

## Version 7 Hydraulic Analysis Features

### Next-Generation Software for Storm and Sanitary Sewer Modeling

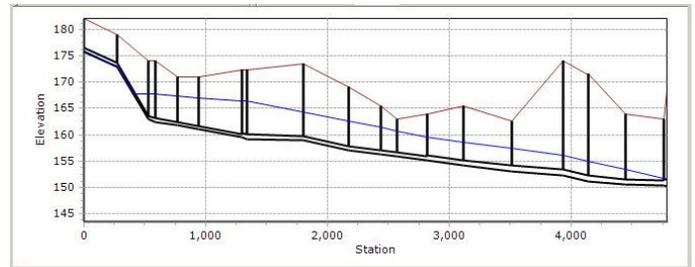
In 1973 Hydra® software by Pizer Incorporated of Seattle, Washington became the first commercially available sewer modeling software in the United States. The hydraulic analysis features have been in continuous development and are unmatched in many core features. Hydra's unique **Design-Solution Approach™** to hydraulic analysis can have remarkable advantages that are not always fully comprehended by engineers who are accustomed to the dynamic wave approach commonly used by other models. Here are just a few:

#### Very Fast Analysis

Hydra's hydraulic analysis is very fast. In practice, this means Hydra is able to analyze tens of thousands of pipes together in one analysis session in minutes. Hydra's speed and size capability is an advantage for several reasons. It enables the municipality to model every pipe in the system in accordance with the principles of CMOM regulations (There is typically 1 pipe for every 10 people served by the sewer). The municipality can use the same data set for hydraulic analysis that is used for system maintenance. On large sanitary sewer projects, modeling every pipe in the system is important. Rainfall often has a big impact on the system flows, and it is critical to take into account that rainfall is not uniform over the basin. Also, the accuracy and shape of the hydrographs as they move through the collection system is a critical component of a model, as it will have a huge impact on the analysis, evaluation and design solutions.

#### Superior Design Capability

Hydra's analysis approach is inherently superior for design of new laterals and by-passes. The analysis process used by other programs makes the design of proposed pipe a tedious "trial and error" process. But Hydra is able to select and modify the diameters and invert elevations to optimize the design during analysis. This difference alone saves countless hours and project costs.



#### Accurate Head Losses

Often overlooked when evaluating the accuracy of hydraulic calculations, head losses at manholes is very important because losses in manholes have a significant impact on the hydraulic grade line. Hydra uses an empirical approach based on American Society of Civil Engineers field research for drop and bend losses, resulting in more sensitivity to surcharging than other models.

#### Solutions for Overflow Problems

Hydra takes a unique approach to the problem of overflows. Unless you indicate otherwise, it assumes that overflows are not an acceptable design solution. It flags the problem, and then re-injects this flow back into the system. This approach allows a single analysis to detect all system overloads as well as pipes that exceed the desired d/D's. For pipes, it flags the problem, and returns three possible solutions – the quantity to remove, the size of the replacement pipe, and the diameter of a parallel pipe. These may not be the final design solution, but are extremely useful in the process of finalizing the solution. For example, if you scan the downstream proposed removal suggestions, pick the largest and go upstream of the first point of overload and insert a bypass with a side-flow weir, and divert that flow to a new lateral – all problems solved! Hydra's results will allow you to re-inject the removed flow downstream of the last point of overload. With this process of identifying problem areas, a solution is possible using Hydra's **Design-Solution Approach™** after only one analysis run.

#### Analysis Results

Each time you run analysis, every entity in the collection system is represented in the results, and the results are complete. Each type of flow (sanitary, stormwater, infiltration, inflow) is quantified, average flow, velocity, time in entity and upstream area and population can be counted. A variety of water surface and HGL elevations are reported, as well as a variety of capacity calculations including new, replacement, and parallel pipes.