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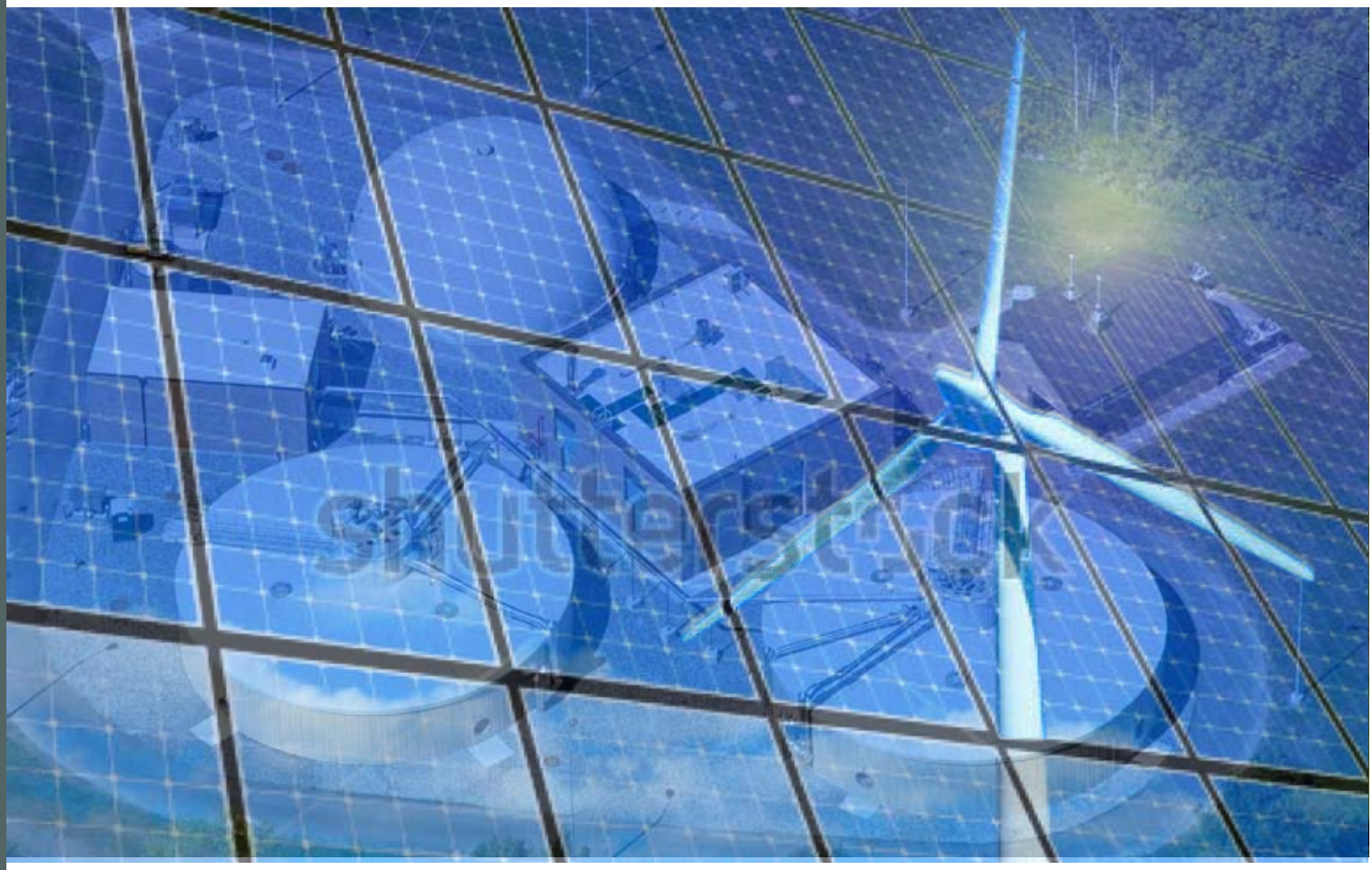

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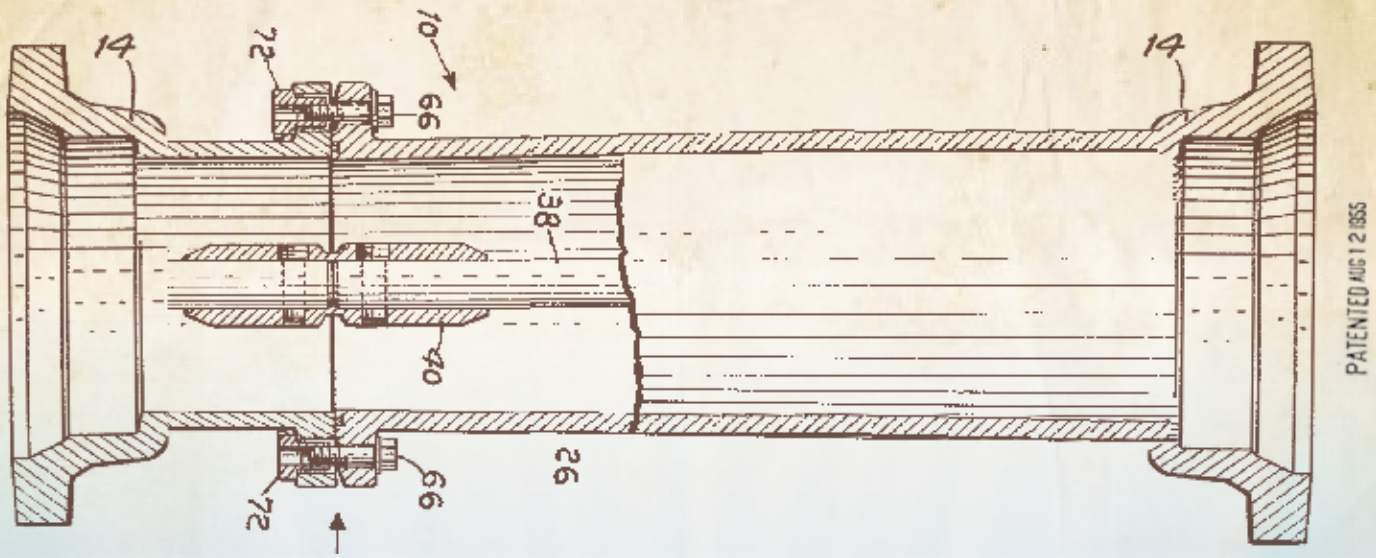

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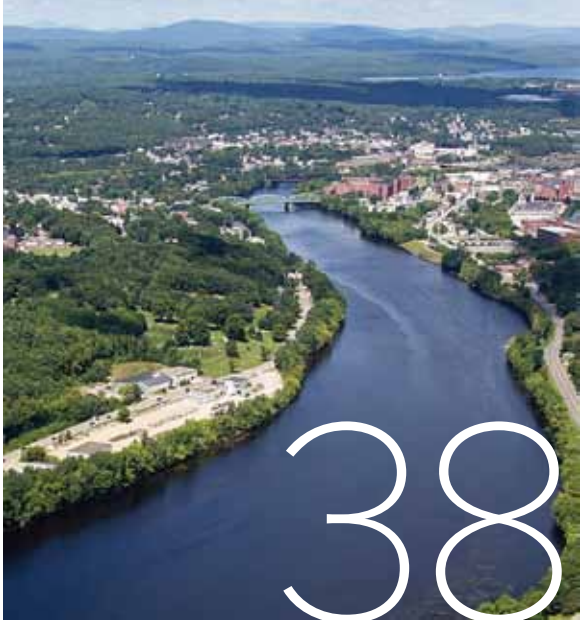

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Contents

On the cover: Renewable energy production and anaerobic digestion—energy recovery, reduce the carbon footprint of New England WWTFs

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Poster winners (page 64)
Jessica Woodcock

NEWEA
WORKING FOR WATER QUALITY

OUR ASSOCIATION WAS ORGANIZED EIGHTY-FIVE YEARS AGO

in Hartford, Connecticut, on April 23, 1929, with the objectives of advancing the knowledge of design, construction, operation and management of waste treatment works and other water pollution control activities, and encouraging a friendly exchange of information and experience. From 40 charter members, the membership has steadily grown to more than 2,000 today. Membership is divided into the following classes:

A Professional Member shall be any individual involved or interested in water quality including any manager or other officer of a private waste treatment works; any person engaged in the design, construction, financing, operation or supervision of pollution control facilities, or in the sale or manufacture of waste treatment equipment.

An Executive Member shall be an upper level manager interested in water quality and who is interested in receiving an expanded suite of WEF products and services.

A Corporate Member shall be a sewerage board, department or commission; sanitary district; or other body, corporation or organization engaged in the design, consultation, operation or management of water quality systems.

An Academic Member shall be an instructor or professor interested in subjects related to water quality.

A Young Professional Member shall be any individual with five or fewer years of experience in the water quality industry and who is less than 35 years of age.

A Professional Wastewater Operations Member (PWO) shall be any individual who is actively involved on a day-to-day basis with the operation of a wastewater collection, treatment or laboratory facility, or for facilities with a daily flow of <1 million gallons per day. Membership is limited to those actually employed in treatment and collection facilities.

A Student Member shall be a student enrolled for a minimum of six credit hours in an accredited college or university.

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Semi-annual meetings, winter and spring, are held throughout the New England states.

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President's message

Ready for winter?

I believe I know the answer for most of us whether it concerns our vocational or personal lives. Personally, I do look forward to the first snow fall, cozying up to the wood stove and sharing a warm drink with friends. Vocationally, fall can be a particularly busy time with the prospects of finishing up infrastructure projects and planning for the next construction season. Many of us in the Northeast face major challenges in meeting the needs of our utilities, and our ability to meet these needs efficiently and effectively can be directly connected to the "company we keep." This is one major area in which NEWEA provides value to its members and to others who read this journal or attend our webcasts, specialty seminars, and conferences. There is a full slate of specialty conferences this fall and beyond, and I encourage you to check the calendar on NEWEA's website for offerings that may help you to cope.

It was good to see so many from NEWEA in attendance at WEFTEC in New Orleans. There were more than 70 attendees at the NEWEA luncheon, which had a full agenda including an address by incoming WEF President Ed McCormick, updates from the WEF delegates, a legislative update, a farewell from retiring Ken Kirk of the National Association of Clean Water Agencies, and the induction of George Vercelli into the Select Society of Sanitary Sludge Shovelers. I had the pleasure of acting the part of influent integrator as we roasted George and made him sing the song that all inductees are required to perform. He was a good sport and his induction was appropriate recognition for his long-time work and support for NEWEA. Congratulations to Mr. Vercelli, who has also accepted a leadership role in WEF on the membership committee. NEWEA and its members were recognized at WEFTEC for leadership, receiving several awards. NEWEA received the Member Association Public Education Award and the Narragansett Bay Commission received the WEF Water Quality Award. John Hart was recognized as a WEF Fellow. It was great also to see all the New England operations challenge teams competing against stiff competition, with our own Force Maine winning first place in the process control event in Division 2. I congratulate all award winners and participants.

There were more than 90 attendees as NEWEA hosted the lunch at the Chicory Restaurant at WEFTEC in New Orleans

George Vercelli, membership chair, was inducted into the Select Society of Sanitary Sludge Shovelers

One thing I like about this industry is that the people whom I know are not "in it" to receive awards. We operators are, foremost, stewards of the environment, and we understand the importance of the service we provide. We are supported by engineering firms and equipment vendors who assist us in accomplishing our service—clean water. A new initiative was announced at WEFTEC that highlighted the need to increase our "circle of friends" if we have not already done so. It is the "Water Works!" campaign, for which one proposed tag line is, "It's all over if we do not fix what's under." "Water Works!" underscores the importance of investing in water infrastructure to keep communities healthy, cities running, and economies growing. It focuses on our long-term stewardship of the water from the source, to point of use, and through reuse. Can you see the circle of friends increasing? NEWEA has already teamed for years with the New England Water Works Association and the New England chapter of the American Public Works Association, and we more recently have created the New England stormwater collaborative to address stormwater issues. This collaborative has begun to mature, and all three organizations will see continued benefits from this group. The future is filled with more opportunities to collaborate with organizations with similar interests, and it may be the only way to successfully meet the challenges that lie ahead.

So, are you ready for winter? I'm not—still have some wood to put up. But I hope that, while you are getting ready, you will also enjoy this edition of the *Journal*. I want to again thank all for affording me the opportunity to serve as president of NEWEA and to express my appreciation for the encouraging support I have received from so many. I look forward to seeing you in January at the annual conference.

We operators are, foremost, stewards of the environment, and we understand the importance of the service we provide.

NEWEA
WORKING FOR WATER QUALITY

From the Editor

As our industry continues to mature, we are seeing a continued focus on the reduction of energy consumption at our water resource facilities. When reading the energy articles in this quarter's Journal, I was struck that most renewable energy projects are still not "cost-effective" on a pure return on investment dollars without some grant or loan program. It may be time for us to begin to look beyond "cost-effective" as purely dollars and cents and apply other "soft" costs as part of the economic analysis (e.g., reduction of negative impacts to the environment).

The first article is of particular interest to me as it highlights how the plant staff at the Hyannis water pollution control facility took ownership and a proactive approach to address energy consumption. It outlines how a two-step approach to the challenge was successful. There was a 15-percent reduction in net energy consumption based on the work completed by plant personnel alone. This article shows how staff can make a difference every day for an entire community in reducing costs of services. Because of their hard work, MassDEP chose the town of Barnstable for an energy management pilot program. The $9 million grant from the state for "green energy" projects funded energy-efficiency improvements and renewable energy facilities, including wind turbines and a photovoltaic array associated with the facility. Once all projects were instituted under the energy management plan, this facility reduced overall energy consumption in 10 years by 90 percent.

The second article explores how wastewater treatment plants are evolving into resource recovery and reclamation facilities. The focus is on multi-prong approaches to energy management using energy conservation, more efficient systems, and renewable energy, including bio-energy production, solar, geothermal, and wind power. It highlights how bio-energy production can result in significant energy savings.

Helen T. Gordon,
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In our third article read how Lewiston-Auburn Water Pollution Control Authority (LAWPCA) is managing energy with new anaerobic digestion and energy recovery facilities that precede and enhance the composting and land application programs. The LAWPCA facility is the only one in Maine employing anaerobic digestion, and the largest city in the state managing its own biosolids program. Read about the project through planning and startup and get lessons learned and possible opportunities for other facilities, especially those without digesters.

The final article reviews an often-unused technology in New England for disposal of effluent, drip dispersal. Although not always cost-effective, it is gaining momentum with its ability to reuse wastewater effluent sustainably. In May 2013, MassDEP provided detailed guidance for drip dispersal systems in its update of "Guidelines for the Design, Construction, Operation and Maintenance of Small Wastewater Treatment Facilities with Land Disposal." Drip dispersal can be appropriate for sites that have a shallow depth to groundwater since the tubing is installed with minimal final cover of 12 inches (30.5 centimeters) or less.

I encourage you to read the state director reports and see how Connecticut Water Pollution Abatement Association is dealing with a significant reduction in our professional ranks due to the aging workforce. Our industry is losing years of knowledge every day, and it will only increase with the current demographics of our profession. Vermont's report highlights the state association's pro-active government affairs work. New Hampshire held its annual trade fair in April, and some of the highlights are in the New Hampshire director's report. Maine's report summarizes the events that have kept that state association busy over the last quarter, including its public education initiative. Read about the Water Infrastructure Finance Bill passed in July of this year in Massachusetts as well as Rhode Island's annual awards event and recipients.

Special thanks to the Guest Editor Daniel Coughlin, who solicited and reviewed the feature articles.

Helen Gordon
Journal Committee Chair and Editor

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Industry news

The Mystic River in Medford, Mass.

EPA AWARDS $120,000 IN URBAN WATERS GRANTS TO REVITALIZE MYSTIC RIVER WATERSHED

by David Deegan, EPA, Region 1 News Release

In two separate grants, U.S. EPA is awarding $120,000 to two organizations working to clean up the Mystic River watershed, just outside Boston. The two grants are part of $2.1 million EPA awarded nationally to 37 organizations in 17 states and Puerto Rico to help restore urban waters, improve water quality, and support community revitalization and other local priorities.

The funding is through EPA's urban waters program, which supports communities in accessing, improving, and benefitting from their urban waters and the surrounding land. Urban waters include canals, rivers, lakes, wetlands, aquifers, estuaries, bays, and oceans in urbanized areas. Many have been polluted for years by sewage, runoff from city streets, and contamination from abandoned industrial facilities. The aim is to reconnect communities to their urban waters to help them restore these waters while improving neighborhoods.

Grants of $60,000 each to address water quality issues will go to Alternatives for Community and Environment (ACE) for the "Chelsea Creek action group urban waters community improvement plan" along the Chelsea Creek and to Mystic River Watershed Association (MyRWA) for the "green infrastructure program for the Malden River."

"EPA funding to help protect urban waters from pollution will help protect the health of the thousands of urban dwellers who get out and enjoy recreation on our local waters," said Curt Spalding, regional administrator of EPA's New England office. "We're proud that this money will help us continue the important work to address water quality issues in the Mystic River watershed."

With the EPA grant, Alternatives for Community and Environment will partner with the Chelsea Creek action group to assist environmental justice communities in implementing their plan to transform the Chelsea Creek into a community asset. ACE plans to engage residents in reviewing and updating the community vision for Chelsea Creek, assisting them in understanding regulatory mechanisms for protecting water quality, and helping them to take a proactive role in promoting Chelsea Creek as an environmental, recreational, economic, and educational resource.

For the second grant, MyRWA will promote green infrastructure in Medford, Malden, and Everett, three watershed environmental justice communities. MyRWA plans to educate residents, business owners, and municipal staff about stormwater and build grassroots support for green infrastructure (GI) on private and public lands. The program trains municipal staff in the three communities on GI, provides a technical GI guidance document, and informs them about areas contributing the highest loads of phosphorus and areas most feasible for application of GI. The project will recommend potential modifications to code/ordinance/bylaws in each community to promote GI.

"The Mystic River Watershed Association is grateful that U.S. EPA is focusing increased attention on the Mystic River watershed and on Malden River in particular. Malden River is a very important amenity for the cities of Malden, Everett, and Medford, and it needs attention. We look forward to working with these communities to achieve our project outcomes—a more and better informed public, better equipped municipal stormwater programs, and stronger partnerships to guide this river to a more healthy condition. Through the urban waters grant that our organization has received, projects will focus on stormwater education and outreach, green infrastructure planning, and greater understanding of existing water quality conditions," says EkOngKar Singh Khalsa, executive director of the Mystic River Watershed Association.

A steering committee of government and local stakeholders has been active in the Mystic River watershed since 2009, working together to improve water quality and increase access to public open space. In 2013, this watershed initiative was named one of 18 urban waters federal partnerships by EPA. Through these federal partnerships, EPA and sister agencies are revitalizing urban waterways and communities that surround them, transforming overlooked assets, and driving urban revival.

More information on EPA's urban waters program: epa.gov/urbanwaters/index.html.

COLLABORATION & THE "WAR ON WIPES"

by Scott Firmin, Director of Wastewater Services, Portland Water District, Portland, ME

Nearly a year ago to the day of my writing this, the National Association of Clean Water Agencies (NACWA) announced it was declaring war on wipes as WEFTEC 2013 prepared to open. This bold statement was precipitated by years of effort by utilities across the U.S. to address a growing number of issues in their collection systems, related to non-woven consumer products or wipes. The WEFTEC 2013 conference presentations on the topic included a panel discussion among representatives of the wipes industry and wastewater professionals from across the country. Bolstered by increasing national and local media attention, WEF, NACWA, and the American Public Works Association (APWA) came together with a goal of directly engaging the wipes industry in a path forward—the "war" was on.

For the next few months the leading associations began negotiations with the wipes industry trade association, INDA, to establish a technical workgroup to develop a collaborative path forward. Countless hours were spent to establish the proper forum and ground rules for the workgroup. Given the tension between the wastewater and wipes industries, the workgroup process is being professionally facilitated by Ross Strategic (Seattle, Wash.). The firm is no stranger to the water and wastewater industry, having facilitated a number of discussions on water issues, including this summer's EPA public health forum on high-flow blending issues.

The technical workgroup on flushability consisted of six wipes industry members and six wastewater utility members from across the country. I served as a wastewater utility member. My participation was made possible through the support of the Maine Water Environment Association and NEWEA. The technical workgroup was tasked with creating a shared understanding of the issues each "side" faced and to develop recommendations for resolving the burden that some products can have on sewerage systems. Any recommendations would have to be approved unanimously by the sponsoring agencies (NACWA/WEF/APWA and INDA).

The workgroup process included pre-meeting assignments, conference calls, and three meetings across the country. During the first workgroup meeting, in Washington, D.C., in May, presentations framed the impact that sewerage systems have experienced and shared information about the current flushability guidelines. The second meeting, at INDA's headquarters in Cary, N.C., in June, developed findings that could help frame the current issues and identify possible recommendations to move the process forward. At the third and final meeting, at the Ocean County Sanitary District in California in mid-August, the workgroup over a day and a half identified two major recommendations for continued collaboration.

In the months since the final meeting, the groups have been negotiating the final recommendations. The final agreement is currently pending.

An update on the process was presented during the final morning of the 2014 WEFTEC conference. The presentation, by the workgroup's facilitator, Rob Greenwood, said that while

formal adoption is pending agreement on final details, the following draft recommendations have been made by the workgroup:

- Convene a technical committee to improve guidelines based on new information and technical collaboration between non-woven fabrics and wastewater sectors
- Engage in a product stewardship initiative to increase consumer awareness about proper disposal of nonwoven (wet wipes) products

The flushability guidelines include several tests to determine if a product can be labeled flushable. The wastewater representatives hope that we will be afforded meaningful participation in the next version of the guidelines to further reduce the burden that products have on sewerage systems.

A major impact in sewerage systems is caused by the disposal of products not designed or intended to be flushed, such as baby wipes, which can make up nearly 20 percent of the materials disposed of in a sewerage system. The product stewardship effort is intended to determine how the "Do Not Flush" message can be communicated more effectively to consumers.

This has been a long but rewarding process. Through the facilitated process we have developed a deeper understanding of the issues faced by each industry and a willingness to share in the next steps in the process. Years of equally difficult efforts lie ahead, but I remain optimistic that we have embarked on a process that will ultimately reduce the burden that these products have on our sewerage systems. I will keep you posted.

EPA FINALIZES SUFFICIENTLY SENSITIVE TEST METHODS FOR NPDES PERMIT APPLICATIONS AND REPORTING

by Catilin Gregg, EPA, NPDES News

EPA finalized minor amendments to its Clean Water Act regulations to require "sufficiently sensitive" analytical test methods under the National Pollutant Discharge Elimination System (NPDES). The rulemaking clarifies that NPDES applicants and permittees must use EPA-approved analytical methods capable of detecting and measuring pollutants at or below applicable water quality criteria or permit limits. This final rule is based on CWA requirements and clarifies existing EPA regulations. The amendments in this rulemaking affect only chemical-specific methods; they do not apply to whole effluent toxicity methods or their use. For more information, go to water.epa.gov/polwaste/npdes/basics/index.cfm.

DRAFT STORM SEWER GENERAL PERMIT FOR MORE THAN 200 SMALL MASSACHUSETTS MUNICIPALITIES WILL HELP CLEAN WATER PROTECTION

by David Deegan, EPA, Region 1 News Release

EPA released for public comment the draft general permit for small "Municipal Separate Storm Sewer Systems" (MS4) located in Massachusetts. The new permit, when finalized, will update efforts in up to 260 municipalities, better protecting rivers, streams, ponds, lakes, and wetlands across Massachusetts.

EPA previously released draft general permits for small MS4s in North Coastal watersheds in 2010 and in the Interstate, Merrimack and South Coastal watersheds in 2011. In response to many of the public comments, and new technical and census information, EPA has revised the two general permits into one document and is releasing the revised draft general permit for public input. EPA has also changed the newly proposed draft permit in response to public comments, seeking more clarity, guidance, and flexibility in meeting permit requirements.

Regulated MS4s include traditional cities and towns, state and federally owned facilities such as universities and military bases, and state transportations agencies. The general permits will apply to all MS4s in an urbanized area as defined by the 2010 census. The previous permit applied to MS4s in an urbanized area based on the 2000 census.

Two hundred and sixty municipalities are in an urbanized area as defined in the 2010 census, of which 17 municipalities are potentially eligible for waivers from the permitting requirements. Waiver eligibility is based on the population within the urbanized area (less than 1,000) and the municipality's potential to contribute pollutants to an interconnected MS4 or an impaired water. EPA expects to receive complete waiver requests soon and will review and respond to them. EPA will release an individual permit for the Massachusetts Department of Transportation's (MassDOT's) highway division later this year. Other MassDOT divisions are eligible for the general permit.

The draft general permit requires regulated small MS4s to develop, implement, and enforce a "stormwater management program" that controls pollutants to the maximum extent practicable, protects water quality, and satisfies the federal Clean Water Act.

The draft permit requires implementation of six minimum control measures that include illicit discharge detection and elimination, public education and outreach, public participation, management of construction site runoff, management of runoff from new development and redevelopment, and good housekeeping in municipal operations. The draft permit also includes requirements that address waste load allocations associated with approved total maximum daily loads (TMDLs) for bacteria, phosphorus, and nitrogen, and requirements that address discharges to impaired waters without an approved TMDL.

This draft permit builds on the requirements of the previous general permit issued in 2003. The draft permit identifies four target audiences for public education, details specific procedures to locate and remove illicit connections,

Concord River, Concord, Mass.

encourages low-impact development practices, and identifies practices to address nutrients, bacteria, chloride, sediment, metals, and oil and grease. EPA has provided a suggested format for the notice of intent information that can be submitted electronically. EPA will also provide templates for the stormwater management program and the annual reports.

EPA has estimated the costs to implement the minimum control measures but does not have sufficient information to reasonably estimate those associated with achievement of water quality-based limitations. Actual municipality costs will vary depending on a number of factors, including population (1,000 to 150,000), resources, infrastructure (number of catch basins, road miles), size of the urbanized area, and work completed during the previous permit term. As drafted, EPA estimates the cost to meet the requirements associated with implementation of the six minimum control measures to be between $78,000 and $829,000 per year averaged over the permit term.

EPA received more than 500 comments on the draft permits first issued in 2010 and 2011, and it has modified the current draft permit in response to many of the submitted comments. Changes include:

- Additional time for completion of required tasks
- Opportunities to optimize activities such as catch basin cleaning rather than mandating a set frequency
- Reduction in the required frequency of street sweeping
- Reduction in the costs associated with monitoring by allowing use of field test kits
- Provisions to address approved TMDLs
- Requirements clarified for discharges to impaired waters

The notice of availability of the general permit was published in the Federal Register on September 30, 2014. The public comment period is 90 days, ending on December 29, 2014. A public hearing will be on November 19, 2014, in Leominster. EPA will also host a series of public meetings, including one on October 28 in Haverhill, to explain the permit requirements and to answer questions. Other public information meetings will be scheduled.

For more information about the draft general permit, a detailed fact sheet, and information on public meetings and the public hearing, visit: epa.gov/region1/npdes/stormwater/MS4_MA.html.

WHITE HOUSE COUNCIL ON ENVIRONMENTAL QUALITY AND EPA HONOR STUDENT LEADERS AND EXCEPTIONAL TEACHERS WITH ENVIRONMENTAL EDUCATION AWARDS

by Rachel Deitz, EPA News Release

On August 12, 2014, the White House council on environmental quality, together with EPA, announced the winners of the annual Presidential Innovation Award for Environmental Educators (PIAEE) and the President's Environmental Youth Award (PEYA), recognizing outstanding student leaders in environmental stewardship and K-12 teachers employing innovative approaches to environmental education in their schools. In a ceremony at the White House, 17 teachers and 60 students were honored for their contributions to environmental education and stewardship. The PEYA student leader winner for EPA Region I Deepika Kurup is described in the article below.

"These awards recognize the outstanding contributions of student leaders and exceptional teachers on some of the most pressing issues facing our nation, including combating climate change and instituting sustainability practices," says EPA Administrator Gina McCarthy. "Environmental education encourages academic achievement, especially in the sciences, and develops the next generation of leaders in environmental stewardship."

"To deal with immense challenges like climate change, we need a generation of leaders who don't back away from complex environmental problems, and who have the skills to solve them," says Mike Boots, acting chair of the White House council on environmental quality. "Across the country, environmental education is helping develop that generation of leaders, and the students and teachers being recognized today are remarkable examples of this kind of education at its best."

Also that day, NOAA, the U.S. global change research program, and collaborators from both the national climate assessment network of stakeholders (NCAnet) and the CLEAN network released guides for educators focused on each of the regions covered in the U.S. national climate assessment released by the Obama Administration in May. The guides, deployed on climate.gov, aim to help unpack regional findings and scientific messages, provide links to key resources, and connect educators with the climate-relevant information they need.

Additionally, the National Environmental Education Foundation and EPA announced the winner of the 2014 Bartlett Award. This additional recognition is given each year to an exceptionally outstanding PIAEE award winner, who can inspire and be a model to others.

For details on the new PIAEE winners, visit epa.gov/education/presidential-innovation-award-environmental-educators-piaee-winners.

For details on the Bartlett Award winners, visit neefusa.org/bartlettaward.htm.

In New England, PIAEE winners included Gerard Reymorev, teacher at the Randolph technical career center, Randolph, Vt. and Melinda Learning, teacher at the R. Stewart Esten elementary school in Pembroke, Mass.

NASHUA STUDENT HONORED BY WHITE HOUSE AND EPA

by David Deegan, EPA, Region 1 News Release

A 15-year-old student from Nashua, N.H., received a President's Environmental Youth Award (PEYA), given jointly by the White House council on environmental quality and EPA.

The Nashua student, Deepika Kurup, developed a green and sustainable method to purify water. Her project also increased the awareness of children and the community about why clean and safe water should be considered an indispensable natural resource.

The winning project involved a lightweight photocatalytic composite that harnesses solar energy for water purification. Ms. Kurup developed a simple, fast, and cost-effective methodology where a composite degrades organics in water, and rapidly inactivates bacteria in sunlight or visible light, or in the dark. Her project also developed several prototypes for real-world applications. She has filed a patent and plans to deploy her invention in places around the world affected by water pollution.

"I am inspired to see such creative and promising work from one of New England's younger citizens," says Mr. Spalding of EPA's New England office. "The solutions to our environmental concerns need to come from all directions. Ms. Kurup's innovative work, and that of the other PEYA winners, bodes well for a cleaner and healthier environment in the future."

PEYA winner Deepika Kurup poses with her father at the White House ceremony

Ms. Kurup says, "I have been passionate about solving the global water crisis since I was in elementary school, as I was exposed to the water problem at a very early age. I believe that environmental education is very important, and I am very honored to be the EPA Region 1 recipient of the 2014 President's Environmental Youth Award. The recognition ceremony held at the White House was an amazing experience, and I was delighted to be introduced to EPA Administrator Gina McCarthy!"

For more information on the 2014 PEYA winners, visit: epa.gov/education/presidents -environmental- youth-award peya-winners.

Reducing the carbon footprint of the Hyannis WPCF through renewable energy production and energy efficiency

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ABSTRACT | The Hyannis water pollution control facility (WPCF) has long aimed to reduce its dependence on off-site energy production. This effort began years ago with simple energy-efficiency measures to reduce power usage; these measures ranged from ideas developed by the plant superintendent and personnel to those recommended by outside sources. The next phase studied the feasibility of on-site energy production via solar and wind, but once completed the studies were shelved as funding was sought. In 2009, a generous state grant was made available to the facility for renewable energy systems and energy-efficiency measures. Together the energy-efficiency upgrades and renewable energy systems reduced the WPCF's carbon footprint by over 720 tons (655,000 kilograms) of carbon dioxide annually, and net energy use at the WPCF dropped by 90 percent.

KEYWORDS | Carbon footprint, net energy reduction, renewable energy, energy efficiency

Figure 1. Hyannis WPCF

INTRODUCTION

The Hyannis WPCF is a 4.2-million-gallon-per-day (15.9-million-liter-per-day) facility in Barnstable, Mass. It is operating at 1.97 mgd (7.45 mld) with approximately 4,000 direct customers. The liquid treatment processes consist of primary and secondary treatment followed by disinfection. The facility falls within the jurisdiction of the Ocean Sanctuaries Act, which prohibits the discharge of commercial, municipal, domestic, or industrial wastes into the ocean. Because of this restriction the facility introduces its treated effluent into the groundwater table through sand disposal beds located on-site. Sludge at the facility is thickened and hauled off-site. The Hyannis WPCF is also a major receiver of septage on Cape Cod. Figure 1 is an aerial view of the Hyannis WPCF showing the sand beds and the renewable energy projects.

The facility has spent up to approximately $300,000 annually to pay for its energy consumption, 85 percent of which is due to electricity consumption (see Figure 2). Between 2005 and 2010, electrical costs for the Hyannis WPCF have risen by as much as 35 percent. Recently these costs have fallen almost back to 2005 levels (see Figure 3).

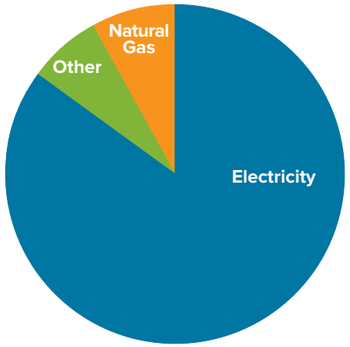

Figure 2. Hyannis WPCF power consumption

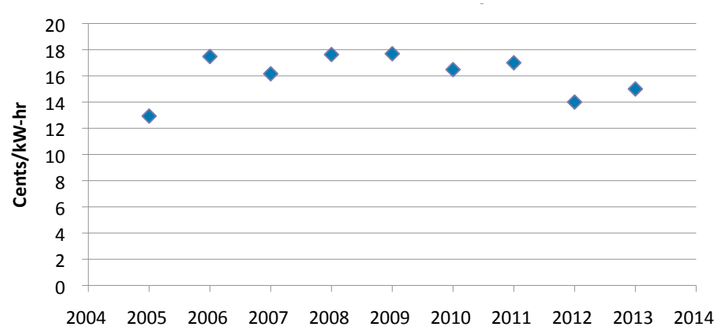

Figure 3. Historical unit cost of power at the Hyannis WPCF

To reduce reliance on outside power, Peter Doyle, superintendent of the Hyannis WPCF, implemented two programs: "kill-a-watt" and "get off the grid." The "kill-a-watt" program was an attempt by plant staff to reduce energy consumption within the facility. Over the past decade, the facility has implemented several energy-efficiency improvements from simply posting signs to improve operator awareness of unnecessary energy use to improving or replacing inefficient equipment.

"Get off the grid" emphasized renewable energy to reduce the facility's net energy consumption. In 2005, the town commissioned separate wind and solar feasibility studies to explore the possibility of using the facility to support renewable energy projects. The conclusion of both studies was that more grant money was needed to make these alternate energy sources economically feasible.

ENERGY EFFICIENCY AND GREEN ENERGY PROJECTS

The facility has continuously attempted to reduce its net energy consumption for the last 10 years. This effort began with energy-efficiency improvements and continued with "green energy" projects funded by the American Recovery and Reinvestment Act (ARRA) of 2009. The contribution each component has played in the overall net energy reduction and carbon footprint reduction at this facility is explained below.

Energy-Efficiency Improvements

The "kill-a-watt" effort changed the mindset of plant personnel. When motors are replaced, they are replaced with highly efficient ones. No room at the facility is lit without someone being inside it. Gentle reminders are posted throughout the facility to think about energy efficiency.

In addition to the facility's own efforts, capital improvements further improved the facility's energy efficiency. These capital improvements were funded as part of larger facility upgrades or through smaller grants from the local utility. Capital improvements included:

- Installation of a variable frequency drive (VFD) on the main treated effluent pump. This allowed the pump to operate on its curve at a far more efficient point for longer periods, reducing energy utilization.
- Replacement of two roofing systems with white roofs. Two administrative facilities needed roof replacements, and an energy-efficient white roofing system was chosen as the replacement to reduce cooling costs.
- Upgrade of the aeration control system. The aeration control system was upgraded to include a dual-loop control (dissolved oxygen and pressure) to allow the system to operate more efficiently.
- Gradual expansion of the supervisory control and data acquisition (SCADA) system. Although this was implemented mainly for process control, being able to monitor and adjust systems to run more efficiently is a side benefit.

Green Energy Projects

Because of its proactive approach to energy reduction, the town was invited to participate in the Massachusetts Department of Environmental Protection (MassDEP) energy management pilot program. The program allows facilities to share information about reducing net energy consumption. With the passing of ARRA in 2009 and the subsequent funneling of grant money for renewable energy to the states, MassDEP spread this money among the 12 participants in this pilot program. The town of Barnstable received notification in March 2009 that it would receive a grant of up to $9 million from the state for "green energy" projects—energy-efficiency improvements and renewable energy facilities, including wind turbines and a photovoltaic (PV) array.

Figure 4. Wind turbine flicker study and sound level analysis results (showing the initial plan for four 225-kW turbines)

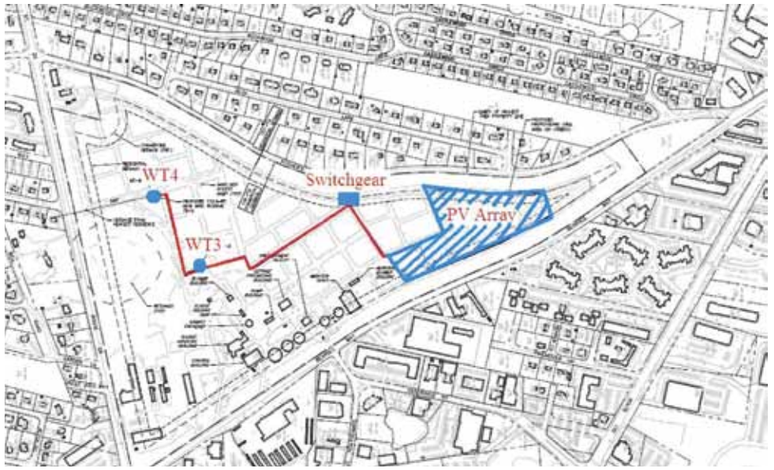

Figure 5. Schematic of on-site facilities including three utility interconnections: two electrical feeds to the plant and one net metering interconnection

Green energy projects included a small amount of energy-efficiency work. For this work, the WPCF used ARRA funds as well as grant money from the local utility to accomplish the following additional energy-efficiency improvements:

- Pace the rate that air is fed to sludge tanks based upon tank level
- Pace the scrubber that treats air from the sludge tanks based on differential pressure to allow it to operate based on the actual volume of air that requires treatment

A preliminary design of the renewable energy facilities and related improvements was developed, based on the prior wind and solar feasibility studies, and included installation of four 225-kW wind turbines, a 290-kW photovoltaic array, and energy-efficiency improvements to process equipment controls. The wind turbine sizes were based on previously obtained Federal Aviation Administration (FAA) permits, which had expired and had to be re-obtained.

The town applied for a new FAA permit, expecting a similar turbine height, but the FAA issued a new permit that restricted the maximum height to 128 feet (39 meters) above ground level (AGL). The new permit reduced the maximum height of the turbines due to a change in flight paths at the airport. This change resulted in shorter, 100-kW turbines having to be incorporated into the design. The height restriction made it more cost-effective to reduce the number of planned turbines from four to two and increase the size of the proposed solar array from 290 to 790 kW. The array was subsequently expanded to 819 kW with an additional state grant.

The site's proximity to the ocean puts it in a highly corrosive environment. Many of the project components needed to be upgraded to corrosion-resistant materials, such as stainless steel. For the turbines, several studies assessed the impact on the nearby residential community. Studies included a visual impact study, a flicker analysis (which measures where the moving/flickering shadows caused by spinning blades fall at different times of the year), and a sound impact study. The project had to meet the Massachusetts air pollution control regulation 310 CMR 7.10, which does not allow a rise of 10 db or greater above background levels at a property boundary. Visual and flicker impacts were found to be minimal and the 100 kW turbines that were used increased sound levels by only 5 to 7 db above background (see Figure 4). This upfront work was critical for public acceptance of the turbines.

Both the wind turbines and the PV system require land area to be sacrificed. However, nearly all of the land at the facility was in use. When the cost to install a PV system supported above the plant effluent sand beds proved to be prohibitively expensive, the focus turned to better defining the need for all sand beds. Through field testing, the facility demonstrated that due to the high permeability of the sand beds, the full bed area required by the state's design criteria was not needed and permission was obtained to decommission a portion of the beds and use the land for other purposes.

The PV array consists of 3,900 photovoltaic panels. The panels have a nameplate rating of 819 kW and are optimized at fixed positions of 20-degree tilt and 158-degree azimuth. The system includes two

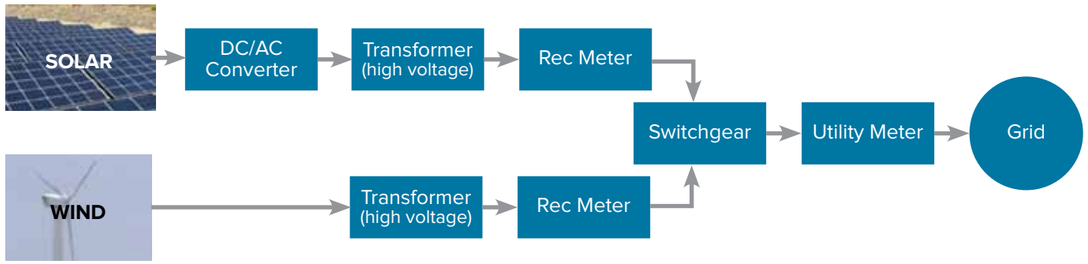

Figure 6. Schematic of the renewable energy system components

inverters and a transformer. A utility grade meter is included to allow for third-party verification of the energy produced. This allows the town to obtain renewable energy credits and also provides Web-based monitoring of the power produced.

The wind turbines consist of two 100-kW units. The units are 98 feet (30 meters) tall, as measured to the hub, and 132 feet (40 meters) to the tip of the blade. The turbines are rated for a maximum wind speed of 32.4 miles per hour (52.1km/hour). Each turbine has a transformer. A utility grade meter is also included at each turbine to allow for third-party verification of energy produced. As with the PV system, this allows the town to obtain renewable energy credits and also provides Web-based monitoring of the power produced.

In the final design, 10 sand beds were decommissioned for the PV array installation and two for the wind turbines. Both renewable energy systems connect through shared switchgear, which transfers electricity generated on-site into the utility grid through a net metering connection. Net metering was required rather than on-site use of the generated power, because the renewable energy facilities at times can produce power in excess of plant demands. A schematic of the on-site facilities is shown in Figure 5, and a full schematic of the system components is shown in Figure 6.

RESULTS

The reduction in net energy consumption and the subsequent reduction in the carbon footprint of the facility are significant. The initial efforts prior to 2010 showed a 15-percent reduction in the net energy consumption of the facility as shown in Figure 7. The corresponding reduction in the carbon footprint was 120 tons (109 tonnes) of carbon dioxide (CO_2). The green energy projects produced a further reduction in net energy consumption of 75 percent calculated using the base year of 2003. The corresponding reduction in the carbon footprint for the facility based on this reduction is more than 600 tons (544 tonnes) of CO_2.

With construction hampered by excessive snow and utility delays, the first full year of operation was 2013. As shown in Figure 8, the overall reduction in

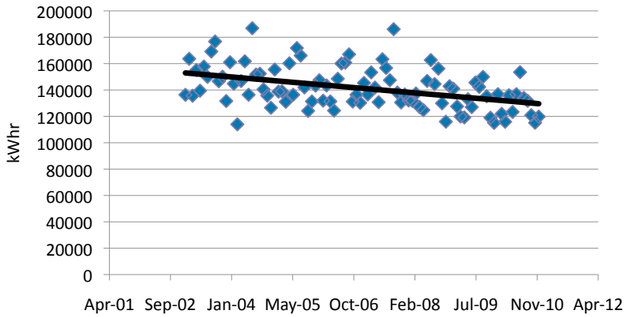

Figure 7. Total monthly kWhr usage shows a 15 percent reduction in net energy consumption—2003 through 2010

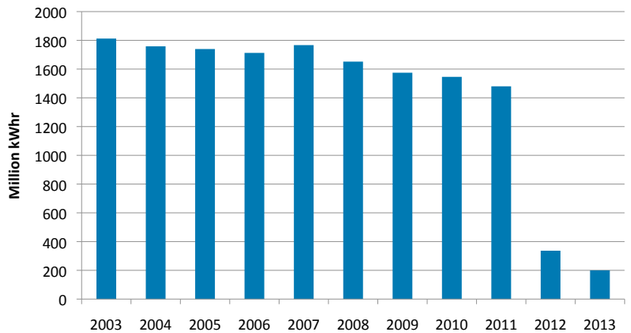

Figure 8. Net energy reduction 2003 through 2013 (Years 2011 and 2012 are estimated due to net metering reporting not being fully operational during this period)

net energy consumption from 2003 through 2013 was 90 percent. In 2013, the net power bill was less than $40,000 after reaching $300,000 in prior years. When renewable energy certificates (RECs) are considered, the net power bill resulted is a net credit to the town of approximately $40,000.

The corresponding reduction in the carbon footprint of the facility is expected to be approximately 720 tons (653 tonnes) of CO_2 per year and is shown in Figure 9. Figure 10 shows the percentage of carbon offset by technology. The overall carbon footprint reduction is approximately the equivalent of the amount of power required for 97 average homes.

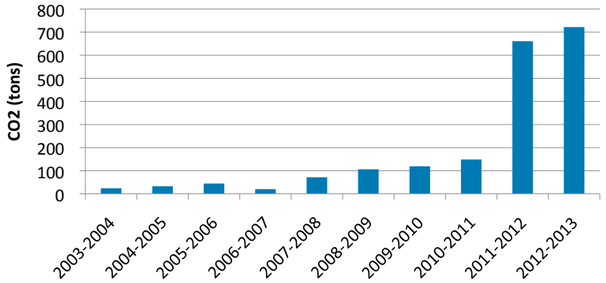

Figure 9. Actual and expected cumulative carbon footprint reduction 2003 through 2013

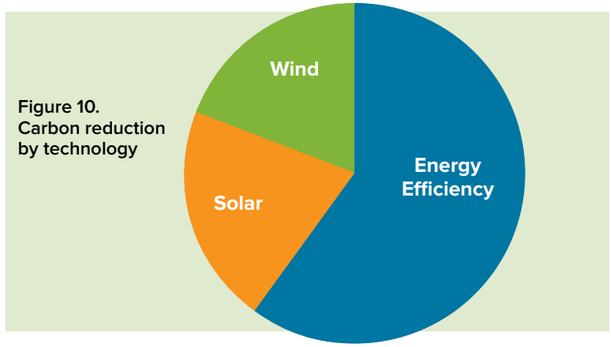

Figure 10. Carbon reduction by technology

DISCUSSION

Other noteworthy aspects of this work are the project costs and interconnection details. Although most of the work was funded through ARRA or local utility grants, current typical funding for renewable energy facilities would still make the project financially attractive. There are also annual costs that reduce the net financial benefit of the renewable energy facilities. In addition, the interconnection with the local utility was challenging; it was the biggest delay of the project.

Project Costs

The work presented above has environmental benefits that are not factored into many cost analyses, because such models are not universally accepted. These benefits include, for example, a reduction in air pollution. Thus, most cost analyses ignore environmental benefits and include analyses strictly based on a payback of the initial investment.

Most of the energy-efficiency improvements at this facility were made with little to no capital expenditure. For example, many improvements were made through state, federal, or utility grant money. Energy-efficiency improvements are typically the most cost-effective way to reduce net energy consumption, and the Hyannis WPCF has benefited greatly by being proactive in seeking grant money for this work.

Virtually all funding for the 2009 green energy project came from ARRA. Thus, the payback is nearly zero. Project costs are shown in Table 1. The facilities have annual costs associated with them, including utility fees and monitoring fees as shown in Table 2.

Thus, after the first year, annual fees for operation of the system are almost $20,000. Assuming an average wholesale electricity price of $0.16 per kW-hr, the combined system is projected to produce a net metering benefit of approximately $200,000. Therefore, the annual costs of operating the system represent approximately 10 percent of the overall benefit.

If the project had no grant funding, the payback would have been as shown in Table 3. At a composite payback of 33 years, these projects would not have occurred. The longer payback on the turbines is due to FAA restrictions, and it shows the need for grant funding in general for either component to proceed.

If typical (non-ARRA) funding available at the time of the project is considered, the payback is much more attractive than the previously calculated payback. In Massachusetts, solar renewable energy credits (SRECs) were available at $300 to $600 per MW-hr during project implementation. This rate allows large PV projects to be cost-effective in a reasonable time. Thus, as shown in Table 4, the PV portion would be cost-effective, but the wind turbines would not have proceeded with only typical funding.

One goal of ARRA green energy funding was to invest in renewable energy facilities to help drive the costs down, and thus MassDEP saw the investment in the turbines as a stride toward this goal. As a result, the turbines were included in the project even when the maximum height of the turbines dropped when the new permit was obtained.

Table 1. Green energy project costs

Component	Cost
Wind Turbines	$1,500,000
Photovoltaic Array	$4,240,000
Energy Efficiency Improvements	$60,000
Total	**$5,800,000***

* Earlier in the Methodology section, it was noted the grant that was given to the town by the state was up to nine million dollars. The project costs ended up being significantly lower because the PV array costs were defined by the state on a $/Watt basis and this maximized the size of the array prior to bidding. Bid costs ended up being much lower than the cost assigned by the state.

Table 2. Annual fees for the renewable energy facilities

Annual Cost	Cost	Benefit
Wind Turbine Maintenance Plan	$2,100 (years 1 & 2) $5,400 (subsequent years)	Includes around the clock remote monitoring and preventative maintenance. Remote monitoring is a manufacturer requirement for operation.
Interconnection Insurance	$8,500 ($8.80/kW annually)	In Year 1, the town was required to buy an insurance policy on behalf of the utility for the interconnection. In subsequent years the town was covered through their existing policy.
Cell Phone Data Plan	$1,200	Data plan required to provide communications between the turbines and remote monitoring at the manufacturer's facility.
Third Party Monitoring	$2,250	Required if the town wishes to accrue RECs. Service also provides a website displaying system output which can be accessed by the public.
Primary Service Connection Fee	$10,800 ($900/month)	Utility charge for having a primary service connection over 500 kv.

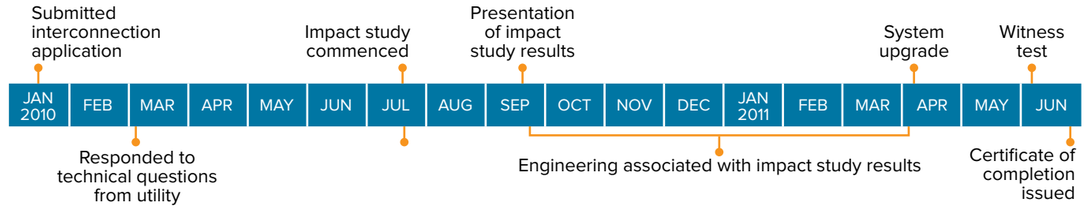

Figure 11. Utility interconnection timeline

Utility Interconnection

The power produced by both the wind turbines and the solar array is delivered to the local utility through a net metering arrangement. The project was held up in a lengthy utility review of the interconnection, the impact of the proposed connection on the grid system, and the various upgrades to the grid needed to accommodate the generated power.

The period from initial application to the utility and the witnessing of the startup of the wind turbines was 18 months. This includes reviews, engineering, and field work by the utility as well as several months lost due to bad winter weather. Figure 11 shows a timeline of this work. The PV system installation also was hampered by bad weather and other delays, and was not fully started up until February 2012.

Table 3. Simple payback without funding

Component	Minimum Payback
Wind Turbines	54 years
Photovoltaic Array	29 years
Total Project	33 years

*Total project payback is based on median SREC value

Table 4. Simple payback with typical funding

Component	Payback
Wind Turbines	Over 20 years. Project would not proceed due to height of turbines
Photovoltaic Array	6 – 11 years
Total Project	9 years*

CONCLUSIONS

As a result of diligent energy-efficiency work and opportune grants for renewable energy and other work, the Hyannis WPCF has reduced its net energy consumption from 2003 through 2013 by 90 percent. Doing so, the facility has cut its energy bill from a high of $300,000 to less than zero as it received a net credit in 2013 due to the pursuit of renewable energy certificates. This work reduces the carbon footprint by approximately 720 tons (653 tonnes) of CO_2 per year. The facility has made great strides in progressing toward becoming a net zero energy facility and its efforts will continue toward this goal.

ABOUT THE AUTHORS

- Marc Drainville is a senior project manager with GHD in Hyannis, Mass. Mr. Drainville has more than 20 years of experience in the planning and design of wastewater infrastructure with a focus on advanced wastewater treatment.
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- Dale Saad, Ph.D, is a senior project manager with the Barnstable department of public works. Ms. Saad oversees staff and programs dealing with water and sewer infrastructure, environmental protection, coastal resources, and energy efficiency.
- Peter Doyle is supervisor of the Hyannis water pollution control facility and has worked at the facility for more than 30 years. Mr. Doyle has overseen all the net energy reduction projects at the facility.

Bio-energy technology advances that promote energy recovery—evolution of a wastewater treatment plant into a resource recovery and reclamation facility

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DRURY WHITLOCK, P.E., CH2M HILL, SALT LAKE CITY, UT

ABSTRACT | Energy management concepts that include bio-energy and energy recovery from wastewater digestion as a source of renewable energy promote sustainability and are an important first step towards energy independence for water resource centers. Energy independence can be achieved through energy conservation, more efficient systems, and renewable energy, including bio-energy production, solar, geothermal, and wind power.[1] Therefore maximizing use of biologically derived energy coupled with other renewable energy sources is now of more interest to water resource and reclamation facility managers. Energy recovery from innovative technical advances in digestion and biosolids provides an opportunity for utilities to invest in energy management to optimize the recovery of energy from various digestion processes, thermal drying and solids reduction, and stabilization to reduce the cost of treatment.[2]

KEYWORDS | Renewable energy, water resource recovery center, bio-energy, anaerobic digestion, energy content, electrical energy efficiency, carbon credit

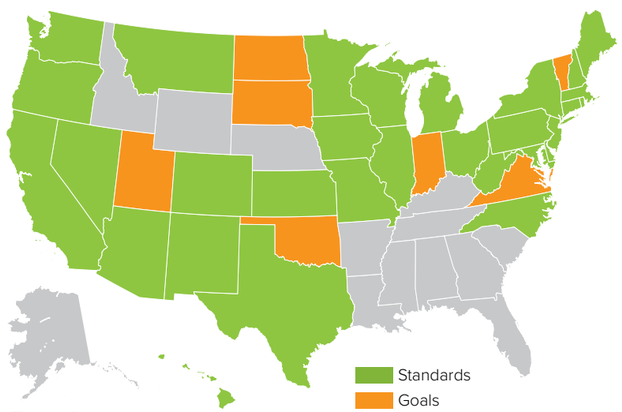

Figure 1.
States with renewable portfolio standards (mandatory) or goals (voluntary), January 2012

PROMOTING RENEWABLE ENERGY

Many wastewater utilities are adopting the perspective of resource recovery in lieu of compliance-oriented regulation as a fundamental sustainability principle. This change has occurred recently and includes the recent evolution of the term "wastewater treatment plant" into a "water resource center" where the products are reclaimed and reused. The three major categories of energy that may be obtained from a water resource center include clean water, nutrients, and hydrocarbons. The drivers for renewable energy include:

1. Enactment of renewable portfolio standards (RPS); more stringent enforcement
2. Carbon management legislation, e.g., carbon tax or cap-and-trade
3. Increase in fossil fuel commodity prices
4. Political will

These four drivers are evolving quickly, which will create new funding opportunities for water resource centers to implement energy recovery. In anticipation of new legislation and quickly evolving state RPS, this paper will summarize how utilities can leverage these new funding sources to promote sustainability and treatment plant energy independence through renewable bio-energy.

Energy management is an important first step towards energy independence for water resource and reclamation centers. Energy recovery from innovative technical advances in digestion and biosolids provides an opportunity to optimize recovery of energy and reduce the cost of treatment.[1]

THE ROLE OF TECHNOLOGY

Technology emergence, growth and development follows a life cycle that may be modeled similar to a microorganism life cycle. Figure 2 depicts the technology life cycle model and shows how the phases change with knowledge, experience with the technology, and successful application.

Four phases make up the technology life cycle, each with a unique focus:

1. Acclimation—Novel, dependent on perception of value added, marketability and strategic importance, risk focused
2. Growth—Understood, well documented applications and signs of transfer success, experience focused
3. Stability and maturation—Growth has been rechecked at the value added plateau. New generation emerges due to feedback and activity from innovation, cost focused
4. Lag phase—The demise of the technology, end-of-life span or emergence of next generation of technology

Table 1 summarizes the life stages of various solids management technologies. The table depicts a number of innovative and acclimating technologies that will emerge with promise or die based on successful application. In many respects the growth of a particular technology is fueled by engineers taking appropriate risk and obtaining experience from new applications to achieve a critical mass that allows the technology to stabilize and mature.

This paper focuses on maximizing the use of the inherent hydrocarbons in wastewater for renewable energy production and will compare and contrast the five wastewater treatment plants regarding

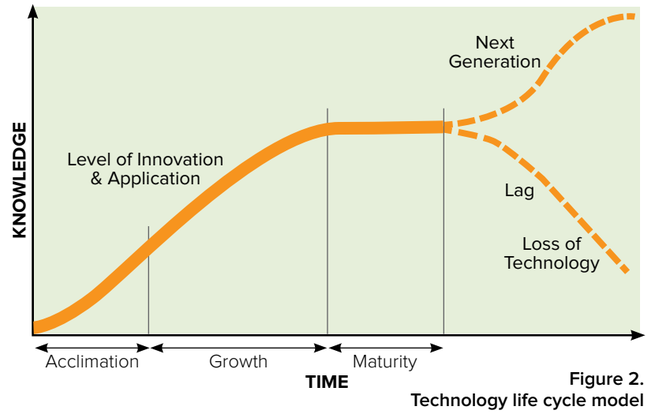

Figure 2.
Technology life cycle model
(Source: Wilson, 2008)

Table 1. Technology life cycle

	Life Phase			
Technology	**Acclimation**	**Growth**	**Stability**	**Lag**
Gravity Belt Thickening			✓	
Rotary Press		✓		
Belt Filter Press			✓	
Vacuum Filter				✓
Centrifuge Dewatering			✓	
Recuperative Thickening		✓		
Acid-Gas Digestion				✓
Temperature Phased Anaerobic Digestion		✓		
Co-Digestion	✓			
Dual Digestion		✓		
Auto-thermal Aerobic Digestion	✓			
Thermal Hydrolysis	✓			
Thermal Drying			✓	
Class A Heat Treat System	✓			
Sludge Disintegration	✓			
Microsludge	✓			
Open Cel	✓			
Lyso	✓			
Ultrasonics	✓			
Ostara	✓			
Co-generation			✓	
Fuel Cell	✓			
Solar Photovoltaics		✓		
Gasification	✓			
Biosolids Composting			✓	

Table 2. Energy content municipal wastewater[5]

Parameter	Raw Wastewater	Primary Sludge	Secondary Sludge	Anaerobic Digested Sludge
-ΔU c (kW-h/lb dry)	0.40	2.00	1.56	1.60
TS (mg/l)	1980	30,500	3160	39100
VS (%)	12%	67%	60%	51%

Data Source: Shizas & Bagley, 2004

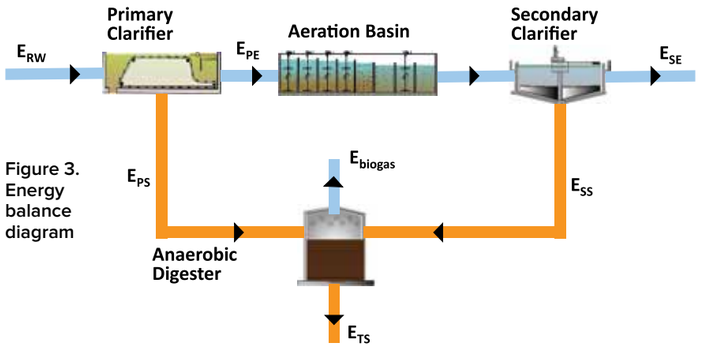

Figure 3. Energy balance diagram

process configuration and energy production. It will review the current state of the art in bio-energy, fuel augmentation, and digestion for achieving and promoting wastewater plant independence from the electrical grid.[3] The energy content inherent in wastewater and solids production will be reviewed to compare the electrical energy production to the energy content in municipal wastewater. Developing statistics for electrical energy production has been a challenge due to the various methodologies for calculating electrical efficiency of systems.[4]

ENERGY CONTENT OF MUNICIPAL WASTEWATER

Raw municipal wastewater has been measured through a calorimeter and combustion process to develop an energy content value for the product. The energy content is defined as -ΔU c and is in units of (kW-h/lb dry) KJ/g dry. This is the energy that is available for work that accounts for the theoretical energy within the organic compounds in raw wastewater or solids processes. The calorimeter measures only the organic fraction of the wastewater. The unit of measure is on a dry weight basis. Table 2 depicts typical measured energy content values for municipal raw wastewater and sludge samples.

The energy content of the raw wastewater is much lower because on a dry weight basis the percent volatile solids are only 12 percent for raw wastewater compared to 51 percent or greater for anaerobically digested sludge. Consequently, most of the energy content of wastewater is in the volatile solids forming the organic compounds, which are principally found in primary and anaerobically digested sludge.

An energy balance may be prepared for a treatment plant based on the energy content of the four major unit processes. The energy balance around a typical municipal treatment plant with anaerobic digestion is depicted in Figure 3.

The energy balance across the unit processes is defined as follows:

- Ep = Qpi(TSpi)(-ΔUpi) - Qpe-i(TSpe-i) (-ΔUpe-i)
- Qp = flow (mgd)
- TSp = total solids concentration (mg/l)
- -ΔUp = energy content (kW-h/d)
- (p =primary, i =influent, e =effluent)

The energy balance neglects the energy in the secondary effluent (Ese) as it is normally negligible. The energy associated with the production of the water quality product is the total embodied energy. Embodied energy comprises the power, chemicals, and building materials for each unit process from point of withdrawal to point of discharge and can be defined as follows:

- n
- ∑ (?e i); i=1
- i=1
- n = unit processes
- ? = energy of process (Kj/kg)

The embodied energy is unavailable for work as it was used to create the water quality product; however, by reducing the energy consumed in each unit process we reduce greenhouse gas emissions. Furthermore, by reclaiming wastewater we reduce the energy imparted in the water cycle through the captured energy consumed in the creation of the water quality. A simple diagram that shows the flow of energy from unit process to unit process is depicted in Figure 4.

The energy in the water cycle and associated energy content when produced by renewable energy reduces the carbon footprint of the reclamation treatment process. The reduction in greenhouse emissions is a function of the energy efficiency of the treatment plant and can be measured by evaluating the electrical energy produced (kW-hour) by each pound of total solids per unit of time.

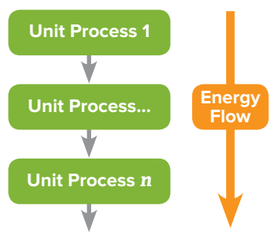

Figure 4. Energy embodied of unit processes

RENEWABLE ENERGY AND PROCESS OPTIMIZATION

Significant renewable energy production at water resource and reclamation facilities may be achieved by including anaerobic digestion processes. Biogas production has a dual purpose of producing electricity and combined heat and power from thermal energy. A study of South Carolina wastewater treatment plants concluded that if biogas were generated at most medium to large facilities, enough energy would be produced to heat 92,000 houses.[6] There is enough energy in biogas typically to heat and power the entire treatment facility if the system sizing and energy efficiency of equipment is not over-designed. Digester bio-augmentation with food wastes and other high-strength wastewaters has been shown to increase biogas production. Additionally, biogas use provides renewable energy credits for treatment plants to achieve a renewable energy portfolio standard by reducing greenhouse gas emissions from fossil fuels. The optimization of biogas production can allow a reclamation facility to be energy neutral.

Besides installation of combined heat and power for more energy production, many measures can improve plant efficiency. For example, it is important to correctly size and position pumps and mixers for each process tank and to include several smaller co-generation engines to allow for an energy effective system.[7]

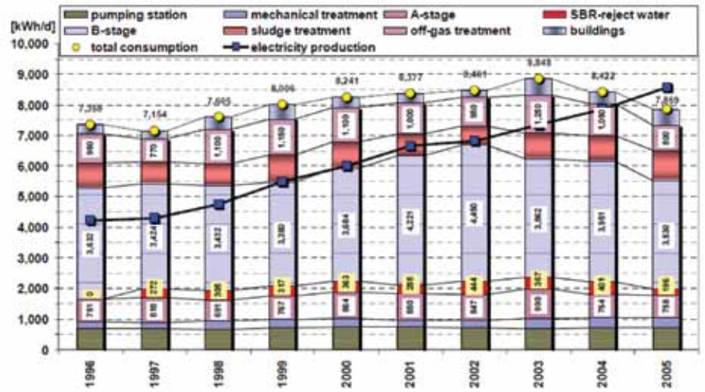

Figure 5. Strass treatment plant energy production and consumption (Wett, et al., 2007)

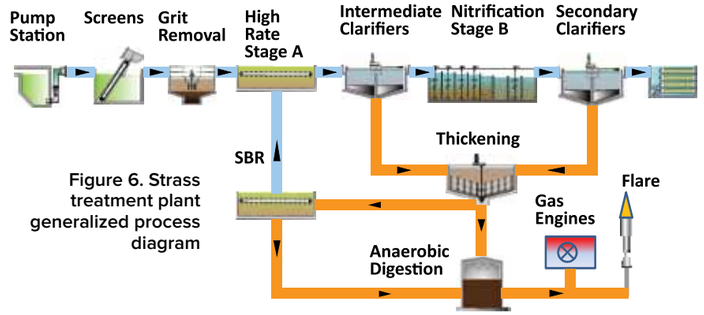

Figure 6. Strass treatment plant generalized process diagram

RENEWABLE ENERGY EXAMPLES

The following examples compare and contrast the solids management operations and renewable energy efficiencies of five facilities, including large [>100 mgd (>378,000 m^3/d)]-to medium [>6 mgd (>23,700 m^3/d)]-sized wastewater treatment facilities looking to achieve sustainable energy independence by augmenting imported energy use through on-site generation. These facilities are being compared to a 6 mgd (23,700 m^3/d)] facility in Innsbruck, Austria, which has achieved energy independence from the electric grid through best-in-class performance. The four facilities being compared from the U.S. were chosen because the municipality and plant operations staff at each facility has a record for long-term energy reduction and use of renewable energy. Table 3 summarizes the facility sizes and unit process configuration.

STRASS WWTP, TWO-STAGE ACTIVATED SLUDGE, ANAEROBIC DIGESTION

This treatment plant has an average daily flow of approximately 6 mgd (23,700 m^3/d) and produces about 3,500 dry tons (3175 dry tonnes) of anaerobically digested biosolids per year or approximately 9 dry tons (8.2 dry tonnes) per day. The treatment plant operates in a two-stage process of intermediate clarification and separate sludge cycle followed by a pre-denitrification stage. The first stage operates on a high organic load to remove 55 to 65 percent of the load while the second stage uses de-ammonification to polish and achieve ammonia nitrogen limits. The first stage is operated at a 0.5-day solids retention time (SRT) and the second stage is operated at a 10-day SRT.[8]

The aeration system in the activated sludge basins is controlled by an on-line ammonia analyzer. The process control is a feedback system, measuring the ammonia concentrations at the effluent end of the basins. The ammonium concentration controls the dissolved oxygen set point in the nitrification and the denitrification basins.

The Strass treatment plant includes combined heat and power and has a biogas to electrical energy

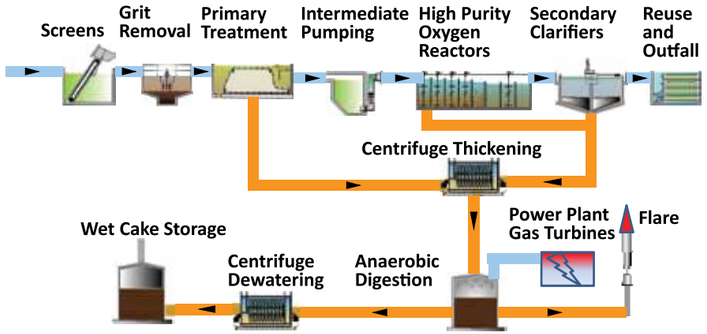

Figure 7. Large facility no. 1 generalized process diagram

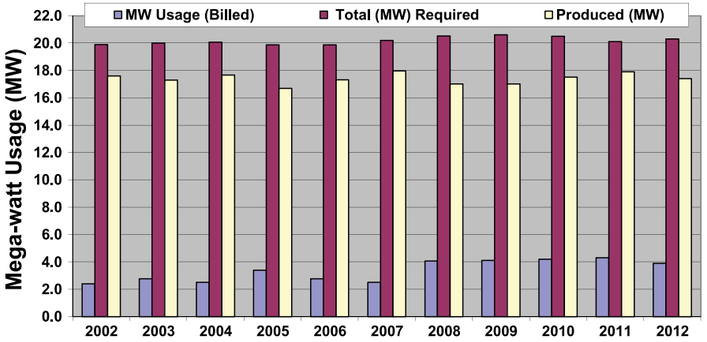

Figure 8. Large facility no. 1 electrical production

Table 3. Wastewater treatment facility comparison

Facility	Q m^3/d ADF (MGD)	Fuel Source	Process
Large facility no. 1	1,210,000 (320)	Biogas	High Purity Oxygen (HPO)
Large facility no. 2	1,210,000 (320)	Biogas	High Purity Oxygen (HPO)
Large facility no. 3*	416,000 (110)	Natural gas/CT	Activated Sludge (AS)
Large facility no. 4	385,700 (102)	Biogas	Activated Sludge (AS)
Medium facility no. 1	79,400 (21)	Biogas	Activated Sludge (AS)
Strass WWTP	23,700 (6)	Biogas	AS - 2 Stage C, N

*Facility is converting to landfill gas; power currently via gas fired combustion turbine (CT).

efficiency of 38 percent. Through optimization of the treatment processes and including a side-stream de-ammonification process it has further decreased energy consumption by approximately 12 percent. The optimizations at the plant are a benchmark for achieving energy independence through optimizing each unit process. The plant generates approximately 8,650 kW-h/d of electricity and consumes about 7,870 kW-h/d so it produces more than 100 percent of its power needs through on-site power generation. This facility has an excellent renewable energy efficiency of 6.4 kW-h/month/lb TSS (14.1 kW-h/month/Kg TSS). The plant can achieve this level of performance due to the combined effects of energy reduction from the de-ammonification process, dissolved oxygen control, biogas production, and other chemical system optimization. Figure 5 depicts the energy production and consumption by unit process.

Figure 6 depicts a generalized process diagram of the facility. The diagram shows both solids and liquids processes.

LARGE FACILITY NO. 1—HIGH-PURITY OXYGEN, ANAEROBIC DIGESTION

This treatment plant uses a high-purity oxygen process and has an average daily flow of 320 mgd (1,210,000 m^3/d). The plant produces about 75,000 dry tons (68,000 dry tonnes) of anaerobically digested sludge annually or 210 dry tons (190 dry tonnes) per day. The sludge is digested anaerobically in a continuous first-stage thermophilic operation followed by an intermittent or cyclic second-stage. The second-stage digester's operation cycles every eight hours. The volatile solids reduction is greater than 60 percent with a 13- to 15-day HRT. The process produces Class A biosolids for beneficial reuse that is land applied as a soil amendment. Approximately 7.5 million to 8 million cubic feet (212,000 to 227,000 cubic meters) of biogas is converted to electricity per day. The biogas is sent to a nearby power plant and is combusted in gas turbines; the power is sold to the treatment plant at a reduced rate.

The plant generates approximately 87 percent of its power needs via on-site power generation. This facility has one of the highest renewable energy efficiencies at 6.7 kW-h/month/lb TSS (14.8 kW-h/month/Kg TSS) based on the amount of on-site power generation. Figure 7 shows a generalized process diagram of the facility.

Figure 8 shows the electrical energy produced by the facility from 2002 through 2012.

LARGE FACILITY NO.2—HIGH-PURITY OXYGEN, ANAEROBIC DIGESTION

The treatment plant uses a high-purity oxygen process and has an average daily flow of 1,210,000 m^3/d (320 mgd). It produces about 40,000 tons (36,000 tonnes) of anaerobic digested solids annually or 110 tons (100 tonnes) per day. The sludge is anaerobically digested in a continuous acid gas mesophillic operation. The volatile solids reduction is typically 55 percent with an 11- to 12-day HRT. The process produces Type 1 (Class A) biosolids for beneficial reuse that is pelletized as a fertilizer for land application. Approximately 4.5 million to 5.5 million cubic feet (128,000 to 156,000 cubic meters) of biogas is converted to electricity per day. The biogas generated from digestion is collected and used in an on-site power plant to create steam that supplies hot water and heat for the facility. The steam is also run through a steam turbine generator that produces electricity. The plant generates approximately 17 percent of its power needs via on-site power generation. This facility has a renewable energy efficiency of 1.9 kW-h/month/lb TSS (4.2 kW-h/month/Kg TSS) based on the amount of on-site power generation.

Digester gas-derived electricity generated by the steam turbine qualifies as a renewable source of energy under the state's RPS program. This program requires that a minimum amount of power that is supplied into the market come from renewable energy. The treatment plant is given credit certificates for each megawatt (MW)-hour of on-site electricity produced. This facility generated $1 million in revenues from renewable energy in 2008 and $700,000 in 2009. Figure 9 depicts a generalized process diagram of the facility.

Figure 10 shows the electrical energy produced by the facility from 2008 through 2010.

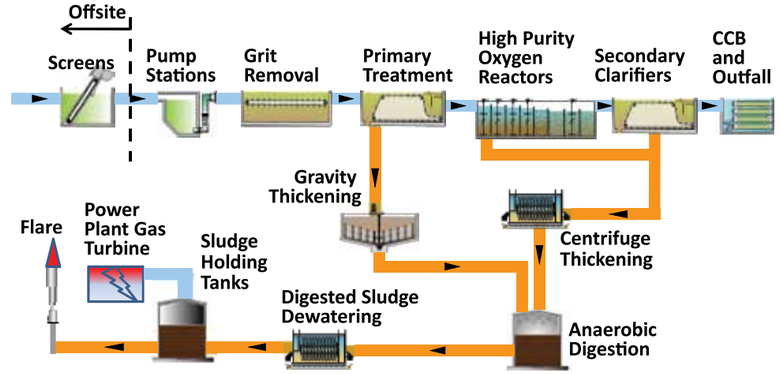

Figure 9. Large facility no. 2 generalized process diagram

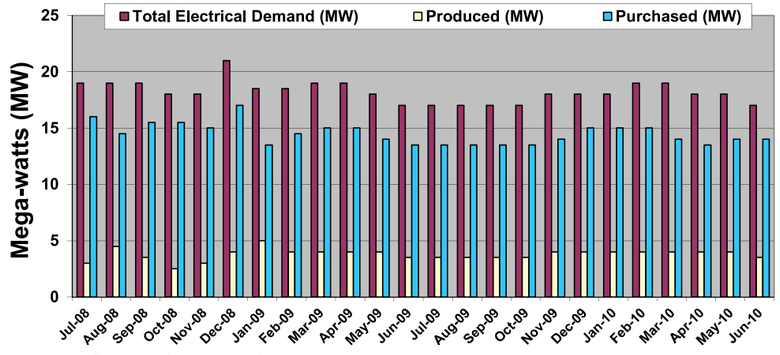

Figure 10. Large facility no. 2 electrical energy production

LARGE FACILITY NO. 3—ACTIVATED SLUDGE, THERMAL DRYING

The treatment plant uses an activated sludge process and has an average daily flow of 110 mgd (416,000 m^3/d). The solids treatment facilities include gravity belt thickening, sludge equalization and blending, belt filter press dewatering, and rotary drum drying. The plant produces about 45,000 tons (41,000 tonnes) of dry biosolids annually from primary and waste-activated sludge or 125 dry tons (113 dry tonnes) per day. The sludge is dried in direct-indirect rotary dryers, and the waste heat supplements the natural gas-fired gas turbines for on-site electricity production. The process produces a Class A pelletized fertilizer for beneficial reuse. Waste heat is collected and used for heating and electricity production.

Much of the electricity at the facility is generated on-site through two combustion turbine generators, each rated for 15 MW of power. The treatment plant's electrical loads generally require between 10 and 12 MW, therefore only one turbine generator needs to operate at a time. The second generator is standby. The turbines were installed in the 1970s and were retrofitted in the mid-1990s. Waste heat from the turbines is used in the sludge drying process. During on-peak periods the turbines are operated to avoid peak demand charges. At night, the turbines produce only enough waste heat to operate the dryers with the remaining electrical power purchased from the electric company. Electricity from the power company can be purchased to supply any difference in on-site generated power and required power. Natural gas is provided to the plant and generates electrical power. Natural gas is also used for sludge drying and to provide heat for on-site buildings.

The plant generates approximately 65 percent of its power needs via on-site power generation. This facility has an energy efficiency of 12.7 kW-h/month/lb TSS (28 kW-h/month/Kg TSS) based on the amount of on-site power generation. Its energy efficiency is higher than the other facilities since

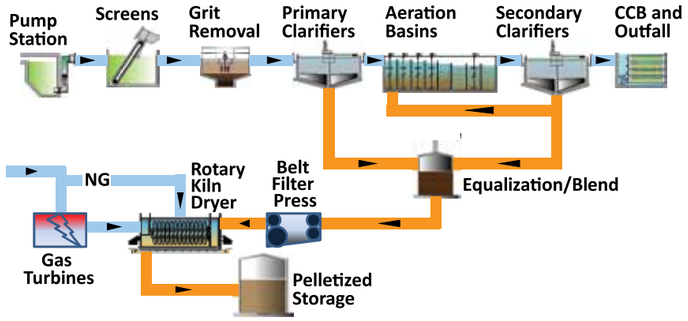

Figure 11. Large facility no. 3 generalized process diagram

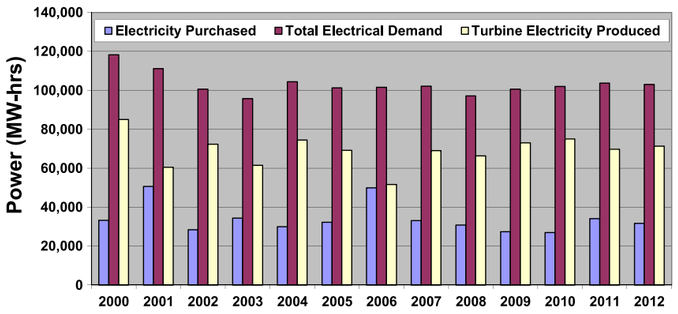

Figure 12. Large facility no. 3 energy production

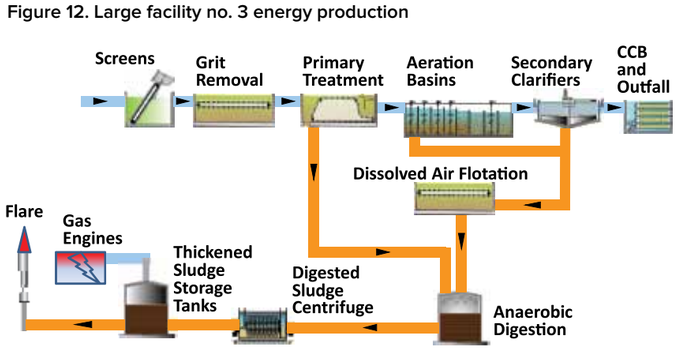

Figure 13. Large facility no. 4 generalized process diagram

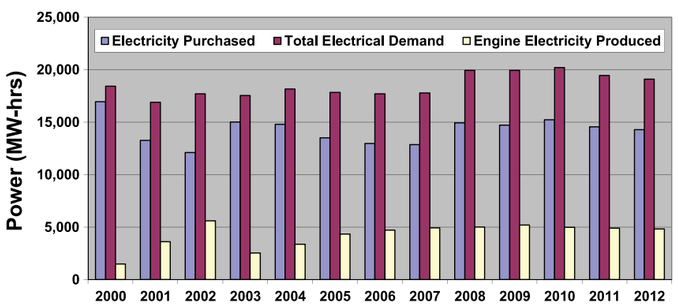

Figure 14. Large facility no. 4 energy production

natural gas is fired in combustion turbines on-site. However, the facility plans to use landfill gas in the future; therefore, renewable energy credits are not being achieved.

The facility is constructing a landfill gas pipeline to replace the natural gas used in sludge drying. The pipeline will save ratepayers approximately $25 million to $65 million over the next 20 years. The saving comes from buying landfill gas at 48 percent of the price of natural gas. The landfill gas would be burned in three new 4.8-MW gas turbines at the treatment plant.

The state where this facility is located has increased its RPS from approximately 2.2 to 10 percent of electricity sales from renewable energy by 2015. Additionally, state agencies were required to increase their annual electric energy purchase from renewable sources to 20 percent by December 2011. Figure 11 depicts a generalized process diagram of the facility.

Figure 12 shows the energy produced at the facility from 2000 to 2012.

LARGE FACILITY NO. 4—ACTIVATED SLUDGE, ANAEROBIC DIGESTION

The treatment plant uses an activated sludge process and has an average daily flow of 102 mgd (385,700 m^3/d). The solids handling facilities include anaerobic digestion, centrifuge sludge thickening, filter press sludge dewatering, and liquid sludge storage. The plant produces about 33,000 tons (30,000 tonnes) of dry biosolids annually from primary and waste-activated sludge or about 89 dry tons (81 dry tonnes) per day. The biosolids are thickened by dissolved air flotation followed by anaerobic digestion. The facility has mesophillic single-stage anaerobic digestion. The process produces a Class B liquid fertilizer for land application and beneficial reuse.

In addition to electrical power from the digester gas-fired engines, the biogas produced from the anaerobic digesters powers the process aeration blowers and an electrical generator. The generator is used for peak shaving, because it is not sized to manage the full electrical load at the treatment plant. Waste heat recovered from the blowers and the electrical generator is routed to the hot water system and used to heat the digesters and other plant buildings.

The plant generates approximately 20 percent of its power through on-site generation. This facility has a renewable energy efficiency of 0.7 Kw-h/month/lb TSS (1.6 Kw-h/month/Kg TSS) based on the amount of on-site power generation.

Figure 13 depicts a generalized process diagram of the facility.

Figure 14 shows the energy produced at the facility from 2000 to 2012.

MEDIUM FACILITY NO. 1—ACTIVATED SLUDGE, ANAEROBIC DIGESTION

This treatment plant has an average daily flow of approximately 23 mgd (79,400 m^3/d), and produces about 4,000 dry tons (3629 dry tonnes) of anaerobic digested biosolids per year or 14 dry tons (12.7 dry tonnes) per day. The solids handling facilities include gravity belt thickeners, anaerobic digestion, digested sludge gravity belt thickeners, and digested sludge storage. The biosolids at the facility are rotary drum screened and then gravity belt thickened to 8-percent dry solids. The anaerobic sludge is digested in a continuous acid-gas mesophillic operation. There are six anaerobic digesters, including four primary and two secondary ones. The volatile solids reduction is typically 80 percent with a 17- to 21-day hydraulic retention time (HRT). Approximately 500,000 to 600,000 cubic feet (14,000 to 17,000 cubic meters) of biogas is converted to electricity per day. The biogas from the digestion process is collected and used in on-site biogas fired engines to create electricity and heat for the facility. The thickened sludge is hauled to another facility where it is rotary drum dried and pelletized. The process produces a Class A product for beneficial reuse and is pelletized as a fertilizer for land application.

The plant generates approximately 37 percent of its power through on-site generation. This facility has a renewable energy efficiency of 3.5 kW-h/month/lb TSS (7.7 kW-h/month/Kg TSS) based on the amount of on-site power generation. Figure 15 depicts a generalized process diagram for the facility.

Figure 16 depicts a detailed advanced biogas system diagram of the facility.

Figure 17 shows the energy produced at the facility from 1994 to 2011.

SUMMARY

Wastewater treatment plants are changing their mission and evolving into resource recovery and reclamation facilities. The facilities that include anaerobic digestion and other renewable energy processes can achieve independence from the energy grid. Utilities can leverage renewable energy to obtain credits from these new funding sources to promote sustainability and plant energy independence through effective use of renewable bio-energy. Figure 18 depicts the energy production based on plant size.

The energy savings from bio-energy production can be significant over a 20-year period. Figure 19 shows the energy savings over 20 years for Medium Facility No.1, using 12 cents per kilowatt-hour. Paybacks for

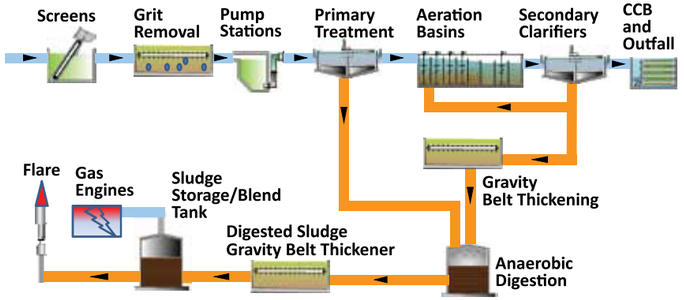

Figure 15. Medium facility no. 1 generalized process diagram

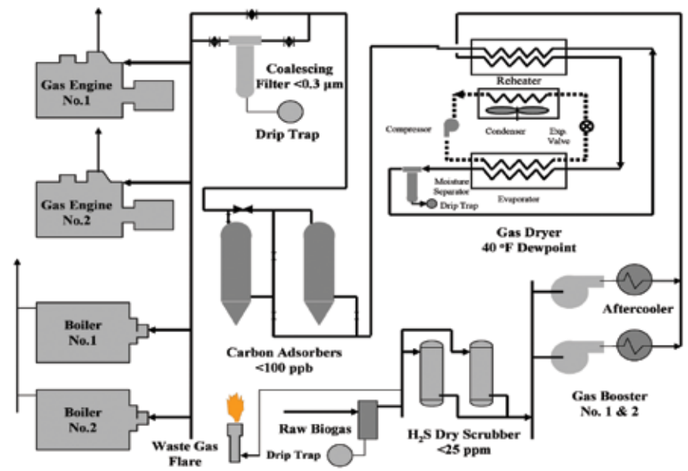

Figure 16. Advanced biogas system diagram

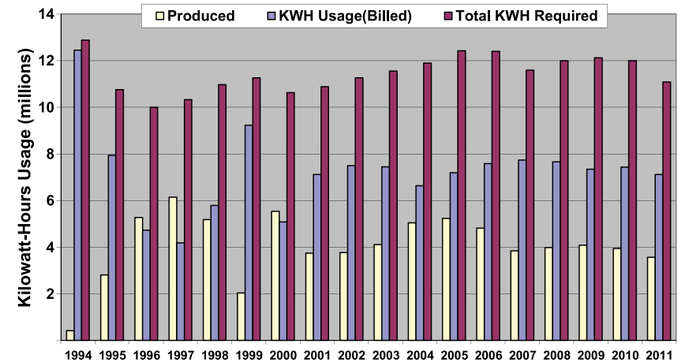

Figure 17. Medium facility no. 1 energy production

energy generation facilities can be 8 years or less, assuming anaerobic digestion is already on-site.

Figure 20 shows the straight line carbon credit for Medium Facility No.1 based on the sub-regional carbon dioxide emission factor and a CO_2 credit of ($3.85/1000kg).

Future resource recovery and reclamation facilities will need to take advantage of potential funding and credit opportunities, and include renewable energy in the design of their facilities to promote sustainability and to achieve energy independence from the electrical grid. Sustainability requires us to look ahead, to harness and promote technology to improve water quality and reduce environmental impacts. Water resource recovery and reclamation facilities will enable us to meet those future challenges.

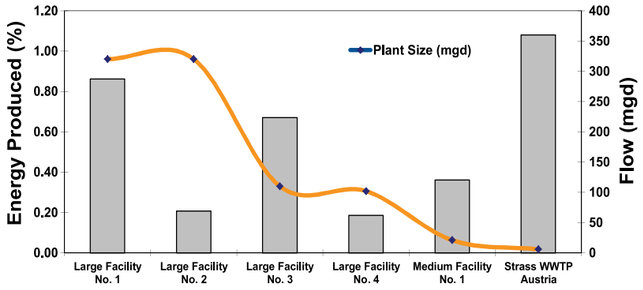

Figure 18. Energy production vs. plant size

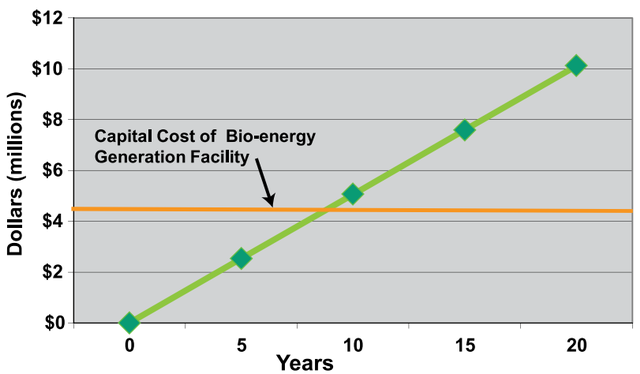

Figure 19. Medium facility no. 1 energy savings

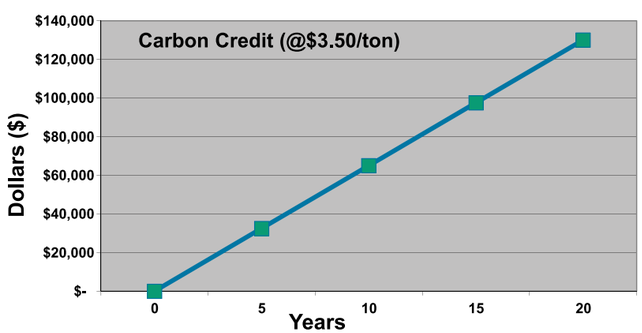

Figure 20. Carbon credit medium facility no. 1

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One of a kind—maximizing resource recovery at Lewiston-Auburn, Maine

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ABSTRACT | The Lewiston-Auburn Water Pollution Control Authority (LAWPCA) operates a 53,000 m^3/d (14 million gallons per day {mgd}) secondary wastewater treatment facility (WWTF) that was placed on line in 1973. For the last 20 years, facility solids have been thickened, dewatered, and transported to a LAWPCA-owned in-vessel composting facility or, seasonally, have been lime stabilized and used on area farms to grow corn and hay. LAWPCA now has new anaerobic digestion and energy recovery facilities that precede and enhance the composting and land application programs. The LAWPCA facility is the only municipal wastewater treatment facility (out of approximately 120 facilities) in Maine employing anaerobic digestion and the largest facility in the state managing its own biosolids programs. The driving factors for the project, a description of the new facilities, and startup and operating results are presented. Lessons learned and possible opportunities for other utilities considering similar changes, particularly those utilities without digesters, are also presented.

KEYWORDS | Anaerobic digestion, energy recovery, combined heat and power, biosolids, beneficial use, resource recovery

INTRODUCTION

The LAWPCA treatment facility serves the southern Maine communities of Lewiston and Auburn, which have a combined population of approximately 65,000 people. The facility also treats septic and holding tank wastes generated in 26 area communities. Average annual wastewater flows range from approximately 38,000 to 46,000 m^3/d (10 to 12 mgd). For the last 20 years, facility solids have been thickened, dewatered, and transported to a LAWPCA-owned in-vessel composting facility, or seasonally have been lime stabilized and used on area farms to grow corn and hay. Figure 1 shows a schematic of the biosolids process.

Primary solids are thickened in two gravity thickeners. Waste-activated solids were thickened by two dissolved air flotation thickeners, which were recently replaced with two gravity belt thickeners. The resulting sludges are then blended and conditioned with polymer immediately before dewatering on two belt filter presses, achieving average cake solids of approximately 17 percent. A portion of the solids were transported to an in-vessel composting facility owned and operated by LAWPCA, and the compost product was sold for a variety of uses. Figure 2 shows the interior of the in-vessel composting facility, and the blending of dewatered biosolids and amendment before the mixture is composted.

After composting, the biosolids mixture is sold as a soil amendment or mulch. Part of the dewatered biosolids production was lime conditioned (bypassing the composting facility) and transported to area farms for field application. Figure 3 depicts vehicles used on the application an area farm.

LAWPCA now has new anaerobic digestion and energy recovery facilities that precede and enhance the composting and land application programs. Figure 4 shows an aerial of the wastewater treatment facility along the Androscoggin River in Maine, with the new facility shown on the lower left.

PROJECT DRIVERS

By 2008, solids generation at the wastewater treatment plant had reached a level where the capacity of the compost facility was seasonally insufficient to process all of the LAWPCA biosolids produced. In addition, the costs for land application had risen significantly due partly to the need to offset the lime used to achieve Class B pathogen and vector standards with supplemental nutrients on farm fields receiving those biosolids. Biosolids that could not be managed "in house" via composting or land application were generally trucked to a distant landfill at much higher costs.

In 2008, the landfilled volume of LAWPCA biosolids reached 12 percent of total production. The volume of biosolids produced was also expected to rise with growth in the twin cities of Lewiston and Auburn. Most of the additional production would likely need to be landfilled, raising operational costs significantly for the facility.

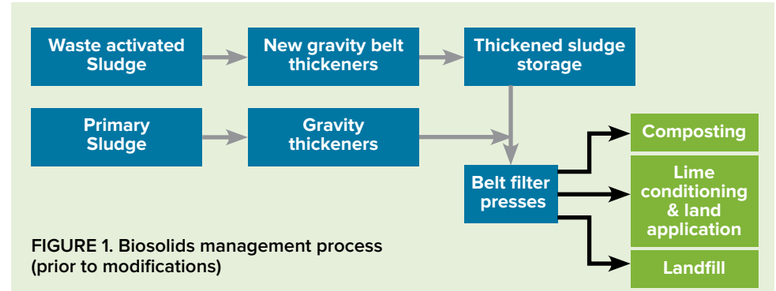


FIGURE 1. Biosolids management process (prior to modifications)

Figure 2. In-vessel composting facility

Figure 3. Application of stabilized biosolids

ECONOMIC EVALUATION

The LAWPCA board of directors commissioned a feasibility study that determined that anaerobic digestion and a combined heat and power energy recovery system could be constructed for approximately $15 million. The study also found that approximately $640,000 would be saved annually in biosolids management-related costs, and an additional savings of approximately $280,000 could be realized from generating electricity to reduce power purchased from the grid.

DESIGN CONSIDERATIONS

The LAWPCA board of directors authorized the project in 2010. Design was completed and construction commenced in 2011. The anaerobic digesters were started up in June 2013 and achieved full operation, including power production, in November 2013. Figure 5 is an aerial view of the LAWPCA facilities before and after construction. Figure 6 is a similar view with the proposed facilities shown using the three-dimensional drawings from the project design. The drawings allowed for visualization of the completed project, enhancing project communication, and they were used extensively at public meetings.

Early design decisions included the following:

- Triple bottom line analysis in which social,

FIGURE 4. Aerial of LAWPCA facility with new anaerobic digesters (lower left)

Figure 5. Pre-construction and post-construction

Figure 6. Three-dimensional rendering of proposed facilities

environmental, and financial attributes are all considered to ensure process sustainability. This is consistent with LAWPCA's environmental management system, which has been certified by the National Biosolids Partnership. Additional benefits were quantified by examining expected reductions in total energy use and greenhouse gas reductions, estimated at 55 and 80 percent, respectively.

- Use of two mesophilic digesters operating in parallel. This decision was made based on their cost-effectiveness and stability of operation compared to thermophillic temperature, phased, and other digester operating modes.
- Configuration of the digesters with conventional straight walls and fixed cover rather than egg-shaped. This selection was chosen due to cost-effectiveness.
- Use of reciprocating engines over micro-turbines. This selection was made because the former is a more mature technology that tolerates moderate levels of siloxanes, known to be found in digester gas, and require less energy input for gas pressurization.
- Selection of pumped circulation in lieu of mixing with gas lances or draft tube mixers. The drivers for this decision were mainly maintenance concerns and operational flexibility.
- Installation of fixed covers for membrane gas storage instead of floating covers to better manage potential process upsets and address safety concerns.
- Inclusion of gas cleaning using iron sponge for hydrogen sulfide removal. This was included with provision for future systems for siloxane removal.
- Re-purposing of one of the two 57-m^3 (15,000-gallon) septage receiving tanks to accept feed-stocks for anaerobic digestion so LAWPCA could experiment with adding high strength wastes to the digesters.

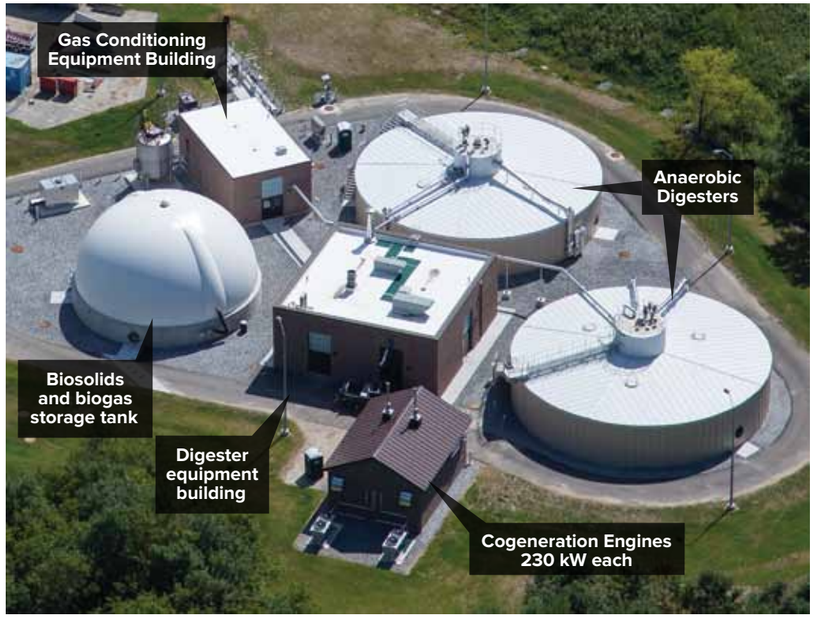
DESCRIPTION OF NEW FACILITIES

Figure 7 is a schematic of the new biosolids processing facilities. Thickened waste-activated sludge, primary sludge, and outside wastes are all conveyed to the digesters. Any overflow of digested biosolids is by gravity to a holding tank. Digested biosolids are pumped to the belt filter presses. Biosolids are distributed to either the composting facility or the direct land application program. The schematic also shows that biogas is stored, conditioned, and used in either the engine generators or the gas boilers. As a last alternative, the gas can also be flared. Under normal operating conditions, ample heat is recovered from the engine cooling system to supply heat to maintain adequate temperature (96˚F) (36˚C) in the anaerobic digesters. Figure 8 shows an aerial view of the major equipment and facilities. Table 1 lists all project equipment and facilities.

PROJECT COSTS, FINANCING AND RATE IMPACTS

A 25-year projection of capital and operating costs was developed as part of a continuous communications program to inform the board of directors, Lewiston and Auburn elected officials, and the public regarding the project. The life-cycle cost analysis was favorable largely due to an expected low-interest loan from the state revolving loan (SRL) fund, potential partial principal forgiveness, cost reductions for biosolids management and purchased power, and possible additional revenues from management of outside wastes. The analysis showed that annual operating costs were expected to be reduced by approximately 40 percent and that $15 million to $25 million could be saved by LAWPCA over 25 years depending on the outside waste revenues realized.

The anaerobic digestion and energy recovery project cost was approximately $15 million, including legal and engineering costs. The cost includes the two gas co-generation engines, which were originally structured as a bid alternate. LAWPCA had determined that the co-generation engines could be added later since the bulk of the savings resulted from reduced biosolids management costs and that grants may be later available for the co-generation engines, since grants were not immediately available when the project went out for bid. There was a favorable bidding climate in 2011 in Maine, and the contractor's bid was approximately $1 million lower than the engineer's estimate and below the project budget established as part of the 2009 project feasibility study. The lower bid cost allowed LAWPCA to add the engines and also complete three additional improvement projects using the available SRL bond funds. These additional projects included two significant electrical upgrades to plant equipment and the addition of infrastructure to accept sewer cleanout truck wastes used by both cities to maintain the collection system.



The new biosolids processing facilities

Table 2 shows the sources of funds for the project, which were largely clean water state revolving funds (CWSRF) that carried an interest rate of 1 percent. The annual debt service on the loan is approximately $921,000. In 2012, LAWPCA retired a 20-year bond for the composting facility, which cost $525,000 per year. Therefore, the project would require a minimum savings of approximately $400,000 per year in order to avoid a rise in sewer use rates.

Table 2 also shows expected cost savings to LAWPCA. Annual savings of approximately $815,000 are anticipated. The land application savings is based on a reduction in volume of biosolids to transport to area farms as well as a significant savings in not having to use lime for stabilization to meet Class B standards. The composting savings is based on the reduced volume transported to and processed by LAWPCA's composting facility. This also accounts for the reduced revenues from the sale of compost product, which is normally sold for approximately $5 to $7 per cubic yard ($7 to $9 per cubic meter). Contract disposal savings are based on the volume reduction achieved in anaerobic digestion, effectively eliminating the need for outside landfill disposal services. The energy savings were estimated based on use of all power on-site.

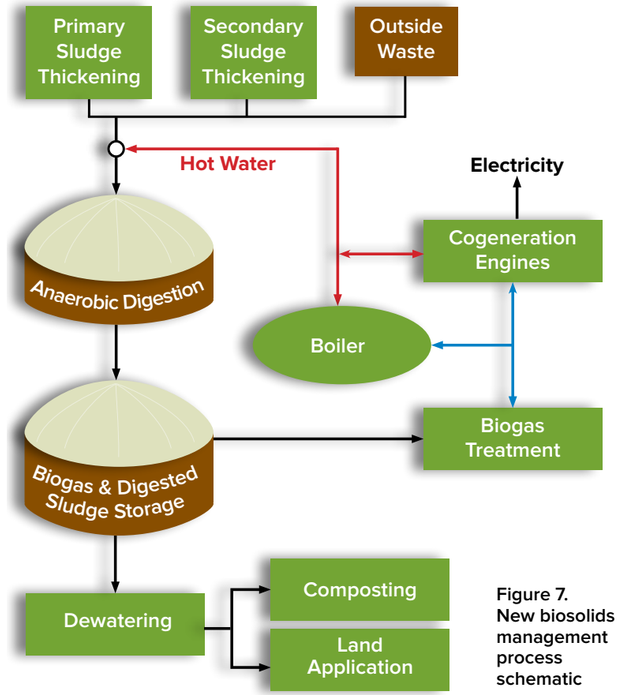


Figure 7. New biosolids management process schematic

Table 1. Project equipment and facilities

ITEM	TYPE	NO.	SIZE (each)
Digester Feed			
WAS Thickening	GBT	2	2-meter
			35 m^3/hr (150 gpm)
Outside Waste Receiving	Tank	1	57 m^3 (15,000 gal)
Feed Pumps	Rotary Lobe	4	0-28 m^3/hr (0-120 gpm)
Anaerobic Digestion			
Digesters	Tank	2	2,610 m^3 (690,000 gal)
			20 m diameter (65 ft)
			7.6 m depth (25 ft)
			20d HRT (Avg)
			15d HRT (Max Mo.)
Mixing Pumps	Chopper	3	815 m^3/hr (3,350 gpm)
Recirculation Pumps	Chopper	3	70 m^3/hr (300 gpm)
Heat Exchangers	Concentric Tube	2	400 kW (1.4 MBTU/hr)
Boilers	Dual Fuel	2	630 kW (2.2 MBTU/hr)
Digested Sludge/Biogas Storage			
Digested Sludge Storage	Tank	1	635 m^3 (168,000 gal)
			2.8d storage
Biogas Storage	Membrane	1	935 m^3 (33,000 cu ft)
			5 hr storage
	Blowers	2	275 m^3/hr (160 scfm)
Tank Mixers	Chopper	2	350 m^3/hr (1,500 gpm)
Belt Press Dewatering Feed Pumps			
Pumps	Rotary Lobe	3	42 m^3/hr (180 gpm)
Biogas Conditioning			
Foam Separator	Spray Wash	1	0.6 m^3/hr (2.5 gpm)
Condensate and Sediment Traps	Electric Actuators	4	0.4 l (1.5 gal)
Hydrogen Sulfide Removal	Iron Sponge	1	22 m^3 (785 cu ft)
Biogas Booster	Rotary Lobe	1	290 m^3/hr (170 scfm)
Waste Gas Burner	Unenclosed/ Natural Gas Pilot	1	24,000 m^3/hr (14,000 scfm)
Co-Generation System			
Engines	Reciprocating	2	
	Electric Output		230 kW
	Thermal Output		340 kW (1.17 MBTU/hr)

A decision was made at the time of facility design to slightly increase overall capacity to manage both future growth and outside wastes. Presently, the market for accepting outside waste material is immature and less defined, thus the potential for increasing revenue from this source is still largely unknown. LAWPCA has been receiving outside wastes or process feedstock at a trial rate of $5.25/1,000 liters ($20/1,000 gallons) and the above estimate for co-digestion of other organics is made based upon that figure. Other related considerations needing further evaluation include the volume of additional gas from a given feedstock, the ease of handling the outside waste material, and the degree to which the material increases solids production from the digesters. LAWPCA has set a below-market rate fee for composting of other biosolids. This is based on LAWPCA's need for periodic maintenance shutdowns and the need to evaluate alternative management options during those periods. The future potential revenue from this source is also unknown.

The total estimated savings and increased revenue exceed the annual bond debt service, so LAWPCA does not have to raise user rates to accommodate the project.

OPERATIONAL RESULTS

Table 3 compares the expected design operating results to actual August 2014 data. The anaerobic digesters are operating at or above expectations. LAWPCA received whey wastes from a yogurt manufacturing facility during the month. These wastes represented from 8 to 16 percent of the total volatile solids feed to the digesters. The whey wastes have a COD of approximately 60,000 mg/L, which is midway between LAWPCA's primary sludge (80,000 mg/L) and waste-activated sludge (40,000 mg/L) values.

Table 2. Project cost, financing, and rate impact

ITEM	AMOUNT
Project Construction and Engineering Costs	**$15,010,000**
Source of Funds	
• CWSRF	$13,800,000
• CWSRF Principal Forgiveness	$880,000
• Efficiency Maine Grant	$330,000
TOTAL	**$15,010,000**
Annual Debt Service on CWSRF Loan	$921,000
Project Annual Savings	
• Land Application	$310,000
• Composting	$170,000
• Contract Disposal	$150,000
• Energy	$130,000
• Co-Digestion of Other Organics	$20,000
• Composting of Other Biosolids	$180,000

Table 3. Anaerobic digestion & energy recovery performance comparison

Parameter	Design Conditions	August 2014
Feed		
kg/d	12,425	8,800
lb/d	27,400	19,400
% TS	5.7	5.1
m^3/d	220	166
gal/d	58,000	44,700
% VS	75	75
VS kg/d	9,320	6,610
VS lb/d	20,550	14,550
HRT, days	24	31
VSR, %	55	56
Biogas Volume		
m^3/hr	202	175
cu ft/d	170,000	148,000
Yield, m^3/kg VSR	0.94	1.12
cu ft/lb VSR	15	18
Biogas Methane Content, %	55	65

Biogas yields, measured by volume divided by volatile solids converted to biogas, are very good which may be a reflection of the outside wastes. Biogas methane content, measured at 65 percent, is also in line with industry standards (55 to 75 percent).

OBSERVATIONS AND LESSONS LEARNED

This project offers many lessons learned for other utilities contemplating similar facilities. The project showed that with the right economic circumstances, a capital-intensive project involving anaerobic digestion and energy recovery can be justified even in a facility that did not originally have anaerobic digestion. Lessons learned and operational observations that may be useful to similar facilities considering anaerobic digestion include:

- Synchronizing the electrical output of the co-generation engines with the grid. Originally, power was not being fed back to the grid. Instead, a constant minimum of 100 kW was coming from the grid. Maintaining this buffer proved to be nearly impossible though. It was necessary to work with the local utility to allow feeding power back into the grid so that both engines could be run even when plant demand was low. This was one of the most complicated aspects of the project.
- Gas conditioning and gas safety equipment cold-weather challenges. The need for enhanced protections became evident during the severe prolonged cold spell known as the "polar vortex" of 2014. Additional tank and equipment insulation and heat tape are being considered as possible solutions to these issues.
- LAWPCA operations and maintenance crews cannot be given enough credit as they have taken on the changes in operation without an increase in staff and have embraced the changes with an unceasing "can do" attitude.
- Meeting Class B biosolids requirements without lime. This has not been a problem, and significant odor reduction has been demonstrated.
- Significant impact on dewatering operations by the change to anaerobic digestion. Slightly higher cake solids had been expected with the lower volatile solids from the digester. However, cake solids have decreased by 4 to 5 percent, and polymer use is two to three times the amount before anaerobic digestion. LAWPCA has re-examined conditioning and dewatering operations, tried different polymers, and is exploring a change in dewatering technology.
- More amendment for the in-vessel composting process. The wetter cake required more amendment for the in-vessel composting process, and the increased polymer content led to clumping

and compost balls appearing in the final product. Compost facility operators worked around these issues, specifically with the use and inclusion of some undigested material from other facilities.

- Optimization of the mixing and feed cycles in the digesters to minimize foaming and temperature swings in the digester heat exchange/circulation loop. The addition of variable frequency drives (VFDs) to the digester mixing pumps and/or decoupling the foam suppression sprays from the mixing pumps (and running instead from the digester circulation pumps) may aid improvements in this area.

CONCLUSIONS

The economic analysis clearly showed how existing practices, if continued, would have resulted in escalating operation and maintenance costs. LAWPCA was fortunate that the Maine Department of Environmental Protection and Maine Municipal Bond Bank were enthusiastic supporters of the project and, as a result of frequent communication and outreach (such as presentations to the city councils of both Lewiston and Auburn), the project had essentially no public opposition. Careful analysis of the economic opportunities, along with a value engineering study that confirmed the economic analysis as well as the design decisions, added to the project confidence level and the support of LAWPCA's board of directors. LAWPCA has added new anaerobic digestion facilities that will add resilience and sustainability to the biosolids beneficial reuse program and provide for reduced greenhouse gas emissions at no additional costs to the rate payers.

ACKNOWLEDGEMENTS

We are thankful to all the team members, including the LAWPCA board of directors who believed in the project, CDM Smith who verified the feasibility of the project and designed the infrastructure, the general contractor, Methuen Construction, and their subcontractors, who worked with both pride and flexibility to make the design a reality, and finally to the treatment plant and compost staff who embraced the changes in operation and made the project work.

ABOUT THE AUTHORS

- John Donovan is a senior vice president of CDM Smith and located in the Cambridge, Mass., office. He has 40 years of experience on a wide variety of environmental projects. He serves as a company-wide expert on biosolids management and is the author of more than 50 publications and presentations on biosolids topics.
- Clayton "Mac" Richardson is superintendent of the Lewiston-Auburn Water Pollution Control Authority. He has been with LAWPCA since 1988, serving as assistant superintendent and now superintendent. During his tenure Mr. Richardson has planned and executed a number of projects, including implementation of selector/contact stabilization processes in the activated sludge system and two major biosolids processing improvements, biosolids in-vessel composting and anaerobic digestion with energy recovery.
- Travis Peaslee is the assistant superintendent of LAWPCA. He has been in that role for the past 5 years. Prior to that, he was lead operator for the Saco, Maine water resources reclamation facility.

LAWPCA hosts specialty conference tour

NEWEA toured LAWPCA's wastewater treatment plant and composting facility as part of the residuals/NEBRA specialty conference held on October 22–23 in South Portland, Maine. The tour was led in two groups by Clayton "Mac" Richardson and Travis Peaslee (shown), and over 25 participants attended from the conference. The specialty conference focused on changes to biosolids regulations under way in three New England states, the ever-increasing demand to manage nutrients and optimize systems, anaerobic digestion, combined heat and power, and co-digestion.

Survey of New England experience with drip dispersal of wastewater effluent

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ABSTRACT | While 95 percent of the U.S. experience with drip dispersal is outside New England, national experience dates back more than 20 years and covers areas of the country with comparable climatic conditions. The number and type of such systems recently installed in New England is presented along with present cost data to illustrate those situations in which drip dispersal may be cost-effective compared to other land-based effluent disposal systems. Drip dispersal is not always cost-effective, but several design aspects help the practitioner to identify cost savings.

KEYWORDS | Drip dispersal, drip irrigation, land disposal, septic tank effluent, mounded disposal system, groundwater recharge

Figure 1. Elements of the typical drip dispersal system
Sources: (A) adapted from American Manufacturing, 2001; (B) Oakson, Inc., 2014

INTRODUCTION

Drip dispersal of wastewater effluent is widely used in the U.S., but it is only recently gaining popularity in New England. This paper documents the number and type of such systems recently installed in New England and presents cost data to illustrate situations in which drip dispersal may be cost-effective compared to other land-based effluent disposal systems.

WHY EFFLUENT RECHARGE IS IMPORTANT

Owners, operators, and design engineers must optimize wastewater management facilities in four areas:

- Wastewater collection
- Wastewater treatment
- Effluent disposal
- Residuals management

In our profession, most of the energy, innovation, and investment have occurred in the first three areas. However, wastewater effluent is increasingly recognized as a "resource," not a "waste requiring disposal," and we need to think more about ways to reuse it. Where surface water discharges are difficult to permit and where land is available, effluent recharge allows aquifer replenishment and polishing of effluent quality, either at the soil surface or in the subsurface. Irrigation with effluent can reduce other demands on surface water or groundwater sources. Drip dispersal of effluent offers several advantages over traditional land-based effluent disposal techniques and warrants consideration in many sites and applications.

DESCRIPTION OF DRIP DISPERSAL TECHNOLOGY

In simplest terms, drip dispersal is a form of subsurface discharge of effluent. Unlike a traditional subsurface leaching system, however, the discharge can be into the A or B soil horizons, often 6 to 12 inches (15 to 30 cm) below the ground surface, and the dispersal system may be placed directly into native soil, not into crushed stone. Effluent is distributed through 0.5-inch (1.27 cm) plastic tubing and enters the soil at evenly spaced "emitters." Often termed "drip irrigation," this technology is better named "drip dispersal" to distinguish it from the widespread agricultural practice of irrigating crops through tubing placed on the land surface.

The fundamental elements of a drip dispersal system are:

- Pretreatment
- Pumping station
- Control unit (including filtration and flow measurement)
- Distribution and dispersal tubing
- Flushing system

Figure 1 illustrates how these functions are configured in a typical system for a single- or multi-family home. Septic tank effluent is pumped through a control unit that includes an in-line filter, flow meter, solenoid valves, and control systems. At pre-set intervals, effluent enters the drip dispersal tubing at sufficient pressure to force it out the emitters. Occasionally the control unit opens and closes the appropriate valves so that the tubing can be flushed back to the septic tank. The in-line filtration and back-flushing limit the solids loading to the emitters so that plugging is not a problem, even with a septic tank as the sole pretreatment device. One of the tubing manufacturers implants a biocide-impregnated material in the emitter to impede bio-growth.

There are two techniques for installing drip tubing. The least expensive method is to plow the tubing directly into the native soil using a vibratory plow or trenching machine. Alternatively, the tubing can be manually laid on a prepared bed of sand, and then covered with fill and topsoil.

New England has two main drip dispersal systems—Perc-Rite and GeoFlow. The two suppliers of these systems furnished the information herein on U.S. and New England installations.

U.S. PRACTICES

Nationwide more than 10,000 systems are in place, and there are perhaps as many as 20,000 systems. Most serve single-family homes, but between 400 and 500 are larger than 1,000 gallons per day (gpd), or 3,785 liters per day (lpd), in capacity. The earliest systems date back to the early 1990s. More than 100 systems are larger than 10,000 gpd (37,854 lpd) across the country, more than 20 larger than 100,000 gpd (378,540 lpd), and a few larger than 1 million gpd (around 3.8 million lpd).

GeoFlow systems are primarily in Texas, California, Washington, and Arkansas. Most of the Perc-Rite systems are in the mid-Atlantic region (Pennsylvania, Virginia, and North Carolina) with a rapidly growing presence in the Northeast. Many drip dispersal systems are in place in the upper Midwest, with climates similar or more severe than New England, and these systems have operated year-round, even with relatively shallow burial.

Table 1. Drip dispersal systems in place in New England in 2013

State	Number of Systems	
	Smaller than 1,000 gpd*	1,000 gpd and Larger
Massachusetts	426	26
Maine	57	3
Vermont	36	1
New Hampshire	10	1
Connecticut and Rhode Island	Few	0
Total	**Approx. 530**	**31**

*3785 lpd

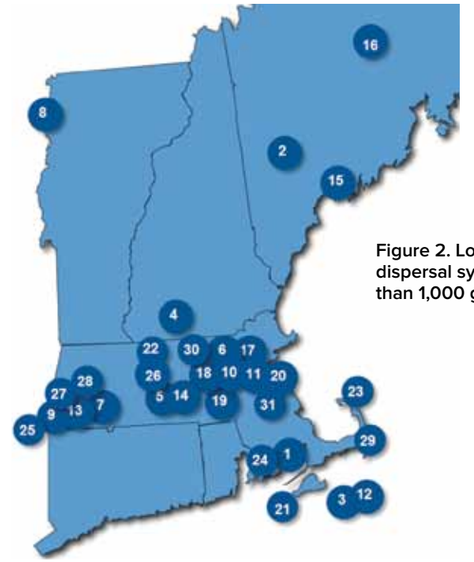

Figure 2. Location of drip dispersal systems larger than 1,000 gpd (3,785 lpd)

NEW ENGLAND EXPERIENCE

A survey identified drip dispersal systems in New England. The survey focused on two system sizes: smaller than 1,000 gpd (3,785 lpd), assumed to be

Table 2. State regulatory approval processes

State	Approval Status
Massachusetts	DEP approval letter covers flows less than 10,000 gpd (37,854 lpd)
	Design-specific review required for flows greater than 10,000 gpd (37,854 lpd)
	Design guidelines apply to flows greater than 10,000 gpd (37,854 lpd)
Maine	Wastewater code covers all flows
	Secondary effluent allowed by code
	DHHS approval letter required for septic tank effluent
Vermont	Secondary effluent allowed by code
	DEC approval letter required for septic tank effluent
	Design-specific review required for flows greater than 6,500 gpd (24,605 lpd)
New Hampshire	DES approval letter covers flows less than 2,000 gpd (7,571 lpd)
	Design-specific review required for flows greater than 2,000 gpd (7,571 lpd)
Connecticut	DPH approval pending for Perc-Rite for flows less than 5,000 gpd (18,927 lpd)
	Design-specific review required for flows greater than 5,000 gpd (18,927 lpd)
Rhode Island	DEM approval letter covers all flows

predominantly single- and multi-family housing, and 1,000 gpd (3,785 lpd) and larger. For this paper, the focus has been on those drip dispersal systems of 1,000 gpd (3,785 lpd) capacity and larger.

Table 1 summarizes the results of this survey. At the end of 2013, about 530 small drip systems were in place, and 31 systems were 1,000 gpd or larger. Approximately 80 percent of the small systems are in Massachusetts, and another 15 percent are in Maine and Vermont. Of the large systems, more than 90 percent are in Massachusetts and Maine (see Figure 2).

In 2008, only two drip dispersal systems were identified with a capacity of more than 1,000 gpd (3,785 lpd). Three more were built in 2009, and six to eight were installed each year since. The local suppliers report many new systems are in the planning and design stages, some of which may have been in the works for years and delayed due to economic conditions.

- **Seasonal vs. Year-round Use**. All but four of these systems are serving year-round facilities.
- **Pretreatment**. Of the 31 larger systems in New England, pretreatment is provided as follows:
  - Septic tank—12 systems
  - Sand filter—2 systems
  - Biological treatment—11 systems
  - Membrane bioreactor—4 systems

  The membrane bioreactor systems appear to have been selected for nutrient removal reasons, and not necessarily to achieve very low effluent suspended solids concentrations. Forty percent of these systems were designed to receive septic tank effluent.
- **Installation Methods**. More than half of these 31 large systems involve drip tubing that was plowed in, and the rest were placed on fill.
- **Loading Rates**. These 31 drip systems were designed with effluent loading rates between 0.2 and 1.5 gpd per sq. foot (8.2 – 61.3 lpd per sq. meter). Most of the systems have design loading rates of 0.60 to 0.75 gpd per sq. foot (24.4 - 30.1 lpd per sq. meter).
- **Burial Depth**. All the large systems identified are installed with 12 inches (30 cm) or less of final cover. The shallowest system has 6 inches (15 cm) of cover, and most fall in the range of 8 to 10 inches (20 to 25 cm).
- **National Comparisons**. Drip dispersal experience in New England is limited compared to the national scene. For systems smaller than 1,000 gpd (3,785 lpd), New England's 530 installations represent perhaps 3 percent of the national total. New England's 31 larger systems represent only 6 to 7 percent of the national totals. While 95 percent of the U.S. experience with drip dispersal is outside New England, national experience dates back more than 20 years and covers areas of the country with comparable climatic conditions.

REGULATORY ISSUES

Table 2 summarizes the regulatory issues for use of drip dispersal in New England. In those states which require product approval prior to a system being installed, drip dispersal systems have been approved in all states except Connecticut, where Perc-Rite's application is pending. Some states require special approval for drip systems receiving septic tank effluent. Most states require state review of design plans for systems larger than a few thousand gallons per day (approximately 1,000 to 3,000 gpd or 5,000 to 10,000 lpd).

The Massachusetts Department of Environmental Protection has provided detailed guidance related to drip dispersal in the May 2013 update to its "Guidelines for the Design, Construction, Operation and Maintenance of Small Wastewater Treatment Facilities with Land Disposal." This document devotes six pages to drip dispersal and covers pressure dosing, drip tubing, and zones, emitters, zone valves, soil conditions, and performance expectations. The allowable application rates for drip systems are 60 to 80 percent of those allowed for trench-type subsurface disposal systems when percolation rates are faster than 10 minutes per inch (2.5 cm), and 90 percent for 10 to 20 minutes per inch (2.5 cm). In tighter soils (those with slower than 20 minutes per inch (2.5 cm) percolation rates), drip systems are allowed higher loading rates, reflective of the relatively good performance experiences under those conditions.

Figure 3. Oak Bluffs effluent disposal site

COST FACTORS

Drip dispersal systems offer cost advantages over traditional effluent disposal systems when the tubing can be installed directly into native soils eliminating the cost of crushed stone and site restoration.

The ability to plow in the tubing can significantly reduce installation time which allows for beneficial use of the property faster than traditional bed construction. An example of this would be on a drip dispersal site that is a ball field and work must be completed between sports seasons.

Because of the shallow burial of the tubing, sites with relatively shallow depth to groundwater can be acceptable for drip systems at no cost or less cost for fill in a mounded system. This makes more sites available for drip disposal than can accommodate traditional systems. Further, since drip systems can be easily segmented into multiple zones, smaller sites are acceptable that may not be for traditional systems.

Depending on site and groundwater characteristics, reduced groundwater mounding can also be demonstrated due to the uniform application rate, evapotranspiration, the timed-dosing of the effluent being applied to the soil, and the ability to have long and linear drip fields.

For vegetated sites, installation of drip systems instead of traditional systems is often easier because less clearing and grading is required. Several successful systems in New England use wooded sites, where minimal clearing was needed. The avoidance of clearing saves money and results in sites more aesthetically pleasing (and thus more publicly acceptable) than sites with complete clearing and significant re-grading.

Shallow-burial drip dispersal systems should reduce irrigation costs on sites that require irrigation (such as ball fields). A similar argument can be made for fertilization. While these are benefits, it is unlikely that the drip dispersal system would provide for all irrigation and fertilization needs.

Aspects of drip dispersal systems can make them more expensive than traditional systems with piping and crushed stone beds or trenches. If the traditional system can be fed by gravity, it will have a cost advantage over drip systems which require pumping. If state regulations dictate a lower loading rate with drip systems, the overall site will be larger and likely entail more site work.

CASE STUDIES

To illustrate the relative importance of the various cost factors discussed above, three case studies were formulated and are presented herein.

Oak Bluffs Case Study

The first step in developing the case studies was to formulate a cost model based on actual costs for a completed project. The Oak Bluffs, Mass., effluent disposal system was selected for the base case in this cost model since it is a municipally owned, publicly bid project that represents a typical large subsurface disposal system. This project is considered a typical installation because it was installed in a large open area without any soil, site, or groundwater-related challenges.

The Oak Bluffs disposal system was designed for 360,000 gpd (1.29 million lpd) of tertiary effluent. It is under Ocean Park, a 7-acre (2.83 hectare) open space, and was constructed in 2001 and 2002. The system includes 28 effluent disposal beds, each 50 by 100 feet (15.2 by 30.48 meters), with 12 inches (30.48 cm) of crushed stone (see Figure 3). One set of four beds is used as a rotating reserve, and the design capacity is provided by the other 24 beds loaded at 3 gpd per square foot (120 lpd per square meter).

To develop the cost model, the contractor's schedule of values was aggregated into the most predominant categories of the project, including: mobilization, bed construction, piping, pumping systems, and site restoration. All elements were captured in one of these categories. The contractor's

Table 3. Cost evaluation for Oak Bluffs case study

	Leaching Bed @ 3 gpd/sf*	Drip Dispersal @ 3 gpd/sf	Drip Dispersal @ 1 gpd/sf**
Mobilization & site prep	90,000	80,000	90,000
Bed construction	450,000		
Drip tubing and installation		70,000	180,000
Pump station, controls, etc.	250,000	420,000	460,000
Piping	70,000	90,000	190,000
Site restoration	130,000	60,000	120,000
Total	**$990,000**	**$720,000**	**$1,040,000**
Savings with Drip Dispersal		(27%) $270,000	(-5%) -$50,000

*0.97 lpd/sm **0.32 lpd/sm

Figure 4. Drip dispersal system under construction at Quail Ridge in Acton, Mass.

pricing for each item was compared to the non-winning bids to account for any unbalanced bidding. Costs were adjusted for inflation through 2013.

The next step was to determine the cost for a comparable drip dispersal system for the same flow conditions to be installed on the same site. A preliminary design was prepared for a Perc-Rite system, including a bill of materials and a cost estimate for materials and installation. This cost information was combined with cost data for the site work, pumping systems, and ancillary work as determined by the unit prices as discussed above. This information was used to develop a construction cost estimate for a drip dispersal system with an application rate of 3 gpd per sq. foot (120 lpd per sq. meter)).

As shown in Table 3, this analysis indicates that a drip dispersal system could have been installed at a considerable cost savings compared with the actual cost of the traditional system, assuming both systems could have been built with the same application rate of 3 gpd per sq. foot (120 lpd per sq. meter). There was little experience with drip dispersal in New England at the time of the Oak Bluffs design, and no experience at this relatively high loading rate. For the stated assumptions, the drip dispersal system might have saved nearly 30 percent of the construction cost. Most of the savings stem from the markedly lower cost of tubing installation and for site restoration, compared with the construction of the subsurface leaching system. These major savings are offset somewhat by the added cost of the pumping and control systems.

To test the cost sensitivity to effluent loading rate, a companion cost estimate was prepared based on the drip system loaded at 1 gpd per sq. foot (40.7 lpd per sq. meter), as shown in the last column of Table 3. For this scenario, the drip system would have cost about 5 percent more than the system that was actually installed. (A major assumption in this alternate analysis is that municipal land could have been made available at no cost at the same site. Such land is not available, so this is a purely hypothetical analysis.)

Mounded System Case Study

Other cost factors were evaluated in the case study for a hypothetical mounded disposal system similar to the one at the Quail Ridge project in Acton, Mass. (see Figure 4). This case study was selected to evaluate the benefits of drip dispersal systems due to their lower profile when separation from groundwater is a controlling factor and earthwork can be reduced compared to a traditional system.

This case study compares a traditional subsurface leaching system and a drip dispersal system for a 50,000-gpd (189,270-lpd) design flow with an application rate of 3 gpd per sq. foot (120 lpd per sq. meter) where fill is required to meet the depth-to-groundwater requirements.

Table 4 presents the cost comparison for this case study. The cost model predicted a traditional system would cost approximately $620,000 compared to $500,000 for the drip system, which could be built with 15 inches (38.1 cm) less fill. Most of the cost savings (19 percent overall) relate to the lower cost of purchasing and placing the fill for the drip system, and the lower cost for tubing installation versus placement of crushed stone.

Wooded Site Case Study

Because of the installation flexibility afforded by drip dispersal systems, wooded sites offer potential cost savings. Since the drip tubing can be installed around potential obstacles such as trees, site preparation and restorations can be significantly reduced. Figure 5 shows how drip tubing can be installed with minimal clearing.

This final case study compared a traditional system and a drip dispersal system each sized for 30,000 gpd (107,340 lpd). The traditional leaching trench system was sized at 2 gpd per sq. foot (81.8 lpd per sq. meter), and would require substantial site clearing. The drip system was sized at 1 gpd per sq. foot (40.7 lpd per sq. meter), with the lower loading rate intended to account for the difficulties working around vegetation that would largely remain in place. While the drip dispersal system would require clearing and grubbing, and site restoration, the magnitude is greatly reduced compared to a traditional system. Table 5 presents the comparative cost estimate that indicates that the drip dispersal system could be installed for approximately 12 percent less.

CONCLUSIONS WITH RESPECT TO COST

Considering the above-noted costs and the results of these case studies, the conditions that are most favorable for drip dispersal systems are:

- Sites where native vegetation must be preserved
- High groundwater conditions
- Irregularly shaped sites
- Sites with steep slopes
- Projects with limited construction time
- Soils with low permeability.

Conversely, the least favorable conditions for drip systems are:

- Disturbed sites where earthwork costs are small
- Soils that allow high loading rates for traditional systems (such as rapid infiltration)
- Projects in states that require a high degree of pretreatment prior to drip dispersal
- Dual-use sites subject to heavy load, where shallow-burial drip tubing might be damaged

While the case studies all show favorable conclusions with respect to the costs of drip dispersal systems, they were formulated to do just that. Drip dispersal is not always cost-effective, but this study should help the practitioner to identify where cost savings may accrue.

CHALLENGES AND OPPORTUNITIES

Effluent recharge via drip dispersal is a viable technology for New England. With more than 500 installed systems of less than 1,000 gpd (3,578 lpd) in capacity, the single-family-home market is well established. While the experience in New England is limited to about 25 projects greater than 1,000 gpd in size installed in the last 5 years, the national experience dates back more than 20 years, including widespread use in climates comparable to New England. The regulatory setting is evolving, but five of the six New England states now approve drip dispersal systems.

As design engineers seek to avoid surface water discharges and prevent hydrologic imbalances, drip dispersal has an important role in decentralized wastewater management. Key advantages include easy installation, reduced need for extensive clearing, ability to easily segment the layout making smaller sites viable, and, often, reduced costs. Research is expected to demonstrate nutrient uptake as an additional advantage.

Table 4. Cost evaluation for hypothetical mounded system

	Leaching Bed	Drip Dispersal
Mobilization and site prep	39,000	39,000
Fill	293,000	190,000
Bed construction	49,000	
Drip tubing and installation		15,000
Pump station, controls, etc.	164,000	186,000
Piping	23,000	19,000
Site restoration	52,000	51,000
Total	**$620,000**	**$500,000**
Savings with drip dispersal		(19%) $120,000

Table 5. Cost Evaluation for Hypothetical Wooded Site

	Leaching Bed	Drip Dispersal
Mobilization and site prep	16,000	16,000
Clearing and grubbing	12,000	3,000
Bed construction	44,000	
Drip tubing and installation		43,000
Pump station, controls, etc.	139,000	145,000
Piping	21,000	19,000
Site restoration	53,000	24,000
Total	**$285,000**	**$250,000**
Savings with Drip Dispersal		(12%) $35,000

Figure 5. Wooded drip dispersal site in northern New England

ABOUT THE AUTHORS

- Michael Giggey is a Senior Vice President at Wright-Pierce. Since the 1970s, he has conceived, designed and carried out innovative wastewater management projects for communities across New England, with a specialty in effluent and biosolids reuse.
- James Hoyt is a project engineer at Wright-Pierce with seven years of experience with municipal water and wastewater facilities.

Clear, consistent policy needed regarding microconstituents

by Brian Braginton-Smith
Chair NEWEA Microconstituents Committee

From time to time we highlight one of the NEWEA position papers on topics that are of particular importance to our industry. In the Fall *Journal* we bring your attention to the NEWEA position paper, "Comprehensive National Response to Microconstituents." One of our NEWEA members was gracious enough to prepare an editorial introduction to the position paper.

Microconstituents stimulate controversy and concern in the environmental science and wastewater treatment arenas. Some contend that just because we can detect an element or compound does not necessarily mean that it should create excess concern. Meanwhile, environmental scientists are researching the impacts of an ever increasing number of potential microconstituents being tied to environmental consequences from genetic anomalies to incidents of cancer in humans and other species, and the concept of the precautionary principle, "first, do no harm." As our technology improves, allowing us to track trace levels (nanograms per liter or lower) of these microconstituents in our wastewater and environment, we need to establish consistent policies and best management practices in dealing with these pollutants. One area of particular importance is federal agency policy and its recommended practices for dealing with these pollutants.

While the industry works with the evolving science of this topic, published materials and guidelines distributed by federal agencies must have a consistent basis on current science. One example is in the pharmaceuticals industry. Prescription drugs are an important subset of this emerging cocktail of contaminants, and recommendations to the consumer need to represent the current science and mirror the suggestions being put forth by other agencies. The Drug Enforcement Agency (DEA) is concerned about narcotics and pain killers as the basis of criminal activity and addiction, and it has initiated drug take-back programs that have proven successful in removing tons of medications from circulation. In 2010, Act 111-273, the Secure & Responsible Drug Disposal Act, was passed giving DEA authority to promulgate regulations, to create a system for safe and secure transfer of pharmaceutical-controlled substances, that have resulted in take-back locations at police stations around the country.

A permanent vehicle is needed, however, beyond the current temporary DEA program for consumers to conveniently return unused prescription drugs rather than having the contaminants ultimately end up in our wastewater or landfills. In addition to its take-back programs, DEA also suggests mixing pills with cat litter or food waste and throwing it in the trash, where it may eventually end up in the environment. Federal Drug Administration (FDA) publications, meanwhile, caution prescription drug users or their caretakers to dispose of unused drugs correctly. In these cases the suggested disposal methods include flushing the drugs down the drain or mixing with cat litter or coffee grounds. Once again, the solution creates another problem downstream. The Environmental Protection Agency (EPA) is wrestling with the issue of toxicity and formulating its pollution guidelines based on best-available science, which is still evolving. All the federal agencies are working to find more sustainable solutions for this problem.

On the front line in this discussion are the environmental scientists, wastewater treatment industry professionals, and consumers, who are trying to make sense of the threat and use appropriate preventative and treatment methodologies to deal with the issue. Lacking expert knowledge and understanding, most consumers and industry professionals turn to the federal agencies for guidelines. It is in this spirit that the federal agencies must establish a clear, consistent policy on prescription drug disposal as well as the host of microconstituents produced, used, and ultimately disposed of by our society.

An excerpt from the NEWEA position paper—

Comprehensive national response to microconstituents

NEWEA advocates further research to enhance our understanding of this evolving and complex issue. Potential future regulatory requirements addressing microconstituents must be driven by sound scientific principles. Because there is so much that is unknown and the potential costs involved in evaluating the presence, fate, and impacts of tens of thousands of microconstituents, it is imperative that future research be appropriately prioritized.

Some of the unknowns regarding microconstituents include: What is the relative abundance and concentration of microconstituents in the environment; how they are transported and what is their fate in the environment; and, at what concentration levels do they pose a risk to humans and other organisms? Other questions are: What are the possible synergistic effects of exposure to microconstituents in combination; what are the acute, chronic, and reproductive effects of microconstituents; what are the costs associated with controlling microconstituents at their source versus treating microconstituents after they have entered wastewater treatment facilities or the environment; and how can we eliminate or reduce these sources while still maintaining our quality of life and the products we all need and use?

NEWEA firmly supports actions to prevent microconstituents from entering into our water resources and the environment. Source control and reduction measures are key issues that must be implemented to avoid the further discharge of these pollutants into our water and wastewater infrastructure and subsequently the aquatic environment. Specific activities include pharmacy take-back programs for prescription drugs, collection and recycling programs, and public education.

NEWEA strongly encourages that the following efforts be undertaken:

1. **Prevention**: Industry, agriculture, and the water and wastewater community should be active proponents of controlling microconstituents at their point of generation, where practical, in order to reduce potential risks. Pollution prevention strategies should be applied, such as recycling or proper disposal of pharmaceuticals and household chemicals.
2. **Product Evaluation and Control**: The U.S. Environmental Protection Agency and the Food and Drug Administration should work together to identify and address gaps in the existing regulatory framework for evaluating new substances prior to their production and use to ensure that they do not present significant threats to public health and the environment after they are dispersed in the environment.
3. **Research**: Federal agencies and academia should engage in cooperative efforts with organizations to accelerate research needed to assess potential risks to human health and the environment posed by microconstituents. Research efforts focused on source control, treatability, presence, transport, fate, and effects of microconstituents are all critical to understanding this complex issue. Screening level risk assessments based on preliminary information should be developed and used to determine priorities for further research and possible safeguards.
4. **Monitoring**: Local, state, and federal agencies should engage in cooperative monitoring efforts to better understand the presence and fate of microconstituents. In addition, federal agencies and academia should support further improvements in the accuracy and cost-efficiency of microconstituent detection and quantification.
5. **Public Outreach**: Federal, state, and local agencies, working with manufacturers and water and wastewater professionals, should educate the public about their role in reducing the release of microconstituents to the environment. Such programs should promote understanding of the proper methods for recycling or disposal of products and the consequences of improper use.

To address the water resource challenges that microconstituents will bring, NEWEA calls on the U.S. Congress to ensure that water resources are a central element of any federal legislation that establishes a framework for a comprehensive national response to microconstituents. The New England region is already in a daily struggle to meet the demands placed on our water infrastructure, and dealing with microconstituents will only put more pressure on the people and the systems that provide safe, clean water. We call upon our nation's leaders to provide the necessary support and leadership to ensure that the nation's water resource professionals have the tools and resources necessary to research and assess the extent of risks posed by microconstituents and to mitigate any significant risks that are found.

The full text of the position paper can be found can be found on our website at newea.org/Resources/GovernmentAffairs/PositionPapers/tabid/389/Default.aspx

Earlier this year, NEWEA submitted the public education committee's school-age presentation toolkit as part of the award nomination process

2014 WEF awards recognize NEWEA and Narragansett Bay Commission

NEWEA's Public Education Award and NBC's Water Quality Improvement Award presented at WEFTEC 2014

In June 2014, the WEF board of trustees selected NEWEA as the 2014 recipient of the WEF Public Education Award—member association category. The Narragansett Bay Commission (NBC), one of NEWEA's member organizations, was also honored with the 2014 WEF water quality improvement award. Both awards were presented during WEFTEC, New Orleans from September 27 – October 1, 2014.

PUBLIC EDUCATION AWARD

Earlier this year, NEWEA submitted the public education committee's school-age presentation toolkit as part of the award nomination process. The "school kit" includes pre-packaged presentation materials for simplified outreach activities by NEWEA members, industry professionals, and teachers. It provides all the materials needed to give high-quality interactive presentations on water and wastewater topics to children of any age, and is now featured as part of NEWEA's 2014 president's challenge. The challenge invites all NEWEA members to reach out to a local classroom, scouting group, or other organization, and use the school kit to teach about the importance of water quality.

Accepting the awards are (L) Pamela J. Reitsma for Narragansett Bay Commission and Elena Proakis Ellis for NEWEA

"The committee is excited about the recent roll-out of the school kit resources and the interest expressed so far by our industry's professionals in reaching out to school-age children," says Elena Proakis Ellis, chair of NEWEA's public education committee. "We have already had an enthusiastic response from NEWEA members and have reached dozens of children since the program began this spring."

The NEWEA school kit is unique because it provides a simple way for industry professionals to reach thousands of students each year. It is based on students' ages, and allows presenters to customize materials depending on their audience. It also features hands-on activities and giveaway materials, and is easily accessible through the NEWEA office and website. The public education committee is expanding the school kit to include presentations on stormwater and water conservation; as the public education award criteria describe, these efforts will continue to promote awareness and understanding of water environment issues among the public.

PHASE ONE OF NBC'S CSO ABATEMENT PROGRAM

The centerpiece of the project is is a 3+-mile long, 26-foot-diameter, 300-foot deep-rock tunnel and an underground pumping station housing four two-stage pumps for moving the flow to the Field's Point WWTF. Seven drop shafts convey combined sewage flow from the surface to the tunnel, which can store and transport 65 million gallons. The pumps have a combined capacity of 50 mgd.

WATER QUALITY IMPROVEMENT AWARD

WEF's water quality improvement award, meanwhile, is part of the operational and design excellence category, and is presented annually to the water quality improvement program that best demonstrates significant, lasting, and measurable excellence in water quality improvement or in prevention of water quality degradation in a region, basin, or water body. Phase one of the Narragansett Bay Commission's combined sewer overflow (CSO) abatement program has significantly decreased pathogen concentrations in the bay since 2008.

"The phase one project captures approximately 1.1 billion gallons of CSO annually, flows that now receive full treatment. Bacterial contamination loads to the bay have been reduced by 50 percent, resulting in the opening of new beaches in the upper bay and allowing shellfishermen to harvest clams 65 more days per year," explains Ray Marshall, NBC executive director. "We see evidence of the positive public response to the project every day as more and more people use upper Narragansett Bay for work and recreation due to the cleaner water quality realized by completion of the CSO phase one tunnel project."

Michael McGiveney, president of the Rhode Island Shellfisherman's Association, echoed the public appreciation of the project: "Because of the dedication of NBC towards water quality improvements, my members have had greater access to important shellfish beds in Narragansett Bay."

In the six years since the completion of phase one, NBC has collected data which documents measurable water quality improvements in Rhode Island's urban rivers and upper bay area that are a direct result of this project.

"When NBC was created in 1982, we knew our task was enormous: the Field's Point wastewater treatment facility was one of the largest municipal polluters in the nation," says Vincent Mesolella, NBC chairman. "To be recognized nationally, repeatedly, as one of the nation's finest success stories in clean water is a testament to the commitment of the NBC board of commissioners, the dedicated staff, and the voters of Rhode Island who consistently support important clean water initiatives."

What's next for NBC? "Additional improvements are expected in 2014 with the completion of phase two of NBC's CSO mitigation program," McGiveney explains. Phase two includes two near-surface interceptors along the Seekonk and Woonasquatucket rivers to bring additional flow to the phase one tunnel, a new storm drainage system in the Summit neighborhood, and a constructed wetlands in Central Falls.

Both NEWEA and NBC were recognized for their achievements throughout the week at WEFTEC. Photos representing each award were shown at the honors and awards display, and each WEFTEC attendee received a brochure profiling all 2014 award recipients. NEWEA is proud to share the accomplishments of our members in public education, water quality improvement, and beyond, and looks forward to the continued success of these projects.

NEBRA Highlights

Participants in the Compost Council of Canada annual national conference toured one of Nova Scotia's leading farms where wood ash and Halifax lime-stabilized Class A biosolids are a routine part of soil fertility

Developing international "sludge" standards

by Denise Vieira, SYLVIS Environmental

The International Standards Organization (ISO), the world's largest developer of voluntary international standards, has convened Technical Committee 275 (TC 275) to develop international standards for sludge recovery, recycling, treatment, and disposal. TC 275 is convened by France, with the secretariat being provided by France's standards association, AFNOR. (No doubt many readers notice the use of the term "sludge" rather than "biosolids"—establishing terminology is part of the work program, but "sludge" is commonly used in Europe.)

Michael Payne (standing) of Black Lake Environmental (Perth, Ontario) chairs the ISO TC 275 "land application" working group

TC 275, which first met in Paris in 2013, comprises experts from around the world who will prepare draft documents which, when finalized and agreed to by consensus of ISO members, will become ISO standards. The targeted completion date is 2017. Following that, the ISO Standards will be available for adoption as national standards, with or without "national" modifications. Within TC 275 are seven working groups with a mandate to address individual areas, specifically:

- Terminology
- Characterization
- Digestion
- Land application
- Thermal processes
- Thickening and dewatering
- Inorganics and nutrients recovery

Sixteen countries are participating in TC 275, including Canada, and 13 countries observing, including the U.S. Canada chairs the land application working group. Several Canadians have been named as experts to that working group.

Any interested U. S. stakeholders can contact Ned Beecher at NEBRA, who has been in touch with the American National Standards Institute (ANSI). NEBRA is testing interest and funding potential for changing the U.S.'s status from observing to participating. Although observing countries can name individual experts to TC 275 working groups, only participating countries contribute actively in the full committee and have formal voting rights. Active participation can ensure the new standard is consistent with a country's policies and practices, and best current science.

Representatives from 10 countries—Argentina, Australia, Austria, Canada, China, France, Israel, Italy, Japan, and the United Kingdom—participated in the most recent meeting of TC 275 and its seven working groups, held earlier this month in Burlington, Ontario.

Reasons for participation in TC 275 are as varied as the countries, organizations, and individuals represented. Among them are sharing knowledge, networking, providing a management framework particularly in countries with limited/no policy frameworks, promoting beneficial use and enabling use opportunities, developing markets (for example, for crops grown in biosolids-amended soil), and increasing stakeholder confidence.

To learn more about ISO and the work of TC 275, go to ISO's website by searching on "ISO TC 275."

What NEBRA does for you....

On October 22, 2014, in South Portland, Maine, NEBRA held its 17th annual meeting of the membership. Here are excerpts from the executive director's report to the membership, October 2014:

I believe NEBRA remains a nimble and effective organization, small as it is. We are watching out for you, our members, ensuring your biosolids and residuals management efforts can continue to grow and bear fruit. It's a fine, cooperative effort. And we rely on—and greatly appreciate—your ongoing support.

Here is a summary of what we have accomplished this year:

Our 2014 Focus—Outreach to Related Organizations: In 2014, the board of directors and staff were focused on talking to more people outside our biosolids and residuals circles—less preaching to the choir. Before she left for a full-time position in the field in April, Maggie Finn helped line up presentations at other organizations' conferences. And then we were on the road, talking to diverse audiences across the NEBRA region, increasing NEBRA visibility from Ontario to Halifax, Boston to Burlington.

More Focus on Training: Beginning last fall, NEBRA has focused more on training, producing more workshops on key topics. We worked with Maine's joint environmental training coordinating committee (JETCC) on the September 2013 anaerobic digestion workshop in Lewiston-Auburn, Maine. This year, we are co-sponsoring a dewatering workshop in Ellsworth on December 2. We complement JETTC's organization with our technical understanding and network of professionals willing to teach. Thanks to Leeann and Spring at JETTC for these coordinated efforts.

New Publications:

- The new WEF fact sheet, Phosphorus in Biosolids: How to Protect Water Quality While Advancing Biosolids Use, that NEBRA helped to write, was released this spring. See www.wrrfdata.org/PhosphorusFS/WEF-PhosphorusFactSheet2014.html.
- Being guest editor and author for the biosolids-focused summer edition of the NEWEA Journal was a great experience. It was a delight to work with the various authors. And the *Journal* editor, Helen Gordon, and all the volunteers and professional who put it together are miraculous: kudos and thanks to all!

Ongoing Public Outreach: A Core NEBRA Function: The NEBRA office continues to serve as a hub for information on biosolids and residuals. We get questions from around the continent, and sometimes beyond. We help journalists, market analysts, public officials, and interested citizens understand this profession. And we proactively scan the horizon for new developments, especially in public engagement.

Keeping the Organization Going: NEBRA is on good financial footing, where it has been for several years. The level of consistent, reliable support from membership continues its long, steady climb. Our board of directors is active and highly competent.

In the past year we have focused less on project and contract work. The WERF project on developing a triple-bottom-line analysis of biosolids management options was completed (and presented at this year's annual residuals conference). All contracted work for the National Biosolids Partnership has also ended. We have not aggressively pursued other such work, so that we may focus on building our membership base of support and focus intently on our core mission: promoting the environmentally sound and publicly supported recycling of biosolids and other residuals in this region.

Compost Council of Canada annual national conference tour

One hundred participants in the Compost Council of Canada annual national conference toured one of Nova Scotia's leading farms where wood ash and Halifax lime-stabilized Class A biosolids are a routine part of soil fertility. The farm also employs the compost pack bedding system, whereby manure and bedding accumulate in a managed, continually composting pile, providing a soft, healthy, low-bacteria resting area for the cows. After a year or two, the compost is land applied.

Since the 1990s, Nova Scotia has been a leader in organics management and diversion from landfills. Randy Delorey, minister of Nova Scotia Environment, kicked off this year's compost conference with a nod to the province's leadership. He noted that today "95 percent of households have green bins,.... and the disposal rate is half the Canadian average."

NEBRA welcomes new members

Individuals: Mary Monahan, Michael Smith
Organizations: BIOFerm Energy Systems
Brown and Caldwell

Ned Beecher, Executive Director
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For more information or to subscribe to NEBRAMail, NEBRA's email newsletter visit nebiosolids.org

Rhode Island State Director Report

by Janine Burke
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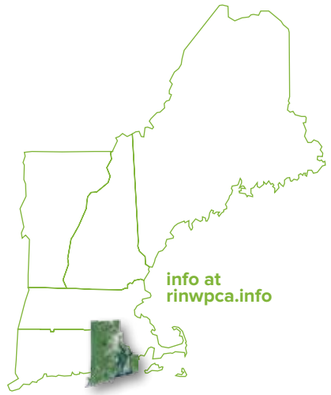

The Rhode Island Connection: EPA New England Administrator Curt Spalding, Senator Sheldon Whitehouse, NWPCA Executive Board members Janine Burke and Michael Spring, and former NEWEA Executive Director Elizabeth Cutone, all Rhode Islanders

Pat Hughes of CDM Smith (center) presents the award for the most efficient small advanced treatment facility to the town of Smithfield. The facility is operated by Veolia Water. The award is being accepted by Veolia's Karen Goffe (project manager) and Don Benz.

Legislative affairs

The Narragansett Water Pollution Control Association (NWPCA) sent a small contingent to Washington, D.C., in April as part of the annual NEWEA congressional briefing. Rhode Island Senator Sheldon Whitehouse spoke at the breakfast meeting. NWPCA members met with each member of the Rhode Island congressional delegation to talk about issues important to Rhode Island's wastewater operators, leaving behind "Water's Worth It" water bottles for the senators and congressmen.

Annual awards banquet

NWPCA held its annual awards banquet on May 9 at the Potowomut golf club in Warwick, R.I. NEWEA Vice President Ray Willis re-presented the Rhode Island Peloquin and Operator of the Year awards as well as four other NEWEA awards for 2014. Rhode Island treatment facilities and personnel recognized for performance in 2013 include:

- Most Efficient Small Secondary Treatment Facility – Town of New Shoreham (Block Island)
- Most Efficient Medium Secondary Treatment Facility – Town of Warren (Operated by United Water)
- Most Efficient Large Secondary Treatment Facility – Narragansett Bay Commission/Field's Point
- Most Efficient Small Advanced Treatment Facility – Town of Smithfield (Operated by Veolia Water)
- Most Efficient Large Advanced Treatment Facility – City of Cranston (Operated by Veolia Water)
- A. Joseph Mattera Safety Award – Narragansett Bay Commission
- James Marvelle Award – Michael Spring (Narragansett Bay Commission)
- Collections System Operator of the Year – Thomas Azevedo (United Water/East Providence)
- Robert J. Markelewicz Award – Joseph Crosby (Narragansett Bay Commission)

Award sponsors included Aqua Solutions, Baker Corporation, CDM Smith, Inland Waters, Inc., Synagro Technologies, Tutela Engineering, United Water, Veolia Water, and Wright-Pierce.

Organizers and volunteers at the NWPCA golf tournament (L to R) Scott Goodinson, Peter Connell, Marisa Desautel, Traci Pena, and Melissa Mooradian

Tom Azevedo of United Water in East Providence (L) accepts the Collection System Operator of the Year plaque from Bobby Routhier of Inland Waters

Annual vendor exhibition and clam bake

NWPCA's annual trade show and clam bake took place on September 12 at Twelve Acres banquet facility in Smithfield, R.I. Forty vendors and more than 200 wastewater professionals participated in the trade show, which was followed by a traditional New England clam bake feast. As part of the day's festivities, there was a graduation ceremony for the 12 operators graduating from the state's superintendent boot camp. NWPCA also presented its annual college scholarships of $500 to the following outstanding young scholars:

- Andrew Linski (Community College of Rhode Island)
- Rachel Salisbury (Community College of Rhode Island)
- Molly Solitro (Stonehill College)
- Bryce Suvajian (Community College of Rhode Island)

Operations challenge team

The Rhode Island operations challenge team took first place in the collection system event at NEWEA's annual competition, held in Rockport, Maine, in early June. The team also received recognition in four other categories, including laboratory testing, safety, maintenance, and process control, earning a spot at WEFTEC's national competition this fall in New Orleans.

"The achievements of this hard-working team demonstrate the technical skills, knowledge and expertise of Rhode Island's wastewater collection and treatment professionals," says DEM Director Janet Coit in a congratulatory press release. "Their important work protects the health of Ocean State residents, the quality of our waters, and our state's economy."

The Rhode Island team, "Ocean State Alliance," includes Ed Davies, Mike Spring, Vinny Russo, Jr., Joe Crosby and Mike Ceasrine. All the team members are employees of the Narragansett Bay Commission except for Vin Russo, who works for the Warwick Sewer Authority.

Golf tournament

The annual NWPCA golf tournament was on June 30, at the Potowomut golf club in Warwick. This was a new venue this year, and NWPCA golfers loved it. One hundred and forty-seven golfers registered for this year's tournament, which raised nearly $7,500 for NWPCA. The Hayes Pump team, consisting of Dick Kramer, Craig Huff, Tom Gilligan, and Robert McGuigan, shot a 62 to win the tournament.

The first annual great chowder cook-off

NWPCA held a "great chowder cook-off" event as part of its regular business meeting in August, on a beautiful afternoon at an idyllic location on the beach in Narragansett (the Scarborough wastewater treatment facility of course!). The chowder cook-off was the brain child of NWPCA Executive Board members Peter Eldridge, Tom Ciolfi, and Mike Spring as a way to increase attendance at monthly board meetings and attract new members. The event even brought back a few "old" members.

Competing for bragging rights with their personal clam chowder recipes were NWPCA President Doug Nettleton and Executive Board members Tom Ciolfi, Scott Goodinson, and Mike Spring. NWPCA members sampled and rated all the chowders based on color, aroma, consistency, and taste. Judging was organized and scores compiled by host Peter Eldridge once everyone had a chance to sample the four (very different) clam chowders. In addition to making chowder for the event, Mr. Ciolfi manned the grill, serving up burgers and hotdogs as well as numerous delicious side dishes. Mr. Goodinson, assistant superintendent in Warwick, took first place with his white chowder recipe and set the bar for what promises to be a great new NWPCA tradition.

Connecticut State Director Report

by Jay G. Sheehan
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As 2014 winds down, we reflect on a year in which important wastewater issues moved many steps forward in Connecticut. The 2014-15 Connecticut clean water fund fiscal year reached an unprecedented level of funding at nearly $1 billion; the state legislature agreed to develop Connecticut's first statewide water policy; the Connecticut Water Pollution Abatement Association (CWPAA) began discussions with the Department of Energy and Environmental Protection (CT DEEP) to improve wastewater operator certification requirements; and CWPAA and the Connecticut Association of Water Pollution Control Authorities (CAWPCA), a newer wastewater organization in Connecticut, began a meaningful collaboration. These accomplishments are due to the hard work of many people who recognize the value of volunteerism within the wastewater industry.

Industry trend—the aging workforce

Our industry clearly requires a complex combination of technology, knowledge, skills, financial savvy, and many other important elements. The workers, however, are the most important resource that we have and continually rely upon. In Connecticut, leadership turnover is extraordinarily high. The U.S. Department of Labor noted in a report, "The Aging Workforce," that 53.5 percent of the utilities workforce is between the ages of 35 to 64 while only 18.8 percent of the utilities workforce is between the ages of 20 to 34. The concern is compounded by a projected 20-percent job growth in water/wastewater utilities through 2018. To address this challenge, we need to identify new talent and train new professionals.

In particular, we are seeing the effects of these reports within our state associations. CWPAA has had some significant departures, including:

- President Carl Almquist (superintendent, town of Groton—retired)
- Vice President/Treasurer Marvin Serra (superintendent, town of Enfield—retired)
- Board Member and former NEWEA President Arnie Bevins (superintendent, town of Vernon—retired)

CAWPCA is also seeing departures, including:

- Former President David Ignatowicz (water pollution control department director, town of Vernon—retired)
- Former President Vin Susco (public utilities administrator, town of East Hampton)
- Former Board Member and former NEWEA Director Glenn Lebrecque (superintendent city of Waterbury—retired)

These six professionals represent nearly 200 years of industry experience that will be extremely challenging to replace.

The State Associations' Response—Leadership Transition

With the associations facing this level and rate of attrition, it became clear that new leaders were needed. Both CWPAA and CAWPCA made independent strategic decisions about succession, recruiting, and the makeup of each board. The groups re-engaged their memberships and tapped into a new and valuable resource of vendors, consultants, and contractors. Leadership has emerged that includes the following officers:

CWPAA

- Mike Bisi (superintendent, town of Gloucester) – President
- Mike Burns (Woodard & Curran, Enfield) – Vice President
- Jane LaMorte (business manager, Stafford Water Pollution Control Authority) – Treasurer

CAWPCA

- Tom Sgroi (director of engineering, Greater New Haven WPCA) – President
- Brian Armet (executive director, Mattabassett District) – Vice President
- Andrew Lord (East Haddam WPCA) – Treasurer
- Sarah Voog (town of Cromwell) – Secretary

Each of these leaders brings a new perspective and different ideas, and these leadership transitions have been quick, quiet, and effective. In addition, both associations added new directors who will help to support their goals.

The State Associations' Response—Leadership Training

In response to the need to replace wastewater leadership in Connecticut, Art Enderle (superintendent, town of East Windsor), Jim Clifton (superintendent, town of Simsbury—retired) and Kevin Shlatz (superintendent, town of Enfield) developed a comprehensive wastewater management leadership training program. The program targets wastewater professionals nearing the transition from operator to manager and provide high-level management and leadership training. The successful program is sponsored by CWPAA, and as a result of the support of many volunteers, the program has graduated 40 students.

The State Associations' Response—Legislative Leadership

CWPAA and CAWPCA recognize the need for proactive legislative leadership and are developing strategies to better manage the rules and regulations that affect utilities. With NEWEA's support, the associations have leveraged the Washington D.C. fly-in and started a Connecticut legislative breakfast. Now the associations are turning their attention to state issues such as water policy and operator certification requirements, and other local regulatory issues, for instance fighting to reduce the laboratory certification requirements in a recent House Bill (HB-5537).

With a new and invigorated leadership team within our two wastewater associations, the future is bright for wastewater professionals in Connecticut. This team can leverage the wisdom and experience of our accomplished retiring professionals, because they have generously agreed to remain available and on-call. It is fun to be a part of the succession, and we offer a sincere "thanks" to all of these dedicated volunteers who are making it happen.

2014/2015 Connecticut wastewater events

The 2014-15 schedule is filling up! Please mark your calendar and plan to participate in the following events:

CAWPCA Fall Meeting	November 14, 2014	Marriott Courtyard in Cromwell, Conn.
CWPAA/NEIWPCC Fall Manager's Forum	December 2014	MDC Training Facility in Hartford, Conn.
NEWEA Annual Conference	January 25-28, 2015	Boston
CWPAA Connecticut Legislative Breakfast	March 2015	Hartford, Conn.
CWPAA Ski Classic	March 6, 2015	Stratton, Vt.

Milestone—M. Hamdy Bechir

M. Hamdy Bechir, P.E., ScD, a former president of NEWEA, passed away in June. Dr. Bechir, or Hamdy as he was affectionately known to friends, was president in 1981, when NEWEA was called the New England Water Pollution Control Association (NEWPCA).

Dr. Bechir received his doctor of science degree from the Massachusetts Institute of Technology (MIT) in the 1960s, and his dissertation focused on nitrogen removal from wastewater, making him a technical expert in nutrient control many years before its importance was fully realized. He taught civil and environmental engineering briefly at Oklahoma State University, returning to New England where he was employed at Charles A. Maguire Engineers until 1972. He then established the consulting firm Cascio, Bechir & Associates in North Haven, Conn., with his partner Gerry Cascio. While president of the company, he continued his passion for teaching at the University of New Haven, where he became a full professor, from which he eventually retired as professor emeritus. He retired from the business in 1995 and relocated to Florida, remaining active in the field for several years by teaching part-time at the Florida Institute of Technology, with the rest of his time dedicated to golfing and watching baseball.

He was an active member of NEWPCA/NEWEA, and as Connecticut state director was an influential contributor to the articles of organization and incorporation, which were adopted in 1977. He was inducted into the Select Society of Sanitary Sludge Shovelers in 1984, and he received the WPCF (WEF) Charles Alvin Emerson Medal in 1987. Those who knew him say that he always wore his 5S shovel proudly.

New Hampshire State Director Report

by Fred McNeill
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Recent events

On April 10, New Hampshire Water Pollution Control Association (NHWPCA) hosted our annual trade fair at Manchester's Executive Court Club. The trade fair is an important event to support our vendors and equipment suppliers, a critical constituent of our professional team. There were equipment demonstrations during the trade fair. At lunch NHWPCA recognized our recent WEF/NEWEA award winners and the winners of our annual grade school clean water poster contest:

- Tom Moran – Operator of the Year
- Shelagh Connelly – Alfred E. Peloquin Award
- George Harrington – James J. Couchaine Award
- Ray Vermette – WEF Operator Ingenuity Award
- Alvin Firmin – WEF Life Membership
- Paul Sutton – WEF Life Membership
- Seacoast Sewer Snakes – WEF Operations Challenge.

NHDES's Harry Stewart and Tom Burack pose with poster contest first-place winners

On April 7, a six-person delegation from New Hampshire joined hundreds of other water professionals in Washington, D.C., to attend "Water Week." This culminated with NEWEA's congressional breakfast on April 9. The objective of Water Week and the congressional breakfast is to promote the water industry's interests, increase awareness of the importance of water, and establish a source of sustainable funding for water projects. This national effort helped bring our unified message to New Hampshire's congressional delegation whom we met with during our trip.

On April 19, NHWPCA continued its educational outreach by participating in "Discover Wild NH Day." This fun-filled educational day is sponsored by the New Hampshire fish and game department. Along with educating our residents about the wildlife and recreational opportunities that New Hampshire has to offer, it also focuses on the criticality of clean water to our state's wildlife.

On June 13, NHWPCA held its annual summer meeting on the cruise ship MS Mount Washington on beautiful Lake Winnipesaukee in Laconia. This cruise ship is a departure from our traditional summer outing but reinforced recreationally how critical clean water is to the economic well-being of New Hampshire. While the weather did not fully cooperate, an adventurous sail and delicious meal were enjoyed by all.

On August 7, NHWPCA hosted its "Silver Anniversary" 25th annual golf tournament at the historical Beaver Meadow golf course in Concord. The association is proud to support the city of Concord's 118-year-old municipal course, one of the three municipal courses in New Hampshire. More than 90 golfers enjoyed a day of golf and fellowship while supporting our organization.

On September 23, NHWPCA sponsored a one-day wipes and FOG workshop and seminar in Concord. The New Hampshire Department of Environmental Services (NHDES) has been championing resolution of this critical issue, and it assisted in bringing this important message to water professionals during the workshop.

NHWPCA's fall meeting was on October 8 in the beautiful Lake Sunapee region. We toured the Sunapee wastewater treatment plant (WWTP), which has been upgraded recently after 40 years of service. The meeting continued with presentations and lunch at the scenic Mount Sunapee ski area and concluded with chair-lift rides to enjoy the fall foliage. A highlight of the fall meeting was hosting Tony Manfre, our exchange operator from our sister state of Connecticut.

Tom Moran draws the next raffle ticket from the bin held by Andrea Martel

Trade show Spectator at the "What's Flushable?" booth receive a lecture

Award winners

Deepika Kurup of Nashua, N.H., won the national Stockholm Junior Water Prize for her paper, "A Novel Photocatalytic Pervious Composite for Degrading Organics and Inactivating Bacteria in Wastewater." She is a past winner of our elementary school poster contest and has now excelled on the national stage. Ms. Kurup is a junior at Nashua High School South and this summer she interned with the National Institute of Health in Bethesda, Md., working on a cure for Parkinson's disease.

Deepika received the 2012 Discovery Education 3M Young Scientist Award for developing this project. She also received the EPA Region 1 President's Environmental Youth Award for 2013-14. U.S. EPA's website posted: "Deepika developed a green and sustainable method to purify water. She increased public and youth awareness of the indispensable natural resource clean and safe water is to all." Ms. Kurup has filed a patent for her invention and plans to deploy her invention in places around the world that are affected by water pollution. She is an excellent example of our next generation of leadership in the water industry.

The Conway and Bartlett school district was the winner of NEWEA's 2014 Humanitarian Award. Our friend and colleague David Bernier sponsored this exciting project of sharing an interactive hydraulic model as an educational outreach tool. This model demonstrates how aquifers work, illustrates impacts from septic systems, and elucidates the overall water cycle to elementary school students.

Our next generation of water professionals

An aging workforce is a critical problem facing both the nation and New Hampshire. A recent survey from NHDES provided the following age distribution for New Hampshire's 605 licensed wastewater operators:

- Less than 30 – 8%
- 30 to 39 – 13%
- 40 to 49 – 23%
- 50 to 59 – 37%
- Greater than 60 – 19%

More than half of New Hampshire's wastewater workforce is over the age of 50. Not only will communities soon be short-staffed but, more important, the institutional knowledge of these professionals will be sorely missed. Succession planning is critical; communities are now addressing this so that our next generation of water professionals can be fully prepared to carry on successfully for another 50 years.

Future events

NHWPCA's winter meeting will take place on December 12 in Hampton. We will be touring its WWTP and, if everyone has been good, we can expect another visit from Santa. Upcoming events for 2015 include the NEWEA annual conference, our annual legislative breakfast, and our newly incorporated ski day with the Maine Water Environment Association.

Association name change

NHWPCA is planning a name change to New Hampshire Water Environmental Association. This branding follows regional (our sister state of Maine) and national trends as our industry continues to sharpen our message that "Water's Worth It!" We hope to implement this name change in 2015.

Maine State Director Report

by Peter Goodwin
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Spring conference

Maine Water Environment Association's (MEWEA's) spring conference was on April 18 at the Black Bear Inn in Orono. The professional advancement committee developed seven exceptional technical sessions on a wide range of water resource topics, including green infrastructure, biosolids, erosion control certification, infrastructure resiliency, natural gas impacts, Maine Department of Environmental Protection (MEDEP) updates, and Wiki O&M manual development. Our active young professionals committee also held a productive "brainstorming" session, which was well attended. More than 100 professionals from across the membership of MEWEA attended and participated in the voting for the Clean Water Week poster competition. The January 2014 NEWEA awards were re-presented at a luncheon ceremony by NEWEA President Brad Moore. On April 17, the executive committee gathered for our annual strategic planning meeting, which was led by First Vice President Tom Connolly and Second Vice President Scott Firmin.

Clean Water Week Poster winners pose with MEWEA officers

Clean Water Week posters

In recognition of Maine Clean Water Week, MEWEA again sponsored a poster competition for Maine students in grades 1-12. The theme of the competition was "Why Water's Worth It to Me!" More than 550 posters were received from cities and towns throughout Maine, and winners were selected by the membership at the MEWEA's spring conference.

Students representing future generations of Maine citizens have shown their support by learning about the importance of water, how water is wasted, how to conserve water, and how to protect the water we have. On June 5, the winning students from each of the four age groups were recognized by MEWEA, MEDEP, and Governor LePage at a presentation at the Hall of Flags in the State House.

Non-dispersible update

In September, MEWEA was invited to provide an update on the "Save Your Pipes-Don't Flush Baby Wipes" campaign to the Maine Legislature's joint standing committee on the environment and natural resources. In January 2012, this committee compelled MEWEA (then MWWCA) and INDA, the industry association of the non-woven fabrics manufacturers, to continue to work together on this issue in lieu of moving forward with LD 781 (focused on requiring products labeled "flushable" and sold or distributed in Maine to meet a standard). The pilot study focused on baby wipes, none of which are labeled as flushable. The study included both comprehensive market research and field observations both before and after the advertising campaign. Field observations were done at the Portland Water District's Cottage Place pump station, which overlapped 100 percent with the area targeted by the campaign message (via television, retail location information, bill stuffers, etc.). Comparison of pre- and post-campaign field observations (both by the number of baby wipes per 100,000 gallons of flow and as a percentage of the total items sorted) showed a reduction in the first 4 to 5 weeks after the campaign was completed. However, the number of baby wipes observed post-campaign increased as time went on, indicating that the message needs to stay in front of consumers. Most important, MEWEA has made all of the campaign information available and recently, the city of Cheyenne, Wyo., has requested the information. The exceptional efforts of many of the MEWEA members throughout the campaign was recognized on two occasions this year with an EPA Region 1 Merit Award presented at Faneuil Hall in Boston and the governor's Environmental Excellence Award in Augusta.

Force Maine took first place in the Operations Challenge Division 2 process event at WEFTEC in New Orleans

Public educational initiatives

As we all remember, NEWEA Past President Mike Bonomo requested that all NEWEA members reach out at least once a year to promote our organizations and the importance of what we do 24 hours a day, 365 days a year. NEWEA's public education committee has developed a comprehensive outreach program that MEWEA has replicated for our members. Dave Hughes and the Scarborough Sanitary District were the first to utilize the information with the local school district. Tim Haskell and the York Sewer District have also stepped up to the plate and hosted the local York town officials to an open house tour. I am sure many other MEWEA members have also moved the needle forward on connecting with our customers.

Our young professionals committee has been active with a consistent social media presence on Facebook and Twitter along with participation in many events, including Portland's urban runoff 5k, the paddle after-hours event in Lewiston-Auburn, and a successful booth presence at the first annual Portland greenfest festival.

Fall conference

Magnificent weather greeted the membership for the annual fall conference at Sunday River in Newry, from September 17 through 19. The conference was kicked off on September 16 by a well-attended golf scramble on the challenging Sunday River golf course. The weather and views were exceptional and the golf memorable.

More than 30 hours of diverse training, seminars, and case studies were developed by the professional advancement committee, chaired by Mike Stein of Woodard & Curran. Of note was the Mr. and Mrs. Fish presentation to 25 attentive first graders from the Bethel elementary school.

The annual business meeting and MEWEA award presentations were held on Thursday at a luncheon and included the announcement of the 2014 MEWEA officers and the presentation of several MEWEA Awards. In addition, the 2014 class of the highly successful management candidate school were acknowledged.

Operator exchange

This year MEWEA hosted Brian Line from the Winooski, Vt. wastewater treatment facility. A full day of facility visits was accomplished that culminated in an exceptional round of golf on Wednesday with NEWEA President Moore and Past-President Bonomo. Many thanks to the hard-working and professional staff from the York Sewer District, the Saco water resource recovery facility, the Portland Water District-East End WWTF, the Lewiston-Auburn water pollution control facility, and the Bethel wastewater treatment facility, which provided comprehensive technical tours of their facilities.

Massachusetts State Director Report

by Mike Moreau
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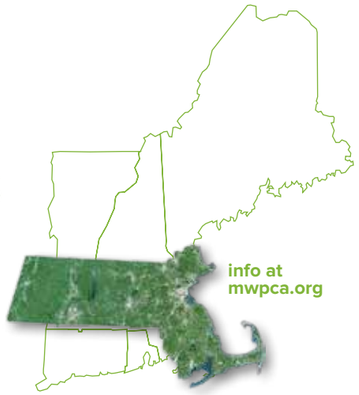

Recent events and MWPCA news

Massachusetts Water Pollution Control Association (MWPCA) attended the Northeast Region Water Conservation Forum, sponsored by the National Science Foundation, at Bristol Community College on May 20. Water quality professionals from New England attended the listening session, which was focused on emerging technician-level workforce demands in drinking water, wastewater, and stormwater management.

MWPCA held its annual golf tournament at Shaker Hills Country Club on June 13. Although the weather was far from optimum, nearly all the registered foursomes braved it and completed the course. Our golf tournament, in honor of MWPCA Past President and Massachusetts Department of Environmental Protection (MassDEP) Trainer Michael Ackerman, raises money to support the Massachusetts operations challenge team at the regional and national competitions. This year we raised more than $2,000 to help send the MASSerators to the national competition at WEFTEC in New Orleans. The MASSerators finished second at the regional competition at the NEWEA spring conference prior to their trip to the nationals.

On July 8, the association held its annual meeting at Chuck's Steak House in Auburn. Several directors could not attend, but those that did attend had a productive meeting reflecting on the past year's events and the future direction of the association.

On July 31, the Massachusetts water infrastructure bill, a compilation of legislation filed by Senator Jamie Eldridge and Representative Carolyn Dykema, was approved by both the House and the Senate. The bill addresses the findings of the water infrastructure finance commission's 2009 report, which identified a $40 billion gap in funding for maintenance, repair, and replacement of water, wastewater,

NEWEA Operator Award winner Joe Fijal expresses his thanks for receiving the Award from his peers

and stormwater infrastructure. The bill will allow an increase in the state revolving fund, from $88 million to $138 million, and will enable cities and towns to levy up to a 3-percent property tax for water-related infrastructure. The bill also establishes a regional water entity reimbursement fund for Massachusetts Water Resources Authority communities, and creates an underground utility coordination commission and a water infrastructure advisory committee. For a link to the complete bill as well as additional resources related to it, visit the MWPCA website at mwpca.org.

In September, MWPCA hosted NEWEA's exchange operator, Kyle Arnold of Woonsocket, R.I. Coincidentally, Kyle Arnold is a nephew of stalwart Frank Arnold, an MWPCA past president. Mr. Arnold toured plants of various processes and sizes across Massachusetts, and finished his exchange with a trip to the MWPCA trade show.

The annual MWPCA trade show was held on September 24 at the Wachusett Mountain ski lodge in Princeton, Mass. On a picture-perfect, early autumn day, more than 50 vendors and

Trade show attendees take a break to enjoy the scenic Wachusett chair lift ride (l-r: Ed Foisy, MWPCA president Mike Foisy, MWPCA executive director Lynn Foisy)

150 members attended. Both the vendors and the attendees agreed that this was one of the best trade shows that the association has sponsored. The vendors were once again pleased with the format of requiring the attendees to obtain signatures from most vendors to qualify for technical training hours, which results in substantive booth traffic. Many attendees took advantage of the scenic chair lift, sponsored by Environmental Operating Solutions and F.R. Mahony, to enjoy the splendid weather.

Operator Jim Madigan (retired) of Uxbridge, Mass., (left) at the trade show

The trade show concluded at 12:30 PM followed by a barbeque buffet that included opening remarks by Association President Mike Foisy and award presentations by Mike Moreau and Ray Willis. NEWEA's Janice Moran and operator Joseph Fijal were re-presented the NEWEA Alfred E. Peloquin Award and the Operator Award, respectively.

At a board meeting following the trade show lunch, directors discussed the trade show results and other important association business. The board determined that a final draft of the association's organizational manual should be reviewed once more, prior to posting on the association's website within the next few weeks.

On October 16, the Massachusetts Water Works Association hosted a joint conference with MWPCA at Devens Common Center in Devens, geared towards all water quality professionals

Training

The pipeline assessment and certification program (PACP) class continues be offered, and each series is extremely well attended. PACP is an internationally accepted method for recording pipeline defects and observations in a standardized fashion to improve management of infrastructure deterioration and renewal. The instructor, Justin deMello of Woodard & Curran, said that he will continue to offer the class as long as there is demand for it. Please check the MWPCA calendar on the website regularly for the next class.

If you have questions regarding MWPCA/NEWEA or have issues or ideas to share, please contact me at 508-989-2744 or at mikem@wwtsinc.com. Thank you for reading the Massachusetts report.

Upcoming events

The next MWPCA quarterly meeting will be held on December 9, 2014, at Bristol Community College. The board has agreed to use the same format as last December's quarterly meeting, with a job fair and technology presentations to be held simultaneously.

MWPCA Quarterly Meeting	Dec. 9, 2014	Bristol Community College, Fall River, Mass.
MWPCA Quarterly Meeting	March 2015	To be announced

Please mark your calendar with these events and look for future events on the MWPCA website, Facebook (www.facebook/mwpca), or Twitter, @MWPCA.

Vermont State Director Report

by Bob Fischer
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Hi, again, from Vermont. This is my last article, as my 4 years as Vermont director (a 3-year term plus 1 year of the previous director's term) ends this January at NEWEA's annual conference. For 2 of those 4 years I was also the Green Mountain Water Environment Association (GMWEA) president. I tried to fulfill the duties of both positions as best I could and believe that the close relationship between NEWEA and GMWEA has grown even closer during my tenure. It has been a rewarding, learning experience, and I would encourage anyone to get involved in NEWEA and/or a state organization in any way he or she can as it more than pays for itself with the networking and knowledge gained.

Government affairs

On May 23, GMWEA with help from NEBRA hosted the first "Water Quality Day" in Vermont. The governor of Vermont, Peter Shumlin, made an official proclamation, declaring "(We)…do proclaim May 23, 2014, as Water Quality Day." Part of the proclamation stated "…the sewer systems and wastewater treatment facilities in communities around Vermont are the first and most critical defense against water pollution from human activities; and . . .the wastewater treatment facilities and the staff that operate them 24/7, 365 days a year are public servants dedicated to protecting public health and the environment and deserve the understanding and support of the Vermont citizenry; and . . .wastewater treatment facilities around the state will host simultaneous open houses and offer tours on May 23, 2014, from 9:00 AM to 2:00 PM (list of sites available at www.gmwea.org) so that Vermonters can learn about this vital, but hidden infrastructure." Tours were offered at facilities across the state, and GMWEA provided signage, refreshments, and talking points. Vermont Department of Environmental Conservation (DEC) Commissioner, David Mears, visited my facility in Montpelier and toured it with the Northfield fifth grade. Television, radio, and newspaper articles covered the event, including a Vermont Public Radio segment with Vermont DEC Wastewater Program Manager Ernie Kelley.

On June 4, I was a panel speaker at the Vermont Environmental Consortium's third annual water quality conference. Speakers included Vermont Governor Peter Shumlin, Burlington Mayor Miro Weinberger, and Pierre Leduc of Corporation Baie Missisquoi. The upcoming Lake Champlain TMDL for phosphorus and other topics were discussed.

At our July GMWEA board meeting Neil Kamman (Vermont DEC) spoke on the proposed amendments to Vermont water quality standards. We encouraged our members to attend the public hearings being proposed as part of the triennial review of the Vermont water quality standards, as required by the federal Clean Water Act (CWA). The proposed amendments to the standards consist of four components:

- Housekeeping changes associated with the transfer of rulemaking authority from the Natural Resources Board (NRB) to the Agency of Natural Resources (ANR)
- Revisions to the E. coli criteria for the protection of waters for swimming for consistency with the EPA guidance under Section 304(a) of the CWA
- Numerous technical revisions to toxic substances criteria contained within "Appendix C" of the current rule, including the addition of criteria for chloride (de-icing salt) for consistency with EPA's guidance under Section 304(a) of the CWA

GMWEA LCI Governor's Cup fishing team with Miss Vermont
(L-R, Bob Fischer, Steve Crosby, Miss Vermont (Lucy Edwards), Governor Shumlin, and Chris Robinson

- A new phosphorus criteria framework for lakes, ponds, and wadeable streams to comply with EPA's national strategy for the development of regional nutrient criteria

We were most concerned about the last change. This change would override any TMDLs and apply potential phosphorus limitations to all facilities in the state, including facilities that have nitrogen limitations due to the Long Island Sound TMDL, based potentially on visual river assessments.

GMWEA spring meeting

The spring meeting was at the Killington grand resort on May 22. It was attended by NEWEA Past President Mike Bonomo and New England Water Works Association (NEWWA) Past President Dave Harris. GMWEA awards were given out and one new director, Ryan Peebles, was elected.

Vermont state science and math fair/ Stockholm Junior Water Prize

GMWEA board members and Vermont DEC's Andy Fish judged the students' work and selected the Vermont winners and the Stockholm Junior Prize winner on March 29 at Norwich University.

World water monitoring challenge

Once again, GMWEA gave out 100 world water monitoring kits to Vermont educators.

NEWEA spring meeting

Other GMWEA members and I participated in the NEWEA spring meeting (June 1-4) in Samoset, Maine, during which I attended numerous meetings (including the awards committee and government affairs committee) and various technical sessions.

GMWEA golf tournament

Almost 100 players and sponsors took part in the George Dow memorial golf tournament on August 22. The proceeds help to fund a GMWEA scholarship.

GMWEA activities

On May 28, GMWEA Vice President Chris Robinson, Board Member Steve Crosby, and I competed in the LCI Governor's Cup fishing derby, with Miss Vermont, Lucy Edwards, as our fourth teammate. She is a sophomore in Neuroscience at the University of Vermont and her platform is "women in science."

On July 17, more than 50 members attended GMWEA "night at the ball game," in Burlington, including a barbeque and seats for a Vermont Lake Monsters baseball game.

Upcoming events

The GMWEA fall trade show is taking place in Burlington on November 6. Vermont will host the Maine exchange operator during this time.

Clean water soap box

by Bob Fischer

In Vermont, GMWEA continues to offer training opportunities, educational outreach to the public, and events for operators to get together and communicate. GMWEA also remains proactive in government affairs (see topics below). As the "boots on the ground" environmentalists, we have also reached out to various other groups concerned with water quality to make New England a better place to live, work, and play. Since we are all working toward the same goals, we hope this style of collaboration can form powerful, effective partnerships that yield measurable results. Although the means may differ, polite discourse between disparate groups is the way to move forward. As trained scientists, we believe in the use of scientific methods to understand problems and then use law, science, and the market to develop innovative, pragmatic solutions to New England's toughest challenges. This has led often to lively debates among the various groups to whom we have reached out. I have heard statements such as, "We are going to put you out of business," but this was expressed in a friendly and honest manner. My counterstatement was "That's okay, because non-centralized systems will have even more need for operations, maintenance, and repair personnel than centralized systems, so I will be fine."

My scientific analysis indicates that wastewater collection systems and treatment facilities, although extremely expensive to build and costly and difficult to maintain, are the best current option for the "health" of the environment and for human health. In many New England communities the equity/liability that the citizens have in their systems is higher than anything else they own, including their residences. While the math is pretty easy, the options are limited. In Montpelier (the system for which I am responsible), for example, there are approximately 3,000 connections. Total replacement cost of the pump stations, pipes, and facility is estimated at approximately $500 million, which divided by 3,000 yields a share of $167,000 per connected household, which is a lot of money no matter how you calculate it. The "non-centralized advocates' recommended solution was "rain collection and composting toilets." My counterargument is that we had these things in the bad, old colonial times before running water, but now 97 to 99 percent of what is received at my facility is water, not solids. I speculated that my wife and four children would be unlikely to maintain a composting toilet, and stop showering and washing clothes; and besides, unless trained water operators control the quality of water from these roof collection systems, there may be a lot of good, old colonial typhoid and dysentery in our future. Of course, no one, including us as operators, has all the answers. We still have a long way to go on public education.

I consider the increased dialog among GMWEA, its 600 members, and disparate environmental groups to be a success during my time in office. Still, there is a long way to go, as illustrated by the rather confrontational opinion of one large organization leader, who opened (and closed) one discussion with the phrase, "limits of technology with offsets." Though I find this way of thinking to be maddening anathema to the scientific method, I still patiently explained that GMWEA is not for the status quo, and that water resource recovery facilities were the only group that achieved the phosphorus limit targets in the last Lake Champlain TMDL. Although we operators are willing to accept lower limits, eventually spending unlimited amounts of money on diminishing returns will not benefit the environment, and the added cost may only push people to move out of traditional New England compact, walkable cities, towns, and villages.

Wastewater collection systems and treatment facilities, although extremely expensive to build and costly and difficult to maintain, are the best current option for the "health" of the environment and for human health

Additionally, even if everyone were to go to on-site septage (assuming that is even possible in an urban setting) some new design would be needed, as between 10 and 20 percent of all on-site systems are not adequately treating waste (U.S. Department of Commerce, American Housing Survey for the United States –1995, issued 1997) and improper construction and maintenance of septic systems are blamed for substantial and widespread nutrient and microbial contamination to groundwater (National Water Quality Inventory 1996 Report to Congress). When presented with figures and studies, one activist responded that he had "no time for paper exercises" and was "too busy to ever meet with you." Even in the face of such reactions, we must continue to communicate our concern about the environment and the negative environmental effects of unlimited spending for limited gain. As operators, we should count and advertise the successes we have had, strive to overcome the difficulties of educating the public about what we actually do, and continue to reach out to anyone who wants to help improve the environment and retain Vermont's tradition of compact settlements separated by rural countryside.

Annual Conference & Exhibit Preview

January 25–28, 2015 • Boston Marriott Copley Place, Boston, MA

We have some exciting additions to the Annual Conference—the biggest and best wastewater forum in New England. NEWEA President Brad Moore will preside over this year's conference featuring expanded technical sessions, two days of poster sessions, exhibitors, and the Awards Ceremony.

The technical program will include 33 sessions that span all areas of expertise in the water quality and resources profession. Topics are wide-ranging and will include emerging issues, practical applications, specific project experience, and lessons learned. New this year are sessions focused on selected "Hot Topics."

New this year—
Two Graduate Level Technical Sessions in addition to our Student Poster Competition

Conference Events

SUNDAY, JANUARY 25

Registration – 4th Floor ..... Noon–4:00 PM

MONDAY, JANUARY 26

Registration – 4th Floor ..... 7:00 AM–6:00 PM
Technical Sessions 1–5 ..... 8:30–10:30 AM
Technical Sessions 6–12 ..... 8:30–10:30 AM
Exhibits ..... 10:30 AM–6:30 PM
Opening Session ..... 11:00 AM
Exhibit Hall Reception ..... 4:30–6:30 PM

TUESDAY, JANUARY 27

Registration – 4th Floor ..... 7:00 AM–6:00 PM
Exhibits ..... 8:00 AM–6:30 PM
Technical Sessions 13–18 ..... 9:00 –11:30 AM
Technical Sessions 19–24 ..... 1:30–4:00 PM
Exhibit Hall Reception ..... 4:00–6:00 PM

WEDNESDAY, JANUARY 28

Registration – 4th Floor ..... 7:30 AM–2:00 PM
Exhibits ..... 8:00 AM–1:00 PM
Awards Presentation & Gavel Passing ...11:00 AM
Technical Sessions 25–30 ..... 8:30–11:00 AM
Technical Sessions 31–33 ..... 1:00–3:00 PM

Event Hotel

Boston Marriott Copley Place Hotel
110 Huntington Avenue
Boston, MA 02116
617-236-5800

SINGLE—$199.00
DOUBLE—$219.00

Conference Registration

Register online/download a complete conference program at newea.org
Phone: 781-939-0908

Early registration before January 9

Hot Topics

- **Advances in Process Monitoring and Control**
- **Emerging Technologies**
- **Funding Stormwater Management**
- **Infrastructure Resiliency**
- **Revolutionizing Training and Learning How to Learn**
- **Sustainable Nutrient Removal**

Conference Exhibitors

ACF Environmental/Fabco Industries
ADS Environmental Services
Advanced Drainage Systems, Inc.
AP/M CentriPipe
Aqua Solutions, Inc.
Aquagen Infrastructure Systems, Inc.
Asahi/America
Associated Electro-Mechanics Inc.
Atlantic Fluid Technology
BAU/HOPKINS
BDP Industries
Bilfinger Airvac Water Technologies
Biosec Enviro., Inc.
BISCO Pump Systems
Blake Equipment Co.
Brentwood Industries, Inc.
Burt Process Equipment
Cabot Norit Activated Carbon
Carl Lueders & Company
Carlsen Systems, LLC
Casella Organics
Coyne Chemical Environmental Svcs.
CUES
David F. Sullivan & Associates, Inc.
DN Tanks
Duperon Corp.
Duke's Root Control, Inc.
Eastern Pipe Service, LLC
Engineered Treatment Systems, LLC
Environmental Dynamics, Inc.
Environmental Operating Solutions, Inc.
Evoqua
F.R. Mahony & Associates, Inc.
F.W. Webb Co. – Process Controls Div.
Fay, Spofford & Thorndike
Flottweg Separation Technologies, Inc.
Flow Assessment Services
FlowWorks, Inc.
Flygt Products – A Xylem Brand
Ford Hall Company
G.L. Lyons Associates
Gabriel Novac & Associates, Ltd.
Geomembrane Technologies Inc. (GTI)
Green Mountain Pipeline Services
Hach Company
Hamilton Kent LLC
Hanna Instruments
Hayes Pump, Inc.
Hazen and Sawyer
HOBAS Pipe USA
Holland Company
Infrastructure Technologies
Innovyze, Inc.
Inovair
J&R Sales and Service, Inc.
Kemira
Maltz Sales Company
Martinez Couch & Associates LLC
Mechanical Solutions, Inc.
National Filter Media
New England Environmental Equipment
Oakson
Pavers by Ideal
Perma-Liner Industries, LLC
PRIMEX Controls
Pump Systems Inc.
R.H. White Construction Co., Inc.
Resource Management, Inc.
RITEC Environmental
Rockwell Automation
Russell Resources, Inc.
Schulz Group, A Timken Brand
SDE, Inc.
SNF Polydyne, Inc.
Statewide Aquastore, Inc.
Synagro North East, LLC
SyTech, Inc.
Technology Sales Associates Inc.
The MAHER Corporation
Trumbull Industries
United Concrete Products Inc.
USA Blue Book
Vari-Tech, LLC
Vogelsang
Walker Wellington, LLC
Wastecorp Pumps LLC
Water & Waste Equipment, Inc.
WESCOR Associates, Inc.
Westech
WhiteWater, Inc.
Winters Instruments
Woodard & Curran
Yeomans Chicago Corporation

as of 10/28/14

2014 Award Recipients

NEWEA

Alfred E. Peloquin, CT ..... Brian Armet
Alfred E. Peloquin, MA ..... James Barsanti
Alfred E. Peloquin, ME ..... Travis Peaslee
Alfred E. Peloquin, NH ..... Harry Stewart
Alfred E. Peloquin, RI ..... Janine Burke
Alfred E. Peloquin, VT ..... Robert Fischer
Asset Management ..... City of Dover, NH
Claire N. Sawyer ..... Edward Rushbrook
E. Sherman Chase ..... Aubrey Strause
Elizabeth Cutone Executive Leadership ..... Sidney Holbrook
Energy Management Achievement ..... Veolia Water/Plymouth, MA WWTP
Founders ..... Norton True
James Courchaine Collection Systems ..... John Sullivan, Jr.
Operator Safety ..... Donald Dubiel
Operator, CT ..... Daniel Sullivan, Jr.
Operator, MA ..... Linda Schick
Operator, ME ..... Michael Tibbetts
Operator, NH ..... Kenneth Noyes
Operator, RI ..... Shawn Murphy
Operator, VT ..... Kevin McLaughlin
Past President Plaque & Pin ..... Michael Bonomo
Public Educator ..... Andrew Fish
SJWP - CT ..... Bridget Oei
SJWP - ME ..... Mary Butler
SJWP - NH ..... Deepika Kurup
SJWP - VT ..... Nevil Desai
Wastewater Utility ..... Montpelier, VT Water Resources Recovery Facility
Young Professionals ..... Dustin Price

WEF (presented at WEFTEC)

Operations Challenge ..... Force Maine
Operator Ingenuity ..... Michael Carle
Public Education ..... NEWEA
Water Quality Improvement ..... Narragansett Bay Commission
WEF Fellows ..... James Crook
WEF Fellows ..... John Hart
WEF Service ..... Jeanette Brown

WEF—MA Awards

Arthur Sidney Bedell ..... Steven Freedman
George W. Burke, Jr. ..... Winnipesaukee River Basin WWTP
Lab Analyst Excellence ..... Mary Jersey
William D. Hatfield ..... Stephen Sloan
Quarter Century Operator ..... Gregory Thulen
Quarter Century Operator ..... Mario Leclerc
Quarter Century Operator ..... Michael Bisi
Quarter Century Operator ..... Phyllis Arnold Rand
Quarter Century Operator ..... Timothy Baker
WEF Life Membership ..... James Pappas
WEF Life Membership ..... Joseph Shepherd
WEF Life Membership ..... Roger Janson
WEF Life Membership ..... Russell Adams
WEF Life Membership ..... Steven Freedman
WEF Service/WEF Delegate ..... Jennifer Lachmayr


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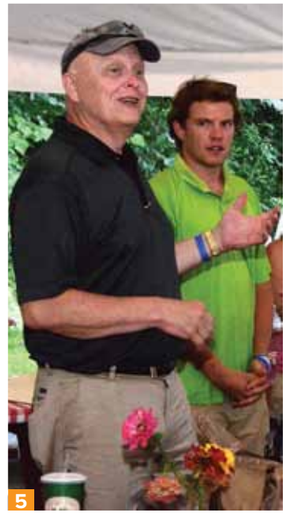
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26th Annual committee member appreciation event

by Dan Roop

Friends, family, and fun: the recipe for a wonderful time. These three ingredients were certainly prevalent on July 17 at this year's committee member appreciation event. On a beautiful summer evening, NEWEA committee members, friends, and families gathered for the second year in a row at Kimball Farm in Westford, Mass., for the 26th annual NEWEA-sponsored committee member appreciation event. Word of the great time we had at Kimball's last year must have spread, as attendance this year more than doubled that from 2013. We hosted 111 adults and 21 children, for an evening of great fun and memories.

"The location was perfect, the food was excellent, the activities were a blast (especially the bumper boats), and, to top it off, the weather was absolutely perfect," Michael Trainque, a NEWEA government affairs committee member, recalls. "Anyone who missed this event missed out on a really great time. Thank you to the folks at NEWEA for putting this together."

Throughout the year, NEWEA committee members work hard for our organization and each other, to preserve, protect, and manage New England's water environment. The purpose of the committee member appreciation committee is to recognize this wonderful work and volunteerism, and to celebrate these efforts together. Whether you attended the event or not, know that your hard work as a committee member is greatly appreciated.

The venue featured many activities for the young and young at heart to enjoy such as the popular bumper boats, mini-golf, batting cages, driving range, pitch and putt golf, and volleyball. When taking a break from activities, folks gathered under NEWEA's private party tent to enjoy good company, drinks, and an all-you-can-eat barbecue. Another highlight was the make-your-own ice-cream sundae bar featuring Kimball's own homemade ice-cream.

While gathered under the tent, NEWEA President Brad Moore and Committee Member Appreciation Committee Chair Dan Roop welcomed and thanked guests for attending and all they do throughout the year. In addition to organizing the appreciation event, the committee also runs the thanks-a-NEWEA program, which was initiated to give a special thanks to committee members who go above and beyond their call of duty. All committee members were invited to nominate any other member who had made a special contribution to a committee. This year's program was spearheaded by Denise Moberg, a new member of the committee member appreciation committee. This year there were 10 thanks-a-NEWEA awards. Each nominee received a certificate of recognition and a $75 American Express gift card. Congratulations to this year's recipients: Jim Laliberte, safety committee; Paul Casey, sponsorship committee; Geri Ciardelli, newsletter committee; Helen Gordon, Journal committee; Ben Mosher, Website committee; Sandeep Sathyamoorthy, microconstituents committee; Marylee Santoro, lab practices committee; Shannon Eyler, safety committee; George Vercelli, membership committee; and Sue Guswa, program committee.

For more information about why each member earned a nomination or to learn more about the thanks-a-NEWEA program, please visit the NEWEA website.

If you could not attend this year, please keep your eyes and ears open for our 2015 event. We will certainly try to keep the great energy we have built this year rolling. In the meantime, there are many great ways to get involved and stay in touch with NEWEA. If you are a NEWEA member and would like to become a committee member, there is no time like the present. The committee member appreciation committee is always looking for fun, energetic new members. Are you a young new NEWEA member? Consider reaching out to Justin Skelly, chair of the young professionals committee. Whichever committee you join, it will be the pathway to making a difference to NEWEA, the industry, and even your own professional development.

The success of this year's event could not have been possible without the hard work and planning of many. A special thanks to Denise Moberg, Melissa Recos, Sarah Belliveau, Karla King, Linda Austin, Mary Barry, and the many others who helped make the event a success. More important, however, a special thanks to all the committee members who came out to enjoy a well-deserved evening of summer fun with us. We look forward to seeing you at next year's annual committee member appreciation event!

1. Gene Forbes, Mary White, and John Jackman and others return from the bumper boats **2.** Director Tom Groves with his son Landon and Susan Sullivan of the Government Affairs Committee. **3.** NEIWPCC's Jim Laliberte and Don Kennedy enjoy the barbecue with their spouses **4.** Amy Anderson, Katelyn Biedron, Meg Tabacsko, and Linda Austin take a moment to pose **5.** Brad Moore and Dan Roop address the crowd. **6.** Justin deMello winds up **7.** Geri Ciardelli celebrates her thanks-a NEWEA award with her two daughters. **8.** The bumper boats were a popular after-supper draw **9.** Elena Proakis Ellis and Rob Musci pause for a refreshment. **10.** Massachusetts Director Mike Moreau with his three children **11.** Past president Mike Bonomo was again a favorite target in the bumper boats.

Specialty conference proceedings

CONFERENCE

COLLECTION SYSTEMS

Hosted by NEWEA's Collection Systems Committee

September 10, 2014, Westford Regency Inn
Westford, Massachusetts

Meeting registrants included: 104 attendees and 15 exhibitors.

The technical presentations commenced on Wednesday with NEWEA President, Brad Moore and NEWEA Collection Systems Committee Chair, John Digiacomo providing the Welcome and Opening Remarks to meeting attendees.

KEYNOTE
- David Ferris, Director, MassDEP

MORNING SESSION
- Moderators: Kevin Olson, Wright-Pierce and Scott Lander, Hamilton Kent

When MOM's Happy, Everyone's Happy
- Sean Fitzgerald, Hazen and Sawyer; Steve Tilson, Tilson & Assoc.

A Proactive Approach to Assessing and Managing the Wastewater Collection System
- Joseph Hausmann, Wright Pierce; William Brink, Stamford WPCA

Winn's Brook Area Sewer Overflow Mitigation
- Justin Gould, Fay, Spofford & Thorndike

Historic Egg Shaped Sewer Gets a Modern Makeover
- Sandra Gonneville and Gus O'Leary, Kleinfelder

AFTERNOON SESSION
- Moderators: Tom Loto, Kleinfelder and John Murphy, Stantec

MWRA Hurricane Preparedness at Chelsea Screen House
- Steven Perdios, Dewberry Engineers, Inc.; Kathleen McCue Cullen, MWRA

City of Milford, CT Combats Odor & Corrosion with Oxygen
- Inken Mello, ECO Oxygen Technologies; Jim Cooper, City of Milford, CT

Building a Dynamic, Consent Decree—Approved Model from the Ground Up, City of Fitchburg
- Laurie Perkins and Matthew Corbin, Wright-Pierce

Looking at the Whole Picture in Woods Hole
- Michael McManus and Michael Schrader, Tighe & Bond, Inc.

EXHIBITORS
ADS Environmental Services
AP/M CentriPipe
BAU/Hopkins,
JWC Company
Hach Flow
CUES
David F. Sullivan & Assoc.
Duke's Root Control, Inc.
F.R. Mahony & Associates, Inc.
Flow Assessment Services LLC
Hamilton Kent LLC
Municipal Sales, Inc.
National Water Main Cleaning Company
NEIWPCC
Precision Industrial Maintenance, Inc.
The Sherwin-Williams Co.
Ted Berry Company, Inc.

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Fuss & O'Neill, Inc.
Green Mountain Pipeline Services
Hayes Pump, Inc.
Hazen and Sawyer, PC
Hoyle, Tanner & Associates
Kleinfelder
Martinez Couch & Associates
Tighe & Bond, Inc.
Weston & Sampson
Woodard & Curran
Wright-Pierce

Upcoming meetings & events

EXECUTIVE COMMITTEE MEETING WITH ALL CHAIRS
January 25, 2015
Boston Marriott Copley Place Hotel, Boston, MA

NEWEA WATER REUSE & INDUSTRIAL WASTEWATER SEMINAR
April, 2015
Windsor Locks, CT

NEWEA CONGRESSIONAL BRIEFING
April 14 & 15, 2015
Washington, DC

NEWEA SPRING MEETING AND EXHIBIT
June, 7–10, 2015
Mt. Washington Resort, Bretton Woods, NH

AFFILIATED STATE ASSOCIATIONS AND OTHER ASSOCIATION MEETINGS & EVENTS

MWPCA QUARTERLY MEETING AND CAREER FAIR
December 9, 2014
Bristol Community College, Fall River, MA

CWPAA HOLIDAY PARTY AND ELECTION OF OFFICERS
December 9, 2014
Kelly Gazerro Post, Cranston, RI

NEW HAMPSHIRE WPCA WINTER MEETING
December 12, 2014
Ashworth by the Sea, Hampton, NH

GMWEA STATE HOUSE MEET & GREET
January 21 & February 13, 2015
VT State House cafeteria, Montpelier, VT

MEWEA JOINT ANNUAL MEETING AND TRADESHOW WITH MWUA
February 3-4, 2015
Holiday Inn by the Bay Portland, ME

GMWEA LEGISLATIVE LUNCH
February 26, 2015
Capitol Plaza, Montpelier, VT

NEWEA ANNUAL CONFERENCE JANUARY 25–28, 2015

The Annual Conference is a great forum to meet colleagues, professional allies, make new friends and exchange information.
We look forward to seeing you there!

Boston Marriott Copley Place Hotel Boston, MA

This is a partial list. Please visit the state association websites and NEWEA.org for complete and current listings.

MWUA/MWWCA MAINE LEGISLATIVE BREAKFAST
February 26, 2015
Augusta, ME

CWPAA CONNECTICUT LEGISLATIVE BREAKFAST
March 2015
Hartford, CT

MEWEA/NHWPCA(NHWEA) JOINT SKI DAY
March 13 or 27, 2015
Saddleback Ski Area, Rangeley, ME

NEW ENGLAND WATER WORKS ASSOCIATION SPRING CONFERENCE
April 1–2, 2015
Conference, DCU Center, Worcester, MA

NHWPCA 2015 ANNUAL TRADESHOW
April 19, 2015
Executive Court, Manchester, NH

CWPAA 2015 ANNUAL TRADESHOW
April 23, 2015
New Life Church, Wallingford, CT

GMWEA SPRING & ANNUAL MEETING
May 21, 2015
Killington Grand Hotel, Killington, VT

NEWEA
WORKING FOR WATER QUALITY

New members
June – September 2014

Ed Block
Cambridge MA (ACAD)

Emily Whalen
Amston CT (COMP)

Andrew Ye
Bangor ME (COMP)

Aidan McGowan
Bath ME (COMP)

Lynn Swanson
Bath ME (COMP)

Amanda Deming
Bethel CT (COMP)

Lauren Nalley
Germantown TN (COMP)

Bridget Oei
Hebron CT (COMP)

Jin Joo Kim
Ridgefield CT (COMP)

Kenneth Dorian
Riverside CT (COMP)

Andrew Ma
Riverside CT (COMP)

Reed McMurchy
Stamford CT (COMP)

Mahesh Raman
Stamford CT (COMP)

Eric Dexheimer
Westport CT (COMP)

Rick Toohey
City of Lowell (COMP)

Rodney L Warrington
Queensbury Wastewater Dept (COMP)

Vinnie Russo
Warwick Sewer Authority (COMP)

Larry Vandeventer
Cambridge MA (EXEC)

Scott Turner
Boston MA (PRO)

Kurt Karlson
Burlington MA (PRO)

Dennis Sullivan
Canton MA (PRO)

Thomas S Miles
Hatfield PA (PRO)

Peter J Ozzolek
Newton MA (PRO)

Mark Devine
Norwell MA (PRO)

Abram Patenaude
Portland ME (PRO)

Richard Couch
Rocky Hill CT (PRO)

Joseph Nadolski
San Clemente CA (PRO)

John Choate
White River Junction VT (PRO)

Josh Tyler
Williston VT (PRO)

Melanie Solmos
Yarmouth ME (PRO)

Justin Rabidoux
City of South Burlington (PRO)

Antonio F Federici
Dewberry-Goodkind Inc (PRO)

Peter Michael Hanrahan
Everett J. Prescott, Inc. (PRO)

Kevin P Klein
Fay Spofford & Thorndike Inc (PRO)

Adrienne R Fine
Fay Spofford & Thorndike Inc (PRO)

Anthony Capo
Fiberglass Fabricators (PRO)

Brian Robinson
Flow Tech (PRO)

Tom M Barrett
GIS Inc (PRO)

Russell B Parkman
GZA Geoenvironmental Inc (PRO)

Evan N Walsh
Lowell Regional Wastewater (PRO)

Jerry Lukowski
MDC (PRO)

Michael T Sullivan
MWH (PRO)

Leeann L Hanson
NEIWPCC (PRO)

Steven A Torres
Pannone Lopes Devereaux & West LLC (PRO)

Alan Williams
Precision Digital Corp (PRO)

Brian M Paganini
Quantum Biopower (PRO)

Ann S Straut
State of Connecticut DEP/BWM (PRO)

Lynnette A Whitney
State of Vermont (PRO)

Sarah F White
Unifirst Corp (PRO)

Jeffrey Backman
Allenstown NH (PWO)

Katherine Kneeland
Broad Brook CT (PWO)

Jason Hofmann
Lebanon CT (PWO)

Phil Laramie
Lyndon VT (PWO)

Kenneth Conaty
Merrimack NH (PWO)

Scott Lausier
Saco ME (PWO)

Nora Lough
Warwick RI (PWO)

Ryan Case
Biohabitats (PWO)

Edward Davies
Narragansett Bay Commission (PWO)

Michael Ceasrine
Narragansett Bay Commisson (PWO)

Joe Crosby
Narragansett Bay Commisson (PWO)

Michael Spring
Narragansett Bay Commission (PWO)

Robert R Pearson
Pepperell WWTP (PWO)

Joseph S Lauria
Weston & Sampson Engineers Inc (PWO)

Rita Ann Cabral
Allston MA (STU)

Kristie Stauch-White
Amherst MA (STU)

Matthew Stanley
Bellingham MA (STU)

Gauthami Davineni
Bridgeport CT (STU)

Patrick Finn
Burlington VT (STU)

Mann Hu
Cambridge MA (STU)

Yuqi Wang
Cambridge MA (STU)

Yiyue Zhang
Cambridge MA (STU)

Quinn Lonczak
Chicopee MA (STU)

Eric Ellison
Glastonbury CT (STU)

Deirdre Arcand
Middletown CT (STU)

Luke Detwiler
Natick MA (STU)

Dawn Henning
New Haven CT (STU)

Nathaniel Merrill
S Kingstown RI (STU)

Carleigh Rixon
South Royalton VT (STU)

Justin Mark Parlapiano
Stafford Spgs CT (STU)

Rebecca Rubinstein
Stafford Springs CT (STU)

Mitchell Page
Uxbridge MA (STU)

Kyle F Hampton
Waquoit MA (STU)

Torey Brooks
Wolfeboro NH (STU)

Kyle Purdy
Boston MA (YP)

Anjuli Jain
Cambridge MA (YP)

Jessica L Dzwonkoski
Chicopee MA (YP)

Charles Snow
Hudson MA (YP)

Ian Carter
Kennebunk ME (YP)

Lydia Krembs
Milford CT (YP)

Kaela M Wiklund
Plainville MA (YP)

Iulia Barbu
AECOM (YP)

Amanda Lade
CDM Smith (YP)

Michael Migliori
CDM Smith (YP)

Corey Lewis
Maine Department of Environmental Protection (YP)

Michael W Masztal
MWH Global (YP)

Anna D Meyer
NEIWPCC (YP)

Kerri Brennan
Town of Danvers (YP)

Affiliate (AFF)
Complimentary (COMP)
Corporate (COR)
Dual (DUAL)
Executive (EXEC)
Honorary (HON)
Life (LIFE)
Professional (PRO)
Professional WW/OPS. (PWO)
Student (STU)
Young Professional (YP)

Thank you

TO ALL OUR 2014 ANNUAL SPONSOR PROGRAM PARTICIPANTS:

Build relationships with water industry leaders *and* make a positive impact on the water environment

- Gold
  - AECOM
  - Aqua Solutions, Inc.
  - ARCADIS
  - CDM Smith
  - EST Associates, Inc.
  - Flow Assessment Services LLC
  - Green Mountain Pipeline Services
  - Hazen and Sawyer, PC
  - Kleinfelder
  - The MAHER Corporation
  - RH White Construction
  - Weston & Sampson
- Silver
  - Fuss & O'Neill
  - Synagro Northeast LLC
  - Tighe & Bond, Inc.
  - United Water
  - Woodard & Curran
  - Wright-Pierce
- Bronze
  - ADS Environmental Services
  - BETA Group
  - Brown and Caldwell
  - CH2M HILL
  - David F. Sullivan & Assoc., Inc.
  - Dewberry
  - Duke's Root Control, Inc.
  - Environmental Partners Group, Inc.
  - Fay, Spofford & Thorndike
  - Hayes Pump, Inc.
  - Hoyle, Tanner & Associates
  - Martinez Couch & Associates
  - NEFCO

Join NEWEA's 2015 Annual Sponsor Program

NEWEA offers companies the opportunity to promote their products and services throughout the year by participating in multiple sponsorship activities. Annual Sponsorships include:

- NEWEA Annual Conference
- NEWEA Spring Meeting & Golf Tournament
- The Operations Challenge Golf Tournament
- A web presence on NEWEA.org's sponsorship program page
- The option to customize sponsorship levels by selecting to participate in up to eight additional unique NEWEA events plus additional activities

Sponsorship Benefits:

- Increased corporate visibility and marketing opportunities within a wide audience of water industry professionals
- Relationship-building access to key influencers involved in advancing water industry services, technology, and policy
- Recognition as an environmental leader among peers and customers

Annual Sponsorship Enrollment Deadline is January 9, 2015.

For more information contact Mary Barry:
EMAIL: mbarry@newea.org
CALL: 781-939-0908

NEWEA
WORKING FOR WATER QUALITY

Advertiser index

NEWEA Membership Application 2015

Water Environment Federation
the water quality people

NEWEA
WORKING FOR WATER QUALITY

Personal Information

Last name | M.I. | First Name | (jr. sr. etc)

Business Name (if applicable)

Street or P.O. Box (☐ Business Address ☐ Home Address)

City, State, Zip, Country

Home Phone Number | Business Phone Number | Fax number

Email Address

☐ Please send me information on special offers, discounts, training, and educational events, and new product information to enhance my career ☐ by e-mail ☐ by fax

☐ Check here if renewing, please provide current member I.D.

**By joining NEWEA you also become a member of the Water Environmental Federation (NEWEA is a member Association of WEF)

Employment Information (see back page for codes)

1. ORG Code: | Other (please specify): | 2. JOB Code: | Other (please specify):

3. Focus Area Codes: | Other (please specify:

Signature (required for all new memberships) | *Date*

Sponsorship Information

WEF Sponsor name (optional) | Sponsor I.D. Number | ACQ. Code for WEF use only | WEF 15

Membership Categories (select one only)

		Member Benefit Subscription	Dues
☐ **Professional Package**	Individuals involved in or interested in water quality	■ *WE&T* (including *Operations Forum*) ■ *WEF Highlights Online*	$157
☐ **Young Professional Package**	New members or formerly student members with 5 or less years of experience in the industry and less than 35 years of age. This package is available for 3 years.	■ *WE&T* (including *Operations Forum*) ■ *WEF Highlights Online*	$67
☐ **Professional Wastewater Operations (PWO) Package**	Individuals in the day-to-day operation of wastewater collection, treatment or laboratory facility, or for facilities with a daily flow of < 1 mgd or 40 L/sec.	■ WE&T (including *Operations Forum*) ■ *WEF Highlights Online*	$96
☐ **Academic Package**	Instructors/Professors interested in subjects related to water quality.	■ *WE&T* (including *Operations Forum*) ■ *WEF Highlights Online* ■ *Water Environment Research* (Online)	$157
☐ **Student Package**	Students enrolled for a minimum of six credit hours in an accredited college or university. Must provide written documentation on school letterhead verifying status, signed by an advisor or faculty member.	■ *WE&T* (including *Operations Forum*) ■ *WEF Highlights Online*	$10
☐ **Executive Package**	Upper level managers interested in an expanded suite of WEF products/services.	■ *WE&T* (including *Operations Forum*) ■ *World Water* ■ *Water Environment Research* (Online) ■ *Water Environment Regulation Watch*	$338
☐ **Dual**	If you are already a member of WEF and wish to join NEWEA		$40
☐ **Corporate Membership** (member benefits for one person)	Companies engaged in the design, construction, operation or management of water quality systems. Designate one membership contact.	■ *WE&T* (including *Operations Forum*) ■ *Water Environment Research* (Print) ■ *Water Environment Regulation Watch* ■ *WEF Highlights Online*	$393

WEF Utility Partnership Program (UPP): NEWEA participates in the WEF Utility Partnership Program (UPP) that supports utilities to join WEF and NEWEA while creating a comprehensive membership package for designated employees. As a UPP Utilities can consolidate all members within their organization onto one account and have the flexibility to tailor the appropriate value packages based on the designated employees' needs. Contact WEF for questions and enrollment.

Payment

☐ **Check or money order enclosed**
Made payable to NEWEA
10 Tower Office Park, Suite 601
Woburn, MA 01801
For more information: 781.939.0908
Fax 781.939.0907 NEWEA.org

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Card # | Exp. Date

Daytime Phone

Signature

Billing Address (☐ check here if same as above) | Street/PO Box | City, State, Zip

Dependant upon your membership level, $10 of your dues is allocated towards a subscription to the NEWEA Journal.

NEWEA Membership Codes 2015

To help us serve you better, please complete the following:
(choose the one that most closely describes your organization and job function)

What is the nature of your ORGANIZATION?

(circle one only) (ORG)

1
Municipal/district Water and Wastewater Plants and/or Systems

2
Municipal/district Wastewater Only Systems and/or Plants

3
Municipal/district Water Only Systems and/or Plants

4
Industrial Systems/Plants (Manufacturing, Processing, Extraction)

5
Consulting or Contracting Firm (e.g., Engineering, Contracting Environmental, Landscape Architecture)

6
Government Agency (e.g., U.S. EPA, State Agency, etc.)

7
Research or Analytical Laboratories

8
Educational Institution (Colleges and Universities, libraries, and other related organizations)

9
Manufacturer of Water/Wastewater Equipment or Products

10
Water/Wastewater Product Distributor or Manufacturer's Rep.

11
Stormwater (MS4) Program Only

12
Other _____
(please specify)

What is your Primary JOB FUNCTION?

(circle one only) (JOB)

1
1. Upper or Senior Management (e.g., President, Vice President, Owner, Director, Executive Director, General Manager, etc.)

2
Engineering, Laboratory and Operations Management (e.g., Superintendent, Manager, Section Head, Department Head, Chief Engineer, Division Head, Landscape Architect etc.,)

3
Engineering and Design Staff (e.g., Consulting Engineer, Civil Engineer, Mechanical Engineer, Chemical Engineer, Planning Engineer, Landscape Architect, Environmental/ Wetland Scientist etc.)

4
Scientific and Research Staff (e.g., Chemist, Biologist, Analyst, Lab Technician, Environmental/Wetland Scientist etc.)

5
Operations/Inspection & Maintenance (e.g., Shift Supervisor, Foreman, Plant Operator, Service Representative, Collection Systems Operator, BMP Inspector, Maintenance, etc.)

6
Purchasing/Marketing/Sales (e.g., Purchasing, Sales Person, Market Representative, Market Analyst, etc.)

7
Educator (e.g., Professor, Teacher, etc.)

8
Student

9
Elected or Appointed Public Official (Mayor, Commissioner, Board or Council Member)

10
Other _____

What are your KEY FOCUS AREAS?

(circle all that apply) (FOC)

1
Collection Systems

2
Drinking Water

3
Industrial Water/Wastewater/ Process Water

4
Groundwater

5
Odor/Air Emissions

6
Land and Soil Systems

7
Legislation (Policy, Legislation, Regulation)

8
Public Education/Information

9
Residuals/Sludge/Biosolids/Solid Waste

10
Stormwater Management/ Floodplain Management/Wet Weather

11
Toxic and Hazardous Material

12
Utility Management and Environmental

13
Wastewater

14
Water Reuse and/or Recycle

15
Watershed/Surface Water Systems

16
Water/Wastewater Analysis and Health/ Safety Water Systems

17
Other _____

Optional Items (OPT)

Years of industry employment? _____
1 (1 to 5) **2** (6 to 10) **3** (11 to 20)
4 (21 to 30) **5** (>30 years)

Year of birth? _____

Gender? _____
1 Female **2** Male

Education level? (ED) _____
1 High School **2** Technical School
3 Some College **4** Associates Degree
5 Bachelors Degree
6 Masters Degree **7** JD **8** PhD

Education/Concentration Area(s) (CON) _____
1 Physical Sciences (Chemistry, Physics, etc.)
2 Biological Sciences **3** Engineering Sciences
4 Liberal Arts **5** Law **6** Business

Water quality professionals, with fewer than 5 years working experience and are under the age of 35, are eligible to join WEF as an Active Member, while participating in the NEWEA/WEF Young Professionals Program. This program allows up to 50% off of the Active Member dues, valid for the first three years of membership. This program is available for new member applicants and Student Members.

FST – *Transforming Innovation into Action*

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Burlington, MA 01803

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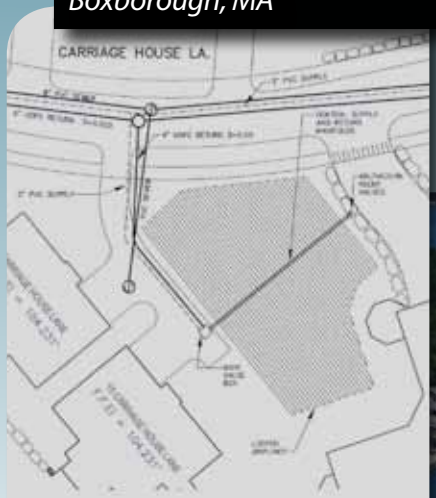
Burlington, Boston, Quincy & Hyannis, MA; Bedford, NH; South Portland, ME; East Windsor, CT; Melville & New York, NY.

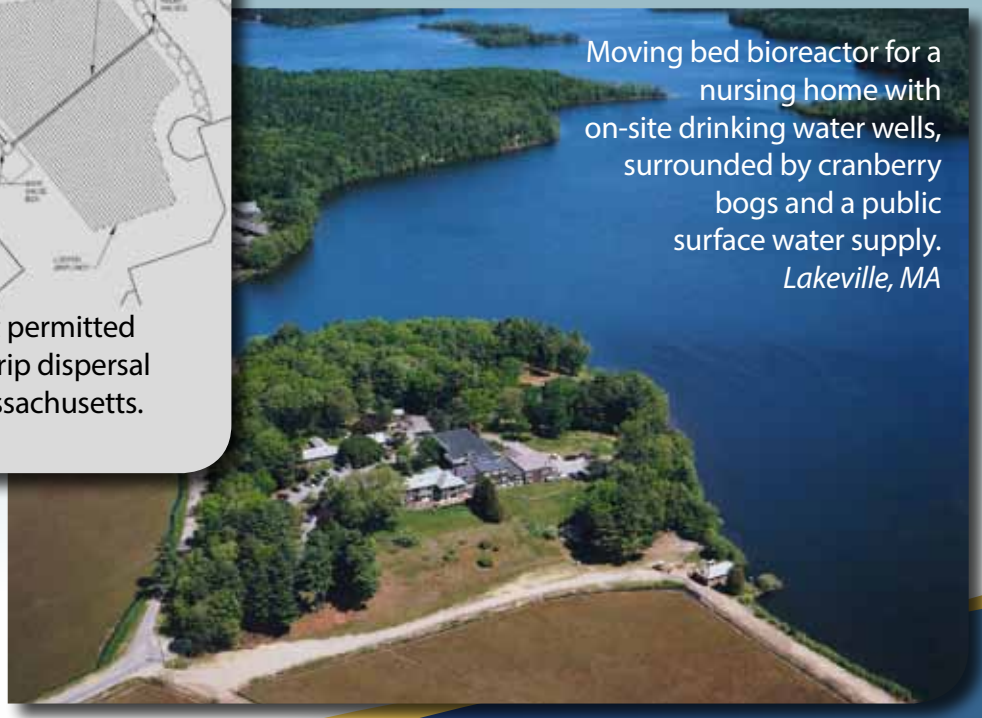
FST is an industry leader and pioneer in environmental engineering. The services provided by our engineers are comprehensive and diverse. Whether it is the upgrade of an existing facility or a completely new and advanced treatment system, FST offers a full range of expertise and services. We are a multidiscipline firm, with environmental, civil, transportation, structural, electrical, mechanical and marine engineers; and transportation and environmental planners.

Evaluating algae-based wastewater treatment at the Lewis Bay Research Center Algae Laboratory.
Yarmouth, MA

Membrane bioreactor to replace existing under-performing treatment system.
Boxborough, MA



Design of first permitted community drip dispersal system in Massachusetts.
Cohasset, MA



Moving bed bioreactor for a nursing home with on-site drinking water wells, surrounded by cranberry bogs and a public surface water supply.
Lakeville, MA

FST
100 YEARS

FAY, SPOFFORD & THORNDIKE