

Project Highlights

- Massive flooding plagued the Northampton villages
- An upstream reservoir was built to capture and retain flood flows
- A 7ft diameter C-type Reg-U-Flo Vortex Valve was selected as the outlet flow control instead of an orifice or a slide gate
- The Reg-U-Flo Vortex Valve reduced the 1-in-3-year reservoir footprint by 66% as compared to a conventional orifice outlet

Vortex Flow Control Outlet on Dam Prevents Flooding, Saves Farmland



Flooding in the villages around Weedon disrupted 45 business and residential properties



The most viable flood prevention option was to create a dammed retention reservoir upstream of the town center on agricultural property.

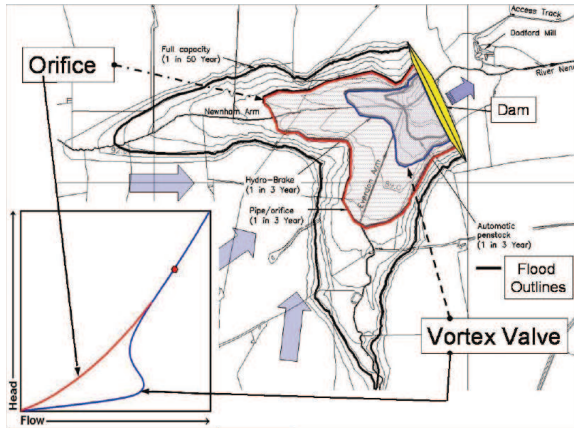
In 1998 the scenic Northampton villages around Weedon, England, in the upper River Nene valley suffered disastrous flooding due to an exceptionally wet season, with more than three times the average rainfall. A total of 45 business and residential properties were flooded, with another 95 properties at risk. Flooding had become an increasingly prevalent issue in the area, with a chance of one major flood every three years.

To alleviate the problem and prevent future flooding, the Environment Agency (EA) and their engineering consultants evaluated two options: enlarge the conveyance channels running through the center of the village or provide stormwater storage upstream of flood-prone village. Because of space constraints around the existing channel and the increased likelihood of downstream flooding if the channel were widened, the team chose to create an emergency flood storage reservoir at a sparsely populated agricultural site upstream.

The reservoir would be created by building a dam with an outlet flow control to prevent excess stormwater flows from surging downstream and flooding the villages. The objective of the reservoir design project was to minimize the footprint, visual impact and required maintenance. Minimizing any possible adverse environmental impacts was a crucial part of the plan. The EA made an arrangement with the local farmers to allow their fields to flood behind the dam during heavy rainfall to avoid damage downstream. The outlet flow control device on the dam would be a key component in the overall design.

The design team considered a fixed orifice outlet, but the orifice would require a larger footprint because it impounds water within the reservoir even during small storm events. The team also considered a slide gate, but a manual slide gate would have required a high maintenance commitment and an automatic slide gate would have been prohibitively expensive.

Comparison of Flooded Agricultural Land Area using Various Outlet Flow Controls



A topographical comparison of the land area flooded using an orifice outlet flow control versus a Reg-U-Flo Vortex Valve outlet flow control on the Weedon Dam

Control	1 in 3 Years		1 in 50 Years	
	Level (ft AOD)	Flooded Area (acre)	Level (ft AOD)	Flooded Area (acre)
Fixed Orifice	293.9	36.11	300.9	103.26
Reg-U-Flo Vortex Valve	290.7	12.27	299.9	91.27
Savings	3.2	23.84 (66%)	1.0	11.99 (12%)

Finally, the team considered a **Reg-U-Flo® Vortex Valve** flow control designed and supplied by Hydro International. With a variable head-discharge curve, the **Reg-U-Flo** prevented the impounding of water (and flooding of farmland) during small storms, yet throttled flood-level storm flows down to an acceptable flow rate of 423 cfs during intense storm events.

The final dam design consisted of a 1476-ft long clay embankment that stands 22-ft high. The culvert on the line of the original river channel conveys the discharge through the reservoir and out the dam. A 7.2 ton, 7-ft diameter C-type **Reg-U-Flo Vortex Valve** sits affixed over the outlet. The area around the dam is landscaped to minimize the visual impact of the structure.

The use of the **Reg-U-Flo Vortex Valve** at the inlet to the culvert provided a controlled maximum design flow of up to 423 cfs of water despite a fluctuating head. The opening characteristics of the **Reg-U-Flo Vortex Valve** allow for a dramatic 66% reduction in land for the 1 in 3 year storm as compared to the land take that an orifice would have required.

Because the **Reg-U-Flo Vortex Valve** achieves maximum design discharge rates at lower heads than conventional flow controls, the effect of reservoir ponding on agricultural land is minimized. The cost of the system was also significantly less because unlike an automatic penstock, the **Reg-U-Flo Vortex Valve** is self-activating with no moving parts and no power requirements.



The 7-ft "C-Type" Reg-U-Flo Vortex Valve Rated at 423 cfs has been preventing flooding in Weedon Bec since 2004