

Chapter 7

Reservoir

7.1 General

The Krishna (Almatti) – Pennar link canal off-takes from the right flank of the Almatti reservoir. Almatti dam is a component of ongoing Upper Krishna Project on Krishna River in Bagalkot district of Karnataka constructed by the Government of Karnataka. The existing tank at Bukkapatnam on Chitravati River also forms the part of the link canal project and lies in Anantapur district of Andhra Pradesh as a feeder/balancing reservoir. One dam is proposed at Kalvapalli across the Pennar in Anantapur district of Andhra Pradesh, which also acts as balancing reservoir for the link project. However, in order to have an overall view of the proposed project, various components of the project are briefly discussed in this report in the relevant chapters. This chapter deals with the brief particulars of the existing Almatti reservoir, Bukkapatnam tank and the proposed Kalvapalli reservoir.

7.2 Reservoir Levels and Storages

7.2.1 Almatti Dam

The Almatti is the existing dam on river Krishna. The dam functions as a conservation structure for releasing water to Narayanpur dam, which is also a part of the Upper Krishna project for irrigation to the drought prone areas of Bijapur, Gulburga and Raichur districts. The link canal off takes from right bank of Almatti reservoir with FSL 510.00 m. The principal levels and corresponding storages of the reservoir are furnished in Table 7.1.

Table 7.1
Principal levels and corresponding storages of Almatti reservoir

	Level (m)	Storage (Mm³)
FRL	519.600	3439.70
DSL	504.744	335.00

7.2.2 Kalvapalli Dam

It is a proposed dam on Pennar River. The link canal out-falls into Kalvapalli reservoir at RD 386.400 km with its FSL at 475.542 m. The alignment further off-takes from right bank of proposed Kalvapalli

reservoir with FSL 463.00 m. The inflows into Kalvapalli reservoir from its own catchment is earmarked for downstream uses and is not proposed to be diverted through the link canal. The principal levels and storages of Kalvapalli reservoir are given in Table 7.2. The sill level of off-take structure at Kalvapalli reservoir to draw water into the link canal will be 3 m above the FSL of the link canal.

Table 7.2
Principal levels and corresponding storages of Kalvapalli reservoir

	Level (m)	Storage (Mm³)
FRL	475	83.0
DSL	466	10.00

7.2.3 Bukkapatnam Tank

The Bukkapatnam tank is an existing tank on Chitravati River in Anantapur district. The tank is proposed to be utilised as second en route balancing reservoir. The link canal outfalls into Bukkapatnam tank on its left bank at RD 536.20 km with FSL 449.766 m and further off-takes from the right bank with FSL 440.00m. The tank has a live storage capacity of 15.30 Mm³ at FTL of 448.07 m.

7.3 Sedimentation Studies

7.3.1 Almatti Reservoir

The Almatti is an existing reservoir on river Krishna. No sedimentation studies of the reservoir have been carried out after impounding. A portion of the fine sediment entering the reservoir during the floods may flow out through the water drawn through the link canal and hence the introduction of link canal will help in increasing the life of the reservoir.

7.3.2 Kalvapalli Reservoir

a) Sediment Inflow from Link Canal

As per CWC Publication No. 113/2001, the trap efficiency in a reservoir is generally more than 90%. It means 90% of the sediment entering a reservoir gets deposited in the reservoir and only 10% pass through various outlets. Since 14% of the total inflow into Almatti reservoir is diverted through the link canal, the percentage of sediment likely to enter into the link canal is only 1.4% of the total sediment inflow into Almatti reservoir, which is negligible. Moreover, the sediment entering

the link canal will be fine sediment as the medium and coarse sediment get deposited on the bottom of the reservoir. The link canal out-falls into Kalvapalli reservoir on the left bank at higher elevation and again off-takes from the right bank of the dam at a lower elevation. Since Kalvapalli reservoir is a balancing reservoir and not a storage reservoir, the small quantity of fine sediment entering the reservoir through the link canal, will pass through the reservoir. Hence, sediment deposit in Kalvapalli reservoir due to link canal is taken as negligible.

b) Inflow from its Own Catchment

The catchment of Kalvapalli reservoir is 5616 km². There is one reservoir (Upper Pennar Project) existing just upstream of Kalvapalli reservoir and its catchment area is 5245 km². Hence the free catchment of Kalvapalli reservoir is 371 km² only. Generally, there is no spill from the Upper Pennar reservoir. The sediment generated in the upper catchment of Pennar River, thus, gets deposited in the Upper Pennar reservoir and sediment inflow into Kalvapalli reservoir will be from the free catchment only. The dead storage and live storage capacities of the reservoir have been fixed considering the rate of sedimentation as 9.84 ha.m/100 km²/year.

As per the studies carried out by CWC in respect of 142 reservoirs in the country, the dead storage, live storage and gross storage capacities are lost annually at the rate of 1.4%, 0.31% and 0.44% respectively. Since the gross storage capacity of Kalvapalli reservoir is 83 Mm³ the loss in storage capacities in 100 years and rate of sedimentation works out as below:

Loss in gross storage	:	36.5 Mm ³
Loss in live storage	:	26.5 Mm ³
Loss in dead storage	:	10.0 Mm ³
Total sedimentation in 100 years	:	36.5 Mm ³
Average annual rate of loss of capacity	:	0.365 Mm ³
Rate of sedimentation	=	$\frac{0.365 \times 100 \times 100}{371}$
	=	9.84ham/100Km ² /year

Since the estimated loss in dead storage is 10 Mm³ in 100 years, the dead storage level is fixed at 466.00 m having a storage capacity of 10.07 Mm³.

7.4 Reservoir Losses

7.4.1 Evaporation Losses

Pan evaporation data of Bijapur IMD Station have been used to work out the reservoir losses.

7.4.2 Seepage Losses

There are no adverse features for seepage losses from the reservoir like concealed solution channels, karst topography, sub-terrain channels following fault plains or inconfirmities, which promote leakage of reservoir. The Kalvapalli reservoir area is devoid of any lime/calcareous formations of highly pervious gravelly material.

7.5 Effect on Sub-Soil Water Table

The preliminary Geological investigations carried out for the proposed Krishna (Almatti) – Pennar link project by Geological Survey of India indicate that in general the depth of water table in the gneissic terrain was found to be 3 to 9 m below ground level. Jointing and fracturing was found to extend to a depth of 40 m and weathered zone was estimated to be up to a depth of 15 m. Hence, it is presumed that, as the project is situated in hilly terrain, the effect on sub-soil water table may not be significant.

7.6 Reservoir Rim Stability

The Krishna (Almatti) – Pennar link is having two main reservoirs viz., (i) Almatti reservoir and (ii) Kalvapalli reservoir. Almatti is an existing dam and required studies have been made by the Government of Karnataka.

Foundation for the dam axis and reservoir area of proposed Kalvapalli dam would be granite gneiss with lenses of amphibolites and intrusions of dolerite dykes. The dolerite dyke in the right bank, sub-parallel to the dam axis will act as a natural barrier. The topography is also gently rolling without any hazard of any landslide or rockslide. It has, therefore, been presumed that there would be no problem of stability to the rim of the reservoir.

7.7 Submergence due to Reservoir

7.7.1 Submergence by the Almatti Reservoir

The Almatti reservoir (Stage -II) submerges a total area of about 490 sq. km at FRL 519.6 m, which lies in Bagalkot district of Karnataka state.

7.7.2 Submergence by the Kalvapalli Reservoir

The Kalvapalli balancing reservoir proposed by NWDA is located on the river Pennar near Kalvapalli village in Anantapur district of Andhra Pradesh. The submergence of the reservoir at FRL 475.00 m is about 13.23 km² affecting 2 villages with a total population of 1333 in Anantapur district of Andhra Pradesh.