

Duddington Mill Flow Splits

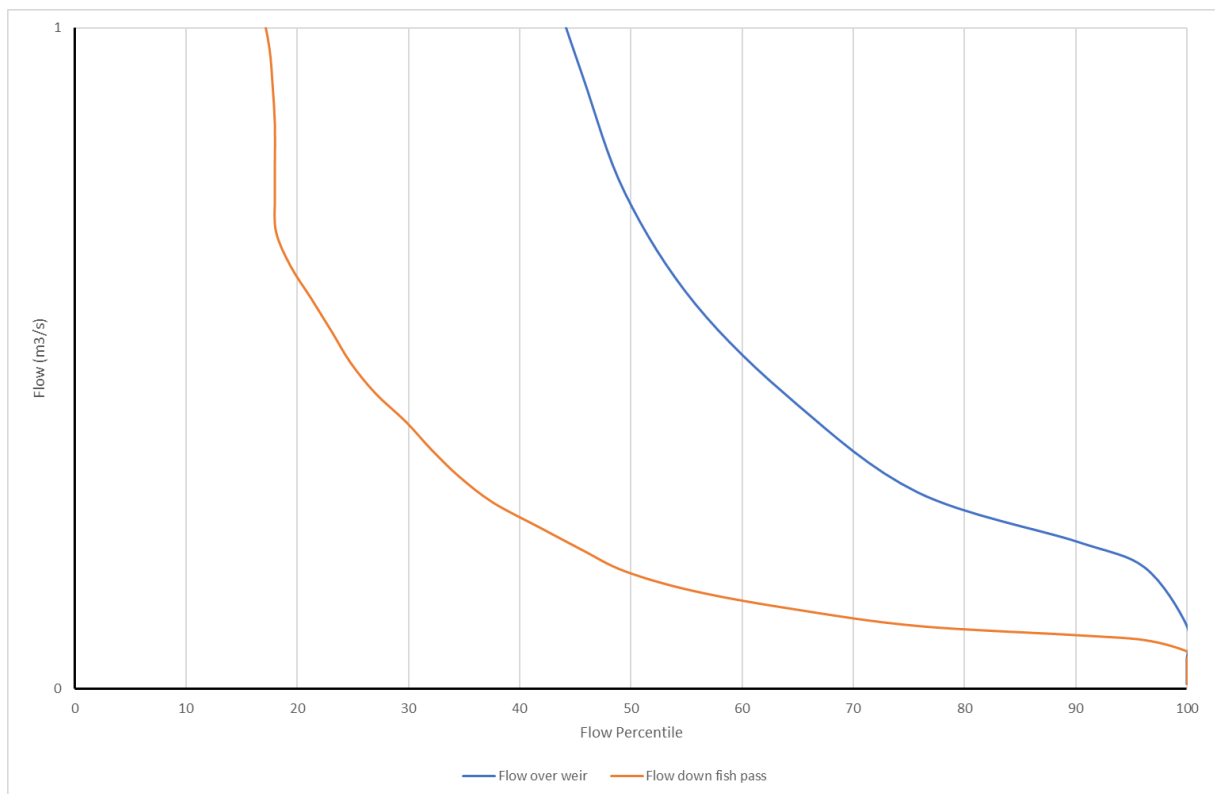
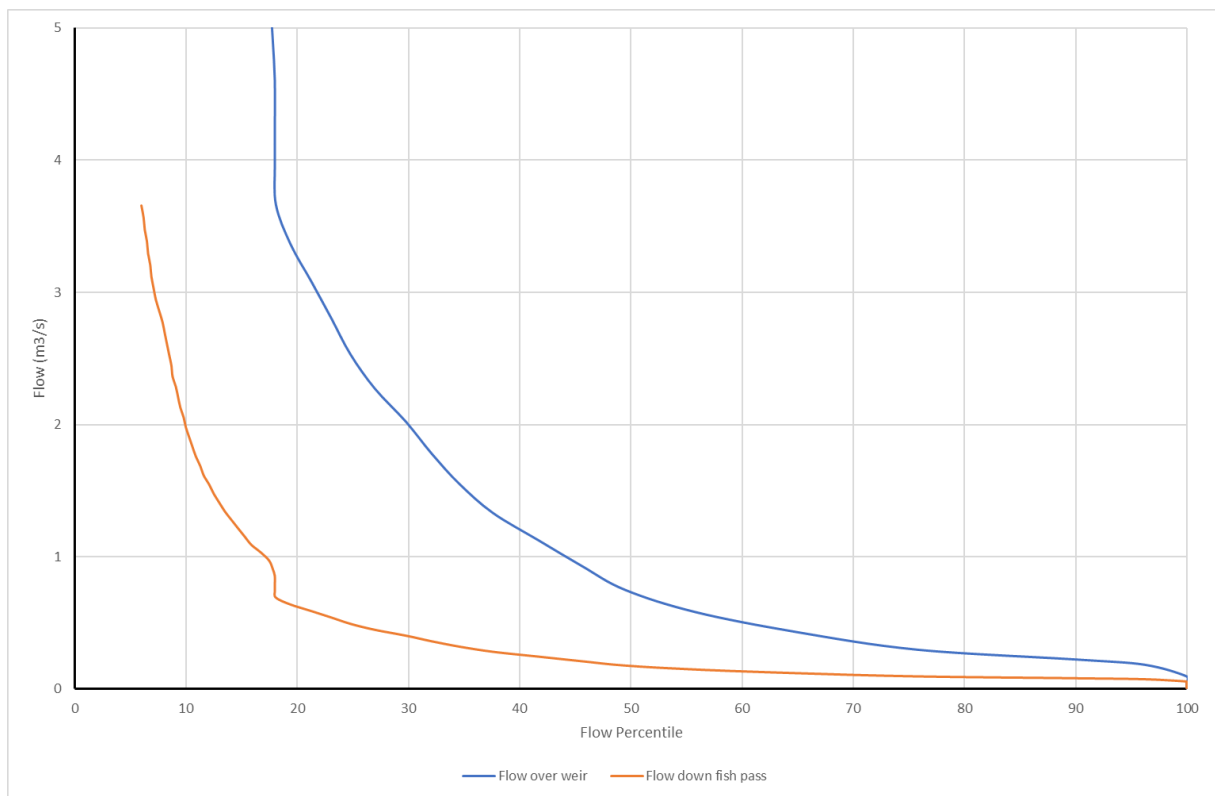
The following flow split data was derived from the 15-minute level data covering the period from June 2013 to October 2018. The spreadsheet used to calculate the flow splits has been attached for reference.

The graphs below show the flow split as-is, i.e. before the proposed hydro system is installed, with the hydro installed and a third option was to see the effect of raising the side-weir height by 50 mm and with the hydro operating. The results are also summarized in the table at the end.

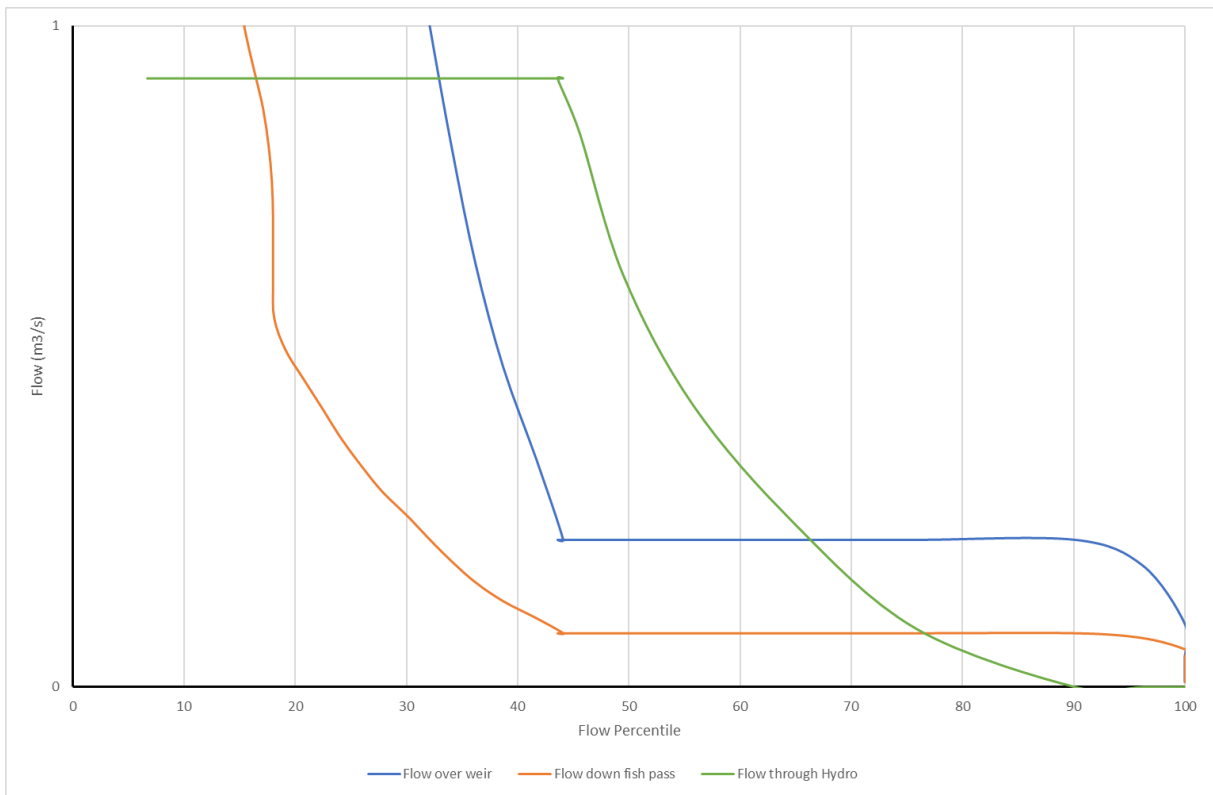
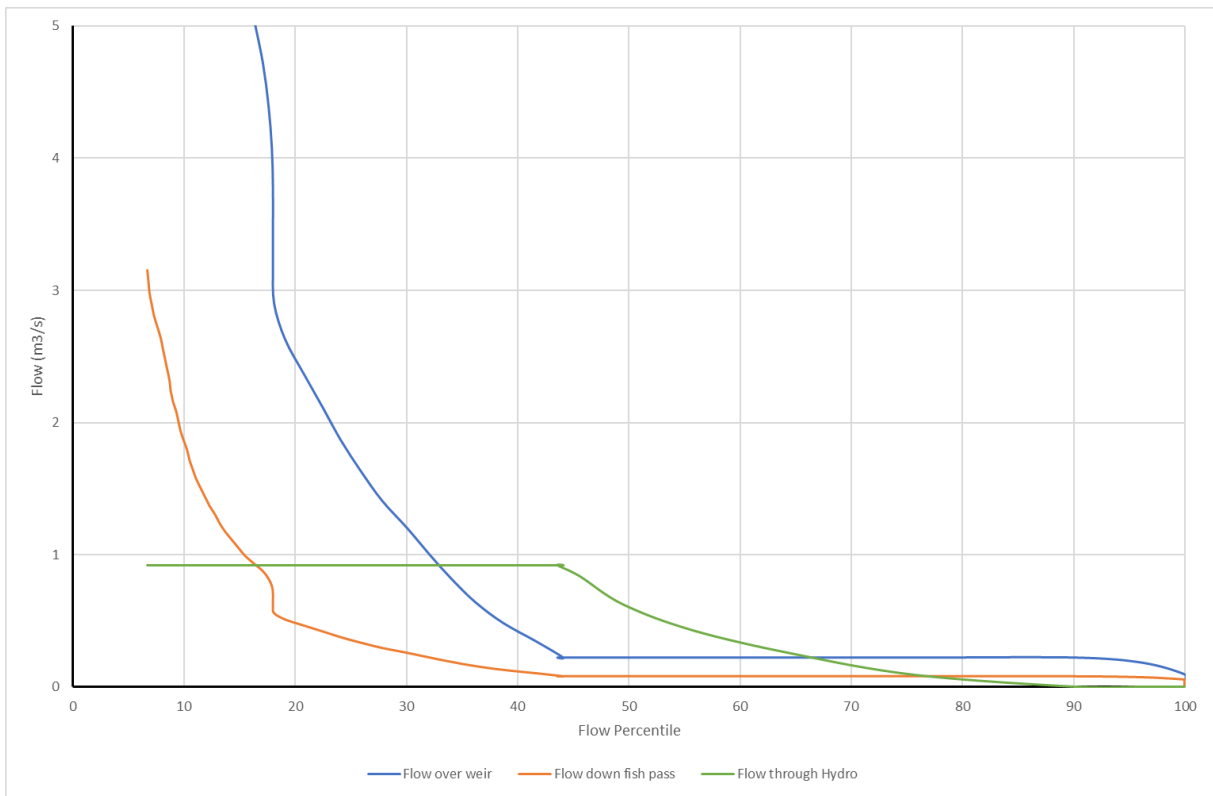
The third option of 'With hydro installed and side-weir raised by 50 mm' was included more out of interest because it looks odd how the existing weir crest and fish pass crest heights are configured at present (they are the same at 30.32 mAOD). This results in that the majority of the flow going down the side-weir and not down the fish pass. By raising the weir crest by 50 mm would make a greater flow pass down the fish pass than over the side weir at flows up to Q42 which in theory would make the fish pass more attractive to fish, and the flow over the side-weir less of a distractant flow. Such a weir modification could be relatively easily incorporated into the hydro project if this was of interest.

The control philosophy of the sluices at the mill have also been provided, but (it is believed) the reference levels provided are for the Welland gauge, so the levels cannot be related to the Duddington Mill site (this is based on the sluice opening interval beginning at 30.3 mAOD, which is below the weir and fish pass crest heights of 30.32 mAOD so is clearly not the Duddington Mill site levels). As these sluices only open during very high flows, and as there was no flow data provided above Q5 anyway (it appears as "---" in the spreadsheet, this has not been included in this analysis because it will be largely irrelevant for fish passage flow distributions because under these flow conditions there would be high flows in all of the channels.

As-is (without hydro)



With hydro installed



With hydro installed and side-weir raised by 50 mm

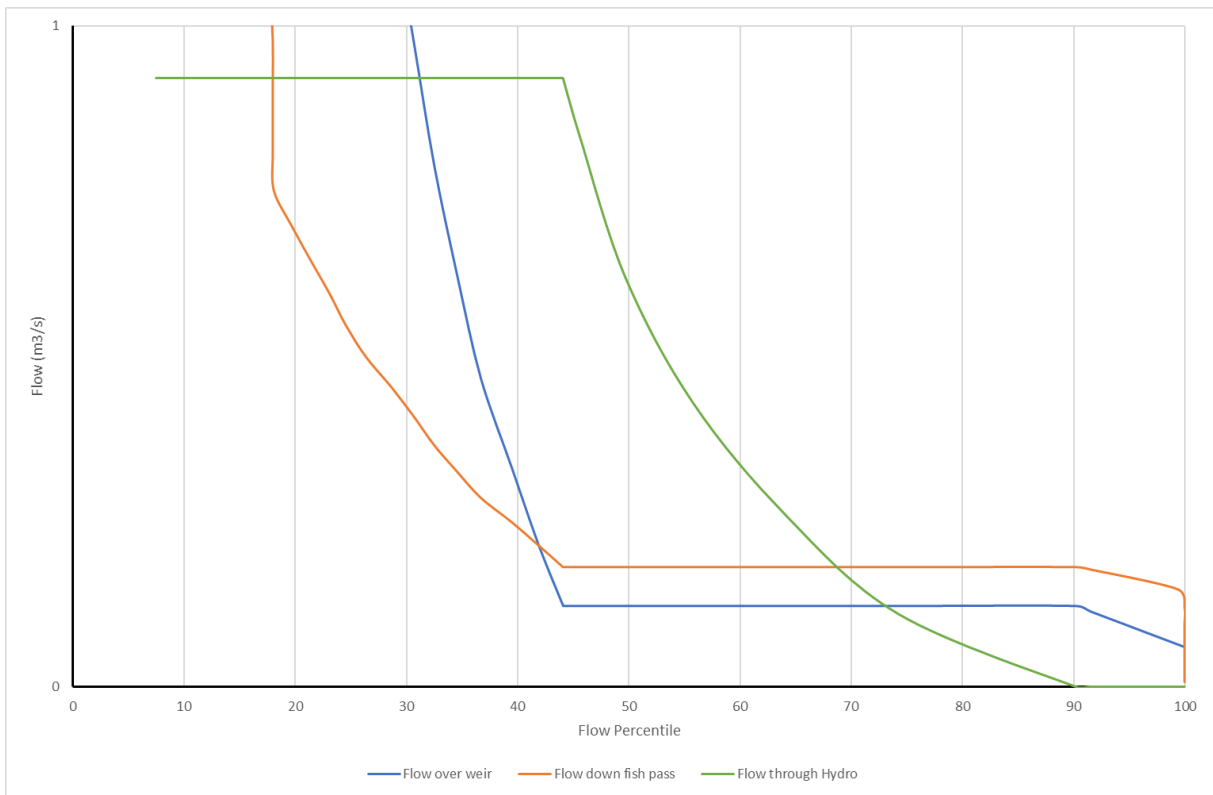
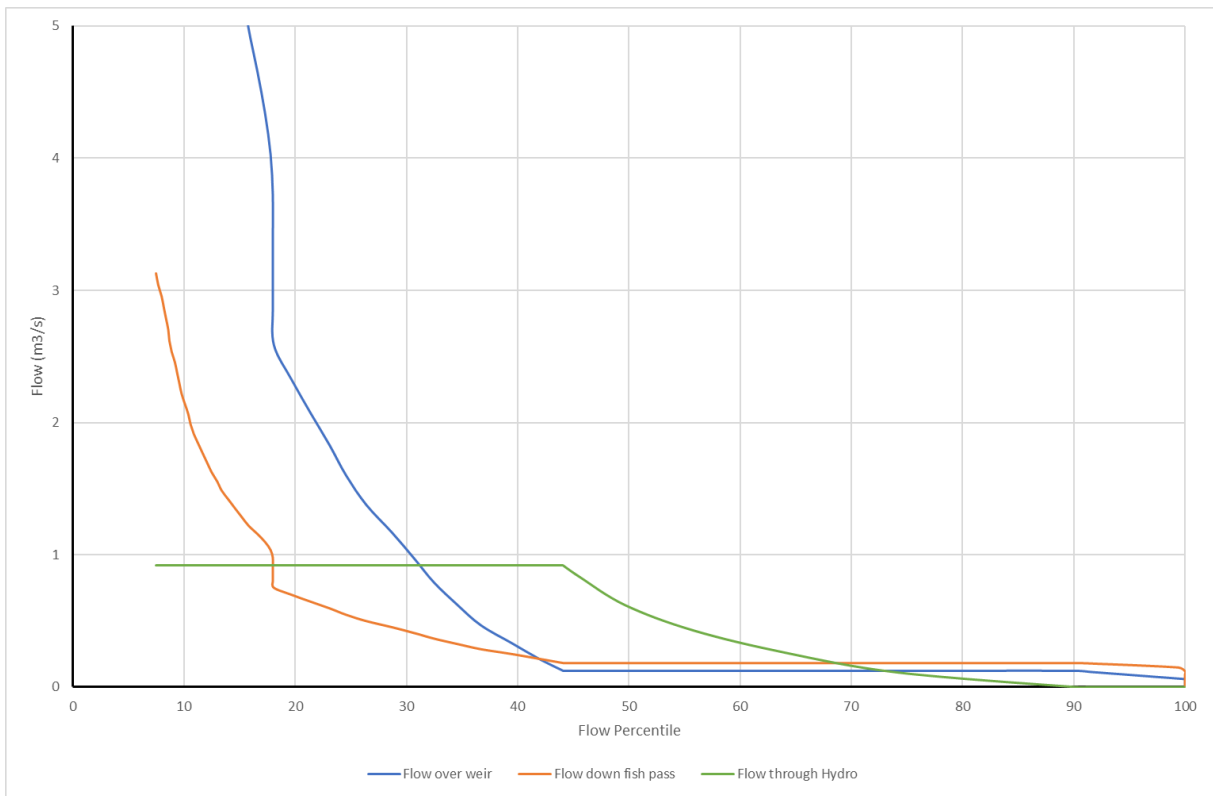


Table of results

Flow Percentile	Channel	As-is (without hydro) (m³/s)	With hydro installed (m³/s)	Hydro installed + 50 mm on weir (m³/s)
Q₂₀	Fish pass	0.619	0.479	0.684
	Weir	3.211	2.434	2.229
	Hydro	n/a	0.917	0.917
Q⁴⁰	Fish pass	0.254	0.120	0.237
	Weir	1.199	0.416	0.299
	Hydro	n/a	0.917	0.917
Q⁶⁰	Fish pass	0.136	0.082	0.183
	Weir	0.506	0.223	0.124
	Hydro	n/a	0.337	0.335
Q⁸⁰	Fish pass	0.091	0.083	0.182
	Weir	0.271	0.224	0.121
	Hydro	n/a	0.055	0.059
Q⁹⁰	Fish pass	0.083	0.083	0.182
	Weir	0.224	0.224	0.125
	Hydro	n/a	0.000	0.000
Q⁹⁵	Fish pass	0.072	0.074	0.169
	Weir	0.191	0.189	0.094
	Hydro	n/a	0.000	0.000