

GIS Improves Stormwater Management

GIS has evolutionary qualities that enable it to continually improve stormwater management.

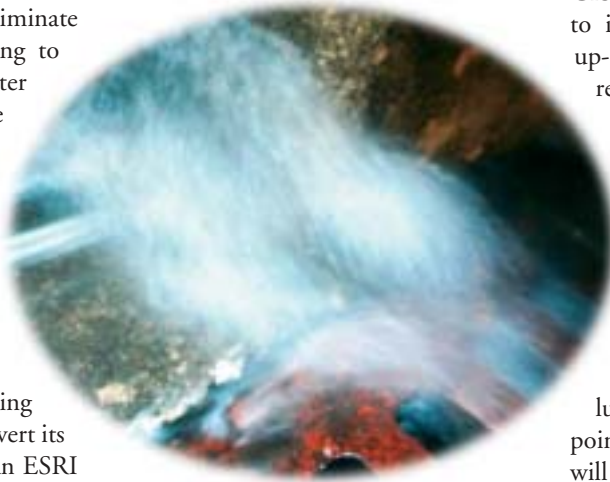
By David Haines

In the evolution of storm sewer management, GIS has become an invaluable tool. New Berlin, WI (population 38,820) is using GIS as an important element of its stormwater management efforts, including the required extension of the city's MS4 (Municipal Separate Storm Sewer System) permit. According to Eric Nitschke, P.E., division engineer, stormwater, of the engineering division of New Berlin, "Our stormwater GIS will be a very important tool in providing the municipality with increased management over the quality of its water, helping to detect and eliminate illicit discharge, and also helping to control the quantity of stormwater runoff. In our opinion, more stringent regulation is one good reason municipalities of all sizes should consider using GIS as part of their stormwater infrastructure. Equally important is the quality of life it assures as a result of improved stormwater management."

The immediate goal for creating a GIS for New Berlin was to convert its entire storm sewer system into an ESRI (www.esri.com) geodatabase format and integrate it with Cartégraph's (www.cartegraph.com) STORMview™ assets management application. This conversion would be similar to the city's recent sanitary sewer system conversion into GIS and Cartégraph, which was also produced by R. A. Smith & Associates, Inc. (www.rasmith.com).

In New Berlin, about half of the city's storm sewer system is ditch and culvert, while the other half is storm sewer. In

total, the mapping conversion included 75 miles of storm sewer main from 280 as-built drawings. In many cases, especially in older areas of the city, there were no storm sewer as-built drawings available. Some of the information had to be gathered from sanitary water and sewer as-built drawings. Even so, city staff estimated that there were no records for about 30 percent of the storm sewer system. A comprehensive stormwater GIS will make it easier for city staff to "fill in the gaps" through onsite review and field verification of the storm sewer system.



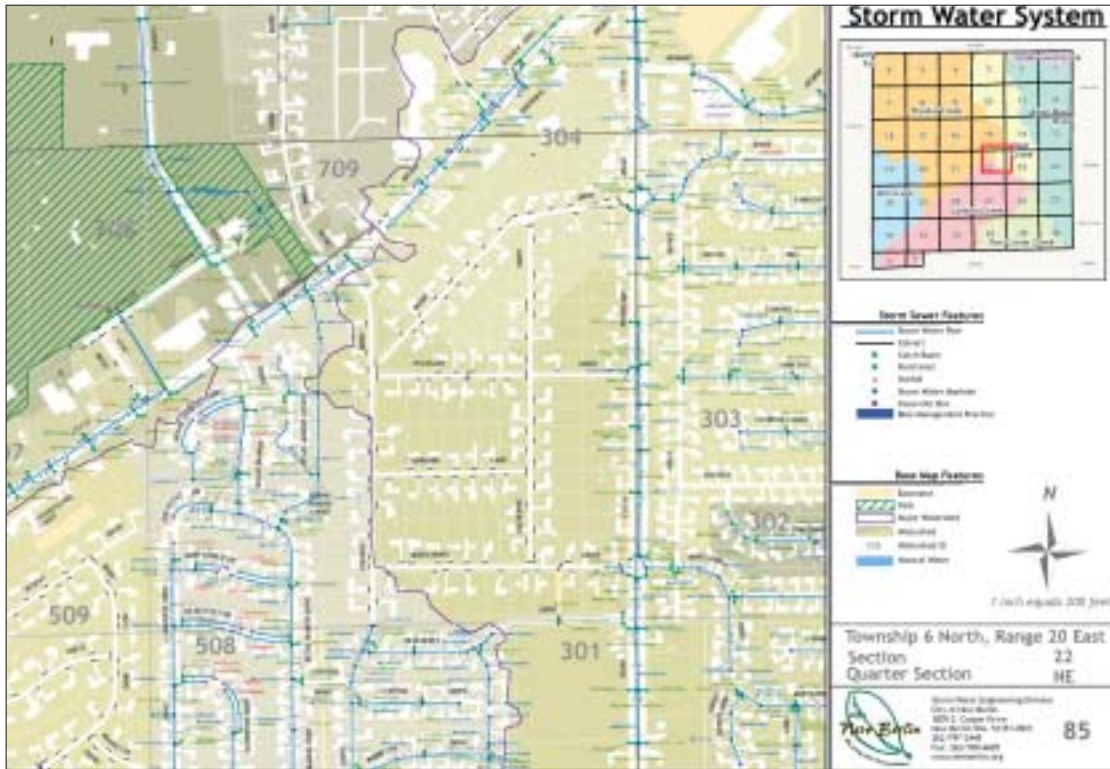
R.A. Smith & Associates, Inc. designed the geodatabase to retain nearly all of the information shown on the hardcopy as-built drawings in addition to the information within the storm sewer CAD files. The geodatabase design also had to accommodate the Cartégraph database structure to allow for easy integration between the systems.

The New Berlin project began with a selected pilot area for conversion. The area selected was a densely populated square mile of the city, which contained both older and newer subdivisions, in addition to both drainage ditch and curb and gutter cross sections. Once the pilot area was completed, the project extended to the eastern half of the city, and then later the western half of the city. The entire project was completed in about 14 months.

Using the Stormwater GIS

According to Nitschke, New Berlin's GIS stormwater program was designed to instantly provide city management up-to-date and complete information regarding the condition of the stormwater system, the size and length of storm sewer mains throughout the system, installation dates for all elements throughout the system, material, elevation, outfall locations, and discharge water quality. The current GIS mapping will assist with both point and nonpoint pollution with the major focus on nonpoint sources. Additionally, the system will make it easier to trace the cause of any stormwater system problems and track maintenance needs.

This GIS will add strength to New Berlin's efforts to narrow down possible sources of contamination from monitoring stations by tracing up or down the storm sewer and stream network. Immediacy, of course, is important to identifying nonpoint sources of illicit discharges. The GIS will play a prominent role in reducing the time it takes to find an illicit discharge source once a



Approximately 75 miles of storm sewer main from 280 as-built drawings were converted into a comprehensive GIS for New Berlin, WI.

discharge is located. The New Berlin stormwater GIS can also be used to monitor the city's best management practices—such as wet ponds, infiltration structures, grass swales, vegetative filter strips, and vegetative buffers to control water runoff.

With time, the New Berlin GIS has the capabilities to evolve substantially and include considerably more management control over the city's stormwater program. Once new development projects are built and become part of New Berlin's stormwater system, GIS can be used to inventory those additions to the system. That inventory then is always available and up-to-date. In this way, maintenance and potential problems can be quickly tracked and resolved. Also, increased quality of life can be assured through close GIS monitoring of environmental conditions and other aspects that affect the community.


Progressive cities have GIS in place and are continually updating the data within these systems. At the most basic level, the GIS provides an accurate and easily accessible repository for physical data, including locations, elevations, dimensions, materials, and dates of con-

struction associated with an urban storm drainage system. It can also include all of the information about the watershed, such as slope and land use, that relates to estimating runoff and can streamline computer modeling efforts. GIS is increasingly being used as an operations and maintenance tool to store data such as locations of complaints and maintenance records for facilities. It can also be used to prepare exhibits and data for public relations purposes.

It is clear that regulations will continue to become more stringent with time as there is an increasing need to prevent flooding by minimizing downstream impacts and to clean up the rivers by minimizing pollutants. Municipalities will be able to document how pollutant loadings have been reduced through a series of water quality driven practices. Further regulations

are expected to have their impact in March 2008 and again in March 2013. Municipalities subject to municipal stormwater permits under Wisconsin Administration Code NR 216, for example, will be required to reduce total suspended solids within the municipal boundary by 20 percent by March 2008 and 40 percent by March 2013.

A stormwater GIS enables communities to better deal with changing regulations, more easily and quickly review and

analyze any potential problem areas, and make better decisions about proposed development and redevelopment. 

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New Berlin's GIS stormwater program was designed to provide city management with current information regarding the condition of any area within its stormwater system.