

South Esk – Great Lake Water Management Review

Scientific Report on Trevallyn Dam Spills

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TREVALLYN DAM SPILLS

1. ASSESSMENT OF ISSUES AND STATUS

During the community consultation stage of the South Esk – Great Lake Water Management Review, several stakeholders in the upper Macquarie and South Esk catchment raised issues relating to the lack of available irrigation water caused by low rainfall and inadequate storages, and issues relating to the ‘red tape’ associated with the construction of farm storages and obtaining licenses to fill them. This is outlined in the *Community Consultation Report: South Esk – Great Lake Water Management Review* (section 3.17).

While Hydro Tasmania does not have control over a number of these processes, the organisation has rights to most the water in the South Esk Basin upstream of Trevallyn Dam. A series of agreements between Hydro Tasmania and the Rivers and Waters Supply Commission currently defines water allocations for irrigation purposes.

When water spills at Trevallyn Dam, it is not being used for the purposes of electricity generation, however, unless irrigators have an allocation, they are not permitted to abstract this water and divert it into storages for later use for irrigation.

This issue affects many current and potential irrigators in the Meander, Macquarie and South Esk sub-catchments of the South Esk Basin, and indirectly, the wider community through lost potential agricultural productivity.

Hydro Tasmania, the Department of Primary Industries, Water and Environment (DPIWE) and the Tasmanian Farmers and Graziers Association (TFGA) have held discussions to clarify water allocation in the South Esk catchment, including the Trevallyn spill issue. Hydro Tasmania was concerned that farmers were taking water in winter when Trevallyn Dam was not spilling and for which they did not have a legal right, and wished to implement better management of winter takes. The DPIWE and the TFGA were also seeking to increase the amount of water that could be taken for irrigation purposes in the catchment. Therefore determining rules to manage takes during spill events made sense.

2. FORMULATION OF STUDY OBJECTIVES

The management objective in relation to this study was to improve the way in which the abstraction of water from tributaries in the South Esk Basin is managed during floods.

For this study, the primary option was to establish a trigger flow at which irrigators would be permitted to abstract water from tributaries in the South Esk catchment. Once the trigger flow was exceeded, water could be abstracted for a given period of time. In addition, the trigger flow had to be at a level where it would not decrease the frequency of small spills or compromise the environment in Cataract Gorge.

In order to determine these trigger levels, hydrological studies were undertaken, and it is these studies that are reported in the following section.

3. DATA COLLECTION AND ANALYSIS

The aim of this study was to establish flow triggers for irrigation purposes in the greater South Esk catchment. In order to do this, an inflow to Trevallyn Dam that is large enough to result in spill was determined. Using this inflow value trigger flows at upstream points in the three major rivers of the catchment were calculated through simple catchment area ratios.

Methods

Pattern of Spill

The first step was to determine the spill pattern for Trevallyn Pond. A flow duration curve of spill was used to illustrate this, which is included as Figure 1. This figure is based on a record of over 40 years of lake level data transformed into spill. From this figure it can be seen that 75% of the time there is no spill from Trevallyn Pond.

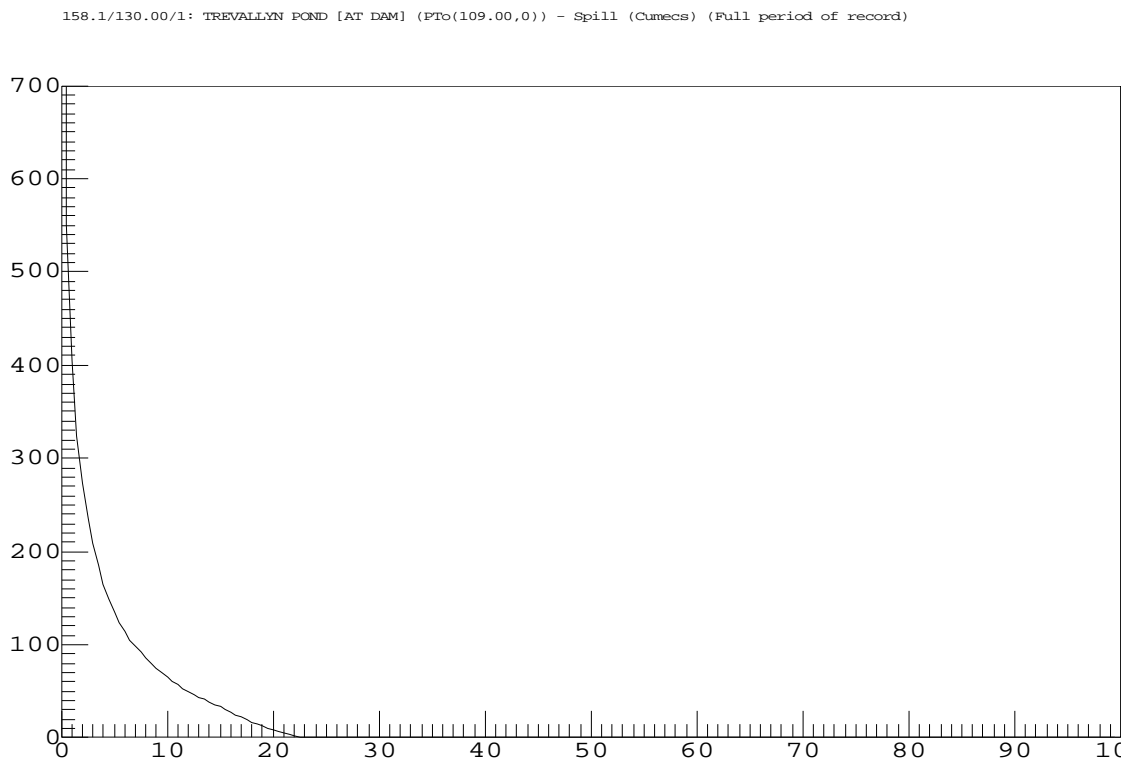


Figure 1: Flow Duration Curve of Spill over the Trevallyn Dam

Inflow to Trevallyn Pond

The calculation of the trigger inflow to Trevallyn Pond required a set of assumptions to simplify the issue. The assumptions are listed below:

- Poatina Power Station discharge is excluded from the calculation;
- evaporation and rainfall onto Trevallyn Pond are not considered;
- Trevallyn Power Station is run at full capacity (90 cumecs discharge); and
- nominal spill of 20 cumecs.

Once full, the storage volume does not change, and a simplified version of the mass storage equations then apply:

$$\text{Inflow-Outflow} = \text{Change in Storage}$$

$$\text{Inflow-Outflow} = 0$$

$$\text{Inflow} = \text{Outflow}$$

$$\begin{aligned} \text{And } \mathbf{Outflow} &= 90 \text{ cumecs through the power station} \\ &+ 20 \text{ cumecs spill} \\ &= \mathbf{110 \text{ cumecs}} \end{aligned}$$

$$\text{Hence } \mathbf{Inflow} = \mathbf{110 \text{ cumecs}}$$

Total Catchment Trigger Flow

To determine a whole-of-catchment trigger flow, or the summation of flows at the three upstream sites that would cause spill at Trevallyn Dam, the required 110 cumecs inflow to Trevallyn Pond was split between the three catchments by assuming a certain percentage of the flow was contributed from each. The percentage values were changed at 5 % steps to give a full range of flow scenarios, ie 5 % Meander, 10 % Macquarie, 85 % South Esk was one scenario while 30 % Meander, 35 % Macquarie, 35 % South Esk was another.

The flows at the sites were determined using the same catchment area ratio as outlined above, and the average sum of the three flows determined for the cases examined. The resultant value is **60 cumecs**. Events greater than 60 cumecs for the period 01/01/96 - 01/01/01 are listed in Table 1. The durations of these events are listed and the table shows that the average duration of events greater than 60 cumecs is five days.

Event Threshold = 60 cumecs			
Start of Event	Finish of Event	No. days in Event	No. hours in Event
01/08/1996 1:00	24/08/1996 21:00	24	572
12/09/1996 6:56	06/10/1996 1:00	24	570
19/10/1996 11:47	20/10/1996 14:00	1	26
03/05/1997 20:26	09/05/1997 7:00	5	131
13/06/1997 10:02	15/06/1997 14:00	2	52
27/07/1997 14:57	28/07/1997 18:00	1	27
07/08/1997 13:16	09/08/1997 6:00	2	41
23/08/1997 1:51	24/08/1997 5:00	1	27
04/09/1997 20:36	12/09/1997 18:00	8	189
21/09/1997 5:44	25/09/1997 0:00	4	90
06/06/1998 14:17	08/06/1998 4:00	2	38
12/06/1998 20:39	13/06/1998 23:00	1	26
26/06/1998 2:41	27/06/1998 7:00	1	28
05/07/1998 23:14	10/07/1998 14:00	5	111
27/07/1998 8:32	07/08/1998 11:00	11	266
22/08/1998 2:52	24/08/1998 11:00	2	56
22/09/1998 20:01	28/09/1998 17:00	6	141
01/10/1998 23:32	05/10/1998 0:00	3	72
06/10/1998 7:36	08/10/1998 7:00	2	47
27/11/1998 17:03	29/11/1998 15:00	2	46
29/12/1998 0:13	30/12/1998 8:00	1	32
07/02/1999 1:26	08/02/1999 8:00	1	31
03/03/1999 3:06	05/03/1999 21:00	3	66
06/04/1999 17:48	09/04/1999 8:00	3	62
25/05/1999 8:43	02/06/1999 13:00	8	196
	AVERAGE:	5	118

Table 1: Duration of Events > 60 cumecs

4. OUTCOMES AND OPTIONS FOR TREVALLYN SPILLS

The outcomes were as follows:

- for Lake Trevallyn to spill at 20 cumecs, there needs to be an inflow of 110 cumecs; and
- for there to be an inflow to Lake Trevallyn of 110 cumecs, there must be a combined flow from the three rivers of at least 60 cumecs.

The review of available hydrological data shows that when the combined flow at Macquarie River downstream of Elizabeth River, Meander River at Deloraine Bridge and South Esk River at Llewellyn exceeds 60 cumecs, this typically leads to a spill event at Trevallyn Dam. Given the limited data set that is available it is recommended that initially a higher trigger flow - ie. 70 cumecs - is used and that the trigger flow is reviewed after a period of five years to determine the effectiveness of the proposed rule in achieving the aim of permitting irrigators to abstract water in anticipation of a spill event at Trevallyn Dam.

It is recommended that:

- Hydro Tasmania and the Department of Primary Industries, Water and Environment adopt a protocol that would allow temporary allocations under section 90 of the *Water Management Act 1999* to be granted whenever combined flows at Macquarie River downstream of Elizabeth River, Meander River at Deloraine Bridge and South Esk River at Llewellyn exceeds 70 cumecs.
- Any temporary allocations have a term of five (5) days.
- If Trevallyn Dam is still spilling at the end of the initial five-day period, then the term of the temporary water allocation is extended to cover the period until the dam ceases to spill.

References

Hydro Tasmania, 2000, *Community Consultation Report: South Esk – Great Lake Water Management Review*, Hydro Tasmania, Hobart.