Overview of the
i3D Antecedent Moisture Model

The Antecedent Moisture Model (AMM)

Calibrated using flow metering data and validated with an independent data set
Automatically generates predictions without further data manipulation

Good engineering for sanitary sewer systems depends upon accurate prediction of peak flows, which is done by computer modeling. The complex paths of wet weather flows result in interaction with surface runoff, subsurface, soils, and groundwater table, which cause the flows to be highly dependent on the wetness, or antecedent moisture, of the system. A schematic depicting the manner in which wet weather flows penetrate a sanitary system is shown in Figure 1.

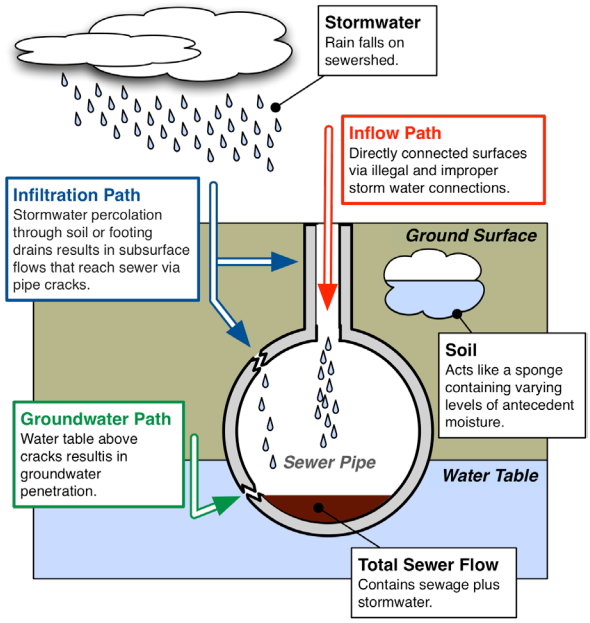

Figure 1 - I/I Flow Paths in Sanitary Sewers

Traditionally in civil engineering, wet weather effects in sewers have been analyzed using storm water techniques. However, experience shows that these techniques are inaccurate as they erroneously assume that the wetness condition of the system is static and predetermined. **The i3D Antecedent Moisture (AM) Model accounts for the effects of this constantly changing wetness condition, making it an order of magnitude more accurate** than existing approaches. Unlike storm water event models, which simulate a single storm under presumed static antecedent moisture conditions, the i3D AM model is a continuous model that simulates multiple storms over many years, and under varying antecedent moisture conditions.

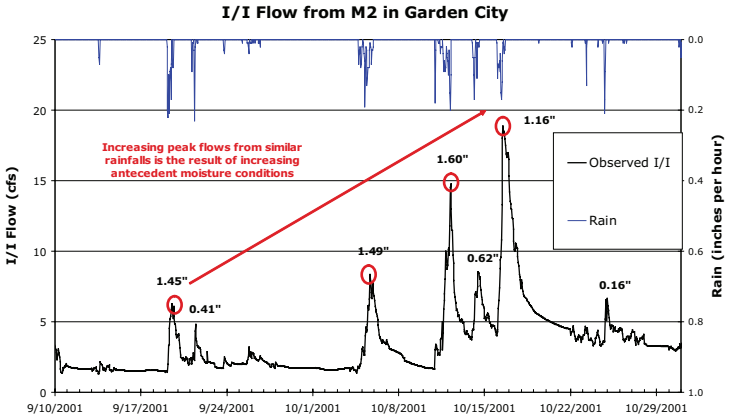

Figure 2 - Antecedent Moisture Effects

Figure 2 demonstrates the antecedent moisture effects for several storms that occurred in a five week period. Note that the four storms circled in red had similar rainfalls, and yet the system response increases for subsequent storms as the antecedent moisture conditions increase. This demonstrates the impacts of antecedent moisture.

The i3D technology utilizes a modeling approach called system identification from within the field of control systems in aerospace engineering. The i3D methodology relies on input-output data to identify parameters within the AM model. Models that represent a given sewershed are identified utilizing rainfall, temperature, and flow measurements. Once the model parameters are identified, the resulting model is then used in simulation to understand how the system will respond to various storm events and wetness conditions. **This approach eliminates overly conservative recommendations,** affording stakeholders the ability to make scientifically justifiable decisions without relying solely on modeler judgment in the process. The i3D AM Model schematic is shown in Figure 3.

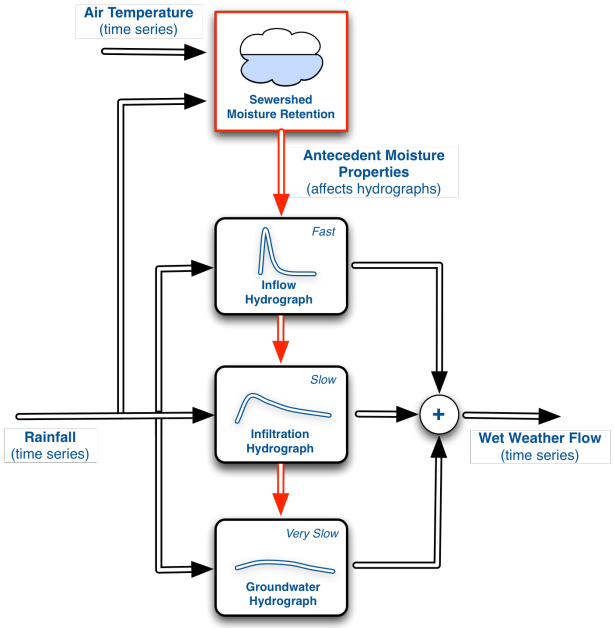

Figure 3 - i3D AM Model Schematic

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