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MODELLING LARGE INDUSTRIAL DRAINAGE SYSTEMS

By

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Synopsis

Large industrial drainage systems are usually characterised by two distinct drainage systems:-

- (a) An **effluent system** which caters for contaminated liquids from the manufacturing processes, 'domestic' sewage and rainfall-runoff from areas of potential contamination.
- (b) A **clearwater system** which carries uncontaminated water from the site. This includes rainfall run-off from non-contaminated areas.

Bullen and Partners have recently completed WALLRUS models of two large chemical works for a major international company. Modelling of such systems required detailed survey of the dry weather flows within the system and analysis of the joint probability of plant discharges and rainfall events. Also, because of the highly corrosive nature of the flow, a different approach to the flow verification survey was necessary in order to apportion risk fairly between the client and contractor.

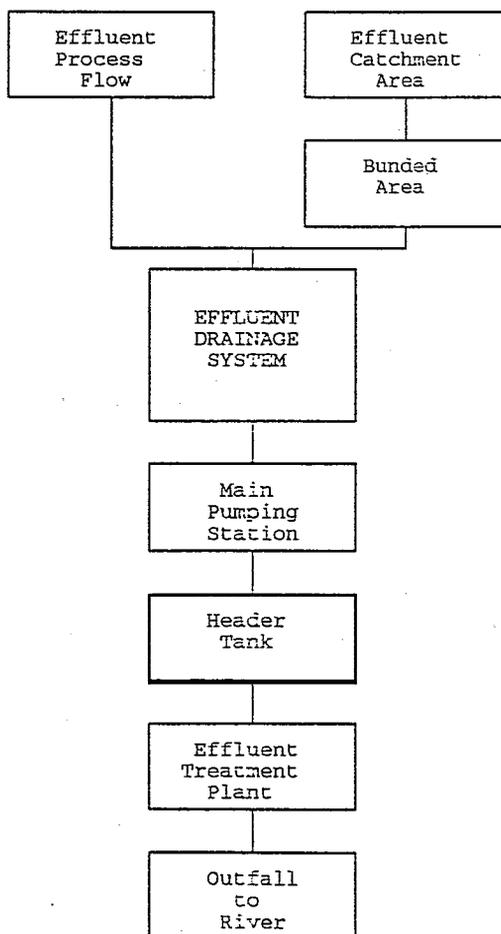
The mathematical models have been developed for use as part of a new drainage strategy and have been fully integrated into the company's computerised drawing and asset management systems. The model has also proved useful in other areas, including :-

- (a) Calculation of the additional pumping requirements and/or increased flooding risk if the proportion of the sites draining to the effluent system is increased.

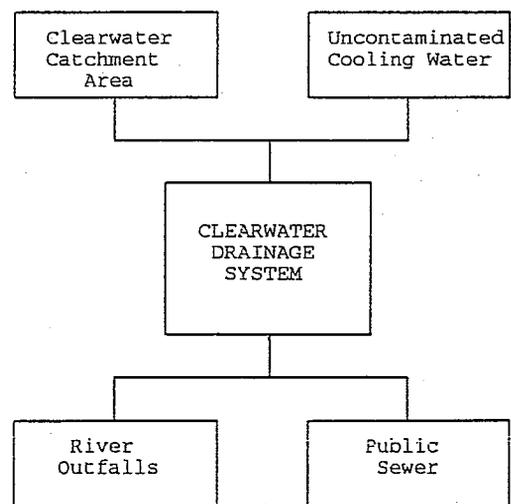
- (b) Estimation of the effects on hydraulic capacity of limestone chippings being washed into the system from certain process areas. This was achieved by using the option in WALLRUS for including the depth of sediment in the invert of the modelled pipes, and by adjusting pipe roughness.
- (c) Estimation of average flow travel times from various site locations, both during dry weather and storm conditions. The results from the model were compared against those from radioactive tracer tests to establish the magnitude of dilution and diffusion effects on spilt chemicals. This information has been used by the client in the contingency planning for spillage incidents.
- (d) Study of the possibility of surcharging the main spine sewers in order to prevent the migration of solvent vapour through the drains.

Schematic Plan of a Typical Works Drainage System

(a) Effluent system



(b) Clearwater system



Mini-Paper 4: Modelling Large Industrial Sewer Systems
J.R. Benn- Bullen & Partners

D Beale (Howard Humphries) : Our findings on a similar study were that fire prevention requirements dominated the design.

Ans : This aspect was not included in our brief, but we did have to consider it.

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A delegate : Were the high temperatures particularly arduous to the monitors?

Ans : No undue problems, we were more concerned with the chemical resistance.