



केन्द्रीय भूमि जल 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

Chincholi Taluk, Kalaburgi District, Karnataka

दक्षिण पश्चिमी क्षेत्र, बेंगलुरु
South Western Region, Bengaluru

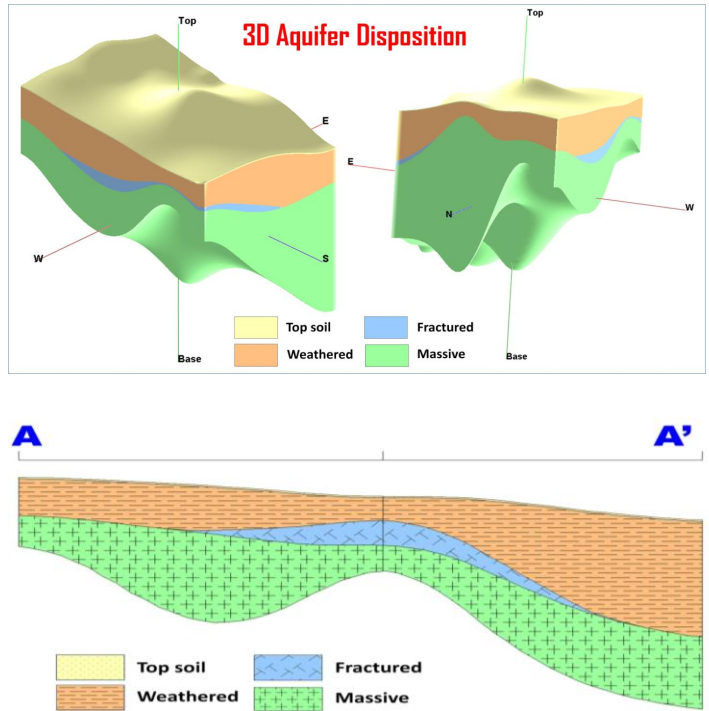
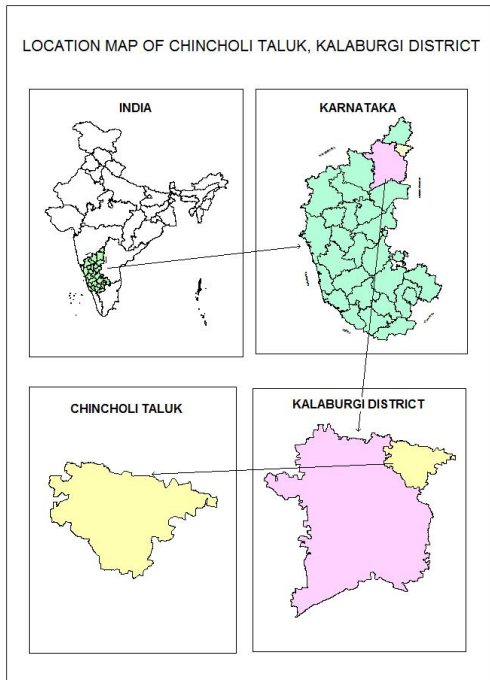
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AQUIFER MAPS AND MANAGEMENT PLAN, CHINCHOLI TALUK, KALABURGI DISTRICT, KARNATAKA STATE

(AAP – 2021-2022)



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AQUIFER MAPS AND MANAGEMENT PLAN, CHINCHOLI TALUK, KALABURGI DISTRICT, KARNATAKA STATE

1 SALIENT INFORMATION

Name of the taluk: **CHINCHOLI**
District: **KALABURAGI**; State: Karnataka
Area: 1552.20 sq.km.
Population: 6,28,800
Annual Normal Rainfall: 716 mm

1.1 Aquifer management study area

Aquifer mapping studies have been carried out in Chincholi taluk, Kalaburagi district of Karnataka, covering an area of 1552.20 sq.kms under National Aquifer Mapping Project. Chincholi taluk is located between North Latitudes 17°14'9.6" and 17°37'44.4" and East Longitudes between 77° 04' 37.2" to 77°41'34.8" and is falling in parts of Survey of India Toposheets 56G/2, G/3, G/6,G/7 &G/11. The study area is bounded on the East by Telagana state, on the North by Bidar district, on the South by Sedam taluk, on the West by Kalaburgi and Chittapur taluks of Kalaburgi district. Location map of Chincholi taluk of Kalaburgi district is presented in **Fig-1**. Chincholi is the taluk headquarter . There are 148 villages in this taluk.

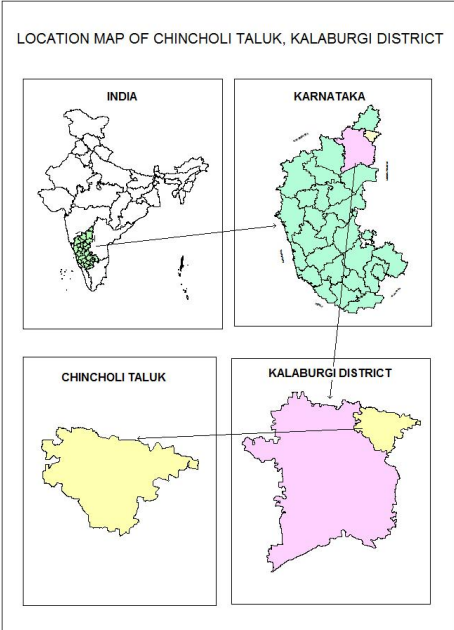


Fig-1: Location map of Chincholii taluk of Kalaburagi district

1.2 Population

According to 2011 census, the population in Chincholi taluk is 2,54,287. Out of which 1,27,748 are males while 1,26,539 are females. The average sex ratio of Chincholi taluk is 966. The Chincholi taluk has an overall population density of 164 persons per sq.km. The decadal variation in population from 2001-2011 is 13.7% in Chincholi taluk.

1.3 Rainfall

Chincholi taluk enjoys semi-arid climate. The area falls under Northern Eastern Transitional agro-climatic zone of Karnataka state. The normal annual rainfall in Chincholi taluk for the period 1981 to 2010 is 923 mm. Seasonal rainfall pattern indicates that, major amount of 724 mm rainfall was recorded during South-West Monsoon seasons, which contributes about 78% of the annual normal rainfall, followed by North-East Monsoon season (126 mm) constituting 14% and remaining (74 mm) 8% in Pre-Monsoon season (Table-1).

Computations were carried out for the 30 year blocks of 1981-2010, the mean monthly rainfall at Chincholi taluk is ranging between 2 mm during February to 223 mm during August. The coefficient of variation percent for pre-monsoon, monsoon and post-monsoon season is 65, 41 & 67 percent respectively. Annual Co-efficient of Variation at this station works out to be 33 percent (Table-1).

Table-1: Statistical Analysis of Rainfall Data of Chincholi taluk, Kalaburagi district (1981 to 2010)

STATION		Jan	Feb	Mar	Apr	May	Pre	Jun	Jul	Aug	Sep	SW	Oct	Nov	Dec	NE	Annual
CHINCHOLI	NRM	7	2	13	20	32	74	128	175	223	198	724	104	18	4	126	923
	STDEV	16	5	30	20	31	48	67	115	137	135	300	76	38	10	84	302
	CV%	215	295	233	101	99	65	53	65	61	68	41	73	214	228	67	33

1.4 Agriculture & Irrigation

Agriculture is the main occupation in Chincholi taluk. Major Kharif crops are Maize, Bajra, Jowar, Tur and Vegetables. Main crops of Rabi season are Maize, Bajra and Jowar (Table-2). Water intensive crops like sugarcane are grown in 5% of total crop area. Jowar is grown in 20% and oil seeds in 5% of total crop area of taluk. Bajra & Maize account 2% of total crop area.

Table-2: Cropping pattern in Chincholi taluk 2016-2017 (Ha)

Year	Wheat	Maize	Bajara	Jowar	Pulses	Fruits	Vegetables	Oil seeds	Sugarcane	Cotton
	Area under cultivation (in ha)									
2016-2017	-	70	291	29729	96906	2163	697	7688	778	20

It is observed that net sown area accounts 91% and area sown more than once is 22% of total geographical area in Chincholi taluk (Table-3). Area not available for cultivation and Fallow land cover 13% & 4% of total geographical area respectively. 50% of net area irrigated is only from bore wells and 32% from lift irrigation (Table-4).

Table-3: Details of land use in Chincholi taluk 2016-2017 (Ha)

Taluk	Total Geographical Area	Area under Forest	Area not available for cultivation	Fallow land	Net sown area	Area sown more than once
Chincholi	155854	19622	16359	6235	142488	35694

Source: District at a glance 2016-17, Govt. of Karnataka

Table-4: Irrigation details in Chincholi taluk (in ha)

Source of Irrigation	Net area irrigated (Ha.)
Canals	-
Tanks	119
Wells	74
Bore wells	1473
Lift Irrigation	928
Other Sources	304
Total	2898

(Source: District at a glance 2016-17, Govt. of Karnataka)

1.5 Geomorphology, Physiography & Drainage

Chincholi taluk is a plateau region formed by basaltic lava flows, which represents “Deccan peneplain”. The central and southern parts exhibit moderate to gently “undulating terrain” having sparsely distributed knolls and tors. The remaining part of the taluk is in general a “plateau area”. The elevation in the plains varies from 629 m in the North western part to 462m amsl in the Southern part of the taluk. This has its bearing on the regional slope which is towards south. The differential altitude is significant because, it is likely to cause irregular ground water flow patterns on the micro scale (**Fig.-2**). Topography is dominantly controlled by geological structures.

The entire Chincholi taluk falls in Mullamari river which is tributary of Krishna river basin. The drainage pattern is dendritic to sub-dendritic(**Fig.-3**).

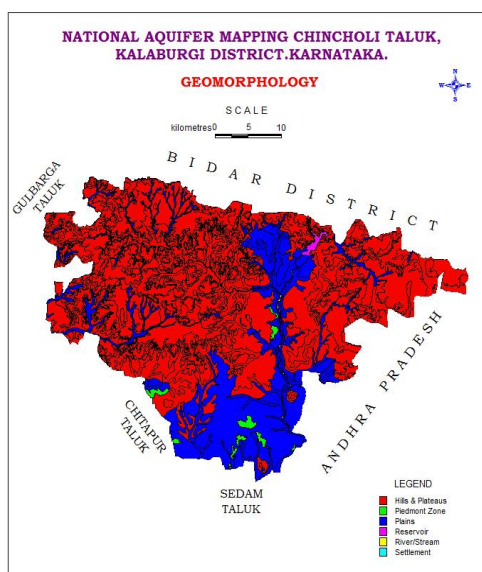


Fig-2: Geomorphology Map

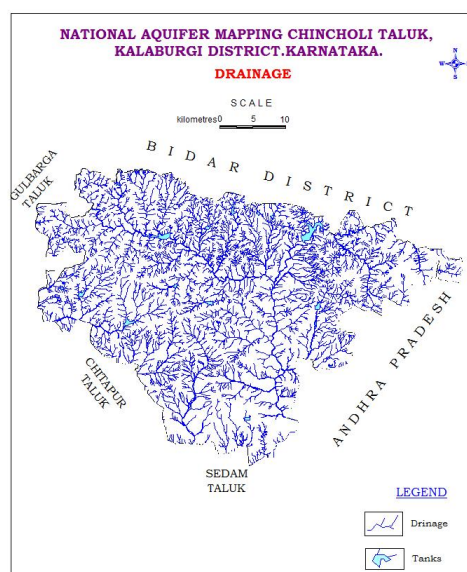


Fig-3: Drainage Map

1.6 Soil

The soils of Chincholi taluk can broadly be classified into Black cotton soils, Red soils and Lateritic soil. These soils vary in depth and texture, depending on the parent rock type, physiographic settings and climatic conditions. Black cotton soils are mature soils with high humus and are mildly alkaline in nature. Along the Mulamari river, these soils are overlapped by alluvial clayey materials. Black cotton soils are the product of highly weathered and decomposed basaltic rocks(Fig-4). The land use map (Fig-5) of the taluk shows that, major part of the taluk is covered by agriculture activity.

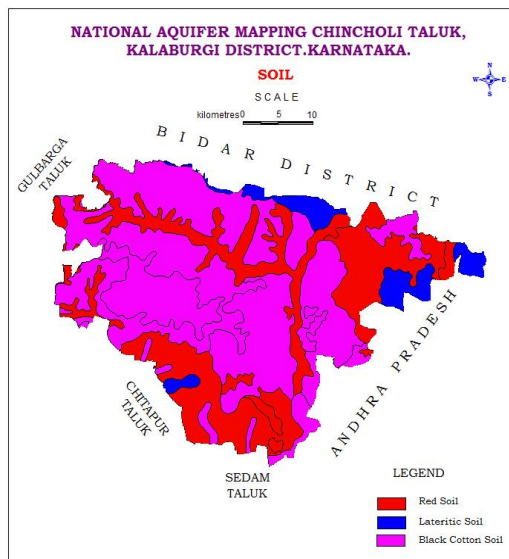


Fig-4: Soil Map

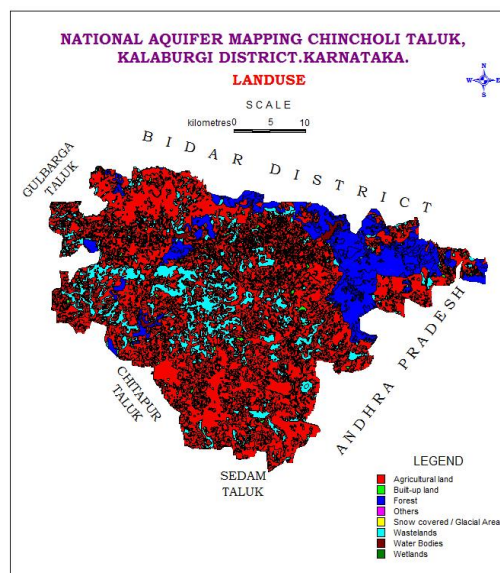


Fig-5: Land use Map

1.7 Ground water resource availability and extraction

Aquifer wise total ground water resources up to 200 m depth is given in Table-5 below.

Table-5: Total Ground Water Resources (2017) (Ham)

Taluk	Annual replenishable GW resources	Fresh In-storage GW resources		Total availability of fresh GW resources
		Phreatic	Fractured (Down to 200m)	
CHINCHOLI	6657	8299	1708	Dynamic + phreatic in-storage + fractured
				16664

1.8 Existing and future water demands (as per GEC-2017)

- Net ground water availability for future irrigation development : 45.10 MCM
- Domestic (Industrial sector) demand for next 25 years : 6.54 MCM

1.9 Water level behavior

(a) Depth to water level

Aquifer-I (Table.6)

- Pre-monsoon: 1.75 – 13.61 mbgl (Fig-6)
- Post-monsoon: 0.01 – 7.72 mbgl (Fig-7)

Aquifer-II

- Pre-monsoon: 13.91– 121.10 mbgl
- Post-monsoon: 11.77 – 16.00 mbgl

(b) Water level fluctuation

Aquifer-I

- Seasonal Fluctuation: Rise ranges 0.55 – 7.72 m (**Fig.-8**).

Aquifer-II

- Seasonal Fluctuation: Rise ranges 2.14 – 5.10 m

Table-6:Depth to water level for Pre-monsoon and Post-monsoon

Sr. No	Village	Source	Pre-monsoon Depth to water May-2019 (mbgl)	Post-monsoon Depth to water Nov-2019 (mbgl)	Water level Fluctuation
Aquifer-I					
1	Ainapur	Dug Well	6.10	2.55	3.55
2	Chimanchode	Dug Well	7.11	4.11	3.00
3	Chincholi	Dug Well	10.30	6.4	3.90
4	Kudali Tanda	Dug Well	13.61	8.18	5.43
5	Kallur	Dug Well	7.80	4.8	3.00
6	Moghe	Dug Well	8.65	0.93	7.72
7	Narnal	Dug Well	9.60	4.65	4.95
8	Sasargaon	Dug Well	3.94	0.01	3.93
9	Kollur	Dug Well	1.75	1.2	0.55
Aquifer-II					
10	Ranapur	Borewell	21.10	16.00	5.10
11	Chandapur	Borewell	13.91	11.77	2.14

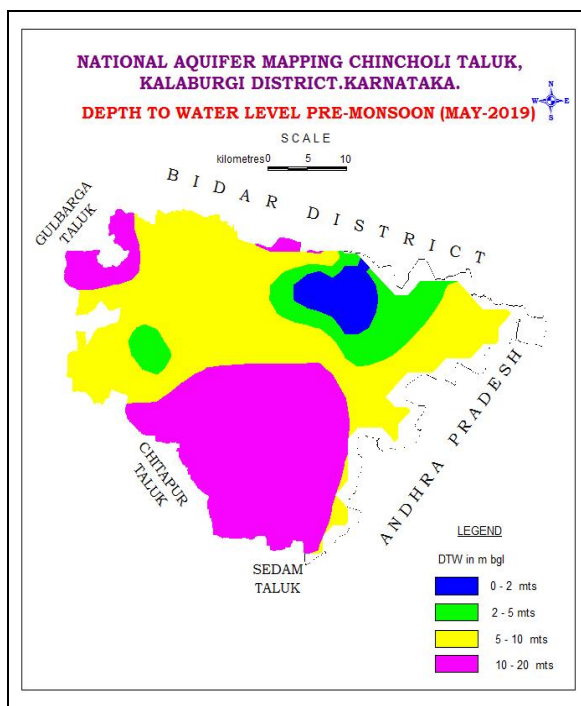


Fig-6: Pre-monsoon Depth to Water Level

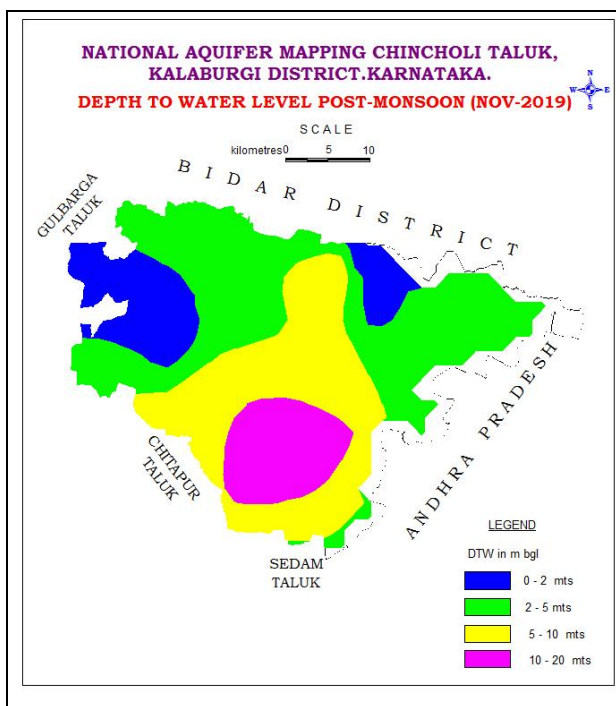


Fig-7: Post-monsoon Depth to Water Level

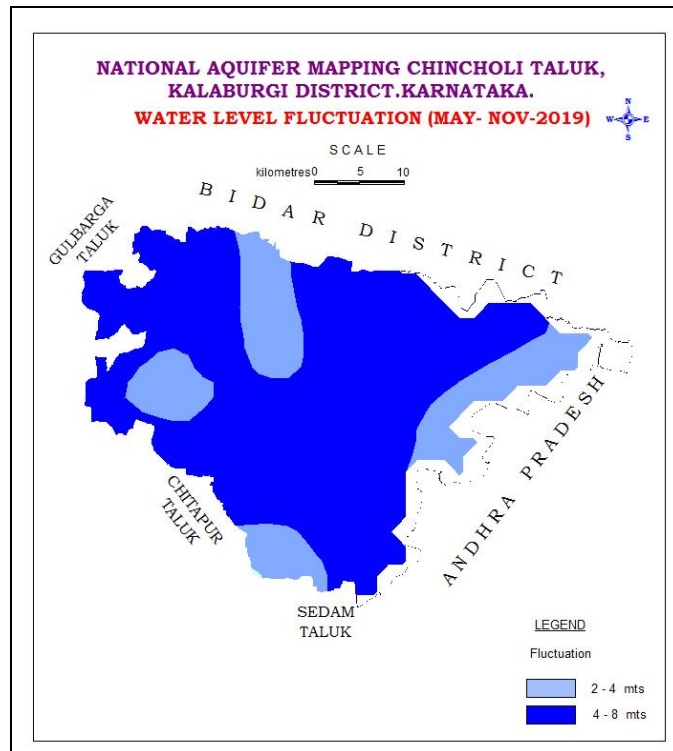


Fig-8: Water Level Fluctuation (Aq-I)

2 AQUIFER DISPOSITION

2.1 Number of aquifers:

In Chincholi taluk, mainly two types of aquifer systems are present;

- i. **Aquifer-I (Phreatic aquifer)** Weathered Basalt and lime stone
- ii. **Aquifer-II (Fractured aquifer)** Fractured Basalt and lime stone

In Chincholi taluk, Basalt and lime stone are the main water bearing formations (**Fig-9**). Ground water occurs within the weathered and fractured Basalt and lime stone under water table condition and semi-confined condition. Bore wells are the predominant ground water abstraction structures. Their depth ranges from 80 to a maximum of 200 mbgl. Depth of weathered zone ranges from 3 to 20 mbgl. Ground water exploration reveals that in the aquifer-II, fractured formation was encountered between the depth of 40 to 200 mbgl. Yield ranges from 0.20 to 9 lps (**Table.7**). The basic characteristics of each aquifer are summarized in **Table-8**. The lithology map is shown in **Fig.10**.

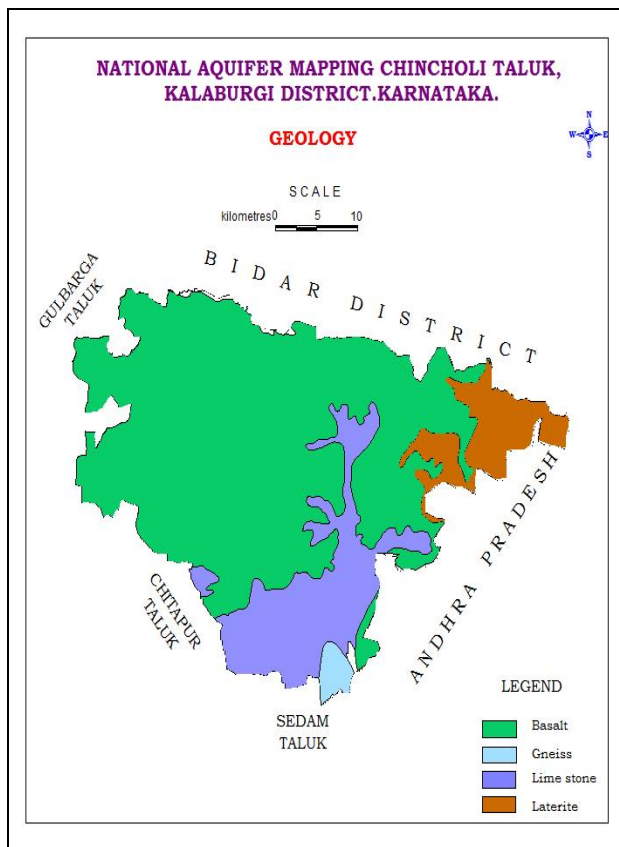


Fig-9: Geology Map

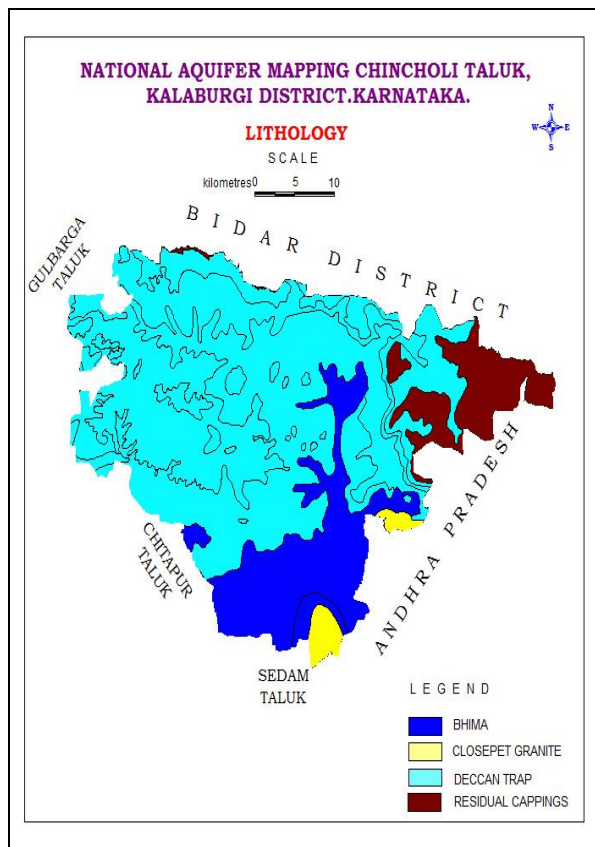


Fig-10: Lithology Map

Table-7: Details of Ground Water Exploration

S. No	Location	Lat & Long	Depth m bgl	Casin g (m)	Lithology	SWL (mbgl)	Q (Ips)	DD (m)	T (m ² /day)
1	Bankur	17° 10' 15" 76° 57' 05"	81.90	3.0	Basalt/ L.st	-	Negl	-	-
2	Chimanchod	17° 31' 30" 77° 17' 20"	50.00	8.05	Basalt	10.79	2.83	0.99	-
3	Gadikeshwar	17° 20' 30" 77° 16' 30"	80.00	9.0	Basalt	66.85	-	-	-
4	Garampally	17° 28' 30" 77° 21' 15"	80.00	4.0	Basalt	6.23	0.30	33.43	0.12
5	Nirgunda	17° 17' 30" 77° 22' 30"	81.20	-	Gr Gn	-	Negl	-	-
6	Siroli	17° 21' 00" 77° 15' 20"	51.05	2.0	Basalt/L. st/ Gr.Gn	0.78	9.00	3.16	-
7	Sullupet	17° 23' 45" 77° 20' 30"	80.00	4.5	Basalt/L. st	2.03	1.75	3.17	2.1
8	Sullupet	17° 24' 25" 77° 20' 25"	302.0	13.0	Basalt/L. st/ Gr.Gn	18.85	0.22	-	0.76
9	Shadipur	17° 27' 45" 77° 25' 15"	204.7	15.6	Basalt/ Gr.Gn	>95	3.5	-	-
10	Chanddapur	17° 26' 45" 77° 25' 15"	136.6	27.5	L.st/ Gr.Gn	7.58	6.0	1.27	1055
11	Marpalli	17° 31' 30" 77° 21' 10"	302.3	26.1	L.st/ Gr.Gn	10.35	2	-	-
12	Karajkhed	17° 18' 45" 77° 25' 15"	250	6.1	L.st/ Gr.Gn	9.74	2.6	27.16	2.11

Table-8: Basic characteristics of each aquifer

Aquifers	Weathered Zone (Aq.-I)	Fractured Zone (Aq.-II)
Prominent Lithology	Weathered Basalt	Fractured / Jointed Basalt
Thickness range (mbgl)	20	Fractures upto 200 mbgl
Depth range of occurrence of fractures (mbgl)	7-15	47-196
Range of yield potential (lps)	Poor yield	0.2 - 9
Specific Yield	2%	0.2%
T (m ² /day)	-	1 – 1055
Quality Suitability for Domestic & Irrigation	Suitable	Suitable

2.2 3 D aquifer disposition and Cross-Sections

The general subsurface aquifer disposition prepared based on the results of exploratory drilling are shown in in **Fig-11, Fig.12 & Fig-13.**

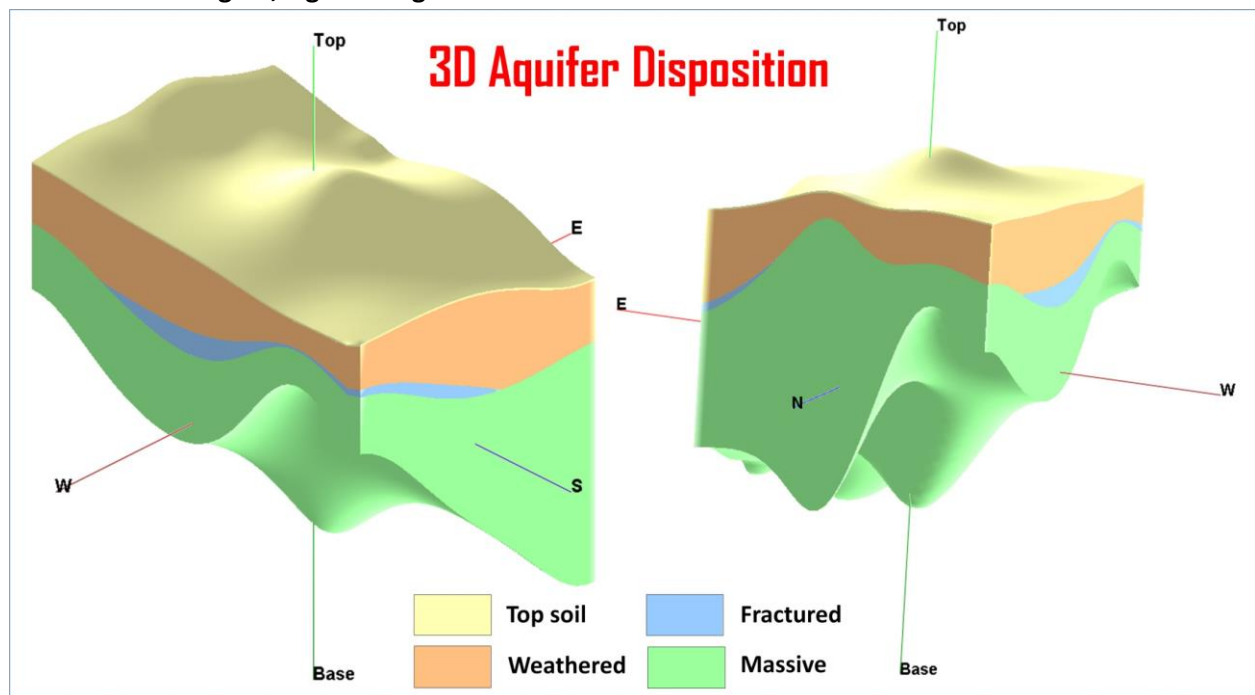


Fig-11: 3D aquifer Disposition

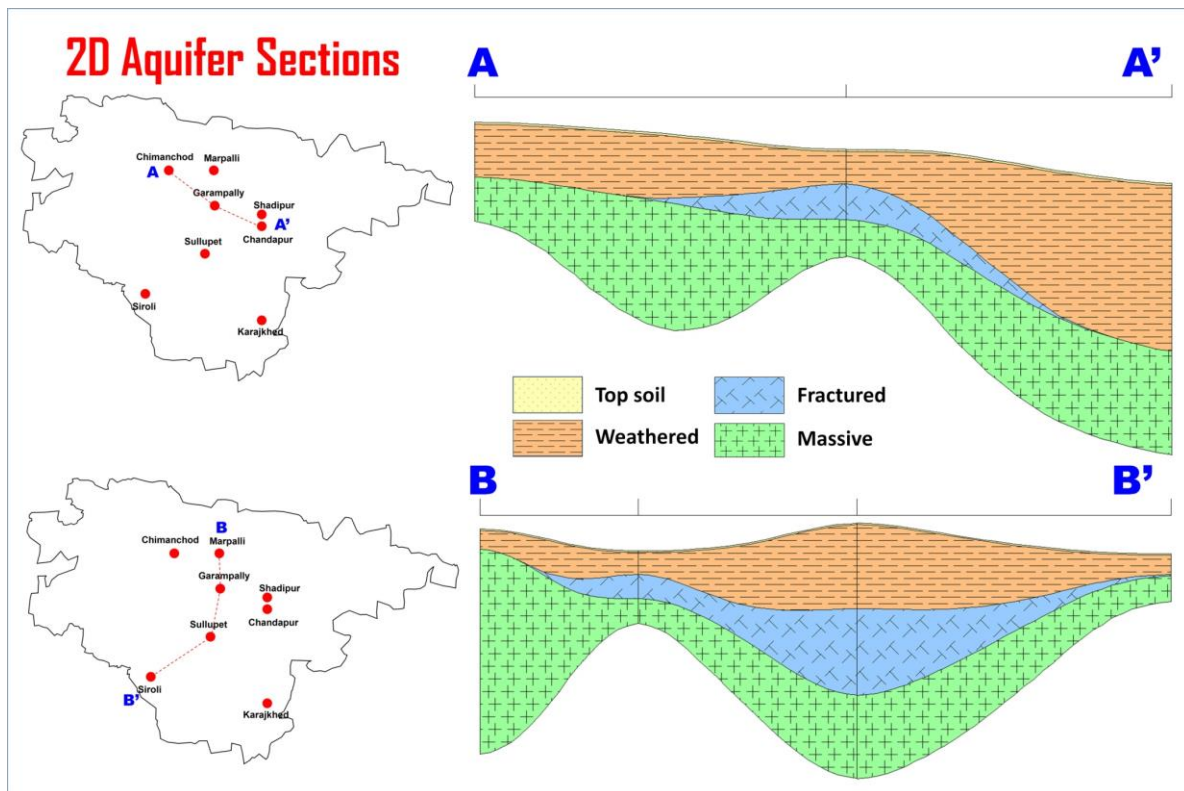


Fig-12: Cross sections in different directions

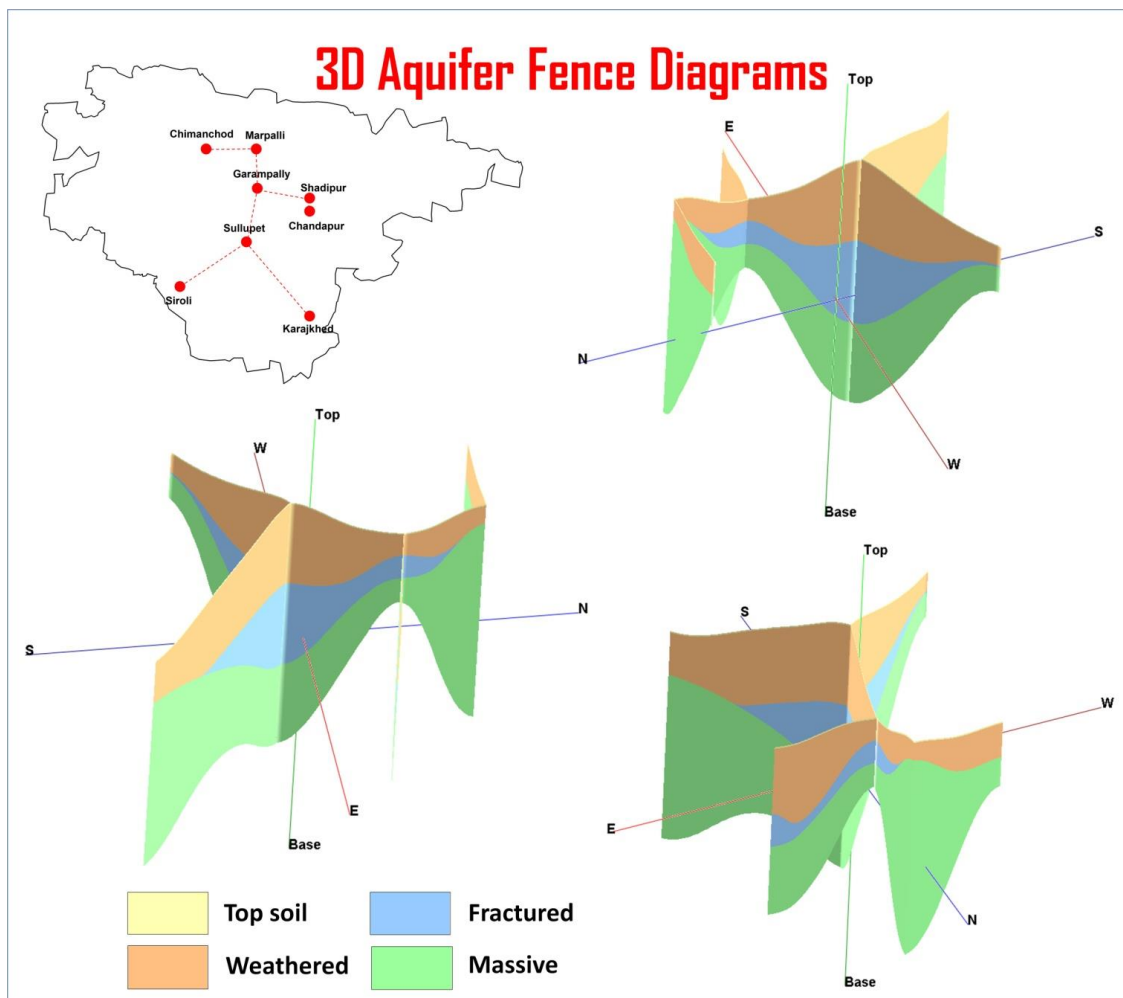


Fig-13: 3D Aquifer Fence Diagram

3 GROUND WATER RESOURCE, EXTRACTION, CONTAMINATION AND OTHER ISSUES

3.1 Aquifer wise resource availability and extraction

Dynamic Ground Water Resource (2020)

Taluk	Annual Extractable GW Resource	GW Extraction for Irrigation Use (Ham)	GW Extraction for Domestic use (Ham)	Total GW Extraction (Ham)	Annual GW allocation for Domestic Use as on 2025 (Ham)	Net GW availability for future Use (Ham)	Stage of GW Extraction (%)	Category
CHINCHOLI	5836.69	1415.14	505.32	1920.45	546.26	3875.30	32.90	Safe

Comparison of ground water availability and draft scenario in Chincholi taluk

Taluk	GW availability (in ham)	GW draft (in ham)	Stage of GW development	GW availability (in ham)	GW draft (in ham)	Stage of GW development	GW availability (in ham)	GW draft (in ham)	Stage of GW development
	2013			2017			2020		
CHINCHOLI	6346	1691	28	6657	2081	31	5836.69	1920.45	32.90

From the above comparison, it can be observed that the stage of ground water extraction is more or less remaining in the same level during the period from 2013 to 2020.

3.2 Chemical quality of ground water and contamination

The interpretation from Chemical Analysis results (Phreatic aquifer) of ground water samples in Chincholi taluk is summarized below. The results are presented in **Table.9**.

- **ELECTRICAL CONDUCTIVITY:** In general, EC values range from 580 to 3500 μ /mhos/cm in the aquifer-I at 25°C (**Fig-14**).
- **CHLORIDE:** Chloride concentration in ground water ranges between 85 and 717 mg/l in the aquifer-I (**Fig-15**).
- **NITRATE:** Nitrate concentration in ground water ranges from 13 and 368 mg/l in the Aquifer –I (**Fig-16**).
- **FLUORIDE:** Fluoride concentration in ground water ranges between 0.24 and 4.0 mg/l in the aquifer-I (**Fig-17**).

Table-9: Quality of ground water in Chincholi taluk of Kalaburagi district

S. No	Location	PH	EC	Cl	NO3	F
1	Chimanchoode	8.212	1850	270	100	4.00
2	Chincholi	7.689	1390	192	275	0.33
3	Huda	7.838	580	85	13	0.79
4	Kadli	7.662	1560	263	225	0.36
5	Kallur	8.000	1560	149	71	2.20

6	Kollur	8.475	3500	717	166	1.40
7	Moghe	8.037	1290	192	368	0.24
8	Nagaidalai	8.085	930	135	98	2.00
9	Sasargaon	8.123	850	92	100	0.44

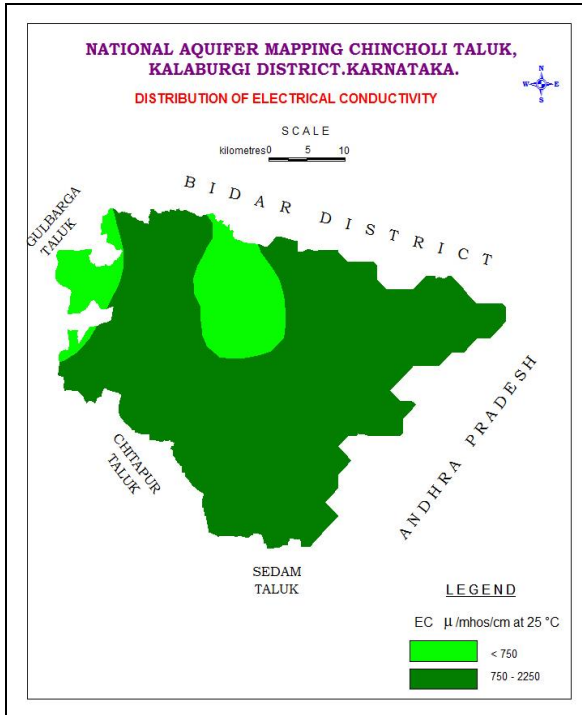


Fig-14 Distribution of Electrical Conductivity

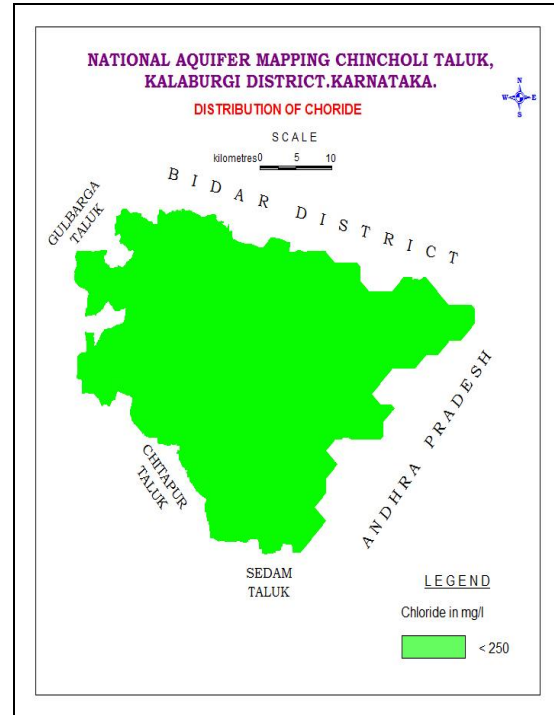


Fig-15 Distribution of Chloride

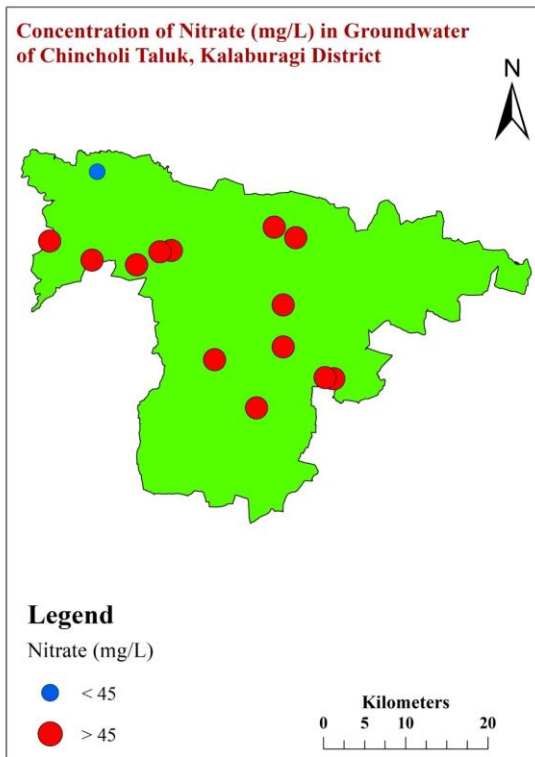


Fig-16 Distribution of Nitrate

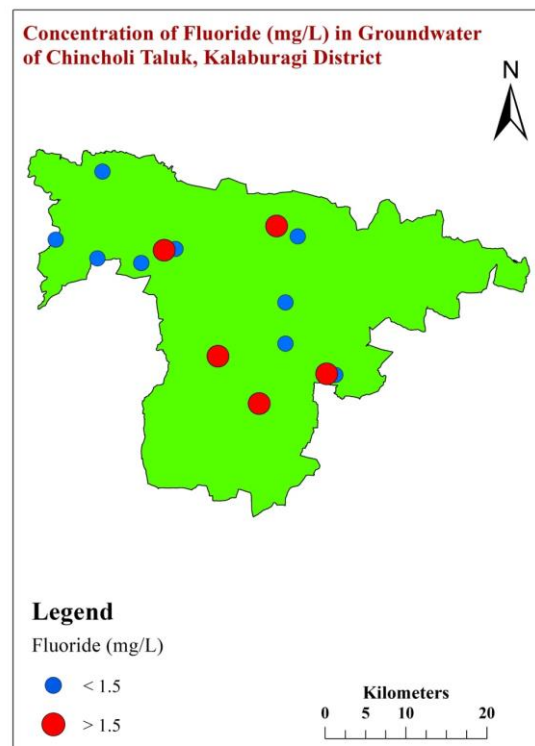


Fig-17 Distribution of Fluoride

4 GROUND WATER RESOURCE ENHANCEMENT

4.1 Artificial recharge and proposed interventions

It is recommended to implement artificial recharge through construction of recharge structures, viz; check dams, percolation tanks & Sub surface dyke (Table-10). Area suitable for AR Structures is shown in Fig-18. The choice of recharge structures should be site specific and such structures need to be constructed in areas already identified as feasible for artificial recharge. The tentative locations of sites proposed for artificial recharge is shown in Fig.19. The tentative list of the proposed Percolation tanks and Check dams are listed in Table.11. The improvement in ground water availability as a result of the implementation of artificial recharge structures in the taluk is detailed in Table.12

Table-10: Quantity of non-committed surface runoff & expected recharge through AR structures

Artificial Recharge Structures Proposed	Chincholi taluk
Non committed monsoon runoff available (MCM)	43.101
Total no. of existing Artificial Recharge Structures	509
Number of Check Dams proposed	68
Number of Percolation Tanks proposed	39
Number of Sub surface dyke proposed	1
Tentative total cost of the project (Rs. in lakhs)	1477.51 Lakhs
Excepted recharge (MCM)	32.33

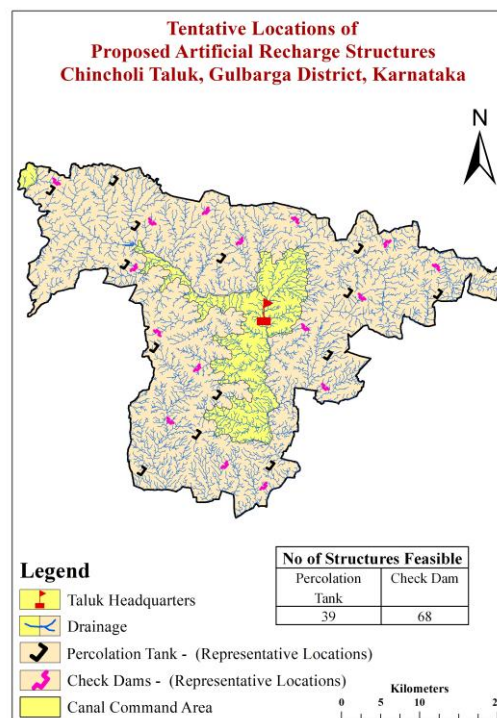
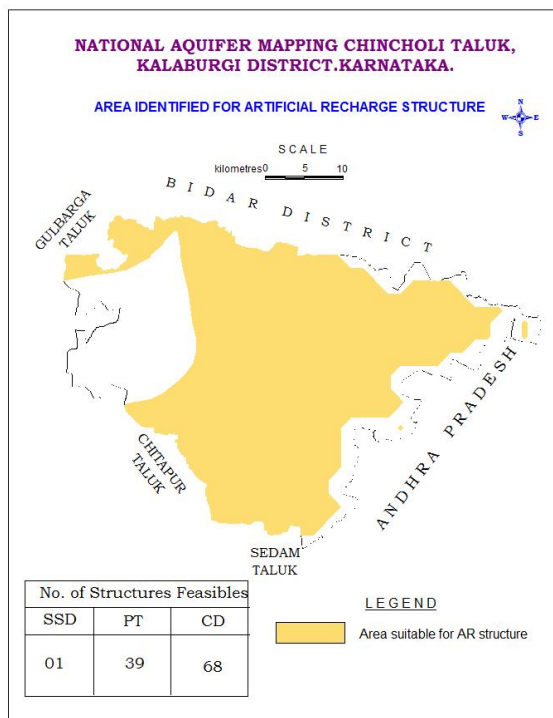


Fig-18 Area suitable for AR Structures

Fig.19 Tentative Locations of AR Structures

Table.11.Tentative Locations of Proposed Percolation tanks, Chicholi Taluk

S. No	Longitude	Latitude	Village	Grama Panchayat	Taluk	District
1	77.3912	17.2475	Halakoda	Jattur	Chincholi	Kalburagi
2	77.3327	17.2668	Shirolli	Shirolli	Chincholi	Kalburagi
3	77.2797	17.2763	Bhuthapura	Gadikeshwar	Chincholi	Kalburagi
4	77.4273	17.2842	Jettura	Jattur	Chincholi	Kalburagi
5	77.3901	17.2990	Venkatapura	Jattur	Chincholi	Kalburagi
6	77.3407	17.3201	Keralli	Kerolli	Chincholi	Kalburagi
7	77.2868	17.3314	Gadikeshwara	Gadikeshwar	Chincholi	Kalburagi
8	77.4466	17.3334	Ganapura	Garagapalli	Chincholi	Kalburagi
9	77.3658	17.3657	Bedagapalli	Kupanoor	Chincholi	Kalburagi
10	77.5182	17.3741	Mariyana	Miriyam	Chincholi	Kalburagi
11	77.3099	17.3785	Hoodebeeranahalli	Hodebeernalli	Chincholi	Kalburagi
12	77.4309	17.4001	Ganganapalli	Anwar	Chincholi	Kalburagi
13	77.4927	17.4108	Somalingadhalli	Miriyam	Chincholi	Kalburagi
14	77.2923	17.4201	Hoovinabavi	Pastapur	Chincholi	Kalburagi
15	77.3425	17.4267	Sulepete	Sulepeth	Chincholi	Kalburagi
16	77.5464	17.4518	Shadhipura	Shadipur	Chincholi	Kalburagi
17	77.4729	17.4583	Kallabhavi	Polakpalli	Chincholi	Kalburagi
18	77.3311	17.4652	Karakamukali	Kanakpur (Karakmukli)	Chincholi	Kalburagi
19	77.2884	17.4714	Dhotikola	Kanakpur (Karakmukli)	Chincholi	Kalburagi
20	77.6180	17.4810	Konchavaram	Kunchavaram	Chincholi	Kalburagi
21	77.5172	17.4830	Nirachalam	Shadipur	Chincholi	Kalburagi
22	77.5743	17.4867	Buragadoddi	Venkatapur	Chincholi	Kalburagi
23	77.6790	17.4941	Mogadhamashara	Kunchavaram	Chincholi	Kalburagi
24	77.5985	17.5036	Mumbapura	Kunchavaram	Chincholi	Kalburagi
25	77.4764	17.5060	Inolli	Ainolli	Chincholi	Kalburagi
26	77.2591	17.5140	Naranahala	Chimmanchod	Chincholi	Kalburagi
27	77.3699	17.5211	Marapalli	Hasargundagi	Chincholi	Kalburagi
28	77.5790	17.5311	Venkatapura	Venkatapur	Chincholi	Kalburagi
29	77.3346	17.5335	Hasiragundagi	Hasargundagi	Chincholi	Kalburagi
30	77.4361	17.5352	Kollura	Nagaidlai	Chincholi	Kalburagi
31	77.5282	17.5352	Dharmasagara	Venkatapur	Chincholi	Kalburagi
32	77.4923	17.5394	Chandramapalli	Ainolli	Chincholi	Kalburagi
33	77.2720	17.5599	Yalamadagi	Gadilingadalli	Chincholi	Kalburagi
34	77.3496	17.5716	Salebeeranahalli	Salebeernalli	Chincholi	Kalburagi
35	77.4109	17.5756	Nagayidhalayi	Nagaidlai	Chincholi	Kalburagi
36	77.3128	17.5904	Yathabarapura	Hasargundagi	Chincholi	Kalburagi
37	77.1739	17.6015	Bhuyara .K	Ainapur	Chincholi	Kalburagi
38	77.2464	17.6108	Benakepalli	Salgar Basantpur	Chincholi	Kalburagi
39	77.2082	17.6161	Iynapura	Ainapur	Chincholi	Kalburagi

(Source: Master Plan, CGWB, 2020. It is likely that the number of structure proposed may vary depending upon the ground truth verification and feasibility criteria)

Tentative Locations of Proposed Check dams, Chicholi Taluk, Kalburagi District

S. No	Longitude	Latitude	Village	Grama Panchayat	Taluk	District
1	77.4189	17.2582	Poothamgal	Jattur	Chincholi	Kalburagi
2	77.3147	17.2616	Kallura .B	Shirolli	Chincholi	Kalburagi
3	77.3999	17.2629	Poothamgal	Jattur	Chincholi	Kalburagi
4	77.2804	17.2652	Bhuthapura	Gadikeshwar	Chincholi	Kalburagi
5	77.3738	17.2836	Nidagundha	Nidagunda	Chincholi	Kalburagi
6	77.4090	17.2926	Karchkheda	Karchkhed	Chincholi	Kalburagi
7	77.3367	17.3042	Nidagundha	Nidagunda	Chincholi	Kalburagi
8	77.3168	17.3065	Chinthapalli	Gadikeshwar	Chincholi	Kalburagi
9	77.2706	17.3178	Gadikeshwara	Gadikeshwar	Chincholi	Kalburagi
10	77.3577	17.3236	Keralli	Kerolli	Chincholi	Kalburagi
11	77.4316	17.3278	Buragapalli	Karchkhed	Chincholi	Kalburagi
12	77.3092	17.3349	Bantanalli	Kerolli	Chincholi	Kalburagi
13	77.2718	17.3510	Gadikeshwara	Gadikeshwar	Chincholi	Kalburagi
14	77.3339	17.3647	Kupanura	Kupanoor	Chincholi	Kalburagi
15	77.3161	17.3679	Kupanura	Kupanoor	Chincholi	Kalburagi
16	77.4474	17.3700	Sangama K	Karchkhed	Chincholi	Kalburagi
17	77.4861	17.3760	Kallura Roda	Miriyan	Chincholi	Kalburagi
18	77.3613	17.3822	Yakapura	Kupanoor	Chincholi	Kalburagi
19	77.3411	17.3980	Sulepete	Sulepeth	Chincholi	Kalburagi
20	77.2976	17.4057	Hoodebeeranahalli	Hodebeernalli	Chincholi	Kalburagi
21	77.4923	17.4085	Somalingadhalli	Miriyan	Chincholi	Kalburagi
22	77.3193	17.4265	Yalakapalli	Pastapur	Chincholi	Kalburagi
23	77.2961	17.4371	Hoovinabavi	Pastapur	Chincholi	Kalburagi
24	77.4657	17.4436	Chikkalingadhalli	Shadipur	Chincholi	Kalburagi
25	77.4939	17.4445	Chikkalingadhalli	Shadipur	Chincholi	Kalburagi
26	77.5172	17.4516	Yakathapura	Shadipur	Chincholi	Kalburagi
27	77.4690	17.4654	Kallabhavi	Polakpalli	Chincholi	Kalburagi
28	77.2944	17.4683	Rusthampura	Pastapur	Chincholi	Kalburagi
29	77.5814	17.4706	Shadhipura	Shadipur	Chincholi	Kalburagi
30	77.3208	17.4776	Karakamukali	Kanakpur (Karakmukli)	Chincholi	Kalburagi
31	77.5301	17.4783	Nirachalam	Shadipur	Chincholi	Kalburagi
32	77.2804	17.4854	Dhotikola	Kanakpur (Karakmukli)	Chincholi	Kalburagi
33	77.5518	17.4869	Shadhipura	Shadipur	Chincholi	Kalburagi
34	77.4899	17.4871	Bogalingadhahalli	Ainolli	Chincholi	Kalburagi
35	77.5235	17.4911	Nirachalam	Shadipur	Chincholi	Kalburagi
36	77.6051	17.4938	Mumbapura	Kunchavaram	Chincholi	Kalburagi
37	77.3843	17.4944	Gowdanahalli	Garampalli	Chincholi	Kalburagi
38	77.5692	17.4947	Buragadoddi	Venkatapur	Chincholi	Kalburagi
39	77.6772	17.4990	Mogadhamashara	Kunchavaram	Chincholi	Kalburagi
40	77.5484	17.5021	Buragadoddi	Venkatapur	Chincholi	Kalburagi
41	77.4986	17.5039	Inolli	Ainolli	Chincholi	Kalburagi
42	77.2697	17.5122	Chimmanaboda	Chimmanchod	Chincholi	Kalburagi

43	77.6171	17.5143	Linganagara	Venkatapur	Chincholi	Kalburagi
44	77.5684	17.5217	Anthawaram	Venkatapur	Chincholi	Kalburagi
45	77.3591	17.5251	Marapalli	Hasargundagi	Chincholi	Kalburagi
46	77.3827	17.5297	Yampalli	Garampalli	Chincholi	Kalburagi
47	77.5411	17.5301	Dharmasagara	Venkatapur	Chincholi	Kalburagi
48	77.4809	17.5383	Chandramapalli	Ainolli	Chincholi	Kalburagi
49	77.5598	17.5390	Venkatapura	Venkatapur	Chincholi	Kalburagi
50	77.3906	17.5426	Shikarapotakapalli	Salebeernalli	Chincholi	Kalburagi
51	77.3272	17.5470	Hasiragundagi	Hasargundagi	Chincholi	Kalburagi
52	77.2569	17.5489	Yalamadagi	Gadilingadalli	Chincholi	Kalburagi
53	77.3544	17.5544	Salebeeranahalli	Salebeernalli	Chincholi	Kalburagi
54	77.3806	17.5621	Thumakunta	Salebeernalli	Chincholi	Kalburagi
55	77.3136	17.5644	Guramapalli	Hasargundagi	Chincholi	Kalburagi
56	77.2883	17.5653	Chimmanaboda	Chimmanchod	Chincholi	Kalburagi
57	77.3940	17.5666	Thumakunta	Salebeernalli	Chincholi	Kalburagi
58	77.4569	17.5676	Manikapura	Nagaidlai	Chincholi	Kalburagi
59	77.3341	17.5677	Hasiragundagi	Hasargundagi	Chincholi	Kalburagi
60	77.3556	17.5782	Salebeeranahalli	Salebeernalli	Chincholi	Kalburagi
61	77.3211	17.5815	Yathabarapura	Hasargundagi	Chincholi	Kalburagi
62	77.2431	17.5933	Benakepalli	Salgar Basantpur	Chincholi	Kalburagi
63	77.2889	17.5945	Salagara (Bassanthapura)	Salgar Basantpur	Chincholi	Kalburagi
64	77.1572	17.5947	Bhuyara .K	Ainapur	Chincholi	Kalburagi
65	77.1783	17.6113	Bhuyara .K	Ainapur	Chincholi	Kalburagi
66	77.2712	17.6123	Benakepalli	Salgar Basantpur	Chincholi	Kalburagi
67	77.2454	17.6168	Benakepalli	Salgar Basantpur	Chincholi	Kalburagi
68	77.2225	17.6213	lynapura	Ainapur	Chincholi	Kalburagi

(Source: Master Plan, CGWB, 2020. It is likely that the number of structure proposed may vary depending upon the ground truth verification and feasibility criteria)

Table-12 Improvement in GW availability due to Recharge, Chincholi taluk

Taluk	Net 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	Expected improvement in stage of ground water development after the implementation of the project	Expected improvement in overall stage of ground water development
	HAM	HAM	%	HAM	%	%
CHINCHOLI	5836.69	1920.45	33	3233	21	12

4.2 Water Use Efficiency by Micro Irrigation Practices

It is observed that wells and bore wells are the source for 1547 ha of net irrigation in the taluk constituting about 53% of the irrigated area. Adoption of water use efficiency (WUE) techniques will

contribute in ground water resource enhancement in the long run by way of saving of water. Efficient irrigation practices like Drip irrigation & sprinkler needs to be adopted by the farmers in the existing 1547 ha of net irrigated area by wells & bore wells. At present (2020), the irrigation draft is 1415 ham.

The water efficient methodology may be applied for growing sugarcane which is grown in 778 ha and is largely ground water dependent as compared to the other crops which are mainly grown during kharif. Efficient irrigation techniques will contribute in saving ground water by 222 ham considering 50% of the sugarcane area is dependent on ground water irrigation and thus will improve stage of development marginally by 1.20% from 32.90 to 31.70%. However, in long run the practice of Efficient irrigation techniques will add to the ground water resource in large extent. **(Table-13).**

Table 13: Improvement in GW availability (2020) due to saving by adopting water use efficiency

Net annual ground water availability	Existing gross ground water draft for all uses	Existing stage of ground water development	Sugarcane grown area	Sugarcane area considered for WUE (50%)	Saving due to adopting WUE measures @ 0.57 m in sugarcane grown area	Cumulative annual ground water availability	Expected improvement in stage of ground water development after the implementation of the project	Expected improvement in overall stage of ground water development
HAM	HAM	%	HA	HA	HAM	HAM	%	%
5836.69	1920.45	32.90	778	389	221.73	6058.42	1.20	31.70

4.3 Ground Water Development Plan

In Chincholi taluka, the present stage of ground water extraction (2020) is merely 32.90 % with net ground water availability of 5836.69 ham and total extraction of 1920.45 ham. The ground water draft for irrigation purpose is @ 1415.14 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 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 33% to 60% in a systematic way by adopting scientific approach. About 474 dugwells (15-30 m depth; 3 to 5 m diameter @ Rs. 3.00 lakh/dugwell) are recommended to be constructed in feasible areas. Further 886 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 2433 ha. The total expenditure proposed to be incurred will be Rs. 31.95 Cr. The detailed ground water development strategy to uplift the ground water use in the feasible areas is presented in Table – 14.

Table – 14: Feasibility of additional GW abstraction structures based on GWRA 2020 availability

Balance GWR available to make SOE 60%	DW unit draft	BW unit draft	No. of DW feasible @ 40% with unit draft of 1 ham	No. of BWs feasible @ 60% 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 by DW's considering crop water requirement of 0.65 m (Ha)	Additional irrigation potential created by BW's considering crop water requirement of 0.65 m (Ha)	Total irrigation potential created by DW's and BW's
1581.56	1	1.25	474	886	1423	1771	730	1703	2433

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

4.4 Change in cropping pattern

Water intensive crops like sugarcane is grown in 778 ha of net cropped area of 1,42,488 ha. However, oil seeds is grown during kharif and rabi period and sugarcane grown only in 778 ha of the cropped area. At present (2020), the stage of ground water extraction is @ 32.90% and taluk has been categorised as Safe, thus change in cropping pattern has not been suggested.

4.5 Other interventions proposed

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

5 SUMMARY AND RECOMMENDATIONS

The main ground water issues are Low Ground Water Development, Limited Ground Water Potential / Limited Aquifer Thickness / Sustainability, Deeper Water Levels particularly in Aquifer-II in some parts, hilly and plateau areas which are all inter-related or inter dependent and Inferior Ground Water Quality due to nitrate contamination major part of the area. The summary of ground water management plan of Chincholi taluk is given in **Table-15**.

Table 15: Summary of Management plan of Chincholi taluk

Stage of GW Extraction and Category (2020)	32.90 %, Safe
Annual Extractable GW Resource (Ham)	5836.69
Total Extraction (Ham)	1920.45
Total GW Resources (Dynamic & Static up to the depth of 200 mbgl) (Ham)	16664
Ground Water Draft for Irrigation (Ham)	1415.14
Ground Water Resource Enhancement by Supply side Interventions	
No of Proposed AR structures	
SSD	1
PT	39
CD	68
Expected Additional Recharge to GW due to AR (Ham)	3233
Additional Irrigation Potential that can be created (Ha)	3900
Total Estimated Expenditure (Rs. in Cr.)	14.77
Change in Stage of GW Extraction (%)	33 to 12
Ground Water Resource Savings by Demand side Interventions	
Expected Saving due to adopting WUE measures in sugarcane area (Ham)	222
Change in Stage of GW development (%)	32.90 to 31.70
Ground Water Resource Development Plan	
Balance GWR available to enhance SOE 60% (Ham)	1581.56
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 – 1.00 ham	474
BW – Depth: 40 to 100 m, Dia: 150 mm, Unit Cost – Rs. 2.00 lakh, Av. Annual Gross draft – 1.50 ham	886
Additional irrigation potential created considering crop water requirement of 0.65 m (Ha)	2433
Total Estimated Expenditure (Rs. in Cr.)	31.95
Increase in Stage of GW Extraction (%)	32.90 to 60
Ground Water Quality – Nitrate contamination	Improving quality by proper drainage of sewage and Limited usage of Nitrogenous fertilizers

As per the resource estimation – 2020, Chincholi taluk falls under Safe category with the stage of ground water extraction is 32.90 %. 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 4310 ham. This can be used to recharge the aquifer mainly through percolation tanks (39), check dams (68) and sub surface dyke structures (1). The volume of water expected to be conserved/recharged @75% efficiency is 3233 ham through these AR structures. The approximate cost estimate for construction of these AR structures is Rs. 14.77 Cr. The additional area which can be brought under assured ground water irrigation will be about 3900 hectares. However, the figures given are tentative and pre-field studies / DPR are recommended prior to implementation of these recharge structures.

- **Ground water resource enhancement by demand side interventions:** At present about 53 % 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 sugarcane crop which is grown in small area of 778 ha and considering 50% area is dependent on ground water irrigation, efficient irrigation techniques will contribute in saving ground water by 222 ham @ 0.57 m and thus will improve stage of development marginally by 1.20% from 32.90 to 31.70%. However, in long run the practice of efficient irrigation techniques will add to the ground water resource in large extent..
- **Change in cropping pattern:** Farmers are facing inadequacy of groundwater for agriculture during summer. Water intensive crops like sugarcane is grown in 778 ha of net cropped area of 1,42,488 ha. However, oil seeds is grown during kharif and rabi period and sugarcane grown only in 778 ha of the cropped area. At present (2020), the stage of ground water extraction is @ 32.90% and taluk has been categorised as Safe, thus change in cropping pattern has not been suggested.
- **Ground Water Resource Development Plan:** The present stage of ground water extraction (2020) is merely 32.90 % with net ground water availability of 5836.69 ham and total extraction of 1920.45 ham. The ground water draft for irrigation purpose is @ 1415.14 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 33% to 60% in a systematic way by adopting scientific approach. About 474 dugwells (15-30 m depth; 3 to 5 m diameter @ Rs. 3.00 lakh/dugwell) are recommended to be constructed in feasible areas. Further 886 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 2433 ha. The total expenditure proposed to be incurred will Rs. 31.95 Cr.
- **Conjunctive use plan in water logged area:** Out of the total 174 sq.km of the canal command area in the taluk, under Lower Mullamari and Chandrampalli (Lower Bhima basin in Krishna basin) about 3267 ha is water logged. About 2428 ha of this is reclaimed and 839 ha is yet to be reclaimed since inception. (Source: CADA as on March 2021). In addition to this reclamation, conjunctive use plan is also recommended to benefit the tail end area of the irrigation command.
- **Drinking water Supply:** In view of ground water contamination with mainly higher concentration Fluoride and Nitrate, drinking water supply from surface water needs to be explored/ ensured.
- **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.
