# MODELLING ELTHAM ROAD PUMPING STATION

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## INTRODUCTION

The Eltham Road Pumping Station is the ultimate station that serves the West Bridgford area on the outskirts of Nottingham. The area is served by a separate surface-water (gravity) sewer system and by a partially combined foul sewer system with flows pumped by the Eltham Road Pumping Station to the Stoke Bardolph Water Reclamation Works.

The catchment is steeply sloping in the southern part and very flat in the northern part where it borders onto the River Trent. The sewers in the northern part are generally to flat gradients.

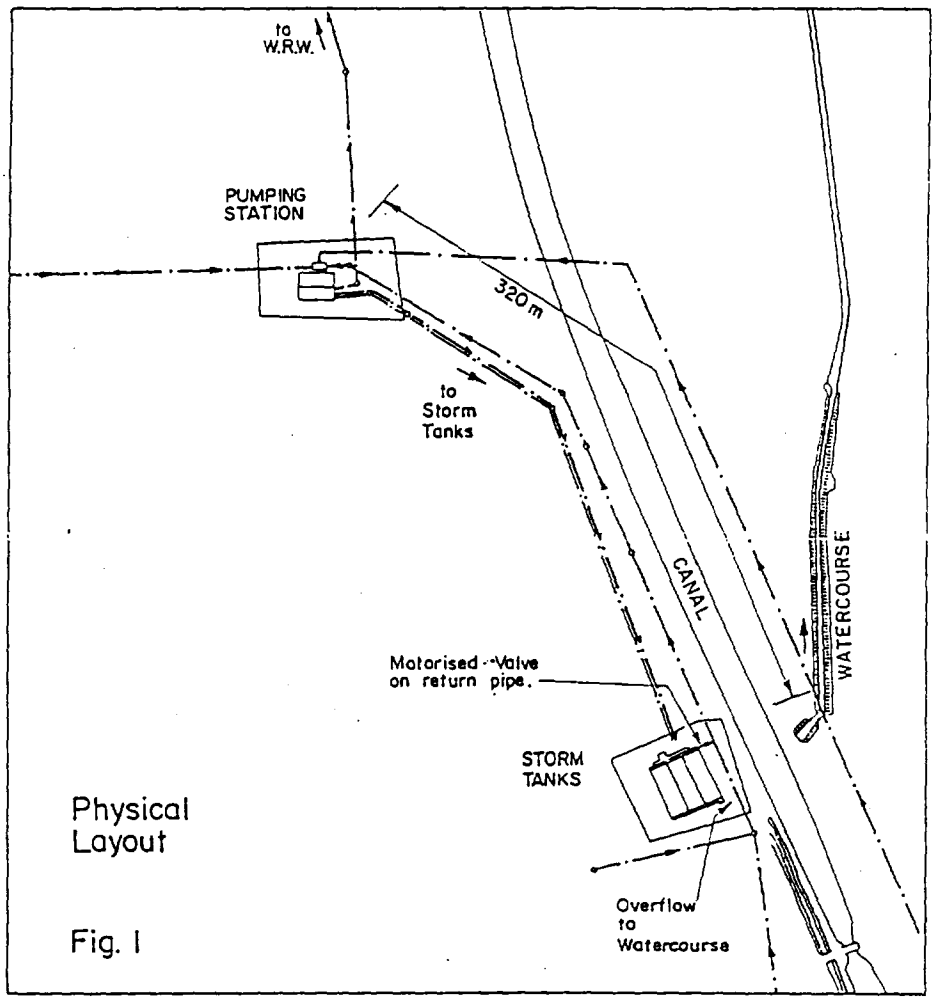
## PHYSICAL INSTALLATION

The Eltham Road Pumping Station comprises 3 wet wells (1 duty and 2 storm) and a dry well housing a total of 5 pumps (2 duty, 2 small storm and 1 large storm).

Flows enter the storm wells via a screening/overflow structure immediately adjacent to the wet wells.

The operating system at the station only allows 1 duty pump and 1 storm pump to operate at any given time.

The duty pumps discharge via a 3km pumping main to the WRW whilst the storm pumps discharge to reinforced concrete storm tanks of 1136m³ capacity located approximately 320m from the station and approximately 12m higher than the wet well invert levels. The return flow from the storm tanks is via one of the main sewers discharging to the station. The release of return flows are controlled by a motorised valve which operates automatically by sensing the level in the duty wet well at the pumping station (see Figure 1).




## INSTRUMENTATION

As part of the short term flow survey for the study of the West Bridgford drainage area, pumping tests were carried out to establish the pumping rates and start/stop levels of all the pumps. In addition, the 3 wet wells and the storm tanks were fitted with depth monitors and the 5 pumps were fitted with on/off sensors.

## MODELLING OBJECTIVES

The installed pumping capacity at the station was known to be less than the capacity of the upstream sewers and it was therefore considered that there maybe significant backwater effects. It was also known that the storm tanks remained partially full for significant periods and that on occasions the storm pumps operated on dry days.

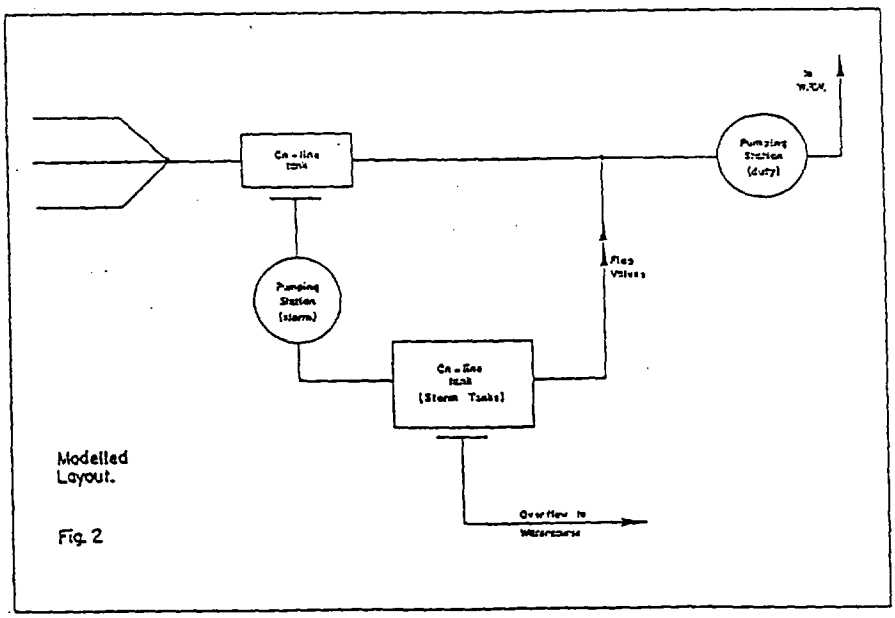
It was considered therefore that the installation, including the reverse flow aspect, should be modelled as accurately as possible.

## WASSP OR WALLRUS

In view of the backwater effects, it was considered essential that the WALLRUS program was used. In addition, the facility to input a diurnal dry-weather hydrograph was found to be extremely useful.

## MODELLED ARRANGEMENT

After several attempts with alternatives, the arrangement shown in Figure 2 was adopted.



Modelled Layout.

Fig. 2

The operation of the overflow structure at the station was simulated by the first on-line tank with the overflow triggered by the backwater effect of the duty pumps not being able to discharge the incoming flows. The further backwater effects on the sewer network due to the inadequacy of the storm pumps was also simulated with a backwater effect in the model across the overflow weir.

The operation of the storm pumps was simulated by a 2 pump pumping station on a duty/assist basis with the "assist" pump being the difference in capacity between the small and large storm pumps.

The operation of the motorised valve was simulated by a flap valve and adjusting the elevation of the storm tanks such that the water level in the duty pumping station (surcharge level in pipes) controlled the opening/closing of the flap valve. The volume of the storm tanks and their overflow was modelled correctly but the plan area was increased and the depth was reduced so that the water level in the storm tanks did not open the flap valve during storm periods.

## CONCLUSIONS

It is important that the correct hydraulic operation or regime is maintained when using WASSP or WALLRUS. This paper serves to illustrate how this can be achieved even though the model appears to have little similarity with the physical installation.