



# 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**

**Arkalgud Taluk, Hassan District, Karnataka**

दक्षिण पश्चिमी क्षेत्र, बेंगलुरु  
South Western Region, Bengaluru

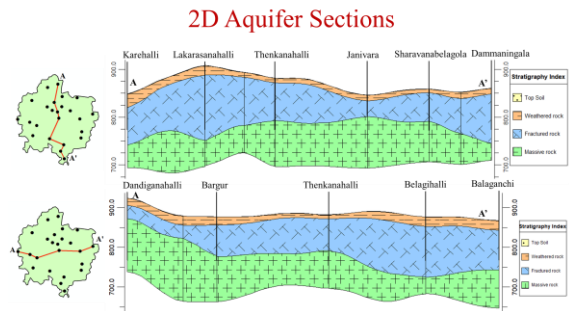
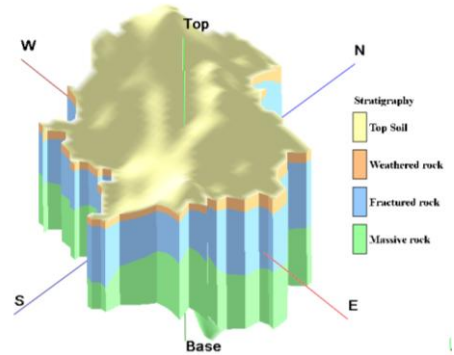
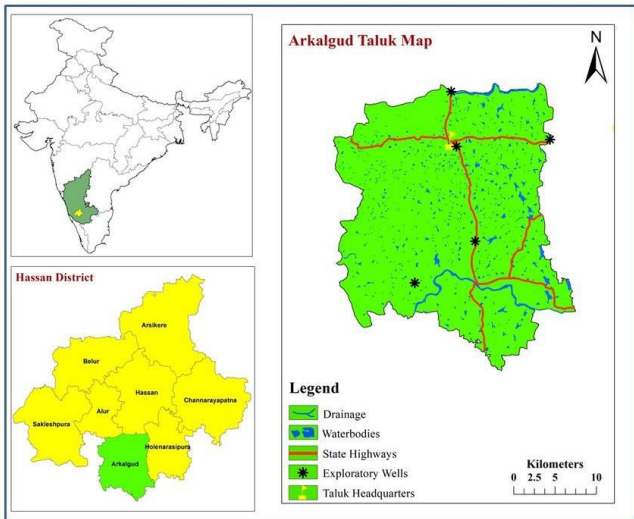
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# AQUIFER MAPS AND MANAGEMENT PLAN, ARKALGUD TALUK, HASSAN DISTRICT, KARNATAKA STATE

(AAP: – 2021-2022)



By

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# AQUIFER MAPS AND MANAGEMENT PLAN, ARKALGUD TALUK, HASSAN DISTRICT, KARNATAKA STATE

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## Contents

<b>1. SALIENT FEATURES</b> .....	<b>1</b>
1.1 Study area .....	1
1.2 Population.....	2
1.3 Rainfall and Climate.....	2
1.4 Agriculture & Irrigation .....	3
1.5 Geomorphology, Physiography & Drainage .....	5
1.6 Soil.....	5
1.7 Ground water resource availability and extraction.....	7
1.8 Water level behavior.....	7
<b>2. AQUIFER DISPOSITION</b> .....	<b>8</b>
2.1 Aquifer Types.....	8
<b>3. GROUND WATER RESOURCE, EXTRACTION, CONTAMINATION AND OTHER ISSUES</b> .....	<b>10</b>
3.1 Comparison of Ground Water Resource and Extraction .....	10
3.2 Chemical quality of ground water and contamination.....	11
<b>4. GROUNDWATER RESOURCE ENHANCEMENT AND PROPOSED MANAGEMENT STRATEGY</b> .....	<b>14</b>
4.1 Resource Enhancement by Supply Side Interventions .....	14
4.2 Demand Side Interventions .....	15
4.2.1 Advanced irrigation practices .....	15
4.2.2 Change in cropping pattern .....	16
4.3 Ground Water Development Plan.....	16
4.4 Conjunctive use plan in water logged area.....	16
4.5 Regulation and Control .....	17
4.6 Other interventions proposed .....	17
<b>5. SUMMARY AND RECOMMENDATIONS</b> .....	<b>17</b>

# AQUIFER MANAGEMENT PLAN FOR ARKALGUD TALUK, HASSAN DISTRICT, KARNATAKA STATE

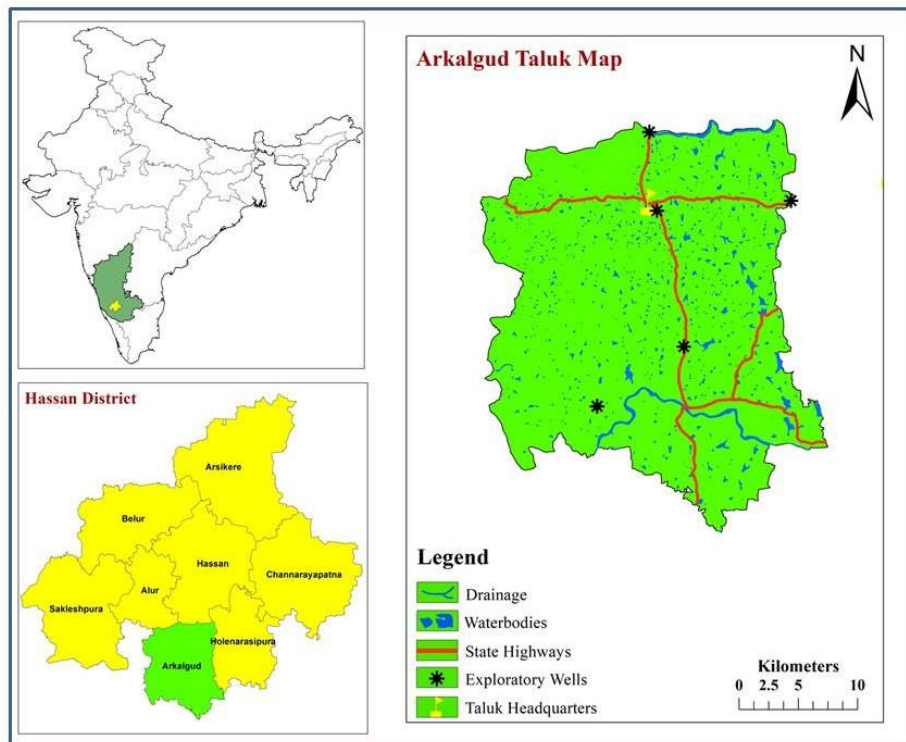
## 1. SALIENT FEATURES

Name of the Taluk	: Arkalgud
District	: Hassan
State	: Karnataka
Area	: 675 sq.km
Population (Census 2011)	: 204585
Normal annual rainfall	: 870 mm

### 1.1 Study area

Aquifer mapping studies have been carried out in Arkalgud taluk, Hassan district, Karnataka State under National Aquifer Mapping Project (NAQUIM). Arkalgud covering an area of 675 sq.km and is situated in between latitudes 12°30'53.28"N - 12°49'17.4"N and longitudes 75°56'27.24 "E - 76°11'44.16"E. The area is bounded on the north by Alur and Hassan taluks of Hassan district, on the south by Piriapatna taluk of Mysore district, on the east by the Holenarsipur taluk of Hassan district and on the west by the Somvarpet taluk. The taluk has 05 hoblies, 36 Gram Panchayaths and 296 villages. Arkalgud is the taluk headquarters.

The location map of the Arkalgud taluk is presented in **Fig-1**.



**Fig 1: Location Map**

## 1.2 Population

According to 2011 census, the human population in Arkalgud taluk is 204585 out of which 19 % constitutes the urban population and 81% constitutes the rural population. The taluk has an overall population density of 303 persons per sq.km. In Arkalgud taluk, the decadal variation in population from 2001-2011 is 2.26 %. The population details are given in **Table-1**.

**Table-1: Population details**

Total	Male	Female	Share of the district population	Rural population	Urban population	Decadal change in population	Decadal change in rural population	Decadal change in urban population
204585	102297	102288	11.51	187775	16810	2.26	1.59	9.76

**Source:** District at a Glance 2019-20, Govt. of Karnataka

## 1.3 Rainfall and Climate

Arkalgud taluk enjoys semi-arid climate. Dryness and hot weather prevails in major part of the year. The area falls under Southern Dry agro-climatic zone of Karnataka and is categorized as drought prone. The climate of the study area is quite agreeable and free from extremes. The year is usually divided into four seasons: summer from March to May; rainy season or south-west monsoon season from June to September; post-monsoon season covering the months of October and November and dry or winter Season from December to February. The data from the year 1981 to 2010 is analyzed and presented in **Table2**.

**Table 2 : STATISTICAL ANALYSIS OF NORMAL ANNUAL RAINFALL OF ARKALGUD TALUK, HASSAN DISTRICT (1981-2010)**

	Jan	Feb	Mar	Apr	May	PRE MON SOON	Jun	Jul	Aug	Sep	SOUTH WEST MON SOON	Oct.	Nov	Dec	NORTH EAST MONSOON	Annual
NRM	2	2	20	39	82	145	100	139	116	106	461	153	46	10	209	815
STDEV	6	5	44	41	52	81	59	80	76	76	156	101	51	15	110	197
CV%	272	286	222	105	63	56	59	57	66	71	34	66	110	157	53	24

The data pertaining to these gauges is of long term nature and are well maintained. It is presumed that they are representative of the taluks and the same is used for analysis. Normal annual rainfall in Arkalgud taluk for the period 1981 to 2010 is 815 mm. The 10 years average monthly, seasonal and annual rainfall data of Arkalgud taluk is given in **Table 3**.

Year	Jan	Feb	Mar	Apr	May	PRE	Jun	Jul	Aug	Sep	MO N	Oct	Nov	Dec	POS T	Annual
2010	50	0	4	32	122	208	97	177	95	146	515	92	247	6.0	345	1068
2011	0	0	17	63	136	216	135	96	113	47	391	86	158	0	244	851
2012	0	0	0	98	78	176	23	117	134	86	360	19	36	13	68	604
2013	0	20	29	1	0	50	23	117	134	86	360	19	36	13	68	478
2014	0	0	0	63	102	165	66	217	150	151	584	104	0	15	119	868
2015	0	0	53	15 8	119	330	195	34	77	80	386	29	47	2	78	794
2016	0	0	0	26	72	98	173	132	52	11	368	19	6	28	53	519
2017	0	0	2	56	139	198	58	84	123	144	409	123	10	8	141	748
2018	0	2	68	76	271	417	234	271	186	153	844	114	3	0	117	1378
2019	0	0	11	24	48	83	54	72	365	150	641	157	16	8	181	905

## 1.4 Agriculture & Irrigation

Agriculture is the main occupation in Arkalgud taluk. Principal crops under Cereals are Paddy, Maize and Ragi, maize, Pulses, Vegetables and under fruits is Banana (**Table-4**). Water intensive crops like Banana grown in 0.90 % of the total crop area. Pulses grown in 48.50 % and oil seeds in 0.17% of total crop area in the taluk.

**Table-4: Cropping pattern 2019-2020 (Ha)**

Crop	Paddy	Maize	Bajra	Jowar	Ragi	Wheat	Pulses	Fruits	Vege tables	Oil seeds	Banana	Total crop
Area(ha)	11801	9603	2	1246	7831	1	32022	886	1930	109	596	66027
Area %	17.87	14.54	0.00	1.89	11.86	0.00	48.50	1.34	2.92	0.17	0.90	100

**Source:** District at a glance 2019-20, Govt. of Karnataka

About 3.81 % of the geographical area is covered by forest. It is observed that net sown area accounts for 61.69 % and area sown more than once is 18.05 % of total geographical area in Arkalgud taluk. Area not available for cultivation, the other uncultivable land and fallow land cover are 14.17 %, 4.62 % and 9.84 % respectively of total geographical area. About 0.65 % of gross area irrigated is from wells out of the total irrigated area, 26.57 % are from bore/tube wells and 28.37 % from tanks, 35.90 % from canals. Further, out of the total irrigated area 64.27 % of irrigation is from surface water and 35.73 % from ground water. Thus major source of irrigation is surface water (**Fig.-2**). The details of land use and the details of Irrigation are given in **Table 5 and 6** respectively. The land use pattern is given in **Fig.-3**. About 34.64% of total area of the taluk is irrigated by various sources.

**Table-5: Details of land use 2019-2020 (Ha)**

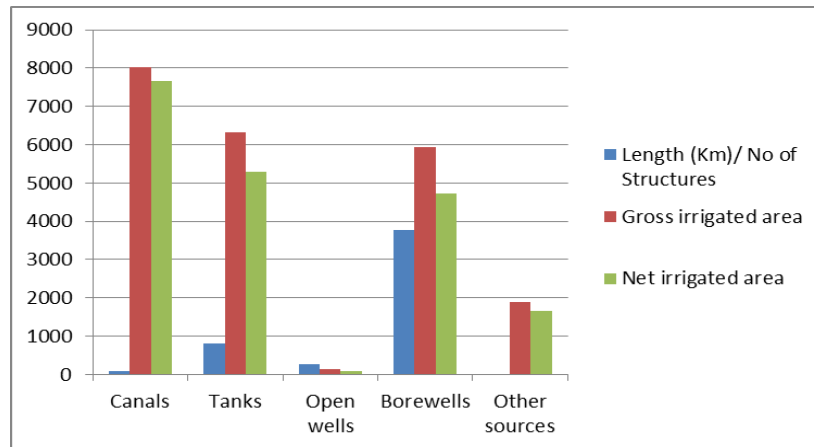
Total Geographical Area	Area under Forest	Area not available for cultivation	Other uncultivable land	Fallow land	Net sown area	Area sown more than once	Gross sown area
64450	2458	9134	6757	6342	39759	11636	51395
% of the area	3.81	14.17	10.48	9.8	61.69	18	79.74

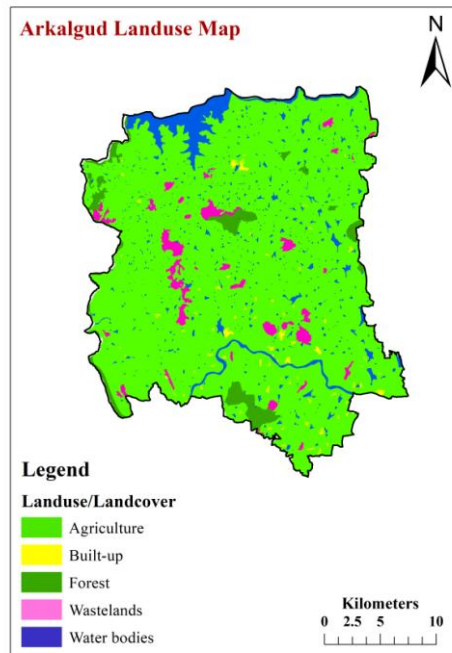
**Source:** District at a glance 2019-20, Govt. of Karnataka

**Table-6: Details of Irrigation**

Source of Irrigation	Length in Km/No of structures	Gross area Irrigated (Ha)	Net area Irrigated (Ha.)	% of area (Total area)
Canals	96	8017	7675	35.90
Tanks	804	6335	5300	28.37
Wells	265	145	85	0.65
Tube wells	3781	5933	4715	26.57
Lift Irrigation	2	0	0	0
Other Sources	0	1900	1652	8.51
Total		22330	19427	100

**Source:** District at a glance 2019-20, Govt. of Karnataka

**Fig 2-Sources of Irrigation**



**Fig. 3: Land use/land cover map**

### **1.5 Geomorphology, Physiography & Drainage**

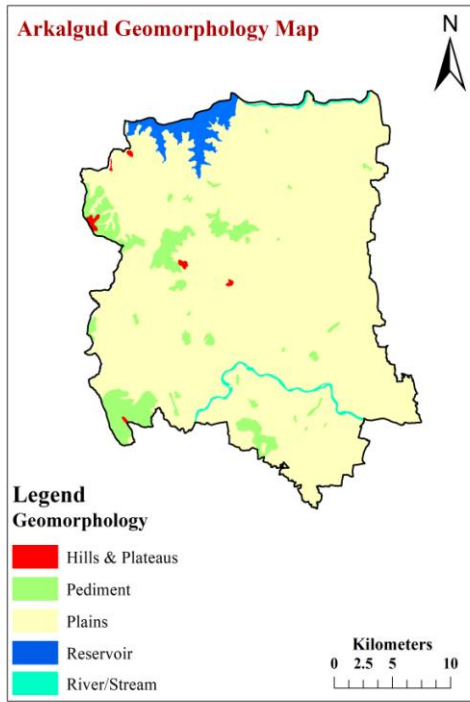
The geomorphology of an area is the external appearance of landforms that gives a reliable picture of the underground strata and its physio-chemical condition. The major part of the taluk is occupied by plain area which is followed by pediments. The general slope of the area is towards south east direction (**Fig.4**).

The Taluk is drained by Cauvery river in the south and Hemavathi river in the north and other streams which flow towards south and east wards. Hemavathi reservoir is located in the northern border of the taluk. The tank system is well developed in the Taluk. The general drainage pattern is dendritic to sub-dendritic in nature (**Fig.5**).

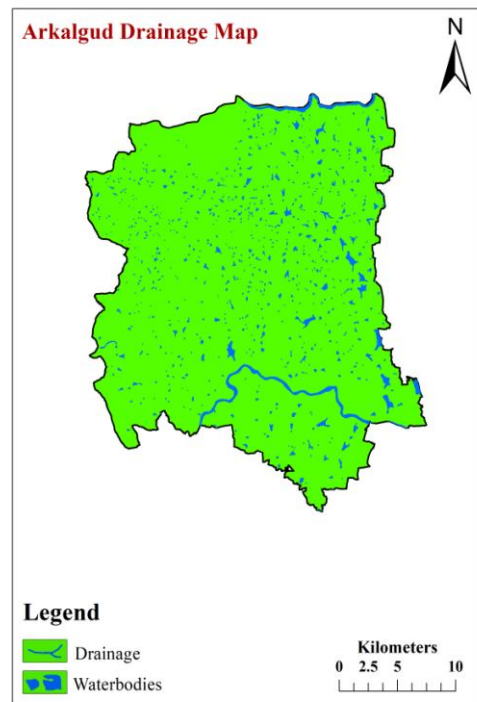
### **1.6 Soil**

Soils play a major role in hydrologic control of the infiltrating water. Soils are generally classified by taking their color, texture, fertilities and chemical combinations includes salts, minerals and the solution effect over them. Most of the area consists of clayey soils followed by clayey skeletal soil (**Fig.6**).

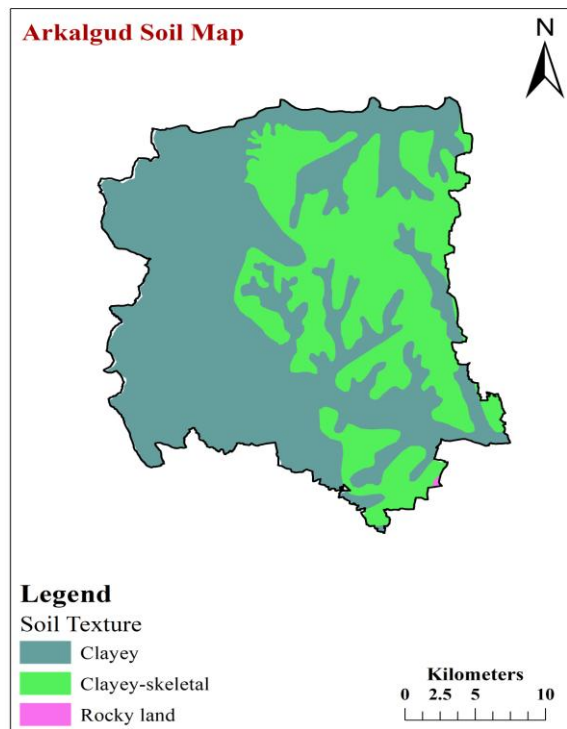




**Fig. 4: Geomorphology map**



**Fig. 5: Drainage map**



**Fig. 6: Soil map**

## 1.7 Ground water resource availability and extraction

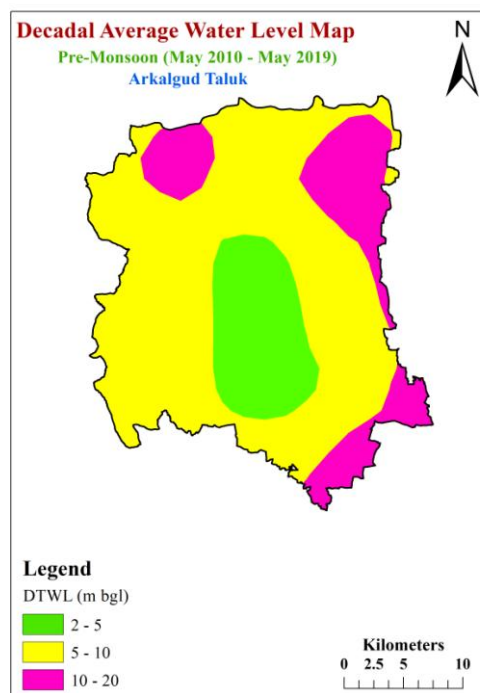
As per the ground water resource estimation 2020 (**Table 7**), the data on ground water resources shows that the Annual Extractable Ground Water Resource is 11273 ham. The existing Ground Water Extraction for Irrigation Use is 3063 ham. The stage of groundwater development is 31 % and falling under SAFE category.

**Table.7 Dynamic Ground Water Resource, (March 2020, in Ham)**

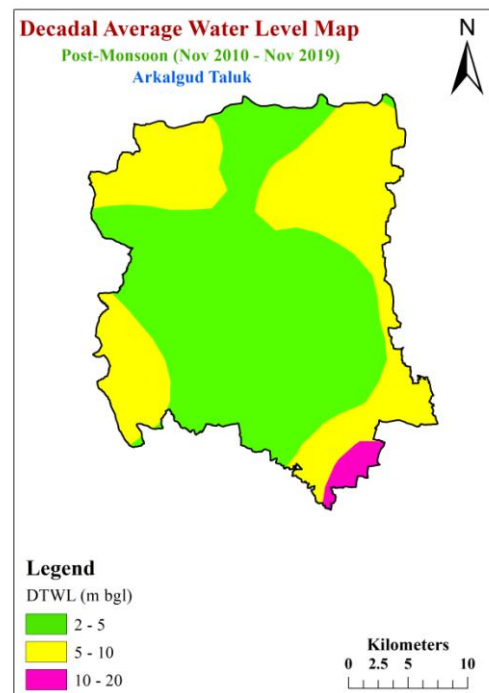
Net Annual Extractable Ground Water Resource	Existing Ground Water Extraction for Irrigation Use	Existing Ground Water Extraction for Industrial Use	Existing ground water extraction for Domestic Use	Total Extraction	Annual GW Allocation for Domestic Use as on 2025	Net Ground Water Availability for future use	Stage of Ground Water Extraction (%)	Category
11273	3063	0	435	3498	529	7902	31	SAFE

## 1.8 Water level behavior

The water level data have been monitored from the representative dug wells and bore wells under the monitoring programme for both pre and post monsoon seasons during 2019 in Aquifer I. During pre-monsoon, the decadal average water level ranges from 0.73 to 14.34 mbgl (**Fig.7**), whereas in post-monsoon it varies from 0.43 to 8.42 mbgl (**Fig.8**). Whereas in Aquifer II, the water level ranges from 17.65 to 66.5 mbgl in pre-monsoon and 3.5 to 28.7 mbgl during post monsoon as per Ground water Department, Govt of Karnataka data.



**Fig7 Pre-monsoon decadal average water level**



**Fig 8 Post-monsoon decadal average water level**

## 2. AQUIFER DISPOSITION

The occurrence and movement of water in the subsurface is broadly governed by geological frameworks i.e., nature of rock formations including their porosity (primary and secondary) and permeability. The principal aquifer in the area is Banded Gneissic Complex and the occurrence and movement of ground water in these rocks is controlled by various factors and it primarily depends on the degree of interconnection of secondary pores/voids developed by fracturing and weathering in the hard rock.

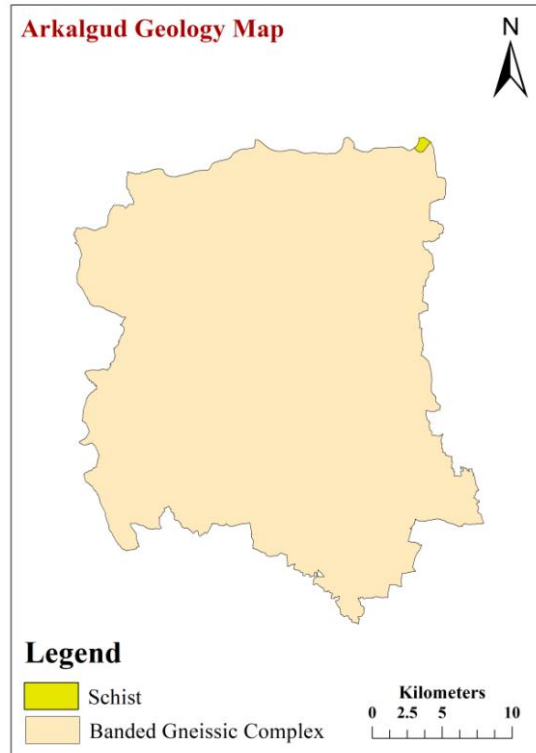
### 2.1 Aquifer Types

In Arkalgud Taluk, there are mainly two types of aquifer systems;

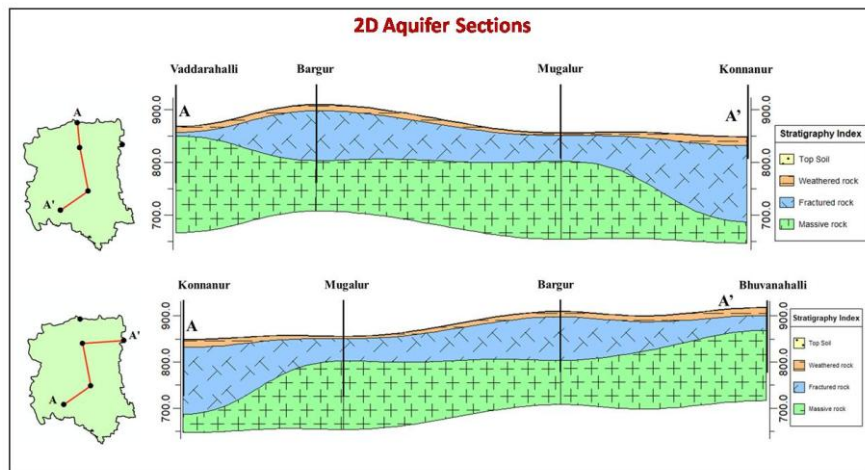
- i. **Aquifer-I (Phreatic aquifer)** comprising Weathered Banded Gneissic Complex / Schist
- ii. **Aquifer-II (Fractured aquifer)** comprising Fractured Banded Gneissic Complex / Schist

In Arkalgud Taluk, Banded gneissic complex occupies the entire part of the taluk area and Schist formation noticed as an isolated pocket (**Fig.9**). Ground water occurs within the weathered and fractured gneisses under water table condition and semi-confined condition. In the Taluk, bore wells were drilled to a maximum of 200 mbgl. Depth of weathered zone (Aquifer-I) ranges from 5.5 mbgl to 18 mbgl.

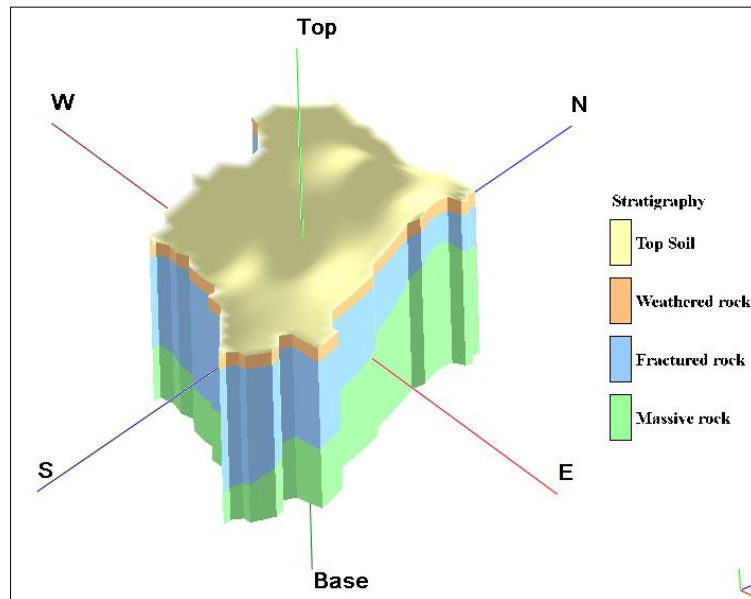
Ground water exploration reveals that aquifer-II, the fractured formation was encountered between the depths of 17 to 166 mbgl. Permeability in the shallow zone is less than 10m/day. Specific Capacity of dug wells ranges from 3.92 to 102.24m<sup>3</sup>/day/m. Potential deep aquifers occur between 25 m and 100 m (explored depth 200 m) in the form of joints, fissures and fractures. The average yield of bore wells in aquifer II (CGWB exploratory wells) is 2.0 lps and dry at some places. Transmissivity ranges from 16 to 22 m<sup>2</sup> /day. During monsoon period the wells tapping this aquifer sustains for 2 to 4 hrs /day of pumping, while during non-monsoon period (May to July) sustains for 1 to 3 hour/day of pumping. In general ground water in fractured aquifer is potable. 2D and 3D aquifer disposition maps are shown in **Figure.10 and 11**.



**Fig-9: Geology**



**Fig. 10: 2D Aquifer section**



**Fig.11: 3D Aquifer model**

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

The main ground water issues are limited Aquifer Thickness / Sustainability, deeper water levels especially in Aquifer II, declining water level trend which are all inter-related or inter dependent.

#### **3.1 Comparison of Ground Water Resource and Extraction**

The Dynamic Ground Water Resource 2017 and as on 2020 have been summarized and are shown in **Table 8**. It is observed that the ground water availability in 2020 is less compare to 2017 due to decrease in rainfall and in water table. The stage of ground water extraction has increased from 29% during 2017 to 31% during 2020. Groundwater resource availability and extraction over the years given in **Fig.12**.

**Table 8: Comparison of groundwater availability and draft scenario (in ham)**

<b>Arkalgud Taluk</b>	<b>GW Availability Ham</b>	<b>GW Extraction Ham</b>	<b>Stage of GW Extraction %</b>
March 2017	11925	3399	<b>29</b>
March 2020	11273	3498	<b>31</b>

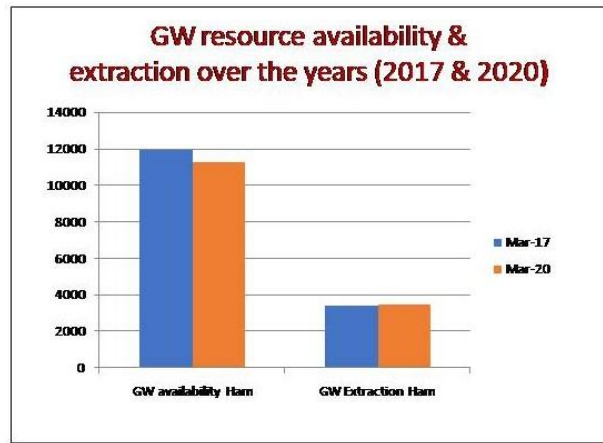


Fig.12: GW resource over the years

### 3.2 Chemical quality of ground water and contamination

The quality of phreatic and of fractured aquifer in Arkalgud taluk has been evaluated from wells inventoried during the field survey as monitoring wells of CGWB and monitoring wells of State ground water department representing fractured aquifer. Total 28 samples were collected, 12 from phreatic aquifer and 26 from the fractured aquifer. The well wise chemical analysis data of the samples representing the phreatic and fractured aquifer are given in the **Table 9**.

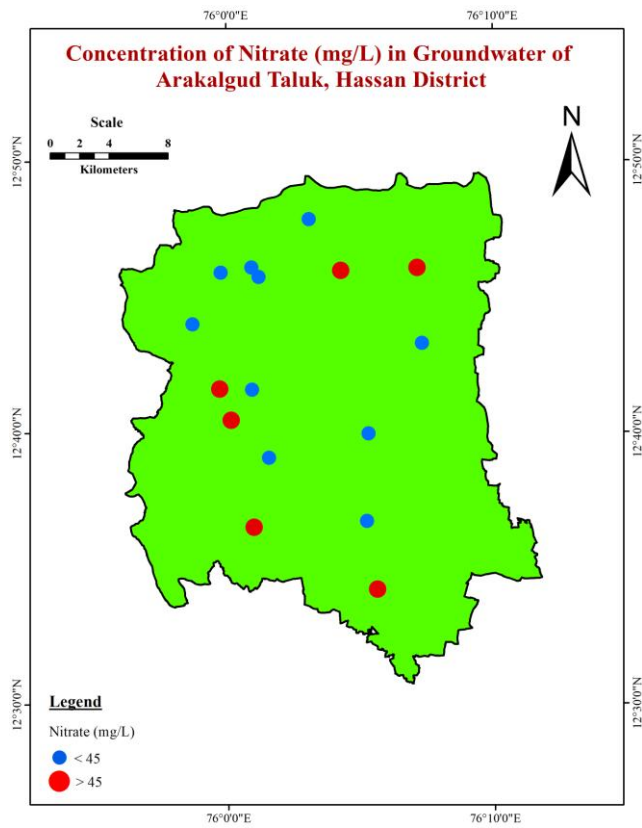
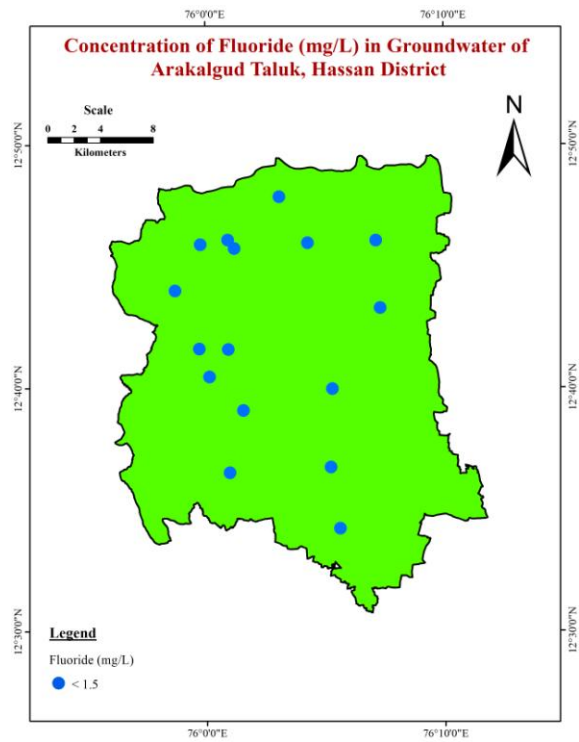
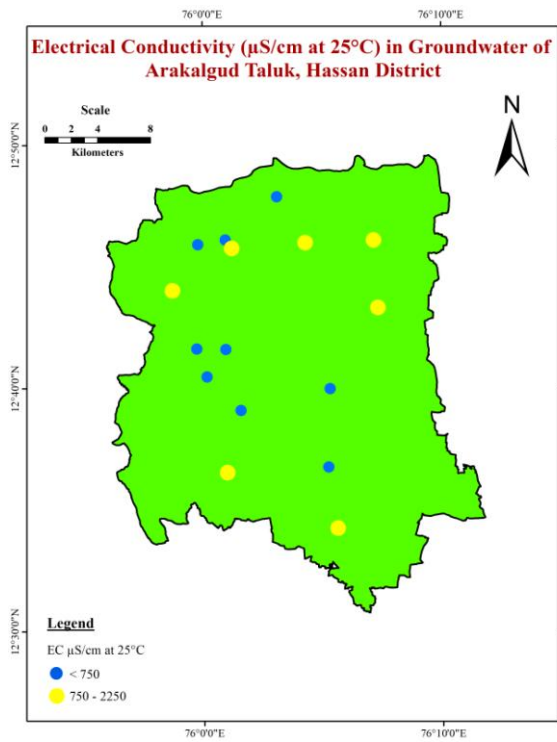
Electrical conductivity is the indicator of the total mineral content of water and hence it indicates the total dissolved solids (TDS) present in water. TDS of water determines its usefulness to various purposes. Generally, water having TDS <500 mg/L is good for drinking and other domestic uses. However, in the absence of alternative sources TDS up to 2000 mg/L may be used for drinking purposes. In phreatic aquifer groundwater quality is fresh and ranging from 400 to 1775 ( $\mu\text{S}/\text{cm}$  at  $25^\circ\text{C}$ ). In one location Mulahosahalli, EC is 3110  $\mu\text{S}/\text{cm}$  and Chloride is 744 mg/l, above the permissible limit of 250 mg/l.

Nitrate ranges from 1 to 53 mg/l. In phreatic aquifer 33 % of wells analysed have recorded nitrate greater than the permissible limit of 45 mg/l. In general, the ground water quality of phreatic aquifer is potable. All the groundwater samples of phreatic aquifer generally have recorded the chemical parameters within the desirable limit. Quality maps given in **Fig.13**.

In fractured aquifer, 38 % of wells analyzed have recorded nitrate greater than the permissible limit of 45 mg/l. EC, Chloride and Fluoride are within desirable limit (Fig. 13). In general, ground water quality in Arkalgud Taluk is good for drinking purpose except in some pockets, where the nitrate is found to be greater than the permissible limit as per "Indian Standard Drinking Water Specification 2009".

**Table.9.: Ground water quality of Arkalgud taluk (2022)**

S.no	Location	Source of GW	PH	EC	TH	Ca	Mg	Na	K	CO3	HCO3	Cl	SO4	NO3	F	U
				µS/cm		mg/L										ppb
1	Ankanaikanahalli	BW	7.76	669	215	50	22	56	4.0	0	217	53	45	20	0.50	4.42
2	Balaiyanakoppalu	BW	7.5	498	190	44	19	26	3.1	0	159	50	27	20	0.40	0.25
3	Vijayapura	BW	7.99	761	295	48	42	35	4.0	0	207	85	35	20	0.74	0.44
4	Darikogalalae	BW	8	547	225	32	35	24	6.4	0	275	36	13	5	0.30	0.59
5	Dasianakoppalu	HP	7.69	570	200	40	24	35	2.8	0	183	53	20	27	0.50	0.11
6	Masvathur	BW	8.02	920	355	74	41	43	4.2	0	409	57	11	18	0.31	BDL
7	Lingadahalli	BW	7.77	660	250	52	29	32	3.5	0	238	46	37	50	0.47	BDL
8	Nehrurnagara	BW	7.8	640	200	42	23	53	3.5	0	250	28	34	51	0.63	7.62
9	Akkalavadi	BW	7.74	610	185	40	21	56	3.7	0	250	28	25	42	0.53	0.1
10	Kerekodi	HP	7.75	830	215	48	23	88	2.7	0	372	57	32	3	0.42	BDL
11	Siddapura	BW	7.91	800	245	54	27	66	5.2	0	329	53	27	48	0.62	0.19
12	Bannur	HP	7.97	870	180	40	19	112	3.2	0	372	43	44	14	0.33	BDL
13	Muduganur	BW	7.77	730	225	48	26	62	4.5	0	262	39	82	11	0.49	1.05
14	Hulikal	DW	7.87	1420	350	78	38	82	135.7	0	488	99	52	53	0.35	1.31
15	Kaneyar	DW	7.97	720	230	48	27	45	19.5	0	250	60	37	32	0.33	3.74
16	Nilavagilu	BW	8	600	180	42	18	47	9.5	0	268	25	32	33	0.50	0.42
17	Ramanathapura	BW	7.97	720	170	40	17	87	3.5	0	348	43	18	5	1.46	3.81
18	Katiyalu	BW	7.63	1130	345	74	39	94	5.4	0	354	53	174	53	0.78	1.62
19	Sheradanahalli	DW	7.55	930	250	58	26	84	20	0	317	74	33	27	0.58	1.68
20	Mulahosahalli	DW	7.29	3110	815	182	88	327	7.3	0	427	744	199	1	0.68	7.84
21	Basavapura	DW	7.77	670	165	42	15	51	41.1	0	232	67	23	2	0.27	0.6
22	Belavadi	HP	8.16	400	160	42	13	20	1.7	0	183	21	5	16	0.15	BDL
23	Keralapura	DW	7.81	640	205	48	21	39	18	0	244	50	13	34	0.25	0.18
24	Budanuru	DW	7.64	1775	465	104	50	187	3.4	0	610	191	60	49	1.22	2.25
25	Arkalgud	BW	7.53	1220	385	84	43	95	5.5	0	293	149	72	50	0.51	0.44
26	Chikkagavanahalli	BW	7.63	1050	340	72	39	76	5.3	0	317	92	75	48	0.63	0.63
27	Hethagowdanahalli	HP	7.78	1155	365	76	43	89	6.6	0	470	53	53	50	0.44	0.1
28	Santhamarur	BW	7.58	1230	390	80	46	97	4.4	0	293	149	75	42	0.36	0.45



**Fig.13: Ground water quality maps**



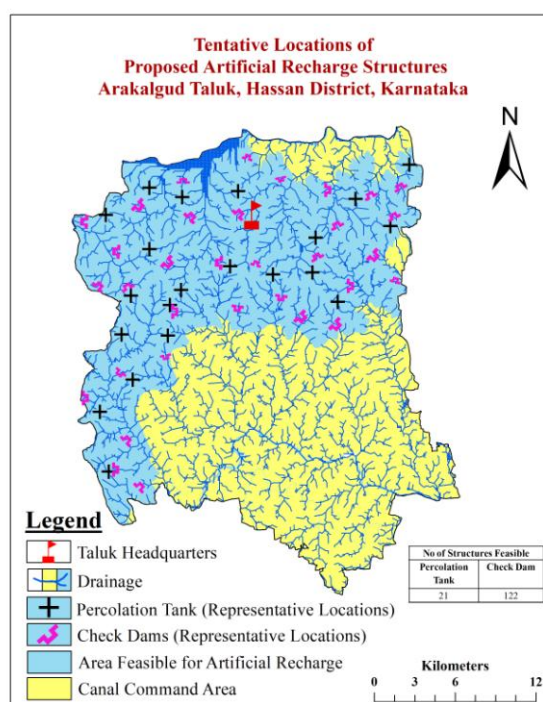
## 4. GROUNDWATER RESOURCE ENHANCEMENT AND PROPOSED MANAGEMENT STRATEGY

### 4.1 Resource Enhancement by Supply Side Interventions

The Master Plan for Artificial recharge to ground water prepared by CGWB (2020) recommended to recharge the de-saturated and dried-up phreatic aquifer (Aq-I) in the taluk, through construction of artificial recharge structures such as Check dams and Percolation tanks (**Table.10**). As of now, recharging dried-up phreatic aquifer in the taluk, through construction of artificial recharge and watershed treatment structures has already been taken up by state Government agencies and are being implemented under MGNREGA. 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 structures proposed in the taluk through utilizing the uncommitted surface runoff of 23.665 MCM (CGWB 2020) is also presented in **Table 10**. By constructing 122 check dams, 21 percolation ponds and one subsurface dyke in the taluk, 0.021 lakhs hectares of additional irrigation potential is likely to be created. Tentative locations for artificial recharge in Arkalgud taluk is shown in **Fig.14** and the details given in **Annexure 1**.

**Table-10: Details of Proposed AR structures**

Geographical area	675
Area feasible for AR	497
Non committed monsoon runoff available (MCM)	23.665
Number of Check Dams	122
Number of Percolation Tanks	21
Number of Subsurface dyke	1
Tentative total cost of the project (Rs. in lakhs)	1660.736
Expected recharge (MCM)	17.748
Additional likely irrigation Potential (Lakh hectares)	0.021



**Fig 14: Tentative locations of proposed ARS**

## 4.2 Demand Side Interventions

### 4.2.1 Advanced irrigation practices

Principal crops under Cereals are Paddy, Maize and Ragi, maize, Pulses, Vegetables and under fruits is Banana. About 0.65 % of gross area irrigated is from dug wells and about 26.57 % are from bore/tube wells out of the total irrigated area. In view of this, Water Use Efficiency (WUE) practices like Drip irrigation needs to be strengthened to save irrigation water by way of precision farming mechanism. This ultimately enhances the area under irrigation potential. The details of the resource enhancement through water conservation and artificial recharge taluk and also through Water Efficiency practices in Irrigation are shown in Table.11.

**Table 11: Details of Resource Enhancement in Arkalgud taluk**

Sl. No.	Resource Details	As per 2020 Estimation
1	Net Ground Water Availability in Ham	11272
2	Existing ground water draft for all uses in Ham	3498
3	Existing Stage of Ground Water Development in percentage %	<b>31</b>
4	Expected Recharge from Artificial Recharge sources in Ham	1775

5	Cumulative Ground water availability in Ham	13047
6	Expected improvement in stage of ground water development %	<b>27</b>
8	Saving due to adopting Water Use Efficiency in Ham	612
9	Ground water availability after AR & WUE in Ham	13659
10	Expected improved stage of ground water development after implementation of AR & WUE %	<b>25</b>
12	Cumulative improved stage of ground water development after all implementation %	<b>6%</b>

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

Farmers are facing inadequacy of groundwater for agriculture during summer and can opt for more rain-fed millets and water efficient Pulses for agricultural production.

#### **4.3 Ground Water Development Plan**

In Arkalgud taluk, the present stage of ground water extraction (2020) is 31 % with net ground water availability for future use is 7902 ham and total extraction is 3498 ham (2020) The ground water draft for irrigation purpose is 3062 ham, thus indicating that ground water irrigation needs to be encouraged in the area after considering the “Safe” level of extraction of 70%. For this, 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 dug wells and bore wells.

As per the conservative estimate and after considering the average unit draft figure for the taluk, about 200 dug wells (10-15 m depth; 3 to 5 m diameter) are recommended to be constructed in feasible areas. Further. as per the estimate about, 2800 bore wells (100 to 200 m depth; 150 mm dia) are also recommended to be drilled in feasible areas so as to maintain the safe category of the taluk. The likely additional irrigation potential which can be created considering prevailing crop water requirement for the area is will be 3360 ha.

#### **4.4 Conjunctive use plan in water logged area**

About 322 sk.km (32200 hectares) of the taluk is covered by canal command area of Hemavathi/Harangi Projects. Out of this, an area of 25 ha. is water logged and this area has already been reclaimed(Source: CADA as on March 2021). In addition to this reclamation, conjunctive use plan is also recommended to benefit the water deficit and tail end area of the irrigation command.

## 4.5 Regulation and Control

- As per the resource estimation – 2020, Arkalgud taluk falls under **Safe** category with the stage of ground water extraction of **31%**. 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.

## 4.6 Other interventions proposed

- Remedial measures need to be adopted in the areas affected by Nitrate and EC rich groundwater through artificial recharge and water conservation etc.
- 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.
- Periodical maintenance of artificial recharge structures should be incorporated in the Recharge Plan.
- Augmenting surface water supply from Cauvery River.
- Intense monitoring of water level is recommended to keep an eye on water level trend in the Taluk.
- Awareness programmes and practice of participatory approach needs to be strengthened with the involvement of all the stake holders for sustainable management.

## 5. SUMMARY AND RECOMMENDATIONS

As per the resource estimation – 2020, Arkalgud taluk falls under “safe” category with the stage of ground water extraction is 31%. However, there is need to formulate management strategy to tackle the water scarcity related issues in ground water dependent pockets and ground water quality affected villages. It is suggested to adopt a scientific and multi-pronged ground water management strategy covering supply side and demand side interventions 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 23.665 MCM. This can be used to recharge the aquifer mainly through check dams (122) and percolation tanks (21). The volume of water expected to be recharged is 17.748 through these AR structures. The approximate cost estimate for construction of these AR structures is Rs.1660 lakhs. 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 35.73 % of the irrigated area is by dug wells and bore wells (ground water). It is proposed to adopt micro irrigation (drip) techniques in fruits and vegetables which is likely to save about 612 ham of ground water and thus enhancing the cumulative net availability of ground water as discussed above.
- **Ground Water Development Plan:** As per the conservative estimate and after considering the average unit draft figure for the taluk, about 200 dug wells (10-15 m depth; 3 to 5 m diameter) are recommended to be constructed in feasible areas. Further. as per the estimate about, 2800 bore wells (100 to 200 m depth; 150 mm dia) are also recommended to be drilled in feasible areas so as to maintain the safe category of the taluk. The likely additional irrigation potential which can be created considering prevailing crop water requirement for the area is will be 3360 ha.
- **Conjunctive use plan in water logged area:** About 322 sk.km (32200 hectares) of the taluk is covered by canal command area of Hemavathi/Harangi Projects. Out of this, an area of 25 ha. is water logged and this area has already been reclaimed(Source: CADA as on March 2021). In addition to this reclamation, conjunctive use plan is also recommended to benefit the water deficit and tail end area of the irrigation command.
- **Drinking water Supply:** In view of ground water contamination with mainly higher concentration Ec and Nitrate, drinking water supply from surface water needs to be explored/ ensured.
- **Regulation and control:** Arkalgud taluk is categorized as "**Safe**" (as per 2020 estimations). 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.
- **Other Management Options proposed:**
  - Scientific disposal of sewage water by the concerned agency
  - Periodical maintenance of artificial recharge structures is recommended for better recharge and long life of the structure
  - RTRWH from each building and in-situ storage and use /mixing with surface water supply or groundwater in urban areas.
  - Priority to promote recycle and reuse of grey water effectively in urban pockets.
- **Water Linkages with other Activities:** Water sector has strong linkages with other developmental activities. Hence, the proposed management plans cannot be considered as static and needs to be reviewed and improved from time to time.

**Annexure 1:****A) Tentative locations of proposed Check dams**

Sl.No	Longitude	Latitude	Village	Gram Panchayath	Taluk
1	75.9564	12.5810	Kantenahalli Kaval	Kaduvinahosahalli	Arkalgud
2	75.9788	12.5859	Kantenahalli Kaval	Kaduvinahosahalli	Arkalgud
3	75.9634	12.5967	Bellavi	Bannur	Arkalgud
4	75.9526	12.6149	Bettahalale	Bannur	Arkalgud
5	75.9698	12.6175	S.I.Hodenuru	Bannur	Arkalgud
6	75.9574	12.6302	S I Taragalale	Tarigalale	Arkalgud
7	75.9697	12.6443	Honnaganahalli	Tarigalale	Arkalgud
8	75.9422	12.6446	S.I.Sulagodu Somapura	Tarigalale	Arkalgud
9	75.9819	12.6590	Heggadthuru	Handrangi	Arkalgud
10	75.9645	12.6613	Hennur Kongalale	Doddabemmathi	Arkalgud
11	75.9969	12.6709	Pemmadihalli	Doddabemmathi	Arkalgud
12	75.9483	12.6725	S.I.Shanubhoganahalli	Doddabemmathi	Arkalgud
13	75.9693	12.6786	Madhanuru	Doddabemmathi	Arkalgud
14	76.0968	12.6903	Dodda Magge	Doddamagge	Arkalgud
15	75.9916	12.6907	Lingadhahalli	Doddabemmathi	Arkalgud
16	75.9700	12.6922	Itlapatna	Doddabemmathi	Arkalgud
17	76.0119	12.6924	Mudaganuru Kaval	Heggadihalli	Arkalgud
18	76.1143	12.6924	Muddanahalli	Koratikere	Arkalgud
19	76.0534	12.6937	Bettadhahalli	Hulikal	Arkalgud
20	76.0900	12.6973	Kodakali	Doddamagge	Arkalgud
21	76.0033	12.7026	Mudaganuru Kaval	Heggadihalli	Arkalgud
22	76.0458	12.7037	Hulikallu	Hulikal	Arkalgud
23	76.0595	12.7079	Kaniyuru	Hulikal	Arkalgud
24	76.1220	12.7082	Dhumma	Santemaruru	Arkalgud
25	75.9759	12.7084	Magalu	Holalagodu	Arkalgud
26	76.1013	12.7097	Dhumma	Santemaruru	Arkalgud
27	76.1456	12.7097	Yalagathavalli	Yalagathavalli	Arkalgud
28	75.9946	12.7101	Shinganakuppe	Holalagodu	Arkalgud
29	76.0742	12.7108	Somanahalli	Mokali	Arkalgud
30	76.0127	12.7125	Jogihosahalli	Heggadihalli	Arkalgud
31	76.0408	12.7137	Siddapura	Hulikal	Arkalgud
32	76.0268	12.7141	Allapatna	Heggadihalli	Arkalgud
33	75.9632	12.7159	Magalu	Holalagodu	Arkalgud
34	76.0876	12.7160	Baraguru	Doddamagge	Arkalgud
35	75.9864	12.7177	Shinganakuppe	Holalagodu	Arkalgud
36	76.1245	12.7192	Mallapura	Santemaruru	Arkalgud
37	76.0674	12.7196	Madake Hosahalli	Mokali	Arkalgud
38	76.1055	12.7204	Ilahalli	Santemaruru	Arkalgud
39	75.9507	12.7207	Bysuru Forest	Aladahalli	Arkalgud
40	76.0529	12.7209	Kanive Kaval	Hulikal	Arkalgud

41	76.0016	12.7217	Abburu Machagondanahalli	Holalagodu	Arkalgud
42	76.1540	12.7229	Yagati	Yalagathavalli	Arkalgud
43	76.0223	12.7241	Madhapura	Kattimallenahalli	Arkalgud
44	76.1369	12.7251	J.I.Mallakammanahalli	Yalagathavalli	Arkalgud
45	75.9812	12.7256	Hondaravalli	Aladahalli	Arkalgud
46	76.0397	12.7265	Thejuru	Kattimallenahalli	Arkalgud
47	76.0816	12.7289	Madhihalli	Mokali	Arkalgud
48	76.0677	12.7330	Mokali	Mokali	Arkalgud
49	76.0001	12.7345	Kolangi	Holalagodu	Arkalgud
50	76.0933	12.7346	Parasanahalli	Santemaruru	Arkalgud
51	76.0323	12.7350	Kyathanahalli	Kattimallenahalli	Arkalgud
52	76.0587	12.7355	Malalakere	Mokali	Arkalgud
53	75.9525	12.7358	Bysuru	Aladahalli	Arkalgud
54	75.9867	12.7365	Masavatthuru	Aladahalli	Arkalgud
55	75.9758	12.7384	Masavatthuru	Aladahalli	Arkalgud
56	76.1404	12.7387	Yagati	Yalagathavalli	Arkalgud
57	76.0992	12.7398	Parasanahalli	Santemaruru	Arkalgud
58	76.0087	12.7398	Kolangi	Holalagodu	Arkalgud
59	75.9436	12.7399	Budhanuru	Aladahalli	Arkalgud
60	76.1182	12.7414	Maruru	Santemaruru	Arkalgud
61	75.9619	12.7440	Basavanahalli	Aladahalli	Arkalgud
62	76.0626	12.7448	Malalakere	Mokali	Arkalgud
63	75.9951	12.7456	Vijapura Forest	Vijapura Forest	Arkalgud
64	76.0834	12.7461	J.I.Mutthige	Mokali	Arkalgud
65	76.0384	12.7466	Hatthimallenahalli	Kattimallenahalli	Arkalgud
66	76.1336	12.7466	Anegondhi Kaval	Honnvalli	Arkalgud
67	76.0130	12.7498	Kalluru	Vijapura Forest	Arkalgud
68	76.1074	12.7501	Shanabinakuppe	Santemaruru	Arkalgud
69	76.1475	12.7514	Anegondhi Kaval	Honnvalli	Arkalgud
70	75.9417	12.7519	Kelagalale	Aladahalli	Arkalgud
71	76.0245	12.7528	Thattekere	Vijapura Forest	Arkalgud
72	75.9850	12.7541	Jhavaragallu	Mallipatna	Arkalgud
73	75.9723	12.7547	Siradanahalli	Mallipatna	Arkalgud
74	76.1316	12.7563	Maraholalu	Bychanahalli	Arkalgud
75	76.0654	12.7565	Machagondanahalli	Arkalgud	Arkalgud
76	76.0472	12.7578	Arakalagudu Kasaba	Kattimallenahalli	Arkalgud
77	75.9602	12.7588	Mallipatna Kasaba	Mallipatna	Arkalgud
78	76.0930	12.7595	Dadadhahalli	Santemaruru	Arkalgud
79	76.0318	12.7602	Aremadhanahalli	Vijapura Forest	Arkalgud
80	76.0016	12.7603	Vijapura Forest	Vijapura Forest	Arkalgud
81	76.1135	12.7610	Chikkagavanahalli	Bychanahalli	Arkalgud
82	76.1614	12.7612	Kallimuddanahalli	Bychanahalli	Arkalgud
83	76.1427	12.7614	Hetthagondanahalli	Bychanahalli	Arkalgud
84	76.1234	12.7630	Doddagavanahalli	Bychanahalli	Arkalgud

85	75.9400	12.7630	Mudlapura	Mallipatna	Arkalgud
86	76.1519	12.7667	Hetthagondanahalli	Bychanahalli	Arkalgud
87	76.0154	12.7670	Vijapura	Vijapura Forest	Arkalgud
88	76.0702	12.7673	Kalluru	Arkalgud	Arkalgud
89	75.9630	12.7686	Magodu	Mallipatna	Arkalgud
90	76.0937	12.7689	Honnvalli	Honnvalli	Arkalgud
91	76.0484	12.7691	Arakalagodu Kasaba	Kattimallenahalli	Arkalgud
92	76.1061	12.7708	J.I.Devarahalli	Honnvalli	Arkalgud
93	76.1424	12.7714	Hetthagondanahalli	Bychanahalli	Arkalgud
94	76.1299	12.7716	Chikkanahalli	Bychanahalli	Arkalgud
95	76.0301	12.7723	Chikkara Arakalagodu	Vijapura Forest	Arkalgud
96	75.9803	12.7729	Manajuru	Mallipatna	Arkalgud
97	76.0124	12.7742	Chikkara Arakalagodu	Vijapura Forest	Arkalgud
98	76.1589	12.7771	Moodanahalli	Ganjalagodu	Arkalgud
99	76.0513	12.7784	Shambhunathapura	Vaddrahalli	Arkalgud
100	75.9657	12.7789	Dasanapura	Mallipatna	Arkalgud
101	76.0656	12.7805	Cholenahalli	Honnvalli	Arkalgud
102	76.0863	12.7806	Nelamane	Honnvalli	Arkalgud
103	76.0990	12.7809	Garighatta	Honnvalli	Arkalgud
104	76.1360	12.7810	Keshavapura	Ganjalagodu	Arkalgud
105	76.0032	12.7810	Mudigere	Vijapura Forest	Arkalgud
106	76.0381	12.7814	Chikkara Arakalagodu	Vijapura Forest	Arkalgud
107	75.9933	12.7817	Kamanahalli	Vijapura Forest	Arkalgud
108	76.0166	12.7832	J.I.Beejaghatti	Vijapura Forest	Arkalgud
109	76.1089	12.7841	J.I.Kenchanahalli	Hebbale	Arkalgud
110	76.1235	12.7850	Hullangala	Hebbale	Arkalgud
111	76.1564	12.7869	Ganjalagodu	Ganjalagodu	Arkalgud
112	75.9780	12.7882	Hosahalli	Mallipatna	Arkalgud
113	76.0503	12.7893	Ankanayakanahalli	Vaddrahalli	Arkalgud
114	76.0750	12.7902	Nygere	Honnvalli	Arkalgud
115	76.0086	12.7905	Dharmapura	Vijapura Forest	Arkalgud
116	76.0178	12.7937	Gundihosahalli	Vijapura Forest	Arkalgud
117	76.1639	12.7939	Basavanahalli	Ganjalagodu	Arkalgud
118	76.0369	12.7952	Ankanayakanahalli Kaval	Vaddrahalli	Arkalgud
119	76.1358	12.7956	Mallathammanahalli	Ganjalagodu	Arkalgud
120	76.0691	12.7972	Neralahalli	Vaddrahalli	Arkalgud
121	75.9843	12.7990	Honganuru	Vijapura Forest	Arkalgud
122	76.0525	12.8062	Vaddarahalli	Vaddrahalli	Arkalgud



**B) Tentative locations of proposed Percolation tanks**

SI.NO	Longitude	Latitude	Village	Gram Panchayath	Taluk
1	75.9570	12.5954	Bellavi	Bannur	Arkalgud
2	75.9511	12.6356	S I Taragalale	Tarigalale	Arkalgud
3	75.9736	12.6570	Heggadthuru	Handrangi	Arkalgud
4	75.9977	12.6864	Doddabemmatthi	Doddabemmathi	Arkalgud
5	75.9661	12.6873	Itlapatna	Doddabemmathi	Arkalgud
6	75.9992	12.7070	Mudaganuru Kaval	Heggadihalli	Arkalgud
7	76.1141	12.7087	Dhumma	Santemaruru	Arkalgud
8	75.9727	12.7133	Magalu	Holalagodu	Arkalgud
9	76.0069	12.7170	Abburu Machagondanahalli	Holalagodu	Arkalgud
10	76.0698	12.7273	Mokali	Mokali	Arkalgud
11	76.0968	12.7285	Shanubhoganahalli	Santemaruru	Arkalgud
12	76.0406	12.7329	Thejuru	Kattimallenahalli	Arkalgud
13	75.9854	12.7446	Masavatthuru	Aladahalli	Arkalgud
14	76.0991	12.7518	Shanabinakuppe	Santemaruru	Arkalgud
15	76.1502	12.7594	Hetthagondanahalli	Bychanahalli	Arkalgud
16	75.9556	12.7676	Magodu	Mallipatna	Arkalgud
17	76.1265	12.7777	Hullangala	Hebbale	Arkalgud
18	76.0079	12.7793	Patna Hosahalli	Vijapura Forest	Arkalgud
19	76.0463	12.7832	Chikkara Arakalagodu	Vijapura Forest	Arkalgud
20	75.9855	12.7857	Honganuru	Vijapura Forest	Arkalgud
21	76.1634	12.8005	Basavanahalli	Ganjalagodu	Arkalgud