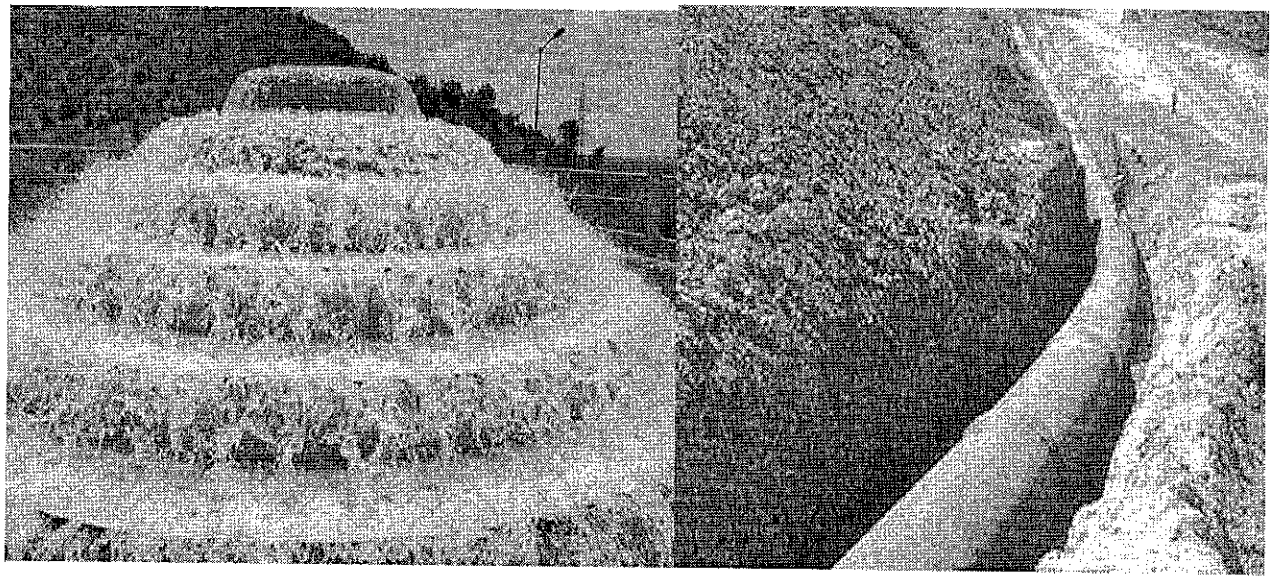
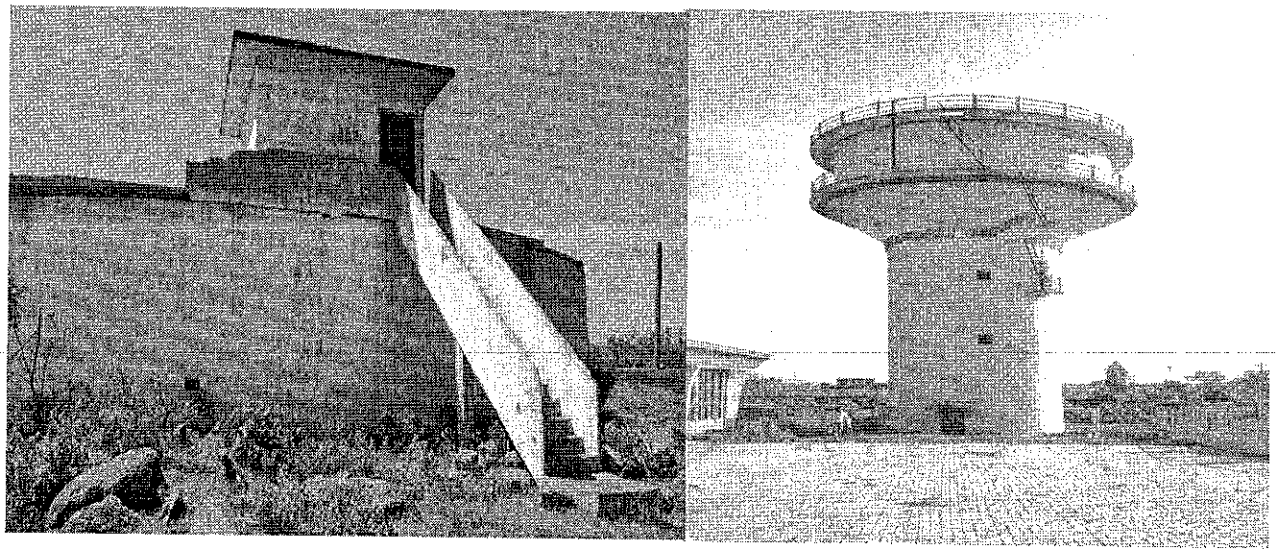
Brief note for construction of water supply tank and laying water pipe lines in Muttyanatti village, Belagavi Taluka and District under KARNATAKA URBAN WATER SUPPLY MODERNIZATION PROJECT (KUWSMP)

to cover entire areas of Belagavi City Corporation





INTRODUCTION

PROJECT BACKGROUND

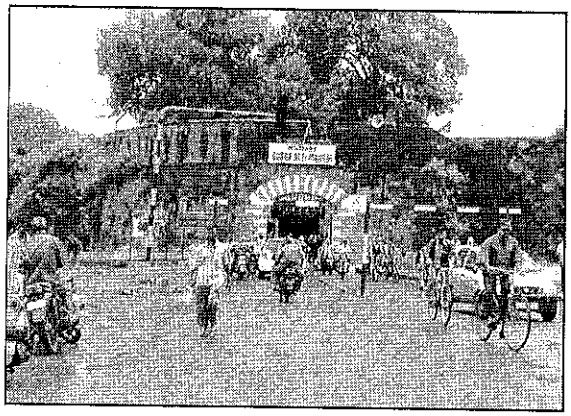
Karnataka Government has successfully implemented **KUWASIP- "KUWASIP-KARNATAKA URBAN WATER SECTOR IMPROVEMENT PROJECT"** Project to bring improvements in Urban Water Supply sector and to provide continuous pressurized 24x7 water supply in selected areas of Belagavi, Hubballi-Dharwad & Kalburgi as Demonstration Project with the financial assisted of World Bank.

Under KUWASIP project 10 wards (24x7 Water supply Demo Zones) of Belagavi city corporation were selected and project is completed in March 2008. These areas are getting the benefit of continuous 24x7 water supplies since March 2008. Total 10373 house service connections are provided in Demo Zones and about 11120 people are enjoying the benefit. Considering the public demand from Non-Demo Zones, the **City Corporation of Belagavi** has resolved to extend this scheme to entire city. Further Government of Karnataka has also approved, Up scaling of 24x7 water supply to entire city of Belagavi on vide G.O. No. **UDD 81 PRJ 2008, dated 06.10.2008.** Accordingly, Tata Consulting Engineers (TCE), were appointed as program consultants to prepare program to extend the scheme to entire City Corporation area of Belagavi.

Now the Government of Karnataka, has intended to take up the implementation continuous 24x7 Water Supply Project to cover entire areas of City Corporation of Belagavi, Hubballi-Dharwad and Kalaburagi under "**KUWSMP - Karnataka Urban Water Supply Modernization Project** with the financial assistance of the World Bank. The program consultant had submitted "Project Report and its Financial Model which is approved by the Govt. vide its order no. **UDD 244 PRJ 2013 Dated 07.11.2013**

GENERAL INFORMATION ABOUT BELAGAVI CITY

Belagavi formerly known as Belgaum, was originally known as Venugram. It is said that Venugram was part of the Kuhundi Mandala of Kuntalanadu ruled by Ratta Rajas. Soundatti was the capital of Kundtalanadu earlier but later Venugram, the present Belagavi, became its capital. The Rattas ruled from 930 to 1230. Thereafter, Kuntalanadu was successfully annexed by the Kadambas of Goa, Yadavas of Devagiri and Rayas of Vijayanagar. From the latter, the Bahamanis led by Mahmood Gawan conquered the city. The city subsequently passed into the hands of the Maratha ruler, Shivaji and from Marathas to the British.



Belagavi Fort

Chenamma Circle

1.1 LOCATION AND TOPOGRAPHY

Belagavi city is located in the latitude 15° - 51′ North and longitude 74°- 33′ East at an average altitude of 762 meters above the mean sea level. The city is located in the north western parts of Karnataka.

1.2 CLIMATE

The city experiences a normal climate. The mean annual maximum and minimum humidity of the city varies from 78 to 95%. The most prominent wind direction is from west. Belagavi experiences a maximum of 35.4°C in May and a minimum of 14.3°C in December. The average annual rainfall experienced by the city is about 1300 mm.

1.3 LINKAGES AND ACCESSIBILITY

Belagavi city is linked by road to Mumbai/Bangalore via NH 48 and NH4A to Goa. A broad-gauge Railway line runs to the state capital and other towns and cities of the country. The Mumbai – Bangalore National Highway passes through the city. The other important state highways, which link the city, are Belagavi - Goa, and Belagavi- Hyderabad. It is situated at a distance of 502 km North of Bangalore and 358 km South of Pune. Airport is located at a distance about 9 km from city center. The nearest River is Markhandeya which is at a distance of 25 km.

1.4 INDUSTRIES AND COMMERCIAL ACTIVITIES

Indian Aluminum Company (INDAL), Tata Power, Gogatae Textiles, Markandeya Sugar Works are the major industries of the city. The several numbers of small-scale industries (like weaving mills, foundries, hydraulic machineries etc), shopping complexes and business activities show the good economic condition of the city.

1.5 EXTENT / AREA OF TOWN AND DEVELOPMENT

The total area of the city is 94.08 sq.km as per the Comprehensive development Plan of Belagavi Urban Development Authority. The industrial growth along the Khanapur road and Pune road has temporarily restricted the city sprawl on the Northern and southern part of the Town. The city topography lies between contours between 815 m and 740 m and is sloping gradually towards North-South.

1.6 PROJECT AREA AND THE HORIZON YEAR

The project area covers the entire corporation limits of existing 58 wards. The total area of the city presently is around 94.08 Sq Km. As per CPHEEO guidelines, water supply system shall be designed to meet the requirements over a thirty-year (30) period. The base year is considered as 2023. Adequacy check for all existing water supply infrastructures shall be
carried out for the year 2031 and 2041. If there is any requirement of new pipeline the same shall be designed for 2053, considering 30 years design period as per CPHEEO Manual.

CHAPTER 1: SERVICE AREA AND POPULATION PROJECTION

2.1 GENERAL

Estimation of future water demand is essential for desiging the water supply system to meet the requirements over the design period. Projection of future population for the service area is one of the important tasks while estimating the future water demands. Hence there is a need to finalise the service area along with its population details for the project design horizon.

2.2 PROJECT AREA

The Project area consists of entire corporation area covering 58 wards and total area of 94.08 sq km.

2.3 POPULATION PROJECTION- DESIGN HORIZON

Designs of raw water transmission main and pure water feeder mains and capacities of Service Reservoirs are based on revised design period of the project of 2031 & 2041. The base year is considered as 2023. Adequacy check for all existing water supply infrastructures is carried out for the year 2031 and 2041. If there is any requirement of new pipeline the same is designed for 2053, considering 30 years design period as per CPHEEO Manual.

The collected census data is analyzed and population projection for design horizon of 2023, 2031, 2041, & 2053 is carried out as per the standard population projections available in CPHEEO Manual. Based on the population projections Demand estimations were carried out considering unit water demand norms as per CPHEEO / IS:1176 standards. Relevant fire fighting demands and bulk water requirements are also included.

2.4 REVIEW AND SELECTION OF THE PROJECTION METHODS

Various methods of population projections are provided in the Table below for ready analysis.

Sl. No.	Method	Population					
		2021	2023	2031	2038	2041	2053
1	Arithmetic Increase Method	530495	538963	572834	602471	615172	665979
2	Incremental Increase Method	538626	549695	597225	643081	663954	754760
3	Geometric Increase Method	634410	668547	824480	990484	1071496	1467449
4	**Graphical Method**	**596243**	**616728**	**702268**	**781843**	**817298**	**967221**

from the above table, population projection by Graphical Method appears to be most appropriate and is considered.

2.5 DISTRIBUTION OF POPULATION TO DIFFERENT WATER SUPPLY ZONES

The total projected population of Belagavi city is distributed among various water supply zones in line with the 2011 census population for different zones. The projected population of various water supply zones is as below

Sl. No.	Zone No.	Ward Covered	Population				
			2023	2031	2038	2041	2053
1	1	12,13,14,22,23 ,26	57260	65207	72598	77734	91994
2	2	4,6,7,9,10	31620	36012	40094	44793	53011
3	3	1,2,3,4,5	45280	51566	57410	63648	75323
4	4	9,12,14,15,16, 19,20,21,23,24 ,25,26	64030	72913	81175	78858	93323
5	5	16,8	2010	2288	2548	2395	2835
6	6	2,3,6,8,17	8890	10121	11267	11860	14036
7	7	6,8,16,19	8720	9927	11052	10700	12664
8	8	22,23,26,27,28 ,50	19540	22246	24767	25639	30342
9	9	3,17,18	20480	23322	25965	27309	32319
10	10	19,25,26	7880	8974	9990	9712	11494
11	11	18,40	8530	9711	10811	12216	14458
12	12	35,37,38,47,48 ,49,50,51	34930	39778	44285	43708	51726
13	13	28,29,30,31,32 ,33,34,35,36,3 7,38,39,47	69620	79269	88251	85601	101304
14	14	39,41,43,45,47	13920	15845	17641	19028	22518
15	15	44,45,46,47	17610	20045	22316	22378	26484
16	16	39,40,41,42	16190	18439	20529	22324	26420
17	17	40	4320	4916	5473	6184	7315
18	18	55	4000	4560	5077	5120	6054
19	19	52,54,57	14730	16771	18671	20859	24685
20	20	52	12320	14031	15621	15741	18629
21	21	51,52,53	6150	7005	7799	7858	9300
22	22	50,51,53,54,57	22180	25262	28124	29506	34919
23	23	58	4450	5064	5637	6371	7540
24	24	50,54,57,58	22850	17662	19760	21322	25524
25	25	56	2488	2829	3150	3559	4210
26	26	50,54,56,57	19590	22304	24831	28058	33205
27	27	55	6000	6843	7613	7674	9082
28	28	58	22140	8350	9200	11400	13200
29	SDZ	4,5,6,7,8,9	49000	25209	28066	28904	34207
30	NDZ	41,42,43,44,45 ,46,47,55	57260	55799	62122	66839	79100
			616728	**702268**	**781843**	**817298**	**967221**

As per the population, treated water requirement for the year 2023, 2031 & 2041 is about 102.56 MLD, 115.39 MLD and 132.64 MLD respectively. Present supply is about 136.26 MLD from surface sources and about 4.55 MLD from ground water source. There is a need for augmentation of present water supply system to take care of immediate as well as future water demand of the city. Considering transmission and treatment plant losses of 5% the raw water requirement to meet the water demand by the year 2041 is 157 MLD.

2.6 PRESENT WATER SOURCE

At present water supply to Belagavi City is by surface water sources as described below.

There are two surface water sources - a) Rakkasakoppa Reservoir and b) Hidkal Reservoir.

There are no major rivers or reservoirs in the near vicinity of the city other than present surface sources.

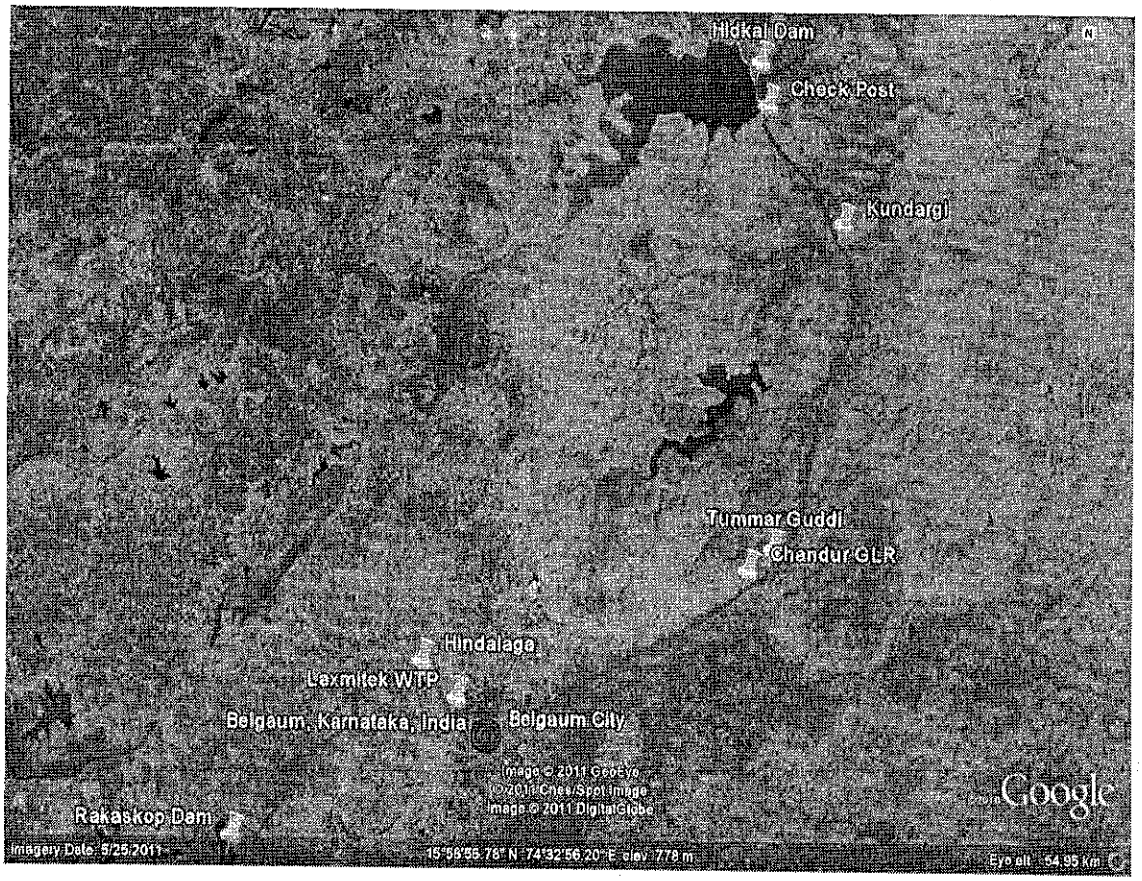
Rakkasakoppa Reservoir

Rakkasakoppa water supply scheme was developed in the year 1962 (Stage-I, 27.28 MLD) and then strengthened in the year 1983 (Stage-II, 27.20 MLD). The Reservoir was formed by constructing an earthen dam across Markandeya River, a tributary of Ghataprabha River.

Hidkal Reservoir

Hidkal Reservoir has been created by constructing a dam across Ghataprabha River near Hidkal village. The reservoir is located at about 40 Km from Belagavi City. This is a multipurpose reservoir mainly used for irrigation and 1.752 Tmc water is allocated for Belagavi Water Supply.

The capacity of the Hidkal water supply scheme is designed for 81.72 MLD.



2.7 WATER TREATMENT PLANT

The existing treatment facility available has been reviewed and phase wise requirements. WTP capacity required for the Belagavi city for the base year 2023 is 102.56 MLD, the total existing water treatment plant capacity is existing WTP of 68.20 MLD at Laxmitek and 30 MLD (32.5 MLD for 22 hours) is newly constructed at Basavankolla. The additional WTP of 70 MLD capacity is required upto the year 2053. Pressently 31 MLD WTP is proposed.

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2.8 STORAGE CAPACITY

Reliability on availability of water is the most important aspect of the 24x7 system. Hence, it is suggested to provide about 50% of the daily requirements as the storage to be provided in the reservoirs at various locations in the system to cater to the fluctuating needs of the system.

As suggested earlier about 35% of the demand requirements are proposed to be stored in the Service reservoirs. Balance 15% is proposed to be stored in Ground level tanks near the treatment plant areas.

2.9 CLEAR WATER TRANSMISSION SYSTEM

The clear water transmission system is divided into two different command areas of the treatment plants based on the topography, physical boundaries and other man-made features such that the system flows by gravity and feed the service reservoirs. The two command areas are Basavankolla WTP command area and Laxmitek WTP command area. The clear water from the two WTPs conveys water to the different ELSRs.

2.10 CLEAR WATER RESERVOIRS

At present there are twenty two (22) numbers of existing service reservoirs (18 no. ELSRs and 4 no. GLSRs) supplying equitable water to the city. All four GLSRs are retained and integrated with the proposed system with rehabilitation works (4 no. GLSRs are catering 7 zones). It is proposed to utilize / retain eleven (11) no. of existing Elevated Service Reservoirs (ELSRs) for the distribution. Total sixteen (16) no. of new ELSRs are newly proposed, which includes construction of 1 no. of new **ELSRs at Muttyanatti.**

2.11 LOCAL DISTRIBUTION SYSTEM

2.11.1 General

The distribution system network is divided into 30 zones for the equitable distribution of water. The command of the existing ELSR and its pressure at the tail end points has been analyzed, accordingly the requirement of additional Reservoirs have been worked out. Accordingly, 30 zones have been formed for the equitable distribution of water. Each zone is planned to be fed with a service reservoir. Interlinking of the zones has been formed at the boundary with a valve which shall be operated during emergency only. Distribution system is designed for 2053 demand.

2.11.2 House Service Connection

Depending upon the requirements the connections shall be 15mm, 20mm and 30mm connections. Bulk water requirements of the city would be addressed separately and the bulk flow meters as required shall be in the consideration of individual bulk consumer only.

Under the project the ELSR at Muttynatti village is proposed to serve the Muttyanatti village. Water will be provide through the distribution as per the hydraulics as a separate hydraulic zone.