HAESTAD METHODS

ClientCare®

NEWSLETTER

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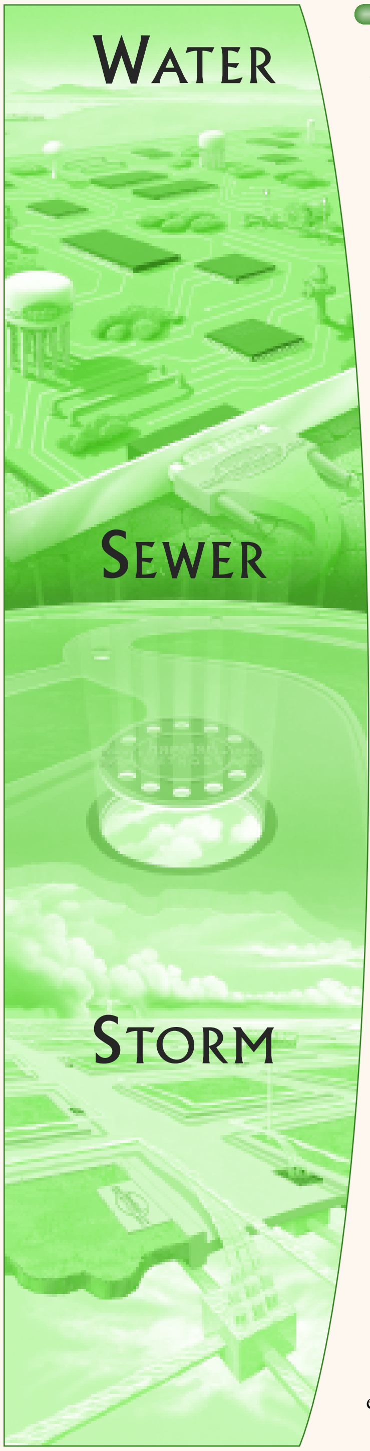
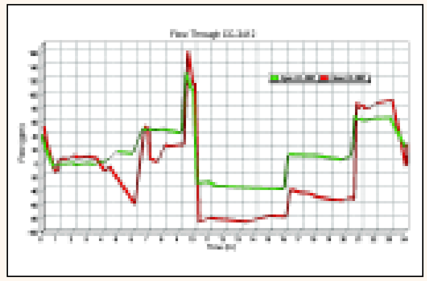
Issue 10, 2004

IN THIS ISSUE



American Water Plans with WaterCAD

Widespread use of WaterCAD has helped American Water streamline its operations and cut expenses while maintaining its position as the **largest private provider of water and wastewater services in the United States.** Senior Planning Engineer, Joseph P. Dugandzic, P.E., explains "executives, system managers, operations personnel, and engineering support rely on WaterCAD results for cost-effective decision-making."



American Water's test results with WaterCAD

Daily WaterCAD Applications

Hydraulic models highlight system deficiencies and evaluate the effectiveness of proposed improvements under future demand conditions. Each of American Water's systems are assessed for adequate capacity and reliability for residential,

WATERCAD *continued on p. 2*

Pressure Mains: How Low Can You Go?

During wet weather events, Anne Arundel County, (Annapolis, MD, USA), experiences **frequent alarms and costly pump-outs** of the main pumping stations at Carr's Ridge, Mayo Peninsula. Lombardo Associates, Inc. (LAI) was commissioned by the county to investigate the cause of the problem and develop a remedial strategy.

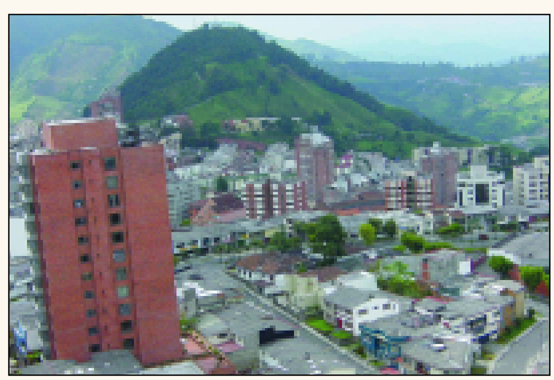
The Carr's Ridge region is low lying with most of the residential area at sea level, and therefore requires individual house pumps to feed the collectors and interceptor. These pumps are either Gould 1/2 HP (.37 kW) or 1/3 HP (.25 kW) depending on the expected system head at the connection.

The main interceptor runs east-west through Carr's Ridge and varies from 2 in. (50 mm) to 4 in.(100 mm) in diameter with bolted inspection holes and air release valves (refer to the profile figure on page 6). A section along this interceptor acts as a variable grade gravity sewer during average dry weather conditions. During wet weather conditions, however, the entire interceptor acts as a low pressure force main, (a.k.a. rising main) with the exception of a small length just prior to the interceptor draining into a pump station.

SEWERCAD *continued on p. 6*

Some StormCAD with that Coffee?

The city of Manizales, located at an elevation of 7,050 feet (3,300 m) in the Colombian Andes, benefits from having perfect conditions for growing world-class coffee. The region's steep slopes allow for average daily sunlight to strike the coffee plants at a near 90-degree angle, improving the growth of the plants, but make for a **difficult location to construct a combined sewer system**.



Over half of the city's sewer system contains pipes at slopes greater than 10%, and in some extreme cases in excess of 50%. This topology, combined with the heavi-

STORMCAD *continued on p. 6*

Haestad Awards Scholarship

Om Gharty Chhetri was awarded the 2003 Haestad Methods Scholarship based on his outstanding academic achievement and his high-quality water resources research. Chhetri's work was on the evaluation of storm sewer system performance using the Rational method. In his paper, he compared how several software programs (including Haestad Methods' StormCAD) handle this type of analysis for both surface components (inlets) and subsurface components (conduits). Chhetri will use his Haestad Methods scholarship to help with the expenses of his master's degree in civil engineering from Lamar University in Beaumont, TX. Chhetri received his bachelor's degree from the Institute of Engineering in Lalitpur, Nepal in 2000 and is an active member of Chi Epsilon and the ASCE.

To find out more about Haestad Methods' Engineering Scholarship program, or to apply, visit:

www.haestad.com/ccnews/scholarships

or e-mail: **scholarship@haestad.com**

WATERCAD *continued from p. 1*

commercial, and industrial usage and associated fire protection needs.

Final selection of capital and operational improvement projects is also based, in part, on computer model simulations. Other WaterCAD applications for American Water include:

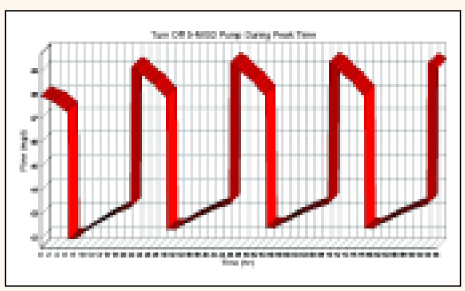
- Capital investment preparation / development
- Main extensions and new developments
- Evaluating available fire flow
- System operational strategies
- Small main replacements
- Customer inquiries, such as low pressure
- System head curve development for pump design
- Potential system acquisitions or O & M contracts

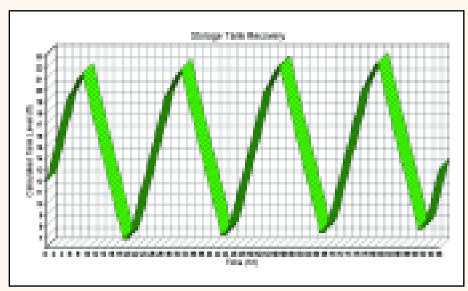
Example 1: Main Replacement

A state DOT was replacing a highway bridge that supported a 12-in. (300-mm) water main. WaterCAD was used to test if an adjacent 6-in. (150-mm) main would be able to handle the increased capacity while the 12-in. was taken out of service.

American Water engineers used their calibrated WaterCAD model to "close" the 12-in. main and simulate its removal. Using WaterCAD's graphing and reporting tools, they found that flow would increase by 20 gpm (1.5L/s) in the 6-in. main, but would not exceed its design capacity. The simulation also showed that pressure upstream and downstream would be affected by less than 2 psi (14 kPa).

Performing the analysis with a model meant that **no operational time was needed** and American Water quickly saw that the 12-in. crossing could be eliminated with no additional capital expenditure.



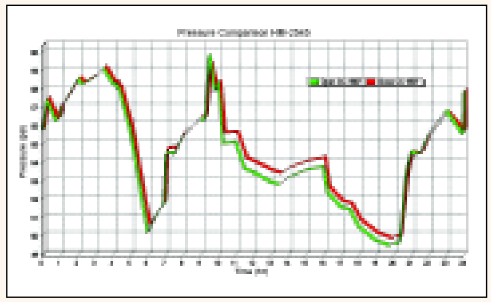


Example 2: Energy Audit Analysis

American Water spends almost $50M/year to purchase energy, primarily on pumping. WaterCAD simulates operational pumping strategies that save them hundreds of thousands of dollars annually.

American Water engineers hypothesized that shifting some pumping operations at a treatment facility to off-peak times would lower power costs, without affecting operations. They set up a 4-day extended-period simulation on their WaterCAD model. After running multiple scenarios with different pumping criteria, they found a workable solution that **saves an estimated $41,000 annually**.

Not only did the exercise save money, but it was completed quickly and with no need for operational tests.



American Water's test results with WaterCAD

New Applications—Impossible Without a Model

According to Mr. Dugandzic, "With the improvement of the software, we continue to discover more applications for its use." The modeling efforts for American Water have grown to include such applications as operational optimization, water quality, energy audits, calculated water age, and constituent dispersion. Without a hydraulic model, most of these analyses are at best, cost and time prohibitive and at worst, impossible.

Perhaps the truest measure of the value of WaterCAD modeling is summed up by Mr. Dugandzic, "The comfort level provided by WaterCAD simulation results provides our operators with inexpensive and timely information to make decisions."

For more information on Haestad Methods water distribution modeling programs, including WaterCAD, visit:

www.haestad.com/ccnews/water

or e-mail us at: **sales@haestad.com**

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Customization

The Power of WaterObjects®

By now most of our clients have heard of WaterObjects, our application programming interface (API) for customizing WaterCAD and WaterGEMS. WaterObjects is being used by consultants around the world as well as our services team to add custom functionality to our software and to build stand-alone applications that utilize specific components of WaterCAD and WaterGEMS.

In a recent project, Haestad Methods teamed up with Bristol Babcock, a leading SCADA provider, to create a custom SCADA/model integration application for the City of Bethlehem, PA (USA). The application connected the city's Bristol Babcock OpenEnterprise SCADA provider software with their existing WaterGEMS model to provide the modeler with **immediate access to real-time and historical field data**.

The goal of this project was two-fold. First, the city wanted to be able to calibrate their hydraulic model using historical and real-time data from the SCADA system. They also wanted the ability to jump start the model at any time using the real-time boundary conditions from the SCADA system. Both were successfully accomplished with a **WaterObjects application called SCADAConnect**.

Here's how it works. Using SCADAConnect, the user creates mappings of SCADA signals to WaterCAD/WaterGEMS elements. Mappings consist of the SCADA signal name and corresponding WaterGEMS element ID and attributes (pressures, flows, initial status, HGL, etc). The mappings also indicate the table name in the SCADA database and whether or not the data is available for calibration, initial settings, or both. These mappings are preserved in an XML file and therefore can be reused across multiple modeling sessions.

The location of the SCADA database and the appropriate database drivers also have to be specified for retrieving real-time and historical information. With the mappings and the connection established, the engineer can import historical and real-time data into WaterGEMS

Typical SCADA control center

Field Datasets for calibration and use real-time boundary conditions to initialize the model. Both of these **operations take just a single mouse click**.

This is just one possible application of Haestad Methods' powerful WaterObjects technology. Our Services team regularly helps clients develop and maintain similar applications that suit their specialized needs.

> To contact our Services department with ideas for new applications, please email services@haestad.com. If we use your idea, we'll send you a free copy of our best-selling *Advanced Water Distribution Modeling and Management* textbook.

www.haestad.com/ccnews/waterobjects

NEW

Software Releases

FREE to ClientCare® Subscribers

HAMMER™ 6.5

Analyze and design surge protection equipment and develop pump control strategies using the most advanced transient model on the market.

www.haestad.com/ccnews/HAMMER

CivilStorm™ *Dynamic* 2004

Simulate the entire stormwater system with one intuitive scaled layout model for Windows or AutoCAD.

www.haestad.com/ccnews/CivilStorm

GISConnect™ for AutoCAD

Create, edit, and query ArcGIS data all within AutoCAD using CAD commands.

www.haestad.com/ccnews/GISConnect

WaterCAD® 6.5 for AutoCAD

WaterCAD is the most widely used hydraulic analysis and decision-support tool available for water utilities.

www.haestad.com/ccnews/WaterCAD

WaterGEMS® 2.0 for ArcGIS

WaterGEMS 2.0 seamlessly combines the hydraulic modeling power expected from Haestad Methods with the geospatial and visualization powers of ArcGIS™.

www.haestad.com/ccnews/WaterGEMS

SewerCAD® 5.5 for AutoCAD

Model both gravity and pressure networks simultaneously under a wide range of conditions using extended-period simulations.

www.haestad.com/ccnews/SewerCAD

StormCAD® 5.5 for AutoCAD

New features include fully customizable profile templates and support for curved pipe alignments.

www.haestad.com/ccnews/StormCAD

PondPack® 9.0

Pond design is made even easier with the new step-by-step pond analyzer and a new paradigm for managing complex watershed data.

www.haestad.com/ccnews/PondPack

Darwin® Designer for WaterCAD

Automatically evaluate thousands of design and rehabilitation alternatives to identify innovative solutions that deliver the most benefit for your budget.

www.haestad.com/ccnews/Designer

Business

Haestad Methods—25 Years & Still Growing!

Haestad Methods celebrates the beginning of its 25th year in business by reflecting on double-digit gains in 2003 and unsurpassed technological innovation. The company's **strong financial results were fueled by the release of several new strategic products**, increased software license sales, higher renewal rates for ClientCare maintenance contracts, record-breaking numbers of attendees at training courses, and the introduction of three new definitive textbooks.

John Haestad, President and CEO, cited the company's intensified spending in R&D as one of its key drivers for market growth. "By investing heavily in R&D, Haestad Methods has once again changed the paradigm of computing in the industry and continues to enhance the bridge between modeling, mapping, and management."

Developments in the international markets have also contributed to the company's dramatic jump in sales. **International sales doubled from 2002** as Haestad Methods won strategic accounts with some of the world's largest utilities. "With the opening of local offices in China, Australia, and Mexico, we are poised for another exceptional year in 2004," said Douglas Maitland, Director of International Sales.

Some of the company's most compelling product launches this year have included **GISConnect** for CAD and GIS interoperability; **HAMMER** for hydraulic transient modeling; **PumpMaster** for on-line pump selection and analysis; and a new release of **Darwin Designer** for optimizing water system design. GISConnect has been reviewed by major industry journals and has recently won the Cadalyst Editors' Wow! Award. HAMMER was selected for use in a major Awwa Research Foundation (AwwaRF) study on the susceptibility of distribution systems to subatmospheric transients.

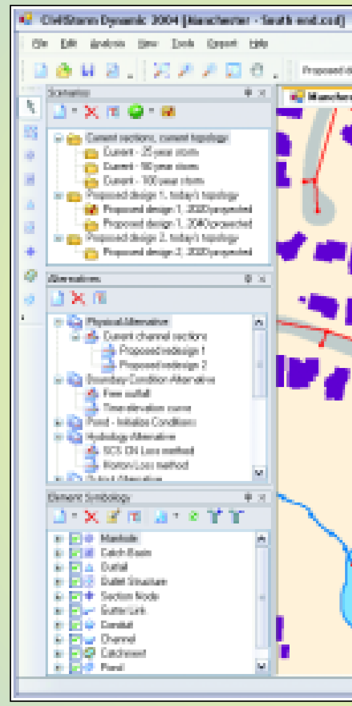
"Our 25th year will be a banner year for our customers. Their commitment to Haestad Methods will be richly rewarded with the most technologically advanced products in the industry," said Niclas Ingemarsson, Executive Vice President.

"Haestad Methods will continue working hard for your business!"

CivilStorm™ *Dynamic*: All-In

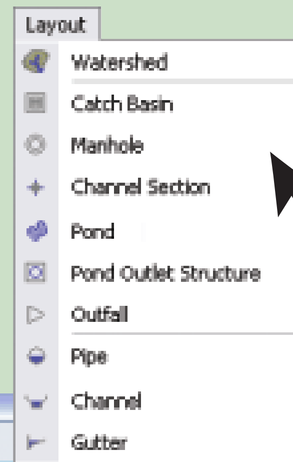
Unify Your Modeling Effort

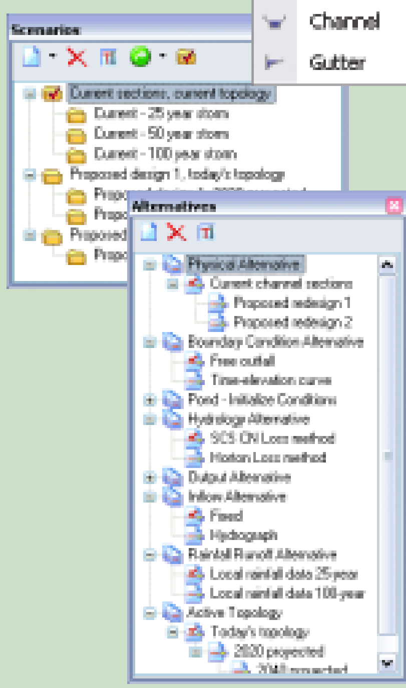
CivilStorm *Dynamic* simulates your entire stormwater system within one intuitive scaled layout model for **Windows or AutoCAD** environments. CivilStorm *Dynamic's* stormwater modeling engine calculates runoff hydrographs and analyzes the hydraulic response through interdependent systems of **gutters, inlets, pipes, channels, culverts, and ponds**.



Scaled System Layout

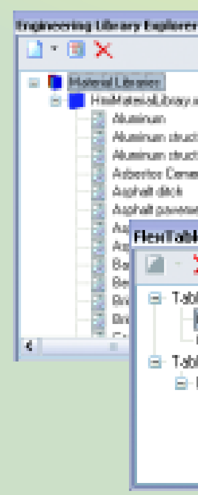
The layout of your model will coincide directly with the actual layout of your system. A pond is represented as a pond and a pipe as a pipe. No work-arounds required. You can even construct the scaled model directly within AutoCAD.





Flexible Management Tools

The project and graphical environment is fully customizable—from unit systems to element prototypes and libraries. **Organize the interface to match your workflow.**



Scenario Management

The Scenario Control Center keeps variations of any model run all in the same file. Run multiple trials simultaneously and compare the results.

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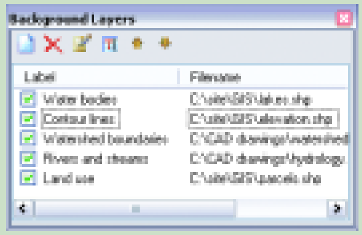
clusive Stormwater Analysis Software

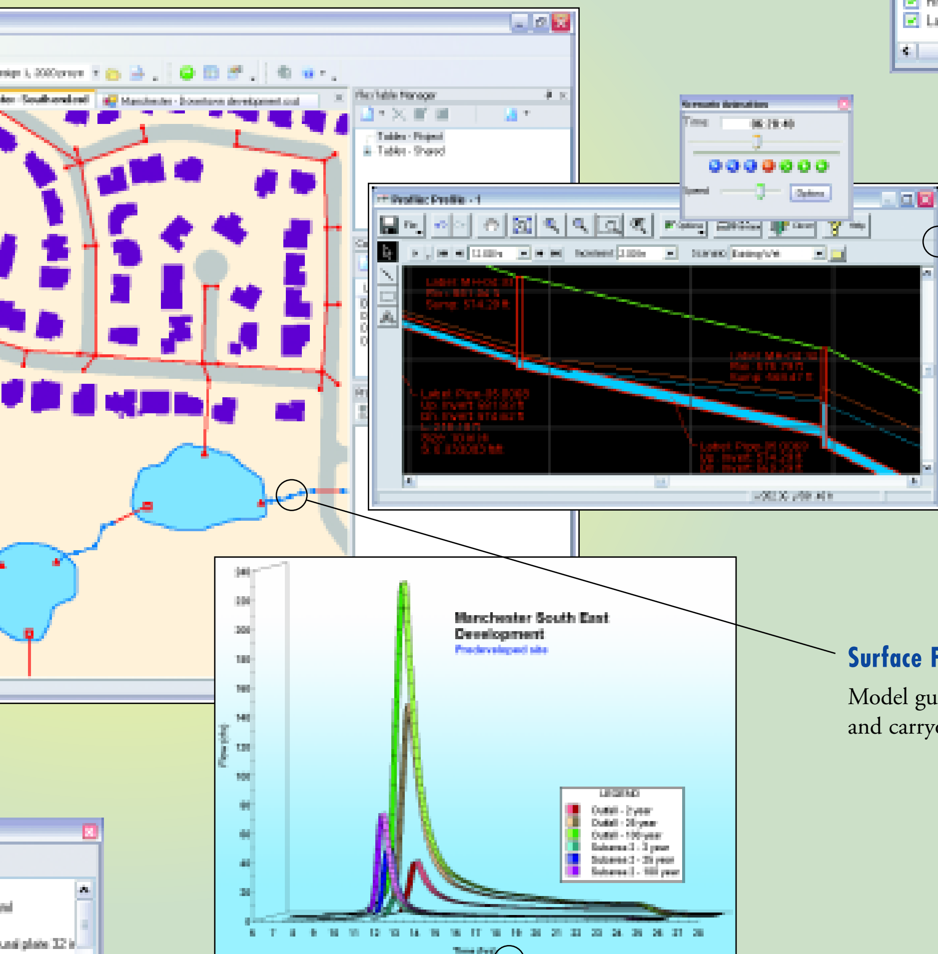
Comprehensive Hydrology

Use popular hydrology methods such as SCS, user-defined unit hydrograph, and EPA Runoff, simulate infiltration using SCS, Green & Ampt, Horton, and other methods.



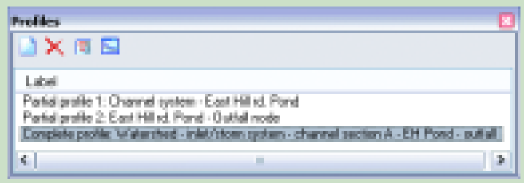
Background

Lay out the drainage system over site maps in any format (.dxf, .jpg, .shp, .bmp, and more).



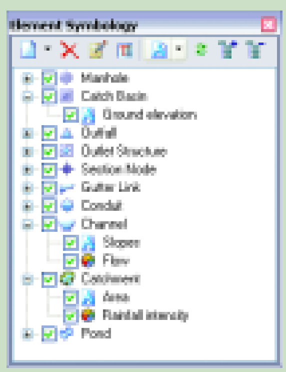
Customizable Presentation Tools

Animate profiles, plan views, and other presentations to observe water levels rising and falling over the course of a storm event.



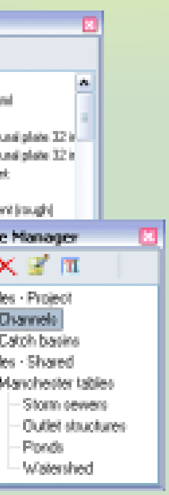
Surface Flow

Model gutter surface flow with capture and carryover between inlets.



Element Symbology

Change the color, style, and size of your symbols to display element properties then animate through time steps to show the dynamic response of the system.



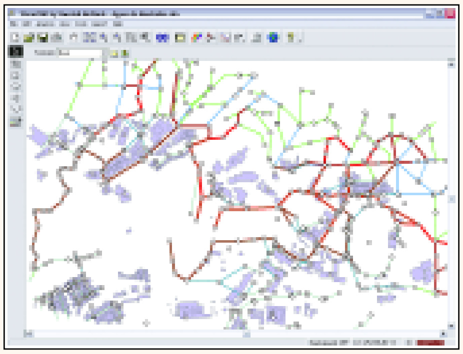
Advanced Reporting

Draw conclusions and make decisions from your model using sharp graphing and flexible reports.

www.haestad.com/ccnews/civilstorm

STORMCAD *continued from p. 1*

est rainfall intensities in Colombia, frequent seismic activity, and small yearly budgets, **challenges local engineers to look for innovative solutions**. Aguas de Manizales, the local utility, is working



StormCAD model—San Luis creek basin

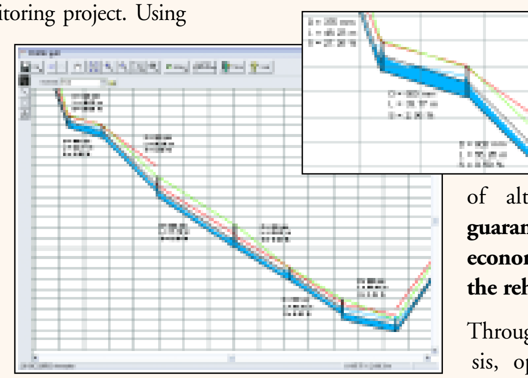
with the National University of Colombia to develop a StormCAD model to analyze the city's combined sewer system and to evaluate low-cost rehabilitation strategies to reduce high flow velocities and **constant overflows in the system**.

"Aguas de Manizales supports the University, allowing students to work on real-world projects to broaden their learning experience," said Carlos Vasquez, the director of the project. "StormCAD is a powerful tool that is easily picked up by the students, and their projects allow us to build a complete combined sewer model of the city."

In the San Luis creek basin, heavy rainfall results in frequent combined sewer overflows (CSO), which exceed the Colombian sanitary regulations (RAS-2000). Pipe collapses due to seismic activity further aggravate the situation. These frequent and nearly constant CSOs have generated a permanent cesspool, with all the associated negative environmental and social impacts. Andres Hoyos, a student at the National University of Colombia, was assigned to develop a StormCAD model of the San Luis creek basin to study this problem and develop a remedial plan.

Aguas de Manizales has an extensive GIS of the water and drainage systems of the city, so the model-building process could be completed quickly using StormCAD's shapefile connection utility. Aguas de Manizales also had a wealth of good field data obtained during a recent monitoring project. Using this data, Hoyos was able to calibrate the model under various loading conditions. "**Excellent agreement between modeled and observed results** helped to reassure the city that sound decisions could be made based on the model," stated Hoyos.

A series of simulations using the calibrated StormCAD model identified that the system was under capacity, even for a 5-year event. These simulations also revealed that this poor performance was not only due to low-capacity pipes but was compounded by the poor design of a diversion structure, which separates flow between two adjacent subcatchments.



Storm drain with grades exceeding 50%

Once the problem areas were identified, scenarios were developed in StormCAD to investigate various proposals for the rehabilitation of the main collecting pipes. Due to the difficult terrain and geological conditions, slopes of the existing system could not be easily modified without a major construction investment. For this reason, special restrictions were created for StormCAD's automated design utility, maintaining the existing structure depths and pipe slopes and only allowing changes to the pipe diameters in certain areas during the optimization runs.

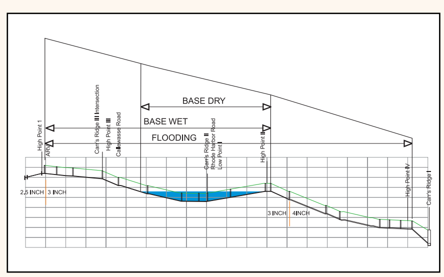
"Our geological and topographical conditions make deep excavations cost prohibitive," remarked Hoyos. "The flexibility of StormCAD allowed us to investigate a wide range of alternatives, thus **guaranteeing the most economic option for the rehabilitation.**"

Through detailed analysis, optimized design runs, and easy scenario comparison features in StormCAD, the city of Manizales is well on its way to overcoming its difficult local conditions for combined sewer systems, and returning to the business of simply being a city situated in the best growing conditions for the best coffee in the world.

SEWERCAD *continued from p. 1*

Modeling low pressure force mains is a difficult task because heads are so dependent on the number of pumps operating. This is why LAI turned to SewerCAD. "Superior pumping algorithms and robust scenario management make SewerCAD the obvious choice for modeling this type of situation," stated Pio Lombardo, President of LAI. "It was necessary to analyze a **plethora of operating scenarios** in order to determine the precise problem areas and to develop the **most effective remedial strategy**."

SewerCAD was used to model three major scenarios that were identified as Dry Weather, Base Wet Weather, and Flooding Wet Weather, which correspond roughly to average daily flow (ADF), two times the ADF, and four times the ADF, respectively. Analysis using SewerCAD identified that sections of the main interceptor operate as a gravity main under Dry and Base Wet Weather conditions, and as a low pressure force main under Flooding Wet Weather conditions. A more detailed study of the Flooding Wet Weather condition revealed that heads in the main could exceed shut off head for all except five of the 36 pumps.



SewerCAD profile of the main interceptor

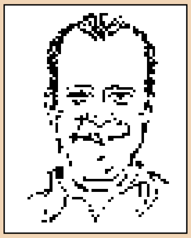
By dropping the loading in seven incremental stages from the maximum Flooding Wet Weather flow, **LAI determined a hierarchy for pump operation**. The first tier represented those pumps that were able to operate even under the Flooding Wet Weather condition. Subsequent tiers progressively stepped down to the Base Wet Weather condition, where all pumps were able to operate. By focusing on the pumps in the more critical locations, LAI was able to develop a comprehensive plan for the replacement of the pumps.

Zeke Speaks

By Zeke Moore, P.E.

Sullivan Donahoe & Ingalls
Fredericksburg, Virginia

Zeke is a regular contributor to StormTalk™, the online stormwater discussion group that covers topics from hydrology methods to frogs in detention ponds. To join Zeke and the other contributors online, visit www.haestad.com/ccnews/forums and register.



Retentive about Detention

I earned the title of "Rainman" shortly after I came on board at Sullivan Donahoe & Ingalls, a small civil firm in Fredericksburg, Virginia, when Stormwater Management (SWM) regulations started changing, and they handed all the new stuff to the new guy. Voila! Baptism by fire.

SWM is an interesting field. When I first started, the focus of stormwater detention design was to control the 2-year peak discharge. Then, localities expanded their SWM programs and extended the requirements to include both 2-year and 10-year peak discharges. Controlling bigger storms is better, right? Then, along came the Chesapeake Bay Act and the introduction of water quality concepts and first-flush volumes. The result was **large-storm peak controls mixed with a small-storm first-flush control**.

The new measures didn't seem to be working as intended, so along came discussions of the impacts of all these small SWM ponds located throughout a large drainage area. The combined impact of these ponds can actually lead to increases in peak flows for the drainage area as a whole if the time to peak for lower drainage subareas are delayed to coincide more closely with the time to peak for the overall area.

This dilemma resulted in a push for regional pond designs, since one large pond is more efficient for peak flow reduction and gives you the benefit of fewer ponds to maintain. But, what happens to the drainage channels leading to the regional facility if you have no smaller SWM ponds above it to reduce flows or provide treatment?

The next concept to come along was **runoff volume control instead of peak flow control**, with the idea that increased runoff volume leads to greater channel erosion since the streams see prepeak flows for longer durations. As a result, the focus has now started to shift to **controlling runoff from smaller storms**, a big part of which is spreading the SWM "ponds" throughout the development area with a focus on infiltration.

Now, is it just me, or does it seem like we still don't know how to handle SWM? I find the changes over the past 13 years to be amazing, especially how the focus has switched from peak control for larger and larger storms to volume control for smaller and smaller storms. Detention design has shifted focus from multiple, small SWM ponds, to fewer, larger regional ponds, and then back to ponds that are even smaller and more numerous than they were originally. Doesn't that just blow your mind? Do you get the feeling we're still doing trial and error? And designs for new SWM "ponds" (which may include infiltration facilities or "extreme" detention facilities) are now a lot more complex because of the need to follow **Integrated Management Practices (IMPs)** and **Best Management Practices (BMPs)**.

When it comes right down to it, Mother Nature is a complex system. There are so many variables and situations that SWM engineering can become a daunting task. Add people and politics to the mix and we have a job that could be argued to be impossible. However, we just call it an "inexact science" and march on. I love it—most of the time.

It's neat to watch and participate in the SWM topics that come up on the StormTalk forum. Someone will ask what appears to be a simple question, but often what follows is a whole slew of questions ("what if," "consider this," etc.) and engineers (myself included) going off on tangents to discuss the complexity of the "simple" question.

To join me and thousands of other professionals in the online civil engineering community, sign up at:

www.haestad.com/ccnews/forums

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NEWSLETTER

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For submission and advertising deadlines, contact the editor at: editor@haestad.com or call **+1-203-755-1666** (Worldwide) or **800-727-6555** (U.S. & Canada Toll Free).

GLOBAL TRAINING

San Antonio, TX (USA)

Mar 15-17 Sanitary Sewer Design (SewerCAD)
Mar 15-19 Stormwater Systems (PondPack/CivilStorm)
Mar 18 CMOM Permitting
Mar 22 NPDES Phase II Permitting
Mar 22-23 Transient Flow Analysis (HAMMER)
Mar 22-26 Water Distribution (WaterCAD/WaterGEMS)
Mar 23 Strategic Modeling & GIS (Water)
Mar 24 Strategic Modeling & GIS (Sewer)
Mar 25 Strategic Modeling & GIS (Storm)

Lima, PERU

Mar 22-24 Water Distribution Modeling (WaterCAD)
Mar 25-26 Sanitary Sewer Design (SewerCAD)

Richmond, VA (USA)

Apr 12-14 Sanitary Sewer Design (SewerCAD)
Apr 12-16 Stormwater Systems (PondPack/CivilStorm)
Apr 15 CMOM Permitting
Apr 19 NPDES Phase II Permitting
Apr 19-20 Transient Flow Analysis (HAMMER)
Apr 19-23 Water Distribution (WaterCAD/WaterGEMS)
Apr 19-23 Floodplain Modeling (HEC-RAS)
Apr 21 FEMA (HEC-RAS/HEC-GeoRAS)
Apr 20 Strategic Modeling & GIS (Water)
Apr 21 Strategic Modeling & GIS (Sewer)
Apr 22 Strategic Modeling & GIS (Storm)

Paris, FRANCE

Apr 5-7 Water Distribution Modeling (WaterCAD)
Apr 8-9 Transient Flow Analysis (HAMMER)

Minneapolis/St. Paul, MN (USA)

May 3-5 Sanitary Sewer Design (SewerCAD)
May 3-7 Stormwater Systems (PondPack/CivilStorm)
May 6 CMOM Permitting
May 10 NPDES Phase II Permitting
May 10-11 Transient Flow Analysis (HAMMER)
May 10-14 Water Distribution (WaterCAD/WaterGEMS)
May 11 Strategic Modeling & GIS (Water)
May 12 Strategic Modeling & GIS (Sewer)
May 13 Strategic Modeling & GIS (Storm)

Munich, GERMANY

May 3-7 Water Distribution Modeling (WaterCAD)

Vancouver, CANADA

May 3-5 Water Distribution Modeling (WaterCAD)
May 6-7 Sanitary Sewer Design (SewerCAD)
May 6-7 Transient Flow Analysis (HAMMER)

Las Vegas, NV (USA)

May 17-19 Sanitary Sewer Design (SewerCAD)
May 17-21 Stormwater Systems (PondPack/CivilStorm)
May 20 CMOM Permitting
May 24 NPDES Phase II Permitting
May 24-25 Transient Flow Analysis (HAMMER)
May 24-28 Water Distribution (WaterCAD/WaterGEMS)
May 25 Strategic Modeling & GIS (Water)
May 26 Strategic Modeling & GIS (Sewer)
May 27 Strategic Modeling & GIS (Storm)

Sao Paulo, BRAZIL

May 31-Jun 2 Water Distribution Modeling (WaterCAD)
Jun 3-4 Transient Flow Analysis (HAMMER)

ON-CAMPUS TRAINING

Haestad Methods in Waterbury, CT (USA)

Mar 4-5 Detention Pond Design (PondPack)
Apr 1-2 Storm Sewer Design (StormCAD)
May 6-7 Water Distribution Modeling (WaterCAD)

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- Automated pump selection
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"Well, we needed the rain."

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