकार

## Central Ground Water Board

Ministry of Jal Shakti,  
Department of Water Resources, River Development  
and Ganga Rejuvenation  
Government of India

Report on

## **AQUIFER MAPPING AND MANAGEMENT PLAN**

**Yellapura Taluk, Uttara Kannada District,  
Karnataka**

दक्षिण पश्चिमी क्षेत्र, बेंगलुरु

South Western Region, Bengaluru

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# AQUIFER MAPS AND MANAGEMENT PLAN, YELLAPURA TALUK, UTTARA KANNADA DISTRICT, KARNATAKA STATE

(AAP – 2022-2023)



By

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# **AQUIFER MAPS AND MANAGEMENT PLAN, YELLAPURA TALUK, UTTARA KANNADA DISTRICT, KARNATAKA STATE**

## **1. SALIENT INFORMATION**

Name of the Taluk: **Yellapur**

District: Uttar Kannada

State: Karnataka

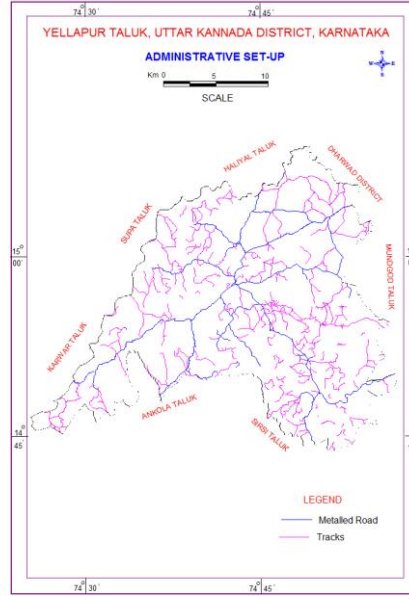
Area: 1463 sq.km.

Population: 78662 (Census 2011)

Normal Annual Rainfall: 2668 mm

### **1.1 Aquifer Management Study Area**

Aquifer mapping studies have been carried out in Yellapur taluk, Uttar Kannada district of Karnataka, covering an area of 1463 sq. kms under National Aquifer Mapping Project during the Annual action Plan of 2022-23. Yellapur taluk of Uttar Kannada district is located between North Latitudes 14°43'51.6" and 15°09'10.8" and East Longitudes between 74° 25'17.8" to 74°56'48.9" and is falling in Survey of India Toposheet No 48 I/12, 16 and 48 J /9 and 13. The study area is bounded on the North by Haliyal taluk, on the East by Mundgod taluk on the South by Sirsi taluks and on the west by parts of Supa and Karwar taluk of Uttar Kannada district. Location map of Yellapur taluk of Uttar Kannada district is presented in **Figure-1.1**. Yellapur is the taluk head quarter and there are 125 villages in total, out of which 144 are habited and 1 is inhabited.



**Figure 1.1: Location Map of Yellapur Taluk, Uttar Kannada district**

## 1.2 Population

According to 2011 census, the population of Yellapur taluk is 78662. Out of which, 39813 are males and 38849 are females. The rural population is 58210, of which 29563 are male and 28647 are female. The urban population is 20452, of which 10250 are male and 10202 are female. The average sex ratio of Yellapur taluk is 976. The Yellapur taluk has an overall population density of 60 persons per sq.km which contribute to 5.47% share of the total population. The decadal variation in population from 2001-2011 is 7.03 % in Yellapur taluk. Total households in the taluk are 18155, of which 13350 belong to rural areas and 4805 belong to urban area. In total, there are 15 Gram Panchayat in the taluk. There is one urban town in the taluk.

## 1.3 Rainfall

Yellapur taluk enjoys tropical monsoon climate. The taluk belongs to the coastal region of Karnataka and falls under Hill agro-climatic zone. Dryness and hot weather prevail in major part of the year. The climate of the study area is quite pleasant and free from extremes. The year is usually divided into four seasons: Summer from March to May; rainy season or south-west monsoon season from June to September; post-monsoon season covering the months of October and November and dry or winter Season from December to February.

The data in respect of this station from the year 1981 to 2010 is analyzed and presented in **Table 1.1**. South West Monsoon contributes to the maximum rainfall in the taluk. As per district statistical office, Karwar there are 14 working rain gauge stations. The data pertaining to these gauges is of long- term nature and are well maintained. It is presumed that they are representative of the taluks and the same is used for analysis.

**Table 1.1: Statistical Analysis of Rainfall Data of Yellapur Taluk, Uttar Kannada District,**

	Jan	Feb	Mar	Apr	May	Pre Monsoon	Jun	Jul	Aug	Sep	South West Monsoon	Oct	Nov	Dec	North East Monsoon	Annual Rainfall
<b>Normal Rainfall (mm)</b>	1	1	7	22	55	86	558	836	580	175	2150	137	34	10	181	2417
<b>ST.DEV</b>	3	4	22	31	60	74	200	306	243	105	503	81	40	27	96	517
<b>CV%</b>	451	377	317	140	109	86	36	37	42	60	23	59	119	282	53	21

**Karnataka for the Period 1981 to 2010**

Computations were carried out for the 30-year blocks of 1981- 2010 on Mean, Standard deviation and coefficient of variation of each month pre monsoon, monsoon, post monsoon and annual and are shown in **Table 1.1**.

The mean monthly rainfall at Yellapur taluk is ranging between 1 mm during January and February to 836 mm during July. The standard deviation of pre monsoon, monsoon and post monsoon season is 74, 503 and 96 respectively. The CV percent for pre monsoon, monsoon and post monsoon season is 86, 23 & 53 percent respectively. Annual CV at this station works out to be 21 percent. Table 1. 2 presents the annual rainfall data of the taluk for the last 11 years i.e. from 2010 to 2020 and it stands at 2668 mm.

**Table 1. 2: Statistical Analysis of Annual Rainfall Data of Yellapur taluk, Uttar Kannada district  
(2010 to 2020)**

STATION		2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	Annual I
Yellapur	Rainfall (mm)	2159	2451	1658	2263	2343	1392	1305	1636	2120	3667	2718	2668

(Source: District at a Glance, 2020-21)

Similarly, the 13 years average monthly, seasonal and annual rainfall data of Yellapur taluk is given in **Table 1.3**. The Yellapur taluk has received less than normal annual rainfall in last 13 years during 2010, 2012, 2013, 2015, 2016, 2017, 2018, 2021 and 2022.

**Table 1.3: ANNUAL RAINFALL OF YELLAPUR, UTTARA KANNADA DISTRICT (2010 to 2019)**

Year	Jan.	Feb.	Mar.	Apr.	May.	Pre monsoon	Jun.	Jul.	Aug.	Sep.	Monsoon	Oct.	Nov.	Dec.	Post Monsoon	Annual
2010	3	0	0	23	11	<b>37</b>	391.5	851.4	415	262	<b>1919.9</b>	131	138	2.4	<b>271.4</b>	<b>2228.3</b>
2011	0	0	0	43	26	<b>69</b>	797	790	651	438	<b>2676</b>	88	48	0	<b>136</b>	<b>2881</b>
2012	0	0	0	53	15	<b>68</b>	307	578	596	240	<b>1721</b>	91	54	4	<b>149</b>	<b>1938</b>
2013	0	8	0	3	0	<b>11</b>	307	578	596	240	<b>1721</b>	91	54	4	<b>149</b>	<b>1881</b>
2014	0	0	12	24	113	<b>149</b>	296	1146	696	241	<b>2379</b>	156	30	5	<b>191</b>	<b>2719</b>
2015	1	0	19	29	94	<b>143</b>	574	185	209	104	<b>1072</b>	114	28	0	<b>142</b>	<b>1357</b>
2016	0	0	0	0	73	<b>73</b>	278	403	394	132	<b>1207</b>	22	3	0	<b>25</b>	<b>1305</b>
2017	0	0	0	9	102	<b>111</b>	443	700	231	246	<b>1620</b>	79	4	3	<b>86</b>	<b>1817</b>
2018	0	0	14	7	167	<b>188</b>	463	1022	596	41	<b>2122</b>	53	8	3	<b>64</b>	<b>2374</b>
2019	0	0	3.2	13.2	22.4	<b>38.8</b>	422.6	842	1681	550	<b>3495.6</b>	345	28	1	<b>374</b>	<b>3908.4</b>
2020	2	1	8	19	113	<b>143</b>	424	596	964	469	<b>2453</b>	114	3	5	<b>122</b>	<b>2718</b>
2021	42.8	42.7	23	83.8	218.4	<b>410.7</b>	473	747.5	244	323	<b>1787.5</b>	190	159	52	<b>401</b>	<b>2599.2</b>
2022	0	0	26.6	54.2	104	<b>184.8</b>	298	807.6	499.2	370	<b>1974.8</b>	143	6.4	5	<b>154.4</b>	<b>2314</b>

### 1.3.1 Assessment of Drought

Rainfall data of Yellapur taluk has been analyzed for 108 years (1901 – 2019) using IMD method to assess the drought condition in the taluk. The results of the classification are listed in the **Table 1.4**. It is observed that the Yellapur taluk has experienced alternating no drought to moderate drought conditions over the years.

The details of the drought assessment are discussed as herein under. Out of 108 years of analysis in Yellapur taluk, “No Drought” condition is experienced in 14 years, “Mild Drought” condition is experienced in 78 years and “Moderate Drought” condition experienced in 16 years in Yellapur taluk. Based on occurrence and frequency of past drought events, the probability of occurrence of various intensities of drought at each station has been studied. It has been observed that the frequency of occurrence of drought is **once in 7 years** at Yellapur taluk.

<b>% Deviation (Di)</b>	<b>&gt;0</b>	<b>0 to -25</b>	<b>-25 to -50</b>	<b>50 to -75</b>	<b>&lt;-75</b>	<b>Probability of drought occurrences</b>
<b>Category</b>	No drought	Mild (Normal)	Moderate	Severe	Acute	
	Years					
Yellapur	14	78	16	0	0	Once in 7 years

### 1.4 Agriculture & Irrigation

Agriculture is the main occupation in Yellapur taluk. Major crops grown are Paddy and Maize. Main crop of Kharif season is Paddy (**Photo 1.1**) and in Rabi season Maize is grown (**Table 1.5 & Figure.1.2**). Water intensive crops like paddy is grown in an area of 2984 Ha. Among pulses, Tur, Bengal gram, Black Gram are grown. Paddy is grown in 6 % of total net area sown of taluk. 35.93% is the percentage of the area under food grain to the total area sown. Among horticulture crops, Banana and mango constitute a major area. 421 Ha is the total area under banana cultivation. Among the commercial crops, sugarcane is grown in an area of 111 Ha and cotton in an area of 46 Ha respectively. Whereas an area of 397 Ha is under spices and condiments. The weather of Western Ghats with bounty of rainfall favors multi cropping (**Photo 1.2**).





**Table 1.5: Cropping pattern in Yellapur taluk (Ha)**

Year	Paddy	Maize	Black Gram	Green Gram	Cow pea	Tur and Bengal Gram	Sugar cane	Cotton
2019-20	2984	218	8	7	7	27	111	46

It is observed that the total forest area is 116986 Ha which accounts for 90% of the total geographical area (**Table-1.6 and Figure 1.3**). It is second most heavily forested taluk of Uttar Kannada istrict. It belongs to the Western Ghats which is a mountain range that runs almost parallel to the western coast of Indian peninsula. It is a **UNESCO World Heritage Site** and is one of the eight " hotspots of biological diversity" in the world. (Draft Working Plan for Yellapur Division, 2012-13 to 2022-23, Forest Department). The dry deciduous forests in its eastern part, moist deciduous forest in the central part and semi-evergreen forests in the western part which, in very favorable localities, tends to fall in wet evergreen forests type. The net sown area is 8259 Ha which is 6.35 % of the total area of the taluk. Areas not available for cultivation cover 1 % of total geographical area.

Among the groundwater abstraction structures, there are 1514 numbers of open well and 447 numbers of handpump or borewell. The percentage of net area irrigated is 56.22% to net area sown. (**Table-1.7**). Though surface water is abundant, but for irrigation purpose it is not used and there is no major or minor irrigation project. As per Directorate of Economics and Statistics and Annual Season Crop report of 2019-20, a total area of 2232.94 Ha is under micro

irrigation, where an area of 1590 Ha is under Agriculture department, 640.54 Ha is under Horticulture and 2.4 Ha is under Sericulture Department respectively.

**Table1.6: Details of land use in Yellapur taluk in 2019-2020 (Ha)**

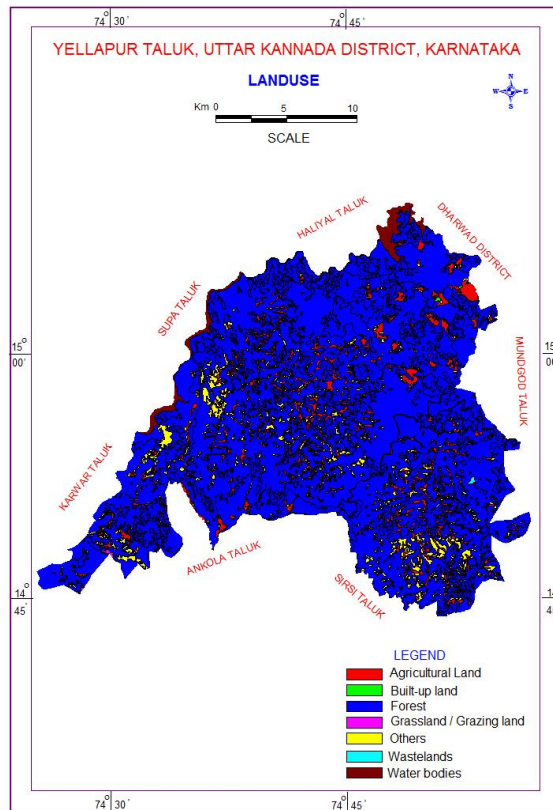
<b>Taluk</b>	<b>Total Geographical Area</b>	<b>Area under Forest</b>	<b>Area not available for cultivation</b>	<b>Other uncultivated land</b>	<b>Total fallow land</b>	<b>Net sown area</b>	<b>Area sown more than once</b>
Yellapur	130110	116986	2218	1631	1016	8259	729

(Source: District at a Glance, 2020-21)

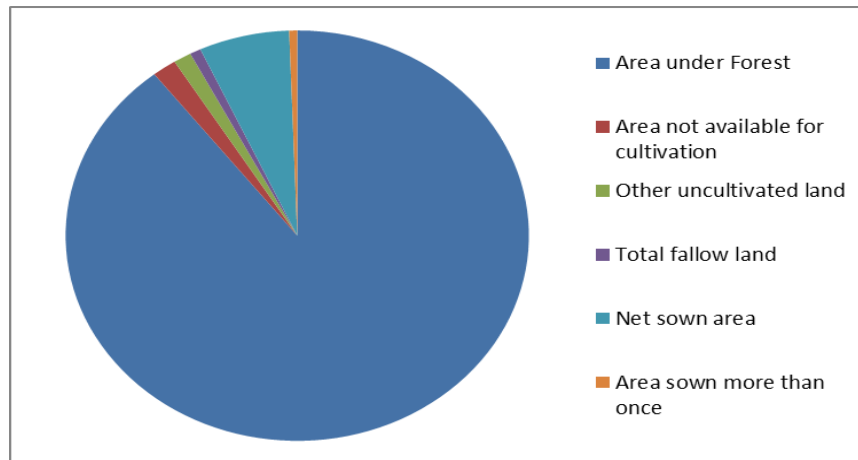
**Table 1.7: Irrigation details in Yellapur taluk in 2019-20**

<b>Source of Irrigation</b>	<b>No.</b>	<b>Net area irrigated (Ha)</b>	<b>Gross Irrigated area (Ha)</b>
Canals	0	0	0
Tanks	248	355	645
Open /Dug Wells	1514	1410	1470
Tube/Bore wells	447	310	339
Lift Irrigation	0	0	0
Other Sources	--	2568	3025
<b>Total</b>		<b>4643</b>	<b>5479</b>

(Source: District at a Glance, 2020-21)



**Figure. 1.2: Land Use and Land cover of Yellapur Taluk**



**Figure 1.3: Land Use Pattern of Yellapur taluk**

### 1.5 Geomorphology, Physiography & Drainage

Yellapur taluk is in the coastal region of Karnataka and falls under Hill agro-climatic zone. The taluk is characterized by a system of ridges and a plateau. The dense to moderately dense forest of Western Ghats are the typical characteristics of the taluk. The western ghat forms the watershed from which all the east flowing and west flowing rivers originate. The

hilly portion is restricted in the western and southern part of the taluk. The general elevation is ranges from 100 m above mean sea level to 712 m above mean sea level. The piedmont zone and plateau regions lie in the eastern part (**Figure.1.4**).

Most of the rivers in ghat section area are perennial and the rivers in Plain area are intermittent and seasonal in nature. The taluk falls in West flowing river basin and is drained by a number of rivers such as Kali (**Photo 1.3**), Bedti or Gangavali (**Photo 1.4**), Dharma, Tattihalla, etc. Out of the above, Dharma is east-flowing the others are west flowing ultimately joining the Arabian sea. The main tributaries of Kali Nadi are Pandhari, Tattihalli and Nagi.

The drainage pattern is mostly dendritic to sub-dendritic in few places (**Figure. 1.5**).



Photo 1.3: Kali Nadi



Photo 1.4: Bedti Nadi

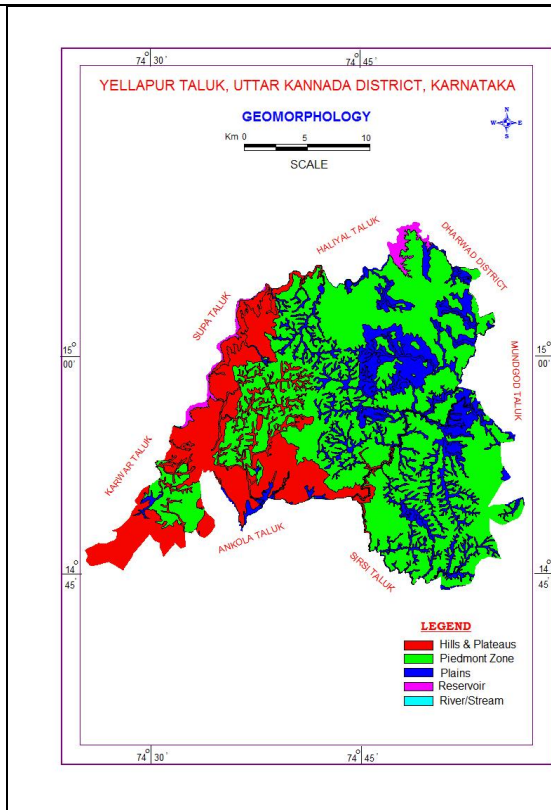


Figure 1.4: Geomorphology of Yellapur Taluk

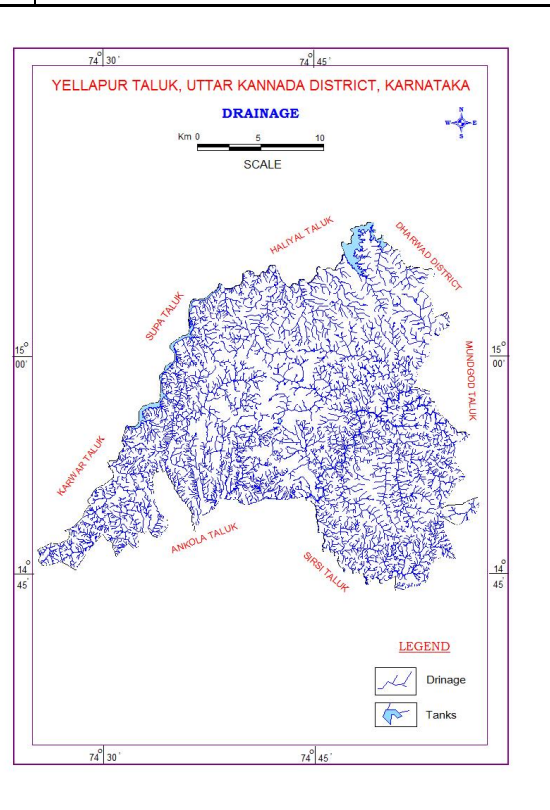


Figure 1.5: Drainage of Yellapur Taluk

## 1.6 Soil

The soil type found in the taluk is mainly of clayey variety. Clayey Skeletal covers the major portion of the taluk followed by clayey and clayey loamy. Thin fringes of alluvial patches are seen around river mouths of rivers Kali and Gangavali river with varying thickness. (Figure 1.6)

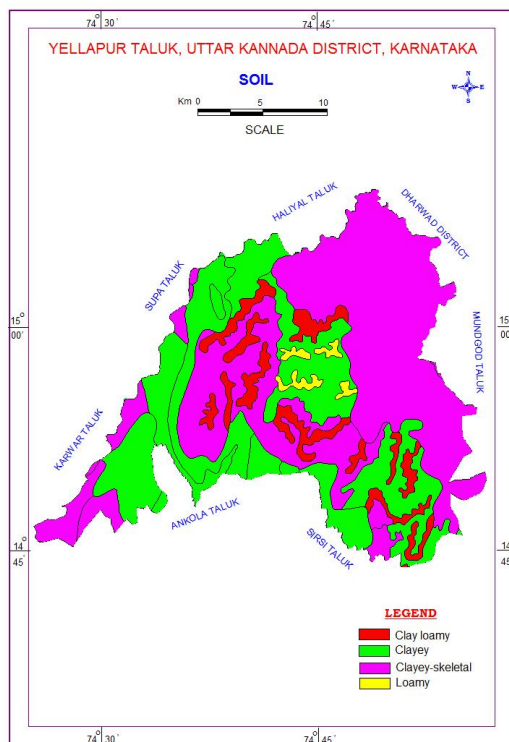


Figure. 1.6: Soil map of Yellapur Taluk

## 1.7 Ground water resource availability and extraction

Aquifer wise total groundwater resources up to 200 m depth are given in Table-1.8 below.

Table-1.8: Total Ground Water Resources (2017) (Ham)

Taluk	Annual Extractable Groundwater Resource	Fresh In-storage GW resources (2017)		Total availability of fresh GW resources
		Phreatic	Fractured (Down to 200m)	
Yellapur	7370.45			Dynamic + phreatic in-storage + fractured
		33436	6628	

### 1.8 Existing and future water demands (as per GWRA 2022)

- Annual Extractable Groundwater Resource: 13047.82 Ham
- Groundwater Extraction for Irrigation: 2735.48 Ham
- Groundwater Extraction for Industries :1.032 Ham
- Groundwater Extraction for domestic use: 185.535 Ham
- Total Extraction: 2922.047 Ham
- Annual GW allocation for domestic use as on 2025: 190.81 Ham
- Net GW availability for future Use: 10120.50 Ham
- Stage of Groundwater development: 22.39%
- Category: Safe

### 1.9 Previous Work.

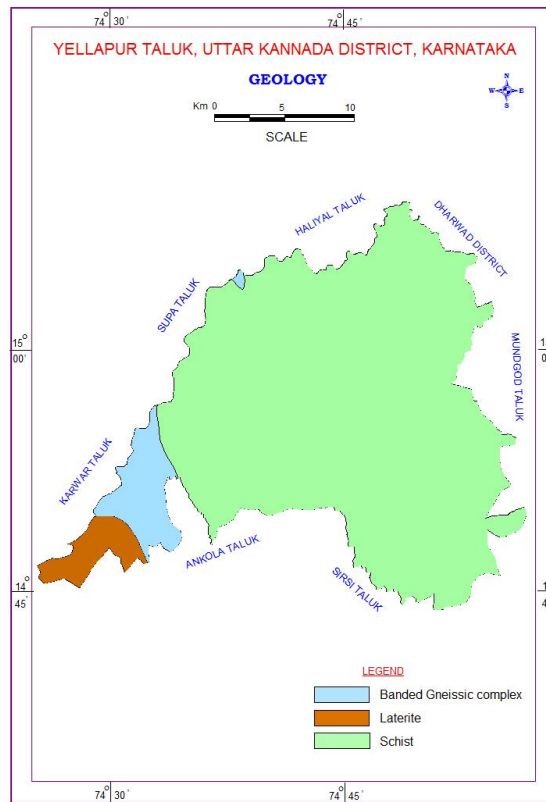
- Systematic hydrogeological surveys have been carried out by Shri S.S.Hegde, Asstt. Hydrogeologist, Central Ground Water Board, SWR, Bangalore covering parts of Yellapur taluk of Uttar Kannada district during the years 1986-87.
- A report compiled by Shri K. Keerthiseelan, Scientist-C, on “Hydrogeology and Ground Water Potential in Uttar Kannada district, Karnataka State” during the year 1990-91.
- Systematic hydrogeological surveys have been carried out by Shri G.S.Deshpande, Scientist B, Central Ground Water Board, SWR, Bangalore covering Yellapur taluk of Uttara Kannada district during the years 1996-97.
- Ground Water Management Studies in parts of Yellapur taluka of Uttar Kannada District, Karnataka was taken up in the pursuance of Annual Action Plan 2011-12 by Dr J. Davithuraj, Sc –B.

## 2. AQUIFER DISPOSITION

### 2.1 Spatial Aquifer System

In Yellapur taluk, weathered Metagraywacke and Schist are the main geological formations (**Figure-2.1**). Main aquifers in the study area are the weathered and fractured zones of meta -volcanics, meta-sedimentaries, granites and gneisses, laterites along with fringes of alluvial veneer found along the major stream courses. The hilly tracks have thin weathered covers and the valley portions have thicker weathered zones. Since, the hard rocks in the area do not possess the primary porosity, the secondary structures like joints, fissures and faults

present in this formation act as a porous media. The ground water under atmospheric influence is the phreatic zone, which generally occurs within the depth range of 3.00 to 20.00 mbgl.



**Figure-2.1: Geology of Yellapur Taluk**

The fracture zones occur at various depth zones within the depth of 120.00 mbgl are expected to be saturated with ground water. It is found that the water bearing characteristics of schistose/ metagraywacke rocks are more or less similar to that of gneisses and granites. But the weathered zones of schist and meta- greywacke may not yield as granites and gneisses because of their compact and fine-grained nature. Alluvium occurs along the river banks of Kali and Bedti with varying thickness.

Ground water in the above aquifer material generally occurs under unconfined to semi-confined and confined conditions, in the shallower zones under phreatic condition and under semi-confined and confined condition in the deeper zones. The ground water is being exploited from within the depth range of 3.00 to 30.00 m bgl through dug wells and 30.00 to 156.00 m bgl through dug-cum-bore wells, hand pump or Bore wells. During survey and on interaction with owner of bore well two to three promising water zones are encountered within 100 m bgl and

one within 105-110 m bgl. Yield generally ranges from negligible to 5 lps. Some hand pumps are drawn manually (**Photo 2.1**) and some of the hand pumps are fitted with submersible pump catering to the water supply in the villages and hamlets. (**Photo 2.2**)



**Photo 2.1: Hand pump where water is manually drawn in Madnur (14.98577, 74.7939)**



**Photo 2.2: Hand pump fitted with pump in Hittanbaili (15.12295; 74.754983)**

Groundwater exploration programme was taken up in the taluk during 1996-67 and two wells were drilled and during 2004-05, four wells were drilled. The depth ranged from 89 m bgl upto 156.55 m bgl. The yield ranged from 2.54 to 5.25 lps. Transmissivity value ranged from 13.38 to 30.18 m<sup>2</sup>/day. The static water level ranged from 6.24 m bgl to 8.15 mbgl (**Table 2.1**) and the basic characteristics of the aquifer are presented in **Table 2.2**.



**Table-2.1: Details of Ground Water Exploration in Yellapur taluk**

S. No	Location	Latitude	Longitude	Year of Drilling (FSP)	Depth Drilled (mbgl)	Casing (m)	Lithology	SWL in mbgl	APT Results		
									Q in lps	DD in m	T m <sup>2</sup> /day
1	Hunshettikoppa EW	14.517778	74.809722	2004-05	126.05	22.50	Meta Greywacke	6.24	3.62	13.27	25.99
2	Hunshettikoppa OW	14.634444	74.809722	2004-05	89.45	19.50	Meta Greywacke	6.27	2.54	14.02	13.38
3	Umachgi EW	14.639444	74.826667	2004-05	156.55	31.08	Meta Greywacke	7.04	5.25	14.02	29.64
4	Umachgi OW	14.572778	74.826667	2004-05	144.95	28.29	Meta Greywacke	8.15	4.38	10.36	30.18

NA: Not available

**Table-2.2: Basic characteristics of each aquifer**

Aquifers	Weathered Zone (Aq.-I)	Fractured Zone (Aq.-II)
Prominent Lithology	Weathered Schist and Granitic Gneiss	Fractured / Jointed Schist and Granitic Gneiss
Thickness range (mbgl)	3-18	Up to 30
Depth range of occurrence of fractures (mbgl)	Within 18	Upto 150
Range of yield potential (lps)	---	2.25 to 5.25
T (m <sup>2</sup> /day)	---	13.38 to 30.18
Quality Suitability for Domestic & Irrigation	Suitable	Suitable

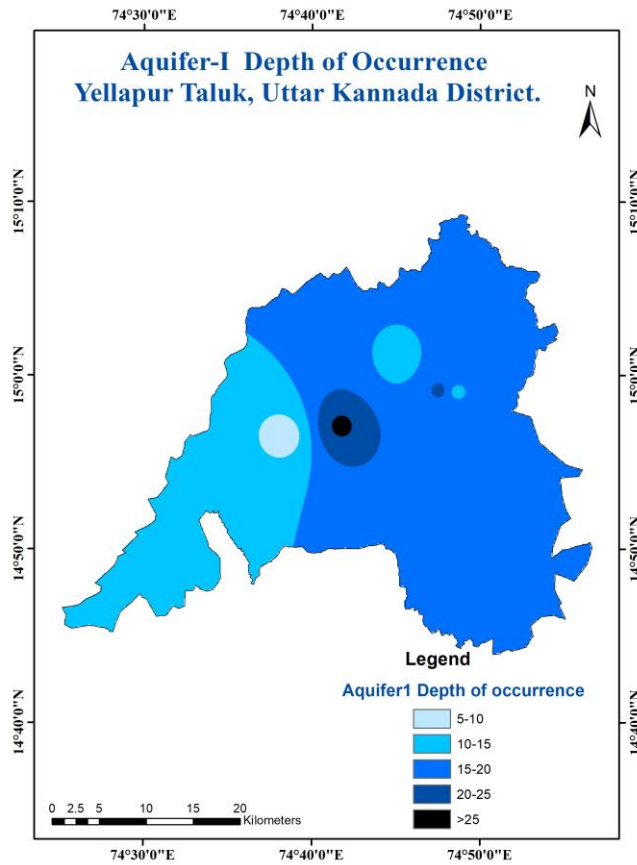
## 2.2 Depth wise Aquifer System:

The data generated from ground water monitoring wells, micro level hydrogeological inventories, exploratory and observation wells, various thematic layers was utilized to decipher the aquifer disposition of the taluk. If we consider the vertical distribution of aquifer, two types of aquifer system are observed i.e., Aquifer – I which is a shallow phreatic aquifer and Aquifer – II which constitutes the deeper fractured aquifer.

- i. Aquifer-I (Phreatic aquifer): Weathered metagraywacke and Schist
- ii. Aquifer-II (Fractured aquifer) :Fractured meta greywacke, schist and Banded Gneiss complex

### 2.2.1 Aquifer-I (Shallow Phreatic aquifer)

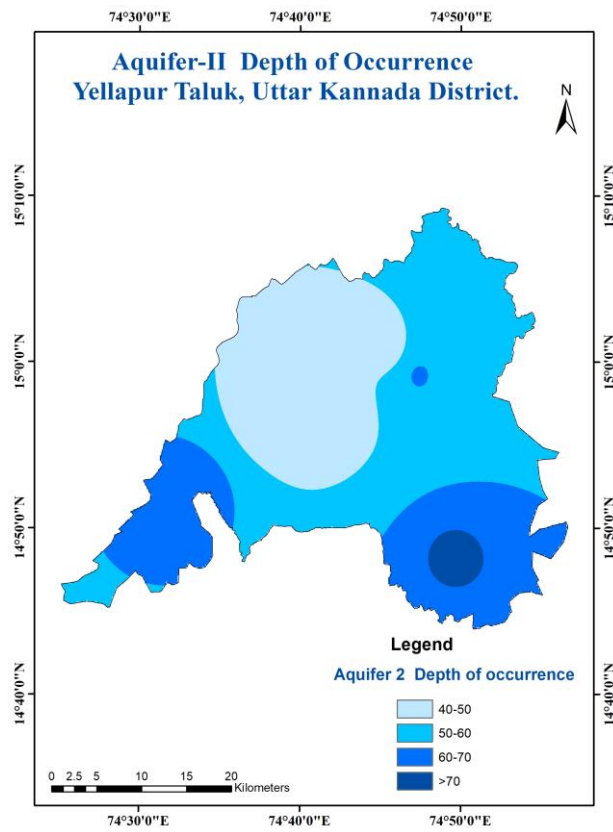
Aquifer I comprises of weathered metagraywacke and schist. The spatial distribution of depth of occurrence of Aquifer-I is depicted in **Figure 2.2.1**.It indicate that the majority of the depth of occurrence of Aquifer I ranges within 15 to 20 m bgl.



**Figure 2.2.1 Depth of Occurrence of Aquifer I**

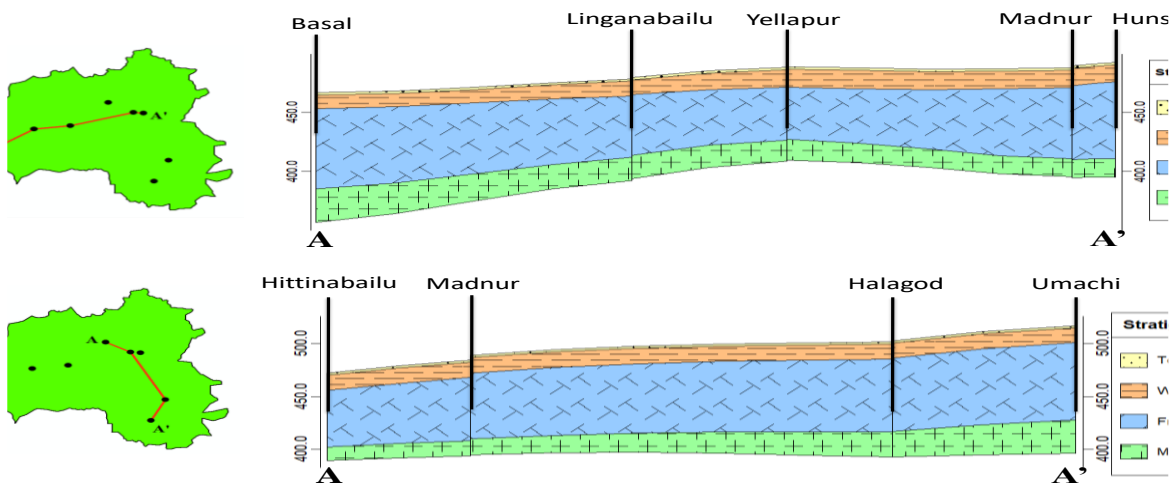
### 2.2.2 Aquifer-II (Deeper Fractured aquifer)

The deeper aquifer comprises of the fractured meta greywacke, schist and Banded Gneiss complex. The spatial distribution of depth of occurrence of Aquifer-II is depicted in **Figure 2.2.2**. It indicates that the depth of occurrence of aquifer – II ranges from 40 m bgl onwards upto more than 70 m bgl.

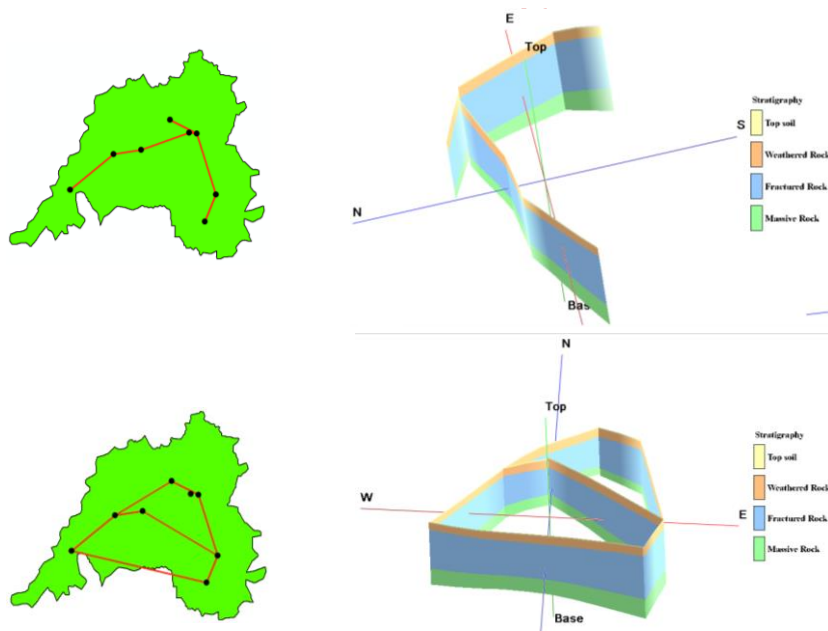


**Figure 2.2.2: Depth of Occurrence of Aquifer II**

**2.3: 2D and 3D aquifer disposition:** The 2D aquifer disposition is shown in **Figure 2.3.1** and **Figure 2.3 .2** respectively.



**Figure 2.3.1:2D aquifer disposition**



## 3D Aquifer Disposition

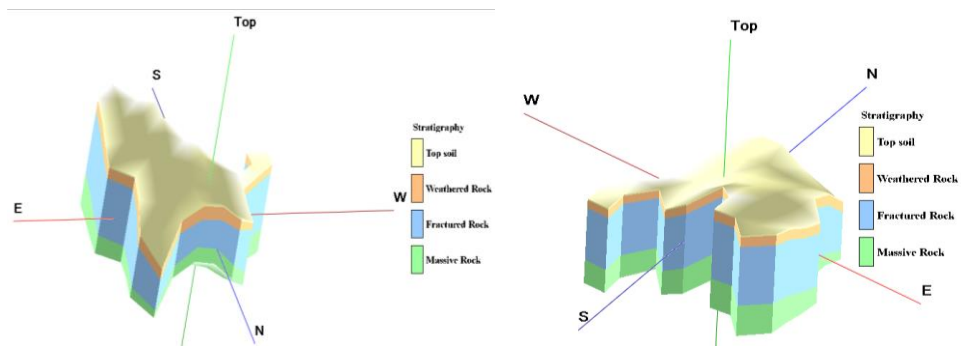


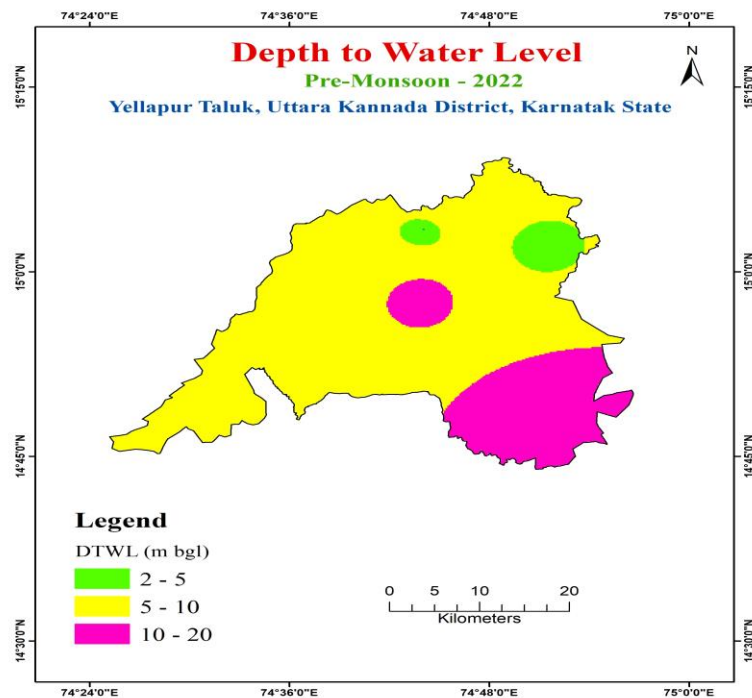
Figure 2.3.2: 3D aquifer disposition and fence diagram

### 2.3 Groundwater Regime

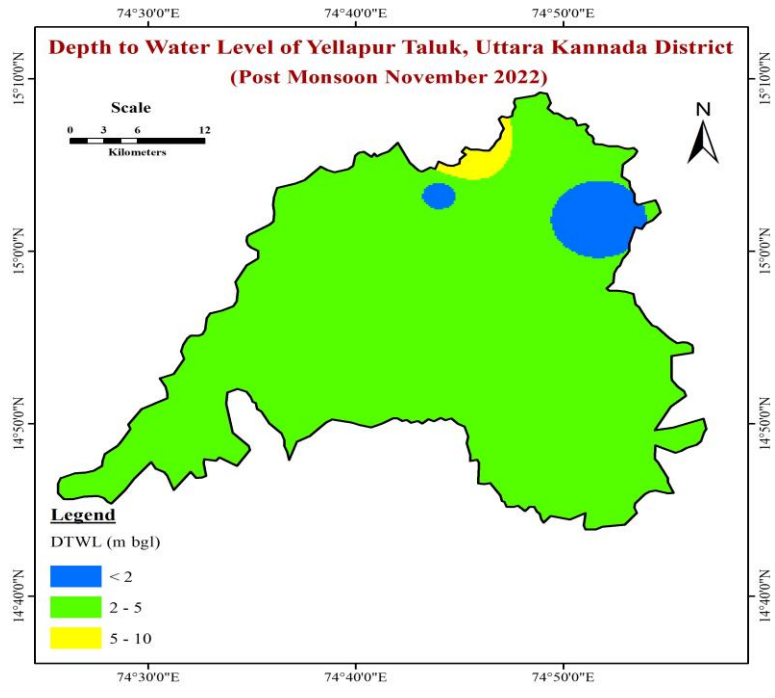
The depth to water level has been monitored during May and November 2022 from a total of 25 key observation wells (**Annexure I**) comprising of 22 dug wells ( includes 2 NHS) and 3 hand pumps which were established during the survey. Water level data is also taken from 5 dug wells (Phreatic Aquifer) and 2 piezometer (deeper Aquifer) of CGWB's NHS and 6 dug wells and 6 borewell of SGWD in Yellapur to depict the ground water regime.

#### 2.3.1 Aquifer-I (Phreatic)

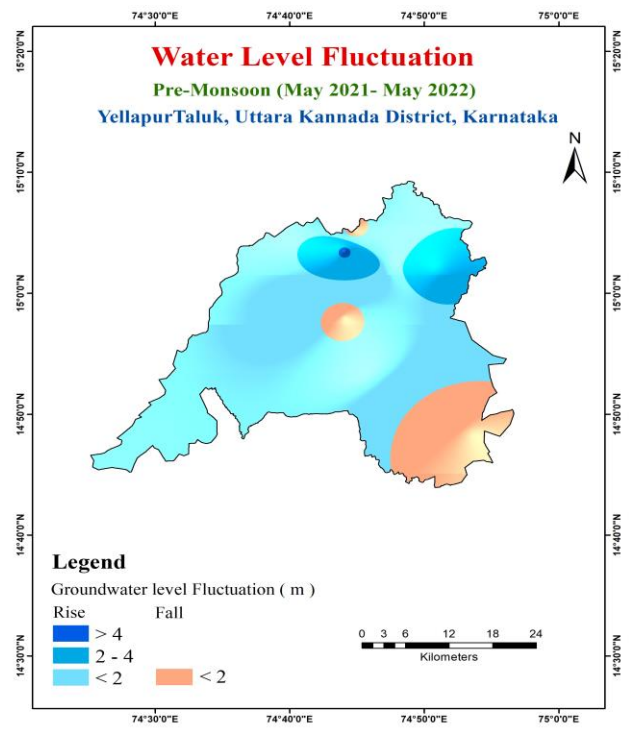
The pre-monsoon (May 2022) depth to water level of Phreatic Aquifer indicates that depth to water level ranged from 2 to 13.58 m bgl (**Figure 2.3.1**). In the post monsoon, depth to water level varies from 0.90 to 9.26 m bgl (**Figure 2.3.2**) and majority of the area shows water level in the range of 2 to 5 m bgl. The water level fluctuation map shows a rise in water level in the range from 0.7 upto 4 m (**Figure 2.3.3**). A fall of water level of less than 2 m bgl is noticed in the central and south eastern part of the taluk .



**Figure-2.3.1: Pre-monsoon Depth to Water Level Map (Aquifer I)**



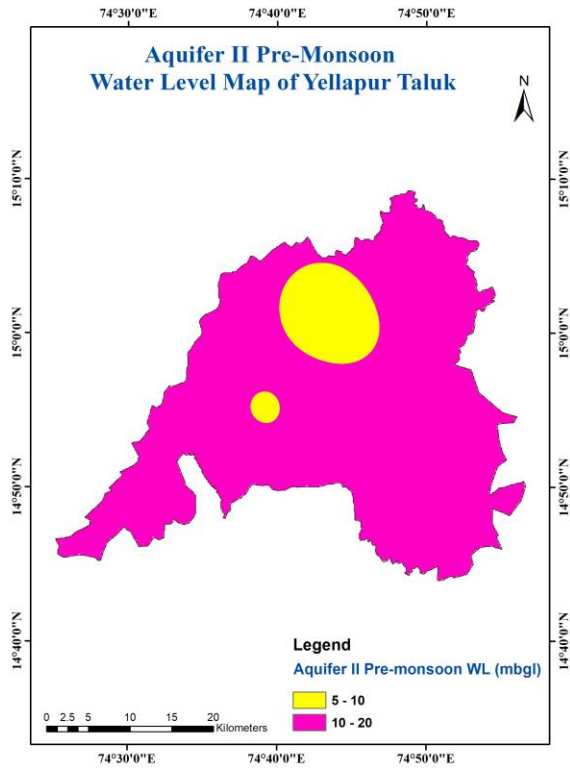
**Figure 2.3.2: Post-monsoon Depth to Water Level Map (Aquifer I)**



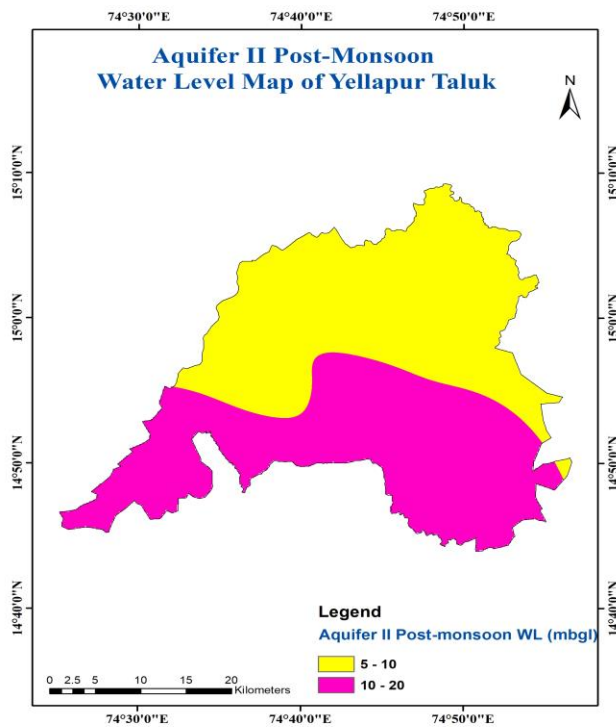
**Figure 2.3.3: Pre monsoon Water level Fluctuation Map (Aquifer I)**

## 2.4. Aquifer II (Deeper Aquifer)

The pre-monsoon (May 2022) piezometric water level of deeper aquifer (Bore well) data indicates that the depth to water level ranged from 7.4 to 16.95 m bgl (**Figure 2.4.1**) and in post monsoon season it ranges from 5.15 to 15.05 mgl. (**Figure 2.4.2**).



**Figure 2.4.1: Pre Monsoon Water level of Aquifer II**



**Figure 2.4.2: Post Monsoon Water level of Aquifer II**

### 3. GROUND WATER RESOURCE, EXTRACTION, CONTAMINATION AND OTHER ISSUES

#### 3.2 Aquifer wise resource availability and extraction

(a) Table 3.1.1: Present Dynamic Ground Water Resource (2022) ham

Taluk	Annual extractable Groundwater Resource	Groundwater Extraction for Irrigation	Groundwater Extraction for domestic use	Groundwater Extraction for industrial use	Total extraction	Annual Groundwater Allocation For Domestic use as on 2025	Net Ground Water Availability for Future use	Existing Stage of Ground Water Development	Category
Yellapur	13047.82	2735.48	185.535	1.032	2922.047	190.81	10120.50	22.39%	Safe



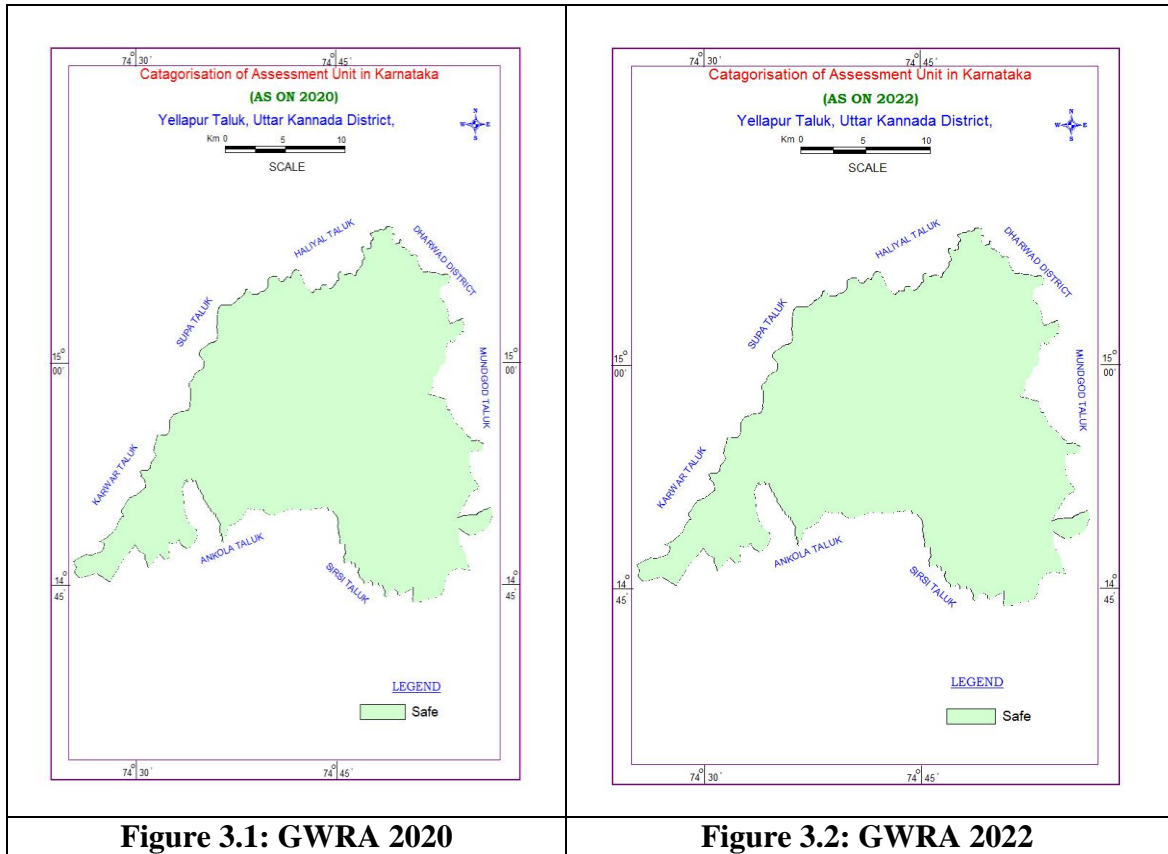
(b) **Table 3.1.2: Total Ground Water Resources (2017) (Ham)**

Taluk	Annual Extractable Groundwater Resource	Fresh In-storage GW resources (2017)		Total availability of fresh GW resources
		Phreatic	Fractured (Down to 200m)	
Yellapur	7370.45			Dynamic + phreatic in-storage + fractured
		33436	6628	47434.45

**3.1.3 Comparison of ground water availability and draft scenario in Yellapur taluk**

Taluk	2020			2022		
	GW Availability	Total extraction	Stage of GW withdrawal	GW Availability	Total extraction	Stage of GW withdrawal
Supa	9940.30	2575.27	25.91 %	13047.82	2922.047	22.39 %

The taluk is in safe category in both GWRA 2020 (**Figure 3.1**) and in 2017 (**Figure 3.2**). The groundwater availability has increased from 9940.30 Ham to 13047.82 Ham resulting in a decreased stage of development from 25.91% to 22.39 %.

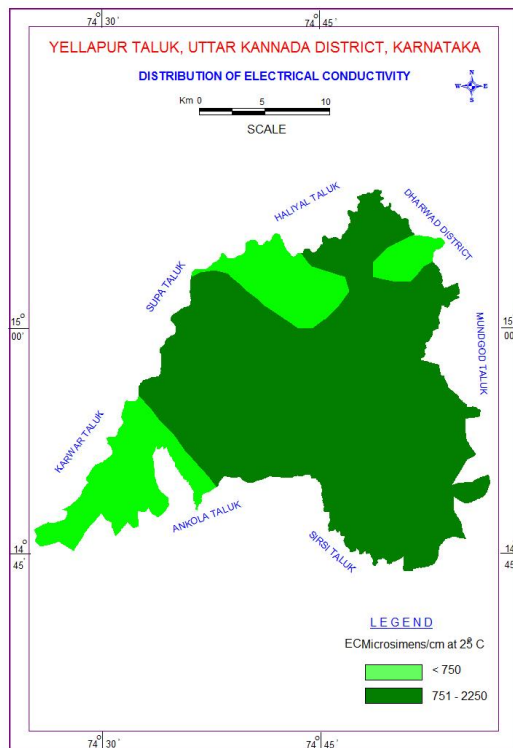


**Figure 3.1: GWRA 2020**

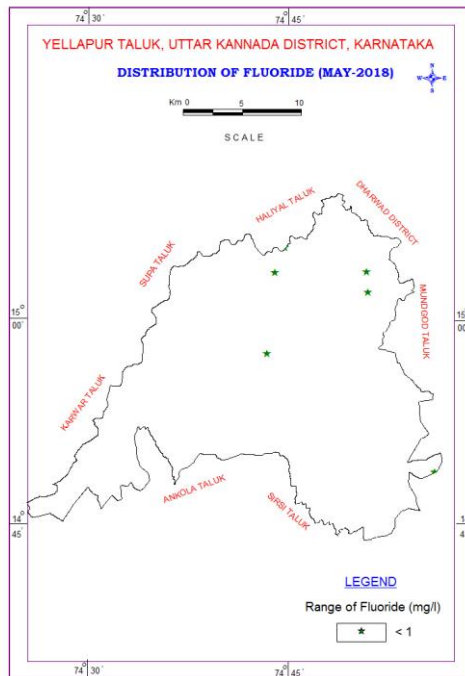
**Figure 3.2: GWRA 2022**

### 3.2 Chemical quality of ground water and contamination

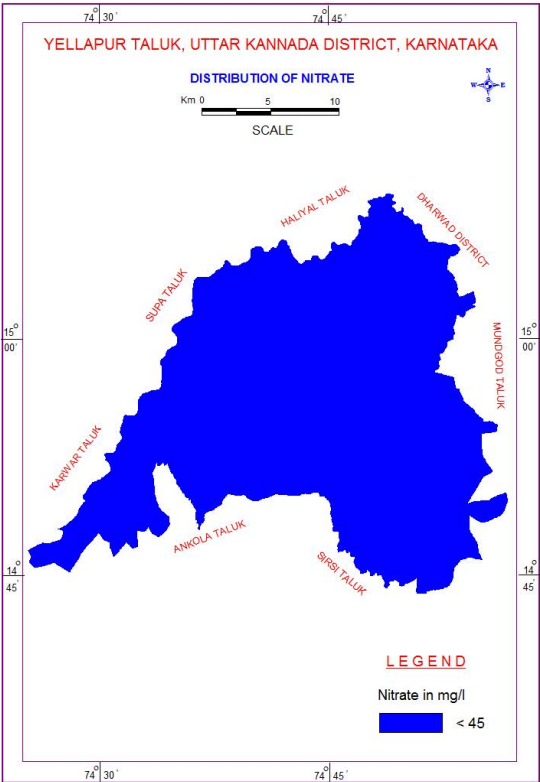
To understand the chemical quality of groundwater, samples were collected mainly from abstraction structures like dug wells, bore wells and hand pumps representing the Aquifer I and Aquifer II. About 19 samples were collected and all the geo tagged locations are shown in **Table 3.2**. Chemical analysis results are awaited. However a perusal of earlier chemical result of 2018 and 2019 indicate that all the parameters like EC (**Figure 3.3**), Fluoride (**Figure 3.4**), Nitrate (**Figure 3.5**) are within permissible limit as per BIS, 2012.



**Figure 3.3: Distribution of EC in Yellapur taluk**



**Figure 3.4 : Distribution of Fluoride in Yellapur taluk**



**Figure 3.5 : Distribution of Nitrate in Yellapur taluk**

**Table 3.2: Geo tagged locations of Groundwater sampling in Yellapur taluk**

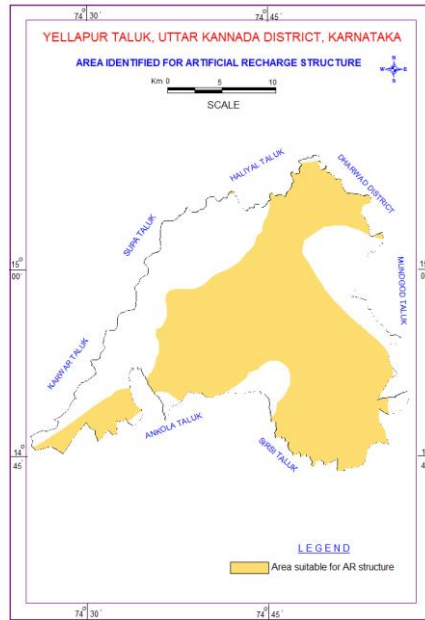
 <p>Latitude: 14.214710 Longitude: 74.621169 Elevation: 87.2517 m Accuracy: 6.9 m Time: 09-24-2022 14:44 Note: Y3 Chikayat DW</p>	 <p>Latitude: 14.919894 Longitude: 74.631968 Elevation: 99.4627 m Accuracy: 6.2 m Time: 09-23-2022 11:03 Note: V2 Channa pura DW</p>	 <p>Latitude: 14.930801 Longitude: 74.619931 Elevation: 545.3152 m Accuracy: 13.2 m Time: 09-23-2022 15:56 Note: V1 Yellapur DW</p>
 <p>Latitude: 14.953382 Longitude: 74.820233 Elevation: 482.81339 m Accuracy: 18.9 m Time: 09-23-2022 16:47 Note: V5 Kallagud DW</p>	 <p>Latitude: 15.239073 Longitude: 74.848692 Elevation: 511.0429 m Accuracy: 7.1 m Time: 09-23-2022 17:01 Note: X Kallagud DW</p>	 <p>Latitude: 14.922742 Longitude: 74.796203 Elevation: 531.18617 m Accuracy: 4.8 m Time: 09-24-2022 06:12 Note: V7 Kallagud DW</p>
 <p>Latitude: 14.813668 Longitude: 74.851487 Elevation: 422.2366 m Accuracy: 6.8 m Time: 09-24-2022 09:42 Note: V6 Hahankoppa DW</p>	 <p>Latitude: 14.770126 Longitude: 74.813663 Elevation: 529.86100 m Accuracy: 11.2 m Time: 09-24-2022 10:42 Note: Y10 Chavathi DW</p>	 <p>Latitude: 14.814638 Longitude: 74.833245 Elevation: 568.29227 m Accuracy: 73.0 m Time: 09-24-2022 10:14 Note: V9 Hahankoppa DW</p>
 <p>Latitude: 14.770126 Longitude: 74.813663 Elevation: 529.86100 m Accuracy: 11.2 m Time: 09-24-2022 10:42 Note: Y10 Chavathi DW</p>	 <p>Latitude: 14.855633 Longitude: 74.728643 Elevation: 493.06127 m Accuracy: 13.8 m Time: 09-24-2022 11:43 Note: Y13 Hengandi DW</p>	 <p>Latitude: 14.926632 Longitude: 74.639924 Elevation: 490.4144 m Accuracy: 8.8 m Time: 09-24-2022 12:39 Note: V12 Kallagud DW</p>
 <p>Latitude: 14.817613 Longitude: 74.859348 Elevation: 745.2417 m Accuracy: 14.9 m Time: 09-24-2022 13:40 Note: Y13 Bidal DW</p>	 <p>Latitude: 14.829973 Longitude: 74.829973 Elevation: 482.81339 m Accuracy: 18.9 m Time: 09-24-2022 13:40 Note: Y15 Madurawadi DW</p>	 <p>Latitude: 14.829973 Longitude: 74.829973 Elevation: 482.81339 m Accuracy: 18.9 m Time: 09-24-2022 13:38 Note: Y15 Lagudi DW</p>



## 4. GROUND WATER RESOURCE ENHANCEMENT

### 4.1 Aquifer wise space available for recharge and proposed interventions

Recharging dry phreatic aquifer (Aq-I) in the taluk, through construction of artificial recharge structures, viz; check dams and percolation tanks has already been taken up by state Government agencies and the area feasible for Artificial recharge is shown in **Figure 4.1**. As per Master Plan for Artificial recharge 2017, an area of 1179 sq.km is found feasible in the taluk. The salient feature of the artificial recharge scheme is shown in **Table 4.1**. An additional 14772.12 ham will be created after implementation of the scheme which will lead to a decrease in the stage of development from 22.39 to % 19.78 with an improvement of 2.60 %. (**Table 4.2**)



**Figure 4.1: Area feasible for Artificial Recharge in Yellapur taluk**

**Table-4.1: Quantity of non-committed surface runoff & expected recharge through AR structures in Yellapur Taluk**

<b>Artificial Recharge Structures</b>	<b>Yellapur Taluk</b>
Non committed monsoon runoff available (MCM)	17.243
Number of Check Dams proposed	69
Number of Percolation Tanks proposed	16
Number of Sub surface Dyke proposed	0
Tentative total cost of the project (Rs. in lakhs)	1009.179
Expected recharge (MCM)	17.243
Additional Irrigation Potential by ARS & RWH (Lakh Hectare)	0.016
Volume of water likely to be recharged (MCM)	12.932

**Table-4.2 Improvement in GW availability due to Recharge, Yellapur Taluk (Ham)**

<b>Taluk</b>	<b>Annual extractable Groundwater Resource</b>	<b>Total extraction</b>	<b>Existing Stage of Ground Water Development</b>	<b>Expected recharge from proposed artificial recharge structures</b>	<b>Total availability of groundwater after implementation of ARS scheme</b>	<b>Expected improvement in stage of ground water development after the implementation of the artificial recharge project</b>	<b>Expected improvement in overall stage of ground water development</b>
Yellapur	13047.82	2922.047	22.39	1724.3	14772.12	19.78	2.60

## 4.2 Demand Side Interventions

### 4.2.1 Advanced irrigation practices:

Agriculture is the main occupation of the people which depends exclusively on ground water. The area is prone to droughts, particularly during the years of low rainfall below the normal. Increase in agricultural activity, ground water withdrawal, depletion of ground water levels, reduction in yield and ground water quality related issues etc., suggests the need for scientific ground water management, enhancement of storage capacity of the aquifers and protection of ground water quality.

The important crops grown in the taluk are paddy and maize which utilizes groundwater for irrigation. Water Use Efficiency (WUE) practices like Drip irrigation needs to be strengthened to save irrigation water by way of precision farming mechanism. This ultimately enhances the area under irrigation potential. This will help in enhancing a quantum of 820.64 ham and will ultimately enhances the area under irrigation potential resulting a stage of groundwater development improvement from 23.91 % to 18.73% with an improvement of 1.05 % (Table 5.1).

**Table-5.1: Improvement in GW availability due to saving by adopting water use efficiency (WUE) in Yellapur taluk**

Taluk	Annual extractable Groundwater Resource	Total extraction	Existing stage of ground water development	Saving due to adopting WUE measures	Cumulative annual ground water availability after ARS and WUE	Expected improvement in stage of ground water development after adopting WUE	Expected improvement in overall stage of ground water development
	Ham	Ham	%	Ham	Ham	Ham	%
Yellapur	13047.82	2922.047	23.91	820.64	15592.76	18.73	1.05



#### **4.2.2 Change in cropping pattern**

An area of only 2984 ha is under water intensive crop like paddy. Change in cropping pattern may not be immediately warranted as the taluk is safe. However farmers may think of implementing a change in cropping from paddy and sugarcane to less water intensive crops keeping in view about long term sustainability.

### **5. GROUND WATER MANAGEMENT STRATEGY**

Even though the district receives good rainfall, because of undulating topography and very permeable formation at the surface most of the rainwater escapes both as surface flow or base flow and in many parts of the taluk after March there is shortage of water for drinking. So the water supply sources should be supported by suitable artificial recharge structures or ground water conservation structures in the vicinity to augment the present water supply. A total of 69 Check dams and 16 Percolation Tanks has been proposed. Rainwater harvesting structures can be popularized through government incentives and schemes as the taluk receive good rainfall.

The present ground water development is of low key and falls under safe category as per GWRA 2022. However, there is still plenty of scope is there for further development. Dug wells are the more common abstraction structures for ground water irrigation and people still prefer Dug well than bore well because of its low cost and less maintenance. **(Photo 6.1)** Though in recent times Hand pumps/Bore wells are also being drilled by lined department for drinking water supply. In many places bore wells are running successfully and Hand pumps gets dried up. **(Photo 6.2)** As the dug wells depends only on phreatic aquifers, the cropping pattern will be as per the availability from the phreatic aquifer but borewells taps water from phreatic as well as deep seated fractured aquifers, the cropping pattern will not respond to the changes in shallow aquifers and in long run it may lead to over development of ground water. The selection of sites for construction of artificial structures and ground water abstraction structures is site specific so after detail hydro geological scientific investigation and after ground truthing. Even though the district receives good rainfall, considering the water scarcity in some pockets during peak summer, a comprehensive programme should be formulated to harvest the rain water through roof top, check dams, surface tanks and bunds to enhance the artificial recharge to the ground water also the subsurface dykes to arrest the sub surface flows and augment the groundwater resources.



**Photo 6.1: Dug well for irrigating commercial crops**



**Photo 6.2: Dried Hand pump**

The ground water worthy areas such as topographic lows, valley portions, area with low groundwater level fluctuations zones should be developed with an adequate soil conservation measures to prevent the soil erosions during rainy seasons. State and Central Government department may take initiatives to protect and preserve structures for sustainability. In Basal village (14.871023, 74.550505), NPCIL Department of Atomic Energy, Kaiga has taken such step (**Photo 6.3**). Similar such initiatives are warranted. In places like Yellapur, where water bodies are present, it is recommended to de-silt the existing surface water bodies to enhance recharge to the phreatic and fractured aquifers for sustainability.



**Photo 6.3: Preservation of Dug well**

During the survey it was observed that surface water present in the nallas and streams are used for irrigation apart from dugwells. (**Photo 6.3**). This practice of utilizing surface water along with groundwater may be encouraged. People should be encouraged to adopt conjunctive use of surface and ground water to maintain a balance. Integrated watershed conservation approaches will help to ensure the sustained water yield in the streams. Being a part of western Ghat, deforestation, forest submergence encroachment and fragmentation should be monitored. Regular monitoring of water level and water quality for creation of scientific database and dissemination of data among the line departments is recommended.



**Photo 6.3: Surface water pumped from nearby nallas for Areacnut and pepper cultivation**

The farming community in the valley and low lying regions should be encouraged with financial assistance, incentives and necessary technical guidance to sink appropriate abstraction structures, to install pump sets, to practice modern irrigation methods thereby to strengthen their economy and improving their financial position and creating water security.

**APPENDIX I**

No	Village and Location details	Taluk	Topo sheet No	Type of well / use	Lifting device	Depth of well (mbgl)	Dia. of the well (m)	Type of aquifer	DTW (mbgl)		
									Pre-monsoon	Post Monsoon	Fluctuation
1	2	3	4	5	6	7	8	9	10	11	
1	<b>Kirvati.</b> Well is in the center of the market.	Yellapur	48I/6	DW/D	R&P	12.00	1.95	Wt.Schist	10.28	7.52	2.76
2	<b>Sidalgundi.</b> Well is located east of Nalla and north of Yellapur – Mundgod road	Yellapur	48J/13	DW/D	R&P	6.70	2.10	Wt.Schist	5.19	3.86	1.33
3	<b>Barathalli.</b> Well is located near cross and entrance of the village.	Yellapur	48J/13	DW/D	R&P	6.80	1.20	Wt.Schist	5.37	3.87	1.50
4	<b>Chavati.</b> Well is near the road after the culvert.	Yellapur	48J/13	DW/D	R&P	12.50	2.10	Wt.Schist	5.23	3.6	1.63
5	<b>Umachi.</b> In the middle of the village near Grameen bank and Government hospital	Yellapur	48J/13	DW/D	R&P	15.00	2.30	Wt.Schist	12.04	10.18	1.86
6	<b>Manchikeri.</b> Well is located near Urdu school in private land and in front of Shri. Isaibram house.	Yellapur	48J/13	DW/D	R&P	17.40	2.55	Wt.Schist	16.31	12.36	3.95
7	<b>Savabgeri.</b> Well is in the govt. school premise.	Yellapur	48J/9	DW/D	R&P	10.40	2.00	Wt.Schist	6.31	4.28	2.03
8	<b>Yellapur.</b> Well is located in house of Mirza near Maruti showroom	Yellapur	48J/9	DW/D	R&P	10.25	2.50	Wt.Schist	10.95	4.43	6.52
9	<b>Kannigeri.</b> Well is located near bus	Yellapur	48I/12	DW/D	R&P	6.50	2.00	Wt.Schist	5.81	3.29	2.52

	stop.										
10	<b>Domgeri.</b> Well is located in front of Shri. Vinod Hedge house.	Yellapur	48I/16	DW/D	R&P	11.50	2.50	Wt.Schist	10.26	7.85	2.41
12	<b>Dehalli.</b> Well is located near Govt. hospital.	Yellapur	48J/9	DW/D	R&P	11.00	2.00	Wt.Schist	8.35	4.32	4.03
13	<b>Lagundi.</b> Well is located in front of forest office.	Yellapur	48J/9	DW/D	R&P	10.26	1.65	Wt.Schist	5.75	3.52	2.23
14	<b>Arabail.</b> Well is located near Govt. Primary school.	Yellapur	48J/9	DW/D	R&P	10.65	2.15	Wt.Schist	7.50	5.12	2.38
15	<b>Telanger.</b> Well is located south of primary school.	Yellapur	48J/9	DW/D	R&P	8.00	2.10	Wt.Schist	4.87	3.10	1.77
16	<b>Basal.</b> Well is located near govt. Primary school.	Yellapur	48J/9	DW/D	R&P	8.90	2.05	Wt.Schist	7.8	5.5	2.30
17	<b>Vajralli.</b> Well is located behind panchayat office.	Yellapur	48J/9	DW/D	R&P	12.65	2.00	Wt.Schist	11.53	8.62	2.91
18	<b>Nandolli.</b> Well is located near nurse quarters.	Yellapur	48J/9	DW/D	R&P	14.10	1.65	Wt.Schist	10.20	6.50	3.70
19	<b>Magod.</b> Well is located behind KPC quarters and Vanadevata temple.	Yellapur	48J/9	DW/D	R&P	11.90	2.00	Wt.Schist	7.26	4.89	2.37
20	<b>Hunshettikoppa.</b> Well is located south of Yellapur Mundgod road.	Yellapur	48J/13	DW/D	R&P	10.50	2.15	Wt.Schist	10.36	6.96	3.40
21	<b>Gera.</b> Well is located adjacent to the Shri. V.N.Ganapumane's house.	Yellapur	48I/12	DW/D	R&P	8.50	2.50	Wt.Schist	6.12	3.87	2.25
22	<b>Yellapur</b> BW is located in the premises of Shri Krishna Residency	Yellapur	48J/9	BW/C	Submersible pump	67	0.1524	Wt.Schist Fractured Schist, Granite	20.58	12.52	8.06
23	<b>Gullapur.</b> On NH 63 near market and	Yellapur	48J/9	DW/D	Pump fitted	10	1.50	Wt.Schist	4.05	0.95	3.10

	KDCC bank										
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24	<b>Chinnapura.</b> Located about 30m NW of check gate in the premises of Sri Anil.	Yellapur	48J/9	DW/D	Pump	12	1.30	Wt. Schist	7.96	6.93	1.03
25	<b>Madnur .</b> On Mungod Road, By the side of Sri shantihari Mahalaxmi Temple	Yellapur	48J/13	HP/D	Hand pumped	45	0.1524	Wt.Schist Schist, Granite	--	--	---