

15 -ാം കേരള നിയമസഭ

4 -ാം സമ്മേളനം

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മുല്ലപ്പെരിയാർ അണക്കെട്ടിന്റെ സുരക്ഷ

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ശ്രീ. എ . പി . അനീൽ കുമാർ		null (ജലവിഭവ വകുപ്പ് മന്ത്രി)	
(എ)	മുല്ലപ്പെരിയാർ അണക്കെട്ടിന്റെ സുരക്ഷയുമായി ബന്ധപ്പെട്ട് ഐ.ഐ.ടി. ഡൽഹി നടത്തിയ പ്രോബബിൾ മാക്സിമം ഫ്ലഡ് ആന്റ് ഫ്ലഡ് റൂട്ടിംഗ് പഠന റിപ്പോർട്ട് പ്രകാരം പ്രസ്തുത അണക്കെട്ട് ജലശാസ്ത്രപരമായി സുരക്ഷിതമല്ല എന്ന് കണ്ടെത്തിയിട്ടുണ്ടോ;	(എ)	ഉണ്ട്
(ബി)	എങ്കിൽ പ്രസ്തുത പഠന റിപ്പോർട്ടിന്റെ പ്രസക്ത ഭാഗങ്ങളുടെ പകർപ്പ് ലഭ്യമാക്കാമോ?	(ബി)	ഐ.ഐ.ടി. ഡൽഹി നടത്തിയ പ്രോബബിൾ മാക്സിമം ഫ്ലഡ് ആന്റ് ഫ്ലഡ് റൂട്ടിംഗ് പഠന റിപ്പോർട്ടിന്റെ പ്രസക്ത ഭാഗങ്ങളുടെ പകർപ്പ് അനുബന്ധമായി ചേർക്കുന്നു.

സെക്ഷൻ ഓഫീസർ

Probable Maximum Flood Estimation & Flood Routing Study for Mullaperiyar Dam



Report Submitted to
Water Resources Department,
Government of Kerala



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1. INTRODUCTION

The Irrigation Department, Government of Kerala requested IIT Delhi to estimate Probable Maximum Flood of Mullaperiyar Dam and compute the impact of passing this flood through the reservoir for different operating conditions of spillway gates.

2. THE CATCHMENT

The Mullaperiyar dam was completed in 1895. The catchment area at this site is 624 Sq. Km. (Figure 1) which lies between latitude $9^{\circ}15'50''\text{N}$ - $9^{\circ}40'00''\text{N}$ and longitude $77^{\circ}07'10''\text{E}$ - $77^{\circ}25'00''\text{E}$ as obtained from 1:25000 digitized toposheet of Survey of India and this tallies with the area mentioned in the book "History of the Periyar Dam with Century Long Performance" by Prof. A. MohanaKrishnan (CBIP Publication No.257). The dam diverts the flows from this catchment to the Vaigai river system in Tamilnadu. Since 1895, three major floods occurred in the catchment.

3. EXTREME EVENTS EXPERIENCED BY THE DAM AND IN THE AREA

The dam experienced a flood with volume of 34103 Mcft (155.87 cm in the catchment) for 21 days in July 1924. The catchment experienced another flood with a volume of 5118Mcft (23.38cm in the catchment) for a duration of 2days in Jan 1943, and again experienced a flood for 6-7 days with a volume of 13283 Mcft (60.67 cm in the catchment) in June 1961. The one day maximum observed point rainfall in a station (lat $10^{\circ}06'\text{N}$ and long $77^{\circ}04'\text{E}$), very near to Mullaperiyar catchment, was observed on 16/7/1924 as 31.7 cm (Page 47 of the Central Water Commission Dam safety project Generalized PMP Atlas published by WAPCOS). The value read from the same Atlas in Figure 18 for 15/7/24 is 24cm. The estimates of one day PMP on page 15 of the WAPCOS Atlas of three stations near this catchment are 58.88 cm (Peermade residency), 64.16 cm (Peermade % Taluk) and 48.3 cm at (Sivagiri). The data indicates that the area is situated in high rainfall zone and is referred to as Zone 101 in the WAPCOS Atlas.

6.6 Computation of Direct Runoff hydrograph (DRH)

The rainfall is arranged in critical sequence and convolved with each of the three 1-hour unit hydrographs.

6.7 Base Flow

To obtain the design flood hydrograph, a base flow must be added to the DRH. The base flow is estimated on the basis of analysis of previous hydrographs. For the Mullaperiyar catchment a base flow of 2000 cusecs (56.63 cumec) has been adopted (*Ref: CWC adopted this value in their study*). The computed Flood Hydrograph as a result of the critical sequencing and addition of base flow is given in Appendix 3 to 5.

6.8 Probable Maximum Flood (PMF)

The PMF hydrographs using the three unit hydrographs is computed. The PMF hydrographs for the various 'k' values is shown in Figure 5. Appendix 4A, 4B and 4C gives the ordinates of the Probable Maximum Flood Hydrograph developed for the three 'k' values of 1.5, 2 and 2.5 respectively. The CWC adopted PMF hydrograph is reproduced and provided as Appendix 5 for comparison.

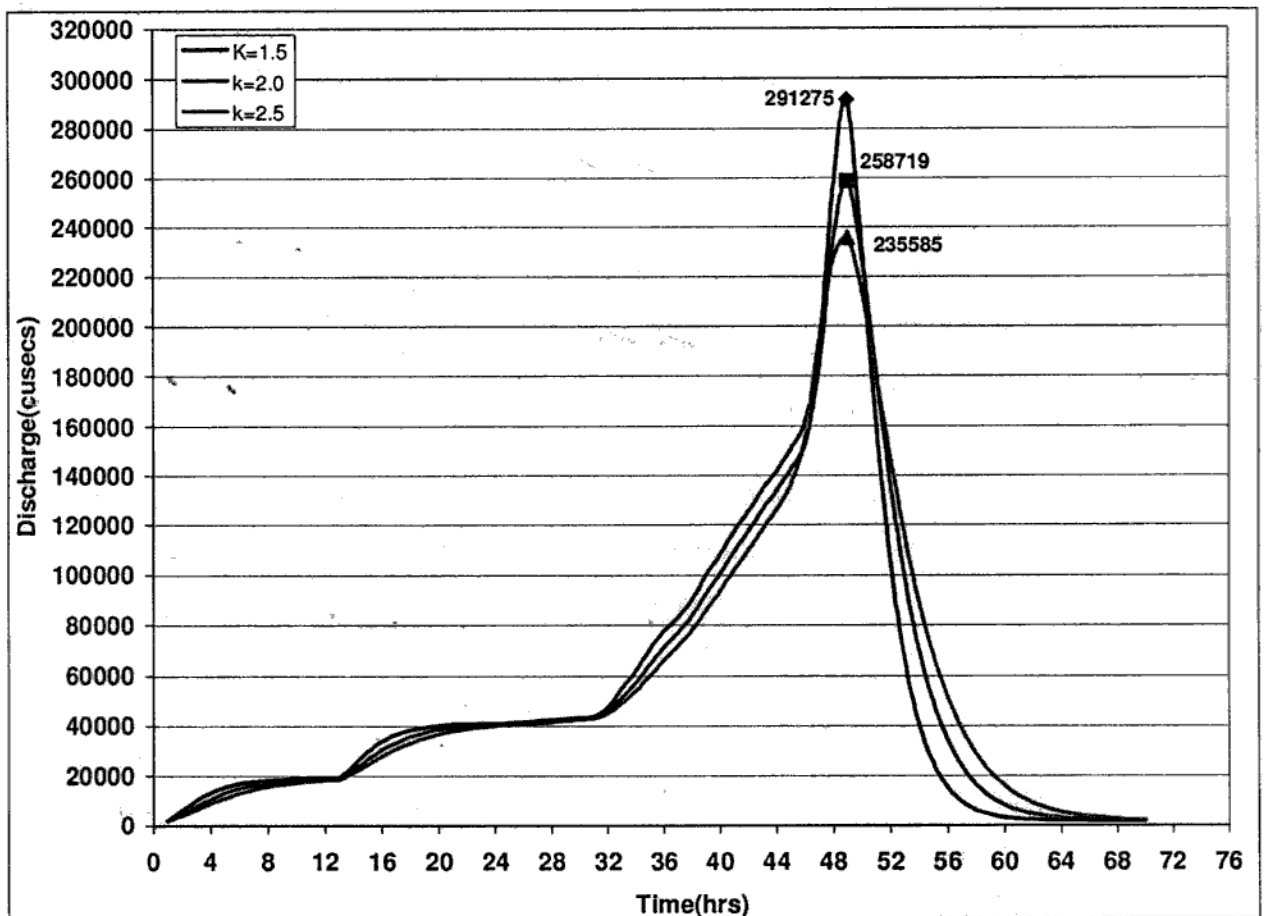


Fig 5: PMF hydrograph computed from the 3 different UH ordinates

7. ROUTING THE PROBABLE MAXIMUM FLOOD

Reservoir Routing was carried out using the SRA (Software for Reservoir Analysis 1999) program developed by NIH. Mass Curve Method was used to route the PMF. The CWC adopted elevation-storage-outflow relation, given in Table 4, was used to route the design flood. The Table was extrapolated to derive the values from elevation 157 feet to 162 feet. Appendix 6 gives the relationship between elevation-outflow-storage, which has been extrapolated to derive the values of outflow and storage.

The three conditions taken to rout the PMF are as follows:

- A. All 13 vents operative
- B. 12 vents operative with 1 new vent inoperative
- C. 11 vents operative with 2 new vent inoperative

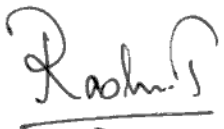
The flood routing studies were carried out under tunnel open condition in the same manner as was done by CWC.

Table 4: Elevation-Storage-Outflow relation (adopted from CWC Report)

Elevation (feet)	Storage (Mcft)	Total outflow with all 13 vents operative (cusecs)	Total outflow with 12 vents operative with one new vent inoperative (cusecs)	Total outflow with 11 vents operative and 2 new vents inoperative (cusecs)**
136	11210	2682	2682	2682
137	11462	3584	3429	3274
138	11714	4864	4427	3990
139	11966	6385	5585	4785
140	12218	9005	7779	6553
141	12488	13146	11441	9736
142	12758	18246	16045	13844
143	13028	24053	21255	18457
144	13299	30288	26885	23482
145	13579	39064	35023	30982
146	13864	45516	40805	36094
147	14153	52204	46794	41384
148	14447	59370	53235	47100
149	14744	67310	60426	53542
150	15046	75618	67961	60304
151	15352	84240	75789	67338
152	15662	93171	83906	74641
153	15976	102552	92454	82356
154	16295	111983	101035	90087

10. CONCLUSIONS

1. The PMF was estimated using the procedures and data in Central Water Commission, Dam Safety Project -Generalized PMP Atlas published by WAPCOS.
2. The 2 day PMP for the Mullaperiyar Catchment works out to 65.43cm.
3. The PMF recommended for Mullaperiyar reservoir is 291275cusecs (8248 cumecs).
4. The flood routing studies were done under tunnel operative condition and using the elevation-storage-outflow relation provided by the CWC. All contingency conditions viz. all thirteen gates operative, 12 gates operative and 11 gates operative conditions were studied and the results are given in Table - 5.
5. The maximum water level (MWL) obtained by routing the PMF through the reservoir for two new vents inoperative condition (*contingency of at least 10% of gates inoperative considering mechanical and human failures*) as recommended by IS:11223-1985, for various impinging levels and limiting the maximum outflow at 1,22,000 cusecs, are more than the designed MWL of 155 ft and the results are:
 - With an impinging level of 136 ft, the maximum water level attained is 160.22 ft.
 - With an impinging level of 142 ft, the maximum water level attained is 160.43 ft.
 - With an impinging level of 152 ft, the maximum water level attained is 161.74 ft.
6. Therefore, the Mullaperiyar Dam is hydrologically unsafe for passing the estimated Probable Maximum Flood with the existing spillway capacity.


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