Chapter 7
Reservoirs

7.0 General

Reservoirs play a significant role in conservation, better management and optimum development of water resources in our country. The precipitation in the country is uneven both in space and time and confined to only monsoon season. Some parts of the country receive much more than the country's normal rainfall leading to heavy floods and at the same time extended lack of rainfall in other parts causing extreme droughts. In such areas, the water availability even for drinking purposes become critical, particularly during summer season as the rivers go dry and the ground water table recedes.

The Cauvery (Kattalai) - Vaigai-Gundar link project is dependent on the preceding Pennar (Somasila) - Palar- Cauvery (Grand Anicut) link project and planned to divert 2252 Mcum of water brought from Himalayan rivers and river Mahanadi through a chain of 9 (nine) link canal system and the intended diversion is proposed to be regulated at Somasila reservoir on river Pennar. The size of the preceding links is considered keeping in view this quantity of 2252 Mcum and the same will be transferred to existing Kattalai barrage through a branch canal proposed to take off from the Araniar river crossing.

No new reservoirs/enroute storages are contemplated under this link proposal. The link canal takes off from the existing Kattalai barrage and falls into Gundar river in the basin area covered by the streams between Vaigai and Vaippar. The Cauvery (Kattalai) - Vaigai - Gundar link project is planned to serve 448340 ha of area for irrigation, domestic and industrial water supply in Karur, Tiruchirappalli, Pudukkottai, Sivaganga, Virudhunagar, Ramanathapuram and Thoothukudi districts of Tamil Nadu State.

7.1 Kattalai barrage

The Kattalai bed regulator which was constructed in 1933 was in operation till the Kattalai barrage was constructed and commissioned in 2014. The Kattalai barrage is located 250 m downstream of the bed regulator at latitude 10^{o} 58' N and longitude 78^{o}14' E near Mayanur village of

Krishnarayapuram taluk in Karur district. Four canals take off from Kattalai barrage of which North Bank Canal branches off left bank and South Bank Canal, Kattalai High Level Canal and New Kattalai High Level Canal branches off right bank. The four channels irrigate over 45,325 ha in Karur, Tiruchirappalli, Thanjavur and Pudukkottai districts. The catchment area of Cauvery river up to Kattalai barrage is 63,694 km^2, out of which 34,273 km^2 lies in Karnataka, 2866 km^2 lies in Kerala and the remaining 26,555 km^2 lies in Tamil Nadu. The total length of the barrage is 1233.20 m. The sill level of the barrage vent is 96.300 m and the Full Pond Level is 101.200 m. The various components of the Kattalai barrage are furnished below:

1) 1233.20 m long barrage with 7.5 m wide carriage way to pass maximum flood discharge of 13,111 cumec.
2) 86 nos. of barrage vents of which 82 nos. are of size 11.00 X 4.90 m and 4 nos. are of size 10.20 X 4.90 m with sill level of 96.300 m to pass maximum flood discharge of 11,305 cumec.
3) 12 nos of scour vents of size 11.00 X 5.50 m with sill level of 95.700 m to pass maximum flood discharge of 1806 cumec.

The Cauvery (Kattalai) - Vaigai - Gundar link canal is proposed to take off from Kattalai barrage with FSL of 100.750 m. The salient features of the Kattalai barrage are furnished in **Annexure 7.1.**

7.1.1 Fixation of storage and reservoir levels

The storage capacity of Kattalai barrage is 29.40 Mcum at Full Pond Level of 101.200 m. The bed level of the barrage is at 95.700 m. The sill level of the barrage vent is at 96.30 m and the sill level of the scour vent is at 95.700 m.

7.1.2 Water quality

Water quality tests are not conducted by the Water Resources Department of Tamil Nadu at Kattalai barrage. Periodical water analysis is done at Musiri G&D site located downstream of Kattalai barrage by Central Water Commission (CWC) for both chemical and physio-chemical analysis for ascertaining the water quality status. The latest data pertaining to the years

2013 to 2016 on laboratory test results of water samples of Musiri G&D site have been collected and presented in **Table 7.1**.

Table 7.1
Test results of water samples at Musiri G & D site

Sl. No	Characteristic (Parameter)	unit	Analysis Result				Drinking water specifications (IS 10500 : 2012)
			2016	2015	2014	2013	Requirement (Acceptable limit)
1	pH		7.87	8.20	8.09	8.04	6.5 to 8.5
2	Dissolved Oxygen	mg/lit	6.42	6.48	6.66	6.68	6 mg/l Min as per CPCB class A Tolerance limit
3	Total Dissolved Solids	mg/lit	334	341	295	276	500 Max
4	Turbidity	NTU	0.73	0.78	0.71	0.71	1 Max
5	Total Alkalinity (as $CaCO_3$)	mg/lit	158	176	156	136	200 Max
6	Chloride (as Cl)	mg/lit	82	78	72	45	250 Max
7	Sulphate (as SO_4)	mg/lit	30	32	27.9	21.1	200 Max
8	Fluoride (as F)	mg/lit	0.48	0.51	0.39	0.32	1.0 Max
9	Total Hardness (as $CaCO_3$)	mg/lit	171	195	170	150	200 Max
10	Calcium (as Ca)	mg/lit	29	31	28.3	28.5	75 Max
11	Magnesium (as Mg)	mg/lit	23.7	28.3	23.8	18.9	30 Max
12	Boron (as B)	mg/lit	0.09	0.12	0.05	0.05	0.5 Max
13	Nitrate as NO_3-N	mg/lit	0.5	2.55	1.38	0.28	10 ppm
14	BOD	mg/lit	2.23	1.97	2.4	2.34	2 mg/l Max as per CPCB class A Tolerance limit
15	Silica	mg/lit	14.33	17.45	17.5	NA	----
16	Iron (as Fe)	mg/lit	0.01	0.02	0.05	0.10	0.3 Max

Source: WRIS India web site

It is observed that the pH level of water at Musiri G&D site ranges between 7.87 and 8.20 during the period from 2013 to 2016. The pH level

indicates slightly alkaline nature of the water and the values are within the acceptable limits of 6.5 to 8.5 as per IS 10500: 2012 specified for drinking and domestic uses. The levels of dissolved oxygen in the collected samples are in the range of 6.42 to 6.68 mg/lit and fulfil the CPCB class A tolerance limit of 6 mg/lit minimum. The levels of total dissolved solids are well within the acceptable limit of 500 mg/lit i.e. ranging from 276 to 341 mg/lit. The turbidity ranges from 0.71 to 0.78 NTU which indicates the water is clear and within the acceptable limit of 1 NTU. The range of total alkalinity (as $CaCo_3$) is between 136 and 176 mg/lit and satisfies the acceptable limit of 200 mg/lit. The concentration of chloride (as Cl) is in the range of 45 to 82 mg/lit which is within the acceptable limit of 250 mg/lit for drinking water quality standards. The concentration of Sulphate (as SO_4) is in the range of 21.1 to 32 mg/lit which is within the acceptable limit of 200 mg/lit. The concentration of Fluoride (as F) ranges from 0.32 to 0.51 mg/lit which is within the permissible limit of 1.0 mg/lit specified for potable water. The range of total hardness (as $CaCO_3$) of the above water samples is from 150 to 195 mg/lit which is within the acceptable limit of 200 mg/lit specified for drinking water.

The concentration of Calcium (as Ca) also is within the permissible limit of 75 mg/lit, ranging from 28.3 to 31 mg/lit. Other parameters such as Magnesium, Boron, Nitrate, Silica and Iron are also within the respective acceptable limits as per IS 10500: 2012. The range of Biochemical Oxygen Demand (BOD) varies from 1.97 to 2.4 mg/lit against the acceptable limit of 2 mg/lit as per CPCB class A Tolerance limit. Though the water is suitable for drinking and domestic uses, it cannot be supplied directly without proper filtration and chlorination.

7.1.3 Sedimentation

The Cauvery (Kattalai) - Vaigai - Gundar link project does not involve formation of any reservoir. The existing Kattalai barrage does not have any live storage and is a small water retention structure only to facilitate drawl of water by the existing canals and the proposed C-V-G link canal. There are a number of reservoirs and barrages in the catchment upstream of Kattalai barrage which act as probable silt arresting structures. Hence, only a small quantum of silt is expected to reach Kattalai barrage and the same could be

released through the 12 nos of scour vents provided at the end of both bank and in the middle of the river.

Sediment analysis is being carried out by CWC at Musiri G&D site (66,243 km^2) on Cauvery river downstream of Kattalai barrage (63,694 km^2). The data on sediment load at Musiri G&D is available for the period from 1973-74 to 2017-18. From the available sediment data, the average annual sediment load observed at Musiri G&D site works out to 5,08,811 MT, out of which 4,45,126 MT is during monsoon period. The data on sediment load at Musiri G&D site for the period from 1973-74 to 2017-18 is furnished in **Table 5.4 in Chapter 5: Hydrology and Water Assessment.**

7.1.4 Life of the reservoir

The sediment trapped at Kattalai barrage can be flushed through the Scour vents provided at suitable locations in the barrage. Hence, the life of the reservoir is considered as 100 years.

7.1.5 Capacities

The gross storage capacity of Kattalai barrage is 29.40 Mcum at Full Pond Level of 101.20 m.

7.1.6 Area of submergence

The water spread area of Kattalai barrage at Full Pond Level is 910 ha which is confined to the river banks.

7.1.7 Flood absorption / reservoir operation policy

As the storage capacity of Kattalai barrage is 29.40 Mcum only, no appreciable flood control is anticipated by the project. Thus, the Kattalai barrage will not alter the flood characteristics.

The Kattalai scheme comprises the ayacut of 1) North Bank Canal 2) South Bank Canal 3) Kattalai High Level Canal 4) New Kattalai High Level Canal and 5) Uyyakondan Channel. The crop period for the various channels and the full supply discharge is presented in **Table 7.2.**

Table 7.2

Crop period and full supply discharge for the various channels

Sl.No.	Canal	Crop period	Full supply discharge (cumec)
1	North Bank Canal	1st July to 31st May	39.1
2	South Bank Canal	1st June to 30th April	7.4
3	Kattalai High Level Canal	1st July to 31st May	11.6
4	New Kattalai High Level Canal	1st August to 15th December	30.1
5	Uyyakondan Channel	1st July to 31st May	21.2

The New Kattalai High Level Canal completed during the year 1959 have an ayacut of 584 ha of which 348 ha are under indirect ayacut fed by 103 tanks and the balance 236 ha under direct irrigation. The canal will be opened for direct irrigation on 1st August of every year when the level and storage in Mettur Reservoir are 94.0' and 57.341 TMC respectively. The supply to indirect ayacut will be given whenever more than adequate supply is available at Grand Anicut which may otherwise go waste provided that the normal and full irrigation requirements under the Cauvery delta are met. This supply after meeting the requirements of direct ayacut will fill up all the 103 tanks once in 14 days.

The Kattalai will act like a balancing reservoir for the link project and there will not be any commitment to the link demands from river Cauvery. Thus, the releases from Mettur in all seasons as per the prevailing Awards and Orders will reach Grand Anicut to meet requirement of Cauvery delta. However, the flood flows during the monsoon months which are in excess of the monthly demands of Cauvery delta can be utilized at Kattalai barrage through the channels mentioned above in **Table 7.2.**