Summer 2012, Vol. 42, No. 2

New York Water Environment Association, Inc.

Clear Waters

Green Solutions for Clean Water Infrastructure

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- Legislative Dialogue Meeting Highlights
- NYWEA Green Infrastructure Task Force

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Clear Waters

New York Water Environment Association, Inc.

Cover Image: Sedum plants installed on this green roof atop the Five Borough Administrative Building, Department of Parks and Recreation, contributes to New York City's sustainability efforts.
Image courtesy of NYCDEP

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Sustainable and Green

This issue of *Clear Waters* provides a focus on green infrastructure and sustainability. I believe both of these programs mean different things to each individual and are difficult to define. So, as a lot of us often do, I "googled" both terms to find definitions that make some kind of sense to our membership and stakeholders.

When we hear of green projects or programs, it can be a laundry list of everything under the sun. I found a definition which I think agrees with what our sector is trying to achieve and, appropriately, it is from the SUNY College of Environmental Science and Forestry in Syracuse. ***Green Infrastructure:*** *"Systems that mimic natural processes in order to infiltrate, evaporate and/or reuse stormwater. Green infrastructure use soils, topography, and vegetation in a way that minimizes the impacts of anthropogenic disturbance and maintains the pre-development hydrology and water quality of urban environments."*

I also believe that the word, sustainability, is used in virtually every concept or initiative with no real regard to what it means. So I found what I believe is the most effective definition that was coined by the Bruntland Commission in the UK from 1987.

Environmental Sustainability: *"Development which meets the needs of the present without compromising the ability of future generations to meet their own needs."*

Many areas of the state are incorporating aggressive green infrastructure components in combined sewer overflow long-term control plans. The most highly publicized at this time is Onondaga County's Save the Rain program with developing plans in NYC, Buffalo, Albany and many other communities. Green infrastructure is a great concept, however, for these innovative plans to be successful, I believe there must be a solid foundation of grey infrastructure. In this issue, we have an article on the NYS Environmental Facilities Corporation's Green Innovative Grant Program (GIGP). This award winning program is now in round four, with a focus on managing rain where it falls to reduce runoff to the grey infrastructure. This program was created in response to the American Reinvestment and Recovery Act (ARRA) of 2009. The monies disbursed from ARRA to the states required a 20 percent green reserve resulting in the creation of GIGP round one.

Albany County Sewer District (ACSD) GIGP Project

My employer, ACSD was extremely fortunate to receive substantial support from the ARRA bill through round one of GIGP and NYSERDA (NYS Energy Research and Development Authority). The project total cost is $8.55 million and is over 90 percent grant funded. The focus of the ARRA bill was job creation by supporting shovel-ready projects. I have been describing our grant award by using a quote from Thomas Alva Edison, *"Good fortune is what happens when opportunity meets with planning."*

The project is a combined heat and power (CHP) project that will utilize the waste heat/flue gases from the ultimate disposal method of biosolids from thermal destruction via multiple hearth incineration at the North Plant. This project is cutting edge, as it is the first of its kind in North America to use an Organic Rankine Cycle System (ORC)/turbo-generator to produce the electricity from sewage sludge incineration. By converting biosolids to renewable energy, the ORC will reduce electrical demands by 70 percent and heating bills by nearly one-third with the associated reduction of greenhouse gases. The project will provide long-term environmental and economic benefits to the district's eight-member communities serving a population of over 200,000. The innovative aspects will also provide a platform for technology transfer to additional stake holders in New York State.

I would strongly urge all municipalities to pursue any funding opportunity that reduces energy consumption with the associated reduction in a carbon footprint. Information is available at www.NYSERDA.org or www.NYSEFC.org.

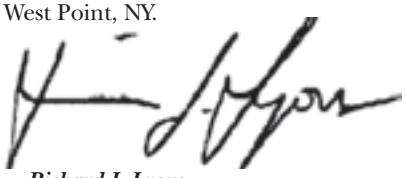
Regulatory and Legislative Advocacy

NYWEA's five-year strategic plan recognizes the importance of influencing the regulatory and legislative arenas. For this organization, leveraging regulatory and legislative agendas is paramount so the limited resources that are available are spent in the most appropriate area, which in turn best serves the interests of the ratepayer. Since February, with great advisement and work from the Utility Executives Group and Government Affairs Committee and others, we have weighed in on the following:

- Draft EPA Integrated Municipal and Stormwater Planning Approach Framework
- DOH/ELAP Certification requirement for settleable solids testing
- Capacity, Management, Operations and Maintenance (CMOM) Program implementation issues
- Sewage Right to Know Act (Bill S6268-A)
- Bottle deposits retained by the state be allocated to the Environmental Protection Fund Bill, S5403-A
- Comments on Design Standards for Intermediate-sized Wastewater Treatment Systems

Our Board of Directors, Utility Executives Group and Government Affairs Committee realize the importance of advocating on behalf of NYWEA's entire membership. We must continue to keep a finger on the pulse of emerging regulations and legislation that may not be in our best interest, with added emphasis on potential impacts to Publically Owned Treatment Works utility members. We must also reach out to our environmental partners to insure that any concerns of our association are heard on environmental initiatives they may pursue, as some other group's goals could be counter-productive to this organization's membership. Our advocacy has included partnering with the Conference of Mayors, Rural Water Association, Citizens Campaign for the Environment and Riverkeeper, to make sure all perspectives on a given issue are being heard, as we do have strength in numbers.

I wish all a happy, safe and enjoyable summer, and I look forward to seeing you at the Watershed Conference on September 13–14 at West Point, NY.



Richard J. Lyons

Green Infrastructure

During NYWEA's 84th Annual Meeting in New York City, USEPA held a Green Infrastructure Educational Forum. This meeting was attended by nearly 100 people and gave the agency an opportunity to share its support of public and private partners to promote the implementation of sustainable green infrastructure.

Green infrastructure is good for the environment – it preserves and protects open space in urban areas, while at the same time serving a fundamental goal of reducing stormwater overflows from entering local waterways. Green infrastructure has become a holistic approach to water quality issues that augments the traditional "grey" engineered systems that exist around the globe.

We are fortunate to have the Executive Office of NYWEA located in Syracuse, NY, a nationally recognized city by USEPA for its green infrastructure program. Locally, we bear witness of green infrastructure projects taking place both in the news and on the streets. To successfully champion a Green Infrastructure program, it takes a commitment of the leadership of counties, cities, private corporations, nonprofit agencies and individuals. The USEPA recognizes local practitioners as the leaders in the implementation of multi-functional green infrastructure programs and seeks to foster continued innovation through information exchange. By devoting an issue of *Clear Waters* to this topic, NYWEA hopes to be a catalyst in the process to help develop a deeper understanding of green infrastructure projects.

As green infrastructure and stormwater are inexorably linked, on the regulatory side of the equation NYWEA members anxiously await USEPA's new stormwater rule that helps establish the framework for the future on policy for all issues relating to stormwater regulations. It is estimated that the proposed rule will be released in Spring 2013.

Handbook on Wastewater Management for Elected Officials

NYWEA is in the process of updating the 2007 *Handbook on Wastewater Management for Elected Officials*. This handbook is available on the NYWEA website and used as a resource for local elected officials. This document is being put together as a collaborative effort between NYWEA and the Public Management and Finance Program at the Environmental Finance Center. This online document will cover the following topics:

- Introduction to Wastewater Management
- Asset Management and Sustainability
- Rate Setting and Financing
- Regulatory Overview and Legal Responsibilities
- Public Engagement and Education
- Stormwater Management and MS4s
- Staffing/Training/Succession Planning and Certification
- Emergency Response

It is anticipated that this document will be available in August. Many thanks to Khris Dodson for reaching out to NYWEA and making the suggestion that the document be updated, and for the other members involved in this undertaking – Tim Taber and Brad Allen DeFrees. Our appreciation also goes out to each one of the authors for their assistance with this document. To access this handbook, please visit the NYWEA website at www.NYWEA.org.

Patricia Cerro-Reehil

How Would You Like to Be NYWEA President in 2016?

If you are interested in a long-term, career-enriching opportunity, please consider applying for this important position.

Being an officer is a rewarding experience, but it is also a commitment of five years (Vice President–Elect, Vice President, President–Elect, President, Immediate Past President). When reviewing applicants, the Nominating Committee will take the following items into consideration (no one is expected to have all of these items in their resumé):

- Leadership skills
- Vision and managerial skills
- Active and viable state committee chair
- Active and viable state committee involvement
- Continuous membership tenure greater than 7 years
- Chapter endorsement (in writing)
- Active member of Chapter Executive Board
- NYWEA award recipient
- Chapter representative
- Chapter officer
- Regular attendance at state meetings
- WEF Board of Directors service

Please submit an electronic resumé with a cover letter that highlights any of the attribute areas above to:

Patricia Cerro-Reehil, Executive Director
NYWEA, 525 Plum Street, Suite 102, Syracuse, NY 13204 • **Phone** 315-422-7811 • **Fax** 315-422-3851 • **Email** pcr@nywea.org

Nomination deadline is August 1, 2012. All members are eligible to apply!

Heart of Sustainability: Work Culture

When talking about sustainability, environmental programs are commonly thought of as the only players. Safety hasn't really been invited to the dance and hasn't invited itself either. Safety professionals are now trying to catch up and contribute to sustainability initiatives.

Organizations are helping this effort by thinking about sustainability in terms of the triple bottom line: people, planet and profit. The people part refers to social components including safety. The planet part includes environmental initiatives. For profit, the concerns are revenue stream, growth and products. For municipal organizations, the same trio holds true if viewed as: workers and the community; waste streams and eco-efficiencies; and, the budget. Each of these segments overlaps one another and really cannot be segregated. One of my favorite visual aids is using the logo of Ballantine Ale or three overlapping circles that create a triangle in the center. That piece in the center, common to all three, is the heart of sustainability.

One of the problems of including safety in talks of sustainability is that there is no widely accepted definition of safety and health sustainability. In the context of safety, sustainability can mean different things to different stakeholders. Generally, it encompasses the protection of people. At the macro-level, safety sustainability involves the design of treatment facilities and systems, selection of chemicals, education of the community, and the consideration of human factors in environmental initiatives. At the micro-level for the operations personnel, safety sustainability includes systematic personnel involvement, prevention versus correction activities, and moving from a compliance-based approach to a proactive approach, all in an effort to develop and sustain safe work behaviors.

An example of micro-level safety sustainability is hygiene practices. How can the act of washing hands and faces become sustainable? Demanding compliance because it is the rule doesn't work and creates resentment because, although the behavior may change, the underlying attitude doesn't change. Disciplinary action is post-exposure and generally co-opts safety. The most viable and sustainable solutions will be those developed by the work teams. Results may include: stressing the front end of the hygiene issue by formalizing techniques to limit exposure to pathogens and waste; increased education regarding potential health issues; engaging a uniform service; moving sinks closer to work areas and lunch rooms; and, cleaning locker rooms to promote changing at the end of the day. It is very likely that the wanted behavior (good hygiene practices) will increase and become part of the culture of the plant (sustainable) due to the direct involvement and input of the people most at risk.

Having skin in the game greatly improves the chances that a desired behavior will be replicated. Replicate that behavior many times and it becomes ingrained. Once it is ingrained, it is not even thought of as a requirement but rather, "how things are," and it becomes sustainable.

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

NYWEA Task Force Leads Technical, Educational Resource Efforts on Green Infrastructure

The NYWEA Green Infrastructure Task Force (GITF) held a kick-off teleconference in February in which group members statewide launched its three-fold mission:

- To assist the Board of Directors in deciding if the field of GI warrants creation of a permanent committee. (The determination was yes.)
- To act as an information resource to its members, governmental entities and regulators with the aim of providing training via workshops on cost effective GI methods, governing regulations and the funding sources available through USEPA, NYS Environmental Facilities Corporation, Clean Water State Revolving Fund and NYSDEC.
- To collect and disseminate information on the selection of cost effective GI methods, monitoring techniques employed to gauge efficiency, and quantify the corresponding reduction in combined sewage overflows and stormwater volumes.

The Task Force, formed in December 2011 by NYWEA past president, Tony Della Valle, is co-chaired by Douglas Greeley, Vice President of Malcolm Pirnie, the Water Division of ARCADIS and Dave Comerford, General Manager of the Buffalo Sewer Authority. The GITF established four working groups this spring to research and prepare position papers focused on identifying and describing issues related to the following aspects of employing natural process systems, or GI, as opposed to traditional piped solutions:

1. **Measuring Effectiveness, Developing Performance Standards and Metrics**, led by Tara Dougherty and members Jennifer Cass, Peter Moffa, Dino Ng, Khristopher Dodson, Tom Whetham.
2. **Developing Cost/Benefits Tools, and Selection of Appropriate GI Techniques**, led by Matthew Marko and members Jennifer Cass, Geoff Baldwin, Jerry Kleyman, Sridhar Vedachalam.
3. **Quantifying Water Quality Benefits of Employing Green Infrastructure**, led by Greg McCorkhill and members Jennifer Chu, David Barnes, Emily Vail, Scott Rybarczyk.
4. **Ensuring Long-Term Performance, Developing Operations and Maintenance Practices**, led by Andy Sansone and members Sandeep Mehrotra, Dan Walker, Tom Whetham.

Other NYWEA members, Dave Comerford, Magdi Farag, Gary Kline, Angela Licata and Margot Walker, will also serve a technical resource function in "Research and Review" for the working groups.

The Working Groups are busy writing position papers, scheduled to be completed later this summer and made available to interested individuals and entities on the NYWEA website (www.nywea.org). As GI educational programs are developed, they will be posted on the website as well.

Special Event

Legislative Office Building, Albany, NY

May 8, 2012
Legislative and Regulatory Dialogue

Commissioner Carter Strickland of New York City Department of Environmental Protection

Matt Millea, Deputy County Executive for Onondaga County, discusses Green Infrastructure projects in Syracuse.

Senator Grisanti speaks to members at the Legislative Dialogue.

NYWEA President Richard J. Lyons addresses participants.

Just over 50 people attended the day-long session covering topics on Water/Wastewater Infrastructure Funding, Nutrients Management, Stormwater Management and Green Infrastructure and Public Notification of Overflows and Bypasses.

Libby Ford and Magdalena Pietrzak participate in discussion.

Chretien T. Voerg of Coloni e, NY

Tom Rhoads, Commissioner of Onondaga County's Department of Water Environment Protection

Sara Dorman of NYSDEC looks on.

Bob Kukenberger moderates the Stormwater Management and Green Infrastructure panel.

Peter Tennant, Executive Director and Chief Engineer at Ohio River Valley Sanitation Commission (ORSANCO)

Andrienne Esposito, Executive Director of the Citizen's Campaign for the Environment, speaks about environmental groups helping to obtain infrastructure funding for water and wastewater treatment plants.

Sandra Allen of NYSDEC speaks about infrastructure funding.

L–r: Bob Feller, Tom Lauro and Keneck Skibinski

Boris Rukovets, Chair of the Government Affairs Committee, welcomes attendees.

Libby Ford moderates the discussion on Public Notification of Overflows and Bypasses.

L–r: Dave Comerford, Dan Bentivogli, Richard Lyons, Tom Lauro, Senator Grisanti, Michael Garland, Patricia Cerro-Reehill and Tom Rhoads

Photos by Patricia Cerro-Reehil

Green Innovation Grant Program Makes It Easy to Be Green

by Suzanna R. Randall

You can be green with envy, green with inexperience, green with money and green in managing the environment. Who says it's not easy being green?

The New York State Environmental Facilities Corporation (EFC) is making it even easier with its Green Innovation Grant Program (GIGP) – a unique competition in which municipalities, schools and other organizations are challenged to create innovative and sustainable projects to enhance water quality.

Over the past three years, more than 100 green projects – from recycling stormwater to restoring a buried riverfront – have been selected for nearly $80 million in GIGP funding. A fourth round of GIGP is expected to occur later this year.

These projects span all corners of the state and were selected from more than 500 applications. The interest and enthusiasm generated by this groundbreaking program is helping the EFC achieve one of its principal goals – to spur environmental innovation and thereby bring green technologies to all parts of New York. As the program helps contractors and workers gain knowledge in the science and techniques associated with such green ventures, they will become less costly and more available statewide.

The EFC was twice recognized nationally for its green program leadership. The US Environmental Protection Agency presented EFC with the Environmental Quality Award earlier this year and, in 2009, it earned the agency's Pisces Award for unique use of federal funds from the American Recovery and Reinvestment Act.

Major River Project

Work is underway on one of the most dramatic projects in the GIGP catalog: the "daylighting" of the Saw Mill River in the City of Yonkers. Selected in 2010 for a $645,000 GIGP grant, the city is unearthing the river which was flowing under a parking lot and urban plaza. The hardscaping along the new riverbanks has been installed and planting is expected to be completed this summer. Fish can already swim up the daylighted river using a new fish ladder ***(see photo)***.

What was once a linear underground pipe of polluted water has been transformed into a meandering stream with dramatic improvements to both aesthetics and water quality. The renewed riverfront will provide recreational opportunities and serve as an anchor for the commercial redevelopment of downtown Yonkers. The EFC is playing a key role in bringing this river back as not just an amenity, but as a focal point that will inspire continued restoration work.

Stormwater Projects

While the first two rounds of GIGP funding awards were open to all kinds of green projects, the latest round (GIGP 3) along with the upcoming round are focused exclusively on green infrastructure stormwater projects.

These green innovations range from green roofs and downspout disconnections to permeable pavement and bioretention/bioinfiltration systems. By helping to manage rain where it falls, these projects decrease the volume of runoff and reduce the need to handle stormwater through traditional and more costly "grey" infrastructure.

These projects also bring other benefits, according to EFC President and CEO, Matthew Driscoll. "They can increase property values, revitalize communities and improve air quality by reducing the emission of greenhouse gases. These green innovations provide added advantages, such as new walkways and natural habitats for recreation. Even a city's heat island effect can be reduced when green roofs, permeable pavement and urban forestry programs decrease the city's overall impervious surface area."

Educational Opportunities

These projects can serve to teach people about the growing field of green technology.

In the Finger Lakes, a proposed museum dedicated to the enjoyment, education and stewardship of the region and fresh water conservation, will soon begin construction thanks in part to a recently awarded $381,000 grant from the Environmental Facilities Corporation.

The funding, which includes another $1.9 million from Empire

Photo courtesy of City of Yonkers

The Sawmill River was daylighted (unearthed) and the hardscaping phase of this GIGP project in Yonkers, NY is shown as it moves forward, nearing landscaping completion this summer. A fish ladder is seen in foreground.

State Development and the New York State Office of Parks, Recreation and Historic Preservation, will be used to renovate the former Branchport Elementary School to create the Discovery Campus, the first of a two-phase multi-million dollar project sponsored by the Finger Lakes Museum.

Upon construction completion, the Museum's Discovery Campus will be a place where regional academic institutions can collaborate in the study of issues like fresh water quality, sustainability and environmental stewardship. The GIGP funding will allow for an innovative and interpretive stormwater management system at the museum, including a porous pavement parking lot, which will absorb rainwater and reduce the runoff of polluted water into Sugar Creek. A rain-absorbing green roof and eco-friendly bio-filters will further treat stormwater runoff, restoring and protecting stream banks along the creek. These sustainable practices, along with others, will be featured through an educational facility at the museum that will be utilized by students of all ages for various research and learning opportunities.

Photo courtesy of Finger Lakes Museum

A kayaker is seen moving out of Sugar Creek and into Keuka Lake, near the proposed Finger Lakes Museum and Discovery Campus. The educational facility will host regional academic collaborations to address fresh water quality and environmental stewardship, and the campus will demonstrate sustainable stormwater management by using porous pavements, a green roof and other practices that will reduce pol luted runoff into the lake's tributary.

The potential for technology transfer, or applying and sharing new technical information, is a theme of these green projects, whether they involve stormwater harvesting and reuse, downspout disconnections, permeable pavement, bioretention and bioinfiltration, or construction/restoration of wetlands, floodplains and riparian buffers. These projects are investments that will pay dividends for years to come.

Suzanna R. Randall, AICP, is the Green Infrastructure Coordinator for the New York State Environmental Facilities Corporation in Albany, NY. She may be reached at: suzanna.randall@efc.ny.gov.

How New York City Leads Green Infrastructure Movement

Blueprint to Achieve Greener Stormwater Systems

by Carter H. Strickland, Jr.

On March 13, 2012 the New York City Department of Environmental Protection (NYCDEP) signed an historic agreement with the New York State Department of Environmental Conservation (NYSDEC) through a mix of cost-effective grey infrastructure and green infrastructure. We estimate that the agreement will reduce combined sewer overflows (CSOs) by approximately 12 billion gallons annually by 2030 and will save ratepayers approximately $2.4 billion over a plan that relied exclusively on additional CSO detention facilities (tanks and tunnels). It took over five years to lay the groundwork for, and then to finalize, this agreement. Now that we can look back with some perspective, some key factors, described here, were identified that made this agreement possible and will help guide other cities toward a greener future.

■ Have the Support of Thoughtful, Committed Leaders

Strong leadership from elected officials is essential to addressing complex challenges like CSOs. In New York City's case, Mayor Michael Bloomberg has led the way toward infrastructure investment and urban sustainability, in large part due to PlaNYC – his administration's long-term vision for a greener, greater New York City. Released in 2007 and updated in 2011, PlaNYC commits the city to achieving 132 broad-reaching initiatives that will prepare it for one million more residents, strengthen the economy, and enhance the quality of life for New Yorkers.

The Mayor's Office of Long-Term Planning and Sustainability (OLTPS) was created to develop, implement, and track the progress of the initiatives set forth in PlaNYC. Line agencies can have discreet missions and focus on achieving those goals, and a lack of coordination can limit their effectiveness at achieving the long-term vision of the municipality as a whole. By focusing agencies on a common vision for sustainability, OLTPS has helped agencies work together and realize that the sum of coordinated efforts is greater than individual, "siloed" projects. Shared effort – and credit – has found new ways for existing and upgraded assets to serve expanded needs of the city. One example is the Schoolyards-to-Playgrounds program, which opens school playgrounds to the public on weekends and during school breaks when they would otherwise be closed. In the future, many of these schoolyards will serve a third purpose by incorporating stormwater management elements into their design such as permeable pavements and bioretention systems.

Photo courtesy of NYCDEP

A Green Infrastructure Citizens' meeting is held in Winter 2011 showing Commissioner Strickland presenting the Green Infrastructure Plan.

Embrace Stakeholders from the Start

In PlaNYC, the Mayor's Office committed to creating an Interagency Best Management Practices (BMP) Task Force to develop a plan for stormwater source controls to reduce CSOs within 18 months. The task force was comprised of representatives from NYC agencies responsible for infrastructure or development that could help control stormwater and CSO pollution in its waterways. Patterned on the drafting of PlaNYC itself, the Interagency BMP Task Force solicited comments, concerns and suggestions from stakeholders in the water quality and stormwater fields early on to develop the best possible plan that was feasible to implement.

After a series of public stakeholder meetings, the task force convened working groups to discuss practical solutions, assessed the costs and benefits of different types of source controls, developed a list of potential source controls for inclusion in the plan, and launched an online source control registry of current installations in New York City. The resulting document from the BMP Task Force – the Sustainable Stormwater Management Plan – concluded that green infrastructure was not only feasible in many areas of the city, but that it could be more cost effective than certain large infrastructure projects, such as CSO storage tanks. The plan also indicated that there was enormous public support and that many organizations and city agencies had already begun experimenting with various green infrastructure systems. For example, the plan combined the extensive research and outreach already performed by groups, like the NYC Department of Parks and Recreation, Columbia University, eDesign Dynamics, LLC, and members of the Stormwater Infrastructure Matters (SWIM) Coalition, into a cohesive argument for using source controls to manage stormwater.

This interagency cooperation has continued. In October 2010, the city brought together commissioners from various agencies to develop a pipeline of agency capital projects that could include green infrastructure. Since then, NYCDEP has led quarterly Green Infrastructure Task Force meetings with representatives from the Departments of Design and Construction, Parks and Recreation, Transportation, Education, and others. The task force has worked collaboratively to develop standard designs for bioswales, to incorporate green infrastructure into existing capital projects, and to implement a maintenance plan for green infrastructure built in the right-of-way.

■ Do Your Homework and Set Forth a Comprehensive Plan

Especially in tough economic times, public utilities must perform thorough cost-benefit analyses for innovative proposals like green infrastructure.

continued on page 14

continued from page 12

The construction of numerous bioswales and the institution of a rain barrel give-away program are part of the citywide green stormwater management effort.

Photos by Carl Ambrose, NYCDEP

After the release of the Sustainable Stormwater Management Plan, NYCDEP further refined the analysis of the financial burden and water quality benefits of green and traditional grey technologies to reduce CSOs, informed by real-world examples. The NYCDEP built more than 20 pilot green infrastructure systems, including right-of-way bioswales, blue and green roofs, and permeable pavements; and monitored the various systems over the course of two years to build the case for green infrastructure on a scientific and local basis. Using existing data from the city's many grey infrastructure investments and preliminary data from pilot green infrastructure projects, NYCDEP determined the optimal mix of green and grey infrastructure in each watershed to reduce CSOs in the most cost-effective way possible.

This analysis led to the NYC Green Infrastructure Plan, which showed that a combination of green and grey infrastructure would reduce greater CSO volumes at significantly less cost to New Yorkers than the all-grey strategy outlined under the then current CSO order. In addition, the sustainability benefits of this green strategy which are not available through the grey strategy would begin to accrue immediately and build over time, in contrast to tanks, tunnels and expansions, which provide only water quality benefits at the end of decades-long design and construction periods.

Over the next 20 years, NYCDEP projected that the NYC Green Infrastructure Plan would reduce CSO volumes from approximately 30 billion gallons a year to approximately 18 billion gallons per year for an estimated cost of $5.3 billion. The plan would reduce approximately two billion gallons per year more than the traditional grey strategy in the CSO consent order and would save the city approximately $2.4 billion. Moreover, green infrastructure would be spread throughout the city and would provide many additional sustainability benefits. After a 20-year period, NYCDEP estimated that New Yorkers would receive between $139 million and $418 million in additional benefits through reduced energy bills, increased property values, and improved health.

■ Make the Case to Your Regulators

Armed with the mayor's backing, the buy-in of stakeholders and a thorough economic and environmental analysis, NYCDEP was ready to present the plan to regulators. In September 2010, the city published the NYC Green Infrastructure Plan and submitted it to NYSDEC as an alternative to the existing CSO consent order. The state evaluated the waterbody-specific cost-benefit analysis that showed green infrastructure would provide greater water quality benefits than the original consent order, and agreed to discuss a revision of the agreement.

On March 13, 2012, after more than a year of negotiating, NYSDEC and NYCDEP announced a revised agreement that locked the NYC Green Infrastructure Plan into place through 2030. Both parties agreed to try the more cost effective approach, with performance goals and periodic milestones for assessing the effectiveness of the program. Not only does the revised agreement save New York City residents and businesses money and improve water quality, it is structured so that the city maintains the flexibility to prioritize green investments in areas of the city that will benefit most from the resulting reductions in CSOs. The adaptive approach incorporated in annual and five-year reports allows NYCDEP to propose alternative ways to meet its performance targets and to make up for any missed targets by changing its investment, design and construction strategies to reflect current conditions and up-to-date information.

In particular, this historic agreement commits NYCDEP to:

- Construct green infrastructure citywide that will manage 10 percent of the runoff from impervious surfaces in combined sewer areas by 2030, which NYCDEP estimates will equate to $2.4 billion in green infrastructure projects over the next 20 years.
- Complete $1.4 billion in cost effective grey infrastructure projects.
- Submit annual reports on progress, and more in-depth five-year assessments against milestones.
- Develop 11 Long Term Control Plans for combined sewer drainage areas by 2017 with significant input from the public.

Rendering of the Bronx Zoo loop visitor pathway, one among numerous projects in NYCDEP's Green Infrastructure Grant Program.

Image courtesy of NYCDEP and Bronx Zoo

■ **Keep the Public Involved and Engaged**

Pollution control investments are funded by ratepayers, and NYCDEP recognizes that educating and engaging the public is critical to its effort to build and maintain thousands of green infrastructure systems across the city. The department hosts Green Infrastructure Citizen's Group meetings to report to the public on the progress of green infrastructure implementation every year, and convenes smaller working meetings with a Green Infrastructure Steering Committee of designers, engineers and environmental business and community representatives on a quarterly basis. This group of stormwater experts has been instrumental in identifying ways to improve recently adopted regulations for stormwater controls in new development and redevelopment. The Steering Committee will also help the department form watershed-specific stakeholder groups as it develops and submits 14 Long Term Control Plans.

The NYCDEP's Green Infrastructure Grant Program has also been very successful in finding partners to help build green infrastructure throughout the city. Over the past two years, the department has awarded grants to various types of organizations including the Bronx Zoo, the Natural Resources Defense Council, the New School, and Brooklyn Grange (for a rooftop farm). To date, NYCDEP has awarded more than $8.4 million, with another $4.3 million in matching funds from its partners. These partners will not only help keep the waterways clean with new green infrastructure systems, they will help raise awareness of the city's investment in its waterways and help spur investment on private property, typically off limits in most city projects.

This summer, NYCDEP will also launch a program for stakeholders to adopt bioswales, which will be one of the city's most common green infrastructure installations. These bioswale projects will help deepen the public's acceptance of green infrastructure and ensure that the installations are respected and maintained by the communities in which they are built ***(see NYC Bioswales article on page 20)***.

After years of work by many people, the City of New York is confident in its plan to overcome the decades-long challenge of combined sewer overflows in a way that will benefit the economic, environmental and quality-of-life goals of all New Yorkers. New York City was fortunate to have the visionary leadership that makes decisions based on sound science and supports those individuals and groups delegated with the tough tasks to see these commitments through to fruition. The city is home to many active, thoughtful and passionate stakeholders who are eager to help. Some are employed by the city and work from within to figure out new solutions to old problems, but most stakeholders are passionate city residents whose perspectives and support are critical to a successful solution. Finally, the city has been lucky to have counterparts in the state and federal governments who are willing to work collaboratively and foster innovation.

Put this all together, and we all are actively engaged in a plan for a greener, greater New York City for generations to come. We hope your city looks forward to a greener future too.

Carter H. Strickland, Jr. is Commissioner of the New York City Department of Environmental Protection. He may be contacted at: AskCarter@dep.nyc.gov.

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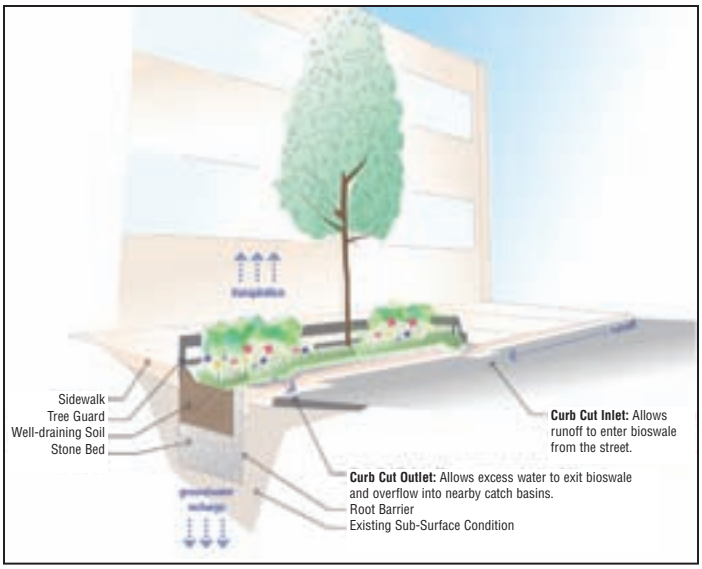
NYC Bioswales Pilot Project Improves Stormwater Management

by John McLaughlin

New York City, like other older urban centers, is largely serviced by a combined sewer system where stormwater and wastewater are carried through the same pipes. Even though wastewater treatment plants (WWTPs) are designed to treat and disinfect twice dry weather flow, during heavy storms the system can exceed its capacity. When this happens, the system is designed to discharge a mix of stormwater and wastewater – called combined sewer overflow or CSO – into New York Harbor in order to prevent damage to wastewater treatment plants.

Streets and sidewalks, two top contributors to stormwater runoff, make up approximately 27 percent of land in combined sewer drainage areas of the city. They represent a significant opportunity to manage stormwater using source controls. Source controls are systems designed to detain or retain stormwater at the source rather than at the end of pipe. In 2010, New York City released the NYC Green Infrastructure Plan, which called for the construction of source controls throughout the city to manage stormwater from impervious surfaces.



Over the past two years, the New York City Department of Environmental Protection (NYCDEP) has designed, built and tested the first generation of bioswales – a type of vegetated source control, or green infrastructure that fits into tight spaces within the right of way. Bioswales capture stormwater from the curb before it enters the sewer, and help reduce the volume of stormwater directed to WWTPs during wet weather ***(see illustration above)***. These pilot systems have already provided information that has influenced the designs and locations of future green infrastructure systems. The ability to evaluate performance, modify designs and improve upon existing green infrastructure is one of the greatest strengths of this adaptive approach to managing stormwater put forth in the NYC Green Infrastructure Plan. Preliminary results learned and modifications made by NYCDEP over the past two years in implementing these bioswales are shared here.

Design and Siting

The NYCDEP constructed bioswales in a variety of locations using different design types to evaluate their performance, maintenance requirements, public reception and costs. The department piloted various designs of first generation bioswales, which are built on the sidewalks upstream from catch basins and look similar to standard tree pits. When it rains, water is diverted into the bioswale from the gutter and infiltrates through the top layer of soil and vegetation. In instances where the bioswale cannot contain all of the stormwater, excess water flows through an outlet and into the gutter. Beneath the top layer of soil is a subsurface layer of engineered soil, gravel, glass or storage chambers. Soils with a high sand content were used, ranging from 70-85 percent, and the different soil variations are being evaluated to determine which sand concentration serves the vegetation's needs while maintaining the highest rates of infiltration.

To determine the design storage volume of the different types of technology, NYCDEP staff assumed that the soil has 20 percent void space, the glass and gravel have 35 percent void space, and the storage chambers have 100 percent void space. Staff calculated that bioswales with a subsurface layer of glass or gravel can store up to 954 gallons of stormwater, while those with storage chambers can store up to 1,626 gallons of stormwater. For above ground, the New York City Department of Parks and Recreation (NYCDPR) advised on the selection of indigenous plant species known to tolerate varying soil moisture conditions throughout the growing season, such as *Liquidambar styraciflua* (Sweetgum), *Acer rubrum* (Red Maple), *Nyssa sylvatica* (Black Gum), and *Quercus bicolor* (Swamp White Oak). These plants have performed well during wet periods (Summer 2011) and dry periods (Summer 2010).

Original designs of the first generation bioswales used a cast iron curb plate at the inlet. The cast iron plate is sturdy, preserves the line of the curb, and can bear the weight of cars and trucks without damage to the curb or the bioswale. However, litter often clogged the curb plate causing water to bypass the bioswale. To solve this, NYCDEP retrofitted the inlets so that now they are either a depressed curb or have had the back-plate on the cast iron curb pieces modified to allow a minimum of three inches clearance. These modifications have increased the overall conveyance of stormwater to the underground storage areas while not adversely affecting vegetation.

In 2011, NYCDEP began working with the departments of Design and Construction (DDC), Transportation (DOT), and Parks and Recreation to create standard designs for bioswales and to coordinate siting procedures across the city. The design group met on a weekly basis to analyze the performance of pilot right-of-way green infrastructure systems and to modify the designs to maximize stormwater capture, reduce costs and make maintenance as unnecessary and safe as possible. To date, the design group has developed more than eight standard designs for bioswales which NYCDEP has posted online and will be building throughout the city.

Monitoring

The NYCDEP installed a variety of monitoring devices including pressure transducers to monitor flow into the systems, flow turbines to measure flow rates inside the inflow/outflow pipes, and piezometers to monitor water levels. To measure local precipitation, department workers mounted a rain gauge at each site. They also installed soil moisture sensors to monitor and measure stormwater capture volume, evaluate water movement within the soil profile, and to help understand the overall water balance throughout the systems.

Photos by Carl Ambrose, NYCDEP

Above: Problems of clogging around the bioswales' curb plates resulted in modifications, such as depressed curbs seen in the lower photo.

In addition to the piezometers used to measure water level, NYCDEP installed inlet and outlet boxes fitted with pressure transducers, and pipes at six sites in June 2011 to measure flow in and out of each system during storm events. At the beginning and end of each monitoring season, hydrant flow tests are performed at each site to ensure that the equipment is working properly and calibrated to validate and raise confidence in the monitoring. Hydrant tests revealed that the pressure transducers greatly overestimated the true water capture volume, while the piezometer water level readings were much closer to predictions. It is believed that the large variance from predictions is due to soil flow restrictions and back pressure within the pipes that led to false flow measurements. Based on the outcome of the calibration tests, it was decided to use piezometers as the standard instrument to monitor water level in all future bioswales.

Performance

The NYCDEP observed the first generation bioswales for one growing season to allow the vegetation to establish before installing monitoring equipment. The performance of each system is specific to its design, the size of the contributing drainage area, and conditions of the surrounding site, such as height of the water table and surrounding soils and geology. The size of the drainage area is determined by the area of impervious surfaces that channel rain into the system because of elevation gradients and direct precipitation onto the site. In general, sites that have larger drainage areas have lower capture rates than sites with smaller drainage areas, even though they capture comparable volumes of stormwater. The project team purposefully varied the location and size of the drainage areas to understand the effect of drainage area size on capture rates. For example, the drainage area of the Union Street bioswale is only one eighth the size of the drainage area of the Eastern Parkway bioswale.

Piezometer readings are illustrated in ***Figure 1*** at the Union Street bioswale from 10 am on August 9, 2011 until 4 am on August 10, and shows how these systems can perform in ideal conditions. Precipitation (blue line) is measured in inches on the right vertical axis and piezometer readings of water level in the system (green line) are measured in feet on the left vertical axis. As the blue bars show, the day was relatively dry until the storm from 2:30 pm until 5:08 pm created a total of 1.25 inches of rain – a short but relatively intense storm. Water level in the bioswale was stable at 0.23 feet from 10 am on August 9 until approximately 30 minutes after the rain started. At that point, the water level in the bioswale rose quickly to a maximum of 2.57 feet at 5:17 pm, just 15 minutes after the peak rainfall. Once the rain stopped, the water continued to infiltrate into the surrounding soils and, by midnight, the water level was down to 0.44 feet, not far from the dry weather baseline.

The dry weather baseline does not reach zero because a small amount of water can be trapped in the monitoring device even after all of the stormwater has infiltrated into the soil. Data from this event is preliminary and unique to the design of the bioswale and is dependent upon event-specific conditions such as storm duration and intensity, prior saturation and inlet clogging. It is also important to remember that green infrastructure should be evaluated as a system and not in isolation. As the city builds more green infrastructure, NYCDEP anticipates that the total percent capture of the system will increase and, as a result, less stormwater will enter the sewers.

Though not all bioswales will perform as exceptionally as the Union Street bioswale did from August 9 to August 10, NYCDEP has seen encouraging results across all of the first generation bioswales.

The percentage of capture is shown and summarized in ***Table 1*** and ***Figure 2*** for 10 bioswales during 185 rain events from Spring 2011 through Summer 2011. Preliminary results show mean stormwater capture of 59 percent and median stormwater capture of 60 percent. For precipitation less than one inch, the bioswales captured an average of 73 percent of the rainfall and a median of 85 percent of the rainfall. The data also suggests that the bioswales perform better than anticipated for storms with total precipitation less than two inches, capturing an average of 67 percent of the rain and a median of 69 percent of the rain.

Maintenance

One critical goal of the Green Infrastructure Task Force, formed by all relevant city agencies, has been to create a dependable and efficient maintenance program to upkeep all green infrastructure in the right of way. In November 2011, NYCDEP signed an agreement with the departments of Transportation, Design and Construction, and Parks and Recreation that delineates each agency's responsibilities for maintenance and restoration of green infrastructure in the right of way, including bioswales, through June 2015. Department of Parks and Recreation crews will maintain the sites for the near future

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Photo by Carl Ambrose, NYCDEP

A completed bioswale located on Dean Street, NYC

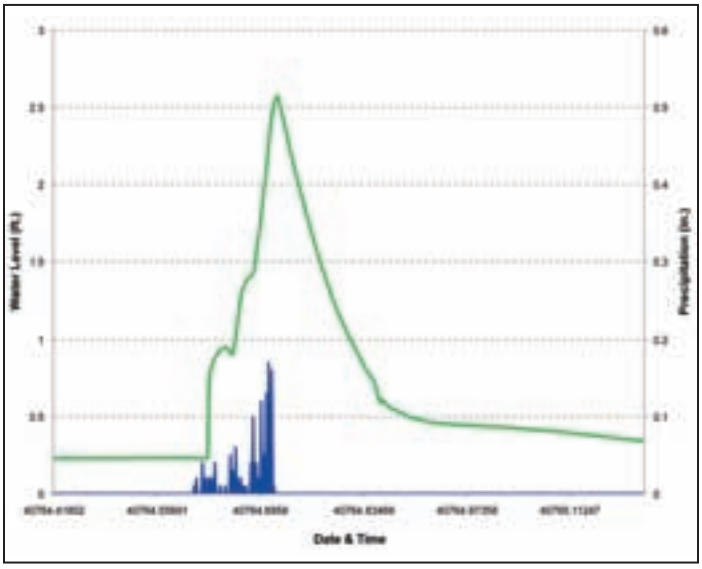

Figure 1. Line Graph Union Street

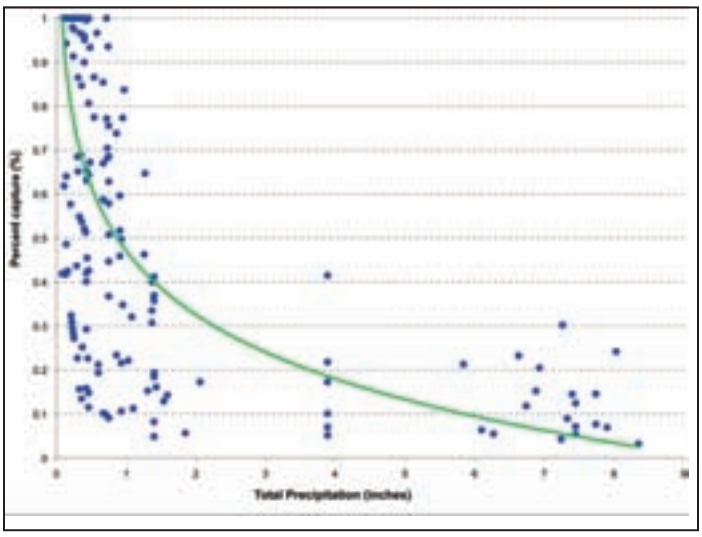

Figure 2. Line Graph 10 Tree Pits

Table 1

Percent Capture of 10 ETPs and SSISs		
Rainfall (in.)	Mean	Median
Below 1.00	73%	85%
1.00–2.00	25%	21%
Above 2.00	14%	12%
Total	59%	60%

because they are already trained to manage vegetated systems and are able to integrate green infrastructure sites into their current workflow, with additional support from NYCDEP.

Community Outreach

Bioswales offer NYCDEP additional opportunities to engage with the community around its construction projects. After a bioswale site is determined, NYCDEP mails letters to abutting property owners explaining the benefits of green infrastructure and offering stewardship guidance. Postcards are also mailed to residents within a two block radius briefly explaining the benefits and providing contact details for more information. Moving forward, NYCDEP will partner with other city agencies to increase the visibility of green infrastructure in the community, develop stewardship programming for local community and business improvement groups, and launch an educational resource so teachers can use the bioswales for experiential learning.

Next Steps

The NYCDEP continues to review all upcoming capital roadway and sewer project plans in hopes of incorporating bioswales into existing projects. Integrating bioswales into existing capital projects has made it possible to build green infrastructure quickly and at a reasonable cost. In conjunction with the Department of Design and Construction, NYCDEP has already constructed a system of four bioswales in the Gowanus Canal watershed and six bioswales in downtown Brooklyn. Over the next year, it will construct at least 60 more bioswales throughout Bronx, Brooklyn and Queens.

In March 2012, NYCEP released Requests for Proposal for three separate engineering and design services contracts to create green infrastructure master plans within three combined sewer watershed areas. Consultants will work with the department to finalize designs, produce construction documents and provide design services. The NYCDEP is also working with other city agencies to include developing area-wide plans in several other priority CSO tributary areas and then saturating those areas with green infrastructure.

These partnerships will further support New York City's efforts to manage stormwater at the source and will help ingrain bioswales as a standard piece of city infrastructure. In addition, NYCDEP will continue to refine its designs as it builds and monitors more bioswales. This adaptive management will ensure that the most strategic and cost effective solutions are used, and will help the city achieve cleaner waterways and greener cityscapes than ever before.

John McLaughlin is Director of Ecological Services for the Bureau of Environmental Planning and Analysis, New York City Department of Environmental Protection, and may be reached at: JohnM@dep.nyc.gov.

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Staten Island Bluebelt Expands to Queens

by A. Dean Cavallaro

Photo by Ken Kellai, EKLA

Rain garden during construction. Straw bales surround diffusion well during this phase and protect voids from clogging with sediment (Site No. 5).

The Staten Island Bluebelt is a nationally recognized program that provides ecologically sound and cost effective stormwater management for approximately one third of Staten Island. This long-standing New York City Department of Environmental Protection (NYCDEP) initiative preserves natural drainage corridors, called Bluebelts, including streams, ponds and other wetland areas. Preservation of these wetland systems allows them to perform their functions of conveying, storing and filtering stormwater. The Bluebelt program is cost effective because it reduces the amount and sizing of necessary traditional infrastructure, such as storm sewer pipes, chambers and storage tanks, in favor of natural conveyance and detention while providing important community open spaces and diverse wildlife habitats. This article shares NYCDEP's expansion of the Staten Island Bluebelt into Queens.

Until recently, the Bluebelt program was focused solely on Staten Island because that borough had the least developed network of storm sewers and the most significant stand of freshwater wetlands in New York City; this translated into the greatest opportunity to design a network of traditional storm sewers coupled with constructed wetlands and natural drainage corridors. As part of PlaNYC (2007) and the NYC Green Infrastructure Plan(2010), the city called for expansion of the Bluebelt program to other parts of the five boroughs where Bluebelt-type flood control and stormwater management solutions could be effectuated.

The first capital improvement project undertaken as part of the Bluebelt expanded mandate is Oakland Lake Park in Bayside, Queens. Oakland Lake and Ravine is a 15,000-year-old spring-fed glacial kettle pond located in Alley Pond Park. Oakland Lake's 13 acres of open water are home to a variety of fish species, including bluegill carp, perch and bass. The natural diversity of the area also attracts cardinals, dark-eyed juncos, herons, mallards and scaups, in addition to thousands of migratory birds.

Design Components

Completed last year at a cost of $2.5 million, the Bluebelt project repairs damage to the 46-acre Oakland Lake Park from uncontrolled stormwater flows from the surrounding streets. The multi-site restoration included repairing and recontouring the park's perimeter side slopes and lake shoreline; constructing a rain garden; planting thousands of new trees, shrubs, herbaceous and aquatic plants; building provisions for new recreational opportunities; installing off-street stormwater management features; and constructing and retrofitting catch basins and storm sewers in the streets peripheral to the park to manage storm flows and prevent erosion.

These restorative efforts will improve the ecological health of Oakland Lake, which suffered from significant erosion on the ravine slopes as well as sediment and debris accumulations within the ravine and lake due to unmitigated stormwater runoff. Improving the water quality of the lake will enhance the wildlife habitat, increase faunal species diversity, and offer expanded opportunities for recreational users to enjoy water activities such as fishing, canoeing and kayaking.

Off-Street Stormwater Management Features

At all sites, NYCDEP has redirected stormwater from peripheral streets that had previously flowed untreated into the park and Oakland Lake. Existing catch basins peripheral to the park were retrofitted with curb pieces to accept more runoff, new catch basins were installed at street low points, and curb heights increased to prevent storm flows from "jumping" curbs and flowing unimpeded into the lake. As part of the restorative effort, French drains at a parking lot located at the edge of Site 2 ***(Figure 1)*** were installed. These drains intercept stormwater from the parking lot and redirect it underground and downslope to the bottom of the ravine. The stormwater now enters the ravine from a concealed outfall, preventing the recurrence of erosion gullies.

Lake and Woodland Restoration

The NYCDEP stabilized side slopes with black locust logs, boulders and both organic and engineered erosion control media. Black locust logs parallel to the contours of eroded slopes were installed to reduce runoff velocities, double as steps for trail users, and facilitate trail renewal as woodland detritus fills in around the logs over time. To convey stormwater flow downslope into the ravine in a non-erosive manner, NYCDEP workers constructed armored drainage swales, consisting of layered boulders, field stones and gravel in several key locations. They also excavated accumulated sediment and invasive phragmites rhizomes from around the lake's existing outlet structure and adjacent shoreline that were impeding the flow of water into the outlet structure.

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Courtesy of NYS DOP (Area sites adapted by Patrick Streeter, NYCDEP environmental planner.)

Figure 1. This aerial of Queen's Oakland Lake Park shows the lake and five area work sites where repairs were accomplished in the 46-acre park to manage stormwater, including a rain garden (Site No. 5).

Vegetation

Replanting efforts evolved as debris removal, slope regrading and invasive plant eradication opened up new areas requiring vegetation. The NYCDEP selected plant species native to New York to revegetate the forest canopy, forest understory, herbaceous layer and the lake shoreline. These species will provide food for native wildlife and complement the indigenous plant communities found onsite. Deciduous trees such as oaks, American beech, tulip tree and hickories are the dominant hardwoods within Oakland Lake Park's forested areas, and additional quantities of these and associate species were planted along the regraded side slopes. Partnering with the New York City Department of Parks and Recreation, the MillionTreesNYC initiative planted native trees onsite after huge erosion gullies were filled and the ravines recontoured.

Recreational Access

As part of the restoration effort, NYCDEP filled in redundant woodland paths with plantings and selected preferred paths for hard surfacing to facilitate nature walks and bird watching. Limited runs of wood-simulated, pigmented concrete post and rail fencing were installed to discourage access to the lake's shoreline and wooded ravine in several locations. To prevent soil compaction and erosion along the lake edge, NYCDEP installed three new paved fishing pads and canoe launches with shoreline boulder seating to improve access to the water and increase park visitors' enjoyment while also limiting access to the lake edge.

Rain Garden

As part of the capital improvement, NYCDEP created a rain garden at the crest of a gullied hillside along the park's periphery. For years, runoff from the adjacent neighborhood flowed unabated down the steep wooded slope, transporting sediment directly into Oakland Lake. The new rain garden is strategically sited off-road, between the adjacent street pavement and vulnerable hillside, where it intercepts urban runoff from a 4.2-acre drainage area ***(Figure 2)***. The vegetated, trapezoidal-shaped depression is designed to detain approximately 53,500 gallons of stormwater. A diffusion well, installed beneath the rain garden, percolates infiltrating stormwater through its multi-layered gravel, river stone and boulder tiers, and into an existing natural sand layer. To intercept the natural sand layer, the diffusion well extends 10 feet below the bottom of the rain garden, and is wrapped in a porous geotextile fabric ***(Figure 3)***. In the event that the rate of stormwater inflow exceeds the rate of percolation, the overflow is designed to tip at a mortared field stone weir, and be conveyed into an armored stone and log drainage swale. Field inspections have revealed that this is an infrequent occurrence.

Photo by Carl Ambrose, NYCDEP

One of the fishing pads was constructed with a canoe launch at the lake's shoreline.

Photo by Carl Ambrose, NYCDEP

The completed rain garden intercepts stormwater flows from the surrounding streets, and promotes infiltration (Site 5).

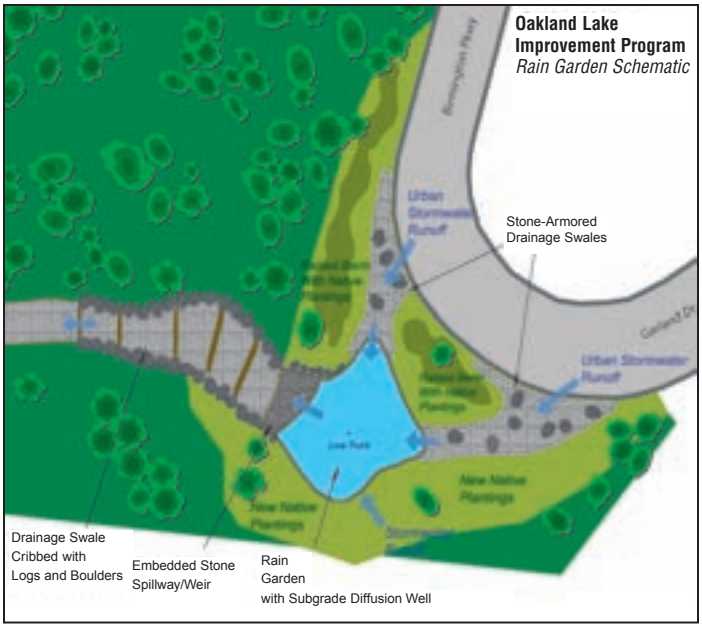

Image by Patrick Streeter, NYCDEP environmental planner

Figure 2. Bluebelt installations that include new bermed plantings and riverstone drainage swales surround the rain garden site to create an effective stormwater collection system.

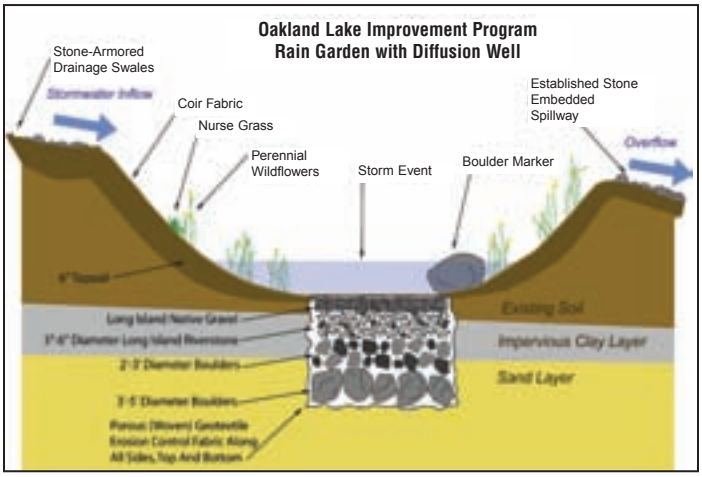

Image by Patrick Streeter, NYCDEP environmental planner

Figure 3. This diagram shows subgrade components that comprise the rain garden system, including the multi-layered diffusion well.

Challenges

The Bluebelt program is well-supported on Staten Island as it has demonstrated sound engineering, sensitivity to plant and animal habitats, and an aesthetic result. Even though Queens is a part of New York City, the Bluebelt program's work on wetland restorations was unknown there, and so the agency forged new working relationships with local elected officials, borough offices of sister city agencies, and the local community.

The lake and ravine restoration for Oakland Lake Park is the first Bluebelt project constructed in Queens to manage stormwater and improve water quality, and is part of the stormwater runoff control plan that NYCDEP has put in place to help avoid combined sewer overflows into New York Harbor.

A. Dean Cavallaro, RLA, AICP, (dcavallaro@dep.nyc.gov) is deputy chief of the Staten Island Bluebelt Program with the New York City Department of Environmental Protection.

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Gloversville-Johnstown Plant Generates Power from Biogas to Achieve Energy Net Neutrality

by George Bevington, Kathleen O'Connor and Robert Ostapczuk

Energy costs constitute a large portion of a typical wastewater treatment plant's (WWTP) operating budget, second only to labor (New York State Energy Research and Development Authority, 2008). Progressive wastewater utilities in New York State are not only becoming exceedingly energy efficient, but are approaching energy net neutrality (i.e., energy in equals energy out).

This is true for the Gloversville-Johnstown Joint Wastewater Treatment Facility (plant), which generated enough electrical power to meet 91 percent of its power needs during the period from December 2010 to November 2011. Additionally, the plant is capable of operating independently from the grid during power outages by using power generated by its biogas-fueled combined heat and power (CHP) system, derived from the plant's anaerobic digesters.

Co-Digestion with Trucked Waste 2003–2006

Beginning in the late 1990s, the traditional leather and tanning industries that had been the mainstay of the economies of the cities of Gloversville and Johnstown moved to overseas markets. As a result, the organic loading to the plant's anaerobic digesters gradually decreased. To fill the void of what was now available capacity, the plant made the decision to accept high strength (liquid) dairy whey.

In 2003, the plant's sludge and solids handling systems consisted of two gravity thickeners, a rotating drum thickener (RDT), a two-stage mesophilic (moderate temperature for bacteria growth) anaerobic digestion process, a digested sludge day tank, and two-belt filter presses. The digestion process consisted of a primary anaerobic digester, 90 feet in diameter, with a volume of approximately 1.5 million gallons, and a secondary digester, also 90 feet in diameter, with a volume of approximately 1.3 million gallons. The plant also had a CHP system that consisted of two 150 kW induction-type engine generators.

High strength dairy whey was trucked to the plant from a local cheese producer and pumped directly into the primary anaerobic digester. Initially, the average organic loading to the primary anaerobic digester was 0.06 pounds of volatile solids per cubic foot of digester volume (VS lbs/ft^3) with an average solids residence time (SRT) of 34 days; the average biogas production was 83,000 cubic feet per day (ft^3/d); and the CHP system produced 816,000 kilowatt-hours (kWh) annually.

Courtesy of Arcadis, Inc.

Figure 1. Site of Gloversville-Johnstown Joint Wastewater Treatment Facility and neighboring Fage USA yogurt plant.

By 2006, with greater volumes of whey trucked in, the organic loading to the primary digester had increased to 0.11 VS lbs/ft^3 with a corresponding decrease in average SRT to 25 days. A decision was made to implement capital improvements to the plant's biogas handling and digester mixing systems, after which biogas production increased to 137,000 ft^3/d. The CHP system now produced 1,881,000 kWh annually.

Also occurring in 2006, was the construction of a Greek yogurt processing facility (Fage USA) in the Johnstown Industrial Park. Fage USA was attracted to the area for its proximity to large metropolitan markets, its access to the Interstate System (I-90), and the robust agricultural dairy production in upstate New York. But most of all, Fage USA was attracted to the Johnstown Industrial Park because it was located adjacent to the plant ***(Figure 1)***. The plant had, by this time, developed a reputation for its ability to successfully co-digest municipal sludge and high strength dairy whey. In addition to construction of the new yogurt processing facility, a dedicated process sewer was constructed to convey medium strength yogurt production washwater from the facility to the plant's primary clarifiers, and a force main was constructed to pump high strength dairy whey directly from the facility to a new 90,000-gallon whey equalization tank at the plant. The high-strength dairy whey was then metered into the primary digester.

Soon after construction of its facility was complete, Fage USA approached plant officials to discuss its intention to expand the facility in the near future. The potential effect the proposed expansion would have on further decreasing digester SRT became the impetus for the plant to begin planning retrofits to the anaerobic digestion and solids dewatering systems. These instincts were correct; by 2009, the year the expansion was completed, the flow and organic loading to the digesters had increased significantly and the annual average SRT was now approximately 13.4 days.

The 2009 operational year is presented in ***Table 1*** and ***Figure 2***. A greater volume of biogas than that shown was most likely produced, however, it's hypothesized that fugitive emissions were lost via pressure reducing valves on the digesters, since the original CHP system, boilers and flare were undersized compared to the volume of biogas being produced by the digesters. It is also worth noting that the concentration of carbon dioxide in the biogas was increasing. It is hypothesized that this was the result of decreasing SRT, and subsequent incomplete digestion.

Planning, Design and Construction to Increase Digester SRT

The plant evaluated several alternatives that would effectively increase digester SRT and, in doing so, effectively treat the increased flow and organic loading from Fage USA. The alternatives included: constructing a third anaerobic digester; constructing an upflow

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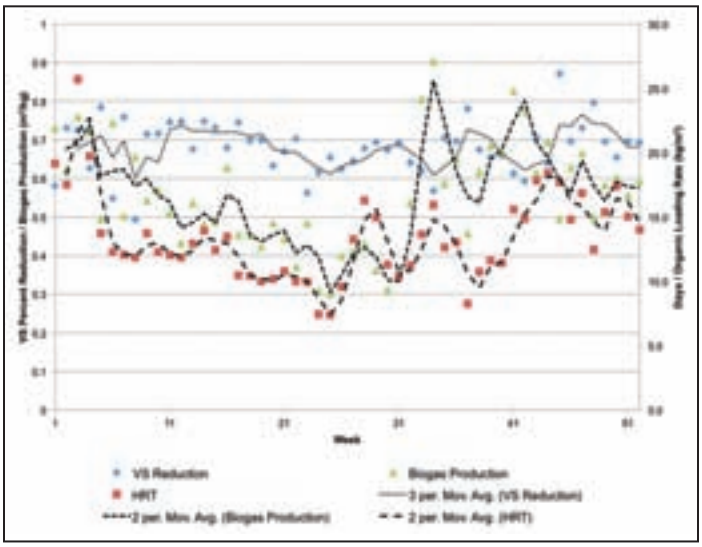
anaerobic sludge blanket (UASB) pretreatment digester; and, retrofitting the existing primary digester with contact digestion/recuperative thickening by either using anoxic gas floatation (AGF) or gravity belt thickening (GBT).

Ultimately, the third alternative was determined to be the most cost effective option, as well as the most practical with respect to existing unit processes at the plant and staff familiarity with operating and maintaining these processes. The third alternative also provided the benefit of simultaneous co-thickening of primary sludge, waste activated sludge (WAS), and partially digested (recuperative) sludge.



Courtesy of Arcadis, Inc.

Figure 2. 2009 Digester Operating Parameters

Table 1. 2009 Annual Average Operational Parameters

Parameter	Units	2009 Annual Average
VFA/Alkalinity Ratio	–	0.026
Primary Digester pH	SU	7.0
Digester Biogas Flows	ft^3/d	195,200
Biogas CO_2 Content	%	43.7
Primary Digester Feed Total Solids	lbs/d	41,770
Primary Digester Feed Total Solids	%	4.3
Primary Digester Feed Volatile Solids	%	80.2
Primary Digester Total Solids	%	2.6
Organic Loading Rate	lbs VS/ft^3	0.14
Volatile Solids Reduction	%	68.2
Solids Residence Time	days	13.4
Biogas Production	ft^3/lbs VS	8.8
Average Monthly Electrical Generation	kWh	142,800

A flow schematic of the plant with the contact digestion/recuperative thickening process that was implemented is shown in ***Figure 3***. The specific components of the third alternative included:

- Converting an existing gravity thickener to a sludge holding tank;
- Replacing two gravity thickeners and a rotating drum thickener (RDT) with two 2.5 meter (m) gravity belt thickeners (GBTs);
- Adding two recuperative thickening (dual disk diaphragm) pumps in a lead/lag configuration.

The project was bid under separate construction contracts in accordance with General Municipal Law in New York State and in two phases. Phase I (Contract No. 4) included the construction of the solids thickening, solids dewatering, dissolved air floatation thickening and recuperative thickening improvements. Phase II (Contract No. 5) included the improvements to the CHP facilities and main service improvements. General construction improvements were bid under contracts 4-G and 5-G and both awarded to Blue Heron Construction Co., of Jordan, NY. Electrical work was bid under contracts 4-E and 5-E and awarded to Gross Electric, Inc. of Queensbury, NY and FPI Electrical, Inc. of Cohoes, NY, respectively.

Contact Digestion/Recuperative Thickening Process

The contact digestion/recuperative thickening process is currently operated so that degritted primary sludge, waste activated sludge and thickened dairy waste (from a recently installed dissolved aeration thickening facility) are pumped to a sludge splitter box. From the splitter box, the comingled sludge flows by gravity to a sludge holding tank. The sludge holding tank has a capacity of approximately 176,000 gallons and has a hydraulic residence time of approximately 6.5 hours. The sludge holding tank is equipped with a submersible mixer to keep solids in suspension. From the sludge holding tank, sludge is pumped to the GBTs. Concurrently, recuperative sludge from the primary digester is pumped to the GBTs. The thickened sludge from the GBTs is fed to the primary digester at approximately six to eight percent solids concentration.

Data from the retrofitted system are shown in ***Table 2*** and ***Figure 4***. The objective of increasing digester SRT was accomplished – the organic loading rate to the digester increased from 0.14 lbs VS/ft^3 to 0.22 lbs VS/ft^3 – a 57 percent increase; and biogas production has increased dramatically – from 8.8 ft^3/lb of volatile solid destroyed to 21.8 ft^3/lb of volatile solids destroyed. Still, it is important to remember when comparing biogas generation data from years 2009 and 2011, the amount reported in 2009 is believed to be lower than that actually produced.

However, there was an unanticipated consequence of the retrofit; the reduction of volatile solids decreased – from 68.2 percent to 62.9 percent – when an increase was expected. Particularly since there was a reduction in the dry sludge cake to primary digester feed ratio – from 0.36 to 0.29. This

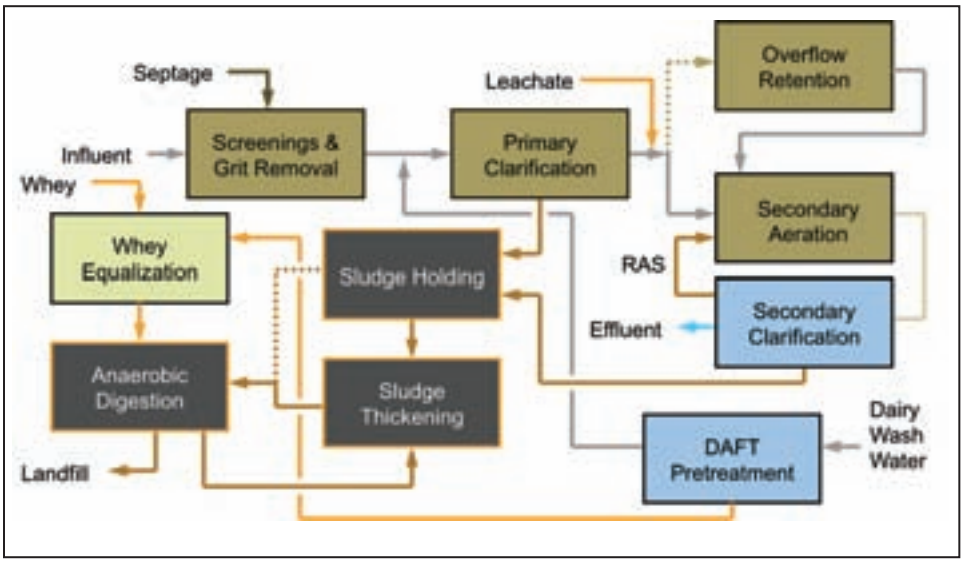


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Figure 3. 2009 Plant Digester Operations

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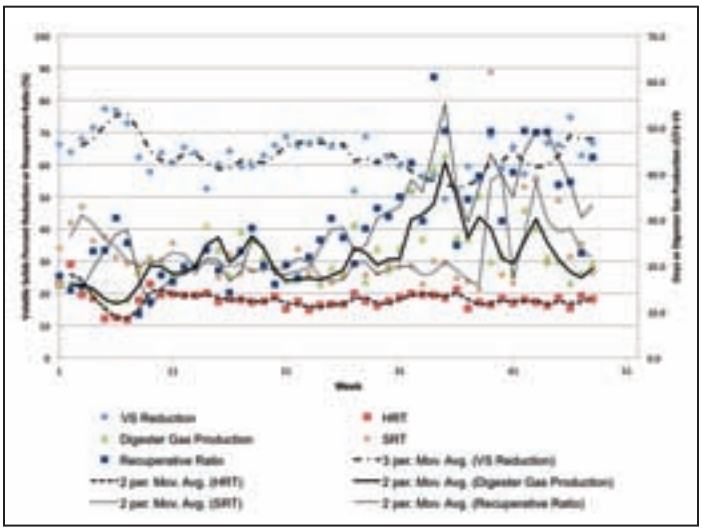
may be explained by one (or more) of the following:

Parameters of Measurement: Since high strength wastes are being co-digested at the plant with municipal sludge, volatile solids destruction may not be an accurate measurement of performance. The chemical oxygen demand (COD) of the high strength waste received by the plant varies between 55,000 milligrams per liter (mg/L) and 120,000 mg/L. Perhaps a more accurate picture of system performance would result if influent and effluent COD were measured and reductions tracked.

VFA Production Imbalance: When recuperative sludge is returned to the GBTs for thickening, the volatile fatty acids (VFA) that are produced in the primary digester are soluble and pass through the thickener with the filtrate. The volatile fatty acids are then treated aerobically in the aeration system. However, there has been a noticeable increase in the volatile fatty acids to alkalinity ratio from 0.026 to 0.044 between the 2009 and 2011 data; therefore, possibly these volatile fatty acids may not be passing through the GBT and/or there are insufficient methanogens to convert the volatile fatty acids to biogas.

Waste Activated Sludge Digestion: The high strength dairy wastes and primary sludge may be more readily digestible in the plant's WAS. The volatile portion of the primary sludge and high strength dairy wastes readily convert to biogas, whereas, WAS digestion may be the limiting factor. The plant is currently pilot testing cell lysing or sludge disintegration technologies to improve hydrolysis of WAS and anaerobes produced in the process and volatile solids reduction.



Courtesy of Arcadis, Inc.

Figure 4. 2011 Digester Operating Parameters

Table 2. 2011 Annual Average Operational Parameters

	Units	2009 Annual Average	2011 Annual Average
VFA/Alkalinity Ratio	–	0.026	0.044
Primary Digester pH	SU	7.0	7.0
Digester Biogas Flows	ft^3/d	195,200	423,300
Biogas CO_2 Content	%	43.7	42.0
Primary Digester Feed Total Solids	lbs/d	41,770	56,470
Primary Digester Feed Total Solids	%	4.3	5.6
Primary Digester Feed Volatile Solids	%	80.2	79.8
Primary Digester Total Solids	%	2.6	2.7
Organic Loading Rate	lbs VS/ft^3	0.14	0.22
Volatile Solids Reduction	%	68.2	62.9
Solids Residence Time	days	13.4	22.4
Biogas Production	ft^3/lbs VS	8.8	21.8
Average Dry Tons Cake/ Primary Digester Feed Ratio	dt/dt	0.36	0.29
Average Monthly Electrical Generation	kWh	142,800	417,000

Macro/Micronutrients Deficiency: The digestion process may be stifled due to the lack of micro/macronutrients in the primary digester relative to the amount of sludge produced. So additional digestion is occurring, but more digestion could occur if a limiting nutrient was determined to be lacking in the process.

As a result, sludge dewaterability has decreased. While the sludge cake does not exhibit any free water, it is likely bound in the cellular walls of the microorganisms. To address this problem, the plant has initiated a pilot program to assess various sludge disintegration technologies. It is expected that the addition of sludge disintegration will enhance volatile solids destruction and, ultimately, sludge dewaterability.

Municipal WWTP or a Power Plant?

Although the addition of contact digestion/recuperative thickening has allowed the Gloversville-Johnstown Joint Wastewater Treatment Facility to greatly increase the volume of biogas produced by its anaerobic digesters, energy net neutrality cannot be achieved without properly sized CHP facilities. In addition to the upgrades to increase digester SRT, new CHP facilities, consisting of two 350 kW engine generators, were installed. Waste heat from the engines is recovered and used to heat both the primary and secondary digesters, and excess heat is released into the atmosphere. Currently, there is sufficient waste heat to maintain the mesophilic primary and secondary digesters at 98 degrees Fahrenheit (°F).

The two engine generators are operated synchronously (i.e., able to operate independently from the grid during power outages). The CHP facilities' control system monitors instantaneous plant load and matches the production of energy from the CHP facilities to plant demand. During most of any 24-hour period, the engines produce less than their rated capacity. However, there are periods during the day when plant electrical load exceeds the generation capacity of the CHP system (i.e., when aeration system and solids dewatering system demands are high). The plant is required to purchase power from the utility grid during these periods.

From December 2010 through November 2011, the plant generated enough power to meet 91 percent of its own electrical power needs. ***Figure 5*** illustrates total monthly plant electricity used including the amounts of electricity purchased and generated by the plant's CHP facilities. To put this in perspective, prior to 2006, the plant generated enough power to meet approximately 12 percent of its own power needs. By 2009, it made enough power to meet approximately 40 percent of its power needs. From January through November 2011, the plant generated just over 5 MWh and used approximately 5.5 MWh. On a monthly average, the plant purchased 44,000 kWh from National Grid and its CHP facilities generated 417,000 kWh.

The plant is exploring the potential for net metering, a method of effectively banking excess electricity production for future credit. New York State Public Service Law (PSL) § 66-j, enables net metering for various generating schemes and consumers, including anaerobic digestion at farms; however, it does not specifically include anaerobic digestion at municipal WWTPs. National Grid's interpretation of

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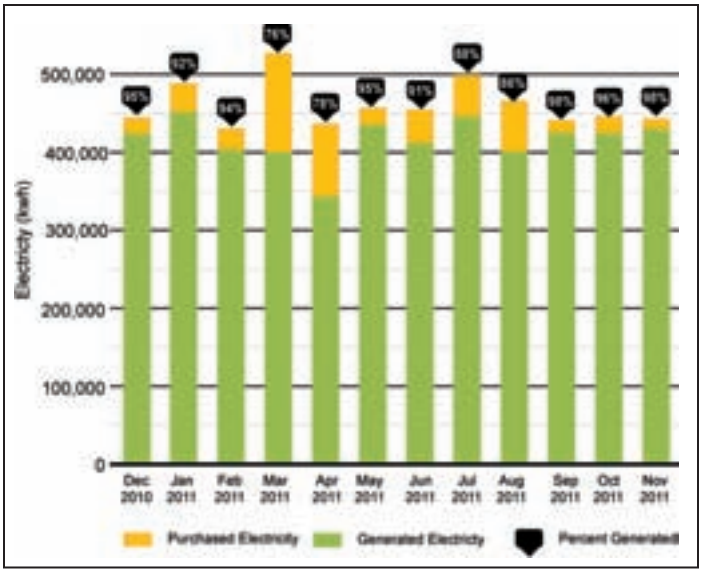

Courtesy of Arcadis, Inc.

Figure 5. Plant Electricity Totals

PSL § 66-j does not allow the plant to be able to net meter back to the electric grid at this time. If net metering in New York State were extended to municipal WWTPs, this plant could produce over 100 percent of its own electrical requirements, assuming a 90 percent runtime on the engine generators and a 700 kW base load. There are times when the two engine generators are insufficient to provide 100 percent of the required power; however, most of the time the plant could produce more power than it requires. Net metering would allow the plant to automatically purchase supplemental power during periods of peak loadings into the WWTP, and then feed power to the grid while loads were reduced, typically at night.

Funding Partners

The plant has benefited from a nearly decade long relationship with the New York State Energy Research and Development Authority (NYSERDA). The relationship began with a NYSERDA co-funded Flexible Technical Assistance study of the plant's aeration system in 2000. The plant also received NYSERDA co-funding for a study that focused on anaerobic digestion optimization (2003) and another study on alternative uses of biogas (2007) for the increased volumes that would result once Fage USA came on line. NYSERDA also provided co-funding and incentives to support the installation of the contact digestion/recuperative thickening process and CHP improvements (2010). The total construction costs associated with this work was $11.5 million. The agency co-funded $400,000 for the full-scale demonstration of the contact digestion/recuperative thickening process through its Research, Development and Demonstration Program. It also will provide up to $1 million of incentives for the new CHP system and for electricity produced by the system through its Anaerobic Digester Gas-to-Electricity Program.

The plant was able to leverage the NYSERDA funding for the contact digestion/recuperative thickening process and CHP improvements to obtain funding from the New York State Environmental Facilities Corporation (NYSEFC) under the Green Innovative Grant Program (GIGP) and funding from the United States Economic Development Agency (USEDA) for the creation of jobs at the Fage USA facility.

Success in Net Neutrality

The Gloversville-Johnstown Joint Wastewater Treatment Facility's experience with co-digesting high strength dairy whey and municipal sludge is considered generally a great success. The operational boundaries of the retrofitted digester system have been established, such that increased digester organic loading rates, SRT, and biogas production, as well as improved biogas quality, have been realized. Contact digestion/recuperative thickening has shown to be a viable approach for co-digestion of high strength dairy wastes and municipal sludge. Should sludge disintegration be proven to enhance volatile solids destruction and sludge dewaterability, the project will be considered an unqualified success.

Considerable planning, significant co-funding, and the ability to attract Fage USA to an adjacent industrial park were vital to the success of the project. However, without the dedication of plant staff to take the initiative to learn about and, subsequently, operate new and relatively unproven equipment and processes, this project would have been a non-starter. As a result, the plant generated enough power to meet 91 percent of its power needs during the period from December 2010 to November 2011, can rely on its CHP system to operate independently from the grid during power outages, and has become one of the first energy net neutral municipal WWTPs in the United States.

George Bevington is Wastewater Consultant with Gerhardt, LLC., and he can be reached at: georgebevington@nycap.rr.com. Kathleen O'Connor, PE is a Senior Project Manager at the New York State Research and Development Authority and can be reached at: kmo@nyserda.org. Robert Ostapczuk, PE, BCEE is Principal Engineer with Malcolm Pirnie, Inc., in the Water Division of ARCADIS in Clifton Park, New York. He can be reached at: robert.ostapczuk@arcadis-us.com.

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Saving Rain – Making Every Drop Count-y

by Matthew J. Millea

This year, Onondaga County's Save the Rain program enters its third and most ambitious construction season. In 2009, County Executive Joanie Mahoney launched "Save the Rain" as a marketing campaign to build community support for plans to abandon the construction of three sewage treatment plants in the City of Syracuse. The County Executive favored the alternative of constructing distributed green infrastructure and stormwater storage solutions throughout the city's combined sewer service area to reduce sewer overflows by at least 95 percent by 2018.

Photo courtesy of Onondaga County

The green roof installation on the 66,000 square-foot rooftop of the Oncenter Convention Center consists of a waterproof membrane liner that is covered with a growing medium and planted with a mix of low-growing succulent vegetation. The new rooftop landscape is a self-sustaining system, requiring little maintenance once established, and relies upon natural processes to retain and evapotranspirate stor mwater runoff, capturing an estimated one million gallons annually. The green roof project is one of the largest in the Northeast region.

Photo courtesy of Onondaga County

The first phase of Syracuse's West Side Skiddy Park Enhancements project includes installing porous pavement basketball courts, seen here. These courts were constructed under a partnership among Onondaga County, the City of Syracuse and Courts 4 Kids – an initiative of the Jim and Juli Boeheim Foundation and the Carmelo K. Anthony Foundation.

Since then, Save the Rain has evolved to encompass the entirety of Onondaga County's efforts to clean up Onondaga Lake and comply with a federal consent order aimed at reducing combined sewer overflows into Onondaga Creek and Harbor Brook, tributaries of Onondaga Lake. In November 2009, Federal Justice Frederick Scullen approved Onondaga County's proposal to amend its consent judgment, authorizing the use of green infrastructure as part of the county's program to abate combined sewer overflow events in the City of Syracuse.

After successfully completing a handful of green infrastructure projects in 2010, the following year Mahoney challenged her team to advance no less than 50 distinct green infrastructure projects under the banner of the Save the Rain program. The project team, made up of officials from the county's departments of Water Environment Protection, Law, Purchasing, Facilities, as well as program managers from CH2M Hill and CDM/Smith, worked with their counterparts in the city to advance an historic suite of green infrastructure projects. Successfully completed projects include the construction of a 66,000-square-foot green roof on the county's convention center, a cistern project at the county's historic War Memorial Auditorium and a pair of 100 percent porous asphalt basketball courts at a city owned playground.

"I really wanted to challenge our team this past year to get a critical mass of green infrastructure projects in the ground so the public could see and experience the benefit of green infrastructure in the community," said Mahoney. "Now rather than simply telling our residents that green infrastructure is the right solution for our community, we are able to show them a green roof, or a green street, or a porous asphalt parking area, and highlight all of the additional benefits that come with using green infrastructure."

To date, Onondaga County has invested almost $15 million in green infrastructure projects which will capture 50 million gallons of stormwater annually. In addition to the aforementioned projects, Onondaga County, working in concert with the City Department of Public Works, advanced several green street projects where roadways were narrowed and bio-retention was added to the city rights-of-way. The $1.4

Photo courtesy of Onondaga County

This Rainwater Reuse System project is located at the Onondaga County War Memorial Arena in downtown Syracuse where conventions and various community events occur. In the basement of the arena, the water reuse system involves approximately 15,000 gallons of below-ground rainwater storage (cistern seen here), in addition to the installation of filtration, disinfection and water reuse technology. This design will gather rain water and snow melt runoff from the arena roof, reusing the runoff for ice production and maintenance for events at the arena, including Syracuse Crunch Hockey games.

million Otisco Street Green Corridor project established a new curb line, six feet into the street with added stormwater inlets, resulting in a runoff reduction of 2.25 million gallons of rainfall annually. The curb extensions have the ancillary benefit of acting as traffic calming devices. The new rain gardens constructed within the curb extensions include plantings of New England Aster, Daylilies, Butterfly Milkweed, Sage and Black-Eyed Susans.

This Year and Beyond

The Save the Rain team exceeded the challenge of advancing 50 projects, in fact advancing 60 distinct projects in 2011, setting the stage for another aggressive construction season in 2012. This year, the county plans to complete work on its Water Street Gateway project, which runs parallel to Erie Boulevard and is one of Onondaga County's most high profile green infrastructure projects constructed to date. The Water Street project is a comprehensive "green street" application that incorporates enhanced tree plantings in the street right-of-way; installation of porous pavers in parking lanes, subsurface infiltration beds, and additional landscaping features throughout the footprint of the block.

Every project advanced over the past three years under the banner of the Save the Rain program, be it grey or green, has a unique webpage on the program's website, www.SaveTheRain.us. Visitors to the site will find details on each project, including photos of site work, GIS information, technical drawings, specifications, after-action memoranda, relevant media coverage and comprehensive project fact sheets. Onondaga County's administration is committed to open sourcing the green infrastructure applications put to use through Save the Rain and encourages communities interested in the opportunities and challenges of using green infrastructure solutions as either stand-alone stormwater best management practices, or in concert with conventional grey infrastructure, to use the Save the Rain website as a resource.

"We are well ahead of the curve on achieving our goal of capturing 250 million gallons of rainfall annually," said Tom Rhoads, Onondaga County's Commissioner of the Department of Water Environment Protection. "Our success to date brings with it new challenges, in particular building a robust maintenance program with the city and community partners to ensure that these investments continue to perform in the long run."

With over 60 projects either in the ground or in construction, Onondaga County is working to incorporate all of its publicly owned projects into Maximo, the county's asset management system employed by the Department of Water Environment Protection. The Maximo system will help to ensure the proper maintenance of green infrastructure in the same fashion a water or sewer department would maintain a pipeline, treatment system or pump station. Ultimately, Onondaga County intends to link community-based maintenance partners into its Maximo system ensuring that the proper preservation of county green infrastructure occurs in a timely and cost effective manner.

For additional details on the Save the Rain program, please visit www.SaveTheRain.us.

Matthew J. Millea is the Onondaga County Deputy County Executive for Physical Services in Syracuse, NY and may be reached at: MattMillea @ongov.net.

Photo courtesy of Onondaga County

The scope of the Water Street Gateway project will incorporate streetscape detail with enhanced tree plantings in the right-of-way; installation of porous pavers in parking lanes; use of infiltration trenches and planters; and additional landscaping features throughout the footprint of the block.

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SALES ASSOCIATES

Contact	Mobile	Email
Gregory Jager (NY Metro)	(201) 214-6525	gjager@jagerinc.com
Robert Fenton (NY Metro)	(201) 412-4370	bfenton@jagerinc.com
Richard Fiedler (NY Metro)	(201) 981-9409	rfiedler@jagerinc.com
Ralph Tingler (Pumps)	(908) 231-0336	rtingler@jagerinc.com
Sal Adamo (Chem Feed & Disinfection)	(201) 316-7194	sadamo@jagerinc.com
Mario Cabrera (Chem Feed & Disinfection)	(973) 886-1681	mcabrera@jagerinc.com
James Bonastia (Chem Feed & Disinfection)	(973) 886-5389	jbonastia@jagerinc.com
Anthony Picozzi (PA Office)	(215) 275-5120	apicozzi@jagerinc.com
Jim Casey PE (PA Office)	(484) 431-2754	jcasey@jagerinc.com
Rick Calmes (Buffalo Office)	(716) 697-5543	rcalmes@jagerinc.com
Randy Ott, PE (Syracuse, NY Office)	(315) 506-2137	randyott@jagerinc.com
Zuzanna Stolc (Parts & Aftermarket)		zstolc@jagerinc.com
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Contact	Mobile	Email
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Robert Fenton *(NY Metro)*	(201) 412-4370	bfenton@jagerinc.com
Richard Fiedler *(NY Metro)*	(201) 981-9409	rfiedler@jagerinc.com
Ralph Tingler *(Pumps)*	(908) 231-0336	rtingler@jagerinc.com
Sal Adamo *(Chem Feed & Disinfection)*	(201) 316-7194	sadamo@jagerinc.com
Mario Cabrera *(Chem Feed & Disinfection)*	(973) 886-1681	mcabrera@jagerinc.com
James Bonastia *(Chem Feed & Disinfection)*	(973) 886-5389	jbonastia@jagerinc.com
Anthony Picozzi (PA Office)	(215) 275-5120	apicozzi@jagerinc.com
Jim Casey PE *(PA Office)*	(484) 431-2754	jcasey@jagerinc.com
Rick Calmes *(Buffalo Office)*	(716) 697-5543	rcalmes@jagerinc.com
Randy Ott, PE *(Syracuse, NY Office)*	(315) 506-2137	randyott@jagerinc.com
Zuzanna Stolc *(Parts & Aftermarket)*		zstolc@jagerinc.com
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Wetlands for Green Treatment Solutions

by Rita Fordiani, Matthew Marko and Matthew J. Millea

As a marquee project of Onondaga County's Save the Rain program, the Harbor Brook Constructed Wetlands Pilot Treatment System will serve a dual purpose. It will treat combined sewer overflow (CSO) currently discharged without treatment into a tributary of Onondaga Lake, while also acting as a demonstration project to test the effectiveness of a variety of constructed wetland treatment systems and operational regimes. The Pilot Treatment System will be located along Harbor Brook on county-owned property on the west side of the City of Syracuse.

The pilot project includes a SUNY College of Environmental Science and Forestry (ESF)-led monitoring and research component that will help Onondaga County and the New York State Department of Environmental Conservation (NYSDEC) to determine the performance of three unique types of treatment wetlands.

The combined sewer outfall in question, known as CSO 018, overflows an average of 42 times per year and discharges approximately 13.6 million gallons of untreated stormwater and sanitary sewage from a 145-acre catchment area. The proposed pilot treatment system has been sized to treat the combined sewage flow generated at CSO 018 during a one-year, two-hour storm event (40 cubic feet per second [cfs]), which presently discharges without any treatment at all.

The constructed treatment wetlands system will provide reduction of bacteria, nutrients (nitrogen and phosphorus), total suspended solids (TSS), and five-day biochemical oxygen demand (BOD_5) ***(Table)***.

When a rain event occurs, the existing 48-inch combined sewer will begin to flow into the proposed grit and floatables facility. The grit and floatables design prototype uses vortex separation technology and consists of a circular vortex chamber with an automatic discharge siphon and sanitary sewer return piping. When the flow in the sanitary sewer system reaches the designed level, the water will overflow to the circular vortex chamber. Floatables and water will be collected on a conical screen and returned to the sanitary system through the return piping; grit will be removed through a separate return pipe off the bottom of the vortex chamber. The grit underflow will discharge to a grit chamber for collection prior to conveying flow back to the sewer interceptor. As the water level continues to rise within the chamber, the discharge will be conveyed through the automatic siphon to the constructed wetlands.

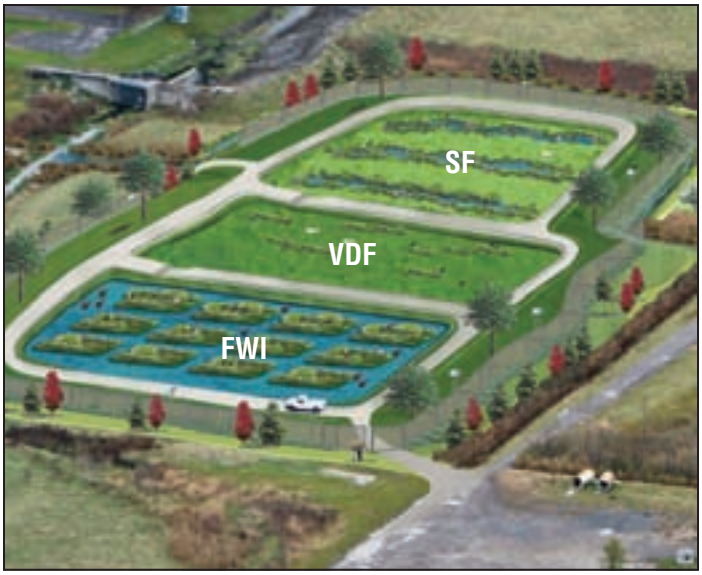

Image courtesy of Onondaga County

Figure 1. The Harbor Brook Constructed Wetlands Pilot Treatment System incorporates three types of wetland cells – from bottom to top: Floating Wetland Island (FWI), Vertical Down Flow (VDF) and Surface Flow (SF).

Removal of grit and floatables will prevent filling in of the wetland treatment cells with inert solids which would reduce the treatment capacity of the constructed wetlands system. Floatables removal will prevent clogging of the wetland cell media, prevent danger to wildlife attracted to the facility, and ensure an aesthetically pleasing and attractive area is maintained.

Onondaga County is advancing three types of wetland cells for inclusion in this full-scale pilot project to determine the optimal CSO treatment potential based on varying the types of vegetation and operational hydraulic configurations (i.e., in series, in parallel, and in series/parallel) ***(Figure 1)***. These include:

Floating Wetland Island (FWI): FWI is a constructed floating island of wetland vegetation with roots that extend down into the water column below the island mat. The use of FWI for domestic

Potential Contaminant Reductions to Harbor Brook from CSO 018 Treatment Wetland

Constituent	Inflow Concentration (mg/L)[1]	Annual Average Reduction Range (%)[2]	Annual Average Outflow Concentration Range (mg/L)	Annual Load Reduction (Tons/yr)[3]
BOD_5	30.38	50 – 80	6 – 15	1.1 – 1.7
TSS	100.25	50 – 90	10 – 50	3.5 – 6.3
TKN[4]	4.14	20 – 40[5]	2.5 – 3.3	0.06 – 0.11
P	0.78	20 – 40[5]	0.5 – 0.6	0.013 – 0.020
Fecal Coliform	430,000 (count/100 mL)	3 orders of magnitude	430 (count/100mL)	

Notes:

1. Based on SUNY ESF report "Creating Stormwater Treatment Wetlands for Harbor Brook, Syracuse, New York: An Urban Ecosystem Educational Partnership – Part II of the CNY Watershed Project, Smardon and Wu
2. Annual average concentration reductions are based on literature including the North American Wetland database, USEPA (1996), Treatment Wetland – Second Edition, Kadlec and Wallace (2009), and experience by CH2M HILL treatment wetland technologists.
3. Based on 18.6 MG/yr CSO 018 discharge flow
4. TKN = Total Kjeldahl Nitrogen
5. Higher reductions may be achieved during warmer temperatures (i.e., summer season) of up to 90% depending on flow rate and concentration

wastewater treatment is a relatively recent application of a process that has been used in the mining industry for many years. It is somewhat similar to the floating aquatic vegetation type of wetland technology that typically used duckweed or water hyacinth plants – which naturally have the leaves floating on the water surface – to vegetate the wetland. While these latter plants need to be harvested to remove contaminants, the FWI vegetation does not need to be removed to provide water quality improvement. Native species will be used for FWI vegetation.

This cell will be drained to a low water elevation of about one foot of water depth between CSO events and will fill to about five feet of water depth before overtopping to the next cell. This expected changing water level is another good reason for using this type of wetland for this application: the cell can provide a high storage volume for storm flows, but plants will not become flooded for long periods of time as they would if planted into the wetland bottom soils.

Vertical Down Flow (VDF): The VDF wetland cell will have water entering either directly from CSO 018 or from the FWI cell. The CSO water will be dosed into Cell 2 from Cell 1 using an automated control valve to the top of the wetland through riser pipes onto splash pads that distribute the flow across the wetland surface. When flow is added directly to Cell 2 from the grit/floatables removal system in the parallel flow mode, the flow will be added continuously to the gravel bed. The water will percolate down through the wetland sand and gravel bed, where the water will be collected in a perforated header piping system and then directed to either the Surface Flow Wetland or Harbor Brook. The VDF wetland will be dosed at a rate of about 55,000 gallons per dose. Once the initial dose has run through the gravel and discharged through the under drain, the cell will be dosed again. This process will continue until the water volume in the FWI (Cell 1) returns to its normal water level (NWL) of 396.50 North American Vertical Datum of 1988 (NAVD 88).

The VDF wetland cell is expected to have a more robust range of vegetation, since this cell will be flooded and drained regularly. Native species such as cattail and bulrush are the most likely candidate species for planting. The benefits of VDF cells are that there is no open water and, therefore, no mosquito productivity, as well as limited CSO water exposure potential to the public.

Surface Flow (SF): The SF wetland most closely resembles a natural wetland, and is also generally the lowest cost per unit area to build and maintain. It will have a vegetated shelf that will be about one-half to one foot deep under dry-weather water level conditions and three feet deep water areas (deep zones) that will help with redistributing flow to reduce the potential for short circuiting. They will provide re-aeration, as well as a refuge for wildlife. The SF cell will have the potential for increased water depth for greater CSO water storage and treatment prior to overflowing to Harbor Brook. The SF wetland outfall is a 30-inch pipe with an invert of 392.5 (NAVD 88). Stop logs in the outlet structure will set the discharge elevation at 393.00 (NAVD 88) allowing six inches of standing water within the wetland.

The SF wetland with constant standing water and regular flooding will also require a robust plant, but will likely be most favorable for native species such as cattail and bulrush. Wild phragmites (perennial reeds) from seeds carried in by wind and water will tend to have a more difficult time germinating and becoming established in standing water.

As with the FWI, the combination of open water and plantings will provide high habitat value but low mosquito productivity when compared with a natural wetland, since mosquito predators should thrive in this environment. Benefits of SF wetlands are that they provide high storage volume to contain CSO storm flows, are aesthetically pleasing with open water and wetland vegetation, have low mosquito productivity due to high predator populations, and the relative cost compared to the other wetlands is low.

The county's design engineers, CH2M HILL and CHA, configured the flow control structures to allow discharge from CSO 018 to enter each wetland cell directly and then be discharged directly to Harbor Brook (parallel operation). In addition, the wetlands will be able to operate in series, flowing from the FWI to the VDF and then finally to the SF cell or in a combination of parallel and series with flow discharge from the FWI being split between the VDF and the SF wetlands before combining and discharging to Harbor Brook.

Once storm event flows have passed through the constructed wetlands, the flow discharges through an outfall to Harbor Brook. Storm event flows in excess of the 40 cfs peak design flow will discharge from the grit and floatables facility through an overflow weir, back to the 48-inch Rowland Trunk Sewer for conveyance into the new Harbor Brook Interceptor Sewer (if excess /capacity exists) or be routed around the treatment wetland facility for direct discharge to Harbor Brook via the facility outlet pipe.

Construction will commence this year. For a more thorough project overview, technical specifications, permit applications and additional project information, visit www.SaveTheRain.us/wetland/.

Rita Fordiani, is Principal Technologist at CH2M HILL in Boston, MA, and may be reached at: Rita.Fordiani@CH2M.com. Matthew Marko (Matthew.Marko@CH2M.com) is a Vice President of CH2M HILL in Syracuse, NY; and Matthew J. Millea (MatthewMillea@ongov.net) is the Deputy County Executive for Physical Services for Onondaga County, NY.

Manufacturer's Sustainable Efforts in Becoming "Water Neutral"

by Kate Chamberlain

Harbec, Inc., known for its innovative manufacturing practices, is embracing the challenge of its newest mission to become "water neutral," expected to be achieved by 2015. The company, based in Rochester, NY with 140 employees, prototypes and manufactures difficult concepts, parts and materials, and is already well on its way to carbon neutrality.

For Harbec, paying attention to water usage is not a new concept. It saves nearly one million gallons of water per year by using an 800,000-gallon reservoir to capture and hold rain water. This reservoir system uses thermal transfer to dump heat from process cooling water (dissipating the heat) prior to sending it to a cooling tower. This reduces the energy required for total cooling requirements and, therefore, reduces the volume of evaporative cooling tower spray water required, by 900,000 gallons per year.

In addition, conventional chemical-based, closed-loop water treatment for mold cooling has been replaced with a completely chemical free, electrostatic alternative. Currently, an alternative project is underway to control and condition the stormwater from the building's roof and parking areas. This water is collected in its pond, which will also provide the water for a fire sprinkler system and employee enjoyment.

In 2012, Harbec partnered with Barclay Water Management to develop solutions for the manufacturer to reduce, reuse and recycle all water, with the exception of drinking and hand washing. A water treatment chemical supply company, Barclay also shares a global approach in providing engineered solutions to customer water usage demands and operational requirements. As a result, it proposed and is implementing a multiple-phase water management program that addresses Harbec's total water reuse plan. The focus of this water treatment program is to provide low environmental impact, or products which are non-toxic, in concert with Harbec's energy management initiatives.

Manufacturing Sustainability

A passion for water has inspired several products to be developed in-house at Harbec in cooperation with the nonprofit, B9 Plastics. According to the World Health Organization, 3.4 million people, mostly children, die annually from water-related diseases, and even greater numbers are hospitalized. B9 Plastics wanted to develop a potable water treatment device designed for use in the developing world that is affordable, sustainable and efficient.

UV Water Device: The Better Water Maker (BWM) is a human powered ultraviolet (UV) water treatment device. The BWM can produce potable water immediately, anytime and anywhere. By physically turning a crank, 12-volt electric power can be generated to pump water through a column containing an ultraviolet light bulb. The device does not allow water to flow unless it has had the proper UV light treatment. Other electronic devices that run on 12-volt DC electricity, such as lights, cell phone chargers, and radios can be connected to the power generating unit as well. The device can also run on household electric, a car battery, a solar panel or other sources of power. The only consumable is the UV light bulb which lasts about 6,000 hours.

The lightweight durable plastic units are easily movable and operational for various individuals and functions. The innovation is being used in churches, schools, businesses, community centers, and even as micro-enterprises. The two companies enlisted the help of local and international universities and

Photo by Taylor Chamberlain

Image courtesy of Harbec, Inc.

The Better Water Maker (BWM) consists of a UV pump and a 12V DC human-powered generator (right). Members of an African village are shown taking advantage of the easy-to-use pump to make potable water.

Photo by Kate Chamberlain

Ecostones offer a more efficient potential per cubic foot than rocks. Plastic jack-shaped product, seen here among cattails, efficiently absorbs runoff pollution from company's parking lots.

organizations to develop and test its use. Each unit provides safe drinking water for up to thousands of individuals. As part of a pilot project, Harbec partnered with B9 Plastics to facilitate placement of more than 70 of these devices in 16 countries around the world. They are now looking for partners for large scale distribution.

Runoff Remediator: Ecostones™ is a remediation alternative. It is a unique jack-shaped product made of scrap plastic materials with twice the surface area for micro-organisms and twice the voids for root growth, compared to conventionally used dolomite or gravel. While Harbec employs a typical cattail filtration system to remediate parking lot runoff (i.e., pollutants such as salt and oil), the cattail roots and associated microorganisms have a symbiotic relationship in the vast surface areas and voids of the Ecostones, instead of the soil. The higher efficiency of Harbec Ecostones has been proven in side-by-side tests of dolomite/gravel versus Ecostones for water purification in ponds.

Harbec's passion for clean water solutions, such as these, has spanned decades and diverse directions. The company shares its experiences whenever possible in the hope of motivating others to consider these important issues and make changes that can benefit not only a company's bottom line, but also the environment for generations to come.

Robert (Bob) Bechtold is founder and president of Harbec, Inc., in Rochester, NY and may be reached at: bxb@harbec.com. Kate Chamberlain is Special Projects Coordinator for Harbec, Inc., and may be reached at: katec@harbec.com.

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Forming Coalitions: Option for Successful Stormwater Management

by Diane Fiorentino

The Chemung County Stormwater Coalition was formed in 2003 to pool member resources and work in concert to fulfill the requirements of Phase II Stormwater regulations (under the Clean Water Act's National Pollutant Discharge Elimination System [NPDES] program). An inter-municipal agreement joined the 11 municipalities, the County Department of Public Works and the Elmira Corning Regional Airport. These entities all fall under the New York State Department of Environmental Conservation (NYSDEC) SPDES General Permit for Stormwater Discharges from Municipal Separate Storm Sewer Systems (MS4s). The members met monthly, acquired funding and partners as they moved toward regulatory compliance.

Consistent Stormwater Training

The coalition established an overall mission to protect and improve water quality and natural resources, involve citizens and agencies, implement projects and advocate for the county's water resources through a stormwater management program. The group embraced the philosophy of consistency and carried out one clear, concise approach to stormwater management throughout Chemung County from 2003 to 2008.

The coalition kicked off its mission with Minimum Control Measures (MCMs), and municipal employees county-wide were trained as a group. For example, all highway employees were brought together to receive the same training on MCM #6 (Pollution Prevention and Good Housekeeping for Municipal Operations) that included good housekeeping BMPs (best management practices).The coalition worked with NYSDEC to obtain code credit approval for the four-hour training in Erosion and Sediment Control, and offered the training to all code officers in the county. Even planning board members and town supervisors were trained together as part of the coalition's efforts to achieve compliance.

A water quality improvement grant brought funding that also allowed the coalition to hire an attorney so the Illicit Discharge Detection and Elimination (IDDE) Law and the Stormwater Management and Erosion and Sediment Control Local Law, required for MS4s, would be met consistently across municipalities. Lastly, in 2008, an annual report was submitted on behalf of all MS4s in Chemung County.

Successful Team Building

Once the five-year lead up to compliance came to an end in 2008, a new inter-municipal agreement was struck. This time, every municipality in the county signed on, including rural non-MS4 communities. A funding mechanism was established to implement and manage a county-wide stormwater management plan and to form a Stormwater Team. This team of three full-time employees is comprised of an engineer, a technician and an educator. Stormwater Team members are County Soil and Water Conservation District employees who work for the coalition out of the district office.

To create an operational budget, each municipality and the county were assessed their contributions to the team's efforts. The assessment was based on a sliding scale and began with using the sales tax formula. Another portion of its proposed budget was assessed for the MS4 designation. Then the coalition took into account lane miles (calculating distance of all lanes on a road), impervious acres, population, IDDE probability, and future development potential. The inter-municipal agreement covers five years and the program will be evaluated prior to another inter-municipal agreement scheduled to be signed in 2013.

Photo courtesy of Diane Fiorentino

Author Diane Fiorentino, CMS4S, presents at a Southern Tier Central Regional Leadership Conference. The course was an introduction to Green Infrastructure for municipal planning boards.

None of this would have been possible without the partnership of the County Soil and Water Conservation District. In the early years, the Soil and Water District manager was the grants administrator and led the charge for the formation of the county-wide stormwater program.

Three-County Coalition Developed

The Chemung County Stormwater Coalition also partners with its neighbors, Schuyler and Steuben counties. Although there are no MS4s in either of these counties, the Water Quality Committee in Schuyler County realized a need to address stormwater issues associated with ongoing construction activities. The counties' Water Quality committees are administered by their Soil and Water Conservation districts, and the three counties agreed it would be optimal to join forces. The Rural

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Photos courtesy of Diane Fiorentino

Excavation for a bioretention demonstration project at the Chemung County Fairgrounds – a green effort by the Chemung County Stormwater Coalition to help filter pollutants and manage stormwater runoff at the site. Equipment used was donated by the County Soil and Water Conservation District, and plant and soil materials to complete the project (shown in second photo), were donated by Natural Resourc e Conservation Services.

Stormwater Coalition (RSC) was born out of this need.

The RSC utilizes the personnel of the Chemung County Stormwater Team and resources from the Southern Tier Central Regional Planning and Development Board (STC). Public education and training are accomplished regionally as well. The group meets quarterly to assess concerns, issues and upcoming events. Through the Rural Stormwater Coalition the three-county region was able to address green infrastructure (GI) issues, a series of education workshops for engineers, planning boards and municipal officials.

Annually, in April, STC hosts a three-county Regional Leadership Conference. In 2011, the RSC rolled out GI concepts in a session for municipal boards and supervisors. This year, pollution prevention BMPs is the topic of a session for highway departments. Since the same contractors, engineers and developers work across a broad section of this region, the coalition goal of a consistent stormwater management message has proven to be well worth the work.

Diane Fiorentino, CMS4S, is County MS4s Education/Outreach Coordinator for the Chemung County Stormwater Coalition and may be reached at: www.chemungstormwater.org.

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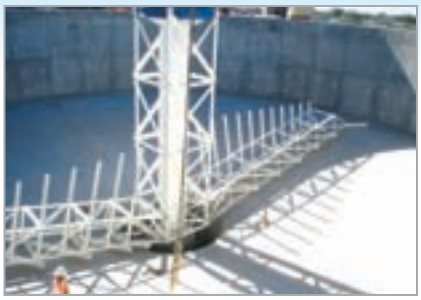

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Oswego Moves Forward on CSO Project and Green Enhancement Plan

by Gwendolyn Girsdansky

While it was state-of-the-art in the 1970s, the West Side sewer system in the City of Oswego is no longer in compliance with state and federal Clean Water Act regulations.

To resolve the storm overflow problems and comply with regulations, the City of Oswego signed a consent decree in 2010 with the federal Department of Justice, US Environmental Protection Agency (USEPA) and New York State Department of Environmental Conservation (NYSDEC).

The combined sewer system (collecting both sewage and stormwater) and the West Side Sewer System Excess Flow Management Facility have been overflowing into the Oswego River and Oswego Harbor. In 2006, the city was notified this combined sewer overflow (CSO) situation no longer met regulations.

"There is an illegal, unpermitted overflow which occurs on average 10 times a year," according to City Engineer Tony Leotta. "The system was not built to handle the extreme wet weather flow."

The combined sewer system does not run throughout the entire West Side, but covers the Oswego River inland to West Sixth Street, and acts as a tributary to the excess flow management facility. Before the combined sewer system on the West Side had been built, about 40 discharges a year occurred into the Oswego River and/or Lake Ontario.

The current system revamp, spanning over the next 10 years, will rehabilitate, expand and separate the combined sewer system. The consent decree requires that over the next decade 75 percent of the combined sewer system be separated, so that sewer and stormwater will not run together. Accomplishing everything in the consent decree will cost the city more than $87 million. In addition to the decree actions being taken, the city is pursuing green infrastructure alternatives through other funding sources.

Decree Project Phases

The city will first expand its West Side WWTP (wastewater treatment plant) by installing disinfection and de-chlorination equipment that will disinfect the sewer system overflow water with chlorine. This will occur during the wet season – June through September – something that was not required when the excess flow facility was originally constructed in 1986. The new sanitation process will cost $3.5 million dollars.

The second phase means further expansion of the WWTP by increasing its wet weather capacity from eight million to 12 million gallons per day, costing approximately $9 million. This will reduce unpermitted overflows by at least 50 percent by directing more overflow to the plant, according to Leotta.

The plan requires that one quarter of the combined sewer system be separated every two years, from 2014 to 2021, to reach the 75 percent separation mandated.

Additionally, this year improvements will be made to the sanitary sewer conveyance system, which brings the separated sanitary sewer flows to the treatment plant. The purpose will be to reduce the amount of inflow and infiltration (I&I) into the main sewers that were originally built in the mid-1800s.

Throughout this stretch of Oswego's West First Street that extends north is the section in which green innovations are being proposed to prevent rainwater and snow melt from entering the sewer system.

Photo by Gwen Girsdansky

Catching Up with Green Initiatives

Ideally, more green initiatives could have been incorporated from the beginning to reduce dependency on grey infrastructure, according to the Director of Community Development Mary Vanouse.

"Everything was done so quickly, in part because we were trying to qualify for federal stimulus money that was available," Vanouse said. "Because of the haste, the original planning precluded newer green initiatives that could have been utilized to reduce the volume of stormwater in the sewer system."

In 2011, the city filed for a separate state grant through the New York State Environmental Facilities Corporation's Green Innovation Grant Program (GIGP) to finance green infrastructure that would effectively prevent stormwater from entering the system in the first place.

"More green infrastructure will help us reduce the amount of money we are spending to sanitize rainwater," noted Oswego Mayor Tom Gillen. "We can employ simple technology, like rain barrels and

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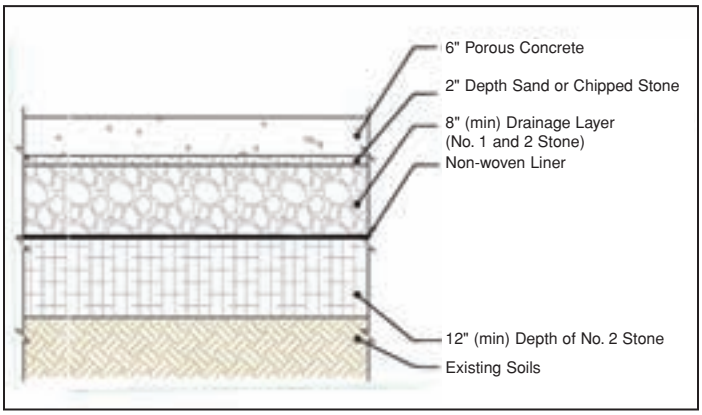

Courtesy of Mary Vanouse

Components of a porous sidewalk that the green initiative proposal would implement to reduce storm runoff along West First Street

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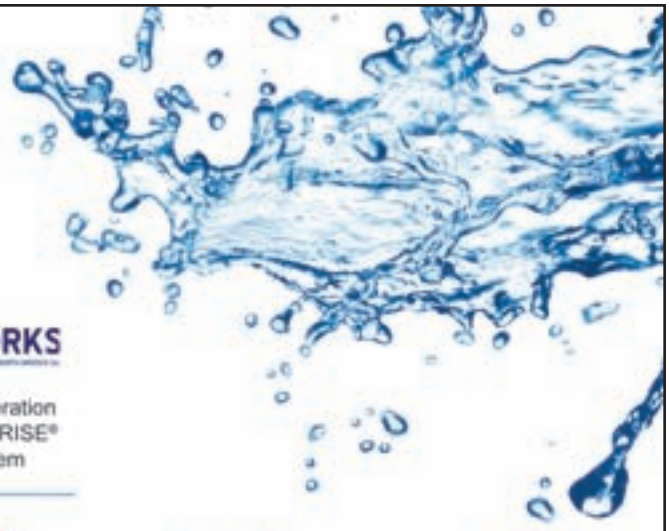

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Jamie Howard, New York Regional Manager
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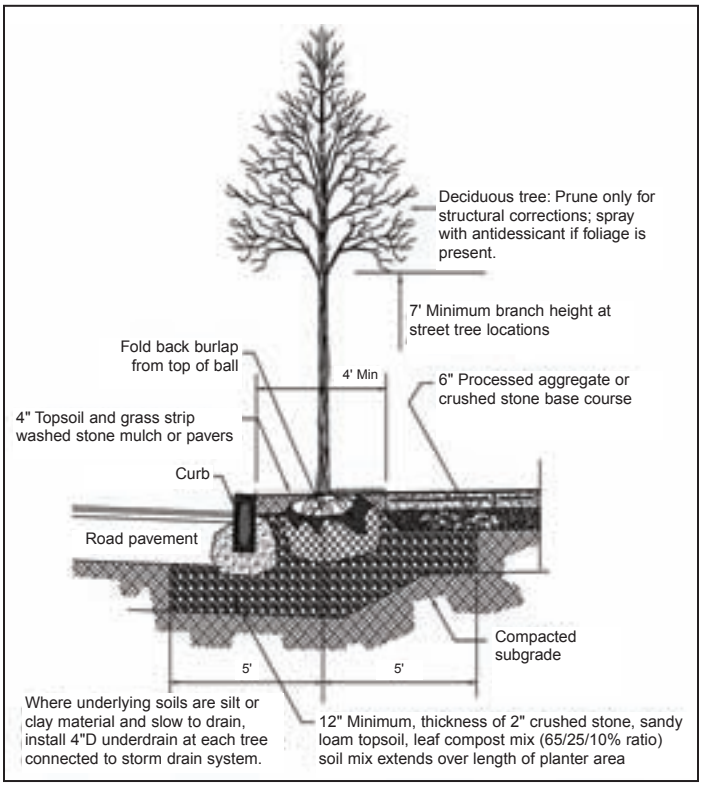
DN TANKS

continued from page 53

plantings, to help take stormwater out of the combined systems."

The green initiative includes installing new materials such as porous sidewalks and parking lots to direct water into the soil. Trees and native plants that would also help absorb stormwater would be placed along West First Street. Small changes such as these will save the city an estimated 86,000 gallons from entering the system during storms which can impact the treatment plant up to 40 times a year. Preventing as much as 3.4 million gallons from reaching the wastewater treatment plant would reduce the taxpayers' costly treatment of stormwater.



Courtesy of Mary Vanouse

For green improvements, this system for tree plantings will absorb more water runoff.

Although a GIGP grant was not secured by the city in the first round of awards (and at the time of this writing), the city will persist in its search for green infrastructure funding to reduce the volume of stormwater impacting CSOs.

"These green infrastructure initiatives will only enhance our city's design and demonstrate its commitment to green technology," Mayor Gillen said.

City officials are on target in their schedule with the USEPA consent decree to achieve total compliance to reduce impacts on the city's water resources, achieve a healthier waterfront and improve aquatic habitat in Lake Ontario and the adjacent harbor. When the City of Oswego makes its pitch – Oswego, Where the Water Never Ends – be assured Oswego has dedicated its resources to clean its waters and improve the environments of the Oswego River and Lake Ontario.

Gwendolyn Girsdansky is a marketing intern for the City of Oswego Community Development Office, Oswego, NY, and may be reached at: girsdans@oswego.edu.

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JOB OPENING

Development Authority of the North Country: Wastewater Supervisor

DANC, a multi-faceted New York State public benefit corporation created in the mid-1980s, is seeking a Wastewater Supervisor to oversee the operation and maintenance of a regional wastewater treatment facility and supervise operations and maintenance personnel responsible for day-to-day operations. Duties will include ensuring compliance with environmental and safety regulatory requirements; establishing written standard operating procedures; providing supervision of personnel; monitoring operations daily, assessing problems, diagnosing failures; developing and maintaining spreadsheets to monitor plant performance; making adjustments necessary to keep facility within permit limits; maintaining Computerized Maintenance Management System (CMMS) to electronically track preventative maintenance and repair work orders, updating capital plan and preparing budget; preparing monthly reports and graphs to communicate to customers about plant performance, status of projects, and budget; completing periodic regulatory reports, permit renewals, etc.; coordination with engineers and customers to resolve problems; work may require irregular hours.

QUALIFICATIONS: The ideal candidate will have a Bachelor's Degree in Engineering, Environmental Science, or related field. Candidates that have completed an Associate's Degree with exceptional experience will be considered. Advanced skills and technical knowledge of wastewater treatment attained by specialized courses and on-the-job training required. Grade IIIA Wastewater certification issued by the State of New York is preferred; ability to obtain license in 18 months required. Minimum of five years directly related experience in wastewater treatment/operations, including at least two years in a supervisory role is recommended. Strong technical and supervisory skills required. Computer proficiency in MS Office applications required; prior experience with a CMMS beneficial.

DANC offers a competitive compensation package. Submit cover letter, resume and application for employment to ctuttle@danc.org. Employment applications are available for download at www.danc.org. Review of applications will begin immediately and continue until the position is filled. ***DANC is an Equal Opportunity Employer.***

Visit nywea.org for more job openings.

Woman Construction Manager: "Having It All"

Prominent CM, Doreen Bartoldus, PE, CCM, LEED GA, gave an outstanding presentation about the complexities intertwining her profession and personal life at a recent NYWEA Women's Initiative seminar in Queens. Bartoldus reviewed the various CM business models and how she rose from a drafter to the top of her chosen career as CM Market Leader for CDM Smith. She has managed billion dollar construction projects in diverse geographies from New York City to the South Pacific.

The multi-faceted dimensions of the construction manager's (CM) role in a project's life cycle are often misunderstood. The CM is a key player not only during the construction phase, but also during facility planning and design. Bartoldus categorized the most common functions of a construction manager, as follows:

- Health and Safety
- Schedule and Cost Management
- Risk Management
- Quality Assurance/Quality Control – Inspection Record Keeping
- Claims Management/Partnering
- Document Control and Processes, such as RFIs, Shop Drawings and Correspondence
- Compliance issues, including Permitting and Environmental Regulations

The CM's responsibilities grow exponentially the larger the project and number of contractors. As CM and Work Inspection Task Leader for the Guam Waterworks Authority, for example, Bartoldus' duties included training and developing standard operating procedures.

Doreen Bartoldus

Also experiencing marriage, parenthood and night school, Bartoldus epitomizes the ultimate balance between career and family. What is the secret to "having it all?" She told the audience that the key to success for a woman in a traditionally male-dominated workplace while raising a family is the realization that you "belong" in your chosen career. With it, hold a strong belief in yourself. She also observed that, there is a gratifying "aha moment," – the defining moment of clarity when one suddenly gains keen insight to a problem and which, if acted upon, can change one's future.

The seminar was attended by representatives from NYSDEC, NYCDEP, Malcolm Pirnie, the Water Division of ARCADIS, CDM Smith, Greeley and Hansen, AECOM, Haider Engineering, CH2M, Ecology and Environment, Inc., Amay Associates, and Toll International, LLC.

The purpose of the NYWEA Women's Initiative is to further women's career development, provide mentoring and networking, and to encourage involvement by women in NYWEA. If interested in NYWEA membership and activities, find applications at www.nywea.org. ***– Contributed by Toby Siegman, PE, AECOM***

NYWEA Members Announce Professional Appointments

LaFever Appointed ISI Chair

Howard B. LaFever, PE, BCEE, Principal with GHD Inc., of Cazenovia, NY was recently named Chairman of the Board of Directors of the Institute for Sustainable Infrastructure (ISI). With 41 years of engineering experience, LaFever specializes in environmental sustainability and water/wastewater. He is a long-time leader in the American Public Works Association, which is a co-founder of ISI, along with the American Society of Civil Engineers and American Council of Engineering Companies.

Recently, ISI launched a new sustainable infrastructure rating system, called Envision™ which is a collaborative product developed between ISI, based in Washington, D.C., and the Zofnass Program for Sustainable Infrastructure at Harvard University. "This new tool will help infrastructure professionals of all types who design and build these projects and who face a tall order to satisfy the ever-growing demand for infrastructure, responsibly address the potential environmental and economic effects in their communities," LaFever said.

Kelleher Appointed President H2M Water

Dennis M. Kelleher, PE, was recently appointed to President of H2M Water, having previously served as Senior Vice President of H2M's Water Resources Division, located in Melville, NY. He will focus on moving H2M Water forward by serving its existing clients in Long Island, New York State and New Jersey and use its capabilities to expand nationally.

Dennis M. Kelleher

Additionally, Kelleher was elected Vice President and is New York Section Director of the American Water Works Association, the nation's largest organization of drinking water supply professionals with more than 55,000 members worldwide.

Hearl Promoted to H2M Vice President

Steven C. Hearl, PE, LEED AP, CCCA was promoted to Vice President of H2M Architects and Engineers from Associate Department Manager. For over 30 years, Hearl has been an integral member of the engineering team in H2M's wastewater division. His primary focus is on planning, evaluation and design of wastewater treatment facilities and wastewater collection and conveyance systems. Hearl is a resident of Greenlawn, NY, on Long Island, and is an active member in state and national professional organizations, and local civic and community organizations.

Steven C. Hearl

Summer 2012, Vol. 42, No. 2

Clear Waters

New York Water Environment Association, Inc.

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DIGESTER SLUDGE MIXING

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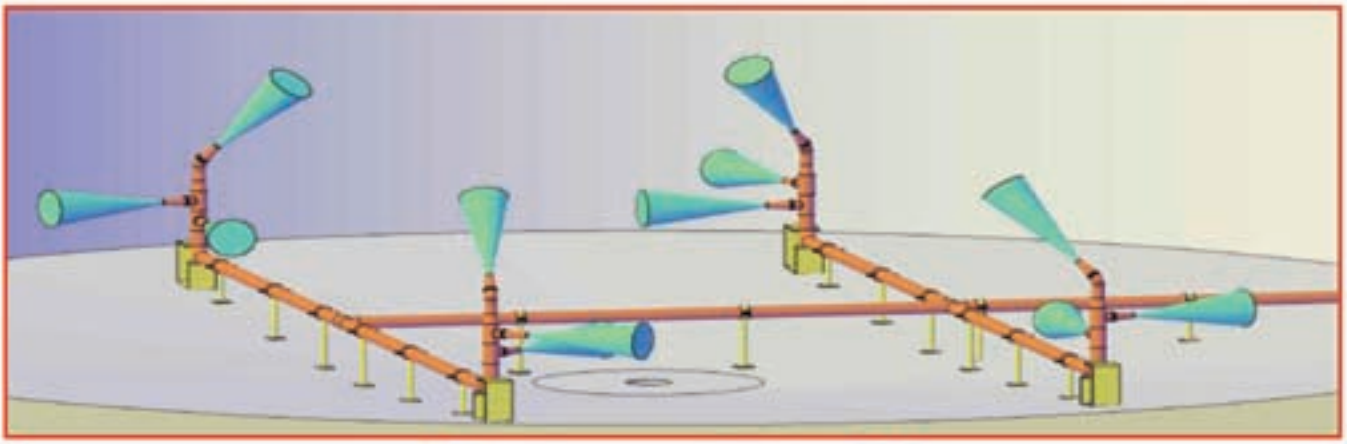

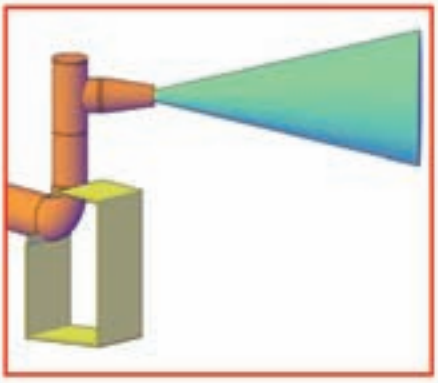

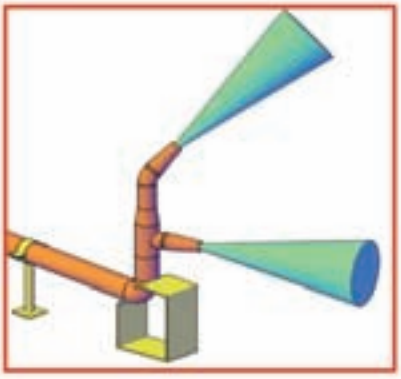

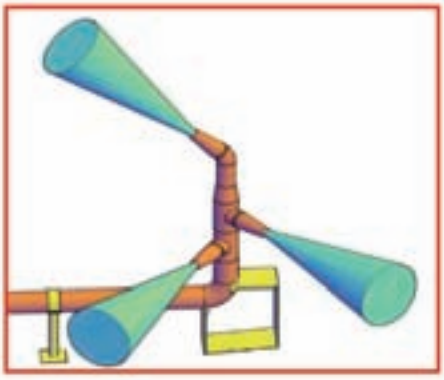

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Customer Testimonial: Ebara Pumps

The **City of Rome** installed an Ebara submersible pump at their Ellsworth Road Pump Station in 2009.

The existing pump station had a failure and it was critical that they get a replacement unit in a timely manner. The original equipment supplier quoted 10-12 weeks for a new unit. The City then called Siewert Equipment, who was able to utilize Ebara's $8,000,000 inventory in Rock Hill, SC.

A replacement 40-HP pump shipped to the site in less than one week.

Dave Marino has commented, "Ebara's 'K' impeller works great in this application and has been running for three years now at the Ellsworth Road Pump Station. We have had no issues with plugging, clogging or ragging."

Rome's Electrical Technician Dave Brockway, Working Supervisor Dave Marino, and Electrical Technician Phil Impicciatore (pictured at left) are all pleased with the performance of the Ebara pump.

Ebara DLFU Submersible Non-Clog Pump

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