



केंद्रीय भूमि जल बोर्ड

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भारत सरकार

Central Ground Water Board

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

AQUIFER MAPPING AND MANAGEMENT OF GROUND WATER RESOURCES

**JEVARGI TALUK, KALABURAGI
DISTRICT, KARNATAKA**

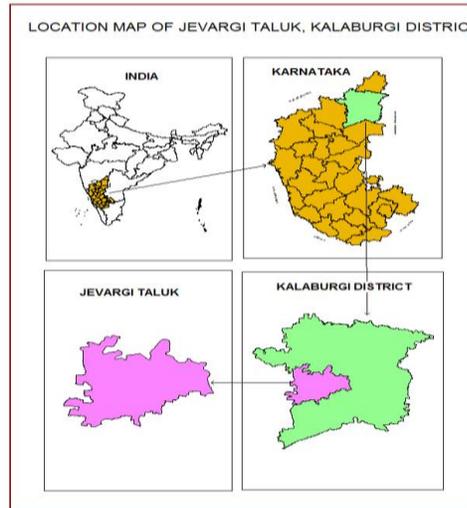
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**GOVERNMENT OF INDIA
MINISTRY OF JAL SHAKTI
MINISTRY OF WATER RESOURCES, RD & GR
CENTRAL GROUND WATER BOARD**

AQUIFER MANAGEMENT PLAN OF JEVARGI TALUK, KALABURAGI DISTRICT, KARNATAKA STATE



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AQUIFER MANAGEMENT PLAN OF JEVARGI TALUK, KALABURAGI DISTRICT, KARNATAKA STATE

1.0 SALIENT INFORMATION

Name of the Taluk: **JEVARGI**

District: **KALABURAGI**

State: Karnataka

Area: 1843 sq.km.

Population: 2,96,903

Annual Normal Rainfall: 827 mm

1.1 Aquifer management study area

Aquifer Mapping Studies have been carried out in Jevargi Taluk, Kalaburagi district of Karnataka, covering an area of 1843.13 sq. kms under National Aquifer Mapping Project. Jevargi Taluk of Kalaburagi district is located between North Latitudes $16^{\circ}43'12''$ and $17^{\circ}10'51.6''$ and East Longitudes between $76^{\circ}25'30''$ to $76^{\circ}55'22.8''$ and is falling in Survey of India Toposheets No 56C/8, C/12, C/16,56D/5, D/9 &D/13. The Jevargi Taluk is bounded on the East by Chittapur Taluk, on the North by Kalaburagi and Afzalpur Taluks, on the South by Shapur and Shorapur Taluks, on the West by Sindagi Taluk of Bijapur district. Location map of Jevargi Taluk of Kalaburagi district is presented in **Fig-1**.

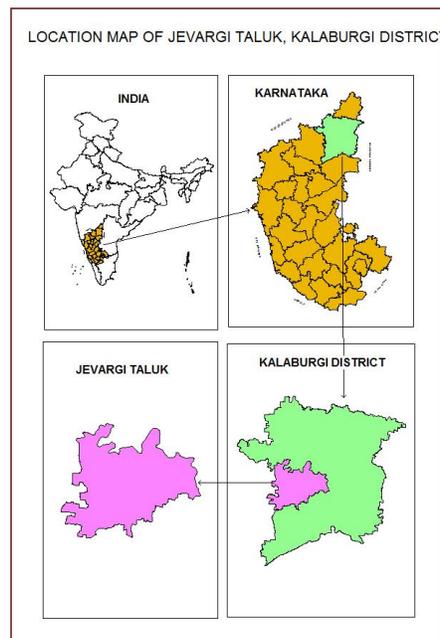


Fig.1: Location map of Jevargi Taluk of Kalaburagi district

1.2 Population

According to 2011 census, the population in Jevargi Taluk is 2,96,903. Out of which 1,50,895 are males while 1,46,008 are females. The average sex ratio is 967. The Jevargi Taluk has an overall population density of 161 persons per sq.km. The decadal variation in population from 2001-2011 is 26.2% in Jevargi Taluk. Jevargi is Taluk head quarter. There are 150 villages in this Taluk.

1.3 Rainfall

Jevargi Taluk enjoys semi-arid climate. The area falls under Northern Eastern Transitional agro-climatic zone of Karnataka state. The normal annual rainfall in Jevargi Taluk for the period 1981 to 2010 is 827 mm. Seasonal rainfall pattern indicates that, major amount of 592 mm) rainfall was recorded during South-West Monsoon seasons, which contributes about 72% of the annual normal rainfall, followed by North-East Monsoon season (161 mm) constituting 19% and remaining (74 mm) 9% in Pre-Monsoon season (Table-1).

On Computations were carried out for the 30 year blocks of 1981-2010, the mean monthly rainfall at Jevargi Taluk is ranging between 2 mm during February to 201 mm during August. The coefficient of variation percent for pre-monsoon, monsoon and post-monsoon season is 65, 41 & 67 percent respectively. Annual CV at this station works out to be 33 percent (Table-1).

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

STATION		JAN	FEB	MAR	APR	MAY	PRE	JUN	JUL	AUG	SEP	SW	OCT	NOV	DEC	NE	Annual
	JEVARGI	NRM	7	2	13	20	32	74	88	105	201	198	592	104	53	4	161
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 Jevargi Taluk. Major Kharif crops are Paddy, Maize, Bajra, Jowar, Tur and Vegetables. Main crops of Rabi season are Maize, Bajra and Jowar (Table-2). Water intensive crops like sugarcane is are grown in 5% of total crop area. Jowar is grown in 14.5% and Pulses in 64.8% of total crop area of Taluk. Bajra & Maize account 16% of total crop area.

Table-2: Cropping pattern in Jevargi Taluk 2016-2017

Year	Paddy	Maize	Bajara	Jowar	Pulses	Fruits	Vegetables	Oil seeds	Sugarcane	Cotton
Area under cultivation (Ha)										
2016-2017	5161	1577	2559	26565	118095	495	1451	3748	9004	29435

It is observed that net sown area accounts 85.5% and area sown more than once is 11% of total geographical area in Jevargi Taluk (Table-3). Area not available for cultivation and Fallow land cover 4% & 10% of total geographical area respectively. Canal water usually available in this is Taluk for six to eight months from June to February, utilized for Kharif and Rabi crops, whereas the wells are the major source of water for summer crops (Table-4).

Table 3: Details of land use in Jevargi 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
Jevargi	182313	310	7427	18562	155904	20628

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

Table 4: Irrigation details in Jevargi Taluk (Ha)

Source of Irrigation	Net area irrigated (Ha.)
Canals	36770
Tanks	110
Wells	439
Bore wells	1803
Lift Irrigation	86
Other Sources	70
Total	39278

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

1.5 Geomorphology, Physiography & Drainage

Jevargi Taluk exhibits an undulating topography with tablelands characteristics of basaltic lava flows in North, 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 402 m in the North western part to 502m amsl in the Southern part of the Taluk. This has its bearing on the regional slope which is towards North. 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 Jevargi Taluk falls in Bhima river which is tributary of Krishna river basin. The Drainage pattern is dendritic to sub-dendritic(Fig.-3). The drainage density ranges from 0.80 to 1.81 km/km².

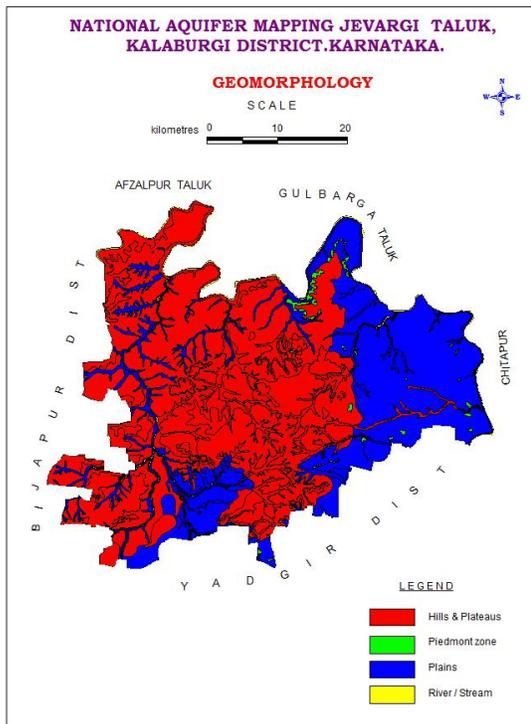


Fig.2: Geomorphology Map

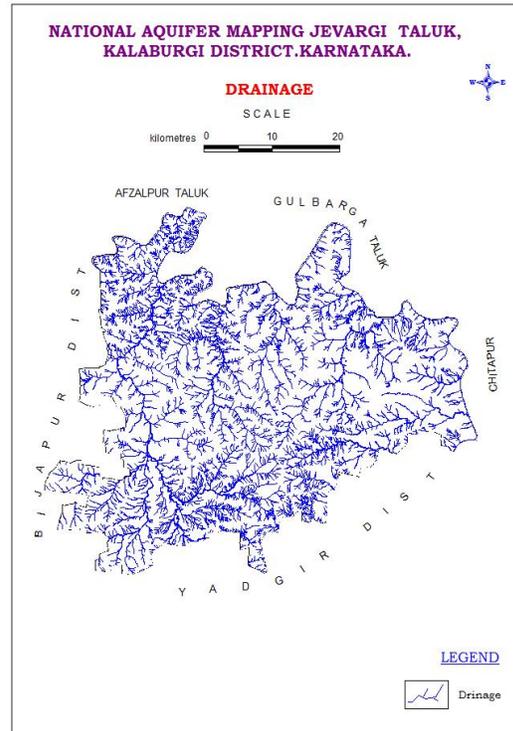


Fig.3: Drainage Map

1.6 Soil

The soils of Jevargi 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 Bhima river these soils have been developed due to weathering and disintegration of sedimentary rocks, Topography, relief, climate and vegetation are the controlling factors. Black cotton soils are the product of highly weathered

and decomposed basaltic rocks. Red soil have high rate of infiltration followed by mixed soils and black cotton soil. There is a wide variation in infiltration rate of Black cotton soils and other type of soils (Table-5).

Table 5: Infiltration rate of soils

Sl. No	Type of soil	Initial rate of infiltration (cm/hr)	Constant rate of infiltration (cm/hr)
1	Black cotton soils	7.2-32.46	0.86-3.2
2	Red soils(sandy)	41.0-39.0	6.85-8.44
3	Red soils (Clayey rich)	25.0-35.0	3.0-7.0

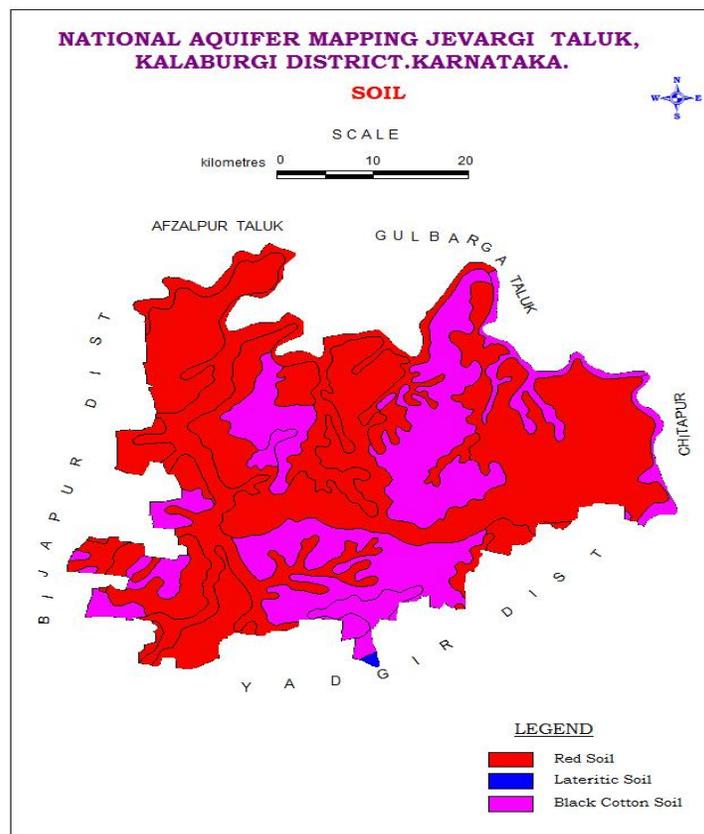


Fig. 4: Soil Map

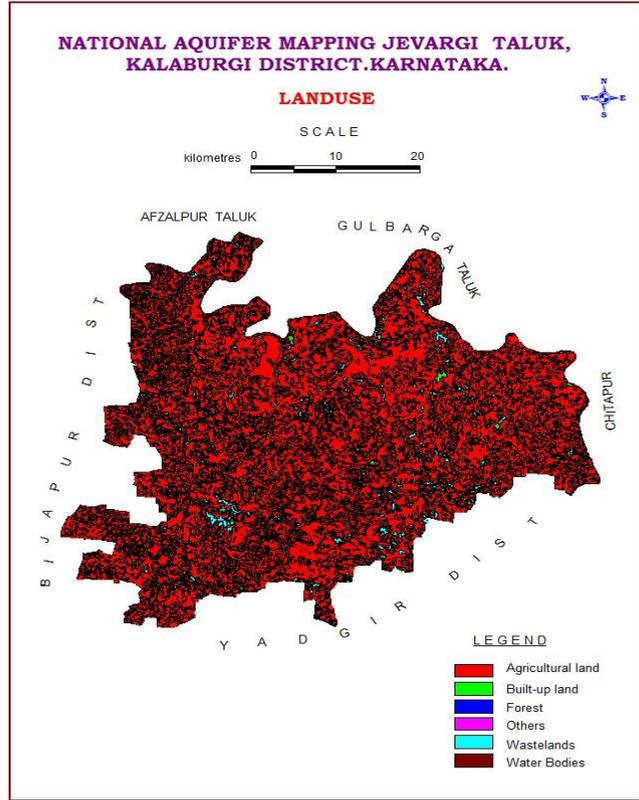


Fig-5: Land use Map

1.7 Ground water resource availability and extraction

Aquifer wise total ground water resources up to 200 m depth is given in Table-6 below.

Table-6: 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)	
JEVARGI	10201			Dynamic + phreatic in-storage + fractured
		10201	1708	16664

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

- Net ground water availability for future irrigation development: 85.74 MCM
- Domestic (Industrial sector) demand for next 25 years : 3.90 MCM

1.9 Water level behaviour

(a) Depth to water level

Aquifer-I

- Pre-monsoon: 3.34 – 21.05 mbgl (**Fig.-4**)
- Post-monsoon: 0.89 – 10.65 mbgl (**Fig.-5**)

(b) Water level fluctuation

Aquifer-I

- Seasonal Fluctuation: Rise ranges 0.35 – 18.25 m (**Fig.-6**)

Table-7: 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 (m)
1	Jevargi	Dug Well	9.13	0.89	8.24
2	Malnoor	Dug Well	8.97	3.94	5.03
3	Alur	Dug Well	11.80	10.65	1.15
4	Chigerahalli	Dug Well	11.51	2.34	9.17
5	Jeratgi	Dug Well	3.74	2.54	1.2
6	Mallabad	Dug Well	7.85	7.50	0.35
7	Mandewala	Dug Well	21.05	2.80	18.25
8	Revannur	Dug Well	3.34	1.31	2.03
9	Shivpur Tanda	Dug Well	8.80	6.35	2.45
10	Sona	Dug Well	6.55	2.37	4.18
11	Ukinal	Dug Well	11.33	3.43	7.9

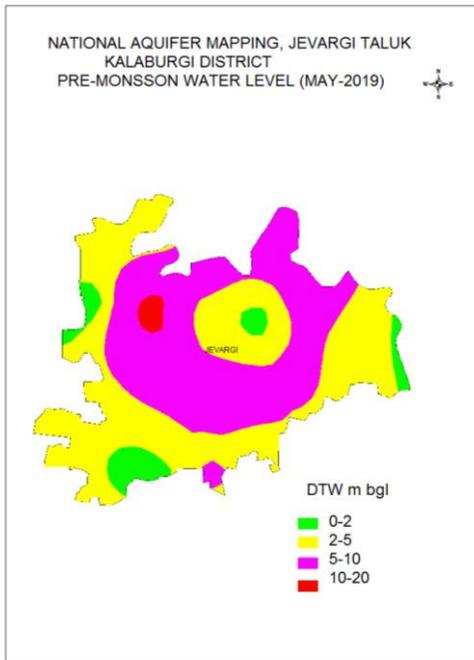


Fig.4: Pre-monsoon Depth to Water level

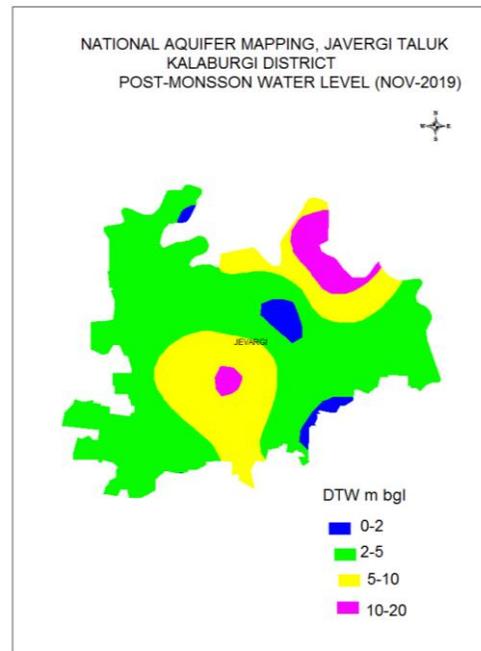


Fig. 5: Post-monsoon Depth to Water Level

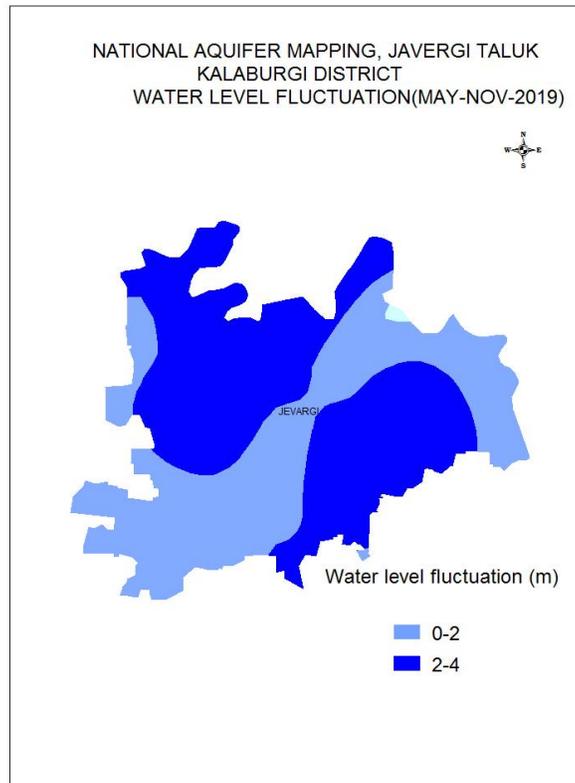


Fig.6: Water Level Fluctuation (Aq-I)

2.0 AQUIFER DISPOSITION

2.1 Number of aquifers: In Jevargi Taluk, there are mainly two types of aquifer systems;

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

In Jevargi Taluk, Basalt and lime stone are the main water bearing formations (Fig-7). Ground water occurs within the weathered and fractured Basalt and lime stone under water table condition and semi-confined condition (Fig -8). In Jevargi Taluk bore wells were drilled from a minimum depth of 80 mbgl to a maximum of 200 mbgl. Depth of weathered zone ranges from 3 mbgl to 20 mbgl. Ground water exploration reveals that aquifer-II fractured formation was encountered between the depth of 40 to 200 mbgl. Yield ranges from 0.20 to 4.82 lps. The basic characteristics of each aquifer are summarized in Table-7.

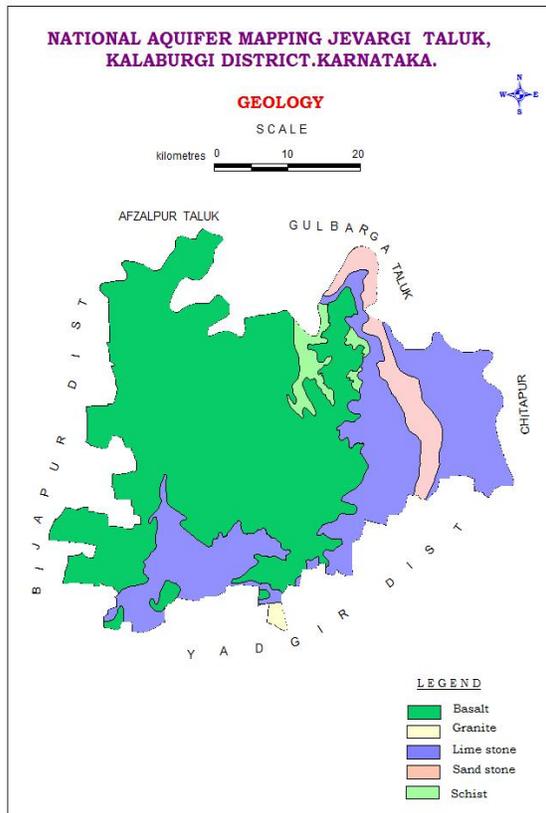


Fig. 7: Geology Map

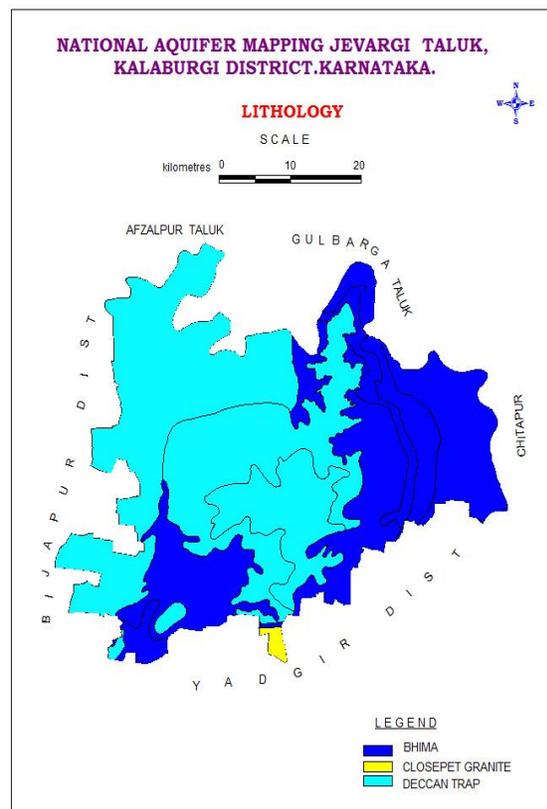


Fig.8: Lithology Map

Table-7: Details of Ground Water Exploration

Sl. No	Location	Lat & Long	Depth m bgl	Casing (m)	Lithology	SWL (mbgl)	Q (lps)	DD (m)	T (m ² /day)
1	Gogihal	16° 51' 30'' 76° 40' 00''	101.0	8.2	Basalt/shale	4.95	1.0	10.6	12
2	Hire Allapur	16° 45' 50'' 76° 23' 43''	87.6	0.9	Basalt/shale	2.60	0.22	-	15.6
3	Jeratgi	17° 01' 00'' 76° 27' 00''	92.05	6.0	Basalt/shale	23.56	1.75	4.23	160
4	Jevargi	17° 00' 10'' 76° 46' 20''	302	5.6	Shale/ Limestone	40	0.20	-	-
5	Nandihal	16° 46' 05'' 76° 37' 30''	54.00	5.0	Shale/ Limestone	17.06	7.0	0.57	17.8
6	Balabatti	16° 47' 27'' 76° 37' 43''	302	13.2	Basalt/Shale /Limestone	6.74	0.13	-	1.63
7	Balwandigi	17° 02' 21'' 76° 29' 50''	302	8.5	Basalt/Shale / Limestone	4.41	0.59	-	2.13
8	Yadrami	16° 51' 33'' 76° 32' 15''	302.0	17	Basalt/Shale / Limestone	-	0.20	-	-
9	Kummana Sirasangi	16° 56' 28'' 76° 34' 21''	302	8.5	Basalt/Shale / Limestone	5.33	0.78		3.10
10	Malla	16° 56' 27'' 76° 55' 48''	242	12.3	Limestone / Shale/Grani tic gneiss	17.93	2.49	26.4 2	3.47

Table-8: Basic characteristics of each aquifer

Aquifers	Weathered Zone (Aq.-I)	Fractured Zone (Aq.-II)
Prominent Lithology	Weathered Basal and Limestone	Fractured / Jointed Basalt, Limestone, Shale and Granitic gneiss
Thickness range (mbgl)	20	Fractures upto 200 mbgl
Depth range of occurrence of fractures (mbgl)	7-15	23-193
Range of yield potential (lps)	Poor yield	<1 - 3
Specific Yield	2%	0.2%
T (m ² /day)	-	2.13 – 160
Quality Suitability for Domestic & Irrigation	Suitable	Suitable

3.0 GROUND WATER RESOURCE, EXTRACTION, CONTAMINATION AND OTHER ISSUES

3.1 Aquifer wise resource availability and extraction

(a) Present Dynamic Ground Water Resource (2017)

Taluk	Net annual ground water availability	Existing gross ground water draft for irrigation	Existing gross ground water draft for domestic and industrial water supply	Existing gross ground water draft for all uses	Allocation for domestic and industrial use for next 25 years	Net ground water availability for future irrigation development	Existing stage of ground water development	Category
JEVARGI	10201	1278	300	1578	390	8574	15	Safe

(b) Present total Ground Water Resource (in ham)

Taluk	Annual replenishable GW resources (in ham)	Fresh In-storage GW resources (in ham)	Total availability of GW resource (in ham)
		(Phreatic Fractured)	Dynamic + phreatic in-storage + fractured in-storage
JEVARGI	10201	2886	13087

(c) Comparison of ground water availability and draft scenario in Jevargi Taluk

Taluk	GW availability (in ham)	GW draft (in ham)	GW development	GW availability (in ham)	GW draft (in ham)	GW development	GW availability (in ham)	GW draft (in ham)	Stage of GW development (%)
	2011			2013			2017		
JEVARGI	6564	1657	34	6346	1691	28	10201	1578	15

3.2 Chemical quality of ground water and contamination

Interpretation from Chemical Analysis results in Jevargi Taluk is mentioned as under in Table 9.

Electrical conductivity: In general, EC values range from 880 to 2800 μ /mhos/cm in the aquifer-I at 25°C.

Fluoride: Fluoride concentration in ground water ranges between 0.46 – 5.20 mg/l in the aquifer-I.

NITRATE: Nitrate value ranges from 93 and 596 mg/l in the Aquifer –I.

Table-9: Quality of ground water (Aquifer-I) in Jevargi Taluk of Kalaburagi district

Sl. No	Location	PH	EC	Cl	NO3	F
1	Farhatabad	8.503	2800	320	197	2.2
2	Ferozabad	8.150	880	57	100	1.8
3	Jeratgi	8.438	1480	227	93	1.7
4	Mandewala	8.616	1340	128	236	5.20
5	Revannur	8.276	1100	128	117	1.6
6	Sona	7.811	2500	596	186	0.46

4.0 GROUND WATER RESOURCE ENHANCEMENT

4.1 Aquifer wise space available for recharge and proposed interventions

Recharge dry **phreatic aquifer (Aq-I)** in the Taluk, through construction of artificial recharge structures, viz; check dams, percolation tanks & point recharge structures (Table-10 & 11). 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.

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

Artificial Recharge Structures Proposed	Jevargi Taluk
Non committed monsoon runoff available (MCM)	56.408
Number of Check Dams	101
Number of Percolation Tanks	49
Number of Point Recharge structures	2
Tentative total cost of the project (Rs. in lakhs)	2013.843 Lakhs
Excepted recharge (MCM)	42.306

Table-11 Improvement in GW availability due to Recharge, Jevargi 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
JEVARGI	HAM	HAM	%	HAM	%	%
	10201	1578	15	4203	10	5

4.1 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.

5.0 DEMAND SIDE INTERVENTIONS

5.1 Advanced irrigation practices

It is observed that ground water through wells & borewells contribute only 6% of the source for irrigation in Jewergi taluk. Balance 94% irrigation is from surface water from canals & tanks. Also, water intensive crops paddy and sugarcane are grown in less than 5% of total crop area from surface water source. Moreover, the present stage of ground water development is only 15% (GEC 2017). Thus, efficient irrigation practices are not suggested in the taluk. Further, change in cropping pattern is also not recommended.

6.0 SUMMARY

The summary of Management plan of Jevargi Taluk is given in Table-12.

Table-12: Summary of Management plan of JEVARGI Taluk

Jevargi Taluk is safe & present stage of GW Development (2017)	15%
Net Annual Ground Water Availability (MCM)	102.01
Existing Gross Ground Water Draft for all uses	15.78
Total GW Resources (Dynamic & Static upto the depth of 200 mbgl) (MCM)	131.07
Expected additional recharge from monsoon surplus runoff (MCM)	42.306
Change in Stage of GW development, %	15 to 10
Excess nitrate & fluoride concentration	<ul style="list-style-type: none">• Dilution of nitrate rich ground water through artificial recharge & water conservation.• Roof top rain water harvesting.