Storm Tank Optimisation
Southern Water
Portsmouth

Introduction

During periods of heavy rainfall, Eastney Sewage Pumping Station diverts flow to the Fort Cumberland Storm Tank. During the first flush, the solids content of the flow is higher than normal, which overloads 6mm band screens located upstream of the Storm Tank. In order to help separate a greater quantity of solids from the flow and enable the screens to work as intended, it was proposed that the storm tank receives the flow and provides a residence time for solids to settle. The concept involved the storm tank being divided into four tanks, where the flow would pass from one tank to the other through openings in the dividing walls, as shown in Figure 1.

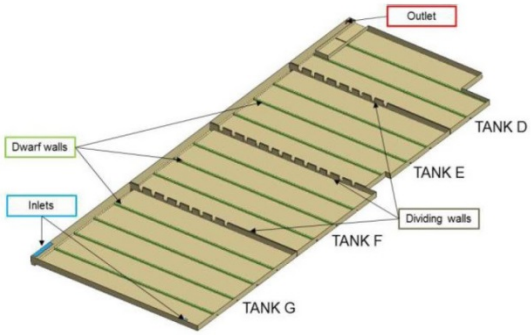

Figure 1: The geometric representation of the Fort Cumberland

To determine the optimum configuration, three opening arrangements within the dividing walls were investigated:

- Low level openings (0.6 m from the tank floor)
- Medium level openings (approx. 1.5 m from the tank floor)
- High level openings (approx. 2.5 m from the tank floor)

Modelling the Flow

Transient calculations approximating a worst case storm event were undertaken. To represent the solids, the transport of 10 particle size groups were solved with 5 size classes representing grit particles, 4 representing tissue and 1 representing floatable material.

Results

It was found that the distribution of solids within the tank was similar for the 'low' and 'medium' level openings. The high level openings were found to be most effective, as these retained a greater percentage of the solids in the first two tanks. This is demonstrated in Figure 2, which shows the distribution of settled solids. It was also found that with dip plates located on the upstream side of the openings, almost 100% of floatable material was retained within the first two tanks, compared to approximately 45% without dip plates.

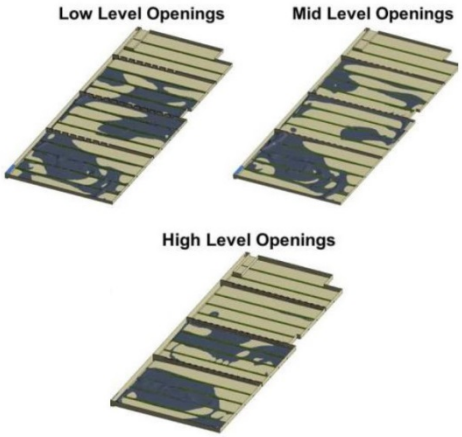

Figure 2: The distribution of settled solids within the tanks

Value Added

The use of Computational Fluid Dynamics (CFD) enabled the storm tank concept to be assessed much faster and at a lower expense (compared to the commissioning physical models).

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