JOURNAL

OF THE NEW ENGLAND WATER ENVIRONMENT ASSOCIATION

VOLUME 50 NUMBER 3 | ISSN 1077-3002 **FALL 2016**

RESIDUALS/ENERGY CONSERVATION

NEWEA
WORKING FOR WATER QUALITY

Anyone can float a bunch of leaky claims…

…Statewide Aquastore has proven results that really hold water.

In addition to <u>THE LOWEST COST OF MAINTENANCE</u> over their lifetime, (compared to any other tanks), **Statewide Aquastore** offers:

- Decades of experience
- Thousands of Installations Worldwide
- Best Coating Available
- Factory Controlled ISO Manufacturing
- Environmentally Friendly
- No Massive Staging Areas
- Fast, Year-Round Construction
- Easily and Economically Expandable
- Trained and Certified Building Crews
- US Manufactured
- Sustained Beauty
- No Recoating, Repainting or Rehabbing
- No Costly Downtime for Maintenance/Repairs

Stop getting soaked by others – get the *"water proof"* you need… from **Statewide Aquastore, Inc.**

Statewide Aquastore, Inc.
6010 Drott Drive
East Syracuse, NY 13057
Phone 315-433-2782
Fax 315-433-5083
www.besttank.com

STATEWIDE AQUASTORE, Inc.

Your Water. Our Business.

JOURNAL

OF THE NEW ENGLAND WATER ENVIRONMENT ASSOCIATION

VOLUME 50 NUMBER 3 I ISSN 1077-3002 FALL 2016

Contents

On the cover: Visualization of the renewable energy from food waste organics facility at the Greater Lawrence Sanitary District

NEWEA Journal ISSN #1077-3002
Published four times annually by New England Water Environment Association, Inc.
This is Volume 50 Number 3
Periodical postage paid at Woburn, MA 01801, and at additional mailing offices

New England Water Environment Association, Inc.
10 Tower Office Park, Suite 601
Woburn, MA 01801-2155
Telephone: 781-939-0908
Fax: 781-939-0907
Email: mail@newea.org
Website: newea.org

Postmaster:
Send address changes to:
NEWEA Journal
10 Tower Office Park, Suite 601
Woburn, MA 01801-2155

Journal Committee Chair & Editor
Joseph Boccadoro
Joe.Boccadoro@aecom.com

Journal Committee
Alan Slater, Alexandra Bowen
Alexandra Doody, Charles Tyler
Dan Coughlin, Don St. Marie
Eric Staunton, Gail Lollis
Geraldine Ciardelli, Helen Gordon
James R. Barsanti, Matthew Hross
Meredith Zona, Michael Sullivan
Susan Landon

Guest Editors
Alexandra Doody
DoodyAT@cdmsmith.com

Eric Staunton
stauntonet@cdmsmith.com

Copy Editor
Thomas Heinlein

Graphic Designer
Robert Randazzo

Photography Editor
Charles Tyler
charles.tyler@mwra.com

Photo credits
Lake Champlain
(page 14)
Travisleehardin
Wikimedia Commons

NY 17 in Chester, NY
(page 60)
Daniel Case
Wikimedia Commons

CT Golf
(page 77)
Ray Bahr

OUR ASSOCIATION WAS ORGANIZED EIGHTY-SEVEN 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:

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.

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.

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.

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

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.

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.

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

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 a utility can consolidate all members within its organization onto one account and have the flexibility to tailor the appropriate value packages based on the designated employees' needs. Contact WEF for questions & enrollment (703-684-2400 x7213).

New England Water Environment Association | Statement of Ownership, Management and Circulation

Publication Title ..... The NEWEA Journal
Publication ..... #24559
Issue Frequency ..... Quarterly (four per year)
Annual Subscription Price ..... $20 (included with membership dues)
Complete Mailing Address, Known Office of Publication, General Business Office, Editors and Owner (non profit organization) ..... NEWEA, 10 Tower Office Park, Suite 601, Woburn, MA 01801
Contact Person/Managing Editor ..... Mary Barry, NEWEA Executive Director
Tax Status ..... No change during the preceding 12 months

BECOME A NEWEA MEMBER TODAY

- Complete and mail the membership application form on pages 91–92
- Download a membership application from **newea.org** by clicking How Do I Join?
- Join online at **wef.org** by clicking Become a Member

2016 RATES

Professional $174.00
Executive $338.00
Corporate $393.00
Academic $174.00
Young Professional $67.00
PWO $105.00
Dual $40.00
Student $20.00

Water Environment Federation®
Preserving & Enhancing the Global Water Environment

Issue date for circulation data below: 06/24/2015

Publication title: NEWEA Journal	Extent and nature of circulation: Technical, Educational, Environmental	Average no. copies each issue during preceding 12 months	No. copies of single issue published nearest to filing date
Total number of copies		2,500	2,500
Legitimate paid and/or requested distribution	Outside county paid/requested mail subscriptions	0	0
	In-county paid/ requested mail subscriptions	2,200	2,200
	Sales through dealers & carriers	8	8
	Requested copies distributed by other mail classes	0	0
Total paid and/or requested circulation		2,208	2,208
Total nonrequested distribution		0	0
Total distribution		2,208	2,208
Copies not distributed		292	292
Total		2,500	2,500
Percent paid and/or requested circulation		100	100

Raymond L. Willis III
Vice President
Onsite Engineering
rwillis@onsite-eng.com

President's message

I hope your summer was full of fun times shared with friends and family. This summer was a busy and exciting time for NEWEA, and we are looking forward to the fall and the many upcoming events.

Looking back at this summer, I want to reflect on some of the events. First, our joint Spring Meeting with the New York Water Environment Association (NYWEA) was very successful. The meeting was attended by nearly 500 water quality professionals and enthusiasts, and featured eight teams competing in the operations challenge competition. Also impressive this year were the Meeting's technical sessions; they were very well attended and featured topics from sustainable design and nutrient removal to collection systems and public awareness, to name a few. The technical content of our Spring Meeting seems to improve each year, a testament to the dedication and hard work of our Program Committee and NEWEA's numerous technical committees. The success of this year's technical program was also due to the cooperation and coordination between the NEWEA and NYWEA committees, as we were treated to the best content from two outstanding Water Environment Federation (WEF) member associations.

While on the topic of the great work of our committees, NEWEA again sponsored the Committee Member Appreciation event at Kimball Farms in Westford, Massachusetts. This event demonstrates our appreciation for the outstanding effort by committee members all year long, and allows NEWEA to treat these members to an evening of food and family fun, as well as all the ice cream they can eat, at a multi-function recreational venue. Keeping with tradition, the annual "soak the president" bumper boat event was held and the participants were, once again, successful in making the president look as though he just went swimming in his clothes. If you are a committee member and have not attended this event, I encourage you to attend next year. If the complimentary food and unlimited ice cream are not reasons enough to join us, the soaking of our next president, Jim Barsanti, should be incentive to make it a must.

Before moving on to future events, I want to inform you of exciting news from the June Executive Committee meeting. Through the Membership Committee, NEWEA is happy to report that a new membership category was approved by the Executive Committee and will be enacted in January 2017, specifically for the regulatory community.

The Membership Committee recognized that state and federal agencies, at one time, had the financial means to support participation in professional associations such as NEWEA. However, because of decreased budgets, the ability of these agencies to support staff members, whether by reimbursement of membership dues, or conference registration fees, has been greatly reduced. Recognizing this, and the importance of having the regulatory community as active members and participants in our association, the Membership Committee proposed a NEWEA-only membership category to reduce membership and registration fees associated with our events. Adoption of this regulatory member category was approved by the Executive Committee in June. I personally acknowledge and thank the Membership Committee for pushing forward this membership category, which I fully support, that allows the regulatory community to become more involved with NEWEA once again. I believe that, as stated by the Membership Committee, "we all are better off when all key water quality professionals are at the table."

Looking forward to the fall, WEF will hold its annual conference, WEFTEC, in New Orleans from September 24–28, 2016. During this conference, NEWEA will continue its year-long partnership with NYWEA by hosting a NEWEA/NYWEA reception from 5:30–7:00 PM on Sunday evening of the conference at the Chicory Restaurant, an original coffee house built in 1852 that features views of the city and the Mississippi River. If you are attending WEFTEC, please make sure to stop by and see us there.

Another event to highlight is the NEWEA Annual Golf Classic, which will be held at the Country Club of New Bedford on October 3, 2016. The NEWEA Golf Classic, formerly known as the Operations Challenge Golf Tournament, has been rebranded to include support for other endeavors that NEWEA sponsors, such as our scholarship program, humanitarian assistance and grant program, and public education initiatives, in addition to the usual operations challenge support. We are excited to offer this new golf venue for the tournament this year, which will feature a continental breakfast, a barbeque snack at the turn, and a banquet dinner. Also, the tournament offers a chance to win a car/truck with a hole-in-one and a free swing evaluation. If you have not done so, grab three of your colleagues and/or friends and secure a spot at the tournament. You will not only have a great day on an elite golf course, you will also assist us in supporting our many great programs that improve people's lives and protect the water environment.

Last, but certainly not least, the planning for our Annual Conference in Boston is well under way. To date, the Program Committee has received more than 180 abstracts, and the Exhibits Committee once again is filling the exhibit halls with vendors showcasing new and innovative products. The upcoming conference takes place from January 22–25, 2017, at the Boston Marriott Copley Place.

This summer's bumper boat melee at the Committee Appreciation event at Kimball Farms

In addition to these upcoming events, NEWEA technical committees will hold specialty conferences in various locations throughout New England. Specialty conference topics include collection systems and biosolids conferences, Young Professional Poo & Brew events in Rhode Island (October 6) and Vermont (November 9), and a Water for People Softball Tournament (October 15) in Cambridge. Please check the NEWEA calendar for more information about these events.

In closing, I reiterate a theme from my first address, that the NEWEA committees and their hardworking volunteers are the engine that drives this association. On behalf of the Executive Committee, I thank you for your efforts. Having been association president for nine months, I continue to see firsthand the great work of our committees and how they continue to improve each year.

I say to any NEWEA member, if you are not a member of one our committees, you are missing out. I know well that many of us lead busy lives, both at and away from work. However, I sense that people hold a misconception that volunteering will take up too much valuable time, and therefore they decide not to get involved. As an active volunteer in this association for many years, I cannot adequately express how rewarding the experience has been for me personally and professionally, and if you spoke with any committee member, present or past, they would likely say the same. Whether you can provide a few minutes or several hours each month, you will be welcomed into our committee community; every helping hand helps lighten the load, reaps the benefits, shares in the fun, and helps the association to continue the important work that will benefit us all! I look forward to meeting you at an upcoming event.

From the Editor

Below I share some thoughts about our industry. As always, any personal opinions expressed do not necessarily reflect the views of NEWEA or its membership.

Baseball fans know that metrics and analytics have taken over the sport. Today, an increasingly heavy emphasis is placed on the use of statistics, keeping with the traditional ones such as runs batted in (RBI), earned run average (ERA), and batting average, as well as developing new ones such as on base plus slugging percentage (OPS), ultimate zone rating (UZR), wins above replacement (WAR), and walks plus hits per inning pitched (WHIP). The science that generated these new statistics has been dubbed sabermetrics. What does this have to do with the water environment? Similar to baseball, our industry, wastewater treatment (or WRR, see below!) in particular, generates a large number of performance indicators: BOD, TSS, TKN, TP, LC50, etc. Many of these have been around for a while, and most facilities have amassed a lot of information in supervisory control and data acquisition (SCADA) databases. What does all of this information really tell us about the performance of our facilities and the health of our ecosystems? Is it time for us to assess how we evaluate this data and allow analytics to enter the wastewater treatment field with gusto? Can we replace some of the traditional performance indicators with one or two innovative new metrics? This is one of those cases where I have a lot of questions but no answers. It would be great to hear from our membership on this issue.

Joe Boccadoro, P.E.
Senior Project Manager – Water
AECOM
Joe.Boccadoro@aecom.com

According to numerous sources, including the American Society of Civil Engineers (ASCE), a monumental gap exists between the estimated costs of addressing wastewater infrastructure deficiencies and funding earmarked to address those needs. As indicated in ASCE's 2016 report, *Failure to Act: Closing the Infrastructure Investment Gap for America's Future*, cumulative estimated water/wastewater spending should approach $150 billion over the next 10 years but projected expenditures will amount only to $45 billion, thus leaving a gap of $105 billion. Will Washington, D.C., do something significant to make up this gap? Unlikely; according to Environmental Protection Agency data, federal Clean Water State Revolving Fund (CWSRF) spending totaled about $11 billion over the last 10 years. And, as you will read in the Industry News section ("House Passes First Interior, EPA Spending Bill in Seven Years"), there could be a $400 million drop in federal CWSRF funding in 2017. Of course, the federal government cannot make up the entire gap—but a disturbing pattern sure seems to have emerged: level or lowered funding when the opposite should be occurring. On a positive note, billionaires such as Bill Gates ($78.6 billion net worth) and Warren Buffet ($66.5 billion net worth) have pledged to give their fortunes away to needy sources. How about some for the water environment?

While attending the NEWEA/NYWEA Joint Spring Meeting from June 5–8 in Groton, Connecticut, I was impressed by the number of treatment plants in New York that refer to themselves as water resource recovery facilities (WRRF). It seems a more appropriate name compared to wastewater treatment plant or facility, which now sounds archaic when you think about it; WRRF considers what is truly accomplished daily. There has been general discussion about more widespread industry adoption of the WRRF term, which I think we all should support. In fact, the rebranding process could generate positive press and educational opportunities if turned into an event; new names on facility signage could be unveiled at an open house, including groundbreaking ceremonies, tributes, political participation, public tours, and refreshments.

Finally, this issue of the *Journal* includes several timely articles on residuals and energy conservation, a continuation of our spotlight series, which this time features one of our members, and reports from our state directors. On behalf of the *Journal* volunteers and professional staff, we appreciate your feedback and support.

Industry news

Too much phosphorus pollution is reaching Lake Champlain, primarily from the streams and rivers draining into it. The major contributor is polluted runoff.

EPA Releases Final Phosphorus Limits for Vermont Segments of Lake Champlain

– David Deegan, EPA Region 1 News Release

The U.S. Environmental Protection Agency (EPA) is establishing the final phosphorus Total Maximum Daily Loads (TMDLs) for the 12 Vermont segments of Lake Champlain.

Too much phosphorus pollution is reaching Lake Champlain, primarily from the streams and rivers draining into it. The major contributor is polluted runoff—rainwater or snowmelt that drains off parking lots, streets, logging roads, farm fields, croplands, and lawns. The runoff carries pollutants—sediment, nutrients such as phosphorus that are naturally present in soils, pet and animal wastes, fertilizers, and other pollutants—and deposits these pollutants into streams and rivers or directly into Lake Champlain. Long-term trends since 1990 indicate that phosphorus concentrations in several segments continue to increase.

EPA's document sets water quality standards in each of 12 lake segments in Vermont and then subdivides the targets among the major sectors that contribute phosphorus to the lake. Those sectors include wastewater treatment facilities, runoff from developed lands and roadways, agricultural and forest lands, and erosion in unstable stream corridors. The final phosphorus TMDLs contain refinements based on public comments received on the proposed TMDLs released in August 2015. These refinements include small adjustments among the sub-allocations within some segments but do not significantly change the overall reduction requirements.

"Today's announcement marks another very important step forward in restoring the priceless beauty that is Lake Champlain," said Curt Spalding, regional administrator of EPA's New England office. "While EPA is setting the targets, the strategies for meeting those targets have and will continue to be led by Vermont. Act 64 and the state's Implementation Plan provide a progressive roadmap for achieving these targets. EPA commends Vermont for some cutting-edge choices on how to tackle all significant sources of phosphorus, and for all the implementation planning already in motion at the state and municipal level. Our action today does not mark the end of EPA's involvement, but rather the beginning of the next phase. EPA will continue to provide support to the Vermont agencies, and will assess and report to the public on progress in meeting the commitments in Vermont's Implementation Plan and reducing phosphorus loads to the lake."

The TMDLs are the product of multi-year collaboration among EPA, the Vermont Agency of Natural Resources, the Vermont Agency of Agriculture, Food and Markets, and the Vermont Agency of Transportation. The effort also benefited from feedback from other agencies such as the Natural Resources Conservation Service, and organizations such as the Friends of Northern Lake Champlain, the Vermont League of Cities and Towns, the Conservation Law Foundation, and many other Vermonters.

"This is a pivotal time for the future of Lake Champlain and Vermont," said Deb Markowitz, secretary of the Vermont Agency of Natural Resources. "EPA's TMDL provides the targets to achieve a clean lake. We look forward to working across all sectors to ensure its effective implementation. Our success will lead to a more vibrant lake, and will support the state's tourism industry and economy overall."

House Passes First Interior, EPA Spending Bill in Seven Years

– This Week in Washington, a weekly publication of the Water Environment Federation's Government Affairs Department

On July 14, 2016, the U.S. House of Representatives passed a $32.1 billion bill to fund the fiscal year 2017 Interior, Environment, and Related Agencies Appropriations bill (HR 5538), mostly along party lines. This is the first time the House has passed this bill since 2009.

The bill, which provides $32.095 billion, is $64 million below the fiscal year 2016 enacted level and $1 billion below the President's budget request. The bill proposes to fund water infrastructure programs at the following levels for fiscal year 2017:

- $2.1 billion for the Clean Water and Drinking Water State Revolving Funds (SRFs), including an increase of $207 million over the current level for the Drinking Water SRF; however, while the Clean Water SRF is funded at $1 billion, a nearly $400 million decrease in funding from the enacted fiscal year 2016 level, the Drinking Water SRF is funded at $1.07 billion, slightly more than last year's draft bill.
- $50 million for the new Water Infrastructure Finance and Innovation (WIFIA) program ($5 million of which would be spent on administering WIFIA), which will generate an estimated $5 billion in water infrastructure construction.
- $109.7 million for state grants, a $7.7 million increase above the current level, to improve operations and oversight of drinking water systems.
- $6.5 million, the full requested amount, for integrated planning within EPA's Office of Water to assist communities as they replace pipes.
- $7.98 billion, a bill that funds the EPA, a reduction of $164 million below the fiscal year 2016 enacted level and $291 million below the President's budget request.
- $1.1 billion, a bill to fund the U.S. Geological Survey (USGS), $18 million above the fiscal year 2016 enacted level.

This funding bill includes a handful of policy riders to block EPA regulations, including those dealing with water, power plant emissions, and coal mining near waterways.

During floor debate this week, Rep. Ken Calvert (R-CA) referred to "a great deal of concern over the number of regulatory actions being pursued by EPA in the absence of legislation and without clear congressional direction. For this reason, the bill includes a number of provisions to stop unnecessary and damaging regulatory overreach by the agency."

Many members were concerned with the bill for reducing clean water funding and endangered species provisions, though both sides spoke positively of funding levels for Native American programming and the National Parks sections of the bill.

Also, a measure to fund water testing in Flint, Michigan, and forgive some of the city's loans as it recovers from a drinking water crisis, was included in the final House bill.

The White House has threatened to veto the bill.

Localized Mystic River Report Card Shows Specific Information about Water Quality

– Emily Bender, EPA Region 1 News Release

In coordination with the Mystic River Watershed Association (MyRWA), EPA is using an enhanced, more locally specific analysis of water quality in the Mystic River watershed for the second year. To better relate environmental conditions for the public, EPA and MyRWA are issuing grades for each segment of the watershed, totaling 14 separate stretches of river and tributaries.

The grades are based on bacterial contamination in analyzed samples collected by MyRWA volunteers over the past year at fifteen monitoring sites throughout the watershed, as well as data collected at numerous locations by the Massachusetts Water Resources Authority (MWRA). From 2006 to 2013, an overall grade was used to track water quality progress in the Mystic River watershed. Beginning in 2014, the amount of data collected each year supports an improved and more sophisticated grading system, in which a grade can be assigned, using similar criteria as before, to each major segment or tributary in the Mystic River watershed.

Mystic River Watershed Water Quality Grades and Compliance Rates—Calendar Year 2015

Grade	Water Segment	Average*
A+	Upper Mystic Lake	95.9%
A-	Mystic River (Salt Water)	88.9%
A-	Chelsea Creek	89.5%
B+	Mystic River (Fresh Water)	86.2%
B	Belle Isle Inlet	77.8%
C+	Aberjona River	65.9%
C	Malden River	63.3%
C-	Meetinghouse Brook	57.9%
D	Alewife Brook	49.5%
D	Mill Brook	48.6%
D-	Little River	44.3%
F	Mill Creek	33.5%
F	Winn's Brook	32.7%
F	Island End River	25.4%

*Average meeting MA water quality standards for boating & swimming

For the second year in a row, data show that water quality in the main stem of the Mystic River, including the Upper and Lower Mystic lakes, is regularly good. However, water quality in many of the urban tributary streams in the Mystic River watershed is poor. Water quality in the main stem of the river from the Mystic lakes, through Medford Square and on to Boston Harbor, meets water quality standards nearly all of the time, especially in dry weather. Water quality in many of the tributary streams feeding the Mystic though often does not meet standards. Water quality is frequently poor due to bacterial contamination in tributary streams such as Winn's Brook, Little River, Mill Brook, the Malden River, the Island End River, and Mill Creek, even in dry weather. Investigations indicate the main causes of high bacteria counts in these water bodies are illicit sewer discharges to storm drain systems and uncontrolled urban stormwater runoff that contains pet and animal waste.

A three-year rolling average was again used to calculate the grade for each segment. A grade for each year is calculated, and the current year's grade is averaged with the prior two years to produce the "rolling" three-year average. Such a system allows for a more complete and accurate assessment of recent water quality, and better addresses climate variability from year to year, while allowing for real data trends to be more easily discerned.

"We have a lot of ongoing work to improve water quality in the Mystic and its tributaries, and this report card serves as motivation to continue that work. EPA and our partners are committed to improving water quality for residents of the Mystic watershed, and while we have seen improvements, we still have a lot of work to do," said Curt Spalding, regional administrator of EPA's New England office said. "This year we have seen water quality improvements in 10 of the 14 segments of the river, and four of those have had grade improvements. The most significant grade improvement this year is Belle Isle Inlet, which improved from a C to a B in 2015, meeting state water quality standards on 77.8 percent of the days in 2015 compared to 63.9 percent in 2014."

"The grade demonstrates the recreational value of the Mystic River and lakes. These are great places for canoeing and kayaking, and we can safely enjoy swimming in the Upper Mystic Lake," said EkOngKar Singh Khalsa, executive director of the Mystic River Watershed Association. "The grade also underlines where there is room for improvement."

Commented U.S. Congressman Michael Capuano, "The Mystic River watershed is a valuable natural resource accessible to many greater Boston communities, and its water quality is important, not only for recreational use but for the wildlife in and around its waters. I am encouraged that we are moving in the right direction along key areas of the watershed. I thank the Mystic River Watershed Association and EPA for their commitment to improving water quality standards in the areas where it is still very much needed and protecting this local treasure."

"We are pleased to be part of a valued partnership with municipalities, the Mystic River Watershed Association and EPA as we work cooperatively on improving water quality in the Mystic River watershed," added commissioner Martin Suuberg of the Massachusetts Department of Environmental Protection (MassDEP).

Throughout the past year there were continued efforts to improve water quality conditions in the Mystic River watershed. Both EPA and MassDEP continue to pursue a number of active enforcement actions to improve water quality throughout the watershed. This enforcement has resulted in the removal of 31,800 gallons (120,000 liters) per day of sewage from storm drains in the Mystic River watershed. Numerous additional illicit connections have been identified and are scheduled to be removed this year. A number of additional repairs have been made that have prevented tens of thousands of gallons of sewage from discharging to the river during rain events. These efforts continue to address violations of water quality criteria with regard to bacteria.

Further improvements in water quality are expected as the 2016 Massachusetts Small Municipal Separate Storm Sewer System (MS4) General Permit is implemented throughout the watershed. The small MS4 general permit will become effective July 1, 2017, replacing the 2003 small MS4 general permit for MS4 operators within the commonwealth of Massachusetts. The conditions in the general permit are established pursuant to Clean Water Act (CWA) section 402(p)(3)(iii) to ensure that pollutant discharges from small MS4s are reduced to the maximum extent practicable (MEP), protect water quality, and satisfy the appropriate requirements of the CWA. Further information about the permit related to MEP and water quality may be found in EPA's Response to Comments document: epa.gov/region1/npdes/stormwater/MS4_MA.html.

The main causes of high bacteria counts are illicit sewer discharges to storm drain systems and uncontrolled urban stormwater runoff that contains pet and animal waste

In addition, last year marked the completion of planned construction of projects related to the MWRA's Long Term Control Plan under the Boston Harbor Federal Court Order. Combined sewer overflow (CSO) controls completed in the Alewife Brook area last year should begin to have a significant impact on water quality. The Alewife projects completed under the Federal Court Order are predicted to reduce annual CSO volume to Alewife Brook by 85 percent on average and reduce the frequency of CSO discharges from the six remaining Alewife CSO outfalls from 63 to seven discharge events a year.

In a separate effort from our report card for bacteria, in the summer of 2015 EPA launched a Mystic River water quality monitoring buoy in front of the Blessing of the Bay Boathouse in Somerville, Massachusetts. This buoy measures a number of water quality parameters such as temperature, dissolved oxygen, pH, turbidity, specific conductance, and chlorophyll that can be viewed by the public in near real time. The 2015 data report is available on EPA's Mystic River website. In addition to providing real-time water quality data to the public, the buoy is used to monitor and track cyanobacteria (blue-green algae) blooms. The buoy was launched again for the 2016 season in early June.

EPA continues to foster long-term improvement of this watershed, including continued support of the Mystic River Watershed Initiative Steering Committee. The Steering Committee includes EPA and MyRWA representatives, as well as representatives from numerous public advocacy groups and municipalities from throughout the Mystic River watershed. The mission of the Steering Committee is to serve as a coordinating and information-sharing body to help establish strategic direction and priorities, as well as to recommend and promote key projects and actions needed to improve environmental conditions in the Mystic River watershed.

For more information on EPA's Mystic River Watershed Initiative, visit epa.gov/mysticriver.

NEWEA 2017 Annual Conference & Exhibit

Save the date! January 22 – 25, 2017
Boston, MA | Boston Marriott Copley Place

This prestigious conference consistently attracts more than 2,200 engineers, consultants, scientists, operators, and students, and features a variety of technical sessions, and more than 200 exhibitor displays. It provides an opportunity for professional exchange of information and state-of-the-art concepts in wastewater treatment and environmental issues.

In addition to traditional sessions, exciting new presentations are planned:

- Environmental Stewardship in the 21st Century Series: Attend sessions on many of today's hottest topics including Global Climate Change, Green Building and Green Design, Low Impact Development, and Water Reuse.
- The Young Professionals' Session: Designed exclusively for Young Professionals to build their presenting skills, this new technical session is dedicated to presentations developed and delivered by their peers.

For more information, visit annualconference.newea.org
call: 781-939-0908 • email: mail@newea.org

NEWEA
WORKING FOR WATER QUALITY

It is all about energy—power generation through heat recovery in Hartford

THOMAS TYLER, Metropolitan District, Hartford, Connecticut

ABSTRACT | Wastewater solids have heat value, much like other fuel sources, and the Hartford Water Pollution Control Facility (WPCF) in Hartford, Connecticut, determined that converting biosolids to energy at the plant would be a beneficial way to use its resources. Wastewater treatment is energy intensive, and on average the Hartford WPCF uses enough electricity to light about 35,000 one-hundred-watt light bulbs. The Hartford WPCF's incineration process burned solids to turn them into inert ash, and the heat produced from incineration was not beneficially used. A heat recovery facility (HRF) was designed to use heat from the sludge incineration process to produce electricity, reducing power costs significantly. The new processes take this heat from the exhaust and turn it into steam in large boilers, where the steam spins a turbine connected to a generator that produces electricity. Use of this heat from incineration generates up to 40 percent of the facility's energy.

KEYWORDS | Heat recovery, incineration, steam turbine-generator, water pollution control facility (WPCF), training, savings, green fuel

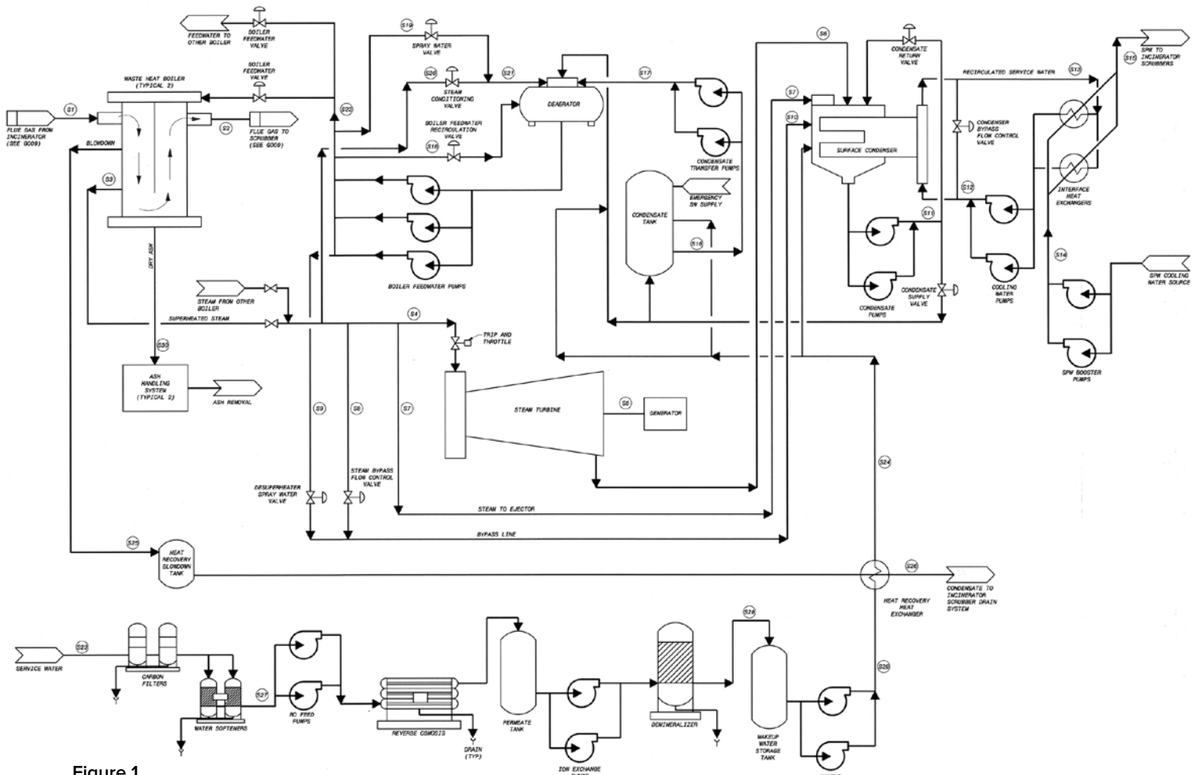


Figure 1.
Heat recovery process schematic

The Metropolitan District owns and operates the Hartford Water Pollution Control Facility (WPCF), the largest such facility in Connecticut, on an approximately 85-acre (34-hectare) site. The facility is permitted to treat 80 million gallons per day (mgd) (300 million liters per day [ML/d]) through secondary treatment processes, with a peak wet-weather capacity of 135 mgd (510 ML/d). Current daily flow averages approximately 60 mgd (230 ML/d). The facility treated more than 21 billion gallons (80 billion liters) of water in 2015. The District performs water supply and treatment, distribution and collection, water pollution control, and mapping/GIS services for Bloomfield, East Hartford, Hartford, Newington, Rocky Hill, West Hartford, Wethersfield, and Windsor. It serves a population of approximately 440,000 residents.

In 2009, a Master Plan was completed at the WPCF to identify peak flows for plant design, recommending treatment processes necessary for wet weather flows as well as processes necessary to achieve nitrogen permit limits. Another key recommendation from the Master Plan was for solids handling improvements for both wet and dry weather flows.

HEAT RECOVERY SYSTEM OVERVIEW

The Hartford WPCF uses incineration to manage its solids. The WPCF operates three multiple hearth incinerators (MHIs) that include air pollution control devices (scrubbers). Sludge enters in the third level (hearth) and follows an inside-outside pattern to the bottom, where it is rendered into inert ash after burning at approximately 1,200°F (650°C). The WPCF processes approximately 100 dry tons (90 metric tons) of solids each day. The origin of the solids includes various sources, including:

- Wastewater that flows to the Hartford WPCF
- Solids pumped from two other District WPCFs
- Solids trucked from one other District WPCF
- Solids trucked from non-District facilities, including other regional WPCFs, permitted commercial and industrial sources, and septage from residential sources not served by public sewers

Energy recovery begins with the removal of heat from a process stream. Prior to the construction of the heat recovery facility (HRF), the Hartford WPCF sent exhaust gases from the three multiple hearth incinerators directly to wet scrubber/quench vessels to remove particulates and to cool the exhaust gas to near ambient temperature. The heat in the exhaust was transferred to the quench water and not beneficially used. The HRF was designed to remove that heat and beneficially use it prior to the exhaust going to the scrubbing process. A process schematic of the heat recovery system is shown in Figure 1.

The District had discussed heat recovery since the early 2000s. However, at that time, electricity costs were too low to justify the investment required to recover heat from the MHIs. In the following years Connecticut deregulated the power sector, and energy prices began an upward trajectory that justified implementing the heat recovery project. Initial concepts for the improvements included a design-build procurement approach, and the District entered into negotiations with a supplier. Initially, the price was attractive, but with time and increased understanding of the improvements included (and not included), the project looked less attractive, and this approach was eventually abandoned. Meanwhile, energy costs continued to rise and the heat recovery concept became economically viable. Traditional design-bid-build procurement was selected.

In 2009, a federal economic stimulus program sought to support shovel-ready Green Infrastructure projects, and the Connecticut Department of Energy & Environmental Protection (DEEP) offered American Reinvestment and Recovery Act grants and low-interest loans to the District. A requirement of the grants was that the project be designed, bid, and awarded by February 2010. The project was bid in December 2009, and awarded in January 2010.

The District upgraded the incineration facility at the Hartford WPCF and installed 1.75 megawatts (MW) of electrical production capacity. The improvements reduced the Hartford WPCF's grid electricity use by approximately 40 percent. The District obtained "green funds" for this type of beneficial use project and received a $17 million grant/low-interest loan from DEEP that represented more than 60 percent of the total project cost. The project was completed in 2012.

Improvements included upgrades to all three incinerators with connections for heat recovery, ducts, and diversion dampers as well as induced draft fans with variable frequency drives (VFDs) and instrumentation/SCADA controls as needed. Incinerator No. 3 was significantly upgraded and included a Venturi scrubber, air pollution controls, and a flue gas recirculation system as well as major refractory brickwork modifications. The 1.75-MW

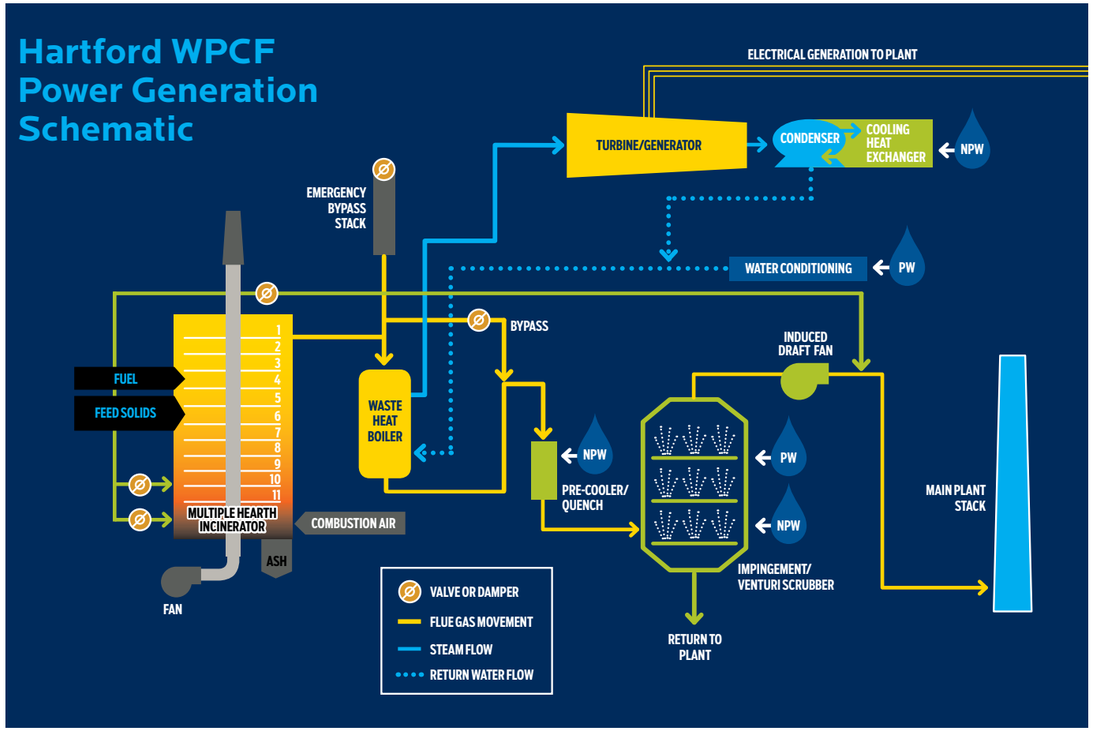


Figure 2. Power generation system schematic

electricity production system was also installed to convert the heat energy to power. The electricity generation system consisted of boilers, a steam turbine-generator, and an associated water treatment system. A schematic of the power generation system is shown in Figure 2.

HEAT RECOVERY SYSTEM

The heat recovery system has three main processes:

1. Heat recovery in the boilers to generate steam from the hot incineration exhaust
2. Steam turbine-generator to convert the steam to electricity
3. Condenser, deaerator, and feed water pumps combined to convert the spent steam back to usable boiler feedwater

In addition to these three main processes, several other processes at the HRF include compressed air, a cooling water system, chemical treatment to produce boiler quality water, and ash handling. These systems are described below.

Heat Recovery from Incinerators to Boilers

The boilers used at the HRF are vertical, two-pass units with a top entry and exit. Ducts with control valves transfer the multiple hearth incinerator's hot exhaust gas from the incinerators to the boiler inlets. The boilers are operated by using damper valves to inlet and remove incinerator exhaust gas, thus allowing the boiler to extract heat and produce steam. Water movement and steam movement are controlled by valves operated by the main plant control system. The hot gas is directed into the superheater section of the boiler and then on through the length of the boiler. The first pass is downward through the boiler, and the second pass is upward through the boiler to the exit. After exiting the boiler at the economizer section, the now much-cooler exhaust gas is carried in warm ducts back to the entrance of the MHI quench process.

Each incinerator has a hot gas damper valve, a warm gas damper valve, and a breech damper valve to control the exhaust gas flow from the MHI. In the normal configuration, MHI exhaust will flow out the incinerator breech into the incinerator quench system. In energy-recovery mode, exhaust gas will flow out of the hot duct into and through the boiler and return through the warm duct to the MHI quench system. The boiler transfers the heat from the MHI exhaust to the water in the boiler thus creating steam, the working fluid used to drive the steam turbine-generator. These boilers produce steam at 500-pounds-per-square-inch-gauge (PSIG) (3,450-kiloPascals [kPa]) internal pressure and 700˚F (370˚C) temperature; however, normal operations are 385 PSIG (2,650 kPA) steam pressure and 600˚F (315˚C) steam temperature. Ash brought into the boilers from the MHI is collected in the bottom of the boiler and removed via a lock hopper. Ash is removed continuously during normal operations and carried by the ash handling system.

Ash Handling System—The incinerator exhaust carries some fly ash from the sludge incineration process. This fine ash settles out on the boiler tubes and inside walls. Denser particles and larger ash particles may also fall out of the exhaust stream as the ash is lifted up the vertical flow section of the boiler. This ash collects at the bottom of the boiler in an ash hopper. A rotary valve at the bottom of this hopper allows removal of ash without a loss of vacuum seal in the boiler. Currently, the ash falls into a temporary dumpster, which is moved and emptied periodically into a larger container for ultimate disposal. Eventually, a fully automated ash handling system will be installed using cooled augers to take the ash to a storage and handling location.

Steam Turbine-Generator—The steam system starts as the produced steam leaves the boiler and enters the high-pressure steam piping. At this time the steam piping carries fully pressurized and high-temperature steam to several points of use. The turbine is the main facility steam user, and because the amount of steam produced will vary widely over time, the steam flow to the turbine is based on steam header pressure. The amount of steam fed to the turbine may vary, but the flow control valve will throttle turbine intake to keep the steam header at a constant 385 PSIG (2,650 kPa) pressure. The generator maintains constant output voltage but the kW output varies.

The steam turbine-generator has a local control cabinet that provides for local operation of the equipment. The main facility control system can also operate the steam turbine-generator system remotely from the control room location. The electric generator output is directly controlled by the amount of steam flow to the steam turbine.

Water Treatment System—The boiler feed water starts with city supply water. This supply water is carbon filtered, softened, filtered, processed through reverse osmosis, and polished through ion exchange before arriving at a storage tank ready for process use. Various boiler chemicals are added to maintain the high quality and protect the boiler piping. Treated water is pumped from the storage tank to the points of use as supply valves open at the various equipment skids. If there is no demand, the water is circulated in the tank.


Steam turbine

TRAINING AND STARTUP

Training and startup of Hartford's heat recovery process began during design. The Water Pollution Control (WPC) division of the District has long-employed the strategy of operator and maintenance staff engagement in all phases of design, and heat recovery was certainly no different. From the very early stages of Basis of Design through post startup operation, staff engagement was encouraged. Site visits were critical, and all levels of staff participated in these trips. Many valuable "lessons learned" were gained from other facilities, and that knowledge was incorporated into the Hartford facility. During the design of a project, staff are encouraged to ask questions and offer insight into design details. For example, maintenance staff are present to ensure adequate access to equipment is included; instrumentation and controls staff are present to ensure data is gathered effectively and incorporated correctly into the plant's SCADA system; electrical staff are present to ensure uniform breakers and panels are provided and set-up per standard. Staff engagement at this level creates an atmosphere of trust and facilitates buy-in, removing the dated approach of "engineer designs, contractor builds, staff operates."

At the onset of startup there was no collective experience in running a steam turbine power plant. While this could have been daunting, one positive was that "we were all in this together, learning" and no bad operational habits could be present. Unlike a plant receiving a pump or clarifier that mirrors existing equipment, we were starting with a new facility, so training was especially important. In all, more than 20 equipment-specific training sessions were held. Because operations staff are present 24 hours per day, 7 days per week, four sessions of each training were offered. This was

done to accommodate staff schedules with training held immediately prior to the start of a shift or immediately after a shift ended. Separate training was also conducted for mechanical, electrical and instrumentation and controls staff, dictated by the maintenance requirements for each piece of equipment.


Deaerator

Significant effort went into developing specifications in the bid documents that detailed the requirements for each training class, as well as trainer qualifications and submittal requirements. Each vendor had to provide a resume of its proposed trainer. Vendors were also required to provide a copy of each presenter's materials (PowerPoint, handouts, etc.) for District review and approval in advance of training. Training classes were timed so that equipment was already installed and and functionally tested. WPCF staff also participated in all functional testing and were encouraged to visit the construction site regularly to view installation of equipment.

In addition to vendor training, the design engineer also delivered training sessions. This included system-wide training and standard operating procedure (SOP) training. The system-wide training tied together all vendor training and offered insight into how the equipment worked together as a system. The designer also developed SOPs that were validated in the field, under actual conditions. This training ensured that all operators had an accurate set of instructions available for operating the facility.

The contractor and design engineer were required to video each training class (one per topic) and provide the video to the District. The District has an on-line operations and maintenance (O&M) system that contains all training videos, SOPs, training handouts, drawings, equipment manuals, etc. The material can be accessed by all staff. As new operators are hired, they can "attend" heat recovery training and have the same handouts and other materials as those who attended the classes.

The District also brought in a power plant operator with more than 40 years of experience to help guide startup and training. This individual was a sounding board for ideas and encouraged operators to ask a lot of "how" and "why" questions. Having a veteran of the power production business on "our side" helped balance things for staff and relieved some of the startup decision-making pressure. This expert was also relied on after startup for regular conference calls and data review/analysis and troubleshooting, and to help ensure that the process was operating correctly.

During startup and initial WPCF operations, brief daily meetings ensured everyone knew what was going on, what happened overnight, and what the day's goals were. This regular communication was vital to keeping everyone informed; it also allowed rapid response to changing conditions and prevented the project from getting too far outside acceptable operating conditions.

DESIGN AND CONSTRUCTION LESSONS LEARNED

In addition to the startup and training recommendations discussed above, several beneficial lessons that were learned from this project can be of use to agencies and consultants implementing similar projects:

- Design the system for full automation through SCADA.
- Design a robust water treatment system, as this is critical to the boiler tube longevity and heat transfer.
- Insulate supply and return ducts to boilers to reduce temperatures in the upper reaches of the room, and carefully design the building with proper ventilation.
- Install the HVAC system to use heat from upper floors to heat lower floors in the winter. This helps to supplement any heat that would need to be added to lower floors for operator comfort.
- Provide redundancy in design for critical equipment that supports the turbine and boilers.
- Leave time in the construction schedule for functional testing of interconnect safety relays and functional testing of all equipment before and during startup. Clearly spell out functional testing in the specifications to prove it was properly tested.
- Design the facility to operate continuously, 24 hours per day, 7 days per week, because a lot of effort and skill is required for startup and shutdown. Most problems occur during startup and shutdown. The process works best when the facility is in steady-state-mode operation.
- Any facility that supports heat recovery (such as incineration, dewatering, and thickening) should be reviewed prior to startup to ensure reliability to support the heat recovery facility. Any issues in these areas will affect heat recovery.
- Install all instruments used to measure boiler drums away from the steam drum. The steam drums emit a lot of localized heat (150˚F, 66˚C) and can affect electronics longevity and operation.
- Install local displays on instruments for ease of calibration/ troubleshooting.
- Incorporate into design the ability to maintain boiler tube temperature above 300˚F (149˚C) when boiler is off line to minimize condensation, which will form sulfuric acid and corrode the boiler tubes.

RESULTS

The main driver in designing and constructing the heat recovery process at the Hartford WPCF was to ultimately save the District's ratepayers money by generating electricity. Significant environmental benefits also come from the process, and safety is a paramount concern.

Safety—The District has operated for decades with a "Safety First" philosophy, and heat recovery is no exception. Safety was considered in every phase of heat recovery design, startup, and ongoing operations, and remains the highest priority. To date no reportable injuries have occurred in the facility. Every operator is authorized to implement an "emergency stop" to the facility at any time for any reason. There are many ways to do this, including use of SCADA and physical "Stop" buttons in the production area. The SCADA system monitors many different points within the systems and can automatically shut the system down if warranted or deliver alarms indicating a trend or an instance that needs attention.

Savings—Since WPCF staff took over operational responsibilities for the heat recovery process on January 1, 2014, results have exceeded expectations. In 2014, the heat recovery facility produced 7.6 million kilowatt hours (kWhs) (27.4 million megajoules [MJ]), valued at around $1 million (using $0.13 per kWh [$0.036 per MJ] as an "all in" rate). Performance in 2015 was even better, producing 9.7 million kWhs (34.9 million MJ), valued at around $1.3 million. Results for 2016 to date indicate a production rate (and savings) that will surpass the 2015 values. The project was designed to produce up to 40 percent of the plant's total electricity needs. In 2014, heat recovery produced 25 percent of the WPCF's electricity needs. In 2015, this increased to approximately 30 percent. Figure 3 shows a monthly comparison of energy production for 2014 and 2015.

Environmental Benefits—Heat recovery at the Hartford WPCF has numerous environmental benefits. The HRF system has reduced thermal waste to the environment, as the heat is now converted to electricity. Producing power onsite also reduces electricity line losses associated with the power produced far away from the WPCF that must travel many miles before being used. One hundred percent of the power generated onsite is used onsite. Pollution emitted at the generation source has been reduced, as less power is needed to satisfy the plant's electrical demand. A renewable source of fuel (biosolids) is now beneficially used. This "green" form of fuel is continuously produced at the WPCF from the sewage received 24 hours per day, 7 days per week.

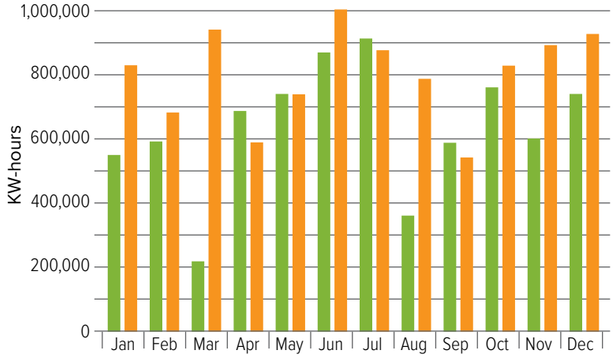


Figure 3. 2014 – 2015 Turbine KW-hours

LONG-TERM OPERATIONS

As the District winds down on the third year of heat recovery operations, long-term planning for plant rehabilitation is underway. Boilers must be inspected annually. This requires a plant shutdown, and while this time needs to be minimized due to lost power production, it creates an opportunity to complete minor maintenance, repairs, and modifications not possible during production. Long-term rehabilitation of major systems (boilers, turbine, high voltage electrical gear, and other systems) will be handled through specification development and bidding. This work is beyond in-house capabilities due to the expertise required. The main goal is keep the system running safely for the full design life to maximize power production.

CONCLUSIONS

The Hartford WPCF has successfully converted biosolids to energy to beneficially use its resources. The new HRF uses excess heat from sludge incineration to produce electricity, reducing power costs significantly. Use of this heat from incineration can generate up to 40 percent of the facility's energy. In the first two years of operation, the new heat recovery and power generation system produced 7,600 MWh and 9,600 MWh (27,000 MJ and 34,500 MJ), respectively, equating to cost savings of $1.1 million to $1.3 million annually.

From an operations perspective, the District's wastewater treatment facility has become a resource recovery facility. This has required operators to add power plant operations and maintenance to their set of skills. Grooming operators who have the interest and proficiency in the system is critical to its success.

ABOUT THE AUTHOR

Thomas Tyler, P.E., manages water pollution control for the Metropolitan District in Hartford, Connecticut. Jeffrey Bowers, Hartford WPCF superintendent, and Michael Zabilansky, facility engineer, contributed to this article and to the project's success.

Co-digestion with food waste organics—the next step toward net zero operation at Greater Lawrence Sanitary District

CHERI COUSENS, P.E., Greater Lawrence Sanitary District, North Andover, Massachusetts
RICHARD WEARE, LSIT, Greater Lawrence Sanitary District, North Andover, Massachusetts
BENJAMIN MOSHER, P.E., BCEE, CDM Smith, Manchester, New Hampshire
MICHAEL WALSH, P.E., BCEE, CDM Smith, Boston, Massachusetts

ABSTRACT | The Massachusetts Department of Environmental Protection (MassDEP) recently imposed a ban on landfill disposal of source-separated organics (SSO), with the goal of diverting an additional 350,000 tons (318,000 tonnes) per year of SSO material from the solid waste stream statewide by 2020. Concurrently, the Greater Lawrence Sanitary District (GLSD) continues to investigate reducing energy consumption at its treatment facilities and improving its biosolids processing systems and management strategies. These two interests have converged as the basis for an innovative project that may be a model for the recovery of energy from wastewater biosolids and food waste organics—materials that have traditionally been viewed as waste products.

KEYWORDS | Anaerobic digestion, source-separated organics, organics to energy, biogas treatment, combined heat and power

The Greater Lawrence Sanitary District (GLSD) owns and operates a 52-million-gallon-per-day (mgd) (196-million-liter-per-day [ML/d]) secondary wastewater treatment facility that serves a population of about 200,000 in five Massachusetts and New Hampshire communities. Typical of 1970s-era facilities, the original GLSD facility design was based both on sludge being a by-product from the liquid treatment process with no value and on the goal of sludge management as a way to reliably dispose of this by-product. Over the nearly 40 years since the GLSD facility began operating, industry trends have steadily moved toward more sustainable approaches to biosolids management, emphasizing beneficial use of biosolids rather than sludge disposal. Further, energy recovery, efficiency, and creative applications of innovative technologies have been developed that can achieve sustainable results. GLSD continues to be a leader in this move to more sustainable wastewater plant operations, as demonstrated by the ongoing organics-to-energy project.

FOCUS ON ORGANICS

Like many states, the commonwealth of Massachusetts has recently banned the disposal of food waste organics by incineration or landfill disposal. This new regulation resulted from a Solid Waste Master Plan by The Massachusetts Department of Environmental Protection (MassDEP) in 2010. Statewide goals identified in the Solid Waste Master Plan include reducing solid waste disposal by 2 million tons (1.8 million tonnes)/year by 2020, reducing disposal of organics by 350,000 tons (320,000 tonnes)/year (17 percent of the total solid waste reduction goal), and developing the infrastructure to support an organics diversion process by developing 250,000 to 300,000 tons (225,000 to 275,000 tonnes)/year of processing capacity along with supporting organics collection infrastructure.

GLSD has been an innovator in biosolids treatment and energy recovery; it operates one of the few anaerobic digestion facilities in New England, with digester gas used as the primary fuel for a thermal biosolids drying operation as well as for for building and process heat. GLSD hopes to eventually achieve a Net Zero energy goal for its wastewater treatment facility, while recognizing that recent bans on source-separated organics (SSOs) in landfills provide an opportunity to further that goal. Specifically, GLSD recognized that these food waste organics can be used, along with biosolids, as a fuel to increase generation of biogas at its anaerobic digestion facility, thereby increasing the generation of clean energy.

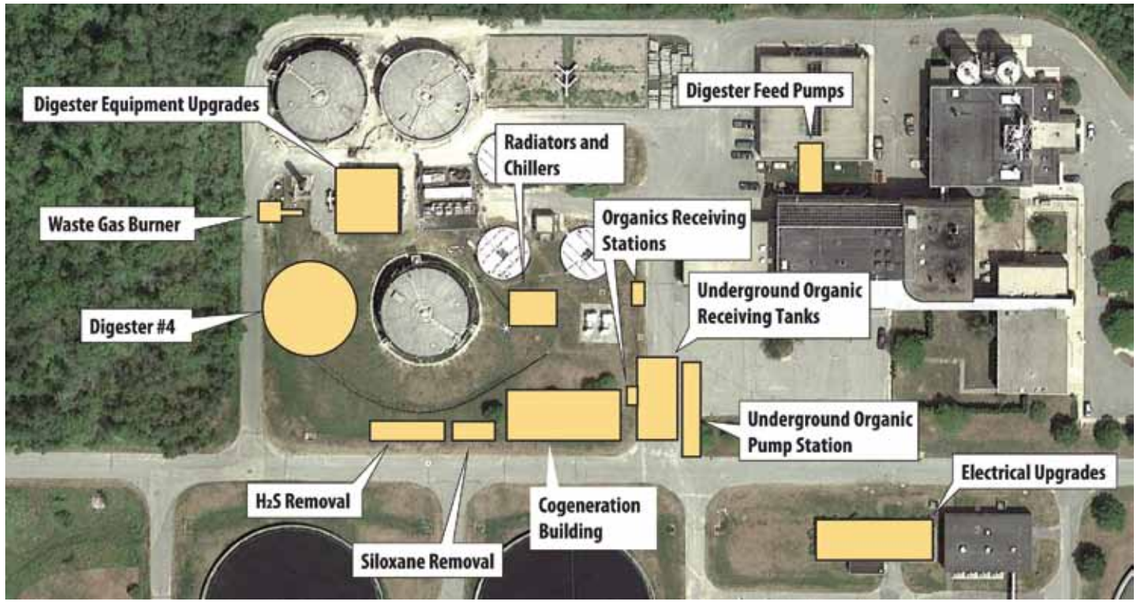


Figure 1. GLSD organics-to-energy project improvements

GLSD completed an Organics to Energy Feasibility Study in June 2013 with these goals in mind. The feasibility study evaluated the efficacy of (1) expanding the digestion system to allow co-digestion of biosolids and food organics, and (2) adding a new biogas-fired co-generation system to provide a regional solution for organic waste disposal and produce renewable energy (both heat and power) for use at the facility. The study found that installation of a fourth anaerobic digester and use of excess capacity for co-digestion of food waste would improve the resiliency and reduce operating costs of the facility as well as greatly reduce or eliminate GLSD's reliance on utility-supplied power. Based on the study's results, a preliminary and final design was developed for the required organics-to-energy infrastructure at the wastewater treatment facility. Final design was completed in January 2016, the project was advertised for construction bids in February and construction commenced in May 2016. Figure 1 shows the organics-to-energy improvements recommended for GLSD's facility.

The new infrastructure will enable GLSD to accept source-separated organic material for co-digestion and produce additional biogas. Under the new system, biogas will continue to be used as the primary fuel for thermal drying and to provide digester and building heat, but the increase in digester gas production will now also support a combined heat and power (CHP) system. The new CHP system could produce enough electricity to remove GLSD's reliance on the electrical grid under many operating conditions and generate approximately 3 megawatts (MW) of power. This could save member communities up to $2 million per year in electrical costs and reduce the stress on the already overburdened electrical grid in the Northeast. This project will produce quantifiable, long-term reductions in both electric and natural gas usage, representing a major step forward for the industry toward a more sustainable approach to wastewater treatment.

Major components of the project include:

- *Organic Waste Receiving Tanks.* Two new SSO receiving tanks sized to provide approximately 238,000 gallons (900,000 liters) of storage. In addition, a pump/jet nozzle mixing system and SSO transfer pumps will mix and transfer the material to an existing sludge blend tank.
- *Anaerobic Digester No. 4.* A new 1.4-million-gallon (5.3-million-liter) digestion tank will be constructed to add digestion capacity. Similar to the existing digester tanks, Digester No. 4 will use draft tube mixers and a steel gasholder cover.

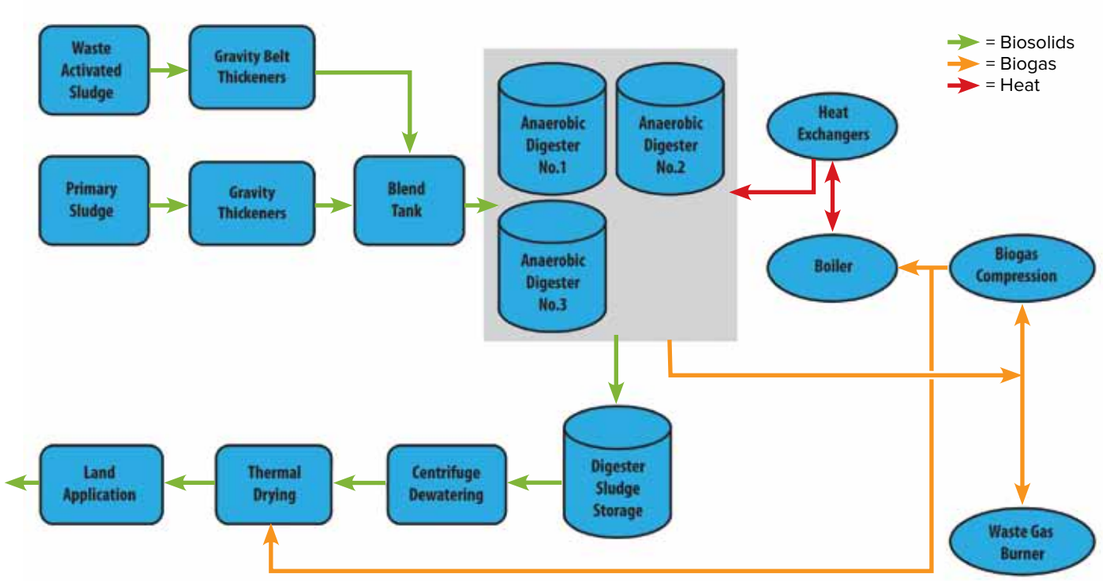


Figure 2.
Existing GLSD biosolids process schematic

- *Anaerobic digestion ancillary equipment.* Additional equipment will be installed within the digester equipment building to support the new digester, including two digester recirculating pumps, one concentric tube heat exchanger (1.7 MBtu/hr or 1,800 megajoules per hour [MJ/hr]) and one hot glycol recirculation pump. Space for this equipment had been provided in the existing digester building as part of the original digestion system design.
- *Biogas conveyance and waste gas burner.* Additional biogas conveyance capacity will be added between the various biogas treatment systems and points of use; a second waste gas burner (flare) also will be added. These additions will enable the biogas conveyance system to handle the anticipated significant increase in gas production from SSO co-digestion.
- *Hydrogen sulfide and siloxane treatment system.* A high level of digester gas treatment is required to protect the CHP engines. The biogas cleaning system includes a fixed media (iron sponge) hydrogen sulfide treatment system in addition to a carbon-media-based siloxane treatment system.
- *Biogas pressure boosting.* Treated biogas will be boosted to between 3.5 and 5.0 pounds per square inch (psi) (24 to 35 kiloPascals [kPa]) to accommodate the cogeneration engines and boilers.
- *CHP engines.* Additional biogas production will be used in reciprocating CHP generators with a capacity of approximately 3 MW. The power produced will be fed to the site electrical system and net metered back to the utility grid. Heat from the engines will be captured to supply process and potentially other on-site heating demands.

Figures 2 and 3 show the general process flow scheme for the current and proposed biosolids and organics processing systems to be installed.

PROCESS

The cost to construct the improvements will be approximately $26 million. Construction began in May 2016 and will take two years to complete. Because of the project's significant environmental and energy benefits, a number of credits and grants were available to assist in funding the construction cost of the proposed facilities. Approximately $6 million in grants and $25 million in State Revolving Fund (SRF) assistance are committed to the project, with grant funding provided by MassDEP, the Massachusetts Department of Energy Resources, the Massachusetts Clean Energy Center, and National Grid. Additionally, GLSD will receive around $1.6 million in SRF loan principal forgiveness due to its Environmental Justice designation.

INNOVATIVE TECHNOLOGY FOR BIOGAS AND EMISSIONS TREATMENT

One innovative part of the project is the application of a multi-step biogas and emissions treatment system that will clean digester gas to a high level to protect the engine generators from fouling and improve the quality of exhaust emissions. For

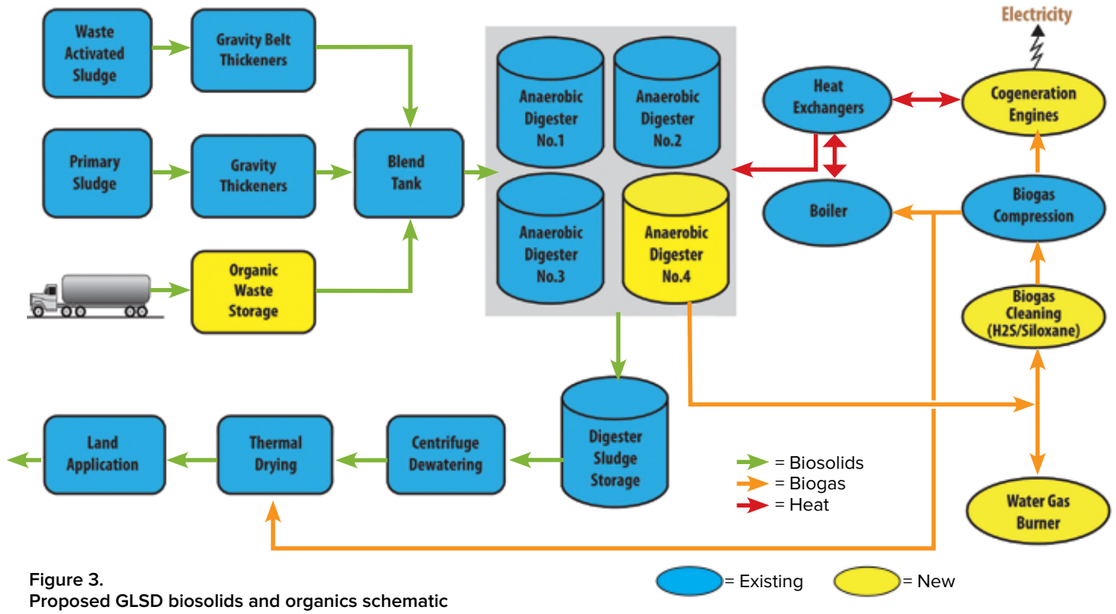


Figure 3.
Proposed GLSD biosolids and organics schematic

several years, GLSD has added ferric chloride to the anaerobic digesters to remove hydrogen sulfide and control struvite; this level of gas treatment is acceptable for traditional digester gas combustion applications such as boilers to provide building and digester process heat. However, an additional means of hydrogen sulfide removal is required for combustion in an engine generator to ensure that hydrogen sulfide concentrations do not create maintenance issues or affect long-term integrity of the engine. The gas treatment train includes a system of fixed media scrubbers that use iron sponge media for hydrogen sulfide removal, with on-line hydrogen sulfide meters upstream and downstream of the scrubbers to monitor removal efficiency.

The engine generators and subsequent emission control equipment must also be protected from the possible impact of siloxanes, which can be converted to silicon dioxide and deposit within power generation equipment during combustion. Siloxanes are used to manufacture personal hygiene, health care, and industrial products, and therefore can be found in wastewater and biosolids. If contained in high enough concentrations, siloxane will form a light coating of white powder on the interior of combustion surfaces and post-combustion catalysts, resulting in equipment downtime for engine or associated exhaust treatment equipment maintenance. To protect against this, the biogas treatment train includes a carbon-media-based siloxane removal system. Additionally, a particulate filter is provided as the final biogas treatment step before the engine generators. Figure 4 (page 32) is a design-phase visualization of the proposed biogas treatment skids and the CHP building.

Following the engine generators, engine emissions will be treated using oxidation catalyst technology to remove volatile organic carbon and carbon monoxide, and selective catalytic reduction (SCR) technology to remove nitrogen oxides. This high level of treatment represents best available control technology as determined by MassDEP and allows the CHP facility to be considered a non-major emission source. SCR technology has not been widely used for the treatment of exhaust gas from digester gas burning equipment and, as part of this project, GLSD representatives visited the Northeast Wastewater Treatment Plant in Philadelphia, one of only two facilities identified with this application of SCR technology on biogas-fired engines. Information from Philadelphia Water Department Plant Manager Robert Lendzinski as part of this visit and subsequent communications were helpful to the design process.

In summary, the treatment of biogas prior to the engine generators and emissions from the engine generators is one of the most complex elements of the project, but is highly necessary, as a clean fuel source is critical to proper operation of the generators and required emissions control equipment. While costly, this high level of treatment allowed GLSD to obtain required air permit approvals within the accelerated project schedule and will increase the already substantial environmental benefits of this project.

Figure 4. Visualization of proposed biogas treatment skids (background) and CHP building (front)

RENEWABLE ENERGY GRANT OPPORTUNITIES

As part of the Massachusetts Renewable Portfolio Standards, electric suppliers must have an annually increasing percentage of their retail sales generated by renewable energy. Electric suppliers fulfill this obligation by purchasing Renewable Energy Certificates (RECs) from the owners of qualified renewable energy-generating systems. Under current regulations, power from GLSD's organics-to-energy system can be sold to the market as RPS Class I RECs. Based on current REC market pricing, the value of the RECs for GLSD's system could be $200,000 to $600,000 per year, depending on the quantity of SSO material processed and the associated CHP operating time with biogas as the fuel source.

Similar to the RPS, the Alternative Energy Portfolio Standard requires a percentage of the state's electric load to be met by eligible alternative technologies; producers of this energy can sell Alternative Energy Credits (AECs). Though the formula for calculation of AECs is being revised by the commonwealth, the proposed system would center on the beneficial use of heat recovered from alternative energy technologies. Though this market faces the same volatility as the REC market, potential operating revenues from AECs are $150,000 to $250,000 per year.

NET METERING

In 2012, Massachusetts passed legislation allowing anaerobic digestion and cogeneration facilities to avail themselves of the "net-metering" provisions of the Green Communities Act. Under the net metering program, a host customer may apply excess power production (net metering credits) to other accounts as long as all the accounts are with the same electric distribution company and located within the same load zone managed by Independent System Operator—New England (ISO-NE). GLSD owns and operates a major pump station, Riverside Pump Station (RSPS), on a separate site one-quarter mile (0.4 kilometer) from the treatment plant and with a separate account for electricity purchased. RSPS conveys virtually all of the influent flow to the treatment plant and therefore is a major energy consumer. GLSD recently gained approval for net metering that will allow excess power production from the plant CHP system to be applied as an offset to RSPS power consumption. This net metering will provide a significant economic benefit to GLSD and improve the payback of the project.

ECONOMICS

The economics of the organics-to-energy project depend on a number of variables, including:

- Current and future value of RECs and AECs, which could exceed $800,000 annually depending upon the quantity of material processed
- Tipping fees for the acceptance of SSO material, which are initially anticipated to be relatively low but could increase over time as the SSO market develops
- Ability to apply net metered power produced at the treatment facility to RSPS power demand, thereby partially offsetting RSPS power costs
- Savings realized by not purchasing power from the local utility, which could be as much as $2 million at current rates and could increase in the future if, as many predict, energy prices continue to increase

These variables depend largely on the volume of SSO material received at the facility, as more material will increase tipping fees, increase generation of clean energy and associated energy credits, and lower GLSD's power costs. Based on current costs, it appears that the organics-to-energy project will provide a net positive cash flow as long as the co-digestion system is operated at greater than 60 percent of SSO design capacity, with acceptance of higher levels of SSO material resulting in a greater economic benefit to GLSD. Based on ongoing discussions with potential suppliers of SSO material, GLSD believes that the 60 percent breakeven point will be met even in the initial years of operation and that the economic benefit of the project will continue to increase as the SSO market further develops and the demand for SSO-processing outlets continues to increase.

CONCLUSION

Wastewater treatment facilities have moved from a mission of treatment and disposal to one of recycle and reuse. This move has come as the value of nutrients and organics in wastewater and biosolids has been recognized and the industry has moved to treat these materials as a resource rather than a waste product. GLSD's organics-to-energy project is a major step in this progression toward more sustainable wastewater treatment operations, as this innovative project will take two materials traditionally viewed as waste products (food waste organics and wastewater sludge) and convert them to an important clean energy source that will, mostly, meet the energy needs of the GLSD facility. Additional benefits include:

- Greater protection against future increases in energy costs
- Greater facility resiliency and operational flexibility, including use of CHP engines during a loss of utility supplied power
- Ability to provide an important service to the commonwealth and to local businesses in processing and beneficially using SSO material
- Greater system reliability, as the additional digester tank volume added as part of this project will make it easier to clean digester tanks regularly
- Major reduction in net greenhouse emissions associated with organics processing

The organics-to-energy project will also benefit GLSD and member communities economically, even more so over time as the cost of traditional energy sources continues to increase and the industry moves to renewable energy sources. In these and other ways, the project can be a model for the wastewater industry as treatment plants develop a more sustainable environmental footprint and find new ways to recover the nutrient and energy value of wastewater to the benefit of the environment and ratepayers.

GLSD acknowledges the tremendous support and cooperation from MassDEP, the Massachusetts Department of Energy Resources, and the Massachusetts Clean Energy Center in developing this project over the past three years. This support—both financial and otherwise—allowed GLSD to advance the project from an initial feasibility study to preliminary and final design on an accelerated schedule while managing the challenges associated with what is, in many respects, a first-of-its-kind project. Without this commitment to innovation and partnership in advancing sustainable approaches to water quality, energy, and environmental issues, the GLSD organics-to-energy project would not have been possible.

ABOUT THE AUTHORS

- Cheri Cousens, P.E., is the executive director of GLSD in North Andover, Massachusetts. Before joining the GLSD in 2014, Ms. Cousens served as executive director of the Charles River Pollution Control District in Medway, Massachusetts. In addition to being a licensed professional engineer, Ms. Cousens is a Licensed Grade 7-C Wastewater Treatment Plant Operator, a director of the Massachusetts Coalition for Water Resources Stewardship, a director of North East Biosolids and Residuals Association and a member of NEWEA.
- Richard E. Weare, LSIT, is the capital projects manager at GLSD. He has over 40 years of experience in the management, design and construction of waste water treatment facilities. He has been employed with GLSD for 16 years, managed the original construction of the biosolids digestion system built in 2000, and is managing the Organic to Energy project.
- Michael Walsh, P.E., BCEE, is a vice president and client service leader with 30 years of experience with CDM Smith in Boston. In this capacity, he provides technical and managerial oversight for water, wastewater, and alternative project delivery projects throughout New England with a particular focus in the areas of water reuse, alternative energy, biological nutrient removal (BNR), and energy recovery technologies at treatment facilities.
- Benjamin Mosher, P.E., BCEE, is an associate and Northeast water services technical delivery manager for CDM Smith in Manchester, New Hampshire. He has 16 years of experience in managing a diverse array of large-scale projects including multidis-cipline wastewater treatment facility upgrades, biosolids digestion, fertilizer production and energy recovery projects.

Energy recovery using raw wastewater —Barnstable pilot project

ANASTASIA RUDENKO, P.E., ENV SP, GHD, Hyannis, Massachusetts
MARC DRAINVILLE, P.E., BCEE, LEED AP, GHD, Hyannis, Massachusetts
ANDREW BOULE, Barnstable Department of Public Works, Barnstable, Massachusetts
RICHARD ELRICK, Town of Barnstable, Barnstable, Massachusetts
DALE SAAD, PhD, Town of Barnstable, Barnstable, Massachusetts
MASSACHUSETTS DEPARTMENT OF ENERGY RESOURCES (DOER)—Project Funding

ABSTRACT | The Massachusetts Department of Energy Resources (DOER) defines wastewater energy recovery (WWER) as the process by which heat energy is transferred from wastewater for heating applications or to wastewater for cooling applications. Although the principle behind the technology is well established, its application with raw wastewater is not prevalent in the United States. While the use of raw wastewater for WWER could meet heating and cooling needs for buildings close to collection system infrastructure, it may also add a maintenance burden on operators.
In 2014, the town of Barnstable was awarded a grant through DOER to pilot a raw sewage heat recovery unit at the town's largest raw wastewater pumping station. The objective of the pilot was to characterize the operational requirements of using WWER in a raw wastewater application. Minimal maintenance was required during the month-long pilot.

KEYWORDS | Wastewater energy recovery, raw wastewater, operator maintenance, Department of Energy Resources, raw wastewater screenings, pilot

INTRODUCTION AND STATEMENT OF OBJECTIVES

The objective of wastewater energy recovery (WWER) systems is to re-capture some of the energy introduced to water for hot water uses (such as showers, dishwashers, and washing machines) after it flows down the drain by using wastewater as a heat source and a heat sink for nearby buildings.

While heat recovery via heat exchangers is a straightforward and well-established technology, its application for energy recovery from raw wastewater is not prevalent in the United States. WWER installations in the United States traditionally use high-quality, low-nutrient effluent, which limits the heating and cooling potential of the technology to buildings close to a wastewater treatment facility—an area typically avoided for high-density development.

Using raw wastewater for WWER could help to meet heating and cooling needs for municipal and commercial buildings near collection system infrastructure—greatly expanding the application range of the technology. However, raw wastewater may require much more maintenance due to the large amount of solids and other constituents in the stream. Potential issues include rapid fouling of the heat exchanger plates and accumulation of screenings at non-centralized locations around the community.

The town of Barnstable has long pursued energy-saving policies and implemented energy-efficiency improvements at its water pollution control facility (WPCF) both to lower energy costs and to reduce carbon emissions. Because of the town's continuing effort to reduce energy consumption throughout its infrastructure, it became interested in piloting a WWER unit at its largest wastewater pumping station to use the heat energy in wastewater for heating and cooling applications at some municipal buildings.

The town was awarded a grant through the Massachusetts Department of Energy Resources (DOER) Waste Water Energy Recovery Assistance Program in 2014 to operate the first raw sewage heat recovery pilot unit in North America at the town's largest raw wastewater pumping station. Although the piloted technology has several WWER installations in Europe, the technology has no operating installations in North America.

Figure 1. Pilot location

The following objectives were established for the pilot operation:

1. Assess the operation and maintenance requirements of using a raw wastewater source for heat exchange
2. Collect flow and temperature data during the pilot's operation and use the data to determine the technical and economic feasibility of a full-scale installation

DESCRIPTION OF WORK AND METHODOLOGY

Pilot Location

The wastewater heat recovery pilot unit was installed at the Old Colony Pumping Station, which is the town's largest raw wastewater pumping station. The pumping station is in the village of Hyannis, which is within the town of Barnstable. This location was chosen for its proximity to two large municipal buildings—Barnstable Town Hall and the school administration building—as shown in Figure 1. Municipal buildings are ideal for this application because they represent a long-term stable energy user compared to commercial establishments, which may change ownership frequently or go out of business. The two buildings have been at their current locations for more than 50 years and are likely to be in continuous operation for years to come, thereby providing a long-term user of heating or cooling capacity. Town Hall has approximately 25,000 square feet (ft^2) (2,323 square meters [m^2]) of conditioned space and uses an 80 ton (281 kilowatt [kW])) chiller with an evaporative cooling tower for cooling and natural gas boiler for heating. The school administration building has approximately 15,000 ft^2 (1,394 m^2) of conditioned space and also uses a chiller with an evaporative cooling tower and a natural gas boiler.

Overview of the Wastewater Heat Recovery Pilot System

The piloted WWER unit consists of a series of horizontal heat exchange pipe modules enclosed in a stainless steel tank, as shown in Figure 2. Pre-screened wastewater flows by gravity through the WWER unit. Heat exchange occurs between the wastewater and clean water through "pipe modules." A mechanical wiper system is operated periodically (typically once a day) to minimize biofilm growth on the heat exchange surfaces. The wiper system rings typically need to be replaced every five years.

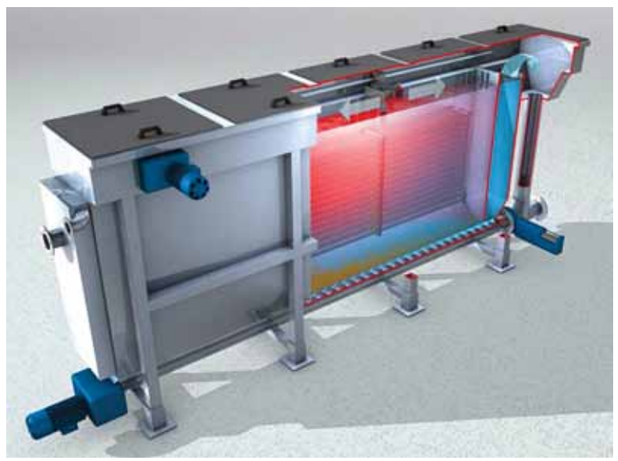


Figure 2. WWER pilot unit

Figure 3. Pilot setup

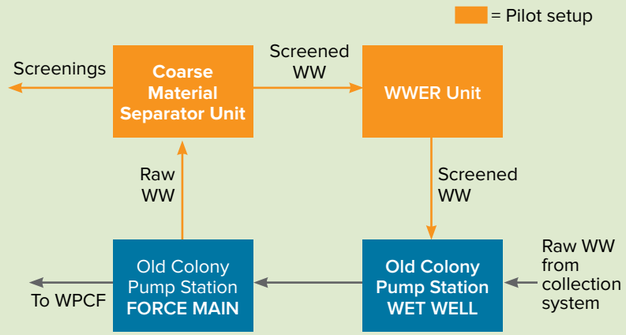


Figure 4. Pilot schematic

Pilot Setup

The pilot setup consisted of the temporary installation of a coarse material separator unit with a 0.24 inch (in) (6 millimeter [mm]) opening size followed by the WWER unit (Figure 3) rated for 238 gallons per minute (gpm) (901 liters per minute [L/m]) of wastewater flow. The footprint of the WWER unit is approximately 17 ft (5 m) long, 5 ft (1.5 m) wide, and 7 ft (2 m) high. The coarse material separator unit included an integrated screenings press zone with a bagging attachment to collect the compacted screenings.

The pumping station's force main was tapped, and piping was installed to convey flow to the screenings and WWER units. Once flow passed through the pilot system it was returned to the pumping station's wet well. Since heat exchange is a well-proven technology with numerous applications in the United States, the main goal of operating the pilot was to assess how well the unit operates with raw wastewater. The unit was not connected to Town Hall's cooling system. Instead, the energy recovery potential was estimated based on industry-established calculations for heat exchange. A pilot schematic is shown in Figure 4.

Pilot Timeline

Prior to delivery of the pilot unit, the following work was performed on site:

- A temporary fence was installed around the site to restrict access to the pilot unit due to security concerns (Figure 5)
- A mechanical contractor laid the base for the unit, which comprised a gravel bed and two 8 by 8 in (0.2 by 0.2 m) timber planks to distribute the weight of the unit over the gravel bed (Figure 6)
- The wall of the pump station was core drilled to allow drain piping to be installed from the unit to the wet well

After completion of this preparatory work, the WWER unit was delivered to the site (Figure 7).

Once the unit was on site, the following work took place over one week (time to set up the unit was driven by availability of the contractors to perform the work):

- Copper piping, a motorized shutoff valve, and a butterfly valve were installed between the force main and the inlet of the screenings unit (Figure 8)
- Flexible hosing (provided by the WWER manufacturer) connected the outlet of the screenings unit to the inlet of the WWER unit (Figure 9)
- Flexible hosing was installed to allow flow from the WWER unit to drain back to the pumping station wet well (Figure 10)
- An electrical contractor connected the motorized shutoff valve to the screenings unit control panel so that the valve would close and isolate the pilot system if the screenings unit registered a fault. The pilot system would remain isolated until an operator visited the site, diagnosed the fault, and brought the system back online. The electrical contractor also connected the pilot unit to the pumping station's electrical system.

Once the pilot setup was complete, the manufacturer's representative started up the WWER unit. The representative was on site for a week to troubleshoot the unit during initial operation. During this first week the pilot system was shut down when no one was at the site to supervise its operation.

After the month-long pilot, the unit was decommissioned and removed from the site in one day. Upon unit removal, the site was restored to its original condition.

Data Collection

Instantaneous flow, inlet temperature, and outlet temperature data were collected throughout the pilot through instrumentation from the manufacturer. The manufacturer provided a wireless communication system that allowed the data to be collected with a remote data logger and accessed through a secure internet website.


5


6

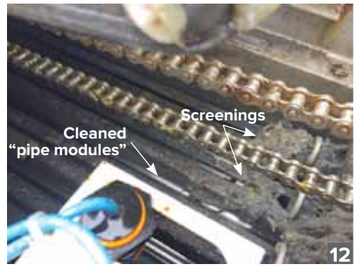

7


8


9


10


11



12

Figures:
5. Pilot site perimeter fence
6. Gravel base for pilot unit
7. Equipment delivery
8. Flow control valving
9. Flexible hosing
10. Pilot discharge to pump station wet well
11. Continuous bagging system
12. WWER unit after month-long operation

RESULTS AND DISCUSSION

Operations and Maintenance Observations and Findings

The goal of the pilot was to characterize the operational requirements of using a WWER system with raw wastewater. The pilot was operated for one month. During the first week, town operators were trained in the operation of the unit, and the system was operated for a limited time during the day to allow the operators time to become familiar with it. After the first week, the WWER unit was operated continuously, 24 hours a day.

Screenings removal operation and maintenance requirements—The amount of screenings in raw wastewater depend heavily on the composition of the wastewater. One goal of the pilot was to assess how often screenings would need to be removed from the pumping station. The screenings unit was installed with a continuous bagging system (Figure 11), which needs to be emptied periodically.

WPCF staff conduct a routine daily visit to each of the town's pumping stations. If the number of visits required to remove screenings exceeded the daily scheduled pumping station visit, the system could place a large operational (and time) burden on facility staff.

Results showed that the bag needed to be changed and removed several times a week and the removal could be conducted during the WPCF staff's regularly scheduled visits.

Cleaning system effectiveness—When the pilot was decommissioned, the WWER unit was partially drained and its interior was inspected to assess the wiper system's effectiveness when handling raw wastewater. Figure 12 shows the cleaned pipe modules immediately after the wiper mechanism was run. Based on a visual inspection, the wiper system functioned well.

Visual inspection also revealed that screenings had made their way past the screenings removal unit to the WWER unit. This indicates that a finer screen would be required in a permanent installation to protect the WWER unit. Installation of a finer screen could increase the amount of screenings generated through the setup. Further piloting would be required to determine the quantity of screenings generated by the finer screen.

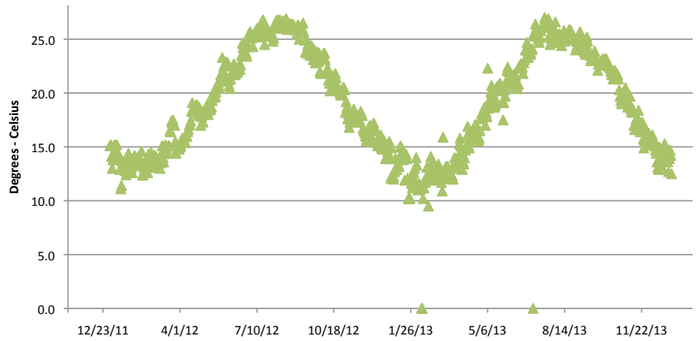


Figure 13. 2012 to 2013 Hyannis WPCF effluent wastewater temperature

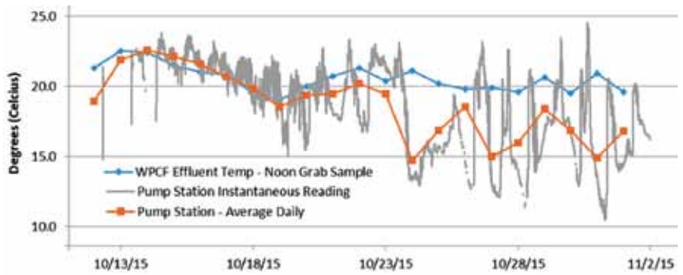


Figure 14. Wastewater temperatures recorded at Old Colony Pumping Station and Hyannis WPCF during WWER pilot

WPCF staff experience—Owing to the pilot project's proximity to downtown Hyannis, one concern of WPCF staff was odor generation. A continuous bagging system was installed on the screenings unit to minimize potential odors. During pilot operation, minimal odors were observed at the site, and the town did not receive any odor complaints.

WPCF staff were also concerned about potential leaks within the pilot setup. Although an automatic shutoff valve was provided to isolate the system, the pilot unit did not have a leak detection system. To mitigate this concern, the pilot was initially operated for a limited time during the work day, in the presence of an operator. As WPCF staff became more comfortable with the system, the unit's hours of operation were increased. After the first week the unit was operated continuously (24 hours a day) for the remainder of the pilot.

Lastly, WPCF staff were concerned about the scale of operational maintenance possibly required. It was found that most of the unit's maintenance during its month-long operation could be accomplished during an operator's regularly scheduled daily visit to the site, including screenings removal.

Andrew Boule, division supervisor of the Water Pollution Control Division, noted: "We had only to empty the screenings unit about once every week or two. The odors were really a non-issue. We did need to manually press the screenings daily to keep flow moving, but again, that was not any added labor on our end aside from pushing a button.

"Our operators were extremely skeptical of this unit, and the work it would take to maintain it," Mr. Boule added, "and in the end they were seemingly satisfied that there was not much additional labor. We would still prefer to carry out grit and rag separation in one central location, but if this project was found to be cost-effective, we would certainly make an exception to this rule."

WWER System Retrofit Setup for a Permanent Installation

Both Barnstable Town Hall and the school administration building use a clean water loop for cooling. The water gains heat during the cooling process and "dumps" the heat through an evaporative cooling tower. To use WWER with the existing cooling setup requires the chiller to be decoupled from the cooling tower. Instead of being pumped to the cooling tower, the clean water would be pumped across the street to the WWER unit, where the heat absorbed by the clean water during the building's cooling process would be transferred into the wastewater.

For a heating application, the town's natural gas boilers would need to be replaced with a heating system that is compatible with the WWER system and operates with a clean water loop. A heat pump would be used to pump clean water across the street to the WWER unit. During the heat exchange process, heat from the wastewater would be transferred to the clean water loop and used to heat the two buildings across the street.

Based on the anticipated heating and cooling loads of the two buildings, the manufacturer recommended its largest WWER model be used in a permanent installation (a smaller unit was piloted during this study). The larger WWER unit available has a maximum flow capacity of 480 gpm (1,817 L/m), representing approximately 45 percent of the average flow to the facility. Further analysis would be needed to determine potential impacts on the biological process at the WPCF due to the temperature change in this stream—a significant amount of flow at the facility.

To retrofit the heating and cooling system at Town Hall, the following major components would be needed in addition to the WWER unit itself:

- A dedicated pump to circulate raw wastewater through the WWER unit
- Screenings removal and compaction unit (screenings unit)
- Pre-engineered structure to house the WWER and screenings unit

Table 1. 2012 to 2013 Average Hyannis WPCF effluent wastewater temperature

	Temperature (°C)		
	2012	2013	Average 2012 – 13
December to February	14.3	13.1	13.7
March to May	17.4	16.2	16.8
June to August	24.9	24.4	24.6
September to November	21.1	20.9	21.0

Table 2. WWER energy offset estimated using building energy model

	Town Hall	School Admin	Total (both buildings)
Annual Heating and Cooling Electric – Current (kWh)	129,000	58,000	187,000
Annual Heating and Cooling Electric – WWER System (kWh)	129,000	69,000	198,000
Electrical Usage Offset (%)	0%	-19%	-6%
Annual Gas Heating – Current (Therms)	13,000	6,900	19,900
Annual Gas Heating – WWER System (Therms)	0	0	0
Gas Usage Offset (%)	100%	100%	100%

- New 4 in (100 mm) high-density polyethylene supply and return piping from the WWER system directionally drilled from the pumping station, under South Street and to Town Hall, to be connected to the chiller in lieu of the cooling tower
- A pump to circulate clean water between the chiller and the WWER system that could either be variable speed or mixing valve-controlled by the chiller head pressure
- Flow control to avoid production of saturated/condensed refrigerant from the low water temperature of the condenser, which could enter the compressor
- Heat pump
- Replacement of the building's natural gas heating system with equipment compatible with the WWER system
- Head pressure controls possibly to be added to the chiller, if not currently installed

Potential Cooling Application Energy Savings and Cost Effectiveness Analysis

Historical Hyannis WPCF wastewater temperature effluent data is shown in Figure 13 and Table 1. The Hyannis WPCF collects a daily effluent wastewater temperature grab sample every day between noon and 1 PM.

Instantaneous wastewater temperature data was collected at the pilot during its operation. Based on the data correlation shown in Figure 14, the wastewater temperature at the pumping station in the summer was assumed to be similar to that at the WPCF. This is a conservative assumption because the data trend typically shows an increase in temperature at the end of the WPCF treatment process. Installation of a temperature probe at the Old Colony Pumping Station would allow the town to gather long-term data on the temperature at the pumping station and therefore to refine the assumptions made for the energy recovery study.

Potential Energy Offset of Permanent WWER Installation

An eQuest 3.65 model was developed to determine the energy offset potential of a permanent WWER installation. Based on the annual effluent wastewater temperatures at the WPCF, heating capacity of the larger WWER unit is estimated to be heating capacity of 1.09 million BTUs per hour (320 kW) and the cooling capacity is 100 tons (352 kW). Table 2 shows the model's results. The model shows a slight increase in electricity costs to operate the WWER system and a savings in gas heating.

Cooling efficiency could be increased by pumping the condenser water through the WWER heat exchanger rather than in the evaporative cooling tower, lowering condenser return water temperatures and improving the chiller energy efficiency ratio. Typical condenser return water temperatures from cooling towers are around 85°F (29°C). The manufacturer indicated that using the design temperature of 77°F (25°C)—average effluent wastewater temperature from June through August based on 2012 to 2013 WPCF data—return water temperatures from the WWER system would also be about 85°F (29°C). This would indicate no increase in efficiency or electricity savings between the WWER system and the evaporative cooling tower.

Also, because of the high wastewater temperature in the summer, the largest cost savings of a WWER system would be in reducing potable water consumption. Based on the town's current water rates, annual savings of $611 are estimated by eliminating the evaporative cooling tower. Net energy saving for the WWER system based on the eQuest model results and the town's current utility rates is estimated to be $6,900.

At the town's current utility rates, the simple payback period of a WWER installation exceeds 20 years, which is greater than the typical service life for equipment.

CONCLUSIONS

The goal of the pilot was to determine the operation and maintenance impact of operating a WWER unit with raw wastewater. With respect to this goal, the pilot was a success and demonstrated that the unit did not require much operations and maintenance effort during its month-long operation.

In this location, however, the economics of the pilot did not result in a viable project. Owing to the high wastewater temperatures in the summer, the WWER system did not offer any cooling efficiency over the existing cooling system during the summer and thus no electricity savings. The estimated saving in potable water through the elimination of the evaporative cooling tower was minimal. As a result, the estimated cost saving from a WWER unit was small, and the project had a long payback period. If a facility is considering a WWER system at a pumping station, a temperature probe is recommended to monitor and characterize the influent temperature at the proposed location, as this data is not typically collected at pumping stations.

The net annual gas savings for heating from the WWER installation is approximately 19,900 therms (2.1 million megajoules) or 580,000 kilowatts per hour. However, the buildings' heating systems would need to be replaced with systems compatible with a WWER system, and the town has indicated that the existing system is still well within its design life. Installing a WWER system would likely only be cost-effective if the town needed to replace these heating systems due to age or known operational issues.

The WWER installation was not cost-effective at the town's current utility rates, but the prices of both natural gas and electricity have historically fluctuated significantly. Future rates may have a significant impact on the calculated simple payback for the WWER system and a sensitivity analysis would determine the electricity, natural gas, and potable water costs to make the system cost-effective in this retrofit application.

Although the study concluded that using a WWER in this retrofit application is not cost-effective at the town's current utility rates, the month-long pilot showed that the WWER unit did not require excessive maintenance in a raw wastewater application. The wiper system was shown to work effectively (based on visual inspection), and the amount of screenings collected by the system did not exceed the quantity that could be removed by operators during daily site visits.

The low maintenance requirements indicate that raw wastewater WWER can be a viable technology:

- When the existing heating and cooling system is past its design life and needs replacing
- As part of new construction in an area with high utility rates
- In an area with cooler wastewater temperatures during the summer

ACKNOWLEDGEMENTS

Thank you to the following entities:

- Massachusetts DOER, for funding this project through its Waste Water Energy Recovery Assistance Program
- Barnstable, for providing a piloting site and continuing to strive toward innovative technologies, especially those with energy reduction potential
- Huber Technology, for providing and supporting the WWER equipment
- Matthew Rodak, GHD, for his contribution to the heating, ventilating, and air conditioning (HVAC) analysis

ABOUT THE AUTHORS

- Anastasia Rudenko is a project engineer with GHD in Hyannis, Massachusetts, with seven years of experience in environmental engineering. Her experience includes wastewater treatment plant design, coastal resilience risk and vulnerability assessments, comprehensive wastewater management planning, and construction management for renewable energy and treatment plant infrastructure.
- Marc Drainville is an associate with GHD in Hyannis. Mr. Drainville has more than 20 years of experience in the planning and design of wastewater infrastructure, with a focus on advanced wastewater treatment.
- Andrew Boule is division supervisor for Barnstable's Water Pollution Control Division.
- Richard Elrick is the energy coordinator for the town of Barnstable.
- Dale Saad is a senior project manager with Barnstable's Department of Public Works. Dr. Saad oversees staff and programs for water and sewer infrastructure, environmental protection, coastal resources, and energy efficiency.

After 40 years of successfully composting biosolids, Merrimack plans for the future

GEOFFREY KUTER, PhD, Agresource Inc., Amesbury, Massachusetts
RICHARD NICOLETTI, PE, BDP Industries, Greenwich, New York
JAMES TAYLOR, Merrimack Wastewater Treatment Facility, Merrimack, New Hampshire
LEO GAUDETTE, Merrimack Wastewater Treatment Facility, Merrimack, New Hampshire

ABSTRACT | Since the 1970s the town of Merrimack, New Hampshire, has been successfully managing the biosolids generated at the wastewater treatment facility through composting. The original aerated static pile system was replaced in 1994 with an enclosed agitated bed facility. After extensive evaluation of alternatives, including both landfill disposal and privatization of the composting operation, the town recently completed a major upgrade to the composting facility. The town's investment in the continued operation of the composting facility was due in part to the compost marketing partnership with a third-party compost blender and marketer.

KEYWORDS | Biosolids, composting, compost, aerated static pile, agitated bed facility

The Merrimack Wastewater Treatment Facility

INTRODUCTION

Biosolids management is a significant cost for wastewater treatment plants in New England. Whereas many municipalities transport and dispose of biosolids in regional landfills or incinerators, the town of Merrimack, New Hampshire, has composted its wastewater residuals into biosolids for more than 40 years as a commitment to biosolids beneficial use. Merrimack has a population of about 26,000, occupies an area of 32.6 square miles (84.4 square kilometers), and is located along the Merrimack River in southern New Hampshire. The town was selected as one of the top 25 places to live in the United States in 2013 by *CNN/Money* magazine. At nearly 800 people per square mile (310 people per square kilometer) it is predominantly an urban-suburban community with a median household income of about $70,000 per year.

This article describes the development of the composting program, changes to the composting technology, various studies and reviews over the years, and the commitment to continue with composting as the preferred option for managing biosolids. Over the years the town has developed a compost marketing program, which is also discussed below.

FACILITY DESCRIPTION

The Merrimack Wastewater Treatment Facility (WWTF) started operation in 1970 and underwent significant upgrades in 2007 and in 2013. The WWTF can treat 5.0 million gallons per day (mgd) (18.9 million liters per day [mL/d]) with an average flow of 1.8 mgd (6.8 mL/d). The Anheuser-Busch brewery generates about 35 percent of the flow and 70 percent of the total suspended solids (TSS) entering the plant.

The liquid treatment process train includes an activated sludge system with an anaerobic zone for enhanced biological phosphorus removal. A screw press produces a dewatered cake from a combination of primary and secondary solids, which is composted to meet Environmental Protection Agency Class A* standards. The facility has received a number of awards, including ones for operations and maintenance, biosolids, and industrial pretreatment.

SOLIDS MANAGEMENT

The WWTF started composting in the 1970s with an aerated static pile (ASP) operation and upgraded to the in-vessel agitated bed facility that began operations in 1994.

When the WWTF began operation, sludge was dewatered with vacuum filters and hauled to a lined lagoon next to the town's landfill off Lawrence Road in Merrimack. The New Hampshire Department of Environmental Services (NHDES) required the town to close the lagoon and remove the accumulated sludge. The town used the ASP composting approach to stabilize the lagoon sludge and operated the ASP at the lagoon site from 1979 to 1981. With the ASP operation being evaluated as successful, composting operations were permanently relocated to the grounds of the WWTF after 1981.

At present, the Merrimack compost facility handles about 9,600 wet tons per year (WTPY) (8,700 wet tonnes/year) of dewatered biosolids at approximately 20 percent dry solids. About 3,600 WTPY (3,300 wet tonnes/year), 37 percent of the total, are received from other treatment facilities in southern New Hampshire and northeastern Massachusetts.

AERATED STATIC PILE COMPOSTING

A pilot was initiated in 1976 using the ASP method pioneered by the United States Department of Agriculture in Beltsville, Maryland (see Epstein et al. 1976). This approach consisted of mixing the dewatered sludge with wood chips (bulking agent) and placing the mixture of chips and sludge over perforated piping. Aeration blowers connected to the end of the pipe pulled air down through the mix. The odorous air was exhausted from the pile though a small scrubber pile of finished compost, which acted as a biofilter to remove odors.

The town encountered operational issues with the ASP system typical of many such operations. The composting was performed outdoors and uncovered, and thus was exposed to both cold temperatures and precipitation. The original ASP facility was limited in controlling the composting process. As a result, the compost product was often wet and difficult to screen, and recovery and reuse of the wood chips was difficult. Since the compost from the ASP facility was wet and heavy, contained an undesirable quantity of wood chips, and as there was no marketing plan for it, the product had minimal value in the market. This meant that significant quantities of compost accumulated at the WWTF over many years. In addition, the air exhausted from the compost piles was odorous and the small scrubber piles did not control odor effectively.

*The U.S. Environmental Protection Agency Part 503 biosolids rule classifies wastewater residuals as "unclassified," "Class B," or "Class A." Unclassified material has undergone no processing for pathogen reduction. Class B material has undergone some processing to reduce pathogens and vector attraction but still has pathogens remaining. Class A material has undergone thermal processing to reduce pathogens to undetectable levels. Owing to the high level of treatment, Class A material can be used almost anywhere, including areas with much contact with the public.

UPGRADE TO ENCLOSED IN-VESSEL COMPOSTING

In the early 1990s the town began evaluating other composting approaches, including various in-vessel systems marketed and installed in the United States in the 1980s. The evaluation included assessing the overall compost process and making a consistent product.

After extensive review and visits to operational facilities, the town chose an agitated bed in-vessel compost technology. This technology was introduced into the United States in 1986 and a fully operational facility was installed at Earthgro, in Lebanon, Connecticut, where it processed manures. A facility similar in size to the facility planned for Merrimack was constructed at the Anheuser-Busch brewery in Baldwinsville, New York, to handle the solids generated from the treatment of brewery wastewater. When Merrimack began its design, several similar facilities were already located at municipal wastewater treatment facilities and were processing biosolids, including in Fairfield, Connecticut, Plymouth, New Hampshire, and Lockport, New York.

The enclosed agitated bed facility offered a number of advantages over the town's ASP system:

- It captured and treated odors using biofiltration
- Agitated bed composting used automated temperature monitoring to control operation of the aeration blowers
- Aeration was operated in a positive mode—controlling compost temperatures more precisely
- Dryer product was generated in a shorter time

Operational facilities demonstrated the system's ability to generate a consistent quality dry product that was marketable. Production of a consistent marketable product was of importance to the town, which had historically struggled to distribute compost.

FACILITY DESIGN AND LAYOUT

The agitated bed composting system is modular with parallel, elongated bays. The compost mix is loaded into the front end of each bay and moved down the bay with an automated agitator traveling

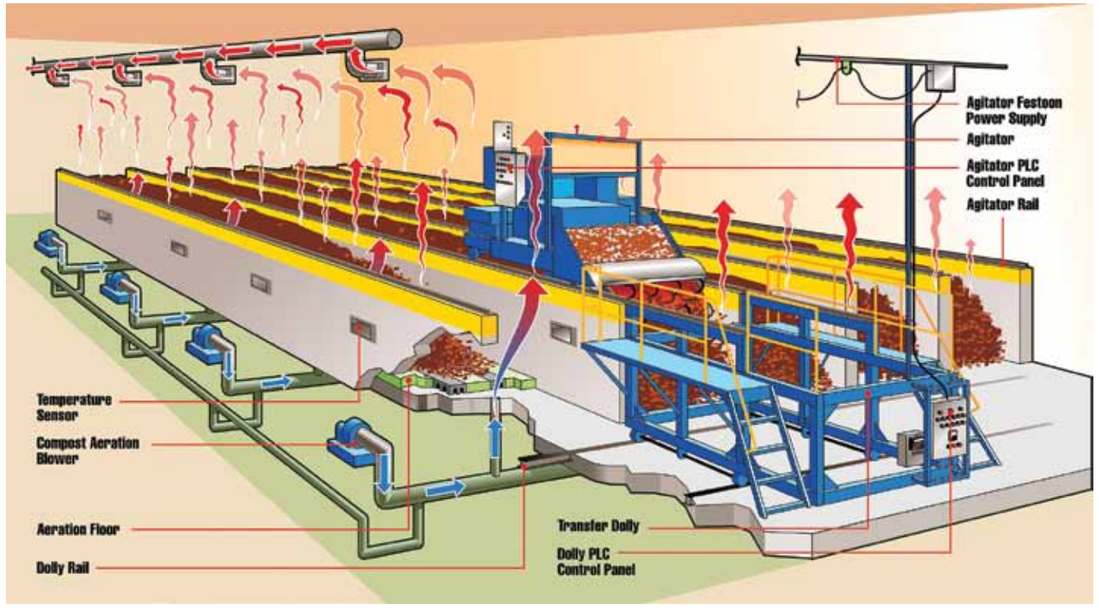


Figure 1. Schematic of agitated bed composting system

on rails mounted on the bay walls. Figure 1 shows the arrangement of the agitators and bays. The Merrimack facility was constructed with 15 bays and three agitators. Each bay can receive a charge of about 14 cubic yards (yd^3) (11 cubic meters [m^3]) of new compost mix following the agitation process. A charge contains approximately 6 yd^3 (4.6 m^3) (~4 tons [3.6 tonnes]) of biosolids and 8 yd^3 (6.1 m^3) (~2 tons [1.8 tonnes]) of wood shavings. Each bay is designed to be agitated five times per week (once each working day). After about a 21-day retention, the compost is discharged from the bays and transferred using a front-end loader to uncovered outdoor curing. Approximately 7 yd^3 (5.3 m^3) of compost are discharged from each bay with each agitation. Compost removed from the enclosed facility is cured outdoors in open windrows for a minimum of 30 days. Paved areas previously used for the ASP operations now provide a location to cure, screen, and store compost. A wooden pole building, also constructed for the original ASP facility, stores the bulking agent.

Temperature sensors (thermocouples) in the bay walls automatically monitor compost temperatures. The temperature data controls the aeration blowers that provide oxygen and cooling. The aeration system follows design principles from various research studies, including Kuter et al. (1985) and MacGregor et al. (1981), that demonstrate the importance of adequate aeration to control temperatures and achieve drying.

The moist and odorous air driven off the compost is contained within an enclosed structure and exhausted from the building using fans located outside of the facility. Odorous air is passed through a biofilter to remove odors. The efficacy of simple biofilters to remove compost odors (largely mixtures of reduced sulfur compounds) has been demonstrated through testing at other agitated bed facilities (see Amirhor et al. 1995).

The enclosed compost facility began operation in October 1994, using proprietary agitated bed equipment including agitators and a computer control system.

COMPOST MARKETING

The agitated bed system allowed the town to avoid the use of wood chips as a bulking agent and use finer-textured wood shavings as an alternative. This substitution resulted in a finer-textured product compost that was screened to a 3/8 inch (9.5 millimeter) size to produce a uniformly textured product, increasing the product's market value. Distribution and marketing of the compost was a concern for the town, so it entered into a compost marketing contract with a third-party compost blender and marketer. Except for some limited local sales, all compost is distributed through the third-party marketer in bulk. The local sales and give-away program for town residents account for about 1,400 yd^3 (1,100 m^3) of compost per year; that is less than 10 percent of the annual production. In 2015, the total volume sold will exceed 15,000 yd^3 (11,500 m^3). The third-party marketer has responsibility to find customers, set up trucking and delivery, and pay for all the delivery and marketing (e.g., promotional materials) expenses.

The town has maintained a commitment to operating the composting program to ensure the compost meets all regulatory standards and customer expectations. For example, although composting can be performed with a variety of amendments, the town has continued to procure sawdust and shavings even during periods of increased price, ensuring the product is consistent in texture and appearance. Through the partnership with the compost blender and marketer, the town shares responsibilities to obtain permits to distribute the compost across New England and New York.

Compost is widely used as a soil amendment. Despite negative perceptions associated with biosolids, strong markets for Merrimack's compost product have been developed and maintained over the years. An advantage of a third-party compost blender and marketer is that it can focus on establishing a diverse customer base that includes custom soil blenders who use the compost to prepare mixes for sports fields and golf course construction, garden centers, and landscape contractors. Third-party marketers also provide a professional sales staff that educates landscapers and landscape architects on the value and benefits of the product.

In recent years there has been a focus on sustainable landscaping using compost to improve soil quality. Because of its uniform and relatively fine particle size, Merrimack compost is used widely as top-dressing over established turf. Customers are adding organic matter to the soil and have reported that they can reduce use of irrigation water by reducing soil compaction and improving root growth. An example of a customer using compost for top-dressing is the Tournament Players Club (TPC) Boston in Norton, Massachusetts, which is the site of the PGA Tour FED EX® cup playoff. Compost is applied to the primary rough areas, resulting in denser turf and reduced irrigation.

The town receives a portion of the sales price in accordance with a revenue-sharing agreement with the third-party blender. Over the past 10 years, revenues to the town have increased through increases in both the share it receives and the value of the compost (Figure 2).

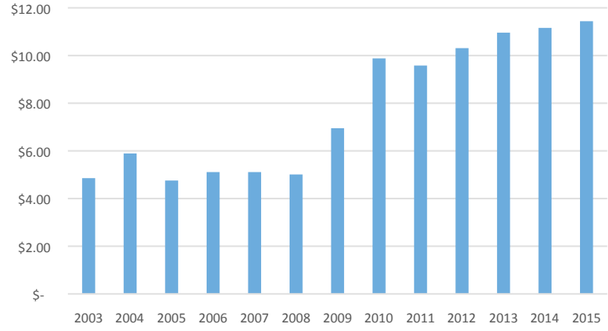


Figure 2. Town of Merrimack revenues ($/cy) from compost sales (2003 to 2015)

2008 STUDY

Since the startup of the enclosed agitated bed facility in 1994, the town has addressed a variety of challenges. Operating within an enclosed building allows for the odorous air exhausted from the compost vessels to be captured and treated. However, the air exhausted from the composts is saturated with water vapor and condenses readily on the interior surfaces, promoting an extremely corrosive environment. After 20 years of operation, structural damage to the building became evident. In addition, proper composting requires large supplies of consistent and dry bulking agent. For each wet ton of biosolids about 2 to 3 yd^3 (1.5 to 2.3 m^3/wet tonne) of wood shavings are used. With increased competition for wood used for fuel, the town found it increasingly difficult to obtain the needed quantities and faced escalating costs to secure the material.

Facing a significant investment to renovate the compost facility, in 2008 the town reviewed alternatives to dispose of biosolids. The following options were considered: One option was to close the compost facility and enter into an agreement with a third party for either landfill disposal or land application of the biosolids. Another option was to make the needed renovations and continue composting with either:

- A private contractor who would assume all responsibilities for the facility operations or
- Continued operation of the facility using treatment plant staff

The town solicited cost proposals for the options above and concluded it was best to renovate the facility and continue with operations. By using excess capacity, the town could generate additional revenues by processing additional biosolids from other treatment facilities outside town. The three most economical proposals were:

1. Composting with town staff = $12.98 million net present value (NPV) or $84.30 per ton ($92.90/tonne)
2. Composting using outside contractor = $13.12 million net present value (NPV) or $85.20 per ton ($93.92/tonne)
3. Landfill disposal = $15.68 million net present value (NPV) or $101.84 per ton ($112.26/tonne)

GREENHOUSE GAS EMISSIONS

At the same time the town was reviewing its options, the North East Biosolids and Residuals Association (NEBRA) reviewed the greenhouse gas (GHG) emissions from composting compared to those from

landfill disposal. The NEBRA study (Beecher 2009) concluded that the composting option generates significantly fewer GHG emissions than landfill disposal. Although composting has higher energy requirements than landfilling, the latter method generates methane, a more potent GHG than carbon dioxide. Calculations indicated that future landfill disposal would emit 2.5 times more GHG equivalents than the current composting operation. With improved dewatering at the treatment plant factored in, the landfill option would generate 3.4 times more GHG than the composting option.

COMPOST FACILITY UPGRADES

Based on the 2008 review the town moved forward to renovate the compost facility at a cost of nearly $2.9 million. The project replaced the roof, computer control system, and compost agitators. The roof was a modified membrane roof with vapor barrier, with 1.5 inches (3.8 centimeters) of foam insulation under a a rubber membrane. One-third of the roof (the front area where most moisture was generated), consisted of stainless steel under hot dipped galvanized roof panels. The facility also received all new purlins, and all bolts were replaced on the main supporting members.

The town also replaced the original three agitators with two new machines. The original agitators had lasted more than 20 years, and the three 25 horsepower (hp) (1.8 kilowatt [kW]) agitators were replaced with two 50-hp (37-kW) agitators to process the same 15 bays in an eight-hour workday. This change saved the town a lot of money and opened space in the mixing area for better loader movement.

The facility renovations and installation of the new agitators were completed in the fall of 2015. The composting operations continued on a reduced schedule as the work was performed.

FUTURE FOR MERRIMACK

The town supported the investment in the renovations to the enclosed agitated bed composting facility. Warrant articles require a two-thirds affirmative vote with all-day voting one month after the traditional town meeting. This hurdle was easily cleared, indicating broad acceptance of composting. The town had, since the early 1980s, provided a giveaway program for residents, and that popular program was likely a factor in the successful vote.

The investment in the renovation underscores Merrimack's long-term commitment to a composting program. This commitment has endured through changes in town staffing and successive public works directors and plant superintendents. Treatment plant staff have faced numerous operational challenges and embraced the attitude that they manufacture a valuable product and are not just treating wastes. Working with a private marketing company has enabled the town to maximize revenues from product sales and control its destiny. The town has also successfully taken on biosolids from other communities and runs the facility at near full capacity, and thus operates with greater economic efficiency.

REFERENCES

- Amirhor, P., Kuter, G. A., and Andrade, M. (1995). Biofilters and biosolids. *Water Environment & Technology*, 7, 44-48
- Beecher, N. (2009). Estimating Greenhouse Gas Emissions of Biosolids Management. *BioCycle*, 50, 26
- Epstein, E., Willson, G. B., Burge, W. D., Mullen, D.C., and Enkiri, N.K. (1976). A Forced Aeration System for Composting Wastewater Sludge. *Journal Water Pollution Control Federation*, 48, 688-694
- Kuter, G. A., Hoitink, H. A. J., and Rossman, L. A. (1985). Effects of Aeration and Temperature on Composting of Municipal Sludge in a Full-Scale Vessel System, *Journal Water Pollution Control Federation*, 57, 309-315
- MacGregor, S. T., Miller, F. C., Psarianos, K. M., and Finstein, M. S. (1981). Composting Process Control Based on Interaction Between Microbial Heat Output and Temperature. *Applied and Environmental Microbiology*. 41, 1321-1330

ABOUT THE AUTHORS

- Geoffrey Kuter is chief executive officer of Agresource, Inc. Prior to his positon at Agresource, he was vice president at Wheelabrator and part of the team responsible for the design and start-up of the Merrimack agitated bed composting facility.
- Richard Nicoletti is the compost system manager for BDP Industries. Prior to joining BDP in 2013, he was with IPS Composting Systems for nearly 20 years and has been responsible for the design and installation of more than 20 agitated bed facilities. He was involved with the supply of the equipment used in the renovation of the Merrimack Composting Facility in 2014.
- James Taylor is assistant director of public works/wastewater with the town of Merrimack. He has been actively involved with the operation of the treatment plant and the biosolids management for more than 35 years.
- Leo Gaudette is chief operator at the Merrimack wastewater treatment facility and has been with the town of Merrimack since 2006. His responsibilities include operations of the composting program and the wastewater plant.

Help Shape the Water Quality Industry

Volunteering on a NEWEA committee is a great opportunity for you to build leadership skills, gain industry recognition, and help shape the water quality field

Consider what you're good at or jump into a new area and start building your skills. Worried about over-committing? Based on a recent survey, members spent on average two hours a month on their NEWEA volunteer work!

Choose from one of more than 44 active committees—from technology and process, communications and outreach, meeting and event planning, or leadership and ad hoc. For more information please visit newea.org.

NEWEA Committees

COLLECTION SYSTEMS/ WATER RESOURCES
Director: Virgil Lloyd
- Collection Systems Certification
- Collection Systems
- CSO/Wet Weather Issues
- Industrial Wastewater
- Stormwater
- Sustainability
- Water Reuse
- Watershed Management

TREATMENT, SYSTEM OPERATIONS, AND MANAGEMENT
Director: Marylee Santoro
- Asset Management
- Energy
- Laboratory Practices
- Microconstituents
- Operations Challenge
- Plant Operations
- Residuals Management
- Small Community
- Utility Management

MEETING MANAGEMENT
Director: Elena Proakis Ellis
- Conference Arrangements
- Exhibits
- Manufactures' Representative
- Program
- Registration

COMMUNICATION
Director: Jennifer Lachmayr
- Journal
- Media Relations
- Newsletter
- Public Awareness
- Website

MANAGEMENT REVIEW
Past President: Matt Formica
- Assessment and Development
- Awards
- Bylaws
- Committee Member Appreciation
- Nominating
- Sponsor

OUTREACH
Director: Jonathan Kunay
- Government Affairs
- Humanitarian Assistance and Grants
- Membership
- Project Delivery Alternatives
- Public Education
- Safety
- Scholarships
- Student Activities
- Water for People
- Young Professionals

AD-HOC
Vice President: Janine Burke-Wells
- Utility Council

NEWEA
WORKING FOR WATER QUALITY

ARTICLE

You have to take my sludge!

INCINERATOR SHUTDOWNS TEST THE CAPACITY OF SOLIDS MANAGEMENT

by **Ned Beecher, Executive Director, North East Biosolids & Residuals Association**

This year has seen major strains in the markets for wastewater solids (sludge) management, especially in southern New England. From January through June, some managers of wastewater solids scrambled to find disposal and end use options. Trucks stood in lines for hours at some incinerators, waiting to dispose of solids. Others hauled solids to upstate New York and New Jersey. The routine flow of solids from some southern New England facilities into northern New England increased. Some municipalities were caught off guard and scrambled to find disposal options, incurring thousands of dollars in extra expense.

Sequence of Events

One factor in this market upset was the March 21, 2016 compliance deadline for new Environmental Protection Agency (EPA) air emissions regulations for sewage sludge incinerators (SSIs). The new regulation (Standards of Performance for New Stationary Sources and Emission Guidelines for Existing Sources: Sewage Sludge Incineration Units, Subparts LLLL and MMMM of 40 CFR Part 60), finalized in 2011, requires all SSIs to meet prescribed ceiling limits on emissions of specific contaminants, including particulates, carbon monoxide (CO), nitrous oxides (NOx), and mercury (Hg). In addition, the new regulation requires site-specific emissions monitoring tests and plans, operator training, and record-keeping.

As the regulation's compliance deadline approached, some SSI operators took only limited steps to prepare, in part because of involvement in a major, multi-party legal challenge brought against EPA that may have changed or delayed the requirements. In contrast, other SSIs had prepared for several years, including installing new emissions control equipment. In response to the developing regulation, each SSI owner and operator had to analyze its needs and best options, and the local decisions and actions regarding each of the 14 SSIs in New England (as well as some in New York) had their impact on what became a crisis in the solids management market in 2016.

But the March 21 compliance deadline was not the only factor. There was the normal uptick in solids production that occurs each year in late winter and spring as wastewater flows increase from snowmelt and precipitation. And, over the past few years, there had been other solids management capacity reductions that played a role as well, such as:

- Rhode Island's 2010 floods wiped out the biosolids compost operation at West Warwick, Rhode Island, and eventually that operation was closed permanently, pushing about 6,000 wet tons (5,400 tonnes)/year (1,200 dry tons [1.100 tonnes]/year) onto the market.
- In recent years, several communities (e.g., most recently Dover, New Hampshire) abandoned on-site composting, and their solids have entered the market.
- In 2012, Fitchburg, Massachusetts, faced aging infrastructure upgrades in addition to the projected cost of meeting the new SSI air emissions regulations. The SSI, which had processed liquid solids from Fitchburg and many smaller communities, was closed. Communities that had relied on Fitchburg scrambled to find other options for their liquid solids disposal—a preview of what was to come in 2016.
- In 2013, the Moretown, Vermont Landfill closed; it had taken in mostly Vermont wastewater solids.
- For several years, the WeCare Environmental alkaline stabilization facility in Plymouth, Maine, has faced increasing local opposition due to its inability to control malodors. It has received numerous Notices of Violation (NOVs) from the Maine Department of Environmental Protection. In the past year, managers reduced the volumes of incoming solids, some of which had been hauled from as far away as Rhode Island. The facility, which has a permitted capacity of 60,000 wet tons (54,400 tonnes) per year, was receiving only about 10,000 (9,100 tonnes) in 2015. By June 2016, the facility was closing and all solids on site were being removed. (Facility management talks about developing a gasification system on the same site, but that is only in the early, exploratory stage, and because of technical and financial challenges no operating full-scale gasification system for wastewater solids in North America exists despite several attempts.)
- In 2015, the Barre, Massachusetts landfill closed and that town's solids went onto the market. The same thing may happen in the next year or two in Manchester, Connecticut.
- And, in April 2016, not far away, Montague, Massachusetts, stopped taking in outside solids from area towns as the plant's treatment system hit capacity, local politics arose, and its solids destruction system came under increased scrutiny.

In the last five years, the only new capacity offsetting these losses has been minor expansion at a few merchant facilities, filling of excess capacity here and there (e.g., Merrimack, New Hampshire, and Lewiston-Auburn, Maine, are now composting solids from a few other water resource recovery facilities [WRRFs]), and a new digestion facility opening this year in Brunswick, Maine plans to take in outside wastewater solids.

Incinerator capacity had expanded considerably in the 2000s (Table 1), creating a sense of plenty of capacity, and prices actually were stable for about 10 years and even fell, as merchant SSIs competed for solids to fill their increased space. Naugatuck, Connecticut, for example, was taking in solids from as far away as Long Island, to keep the SSI full and to help offset high fixed costs.

But by 2015, that sense of excess capacity was fading. Coming into 2016, the capacity for solids management in New England had been diminishing. So the new SSI air emissions regulation compliance deadline in March was the last straw—a point in time on which SSIs focused. Decisions at SSIs began to pile up, with facility shut-downs increasingly overlapping:

- The SSI at Glens Falls, New York, closed, unable to afford the upgrades needed for compliance, shutting off an outlet on which several Vermont facilities especially had relied.

Table 1. Status and capacity of New England's sewage sludge incinerators (dry U. S. tons of solids per day)

Sewage Sludge Incinerator (operated by)	Capacity circa 2000	Capacity Today	Accepts Outside Solids?	Notes
Manchester, NH (Manchester)	—	36	No	Fluidized bed; has proactively worked toward compliance with new air emissions regulation.
Lynn, MA (Veolia)	—	~15	No	Fluidized bed. Has installed upgrades to comply with new air emissions regulation.
Fitchburg, MA	—	CLOSED (in 2012)	Yes, until closed	Fitchburg solids go to landfill now.
Brockton, MA (Veolia)	18	18	No	Multiple hearth; completed upgrades to meet new air emissions standards in January 2011.
Fall River, MA (Fall River)	—	CLOSED (in 2016)	No, now closed	Costs to meet new air emissions regulation too great; solids now going to merchant incineration facilities.
Upper Blackstone WPCF (Upper Blackstone)	91	144	Yes, but more selective than before	Multiple hearth. SSI permitted throughput is now limited by stack test.
Hartford WPCP (MDC)	60	120	Yes, but less than before	3 multiple hearth units (permit limits operations to 2 units at one time). Takes in less outside solids now. Has energy recovery system.
New Haven, CT (Synagro)	—	42	Yes, but less than before	Multiple hearth. Takes in less outside solids now. Has energy recovery system.
Mattabassett – Cromwell, CT (Mattabassett District)	—	36	Takes in liquid only, but less than before	Fluidized bed; has proactively worked toward compliance with new air emissions regulation.
Naugatuck, CT (Veolia)	54	84	Yes	Fluidized bed. Provides significant capacity; contract for operations expires in 2020.
Waterbury, CT (Synagro)	—	60	Yes	Fluidized bed. Currently seeking input on future options; current contract expires soon.
West Haven, CT (West Haven)	—	~10	No	Fluidized bed.
Cranston, RI (Veolia)	40	66	Yes	Multiple hearth. Takes liquid solids only; has been reliable outlet.
Woonsocket, RI (Synagro)	70	110	Yes	Fluidized bed; has completed significant upgrades to meet new air emissions regulation.

Note: Glens Falls and, occasionally, other incinerators in New York (e.g., Saratoga Springs) have taken New England wastewater solids in the past. Glens Falls and Saratoga Springs incinerators are now closed due to costs of aging infrastructure and upgrades to meet new air emissions regulation.

- Likewise, Fall River, Massachusetts, evaluated its options and found the prospect of upgrades too costly. It shut down its SSI permanently this year, sending its solids into the market.
- The Brockton, Massachusetts WRRF addressed the new air emissions requirements early, completing upgrades in 2011 that allow it to meet the new standards. But it only processes Brockton solids.
- The Upper Blackstone facility (serving the Worcester, Massachusetts area) has addressed the new SSI air emissions requirements and trucked in as much outside solids as it could during the SSI stack tests required by the new regulations. However, the solids throughput tested was lower than the rated capacity of the incinerators, and therefore the SSI throughput is currently limited by the stack test results
- The SSI at Lynn, Massachusetts, invested in new air emissions controls more recently. After running the new system several months, the carbon system fouled in May, and it shut down for six weeks. It is running again.
- In Connecticut, New Haven and the Mattabassett District evaluated their operations with compliance in mind. New Haven's multiple hearth incinerator (MHI) seemed able to meet the new standards applicable to that kind of SSI, but upgrades at the WRRF have meant it cannot take in as much outside solids (just as with the Metropolitan District Commission in Hartford). The fluidized bed incinerator at Mattabassett required investment of considerable time and money to meet the stricter limits for that kind of SSI. Both facilities had to reduce the amounts of outside solids taken in.
- Operators of West Haven, Connecticut's MHI, which was rebuilt in 2006, have been evaluating its compliance needs. In early April, a mechanical failure shut it down. Hartford Metropolitan District helped out (as did other SSIs), but the deliveries to Hartford were sporadic: a truckload one day, none for a few, and then suddenly five in a day. To ease its own operations, Hartford stopped taking it. Thus, a considerable portion of West Haven's solids have been hauled out of state. In August, the SSI shut down again.
- The larger privately run merchant facilities in Connecticut and Rhode Island mostly planned ahead and completed upgrades before this year. More than $6 million were spent on upgrades at the Woonsocket, Rhode Island SSI. The Cranston, Rhode Island MHI facility can meet the new air emissions standards. It has remained a reliable outlet for liquid solids. But that reliability has led to lines of trucks waiting at the gate, as other options for liquid solids have diminished.
- Waterbury, Connecticut, is facing challenges. Basic infrastructure repairs are needed, and upgrades needed to meet the new air emissions requirements add to the cost of continued operations. In the past 18 months, the city has issued three requests for proposals of interest seeking suggestions—upgrade the SSI or do something else with the solids. Three bidders presented ideas at a meeting in early July, and a decision was expected in late summer.
- And most significantly, in late January, the Naugatuck SSI, one of the large merchant facilities (84 dry tons [76 tonnes]/day), had mechanical issues and shut down. Repairs continued until close to the March 21 compliance deadline, and rather than operate out of compliance, the shut-down was extended. (A contract dispute with the town of Naugatuck was an added complication.) Negotiations with the enforcement staff at EPA Region 1 resulted in a plan to move forward, and the facility started up again on June 25. The facility operator absorbed the costs of the shut-down. But those six months without this large amount of capacity heightened the solids management crisis.

Suddenly, haulers had nowhere to take loads of solids—especially liquid solids. Companies holding contracts with municipalities tried not to have to default on the contracts, but some were renegotiated. "I had one customer in New York whom I advised to find a closer solution," said a CT-based SSI operator. "I gave them suggestions, but they were dissatisfied with the service they found there locally. So they came back to our facility and accepted a substantial rate increase to cover ever-increasing transportation and operational costs for serving a customer so far outside of the normal service radius, even though the new contract specifies that we will take their solids only on a space-available basis."

One hauler reported his trucks were waiting in line for up to seven or eight hours. Where he used to make three round-trips in a day, he was down to one because of the length of the line or the length of the haul. His municipal customers were waiting longer for their solids to be removed, and worried about their solids holding capacity. "They weren't happy," he said. "The worst of it was May, June, and July, because Montague shut off in April. Naugatuck closing was bad too, but it just caused longer lines at Cranston."

One SSI operator remembers a phone call in March from a Connecticut facility that was hauling liquid solids to New Jersey at great cost. "But I am paying x dollars to Passaic Valley! You have to take my sludge!" To make matters even worse, in late August, news came that a fire at the Mattabassett District might keep its SSI closed for three to five months.

Market Adjusts and Enforcement is Gradual

The immediate crisis in the solids markets ended when Naugatuck came back online in late June. But, in the crisis, the market had responded—albeit at considerable cost to solids generators and haulers—and absorbed the extra solids. Much more than usual was hauled out of the region, to New Jersey and to upstate New York (sometimes with the additional cost of mobile dewatering). More went to landfills. And some biosolids management companies worked it into their operations in northern New England.

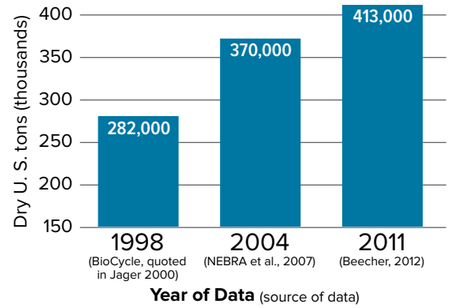


Figure 1. Historical estimates of New England wastewater solids production

The second relief valve to the capacity pressure came as SSI owners and operators realized that EPA enforcement of the new air emissions regulations was not going to be heavy-handed. Yes, NOVs are being issued (see sidebar), but SSIs are not having to shut down as they work toward compliance.

Those most directly involved in managing solids in southern New England are glad the crisis is past, but remain wary. One sees a silver lining: "It was a good test. If anything catastrophic happens to one of the incinerators, we know the system can handle it."

But not everyone considers the crisis over, and those most directly involved are watching capacity far more closely than before. One Massachusetts-based hauler said in late August: "I think that anybody who thinks the crisis is over is kidding themselves. On a day-to-day basis, everything is still full. There are even a couple of smaller facilities that are trying to figure out how to take in some outside sludge to gain some revenue."

Is This Just Part of a Market Cycle?

A look back shows that capacity is always in flux, driven by market demands. A *NEWEA Journal* article in 2000 lamented "disposal options are limited. New England's landfills are filling up, and the capacity of our incinerators is, for the most part, fixed. It is extremely difficult to site new disposal facilities, and the ones we have operating now are becoming increasingly expensive to keep due to their age and new regulatory requirements" (Jager, 2000). At the same time, the late 1990s had seen the height of public controversy over biosolids land application that led to restrictions in numerous towns in New Hampshire and a few in other states. "As a result, municipal officials responsible for establishing safe, environmentally, and economically sound programs are dealing with a mounting crisis," wrote Jager.

A few years later, another *NEWEA Journal* article counted 14 SSIs in New England, which, along with thermal drying facilities at Greater Lawrence Sanitary District (GLSD) and the Massachusetts Water Resources Authority (MWRA), served "some 8.5 million people" and managed "more than 75 percent of the municipal wastewater sewage solids generated in Connecticut, Massachusetts, and Rhode Island" (Donovan, 2004). The author touted the benefits of regional facilities, especially the cost benefits for smaller communities that could transport their solids—often in liquid form—to a moderately priced disposal facility. For example, he noted that Plymouth, Massachusetts, decided to abandon a plan to build a new dewatering system, "owing to a competitive solids service market in southern New England." By simply transporting liquid (not dewatered) solids to incineration, they saved $1 million in capital costs. In 2004, there was adequate capacity, and costs for solids disposal were reasonable.

Indeed, according to several solids management professionals, for much of the past decade there had been adequate or excess capacity in the solids management marketplace in New England—especially in the incineration market. As Donovan reported in 2004, several of the region's larger SSIs at that time were installing new fluidized bed burners or flue gas recirculation systems, significantly increasing the amount of solids they could process (Table 1).

So was this year's capacity crisis an anomaly? Perhaps somewhat. But the timing of the crisis could have been foreseen, with the March 21 compliance deadline for the new EPA air emissions regulation piling onto the fact that the region's incinerators—like other infrastructure—have been aging while municipal budgets and regulations have been tightening.

Was Over-Reliance a Factor?

The constraints of the new EPA air emissions regulation strained the New England markets for wastewater solids use and disposal in part because of southern New England's long-term heavy reliance on incineration. That region holds the greatest density of SSIs in North America (Table 1). Since the 1980s, Connecticut and Rhode Island especially have relied on incineration for disposal (Donovan, 2004), and a good amount of Massachusetts solids (both liquid and cake) is burned there as well. At the turn of the century, New England produced roughly 282,000 dry U. S. tons (256,000 tonnes) of solids annually, and 124 of New England's approximately 500 WRRFs—including many smaller ones— incinerated their sludge at facilities in Connecticut, Massachusetts, New York, and Rhode Island (Jager, 2000). In 2004, 94 percent of the 118,000 dry tons (107,000 tonnes) of solids produced in Connecticut and 89 percent of the 27,500 dry tons (25,000 tonnes) of solids produced in Rhode Island were incinerated, mostly at SSIs in those two states. Much of Massachusetts' wastewater solids have also been incinerated, mostly at several in-state SSIs, and one SSI has long served New Hampshire's largest city, Manchester. In 2004, 203 WRRFs (40 percent of New England's facilities) were sending solids to incineration, and total solids production throughout New England was about 370,000 dry U. S. tons (335,700 tonnes) (North East Biosolids & Residuals Association [NEBRA] et al., 2007). Today, more than 400,000 dry U. S. tons (363,000 tonnes) of wastewater solids are produced in New England (Figure 1).

Is having 40 percent of the region's WRRFs serviced by six large outlets a concern? Are there too many solids in the incineration basket? The testing of the market this spring suggests that the system is adequate but may benefit from diversification. In other parts of New England, regulations, experience, and knowledge for other solids management options are more developed. And that knowledge and capacity helped southern New England through the crunch. Clearly, however, few options exist for untreated liquid solids. And, most important, keeping all options open for solids management is critical and should be a focus for the region's regulatory agencies and policy makers, as well as for each WRRF.

Looking Ahead

As the fall arrives, solids management markets have settled down. But markets are not where they were a year or two ago. And most do not think they will be any time soon. Capacity remains constrained. Where else can it be found?

One possible source is anaerobic digestion (Table 2). It can provide capacity in two ways:

Table 2. Other current regional wastewater solids processing and disposal options in New England

Name	Location	Owner/Operator	Type	Capacity for WW Solids?
BENEFICIAL USE FACILITIES				
Grasslands Facility	Chateaugay, NY	Casella Organics	Advanced alkaline stabilization producing Class A biosolids lime & fertilizer product	**Some**
Residuals Management Facility	New Hampton, NH	Resource Management Inc.	Alkaline stabilization producing biosolids for land application	**Some**
Merrimack Compost	Merrimack, NH	Town of Merrimack, NH	Composting of local & some outside wastewater solids and leaf & yard waste	**Possibly some**
WeCare/Soil Preparation	Plymouth, ME	WeCare Environmental	CLOSED. Is removing all material from site (claims to be developing gasification system with ~60,000 wet ton capacity)	**Capacity lost, may not come back**
Hawk Ridge Compost Facility	Unity, ME	Casella Organics	New England's largest compost facility producing Class A biosolids composts and other composts and mulches	**Some**
Lewiston-Auburn WPCA	Lewiston, ME	Lewiston-Auburn Water Pollution Control Authority	Anaerobic digestion and composting of wastewater solids; piloting accepting other liquid high-strength organics into the AD system and some solids to composting	**Possibly some**
Village Green Digester	Brunswick, ME	Village Green Ventures	NEW 850,000 gal. anaerobic digestion of local wastewater solids, food scraps, and other organic residuals	**Some**
Ipswich Compost	Ipswich, MA	Agresource & Town of Ipswich	Composting of local wastewater solids, leaf & yard waste, food scraps	**Full**
LANDFILLS				
Waste USA Landfill	Coventry, VT	Casella	Accepts wastewater solids	**Yes**
Bethlehem Landfill	Bethlehem, NH	Casella	Accepts wastewater solids	**Yes**
Turnkey Landfill	Rochester, NH	Waste Management	Accepts wastewater solids, mostly from SE NH communities	**Yes**
Crossroads Landfill	Norridgewock, ME	Waste Management	Accepts wastewater solids	**Yes**
Juniper Ridge Landfill	Old Town, ME	Casella	Accepts wastewater solids, but only from Maine	**Yes**
Southbridge Landfill	Southbridge, MA	Casella	Does not accept wastewater solids	**No**
Central Landfill	Johnson, RI	RI Resource Recovery Corporation	Accepts wastewater solids, but only from Rhode Island; is seeing increasing amount of wastewater solids coming in.	**Yes**

Note: This list does not include larger water resource recovery facilities (WRRFs) that accept and process small amounts of outside solids

What's next for New England's SSIs?

March 21 was the deadline for sewage sludge incinerators (SSIs) to comply with new EPA air emissions regulations. The rule was originally instigated by a court order and first proposed in October 2010, with new emissions standards finalized on March 21, 2011 (Standards of Performance for New Stationary Sources and Emission Guidelines for Existing Sources: Sewage Sludge Incineration Units, Subparts LLLL and MMMM of 40 CFR Part 60). Five years later, after some litigation, the rule and the original compliance deadline remained intact.

But what looks, in retrospect, like a clear march from new rule promulgation in 2011 to implementation in 2016 was anything but. The new air emissions regulations are complicated—far more than the air emissions requirements under 40 CFR Part 503 (EPA biosolids rule), applied to SSIs before. In addition, the SSI air emissions rule was linked to other developing rules (e.g., definition of sludge as a solid waste), creating more confusion. And as the court challenges against the rule progressed, led by the National Association of Clean Water Agencies (NACWA) and several municipalities (including, for example, Hartford Metropolitan District), it was not unreasonable for stakeholders to assume that the final rule would be changed or delayed.

So, when March 21 came around, almost all the 14 SSIs in the region were not ready, and some had not prepared for compliance, despite several EPA assurances that the rule was going to happen—and on time. Of course, EPA was also behind in, for example, developing the final implementation guidance for the new rule (under 40 CFR Part 62); that document was finally signed by EPA Administrator Gina McCarthy on February 22, 2016, only a month before the compliance deadline. And EPA Region 1 air program and enforcement staff, who started out with little experience with SSIs and their unique operations and complications (and their associated water resource recovery facilities), were burdened with applications and reports submitted by SSIs beginning to work toward compliance.

Thus, looking back, it is easy to see how these and other forces led to the most stressful testing of the region's solids management markets in decades (see main article).

This spring's crisis understandably heightened misunderstandings and apprehensions regarding the new EPA air emissions regulation and how it will be enforced. As the March compliance deadline moves into the past, some things are becoming clear:

- **EPA Region 1 is enforcing the rule**. So far, as of mid-August, it had sent Notices of Violation (NOVs) to eight SSIs (Brockton, Cranston, Manchester, Naugatuck, New Haven, Waterbury, West Haven, and Woonsocket), listing numerous compliance violations as of the rule's effective date of March 21. The rest have had or will soon have site visits from EPA. Most of the facilities seem able to meet all or most of the new air emissions limits. (Mercury is a challenge for some, and that has been the target of many of the most extensive emissions control upgrades in recent years.)

> **"We have not required facilities to shut down while they are working toward compliance."**
> – Steve Rapp, EPA Region 1

- **The regulation requires far more than SSIs have had to do before, and operators as well as EPA staff are continually learning**. For example, the new regulation requires strict control and monitoring protocols that will help ensure continuous compliance with the new emissions limits. Most of the violations being identified by EPA pertain to those control and monitoring systems, including the need for approved emissions testing for establishing specific operating parameters. A control plan is required for each of the nine regulated pollutants. This is challenging for mercury emissions if an SSI does not need to install new controls to meet the applicable standard. According to EPA, an option is to use theoretical calculation and mass balance of mercury in the wastewater and incineration system, and apply conservative assumptions to demonstrate the likelihood of an exceedance is very low. But, as one SSI operator noted, it is hard to complete mass balance calculations in the complexity of a sewer system, a WRRF, and an incinerator.
- **The NOV process is unlikely to shut down any facility**. As Steve Rapp, EPA Region 1, explained, "We have not required facilities to shut down while they are working toward compliance." He noted, for example, that in response to apprehensions at Naugatuck (and the defeat of a bond vote that would have funded the needed upgrades), EPA wrote the city a letter saying EPA would work with the borough to establish a compliance schedule for the design and installation of any necessary air emissions controls. "In cases like these, the agency wants to ensure that there are safeguards in place and they are not creating an immediate or imminent danger to public health. I don't think that most of the things that need to be done at these facilities is a significant endangerment of public health. However, we do require that they work toward minimizing emissions." He pointed to the operations at the Lynn SSI as an example of good practice: "As they have been working toward full compliance, operators have throttled back the solids feed rate as a hedge toward reducing emissions."

Rapp wanted to make clear that EPA does not have any say or preference in how a WRRF's solids are managed. "EPA, directed by Congress, sets air standards and regulations. We are in the mode of seeing that people are following those standards, setting a level playing field. We are not saying that this way of managing this material should be stopped. A decision to no longer operate is outside our decision-making; that is the municipality's decision. All we are concerned about is people being in compliance with the standards."

The NOV process now leads to meetings between each SSI and EPA, at which expectations, solutions, and timetables are agreed to. EPA understands that some upgrades will take a year or more to design and install. Rapp says EPA just needs to see plans and steady progress.

1. A stand-alone anaerobic digestion system can serve as a merchant facility, taking in liquid solids from various WRRFs (as noted above, outlets for liquid solids are particularly needed).
2. Anaerobic digestion reduces solids volume dramatically, creating less to be managed.

Anaerobic digestion has received much attention in recent years. Many projects have been proposed, but few have come to fruition, despite, for example, significant technical, regulatory, and grant support from the commonwealth of Massachusetts, including required diversion of food scraps from landfills. Many reasons account for the lack of progress on new anaerobic digestion capacity. One is that proponents of anaerobic digestion find it difficult to secure long-term, stable contracts for large-enough volumes of food scraps and other organic residuals to fill proposed new digesters. Too often overlooked is that taking in wastewater solids can make a project more financially viable. For example, the most promising Massachusetts project recently was planned for Bourne. It was to take in wastewater solids. But, early in 2016, the plan was scrapped due to funding shortfalls related to a failed power-purchase agreement.

Massachusetts does have two successful on-farm digesters treating manures and source-separated organics (SSO), but, like many of the recently proposed anaerobic digestion projects, they are not permitted for, nor do they accept, wastewater solids. Similarly, in Connecticut, which passed its large-scale food-waste ban legislation in 2011, only one of five proposed anaerobic digestion projects has moved ahead: The Quantum Biopower anaerobic digestion facility in Southington is under construction, but it will not take in wastewater solids.

This points to a significant issue in developing capacity for organics management through anaerobic digestion. In some circles, co-digestion is discouraged. This seems to be the position of the Connecticut Department of Energy and Environmental Protection (DEEP). In contrast, organics management professionals—and some regulatory agencies such as the Massachusetts Department of Environmental Protection (MassDEP)—recognize that wastewater solids are not that different from SSO, and, for anaerobic digestion projects to be economically and functionally viable and sustainable, co-digestion of all sorts of liquid organic residuals provides flexibility and a better chance of success.

This is the model that seems to be working for Village Green Ventures in Brunswick, Maine. This new 850,000-gallon (3,217,600-liter) anaerobic digestion system is beginning to co-process solids from the local WRRF, along with SSO, and will likely take in other WRRF solids.

While new capacity for wastewater solids treatment in stand-alone, merchant anaerobic digestion systems advances slowly, more immediate promise lies in expansions of existing capacity in anaerobic digestion systems at WRRFs. Such facilities already have expertise in managing liquid organic residuals, and some of them have experience with anaerobic digestion, biogas management, and combined heat and power (CHP). Last year, new digesters at the Fairhaven, Massachusetts WRRF settled into steady operation after several challenging years of startup; they are now taking in some outside fats, oils, and grease (FOG) but are unlikely to take in outside wastewater solids. This was the first new anaerobic digestion system at a New England WRRF since GLSD installed digesters in the early 2000s, although a few digestion systems have seen upgrades (e.g., Pittsfield, Massachusetts).

Soon after Fairhaven, the Lewiston-Auburn Water Pollution Control Authority (LAWPCA) in Maine installed new digesters and CHP, and that facility is now experimenting with taking in outside wastes to the digesters. In addition, by reducing the final biosolids volume exiting the LAWPCA WRRF, the new anaerobic digestion system has freed up capacity at LAWPCA's compost facility for other facilities' wastewater solids.

The greatest expansion of digester capacity in the region in the near term will likely be at GLSD, where upgrades will include a new 1.4-million-gallon (5.3-million-liter) digester, SSO storage capacity, biogas treatment systems, and two co-generation engines. But GLSD expects to fill this additional capacity only with SSO (e.g., food residuals and other high-strength wastes such as FOG), providing an outlet for a significant portion of the 350,000 wet tons (317,500 tonnes) of food waste that MassDEP hopes to see diverted under the 2014 commercial food waste disposal ban. MWRA is considering taking in SSO as well, but that potential is challenged by the need to convey SSO to the Deer Island Treatment Plant by barge.

Thus, expansion of New England's anaerobic digestion capacity is focused mostly on SSO—and almost none of the new capacity can be expected to provide an outlet for wastewater solids anytime soon.

What About Composting and Other Class A Processes?

In the late 1980s, the Hawk Ridge Compost Facility in Unity, Maine, started processing wastewater solids and other organics. It later expanded and now receives material from numerous large and small WRRFs in Maine, New Hampshire, and Massachusetts, and occasionally from further south. The facility has had its challenges, and it benefits from its rural location (but odor management is still critical). Overall, though, it has been successful in providing abundant capacity for wastewater solids and organic residuals processing, and producing valuable products.

Nevertheless, despite such demonstrated success, it is hard to imagine anyone siting another large regional biosolids composting facility anywhere else in the region, because current regulatory requirements and public perceptions seem overwhelming. Such facilities are being built in other states (e.g., California), and the markets for high-quality compost and other soil amendments remain strong.

Indeed, since the 1990s, just two new regional facilities have been built for processing New England wastewater solids for beneficial use. The first is the Residuals Management Facility in New Hampton, New Hampshire. It treats raw and minimally treated cake (dewatered) solids with alkaline stabilization, creating biosolids that are land-applied on farm fields and reclamation sites.

The second is actually not in New England. The Casella Grasslands facility in Chateaugay, New York, produces Class A advanced alkaline stabilized biosolids for use on farms, serving New England in a limited way: The primary source of the wastewater solids it processes come from Chittenden County (Burlington, Vermont area). While it shifted Chittenden County solids from landfills to beneficial use, the facility does not provide much for the rest of New England, because of its distant location in upstate New York.

What About Landfills?

Over the past 30 years, most local landfills have been closed, and standards for landfill construction and operations have tightened dramatically, leaving a relatively small number of larger regional landfills to service New England (Table 2). Some of these landfills accept wastewater solids. They require the solids to be dewatered and to meet paint filter tests and sometimes other requirements. Landfill operators and neighbors dislike odorous solids, and prices for disposal are greater as odor increases and solids content decreases. Before it closed in 2013, the Moretown, Vermont landfill had experienced odor issues and stopped taking in wastewater solids. The Southbridge, Massachusetts landfill does not accept wastewater solids; and the same is true of many other of the remaining smaller, local landfills.

What About Out-of-Region Capacity?

New York is our nearest neighbor, and it is facing the same solids management pressures. Two of that state's SSIs—Saratoga Springs and Glens Falls—which once served some New England communities, have shut down. Like Fitchburg and Fall River, Massachusetts, their equipment was aging and needed upgrades. Add to that the cost of meeting the new EPA air emissions standards, and the rational decision was to shut down. New York does provide landfill capacity, but, except for some western New England communities, the hauling distances make New York options costly. Still, out-of-state transport has always been popular as at least a back-up option.

Another Option: Make Your Own Marketable Product

The capacity to manage wastewater solids does not come solely from regional or other facilities taking in untreated or minimally treated solids from various WRRFs. That has been the most common model in Connecticut and Rhode Island, where merchant incinerators have serviced the market reliably for decades. Elsewhere in the region—and across North America—much of the capacity comes from WRRFs treating their own solids to a high standard for beneficial use. They make products that meet EPA Class A Exceptional Quality (EQ) and state standards for general distribution. Or they make Class B biosolids for managed and permitted use. In general, the more treated and aesthetically appealing the final product, the broader the options for its use. Thus, for example, for decades the Merrimack, New Hampshire WRRF has been producing highly valued biosolids compost that sells at retail for $30 and up per yard ($39.00 and up per cubic meter).

But making and marketing high-quality biosolids is not easy. It increases costs and complications at the WRRF. However, today an ever-increasing variety of technology and system options are available for all sizes of WRRFs. Heat-drying and thermal hydrolysis have been scaled down to work for moderate-sized facilities. Anaerobic digestion and CHP have proven viable for some small facilities (e.g., Essex Junction, Vermont). Dewatering (e.g., by screw presses) has improved dramatically. And composting remains an option—Sanford, Maine, is just starting up composting.

Being successful at making your own product requires marketing by people knowledgeable about the needs of farmers, landscapers, growers, and other product end users. That kind of knowledge and experience is available and used in New England through contracts between WRRF biosolids generators and biosolids management companies that provide marketing, permitting, and land application services. (In some parts of North America, e.g., Chicago, that expertise is found in public utilities, which have soil scientists and agronomists on staff.) One big challenge of selling a biosolids product is continually addressing questions and concerns from the public. But, today, there is much information and help available for that from NEBRA, NEWEA and its Residuals Management Committee, WEF, and others.

Another angle to consider is solids minimization. Less solids to manage means lower costs. While a quality biosolids product can have high demand (and some producers run out every year and have farmers on waiting lists), every ton that needs to be managed still has net costs associated with it, even accounting for any revenues. Therefore, if you can produce less, you save money. For LAWPCA, that was the main economic driver behind its new anaerobic digestion system; most of the savings came from reduced solids end-use costs, not from producing electricity or charging tipping fees for outside wastes. Anaerobic digestion is a proven form of solids minimization. Over the years, a variety of technologies or processes have been advertised to minimize; many proved to be magic black boxes that did not perform. Still, the goal is worthy of consideration by any WRRF solids management planner.

Diversify Options

Diversification of options has long been a cornerstone of sound wastewater solids management planning and policy. Many of the continent's largest WRRFs use several different solids treatment processes as well as different contractors and market outlets.

A benefit of making a quality biosolids product is an increased diversity of end-use and disposal options. MWRA and GLSD are currently the two producers of heat-dried, Class A biosolids pellets in New England. About 20 percent of the MWRA product has been used as an alternative fuel in a Maryland cement kiln, where it replaces some coal (with greenhouse gas and air emissions benefits). And, if necessary, pellets can easily go into a landfill.

In southern New England, the reliance on incineration has been nearly universal for many utilities. For decades, the system has been reliable and at reasonable cost. This year's capacity crisis is a reminder that solids management planning should be ongoing, and back-up plans are crucial. A facility that produces liquid solids likely has the fewest options. That WRRF's solids treatment costs are minimal, but there is

really only one place to go for disposal—an incinerator. For a small facility, that is not a problem, because the incinerators still operating in this region today are likely to continue to do so, and many are large enough to absorb a few truckloads a week from a small plant. But a larger facility, or a lot of small facilities together, can begin to test the system's capacity. Should the system reach capacity, liquid sludge cannot go to composting or landfill without dewatering and quickly becomes expensive if it has to be hauled longer distances. A plant with a liquid-only program only can suddenly face large increases in disposal costs.

Cost Expectations

Providing a sense of the cost for solids management is challenging, because many factors affect tipping fees and the prices charged by contracted companies (Table 3). (And calculating in-house costs of solids treatment and management is an even greater challenge.) The simplest common indicators of market prices are tipping fees charged at a facility where solids are discharged and/or the contracted price for a biosolids management company or hauler to take solids from a WRRF.

Table 3. Costs for contracted wastewater solids management

	Apx. Cost (dry U. S. ton)
APPLICATION TO SOILS	
Raw cake solids – hauling, processing, & land application (NH, 2016)[a]	$360
Class B biosolids – hauling and land application (2016)[a]	$180 – $280
Class A EQ biosolids – hauling and land application (2016)[a]	$140
Hauling, processing to Class A EQ, and land application (VT, 2014)[b]	$360 predicted $300 actual *
Compost facility tip fee,[a] does not include hauling	$250
LANDFILL DISPOSAL	
Landfill disposal (average tipping fee in New England, U. S. EPA data mid-2000s)[b]	$308
Hauling and disposal (VT, 2014)[b]	$376
Hauling and disposal (MA, 2016)[a]	$344 ($86/wet ton)
Disposal (RI), does not include hauling	$360 ($90/wet ton)
INCINERATION	
Incineration, does not include hauling	$230 – $325

* Due to reduced fuel costs in 2015-16

Sources: [a] Personal communications with biosolids management companies

[b] Vermont Department of Environmental Conservation, 2016: *A Report to the Legislature on Wastewater Treatment Sludge & Septage Management in Vermont*

Prices will vary significantly based on such factors as hauling distances and solids quality (odor potential, percent solids). Conversions of data from the identified sources from wet tons to dry tons assumes 25 percent solids. (This solids percentage is assumed just for comparing approximate costs in dry tons; if a WRRF has a lower solids percentage going to application to soils or landfill, it will likely pay more per dry ton than the cost shown.).

Tipping fees are straightforward, but even they will change based on the nature of the particular wastewater solids. For example, some landfills charge more for lower solids (< 20 percent solids) material, because it requires more careful integration into landfilled waste. Similarly, at a compost facility, a lower-percent solids means more amendment is needed, so the tipping fee goes up. In New England, tipping fees are $340 to $380/dry ton ($375 - $418/tonne) at landfills and $230 to $325/dry ton ($253 - $358/tonne) at incinerators and compost facilities.

The prices in contracts for biosolids management companies to take raw solids or processed biosolids from a WRRF vary much more, because more factors influence the price calculation.

Factors affecting the price a contractor charges for taking solids from a WRRF include:

- Changing fuel costs (Some contracts adjust the per-ton price based on actual fuel costs.)
- Odor potential or other nuisance concerns (more odorous biosolids require additional contractor care.)
- Distance from the WRRF to the planned use or disposal site(s)
- Percent solids of the material
- Level of stabilization (Class A, Class B)
- Chemical quality (e.g., metals)

In general, use of biosolids on soils can be less expensive than for landfill disposal. But it depends on the level of treatment at the WRRF. For taking raw, dewatered solids and providing hauling, treatment, and land application, a biosolids management company may charge $300 to $360/dry ton ($331 - $397/tonne). However, if the WRRF treats its biosolids to Class A EQ standards, the biosolids management contractor provides mostly marketing and distribution, and the price is around $140/dry ton ($154/tonne). One contract for land application (or other use or disposal) of a low-odor, Class B biosolids produced in southern New Hampshire is priced at about $180/dry ton ($198/tonne).

This year, however, prices are changing. Said one hauler of liquid solids: "Customers have had it good for a very long time.... As contracts expire, prices will go up." This sentiment was mirrored by all those interviewed for this article. Contract solids management prices for companies taking solids from a WRRF have increased from an average of $80 wet ton ($88/tonne) in 2015 to $90 ($99) or more in mid-2016. Some contracts now show more than $100/wet ton ($110/tonne), which, assuming 25 percent solids, is more than $400/dry ton ($441/tonne).

Conclusion

Since the spring of 2016, indications are that, for at least the next couple of years, New England will have little excess capacity in the solids management market. And when supply is short, prices go up. The companies that operate large merchant SSIs have had to become far more careful with their contracts, standards, and pricing. Some public SSIs are doing the same. One incinerator operator said: "We've started to increase our rates. And we're being more careful looking at what comes in. Septage rates are going to go up as well....

To set the price for a sludge, I look at how much capacity I have... I look at consistency: If you have large loads regularly for a long-term duration you get a better rate.... But if you're bringing just one truck a week that's digested you'll pay more. Also, we don't have the ability to store solids, so we've economically incentivized people to come at off-hours to equalize loading to the plant. We just started doing this in the past two years. We also prefer to provide service for Connecticut, so out-of-state sludge can only come in during off-hours and weekends. And we encourage dry-ton contracts, not wet tons or gallons. We test every new customer for metals, do testing ourselves as well as demand data from the recent past. We had one Massachusetts customer show some normally non-detect PCB congener, and we told the customer to clean it up before bringing in any more."

In addition, solids managers and haulers are having to work harder on tracking the market to locate capacity. They need to be ready for unexpected shutdowns that may force them to haul solids to New York or New Jersey or wait hours in line at a disposal outlet—adding significant costs to their operations. Said one incinerator manager: "While the capacity used to be great enough for all of us to help each other out in a pinch, this spring that became no longer possible all the time. Each incinerator is having to protect its own operations and interests more carefully now."

So the major message from this year's crisis is that WRRF managers need to pay close attention to solids management. Review your options and contracts. Expect price increases in the next year or two. Have contingency plans. Talk regularly with your contract hauler. And consider what you will do if and when you get the call: "We have nowhere to go with your solids today." Can you store onsite? Can you call on a back-up option? Do you have money to pay for the increased cost?

This year's events also remind the wastewater profession—operators, managers, engineers, and regulators—that solids management is a constant challenge. An increasing and intensifying number of factors impede every option:

- The growth of beneficial use on soils is stymied by excessive regulation driven by public perception.
- New England landfill space is limited and costly, and odor issues sometimes shut down this option.
- Incineration has just been shaken down, with several players dropping out and others becoming far more cautious as new regulatory requirements squeeze their operations.

The market is naturally responding. Prices are increasing and will, perhaps, stimulate new options and capacity. But for public utilities that have been hard-pressed financially for most of the past decade, these new costs will be competing with other vital local needs, including aging infrastructure and tighter regulatory requirements on the liquid and stormwater side.

Wastewater treatment is in a challenging time in this region and across the continent. There are opportunities, but ever-increasing requirements are driving costs beyond what some municipalities can manage. Solids management costs are a significant portion of any WRRF's budget, and all the current drivers—regulations and aging infrastructure—are only driving those higher.

As one of those interviewed for this article noted, "It makes sense for there to be a reassessment of all the different options for solids management. It's important that treatment plants think about this."

Another person said: "I hope DEEP is paying attention. I think it is hoping this will not become an issue. But for municipalities, it is big deal. Municipal budgets are still tight. When sludge management costs go up 10 to 20 percent, other things need to be cut to present the town with a not-too-big budget increase. For many years, sludges have been a transactional material, just something you pay someone to put on a truck and take away. That is no longer the case. This is a material that needs attention and expertise for use or disposal, and that costs something. A lot of facilities have ignored this fact."

ACKNOWLEDGEMENTS

Information for this article came from interviews with the following experienced professionals. Any errors or omissions are the sole responsibility of the author. Many thanks to: Glen Almquist, Woodard & Curran; Brian Armet, Wright-Pierce (and Mattabassett District, retired); Jim Baird, Waste Water Services Inc.; Patrick Bird and Steve Rapp, EPA Region 1; Shelagh Connelly, Resource Management Inc.; Pat Ellis, Casella Organics; Dan Gorka, Veolia Water NA; Phil McCarthy, WeCare Environmental; Pat Rimkoski, Synagro Northeast; and Tom Tyler, Metropolitan District, Hartford.

REFERENCES

- David, Beth. 2015. NEWEA Recognizes Fairhaven's Linda Schick. *Fairhaven Neighborhood News*: 10:3, January 22, 2015. (fairhavenneighborhoodnews.com/wp-content/uploads/2016/05/01-22-15-LindaShick.pdf)
- Donovan, John F. 2004. The Biosolids Management Method of Choice in Southern New England: Regional Thermal Processing. *NEWEA Journal*: 38: 2, 190-200. November
- Jager, Ronald A. 2000. Managing New England's 282,000 Dry Tons of Biosolids. *NEWEA Journal*, 34:2, 172-189. November, 2000.
- NEBRA (North East Biosolids & Residuals Association). 2007. A National Biosolids Regulation, Quality, End Use, and Disposal Survey. (nebiosolids.org/about-biosolids
- Sapienza, Frank; David Norton; and Louis Barry. 2012. Upgrade to Brockton's Multiple Hearth Sludge Incinerator to Meet Current Air Quality Standards. *NEWEA Journal*: 46:3, 32-40
- Vermont Department of Environmental Conservation (DEC). 2016: *A Report to the Legislature on Wastewater Treatment Sludge and Septage Management In Vermont*. (dec.vermont.gov/sites/dec/files/wmp/residual/Act%2064_Legislative%20Report%20on%20Sludge%20and%20Septage.pdf)
- Zaretsky, Mark. 2016. West Haven to pay out of state sludge disposal after incinerator breaks. New Haven Register: April 4, 2016. (nhregister.com/environment-and-nature/20160404/west-haven-to-pay-for-out-of-state-sludge-disposal-after-incinerator-breaks)

NEBRA Highlights

Farm in Chester, New York

New Biosolids Molybdenum Standard

On July 8, Acting NEBRA President Mark Young submitted comments and thanks to the Massachusetts Department of Environmental Protection (MassDEP) for its proposed regulation change, which updates the numerical standard for the maximum concentration of molybdenum allowed in biosolids land applied in the state. The old standard was two-tiered, with an extremely low limit of 10 mg/kg dry solids for use of biosolids on crops to be consumed by ruminants and an overall standard of 25 mg/kg. The new limit is 40 mg/kg, which is based on risk assessment and is scientifically defensible. NEBRA, Massachusetts Water Resources Authority (MWRA), and others had urged this change, and NEBRA organized a June 2015 workshop that provided the technical details and risk assessment on molybdenum in biosolids and soils.

Molybdenum crystaline fragment

NEBRA's letter said: "NEBRA thanks the Department for your transparent and conscientious work on making this important regulatory change under the aegis of Governor Baker's Executive Order 562 for regulatory reform. We appreciate the fine work by Mark Smith, Bethany Card, Doug Fine, and others and the communications we have had with them. This simple regulatory change will allow for the greater use in the commonwealth of biosolids produced here. Significant environmental and economic benefits are to be expected from this regulatory change, as distribution of biosolids will be closer to production facilities, and local farmers and other landowners will be able to use more of this cost-efficient soil amendment and fertilizer."

CONCORD EDUCATES

Concord, New Hampshire General Services and its wastewater facility staff are leading the public promotion of the water quality services they provide. At the annual Market Days street fair in downtown Concord in late June, they set up an informative display on wastewater treatment and resource recovery and handed out informative brochures. Biosolids recycling is integral to its story; Concord has been recycling biosolids to farm fields and reclamation sites for decades, including within the city limits. The Class A product is advanced lime-stabilized, providing pH adjustment as well as nutrients and organic matter. Photo—The Concord water resource recovery team (l to r): Brandy Ames (Resource Management Inc.), John Adie (operations supervisor, Concord Hall Street), Dan Driscoll (superintendent), and Kristin Noel (laboratory & industrial pretreatment)

New York Court and Agencies Weigh in on Biosolids Use on Farms

On May 6, 2016, a lower court in Niagara Falls, New York, upheld the town of Wheatfield's ban on use of biosolids, which was created in July 2014. Sustainable BioElectric LLC, a quasar energy group company, had petitioned the court to annul the ordinance.

But one month later, on June 9, the New York State Department of Agriculture and Markets (NYSDAM) ordered Wheatfield not to enforce its ordinance in agricultural districts, because it unreasonably restricts a local farm's operation in violation of the state's "right-to-farm" law. NYSDAM stated that "the town has not demonstrated that the public health or safety is threatened by the farm operation's land application of *equate* biosolids on land used for crop production."

In his May decision in support of Wheatfield's biosolids ban, Judge Frank Caruso supported many of the town of Wheatfield's legal and procedural arguments, which made up most of the case. However, he made it clear that his decision had nothing to do with the benefits or risks of biosolids use. "It cannot be stressed enough that it is not the role of the court to examine this information and come to its own conclusion as to what the proper answer is. The only determination to be made is if the procedure has been properly followed and the result is not arbitrary or capricious.... Here, the court determines that the town followed proper procedures and took the appropriate 'hard look' at the environmental concerns."

As legal professionals have pointed out, this court decision has minor impact: It is a first step in the legal process and does not set legal precedent for any other jurisdiction. An appeal would further test the validity of Judge Caruso's decision.

Judge Caruso's decision was offset by the June 9 letter to Wheatfield from Michael Latham, director of NYSDAM. NYSDAM has the authority and responsibility to enforce the state's "right-to-farm" law, which, according to the NYSDAM letter, "prohibits local governments from enacting and administering laws that would unreasonably restrict farm operations within a county-adopted, state-certified agricultural district, unless the locality can show a threat to the public health or safety." Milleville Farm, which planned to use biosolids from the Sustainable BioElectric facility on 37.6 acres (15.2 hectares) of permitted land in Wheatfield, asked NYSDAM to review the local ordinance in September 2014. On May 1, 2015, NYSDAM agreed that Milleville Farm had a reasonable case and proceeded with the requested review. In response, Wheatfield sent letters to NYSDAM in July and December 2015, arguing that local public health and safety would be threatened by local biosolids use.

NYSDAM said that the New York Department of Environmental Conservation (NY DEC) "regulations are not outdated, that NY DEC revised the Part 360 biosolids regulations in 2003, and the Environmental Protection Agency (EPA) continues to assess—but has seen no need to update—Part 503 regulations. Both EPA and NY DEC believe current regulations are protective and appropriate for the concentration of pollutants that may be present in biosolids.... In addition, the New York State Department of Health (NYSDOH) has indicated that based on the lack of evidence that the biosolids land application regulations are inadequate for the protection of public health, it does not believe additional health studies are necessary."

Citing statements by Dr. Murray McBride of Cornell University and others who have expressed opposition to biosolids use, NYSDAM further stated: "NY DEC regulations minimize the potential contamination of food, animal forage, and groundwater. Dr. McBride's presentation did not include any examples where issues arose with the land application of biosolids in New York State, when done in compliance with NY DEC and EPA regulations.... The town of Wheatfield did not provide any new information demonstrating that the existing NY DEC and EPA regulations for the land application of biosolids in New York have not been adequate to protect the public health and safety."

Attached to the NYSDAM letter was a letter from Sally Rowland, PhD, of DEC, which summarizes the minimal risk posed by biosolids use on farms in accordance with state and federal regulations. NYSDAM also included a letter from NYSDOH to State Representative John Ceretto, dated June 25, 2015, stating: "Land application of biosolids is a common and widely accepted practice statewide that has been governed by NY DEC regulations since the early 1980s.... Credible evidence of adverse health effects associated with biosolids land application sites in New York State has not come to the attention of NY DEC."

NYSDAM's order pertains only to Wheatfield's ban on biosolids use. However, it makes clear that a locality can adopt reasonable further local requirements that go above and beyond state regulation. For example, it mentions that the town could require monitoring of the required 24 inch separation of biosolids from groundwater.

Thank you Dr. Rufus Chaney

The NEBRA board of directors congratulated Rufus L. Chaney, PhD, on a long and distinguished career with the United States Department of Agriculture. Dr. Chaney retired in July after 47 years of public service. He has been a senior research agronomist and noted figure in the world of biosolids, having published hundreds of research papers on all aspects of soils and biosolids and the fate and transport of constituents in them. He was instrumental in the scientific peer review process by the expert W-170 research group, which brought significant change to the final federal biosolids regulations in 40 CFR Part 503 that were adopted in 1993. He also conducted extensive research to quantify the benefits of biosolids and biosolids compost in reclamation of superfund mine sites, contaminated urban brownfields, and other reclamation projects. Dr. Chaney's research stands as seminal credible work adhering to the strictest of scientific principles and as the foundation in support of biosolids land application. Dr. Chaney summarized his work at the 2013 Northeast Residuals & Biosolids Conference (see *NEWEA Journal*, Summer 2014).

NEBRA Annual Meeting
October 12, 2016, 11:30 AM—Radisson Hotel, Cromwell, CT. NEBRA members will convene again this year over lunch at the annual Northeast Residuals & Biosolids Conference. The conference is produced by NEBRA, NEWEA's Residuals Committee, and the two Connecticut professional wastewater associations.

Northeast Digestion Roundtable
NEBRA's quarterly webinar exchanges technical information on anaerobic digestion, co-digestion, combined heat and power, and other topics. The roundtable takes place on the first Friday of each quarter at noon.

Managing Phosphorus in Organic Residuals Applied to Soils
UMass/Amherst Extension, with support from the NEBRA, is hosting a symposium on November 2 on the behavior and fate of phosphorus in biosolids and other organic residuals used as soil amendments. This symposium is the result of the new Massachusetts Department of Agricultural Resources plant nutrient regulations that went into effect in 2015. The regulations do not adequately address phosphorus in organic residuals such as biosolids, and this symposium is expected to provide input to future UMass/Amherst Extension guidelines.

Anyone managing biosolids or other organic residuals in Massachusetts is encouraged to attend. Presenters include leading researchers in this region in dealing with phosphorus in soils. Registration is at ag.umass.edu/events/managing-phosphorus-in-organic-residuals-applied-to-soils.

The Milleville Farm request for NYSDAM review was not the first. Last year, the nearby town of Bennington was similarly ordered by NYSDAM not to enforce its ban on biosolids. There are also biosolids bans in the nearby towns of Wales and Marilla. A farm in Marilla asked NYSDAM to review that town's ordinance, and a letter similar to that provided to Wheatfield is expected soon.

Other Regulatory Developments

New York State is revising its solid waste regulations, and biosolids and residuals are affected. The proposed regulations divide various types of material into separate subparts; for example, Subpart 361-3 now covers just compost and other organic processing facilities, and there is a new Subpart 361-8 for used cooking oil and yellow grease-processing facilities. The proposed regulations have an exemption for small compost operations, allowing for community garden composting, and only a registration is required, rather than a permit, for "food scrap composting from 1,000 to 5,000 cubic yards (765 to 3,823 cubic meters) per year."

The Massachusetts Plant Nutrient Management Regulations are seeing their first revision since their 2015 adoption. These regulations, focused on restricting use of phosphorus fertilizers, may significantly reduce the areas in the state where biosolids and other organic residuals can be applied to soils. However, through the state's regulatory reform initiative and because of criticism of the original rule, Massachusetts Department of Agricultural Resources (MDAR) is proposing changes. The biggest changes will be reduction of requirements in the agricultural part of the rule. According to MDAR's legal counsel, Jessica Burgess, "the revised language is written so that science based details can be integrated into guidance rather than requiring regulation changes. In that way, UMass guidance documents can evolve as new science comes to light."

One of several Maine Legislature solid waste bills (LD 1578) "died on adjournment" at the end of April. The original bill had included a variety of tweaks to solid waste laws that NEBRA was watching, including adjustments to fees for landfill disposal and a "food recovery hierarchy" and other measures for increasing diversion from landfills. But, through many meetings and considerable public input, the Joint Committee on Natural Resources shifted this bill's focus mostly to a stewardship program for batteries. That, and other parts of the original bill, are likely to be brought up in the 2017 legislative session.

Maine's food waste hierarchy and other portions of the original omnibus bill ended up in LD 313, which eventually passed as "An Act to Create a Sustainable Solution to the Handling, Management and Disposal of Solid Waste in the State." It was signed into law by Governor LePage in mid-April. This new law creates a food waste management hierarchy:

1. Reduction of the volume of surplus food generated at the source
2. Donation of surplus food to food banks, soup kitchens, shelters, and other entities that will use surplus food to feed hungry people
3. Diversion of food scraps for use as animal feed
4. Utilization of waste oils for rendering and fuel conversion, utilization of food scraps for digestion to recover energy, other waste utilization technologies, and creation of nutrient-rich soil amendments through the composting of food scraps
5. Land disposal or incineration of food scraps

It also sets a new goal for recycling and composting of 50 percent of the state's municipal solid waste tonnage by January 1, 2021; establishes the Maine Solid Waste Diversion Grant Program; gives the Department of Environmental Protection authority to institute additional fees on disposal of various materials consistent with the waste management hierarchy; and establishes three food scrap composting pilot projects scattered around the state. However, funding for these was not provided.

Vermont Department of Environmental Conservation (VT DEC) is moving the residuals management program, focusing more on emerging contaminants in the environment, and shifting staff accordingly. Ernie Kelley, former wastewater program manager, is moving, with the residuals program, under the solid waste umbrella. This makes Mr. Kelley the key contact person for residuals management.

Ned Beecher, Executive Director
Tamworth, N.H.
603-323-7654 | info@nebiosolids.org

For additional news or to subscribe to NEBRAMail, NEBRA's email newsletter visit nebiosolids.org

nebra
North East Biosolids & Residuals Association

Spotlight: member profile

John Sullivan, Chief Engineer Boston Water and Sewer Commission

Early in his career John Sullivan, chief engineer of Boston Water and Sewer Commission (BWSC), discovered the challenges of water delivery and sewer collection systems. When he joined Boston's Water Division in 1972, water leakage from the old water distribution system was "tremendous" at more than 50 percent. When he became director of engineering for the newly established water and sewer commission five years later, the sewer system was discharging more than 14 million gallons per day (53 million liters per day) of raw sewage into the Boston Harbor. In the face of that challenge, he recognized opportunity: a "green job" where he could learn, grow, and help make things right for the city—and the environment. "We were a modern city, yet some of the problems we had didn't reflect that," Mr. Sullivan recalls. "We needed to undertake major capital improvements."

One of the first projects was to upsize an interceptor that ran along the east side of Boston—a pipe dating to 1874. It was rebuilt in sections from the city's North End to Columbus Park in South Boston, where the system ties into the Massachusetts Water Resource Authority (MWRA). (MWRA provides treatment of water and wastewater for 61 communities in and around Boston, and some communities in the western part of the state.)

In 1988, Mr. Sullivan became chief engineer, responsible for overseeing maintenance and engineering, planning and design, and construction. One of his key strategic initiatives was to shift from treating immediate problems with quick fixes to finding total solutions to prevent problems in the first place. Understanding the financial cost of that, Mr. Sullivan complemented his engineering degree with a master of business administration (MBA) from Northeastern University. "I wanted to be sure that I understood the business end because it's not all about engineering; it's about running a business," he says of his decision. "You've got to understand how to get the money to build the product that will deliver the service." The MBA also helped him better understand how to lead the organization and be ready for change, which soon came from massive rainstorms in 1996 and 1998. "We hadn't seen rainfall and inundation like that since the mid-1950s when the city felt the impact from several hurricanes," he recalls.

A subsequent master's degree—this time in emergency management—provided Mr. Sullivan with additional insight to build systems to coordinate emergency response among institutions, the business community, and city and state agencies, and laid the early groundwork for climate adaptation planning. "To operate utilities, you have to totally understand the interconnections between what you do and what everyone else does in an emergency situation to take care of people and recover systems," Mr. Sullivan explains. "It's a balancing act."


John Sullivan

ONE WATER

Mr. Sullivan's accomplishments are proof that his holistic approach has worked. By the mid-1990s, the BWSC interceptor system was upgraded, and in December 2015 it completed its combined sewer overflow (CSO) plan that has positively affected the cleanliness of Boston Harbor and local watersheds. And even though the water system is one of the oldest in the country (it still operates pipes dating to 1848), it has the lowest number of water-main-break interruptions of any major U.S. city, he says. For the past 10 years, in fact, water leakage has been just 8 percent. "Since the commission encompasses both water and sewer, we're able to do full utility reconstruction instead of looking at it as just a drainage problem or just a sewer problem," Sullivan notes. "Our work also drives gas, electric, and telecommunications. We can collaborate with other utilities to renew everything so that we disrupt people's lives for a year, but then we don't bother them again for another 80 to 100 years." His ultimate goal is to help people better understand and value both drinking water and wastewater as part of the natural water cycle. "There is a total water solution in everything we do."

In 2010, BWSC conducted a major assessment of the water system; a risk number has been assigned to every water pipe in the city to help determine when it will need repair, and 95 percent of the system has been replaced or rehabilitated with cement mortar lining. A similar 10-year assessment plan will determine the internal conditions of the sewer system. Currently, eight rain gauges monitor water levels in various sewers during rain events to help identify problems with sanitary sewer overflows in the collection system. "This kind of total asset management is important to allocate long-term spending and avoid emergencies that would cause a major rate increase and rate shock for customers," Mr. Sullivan says.

Avoiding leaks of clean drinking water into the sewer system reduces maintenance and costs to treat water that is not dirty. Fixing water leaks also prevents possible damage to other underground utilities. From a sustainability perspective, successful water management maintains water supply in a drought—a major advantage as some areas of the country face water scarcity. (According to Mr. Sullivan, the city of Boston has enough water to sustain its population for four years in a drought.)


MWRA's Deer Island Sewage Treatment Plant

GREEN NETWORK

Mr. Sullivan's knowledge has helped establish him as a national expert of water and sewer infrastructure. But he credits much of his success to people. He originally joined Boston's Water Division at the urging of his father, who was then chief engineer. (His grandfather served in the role from 1911 to 1962.) When the water and sewer commission was formed, Mr. Sullivan says he realized that he needed a better understanding of complex sewer systems. "I learned early to ask lots of questions to people who know the answers that I don't," he says. "But you can't just cold call people; you need to develop relationships first, then the help will come rolling in." He joined NEWEA in 1979, intent on building relationships with state regulators and industry experts. Conferences provided a venue to share problems and explore potential solutions. "These are the people you can count on to help you out."

He serves on the MWRA advisory board as well as the boards of the National Association of Clean Water Agencies (NACWA), the Association of Metropolitan Water Agencies (AMWA), and the Water Research Foundation. He is commissioner for the New England Interstate Water Pollution Control Commission (NEIWPCC) and past president of New England Water Works Association (NEWWA). "None of us truly have the capability to solve all of the problems we face every day," he says of building a network. "The biggest thing I've learned is to make sure you delegate; tap the best talents of those around you to help solve problems. It's not about getting the fame for yourself; it's about trying to get the problem solved for the people you serve."

As a leader, Mr. Sullivan is committed to encouraging BWSC staff to reach their potential. "Several people have become national leaders because we urge them to take courses and develop their strengths. Managers need to identify people's talent—even if it causes them to leave the company."

WATER FOR THE FUTURE

Water and wastewater organizations create a tight-knit group of people working toward a common goal: preserving the water supply for future generations. Issues in the United States include major population growth and legislation that affect big cities. "The good news is that the big cities generally find the funds to take care of the problems," Mr. Sullivan says. "But mid-size and smaller cities are at risk for crisis because they don't have the population and rate base." Lack of capital and asset management caused major public water supply issues in Flint, Michigan, he says.

In February 2016, Mr. Sullivan was tapped by Boston Mayor Marty Walsh to help Flint city officials identify the problem and offer potential solutions. He traveled to the city to share reports on Boston's infrastructure and operating procedures.

> **"The biggest thing I've learned is to make sure you delegate; tap the best talents of those around you to help solve problems."**

According to Mr. Sullivan, "the decision to use an untested water supply, combined with a water treatment problem in a plant with inexperienced operators, led to tainted drinking water distribution to Flint residents. It was a series of administrative and management failures."

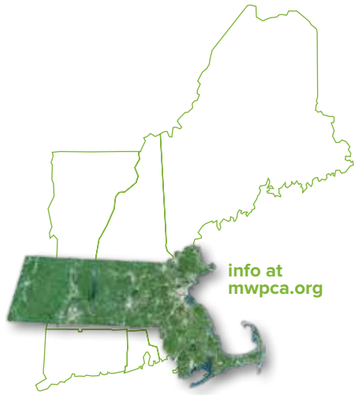
Many cities in the United States have followed Boston's lead on remote metering. Water usage data is sent to BWSC staff to review and flag issues, and it is available online for customers to monitor usage.

Internationally, Mr. Sullivan also works with the United Nations Educational, Scientific, and Cultural Organization (UNESCO) to address population growth, climate change, and deterioration of urban infrastructure systems. "How will we take care of two million people moving from an area because it's dried up or flooded? How do we prepare to bring them to other places in the world so there is adequate water and sewer sanitation for them?" Another problem, he adds, is sea level rise, which could potentially inundate sewers if coastal streets are flooded by intense rainfall. "Our country's infrastructure is not built to deal with this. Instead of saying 'Get a bigger pipe' we need to find ways to hold water upland by developing natural ponds and marshes." Mr. Sullivan considers these "big problems with more than one answer" as the thrilling part of his job—even after 44 years in the business. And that circles back to his network.

"Technical answers are out there and you can always find them" he says. "But you can find them much quicker by being able to call people, explain the situation, and start working together to find solutions."

Massachusetts State Director Report

by Mike Moreau
mikem@wwtsinc.com



Another eventful year in Massachusetts wastewater, and with the 50th Anniversary Celebration behind us, we are moving forward, continuing to build and grow the association. The continued focus will be on outreach, education, and continued momentum toward the Legislative initiative.

Recent Events and Association News

New officers were nominated by the Massachusetts Water Pollution Control Association (MWPCA) Nominating Committee, and a membership vote on the officers was held on June 14 at the Election Meeting. At the board of directors meeting on July 7, Nominating Committee Chair Charles Tyler announced the election results, which were unanimously accepted by the board. The MWPCA board of directors welcomes Jeremiah Murphy and John Downey, both first-time nominees, as new directors on the board. Incumbents Michael Burke and Thomas Azevedo were also re-elected to the board. Kenneth Harwood, co-chair of the MWPCA Safety Committee, was appointed by unanimous approval to fulfill the remaining two years of the director term vacancy created by the resignation of Board President Marcel Tremblay.

After serving a one-year term as president of the MWPCA, Mr. Tremblay passed the gavel to Robert Greene. Mr. Tremblay is resigning his board position to pursue other interests. MWPCA acknowledges with gratitude his service, and we also congratulate President Robert Greene.

The March 16 Quarterly Meeting was at the Devens Common Center, in Devens, and the June Quarterly Meeting was held on June 14 at our usual venue, The Log Cabin in Holyoke. Both meetings were well attended by membership and included numerous industry professionals discussing important industry topics.

MWPCA hosted another successful golf tournament on June 21 at the Shaker Hills Country Club in Harvard. The tournament was well attended. Congratulations to the tournament winners: 1st Place, New England Environmental Equipment; 2nd Place, Duke's Root Control; and 3rd Place, Associated Electro-Mechanics & Ted Berry Company. Awards were also given to Tara McManus for the longest drive and to Mike Sullivan for closest to the pin.

License renewals were due this year for Massachusetts wastewater treatment plant operators. More than 5,000 licenses were successfully renewed, while about 700 licenses were allowed to lapse.

Government Affairs

MWPCA hosted its sixth Annual Legislative Event at the Omni Parker House in Boston on March 3. The luncheon format was the right choice again as the room was filled with legislators and staff who listened to officials from numerous cities and towns in Massachusetts who were well prepared to discuss their water and wastewater infrastructure concerns. Funding, mainly for projects related to aging infrastructure and compliance, was again the primary theme. The diverse group of presenters articulated this message effectively to the audience.

Outreach

Bristol Community College (BCC) in Fall River has provided training in water and wastewater for the last 19 years. BCC was recently awarded a National Science Foundation Advanced Technological Education Grant for $602,000 to develop the curriculum for the New England Water Treatment Training program (NEWTT) in response to the current need for water and wastewater professionals in New England.

The three-year grant began on July 1, 2016. The first major project will be a modified DACUM (Developing a Curriculum) method. The goal will be to develop an industry-driven curriculum that reflects the current needs of the industry. On September 27 and 28, at the Whites of Westport in Westport, a workshop will review existing competencies and discuss whether those skills are still adequate and valid. The emphasis will be to adjust training to meet industry needs. The focus on the first day will be wastewater operations and collection systems, and on the second day, drinking water operators and distribution systems.

"Anyone interested in providing input or assistance to this program should contact Robert Rak, professor and environmental science and technology coordinator at BCC. Although, when this article is published, it will be too late to register for attendance at the workshops, enthusiastic input and counseling is always encouraged. Mr. Rak can be reached at robert.rak@bristolcc.edu or at 508-678-2811 Ext 2771.

Upcoming Events and Training

In the fall of 2016 a three-day course will be held for: National Association of Sewer Service Companies (NASSCO) certification in Pipeline Assessment and Certification Program (PACP); Manhole Assessment and Certification Program (MACP); and Lateral Assessment and Certification Program (LACP).

A more complete fall training schedule will be published on the MWPCA website starting in late August.

On September 20, the MWPCA Annual Trade Show was held at the Wachusett Mountain Resort in Princeton.

On September 19 and 21, tours were given to our guest operator from Vermont.

On December 7, the December Quarterly Meeting will be held in Mansfield.

If you have questions regarding MWPCA or NEWEA and/or have any issues or ideas to share, please contact me at 508-989-2744 or at mikem@wwtsinc.com.

The well attended spring quarterly meeting was held in Devens, Marcel Tremblay (left) emceed

Maine State Director Report

by Clayton “Mac” Richardson
mrichardson@lawpca.org

Government Affairs

The Maine Water Environment Association (MEWEA) has been busy since our last update in the spring issue of *NEWEA Journal*. Staffing a booth in the Maine State House “Hall of Flags” on January 12, a dozen volunteers engaged

(l-r) Mac Richardson, Scott Firmin, Mike Broadbent, Senator Angus King, Matt Timberlake, Jefferson Longfellow, and Peter Goodwin discussed infrastructure funding during the Washington Fly In

many legislators and their staff with a lively booth of displays, free water bottles, “commit-mints,” an Enviroscape watershed model, and a video of divers inspecting the Scarborough Sanitary District outfall.

We followed this government affairs effort with our annual legislative breakfast at the Senator Inn in Augusta on March 3. Sixteen legislators and numerous staff were treated to a fine meal and productive discussion of infrastructure needs.

Continuing with the government affairs theme, MEWEA President Scott Firmin, Vice President Matt Timberlake, past NEWEA director Peter Goodwin and current NEWEA director Mac Richardson participated in the Annual Washington Fly-In on April 12 and 13. We met with key staff of both of our state representatives and in person with both senators, and reinforced our message with help from Maine Water Utilities officers Jefferson Longfellow and Mike Broadbent.

MEWEA/NHWPCA Ski Day

March 25 was time for a little fun with the 10th annual MEWEA/New Hampshire Water Pollution Control Association (NHWPCA) ski day held at Sunday River Resort in Newry, Maine. Forty hearty souls braved the morning’s freezing drizzle to be rewarded with a day of fine skiing. We look forward to next year’s event, and are aiming for a New Hampshire mountain in conjunction with NHWPCA’s 50th anniversary.

Urban Runoff 5K

April 23 saw more than 30 MEWEA members and families participate in the Urban Runoff 5K and the Green Neighbor Family Festival that followed. With that turnout, MEWEA was the largest (though slowest) non-profit group in the event. During the festival association members staffed a booth and answered questions about water supply, wastewater treatment, non-point source pollution, and career opportunities in the water environment field.

Urban Runoff 5K 2016—MEWEA Young Professionals Mike Guethle, Paula Drouin, and Stacy Thompson are ready to talk urban runoff after running in the urban runoff 5K

Operations Challenge

Our Operations Challenge team traveled to Holyoke, Massachusetts, for the training day on April 29, and competed in the challenge at the NEWEA Spring Meeting in Mystic, Connecticut on June 6–8. The team made us proud and will be heading to WEFTEC in New Orleans this fall. On a side note, this year’s spring meeting (held in cooperation with the New York Water Environment Association) was terrific, with great technical sessions, engaged product vendors, and special events such as effluent wine and beer tasting!

Spring Conference

The MEWEA Spring Conference was at the Bangor Hilton Garden Inn on April 15 and was preceded by a day of long-range planning for the Executive Committee. The planning session explored the association’s past 49 years of accomplishments and failures, evaluated the organization’s mission, and discussed keeping strong volunteers and a committee structure that supports involvement.

The conference was well attended and two sessions (in which long-serving members of the Maine water community shared their thoughts on our industry, our association, and their experiences) were especially well received. Mickey Kuhns, Department of Environmental Protection (DEP) Water Bureau director, delivered a fine keynote address with an overview of the improvements in water quality in Maine. In addition, the new DEP commissioner, Paul Mercer, attended, lending his support to the valuable collaboration that MEWEA and Maine DEP have developed over many years.

Education Outreach

May 4 found Paul Collins, treatment systems manager, and Fred Dillon, stormwater program coordinator for the city of South Portland, at a high school career fair hosted by the South Portland and Cape Elizabeth Chamber of Commerce.

On June 10 First Vice President and outgoing public relations chair Matt Timberlake and Second Vice President Paula Drouin presented awards to this year’s Clean Water Week poster-contest winners. The event took place in Lewiston, with the Androscoggin River rushing over Great Falls in the background. The winners were:

Grades 1–3: Freya Qualls of North Berwick
Grades 4–6: Kate Friedell of Stonington
Grades 7–8: Alyssa Gagnon of Bethel
Grades 9–12: Jordan Smiley of Lewiston

Scott Firmin, Matt Timberlake, and Auburn Mayor Jonathan Labonte celebrate with Clean Water Week poster-contest winners

After the presentation, the winners and their family members took a tour of the Lewiston-Auburn Water Pollution Control Authority’s (LAWPCA’s) treatment facility. The day before members of our Young Professionals Committee and Warren Burnham, a millwright at LAWPCA, spent a few hours participating in a river bank cleanup along a stretch of the Androscoggin between the treatment plant grounds and the Lincoln Street boat launch park.

Nabbing Nitrogen

On July 10, Scott Firmin, Nancy Gallinaro, Charlene Poulin, Doug Romcarati, Fred Dillon, and Mac Richardson participated in the Friends of Casco Bay Nabbing Nitrogen event. Although rainy weather and rough seas prevented much of the sampling anticipated to be completed by kayaks and other small craft, volunteers grabbed nearly 100 samples at the same time—10:10 on July 10. This event was not only an opportunity to network with others who care passionately about the health of Maine’s waters, but also to spread the word concerning water quality to the public.

Memento Mori

With gratitude and sadness, we mark the passing of people who contributed much to Maine’s water environment: Ed MacDonald, safety educator extraordinaire; John Vear, contract operator and innovator; Dick Sarle, founding member; and Dr. David Anderson, chemist, past MEWEA president, and mentor. We will miss them as we remain thankful for their contributions.

Our 50th Anniversary

On Sept. 15 and 16 we celebrated our 50th anniversary at our annual conference. At the conference the seventh class of the Joint Environmental Training and Coordinating Committee’s Management Candidate School graduated. As with many of our sister states, this program continues to provide an excellent opportunity for the next generation of water quality professionals and environmental leaders.

New Hampshire State Director Report

by Sean Greig
sgreig@newmarketnh.gov

The New Hampshire Water Pollution Control Association (NHWPCA) has had a busy spring. We have had many successful spring events in 2016, and we look forward to a successful fall.

Recent Events

The NHWPCA Trade Fair/Spring Meeting was on April 8, 2016, at the Executive Court Banquet Facility in Manchester. The event featured 46 vendors and drew more than 100 attendees. Operators mingled with one other and exhibitors in the morning, and the trade show was followed by a formal lunch and award presentations.

The trade floor was crowded at mid-morning during the April Trade Fair

In a change of format this year, NHWPCA with New Hampshire Department of Environmental Services (NHDES) held a special dinner program for its school poster contest winners. Short presentations recognized the contest winners. A dinner followed in which NHWPCA and NHDES representatives interacted with the winners and their families. The event was so successful that NHDES and NHWPCA plan to continue this format. Special thanks to Geri Ciardelli for organizing and administering the poster contest.

The association had a booth at Wild New Hampshire Day, an event put on by New Hampshire Fish and Game. A few thousand people attended to take in demonstrations and experience hands-on activities including fishing, trained dogs, hunting, building bird houses, and more. The NHWPCA booth raffled off 20 fishing poles. Everyone had a great time.

Raffle winner John Esler picks the next ticket from the bowl held by NHWPCA President Andrea Martel

NHWPCA held its Legislative Breakfast in Concord on March 23, 2016. The event featured keynote speakers Hayley LaPoint, meteorologist from WMUR Chanel 9; Peter Rice, city of Portsmouth director of public works; and Thomas Burack, NHDES commissioner. The event was well attended with 103 participants. The legislators were engaged and asked a lot of great questions.

The Washington Fly-in was another successful trip for New Hampshire. This annual effort is to get in front of our elected officials in Washington to make sure they understand how important funding water infrastructure and supporting programs and policies is to ensure clean water for all communities. New Hampshire was well represented by Andrea Martel, current president of NHWPCA; Harry Stewart of Normandeau Associates; Peter Goodwin of Ted Berry Company; and Shelagh Connelly of Resource Management, Inc. Special thanks to Ms. Connelly for her work on legislative issues.

The 2016 New Hampshire Operations Challenge team is revamped with some new blood. They attended the training day in Holyoke, Massachusetts, and competed at the NEWEA Spring Meeting in Mystic, Connecticut. The team looks forward to the competition at WEFTEC in New Orleans this fall. As a former team participant, I am sure they will represent New Hampshire and New England well.

NHWPCA congratulates Mary Zhu, a student at Nashua High School South, who was named the state winner of the 2016 Stockholm Junior Water Prize (SJWP) competition—the most prestigious youth award for a water-related science project. Her winning project was Food for Thought: A Novel Computational Approach to Modeling the Impacts of School Nutrition Policies on the Blue Water Footprint. Ms. Zhu represented New Hampshire at the national competition on June 18 in Charlotte, North Carolina, where she competed against other young researchers from across the country for the opportunity to represent the United States at the international competition in Stockholm, Sweden. Although she was not chosen to present in Stockholm, NHWPCA is proud to have sponsored her. Her research is the forward-thinking innovation that the world will need much more of in the future. Congratulations, Mary Zhu!

Other Events

On August 4, NHWPCA held its annual golf outing at the Beaver Meadow Golf Course in Concord.

On September 16, NHWPCA held its Fall Meeting in Lebanon. New Hampshire is sharing the Operator Exchange with Rhode Island this year; the operator from Rhode Island toured New Hampshire plants on September 14 and 15, and then attend the Fall Meeting the following day.

On December 9, NHWPCA will have its Winter Meeting at the Dover wastewater treatment plant. Additional information and registration forms will be available soon on the NHWPCA website.

Incoming WEF delegate Fred McNeil and several other water professionals from throughout New Hampshire are working with New Hampshire Public Television on production of a half-hour documentary tentatively entitled “NH TAPPED.” This documentary will describe all aspects of New Hampshire’s water industry, including wastewater, drinking water, and stormwater management. After it airs on television, the documentary is intended to be available for use as an outreach tool for schools and other public forums statewide. This should be a great outreach tool for use by NHWPCA members and others as appropriate.

Water System Operators Plus staff show their “Proud Wastewater Treatment Plant Operator” shirts: Priscilla Fitch, Reece Boisvert, Charles Damour, Joshua Horner and Cody Boisvert

The 2016 Seacoast Sewer Snakes prepare for competition: (l-r) Brian Farmer, Patty Chesebrough, Dustin Price, Sean Kehoe (back)

The Dover, NH WWTF staff receiving the NEWEA Utility Management Achievement Award; Earl Friede, Tim Pine, Allan Johnstone, and Ray Vermettte

Vermont State Director Report

Nathan Lavallee
nlavallee@town.milton.vt.us

Report by Bob Fischer GMWEA Board Member/ Vice-Chair NEWEA Government Affairs

In Vermont, Green Mountain Water Environment Association (GMWEA) continues to offer training opportunities, educational outreach to the public, and events for operators to get together and communicate. It also continues to be proactive in government affairs.

Water Quality Day

On May 27, GMWEA hosted the second Water Quality Day in Vermont. The first event took place in May 2014, and after skipping a year we hope to make this an annual event. This year we included water and stormwater and, along with the tours at various wastewater facilities, several water facilities also gave tours along with a stormwater demonstration in South Burlington. The governor of Vermont, Peter Shumlin, made an Official Proclamation declaring "...do proclaim May 27, 2016, as Water Quality Day." Part of the Proclamation stated: "...WHEREAS, the storm-water, wastewater and drinking water systems in communities around Vermont are the first and most critical protections and barriers against water pollution to protect the public health; and WHEREAS, the stormwater, wastewater and drinking water systems 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..." GMWEA provided coordination, signage, refreshments, and talking points.

Government Affairs

Act 86—In May, the Vermont Legislature passed Act 86 concerning public notice of wastewater discharges. This act requires public notice of untreated discharges from wastewater facilities and of cyanobacteria outbreaks. The act requires wastewater treatment facility operators to post a public alert within one hour of discovery of an untreated discharge of sewage by logging into the state website and reporting the discharge. This applies also to permitted combined sewer overflow (CSO) locations. If the operator lacks access to a telephone or to the Internet, the operator shall post the alert within four hours of discovery. The operator must submit to the Agency of Natural Resources (ANR), within 12 hours of discovery, specified information regarding the untreated or incompletely treated discharge. The act also requires that every CSO outfall be marked with a permanent sign, and that a municipality in which an untreated discharge from a wastewater treatment facility occurs shall post signs in the area of the discharge. The act also requires the Department of Health (DOH) to maintain a publicly accessible website displaying information about the presence of cyanobacteria in state recreation areas. GMWEA members testified in support of modifying the original bill that required a 15-minute notification to the state website and for allowing the bill to apply only to discharges that reach waters of the state; some groups had proposed any spill, of any amount, in any location needed to be reported within 15 minutes, since it could be a public health issue.

H 518—GMWEA members testified in support of expanding the Vermont Clean Water Fund board of directors. As a consequence of Act 64 that was passed in 2015, an increase in the property transfer tax was enacted to help provide funding for the improvement of water quality in Vermont. The board in charge of dispersing the funds consists of the heads of several state agencies. GMWEA was in favor of expanding the board by including citizen representation. The bill passed but was vetoed by the governor as one of his only two vetoes this year, at the urging of the ANR secretary.

Governor Candidate's Debate

On June 7, GMWEA hosted, along with Vermont Rural Water Association, Lake Champlain Regional Chamber of Commerce, Vermont Businesses for Social Responsibility, Vermont Council Trout Unlimited, and several other groups, the first gubernatorial candidate forum on a Vermont clean water economy. All the competitors for the open governor's seat: Democrats Peter Galbraith, Sue Minter, and Matt Dunne, and Republicans Bruce Lisman and Phil Scott, attended. It was moderated by Peter Hirschfeld of Vermont Public Radio. The scope of issues related to water and the economy include: drinking water infrastructure, wastewater infrastructure, sustainable agriculture, Total Maximum Daily Loads (TMDLs) impacting several waterbodies statewide, renewable energy, water-based tourism, recreational waters, fish and wildlife, and the most recent Agency of Commerce and Community Development Comprehensive Economic Development Strategy (ACCD CEDS) report, which declares that in 200 of our 251 communities insufficient water/wastewater infrastructure limits economic opportunities.

Lake Champlain TMDL

The Vermont Lake Champlain Phosphorus TMDL Phase 1 Implementation Plan was released (epa.gov/tmdl/lake-champlain-phosphorus-tmdl-commitment-clean-water); three public meetings were held, and comments on the draft were accepted through September 7. Highlights for wastewater include: a "trigger" for upgrades when a facility discharges more than 0.2 milligrams per liter total phosphorus (TP) multiplied by 80 percent of hydraulic design capacity; reductions in wastewater allocation are targeted only to facilities in those lake-segment watersheds where the currently permitted wastewater load is a significant proportion of the total phosphorus load from all Vermont sources, and where wastewater upgrades would meaningfully reduce the phosphorus reduction burden on non-wastewater sources; discharge permit limits shall be defined as annual average phosphorus loading rates, rather than as concentration limits, to allow operational flexibility in attaining the limits. Comments (epa.gov/sites/production/files/2016-06/documents/response-to-comments-lake-champlain-tmdl-jun-17-2016.pdf) included the following from the Conservation Law Foundation: "... For Lake Champlain, the annual phosphorus concentrations already exceed water quality standards and impact designated uses. Therefore, the draft 2015 TMDL allocations cannot justify additional discharges of phosphorus pollution into Lake Champlain. For wastewater treatment facilities in impaired lake segments, an allocation set above the actual phosphorus load of that facility is inconsistent with the CWA...While 14 facilities' loads have already exceeded 80 percent of the new allocation, the remaining 12 facilities can increase their discharge of phosphorus pollution until the 80 percent threshold is met or they can maintain their current discharge indefinitely..."

Award—On June 24, GMWEA was awarded a Lake Champlain Initiative Champlain Heritage Service Award for the work operators perform protecting lake water quality, presented by Sen. Patrick Leahy (center) to GMWEA representative Bob Fischer (left) and GMWEA President Rick Kenney

GMWEA Governor's Cup competitors received a can of sardines for their second place showing: (l-r) Miss New Hampshire, Rick Chaput, Erik Bailey, Bob Fischer, and Lake Champlain International's James Ehlers

GMWEA Spring Meeting

The Spring Meeting was held at the Killington Grand Resort on May 26. It was attended by NEWEA President Ray Willis III, who gave a NEWEA update. GMWEA awards were given out and one new director, Christopher Cox, chief operator of the Montpelier Water Resource Recovery Facility, was elected. Three other board members won new terms. Outgoing President Chris Robinson passed the gavel to the new GMWEA president, Rick Kenney.

GMWEA Golf Tournament

Nearly 100 players and sponsors took part in the George Dow Memorial Golf Tournament on August 19. The proceeds help fund a GMWEA scholarship.

GMWEA Activities

On May 20, GMWEA Board Member Erik Bailey, GMWEA Past Board Member Rick Chaput, and I competed in the Lake Champlain International Governor's Cup Fishing Derby, defending our 2015 Championship. Unfortunately, we came in second and had to relinquish the Cup but plan on trying again next year.

On July 21, more than 50 members attended GMWEA Night at the Ball Game, in Burlington, where they were treated to a barbeque while watching the Vermont Lake Monsters.

World Water Monitoring Day

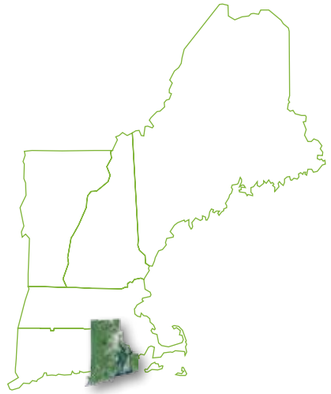
Once again, GMWEA gave out 100 water testing kits to Vermont educators.

Upcoming Events

The GMWEA Fall Trade show will take place at the Burlington Sheraton on November 10. Vermont will host the NEWEA Exchange Operator from Massachusetts before and during this event.

Rhode Island State Director Report

by Michael Spring
mspring@narrabay.com



The Narragansett Water Pollution Control Association (NWPCA) has been busy in 2016. We are on track with our goal to assist with operator training as well as participation within our community and our state.

Highlights of our Continuing Education Efforts

Hach WIMS for reporting NetDMR purposes
March 29, 2016, Field Point's Education Room, Narragansett Bay Commission (NBC), Providence.
Instructor: Tim Hutchins
This informational class focused on using Hach WIMS software for NetDMR reporting. A webex was presented by Bryan Sharpnack, a WIMS applications development manager (ADM).

Emerging Laboratory Technologies Conference
May 3, 2016, Narragansett Bay Commission, Providence.
Instructors: Walter Palm, Dennis Palumbo, Nora Lough, and James Galasyn
This conference was focused on instrument technologies and laboratory information management systems (LIMS). As part of the training attendees toured NBC.

Sustainable Management for Wastewater Systems
March 3, 2016, Warwick Sewer Authority
Instructor: Diane Johnson, P.E.
This four-hour interactive workshop introduced and focused on 10 key management areas for effectively managed utilities. Participants completed a short self-assessment for their system's operations, highlighting management priorities to work on during the class, and were given a compendium of resources that could help them implement the improvements identified during the assessment.

Legislative Initiatives

The **NWPCA Clean Water Legislative Luncheon** was on March 15 at the Rhode Island State House in Providence. Opening remarks were presented by NWPCA President Scott Goodinson and NEWEA Vice President Janine Burke-Wells, the committee chair who also served as master of ceremonies. They were joined by distinguished speakers: The Honorable V. Susan Sosnowski, senator, District 37; The Honorable Teresa A. Tanzi, representative, District 34; Janet Coit, director, Rhode Island Department of Environmental Management (RIDEM); and Nancy Hess, supervisor, State Guide Plan—Water Quality 2035 Rhode Island Division of Planning.
This successful legislative luncheon was an opportunity for members and local officials to get together with legislators to discuss clean water issues that challenge our communities.

NEWEA Congressional Briefing, Washington, D.C., held on April 12–13, was attended by delegates Scott Goodinson (NWPCA), and Peter Ginaitt (Warwick Sewer Authority board member). Both Mr. Goodinson and Mr. Ginaitt met with all the Rhode Island elected officials and discussed ways that we (NWPCA and NEWEA) can work together with Rhode Island government officials to loosen up funding for projects throughout Rhode Island. NEWEA President Ray Willis and NEWEA Collection Systems Committee Vice Chair Peter Garvey showed their support and attended several meetings with our government officials.

Awards

NWPCA Annual Awards Banquet was on May 24 at the Potowomut Golf Club in Warwick. Opening remarks were presented by NWPCA President and Master of Ceremonies Scott Goodinson.
We were pleased to have Ray Willis, NEWEA president, and Bill Patenaude, RIDEM principal engineer, offer encouraging remarks to the award winners and attendees. Mary Barry, executive director of NEWEA, also attended, along with 136 others. Award winners are listed below:

- *James Marvelle Award:* **Edward Davies**
- *Collections System Operator of the Year:* **Dennis Colberg**
- *Robert Markelewicz Award:* **Richard Ferreira**
- *A. Joseph Mattera Safety Award:* **East Providence WWTF** (>5 MGD) **Town of Narragansett WWTF** (<5 MGD)
- *Plant Performance Gold Award* (zero violations): **Town of Narragansett WWTF** and **Quonset Point WWTF**
- *Plant Performance Silver Award* (one violation): **Jamestown WWTF, NBC Bucklin Point WWTF, NBC Field's Point WWTF, New Shoreham WWTF, Smithfield WWTF, and Warwick Sewer Authority**

Spring Meeting

NEWEA/NYWEA Spring Meeting was on June 6-8 in Groton, Connecticut. Rhode Island's Ocean State Alliance team participated in the Operations Challenge. The team includes Captain Vinnie Russo, Jr. and Ed Davies (both of the NBC Field's Point WWTF), and Ryan Patnode and Sam Sullivan (both of the West Warwick WWTF). The team achieved first place overall for New England. Ocean State Alliance scored first place in the lab and maintenance/pump repair categories; second place in the safety event; and third place in the process control and collection system/pipe repair events. The team will now participate in the national competition at WEFTEC in September 2016 in New Orleans.

Events

Second Annual NWPCA PawSox Night was on June 11 at McCoy Stadium in Pawtucket. NWPCA obtained 53 reduced-cost tickets for members and families through our local sponsors. This was a fantastic family event that was followed up with fireworks set to a *Star Wars* theme.

We look forward to upcoming events, which include the NWPCA Golf Classic, Hot Dog Roast/General Business meeting at the Smithfield WWTP, our third Annual Chowder Cook-off/General meeting at the Narragansett WWTF, the Annual Clambake/Tradeshow, and our 6th Annual December Holiday Party & Food Drive. As always, the election of officers will be held at the Holiday Party, which will conclude an outstanding year for NWPCA.

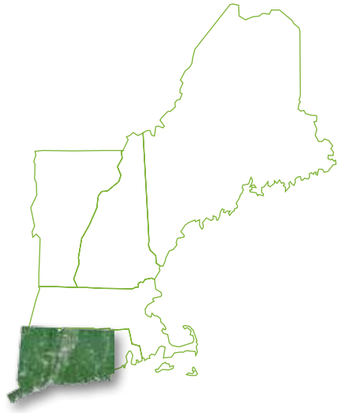
Holding wastewater process samples at the Clean Water Legislative Luncheon at the Rhode Island State House: Janine Burke-Wells (vice president, NEWEA); Nancy Hess (supervisor, State Guide Plan – Water Quality 2035 Rhode Island Division of Planning); The Honorable Teresa A. Tanzi (representative, District 34); and Janet Coit (director, RIDEM)

Gold Award for zero permit violations for 2015: (left) Narragansett WWTP—Dan Johnson (operator) and Peter Eldridge (plant superintendent); (right) Quonset Wastewater Treatment Facility—Dennis Colberg (plant superintendent)

Scott Goodinson, Traci Pena (RIDEM), and Bill Patenaude (director, RIDEM) enjoying the Awards Banquet

Connecticut State Director Report

by Jay Sheehan
jsheehan@woodardcurran.com



It has been another incredible year for wastewater in Connecticut as we continue to build off our 2015 successes. The Connecticut Water Pollution Abatement Association (CWPAA), the Connecticut Association of Water Pollution Control Authorities (CAWPCA), and the Connecticut Lab Association—all advanced their agendas significantly.

Driving the Wastewater Agenda in the Nutmeg State

The Connecticut associations have facilitated many events this year. These include legislative events in both Hartford and Washington, D.C.; technical events including plant tours, technical sessions, wastewater manager's classes, and a trade show; social events including a ski trip, golf outing, and Younger Member Poo & Brew (at the Stratford water pollution control facility and Two Roads Brewery); and public awareness events such as the 20th Annual Source to Sea Cleanup and Wastewater Appreciation Day. Connecticut even moved closer to participating in the Operations Challenge for the first time in over a decade with two teams being formed and observing the events at the NEWEA Spring Meeting in Mystic. With all of this great energy and momentum, we should be very proud.

However, there is a dark cloud looming… The fiscal years of 2015 and 2016 presented an unprecedented level of wastewater funding from the state. The Clean Water Fund was allocated $896 million, hundreds of thousands more than in fiscal years 2013 and 2014. The proposed funding for fiscal years 2017 and 2018, however, was reduced to $379 million, a disappointing but palatable decrease with all the prior years' utility improvements still being finalized. In addition, this spring the governor proposed another $100 million reduction in Clean Water funds. This would put Connecticut treatment facility and collection system improvements in great peril, while regulatory, resiliency, and other requirements are continually calling for more. So be prepared for challenging discussions about deferring investment and raising sewer rates.

Less Funding May Mean Higher Rates—the Public Needs to Know!

Public education will be critical over the next few years, to educate users on the rising cost of treatment, new regulatory and reporting requirements, reduced funding levels, climate change, and many other ongoing issues. Without strong public interaction, people cannot possibly understand the challenges facing the wastewater industry, and they may not support the large rate increases we will soon need. With such a challenging and dubious funding future, we have to get the word out about clean water more effectively than ever before. Our ability to communicate to utility users is changing quickly as social media is becoming a highly effective means of communicating. If you do not have a utility social media strategy already, you should make it a priority in 2017!

Getting Creative with Wastewater Public Awareness

There is a trend in wastewater public education to bring the subject of clean water to reference points that the general public will easily understand. One effective way of getting the message out is by using something universal from everyday domestic life as the example. The American Water Works Association has come up with "Without Water, There's No Whiskey." This July, the NEWEA Young Professionals (YP) Committee leveraged a similar concept into the successful Poo & Brew event, which saw more than 40 YPs converge on the Stratford Connecticut WPCF and the nearby Two Roads Brewery. Also, for those who missed the NEWEA Spring Conference, six-packs of a brand new beer, Port-a-Potty Pale Ale, and several bottles of wine—made with 100 percent reclaimed wastewater effluent—were taste-tested and raffled off, raising more than $1,000 to benefit Water for People. In addition, the June issue of *Water Environment & Technology* included an article about beers in California, Wisconsin, and Arizona made from wastewater effluent. The wastewater/water/beverage nexus is apparently an important message within the utility industry.

138 golfers at July's Sewer Open tournament listened to the course rules prior to the shotgun start on a perfect day for golf. $3,400 was raised for the CWPAA scholarship fund

Poo & Brew event: in July, more than 40 Young Professionals converged for a tour of the Stratford, Connecticut WPCF and the nearby Two Roads Brewery

Find Your Own Creative Message and Gain Public Support

The trend is clearly strong to have the public understand the importance of clean water through a common theme—the alcoholic beverage. This is a chance for New England utilities to leverage this and find other creative everyday examples of water use that demonstrate the importance of investing in clean water. NEWEA has started a similar new outreach campaign using "Water Champions" and "Water For Life." Do not wait; start testing your novel communication concepts now.

You will need public support very soon. The cost of clean water will continue to increase.

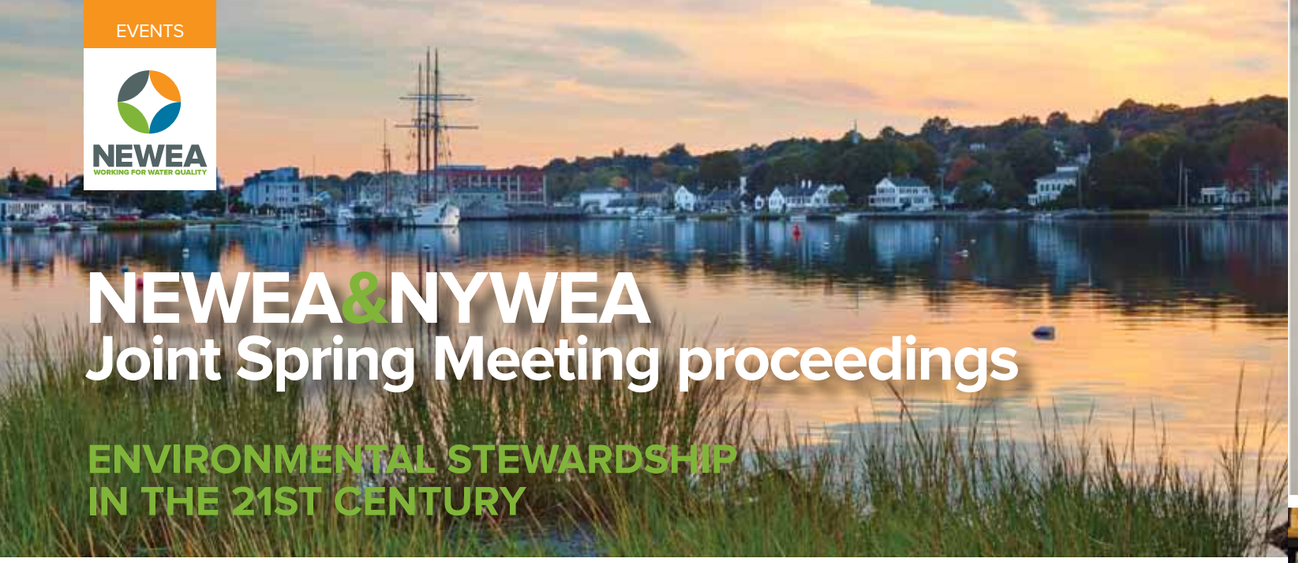
2016/2017 Events

There is a flurry of planned activity in Connecticut that will bring a great 2016 to a close and kick off 2017. Please mark your calendar.

For information on CWPAA events contact Mike Bisi (Mike.Bisi@glastonbury-ct.gov).

For information on CAWPCA events contact Tom Sgroi (tsgroi@gnhwpca.com).

Event	Date	Location
Plant Tour	September	To be determined
20th Annual Source to Sea Cleanup	September 23-24	Various locations on the Connecticut River
Connecticut Operator Exchange (with Maine)	October/ November	Various wastewater treatment facilities throughout Connecticut
CWPAA/NEIWPCC Fall Manager's Forum	October/ November	Metropolitan District Training Facility, Hartford, CT
Northeast Biosolids & Residuals Seminar	October 12-13	Cromwell, CT
CAWPCA Fall Workshop	November 4	Aqua Turf Club, Southington, CT
NEWEA Annual Conference	January 2017	Marriott Copley, Boston
Connecticut Legislative Breakfast	February/ March 2017	Legislative Office Building, Hartford, CT
CWPAA Ski Trip	March 3, 2017	Stratton Mountain, Vermont
CAWPCA Spring Meeting	April 2017	Aqua Turf Club, Southington, CT



NEWEA&NYWEA Joint Spring Meeting proceedings

ENVIRONMENTAL STEWARDSHIP IN THE 21ST CENTURY

The New England Water Environment Association co-hosted its Annual Spring Meeting with the New York Water Environment Association (NYWEA) on June 6–9, 2016, at the Mystic Marriott Hotel in Groton, Connecticut.

Meeting registrants totaled 499, split almost evenly between NEWEA and NYWEA registrations (NEWEA had 243, NYWEA had 256). NEWEA registrants included 170 members and 32 non-members, 14 Operations Challenge participants, and 11 guests. The meeting also featured 50 exhibit booths.

A full NEWEA Executive Committee meeting with committee chairs was held on Sunday, June 5, with NEWEA President Ray Willis presiding.

In addition to the Opening Session, there were 16 technical sessions and one tour.

OPENING SESSION WITH BREAKFAST

Welcome:
- Ray Willis III, NEWEA President
- Joseph Fiegl, NYWEA President
- Rob Klee, Commissioner of Connecticut's Department of Energy and Environmental Protection (DEEP)

Keynote Address:
- Heather Goldstone, NPR Environmental Reporter

SESSION 1 UTILITIES OF THE FUTURE

Moderators:
- Charles Wilson, Hazen and Sawyer
- John Scheri, Hatch Mott McDonald

National Association of Clean Water Agencies (NACWA)—Utilities of the Future
- Adam Krantz, NACWA

How the Internet of Things Can Help Communities Better Manage Urban Stormwater Impact
- Jamie Lefkowitz, OptiRTC, Inc.
- Marcus Quigley, OptiRTC, Inc.

Comprehensive Sampling Program in Support of a Large New Jersey LTCP
- Timothy Groninger, HDR Engineering
- Francisco Brilhante, HDR Engineering
- Bridget McKenna, Passaic Valley Sewerage Commission

How Including the Public Helped in Developing a Stormwater Utility
- Nancy Gallinaro, City of Portland, ME
- Justin Pellerin, City of Portland, ME

SESSION 2 MAINTAINING OUR COLLECTION SYSTEMS INTO THE FUTURE

Moderators:
- Robert DeGiorgio, D&B Engineers
- David Van Hoven, MWH Global

Force Main and Trunk Line Sewer Installation/Rehabilitation Utilizing Three Trenchless Technologies
- Kevin Shannon, GHD
- Sandra L. Tripp, GHD

Managing Boston's Investments in Buried Infrastructure through Systematic Evaluation of Condition and Risk
- Jacob Peck, CH2M
- Chase Berkeley, Boston Water & Sewer Commission

Designing, Permitting and Constructing Wastewater Treatment Improvements and Sewer System Expansions
- Mark Thompson, Kleinfelder, Inc.

Sewer Trunkline Repairs and Stream Stabilization
- Anthony Eagan, Barton & Loguidice, D.P.C.
- Richard Straut, Barton & Loguidice, D.P.C.

SESSION 3 PROCESS EFFICIENCY AND COST SAVING MEASURES

Moderators:
- Fotios Papamichael, Gannett Fleming
- Ken Kohlbrenner, Woodard & Curran

ECM—Pro-active Energy/GHG Reduction Measures for the Future
- Robert Pape, AECOM
- Gabrielle Moore, AECOM
- Jane Atkinson, AECOM
- Tami Lin, NYCDEP
- Anthony Fiore, NYCDEP

1. Keynote Speaker Heather Goldstone, NPR science and environment reporter, held the audience spellbound 2. and 3. Connecticut Department of Energy and Environmental Protection Commissioner Rob Klee was the kickoff speaker at the Opening Session

Reducing the Risks of Climate Uncertainty on Water
- Frances Bui, CDM Smith
- Lauren Klonsky, CDM Smith
- Kirk Westphal, CDM Smith
- Daniel Johnson, Metropolitan North Georgia Water Planning District

How the Application of Spectrophotometry to Optimization of Aeration and Disinfection Saved 25 Percent of the Energy in a 10 mgd Plant
- Robert Dunbar, ZAPS Technologies
- Nathan Klinkhammer, ZAPS Technologies
- Chris Russo, ZAPS Technologies

Struvite Control, Polymer Reduction and Cake Dryness Improvement with Energy Efficient Process—HydroFLOW
- Douglas L. Miller, Douglas L. Miller Consulting
- Tal Journo, HydroFLOW-USA
- Chuck Glessner, HydroFLOW-USA

SESSION 4 MANAGING STORMWATER THROUGH GREEN INFRASTRUCTURE

Moderators:
- Jennifer Johnson, Nitsch Engineering, Inc.
- Brian Skidmore, Barton & Loguidice, D.P.C.

Narragansett Bay Commission Stormwater Mitigation Program
- Stephen Lallo, Narragansett Bay Commission

Green Infrastructure/Stormwater Management Requirements in the City of Buffalo (A Mixed CSS and MS4 System)
- Rosaleen Nogle, Buffalo Sewer Authority

Enhancing New York City's Public Spaces with Stormwater Management
- Dahlia Thompson, Hazen and Sawyer
- Liza Faber, Hazen and Sawyer
- Kevin Dahms, NYCDEP
- Adriana Kocovic, NYCDEP

Biofiltration for Advanced Green Infrastructure Stormwater Treatment
- Daniel Bourdeau, Geosyntec Consultants
- Julia Keay, Geosyntec Consultants

SESSION 5 DIGESTION AT THE WATER RESOURCE RECOVERY FACILITY

Moderators:
- Amy Anderson, ARCADIS
- Nancy Struzenski, Alpha Analytical, Inc.

Net Zero at the Danbury, Connecticut WPCF
- Brian Messner, Wright-Pierce
- Steve Hallowell, Wright-Pierce

The Path to Resource Recovery through Enhanced Primary Treatment
- Alex Wright, ClearCove Systems

Energy and Resource Recovery Strategies for the Green Bay Metropolitan Sewerage District
- Jay Surti, CH2M
- Peter Burrowes, CH2M

Rome Regional Anaerobic Digestion Facility—Small, Medium or Large?
- George Bevington, Gerhardt LLC
- Dennis Clough, Energy Systems Group
- Rick Kenealy, Rome WPCF
- Richard Straut, Barton & Loguidice, D.P.C.









Presenters during the program sessions included: 1. Timothy Groninger, HDR 2. Nancy Gallinaro, City of Portland, Maine 3. Robert Sharp, Manhattan College 4. Lola Olabode, WERF 5. Allison Deines, WERF 6. Alan Wells, Kleinfelder

1. A beluga whale peers over Patty Chesebrough's shoulder at the Mystic Aquarium reception 2. Attendees relax and watch the wildlife at the Mystic Aquarium reception 3. A crowd of generous athletes posed at the Water For People charity Fun Run/Walk early on Tuesday morning

SESSION 6
SUSTAINABLE DESIGN 1

Moderators:
- Will Stradling, Siewert Equipment
- Jeff Cantwell, Flow Assessment Services

Decentralized Wastewater Collection and Advanced Treatment Technology—A Case Study in Christiansburg, Ohio
- Julie Barown, Orenco Systems
- Wes Anderson, Orenco Systems
- Tyler Molatore, Orenco Systems
- Brice Schmitmeyer, Access Engineering Solutions

Decision Analysis for Project Phasing Using Real Options Tools
- Geoff Baldwin, CDM Smith

Waterfront Structures Resiliency
- Dominica Stasiak, CH2M

The Town of Groton, Connecticut Looks to the Future: Upgrades to the WPCF Effluent Pump Station and WPCF Resiliency
- Virgil Lloyd, Fuss & O'Neill, Inc.
- Chris Lund, Town of Groton, CT

SESSION 7
NUTRIENT REMOVAL 1

Moderators:
- Timothy Vadney, Wright-Pierce
- Rosaleen Nogle, Buffalo Sewer Authority

Assessing Surface Water Nutrient Impacts and Implications on Wastewater Removal
- Andrew Thuman, HDR
- Richard Isleib, HDR
- Thomas Gallagher, HDR
- Cristhian Mancilla, HDR

The Grand Experiment for Great Bay Estuary—Confirming Whether TN Control is Justified
- William Hall, Hall & Associates
- John Hall, Hall & Associates
- Benjamin Kirby, Hall & Associates

Disinfection Alternatives for New York City WRRFs
- Krish Ramalingam, City College of NY
- John Fillos, The City College of NY
- Xin Xu, The City College of NY
- Allen Deur, NYCDEP
- Mauro Orpianesi, NYCDEP

Evaluation of Nitrogen Removal Technologies at Port Jervis, NY WWTP
- Rodrigo Pena Lang, Dvirka and Bartilucci Consulting Engineers
- Magdalena Gasior, Dvirka and Bartilucci Consulting Engineers
- Paul Smith, NYCDEP

SESSION 8
PUBLIC AWARENESS

Moderators:
- Tom Posella, Koester Associates
- Ken Carlson, Woodard & Curran

Captain Plunger to the Rescue: How New Bedford Transformed Their IPP and FOG Program Using Outreach and Technology
- Shawn Syde, CDM Smith
- Zeb Arruda, City of New Bedford
- Ronald Labelle, City of New Bedford
- Wayne Perry, City of New Bedford

The City of Groton, Connecticut's Public Awareness Campaign in Support of WWTF Improvements and the Mashantucket Pequot Tribal Nation's WWTF Water Reuse Success Story
- Stephen Seigal, Tighe & Bond
- David Drobiak, Mashantucket Pequot Tribal Nation

Developing an Effective Public Outreach Strategy to Pass a Sewer Referendum in Enfield, Connecticut
- Jay Sheehan, Woodard & Curran
- Tom Arnone, Town of Enfield, CT

The Evolution of Framingham, Massachusetts' Public Awareness Program
- Kerry Reed, Town of Framingham, MA
- Jim Barsanti, Town of Framingham, MA

SESSION 9
REDUCTIONS IN GREENHOUSE GAS EMISSIONS

Moderators:
- Dan Durfee, CDM Smith
- Glen Knecht, Casella Organics

Optimizing the Use of Digester Gas with Gas Blending Systems
- Megan Messmann, CDM Smith
- Chris Korzenko, CDM Smith
- Igor Katsnelson, NYPA

Year-long Study of Nitrous Oxide, Methane and Carbon Dioxide Emissions from Biological Nitrogen Removal
- Elizabeth Brannon, University of Rhode Island
- Serena Moseman-Valtierra, University of Rhode Island
- James McCaughey, Narragansett Bay Commission

Green House Gas Emissions Reduction and Energy Efficiency Strategies for New York City's WWTPs to Meet Deep Carbon Reduction Goals
- Jane Atkinson, AECOM
- Tami Lin, NYCDEP

Sustainable Energy Planning Update at the Narragansett Bay Commission
- Barry Wenskowicz, Narragansett Bay Commission

SESSION 10
SUSTAINABLE DESIGN 2

Moderators:
- Cynthia Baumann, CDM Smith
- Emery Myers, MWH Global

Green Infrastructure Design and Flood Mitigation in Westchester County
- Rob DeGiorgio, D&B Engineers & Architects
- Steve Pappalardo, Village of Scarsdale

Targeted Study Reveals Effective Approach to Improving and Rehabilitating "Squircle" Clarifiers
- Erik Osborn, Woodard & Curran
- Aaron Fox, Lowell Regional Wastewater Utility

Ellenville WWTP Upgrades and the Greening of the Hudson Valley
- Donald Fletcher, Barton & Loguidice, D.P.C.
- Richard Straut, Barton & Loguidice, D.P.C.

Gravity Belt Thickeners and The Big Picture
- Howard Matteson, CDM Smith
- Sol Posada, NYCDEP

1

2


1


2

3


4


3

4

1. Stormy Award presented to Boston Water and Sewer Commission, accepted by Charlie Jewell and Katherine England **2.** Rob Robinson presents a Stormy Award to the town of Shelburne, Vermont, represented by Chris Robinson **3.** Joint winners of a Stormy Award for a creative outreach program: Colleen Kelley (Hitchcock Center for the Environment), Val Partyka (Suez, N.A.) and Andrew Fisk (Connecticut River Watershed Council) **4.** Virgil Lloyd (l) and Peter Grose (2nd from rt) await their 5S induction call

SESSION 11
RESIDUALS

Moderators:
- Tom Schwartz, Woodard & Curran
- Joe Palomene, Sherwood Logan & Associates

Impacts of On-Site Treatment of Food Waste to New York City's Sewer Collection System and Wastewater Treatment Plants
- Brian Como, Hazen and Sawyer
- Robert Sharp, Hazen and Sawyer
- Stephen Cluff, Hazen and Sawyer
- Keith Beckmann, NYCDEP

Food Waste Digester Construction
- Brian Paganini, Quantum BioPower
- Michael Curtis, Nerac, Inc.

Developing a Beneficial Reuse Market for Class A Biosolids—A Case Study in the Challenges and Successes with the Start-up of the Rensselaer County Sewer District's New Biosolids Facility
- Shelagh Connelly, Resource Management, Inc.
- Chris Cooper, Resource Management, Inc.
- Brian Hilts, CDM Smith
- Gerry Moscinski, Rensselaer County SD #1

Advantages of Modern Septage Receiving Stations
- Michelle Harrod, Flowpoint Environmental Systems
- Jay Morrison, Flowpoint Environmental Systems

SESSION 12
GLOBAL CLIMATE CHANGE

Moderators:
- Tim Clayton, Holland Company
- Katherine Goyette, Kleinfelder

Statewide Cooperation in Preparing for Climate Change at Rhode Island's Wastewater Treatment Facilities
- Jan Greenwood, Woodard & Curran
- William Patenaude, Rhode Island Department of Environmental Management

Updating Design Guidelines for Storm Resiliency
- Thomas Groves, New England Interstate Water Pollution Control Commission (NEIWPCC)
- Michael Jennings, NEIWPCC

Managing Climate Change Risks
- Tom Noble, Horsley Witten Group, Inc.
- Kathleen McAllister, Horsley Witten Group, Inc.

Evaluation of Mitigation Measures for Coastal Flooding in Newport, Rhode Island
- Peter Von Zweck, CH2M
- Greg Brenner, CH2M
- Julia Forgue, City of Newport

SESSION 13
THE STORMY AWARDS

Moderators:
- Zach Henderson, New England Stormwater Collaborative Co-Chair
- Ginny Roach, New England Stormwater Collaborative Co-Chair
- Rob Robinson, New England Stormwater Collaborative Co-Chair

Development of Regional Inter-municipal Stormwater Programs—Town of Shelburne, VT
- Tom DiPietro, Town of Shelburne, VT
- Chris Robinson, Town of Shelburne, VT

1. Old friends Carol and John Donovan and Judy and David Sullivan pose at a reception **2.** Maureen Kozol and Maggie Hoose of NYWEA **3.** Nora Lough and Walter Palm of Narragansett Bay Commission pose as Lab Practices Committee Chair James Galasyn smiles in the background **4.** Charlie Tyler and Andy Fish share a rare laugh

Leveraging Boston School System Master Planning for Green Infrastructure Implementation—Boston Water and Sewer Commission
- Katherine England, Boston Water and Sewer Commission

Integration of Art and Science for Stormwater Program Outreach—Connecticut River Watershed Council
- Val Partyka, SUEZ North America
- Andrew Fisk, Connecticut River Watershed Council
- Colleen Kelley, Hitchcock Center for the Environment

SESSION 14
LOW IMPACT DEVELOPMENT

Moderators:
- James Barsanti, Town of Framingham, MA
- James Wancho, PS&S Integrated Services

Green Infrastructure for Flood Reduction? Case Studies in Modeling Green Infrastructure for Flood Mitigation
- Kate Mennemeyer, CH2M
- Dan Wible, CH2M
- Michelle Hollander, CH2M

Pontilly Stormwater Project, New Orleans: Tailor-Made Green Infrastructure
- Jessica Fosbrook, CDM Smith

Laboratory Study on Optimization of Green Stormwater Infrastructure (GSI) System Configurations and the Applicability to GSI Retrofits for Highway Runoff
- Iulia Barbu, AECOM
- Kate Mignone, AECOM
- Anne Bastoni, Massachusetts Department of Transportation

Decentralized Treatment Network Helps the City of Marathon, Florida Win the Race to Meet Advanced Water Treatment Requirements
- James Steffen, Evoqua Water Technologies

SESSION 15
NUTRIENT REMOVAL 2

Moderators:
- Lauren Hertel, Stantec
- Elena Proakis Ellis, City of Melrose, MA

Evaluating and Improving Clarifiers—We'll Never Stop Learning!
- John Esler, Clarifier Performance Evaluations, Inc.

Strategies for Dealing with Lower Phosphorous and Metals Limits
- Austin Weidner, Tighe & Bond Consulting Engineers
- Frederick Mueller, Tighe & Bond Consulting Engineers
- Ian Catlow, Tighe & Bond Consulting Engineers

Permitting and Process Flexibility Using the VOM Process Provide Cost-effective Nitrogen Removal for Warren, Rhode Island
- Paul Dombrowski, Woodard & Curran
- Jonathan Himlan, Woodard & Curran
- Joseph Haberek, State of Rhode Island DEM
- Angelo Liberti, State of Rhode Island DEM

Monticello, New York—Readiness for Economic Development and Its Future
- Richard Straut, Barton & Loguidice, D.P.C.
- Anthony Eagan, Barton & Loguidice, D.P.C.

1. Ops Challenge laboratory event judges: Phyllis Arnold Rand, Nora Lough, Andrew Fish, Walter Palm, Dennis Palumbo, James Galasyn, Nancy McAuley-Lesieur, Margie Bower, and Marylee Santoro **2.** Howard Carter, Jeanette Brown, and Phyllis Arnold Rand trade ideas at the Past Presidents Breakfast **3.** Ocean State Alliance in prep time for the Ops Challenge safety event

SESSION 16
EMERGING AND CURRENT ISSUES IN WATER QUALITY

Moderators:
- Jamie Saxe, GA Fleet
- Tom Sgroi, Greater New Haven WPCA

The Reduction of Certain Contaminants of Emerging Concern by the GPC Process in the Final Effluent at a Water Resource Recovery Utility
- Michael McGrath, Holmes and McGrath

Studies to Determine Impact of New Enterococcus Criteria on Disinfection Operations and Other Plant Effluent Criteria
- Robert Sharp, Manhattan College
- Keith Mahoney, NYCDEP
- Laura Grieco, NYCDEP
- Sarah Galst, Hazen and Sawyer

New Innovation—Disinfection: Leaders Innovation Forum for Technology (LIFT) Disinfection Work Group
- Lola Olabode, Water Environment Research Foundation
- Allison Deines, Water Environment Research Foundation

Green Energy at a Wastewater Treatment Plant in Western Massachusetts: An Operator's Perspective and Lessons Learned
- Pamela Westgate, Kleinfelder, Inc.
- Al Wells, Kleinfelder, Inc.
- Carl Shaw, City of Pittsfield, MA

TOURS

A tour of two wastewater treatment facilities took place on Tuesday, June 7. First, attendees visited the city of Groton's WWTF to check out the $4.5 million renovation project that includes new laboratory space, and digester and clarifier upgrades. The second tour of the Mashantucket WWTF allowed attendees to see design features that minimize odors and the functioning reclaimed water system.

OPERATIONS CHALLENGE

NEWEA Operations Challenge Committee: Michael Burke, Chair
Travis Peaslee, Vice Chair

The Operations Challenge competition was held on Tuesday, June 7—eight teams participated in the competition:

New York (Long Island Chapter)—*Brown Tide*
Jake Miller, Alec Breen, James Behr, Rob Jentz, Dale Grudier (Coach/Alternate)

New York (Met Chapter)—*Jamaica Sludge Hustlers*
Robert Ferland, Ray Antenucci, Anthony Petrone, Yu-Tung Chan

New York (Met Chapter)—*26th Ward Unflushables*
Michael Leone, David Taylor, Ellis Watson, Salvatore Scapelito

New Hampshire—*Seacoast Sewer Snakes*
Brian Farmer, Dustin Price, Sean Kehoe, Patty Chesebrough, Mike Carle (Coach)

1. 2016 NEWEA champions Ocean State Alliance: Vinnie Russo, Sam Sullivan, Ryan Patnode, and Eddie Davies **2.** Force Maine's Dan Laflamme and Ian Carter show their skills in the laboratory event **3.** Seacoast Sewer Snakes (absent team member Brian Farmer): Sean Kehoe, Patty Chesebrough, Dustin Price, and Mike Carle, coach. **4.** Force Maine with their collection system event award: Scot Lausier, Ian Carter, Dan Laflamme, and Alex Buechner

Maine—*Force Maine*
Alex Buechner (captain), Dan Laflamme
Scot Lausier, Ian Carter

Rhode Island—*Ocean State Alliance*
Vinnie Russo (captain), Eddie Davies, Sam Sullivan, Ryan Patnode, Mike Spring (coach)

Chesapeake—*Motley Poo*
Brad Yeakle (captain), Wayne Rumbaugh, Jim Elliott, Kirk Parks, Jesse McAllister (alternate), Ellen Frketic (coach)

Virginia—*Team HRSD*
Scott Mattice (captain), Seth Blake, Keegan Ankofski, Jason Hobor, Justin Edwards (alternate), Tim Scott (coach)

The Operations Challenge Awards Reception was held on Tuesday, June 7 Committee Chair Mike Burke and each event coordinator, assisted by NEWEA President Ray Willis, presented trophies to the winning teams of each event, as well as the overall first-, second-, and third-place winning teams. The NEWEA team results follow:

First Place Individual Events:
- Process Control—Seacoast Sewer Snakes
- Safety—Seacoast Sewer Snakes
- Collection Systems—Force Maine
- Laboratory—Ocean State Alliance
- Pump Maintenance—Ocean State Alliance

Overall Competition:
- Third Place— Seacoast Sewer Snakes
- Second Place—Force Maine
- First Place—Ocean State Alliance

NEWEA will support the first-, second-, and third-place teams at the 2016 WEF National Operations Challenge competition to be held in New Orleans in September.

Event and Equipment Coordinators:
- Overall Coordinators—Michael Burke and John Fortin
- Process Control—Michael Harris, Bob Wither, Paul Dombrowski
- Safety—André Brousseau, Martin Bunce
- Collection Systems—Michael Smith, Joseph Atkins
- Laboratory—MaryLee Santoro, Bill Sedutto, Dennis Palumbo, Margie Bower
- Pump Maintenance—Xylem-USA, Brian Farmer, Nate Melanson, Kevin McCormick
- Special Support—Bill Grandner, Howard Robinson, Joe Massaro, Donna Bee, Michael Spring, Ron Tiberi

Scorekeeping:
- Overall—Travis Peaslee, John Fortin, Joe Massaro

Judges:
- Process Control—Tanya Jennings Michael Harris, Paul Dombrowski
- Safety—Maria Duran, Joseph Massaro, John Sansalone, Patrick Scanlon, Vincent Mingrone, Jason Swain
- Collection Systems—Howard Robinson, Kevin Peterson, Charles Hemphill, Michael Armes, Tim Vivian
- Laboratory—Marylee Santoro, Dennis Palumbo, Margie Bower, James Galasyn, Phyllis Arnold Rand, Nancy McAuley Lesieur, Nora Lough, Walter Palm, Andy Fish

Judges (continued):
- Pump Maintenance—Dick Crescenzo, Tom Raihl, Anthony Eagan, Ron Wade, Pedro Rivera

Special Thanks to the NYWEA and NEWEA Operations Challenge Support Staff and Coordinators:
- Support Staff: Bill Grandner, Howard Robinson, Joseph Massaro, Donna Bee
- Coordinators: Mike Burke, John Fortin
- Regional Coordination: Donna Bee

SELECT SOCIETY OF SANITARY SLUDGE SHOVELERS

During the Monday evening reception, Influent Integrator Charles Tyler inducted 9 new members into the Select Society of Sanitary Sludge Shovelers:
- Patricia Chesebrough
- Peter Grose
- Virgil Lloyd
- Elena Proakis Ellis
- Thomas Schwartz
- Jay Sheehan
- Michael Sullivan
- John Trofatter
- Michael Wilson

MISCELLANEOUS

A variety of committee meetings were held throughout the Spring Meeting. The Tuesday evening reception and dinner was held at the Mystic Aquarium. The Annual Spring Meeting Golf Tournament was held at the Stonington Country Club in nearby Stonington, Connecticut. Attending spouses and guests enjoyed a number of recreational and social activities during the meeting, including winery tours, painting, and local food excursions.

MEETING PLANNERS

- Conference Arrangements—Ron Tiberi
- Program—Helen Gordon and Lauren Livermore
- Registration—Kerry Reed, NEWEA and NYWEA staff
- Operations Challenge—Michael Burke and John Fortin
- Guest Program—Joy Lord
- Golf Tournament—Peter Kibble

MEETING MANAGEMENT

- Director—Meg Tabacsko
- Sponsors—Glenn Haas

EXHIBITORS

ACF Environmental
ADS Environmental Services
Advanced Drainage Systems, Inc.
Aftek, Inc.
Blake Equipment
Boerger
Carlsen Systems
Casella Organics
CIDRA
CUES
David F. Sullivan & Associates
DN Tanks
Duke's Root Control, Inc.
EMS – New England
Environmental Operating Solutions, Inc.
Erdman Anthony
EST Associates, Inc.
ETA Process Instrumentation
Flow Assessment Services LLC
GA Fleet
GNA Ltd.
Ground Penetrating Carbon, Inc.
Harper Control Solutions, Inc.
Harper Haines Fluid Control
Hydra-Numatic Sales Co.
IDEXX Laboratories, Inc.
Industrial Pump Sales & Service (IPS)
Lane Enterprises, Inc.
Lystek International Inc.
Mechanical Solutions, Inc.
New England Water Group
NozzTeq Inc.
Oldcastle Precast
Orenco Systems Inc.
Pioneer Pump Systems, Inc.
PMC
PSI Process & Equipment
Raritan Group
Resource Management Inc.
Righter Group, Inc.
SCAVIN Equipment
Storm Trap
Strategic Water ReSources
Ted Berry Company, Inc.
Thermo Fisher Scientific
Total Control System Services, Inc.
Viatran
Victaulic
Vogelsang USA
Wells Tudor Environmental, LLC

SPONSORS

ADS Environmental
AECOM
ARCADIS
Barton & Loguidice
Carlin Contracting Co Inc.
CDM Smith
CH2M
D&B Engineers and Architects, PC
Dewberry
GA Fleet
GHD
H2M architects + engineers
Harper Control Solutions, Inc.
Homa Pump Technology
NACWA
Vent-Tech SS Air Valves/HarperValves.com
Victaulic

Upcoming meetings & events

WEFTEC ANNUAL CONFERENCE
September 24-28, 2016
New Orleans, LA

NEWEA RECEPTION AT WEFTEC
September 25, 2016
New Orleans, LA

ANNUAL GOLF CLASSIC BENEFIT
October 3, 2016
The Country Club of New Bedford, MA

WATER FOR PEOPLE SOFTBALL TOURNAMENT
October 15, 2016
Danehy Park, Cambridge, MA

NORTH EAST RESIDUALS & BIOSOLIDS CONFERENCE
October 19-20, 2016
Radisson Hotel, Cromwell, CT

POO & BREW NETWORKING
October 20, 2016
Providence, RI

POO & BREW NETWORKING
November 9, 2016
Burlington, VT

EXECUTIVE COMMITTEE MEETING WITH ALL CHAIRS
January 22, 2017
Boston Marriott Copley Place Hotel,
Boston, MA

NEWEA ANNUAL CONFERENCE & EXHIBIT
January 22-25, 2017
Boston Marriott Copley Place Hotel,
Boston, MA

2016 Northeast Residuals & Biosolids Conference, Exhibit & Tour

This NEWEA/NEBRA conference and exhibit is a great forum to learn the latest trends in the management of biosolids and residuals, and it is a "must" for all those involved in the challenge of managing biosolids and residuals in the Northeast.

October 19 – 20, Radisson Hotel, Cromwell, CT

AFFILIATED STATE ASSOCIATIONS AND OTHER EVENTS

GMWEA BOD MEETING
October 12, 2016
TBD

GMWEA FALL TRADE SHOW
November 10, 2016
Sheraton Hotel & Conference Center
Burlington, VT

CAWPCA FALL WORKSHOP
Novermber, 2016
Aqua Turf Club, Southington, CT

NHWPCA WINTER MEETING
Decmber 9, 2016
Dover, NH

MWPCA QUARTERLY MEETING
December 7, 2016
Holiday Inn. Mansfield, MA

NWPCA HOLIDAY PARTY, FOOD DRIVE, AND ELECTIONS
December 6, 2016
Cranston, RI

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

New members June–August 2016

Aida Arms
Shelburne, VT (STU)

Celina Balderas Guzman
Cambridge, MA (YP)

Kevin Barry
Plymouth, MA (PWO)

Stacey Beasley
MDC Hartford, CT (PWO)

Nicolas Berg
North Kingstown, RI (STU)

Robert Bersin
Green Seal Environmental Inc.
Sagamore Beach, MA (PRO)

Steven Boske
Town of Vernon WWTP
Vernon, CT (PWO)

Allison Brown
Shelton, CT (STU)

Paige Brown
Bangor, ME (STU)

Matthew Brown
ADS Environmental
Londonderry, NH (YP)

Tom Buzelle
Stamford WPCA
Stamford, CT (PWO)

Lilliam Cain
Worcester, MA (STU)

Vanessa Calderon
Charlestown, MA (PRO)

Kathryn Chadwick
Environmental Operating
Solutions, Inc.
Bourne, MA (YP)

Avi Cohen
South Burlington, VT (STU)

Scott Dixon
City of Melrose
Melrose, MA (PRO)

Josie Ford
South Burlington, VT (STU)

Madeline Gill
Fairfield, CT (STU)

Jason Gilllette
MDC
Hartford, CT (PWO)

Raymond Gordon
NH DES
Concord, NH (PWO)

Pranav Grandham
Lexington, MA (STU)

Robert Grasis
Town of Vernon WWTP
Vernon, CT (PWO)

Matthew Hane NTM
Pittsfield, MA (PWO)

John Hannon
Warwick, RI (PWO)

Jose Jurado
MDC
Hartford, CT (PWO)

Balaji Kamakoti
Natick, MA (STU)

Jong Yoon Kim
Lexington High School
Lexington, MA (STU)

Heather Larocque
City of Nashua WTF
Nashua, NH (PWO)

Ann Luppino
Wareham, MA (STU)

Brendan Luther
Environmental Operating
Solutions, Inc.
Bourne, MA (YP)

Peter Lyons
Woodard & Curran
Andover, MA (YP)

Liam McCann
Pepperell, MA (PWO)

Anna Mehrotra
Auburndale, MA (PRO)

Marlon Monroe
MDC
Hartford, CT (PWO)

Marc Morin
Tata & Howard, Inc.
Concord, NH (PRO)

D. Andrew Morrill
Wright-Pierce
Portsmouth, NH (PRO)

Stephen Morse
Accenture
Franklin, MA (EXEC)

Richard Nicoletti
BDP Industries
Greenwich, NY (PRO)

Jeremy Osborn
Edgartown, MA (PWO)

James Papadimitriou
Wright-Pierce
Middletown, CT (PRO)

Lauren Pawlowski
Shelton, CT (STU)

Marissa Peck
Huntington, CT (STU)

Ian Rudnick
Shrewsbury, MA (STU)

Alissya Silva
Marion, MA (STU)

Bharat Srirangam
Lexington, MA (STU)

Micah Strauss
Ayer, MA (STU)

Christopher Torre
City of Norwalk
Norwalk, CT (PRO)

Nick Withee
MDC
Hartford, CT (PWO)

Xiaotian Zhang
Westport, CT (STU)

Mary Zhu
Nashua, NH (STU)

Academic (ACAD)
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 2016 ANNUAL SPONSOR PROGRAM PARTICIPANTS:

Platinum
AECOM
ARCADIS

Gold
Aqua Solutions
AquaGen
CDM Smith
EST Associates
Flow Assessment Services
Green Mountain Pipeline Services
The MAHER Corporation
Weston & Sampson

Silver
ADS Environmental Services
Brown and Caldwell
CH2M
Environmental Partners Group
Fuss & O'Neill
Hazen and Sawyer
NEFCO
SUEZ
Synagro Northeast
Tata & Howard
Tighe & Bond
Woodard & Curran
Wright-Pierce
WSP/Parsons Brinckerhoff

Bronze
Carlin Contracting Co., Inc.
David F. Sullivan & Associates
Dewberry
Duke's Root Control
Hayes Pump
Hoyle, Tanner & Associates, Inc.
Kleinfelder
Stantec

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

Join NEWEA's 2017 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 Annual Golf Classic Benefit
- 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

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

Advertiser index

NEWEA/WEF* Membership Application 2016

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	Mobile Phone Number	Business Phone number	
Email Address		Date of birth (month/day/year)	

☐ 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.

***NEWEA is a member association of WEF (Water Environment Federation). By joining NEWEA, you also become a member 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 I 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*	$174
☐ **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*	$105
☐ **Academic Package**	Instructors/Professors interested in subjects related to water quality.	■ *WE&T* (including *Operations Forum*) ■ *WEF Highlights Online* ■ *Water Environment Research* (Online)	$174
☐ **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* ■ *Water Environment Research* (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* ■ *WEF Highlights Online*	$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 & enrollment (703-684-2400 x7213).

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	**Charge** ☐ Visa ☐ American Express ☐ Master Card ☐ Discover	Card #	Security/CVC
		Signature	Exp. Date
		Daytime Phone	
Billing Address (☐ check here if same as above)	Street/PO Box	City, State, Zip	

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

NEWEA/WEF* Membership Application 2016

To help us serve you better, please complete the following:

(choose the one that most closely describes your organization and job function)

***NEWEA is a member association of WEF (Water Environment Federation). By joining NEWEA, you also become a member of WEF.**

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
Public Financing, Investment Banking

13
Non-profits (e.g., Trade, Association, NGO, Advocacy, etc.)

99
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)

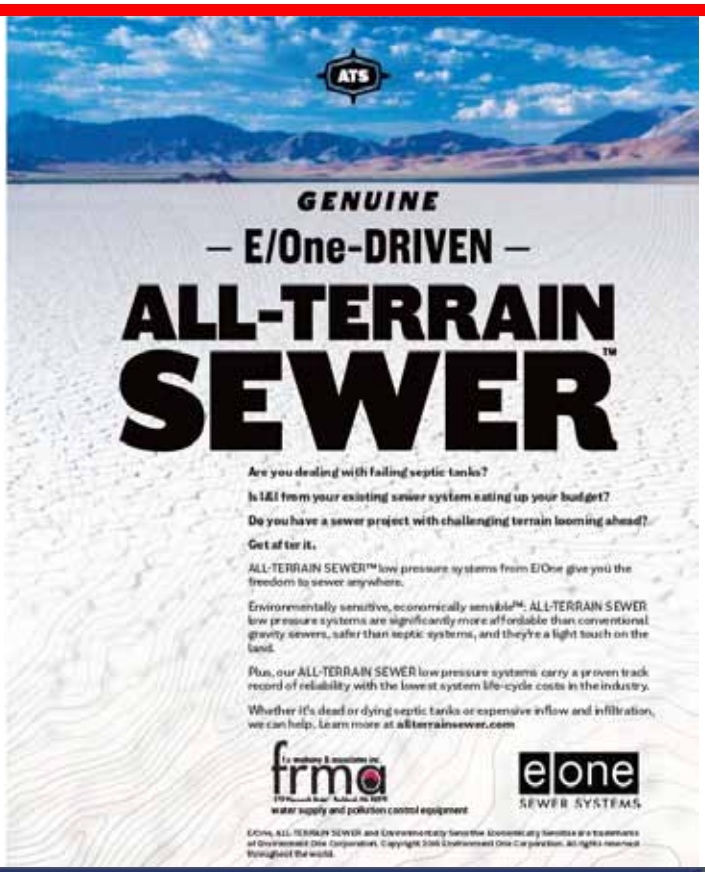
Years of industry employment? _____
1 (1 to 5) **2** (6 to 10) **3** (11 to 20)
4 (21 to 30) **5** (>30 years)

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 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.



Represented in New England by:

Please visit our recently updated WEB SITE!

f.r. mahony & associates inc.
frma
273 Weymouth Street • Rockland MA 02370

Contact ED QUANN c.781.820.6268
edquann@frmahony.com
t.781.982.9300 f.781.982.1056
www.frmahony.com

Stantec

Intelligent infrastructure creatively applied for residuals and energy management

Today's most efficient and intelligent infrastructure, like that at the Greater Lawrence Sanitary District, is setting a new bar for energy conservation.

Improved HVAC system reduces energy and improves safety; updated temperature controls enhance comfort and energy efficiency

Burning digester gas, a renewable resource, reduces reliance on fossil fuels

New dual-fuel boilers/burners use natural and digester gas

Design/build installation of 443 kW ground-mounted solar photovoltaic system makes use of renewable energy

Design with community in mind
stantec.com/water