

Cowdenbeath

Aerated saturated vertical flow: Combined sewer overflow



Project

Cowdenbeath,
Scottish Water

Location

Cowdenbeath, Fife

Project type

New build

Wastewater type

Combined sewer overflow

Completion date

March 2014

Treatment

Aerated vertical flow

Need

A major Scottish Water infrastructure development was undertaken in Cowdenbeath including the construction of two new Combined Sewer Overflows (CSOs) which collected additional surface water from within the town. Historically, waste water from Cowdenbeath had been treated at a Waste Water Treatment Works (WWTW) on the south-east edge of the town discharging into the Lochgelly Burn. As the town expanded this WWTW became undersized and was converted to a pumping station passing flows forward to a larger works at Glenrothes. A holding tank of 1200m³ was retained for this purpose. The increased flows generated by the new CSOs, totalling 229,700 m³/annum, could not be managed by the pumping station or holding tank so a new treatment facility was required at the site to attenuate and treat the intermittent CSO flows prior to discharge into the Lochgelly Burn.

Scottish Water did not want to re-establish a full WWTW on the site and were therefore looking

	Flows	BOD	Total NH4	Unionised NH4
Loads	3000 m ³ /day	16,429 Kg/yr	625 Kg/yr	-
Consents	-	9.0 mg/l	1.5 mg N/l	0.04 mg N/l

for a low maintenance treatment solution which could handle intermittent flows and discharge, within consent, into the Lochgelly Burn. Modelled CSO flow and load data was provided for a nine year period and provided a basis from which to generate design parameters. These are summarised above.



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Solution

The proposed site for the treatment solution was to the east of the pumping station on an old landfill site which covered mine workings. This meant that significant project costs would be linked to ground remediation thus minimising the size of the treatment solution would be critical. Consequently an aerated vertical flow reed bed was the selected solution as this provides a high treatment capacity per unit area thus minimising the total land take. This was enhanced by making the bed much deeper than standard systems reducing the required treatment area further.

The data set was converted into cumulative summaries which determined that achieving complete treatment would not be cost effective as taking into account the highest flow outliers would greatly increase the size of the treatment area. The optimum treatment capability was concluded to be 79% of the annual BOD load, providing 95% overall compliance, and 100% of the ammonia load. The design solution was a two metre deep bed with a 4,000 m² process area which could treat 4000 m³/d.

Flows are fed forward to the bed at a maximum rate of 46 l/s from a 3000 m³ holding tank. On the occasions where flow rates exceed the storage capacity flows will spill to the Lochgelly burn on the basis that they these will be rare events and the CSO will be significantly diluted.

Benefits

The aerated reed bed system has provided Scottish Water with an effective low maintenance treatment solution at Cowdenbeath avoiding the need to construct a new WWTW to handle the significantly increased flow of waste water generated by the new CSOs in Cowdenbeath. Compared to the alternatives the system has a lower TOTEX and aesthetically and ecologically enhances the landfill site.