



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

**Chikmagalur Taluk, Chikmagalur District,
Karnataka**

दक्षिण पश्चिमी क्षेत्र, बेंगलुरु
South Western Region, Bengaluru

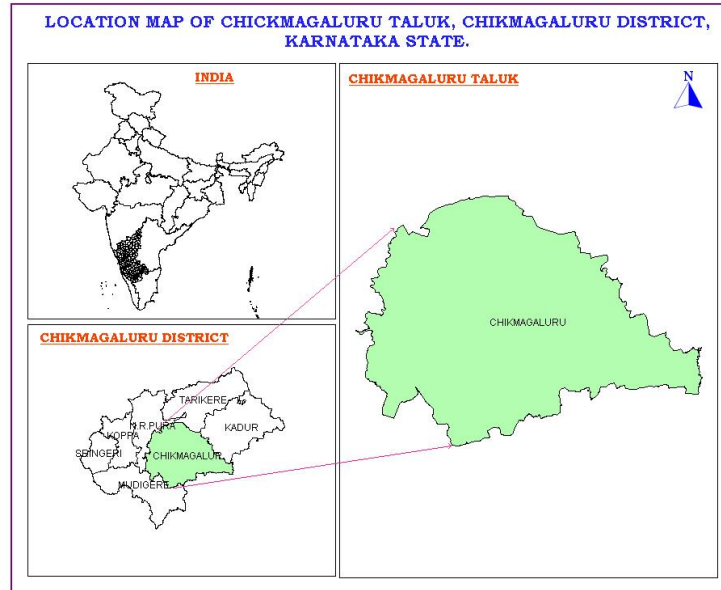
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REPORT ON AQUIFER MAPS AND MANAGEMENT PLAN, CHIKMAGALUR TALUK, CHIKMAGALUR DISTRICT, KARNATAKA STATE

(AAP – 2022-2023)



By
Anamika Aich, Scientist-B, CGWB, SWR, Bengaluru

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REPORT ON AQUIFER MAPS AND MANAGEMENT PLAN, CHIKMAGALUR TALUK, CHIKMAGALUR DISTRICT, KARNATAKA STATE

1 SALIENT INFORMATION

Name of the taluk: Chikmagalur

District: Chikmagalur

State: Karnataka

Area: 1606 sq.km.

Population: 3,05,368

Annual Normal Rainfall: 836 mm

1.1 Study area

Aquifer mapping studies have been carried out in Chikmagalur taluk, Chikmagalur district, Karnataka state under National Aquifer Mapping Programme. The taluk is covering an area of 1606 sq.kms. The geographical extents of Chikmagalur taluk of Chikmagalur district is located between North Latitudes 13°15'0" and 13°35'0" and East Longitudes between 75°32'0" to 76°03'0" and is falling in Survey of India Toposheets bearing no.48O/7, 48O/10, 48O/11, 48O/12, 48O/15, 48O/16. The study area is bounded on the North by Tarikere & NR Pura taluk of Chikmagalur district, on the West by N R pura taluks of Chikmagalur, on the South by B Taluk of Chikmagalur district & on the East by Kadur taluk of Chikmagalur district & Hassan district. Chikmagalur town is taluk head quarter and there are about 229 villages falling under its jurisdiction. Location map of Chikmagalur taluk of Chikmagalur district is presented in Fig. 1 & 2.

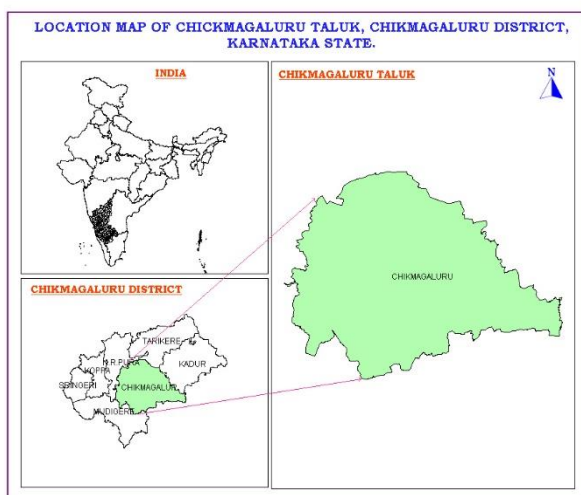


Fig . 1 Location map of Chikmagalur taluk.

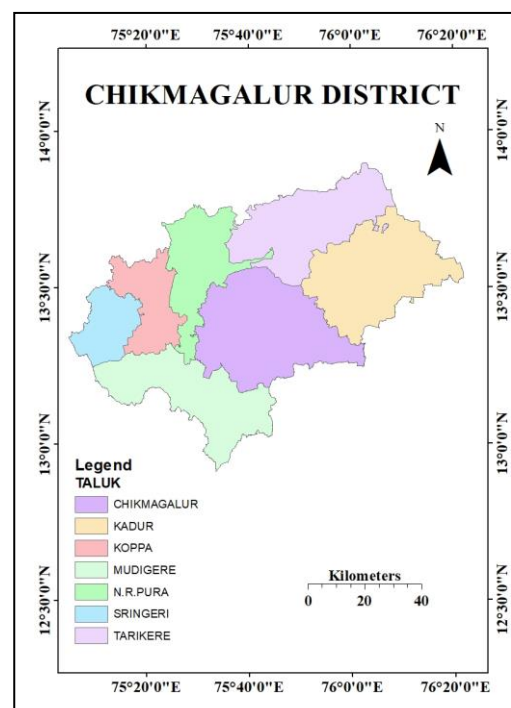


Fig . 2 Location map of Chikmagalur taluk.

1.2 Population

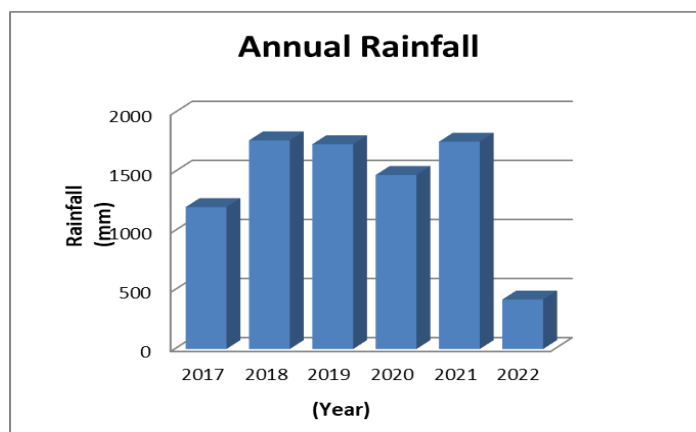
According to 2011 census, the population in Chikmagalur taluk is 3,05,368. Out of which 1,51,921 are males while 1,53,447 are females. The average sex ratio is 1010. The taluk has an overall population density of 192 persons per sq.km. The literacy rate of the taluk is 81.71%, out of which 87.16 % males are literate and 76.33 % females are literate. The decadal change in population for the period (2001-2011) is 15.77 %.

1.3 Rainfall

Chikmagalur taluk receives rainfall from south west monsoon from June to September and north east monsoon from October to December. During May and retreating monsoon months, the area gets rainfall in association with thunderstorm followed by heavy pre-monsoon/retreating showers. The monthly rainfall data from 2017 to 2022 (May) is given in Table 1. The rainfall data reveals that the annual rainfall ranges from 1201.20 to 1765.9 mm. The highest annual rainfall is observed in the year 2018 .

Table 1: Monthly rainfall data of Chikmagalur taluk (unit:mm)

YEAR	January	February	March	April	May	June	July	August	September	October	November	December	Annual Rainfall
2017	1.52	0.08	11.85	63.66	136.4	134	225.7	270.29	220.94	109.93	24.19	2.73	1201.26
2018	0.17	5.6	47.4	64.02	229.1	320.3	438.1	399.51	134.09	97.26	24.26	6.13	1765.98
2019	0.19	14.63	6.3	52.97	74.87	136.3	180.8	613.34	233.47	357.08	28.07	35.64	1733.62
2020	0.7	0.5	6.7	55.8	153.5	143	229.9	393.5	254.3	184.8	31.3	19	1473
2021	42.9	60.8	2.05	80.15	201.4	163	405.8	200	90.2	256.6	225.8	26.2	1754.891378
2022	0.3	0	53.2	101.9	263.6								419



1.4 Agriculture & Irrigation

Agriculture is the main occupation in Chikmagalur taluk, Chikmagalur district. Major Kharif crops are Maize, Paddy, Ragi, Sugarcane, Mulberry, Coconut, Cotton, etc. Main crops of Rabi season are Ragi. The water intensive crops like sugarcane and paddy are grown significantly in the taluk. The net irrigated area is 5184 ha. It is also observed that net sown area accounts about 60744 ha & % of Net Area Irrigated to Net Area Sown is 8.53 as per District at a glance 2019-20. The details of the land utilization is given in Table 2. The land use map is given in Fig. 3.

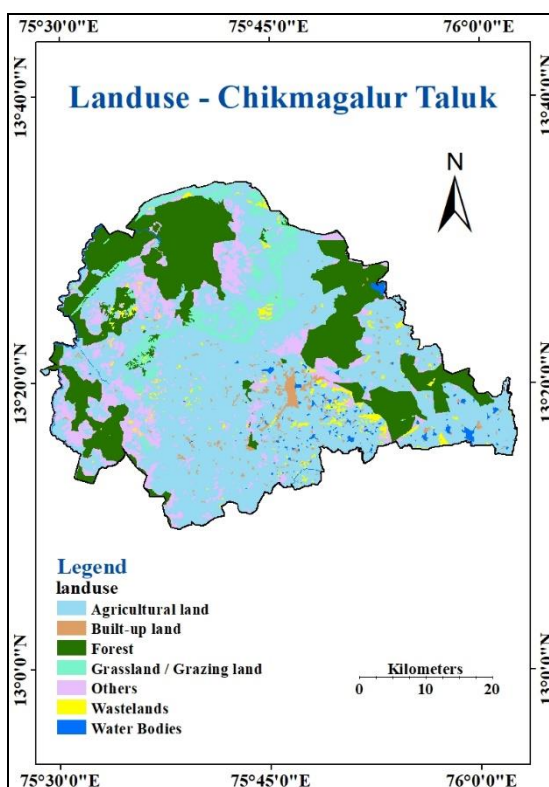


Fig.3 : The land use map

Category	Major crops
Cereals	Paddy, ragi, maize, jowar
Pulses	Red gram, horse gram, green gram, black gram and bengal gram
Oil Seeds	Sunflower and groundnut
Vegetables	Potato, chilli, tomato and onion
Flowers	Rose, anthuriums, chrysanthemum and marigold
Fruits	Banana, mango, mandarins and sapota
Commercial crops	Sugarcane and cotton
Plantation crops	Coffee, tea, coco, beetal leaf
Horticultural crops	Coconut and arecanut
Spices	Pepper, cardamom, ginger and turmeric

Groundwater is the major source of irrigation (74%) followed by Canal irrigation (24%) from KRS project (Cauvery river). Groundwater for irrigation in agriculture sector is developed through 3863 Tube wells. Groundwater development is low as canal water is made available for irrigation though 594 canals. The ground water thus extracted is utilized for irrigation by adopting different efficient water use irrigation practices such as sprinklers irrigations and drip irrigations. As a major part of the taluk is hilly and covered by forest, groundwater development is low.

Table 2: Distribution of land utilization in Chikmagalur taluk.

Sl. No	Particulars	Area (ha)
1.	Forests	47455
2.	Land not available for cultivation	14828
3	% of Forest Area to Geo Graphical Area	29.5

4.	Net Sown Area (NSA)	60744
5.	Net Irrigated Area (NIA) (hectares)	5184
6.	Percentage NIA to NSA (Percentage)	8.53
7.	Cropping pattern	Area (ha)
	Paddy	3011
	Ragi	2419
	Total cereals	10420
	Total pulses	1839
	Total oil seeds	925
	Sugarcane	319
	Total Condiments & spices	11064
	Coconut	3227
	Cotton	1058

Source: Chikmagalur district at a Glance (2019-20)

1.5 Geomorphology, Physiography & Drainage

In general, the geomorphology of the taluk is a table land comprising of plains to undulating as well as mountainous undulating plains and hills. Physiographically, the taluk may be divided into two distinct units viz., mountainous terrain and flat plains. The major part of the area is hilly tract. The western & South-western parts of the taluk forms a continuous hill ranges covered by forests. The elevation of the taluk ranges in between 700-1925 m above sea level. Mullayyanagiri, the highest peak in Karnataka, is located in the Chandra Dhrona Hill Ranges of the Western Ghats of Chikkamagaluru Taluk With a height of 1,925 metres. The taluk forms a part of Krishna basin. Most of the area is drained by the river Krishna and its tributaries along with number of ephemeral streams. The drainage pattern of the area can be described as dendritic in nature. The Bhadra River flows through the western boundary of the taluk.

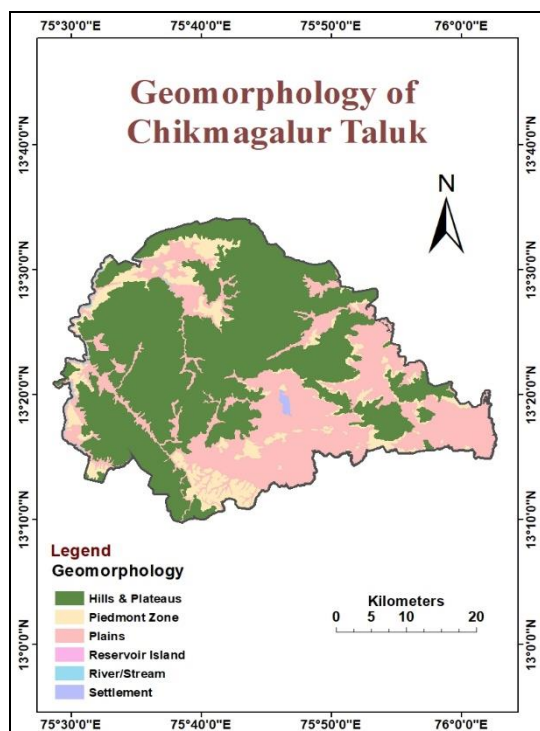


Fig. 4: Geomorphology map

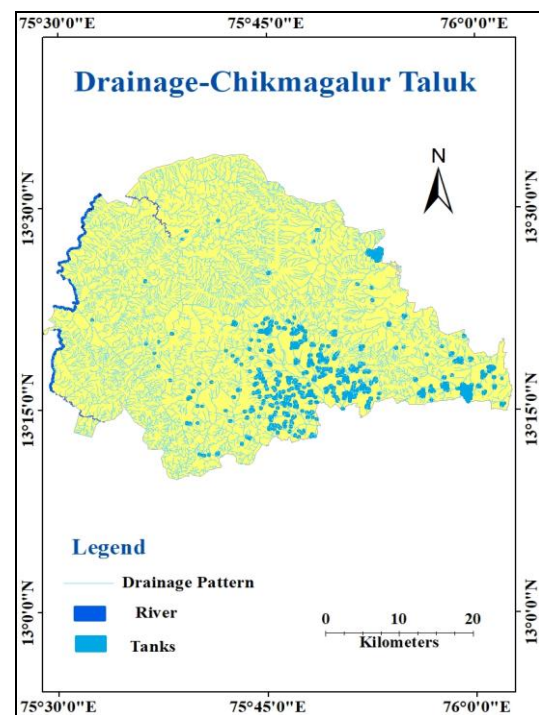


Fig. 5: Drainage map.

1.6 Soils

The major soil type in the district comprises of red loamy & sandy soil. However, hilly area soil and mixed red & black soil are also found to occur in small areas in the taluk.

The soil map of Chikmagalur taluk is given in Fig. 6.

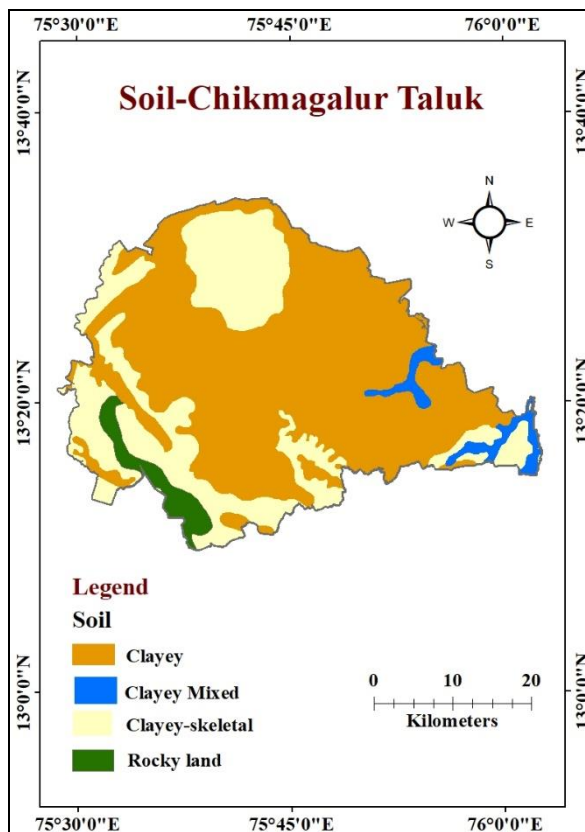


Fig.6: The soil map

1.7 Ground water resource availability and extraction

As per the ground water resources estimation 2022 (Table-3), the data on ground water resources shows that the net annual ground water availability is 6664.50 ham. The existing gross groundwater extraction for irrigation is 4731.25 ham. The stage of ground water development is 44.05 % and falling under **‘SAFE’** category.

Assessment Unit Name	Assessment Unit Type	Annual Extractable Ground Water Resource (Ham)	Ground Water Extraction for Irrigation Use (Ham)	Ground Water Extraction for Industrial Use (Ham)	Ground Water Extraction for Domestic Use (Ham)	Total Extraction (Ham)	Annual GW Allocation for Domestic Use as future use (Ham)	Net Ground Water Availability for future use (Ham)	Stage of Ground Water Extraction (%)	Categorization (Over-ExploitedE/Critical/Semicritical/Safe/Saline)
CHIKKA MAGALURU	BLOCK	13585.59	4958.25	0.13782	772.912	5731.3	895.99	7731.21	42.1866	SAFE

Table 3: ground water resources estimation 2022

1.8 DATA GAP ANALYSIS

a. Exploratory Data Availability

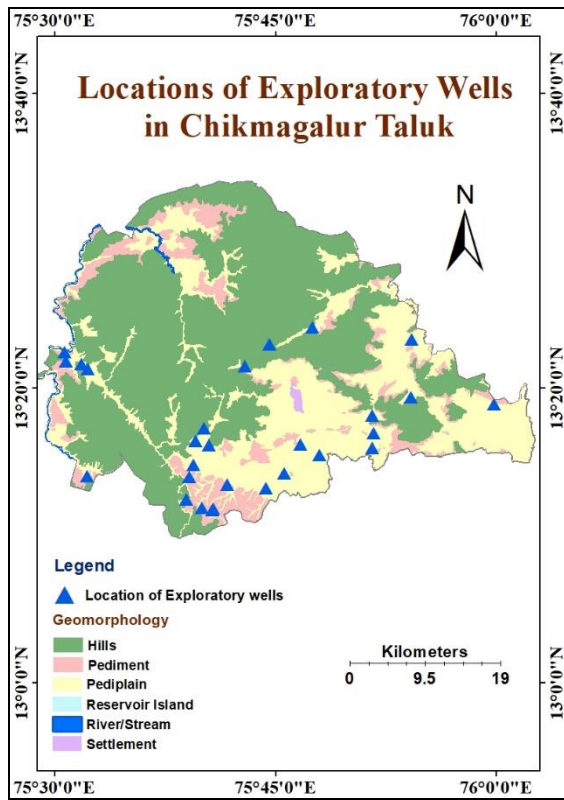


Fig7: Location of existing exploratory wells in the taluk

Village	Latitude	Longitude
sirgapura	13.2696	75.7777
k r pete	13.2371	75.7596
marle	13.2819	75.8607
haliyur	13.2737	75.6590
bilukoppa	13.3637	75.5124
honnekoppa	13.3742	75.5106
hosakote	13.3023	75.8597
kanivehalli	13.3227	75.9029
baalenahalli	13.3886	75.9043
degulapura	13.2658	75.8596
kuduvalli	13.2202	75.7393
Kotevoor	13.2881	75.6688
saragodu	13.2336	75.5366
s m pete	13.3602	75.5300
gorigandi	13.3550	75.5367
hebbali	13.4022	75.7917
Boochenahallikaval	13.3152	75.9978
Machagondanahalli	13.1975	75.6659
haandi	13.1967	75.6792
sathihalli	13.2073	75.6485
hirekolale	13.3577	75.7146
thodadahalli	13.3828	75.7426
hosahalli	13.2461	75.6565
dinnekere	13.2238	75.6953
balehalli	13.1955	75.6779
biggadevanahalli	13.2579	75.7998
thoranamavu	13.2686	75.6741
kataradahalli	13.2326	75.6517

Table 4: Location of existing exploratory wells in the taluk

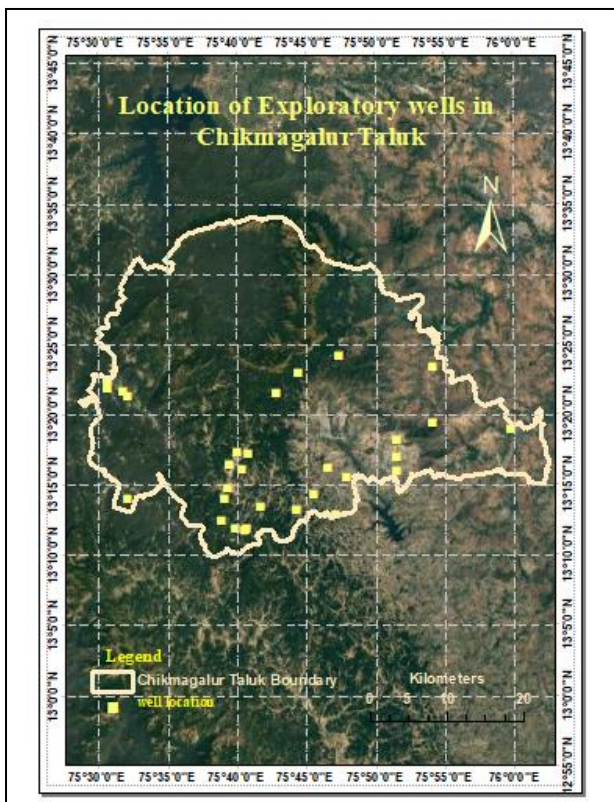
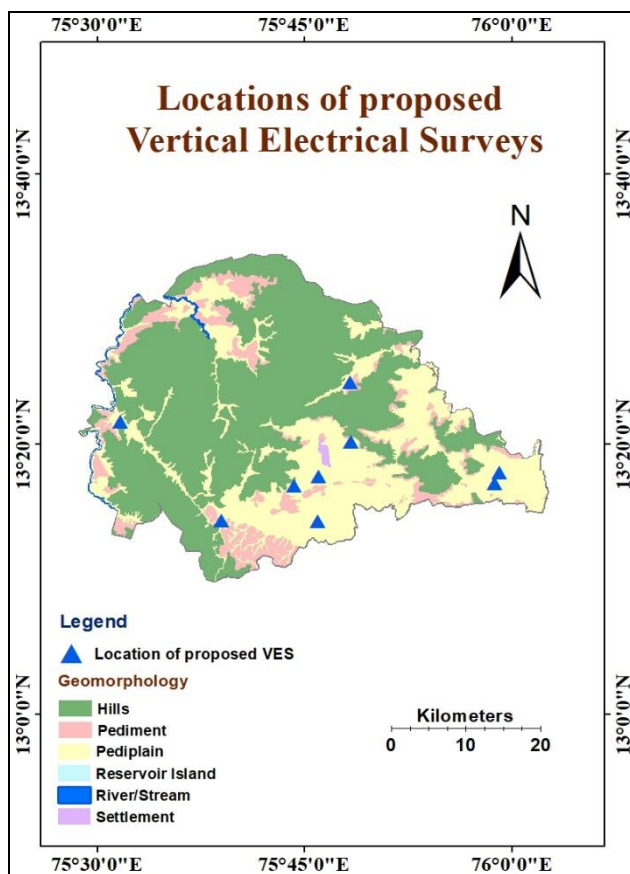


Fig8: Location of existing exploratory wells in the taluk on Google Earth

- From the above map it is observed that exploratory wells are spreaded into eastern, southern part and few wells are located in western part also. From figure 7 & 8 it is clear that the wells are located in pediplain area.
- From geomorphology and landuse details of the taluk it is observed that the north western part is covered by dense forest and western , northern & part of south western taluk are covered by hills. Therefore, it may be concluded the the area in between **North Latitudes 13°22'0" and 13°35'0"** and **East Longitudes between 75°30'0" to 75°42'0"** are unapproachable and data collection will be difficult.
- In eastern and Southern part, exploratory data from 28 wells are available which can be utilized to get information of the aquifers of the region.

b. Availability of Geophysical data

In chikmagalur taluk, no data is available for Geophysical information. Therefore around 9 no of Vertical Electrical Surveys have been proposed in the taluk. The proposed locations are mostly in the pediplain area. As the area is hilly and covered by dense forest in the northern, western and southern part, Geophysical investigations may not be feasible to conduct.



Sl. No	Village	Latitude	Longitude
1	Beekannahalli	13.33606	75.80633
2	Mallenhalli	13.40977	75.80463
3	Mugthihalli	13.28189	75.73718
4	Tegur	13.29306	75.76681
5	K.R.Pete	13.23757	75.76616
6	Eswarahalli	13.28428	75.97921
7	Belavadi	13.29833	75.9848
8	Aldur	13.23922	75.64922
9	Devadana	13.36095	75.52765

Table 5: Location of Proposed VES in Chikmagalur Taluk

Fig 9: proposed VES in Chikmagalur taluk

c. Ground Water Monitoring Data availability

- From the map hiven below it is observed that Ground Water Monitoring Data are spreaded into eastern, southern part and few wells are located in western part also. From figure 7 it is clear that the wells are located in pediplain area.
- From geomorphology and landuse details of the taluk it is observed that the north western part is covered by dense forest and western , northern & part of south western taluk are covered by hills. Therefore, it may be concluded the the area in between **North Latitudes 13°22'0" and 13°35'0" and East Longitudes between 75°30'0" to 75°42'0"**are unapproachable and data collection will be difficult.
- In eastern and Southern & western part, Groundwater level data from 28 wells are available out of which 10 no of borewells will provide waterlevel of semi-confined/deeper aquifer and 18 no of dugwells will provide water level of phreatic aquifer

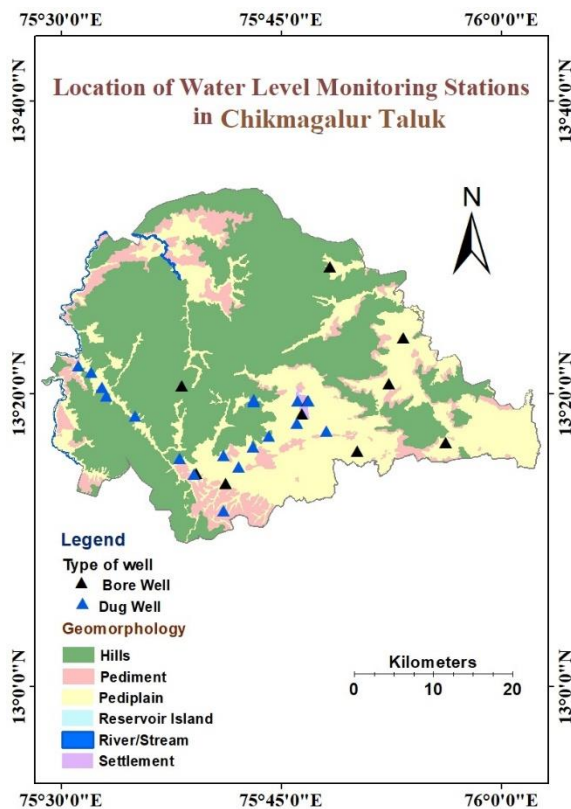


Fig 10: Existing GW level monitoring stations

Sl. No	Latitude	Longitude	Village	Type of well
1	13.28	75.94	Kalasapura	Bore Well
2	13.27	75.84	Magadi	Bore Well
3	13.40	75.89	Uddeboranahalli	Bore Well
4	13.34	75.64	Avathi	Bore Well
5	13.48	75.80	Hosapete	Bore Well
6	13.31	75.77	Chikmagalur (Rural)	Bore Well
7	13.23	75.69	Kabbinasethve	Bore Well
8	13.34	75.87	Lakya	Bore Well
9	13.24	75.65	Aldur	Bore Well
10	13.33	75.78	Chikmagalur	Bore Well
11	13.34	75.55	Sangameswarapete	Dug Well
12	13.27	75.72	Aladagudde	Dug Well
13	13.24	75.65	Aldur	Dug Well
14	13.26	75.63	Bannur_CKM	Dug Well
15	13.33	75.77	Chikkamagalur Town	Dug Well
16	13.36	75.53	Gori Gundi	Dug Well
17	13.20	75.68	Handi	Dug Well
18	13.32	75.72	Hukkunda	Dug Well
19	13.33	75.55	Hunsehalli	Dug Well
20	13.31	75.58	Kanati	Dug Well
21	13.29	75.80	Karthikere	Dug Well
22	13.26	75.68	Kooduvalli	Dug Well
23	13.29	75.73	Mugthihalli	Dug Well
24	13.30	75.77	Rampura	Dug Well
25	13.33	75.72	Thali Halla	Dug Well
26	13.25	75.70	Vasthare	Dug Well
27	13.33	75.78	Chikmagalur Town	Dug Well
28	13.37	75.52	Kadubugere	Dug Well

Table 6: Location of existing water level monitoring stations in Chikmagalur Taluk

d. Ground Water Quality Data availability

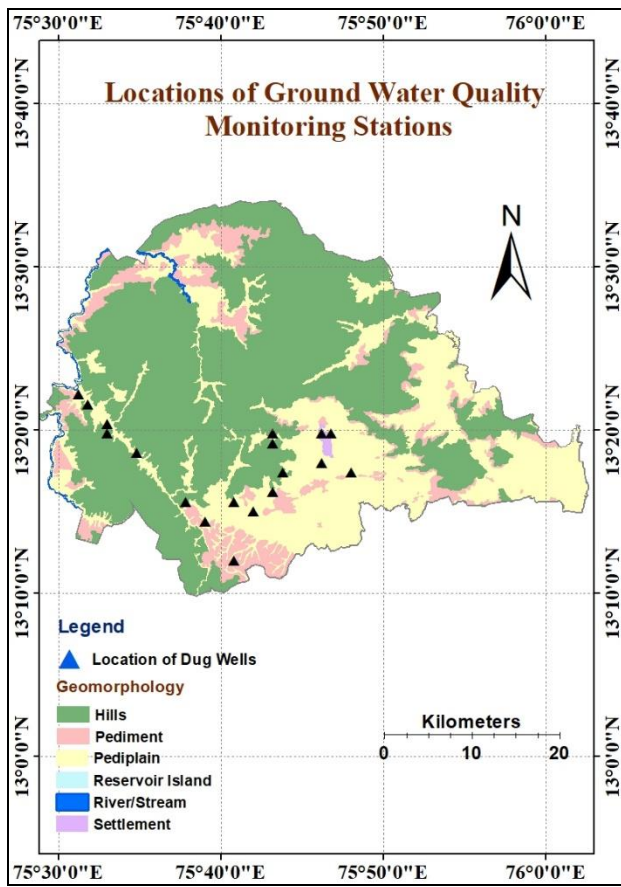


Fig 11: Existing Stations for GW quality monitoring

Sl No.	Latitude	Longitude	Village	Type of well
1	13.34	75.55	Sangameshwarapete	Dug Well
2	13.27	75.72	Aladagudde	Dug Well
3	13.24	75.65	Aldur	Dug Well
4	13.26	75.63	Bannur_CKM	Dug Well
5	13.33	75.77	Chikkamagalur Town	Dug Well
6	13.36	75.53	Gori Gundi	Dug Well
7	13.2	75.68	Handi	Dug Well
8	13.32	75.72	Hukkunda	Dug Well
9	13.33	75.55	Hunsehalli	Dug Well
10	13.31	75.58	Kanati	Dug Well
11	13.29	75.8	Karthikere	Dug Well
12	13.26	75.68	Kooduvalli	Dug Well
13	13.29	75.73	Mugthihalli	Dug Well
14	13.3	75.77	Rampura	Dug Well
15	13.33	75.72	Thali Halla	Dug Well
16	13.25	75.7	Vasthare	Dug Well
17	13.33	75.78	Chikmagalur Town	Dug Well
18	13.37	75.52	Kadubugere	Dug Well

Table 7: Existing Stations for GW quality monitoring

- From geomorphology and landuse details of the taluk it is observed that the north western part is covered by dense forest and western , northern & part of south western taluk are covered by hills. Therefore, it may be concluded the the area in between **North Latitudes 13°22'0" and 13°35'0" and East Longitudes between 75°30'0" to 75°42'0"**are unapproachable and data collection will be difficult.
- In eastern and Southern & western part, Groundwater quality data from 18 wells are available which will provide water quality of phreatic aquifer.

1.9 Water Level Behaviour

The water level data have been monitored from the representative dug well and borewells for both pre and post-monsoon seasons. During pre-monsoon season in i) aquifer-I (phreatic) water level ranges from 1.55 to 16.2 mbgl, ii) aquifer-II (fractured) water level ranges from 2.10 to 18.30 mbgl , whereas in post-monsoon it varies from 1.38 to 15 m bgl in aquifer-I (phreatic) and 2.10-19 mbgl in aquifer-II (fractured) . The pre-monsoon decadal average water level for aquifer-I varies from 1.71 to 10.93 mbgl. The post-monsoon decadal average water level for aquifer-I varies from 0.93 to 10.55 mbgl.

Depth to water level

Aquifer-I

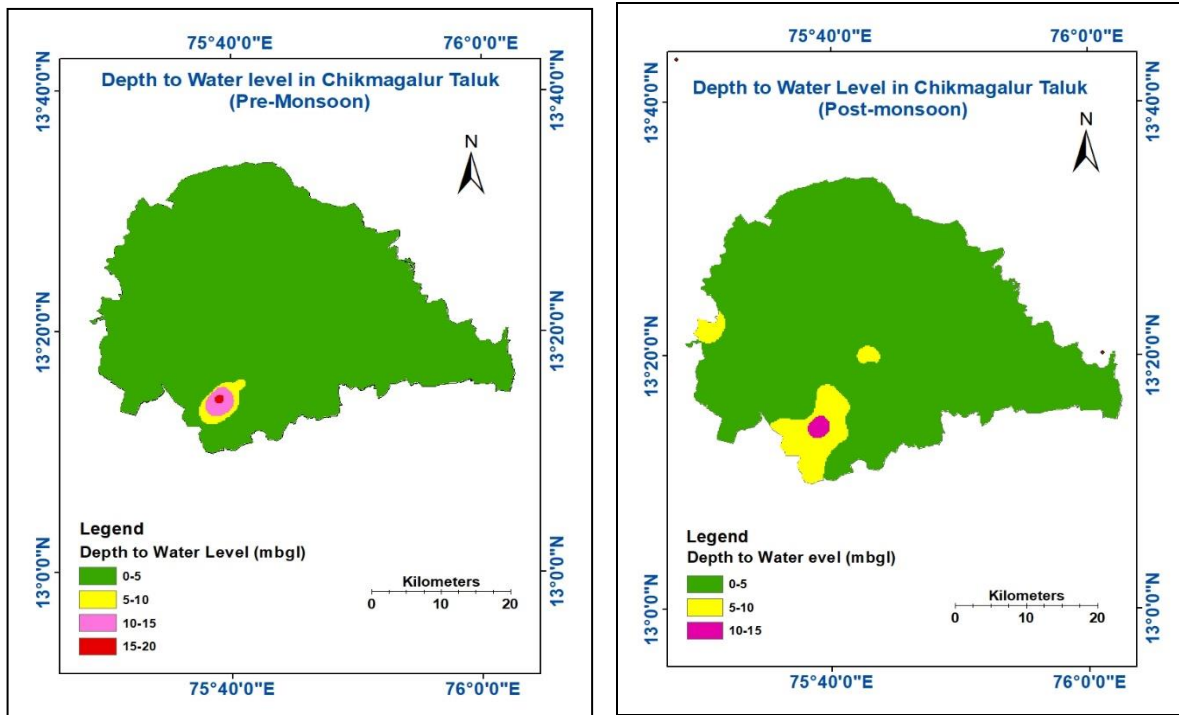
(a) Pre-monsoon: 1.55 to 16.2 mbgl (May 2022)

(b) Post-monsoon: 1.38 to 15 mbgl (Nov 2022)

Aquifer-II

(a) Pre-monsoon: 2.10 to 18.30 mbgl (May 2022)

(b) Post-monsoon: 2.10-19 mbgl (Nov 2022)



1 Fig 13: Depth to Water Level of Aquifer I (Post-monsoon)

Village	Type of Well	November, 2022 WL (mbgl)
Kalasapura	BW	4.20
Magadi	BW	7.30
Hosapete	BW	6.80
Chikkamagaluru (Rural)	BW	2.30
Kabbinasethve	BW	2.60
Lakya	BW	2.10
Aldur	BW	7.70
Uddeboranahalli (Billekallahalli)	BW	5.70
Sangameshwarapete	BW	19.00
Avathi (Danihalli)	BW	7.10
Aladagudde	DW	2.85
Aldur	DW	15
Bannur_CKM	DW	2.13

Village	Type of Well	May, 2022 WL (mbgl)
Kalasapura	BW	7.90
Magadi	BW	11.00
Hosapete	BW	8.60
Chikkamagaluru (Rural)	BW	2.10
Kabbinasethve	BW	5.40
Lakya	BW	6.80
Aldur	BW	7.30
Uddeboranahalli (Billekallahalli)	BW	8.40
Sangameshwarapete	BW	18.30
Avathi (Danihalli)	BW	10.10
Aladagudde	DW	4.55
Aldur	DW	16.2
Bannur_CKM	DW	2.16
Chikkamagalur Town	DW	2.05
Gori Gundi	DW	5.73
Handi	DW	6.1

Chikkamagalur Town	DW	3
Gori Gundi	DW	3.8
Handi	DW	3.34
Hukkunda	DW	3.15
Hunsehalli	DW	3.2
Kanati	DW	1.38
Karthikere	DW	1.88
Kooduvalli	DW	5.25
Muthinakoppa	DW	2.2
Rampura	DW	2.26
Thali Halla	DW	7.32
Uppalli	DW	2.28
Vasthare	DW	3.5
Chikmagalur Town	DW	1.7
Kadubugere	DW	6

Table 8: DTW of Aquifer I & Aquifer II (Pre-monsoon)

Hukkunda	DW	3.25
Hunsehalli	DW	4.7
Kanati	DW	1.58
Karthikere	DW	1.55
Kooduvalli	DW	8.9
Thali Halla	DW	6.4
Vasthare	DW	5.75

Table 9: DTW of Aquifer I & Aquifer II (Post-monsoon)

The long term groundwater trend (2011-2022) for pre-monsoon period shows a fall in the range 0.49m/year to 3.83 m/year and rise in the range of 0.13m/year to 5.75m/year. The long-term groundwater trend (2011-2022) for post-monsoon period shows a fall in the range 0.04 m/year to 0.71 m/year and rise in the range of 0.11m/year to 3.41 m/year. Both during pre-monsoon & post-monsoon period monitoring stations are mostly showing rising trend.

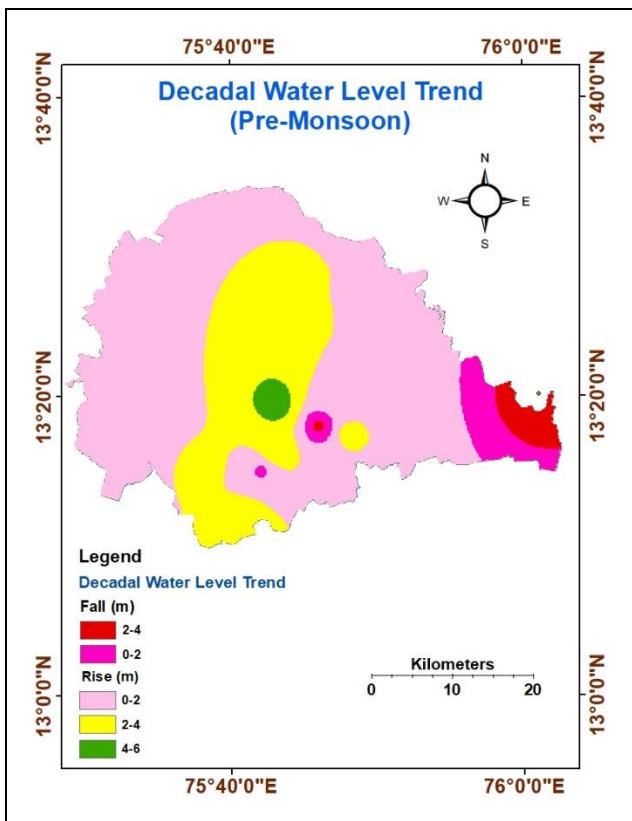


Fig 14: Decadal Water Level Trend (Pre-monsoon)

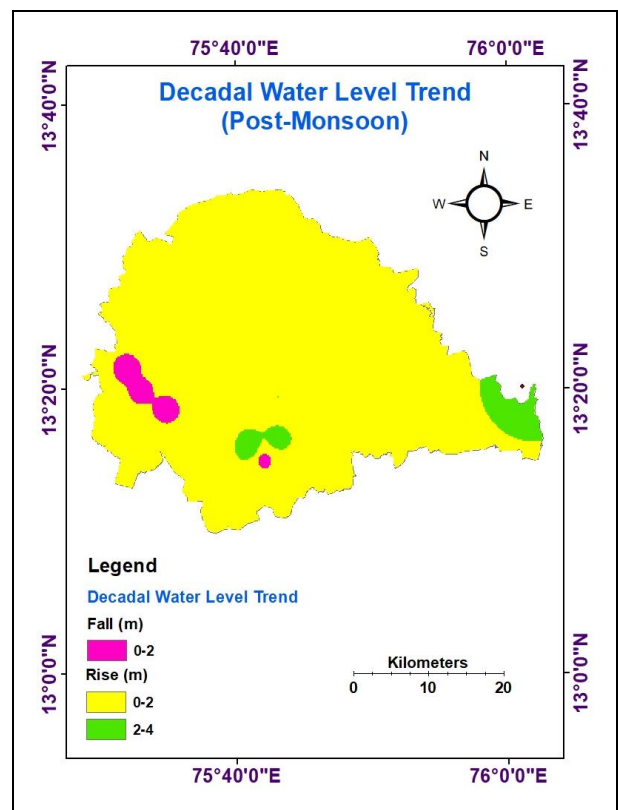


Fig 15: Decadal Water Level Trend (Post-monsoon)

LOCATION	LAT	LONG	FLUCTUTION (m/year)
Rampura	13.3	75.7667	1.74
Aladagudde	13.2731	75.7172	2.69
Bannur_ckm	13.26	75.6333	0.11
Chikmagalur Town	13.3256	75.78	0.48
Gori Gundi	13.3578	75.5333	-0.05
Handi	13.2	75.6833	1.83
Hukkunda	13.3247	75.7175	2.17
Hunsehalli	13.3308	75.5506	-0.04
Kanati	13.3083	75.5833	-0.14
Karthikere	13.2911	75.8008	1.88
Kooduvalli	13.2636	75.6833	3.41
Thali Halla	13.3267	75.7175	0.96
Uppalli	13.3356	76.0178	2.34
Vasthare	13.25	75.7008	-0.71

VILLAGE	LAT	LONG	FLUCTUTATION (m/year)
Rampura	13.3	75.7667	-2.62
Aladagudde	13.2731	75.7172	3.99
Bannur_ckm	13.26	75.6333	2.64
Chikmagalur Town	13.3256	75.78	0.7
Gori Gundi	13.3578	75.5333	0.71
Handi	13.2	75.6833	2.79
Hukkunda	13.3247	75.7175	5.75
Hunsehalli	13.3308	75.5506	1.05
Kanati	13.3083	75.5833	0.13
Karthikere	13.2911	75.8008	2.76
Kooduvalli	13.2636	75.6833	1.91
Thali Halla	13.3267	75.7175	4.53
Uppalli	13.3356	76.0178	-3.83
Vasthare	13.25	75.7008	-0.49

Table 10: Decadal Water Level fluctuation (Post-monsoon)

Table 11: Decadal Water Level fluctuation (Pre-monsoon)

2.0 AQUIFER DISPOSITION

Most of the area in Chikmagalur taluk is covered by schist followed by gneissic rock formation in southern part of the taluk. Weathered, fractured and jointed schist and gneiss serve as potential aquifers in the area.

- **Aquifer-I (Phreatic aquifer)** comprising weathered Schist and Granitic Gneisses.
- **Aquifer-II (Fractured aquifer)** comprising Fractured Schist and Granitic Gneisses.

In this taluk bore wells were drilled from a minimum depth of 114 mbgl to a maximum of 290 mbgl. Depth of weathered zone ranges from 12-48 mbgl. Ground water exploration reveals that aquifer-II fractured formation was encountered between the depth of 40-70 mbgl. Yield ranges from 0.4-3.8 lps. The details of wells drilled are given in Table 12. The basic characteristics of weathered and fractured aquifers are given in Table 13.

sl no.	Village	Latitude	Longitude	Total depth drilled(mbgl)mtr	Depth of casing pipe lowered (mbgl)mtr	Water tapped zones fractures	yield of well (lps)
1	baalenahalli	13.3886	75.9043	145	24	60	2.3
2	balehalli	13.1955	75.6779	171	16	60	1.5
3	biggadevanahalli	13.2579	75.7998	114	31	60	1.0
4	bilukoppa	13.3637	75.5124	160	20	50	3.3
5	Boochenahallikaval	13.3152	75.9978	180	22	50	1.5
6	degulapura	13.2658	75.8596	150	15	60	2.3
7	dinnekere	13.2238	75.6953	191.2	18	45	3.8

8	gorigandi	13.355	75.5367	166	27	40	2.0
9	haandi	13.1967	75.6792	180	30	45	0.4
10	haliyur	13.2737	75.659	141	18	40	2.0
11	hebbali	13.4022	75.7917	168	22	45	1.5
12	hirekolale	13.3577	75.7146	167	48	40	1.5
13	honnekoppa	13.3742	75.5106	155	22	50	1.5
14	hosahalli	13.2461	75.6565	144	36	45	3.3
15	hosakote	13.3023	75.8597	158	24	60	2.3
16	k r pete	13.2371	75.7596	190	21	60	0.6
17	kanivehalli	13.3227	75.9029	290	20	60	1.5
18	kataradahalli	13.2326	75.6517	156	25	50	1.3
19	Kotevooruru	13.2881	75.6688	142	18	40	1.5
20	kuduvalli	13.2202	75.7393	142	18	50	2.0
21	Machagondanahalli	13.1975	75.6659	130	24	45	1.0
22	marle	13.2819	75.8607	150	12	60	1.5
23	s m pete	13.3602	75.53	184	20	45	1.0
24	saragodu	13.2336	75.5366	148	26	45	1.9
25	sathihalli	13.2073	75.6485	129	24	45	0.9
26	sirgapura	13.2696	75.7777	190	25	70	2.3
27	thodadahalli	13.3828	75.7426	138	36	40	1.5
28	thoranamavu	13.2686	75.6741	163	30	40	1.0

Table 12: The details of Exploratory wells in Chikmagalur Taluk

Aquifers	Weathered Zone (Aq.-I)	Fractured Zone (Aq.-II)
Prominent Lithology	Weathered Granitic Gneiss / schists	Weathered Granitic Gneiss / schists
Thickness range (mbgl)	12-48	Fractures upto 70 mbgl
Depth range of occurrence of fractures (mbgl)	40-48	50-70m
Range of yield potential (lps)	-	0.4-3.8 lps
Quality Suitability for Domestic & Irrigation	Suitable	Suitable

Table 13: The details of Aquifer I & Aquifer II in Chikmagalur Taluk

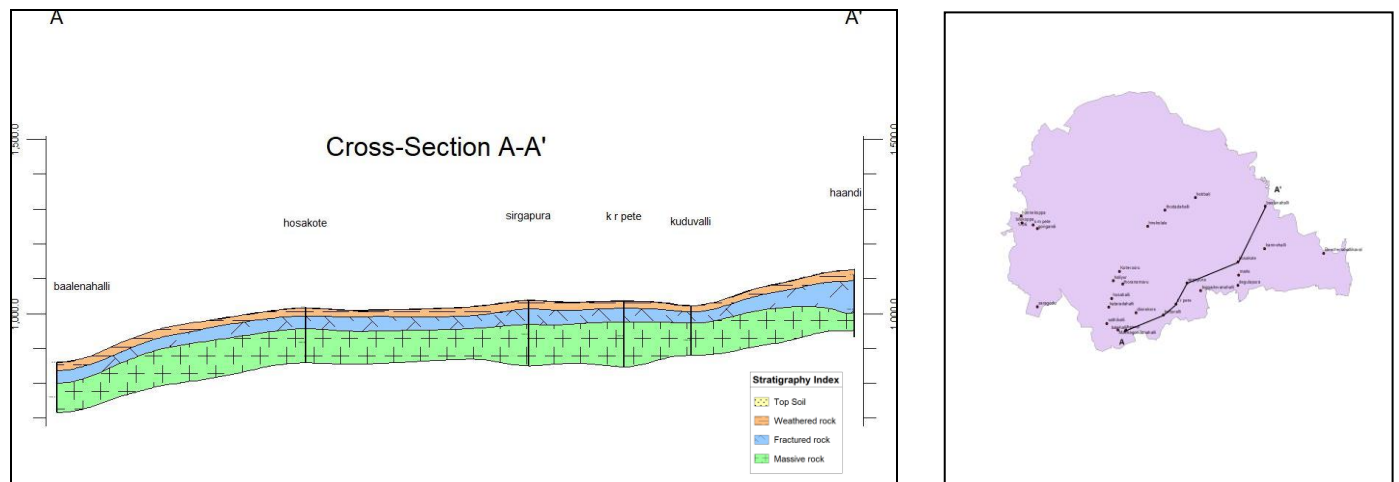


Fig 16: Cross Section of Exploratory wells drilled in Chikmagalur Taluk in NE-SW directions which is showing the thickness of Weathered rock, fractured rock massive rock

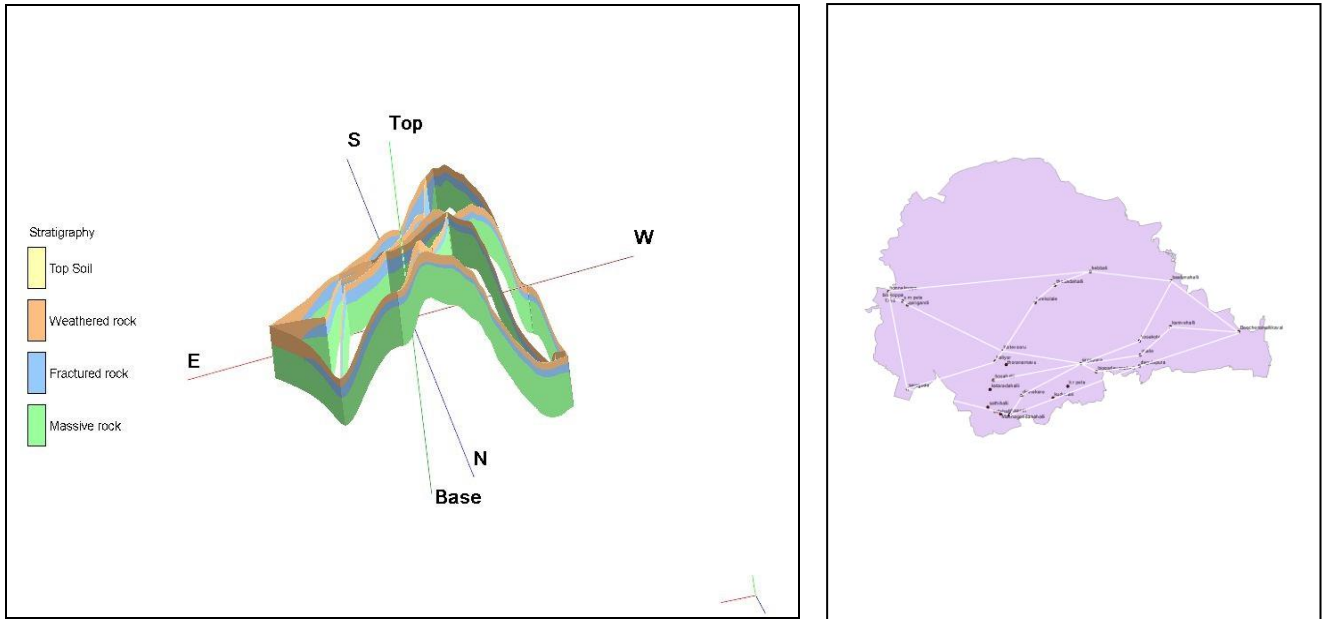


Fig 17: Fence Diagram of Exploratory wells drilled in Chikmagalur Taluk

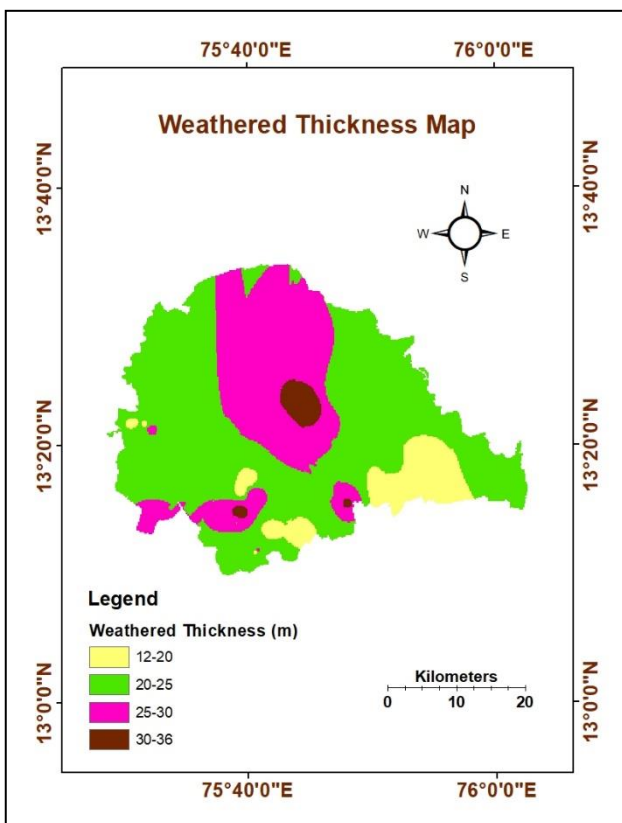


Fig 18: Weathered thickness of aquifers in Chikmagalur Taluk

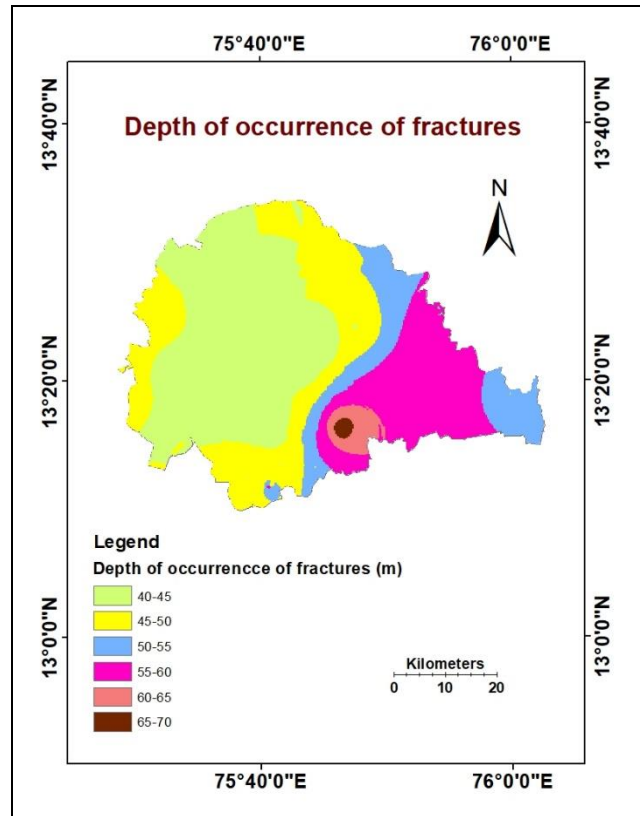


Fig 19: Depth of occurrence of fractures in Chikmagalur Taluk

Majority of the taluk is having weathered thickness in the range 20-30m

In majority of the taluk the depth of occurrence of fractures is in the range of 40-50m

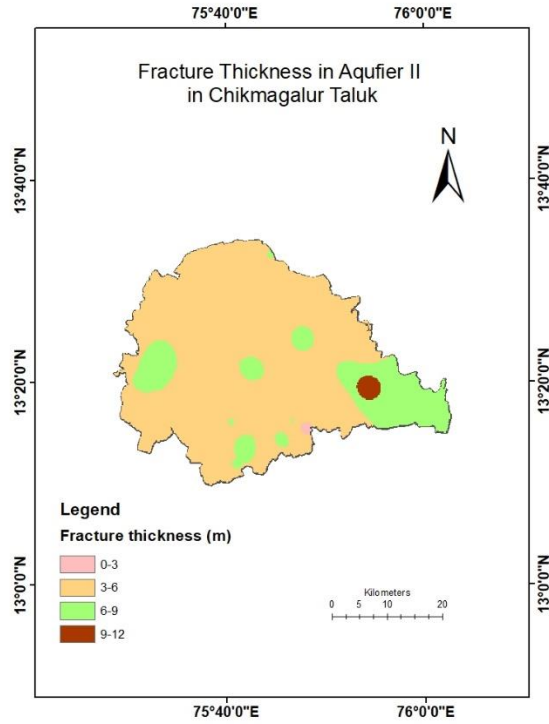
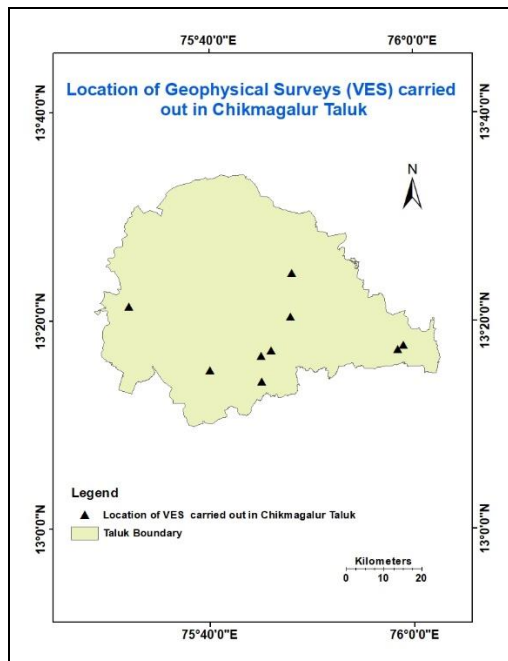


Fig 20: Thickness of fractures in Chikmagalur Taluk

3.0 GEOPHYSICAL DATA

Vertical Electrical Sounding (VES) survey was conducted using the IGIS Resistivity meter, SSRMP-ATS with Schlumberger Electrode Configurations. The sounding was conducted upto a half current electrode spread of (AB/2) -200m. The surveys were carried out in the following locations-



Sl. no	Location	Lat	Long
1	Bakhtahalli	13.29431	75.98421
2	Bankal	13.13845	5.546224
3	Chudur	13.25486	75.6675
4	Devdana	13.3571	75.535
5	Belavadi	13.3405	75.7998
6	Eshwarhalli	13.28811	75.97477
7	RK Pete	13.2365	75.7524
8	Mallenhalli	13.4104	75.8014
9	Mugtehalli	13.27706	75.75129
10	Tegur	13.2866	75.7675

Results:

1. Bakhtahalli

The interpreted result of the VES in Bakhtahalli has indicated four layers with HA type of VES curve. First layer is top soil characterized with a resistivity of 68.4 Ohm.m and a thickness of this layer is 3.6m. The second layer with resistivity of 22 Ohm.m is attributed to weathered formation and thickness of this layer is 8.7m. Third layer is attributed to hard and fractured which is exhibiting resistivity of 320 Ohm.m and thickness of 39.0m. This is underlain by high resistivity layer which is massive formation and this layer is extending with depth.

2. Bankal

The interpreted result of the VES in Bankal has indicated four layers with HA type of VES curve. First layer is top soil characterized with a resistivity of 618.0 Ohm.m and a thickness of this layer is 1.0m. The second layer with resistivity of 130.0 Ohm.m is attributed to weathered formation and thickness of this layer is 24.7m. Third layer is attributed to hard formation which is exhibiting resistivity of 464 Ohm.m and thickness of 7.9m. This is underlain by high resistivity layer which is massive formation and this layer is extending with depth.

3. Chudur

The interpreted result of the VES in Chudur has indicated four layers with HA type of VES curve. First layer is top soil characterized with a resistivity of 1646.0 Ohm.m and a thickness of this layer is 1.2m. The second layer with resistivity of 895.0 Ohm.m is attributed to weathered formation and thickness of this layer is 3.7m. Third layer is attributed to hard and fractured formation which is exhibiting resistivity of 229 Ohm.m and thickness of 33.5m. This is underlain by high resistivity layer which is massive formation and this layer is extending with depth.

4. Devdana

The interpreted result of the VES in Chudur has indicated four layers with HA type of VES curve. First layer is top soil characterized with a resistivity of 1646.0 Ohm.m and a thickness of this layer is 1.2m. The second layer with resistivity of 895.0 Ohm.m is attributed to weathered formation and

thickness of this layer is 3.7m. Third layer is attributed to hard and fractured formation which is exhibiting resistivity of 229 Ohm.m and thickness of 33.5m. This is underlain by high resistivity layer which is massive formation and this layer is extending with depth.

5. Eshwarhalli

The interpreted result of the VES in Eshwarhalli has indicated three layers with A type of VES curve. First layer is top soil characterized with a resistivity of 152.0 Ohm.m and a thickness of this layer is 1.9m. The second layer with resistivity of 291.0 Ohm.m is attributed to weathered/Hard formation and thickness of this layer is 14.3m. This is underlain by high resistivity layer which is massive formation and this layer is extending with depth.

6. RK Pete

The interpreted result of the VES in RK Pete has indicated four layers with HA type of VES curve. First layer is top soil characterized with a resistivity of 385.0 Ohm.m and a thickness of this layer is 1.5m. The second layer with resistivity of 106.0 Ohm.m is attributed to weathered formation and thickness of this layer is 6.3m. Third layer is attributed to hard and fractured formation which is exhibiting resistivity of 305 Ohm.m and thickness of 25.2m. This is underlain by high resistivity layer which is massive formation and this layer is extending with depth.

7. Mallenhalli

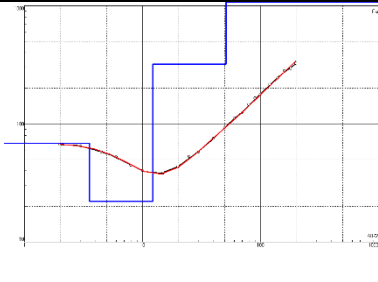
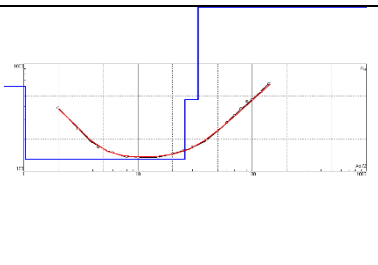
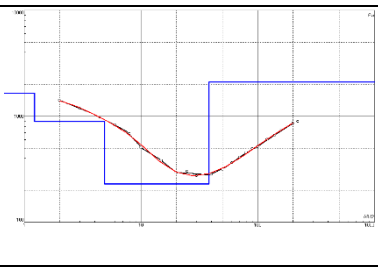
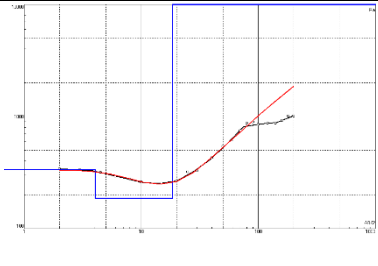
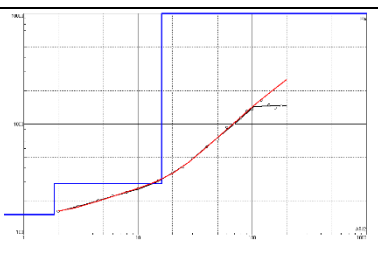
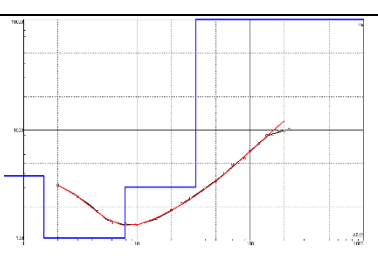
The interpreted result of the VES in Mallenhalli has indicated three layers with A type of VES curve. First layer is top soil characterized with a resistivity of 21.4 Ohm.m and a thickness of this layer is 3.7m. The second layer with resistivity of 55.0 Ohm.m is attributed to weathered formation and thickness of this layer is 24.6m. This is underlain by high resistivity layer which is massive formation and this layer is extending with depth.

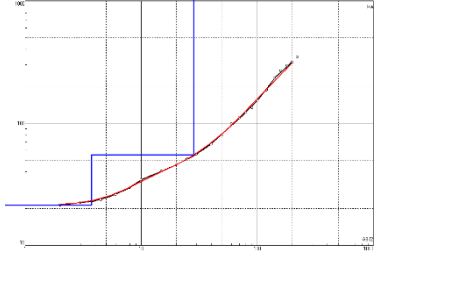
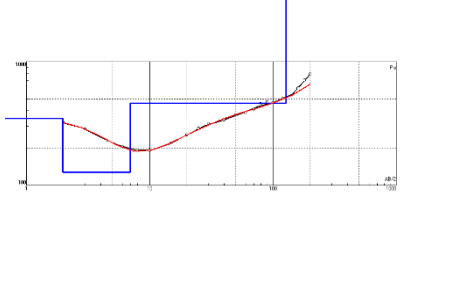
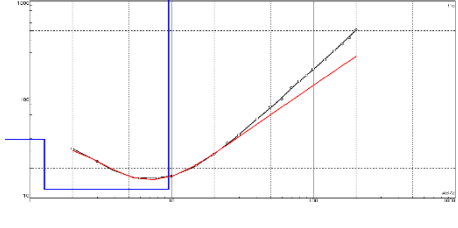
8. Mugtehalli

The interpreted result of the VES in Mugtehalli has indicated four layers with HA type of VES curve. First layer is top soil characterized with a resistivity of 348.0 Ohm.m and a thickness of this layer is 2.0m. The second layer with resistivity of 127.0 Ohm.m is attributed to weathered formation and thickness of this layer is 5.0m. Third layer is attributed to hard and fractured formation which is exhibiting resistivity of 460 Ohm.m and thickness of 121m. This is underlain by high resistivity layer which is massive formation and this layer is extending with depth.

9. Tegur

The interpreted result of the VES in Mugtehalli has indicated four layers with H type of VES curve. First layer is top soil characterized with a resistivity of 39.5 Ohm.m and a thickness of this layer is 1.3m. The second layer with resistivity of 12.2 Ohm.m is attributed to weathered formation and thickness of this layer is 8.3m. This is underlain by high resistivity layer which is massive formation and this layer is extending with depth.

Bakhtahalli		<table border="1"> <thead> <tr> <th>N</th> <th>1</th> <th>2</th> <th>3</th> <th>4</th> <th></th> <th></th> </tr> </thead> <tbody> <tr> <td>p</td> <td>68.41</td> <td>22.07</td> <td>320</td> <td>9999</td> <td></td> <td></td> </tr> <tr> <td>h</td> <td>3.555</td> <td>8.683</td> <td>38.9</td> <td></td> <td></td> <td></td> </tr> <tr> <td>d</td> <td>3.555</td> <td>12.24</td> <td>51.14</td> <td></td> <td></td> <td></td> </tr> <tr> <td>Alt</td> <td>-3.5553</td> <td>-12.238</td> <td>-51.14</td> <td></td> <td></td> <td></td> </tr> </tbody> </table>	N	1	2	3	4			p	68.41	22.07	320	9999			h	3.555	8.683	38.9				d	3.555	12.24	51.14				Alt	-3.5553	-12.238	-51.14			
N	1	2	3	4																																	
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h	3.555	8.683	38.9																																		
d	3.555	12.24	51.14																																		
Alt	-3.5553	-12.238	-51.14																																		
Bankal		<table border="1"> <thead> <tr> <th>N</th> <th>1</th> <th>2</th> <th>3</th> <th>4</th> <th></th> <th></th> </tr> </thead> <tbody> <tr> <td>p</td> <td>618</td> <td>129.5</td> <td>464.2</td> <td>9999</td> <td></td> <td></td> </tr> <tr> <td>h</td> <td>1.033</td> <td>24.7</td> <td>7.863</td> <td></td> <td></td> <td></td> </tr> <tr> <td>d</td> <td>1.033</td> <td>25.74</td> <td>33.6</td> <td></td> <td></td> <td></td> </tr> <tr> <td>Alt</td> <td>-1.0328</td> <td>-25.736</td> <td>-33.599</td> <td></td> <td></td> <td></td> </tr> </tbody> </table>	N	1	2	3	4			p	618	129.5	464.2	9999			h	1.033	24.7	7.863				d	1.033	25.74	33.6				Alt	-1.0328	-25.736	-33.599			
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Alt	-1.22	-4.88	-38.38																																		
Devdana		<table border="1"> <thead> <tr> <th>N</th> <th>1</th> <th>2</th> <th>3</th> <th></th> <th></th> <th></th> </tr> </thead> <tbody> <tr> <td>p</td> <td>336</td> <td>186</td> <td>9999</td> <td></td> <td></td> <td></td> </tr> <tr> <td>h</td> <td>4.05</td> <td>14.4</td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>d</td> <td>4.05</td> <td>18.5</td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>Alt</td> <td>-4.046</td> <td>-18.48</td> <td></td> <td></td> <td></td> <td></td> </tr> </tbody> </table>	N	1	2	3				p	336	186	9999				h	4.05	14.4					d	4.05	18.5					Alt	-4.046	-18.48				
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Eshwarhalli		<table border="1"> <thead> <tr> <th>N</th> <th>1</th> <th>2</th> <th>3</th> <th></th> <th></th> <th></th> </tr> </thead> <tbody> <tr> <td>p</td> <td>152</td> <td>291</td> <td>9999</td> <td></td> <td></td> <td></td> </tr> <tr> <td>h</td> <td>1.85</td> <td>14.3</td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>d</td> <td>1.85</td> <td>16.1</td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>Alt</td> <td>-1.848</td> <td>-16.11</td> <td></td> <td></td> <td></td> <td></td> </tr> </tbody> </table>	N	1	2	3				p	152	291	9999				h	1.85	14.3					d	1.85	16.1					Alt	-1.848	-16.11				
N	1	2	3																																		
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N	1	2	3	4																																	
p	385	106	305	9999																																	
h	1.51	6.34	25.2																																		
d	1.51	7.85	33.1																																		
Alt	-1.51	-7.85	-33.06																																		

Mallenhalli		N	1	2	3				
		p	21.4	55	9999				
		h	3.73	24.6					
		d	3.73	28.4					
		Alt	-3.732	-28.36					
Mugtehalli		N	1	2	3	4			
		p	348	127	460	9999			
		h	1.97	4.98	121				
		d	1.97	6.95	128				
		Alt	-1.971	-6.952	-127.8				
Tegur		N	1	2	3				
		p	39.5	12.2	9999				
		h	1.27	8.25					
		d	1.27	9.52					
		Alt	-1.27	-9.52					

Summarized results:

Sr No.	Taluk	Village	R1 Ohmm	H1 (m)	Inferred Lithology	R2 Ohmm	H2 (m)	Inferred Lithology	R3 Ohmm	H3 (m)	Inferred Lithology	R4 Ohmm	H4 (m)	Inferred Lithology
1	Chikmagalur	Bakhtahalli	68.4	3.6	top soil	22.1	8.7	weathered formation	320	38.9	Hard and Fractured	VH		Massive
2	Mudigere	Bankal	618	1	top soil	130	24.7	weathered formation	464	7.7	Hard and Fractured	VH		Massive
3	Chikmagalur	Chudur	1646	1.22	top soil	895	3.7	weathered formation	229	33.5	Hard and Fractured	2102		Massive
4	Chikmagalur	Devdana	336	4.05	top soil	186	14.4	Hard	VH		Massive			
5	Chikmagalur	Eashwarhalli	152	1.85	top soil	291	14.3	Hard	VH		Massive			
6	Chikmagalur	RK Pete	385	1.5	top soil	106	6.34	weathered formation	305	25.2	Hard and Fractured	VH		Massive
7	Chikmagalur	Belavadi	UI											
8	Chikmagalur	Mallenhalli	21.4	3.7	top soil	55	24.6	weathered formation	VH		Massive			
9	Chikmagalur	Mugtehalli	348	1.97	top soil	127	4.98	weathered formation	460	121	Hard and Fractured	VH		Massive
10	Chikmagalur	Tegur	39.5	1.27	top soil	12.2	8.25	weathered formation	VH		Massive			

4.0 GROUND WATER QUALITY

Interpretation from Chemical Analysis of Aquifer - I results in Chikmagalur taluk (Table 18) shows that the Electrical Conductivity ranges from 120 to 2150 μ /mhos/cm in the aquifer-I at 25°C. The Nitrate value ranges from 1.23 to 39.61 mg/l and Fluoride concentration in groundwater ranges between 0.02 to 1.60 mg/l. All the values of EC, Nitrate, Fluoride are within permissible limit except 1 location i.e Karthikere which shows a F value of 1.6. mg/l. The detailed chemical analysis is given below:

Location	pH (6.5- 8.5)	EC in m S/cm	TH (600) in mg/L	Ca (200)	Mg (100)	Na	K	CO ₃	HCO ₃	Cl (1000)	SO ₄ (400)	NO ₃ (45)	SiO ₂	PO ₄	F (1.5)	TDS (2000)
Agalagundi	6.91	120	40	14	1	3.98	4.9	0	37	11	5	2.58	7.01	0.11	0.10	58
Aldur	7.04	450	162	71	4	25.75	1.1	0	104	60	20	39.61	42.9	0.45	0.22	225
Bannur_CK M (Card)	7.08	370	131	22	18	21.72	6	0	74	50	15	35.56	29.64	0.08	0.07	169
Chikkamaga luru Town	7.77	680	232	28	39	33.21	1.6	0	270	50	28	9.71	33.79	0.2	0.24	312
Gorigundi	7.22	250	96	20	11	12.24	0.8	0	43	32	6	31.96	35.99	0.14	0.04	103
Handi	7.03	200	66	12	9	10.75	6.5	0	43	32	6	11.34	3.96	0.06	0.02	97
Hukkunda	7.6	650	253	38	38	23.38	5.7	0	252	50	30	17.42	26.76	0.12	0.10	309
Hunsehali	7.25	350	126	20	18	18.32	3.4	0	74	46	12	22.42	34.17	0.34	0.06	154
Kadubugere (Billukoppa)	7.07	270	96	22	10	13.3	1.8	0	68	28	8	27.17	9.47	0.14	0.03	116
Kanati	6.45	230	71	14	9	15.97	4.5	0	55	18	22	23.94	14.2	0	0.11	110
Karthikere	8.18	2150	197	28	30	195.3	362	0	823	170	104	38.88	9.32	0	1.60	1293
Kooduvalli	7.29	650	232	59	21	39.42	3.2	0	153	82	44	37.64	22.19	0.04	0.16	324
Muthinakop pa	7.48	230	86	22	7	12.51	2	0	86	14	20	1.23	13.64	0	0.05	120
Talihalla	7.69	280	106	22	12	12.44	1.7	0	111	18	15	6.61	18.96	0	0.14	135
Uppali	7.52	800	258	40	38	58.61	0.7	0	338	60	30	7.46	17.1	0	0.15	393
Vastra	7.14	360	141	26	18	13.69	7.7	0	117	39	20	0.68	15.44	0	0.12	182

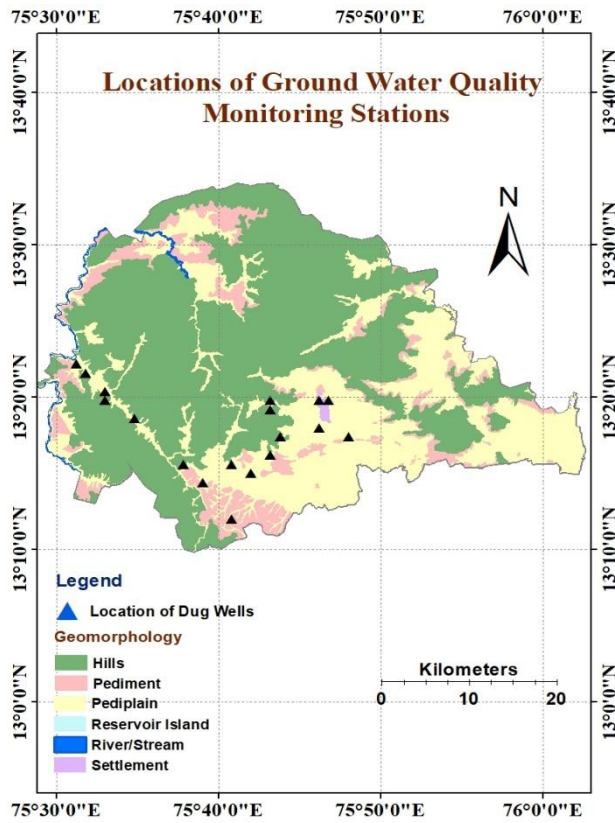


Fig 21 : Location of Groundwater Quality monitoring stations

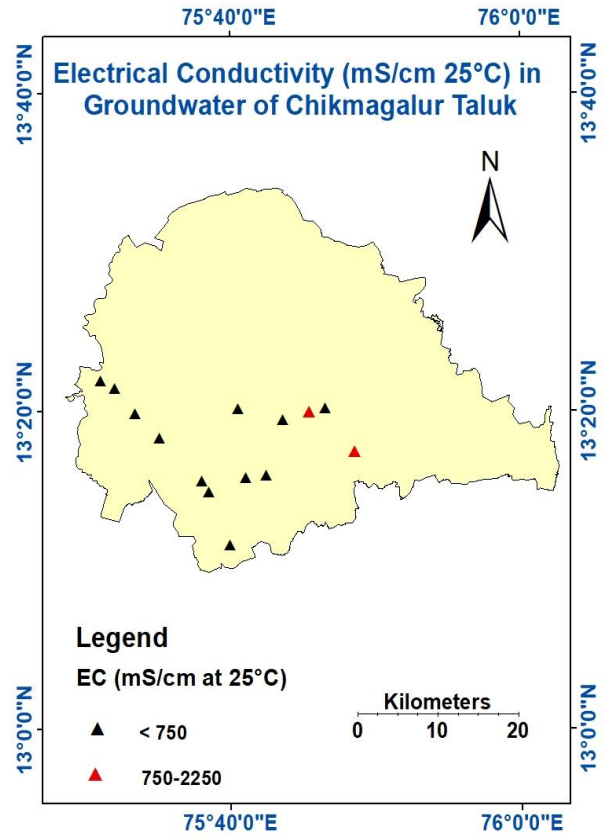


Fig 22: EC in Groundwater of Chikmagalur taluk

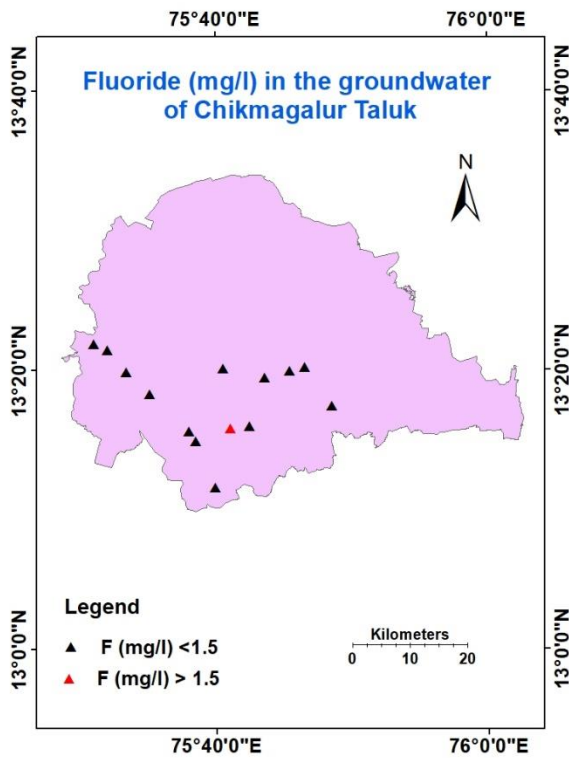


Fig 23: F in Groundwater of Chikmagalur taluk

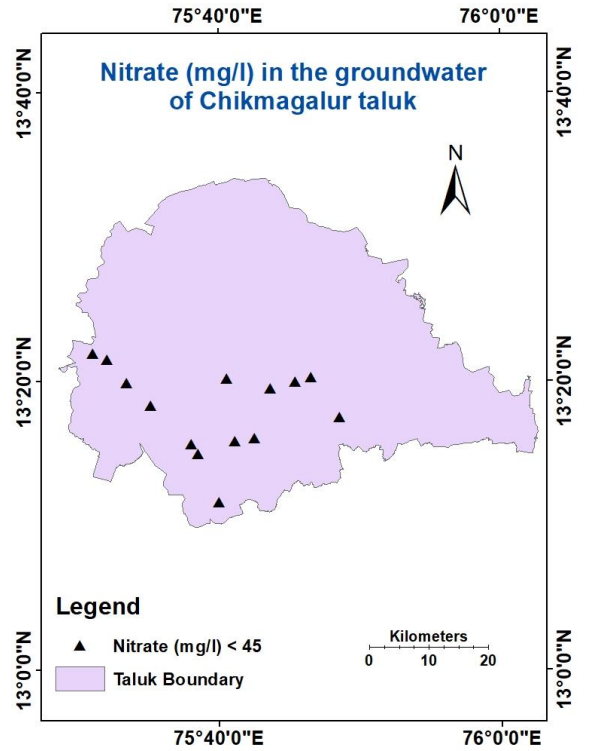


Fig 24 : Nitrate in Groundwater of Chikmagalur taluk

5. GROUND WATER RESOURCE ENHANCEMENT

5.1 Artificial recharge and proposed interventions

The overall stage of ground water development is 42.1866 % as per GEC 2022. The area feasible for recharge in the taluk is worked out as 1226 sq.km and the surface surplus non-committed runoff availability is 68.795 MCM. As per Master Plan on Artificial Recharge, Karnataka and Goa, 2020 Various recharge structures are proposed in the taluk. However, the figures given are tentative and pre-field studies / DPR are recommended prior to implementation of these recharge structures. Volume of water likely to be recharged is 51.596 MCM and Additional irrigation potential will be 0.062Lakh Ha. The details pertaining to proposed recharge structures, cost estimates and likely Recharge benefits for Chikmagalur taluk, Chikmagalur district have been carried out and given in below:

Area Feasible for AR (Sq.Km)	Number of Recharge Structures Completed by various agency			Number of Proposed Recharge Structures				Cost of Recharge Structures (Rs. In Lakhs)			
	CD/MACD/VD	PT	PRS	Sub surface dyke	Pecolation tank	Check dam	Filter Beds	Sub surface dyke (@Rs 20 lakhs)	Pecolation tank (@Rs 20 lakhs)	Check dam(@Rs 10 lakhs)	Filter Beds(@Rs 1.5 lakhs)
1226	67	246	258	2	0	300	0	36.69	0	2999.05	0

Expected benefit of artificial recharge & RWH

Availability of Surface non committed monsoon runoff (MCM)	Recharge Capacity of each structure (MCM)				Total Recharge capacity (MCM)	Total Cost in Lakhs
	Sub surface dyke	Pecolation tank	Check dam	Filter Beds		
68.795	10.319	34.379	17.199	6.879	68.795	3035.744

Vol. of water likely to be recharged (MCM)	Additional Irrigation Potential (Lakh Hectares)
51.596	0.062

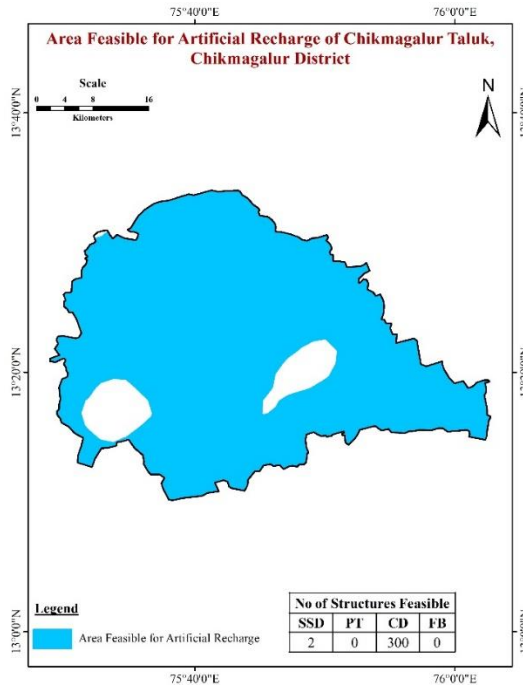


Fig 25: Area Feasible for AR in Chikmagalur Taluk

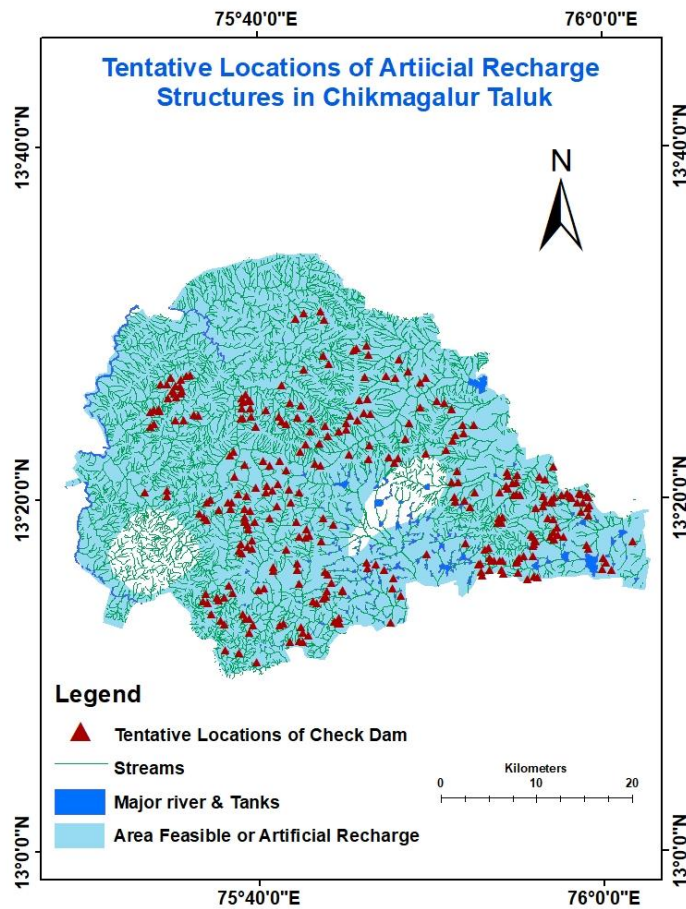


Fig 26: Tentative Locations of AR structures in Chikmagalur Taluk

Tentative Locations of Check Dam in Chikmagalur Taluk			
SI No	Longitude	Latitude	Village Name
1	75.66481143	13.17952052	Haandhi
2	75.64790786	13.18879349	Machagondanahalli
3	75.63509827	13.19106481	Satthihalli
4	75.69692006	13.19860219	Balehalli
5	75.70995768	13.19871095	Kuduvalli Channapura
6	75.70608267	13.19975679	Vatiganahalli
7	75.71482316	13.20465263	Hacchadamane
8	75.70990273	13.20778932	Hacchadamane
9	75.65826783	13.20821674	Machagondanahalli
10	75.70809624	13.21287393	Hacchadamane
11	75.68770936	13.21452091	Balehalli
12	75.66152107	13.21491723	Satthihalli
13	75.63386503	13.21527709	Elegodige
14	75.74399894	13.21609038	Bhudhinike Agrahara
15	75.74590345	13.21613311	Bhudhinike Agrahara
16	75.79488091	13.21664842	Banavara
17	75.69151548	13.21682734	Balehalli
18	75.74057359	13.21794599	Bhudhinike Agrahara
19	75.63092066	13.219549	Aldhuru
20	75.65475734	13.22078404	Elegodige
21	75.6577946	13.22093963	Elegodige
22	75.74430993	13.22129299	Kundhuru
23	75.62156189	13.22530432	Aldhuru
24	75.65177958	13.22536208	Aldhuru
25	75.61824897	13.23551035	Havvalli
26	75.723457	13.23593477	Halasumane
27	75.71959884	13.23719603	Valagerahalli
28	75.6132244	13.23786795	Donagudige
29	75.62849813	13.23844221	Havvalli
30	75.72964705	13.23971073	Thirugane
31	75.62718392	13.24065612	Donagudige
32	75.73187999	13.24136811	Valagerahalli
33	75.63389876	13.24138812	Havvalli
34	75.80420206	13.24257124	Hadhihalli
35	75.61599083	13.24445275	Kesavina Hakkalu
36	75.6425551	13.2451981	Havvalli
37	75.73348109	13.24704199	Kenchenahalli
38	75.74816714	13.24719374	Kenchenahalli
39	75.74830516	13.24770626	Kenchenahalli
40	75.66737194	13.2480749	Aldhuru
41	75.79622724	13.24952291	Hadhihalli
42	75.67252911	13.25000091	Aldhuru
43	75.63886871	13.25280919	Bannuru
44	75.70635358	13.25399382	Huluvalle
45	75.73780848	13.25440768	Kesavinamane
46	75.92678053	13.25753928	Hanandhadike
47	75.79705104	13.25873273	Biggadevanahalli
48	75.93631415	13.25907012	Galihalli

49	75.93291265	13.26044595	Galihalli
50	75.88278872	13.26133139	Nagarahalli
51	75.73452579	13.26276128	Kadrimidri
52	75.91827098	13.26336932	Hanandhadike
53	75.90347813	13.26339228	Payagondanahalli
54	75.88268342	13.26451314	Nagarahalli
55	75.73160972	13.26524851	Dhummagere
56	76.0080678	13.26614193	Vaddarahalli
57	75.68147222	13.2663253	Gouthameshwara
58	75.9015828	13.26636014	Payagondanahalli
59	75.89006508	13.26640072	Nagarahalli
60	75.78883906	13.2671214	Ambale
61	75.99919977	13.26728101	S.I.Govindhapura
62	75.70448639	13.26732845	Vasthare
63	75.77210338	13.26839683	Malaluru
64	75.68190441	13.270033	Gouthameshwara
65	75.87975274	13.27153628	Nagarahalli
66	75.78068937	13.27234892	Malaluru
67	76.00258572	13.27268474	Belawadi
68	75.88109374	13.27276032	Nagarahalli
69	75.91591369	13.27313777	Payagondanahalli
70	75.70447501	13.27350448	Vasthare
71	75.77134866	13.27368791	Kadrimidri
72	75.89196853	13.27484647	Nagarahalli
73	75.89997418	13.27514316	Payagondanahalli
74	75.89509257	13.27517443	Nagarahalli
75	75.91743778	13.27532808	Payagondanahalli
76	75.90318055	13.27560633	Payagondanahalli
77	76.00051936	13.27708126	Belawadi
78	75.89007937	13.27808397	Marle
79	75.91880237	13.27811392	Kalasapura
80	75.93195151	13.27922006	Kalasapura
81	75.92307201	13.27962722	Kalasapura
82	75.82989959	13.28201417	Mugalavalli
83	75.65079901	13.28291177	Hedadhalu
84	75.64857466	13.2853903	Hedadhalu
85	75.88567122	13.2859657	Marle
86	75.98573645	13.28603719	Yarehalli
87	75.69374301	13.28678816	Aanuru
88	75.88969438	13.28720624	Marle
89	75.66141358	13.28725303	Kotevuru
90	75.93227793	13.28872986	Kalasapura
91	75.65614392	13.28919039	Hedadhalu
92	75.98376391	13.28973936	Yarehalli
93	75.93323499	13.29120119	Kalasapura
94	75.65027205	13.29184914	Hedadhalu
95	75.86755872	13.29207751	Marle
96	76.02880942	13.29330711	Kurubarahalli
97	75.93500961	13.2937772	Mallammanahalli
98	75.72757005	13.29397035	Matthavara

99	75.93393414	13.29477734	Mallammanahalli
100	75.66110216	13.29489323	Hedadhalu
101	75.95313517	13.29511453	I.Chikkalasapura
102	75.93193414	13.29749801	Mallammanahalli
103	75.94946914	13.29774982	I.Chikkalasapura
104	75.71266218	13.29781469	Aanuru
105	75.96138738	13.29799788	Eshwarahalli
106	75.70665445	13.29868394	Aanuru
107	75.71678242	13.29972855	Aanuru
108	75.95652932	13.29979667	Shindhigere
109	75.93085737	13.30000371	Mallammanahalli
110	75.95205685	13.30181718	Shindhigere
111	75.65771946	13.30559381	Hancharavalli
112	75.71355788	13.30578954	Mylimane
113	75.95528487	13.30626257	Shindhigere
114	75.65693824	13.30983552	Hancharavalli
115	75.73976211	13.31015075	Nalluru
116	75.9021133	13.31093155	Kanivehalli
117	75.89887342	13.3109412	Kanivehalli
118	75.65399684	13.31265644	Hancharavalli
119	75.70350798	13.31280332	Mylimane
120	75.66411888	13.31296373	Basagodu
121	75.61733398	13.31439051	Byguru
122	75.95177487	13.3147854	Shindhigere
123	75.94716692	13.31549867	Kouthalu
124	75.89905035	13.31560609	Kanivehalli
125	75.73021745	13.31637476	Ukkundha
126	75.9034271	13.31652272	Kanivehalli
127	75.6778588	13.31653979	Basagodu
128	75.6540106	13.31677436	Basagodu
129	75.61494576	13.31690702	Byguru
130	75.98636857	13.3176311	Shindhigere
131	75.60994737	13.32034715	Bettadhamalali
132	75.97863624	13.32108927	Shindhigere
133	75.65890829	13.32289849	Thalihalla
134	75.62855047	13.32443543	Keremakki
135	75.98504729	13.3247831	Shindhigere
136	75.93481322	13.32486288	Devagondanahalli
137	75.64030544	13.32486752	Keremakki
138	75.65372217	13.32511145	Keremakki
139	75.871632	13.3261544	Kyathanabeedu
140	75.94259733	13.32695195	Devagondanahalli
141	75.9866946	13.32739827	Shindhigere
142	75.68539464	13.32774511	Ilahole
143	75.9754889	13.33004128	Shindhigere
144	75.95156377	13.33027749	Kabbigarahalli
145	75.98045458	13.33032246	Shindhigere
146	75.64113862	13.33065542	Keremakki
147	75.61725008	13.33080831	Bettadhamalali
148	75.63777535	13.33087816	Keremakki

149	75.69896655	13.33095687	Joladhalu
150	75.94376516	13.33133103	Devagondanahalli
151	75.85737847	13.33134141	Halelakya
152	75.86665076	13.33249277	Lakya
153	75.9508025	13.33265585	Kabbigarahalli
154	75.62114455	13.3336842	Avuthi
155	75.96985847	13.3340581	Shindhigere
156	75.95281539	13.33519939	Kabbigarahalli
157	75.98605709	13.33534289	Boochenahalli Kaval
158	75.96811217	13.33599394	Shindhigere
159	75.85701383	13.33606802	Halelakya
160	75.94246088	13.33646529	Devagondanahalli
161	75.95975218	13.33675437	Kabbigarahalli
162	75.98411345	13.33701747	Boochenahalli Kaval
163	75.6560323	13.33711903	Avuthi
164	75.91350998	13.33714341	Kanivehalli
165	75.5793775	13.33716563	Beranagodu
166	75.97901928	13.33750466	Boochenahalli Kaval
167	75.92040765	13.33750882	Lakkammanahalli
168	75.91678312	13.33771136	Kanivehalli
169	75.64798991	13.3386486	Avuthi
170	75.97725561	13.33868763	Boochenahalli Kaval
171	75.96524308	13.33874074	Kabbigarahalli
172	75.87597943	13.33961897	Lakya
173	75.90053542	13.33986995	Kyathanabeedu
174	75.67428749	13.34028821	Thalihalla
175	75.70684538	13.34082548	Joladhalu
176	75.55755883	13.34093507	Hyarambi
177	75.68104832	13.34209824	Ilahole
178	75.57861996	13.34282358	Beranagodu
179	75.69714794	13.34312582	Joladhalu
180	75.90804499	13.34369639	Kyathanabeedu
181	75.66502785	13.34504986	Jakkanahalli
182	75.90707707	13.34580234	Kyathanabeedu
183	75.67579783	13.34651177	Jakkanahalli
184	75.68619852	13.34881815	Channagondanahalli
185	75.9127247	13.34890625	Lakkammanahalli
186	75.91619716	13.34945127	Lakkammanahalli
187	75.85371362	13.34984008	Devarahalli
188	75.85983868	13.3498927	Devarahalli
189	75.94400188	13.35213898	Shirabadiga
190	75.93849676	13.35480365	Shirabadiga
191	75.64393633	13.35520907	Shiraguru
192	75.90844798	13.35558746	Lakkammanahalli
193	75.91775469	13.35679085	Lakkammanahalli
194	75.9079333	13.35921315	Lakkammanahalli
195	75.85903563	13.36001391	Devarahalli
196	75.6945747	13.36189968	Hirekolale
197	75.95208884	13.36426864	Shirabadiga
198	75.67795181	13.36560549	Byaravalli

199	75.72732965	13.36602106	Aralaguppe
200	75.65417437	13.36712296	Byaravalli
201	75.72202779	13.36734183	Hirekolale
202	75.79865483	13.36856305	Beekannahalli Kaval
203	75.67179299	13.37025773	Byaravalli
204	75.68832913	13.3703337	Channagondanahalli
205	75.77414503	13.37197916	Huliyarahalli
206	75.80199498	13.3725483	Churchequdda Kaval
207	75.79324895	13.37370995	Beekannahalli Kaval
208	75.63951485	13.37560052	Bhagamane
209	75.8294616	13.37651062	Churchequdda Kaval
210	75.75481477	13.37661308	Dasarahalli
211	75.70786257	13.37880684	Hirekolale
212	75.64304058	13.37916032	Bhagamane
213	75.84846982	13.38067698	Churchequdda Kaval
214	75.77432342	13.38486915	Arisinaguppe
215	75.71261995	13.38626435	Hirekolale
216	75.72611664	13.38682496	Aralaguppe
217	75.85506075	13.38941717	Churchequdda Kaval
218	75.80910638	13.39117308	Churchequdda Kaval
219	75.73430301	13.39397982	Mavinahalli
220	75.85792531	13.39421491	Churchequdda Kaval
221	75.86574341	13.39605726	Karisiddanahalli
222	75.71727934	13.39787266	Pandarahalli
223	75.74555028	13.39821356	Dasarahalli
224	75.75269405	13.39994536	Dasarahalli
225	75.66463367	13.40243075	Byaravalli
226	75.7321787	13.40298233	Dattatreya Peeta
227	75.56280941	13.40325312	Bogase
228	75.8647869	13.40365242	Sarpanahalli
229	75.87542031	13.40395358	Sarpanahalli
230	75.56672106	13.40543646	Bogase
231	75.6940948	13.40557385	Pandarahalli
232	75.81272139	13.40611053	Bindiga
233	75.75233182	13.40638149	Dasarahalli
234	75.69024158	13.40753573	Pandarahalli
235	75.59553404	13.40880063	Shiravase
236	75.76324613	13.40889842	Arisinaguppe
237	75.58680127	13.40896948	Bogase
238	75.71878709	13.41038043	Pandarahalli
239	75.6524098	13.4106729	Byaravalli
240	75.65018082	13.41098985	Byaravalli
241	75.7052491	13.41161593	Pandarahalli
242	75.68727137	13.41234654	Pandarahalli
243	75.66063109	13.41240058	Byaravalli
244	75.75618735	13.4127136	Dattatreya Peeta
245	75.60916354	13.41371094	Shiravase
246	75.60506268	13.41466054	Shiravase
247	75.77575018	13.41494123	Bindiga
248	75.76911954	13.41560735	Arisinaguppe

249	75.56354476	13.4170974	Bidare
250	75.57201407	13.41753956	Bogase
251	75.67516745	13.41843005	Pandarahalli
252	75.56709786	13.4184773	Bidare
253	75.85460928	13.41887669	Churchegudda Kaval
254	75.57082024	13.41938665	Bidare
255	75.65999205	13.42006329	Jagara
256	75.65175352	13.42043777	Shiravase
257	75.8234715	13.42101277	Halasabalu
258	75.70838476	13.42309158	Kolagame
259	75.84725548	13.42508775	Churchegudda Kaval
260	75.69835382	13.42513165	Pandarahalli
261	75.83971736	13.42670612	Churchegudda Kaval
262	75.65227504	13.42677737	Jagara
263	75.65997573	13.42701448	Jagara
264	75.76497965	13.42772355	Nagenahalli
265	75.65739725	13.42814359	Jagara
266	75.77328803	13.4287817	Nagenahalli
267	75.58053308	13.42995606	Bidare
268	75.65181358	13.43003533	Jagara
269	75.58859007	13.43108813	Sugudavani
270	75.65495803	13.43324578	Jagara
271	75.59277936	13.43393241	Sugudavani
272	75.58594604	13.43481534	Sugudavani
273	75.59312087	13.4366378	Sugudavani
274	75.58431525	13.43726934	Sugudavani
275	75.59214336	13.4410686	Sugudavani
276	75.58765132	13.44128884	Sugudavani
277	75.6903072	13.44188046	Kolagame
278	75.57326828	13.44278632	Bidare
279	75.57886291	13.4431297	Sugudavani
280	75.82355957	13.44380723	Kamenahalli Kaval
281	75.5922235	13.4474438	Sugudavani
282	75.79981884	13.44835056	Galipooje
283	75.82954742	13.44847835	Kamenahalli Kaval
284	75.58317302	13.44950676	Sugudavani
285	75.77052874	13.44956971	Mutthinapura
286	75.79058859	13.45061543	Galipooje
287	75.59812971	13.45078538	Sugudavani
288	75.60159926	13.45222504	Sugudavani
289	75.81271039	13.45452671	Kamenahalli Kaval
290	75.71114569	13.45646804	Malagaru
291	75.73551412	13.4622923	Kolagame
292	75.80366098	13.46619662	Gonakal
293	75.73009337	13.46990511	Kolagame
294	75.77422728	13.47075256	Gonakal
295	75.75958981	13.4745769	Mahalyane Basagni Mata
296	75.76274504	13.47690122	Gonakal
297	75.77216078	13.47915239	Thogarihankalu
298	75.73118065	13.50393265	Melu Huluvatti

299	75.70342374	13.50446053	Melu Hluvatti
300	75.7115547	13.51034345	Kesavinamane

Table 14: Tentative Locations o Check Dam in Chikmagalur Taluk

Table 15: Present ground water availability and draft scenario (2022) in Chikmagalur Taluk and expected improvement in Stage of Ground Water Development in future, on implementation of artificial recharge schemes-

Taluk	Cumulative Annual Ground Water Availability	Existing Gross Ground Water Draft for All Uses	Existing Stage of Ground Water Development	Expected Recharge from Proposed Artificial Recharge Structures	Cumulative Ground Water Availability after Artificial Recharge Structure Implementation	Stage of Ground Water Development after Artificial Recharge Structure Implementation	Expected Improvement in Overall Stage of Ground Water Development
	HAM	HAM	%	HAM	HAM	HAM	%
Chikmagalur	13585.59	5731.3	42.1866	5159.6	18745.19	30.57	11.16

5.2. Ground Water Development Plan

In Chikmagalur taluk, the present stage of ground water extraction (2022) is **42.18 %** with net ground water availability of 7731.21 ham and total extraction of **5731.3** ham. The ground water draft for irrigation purpose is 4958.25 ham, thus indicating that ground water irrigation needs to be encouraged in the area. Also the less ground water development is most probably linked to the low ground water potential areas and limited aquifer thickness in Aquifer-II. To overcome these, it is imperative to have a robust ground water resource development plan for the area, which can be implemented in scientific manner. The implementation of the plan needs to based on site specific detailed hydrogeological, geophysical and scientific surveys for pinpointing the sites for construction of dugwells and Borewells.

In view of above, the focus of proposed ground water development plan is to up the ante of ground water development from the present 42.18 % to 60% in a systematic way by adopting scientific approach. About 1573 dugwells (15-30 m depth; 3 to 5 m diameter @ Rs. 3.00 lakh/dugwell) are recommended to be constructed in feasible areas. Further 678 borewells (40-100 m depth; 150 mm dia @ Rs. 2.00 lakh/borewell)

are also recommended to be drilled in feasible areas. Additional irrigation potential which can be created considering crop water requirement of 0.65 m (Ha) will be **3723 ha**. The detailed ground water development strategy to uplift the ground water use in the feasible areas is presented in **Table–15**.

Table–16: Feasibility of additional GW abstraction structures based on GWRA 2022 availability

Balance GWR available to make SOE 60%	DW unit draft	BW unit draft	No. of DW feasible @ 65% with unit draft of 1 ham	No. of BWs feasible @ 35% with unit draft of 1.25 ham	Cost of Proposed DW's/year @ unit cost of Rs. 3 lakhs	Cost of Proposed BW's @ unit cost of Rs. 2 lakhs	Additional irrigation potential created considering crop water requirement of 0.65 m (Ha)	Additional irrigation potential created considering crop water requirement of 0.65 m (Ha)	Total irrigation potential created by DW's and BW's (ha)
2420.05	1	1.25	1573	678	4719	1355	2420	1303	3723

Note- Hydrogeological and scientific intervention is needed for pinpointing the sites for construction of dugwells and Borewells

5.3 Change in cropping pattern

Change in cropping pattern is necessary since cultivation of water intensive crops is prevalent in the Taluk. Though only 3011 hectares is covered under Paddy in the taluk which can effect groundwater availability. At present (2022), the stage of ground water extraction is @ 42.18 % and taluk has been categorised as Safe, thus **change in cropping pattern has not been suggested**.

5.4 Other interventions proposed

- Periodical maintenance of artificial recharge structures should also be incorporated in the Recharge Plan.
- If excess nitrate & fluoride concentration is found in ground water samples, its require remedial measures viz.
 - Dilution of nitrate rich ground water through artificial recharge & water conservation.
 - Roof top rain water harvesting.

6. SUMMARY AND RECOMMENDATIONS

As per the resource estimation – 2022, Chikagalur taluk falls under Safe category with the stage of ground water extraction is **42.18 %**. However, there is need to formulate management strategy to tackle the water scarcity related issues in the taluk in the coming days to avoid water crisis in the future. It is suggested to adopt a scientific and multi-pronged ground water management strategy covering supply side interventions, demand side interventions, ground water development interventions and ground water quality protection aspects as mentioned in the management plan suggested above

- **Ground water resource enhancement by supply side interventions:** Quantity of surface water available through non-committed surface run-off is estimated to be 68.79 MCM. This can be used to recharge the aquifer mainly through check dams (300) and sub surface dyke structures (2). The volume of water expected to be conserved/recharged @75% efficiency is **5159.6** ham through these AR structures. The approximate cost estimate for construction of these AR structures is Rs. 30.34 Cr. The additional area which can be brought under assured ground water irrigation will be about 6200 hectares.
- **Ground water resource enhancement by demand side interventions:** At present majority of irrigation is by wells and bore wells (ground water). The micro irrigation practices like drip and sprinkler irrigation are comparatively less practiced in comparison with traditional surface flooding mode of irrigation. The micro irrigation water efficient methodology needs to be adopted for growing water intensive crop like paddy which is grown in 4573 ha and is dependent on ground water irrigation, efficient irrigation techniques will contribute in saving ground water.
- **Ground Water Resource Development Plan:** The present stage of ground water extraction (2022) is 42.18 % with net ground water availability of 7731.21 ham and total extraction of 5731.21 ham. The ground water draft for irrigation purpose is @ 4958.25 ham, thus indicating that ground water irrigation needs to be encouraged in the area. To overcome the low ground water development, it is imperative to have a robust ground water resource development plan for the area, which can be implemented in scientific manner. The implementation of the plan needs to be based on site specific detailed hydrogeological, geophysical and scientific surveys for pinpointing the sites for construction of dugwells and Borewells.
- In view of above, the focus of proposed ground water development plan is to up the ante of ground water development from the present 25.9% to 60% in a systematic way by adopting scientific approach. About **1573 dugwells** (15-30 m depth; 3 to 5 m diameter @ Rs. 3.00 lakh/dugwell) are recommended to be constructed in feasible areas. Further **678 borewells** (40-100 m depth; 150 mm dia @ Rs. 2.00 lakh/borewell) are also recommended to be drilled in feasible areas. Additional irrigation potential which can be created considering crop water requirement of 0.65 m (Ha) will be **3723 ha**.
- **Regulation and control:** Taluk is categorized as "**Safe**". However, the mandatory guidelines like rainwater harvesting and artificial recharge issued by Karnataka Ground Water Authority needs to be strictly implemented in the taluk so that quality of ground water will improve in due course of time.

- **Participatory management:** Awareness programmes and practice of participatory approach needs to be strengthened with the involvement of all the stake holders for sustainable management.

Stage of GW Extraction and Category (2022)	42.1866 %, Safe
Annual Extractable GW Resource (Ham)	13585.59
Total Extraction (Ham)	5731.3
Total GW Resources (Dynamic & Static up to the depth of 200 mbgl) (Ham)	7731.21
Ground Water Draft for Irrigation (Ham)	4958.25
Ground Water Resource Enhancement by Supply side Interventions	
No of Proposed AR structures	
SSD	2
PT	0
CD	300
Expected Additional Recharge to GW due to AR (Ham)	5159.6
Additional Irrigation Potential that can be created (Ha)	6200
Total Estimated Expenditure (Rs. in Cr.)	30.35
Change in Stage of GW Extraction (%)	42.186 to 30.57
Ground Water Resource Development Plan	
Balance GWR available to enhance SOE 60% (Ham)	2420.05
No. of wells proposed	
DW – Depth: 15 to 30 m, Dia: 3 to 5 m, Unit Cost –Rs. 3.00 lakh, Av. Annual Gross draft – 0.6 ham	1573
BW – Depth: 40 to 100 m, Dia: 150 mm, Unit Cost – Rs. 2.00 lakh, Av. Annual Gross draft – 3.9 ham	678
Additional irrigation potential created considering crop water requirement of 0.65 m (Ha)	3723
Increase in Stage of GW Extraction (%)	42.186 to 60