

Shannon Water Level Management

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The water levels along the Shannon River and its lakes are the subject of much discussion, particularly during periods of drought or heavy rain. What I hope to do in this article is explain the controls that are on the levels and how they are managed.

Initially, let me state that for the last eleven years I was ESB's manager at Ardnacrusha Hydroelectric Power Station and, while no longer in that position, am still an ESB employee.

The article uses some technical terms and measurements:

- m^3/s = cubic meters per second = tonnes per second ($1m^3/s = 220$ gals per second)
- m O.D. = meters Ordnance Datum (Poolbeg), ie the level above a fixed point at Poolbeg in Dublin.

The River Shannon is some 256km from its source in the Cuilcagh Mountains on the Cavan–Fermanagh border to its mouth between Loop Head and Kerry Head. ESB and Waterways Ireland manage the controls of the River Shannon water levels, where such controls exist. ESB controls water levels for the purpose of electricity generation at Ardnacrusha and Waterways Ireland controls levels (or depths) for navigation purposes.

ESB and Waterways Ireland each morning collect information from their respective gauges and share the relevant information with each other. This gives both organisations a broad picture of what is happening throughout the river.

For the purposes of this article the Shannon can conveniently be divided into five sections:

- source to Lough Allen outlet
- Lough Allen to Lough Ree outlet
- Lough Ree to Meelick Weir
- Meelick Weir to Parteen Weir and Ardnacrusha
- Parteen Weir and Ardnacrusha to the mouth of the Shannon.

Source to Lough Allen outlet

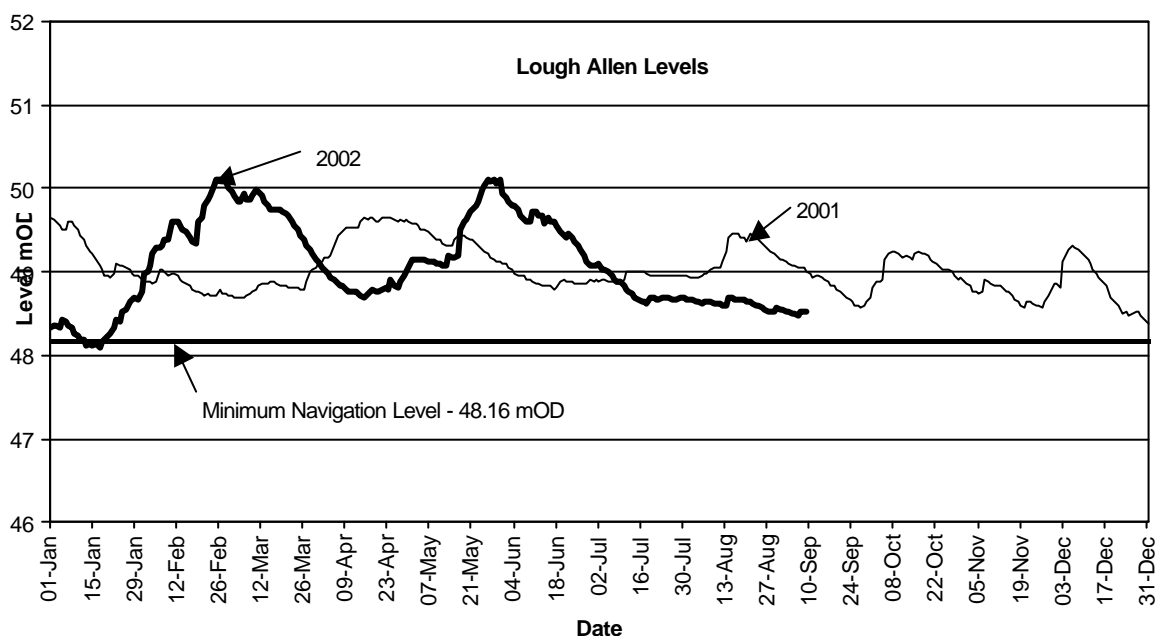
The only control on water levels in this section is ESB's sluices at Bellantra at the outlet of Lough Allen. These sluices were constructed in the period 1935–1937, replacing an existing sluice barrage that had been erected in the 1870s to regulate the levels for navigation. The channel between the lake and the sluices was dredged as the sill of the new sluices was 2.44m below that of the old sluices. The old navigation channel was dammed. This was done to increase the utilisable storage of Lough Allen for generation purposes. The optimisation of the storage has ceased to be a factor and ESB has endeavoured to manage the level in the lake to meet the conflicting demands of the various interests.

In 1996 navigation was re-opened into Lough Allen. The minimum navigation level in Lough Allen is 48.16m OD and ESB has undertaken to try and maintain the level of the lake above this during the period mid-March to mid-September. Easier said than done.

There is a requirement to discharge a minimum 5.0m³/s through the sluices to maintain the channel downstream in good order and have a fair flow in the river. This unfortunately exceeds the average summer inflow to the lake. This means that in most years the level in Lough Allen will continue to fall during the summer months. The drier the summer, the more it falls. Ideally, the level in mid September would be exactly at the minimum navigation level and the level could then be lowered further to increase the storage capacity of the lake for winter floods. If only it rained when we wanted!

Generally, with our weather pattern there is seldom difficulty in maintaining navigation levels mid-March to May. However, it is desirable in May and early June that the level in Lough Allen should be around 48.66m O.D. Should there be no prolonged periods of drought then the minimum navigation level will not be reached. If, however, March and April are dry and they are followed by a good summer then navigation in to Lough Allen will not be possible at some stage during the summer/autumn period. We have not had those set of conditions yet since the reopening of navigation. But they will occur.

During flood conditions, when Lough Allen reaches its upper level the sluices are set to discharge any excess water above this level. No further control is exercised and the level reached in the lake is a matter of the magnitude of the inflows to the lake and of course the outflow.



The Lough Allen Water Levels chart shows the variation in water level for 2001 and 2002 to date. You will remember that 2001 was a reasonably dry year (without much sunshine) and 2002 has sort of ensured that there will be no lack of water in the nation's reservoirs!

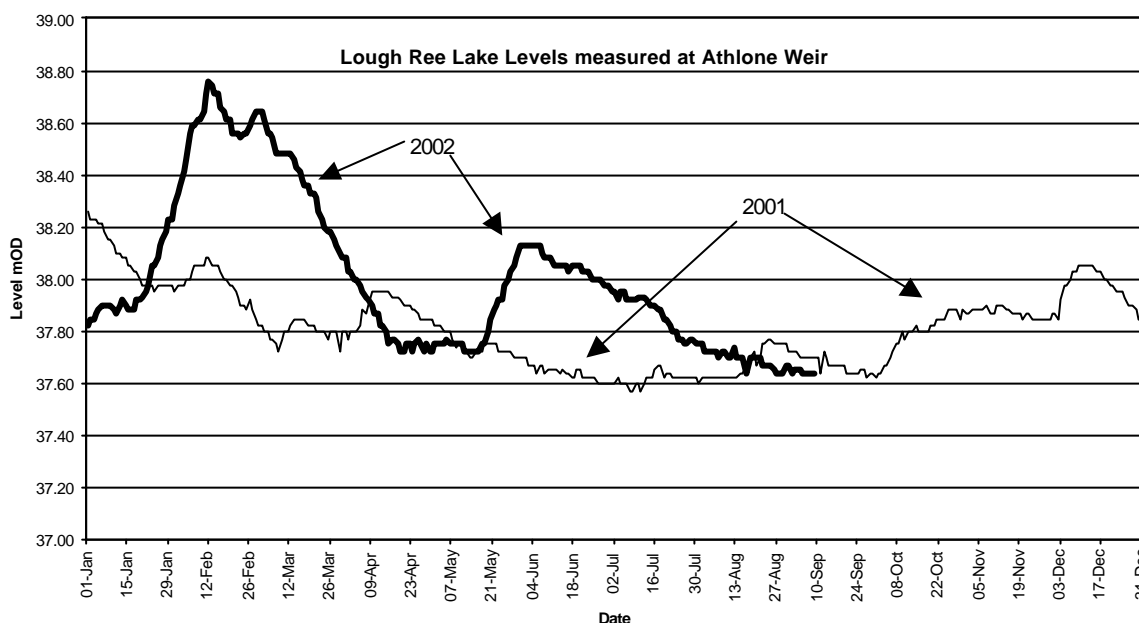
Lough Allen to Lough Ree outlet

Waterways Ireland control the River Shannon water level/depth for navigation by weirs with sluices at Jamestown, Roosky and Tarmonbarry. At each location sluices are opened or closed to maintain an identified level. During flood conditions all sluices are open.

A navigational weir controls the water level in and discharges from Lough Ree with sluices at Athlone. The weir was installed for navigation purposes in the mid-nineteenth century and the sluices were added in the 1880s to control river flows during low flow conditions. Waterways Ireland staff, on instructions from ESB at Ardnacrusha, operate the sluices.

The minimum navigation level in Lough Ree is 36.88m OD. However, ESB has agreed that it would endeavour to restrict the drawdown of Lough Ree to 37.49m OD until mid August and to 37.19m OD until mid October. Should circumstances permit, ESB would endeavour to lower Lough Ree below that level after mid-October to provide flood storage capacity in the lake. This very seldom occurs and has no significant impact on flooding in the Shannon.

The sluices in the weir at Athlone are only opened when the lake level drops near the crest level of the weir, ie 37.4m OD. Prior to that stage the level of Lough Ree depends on the inflow to the lake as no control is exercised: water flows naturally over the weir. The standing instructions are that, when the lake level reaches 37.49m OD, two sluices should be kept open 0.91m each in order to maintain a flow to keep the river fresh. There is a proviso that, if the level downstream of the weir reaches 36.12m OD during the period April to mid-October, then all sluices are closed.



It is interesting to note that the sluices at Athlone have not been opened since 1998 but it looks as though they may be opened this month (September 2002) if rainfall amounts continue to be low. Readers will remember that 2001 was a dry year and 2002 a wet year! However, it has been relatively dry for the last number of weeks and it looks as though the water levels downstream of Athlone Weir will permit opening of the sluices. This will enable ESB to lower the level in Lough Ree to increase its storage capacity before the onset of Autumn/Winter rains.

The nature of the operations at Athlone mean that during flood conditions no control is exercised or is possible by any agency on the water levels.

Lough Ree to Meelick Weir

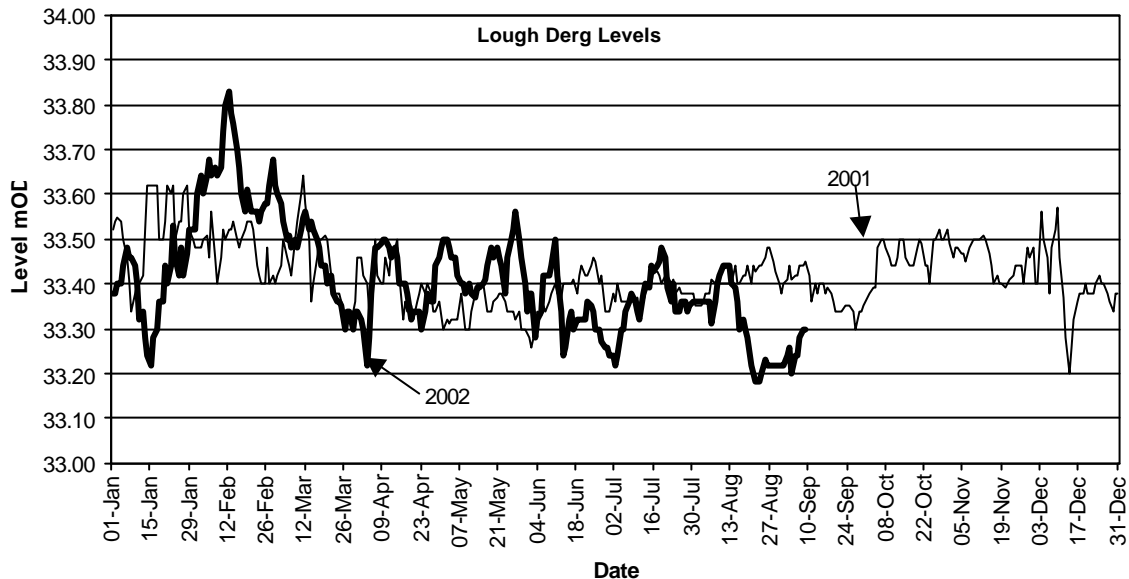
Waterways Ireland have two sets of sluices at Meelick, one on the main river channel at Keelogue Weir consisting of 12 sluices and the other at Marlborough, otherwise the "New Cut", consisting of 18 sluices. The opening regime for the sluices is as the other sluices on the navigation system. Weir boards are placed in position to maintain navigation depth upstream of the weir. As flows increase the weir boards are gradually removed. If the water level exceeds 35.42m OD all the sluices are opened.

Again, as in other areas on the Shannon this far, no control is exercised, or indeed is possible, on the levels reached during flood conditions.

Meelick Weir to Parteen Weir and Ardnacrusha

The level in Lough Derg and the River Shannon from Lough Derg to Parteen Weir is managed by ESB by the use of the water to generate electricity at Ardnacrusha and, if required, opening of sluices at Parteen Weir. A minimum flow of $10\text{m}^3/\text{s}$ must at all times be discharged down the Shannon River below Parteen Weir. Ardnacrusha Station can discharge up to $400\text{m}^3/\text{sec}$ through the turbines when on full output.

ESB agreed to endeavour to maintain a minimum level to facilitate navigation of 32.80m OD, although the statutory low water level is 0.8m lower. The upper limit is 33.56m OD. Except in very dry years, no difficulties are experienced in maintaining the level above the lower limit.



The level is managed outside flood conditions by daily calculating the inflows to, and the outflows from, the lake and translating the difference into the megawatt-hours of generation of electricity required to maintain, raise or lower the lake level. ESB's National Control Centre is then given that megawatt-hour target for the day. That target can frequently be zero as, during periods of low flow, the inflows might not be sufficient to maintain the lake level or the lake level may be being raised in anticipation of a period of forecast very good weather.

Unlike all other locations, significant control exists at Parteen Weir on the level reached by Lough Derg during flood conditions. On the approach of a flood, when the water level in the lake reaches 33.40m OD, the four turbine generators at Ardnacrusha are put on full output. When Lough Derg reaches its upper limit and the inflows to Lough Derg are greater than the throughput of Ardnacrusha, ESB opens sluice gates at Parteen Weir to release excess water. This water is spilled down the Shannon River downstream of Parteen Weir. Due to the restriction in the channel at Killaloe it is not possible to exactly match inflows and outflows at Lough Derg. Parteen Weir can discharge greater quantities of water than exit Lough Derg.

Parteen Weir and Ardnacrusha to the mouth of the Shannon

No control is exercised on water levels in this stretch of the River Shannon from Parteen Weir, and the canal from Ardnacrusha, to the mouth of the Shannon.

I hope that in the above I have satisfactorily explained where and how the Shannon water levels controlled are managed.

Over the past few years, I've pestered Bob Cullen every so often for information about Ardnacrusha, so that I could keep readers updated. He has always given it, and more than that he has always been direct and straightforward about it, something I appreciate in an era of spinners and PR flacks. On behalf of our readers I'd like to thank him for all his help and to wish him the best in the future. Brian J Goggin, Editor.

