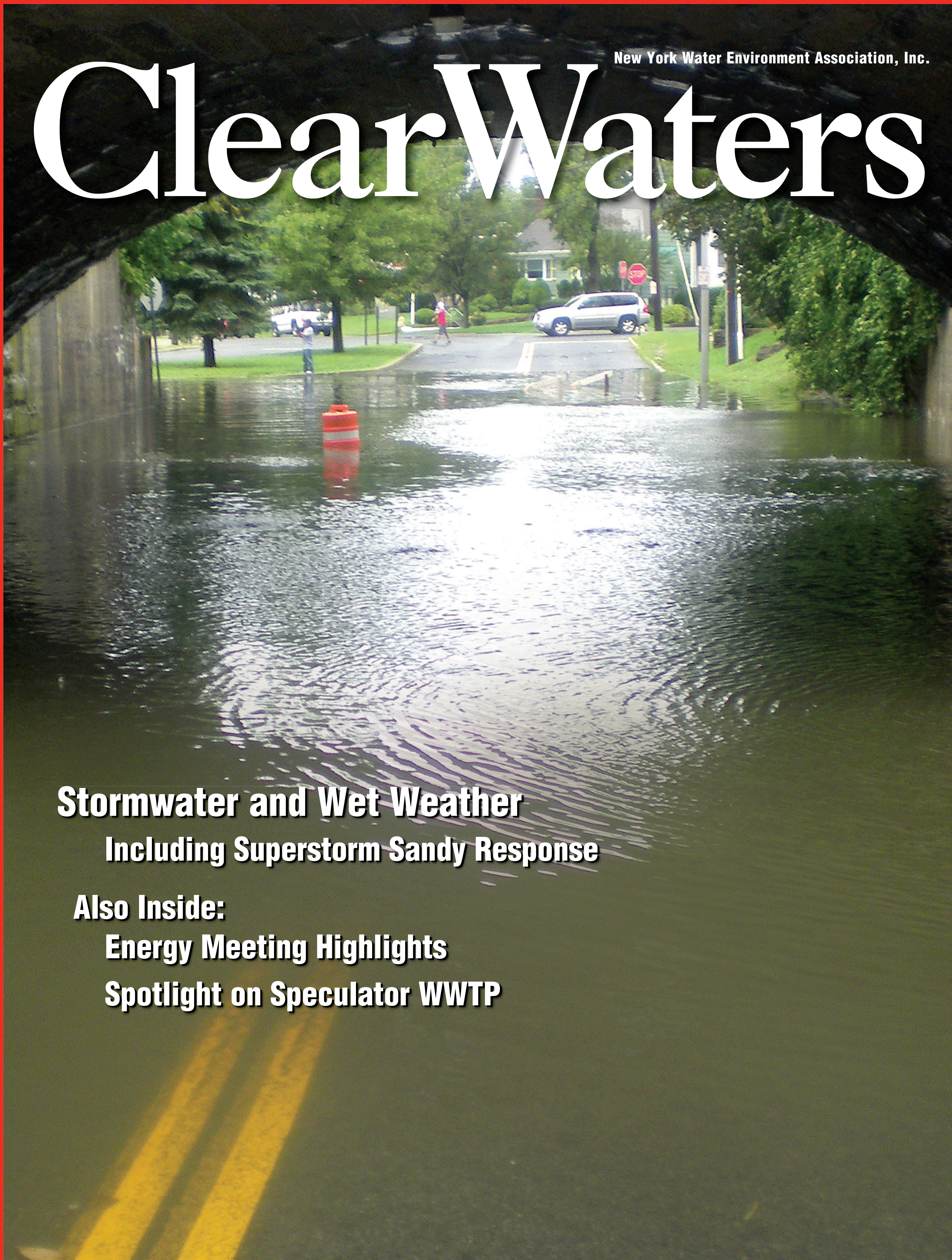
Winter 2012, Vol. 42, No. 4

New York Water Environment Association, Inc.

Clear Waters



Stormwater and Wet Weather

Including Superstorm Sandy Response

Also Inside:

Energy Meeting Highlights

Spotlight on Speculator WWTP

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Cover Image: This is the Jefferson Avenue underpass that carries outflows of Columbus Park from the Mamaroneck and Sheldrake rivers in Mamaroneck, NY, seen during Hurricane Irene 2011 flooding. *Photo by Tony Gelber* **– See his opinion piece on page 48.**

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As I write this message, the recovery efforts from the devastating impact of Hurricane Sandy are ongoing and will continue for a long period of time. This "super storm" has impacted millions of people, including many members of our association and their families. My heart goes out to all who have suffered and who are still challenged in getting back to a normal life.

It was recently estimated that the financial loss from this storm will reach $42 billion, which includes $1.1 billion for wastewater. We are very fortunate that the loss of life was much less than the impacts of Katrina to New Orleans. Much credit should go to the New York City Department of Environmental Protection in its response to the catastrophic effects on the city's wastewater infrastructure and its capabilities in mitigating the losses as quickly as humanly possible. Anyone who has been involved with severe wet weather events can relate to the dedication, vigor and professionalism of wastewater personnel who, on the frontlines, rise to meet such challenges.

Our own organization kept its finger on the pulse of the needs in downstate by providing networking through the New York Water/Wastewater Agency Response Network (WARN). Also, "kudos" are deserved by the Onondaga County Department of Water Environment Protection which voluntarily deployed staff and equipment to pump out basements of NYC Housing Authority buildings *(see article on page 43)*. In Upstate, we met the challenge of Hurricane Irene last year and I can only imagine the herculean efforts that occurred during Hurricane Sandy.

The impacts of these two storms in the past year can provide an opportunity once again to turn the spotlight on the need for investment in wastewater infrastructure. We must continue to pursue making our sector needs part of a national dialogue. The message should be strong and clear that the needed investment will stimulate the economy and create good paying jobs, while protecting public health and the environment.

WEFTEC

The WEFTEC annual conference was held in New Orleans in early October and NYWEA members were well represented, including the executive director and most of the executive committee. The NYWEA hosted a cocktail reception one evening during the conference and the room was full to the brim with members and friends.

The theme of the general opening session was, "Navigating Our Water's Future" with the keynote address by Lisa Jackson, EPA Administrator. Her presentation was, "40 Years of Clean Water and Innovation for Tomorrow." This was followed by a panel discussion providing perspectives from public and private utilities, a technology provider, a regulator and an academic. Later in the meeting, Jon Ruff from Plattsburgh, Mike Garland from Monroe County, NYWEA Executive Director Patricia Cerro-Reehil and I attended a very worthwhile Utility Executive session. This meeting had representation from utilities across the country, providing an excellent forum to network and discuss like challenges. The dialogue also offered ideas regarding future initiatives for NYWEA's Utility Executives Group that at the November 14 board meeting by resolution is now a formal committee.

Energy Specialty Conference

The November 15 Energy Specialty Conference held in Albany was a great success. The meeting was attended by 122 people, and the focused topic of energy was of value to our membership. I thank the Planning Committee, NYWEA professional staff and our co-sponsors – NYSEFC, NYSDEC and NYSERDA – for their support in organizing this meeting. Also, the night before the meeting, a tour was conducted of the Albany County Sewer District's waste heat to energy project with over 40 attending. This was followed by a soiree in downtown Albany hosted by the Capital Chapter's Young Professionals, organized by Michael Guethle. I observed that these events were attended by a diverse group with many new faces, including a large contingent of young members.

In Gratitude – Passing the Gavel

I know that every president says this, but – WOW! – did my year as president fly by! I can't express how thankful I am for this opportunity given me by the association. The year has been an extremely rewarding experience that I will value forever. The NYWEA is like family to me, and I greatly appreciate the personal and professional relationships I have made in it. I would like to thank the Board of Directors and the membership for the support shown to me this year. Also, special thanks to our hard working professional staff in the Syracuse home office – Maggie Hoose, Maureen Kozol and Tanya May Jennings – led by our dedicated executive director, Patricia.

It will be my privilege to pass the gavel at the annual conference in February to our President–Elect Mark Koester. Mark is a man of passion, compassion and integrity. Mark is a great friend who is committed to NYWEA and will be an outstanding leader for the organization. I look forward to staying active and working with him as immediate past president.

I hope to see you all at the 85th Annual NYWEA Meeting in New York City, February 3–6, 2013. It includes the Awards Luncheon where we recognize the achievements of outstanding members. The program and registration information is available at: www.nywea.org. *Cheers!*

Richard J. Lyons

85th Annual Meeting

The New York Water Environment Association's 85th Annual Meeting is right around the corner, and we hope you can join us in New York City at the Marriott Marquis, February 4–6, 2013. A strong technical program has been developed under the leadership of Geoff Baldwin and Dick Pope and offers unique educational presentations featured during the 23 breakout sessions.

The Opening Session on Monday will include a Succession Planning presentation by Claire Baldwin and a Hurricane Sandy panel that will share the lessons learned from a variety of stakeholders in the Metropolitan/New Jersey regions. On Tuesday, we will hold (in conjunction with the National Association of Clean Water Agencies) a Utility Executives Forum with George Hawkins of DC Water who is sure to give another one of his dynamic speeches. The meeting will also feature over 160 industry exhibits, activities for students and Young Professionals. and on Wednesday, NYSDEC Commissioner Martens will join us as we recognize the outstanding achievements of NYWEA members at the Awards Luncheon.

Fiscal Year Ends Better than Expected

For NYWEA, the fiscal year ended August 31, 2012 in better shape than originally expected. By tightening up expenditures and working to maintain revenues, we ended on a positive note – able to transfer the unanticipated revenues to reserves for emergencies and to assist the NYWEA board in setting goals that advance the mission of the organization.

You can find more about our finances, membership, the operator certification program, as well as other programs to be posted as a new feature on our website (www.nywea.org) titled, Administrative Dashboard. It is anticipated to be available online by mid-January.

On the Horizon

In addition to what we can expect to be snowy weather during the winter months, on NYWEA's horizon are several items that have been in the works for quite some time:

- **2013 Training Catalog** – Based on the success of the 2012 Catalog of Training, Keneck Skibinski, in conjunction with the Member Education Committee and the seven NYWEA chapters, has once again developed a variety of training opportunities available to members. Visit your local NYWEA chapter's website for a listing of events taking place and the online catalog for unique training programs offered by your chapter.
- **Joint Watershed/Tifft Symposium in September of 2013** – We are very pleased to announce that the New York State American Water Works Association (NYSAWWA) and NYWEA will jointly host the NYWEA Watershed and NYSAWWA Edwin C. Tifft Symposium in September of 2013. The event will take place in the New York City watershed region and, as we go to press, the details regarding venues and meeting logistics are still being determined. We hope to make an announcement on the date and place very soon. Check our website for details.
- **Themes for *Clear Waters*** – This issue of *Clear Waters* was planned over a year ago, and little did we know that while we were preparing to go to print, the northeast would be severely affected by superstorm Sandy. We did try to cover the storm with some information that came in during production, but we'll need to devote more time and pages to this in future issues. Upcoming themes for future issues include Industrial Wastewater Improvements in the 21st Century, Women in the Environmental Field, CMOM and Asset Management, and Oxidation Processes to name a few. If you have an idea for a theme, we welcome your input. Please contact me at pcr@nywea.org.

Happy New Year!

As the year draws to a close, I would like to acknowledge the work of the Board of Directors, chapter officers, committee chairs and members for all of the initiatives brought forth during the year. We are continually looking for involvement from more members in the programs carried out, and encourage you to get involved if you are not already. As always, we welcome your input and feedback, and please do not hesitate to contact me with questions.

I look forward to another exciting and busy year, and wish you all the best in 2013!

Patricia Cerro-Reehil

Upcoming NYWEA Meetings

Activated Sludge Process Control
January 11, 2013
Mayville, NY

85th Annual Meeting
February 4–6, 2013
New York City Marriott Marquis

Emergency Preparedness and Crisis Management
March 5, 2013
Syracuse, NY

Legislative Dialog
May 7, 2013
Room 711A–LOB, Albany, NY

2013 Spring Technical Conference & Exhibition
June 3–5, 2013
Sheraton, Syracuse

Joint NYWEA Watershed and NYSAWWA Tifft Symposium
September 2013
Date and Location TBA

For a more detailed listing of all Chapter events, visit www.nywea.org.

NYWEA
LEADING THE WAY IN WATER QUALITY MANAGEMENT

Energy Specialty Conference, Hotel Albany November 15, 2012

NYWEA President Richard Lyons welcomes attendees.

George Bevington

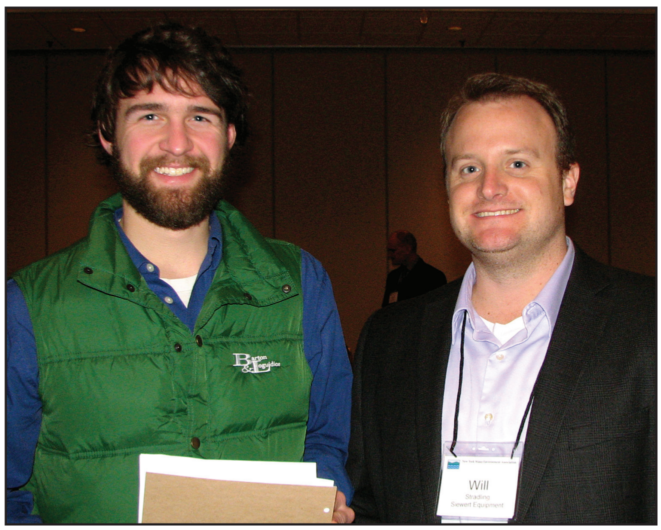
Above: Craig Westcott from the Samson Environmental Center at the Darrow School in New Lebanon, NY, spoke about the school's living system.

Angela Hintz (left) and Betty Green

Brian Sibiga of Wendel

President–Elect Mark Koester engages his audience during a conference presentation.

Danyelle Greene (left) and Kristen Wildenstein from RIT



Michael Guethle (left) and Will Stradling

Jason Turgeon, USEPA Region 1, refers to Wastewater Treatment Plants as "Energy Factories."

Jim Tierney of NYSDEC talks about the importance of Energy issues to POTWs.

Timothy Burns of NYSEFC talks about funding opportunities.

Albany County Executive Daniel P. McCoy addresses NYWEA members.

Above: (l–r) Kathleen O'Connor of NYSERDA, Kathy Macri of NYSEFC, NYWEA President Richard Lyons and Craig Westcott, luncheon keynote speaker.

Will Stradling of Siewert

Father and son team, Paul and John Jeris

George Bevington actively listens to Craig Westcott, luncheon keynote speaker.

Above: Marianna Novellino (left) and Jean Grenier from Parkson

Right: President Richard Lyons and Wendi Richards listen to conference speaker.

Above: Matt Goss gives a tour of ORC Building at Albany County.
Left: Attendees tour Albany County Sewer District.

Water Views | Winter 2012

Getting Green with CSOs

The topic of wet weather makes me think of the many communities across New York struggling with combined sewer system issues. In the past, some sewer systems were designed to collect stormwater runoff, domestic sewage and industrial wastewater in the same pipe. Most of these combined sewer systems were constructed before the advent of wastewater treatment.

The legacy of combined sewers has left us with major challenges to restore water quality in urban areas. During wet weather events, excessive stormwater enters the sewers and can overwhelm the system, causing under treated waste to be discharged into waterbodies. These combined sewer overflows (CSOs) – which can contain high levels of pollution and exceed NYS water quality standards – may pose risks to human and aquatic health and cause beach closures, shellfish bed closures or algae blooms.

Unfortunately, about 10 percent of CSOs in the US occur in New York. The state addresses CSO discharges by requiring them to have a State Pollutant Discharge Elimination System (SPDES) permit, which includes best management practices to optimize the combined sewer system to reduce CSOs. The SPDES permit also requires the development and implementation of a Long Term Control Plan to meet the water quality goals of the Clean Water Act.

Addressing CSOs can be an onerous task for a community. However, we are finding that green infrastructure can effectively complement grey infrastructure to reduce CSOs while providing additional benefits, such as green space in urban areas. The City of New York and the City of Syracuse are two communities that are working to address their CSOs by incorporating green infrastructure into their plans.

New York City was required under a 2005 Order on Consent to reduce CSOs from its sewer system to improve the water quality of its surrounding waters, such as Flushing Bay, Jamaica Bay, tributaries to the East River, Long Island Sound and Outer Harbor. In 2011, the NYS Department of Environmental Conservation (NYSDEC) and NYC modified the existing Consent Order to integrate green infrastructure into the city's Long Term Control Plan. Underway with planning and initial implementation, the city's use of green infrastructure to treat the CSOs looks promising.

In 2009, Onondaga County's Syracuse became the first community in the US to be legally required to reduce sewage overflows using green infrastructure. Onondaga County partnering with Syracuse implemented a strategy to use about two-thirds green infrastructure and one-third grey infrastructure to meet its CSO requirements. Implementing the plan is not cheap. The green infrastructure investments to date total nearly $80 million and are funded through sewer fees, low-interest loans and state grants. Currently 60 projects have either been completed or are under construction.

As more communities explore green infrastructure to address CSOs, the state is making more project funding available. For example, the Water Quality Improvement Projects program, the Green Innovative Grants Program and some NYSDEC watershed programs have offered subsidies for green projects in their last round of funding.

I encourage all communities to consider green infrastructure to help tackle their wet weather issues.

– James Tierney, Assistant Commissioner for Water Resources
NYS Department of Environmental Conservation

Focus on Safety | Winter 2012

Plan Safety in the Sunshine

At some point, you will have to work in the rain. This is a given. Just like having your flashlight burn out at the worst moment, having a flat tire at night, or having your hot water heater die the day your handyman leaves for his elk hunting trip in Canada. Unlike these other problems, the fact that you *know* that you will need to work in the rain/inclement weather means that you can plan for its eventuality. Planning for work in inclement weather should not start during a deluge – it needs to start in the sunshine.

Part of a safety management plan includes a risk assessment of work activities that can occur in wet/inclement weather and the means to lower the risks. The resulting information then has to be in a location that is accessible to the work crews and in a usable format. The wet weather operating plan (WWOP) of a wastewater treatment plant (or similar facility), specifically the section that addresses "what to do when all heck breaks out!" should also address the safety aspects of the activities involved. The time was taken to think about what to do with the treatment plant before, during and after the wet weather event, so how about adding a section to the WWOP that outlines the precautions needed to protect the crew while they are working to protect the environment?

This safety information should be found where and when staff needs it within the WWOP. Take the information developed in the risk assessments, parse out the pertinent information and add it to the formal WWOP. Including a safety section could be as easy as slipping in a page or two. However, if the WWOP is a controlled document and a safety section cannot be "officially" added until the next revision, an unofficial appendix would provide the same accessibility.

Please remember that any information developed in the risk assessment process is just words on a page unless the safety infrastructure is also in place. For instance, if a risk assessment indicates specific personal protective equipment needed to lower the risk level of that activity or hazard, then the storage location, inspection, maintenance, training and reordering processes must also be addressed and documented in either a Safety Operating Plan or safety policy as well. This may sound like too much busy paperwork, but it is needed for precisely the same reason that the WWOPs were developed – to provide guidance in the time of need.

– Eileen M. Reynolds, Certified Safety Professional
Owner, Coracle Safety Management

Wet Weather Operations Overview

by Sandy Lizlovs

The 1994 US Environmental Protection Agency Combined Sewer Overflow Policy required treatment plants served by combined sewer systems to develop a Wet Weather Operating Plan. Since then, communities served by separate sewer systems have begun to develop and implement wet weather operating strategies. Why? As collection systems age, inflow and infiltration rates increase, resulting in high wet weather flows at the plant, biosolids washouts and effluent violations. Strategies that operators should consider when developing a Wet Weather Operations Plan for their plant are discussed here. Operators should also develop a strategy for collection systems, however, that topic is not covered in this overview.

In 1998, the NYS Department of Environmental Conservation (NYSDEC), Stearns and Wheler Engineers (now GHD), and SUNY Morrisville collaborated to put together a technology transfer document for treatment plant operators. This document is available in its entirety on NYSDEC's web page at: http://www.dec.ny.gov/docs/water_pdf/wwtechtran.pdf. An overview of this document is provided below.

Key Elements of Wet Weather Operating Plan

Each wastewater treatment plant and collection system is unique and, therefore, each Wet Weather Operating Plan will be unique. All plans, however, should have the following elements:

- Goals of the Plan: Define the overall objectives of the wet weather operating plan with respect to protecting water quality and plant performance
- Critical Components: List the critical components of the collection and treatment system that significantly impact wet weather performance. For each critical component, define specific objectives.
- Operating Guidelines: For each critical component, develop step-by-step guidance for operation, maintenance and management procedures to be followed before, during and after a wet weather event.
- List of Contacts: The list should include supervisors and other involved public officials, equipment representatives, service organizations and the regulatory agencies.

Characterize Wet Weather Flows

A thorough understanding of the collection system provides necessary information when identifying options for improved wet weather operations. Before an operator can develop a Wet Weather Operating Plan, he or she must first characterize the collection system and the treatment plant. Some items to look at include the following:

- Age and condition of the sewer system
- Groundwater elevations
- Sources of inflow, such as footing drains, roof leaders and manhole covers
- Design of interconnections between the storm and sanitary sewer systems
- Storage capacity in the sewer system
- Operation of CSOs or SSOs
- Capacity of each major unit process at the treatment plant
- Operational strategies employed to deal with wet weather

A good place to start is to study maps and drawings of the sewer system showing routing, sizes and invert elevations of the collection system. The maps should show the location and design of control structures including regulators, combined sewer overflow points, sanitary sewer overflow points, and pump stations. An operator should have access to information as to how existing pump stations operate.

Next, look at the plant flow history. Based on the plant flow records, determine the following:

- Average dry weather flow
- Maximum 30-day average flow
- Peak daily flow
- Peak hourly flow

Review the plant's wet weather flows. What rainfall and/or snow melt events cause flows to increase? How quickly do the flows come up? How quickly do they drop? Look at each treatment unit. What is the peak design flow for each unit? Look at the operating records to determine what issues came up during peak flows.

Impacts on Major Unit Processes, Operating Strategies

It is very important to understand how storm events will impact the major unit processes at the plant, and then to develop a plan that will keep the plant operating well. On pages 14–15 is a summary of the major unit processes, potential impacts and operational strategies that operators should consider.

Above: Flooded drying beds at a wastewater treatment plant

Below: Influent channel flooding

Photos by Jim Cunningham

continued on page 14

continued from page 13

Unit Process	Potential Impacts	Before Storm Event	During Storm Event
HEADWORKS Bar Screen, Grit Removal	• Overflowing screen feed channels • Activation of upstream combined sewer overflows • Passage of some screenings through the screens due to localized high velocity through the bars • Overflowing screenings containers • Overloading and shutting down grit removal facilities • Excessive grit carrying through grit removal facilities to downstream processes • Grit blocking channels and pipes at the treatment plant • Overflowing grit receiving containers	• Clean grit chamber, and bar screen • Empty out grit and screenings containers • Set controls for continuous operation • Clean sewers and catch basis regularly • Place all units in service	• Monitor daily volumes of grit and screenings, • Remove grit continuously • Empty containers as necessary
PRIMARY CLARIFIERS	• High solids loading in the first flush, causing high sludge blanket levels • Scouring of solids from the sludge blanket, resulting in excessive solids in the primary effluent • Reduction in overall removal efficiency of BOD and TSS • Excess grit and screenings loadings to primary clarifiers due to overloaded preliminary treatment processes • Flooded scum removal and storage boxes	• Inspect and repair sludge collectors, gear drives, sludge pumps, scum collectors • Draw sludge blankets down • Decide if spare tanks should be put on line • Improve flow split to tanks • Improve hydraulics by modifying weirs • Improve hydraulics by installing baffles • Install chemically enhanced primary treatment (CEPT)	• Monitor influent and effluent solids levels • Monitor sludge levels, pump as necessary • Discontinue secondary sludge feed to primary clarifiers. • If CEPT is available, turn on chemical feed.
ACTIVATED SLUDGE	• Loss of biomass from the aeration tanks and secondary clarifiers • Overloading of the aeration system resulting from high BOD loadings caused by solids washout from the sewer system and solids washout from the primary clarifiers • Electrical overload of mechanical surface aerators caused by high water levels • Decreased BOD removal efficiency due to shortened hydraulic retention time in the aeration tanks	• Develop wet weather operations target values for MLSS, RAS rates, and WAS rates	• Adjust RAS rate: increase if: • Low solids in the aeration tanks, high blanket in clarifier • Increasing clarifier sludge blanket level, clarifier solids loading rate is below the clarifier's solids handling capacity • Solids loss is occurring, and some aeration is shut down for solids storage Decrease if: • Low clarifier blanket and additional solids storage is desired in clarifier • Low or mid-level clarifier blanket with clarifier solids loading rate approaching its upper limit *Other steps:* • Maintain low MLSS • Control filaments • If necessary, reduce aeration to conserve biomass

Unit Process	Potential Impacts	Before Storm Event	During Storm Event
FIXED FILM	• Lower hydraulic detention time in the fixed film reactor can decrease BOD removal efficiency • High hydraulic loading on trickling filters can rotate distributor arms too fast • High hydraulic loading rates can cause sloughing of biomass in extreme cases • Uneven flow distribution accentuated by high flows	• For trickling filters/bio towers: make sure ports are clean, make sure underdrains are operational • For RBCs: maintain gear drives	• Monitor loading • Reduce or stop recirculation flows • Adjust trickling filter arm speed • Place units in parallel operation
SECONDARY CLARIFIERS	• Loss of biomass • Reduction in overall removal efficiency of BOD and TSS • Flooded scum removal and storage boxes	• Inspect and repair sludge collectors, gear drives, sludge pumps, scum collectors • Adjust blanket levels as necessary • Place spare tank on line • Make weir modifications • Add baffles	• Monitor blanket levels • Monitor for solids washouts. • Adjust RAS and WAS rates as necessary • Add chemicals to help settle solids.
TERTIARY SAND FILTERS	• Washing of excessive solids from secondary clarifiers resulting in premature blinding of filter media • Hydraulic overloading of filters resulting in excessive headloss	• Place all filters in service • Backwash before the high flows arrive to be sure that all filters are available at peak capacity	• Monitor operations • If necessary, bypass filters to keep from overloading them • Reduce backwash time during high flow periods • Reduce secondary clarifier blankets before high flows to minimize excessive secondary solids carryover
DISINFECTION	• Insufficient exposure time in the chlorine contact tank or the ultraviolet disinfection chamber to adequately disinfect the effluent. • Excessive solids in secondary effluent resulting from high flows	• If using chemicals, make sure to have enough on site to maintain disinfection • For UV, check bulbs, make sure bulbs are clean • Optimize mixing in chlorine contact tank	• Adjust chemical feed as necessary. Chlorine demand may be higher than under normal operation. • Add extra bank of UV on, if necessary
SOLIDS HANDLING	• Excess solids entering plant with first flush • Poor treatment efficiency of solids handling recycle streams (such as digester supernatant or belt press filtrate) during wet weather flows • Inability to achieve adequate drying on drying beds during wet weather	• Inspect, repair pumps, dewatering equipment etc. as necessary • Reduce quantity of solids stored prior to wet weather. • Make arrangements for alternate methods of solids disposal.	• Consider not pressing solids to reduce side stream loads to system • Consider not sending supernate back to plant to reduce side stream loads
EMERGENCY POWER	• Loss of power at treatment plant or pump stations	• Maintain generator • Make sure you have fuel • Exercise generator under load on regular basis	• If power goes out, make sure generator is operating. • If you have RBCs, check media to ensure it hasn't become unbalanced due to RBCs stopping.

Operating a wastewater treatment plant is a daily challenge, especially during wet weather. Having a plan in place is critical in maintaining compliance. Operators must keep their local NYSDEC office in the loop as well, especially if the operator anticipates being in non-compliance with the plant's State Pollutant Discharge Elimination System permit requirements.

Sandy Lizlovs, PE, is Environmental Engineer for the NYS Department of Environmental Conservation's Region 7 office, located in Syracuse, NY.

Do Design Storms in New York State Need Updating?

by Stephen Shaw and Doug Daley

The sizing of stormwater conveyance and management structures, such as culverts, ponds, and channels, largely depends on the choice of the design storm. The design storm specifies the amount of precipitation occurring over a given duration with a given probability of occurrence. For instance, the diameter of a culvert may be sized to pass the runoff resulting from a "24-hour, 10-year return period" storm, meaning the storm event that is 24 hours in duration that produces a rainfall amount equaled or exceeded on average every 10 years.

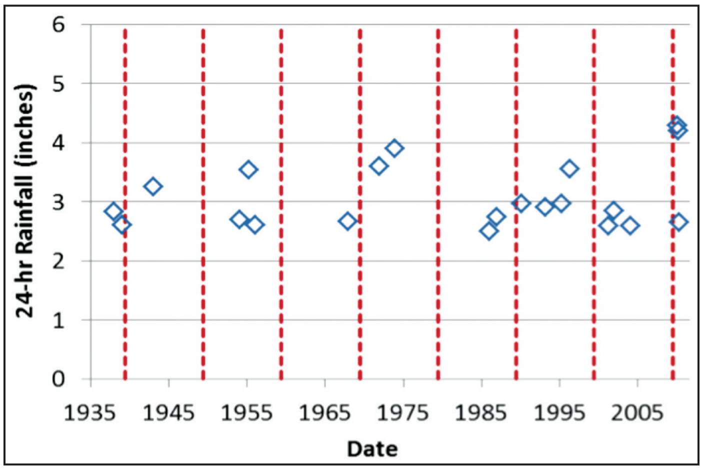


Figure 1. Date of 24-hour rainfall events resulting in more than 2.5 inches of rainfall as recorded at Hancock International Airport, Syracuse, NY from 1938 to 2012. The red dashed lines indicate the separation between decades. Both the 1940s and 1960s only had one 2.5+ inch storm event. Since the 1980s, large storm events have been more frequent.

In New York (as in much of the Northeast), there is clear evidence that the frequency and magnitude of large storm events appear to have increased in the last several decades. As a simple illustration, one can look at extreme daily rainfall amounts at Hancock International Airport in Syracuse since 1938. ***Figure 1*** shows all 24-hour rainfall events that exceeded 2.5 inches (approximately the three-year return period storm) between 1938 and 2012 plotted in time. It is apparent that there have been more of these 2.5+ inch rainfall events in the last three decades and that the largest rainfall events have primarily occurred in recent years. The 1940s and 1960s had only one 2.5+ inch event apiece, but since 1980, these events have occurred more consistently. Climatologists at the Northeast Regional Climate Center in Ithaca, NY undertook a much more in-depth analysis and identified a similar result. They found a consistent upward temporal trend in 2-year, 50-year, and 100-year return period storm amounts for multiple precipitation stations across the Northeast and Western Great Lakes *(Degaetano 2009).*

Furthermore, there is evidence that in a warming climate, rainfall intensity (inches/hour) will likely increase. A primary line of evidence comes from the fact that warmer air can hold more moisture than cooler air. Thus, if all other factors affecting rainfall intensity remain the same, a storm occurring on a warmer day has greater potential to generate more rainfall because there is likely to be more moisture in the atmosphere that can condense out. Most climate models indicate a likely increase in rainfall in the Northeastern US in a changing climate. However, it must be acknowledged that a scientist's ability to predict future rainfall amounts at a regional scale – particularly extreme events – remains somewhat limited. For instance, the assumption that a warming climate can hold more moisture is only relevant to storms several hours in length; long storms almost certainly transport in moisture from many 100's of miles away and do not rely only on moisture locally accessible in the atmosphere. Precipitation estimates remain one of the greater uncertainties in generating future climate predictions.

Factors to Consider

Despite this obvious change in rainfall frequency and the possibility for continued changes, design storms are still often based on quite old records. As shown in the NYS Stormwater Design Manual *(NYSDEC 2010),* 10-year and 100-year return period storm events in New York are very often based on Weather Bureau Technical Paper 40 (also known as TP-40 or the Hershfield maps). The TP-40 is based on climate data collected during a relatively short period between 1930 and 1960. In other states as nearby as Pennsylvania, TP-40 is being replaced by new documentation of precipitation climatology as provided in NOAA Atlas 14, although even Atlas 14 is based on data that are now a decade or two old. Does this suggest that design storms based on half-century old data are in dire need of an update? There are several elements to consider.

First, the last several decades of increased frequency of large precipitation events has not been conclusively tied to global climate change resulting from increased greenhouse gas emission. Interestingly, the wetter conditions correspond to a relatively sharp change in rainfall intensities occurring around 1970 (somewhat evident in ***Figure 1***), not a gradual trend following increased greenhouse gas emissions over the last several decades. Attempts to replicate the wetter conditions using global climate models do not suggest the change is driven by increased greenhouse gas emission. Instead, the climate models indicate recent wet conditions in the Northeastern US are likely related to natural variability in the regional climate system *(Seeger et al. 2012)* unrelated to greenhouse gases. This shift to wetter conditions thus is not easily explained by any specific mechanism, and this relatively recent shift may not necessarily continue indefinitely into the future. In the same way the climate records from the 1930s to 1960s prove not to be representative of our most recent 30 years of precipitation conditions, the last 30 years may not be representative of the next 30 years.

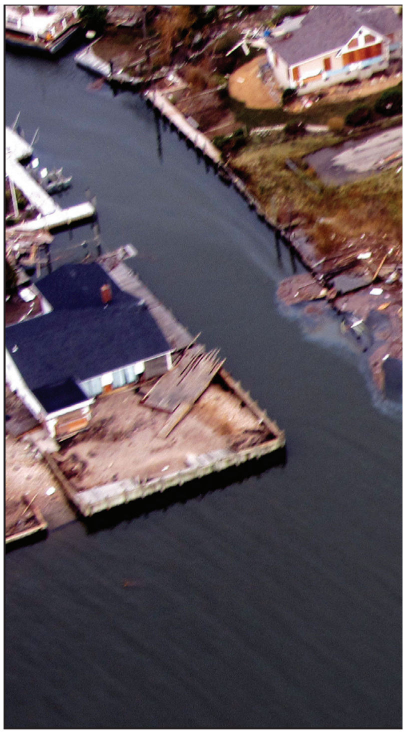


Photo courtesy of NYSDEC

Second, precipitation amount does not tell the whole story when trying to determine wet weather flows. Certainly, in small, highly impervious watersheds, such as parking lots or heavily urbanized city blocks, rainfall intensity and amount will be closely related to the runoff magnitude and volume. However, in larger watersheds with more pervious surfaces and storage, the amount of runoff generated is often as dependent on the antecedent moisture storage in the soils as it is on the rainfall amount. In New York, large rainfall amounts often occur in the summer, but since the soils are often dry, these storms do not often result in large runoff amounts *(Shaw and Riha 2011)*. Certainly, the very largest rainfall events (5+ inches in 24 hours) will exceed to storage capacity of even very dry watersheds and make the initial degree of storage somewhat moot, but at least for moderately large rainfall events (e.g., 2- and 5-year storms), one must still consider the possible compensating effects of dry initial moisture storage. Conversely, if a watershed has very little available moisture storage (and maybe even some accumulated snow) only medium amounts of rain may result in very large flows. Thus, updating the rainfall frequencies alone without considering the interaction with antecedent conditions may not necessarily result in a more accurate representation of design runoff amounts.

Third, the choice of design storm – while now somewhat codified in state and municipal laws – has its roots in the consideration of economic benefits. Namely, do the benefits (e.g., avoided damages) of installing a new or larger structure outweigh the cost of designing and building the new structure? In specific terms, if the current 10-year return period storm increases in frequency such that it now occurs twice as often, does installing a new larger culvert to avoid an additional period of overflow actually payback over time? Answering such a question depends on understanding what type of damages are trying to be avoided. If the "damage" is runoff running over the road and temporarily impeding traffic twice instead of once per decade on average, the additional cost of a larger culvert may not be justified. If the "damage" is a washed out road that requires several weeks of repairs before it can be used again, it may certainly be worthwhile. If the road is the primary thoroughfare to the local hospital one may want to consider adding an additional margin of safety. Thus, while

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An aerial scene of a section of New York's shoreline in the aftermath of October's Hurricane Sandy, a "superstorm" which impacted wastewater treatment plant processes and thousands of neighborhoods.

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we may know the records used to calculate a 10-year return period design storm may be out of date, very rarely does anyone ask whether the economic benefit of using a 10-year return period storm was reasonable in the first place. While one would not want to do this on a case-by-case basis for every upgrade to stormwater infrastructure, it is possible that a more refined strategy for including a cost-benefit analysis in selection of a design storm may be as useful to informing good infrastructure planning as updating the climate data on which the design storms are based.

Adapt More Effectively

There is already some existing work to provide information on design storms using more recent climate records. The Northeast Regional Climate Center has updated intensity-duration-frequency curves using climate data through 2008. They are available at an interactive website at: precip.eas.cornell.edu. Therefore, if one is interested in seeing how much a design may change given updated climate records, the reader is encouraged to begin by using this convenient resource. Hopefully though, it is apparent that answering the question of whether we need to revise design storm standards is not as straightforward as simply running additional statistical analyses on recently acquired weather data. As with many issues regarding climate change adaptation, the uncertainty associated with the future climate offers an opportunity to step back and consider the whole picture. From a cost-benefit perspective, do we really have an understanding of likely damages if design criteria are exceeded, and is a tightening of the design criteria really justified given the uncertainty? Has the fact that design storms often do not consider other factors that influence runoff, made them more conservative than often anticipated?

Given that we have already been dealing with more frequent intense rainfall events than some facilities were designed for (e.g. using 1930-1960 data for 2000 era rain events), are there actually clear and consistent indications that existing infrastructure is under-designed for changed conditions? Updating design storms with new data may be easier than answering these questions. In the long run though, dealing with these questions may lead to more effective adaptation of stormwater systems to a changing climate.

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How Two Municipalities Implemented CSO LTCPs Post-Construction Compliance Monitoring

by Brian J. Platt, Dwight A. MacArthur and John J. LaGorga

The City of Binghamton and Village of Johnson City are served by combined sewer systems (CSSs) that convey both sanitary sewage and stormwater to the Binghamton-Johnson City Sewage Treatment Plant (BJCSTP). The city and village have completed implementation of their Combined Sewer Overflow (CSO) Long Term Control Plans (LTCPs) by characterizing their collection system, increasing the capacity of the sewage treatment plant, and constructing CSO screening facilities at defined overflow locations.

Both the city and the village are characterized as urban environments, with a high percentage of impervious areas such as streets, driveways, sidewalks, rooftops and parking lots. Much of the precipitation that falls on these areas is eventually routed into the combined sewer system. Binghamton's CSS has two major interceptors, one north and one south of the Susquehanna River. Runoff from seven major sub-basins totaling 760 acres flows into the north interceptor, which then is conveyed through twin 30-inch sewers beneath the Susquehanna River to the BJCSTP. Three major sub-basins comprising 320 acres flow into the south interceptor, which are then pumped by the Pennsylvania Avenue Pumping Station to the BJCSTP. Excess flows from the combined system have the potential of occurring at nine CSO discharge locations.

In the Village of Johnson City, two major drainage basins are tributary to CSO 002, encompassing 300 acres. A third major sub-basin is smaller (approximately 20 acres) and is tributary to CSO 001. Flows from the village are pumped by the terminal pumping station to the sewage treatment plant. Both CSO Outfalls 001 and 002 are upgradient of the terminal pumping station.

In October 2002, Binghamton completed its CSO-LTCP, which included upgrades to several sewer system overflow structures. As a result of the LTCP, the city added screening devices to CSO Outfalls 001, 002, 003, 004 and 005. In addition, Outfalls 006, 009 and 013 were equipped with gates to control discharges. Improvements were also made to the BJCSTP to improve the quality of plant effluent, and to provide for a much higher wet weather delivery rate to the plant from the city and village collection systems via the city's Pennsylvania Avenue pumping station and the village's terminal pumping station.

The final CSO-LTCP report approved in 2000 indicated that the combination of the BJCSTP expansion, continued separation of sewers on the south side of Binghamton, and implementation of best management practice (BMP) measures would be sufficient for the city to achieve CSO percent volumetric capture at a rate of between 90 and 95 percent. Estimates of percent volumetric capture made by the city since implementation of the CSO-LTCP have ranged from 89 to 92 percent. The Village of Johnson City partially fulfilled its CSO-LTCP by constructing screening facilities at CSO 001 and 002. Similar to Binghamton's, improvements to the BJCSTP resulting in an increased conveyance of wet weather flow also assisted the village in meeting the objectives of its LTCP.

PCCM Plan

The Post-Construction Compliance Monitoring (PCCM) Plan was required to be implemented within five years of implementation of the CSO control facilities identified in the LTCP. The goal of the PCCM was to determine, with a reasonable amount of monitoring, the effectiveness of the implemented CSO controls in reducing impacts on water quality in the receiving streams. In May 2012, the US Environmental Protection Agency (USEPA) issued its CSO Post-Construction Compliance Monitoring Guidance document. This document wasn't available for use at the time this PCCM Plan was developed, but the document outlines an approach very similar to that utilized by the City of Binghamton and Village of Johnson City.

The first step was to develop a monitoring and quality assurance project plan. The Monitoring Plan and Quality Assurance Project Plan for Combined Sewer Overflow Post-Construction Monitoring Report (the QAPP) developed for this effort was approved by the NYS Department of Environmental Conservation (NYSDEC) on March 1, 2010. The second step was to perform the water quality sampling and analysis effort (in accordance with the approved QAPP).

As an initial step in the development of the PCCM plan, a coordination meeting was held between the various involved parties (city, village, BJCSTP and NYSDEC) to discuss the requirements and objectives of the PCCM effort. Discussions led to a consensus that, because the Susquehanna River was a common receiving water for both CSO communities and the activities required by each community were similar, the project QAPP, sampling schedule and logistics, and final report should be coordinated as a single effort, with the final report submitted as one document to the regulatory agency for review and approval. This approach led to the field efforts being conducted simultaneously, using the same methods and protocols, resulting in more efficient use of resources.

Image courtesy of BJCSTP

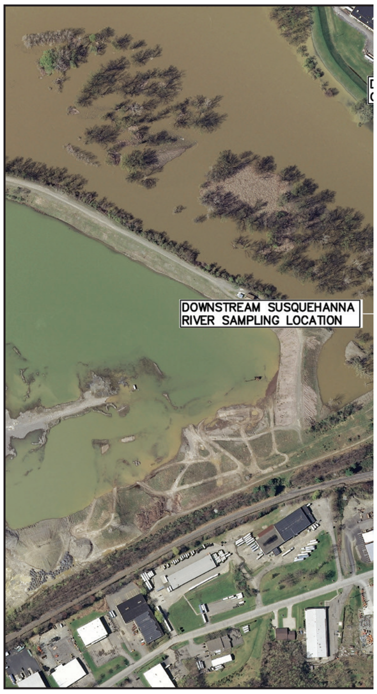

Image courtesy of BJCSTP

Water Quality Standards

The Susquehanna River is classified as a Class A fresh surface water in the region of the city and village CSO outfalls. The usages of Class A waters with the most stringent water quality standards (WQSs) are as a source of water supply for drinking, culinary or food processing purposes, primary and secondary contact recreation, and fishing. The most pertinent water quality standards for a Class A fresh surface water are outlined in ***Table 1***. The Little Choconut Creek (classified as a Class C fresh surface water) and Chenango River (classified as a Class B fresh surface water) contribute to the Susquehanna River. For the primary parameters of interest in this study (coliforms and the narrative standards), the WQSs were the same for Classes A, B and C. Therefore, all three water bodies were discussed as having to meet the same standards.

As outlined in the QAPP, NYSDEC requested analysis of additional parameters (e.g., priority pollutant metals) as well, which was consistent with the philosophy expressed in the PCCM Guidance documents issued by USEPA that a PCCM program should be coordinated, where possible, with sampling and analysis programs required by other regulatory requirements (SPDES permits, Consent Orders, TMDLS, etc.).

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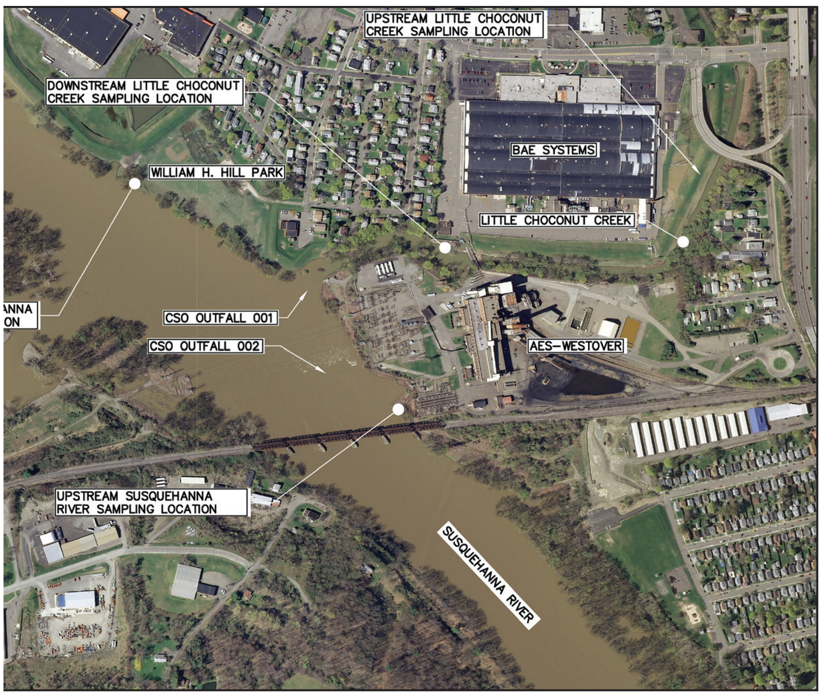
Above: City of Binghamton's sampling locations for its CSO-LTCP post-construction monitoring plan



Above: Village of Johnson City's sampling locations for its CSO-LTCP post-construction monitoring plan

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Table 1. Receiving Water Quality Standards.

Parameter	Standards for Parameters of Concern for Stream Classes A, B and C Susquehanna River [A], Chenango River [B] and Choconut Creek [C]
Total coliforms (counts per 100 mL)	The monthly geometric mean, from a minimum of five examinations, shall not exceed 2400, and no more than 20% shall exceed 5000.
Fecal coliforms (counts per 100 mL)	The monthly geometric mean, from a minimum of five examinations, shall not exceed 200.
pH	Shall not be less than 6.5 or more than 8.5.
Dissolved oxygen (DO)	For non-trout waters, the minimum daily average shall not be less than 5.0 mg/L, and at no time shall the DO concentration be less than 4.0 mg/L.
Temperature	The water temperature at the surface of a stream shall not be raised to more than 32˚C at any point.
Trash	No visible trash impairing the aesthetic value of surface water.
Total suspended solids	None from sewage, industrial wastes or other wastes that will cause deposition or impair the waters for their best usages.
Total dissolved solids	Shall be kept as low as practicable to maintain the best usage of waters but in no case shall it exceed 500 mg/L.
Oil and floating substances	No residue attributable to sewage, industrial wastes, or other wastes, nor visible oil film nor globules of grease.
Turbidity	No increase that will cause a substantial visible contrast to natural conditions.
Phosphorus and nitrogen	None in amounts that will result in growths of algae, weeds and slimes that will impair the waters for their best usages.

Source: NYSDEC Regulations, Chapter X – Division of Water, Part 703: Surface Water and Groundwater Quality Standards and Groundwater Effluent Limitations

Water Quality Sampling

The water quality sampling effort was performed by representatives of the city and village Public Works staffs. Their consultants trained the municipalities' sampling crews to perform the equipment calibration, water quality sampling, floatables and trash observations, and data recording. The trainers were onsite during the first sampling event to ensure that the crew followed the sampling procedures outlined in the QAPP. Approximately three additional training visits were conducted as required throughout the sampling period to review proper sampling methods.

A field foreman from the City of Binghamton coordinated the sampling and was responsible for onsite decisions regarding when sampling would take place. For the months in which sampling occurred one dry weather sample was collected each week, and one wet weather sample was collected after a rainfall event of 0.05 inches. The field foreman was also responsible for calibrating and maintaining equipment, collecting QA/QC samples, overseeing collection of water quality samples, and coordinating with the laboratory for pickup and delivery of sample bottles. Sample collection was performed from bridges or from the shoreline when flows in the receiving waters were determined or considered to be too dangerous to enter. A bucket and rope were used to collect the samples. A portable Oakton PD 300 field meter was used to measure DO, pH and temperature. Floatables were photo documented with a digital camera and representative photographs from each sampling location were obtained.

Water quality samples were collected upstream and downstream of the village and city CSO outfalls on the Susquehanna River, Chemung River, and Little Choconut Creek, so the net impact of CSOs could be assessed. The sampling locations are illustrated in ***Figure 1*** and ***Figure 2*** for Binghamton and the Village of Johnson City, respectively. As documented in the QAPP, samples were collected during the months of April, June, July and October 2010. During the months of April, June, and October, a dry weather sample was taken weekly, and wet weather samples were taken once a week, depending on weather. Dry weather samples were generally taken at the same time and day of the week to provide consistency in interpreting the analytical result (typically between 8:30 and 10:30 a.m. on Tuesdays). In June, July and October, CSO events occurred during the weekly wet weather samplings, providing specific data on the effects of the CSO discharges.

Samples were collected at each of the identified sampling locations and ***Table 2*** summarizes the number and type of samples collected.

Table 2. 2010 Sampling Event Summary.

Month	Dry Event Sampling Events	Wet Event Sampling Events	Total Sampling Events
April	4	2	6
June	4	2[1]	6
July	0	1[1]	1
October	4	2[1]	6
Total	**12**	**5**	**19**

[1]Included CSO overflow event

The USEPA approved methods were used by the analytical testing laboratory to measure the pollutant content in the water samples. The laboratory was responsible for calibration, maintenance and QA/QC related to the sampling analyses. As described in the QAPP, data from the sampling results was reviewed for the following quality objectives: comparability, completeness, representativeness, accuracy and precision.

Field duplicates were taken to measure the precision attributable to collection, handling, shipment, storage, and/or laboratory handing and analysis. Field blanks were prepared with deionized water to identify potential sample contamination occurring during field collection, handling, shipment, storage, and laboratory handling and analysis. The average relative percent differences in precision for each of the sampling dates were calculated in accordance with the QAPP where field duplicates were collected. The differences ranged from 3–39 percent over all samples, with an average difference of about 16 percent.

Sampling Results

Water quality sampling was performed on a total of 19 days during April, July and October 2010. Several CSO events occurred during the sampling period and water quality sampling was conducted

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during three of the events. ***Table 3*** summarizes the characteristics of each CSO event.

For each of these events, water quality sampling occurred within 12 hours of the CSO discharge. The effects of CSO discharges on the most pertinent water quality standards for Class A fresh water bodies identified for this PCCM plan were examined.

Table 3. Summary of 2010 Wet Weather Sampling CSO Events.

Event Date	Total Rainfall[1]	CSO Volume (gallons)	Active CSOs Binghamton	Active CSOs Johnson City
June 17	0.67 inches in 0.5 hours	117, 200	001, 002, 003, 004, 005	001, 002
July 22	0.79 inches in 5 hours	102,100	001, 002, 003, 004, 005	001
October 1	5.79 inches in 28 hours	2,870,700	001, 002, 003, 004, 005, 007, 009	001, 002

[1]Rainfall was measured in the vicinity of the City of Binghamton Water Treatment Plant located at 1 Broome St., Binghamton, NY.

Solids and Floatables Capture

The city and village perform routine inspections of CSO screening facilities during or after overflow events to verify proper operation and determine if maintenance is required prior to future events. During a CSO event that occurred on June 6, 2010, photographs were taken in the vicinities of Binghamton's CSO Outfalls 002 and 005 while they were overflowing. These photographs demonstrated the effectiveness of the CSO Romag™ screens in capturing solids and floatables during this overflow event in that no visible solids or floatables were observed being discharged.

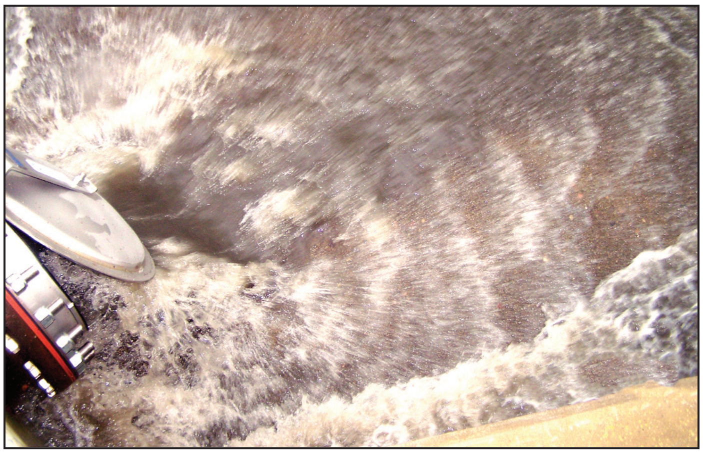

Photo courtesy of BJCSTP

The City's CSO 005 outfall into the Susquehanna River during a June 6, 2010 combined sewer overflow event

Compliance with WQS

Sampling results for the most pertinent water quality parameters of concern noted earlier in ***Table 1*** were conducted. For the parameters of concern the numerical and narrative standards for Class A and Class C surface waters are nearly the same, so the following summaries treat them as being the same, i.e., Class A. Most parameters were in compliance with WQSs. However, the results indicated that fecal coliforms and iron concentrations frequently exceeded the WQSs, although such exceedances were observed during dry weather conditions as well as wet weather conditions. Significant findings with respect to fecal coliforms and iron are summarized:

Fecal Coliforms (FC): The water quality standard for FC is the monthly geometric mean, from a minimum of five examinations, shall not exceed 200 counts per 100 ml. The geometric mean was calculated for each month that sampling occurred for the upstream and downstream sampling locations. With the exception of the month of April at the upstream Susquehanna River sampling location, each of the calculated geometric means was above the 200 counts per 100 ml threshold. Specific observations were as follows:

- The geometric mean concentration during all three sampling months was above the standard of 200 counts/100 ml at both upstream and downstream locations (less than 400 counts/100 ml).
- The geometric mean concentrations downstream of the CSOs in the Susquehanna River were slightly greater than they were upstream, but by less than one order of magnitude.
- On dry days only, 50 percent of the samples taken at the Susquehanna upstream location were above the FC standard, and downstream 75 percent were above the standard. At the upstream Chenango location, 8 of the 12 dry weather sampling events showed FC concentrations exceeding the standard.
- During all three sampling events that corresponded with a CSO event, the FC levels were at or above the standard at both the upstream and downstream locations
- In Little Choconut Creek, the upstream and downstream FC geometric mean concentrations were about the same under dry weather conditions, although individual samples were higher than the standard of 200 counts/100 mL for 8 of the 12 dry weather events at both locations.
- During wet weather, the FC concentrations were frequently as high or higher upstream of the two CSOs than they were downstream of the CSOs, even for the two events in which overflows at CSOs 001 and 002 were observed.

The FC parameter was out of compliance with water quality standards; however, it seems clear that other sources (e.g., storm sewer discharges or agricultural runoff) in addition to CSOs may play a role in the non-compliance in these receiving waters.

Iron: The water quality standard for Class A, Type H (WS) water bodies is 0.3 mg/L. The average iron concentration measured in the Susquehanna River was approximately 13 mg/L, and the average iron concentration measured in the Little Choconut Creek was approximately 8.3 mg/L, most likely representing ambient background conditions.

Results Beneficial

The city and village worked collaboratively to assess the effectiveness of their CSO LTCPs resulting in efficiencies that saved both municipalities money. The PCCM Plan concluded that the village and city are meeting established targets of no more than four overflow events per year and that the installed screening facilities are working effectively. Though concentrations of fecal coliform and iron exceed the water quality standard, this is due to sources upstream of the two communities. Other communities required to complete a PCCM Plan may benefit from the approach used by these two municipalities, and the recently completed CSO Post-Construction Compliance Monitoring Guidance issued by the USEPA in May 2012 outlines an approach very similar to that utilized by the City of Binghamton and Village of Johnson City.

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Tidal Gate Project Restores Sanctuary's Lake and Wetland

by Hugh J. Greechan, Thomas P. Shay and Robert Doscher

Manursing Lake is a man-made 80-acre lake located within Westchester County's Playland Amusement Park and the 179 acre Edith G. Read Natural Park and Wildlife Sanctuary in the City of Rye, NY. Historically, Manursing Lake existed as tidal wetlands associated with the Long Island Sound, but was dredged in the 1920s as part of the development of Playland Amusement Park. For the past 90 years, the lake has been used for paddle boats and lake boating tours.

Photo courtesy of Woodard & Curran

An aerial photograph of Manursing Lake identifies the project work locations.

The lake has provided refuge and spawning/nesting sites for various fish and migrating avian species. Due to the lack of tidal flow associated with an inoperative tide gate system, negative ecological consequences, such as hypoxia and anoxia, reduced fish access and breeding habitat, and increased sedimentation, resulted in loss of intertidal areas and native vegetation, as well as expansion of invasive phragmites (reed grass) species.

The engineering firm Woodard & Curran was retained by Westchester County for the planning, permitting, design and construction oversight of an automated tide gate system and the design of an aquatic habitat restoration along a 1,600 linear foot portion of the lake's shoreline. The goal was to improve the tidal exchange with Long Island Sound while controlling the lake levels to elevations conducive for aquatic habitat restoration and establishment of tidal wetlands and estuarine functions. In addition to completing this technically challenging task, other challenges included a fast track design and construction schedule with fixed completion deadlines, adhering to various New York State regulatory requirements, and coordination with multiple representatives of four county departments, including Planning, Parks, Public Works, and Environmental Facilities.

Antiquated to Automated System

The manually operated, wooden tide gates in the original system were located beneath an existing stone bridge at the southern outlet of the lake near the entrance to the Edith Read Wildlife Sanctuary. This system was antiquated and essentially inoperable due to broken components and corrosion resulting in limited tidal exchange during tide cycles. When operating, an operator had to manually crank the gates up and down. The only tidal exchange the lake experienced was during high tides that exceeded the elevation of the top of the gate which acted as a weir. There was limited variation in water elevation during tide cycles within the lake as a result.

The original proposed design concept involved a system comprised of multiple large diameter corrugated metal pipes connected to self-regulating tide gates located off to the side of the bridge. This concept was evaluated and disregarded due to hydraulics, high cost, long schedule, added maintenance and permitting issues.

The tide gate design that was ultimately selected was comprised of two custom, automated, stainless steel slide gates. These slide gates were installed within the same openings as the former wooden tide gates. This design was considered a replacement in kind that greatly expedited the permitting process. The availability of electric power in proximity to the project site made it possible to power the gates and control them automatically by a Supervisory Control and Data Acquisition (SCADA) system; however, the gates are also equipped with a manual backup system in the event power is lost.

The SCADA system receives signals from ultrasonic level transmitters that monitor the water level on either side of the gates. These level transmitters are fixed to the bottom of the bridge deck. The SCADA system is programmed to operate the gates based on specified minimum and maximum water levels within the lake and the actual water level within the Long Island

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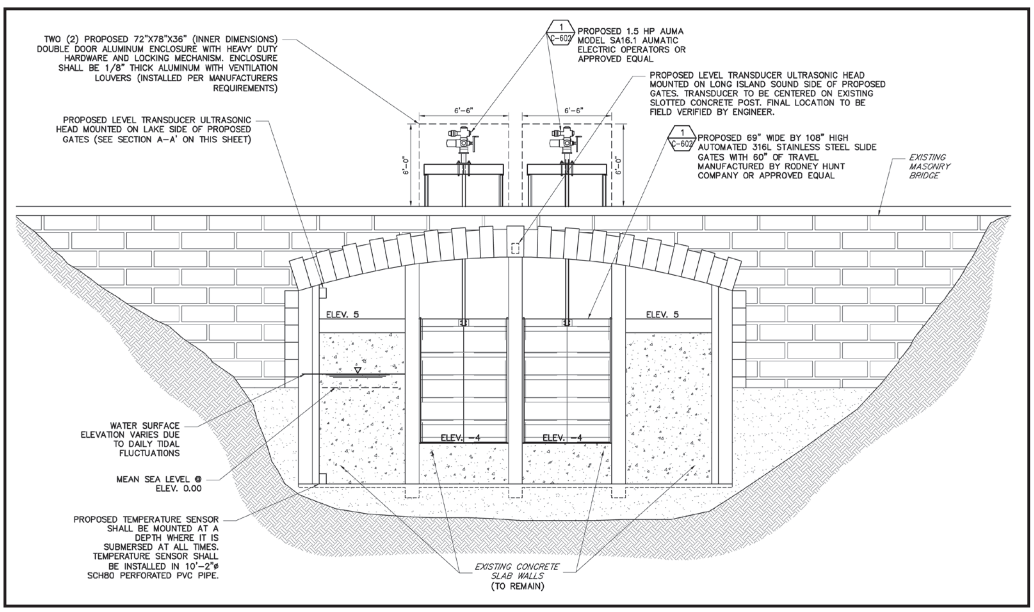

Diagram courtesy of Woodard & Curran

A detailed elevation diagram of the tidal gate shows its design and function.

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Sound. These levels can be monitored remotely as the water level data is transmitted to a website.

The new gate system allows for safer, more efficient operation, and more control of the flows in and out of the lake. The gates allow for precise control (within 0.1 feet) of the lake water levels, which was invaluable during construction of the aquatic habitat restoration, when the lake water level was reduced to allow for earthwork and planting activities to occur in dry conditions. Control of the water level also allows for the water elevation to be reduced during the winter season which helps reduce damage to the intertidal marsh grasses from ice buildup.

The tidal fluctuation within the lake has increased by four times from four inches to 16 inches during typical high tides. This has resulted in an increased tidal exchange into the lake of more than 80 acre-feet of saltwater from Long Island Sound. Observations and preliminary studies have shown that the new system has potential for significant ecological improvements within the lake.

Photo courtesy of Woodard & Curran

Tidal wetland restoration area (that included a total of 60,000 grass, shrub and tree plantings) is shown just after planting in August 2010.

Photo courtesy of Woodard & Curran

Natural habitat restoration is seen with full establishment of vegetation in September 2012.

Site Ecologically Restored

With the tidal gate replacement completed, the design and construction for the aquatic habitat restoration along 1,600 linear feet of the lake's shoreline was initiated. Creative Habitat Corporation, a firm specializing in ecological restoration, supported the engineers with the tidal wetland restoration component of the project. The ecological aspects of the project included the assessment of the natural resources in the lake and surrounding areas, wetland delineation and preparing a complete natural resources inventory. It also included selecting the types and locations for extensive wetland and upland plantings and working with the engineers to establish the appropriate grading and drainage across the restoration site. The former erratic tidal fluctuations and steep slope of the shoreline were not naturally conducive to creating a significant amount of tidal salt marsh. As a result of increased tidal fluctuation, control of the minimum and maximum water levels, and reshaping of the shoreline, approximately four acres of tidal wetland, grassland and upland planting areas were created. Over 60,000 grass plugs, shrubs and trees were planted as part of the restoration work.

Freshwater was intercepted in upland areas via trench drains and swales to limit the amount of freshwater entering the tidal wetland with the intent to reduce the probability of invasive species survival. Coir (coconut fiber) logs were installed as a breakwater along the shoreline of the restoration to support the wetland planting media and reduce erosion due to occasional wave action within the lake. The construction of the tide gate system and increased tidal exchange allowed the wetland restoration to be accomplished, which will ultimately lead to improved water quality and an increase in the diversity and productivity of the surrounding ecosystem.

This project demonstrates how multiple technologies can be integrated to produce a remarkable environmental system. One example of a simple yet extremely effective component during construction was the use of a temporary cofferdam system, called a Port-a-Dam. This system was constructed of a support structure and synthetic liner that was used to isolate and dewater the area beneath the bridge allowing the tide gate construction work to occur more quickly with less environmental impact. The Port-a-Dam allowed for quicker installation and much less disturbance as compared to an impermeable, soil based dam system. This solution also avoided

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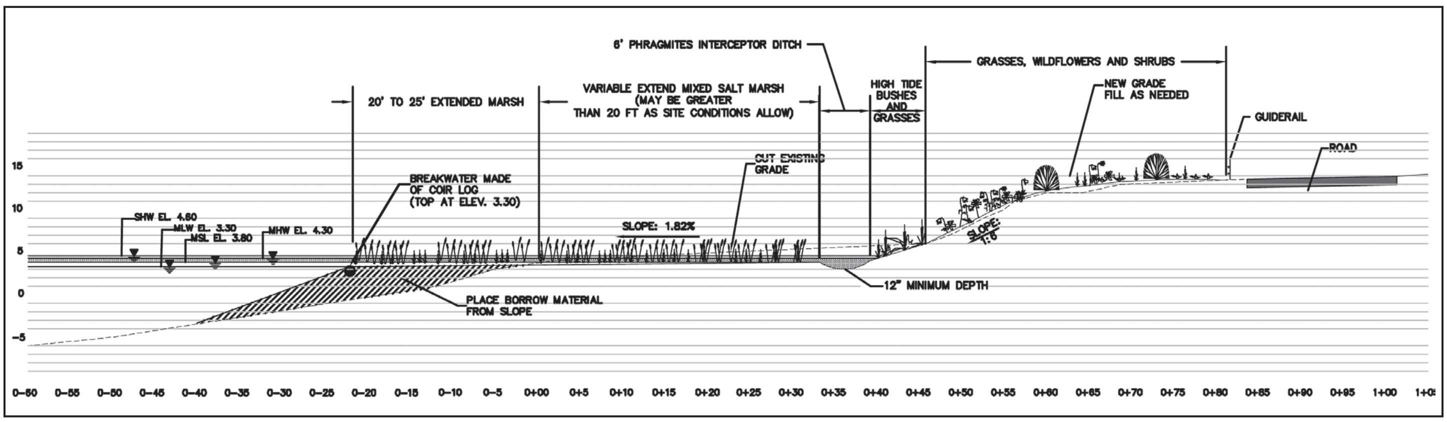

Diagram courtesy of Woodard & Curran

This cross-section diagram shows the elements and design for a typical tidal wetland habitat restoration used for this project.

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filling with compacted soil and stone within navigable waters, eliminating the need for associated regulatory permitting. The previous tide gate replacement work (installation of the former wooden gate system) utilized an earthen berm system to control the lake levels during construction and this system ultimately had a negative impact on lake water quality and resulted in a fish kill.

While the project site is contained within a municipal park and wildlife sanctuary, it is located in a highly visible and trafficked area. Many longtime passersby and county personnel viewing the restoration for the first time were surprised and impressed by the transformation and expressed that the project has had a positive impact on the surrounding community. This project was planned and designed keeping social, economic and sustainable design considerations in mind. Multiple design options were reviewed and the most responsible components were chosen with respect to cost, the environment, and maintaining the recreational components of Manursing Lake.

The construction costs were reduced as compared to historical options, the property has enhanced aesthetic and educational components, and the water quality has improved, all of which were the primary goals of this project. The wildlife sanctuary curator is able to provide tours and educational workshops that showcase the newly created aquatic habitat environment. This project sets a direction and a standard to work from, showing that wetland restoration and similar improvements can be completed economically in challenging areas with proper planning, engineering and collaboration with municipal officials and regulators. The total construction cost for the tidal gate replacement and the aquatic habitat restoration work came in under budget at approximately $950,000.

Photo courtesy of Woodard & Curran

This is a view from Long Island Sound near the entrance to the Edith Read Natural Park and Wildlife Sanctuary of the stone bridge and new tidal gate system (the aluminum enclosures cover the actuators) in its closed position.

The wetland restoration and continued use of the lake as a recreational component of the park would not be possible without the precise water control and increased tidal fluctuation provided by the automated tide gate system. The system that was implemented is a compilation of existing technologies packaged in a manner to create a user friendly, environmentally responsible system for the community to enjoy. Unique and notable components of the project include:

- Port-a-Dam temporary cofferdam system (during construction);
- Two automated, six-foot wide by nine-foot high stainless steel slide gates;
- SCADA system and program to monitor and control the tide gates including ultrasonic level transmitters, water temperature sensor and mobile alerts sent via phone call, email, and text message;
- Project website for real time water level data and historical data storage;
- Creation of four acres of tidal wetland, grassland and upland planting areas; and
- Eradication of invasive species including phragmites australis.

This project provides value to the engineering profession in particular because it shows how existing innovative technologies can be packaged in a manner that otherwise would not allow for all stakeholders to be accommodated. This project shows how a vision can become reality with the right approach, engineering, construction methods and cooperation among stakeholder groups. The design generated a turnkey project and that has been recognized as a major environmental improvement.

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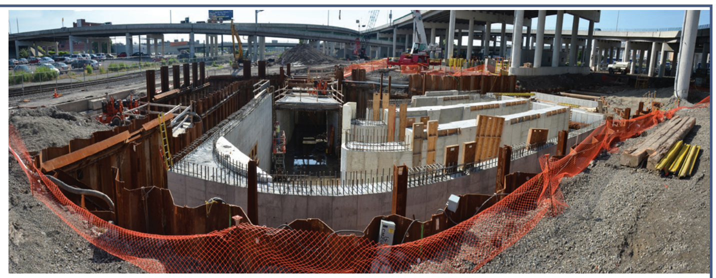

Study of Rainwater Harvesting Quality

by Kyle E. Thomas

Onondaga Commons, LLC, has been approved for funding through Onondaga County's Save the Rain program for implementation of a rainwater harvesting system in association with the Gar Building development project located at 414–416 West Onondaga Street, Syracuse, NY. The project is a component of the broader Onondaga Commons Comprehensive Green Expansion and Jobs Creation Initiative, a project of the Syracuse development firm, Short Enterprises. The proposed rainwater harvesting system would recover rainwater for both potable and non-potable uses in the new facility. Although common in more arid climates, rainwater harvesting for potable uses is uncommon in humid climates of the United States. This study was undertaken to evaluate potential health implications associated with harvesting rainwater for potable use in Central New York or the northeastern US in general.

Background

Rainwater harvesting is defined as "the gathering and storage of water running off surfaces on which rain has directly fallen" *(Pacey and Cullis, 1986)*. The most common approach is to collect water from rooftops immediately following a rain event. This provides a source of water that can be used when groundwater is scarce, which is especially useful in arid climates. The water source is located close to the point of use, reducing the need for complex distribution systems and the associated utility bills. In wetter climates, rainwater harvesting acts as a stormwater mitigation technique, reducing the stormwater volume, thereby lessening downstream erosion and decreasing the load on storm sewers *(Krishna, 2005)*.

The quality of harvested rainwater depends primarily on both air quality and the cleanliness of the rooftop catchment. Vehicles through which contamination of harvested rainwater occur are the dry deposition of airborne contaminants, dry weather accumulations of contaminants, such as bird and other animal feces, and leachates from rooftop materials *(Macomber, 2001)*. Contaminants known to be associated with roof rainwater include metals such as aluminum, manganese, copper, zinc and lead, as well as microbiological pathogens such as *E. coli, Cryptosporidium, Giardia lamblia,* total coliforms, legionella, and fecal coliforms *(Krishna, 2005; Lye, 2009)*. The quality of rainwater collected from rooftops is often not sufficient to meet drinking water standards primarily due to the presence of bacteria and pathogens *(Li et al., 2010; Mwenge Kahinda et al., 2007)*.

Consistent with stormwater pollution from impervious surfaces in general, higher contaminant levels have been shown to be associated with the "first flush" (1–2 mm) of runoff from roof systems compared with the runoff that follows *(Vasudevan et al., 2001)*; and research has shown that contamination of rainwater increases as the duration between rainfall events increases. Rainfall acts as a cleansing mechanism for the rainwater catchment with removal efficiency increasing with the intensity of the rainfall event *(Yaziz et al., 1989)*. Therefore, it follows that the length of dry periods between rain events will affect the quality of the first flush volume. Because dry periods in the Northeast are relatively short, the typical first flush volume should be smaller than would be found in more arid climates.

Metallic contaminants in harvested rainwater such as lead and copper usually occur as a result of leaching from roof substrate and piping, and can largely be controlled through system design and construction. In industrial and urban areas, particulate matter and increased acidity from fuel combustion may be of concern *(Krishna, 2005)*. However, the primary contaminants of concern in the Northeast are likely to be biological contaminants from animal, especially bird, feces. Pathogens of greatest concern are those associated with birds such as pigeons, gulls, sparrows, starlings, etc., which are known to inhabit urban areas in the Northeast *(National Audubon Society, 2010)*. Tsiodras et al. *(Tsiodras et al., 2008)* identify biological pathogens associated with birds worldwide. Based on this work, enteric biological contaminants associated with birds that might be expected to inhabit an urban area in northeastern US, such as Syracuse, NY, have been identified and are presented in ***Table 1***.

Table 1: Pathogens Associated with Water Contaminated by Bird Feces
(Tsiodras et al., 2008).

Microorganism	Associated Bird Species
(1) Bacteria	
Enterococcus	Seagulls
Staphylococcus	Seagulls
Enterobacteriaceae (*E. coli and Salmonella)*	Seagulls, pigeons, sparrows, starlings
Campylobacteraceae	Pigeons, seagulls, sparrows
Anaerobic bacteria	Seagulls
(2) Parasites	
Cryptosporidium	Seagulls
Giardia lambia	Doves, pigeons

Standard rainwater harvesting designs routinely incorporate a first flush diverter to prevent collection of these contaminants in rainwater to be reused. Where rainwater is also to be used for potable purposes subsequent treatment systems also have included chlorination, solar sterilization, sand filtration and solar pasteurization *(Krishna, 2005; Li et al., 2010; Mwenge Kahinda et al., 2007)*. More sophisticated treatment methods such as carbon filtration combined with ultraviolet (UV) sterilization have been used in Europe since the early 1900s and, more recently, in the United States, and have been demonstrated to be capable of achieving potable use stan-

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Photo by Andrew Nessel

The rainwater harvesting system at Baker Hall located at the SUNY College of Environmental Science and Forestry campus in Syracuse, NY was used for the study's samplings to be representative of Central New York/the Northeast.

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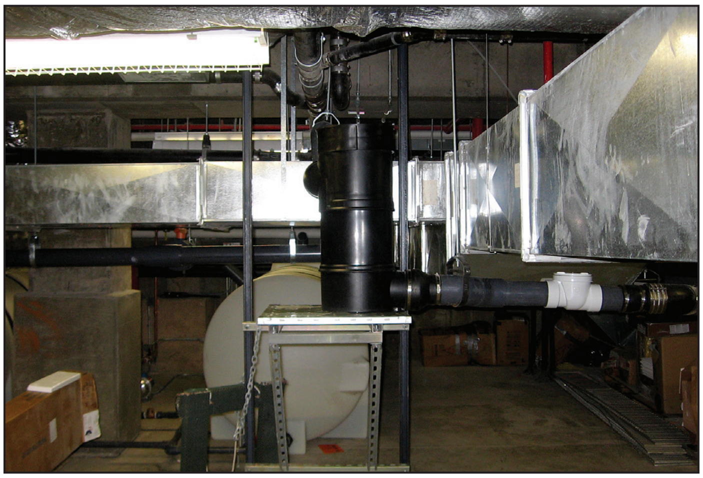
dards *(Krishna, 2005)*. While some research regarding the quality of harvested rainwater with respect to microbiological contamination has been done in more arid regions of the US, especially Texas, it appears that little research to characterize or quantify the nature or degree of contamination of rooftop runoff has been performed in more humid climates, particularly the Northeast.

While it is possible to test for pathogenic microorganisms such as *Cryptospridium* and *Giardia lambia,* the tests are usually costly. Thus, tests for total coliforms or fecal coliforms, or both, are often used as indicators of biological contamination for conventional drinking water sources, such as groundwater or surface waters. Little research appears to have been performed in the area of fecal coliforms as indicators of pathogenic contamination in rainwater. However, tests for fecal coliforms appear to represent a satisfactory surrogate for other fecal pathogens much as they similarly serve as such indicators for conventional potable water sources *(USEPA, 2010)*.

The Public Version 1.0 of the International Green Construction Code™ (IGCC) was published for public comment in March 2010. The document has been undertaken to meet the need for a mandatory baseline of codes addressing green commercial construction, providing a framework linking sustainability with safety and performance through model code regulations that promote safe and sustainable construction in an integrated fashion with the ICC Family of Codes. The Code, which will reportedly be relied upon by New York State for establishing acceptable practices for rainwater harvesting, states that accumulated rainwater shall be tested for *Echerichia coli,* total coliform (TC), heterotrophic bacteria and *cryptosporidium*. The Code stipulates that the tests shall be performed prior to connection to a potable rainwater distribution system and annually thereafter.

Turbidity, suspended solids, and pH tests are simple and relatively inexpensive, and may be useful for evaluating general water quality. While not likely to be significant, testing for levels of potentially harmful metals, such as aluminum, manganese, copper, zinc and lead, may also be useful. Further investigation into the effectiveness of carbon filtration and UV sterilization as treatment options may also be important to support rainwater harvesting designs for potable use.



Photos by Andrew Nessel

Components of the rainwater collection system included: these white tanks for the rainwater's storage vessels; the rainwater's treatment system in the blue canisters; and the first-flush diverter section (in black).

Methodology

This study identified fecal coliforms to be used as an indicator of fecal contamination of rainwater collected from a representative rooftop. The rainwater harvesting system located at Baker Hall at the SUNY College of Environmental Science and Forestry (SUNY-ESF) was selected for the study. The system is equipped with a vortex first-flush-diversion device and a carbon and ultraviolet treatment system. Sampling was performed at both the diversion outlet and harvesting outlet of the first-flush vortex diverter through a 4-inch saddle tee installed at each pipe on November 4, 2010.

Five replicate samples were collected at both the first flush diverter sampling port and from the pipe leading to the harvesting storage tanks. Samples were collected in 100-milliliter (ml) containers provided and certified as sterile by Certified Environmental Services, Inc. (CES) in Syracuse. Following collection, samples were placed in a cooler with ice and transported to CES for laboratory analysis for fecal coliforms according to Method SM18 9222D. Samples were identified as FF1 through FF5 for those collected from the first-flush diverter.

Table 2: Meteorological Conditions Associated with Rainwater Sampling Event.

Date	High Temp. (°F)	Low Temp. (°F)	Atm. Cond's	P (in)
October 29	48	42	Rain	0.23
October 30	54	38	Clear	0.0
October 31	53	33	Rain	0.07
November 1	40	33	Clear	0.0
November 2	48	31	Clear	0.0
November 3	55	31	Clear	0.0
November 4	47	41	Rain	0.28

Meteorological data for the period preceding and coincident with the sampling event were obtained from the weather station located at SUNY-ESF's Walters Hall. The meteorological conditions preceding and coinciding with the sampling event are summarized in ***Table 2***.

As reflected in ***Table 2***, the November 4 sampling event was preceded by three days of clear weather, allowing an ample period for buildup or accumulation of potential rainwater contaminants. Air temperatures were moderately cool preceding and during the sampling event, with low temperatures possibly below freezing during two nights preceding the sampling event.

Results

As presented in ***Table 3,*** fecal coliforms were not detected in samples collected from the first flush diverter (detection limit 2 cfu, coliform fecal units, per 100 ml). Fecal coliforms were also not detected in samples collected from the rainwater to be harvested, with the exception of one sample (AF2) in which fecal coliforms were detected at the detection limit of 2 cfu/100 ml.

Table 3: Rainwater Sampling Results – Fecal Coliforms.

Sample ID	Result (cfu/100ml)
FF1	< 2
FF2	< 2
FF3	< 2
FF4	< 2
FF5	< 2
AF1	< 2
AF2	2
AF3	< 2
AF4	< 2
AF5	< 2

The laboratory report containing the detailed results for the sample analyses is presented in ***Appendix A*** to this report (available with this article online at: www.nywea.org/clearwaters/.)

Conclusions and Recommendations

Conclusions: Laboratory analytical results for the samples collected through this study indicate that fecal contamination was not present in the first flush diversion from a representative precipitation event occurring from an existing rainwater harvesting system. Although fecal coliforms were detected nominally in one sample collected from the harvested rainwater, no difference was statistically discernible between the first-flush samples and the harvested water samples with respect to fecal coliforms.

This study was not performed to demonstrate compliance with drinking water standards, but instead to evaluate the possible presence of fecal contamination. Nevertheless, it is instructive to reference USEPA/Onondaga County standards with respect to indicator parameters, which state that:

> *No more than 5.0 percent samples total coliform-positive in a month. (For water systems that collect fewer than 40 routine samples per month, no more than one sample can be total coliform-positive per month.) Every sample that has total coliform must be analyzed for either fecal coliforms or E. coli if two consecutive TC-positive samples, and one is also positive for E. coli fecal coliforms, system has an acute MCL [maximum contaminant level] violation.*

Based on the above, the detection of fecal coliform in one sample at 2 cfu/100 ml does not suggest that an MCL violation would be necessarily indicated if this source were subject to monitoring requirements associated with a conventional drinking water source. A more rigorous sampling program in terms of frequencies and numbers of analytes would be necessary to demonstrate that a particular rainwater harvesting system complies with the federal/county drinking water requirements, however.

Recommendations: As discussed, the IGCC stipulates a specific testing regime prior to implementing a rainwater harvesting system for potable use. It is recommended that such a testing regime be implemented either immediately following construction of the rainwater harvesting system at the Gar Building, but prior to connection to the potable distribution system, or that such a testing effort be performed at a representative collection system to support the Gar Building system design. The ESF Baker system might be used again for such a study. Although chemical contaminants such as copper and zinc could presumably be precluded as significant potential contaminants from the harvested rainwater through proper design of the system, analysis for certain other environmental/atmospheric contaminants, such as lead, may be desirable as well.

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Superstorm Sandy Unleashes Record Flooding in New York

WWTP Staff Act to Safeguard Water Supply

Hurricane Sandy, with its 90 mile per hour winds and strong storm surge, made landfall near Atlantic City, NJ on October 29, causing over 16,000 downed trees and serious flooding damage in New York City and surrounding communities. The storm resulted in more than 130 deaths – 53 people died in New York alone – and about 1.5 million New Yorkers experienced electrical outages, some lasting for weeks in the hardest hit areas. An estimated $50 billion in total damages has been caused by this, the largest hurricane by area to hit the US in decades.

Hurricane Sandy's record-level storm surge during October 29-30 inundated neighborhoods and business districts throughout low lying areas in all five boroughs of New York City, parts of Long Island and surrounding municipalities in its destructive path, to include essential water/wastewater treatment infrastructure. As Sandy rolled in, New York City Department of Environmental Protection (NYCDEP) staff including treatment plant employees braced for the storm's impact at facilities around the city, completing final storm preparations of sandbagging, relocating equipment to high ground and double checking emergency generators. These individuals met the challenge of emergency flooding situations and performing subsequent repairs in order to help prevent further environmental devastation to their communities.

Courtesy of NYCDEP

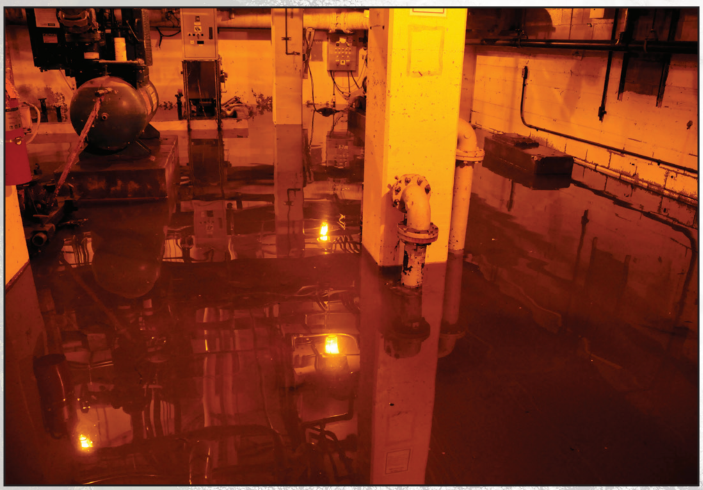
Washed up boat at the Coney Island Wastewater Treatment Plant

Staten Island was particularly pummeled by Sandy. At the height of the storm surge, the Oakwood Beach Wastewater Treatment Plant, located on the east side of Staten Island, was completely surrounded by water. The staff onsite were trapped inside but continued working to keep the plant operating while protecting the critical infrastructure. Overnight the facility lost power, and staff used emergency generators to continue operating the plant. This meant that staff had to manually clean the jammed influent screens that were continuously getting clogged with sand and debris from the storm. Thanks to the hard work of the Oakwood Beach staff, the plant continuously provided primary treatment before, during and after the storm and prevented approximately 80 million gallons of untreated wastewater (raw sewage) from being discharged into New York harbor or from backing up into homes.

Plant chief Phil Rocle, who has 25 years with NYCDEP, was among those who worked 32 hours straight despite having family members on Staten Island struggling to survive the storm, according to the Staten Island Advance *(Maura Grunlund)*. "I've seen rough storms before. This is the first time anybody has seen anything like this," Rocle said.

Security cameras gave them a good view even at night of the approaching storm as the waters breached the seawall and flooded the neighborhood. At high tide, the facility experienced a tremendous surge of additional flow, mostly seawater. The only good thing about the fact that the incoming water was mainly from the ocean was that it required less treatment than other forms of sewage.

Another NYCDEP crew of 12 kept the 17 unmanned pumping stations throughout Staten Island operating as best they could for



Courtesy of NYCDEP

Damage shown at the Owl's Head Wastewater Treatment Plant in Brooklyn of its sodium hypochloride facility basement

Courtesy of NYCDEP

Storm damage at Brooklyn's 26th Ward Wastewater Treatment Plant dock used by sludge vessels

the Oakwood Beach and Port Richmond WWTPs. Conditions were so treacherous that crews could not be out in the height of the storm and it wasn't until 6 a.m. the next morning that they could resume getting some of the water-logged pumping stations running.

The Oakwood plant was one of 14 city WWTPs impacted by the storm. On November 3, while substantial repairs were still needed at many locations, NYCDEP reported it was treating more than 99 percent of the city's wastewater and 13 of the city's 14 treatment plants were processing 100 percent of wastewater entering the facilities. At that time, the Rockaway WWTP, the city's smallest wastewater facility, was still experiencing some damage allowing seawater to enter the sewer system, some of which was being discharged with small amounts of untreated wastewater at high tide.

Sandy had submerged many of the treatment plants electrical equipment in seawater and degraded their ability to pump and treat wastewater. Ten of the city's 14 WWTPs and more than 40 sanitary sewer pumping stations across the five boroughs were damaged. The NYCDEP crews and contractors were pumping out seawater and making electrical repairs to equipment and continued to do so until all the plants and pumping stations were fully operational.

The NYCDEP reported that the four combined sewer overflow retention tanks located across the city, "operated as designed throughout Hurricane Sandy." *(See sidebar article, right.)*

In addition to NYCDEP, 15 watershed members from surrounding counties and heavy equipment operators were deployed to the city providing valuable assistance with flood abatement and downed trees. Industrial pumps drained Manhattan Battery Underpass of floodwater and were assisting in removing water from sewage pumping stations in Brooklyn as well as school facilities in Queens. The US Army Corps of Engineers, which led a dewatering task force at several locations in NYC, reported it concluded its mission in the city on November 10 with 270 million gallons of saltwater removed from tunnels, underpasses and other locales in the NYC metro area. In total, the FEMA-assigned joint dewatering mission covering 14 locations drained more than 470 million gallons of water from the metro area – enough to fill 843 acres of Central Park with roughly two feet of water *(Justin Ward, USACE news release Nov.11, 2012)*.

Another plant, the Yonkers Joint WWTP located in Westchester County and bordering New York City, reported into *Clear Waters* on some of the serious damage it experienced. The facility went under water and staff asked Con Edison to cut the power to the facility, helping them regain power to the plant once the surge passed. Flooding floated the secondary polymer room bulk storage tanks, rupturing piping and releasing some 6,000 gallons of cationic polymer, requiring a major cleanup effort.

Photos courtesy of Westchester County DEF

Damage from flooding in the secondary polymer room of the Yonkers treatment plant.

Many Long Island WWTPs were put out of commission. Possibly the worst hit were Bay Park, which was forced to bypass, and Long Beach in Nassau County. Plants in Suffolk, and other counties inland of NYC, also lost power and were flooded.

There is no doubt that storm preparations with dedicated crews working around the clock made the difference for New York in helping to weather the flow of this devastating storm.

NYC Invests to Reduce CSOs by Managing Stormwater

Since 2002, New York City has invested about $10 billion in combined sewer overflow (CSO) reduction and wastewater treatment plant upgrades to increase treatment capacity. Capital investments have included the construction of four CSO storage facilities that hold approximately 120 million gallons of wastewater until it can be properly treated. The storage facilities, located at Alley Creek, Spring Creek, Flushing Bay and Paerdegat Basin, reduce CSOs by more than 2.5 million gallons annually. Conservation methods and improved operational practices, such as lowering wet wells in anticipation of heavy storms and regular cleaning of interceptor sewers, have also reduced CSO volumes.

Photo courtesy of NYCDEP

Aerial view of the Paerdegat Basin CSO Retention Facility in New York City.

In June 2012, the NYC Department of Environmental Protection completed a two-year project to clean 26 miles of the city's largest interceptor sewer pipes, removing nearly 29 million pounds of debris and sediment and providing roughly 1.9 million gallons of extra sewer capacity during wet weather. That effort will reduce untreated sewage discharges by an additional 100 million gallons annually. During this period, CSOs have also become more dilute with the percentage of sanitary waste in CSO discharges decreasing from 30 percent in 1980 to 12 percent today.

Under the NYC Green Infrastructure Plan, launched in 2010, NYCDEP will invest more than $187 million by 2015 and a projected $2.4 billion in public and private funds by 2030, to reduce CSOs by managing stormwater before it ever enters the city's combined sewer system.

This report was written by Lois Hickey, editor of Clear Waters magazine, with major assistance from NYCDEP communications staff, as well as other sources cited. Special thanks are extended to NYWEA member Tom Lauro, commissioner, and G. Michael Coley, PE, first deputy commissioner, of the Westchester Department of Environmental Facilities, and all who provided information and images during this very busy time!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Onondaga County WEP Aids in Sandy Recovery Efforts

by Tom Rhoads

Winding its way up the northeast coast, Hurricane Sandy rapidly evolved into a meteorological "superstorm" and Halloween week became a media frenzy about the impending "Frankenstorm." Meanwhile, Onondaga County Department of Water Environment Protection (WEP) initiated its usual preparations for severe wet weather and hurricane wind impacts to its infrastructure and operations in the Syracuse, New York area. Governor Andrew Cuomo declared a state of emergency and asked for a pre-disaster declaration on October 26, 2012, while Onondaga County Executive Joanne Mahoney directed the county's Emergency Operations Center to prepare for the worst.

Hurricane Sandy made landfall at 8 pm near Atlantic City, New Jersey on October 29, 2012. Through local Syracuse media and National Weather Service announcements, the county's Emergency Management Commissioner, Kevin Wisely, provided regular updates on the storm. It was through these regular updates that WEP learned that the storm path would largely pass to the southeast of Syracuse. While the storm spared Central New York, WEP soon received reports of heavy damage to its downstate neighbors. It is now known that this superstorm left 53 New Yorkers dead, and the damage totals are in the tens of billions of dollars.

With WEP's emergency assets still in the garage and no additional severe weather in the forecast, County Executive Mahoney and Deputy County Executive Matthew Millea made the decision that those resources should be deployed to the crisis and recovery in New York City. At approximately the same time, the New York Water Environment Association began to communicate the needs of downstate systems for recovery relief through NYWARN (New York Water/Wastewater Agency Response Network) email aid broadcasts. Through this, Onondaga County became aware of flood damage to the New York City Housing Authority (Authority) and it decided that action was critically needed.

On October 31, WEP asked for six experienced volunteers to help with the emergency response effort. Russ Bisesi, Lee Brown, Jamie Isgar, Joanna Anthony, Doug Neish and George Avery quickly jumped at the chance to make a difference helping others in dire need. Mr. Bisesi, for one, calmly remarked that helping others after a natural disaster was something that was on his "bucket list."

Dewatering Deployment to Brooklyn

On November 1 for the deployment, WEP's Flow Control Team carefully prepared a convoy of four trucks and trailers loaded with six trailer-mounted pumps capable of pumping 2,000 gallons per minute to dewater the New York City Housing Authority's boiler rooms so that water service and heat could be restored to the thousands of residents stranded in the Authority's apartment units in Brooklyn. Careful thought was given to every item packed for the trip. For example, all the pumps were diesel powered so that WEP's fuel trucks could keep the team running in the event of shortages. Every hose and connector was checked and every tool box was loaded in consideration of what could go wrong with the harsh duty anticipated.

In the background, Kevin Wisely kept the State Emergency Management Agency informed of the mutual aid WEP would provide. Mr. Wisely provided tremendous insights from his own previous emergency placements. The recovery task was authorized, and the team was asked to return early the next morning to deploy. Flow Control Division Manager Nick Capozza stated that it was very unnerving sending employees into a disaster area considering the level of uncertainty they faced.

The six members of the team left work that day not knowing exactly what to expect or how long they might be deployed. Everyone packed a duffle bag of clothing, food and even sleeping bags and ground cloths, anticipating the worst. All they really knew was what they had seen on TV of the devastation and that they had something to offer in aid. All six slept very little that night, most waking up at 3 or 4 in the morning, too emotionally charged to sleep. At 5:30 am on November 2, Mr. Wisely and Mr. Capozza finished their safety and mission briefing to the team and the truck convoy left for New York City.

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Courtesy of Onondaga County WEP

Two of the four trucks (seen foreground and background) being readied on November 1 for deployment to New York City with water pumping equipment

Courtesy of Onondaga County WEP

The New York City Housing Authority plowed away sand and debris to make a landing area for the WEP team to begin its work.

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With fuel shortages already starting to affect the areas hardest hit by the storm, the WEP team topped off fuel tanks before entering the city where they were met with heavy traffic clogging the roadways. To its delight, the WEP team was met in the Bronx by the NYPD and given a police escort. With lights blazing and horns and sirens sounding, the team had a quickened sense of mission and appreciation for just how critical the damage was in the storm's wake. The team arrived at the Authority's Coney Island housing units at 5 pm – already having been on duty over 12 hours.

Long, Hard Work Ahead

The Authority's front-end loader pushed sand mounds out of the way and WEP's convoy parked and unloaded. Huge piles of sand and storm debris prevented the trailer-mounted pumps from being driven to the basement access areas of the huge housing units. As they removed and hand positioned the pumps, the team wondered what to expect to find when the pitch dark basements were drained. They had been told one storm victim already had been found near the Authority site. Fortunately, they had no such grim encounters. Ten seconds after firing the first pump, however, its suction end was already clogged with debris. After unclogging and restarting the pump, it reclogged within 30 seconds. The crew knew that the conditions would not allow them any rest – they continued working until four in the morning.

Fortunately, the Authority was able to secure undamaged accommodations for the team at a Brooklyn hotel. After an hour's drive through the storm ravaged streets, the WEP workers got to their beds and passed out quickly, just a few miles from the thousands of residents still without heat, light and running water.

As the work team later described the situation, the following day was "a blur" of activity. To see the extent of the damage and recovery necessary, it was hard to even sit down for a break with so much to be done. On this second day, the team would work 17 hours. Late that afternoon they enjoyed a pizza and soda break at a local deli that had electricity and natural gas for its ovens. Team members donated the food they had brought with them to local residents because they quickly realized many residents had nothing, and had been stranded in their apartments for days.

By the third full work day, the team would complete the dewatering of five boiler and basement complexes – each basement contained approximately 450,000 gallons of water. It was a disappointment to learn that the boiler control panels would need to be completely replaced before heat could be restored for the residents. However, by dewatering the basements, potable water could be provided to at least the first seven floors of each building.

On Monday, November 5, the team from Syracuse left Coney Island as FEMA set up its operations center three blocks away near the Coney Island pier. The team left New York City with a deep sense of satisfaction that its efforts at least made a dent in the recovery effort. Team members were further grateful for the tremendous support they received from the New York City Housing Authority and the NYPD. Both of these groups secured the site and the equipment as well as gave the team a tremendous sense of security even in unfamiliar, damp and devastated surroundings.

The experience reinforced Onondaga County's conviction that helping a needy municipal neighbor is always the right thing to do. In addition, the agency knows such involvement helps to prepare it for future emergencies. It is only a matter of time before Onondaga County will need mutual aid as well.

The team had to maneuver pumps into place by hand due to the sand and debris

Onondaga County's work team is familiar with Syracuse snow banks, but

Courtesy of Onondaga County WEP

around the housing unit complex.

Lessons Learned:

- Have a strong executive commitment to respond quickly to emergency events. Onondaga County WEP plans to revisit NYWARN's mutual aid resolutions to further improve response planning.
- Onondaga County WEP realizes that response requires a full range of resources. In addition to the operators, critical support was also provided from the Onondaga County Executive, Emergency Management and Purchasing departments.
- The team carefully planned and equipped itself for the worst. Even with a spare fuel truck, resource needs became very severe by the end of the deployment.
- While WEP sent a highly experienced team of operators and crew leaders, it may have benefitted by bringing one equipment mechanic. The severe duty and constant use tested every pump.
- Small essentials matter: the team lacked credit cards to support incidental purchases and tolls. WEP emptied out all of its available petty cash to send the team to New York City with only $381. Thankfully, tolls were waived on the way back, but at over $65 per bridge crossing, what little cash the team was given did not go far.
- Close coordination with the receiving group is critical. The Housing Authority's team could not have been more supportive or thoughtful regarding the needs of its residents and of WEP's team. In a post disaster situation, when arriving prior to the main FEMA resources, knowing the conditions and preparing for them is critical to safety and success.

Russ, Lee, Jamie, Joanna, Doug and George were all thankful for the opportunity to be involved in the Sandy recovery. They also recognize that there is so much left to be done in recovering from the storm. Getting materials in and work completed to rebuild will be a huge effort. We all still have an opportunity to help!

The American Red Cross donation link is: http://www.redcross.org/hurricane-sandy.

Tom Rhoads, PE, is Commissioner of the Onondaga County Department of Water Environment Protection in Syracuse, NY, and he may be reached at: tomrhoads@ongov.net. He would like to thank all the WEP team members who served in the recovery and helped him in writing this article.

Courtesy of Onondaga County WEP

superstorm Sandy left huge sand banks in its wake instead.


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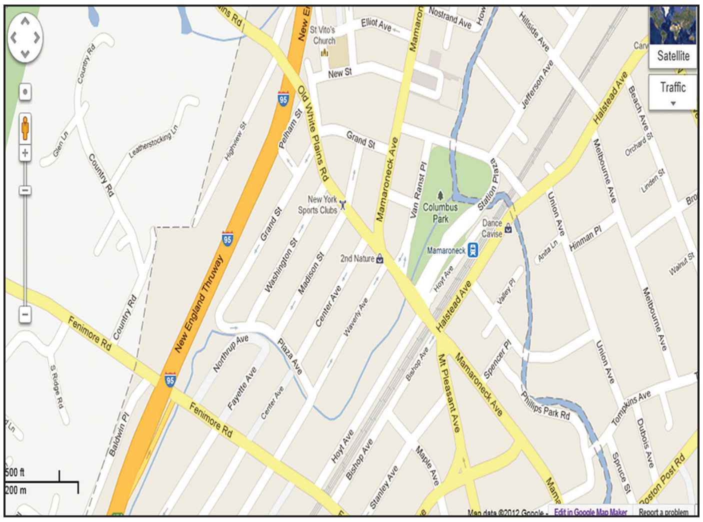
Opinion –

Citizen's Quest to Develop Flood Control Plan for Mamaroneck, NY

by Anthony Gelber

Mamaroneck lies in the southeastern portion of Westchester County, New York. It is the home to about 25,000 residents in the Town and Village of Mamaroneck. I call the Village of Mamaroneck the New Orleans of Westchester County, as it is at the bottom of the watersheds of both the Mamaroneck and Sheldrake Rivers. As a result, the village floods badly and frequently as has been recorded since about 1880. These two rivers drain an area 24 square miles and come together at Columbus Park, located in the middle of the village, which I call the "bathtub." From Columbus Park, the combined rivers flow into Long Island Sound as the Mamaroneck River.



A flooding story of where two rivers – the Mamaroneck and the Sheldrake – meet at Columbus Park in the middle of the Village of Mamaroneck.

Unlike New Orleans, the tidal effect during most storms is generally limited to low and high tide. There is an elevation gradient between high tide and Columbus Park that limits flooding. Occasionally there is a tidal event (e.g., Hurricane Irene last year and Sandy this year), which causes shoreline flooding and makes high tide higher. This gradient can be a factor in flooding between Columbus Park and Long Island Sound. Causes of flooding are heavy precipitation events year round that have included spring rains and snow melt, rains on saturated ground, summer cloudbursts, hurricanes and tropical storms.

Main Sections That Flood: Flooding occurs in three primary areas: Harbor Heights along the Mamaroneck River; Columbus Park and its surroundings (the confluence of the Mamaroneck and Sheldrake Rivers); and, "the flats" along the Sheldrake River between Fenimore Road and Mamaroneck Avenue. The flooding in Harbor Heights is a result of the Mamaroneck River overflowing its channel.

Based on my own analysis, flooding at Columbus Park is caused by the intersection of the two rivers in the bathtub. After joining, the two rivers must then make two 90-degree turns to exit. This restriction, combined with the fact that the rivers enter the bathtub at almost 180-degrees to each other, cause massive turbulence and restricted flow. Another problem is simply the volume of the water and size of the channels.

Photo by Tony Gelber

From the Station Plaza Bridge, people view the rivers' combined flows leaving Columbus Park during 2011 Hurricane Irene flooding.

The third major flooding area, "the flats" along the Sheldrake River is caused by the large volume of water, two 90-degree bends and a narrow channel. My proposal, I briefly describe later, addresses Columbus Park and the flats. (I have not studied Harbor Heights sufficiently).

History of Flood Plans

Over the past 75 years, the federal government, county and village have paid for many flood study reports, most resulting in little action because of implementation costs. In the 1970s, a series of storms and floods prompted federal, state and local officials to retain the US Army Corps of Engineers (USACE) to study flooding in Mamaroneck and its surroundings. The contract was a multiyear, multimillion dollar study which resulted in recommendations for about $60 million in work. The recommendations were to improve outflows at Columbus Park, widen and deepen channels, and install a tunnel to divert water from the Sheldrake River directly into Long Island Sound via Fenimore Road. The funding structure required federal, state and local participation, with the latter requiring voter-approval on a bond. Locals opposed the spending of taxpayer dollars to solve the problems of those who bought properties in the floodplain. No bond, no project.

Flooding History Repeats Itself

Not much then occurred until the two major flooding events of 2007 – one in March and the second, in April. The March flood resulted in approximately four feet of water on Mamaroneck Avenue adjacent to Columbus Park; and, the April event brought nine feet of flood water into the same area. The losses to residents and businesses were large. Again, flood politics rose up and the USACE was authorized to prepare another multiyear, multimillion dollar study.

Additional flooding occurred in 2009 and 2011, and again with this October's Hurricane Sandy. Currently, the USACE study is about 50 percent completed and there is a moratorium on other studies and related work until the report is finalized.

One Person, One Vote

I began taking photos of the flooding events in 2007, and continued with those up until today. After Hurricane Irene, I attended a Village of Mamaroneck Flood Mitigation Advisory Meeting, applied for volunteer membership and became a member in 2012. In doing so, my personal quest has been to help develop practical, cost effective solutions for flooding and flood control in Mamaroneck. The main premise of the five point proposal I developed is to provide engineered overflow paths for when stormwaters reach the flood stage and for peak flows. Peak flows occur when weather conditions and ground conditions are both contributing maximum water to a channel.

My proposal's concepts need to be investigated and refined by the planning and design community to see if at least a portion of them can be implemented. I have presented some points of my proposal to the village committee and they are under review. This preliminary plan I hope will at least foster thought and development of innovative solutions for storms that exceed the design storm – the 50, 75, 100, 200 year storms – for streams, rivers, lakes, etc. My recommendation points are not necessarily in order of priority, as #5 (Obtaining Data) could also be my first recommendation.

***My proposal, in its entirety, is available by contacting me at** argelber@pratt.edu.*

RECOMMENDATION 1: Improve Outflows at Columbus Park

I advise to separate the rivers at Columbus Park, reduce turbulent flow and provide an overflow channel (culvert) for the Mamaroneck River that would run under the existing parking lot to the North culvert in the existing railroad bridge. (The culvert would be the same size as a tunnel proposed in the 1970s USACE report to carry the Sheldrake overflow to the Long Island Sound via Fenimore Road.) The new culvert would allow water out of Columbus Park as soon as it arrives so flows would be consistently higher allowing more water to pass freely.

RECOMMENDATION 2: Provide Overflow Capacity for the Sheldrake

The Sheldrake River has a relatively narrow channel and makes two 90-degree bends between Fenimore Road and Mamaroneck Avenue. In this area, called the flats, I advise constructing a berm (with a recreation trail) along Mamaroneck Avenue to serve as a path for excess overflow water.

RECOMMENDATION 3: Facilitate Natural Flows by Modifying Local Roads

We could plan for the floodwaters to leave the channels at critical points (river bends) and flow down into streets that typically flood but otherwise could be redesigned to have troughs for water flow (Center, Waverly and Hoyt avenues). Redesigning the street shape from concave to convex at one curb could provide a trough for stormwater. In addition, lowering Mamaroneck Avenue from the railroad bridge at Hoyt Avenue to the North entrance of I-95 could allow more unrestricted flow.

RECOMMENDATION 4: Provide Peak Storage Options

Reservoirs, ponds, dams and tanks (gray infrastructure) are all used to store stormwater. New green infrastructure, such as permeable surfaces, bioswales, blue roofs and wetlands, are being designed and built to store stormwater as well. In Mamaroneck, the Larchmont Reservoir and the duck pond are drained prior to major storms but doing this may not meet demands for peak storage. Flows into and out of storage chambers need to be timed by the severity of the storm, along with the ground conditions and peak flows. Incorporating green infrastructure with gray infrastructure to better function at peak storage throughout the duration of a flood event is possible with today's radio and wireless network control technologies. Peak storage could be augmented in Mamaroneck by revisiting the existing gates and controls and by identifying additional peak storage facilities or areas.

RECOMMENDATION 5: Obtaining Accurate, Local, Timely Data

Local data is critical to managing flood waters. Overflow channels – roads, berms and paths – must be closed or sectioned off as flood waters rise. Peak storage devices need to be opened and closed depending on flow conditions. Accurate, local, timely weather and ground data are needed, such as local weather stations and strategically placed monitoring equipment throughout the community and in streams, rivers and lakes. People to receive and act on this data to manage peak flows and overflow channels, are also needed.

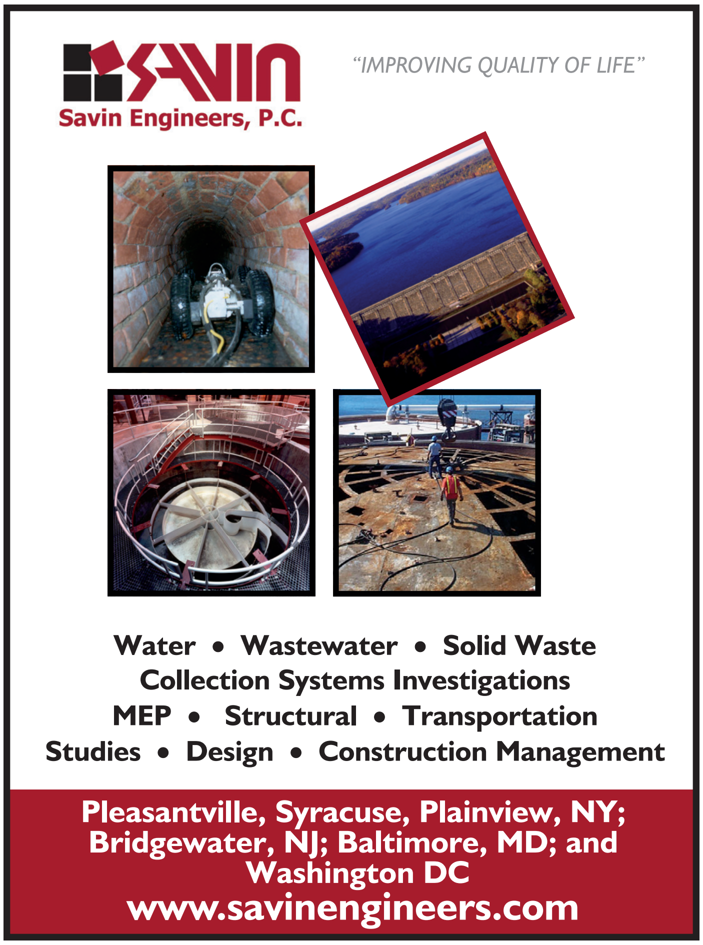
Photo by Tony Gelber

The Mamaroneck community bandstand – shown looking east out to Long Island Sound – is overtaken by several feet during high tide with the coastal storm surge of Hurricane Sandy.

Impossible Quest?

Can we successfully plan for flooding and flood control in Mamaroneck, NY? I believe we can, and that reducing the impact of flooding can be accomplished with less capital cost if a portion of this five point proposal could be implemented.

Tony Gelber lives in Mamaroneck, NY and is Director of Administrative Sustainability for the Pratt Institute, located in Brooklyn, NY. He also is an adjunct professor for the Pratt Institute's School of Continuing Education teaching Sustainable Building and Infrastructure Design and Management. He is serving as a volunteer member of the Village of Mamaroneck Flood Mitigation and Advisory Committee. He may be reached at argelber@pratt.edu.



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Spotlight on Village of Speculator WWTP

by Florence Braunius

The Village of Speculator in the southern Adirondacks, had established itself as a tourist destination by the late 1960s, with people coming from across New York State to camp at Moffitt's Beach, learn to ski at Oak Mountain or stay at Camp of the Woods. These are all examples of Speculator's hub of natural attractions found in this part of the Adirondacks where the NYS Scenic Byways, Routes 8 & 30, intersect. It is because of this tourist industry that the small village had its wastewater treatment facility built in the early 1970s.

Fortunately, during this time there were people with the insight to recognize that the population and tourism would impact the water quality of this area's lakes, rivers and streams. These village officials took the necessary preventative measures to protect the waters and, in July 1968, the Village Board received the final engineering report from Morrell Vrooman Engineers to develop the collection system and wastewater treatment plant (WWTP).

That was 45 years ago, and to read through the report today, it is an accurate depiction of today's treatment processes. Currently, flows average 0.130 mgd during the summer months and significantly less during the remainder of the year. The original flow design was 0.150 mgd for the operation of one package plant. The original plan was a project with two phases, and it is unfortunate that the second phase – a collection system along the north shore of Lake Pleasant – was never initiated. Lake Pleasant is partially within the village boundary and the remainder of the lake is within the Town of Lake Pleasant. The completion of the second phase would have extended sewer services into the town as well as the village.

Photo by Robert Camoin

Photo by Florence Braunius

Above and right:
A view of beautiful Lake Pleasant from Osborne Point Park's gardens, adjacent to the Village of Speculator's public park and beach.

History and Developments

The original project cost projection to build the WWTP was $632,000 with a grant of 45 percent from federal subsidies with the Farmers Home Administration. The village allotted one person to operate the plant and the engineers suggested a salary of $6,000 per year, with $600 a year for benefits.

The total operation and maintenance (O&M) annual budget for this facility was estimated to be $10,640. This included a reimbursement from New York State for 33 percent of the O&M budget at like facilities. This was to continue for 10 years, contingent upon approval of the NYS Commission of Health. Wouldn't plants like to have an offer like that in current budgets?

The Speculator treatment plant is an activated sludge plant – actually two Sanitaire Package plants that sit side-by-side. Its design flow is 0.300 mgd and it rarely reaches this capacity. When the facility was built, there was anticipated development, as well as a second phase of the original project. One plant operates 12 months out of the year, and when the population increases for the summer months, the second package plant is added online. Influent biological oxygen demand (BOD) averages 300 mg/L during the summer months. The winter season brings its own problems to the facility when it may face influent BOD

continued on page 54

Photo by Caitlyn Eyre Stewart

The Village of Speculator and its environs hold many examples of scenic attractions. The Sacandaga River Community Park and pathway is directly across the river from the Speculator treatment plant.

Photo by Florence Braunius

The pole barn has porous pavement drying beds and one storage bay with nonporous pavement for biosolids handling. Since 1994, the WWTP has been permitted to land apply its treated solids in May, July and September.

continued from page 52

Photos by Florence Braunius

Village of Speculator WWTP's renovated Administration and Laboratory Building (left). The treatment operations facility (right) has new panels and glass enclosure for the enclosed unit as well as new coating on the outside of the circular aeration tanks.

loadings under 75 mg/L. Plant operators cope with this by using a biological augmentation to help offset the lower loadings.

When the plant was built, energy was cheap and it had three centrifugal blowers and course bubble diffusers for aeration. By 1996, the village was ready to upgrade the facility –making improvements that would offset energy costs and refurbish parts of its structure. This project, developed by Lamont Engineers, included new positive displacement blowers, new membrane diffusers, new glass and new panels on the enclosed plant, recoating of the steel clarifiers, repair and recoating of concrete tanks, and the addition of variable frequency drives. This was done with a $300,000 loan from the NYS Environmental Facilities Corporation at zero percent interest. The improved energy savings are evident with each electric bill.

The plant discharges to the Sacandaga River, which is a recreational waterway used frequently by paddlers. The plant also lies directly across the river from the Sacandaga Pathway which is a river walk built entirely by volunteers with an overlook. The aesthetics that were completed to the building also made the facility more attractive to the public.

Solids Handling

Another dilemma taking place behind the scenes of the upgrade project was concerning solids handling. The plant has two 12,500 gallon aerobic digesters and, in 1996, it had fiberglass enclosed drying beds with sand for the base. This was a limiting factor for treatment capability. Up until 1996, the facility disposed of its solids at the local landfill, but the landfills within the Adirondack Park were closing and the village needed to find a solution. The village would be transporting its refuse and recyclables to the transfer station operated by the county and the county would haul refuse to the facility in Rodman NY – 2.5 hours away. The treatment plant needed an option to allow staff control over the schedule of pumping to its beds and removing the material to keep treatment operations optimal.

In 1994, plant staff initiated an application to NYSDEC and the Adirondack Park Agency for a permit to land apply the facility's biosolids to a parcel of land owned by the village. After two years of work with Kestner Engineers of Troy, and preparation work to the property itself, the village received a permit to land apply Class B solids. This permit allows land application of up to 25 tons of dry solids in May, July and September to this parcel

A polymer injection unit and a sludge concentrator were purchased to optimize percent solids that are discharged to the drying beds. The plant continues with this process today and it has accomplished the goal of being able to have control of its own operations. In addition, the fiberglass enclosed drying beds finally fell victim to the snow load in 1998. A new pole barn facility that included porous asphalt drying beds and a non-porous storage area for the solids was constructed. Costs for disposal of these solids, with everything taken into consideration, are about $4,000 a year.

Other improvements made in the last decade included new control panels and upgrades for all the original pump stations; and, an additional 1.5 miles added to the collection system in 2008, designed by Lamont Engineers. This was accomplished with a USDA Rural Development loan and grant to provide watershed protection for the municipal water supply.

Today and the Future

Fast forward 45 years to September 2012 and the treatment plant now looks to what must be done in the next five years for a second upgrade. The clarifiers need recoating, the drying beds' asphalt needs replacement, as do the variable frequency drives, to name a few items. No expansion of service to areas outside the village is anticipated, but the WWTP needs to maintain its current operations while pursuing ways to optimize its treatment process.

The budget has grown from that early estimate in 1967 to $276,143. In this budget, $59,180 is allocated for debt service for the upgrade project and the collection system extension. The $600 for benefits for one operator has grown to $47,050 for 1.5 operators (three employees divided evenly between two departments).

Here is the biggest challenge: how does the plant maintain what it has, improve for changing regulations, and sustain a capital reserve fund for future equipment purchases and system improvements? With debt service outlasting the equipment's useful life span, it is a challenge to insure resources to produce the water quality that meets permit standards and have an affordable solids handling program. The village has always tried to forecast ahead to avoid immediate response situations. In the past, plant operators have been able to find low cost alternatives, such as the land application process. Today, low cost alternatives are diminishing to the point of being nearly nonexistent.

Award Winning Teamwork: The Village of Speculator is fortunate to have administrations throughout these last 45 years that have recognized the value of trained staff and the importance of maintaining water quality. Current staff members, Jim Desrochers, Rob

Peck and Florence Braunius, are all certified operators for both the wastewater and water systems. As a result of these efforts, the plant has been honored with several awards. First, it won the NYSDEC Andrew M. Weist Operations and Maintenance Award. It went on to win the 1997 USEPA Award for Operation and Maintenance for small secondary plants. Most recently, in 2008, the Speculator WWTP again was awarded the Andrew M. Weist Award for O&M. These have been tributes to the plant's team effort maintained over the years.

Looking to the future, operating costs will continue to grow and training and communicating with others in the industry will be more important than at any other time. When you can call the Adirondacks home, it's easy to see the reasons for having a wastewater treatment system operating at its best.

Florence Braunius is Chief Operator at the Village of Speculator (NY) Wastewater Treatment Plant and may be reached at specwwtp@frontiernet.net.

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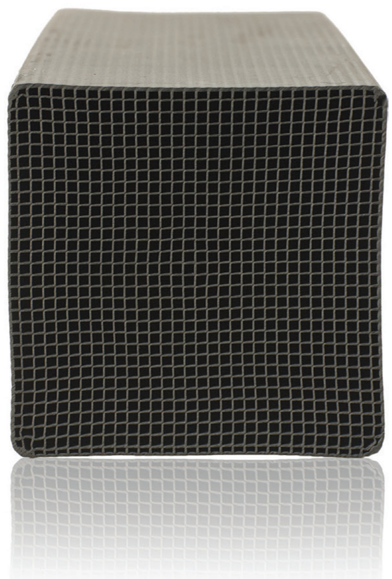

Of Interest

WEF, US Labor Department Announce Operator Training Standards

The US Department of Labor recently adopted new national guidelines for wastewater systems operator apprenticeship programs. The new guidelines, developed jointly with the Water Environment Federation, define minimum educational and on-the-job learning requirements for operators and establish a clear point of entry into the profession.

The national guidelines suggest a two-year intensive schedule of 3,520 work process hours and 480 instructional hours. Work process hours will provide on-the-job experience alongside supervisors and coworkers. Industry curriculum is structured around six pillars: orientation and safety, operations, maintenance, quality control, logistics and administration. Additional instruction focuses on the theoretical aspects of the occupation, such as pumping systems, mathematics and solids management.

The DOL announced the new guidelines to its state's divisions which will work with employers and local sponsors to introduce them to wastewater utilities. The new standards are a model for developing local apprenticeships programs registered with the Office of Apprenticeship or a State Apprenticeship Agency for the wastewater treatment plant operator occupation.

Widespread adoption of national standards will lead to more consistency in training and certification, an elevated profile for the operator profession and greater opportunities for reciprocity, according to Christine Radke, WEF's technical and educational program manager.

The new operator apprenticeship guidelines is a component of the broader Operator Initiative, established by WEF and its member associations to help raise awareness of wastewater operators as front-line public health professionals.

More information can be found at www.wef.org/Operations Resources.

EPA Announces NYS Clean Water Funds and New Waterways App

The US Environmental Protection Agency recently announced awarding $218 million to New York State to help finance improvements to water projects that are essential to protecting public health and the environment. The funds are primarily to be used to upgrade sewage plants and drinking water systems throughout the state. The majority of the funds, $157.2 million, went to the Clean Water State Revolving Fund program (administered by NYSDEC and NYSEFC) and $60.9 million went to the Drinking Water State Revolving Fund (administered by the NYSDOH). Both programs will provide low-interest loans for water quality protection projects.

The EPA also announced it launched a new app and website to help people find information on the condition of thousands of lakes, rivers and streams across the United States from their smart phone, tablet or desktop computer. Available at: http://www.epa.gov/my waterway, the How's My Waterway app/website uses GPA technology or a user-entered zip code or city name to provide information about the quality of local water bodies – whether they are healthy – safe for swimming, fishing – and what is being done about any reported problems. Release of the app marks the 40th anniversary of the Clean Water Act, enacted by Congress in October 1972.

New Data on Biogas Production at WWTPs

The North East Biosolids and Residuals Association (NEBRA) recently unveiled a new website that provides updated data on anaerobic digestion and biogas production at wastewater treatment facilities across the US. The website, www.biogasdata.org, provides key information about the potential for biogas production as a renewable fuel. Biogas can be used in place of natural gas in boilers and engines to produce heat and electricity. The data builds on US Environmental Protection Agency data showing that the wastewater solids (sludge) from more than 1,200 large-scale US wastewater treatment facilities undergo anaerobic digestion and produce biogas out of 3,300 major facilities. Only a small number of the 13,000 minor facilities (less than 1 MGD in size) operate anaerobic digesters.

People

DeGiorgio Promoted at D&B

Robert J. DeGiorgio

Dvirka and Bartilucci Consulting Engineers (D&B) recently announced the promotion of Robert J. DeGiorgio, PE, to Vice President. DeGiorgio has over 20 years of experience in environmental engineering design and management of industrial, sanitary and remediation projects for public and private sector clients. His technical expertise encompasses sanitary, remediation and process design, stormwater management, construction, operations and maintenance. For the past six years, he has managed the White Plains, NY office and provided services throughout the Hudson Valley on the county level and for a number of towns and villages. Since 2003, DeGiorgio has been a Water Environment Federation and NYWEA professional member. He currently serves as the Chair and Secretary for NYWEA's Lower Hudson Chapter.

Barnes New Project Manager, Buffalo

David A. Barnes

CDM Smith welcomes David A. Barnes, PE, in its Water Services Division as a Senior Project Manager in the Buffalo, NY office. Barnes has more than 20 years of municipal infrastructure engineering experience including with the Massachusetts Department of Environmental Protection, the Boston, MA Water and Sewer Commission, and he has been in the engineering consulting industry for the past 14 years. His expertise is infrastructure system analysis and wet weather solutions. Barnes has managed and developed numerous sanitary and combined sewer system long term control plans throughout the northeastern US, including work for the Town of Tonawanda and the Buffalo Sewer Authority. Barnes is active in the New York Water Environment Association and resides with his wife and two children in Orchard Park, NY.

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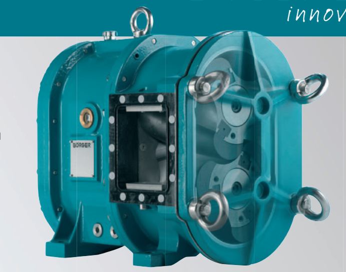

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Clear Waters

New York Water Environment Association, Inc.

ADVERTISERS **PAGE**

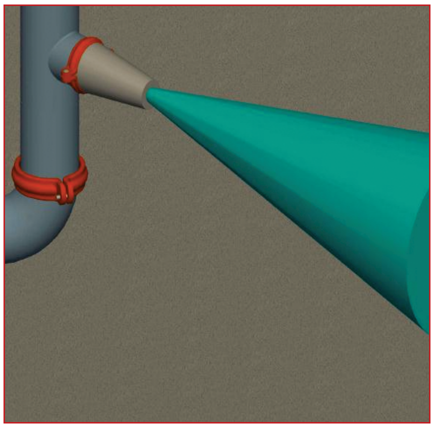
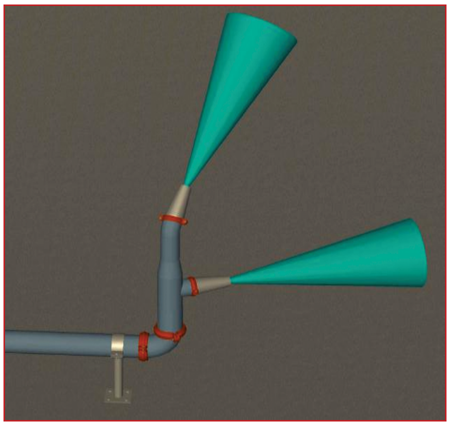
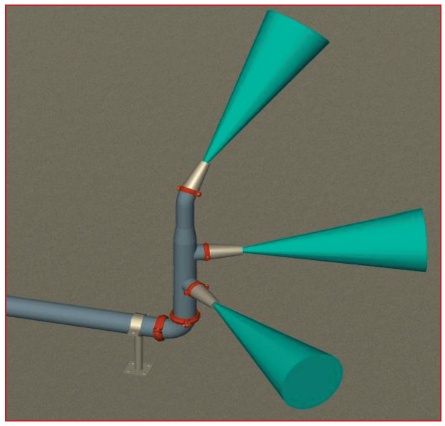
JET MIXERS ♦ HYDRAULIC SLUDGE MIXERS ♦

SEQUENCING BATCH REACTORS ♦ JET AERATORS

DIGESTER SLUDGE MIXING

MIXING SYSTEMS, INC.



HYDRAULIC SLUDGE MIXING BENEFITS

- Variable liquid level
- Energy efficient
- Stainless steel nozzles
- Nozzles hardened to a Brinell hardness of 450+
- Chopper pumps
- CFD mixing analysis

MIXING SYSTEMS, INC.

- Preferred provider of submerged jet Aeration and jet mixing systems
- Triple zone mixing
- No rotating equipment in digesters

HYDRAULIC SLUDGE MIXING APPLICATIONS

- Digester mixing
- Mixing anaerobic digesters
- Sludge holding tanks
- Aerobic Digester Mixing
- Equalization tanks
- Variable liquid level tanks

For more information on jet aerators, jet mixers, or sequencing batch reactors, contact:

MIXING SYSTEMS, INC.

7058 Corporate Way, Dayton, OH 45459-4243

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Web site: www.mixing.com

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SIEWERT EQUIPMENT

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Low Pressure Sewer Systems

Gary Dinehart, Operations Manager of the Town of Jerusalem Water/Sewer Deaprtment (left) and Kevin Ryan of Siewert Equipment. In the background is a view of Keuka Lake.

The **Town of Jerusalem, NY** is located on the northern end of Keuka Lake in Yates County. The Town installed a low pressure sewer system in 2003, with the help of **Environment One** and **Siewert Equipment**. The installation consists of 280 E/One semi-progressive cavity grinder pumps.

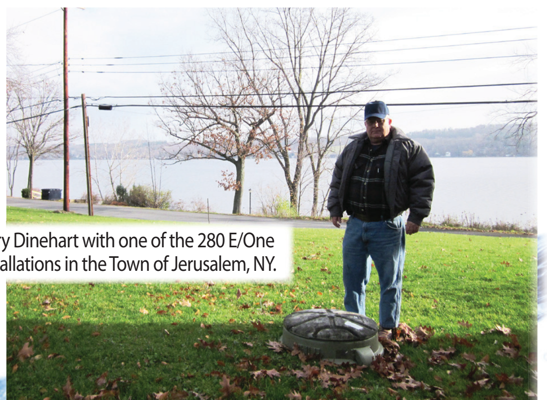
Nearly 10 years later, here's what members of the **Town of Jerusalem's Water/Sewer Department** have to say about their E/One installation:

> "These houses are on steep lakeside terrain., with most being well below the road and mainline sewer. We would not have sewer at all if it were not for E/One and low pressure sewer.
> LPS has allowed homeowners to further develop their land".
> *- Wayne Ackart, P.E., Town Engineer*

> "In 10 years I can only remember one jammed pump.
> We've tried other pumps, and E/One is the best."
> *- Gary Dinehart, Operations Manager*

> "E/One and Siewert have always been here to support us."
> *- Carrie Wheeler, Account Clerk*

Jerusalem Town Engineer Wayne Ackart, P.E., and Account Clerk Carrie Wheeler.



Gary Dinehart with one of the 280 E/One installations in the Town of Jerusalem, NY.

E/One Model DH071 Simplex Grinder Pump
manufactured at the
Environment One Headquarters/Factory in Niskayuna, NY

eone
SEWER SYSTEMS

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