JOURNAL OF THE NEW ENGLAND WATER ENVIRONMENT ASSOCIATION

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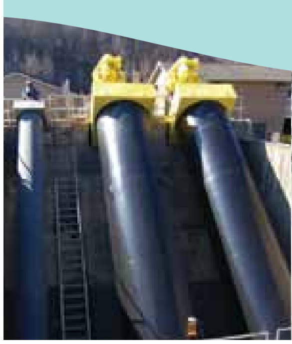
SMALL SYSTEMS

NEWEA
WORKING FOR WATER QUALITY



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Contents

On the cover: Effluent recharge site under construction, Littleton, Massachusetts

Page 68: Measurement unit conversions and abbreviations

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Satellite view of Cape Cod
(page 10)
NASA

Spring Meeting
(page 58–63)
Charles Tyler

OUR ASSOCIATION WAS ORGANIZED NINETY-FOUR 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.

Regulatory Member—this membership category is a NEWEA only membership reserved for New England Environmental Regulatory Agencies, including: USEPA Region 1, Connecticut Department of Energy and Environmental Protection, Maine Department of Environmental Protection, Massachusetts Department of Environmental Protection, New Hampshire Department of Environmental Services, Vermont Department of Environmental Conservation, and Rhode Island Department of Environmental Management.

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.

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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).

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- Download a membership application from **newea.org** by selecting—*Join Us/Become a NEWEA Member*
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2023 RATES ($)

Professional 215
Executive 385
Corporate 446
Regulatory 50
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Young Professional 88
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Robert K. Fischer
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President's Message

Greetings again from Bob Fischer, water quality superintendent for the City of South Burlington, Vermont, and the 93rd president of NEWEA. In this second *Journal* message as president, I will further promote the concept of One Water. To recap my background, I am a past president of Green Mountain Water Environment Association (GMWEA, Vermont's joint association of clean water and drinking water professionals), a Vermont licensed clean water and drinking water operator with experience operating and supervising wastewater and drinking water facilities, and a former federal fisheries biologist.

In April I attended Water Week 2023 in Washington, D.C., representing NEWEA and Vermont. Although the Water Week program (involving WEF, the National Association of Clean Water Agencies, American Society of Civil Engineers, American Public Works Association, and others) was separate this year from the American Water Works Association (AWWA) drinking water fly-in, which took place almost a month earlier, the advocacy meetings with the Vermont senators and representative were again attended jointly by Vermont clean water and drinking water professionals. Our joint delegation included GMWEA President Joe Duncan (the general manager of the largest drinking water agency in Vermont, also representing New England Water Works Association, Vermont NEWEA Director Mike Smith, biosolids expert Christina Adams, and me, illustrating Vermont's leadership in promoting One Water. The good news is that the nationally negotiated memorandum of understanding for this event has been renewed for next year; so, although AWWA does not officially attend the joint Water Week program, its event next year will at least be contiguous with Water Week as it has been in the past, a step forward for One Water.

The congressional delegations (along with their constituencies) do not know the difference between clean water and drinking water, and are often confused, understandably asking, "Were you not here last month?" Both clean water and drinking water advocates generally stand for the same issues: financing, including robust State Revolving Fund support; PFAS, including potential exemptions for clean water and drinking water from a federal CERCLA hazardous waste designation (with its impact on biosolids and drinking water residuals); Buy America Build America policy due to its complication of needs and affordability of specialty equipment; and other common issues.

The One Water theme was chosen this year for several reasons. Although the environmental benefits of clean water treatment are now obvious and important, clean water and drinking water treatment in the United States was developed concurrently for one common purpose: protection of public health. Advancements in sewage disposal and clean water recovery are often viewed, even in medical circles, as one of the most important medical milestones in modern history, along with the close relation to the availability of clean drinking water; it should be abundantly clear that public health relies on One Water.

As a clean water and drinking water professional and former fisheries biologist, I understand how the quality of all water affects the environment. With the immense stresses the water industry faces, including rapid inflation across all aspects of treatment, workforce development, aging infrastructure, and emerging contaminants, all water professionals must collaborate for success. We need one united voice to communicate and advocate practical reasoning to uninformed legislators who, often with the best of intentions, vote to enact rules that may have unintended consequences and do more harm than good. For example, when switching from land application of biosolids to disposal in landfills all the environmental impacts must be understood, including the large increases in greenhouse gas emissions from increased trucking and off-gassing at the landfills, looming landfill capacity issues, landfill leachate treatment issues, greenhouse gas emissions from the importation of chemical fertilizers, contaminant levels in those fertilizer products, limited availability of phosphorus for mining (and greenhouse gas emissions from the mining), loss of carbon sequestration, the need to use limited native topsoil for reclamation rather than for important crop production, and many other complex factors, before deciding on large expenditures that agencies could use for other purposes and technological limitations on treatment. We are first-line defenders of public health, but often these complex issues are not solvable by easy answers, so we must speak clearly in such discussions with a unified voice.

Finally, achieving One Water is the chosen theme because it is a challenge that will require all of us to continue to strive for excellence. Getting everyone to work together with money issues, "turf" issues, personalities, etc., is a herculean task that is well beyond the abilities of any one entity. In New England for example, ongoing major membership and other issues are affecting the NEWWA and AWWA affiliation. We must foster cooperation rather than allowing discord among our support organizations despite our often-competitive histories. Fifteen years ago, when the GMWEA Government Affairs Committee (GAC) invited the Vermont Rural Water Association (VRWA) and then the Vermont League of Cities and Towns (VLCT) to join the committee, "pushback" was heard from both sides with concerns over competition among the agencies for training dollars and other topics. Over time, however, the interrelationship has grown and been good for Vermont, with GMWEA and VRWA producing joint statements and advocacy papers and working with VLCT at the statehouse on water issues often over the years. With effort and persistence, we can all work together for One Water.

When the GMWEA initiated quarterly meetings with the Vermont Agency of Natural Resources (ANR), it not only facilitated dialog between the water sector and the regulators, it even helped within the separate ranks (as one of the regulators was heard to say, "I learn more about what the other ANR divisions are doing during these meetings than anywhere else!"). While I later chaired the NEWEA GAC, we initiated meetings among the regulators at the NEWEA Annual Conference, hoping not only for dialog between the regulators and the regulated but for more communication among the regulators of the New England states. With the anticipated startup of a regulators' committee at NEWEA this year, even more dialogue will ensue. With determination, we can be much more effective as water advocates when we all work together. We all have the same purpose—protecting public health and the environment.

We need one united voice to communicate and advocate practical reasoning to uninformed legislators who, often with the best of intentions, vote to enact rules that may have unintended consequences and do more harm than good.

We must realize that even if we can only "move the needle a little," we are working toward success, as these earlier efforts have allowed for successes by bringing together all the voices from various positions of concern. In spite of slow progress, we should never give up. During college research, I studied Lord Acton (author of the famous 1887 quote, "Power tends to corrupt, and absolute power corrupts absolutely"), who spent his career trying to reconcile religion and science. The people, whether advocating for religion or science, did eventually come together—in their opposition to Lord Acton! Even if a dialog results in everyone agreeing to disagree with a concept, at least they are all working together for one purpose, and the dialog among them may lead to more. Let us all continue to work toward a focus on One Water. It just makes sense.

From the Editor

I have a confession: I'm a bit of an urbanophile. As a Boston resident, I love walking around the corner for all my last-minute errands, I love grabbing a museum pass to visit the Mapparium or the Museum of Fine Arts, and most of all, I love blaming my tardiness on the T. Having lived exclusively in cities (aside from two years in the Peace Corps, but that is a story for another column), I felt a bit unqualified to comment on this *Journal's* theme of small systems. To remedy that, I walked around the office to learn more about water and wastewater in small-town life. While I heard several hilarious anecdotes (including one person's recounting of a week-long boil order because a seagull found its way into the town's drinking water storage tank), I realized I had a lot to learn.

Jennifer Lawrence, PhD
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Growing up with Massachusetts Water Resources Authority drinking water and sewage services, I never thought twice about drinking water from the tap, or taking a shower for as long as I wanted. I flushed the toilet, and—another confession—for a long time, never really thought about where the wastewater went. My co-workers from small towns, however, grew up much more intimately aware of their relationship with water. They helped change the filter cartridges for their well-based drinking water; they were relieved of car-washing duties when water restrictions prohibited it, and they saw their septic tanks emptied with regular frequency (so they knew right from the start that their wastewater didn't magically disappear). If not for my amazing teachers in middle school and high school, my city-dwelling self may have never thought about the value of our local water resources. I was so glad to read about the two amazing Rhode Island teachers in the Industry News section who won the Presidential Innovation Award for Environmental Educators; they truly are inspiring the next generation (including those city dwellers, like me!) to live more sustainably.

A recent review of Clean Water State Revolving Fund assistance provided between 2011 and 2020 revealed that smaller municipalities were among those less likely to receive federal assistance for upgrading wastewater treatment plants and stormwater management systems.* As we strive toward our NEWEA president's theme of One Water, small systems and small communities will have a big role to play, and the four feature articles in this issue highlight just a few of the challenges they face.

The first article, by Clayton "Mac" Richardson, discusses just how complicated it is to run a small (well, absolutely tiny!) wastewater system serving a public school in Maine. The second article, by David Formato, shares an interesting tale of how a "glamping" upgrade at a recreational vehicle campground in Massachusetts funded a new water resource recovery facility. While these two systems are wildly different, they both take uncommon approaches to dealing with one of the big challenges for small systems—intermittent flows.

The third feature article, by Michael Smith, Josh Mandel, and Rachel Greene, describes a pretreatment system recently installed to reduce fats, oil, and grease at a liquid soap manufacturing plant in Vermont. Operator ingenuity really shines throughout this article; with only the smallest of tweaks, the plant produced a clever way to remove zinc, and also reduce sludge disposal volumes and costs. The final feature article, by Kara Rozycki, talks about the transition of a small community from septic to sewered wastewater treatment. I imagine many towns across New England will be grappling with this same decision in the coming years, and this article does a great job of highlighting the steps toward making such a big transition.

As always, I hope you enjoy this edition of the *Journal!*

* https://www.nrdc.org/resources/fairer-funding-stream-how-reforming-clean-water-state-revolving-fund-can-equitably Accessed 6/6/2023.

Industry News

Satellite view of Cape Cod, Massachusetts

EPA Proposes Draft Determination to Protect Cape Cod's Sole Source of Drinking Water

In April EPA announced it was issuing a draft determination under the Safe Drinking Water Act that a multipurpose machine gun range proposed to be constructed by the Massachusetts Army National Guard may contaminate the Cape Cod aquifer, thereby creating a significant public health hazard. No reasonable alternative drinking water sources are available for Cape Cod residents if the aquifer becomes contaminated. EPA held a formal public hearing on May 24 and accepted public comment on this proposal through June 26.

"Cape Cod's sole source aquifer is a public health resource that must be protected," said EPA New England Regional Administrator David W. Cash. "We have studied the proposed machine gun range carefully, because EPA recognizes the need for our armed forces to maintain readiness and provide training to service members. However, the risk of irreparable damage to the only drinking water source on Cape Cod is too significant."

The Sole Source Aquifer Program, used by EPA in making this draft determination, provides EPA a proactive tool to protect this valuable water supply, thus avoiding expensive and consequential cleanups. If this determination becomes final, no commitment of federal financial assistance may be allowed.

The Massachusetts Army National Guard proposed construction of a new permanent 138 ac (56 ha) machine gun range at Joint Base Cape Cod. In August 2021, EPA started to review the proposed project and has now completed a 20-month scientific review of the design and operational plans for the proposed site to evaluate potential impacts to Cape Cod's sole source aquifer. The Safe Drinking Water Act (SDWA) mandates a strong preventive approach where a drinking water supply depends on a single aquifer, and EPA's draft determination is based on protecting Cape Cod's sole source of drinking water.

In 1982, the Cape Cod aquifer was designated as the sole or principal source of drinking water for Cape Cod. As a result, projects proposed to be constructed on Cape Cod receiving federal financial assistance may be subject to a sole source aquifer review, at EPA's discretion, as outlined in the Safe Drinking Water Act. EPA defines a sole source aquifer as one where the aquifer supplies at least 50 percent of the drinking water in its service area, and there are no reasonably available alternative drinking water sources should the aquifer become contaminated.

Note: All EPA industry news provided by EPA Press Office

EPA's review focused primarily on the project's potential impacts to the aquifer, and was not a comprehensive review of all other potential environmental or public health impacts, such as those evaluated by other agencies through their environmental reviews and their public involvement mechanisms.

Investment for Clean Water Infrastructure Upgrades in New England

In March, EPA announced that the 2023 Consolidated Appropriations Act will provide $57,253,000 for states, Tribes, and territories through this year's Clean Water State Revolving Fund (CWSRF) in the six New England states. The funding will help communities upgrade essential wastewater and stormwater systems to protect public health and treasured water bodies across the region.

"The investments we are making now will result in long-lasting benefits for communities across New England, from southern Connecticut all the way up to rural northern communities in Maine, Vermont and New Hampshire," said EPA's Mr. Cash. "Upgrading wastewater treatment plants means protecting the environment that sustains our communities, and it means healthier places in which to live and raise our families. I am especially proud that EPA and the Biden Administration are making these investments to ensure that historically underserved communities are getting the investments and environmental protection they deserve."

EPA has announced the following:

- Connecticut will receive $9,282,000
- Maine will receive $5,865,000
- Massachusetts will receive $25,726,000
- New Hampshire will receive $7,572,000
- Rhode Island will receive $5,088,000
- Vermont will receive $3,720,000

The March announcement builds on the second wave of $2.4 billion in funding that EPA announced in February for clean water infrastructure upgrades through President Biden's Bipartisan Infrastructure Law. Over $3.2 billion will be provided to the CWSRF when combined with fiscal year 2023 funding available through the Bipartisan Infrastructure Law. This investment aims to strengthen the nation's wastewater and stormwater systems, while providing resources to mitigate nonpoint source pollution and improve energy and water efficiency. It also addresses key challenges, including climate change and emerging contaminants like

U.S. SENATE BILL INTRODUCED TO PROTECT WATER AGENCIES FROM PFAS LIABILITY

On May 3, 2023, U.S. Sen. Cynthia Lummis (R-WY) introduced the Water Systems PFAS Liability Protection Act. This bill will provide an exemption for drinking water, wastewater, and stormwater agencies, including contracted services providers, from legal liability under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) for the release of per- and polyfluoroalkyl substances (PFAS) into the environment.

"We're grateful to Senator Lummis for her support of water professionals and water utilities," said Walt Marlowe, executive director of WEF. "A liability exemption will allow utilities to continue protecting public health and not place a financial burden for PFAS cleanup on ratepayers or taxpayers. The economic burden should be borne by PFAS producers, not the public."

Water agencies are passive receivers of PFAS. PFAS enters treatment and collection systems through a multitude of sources. Without the proposed liability exemption, a water agency could potentially be pulled into an enforcement action taken against a polluter, such as a PFAS manufacturer or industrial user. Such actions could lead to extensive unwarranted and misapplied legal and financial burdens for water agencies and their ratepayers.

The mission of water agencies is to protect public health and the environment. In the coming years, part of this mission will be to help clean up PFAS contamination, but agencies should not be held legally and financially liable for the pollution created by PFAS manufacturers and users.

Collaborative Action

As members of the Water Coalition Against PFAS, WEF and other national water associations worked closely with Sen. Lummis to develop this legislation. The Water Coalition Against PFAS has provided an endorsement letter for the bill and looks forward to assisting in its passage by the Senate.

Sen. Lummis is Ranking Member of the Subcommittee on Fisheries, Water, and Wildlife of the Senate Environment and Public Works Committee, which has authority over PFAS matters. Co-sponsors of the legislation include U.S. Sens. Roger Wicker (R-MS), John Boozman (R-AR), Kevin Cramer (R-ND), Pete Ricketts (R-NE), Markwayne Mullin (R-OK), Dan Sullivan (R-AK), and Lindsay Graham (R-SC).

Show Your Support

Use the WEF Water Advocates grassroots advocacy tool to lend your support. Go to wef.org/water-advocates, and send a letter to your Members of Congress in support of the Water Systems PFAS Liability Protection Act to give water agencies liability protection from legal and financial actions taken through CERCLA regulatory enforcement. Contact your member of congress at oneclickpolitics.global.ssl.fastly.net/promo/5F3.

per- and poly-fluoroalkyl substances (PFAS). In February, EPA announced funding made possible by the Infrastructure Investment and Jobs Act to New England states for clean water infrastructure upgrades in the following amounts:

- Connecticut—$28,424,000
- Maine—$17,961,000
- Massachusetts—$78,777,000
- New Hampshire—$23,186,000
- Rhode Island—$15,579,000
- Vermont—$11,390,000

President's Environmental Youth Awards Winners from Massachusetts Announced

The President's Environmental Youth Award (PEYA) was established by the Environmental Education Act of 1970 and recognizes outstanding community-level environmental projects by K-12 youth that promote awareness of natural resources and encourage positive community involvement. Each year, PEYA honors local projects developed by students, school classes, summer camp attendees, and youth organizations to promote engagement in environmental stewardship and protection.

Two students from Massachusetts were chosen to receive the PEYA for their work to solve local and global environmental problems. They are among 15 PEYA winners nationwide recognized for their environmental work.

Aanya Soni—Every Turtle Matters
Award Category: Grade Level K-5, Hopkinton, MA

In her hometown of Hopkinton, Aanya, a fourth-grader at Edward J. Hopkins Elementary School, always hopes to spot one of her favorite animals: the turtle. Unfortunately, too many times she has seen them fall prey to motor vehicles, particularly when they were crossing roadways. As a result of these discouraging sightings, Aanya was determined to stop turtle endangerment, so she began her own wildlife conservation project—Every Turtle Matters.

Through her conservation work, Aanya learned that turtles are scavengers, omnivores, and important contributors of biomass within their ecosystems. Her newfound knowledge inspired her more to defend these creatures, so she wrote to Edwin Harrow of the Hopkinton Conservation Commission searching for a solution that would keep Hopkinton's turtles safe. Because of her initiative, the Conservation Commission—in collaboration with the Department of Public Works—installed turtle-crossing signs in areas of notable turtle activity. It is a straightforward action for an achievable solution: The signs remind drivers to take caution, saving turtles' lives in the process. This is the first time such an action has been taken in Hopkinton, and the event has helped educate residents.

Since 2021, turtle-crossing signs have been placed at critical locations from the spring until the fall (when turtle precautions are most necessary). As time will prove, Aanya's activism will not only save the lives of her favorite animal, but also save the lives of other species, reminding drivers to always consider nature.

Aryan Mago—Together for Waterways
Award Category: Grade Level 6-12, Groton, MA

Outside the classroom, Aryan, a junior at the Groton School, enjoys hiking and swimming in the local watershed. His passion for waterways, and for nature in general, has led Aryan to join local watershed associations, attend awareness movements, and create his own project—Together for Waterways. Aryan was taking water quality samples for Worcester's cyanobacteria monitoring collaborative when he noticed a problem; namely, that Worcester's water bodies are filled with litter, scum, and invasive species. After reviewing EPA statistics, he learned that an astonishing 67 percent of his local watershed is impaired by trash, which excludes harmful interference from algae, nutrient pollution, and invasive plants, each of which has its own startling statistics.

While the Worcester Lakes and Ponds Program was addressing these watershed threats, Aryan knew that community involvement was essential. Thus, he set out to establish an organization that harnesses the creativity, technology, and media skills of savvy students to inform consumers of the consequences of their purchases. So far, Together for Waterways has distributed flyers, provided action toolkits, and brought environmental data to more than 12,500 site viewers. The results have been remarkable: Between 2021 and 2022, plastic litter has decreased by 37 percent, nutrient pollution by 48 percent, and invasive aquatic species in Worcester's water bodies by 23 percent. Aryan's work united Worcester under the power of the consumer for cleaner, more sustainable watersheds.

"These students are making a real, immediate, and significant improvement to the environment they live in," said EPA's Mr. Cash. "They have tackled environmental challenges in their communities and in the world at large, and we thank them for their hard work."

Two Rhode Island Teachers Receive Presidential Innovation Award for Environmental Educators

EPA, in partnership with the White House Council on Environmental Quality (CEQ), has announced the 2023 recipients of the Presidential Innovation Award for Environmental Educators (PIAEE).

Two of the nine national awards were presented to Rhode Island educators. This year's recipients are Margaret Brennan from Portsmouth Middle School in Portsmouth and Gwynne Millar from Exeter West Greenwich High School in West Greenwich.

The PIAEE award was established by the 1990 National Environmental Education Act and seeks to recognize, support, and bring public attention to the outstanding environmental projects performed by teachers who go beyond textbook instruction to incorporate methods and materials that use creative experiences and enrich student learning in K-12 education.

"The extraordinary achievements of Margaret Brennan and Gwynne Millar are remarkable in scope," said EPA's Mr. Cash. "They have tackled relevant, environmental challenges in their communities, inspired students, and helped prepare for a more sustainable, inclusive, and hopeful future. We thank them for their hard work preparing the environmental leaders of tomorrow."

Margaret Brennan

At Portsmouth Middle School, Mrs. Brennan met with the Eastern Rhode Island Conservation District to improve her students' education through outdoor and project-based learning. Through this partnership Mrs. Brennan had access to a 6 ac (2.4 ha) plot of land half a mile (0.8 km) from her school, and she developed an after-school program to teach students about land development with an environmental focus. For eight weeks, she and 25 of the school's students created five areas of interest on this land: a garden area, a high tunnel, a solar energy area, an irrigation area, and a chicken area. After encouraging the students to research information about these areas, the Portsmouth AgInnovation Farm was born, and by June 2022, students completed the construction of each area. Today, the Portsmouth AgInnovation Farm engages with 75 students each year (including high school students) and is preparing to offer educational field trips to students hoping to work on the farm for hands-on learning.

Mrs. Brennan has been sure to balance learning with fun at the Portsmouth AgInnovation Farm. She balances daily chores, for example, with fun activities. Students learn how to fish in the nearby reservoir, drive a tractor, build irrigation systems, and pollinate certain vegetables. Mrs. Brennan also teaches students about soil health, covering everything from photosynthesis to composting to carbon sequestering. Furthermore, as part of her vision to merge sustainability with community, Mrs. Brennan has encouraged students to bring some of the farm's plants to disadvantaged homes to demonstrate how to grow healthy and affordable food in small spaces.

In addition to sounding the alarm about environmental concerns, Mrs. Brennan's farm has united the community by integrating students with various socioeconomic backgrounds and learning styles. For students with social struggles, the farm has helped them find their sense of belonging, and many have newfound confidence that will aid them beyond the farm's borders. In addition, parents are encouraged to participate with their children through their own sustainability plots, and students at Thompson Middle School—an inner-city school with many free- and reduced-lunch students—visit during the summer to learn how to plant and grow their own vegetables.

Mrs. Brennan believes that outdoor learning is the best way to engage her students, and the results at the Portsmouth AgInnovation Farm support that belief. Through her work, students are not only learning how to help the environment but also interacting with other students and their community through unprecedented, hands-on collaboration.

"Connections to nature improve our physical and emotional health while applying critical thinking to our everyday learning. Students learn best when outside and learn to respect nature and our food source. This creates sustainability, as the hope will be that they grow up and work in a field that will help the environment, the community, and the next generation of learners," said Mrs. Brennan. "I am grateful to work with a district that values outdoor education and our community. It is an honor to receive this award, and I would like to thank my administration, my colleagues, my students, and families who have supported my efforts in outdoor education and connections to environmental organizations on Aquidneck Island."

Gwynne Millar

A biology and environmental sustainability teacher at Exeter West Greenwich High School, Ms. Millar sees herself as more than someone who imparts knowledge onto the next generation. Instead, she is a facilitator of learning who encourages students to think for themselves, take risks, and understand that true learning is more than memorization. With more than 30 years of experience, Ms. Millar knows that a true teacher encourages students to face the risk of failure. In fact, science as whole, she affirms, is a series of failures that have pushed humanity forward. This belief is reflected in her teaching style, which is characterized by experimentation and choice boards, and she allows students to choose the problems they hope to solve, all the while supporting their decisions and designs.

Recently, Ms. Millar's class investigated matter cycling—specifically, composting—which is particularly relevant to the problem of excessive food waste accumulating in the state's only landfill. Considering that Rhode Island's landfill is projected to reach capacity by 2035, and with Rhode Island schools generating 5 million lbs (2.27 million kg) of food waste each year, she and her class investigated different composting methods to develop an effective program for the school.

Additionally, Ms. Millar leads an annual research trip to the Cape Eleuthera Institute in the Bahamas to study green sea turtles. She encourages students to experience the life of field scientists as they capture, tag, and collect data on these sea turtles for a national database. Following their experience on this trip, many students decide to pursue environmental science in their college careers.

Ms. Millar is also cognizant of the need to encourage her students to serve communities and vulnerable populations. She does this, for example, through local beach cleanup events and water sampling. She also sponsors kayak trips for families who wish to explore local waterways and essential wildlife. During the holiday season, she has collected Christmas trees to support trout habitats and combat river erosion. Currently, Ms. Millar is seeking grant funds for community programs to eradicate invasive species.

Overall, Ms. Millar's immersive lesson plans encourage students not only to understand the environmental present but also to empower them to create solutions for its future. Her programs combine education and experience, both of which are supplemented by her inspirational approaches to taking risks, involving local communities, and problem-solving with passion.

"Students learn best when allowed to investigate real-world problems and answer questions using inquiry-based and phenomenon practices. Environmental education is the perfect vehicle for this engagement," said Ms. Millar. "It provides students with the building blocks for living a sustainable lifestyle, and hopefully, they will serve as leaders in their communities, motivating others to live a sustainable lifestyle as well. It is an honor to be recognized for this award."

Honorable Mentions: 2023 Presidential Innovation Award for Environmental Educators—Matthew Dransfield and Chris Donnelly

Matthew Dransfield, South Burlington High School, South Burlington, Vermont, sees himself not only as a teacher but also as a trusted mentor. He knows that students learn best when they have a fun, engaging relationship with their teacher, and he is an effective leader and role model. Having a rapport with students has allowed him to encourage them to experiment without a fear of failure, and his optimism replaces their "I can't" with "Try this." This approach has allowed students to explore the topics that interest them and find out for themselves what they are truly capable of achieving. Mr. Dransfield also understands that not all students process information the same way, and his relationship with them allows him to personalize his teachings to suit their needs.

Chris Donnelly, Boston Green Academy, Brighton, Massachusetts, makes environmental justice the cornerstone of his program, giving students the context necessary to understand how environmental issues disproportionally affect minorities, both in Boston and around the world. The school was grateful for Mr. Donnelly's contribution in founding the Environmental Science Career and Technical Education program.


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Small flows, big headaches—upgrades and permit revisions to a public school's wastewater treatment plant

CLAYTON "MAC" RICHARDSON, PE, Licensed Environmental Operations, Windham, Maine

ABSTRACT | The wastewater treatment plant at Regional School Unit #14 in Windham, Maine, serves just three schools within the regional school unit and faces issues of intermittent influent flow delivered to old, often obsolete equipment. The plant consists of influent screening, activated sludge (without primary treatment), and seasonal effluent disinfection using sodium hypochlorite. This article describes the plant upgrades and permit revisions that brought this tiny plant back into compliance with its discharge permit.

KEYWORDS | Small flows, denitrification, oxidation reduction potential control, intermittent flows, oxidation ditch, permit compliance

The Windham, Maine School District acted progressively in 1967 when it installed one of the first oxidation ditch treatment plants in the United States. Over time, however, the plant produced a variable record of treatment and permit compliance. By 2006, the plant suffered from a lack of investment and maintenance. Also, because the treatment plant served only the Regional School Unit #14 (the high school, middle school, and K-3 school on-site) it was subject to extreme cycles of feeding followed by cycles of little or no waste coming in during school holidays and the summer season. No provision had been made for control of aeration, wasting, or equalization of flows. Aeration was provided to the oxidation ditch by a drum aerator with only on–off control. Wasting was accomplished largely through a manually operated valve discharging settled solids slurry to a solids holding tank that was pumped out as needed by a local septic waste hauler. Also complicating operations, the plant was prone to flooding from adjacent ball fields, and the operations building suffered from a leaking roof.

In September 2006, the plant was transferred to a new contract operator. Through a long-term, gradual program of capital improvements and working with the Maine Department of Environmental Protection (DEP), the plant has turned from a record of frequent effluent violations to one of few violations despite its extreme feeding cycles. The capital improvements and permit modifications are all discussed below. Table 1 illustrates the successful improvements in the compliance record.

Table 1. Exceedences of MEPDES permit requirements

Quarter	BOD_5/ $CBOD_5$	TSS	*E coli* & TRC
4Q 2006	6	0	0
1Q 2007	19	0	n/a
2Q 2007	18	3	6
3Q 2007	4	17	10
4Q 2007	11	7	n/a
1Q 2008	27	3	n/a
2Q 2008	27	10	8
3Q 2008	12	7	16
4Q 2008	30	3	n/a
4Q 2020	0	0	n/a
1Q 2021	0	0	n/a
2Q 2021	0	0	1
3Q 2021	0	1	0
4Q 2021	7	8	n/a
1Q 2022	0	3	n/a
2Q 2022	0	0	0
3Q 2022	0	0	0
4Q 2022	0	0	0

TREATMENT PLANT IMPROVEMENTS

The treatment train at Regional School Unit #14 consists of influent pumping, influent sidehill screening, an oxidation ditch, a clarifier, and effluent chlorination. During school days, the plant average flow has decreased from approximately 15,000 gpd (56,775 L/d) in 2007 to about 9,000 gpd (34,065 L/d) today. The diminished flows are most likely from eliminating extraneous flows from ball field runoff, and other stormwater sources. During weekends, holidays, and the summer season, flows have remained relatively stable at the lower value of approximately 1,500 gpd (5,677 L/d). This large variation in the range of flows continues to make operation of the plant difficult. While the flow during the "no school" periods is still significant enough to require continued plant operation, the load coming in is often insufficient to maintain a well-functioning biological treatment system. However, the school district must operate the plant during these low flow/low waste periods, as the plant cannot be shut down completely.


Regional School Unit #14 WWTP


Aspirating aerator

Concurrent with the regulatory changes discussed below, the school district made progressive capital upgrades to the plant to improve treatment performance and permit compliance. Many of these are described as follows:

- 2006 – Purchased an automatic sampler to allow the facility to obtain eight-hour composite samples as required by the Maine Pollutant Discharge Elimination System (MEPDES) permit
- 2008 – Changed the chlorine feed pump from a piston chemical feed pump to a peristaltic pump. This was needed because the effluent pump cycles were running less than 30 seconds, often resulting in anywhere from no hypochlorite injection during the cycle to slug dosing
- 2008 – Replaced the treatment building roof and experimented with animal feed to supplement low influent strength periods and soda ash addition to raise pH depressed by a high level of nitrification
- 2008 – Installed a dissolved oxygen meter in the oxidation ditch
- 2009 – Installed an aspirating aerator. Although an improvement, the aerator experienced frequent plugging from sticks, rags, leaves, and other debris
- 2010 – Installed baffles on the clarifier to reduce solids carry over from floating sludge resulting from periods of denitrification
- 2010 – Installed an on–off timer control for the aspirating aerator
- 2012 – Started adding septage from other school district facilities in a trial approved by Maine DEP. Slug loading issues were experienced
- 2014 – Cleaned out the oxidation ditch during the summer plant shutdown. Accumulated debris was also cleaned out, and the system was reseeded with mixed liquor from a nearby activated sludge plant
- 2017 – After many instances of plugging and the aerator accumulating so much ice that the aerator sank in the ditch, the aspirating aerator was replaced with an alternative brand and eventually mounted on a walkway above the oxidation ditch
- 2017 – Replaced the effluent and return activated sludge pumps, and installed a grinder pump in the waste sludge tank, eliminating frequent tank overflows
- 2019 – Updated instrumentation and controls and upgraded the effluent flow meter
- 2019 – Added 10,000 gal (37,850 L) of flow equalization volume upstream of the influent pump station
- 2020 – Added an oxidation reduction potential (ORP) meter and subsequent ORP control of both aerators

PERMITTING MODIFICATIONS

In addition to the plant upgrades, three changes to the facility permit that have helped improve compliance were granted by Maine DEP over the years.

The first of these permit changes, in 2012, recognized that most of the BOD_5 permit violations resulted from nitrogenous oxygen demand (the conversion of organic nitrogen and ammonia to nitrate). After requiring the school district to add a second aerator (an aspirating aerator/mixer) to the oxidation ditch, nitrification progressed to result in both severe drops in the effluent pH and episodes

1. Dissolved oxygen and oxidation reduction potential probes in oxidation ditch 2. Influent screen 3. Original drum aerator

Table 2. Most recent 12-month data

Monthly avg. *school in*	Monthly avg. *school out*	Maximum day	Minimum day
Flow (gal/day)			
8,500	3,500	19,767	422
Influent $CBOD_5$ (lb/day)			
33.6	8.6	128.3	3.6
Effluent $CBOD_5$ (lb/day)			
1.1	0.1	4.8	0.1
Influent TSS (lb/day)			
62.6	11.7	291	4.2
Effluent TSS (lb/day)			
1.3	0.7	4.3	0.2

of rising solids in the clarifier (due to denitrification). Thus, the permit was revised to measure compliance for carbonaceous biochemical oxygen demand ($CBOD_5$), instead of the more common biochemical oxygen demand test (BOD_5). Important to note, concentration and the corresponding mass limits were numerically reduced. As an example, the average concentration limit was reduced from 30 mg/L BOD_5 to 25 mg/L $CBOD_5$.

The second permit change, in 2017, allowed the school district to add septic tank wastes from other district facilities to the treatment plant influent during periods of low influent loading. Currently the volume of one truck tank (generally 1,000 to 3,500 gal [3,780 to 13,230 L]) is added every 7 to 15 days during the summer. This permit change was granted after numerous fruitless attempts to use dog food and other livestock feeds as supplemental food during these periods.

The third permit change, in 2019, moved the total residual chlorine and *E. coli* compliance points from the sample tap inside the treatment facility to the manhole immediately upstream of the discharge to the receiving stream. This change recognized that the residence time between the start of the facility's effluent pumps and chlorine feed pumps and the flow passing the sample tap is less than six seconds. With such a short reaction time, it became clear that it was impossible to dose the effluent sufficiently to achieve at that sampling point a kill of *E. coli* while simultaneously not exceeding a total chlorine residual below 1 mg/L. The current compliance point uses approximately 0.25 mi (0.40 km) of force main to provide adequate contact time for disinfection.

Table 2 highlights the most recent year of data for the Regional School Unit #14 treatment plant. This demonstrates both the variability experienced and the system's ability to perform well under such changing conditions.

Table 3. Current permit requirements

Mass	lb/day (kg/day)
Monthly average $CBOD_5$	3.1 (1.40)
Daily maximum $CBOD_5$	5.6 (2.54)
Monthly average total suspended solids (TSS)	3.7 (1.68)
Daily maximum TSS	6.3 (2.86)

CONCLUSION

Since 2006, the facility has struggled to achieve stable operation and permit compliance due to the difficulties inherent in operating a small treatment plant experiencing highly variable loading. Early attempts to meet the BOD_5 and TSS requirements by aerating thoroughly were unsuccessful (to completely nitrify and thus leave no available carbon to spur denitrification in the clarifier). These efforts also included years of adding various polymers to the clarifier feed flow in an attempt to control loss of solids during periods of denitrification. Similarly, for around three years the facility added various animal feeds (dog food, sheep food, and goat chow) to the oxidation ditch as replacement food during extended low influent waste periods, such as during summers and winter holidays. These attempts were unsuccessful due either to extreme fat not being fully metabolized or to breakthrough of particulate from various grains. For example, barley, oats, and other grains were often left undigested and floating in the clarifier.

Two changes to the facility and its operation were key to success. The first was to add additional aeration capacity and automatic control of cyclic aeration. Through adding a second aerator and enabling its control through ORP, the facility can now maintain the long biological detention time needed to provide treatment during low-flow periods. With the second aerator controlled by ORP, the facility can now also accommodate the nitrification inherent with a long sludge age and allow denitrification in the oxidation ditch, thus eliminating periods of rising sludge in the clarifier. The second key change was approval to add septage to the facility and install the equalization volume necessary to keep slug loading from shocking the system.

Many smaller upgrades to the facility were also important. These included piping changes to eliminate flexible type couplings on pressurized pipes, replacing pumps to eliminate clogging failures leading to overflows of process tanks, and repairs to the roof and grounds to eliminate excess loads of leaves and stormwater runoff into the process.

ACKNOWLEDGMENTS

Credit for much of the success is given to the school district's facilities director, Bill Hansen, for his unending support of operations, project planning, and ability to secure funding for needed upgrades. For listening, understanding, and being willing to make sensible changes to the operating permit when warranted, I also acknowledge DEP staff: Fred Gallant, Gregg Wood, and Stuart Rose.

ABOUT THE AUTHOR

Clayton "Mac" Richardson is the semi-retired operator of the Regional School Unit #14 wastewater treatment plant along with sundry other part-time projects. His career includes nearly 30 years with the Lewiston–Auburn Water Pollution Control Authority. He holds a class 5 Maine Wastewater Treatment Plant Operator's license and a Maine Professional Engineer's license.

NEWEA
WORKING FOR WATER QUALITY

Small wastewater treatment facilities prove vital to expand and revitalize aging developments

DAVID C. FORMATO, PE, Onsite Engineering, Inc., Franklin, Massachusetts

ABSTRACT | In a post-Covid world, non residential uses such as retail and office space have seen precipitous declines in use, while recreational uses have experienced a noteworthy revival and offer significant redevelopment potential. Private wastewater treatment systems can be pivotal in these redevelopment projects. This article presents technical and permitting approaches to resolve wastewater treatment and disposal limitations critical to the successful redevelopment of the (effectively) abandoned Yogi Bear Campground into the new Pine Lake RV Resort in Sturbridge, Massachusetts.

KEYWORDS | Decentralized wastewater treatment, water resource recovery, groundwater discharge, sewer, Title 5, septic, redevelopment, campground, nitrogen

Over the past decades (until Covid), societal shifts in how people vacation contributed to the steady decline of a past cherished recreational activity—staying at family campgrounds. As a result, many campgrounds have scaled back activities or closed. In past practice, campgrounds often offered campsites or recreational vehicle (RV) sites that also traditionally included bathhouses and/or access to potable water. Given that these sites are rarely in areas with public utilities, these services were provided via on-site public water supply wells interspersed with small cesspools and/or septic systems. From an environmental and water supply protection perspective, this model, at typical campground sizes, is problematic relative to protecting public health and the environment, as untreated nitrogen-laden discharges from these systems can directly affect groundwater quality used for drinking water, and can also accelerate eutrophication of nearby surface water bodies. Massachusetts regulations now prohibit the use of septic systems at flows above 10,000 gpd (37,854 L/d), the equivalent of approximately 110 campsites. Unfortunately, conversion of these old (often abandoned) campsites to resort-style venues with amenities at those lower flow limits is typically not cost-effective and, therefore, these sites become abandoned or fall into disrepair.

The Pine Lake RV Resort was borne out of a vision to return the idea of family RV style camping to New England by attracting the new type of camper: families who are looking for a higher-end experience with resort-style amenities and access to sanitary facilities, often referred to as "glamping." This model has been successful in other parts of the country and, given the void in Massachusetts of family-style campgrounds, it seems this concept could succeed here as well. To make this vision a reality, updating the old "septic system model" of sewage treatment and disposal to align with current regulations would also need to be addressed, since successful site redevelopment would only be realistic if the increased scale of wastewater disposal to make the project economically viable could be addressed. At these scales, either connection into the municipal system or the use of advanced treatment, via a decentralized on-site private water resource recovery facility (WRRF), would be necessary to allow the site to expand to a scale large enough to make it a viable resort-style campground/RV park,

Pine Lake RV Resort in Sturbridge, Massachusetts

while also generating sufficient revenues to justify capital investment in upgrading the wastewater infrastructure. Since a municipal sewer was not available at this site, the development team's willingness to integrate a private on-site WRRF allowed for the property to be maximized relative to site access constraints. Scaling up the site's facilities allowed for the costs to construct this new infrastructure to be recuperated and to make this site a more attractive vacation destination. While this concept seems straightforward, design and permitting of such facilities encompass many aspects of both science and engineering and require professionals with experience and knowledge in geology, hydrogeology, hydraulics, and wastewater treatment engineering.

PROJECT DESCRIPTION

The new Pine Lake RV Resort was conceived for and built at the old Yogi Bear Campground site at 30 River Road in Sturbridge, Massachusetts. As the site was previously a campground and RV park, several on-site septic systems served the property, mainly connected to bathhouses and comfort stations, along with a system connected to the RV onboard chemical toilet dump tanks. Those systems had been in use since the park's inception and created pollution issues at the adjacent Pine Lake, its associated wetlands, and local perennial stream. Based on the site conditions, the Massachusetts Department of Environmental Protection (MassDEP) determined in 2009 that the site was not in compliance with current wastewater regulations as the total aggregate flow generated by all uses at the site exceeded 10,000 gpd (37,854 L/d) and the septic systems were degrading groundwater quality.

At that time, MassDEP determined that the maximum day design flow for the site, based in accordance with 310 CMR 15.000 (the state environmental code, Title 5) should be 35,910 gpd (136,000 L/d), which was based on the 396 camping and RV sites at the campground at the MassDEP defined sewage generation rate of 90 gpd/campsite (341 L/d/campsite). As a result, the previous owner of the park entered into an administrative consent order (ACO) with MassDEP, agreeing either to upgrade the on-site disposal systems to achieve compliance or to connect to town sewer. While Sturbridge had considered and studied extending sewers to this part of town, there was never much appetite to fund these projects, given the limited benefits to most of the town's residents and, as such, a sewer connection was never built. This is all-too-often an outcome in suburban and rural areas when municipal sewer expansions are contemplated, where local resident benefits are limited and it is hard to justify the expense to taxpayers.

Without a municipal sewer extension and given the constraints on septic system use imposed on the campground by MassDEP via the ACO, the Yogi Bear Campground was effectively shut down; declining occupancy and revenues could not support the investment necessary to upgrade the septic systems to a private decentralized WRRF. It was not until a new ownership group saw the value in restoring this site and upgrading it to its business model of high-end, amenity-rich glamping that any serious consideration was given to moving forward with the design, permitting, and construction of a MassDEP-approved WRRF. Based on the new ownership group's internal sizing metrics, it determined the best way to maximize revenue, while providing a more enjoyable and immersive experience, was for the new configuration to have a maximum of 345 sites, anticipating this would generate a maximum flow of 31,050 gpd (118,000 L/d). The reduction in camping/RV sites allowed for those areas to be converted to common amenity spaces. These upscale amenities are reserved for guests of the park and include

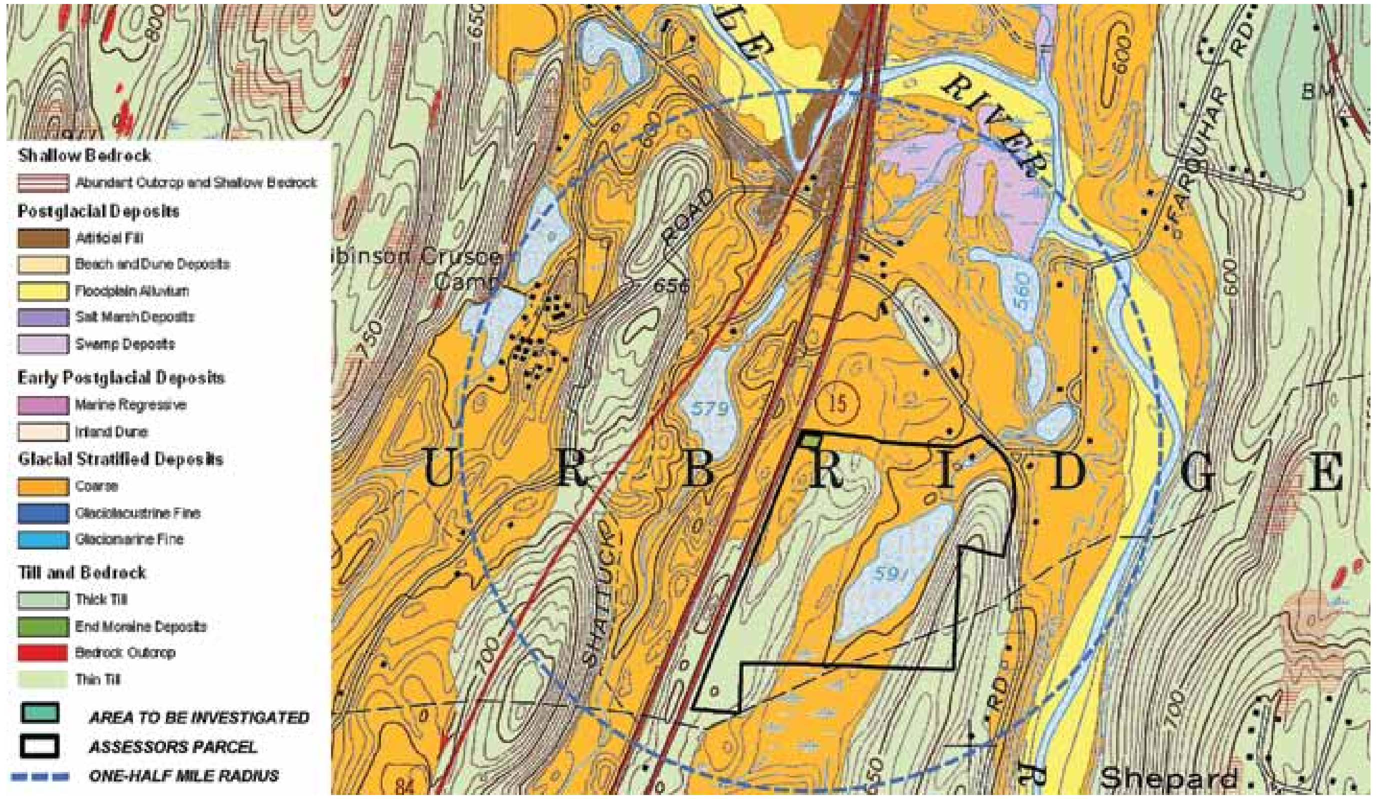

Figure 1. The site includes coarse glacial stratified deposits that were bisected by a geological formation that consisted of shallow depth to bedrock overlaid by a dense glacial till in certain locations

several high-end comfort stations (which have high-capacity laundry machines), an in-ground swimming pool with cabana space, and several large function halls that include game rooms, meeting and event spaces, outdoor patios, playgrounds, and lawn areas for outdoor games, movies, and fire pits.

SITE EVALUATION AND SUITABILITY

This project required a range of science and engineering facets, from testing and modeling of the site's geology and hydrogeology, to sewage collection and pumping to biological treatment of sewage. The critical path in designing the system was first to identify suitable soils on the site for subsurface effluent disposal and then to design, permit, and construct the private WRRF that would produce a treated effluent that meets or exceeds the MassDEP's discharge standards associated with the Groundwater Discharge Permit (GWDP) regulations (314 CMR 5.00).

The first step in this three-phase process involved the assessment of the site to determine soil and groundwater characteristics relative to their ability to successfully accept treated WRRF effluent. The initial phase included a review of soil mapping and historic soil and groundwater information to assess if there were areas of the site that might prove to be preferred for effluent disposal. The next phase included completion of soil test pits and percolation (perc) tests that were witnessed by MassDEP to determine the types and relative depths of the naturally occurring pervious soils at the site and to quantify the perc rates to develop a long-term acceptance rate (LTAR), or loading rate, for the effluent disposal system. The final phase here included groundwater conductivity testing at the site to determine the aquifer and soil permeability characteristics relative to the subsurface geological formation's ability to accept and move the additional water discharged from the effluent disposal system.

Based on historic soil data from the original septic system testing, as confirmed by mapping, the site includes coarse glacial stratified deposits that were bisected by a geological formation that consisted of shallow depth to bedrock overlaid by a dense glacial till in certain locations. (Figure 1, from the Hydrogeological Site Assessment Report[1] submitted to MassDEP in support of the BRP WP 83 [Bureau of Resource Protection Water Pollutant hydrogeologic evaluation] Application.) Given that the more pervious coarse-stratified deposits were along the edge of Pine Lake and along the property boundary, the most logical location to complete further site investigations was along the property line, in the location of a large (abandoned) original septic system, where the previous owner was aware that this location did, in fact, consist of highly permeable sand and gravel deposits.

Using this information, soil test pits and perc tests were completed and witnessed by MassDEP. The process helped to determine estimated seasonal high groundwater (ESHGW) levels, depth to impervious layers or bedrock, and perc test rates to be used in defining the proposed effluent disposal system's LTAR. To complete this work, a series of test pits was excavated to depths of up to 13 ft (3.96 m) with no refusal observed, and the materials encountered ranged from fine to medium sand with pockets of medium to coarse sand. No groundwater or evidence of ESHGW was observed. Perc tests conducted in this area resulted in a rate of less than 2 minutes per in. (mpi) (0.79 min/cm) of water drop in the perc test hole. Given that the soil testing revealed a Class I soil (sands and gravel) and the perc rate was less than 5 mpi (1.97 min/cm), the MassDEP "Guidelines for the Design, Construction, Operation and Maintenance of Small Sewage Treatment Facilities with Land Disposal" (Guidelines)[2] allow for a LTAR up to 3 gpd/ft^2 (122 L/d/m^2) of effluent to leaching area when leaching chambers that are configured in a trench format are used.

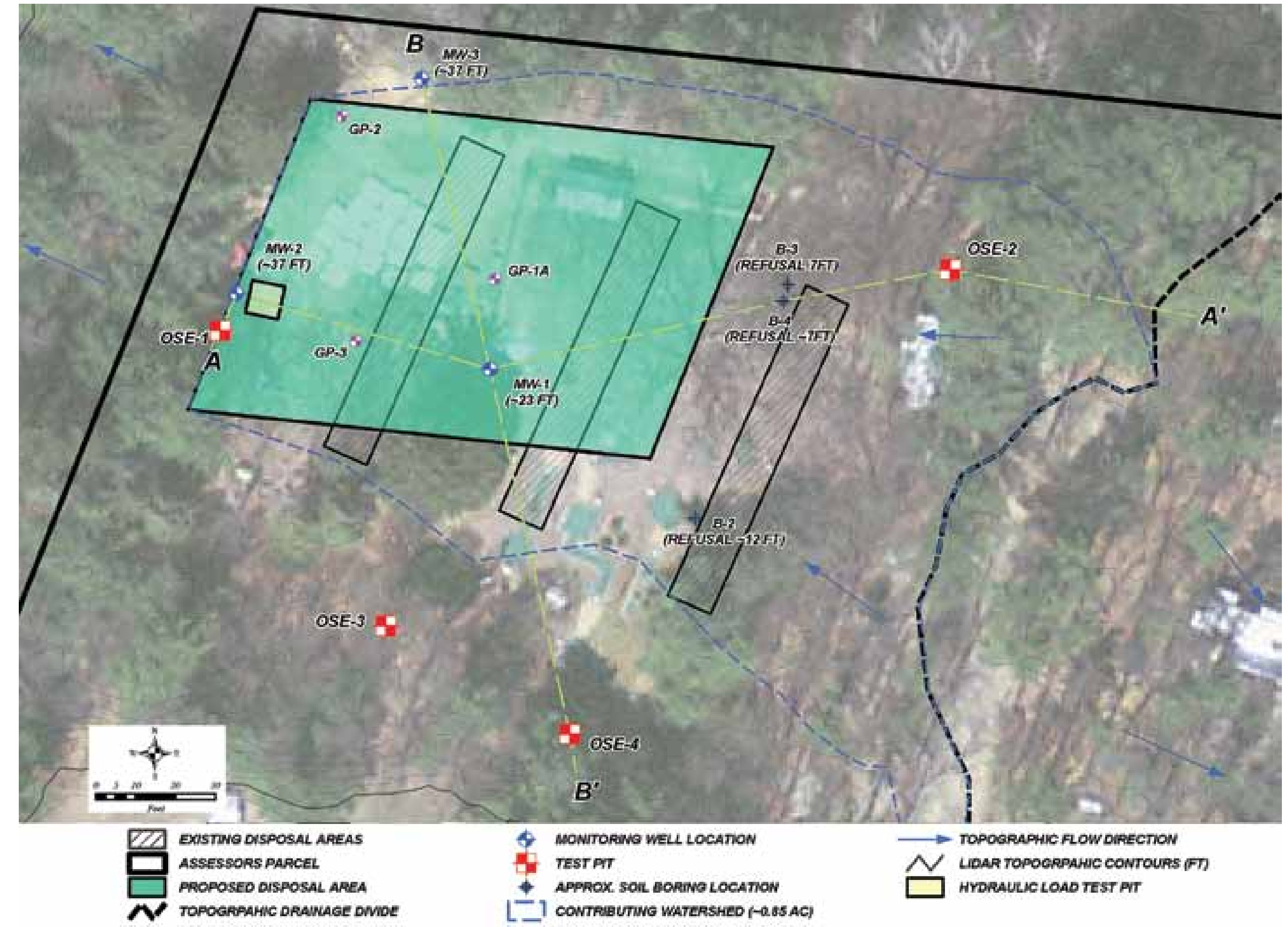

Figure 2. The site was investigated via borings, monitoring wells, and groundwater conductivity testing

Given the high LTAR determined during soil testing, this area of the site was worthy of further investigation and study via borings, monitoring wells, and groundwater conductivity testing. Initially, three 2 in. (5 cm) diameter monitoring wells (MWs 1, 2, and 3) and three soil borings (GP-1A, GP-2, and GP-3) were completed using a hollow stem auger drilling rig, with split spoon samples collected at 5 ft (1.5 m) intervals. (Figure 2, from the Hydrogeological Site Assessment Report[1].) The borings were advanced using a track-mounted hollow stem auger drilling rig and the monitoring wells were completed with 15 ft (4.6 m) of 0.010-in. (0.254 mm) slot screens, filter pack, and bentonite. Materials encountered near the proposed groundwater discharge were glacial outwash deposits consisting of fine to medium sand with some silt.

At monitoring well MW-1, near the center of the existing and proposed disposal areas, the outwash deposits were underlain by a basal till deposit at a depth of approximately 21 ft (6.4 m) and bedrock at a depth of approximately 23 ft (7.0 m). A second round of soil borings (B-2, B-3, and B-4), approximately 75 ft (23 m) east of MW-1, encountered similar unconsolidated deposits and refusal at depths ranging from 7 to 12 ft (2.1 to 3.7 m). Monitoring well MW-2 (~80 ft [24 m] west of MW-1) and monitoring well MW-3 (~ 90 ft [27 m] north-northwest of MW-1) were both advanced to depths of 37 ft (11.3 m) and both encountered a layer of clay and silt at depths of approximately 36 ft (11 m), at which point drilling was terminated. No groundwater was observed during the monitoring well installation. Soil mottling, which is evidence of ESHGW, was observed at monitoring well MW-1 at a depth of approximately 16 ft (5 m) and at monitoring well MW-2 at a depth of 12 ft (3.6 m). Depths to refusal observed at the site suggest that the bedrock surface slopes steeply to the west, which was anticipated based on the surficial geology and bedrock mapping reviewed.

Because the testing program revealed a deep layer of impervious soils in MWs 2 and 3 and no groundwater was in the upper sands and gravel layers, traditional slug testing or pump tests to determine conductivity could not be completed. To adjust the plan, a first round of testing was performed using *in situ* vadose zone borehole permeability tests in borings GP-1A, GP-2, and GP-3. These tests use the method described by Reynolds and Elrick (1985)[3] and were done using a Guelph Permeameter, which works on the Mariotte principle and measures the steady-state rate of water recharge into unsaturated soil from a cylindrical hole of constant water depth. Using this method, the calculated permeability of the unconsolidated deposits at the site ranged from 45.0 to 56.7 ft/day (13.7 to 17.3 m/d) with an average value of 50.9 ft/day (15.5 m/d).

As this testing was completed in an unsaturated highly permeable soil, a second test to further assess the viability of the proposed effluent disposal site was conducted. A small-scale hydraulic load test was configured and run at the site to measure conductivities at a known discharge rate, which would then be able to be scaled to the full discharge in the mounding model calculations.

This testing was completed with a six-day hydraulic loading test. To complete this work, a 10 ft by 10 ft (3 m by 3 m) pit with a depth of 3 ft (0.9 m) was excavated approximately 2.5 ft (0.76 m) east of MW-2 and then back-filled with non-native permeable sand. A garden hose outfitted with a totalizing flow meter and rotometer-type direct read flow meter was directed to the pit and set to a constant discharge rate of 2 gpm (7.6 L/m). Given this flow and the area of the pit, this corresponds to a loading rate of approximately 28.8 gpd/ft^2 (1,173 L/d/m^2). Based on the runtimes recorded during the six-day test, approximately 9,036 gal (34,205 L) were discharged to the pit. At no point during the test was water detected in MW-2, and during that time the pit did not overflow. Since the well screen for monitoring well MW-2 was constructed just above the clay layer observed at approximately 36 ft (11 m) below ground surface, the fact that no water accumulated beneath the pit suggests the unconsolidated deposits were highly permeable and that the clay layer may not be continuous, most likely resulting in recharge to deeper portions of the aquifer.

Based on this approach and the data obtained, sufficient information was available to prepare a full-scale analysis of the proposed groundwater discharge of treated effluent. An analytical groundwater mounding model, using proprietary mounding software, was run for this analysis. The software was used to simulate the leaching areas' actual sizes, orientations, and loading rates in the aquifer, assuming a uniform thickness, permeability, and specific yield. Based on the MassDEP LTAR of 3.0 gpd/ft^2 (122 L/d/m^2) and the maximum Title 5 discharge of 31,050 gpd (118,000 L/d), a leaching area using plastic leaching chambers installed in a trench format was laid out and required a footprint of approximately 14,000 ft^2 (140 by 100 ft) (1,301 m^2 [42.7 by 30.5 m]). As required in the Guidelines, treated wastewater flows of 80 percent of the Title 5-based flow rate (31,050 gpd x 80%) = 24,840 gpd ([118,000 L/d x 80%] = 94,000 L/d) is the loading rate used in the groundwater mounding analysis. This discharge, over the proposed leaching area, results in an actual loading rate of 1.77 gpd/ft^2 (72 L/d m^2). As required, the model simulation of the discharge was done over 90 days in an aquifer with a specific yield of 0.30. Based on these input parameters, the maximum predicted groundwater mound at the center of the discharge was estimated to be approximately 1.8 ft (0.55 m).

These results indicate that the effluent disposal area proposed for this site was, in fact, suitable at the proposed discharge of 31,050 gpd (118,000 L/d) and that the site could accommodate this size discharge and not affect any environmentally sensitive receptors, such as Pine Lake or any nearby water supply wells. Because of the presence of the surficial geological divide, it also appears as if the proposed discharge location is within an aquifer that does not direct groundwater toward Pine Lake or the associated wetlands and stream, thereby allowing for that impaired waterbody to begin to restore itself once the existing septic system discharges located within that area were taken offline. In addition, there are no public water supply wells or MassDEP-defined sensitive receptors (such as priority habitats for rare species or certified vernal pools) within ½ mi (0.8 km) of the proposed discharge in the down-gradient groundwater flow direction and only one private water supply well within ⅓ of a mi (0.53 km) of the discharge. Given the high level of treatment anticipated from the WRRF, the presence of a single private water supply well, when such wells are allowed to be located at least 100 ft (30.5 m) from a septic system discharge, was determined to be of little concern by MassDEP.

SEWAGE COLLECTION SYSTEM AND WRRF

The sewage collection system at the site was a reconstruction of the existing system and used novel approaches to collect RV wastewater. A custom RV sewer connection station was designed and built at each RV pad so that when customers pull in with their RV, there is a dedicated connection point for their waste tank discharge hose in the proper location (based on typical RV configurations) that consists of a specialized 4 in. (10 cm) PVC RV connection port. Each pad also allows the guest to connect into the resort's potable water and electric

systems, which are part of the upscale amenities. For the sites that have trailer cottages, permanent gravity building sewer connections were designed and constructed based on a modular home sewer connection configuration.

Given the topography of the site, where the lowest areas are adjacent to Pine Lake, and a ridge high point runs east–west through the middle of the parcel, the sewer system was divided into three main sections: the upper section, connecting directly into the WRRF sewer system; the main lift station, collecting most of the sewage from the down gradient side of the ridgeline, and the area around the main amenity buildings, which has a dedicated pump system that feeds into the main lift station. The lift stations were configured with submersible duplex pump systems in precast concrete wet wells. This configuration was set up to minimize sewer lengths and depths to maximize collection efficacy by reducing sewage pipe residence time. The raw sewage is directed to the WRRF location where it flows via gravity into the first unit process tank.

Table 1. Influent and effluent water quality aspects

Parameter	Typical RV park influent values	Target effluent values	GWDP permit limits
Total Biochemical Oxygen Demand (BOD)	400 mg/L	<25 mg/L	30 mg/L
Total Suspended Solids (TSS)	300 mg/L	<25 mg/L	30 mg/L
Total Nitrogen (as Nitrogen)	65 mg/L	<10 mg/L	10 mg/L
Nitrate-Nitrogen	N/A	<10 mg/L	10 mg/L
Ammonia-Nitrogen (as Nitrogen)	55 mg/L	1 mg/L	N/A
pH (standard units)	6.5 – 8.5	6.5 – 8.5	6.5 – 8.5
Dissolved Oxygen	N/A	5.0 mg/L	N/A
Oil and Grease	N/A	<15 mg/L	15 mg/L
Temperature	55 F (12.8 C)	N/A	N/A
Alkalinity	275 mg/l	N/A	N/A

The WRRF at Pine Lake, approved under the Massachusetts General GWDP Program, combines advanced aerobic and anoxic biological processes with filtration to accomplish treatment, and therefore produces an effluent far superior to that of the previously used subsurface sewage disposal systems. In addition to the need to provide tertiary level treatment commensurate with MassDEP's General GWDP, the seasonal nature of this site and use also presented unusual challenges in maintaining a biological population during low seasonal flows. Based on these metrics, a pre-packaged advanced biological treatment system was determined to be the most cost-effective and operationally flexible system for this project.

The proprietary treatment system uses a combination anoxic/flow equalization reactor to settle coarse solids and equalize diurnal flows, followed by two fixed sand/media bed systems or biological aerated filters (BAFs) that are operated in both aerobic and anoxic environments to biologically treat and filter the sewage from the site. This system can produce a high-quality effluent while operating over a wide range of hydraulic and organic loadings. The biological growth providing waste treatment develops in response to the imparted load and the very high concentration of organisms within the reactors because of the nature of the interstitial space within the sand/media bed reactors. During periods of low hydraulic or organic loading, the biological growth is concentrated and maintained within the reactor by adjusting the frequency of filter backwashes. However, as the flow (or organic load) is increased, the organisms begin to proliferate, and a larger percentage can remain in the system and be used for high levels of treatment.

This was a critical consideration/design feature for this site because, as one can imagine, the peak flows and loading from the summer vacation season are orders of magnitude greater than the low flows during winter and, depending on the weather, etc., the RV resort could even shut down for a period during the coldest months of the year. For this site and project, the WRRF system has to maintain a base biological population under low or no flow conditions and quickly ramp back up to achieve treatment when the flows increase during the spring heading into peak summer vacation season. With a combination of low flow operational settings and recycle pathways, the Pine Lake WRRF has operated well across these wide fluctuations in seasonal flows to the facility.

In addition to removing organic matter, the treatment system was designed to oxidize influent nitrogen, typically present as ammonia–nitrogen and organic nitrogen forms in raw sewage, converting it to nitrate–nitrogen. Once fully oxidized, the nitrate–nitrogen is converted to nitrogen gas via anoxic denitrification. The anoxic reactor is a constantly submerged sand media bed that creates the necessary anoxic environment for final denitrification. Once complete, this process releases nitrogen to the atmosphere as nitrogen gas, enabling the treatment facility to comply with the stringent GWDP total nitrogen and nitrate–nitrogen limitations shown in Table 1.

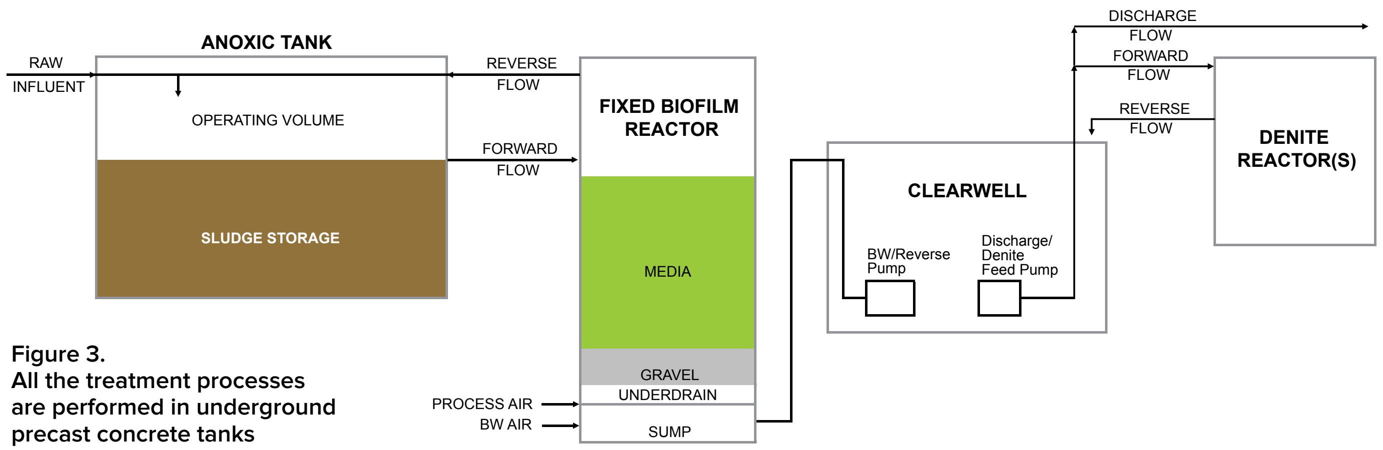

Figure 3.
All the treatment processes are performed in underground precast concrete tanks

As shown in Figure 3, taken from the MassDEP Permit Application Engineering Report, all the treatment processes are performed in underground precast concrete tanks of varying sizes and depths, allowing for a small, unobtrusive footprint for the system. This was also a critical design consideration because, as is often the case with GWDP systems, they are typically sited in and around public areas, whether it be residential apartments, office buildings or, as in the case of Pine Lake, a vacation resort.

As previously noted, the WRRF system uses a modified fixed-film suspended growth batch process, and the sizing of each unit process and the required treatment equipment was completed using standard biological treatment process kinetic calculations as well as the design standards in both Technical Release 16 (TR-16) "Guides for the Design of Wastewater Treatment Works" published by NEIWPCC[4], and the MassDEP design Guidelines[2]. Since the Pine Lake site will receive very different warm and cold weather flows, design kinetics for both scenarios were run in a biological modeling software program, with winter conditions the governing factor in the design, particularly for denitrification. As shown in Figure 4 (this facility's block process flow diagram[5]), the proprietary batch process is configured to perform up to six passes, or batches, per day through the main reactor, which functions as both an up and down flow reactor bed and is operated both in the presence of, and with the absence of, oxygen to simultaneously encourage aerobic CBOD removal and nitrification/ denitrification.

In case nitrate–nitrogen and/or aeration levels in the main reactor are such that full denitrification does not occur before the batch process is complete, a dedicated anoxic (denitrification) reactor was included in the design and also runs in a batch configuration. The operator adjusts the batching sequence of this reactor, whereby any remaining nitrates are passed through the anoxic media bed while a commercial supplemental carbon source is added to encourage final denitrification to permit limits or below.

Once final treatment is complete, the treated effluent is stored in the effluent dosing chamber where it is periodically (up to eight doses per day at full design flow) dispersed into the effluent disposal system, which as noted previously consists of plastic infiltration chambers in a trench format. The system for Pine Lake is sized for the peak day flow of 31,050 gal (118,000 L) spread out over eight doses per day, resulting in each dose being 3,881 gal (14,691 L). The effluent is pumped into a large 14-outlet distribution box, which evenly distributes the flow to each chamber trench, with each trench receiving 277 gal (1049 L) from each dose. The 14 trenches are each 100 ft (30.48 m) long and have a 4 in. (10 cm) Schedule 40 PVC perforated pipe installed along the entire length of the trench, ensuring equal and proper distribution over the leaching area from each effluent dose.

DISCUSSION

As shown herein, suburban and rural areas that do not have access to municipal sewer systems must employ alternative methods of sewage treatment and disposal beyond the traditional septic system for the scale of developments often required in today's economic climate to be viable. This concept is especially applicable to the redevelopment of campground sites, as they are usually in rural areas, away from any public sewer infrastructure and often served by old, out-of-code septic systems. Pine Lake RV Resort demonstrates what can be achieved when a cost–benefit analysis method is used to identify the optimum size of this style of resort relative to the cost of private WRRF systems to support that development program. As the process clearly showed, absent an available connection to public sewer, these redevelopment projects must be sized well beyond the limits supported by traditional (septic system) means of on-site sewage disposal and therefore must be cost-effective while factoring in tertiary levels of wastewater treatment at the site.

Through the MassDEP GWDP regulations and program, there is a well-defined system and process

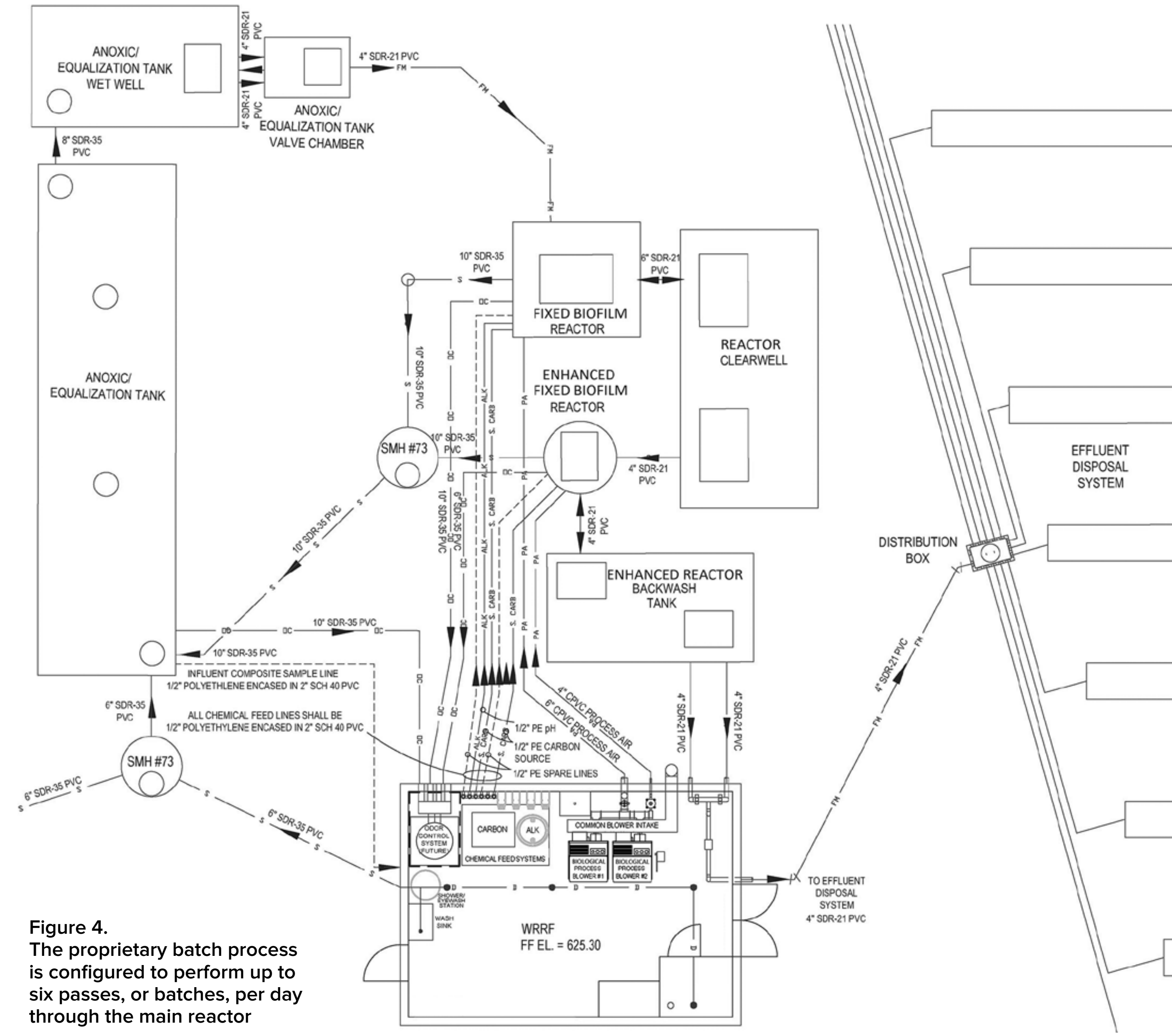

Figure 4.
The proprietary batch process is configured to perform up to six passes, or batches, per day through the main reactor

for the necessary site evaluations, design, permitting, and operation of these types of facilities. While the flows and loadings may seem minor compared to a multi-mgd municipal facility, the sophistication necessary to complete the feasibility analyses for site approvals as well as to achieve the level of treatment required are often more robust that what is typically permitted at larger facilities. While this process can seem both daunting and burdensome for a project of this size, it is important to note that, since the inception of the GWDP regulations some 40 years ago, this industry has greatly matured and the many available technologies and systems can make these decentralized WRRFs cost-effective to design, build, and operate. Over the past 40 years that this program has been in effect, over 1,000 of these systems have been permitted and/or are in use in Massachusetts, many similar in size and type as the Pine Lake WRRF.

CONCLUSIONS

As land development and land reuse changes over time in Massachusetts, it has become ever more important that sites that have been developed are "repurposed" to encourage new housing and recreational uses in suburban and rural areas, while at the same time not requiring the expensive and often controversial expansion of municipal sewer systems. Although there can be an economy of scale with large centralized sewage collection and treatment, the updated science has shown us it is important to limit the amount of water transferred between major basins. To protect low-flow streams, rivers, and sensitive aquifers, efforts must be made to avoid withdrawing groundwater from one basin as drinking water and feeding it into another basin via a surface-water wastewater discharge from a centralized sewage treatment plant.

The size and scale of development required today cannot be supported via on-site septic systems while also protecting public health and the environment, and centralized sewer capacity is not (and will not be) coming to these suburban and rural areas. As such, private decentralized on-site wastewater collection, treatment, and subsurface effluent disposal systems are pivotal in the continued redevelopment of underused and abandoned properties throughout suburban and rural Massachusetts. As more and more GWDPs are issued, development companies are becoming more comfortable with these systems and how they can be effective in redeveloping parcels. Furthermore, as technologies and automation improve and systems continue to become smaller and more efficient, the process is becoming more cost-effective at lower aggregate flows, thereby further providing options for these types of systems in many other types of development and redevelopment projects.

The new Pine Lake RV Resort was born out of a developer's desire to preserve a historic campground site while also providing a new style of camping vacation to an underserved population in Massachusetts. Without the expertise and mechanisms available to cost-effectively allow for the design, permitting, building, and operation of a small privately funded and owned decentralized wastewater treatment facility, these revitalization stories would be few and far between and redevelopment would continue to be concentrated in urban areas, further exacerbating the urban–suburban imbalances that exist.

ACKNOWLEDGMENTS

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ABOUT THE AUTHOR

David Formato is the founding principal engineer of Onsite Engineering, Inc., and has over 25 years of experience in the design, permitting, evaluation, and compliance monitoring of decentralized groundwater discharge wastewater treatment and disposal systems.

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NEWEA
WORKING FOR WATER QUALITY

Performance of DAF thickening for FOG removal in liquid soap manufacturing

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ABSTRACT | A contract manufacturer of soap and skincare products in Vermont needed to reduce its fats, oils, and grease (FOG) load to the local wastewater treatment plant in Essex. To achieve that goal, the manufacturer turned to a pretreatment process technology, dissolved air flotation (DAF), to lower the FOG prior to discharge to the town's wastewater collection system. Results thus far have shown that the DAF system has consistently reduced FOG levels to well below the 100 mg/L limit at the point of discharge, and that this pretreatment system is robust, flexible and reliable, and simple to operate. The time required to operate and maintain this system has also been minimal. In addition to the DAF system, the manufacturer improved zinc removal, residuals management, and foam control at the facility.

KEYWORDS | Industrial wastewater, FOG removal, zinc removal, BOD removal, dissolved air flotation

A company manufacturing bar soap products was founded in 1972 in Quebec, Canada. The business later relocated to Winooski, Vermont, and evolved over the years to become an industry leader in bar soap innovation and sustainability. The company entered the premium natural skincare space in the early 2010s and rebranded. It currently manufactures on a contract basis both bar soaps and liquid skincare products for over 140 name brands worldwide, with 240 employees at its facilities in Winooski (bar soap) and Essex, Vermont (liquid skincare products).

As part of its expansion into the liquid skincare product market, the manufacturer began construction of a liquid soap manufacturing line in warehouse space it purchased in Essex in 2014. A review of wastewater discharge permitting requirements for the town of Essex revealed that wastewater strength in terms of biochemical oxygen demand (BOD) would not be a significant issue. However, a high concentration of fats, oils, and grease (FOG) was a major concern. Essex found, from prior experience with industrial dischargers releasing FOG into its municipal wastewater collection system, that FOG results in significant operation and maintenance costs for the town, primarily related to sewer blockages. Their sewer ordinance now requires that wastewater generated by connected users not exceed 100 mg/L for FOG.

PROCESS SELECTION

Wastewater from the manufacturer's Essex facility consists primarily of washdown of production and packaging equipment between production runs. Therefore, relatively little wastewater, on the order of 2,000 gal/d (7,570 L/d), is generated. Effluent quality analyses obtained prior to design of the pretreatment system showed BOD to average 3,900 mg/L and FOG to average 500 mg/L, with an average pH of about 7.8. While these averages are not out of line for wastewater of this type, the wastewater quality varied greatly, depending upon the product being manufactured at the time.

Since the company contract-manufactures liquid soap, sunscreen, and other skincare products at the Essex location, wastewater quality varies drastically depending on the products made and the size of each batch, which also varies greatly. Figures 1 and 2 show the variability in the wastewater quality between February 2015 and May 2016, before the pretreatment system was commissioned.

Wastewater from the Essex facility was discharged by gravity from the building to a small duplex submersible pump station, which lifted the wastewater to the municipal wastewater collection system. Because of the wastewater's heavy FOG loading prior to implementing a pretreatment system, the manufacturer had to periodically pressure-wash this pump station with a vacuum tanker to remove accumulated grease, which had in the past caused the pump station to fail.

Figure 3 depicts the manufacturing process at the Essex facility and the areas that generate wastewater. At this facility, ingredients for specific soap and skincare products are batched in a heated, jacketed kettle. Once the on-site laboratory has confirmed the product quality and ensured it meets the customer's specifications, it transfers the kettle contents in batches to a tote or mobile kettle where the product can be maintained at a certain temperature while being delivered to the product packaging line for placement into final packaging.

From the product packaging line, individual product units are removed and bundled for packaging and shipping. For each process where the product contacts equipment, a clean-in-place (CIP) system washes and sanitizes the process equipment. Spent CIP system wash water is discharged to a trench drain that passes through the facility. This is the wastewater, containing soap and sunscreen residuals, that is sent to the municipal wastewater collection system as described above.

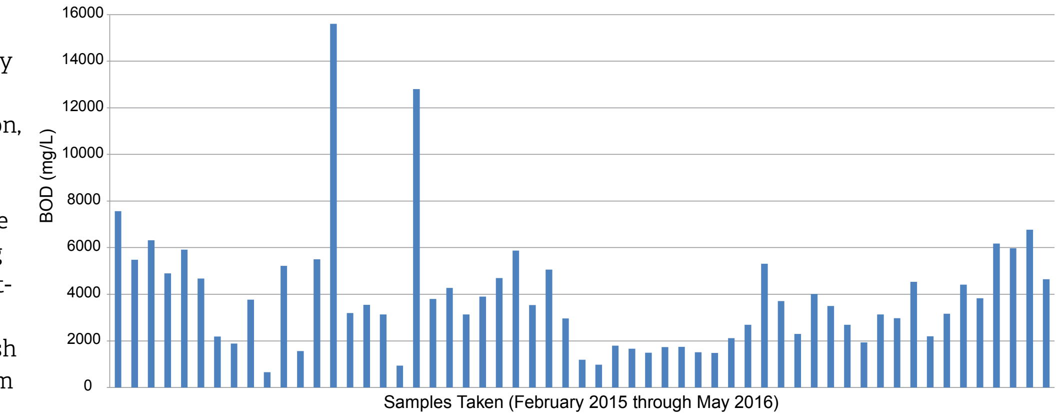


Figure 1. Pre-project influent BOD variability (pretreatment)

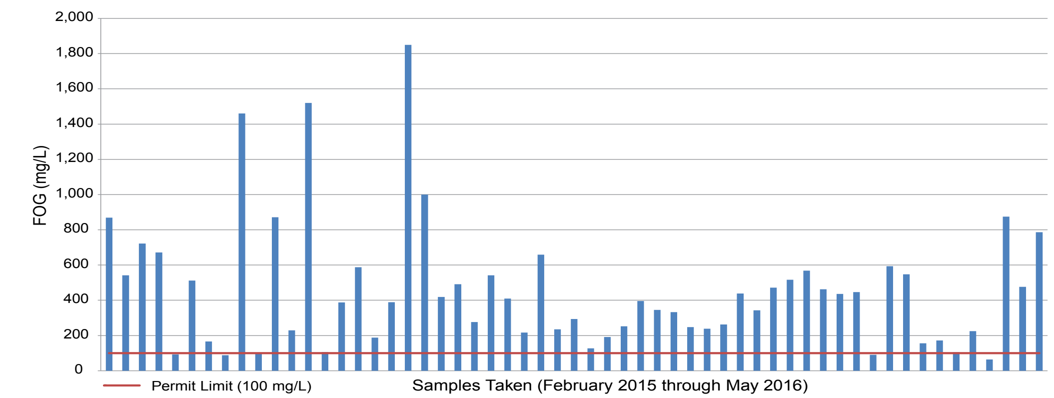


Figure 2. Pre-project influent FOG variability (pretreatment)

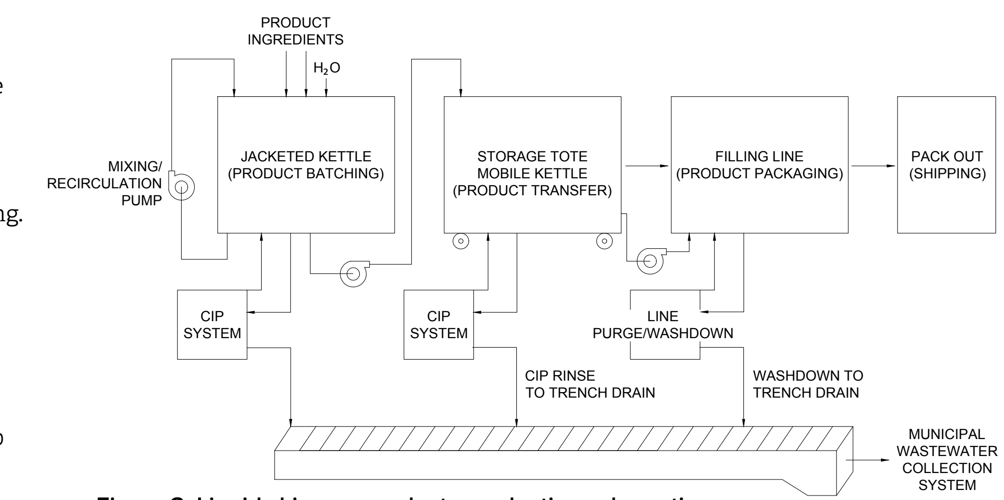


Figure 3. Liquid skincare products production schematic

Based on its experience, the manufacturer anticipated the new liquid skincare production facility would continue to generate much higher concentrations of FOG than the local limit of 100 mg/L. It found that meeting this limit was not achievable using best management practices on the manufacturing line. Therefore, a pretreatment system had to be designed and constructed that would consistently remove FOG to below 100 mg/L prior to discharge to the town's wastewater collection system.

Domestic wastewater from this facility is discharged to the same effluent pump station, but was deemed not to contribute to the FOG issue. The town indicated that, while the manufacturer's average effluent BOD was much higher than in domestic wastewater, this did not pose a problem for the treatment system. It said it could be addressed simply by having the manufacturer pay a high-strength surcharge to cover the additional treatment costs related to the higher organic load. FOG, however, could not be discharged above the permitted limit of 100 mg/L.

In 2015, the manufacturer retained a wastewater engineering consultant to identify and design a

1. Air entrainment system

2. Wastewater storage tanks

3. Basket strainers

treatment process for removal of FOG to both satisfy local wastewater discharge requirements and reduce O&M costs in managing its wastewater. A dissolved air flotation (DAF) wastewater pretreatment system was recommended.

For this project, "process wastewater" was defined as equipment and process area washdown, CIP system discharge, and controlled releases of rejected product. No domestic wastewater was included in the pretreatment system influent load.

PROCESS DESCRIPTION

Since FOG was the target constituent for removal and tends to have a lower specific gravity than water, causing it to float to the surface, DAF was the most efficient means of removal. DAF is a wastewater treatment process that can clarify wastewater by removing suspended matter such as oils or suspended solids. It does so by dissolving air in the water or wastewater under pressure and then releasing the air at atmospheric pressure in a flotation tank. The released air forms tiny bubbles that adhere to the suspended matter, causing the suspended matter to float to the surface of the water where it may be removed by a mechanical skimming device. For this manufacturer, the feed water to the DAF tank is typically dosed with a coagulant (such as ferric chloride or aluminum sulfate) to coagulate the colloidal particles and give them more surface area for the air bubbles to cling to. Flocculants (polymers) also help remove coagulated particles to improve process efficiency.

Manufacturers use different methods of entraining air into the wastewater. Traditionally, a portion of the clarified effluent water leaving the DAF tank is pumped into a small pressure vessel (called the air drum) into which compressed air is also introduced. This results in saturating the pressurized effluent water with air. The air entrainment system used by this manufacturer is based on equipment that uses air induction via a venturi located on the downstream side of a recirculation pump to saturate recirculated wastewater with air. Air flow is controlled with a rotameter and needle valve for system optimization. As the wastewater is pumped through the venturi, the cone-shaped throat constriction increases the fluid velocity, dropping its pressure and producing a partial vacuum. This partial vacuum pulls ambient air into the wastewater stream, and as the wastewater leaves the constriction, its pressure increases back to ambient. This results in the same air saturation effect, but it occurs more efficiently (Photo 1).

Because of the facility's wide variability in wastewater quality and the small volume of wastewater discharge, the design is based on batch treatment. This allows for better process control and provides a consistent wastewater quality entering the pretreatment system to enhance system effectiveness. To achieve this, the design includes two 10,000 gal (37,854 L) polyethylene wastewater storage tanks, sized to allow for several days of wastewater storage, and a pH adjustment system (Photo 2).

Process wastewater collected throughout the building is pumped through fine 0.1 in. (2.5 mm) basket strainers (Photo 3) before entering the storage tanks. These strainers remove plastics and debris that could adversely affect the pretreatment equipment and its performance.

Once enough wastewater accumulates to completely fill one of the storage tanks, this tank is hydraulically isolated, a mechanical mixer homogenizes the tank contents, and wastewater is recirculated through the tank using a centrifugal pump. A 2 hp (1.49 kw) mechanical mixer is suspended on a structural steel platform above each tank. This platform, shown in Photo 2, allows for mechanical mixing, which is more efficient and less costly than pumped mixing. The platform is designed to withstand the dead load of the mixers as well as torsional loads from shaft rotation and motor start-up. It also withstands axial loadings from the shaft resulting from the mixer's impeller action.

Four manually actuated valves allow one pH adjustment skid (Photo 4) to serve both wastewater storage tanks, and wastewater from the tanks is recirculated by a pH recirculation pump. A programmable logic

DAF THICKENING FOR FOG REMOVAL

4. pH adjustment skid

5. Chemical feed system

6. Solids removal in DAF

controller (PLC)-based control system automatically paces injection of acid (H_2SO_4) or caustic (NaOH) as necessary into the recirculation line to bring the pH into the range determined by the operator to facilitate coagulation using the selected chemical (Photo 5).

Once the pH stabilizes in the correct range, transfer pumps feed the conditioned wastewater to a coagulant and flocculant (polymer) injection system consisting of an injection point and length of serpentine piping to allow for sufficient contact between the coagulant, polymer, and suspended solids. Wastewater then enters the DAF unit where the fine bubbles described previously float the coagulated solids to the surface of the tank for removal by a mechanical skimmer. Skimmed solids drop into a sump at one end of the DAF (Photo 6). From there, they are pumped into storage vessels via an air-operated diaphragm pump. Typical solids concentrations from this process are 2 percent to 3 percent total solids by weight. The design included reuse of 400 gal (1,514 L) polyethylene totes (first used to deliver raw materials for the skincare products) as temporary sludge storage. Once full, these totes are loaded onto trucks and taken to the local municipal wastewater treatment facility where the sludge is processed through the facility's anaerobic sludge digestion system. This system has since been enhanced and is described below.

Clarified effluent from the DAF discharges by gravity to an 8 in. (20.3 cm) diameter gravity sewer that conveys effluent from the pretreatment room to the duplex wastewater pump station, where it is pumped to the municipal wastewater collection system. DAF discharge is metered using an inline magnetic flow meter that transmits a signal back to the PLC in the process control panel (PCP). The PLC provides data logging for flow (Photo 7).

Because this facility's process wastewater consists primarily of soap residuals, foaming was anticipated to be a problem. Therefore, an anti-foam compound is injected into the wastewater collection sump upstream of the two wastewater storage tanks.

OPERATION

As noted above, the concentrations of FOG in the wastewater can vary greatly depending on the products in production when the process equipment is cleaned. As each 10,000 gal (37,854 L) storage tank is filled, it is isolated and mixed, and the pH adjusted. Once the pH of the tank volume has stabilized, the system operators perform jar testing to determine optimal coagulation and flocculation chemical feed rates. Jar testing is done with four 1,000 ml beakers, and samples are drawn from a big sampling tub behind the pH adjustment skid. Wastewater samples are agitated, and different concentrations of coagulant are injected into each sample. Once coagulation is complete and a pin flock has formed, the operators note the coagulant dose rate for the sample that has generated the best pin flock. If a pin flock does not appear in any of the four samples, the tests are repeated at different dosage rates.

Once the coagulation test has been completed, the selected sample—the one with the best pin flock formation—is agitated gently, and different concentrations of flocculant are added to each beaker (Photo 8).

7. Process control panel

8. Jar testing (l to r): raw wastewater, flocculated wastewater, and final effluent

9. Dewatering bag and tote configuration

The sample with the best flocculation particles—the size of ¼ to ½ the size of a marble—is selected for final testing and verification. Using the dosage rates and visual information from the jar testing, the operators can program optimal coagulant and flocculant feed rates for the batch of wastewater to be processed. These feed rates are programmed into the PLC, and the treatment process is initiated. Wastewater is pumped from the isolated storage tank to the DAF unit through a chemical injection manifold. Coagulant and flocculant are injected as the water flows past the injectors, and mixing takes place as the wastewater flows through serpentine piping suspended on the side of the DAF unit. This process is repeated for each 10,000 gal (37,854 L) batch and has proven efficient. Over several years, the system operators have noticed similarities in wastewater quality from specific product runs, giving them an edge when conducting the above jar testing procedure and allowing them to optimize dosages more quickly.

The controls for this pretreatment system incorporate the following interlocks to promote efficient operation and extend the operational life of the equipment:

- When liquid level in the storage tanks runs below 30 percent, the mixer will cut off
- When liquid level in the storage tanks runs below 4 ft (1.2 m), the transfer pump will cut off
- The anti-foam pump shuts down when the pH recirculation pump is not running
- Coagulant and polymer feed systems run when the transfer pump is running, shutting down when the transfer pump is off
- If chemical feed pumps are running, but no forward flow is recorded, all chemical feed pumps will shut down

SUBSEQUENT IMPROVEMENTS

After having operated this equipment for about one year, the manufacturer's operations staff identified and implemented optimization strategies for the installed system to improve performance and address additional wastewater quality issues. These improvements are zinc removal, residuals management, and an anti-foam feed.

Zinc Removal

Sunscreen, one of the products produced at this facility, contains zinc, concentrations of which can reach 22 mg/L during production runs. While the municipality did not note this as a constituent of concern, the manufacturer recognized an opportunity to reduce this constituent with minor adjustments to the pretreatment system.

Zinc enters pretreatment in a stable aqueous form, making it unable to form as a solid. By elevating the pH to just above 8.0 in the wastewater storage tank, the manufacturer can form a zinc hydroxide (an insoluble precipitate) that can bind with coagulated FOG particles and be removed effectively by DAF. Operational data from the manufacturer shows that this process, which was not part of the original design intent, can achieve zinc removal efficiencies more than 90 percent. *Note: Because copper forms a hydroxide ion at a similar pH, copper is also removed from the wastewater through this process, with a similar removal efficiency.*

Residuals Management

Sludge collected from the DAF was originally pumped with an air-operated diaphragm pump to a chemical tote repurposed for temporary sludge storage. The liquid sludge was then loaded onto trucks for transport to a municipal wastewater treatment facility with anaerobic digesters and fed through that facility's solids stream process. The manufacturer found that the sludge totes occupied valuable floor space in the process room that could be otherwise utilized. In addition, it was looking for a way to reduce disposal costs, as most of the material being disposed of was water (sludge was averaging less than 2 percent solids).

The manufacturer's operations staff researched low-cost options for sludge dewatering and found a materials management company that produced a bulk materials bag made from a filter cloth with a proprietary weave to promote solids retention while allowing water to pass through. The bag manufacturer noted that the bag would deflect when loaded, and that the solids retention efficiency might not be consistent. When loaded to the maximum weight of 2,205 lbs (1,000 kg), a 35 in. (89 cm) square bag may expand to between 40 and 42 in. (102 and 107 cm), a 20 percent expansion.

To address bag stretch and weave deflection, the manufacturer cut the top of a 400 gal (1,514 L) polyethylene raw product tote and placed a drainable bulk bag inside. The tote's sides support the bag to minimize fabric deflection and maximize solids retention. This innovative approach has been effective. Water that passes through the filter cloth drains out through a bung at the bottom of the tote into a hose to the trench drain and back to the pretreatment system influent sump. This passive dewatering system results in a block of sludge that can be disposed of as solid waste rather than liquid waste. Because of the significant volume reduction through this process, waste disposal takes place far less frequently, reducing both transportation and disposal costs.

Photo 9 shows the bag and tote configuration. Photo 10 shows the consistency of the dewatered sludge, with the sludge color varying depending on the dyes used in product manufacturing.

Anti-foam Feed

As noted previously, an anti-foam agent was injected into the process wastewater sump to be mixed with wastewater before transfer into the 10,000 gal (37,854 L) storage tanks. The purpose of the anti-foaming agent was to prevent foaming within the storage tank while the mixer was in operation. The manufacturer found that the performance of the anti-foaming agent was enhanced the longer it was in contact with the wastewater. As a result, the chemical injection point for the anti-foam agent was moved upstream in the wastewater collection system to be as close to the packaging equipment as possible. Mixing between the anti-foam agent and the wastewater occurs as the wastewater passes through the trench drain. This also addressed occasional foaming in the trench drain system.

PERFORMANCE

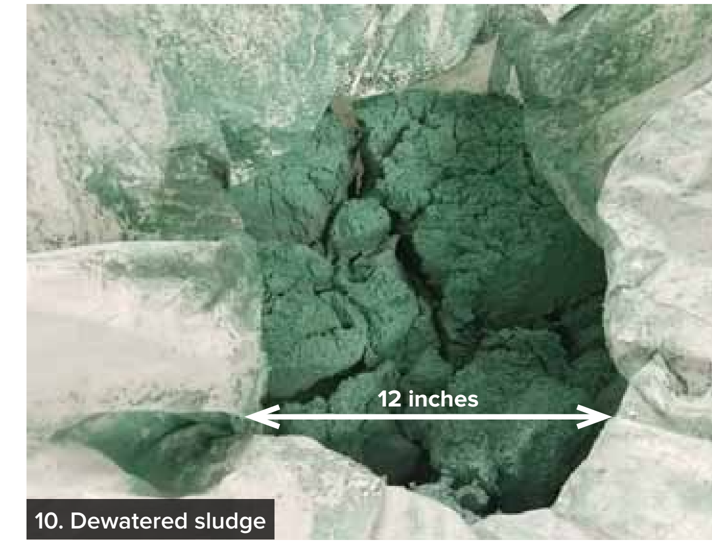
Immediately upon start-up, effluent water quality improved dramatically. After the typical start-up effluent quality variations stabilized, and the operators optimized the system, the pretreatment process consistently achieved FOG levels well below 100 mg/L. Table 1 summarizes data from the manufacturer collected over the past two years. Influent and effluent parameters represent an average of operational data collected during this period, and removal efficiencies were calculated using these averages.

Table 1. DAF performance

Parameter	Influent (mg/L)	Effluent (mg/L)	% Removal
FOG	413.50	12.80	96.9
Zinc	11.93	0.85	92.9
Copper	0.55	0.04	92.2
BOD_5	1,246.67	370.00	70.3

CONCLUSION

The bar soap and liquid skincare product manufacturer reports that the DAF pretreatment system is robust, flexible, and reliable. The operators find that the system has been simple to operate, and that the time commitment for operation and maintenance has been minimal.



10. Dewatered sludge

In addition to the manufacturer exceeding performance goals for FOG removal, it consistently removed most of the dissolved zinc in their wastewater and cut the BOD load in the effluent by more than half, resulting in much lower monthly surcharges from the town. The manufacturer has also improved the residuals management system, reducing both the volume of residuals for disposal and the disposal costs. Adjustments for foam control also improved foam management in the trench drain system and the wastewater storage tanks.

In 2018, the manufacturer purchased an adjacent property with open manufacturing space, and is installing a second liquid skincare manufacturing facility and another similar pretreatment system.

ABOUT THE AUTHORS

- Michael Smith, PE, is a senior technical leader at Weston & Sampson in Waterbury, Vermont. He earned his Bachelor of Science in Environmental Engineering Technology from Norwich University, and has 35 years of engineering experience in wastewater facilities planning, industrial wastewater pretreatment, process design and control, systems evaluation, and construction. He also has a background with anaerobic digestion and bioenergy production. He has supported industrial wastewater pretreatment projects throughout New England.
- Josh Mandell is the engineering manager at Twincraft Skincare in Vermont. He earned his Master of Science in Mechanical Engineering from the University of Vermont and has been working in various industries from clean energy to manufacturing for the last 15 years. He specializes in project management, pilot plants, capital projects, and manufacturing engineering.
- Rachel Greene is a manufacturing engineer at Twincraft Skincare in Vermont. She earned her Bachelor of Science in Chemical Engineering from the University of Utah and has been working at Twincraft for four years. Her responsibilities include managing and overseeing the operation of the wastewater pretreatment system at its Essex, Vermont production facilities.

NEWEA
WORKING FOR WATER QUALITY

Wastewater planning and design to address environmental and economic objectives in Littleton, Massachusetts

KARA M. ROZYCKI (JOHNSTON), PE, PMP, CDM Smith, Boston, Massachusetts

ABSTRACT | Littleton, Massachusetts, a town in north central Massachusetts, has historically relied primarily on septic systems for its wastewater management. Recently, however, the town has implemented projects to develop a municipal collection system and wastewater treatment facility. With a desire for economic growth, it performed a needs assessment, created sewer use regulations, and designed a centralized treatment facility, a collection system, and an effluent recharge site. This project highlights the need for communities of any size to allow for evolving interests, needs, and financial responsibilities.

KEYWORDS | Wastewater, needs assessment, collection system, membrane bioreactor, groundwater effluent recharge, regulations

Littleton, Massachusetts, has a population of around 10,000 people and relies primarily on septic systems for wastewater management. A few privately owned package treatment plants exist, as does a small package plant treating municipal flow of approximately 4,000 gpd (15,000 L/d) that is managed by the Littleton Electric Light and Water departments. The Littleton Water Department (LWD) manages around 80 mi (130 km) of water main, supplying water to around 3,300 customers.

With a desire for economic growth, Littleton had special legislation enacted creating the Littleton Common Sewer District, proceeded with a full town-wide needs assessment led by LWD, created sewer use regulations, and began design of a centralized wastewater treatment facility, a sewer collection system expansion, and a new effluent recharge site.

WASTEWATER NEEDS ASSESSMENT

The purpose of the wastewater needs assessment was to develop a recommended wastewater management program that incorporates planned economic development as well as restores areas negatively affected by on-site septic systems. The recommended program will be a road map for the town's wastewater management that can be modified appropriately to meet the needs of the community as they evolve.

A thorough environmental analysis was performed for the entire town. This was done to ensure that areas that exhibit negative environmental impacts due to on-site septic systems or other environmental factors, referred to as Areas of Concern, would be considered in the wastewater management program while also accommodating areas of desired economic smart growth.

The environmental concerns reviewed in the project included impact to drinking water Zone II areas, nitrate in wells, impaired water bodies, poor soils for infiltration, small lots that may inhibit the sizing of septic systems, high groundwater, flood zones, and wetland proximity.

Littleton has also extensively evaluated its economic areas through various planning efforts, including the 2017 Master Plan. Planning areas where growth and economic development or redevelopment are desired, along with future housing and residential development, have been identified,

Table 1. Water quality Areas of Concern and planning areas

	Zone IIs	Nitrate in Wells	Impaired Water Body	Poor Soils	Small Lots	High Ground-water	Flood Zone	Wetlands	Planning Area
Primary Water Quality Areas of Concern									
Beaver Brook	✓	✓	✓	✓		✓	✓	✓	✓
Beaver Brook Connection	✓						✓	✓	
Long Pond			✓		✓				✓
Mill Pond	✓		✓	✓	✓	✓	✓	✓	
Taylor Street Industrial Area	✓			✓		✓	✓	✓	✓
Spectacle Pond	✓	✓	✓						
Secondary Water Quality Areas of Concern									
Colonial Drive			✓	✓		✓	✓		
Forge Pond									
Fort Pond					✓	✓			
Grist Mill Road						✓			
Mill Pond East	✓		✓			✓			
Planning Areas Outside of Water Quality Areas of Concern									
Industrial Park Planning Area									✓
Littleton Common and Great Road Planning Area	✓								✓
Littleton Depot Planning Area									✓
MBTA Station Planning Area									✓
Taylor/Foster Street Planning Area									✓

all while protecting the town's historic, cultural, and natural resources. For each of these planning areas, the Master Plan discussed the integration of infrastructure needs. In some cases, the need for sewers was specifically stated to allow for planned development.

The water quality Areas of Concern and planning areas identified in these analyses were compared to rank locations of the highest need based on weighted criteria as shown in Table 1.

Weighting factors used in the ranking criteria reflect the town's needs. The setting of the weighted values per ranking criteria allowed for the inclusion of Littleton stakeholder perspectives, priorities, and experience. A 50 percent split between environmental and economic planning criteria was selected. As shown in Table 2, the eight environmental criteria account for 50 percent of the total weight, and the one economic planning criterion accounts for the remaining 50 percent.

The prioritized list of Areas of Concern generated through the weighted rating matrix was a basis for the phasing plan for Littleton's wastewater management program. The recommended phasing plan for sewering included initial flows of around 100,000 gpd (378,500 L/d), with a future expansion to 175,000 gpd (662,500 L/d).

Expanding the small package facility at Littleton High School would not be feasible to manage the full phasing plan recommended from the needs assessment. The needs assessment concluded

Table 2. Ranked criteria

Criteria	Secondary Weighting Factors
Zone II	10
Nitrate in Wells	3
Impaired Water Body	10
Density/Lot Size	8
Soils	3
High Groundwater	10
Flood Zone	3
Wetlands	3
Economic Planning	50
Total	**100**

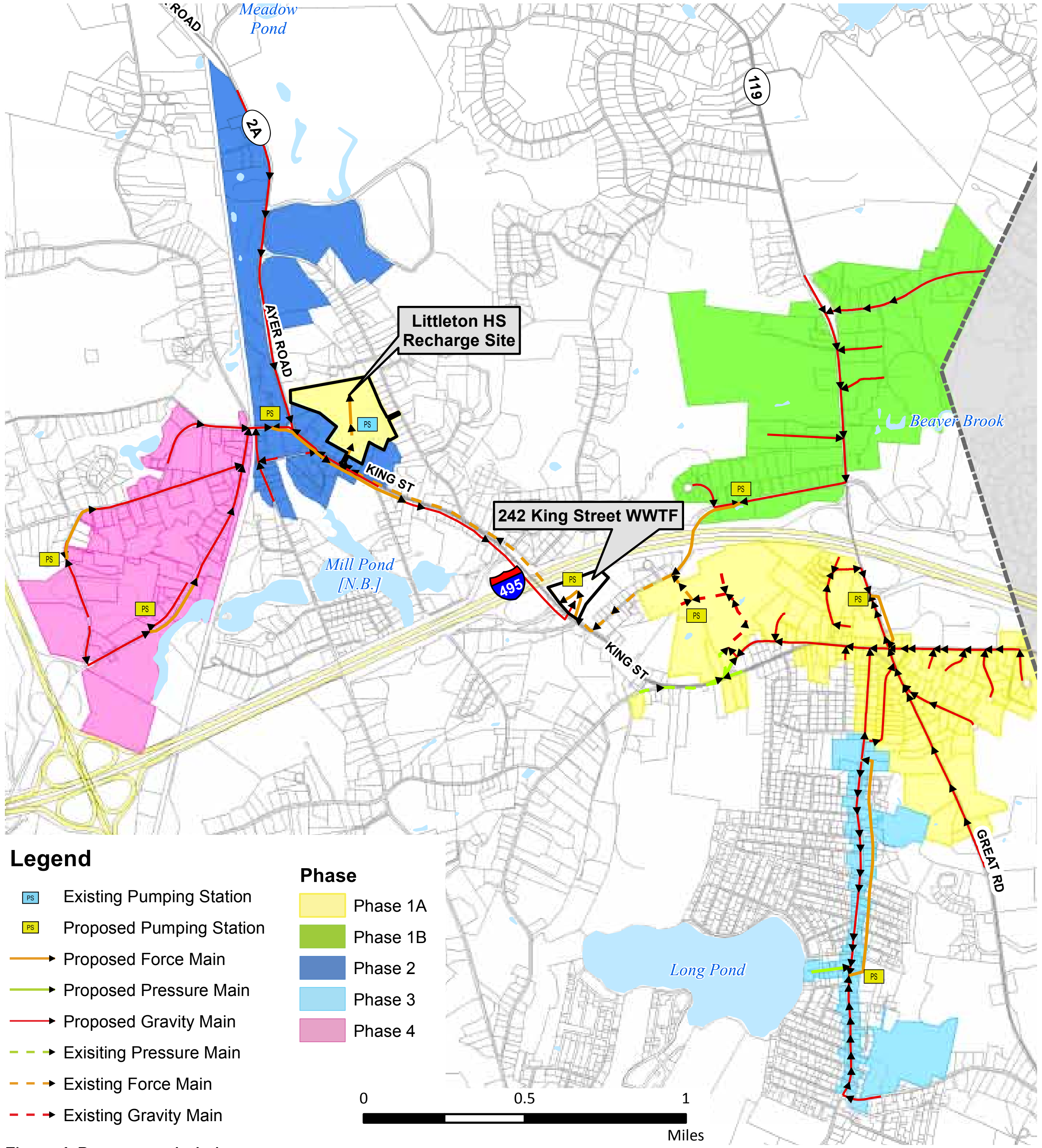


Figure 1. Recommended plan

with recommending a centralized water resource recovery facility (WRRF). Various technologies were reviewed, and a membrane bioreactor (MBR) was recommended due to its high-quality effluent and flexibility to expand in the future.

A graphic information system site-screening analysis was performed to identify a location for the future WRRF with criteria including parcel size, drinking water zones, flood hazard areas, wetlands, priority habitat areas, proximity to service area, proximity to highway, and more. LWD selected a parcel at 242 King Street and purchased the site from a private landowner.

Planning-level costs were developed for the recommended plan shown in Figure 1, and LWD proceeded with the design of Phase 1.

DESIGN OF NEW WATER RESOURCE RECOVERY FACILITY, COLLECTION SYSTEM, AND EFFLUENT RECHARGE SITE

Following the completion of the needs assessment in 2020, Littleton began the design of three packages—WRRF, collection system and water main improvements, and groundwater recharge site—that required close coordination due to their direct integration with each other.

WRRF

Owing to the substantial newness of the collection system, the preliminary design determined the projected WRRF flows using water use data and projected development. The pandemic significantly affected the town, causing a shake-up in town development and increasing the future buildout flow at the WRRF to 290,000 gpd (1.098 ML/d). Projected loadings were determined using industry and guideline loading values. Preliminary design also required the selection of the MBR system and vendor on which the final design of the WRRF would be based. In collaboration with LWD, the Massachusetts Chapter 30B Request for Proposal process was followed. The review of the proposals considered technical evaluation criteria as well as capital and operations costs. In addition to supplying the equipment to be purchased by the future WRRF contractor, the selected vendor would provide design, start-up, and commissioning services of the MBR system.

The WRRF design was a multi-discipline effort to develop a new treatment facility at a completely undeveloped site. Although the site was large, constraints had to be worked around, including wetlands and flood zones. The design flow was carefully considered to allow for an initial facility size that could be expanded to accommodate future buildout flows. The WRRF design, shown in Figure 2, includes an influent equalization tank, influent pumping station, process building, bioreactor tanks, odor control, effluent pumping station, and generator and transformer, along with a new access driveway and flood storage/stormwater basins. The process building design included a pre-engineered metal building to house the membrane tanks, permeate pumps, blowers, electrical room, influent screening room, chemical storage/feed, and restroom.

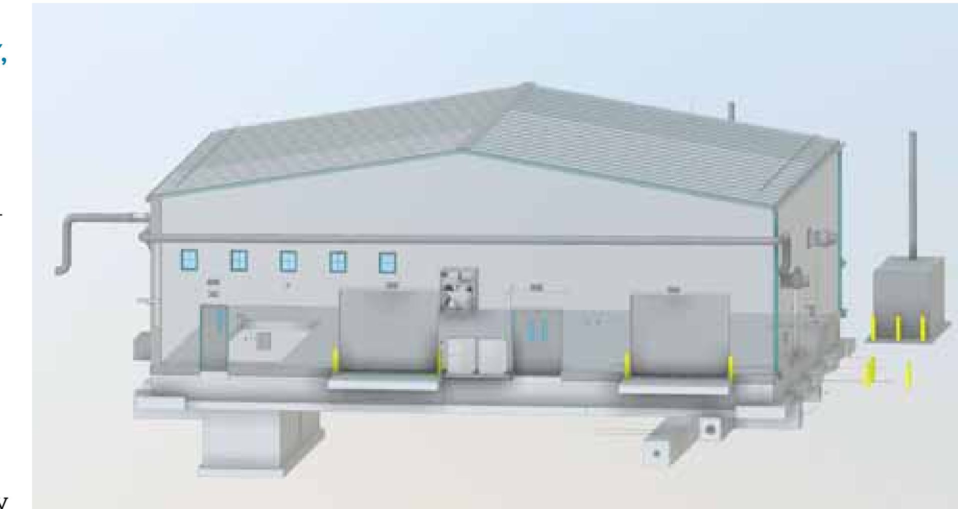


Figure 2. WRRF process building design model

COLLECTION SYSTEM

The first phase of the collection system design leveraged the small municipal sewer system that LWD manages and included system expansion to collect wastewater flow from private customers. The design, shown in Figure 3, included the following:

- 9,250 linear ft (2,820 m) of 8 to 18 in. (20 to 46 cm) polyvinyl chloride (PVC) sewer pipe
- 9,000 linear ft (2,740 m) of 4 to 8 in. (10 to 20 cm) cement-lined ductile iron force main
- 950 linear ft (290 m) of 2 in. (5 cm) low-pressure sewer pipe
- New submersible pumping station
- Upgrades to submersible pumping station

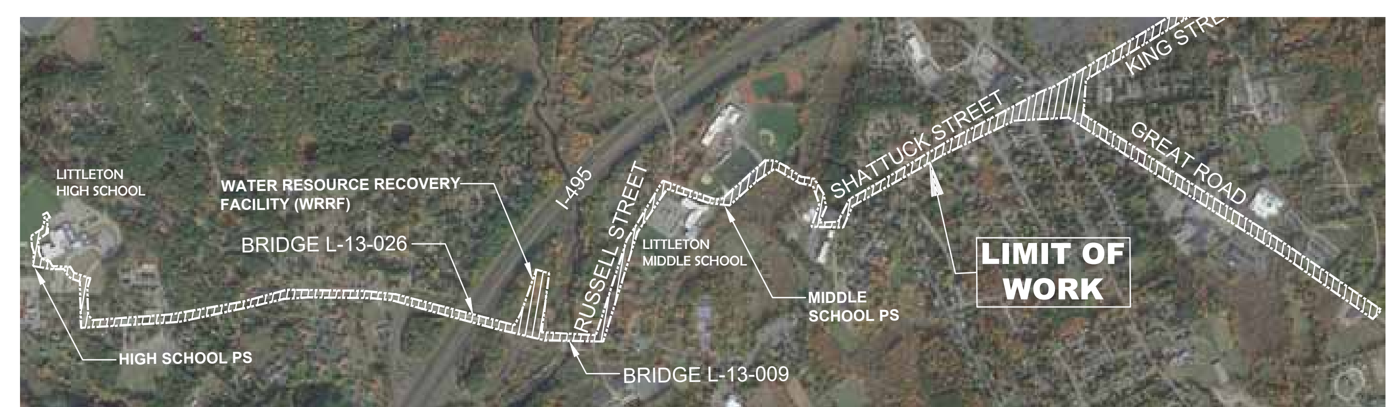


Figure 3. First phase of the collection system

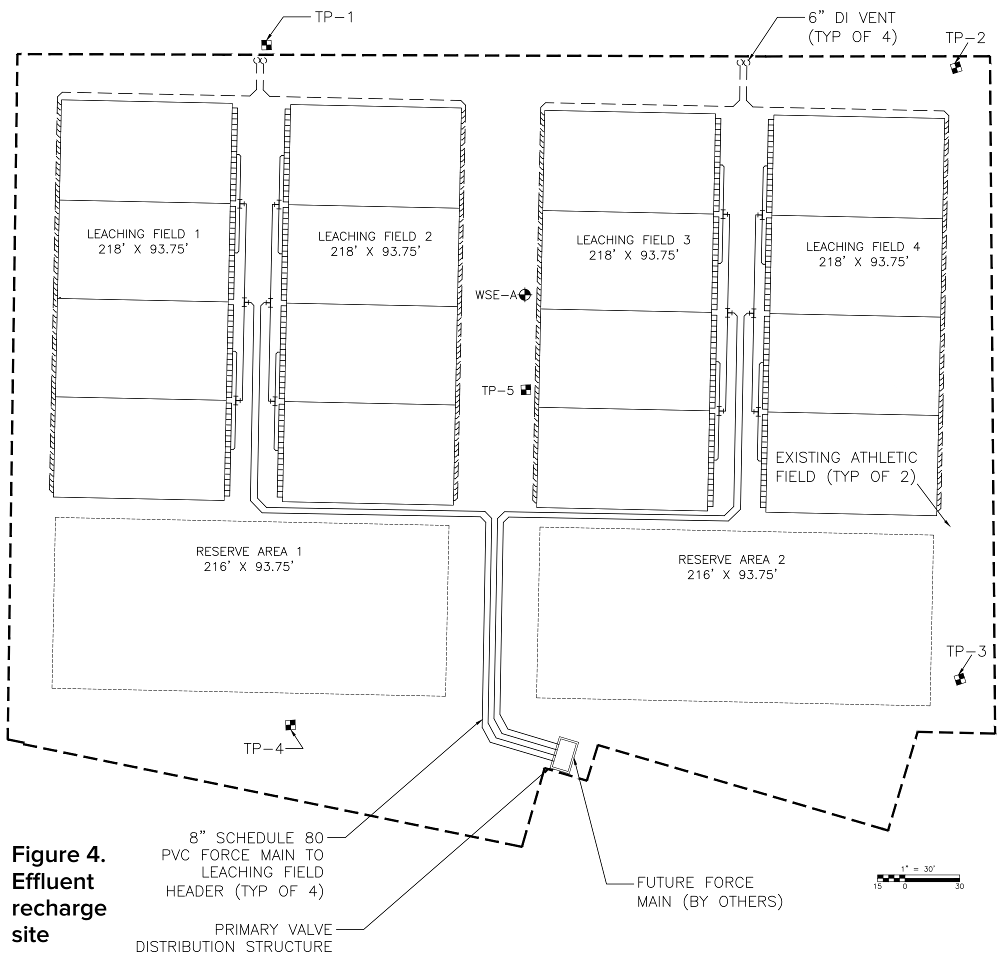


Figure 4. Effluent recharge site

Effluent recharge site under construction

EFFLUENT RECHARGE SITE

The WRRF's treated effluent will be pumped to the effluent recharge site at Littleton High School, to be recharged through a subsurface leaching system below the athletic fields. The effluent recharge site was permitted through the Massachusetts Department of Environmental Protection (MassDEP) groundwater discharge program, with a maximum capacity of 243,000 gpd (920,000 L/d).

The design, shown in Figure 4, includes a precast distribution valve structure, PVC force main piping, infiltration chambers and appurtenances, irrigation system replacement, and surface restoration with sod.

PROJECT PERMITTING

Permitting was required for all three contracts, including the following:

- Massachusetts Environmental Policy Act Environmental Notification Form, with Supplemental and Final Environmental Impact Reports
- Two Massachusetts Department of Transportation Access Permits
  - Sewer: 60 percent of new sewer on a state road
  - Driveway: new entrance off a state road for WRRF
- Littleton Conservation Commission Abbreviated Notice of Resource Area Delineation and Notice of Intent
- Littleton Planning Board Special Permit
- Plumbing variance
- Mass Historical Commission approval
- State Revolving Fund approval
- MassDEP Groundwater Discharge Permit

SEWER USE REGULATIONS

Throughout the design LWD also developed sewer use regulations to collect flow from private customers. The sewer use rules and regulations included 12 articles, covering topics such as use of public sewers, regulation of wastewater discharges, power and authority of inspection, penalties and enforcement, and sewer collection fees. The sewer use rules and regulations were formally adopted on June 30, 2021, by the Littleton Board of Water Commissioners acting in its role as the town's Board of Sewer Commissioners.

PROJECT FUNDING, BID RESULTS, AND ANTICIPATED CONSTRUCTION SCHEDULE

Littleton strives for a cost recovery approach that is equitable and justifiable to taxpayers, residents, and business owners. It considered options including taxes, betterment fees, connection fees, grants, and more. The Commonwealth of Massachusetts has appropriated $13 million for this project (through the Economic Development Bill, American Rescue Plan Act, and two MassWorks grants). The rest of the sewer project cost will be paid for through betterment fees based on flow. Littleton is using a State Revolving Fund loan for the WRRF and collection system contracts.

The bid results and anticipated construction schedule for all three design projects are shown in Table 3.

LESSONS LEARNED

This project highlights the need for communities of any size to be flexible to changing interests, needs, and financial responsibilities. Wastewater design is complex even for a "small" community. When starting from nothing, planning ahead is important. Hurdles throughout this project included permitting, pre-selecting treatment technology, and obtaining the support of Town Meeting and future customers. Additionally, LWD is creating a Wastewater Department, requiring the hiring and training of staff.

The project required close coordination and routine communication between LWD, town personnel, the design engineer, and the selected MBR vendor. Implementing off-site wastewater management solutions for the areas identified in the needs assessment will allow desired smart growth to occur while protecting the town's environmental resources and reflecting its current zoning.

Table 3. Bid results and anticipated construction schedule

Contract	Low Bid ($)	Construction Period
WRRF	19,996,194	June 2023 – June 2025
Collection System	19,393,038	June 2023 – December 2024
Effluent Recharge	2,470,000	March 2023 – July 2023

ACKNOWLEDGMENTS

- CDM Smith
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- Littleton Water Department and town of Littleton
- MassDEP
- Veolia North America (Suez)

REFERENCES

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ABOUT THE AUTHOR

Kara Rozycki (Johnston) is a civil engineer based in Boston with CDM Smith. Kara has experience in wastewater planning, sewer design, infiltration and inflow removal, utility rehabilitation and replacement, and project construction/bidding services.

NEBRA Highlights

Hawk Ridge composting facility, Unity, Maine

Biosolids Disposal Disrupted in Maine

In late February, the combined impacts from two new laws passed by the Maine State Legislature in 2022 finally hit home. LD1911 was the bill that banned the "sale or distribution and use" of biosolids-based products on land, effective August 2022, and LD1639 prohibited the import of oversized bulky waste (OBW) from out of state, effective February 8, 2023.

OBW is needed to dispose of wet wastes like biosolids (about four parts OBW to one-part wet waste) to ensure slope stability and operational safety. Despite behind the scenes efforts to avert the impacts of those two laws on biosolids disposal, an unsafe situation at the Juniper Ridge Landfill (JRL) caused a pause in disposal of Maine's biosolids.

On February 17, the JRL operators (Casella Resource Solutions) filed with the Maine Department of Environmental Protection (DEP) for emergency authorization to use its Hawk Ridge composting facility in Unity, Maine, to receive and transfer the solids more efficiently to their ultimate destination. Casella notified its customers—about 35 water resource recovery facilities (WRRFs)—in February about the situation and expected costs.

Shortly after, a major safety issue arose at the landfill. Casella had to inform its customers that they could not take sludges at JRL for about a week until the problem area of the landfill could be excavated and repacked. According to reports in the Portland Press Herald, Casella had to drastically reduce the amount of sludge going to JRL by about 60 percent or 4,000 tons (3,630 tonnes) a month in the short-term and 2,500 tons (2,268 tonnes) in the longer-term. That short-term number translates into 130 truckloads per month being diverted from JRL.

On February 24, Maine DEP approved a short-term solution, allowing Casella to utilize the Hawk Ridge facility as a transfer station to accept sludges and quickly get the materials transferred for ultimate disposal. The temporary, emergency approval expires August 31. Casella has found other short-term outlets in Canada, but that is not its long-term plan, especially because of transportation costs. Compounding the problem is that these longer distances are translating into driver and vehicle shortages. Casella is exploring expanded rail service to send biosolids to landfill or other outlets in states such as Ohio, Alabama, and Pennsylvania.

Juniper Ridge Landfill

In the short-term, the disposal of biosolids from Maine WRRFs has resumed; however, mid-term and long-term solutions are still needed. Sludge storage is generally limited and a major concern for operators. Efforts are underway, as of press time, to delay the implementation of LD1639. But the crux of the problem remains: the lack of options and capacity for biosolids disposal and end uses in Maine and across the entire Northeast. All of this translates into significant biosolids management cost increases for some WRRFs in Maine.

Quebec Restricts Imports of U.S. Biosolids

In February the *Ministère de l'Environnement, de la Lutte contre les changements climatiques, de la Faune et des Parcs (MELCCFP)* published its intent to amend its regulations to ban U.S. biosolids in direct agricultural application. *MELCCFP* also issued a temporary moratorium to do just that. Specifically, *MELCCFP* is proposing to amend the Environmental Quality Act relating to agricultural operations by inserting the following after Section 29.2:

"The spreading on any parcel of land of sludge from a municipal or industrial wastewater treatment plant or any other wastewater treatment or collection system, as well as de-inking sludge from pulp and paper mills, where the sludge originates from outside Canada, or any product containing such sludge, is prohibited."

NEBRA submitted comments, in French, by the April 8 deadline. More information about this *MELCCFP* "consultation" can be found here: Regulatory Omnibus Proposal 2023 amending 24 regulations (gouv.qc.ca). *MELCCFP* has published an update to its guide for recycling residuals or *matières résiduelles fertilisantes (MRF)*. The updates to the guide will remain in effect until control measures are in place. For the full story, go to Quebec Restricts Biosolids Imports — NEBRA (nebiosolids.org).

NEBRA Collaborating with NEIWPCC to Advance BioHub for Maine

NEIWPCC is leading a multi-stakeholder effort, including NEBRA, the Maine Water Environment Association, Maine DEP, and others, that proposes to create a "BioHub." The vision is for a center for researching and vetting emerging technologies for biosolids management and, especially, studying the potential for destroying per- and polyfluoroalkyl substances (PFAS). The BioHub would also be a repository for research and innovation on biosolids and PFAS. Currently, the model for the BioHub is the University of New Hampshire's Stormwater Center.

The BioHub concept has widespread support from operators and regulators alike as a way to get to long-term, sustainable solutions for managing biosolids in Maine and the entire region. NEIWPCC took the lead in developing a grant proposal for congressional funding to make the BioHub a reality. NEBRA wrote several letters of support for the grant application. Senator Angus S. King, Jr., has included the project in the Senate Appropriations bill.

NEBRA sees the value of having a place for innovators and technology developers to get help "working out the kinks" quickly and giving a technology a stamp of approval so that WRRFs can be assured it works the way the developers say it will work. NEIWPCC is hoping the BioHub concept will be a model for other states. There could be more than one in the Northeast; for example, a BioHub focused on thermal technologies could be located in one of the southern New England states that rely heavily on incineration. Collaborations with local universities and WRRFs are being developed. For more information about the proposed BioHub for Maine, go to Regional Residuals BioHub: neiwpcc.org/biohub/.

EPA Biosolids Panel Kicks Off Review

EPA's Science Advisory Board (SAB) biosolids panel had its first meeting on April 5 to kick off its review of EPA's Approach to Biosolids Chemical Risk Assessment and Biosolids Tool (see sab.epa.gov/ords/sab). This panel provides feedback to EPA on a proposed framework for biosolids risk assessment. SAB panelists had to submit their preliminary comments by April 12 and met again in person in early May. Those meetings are expected to be public.

More than 700 chemicals have been detected in biosolids based on sewage sludge and literature surveys (see past news article: EPA Publishes Curated List — NEBRA [nebiosolids.org]). With so many chemicals to evaluate, EPA has proposed the following three-step process:

1. Use EPA's Public Information Curation and Synthesis (PICS) process to prioritize the list of chemicals found in biosolids. This approach is similar to one developed to meet EPA's obligations for risk assessments under the Toxics Substances Control Act and is being customized to target the biosolids program needs.
2. Use the BioSolidsTool (BST) to conduct screening-level risk assessments on chemicals prioritized in Step 1. This is similar to Massachusetts Department of Environmental Protection's Massachusetts Contingency Plan (MCP) lookup tables.
3. Conduct refined risk assessments for chemicals that pose the greatest risk as identified in Step 2. This would be similar to MassDEP's MCP Method 3 Risk Assessment.

EPA's presentations to the SAB, a white paper on the approach, the BST, and charge questions offered for SAB deliberation are available

Janine Burke-Wells on ECOS panel (far right)

NEBRA Executive Director Participates in Biosolids Panel Discussion with Regulators

NEBRA's executive director, Janine Burke-Wells, was invited to the 2023 Spring Meeting (The Environmental Council of the States [ECOS]) to participate in a roundtable panel discussion on best practices on PFAS and biosolids. The theme of this year's gathering of state environmental regulators was "building bipartisan solutions." Janine flew to Washington, D.C., for one day of the conference, which took place in Crystal City, Virginia, from March 27–30. The biosolids roundtable discussion was held on the conference's first full day, which was all about PFAS, materials management, resilience, and water. The biosolids session was moderated by Katrina Kessler, commissioner of the Minnesota Pollution Control Agency (also on the ECOS Region 5 Executive Committee). Besides Janine, panelists included Julie Moore, secretary, Vermont Agency of Natural Resources; Rod Snyder, senior advisor for Agriculture, Office of the Administrator, EPA; Jeff Witte, secretary, New Mexico Department of Agriculture.

The panel discussions were based on the ECOS report issued on January 27, 2023, "PFAS in Biosolids: A Review of State Efforts & Opportunities for Action – The Environmental Council of the States."

In her comments, Janine noted that the needs expressed by all the states in the ECOS report included commonly agreed upon topics: better/more unified risk communications, source control, research (especially fate and transport), and interim measures/limits. Thus, there is a good base for "building bipartisan solutions." Janine thought there was also agreement on the need for and benefits of good water quality, a healthy environment, assistance to farmers, improvement in soil health, reduction in greenhouse gas emissions from wastewater, and greater resource recovery, especially recycling nutrients and generating renewable energy.

on the meeting website as well. The EPA's draft framework has been under development for several years. It is being used already to assess the risks from perfluorooctanoic acid (PFOA) and perfluorooctane sulfonate (PFOS). The SAB biosolids panel is just the first step in regulating PFAS and other contaminants in biosolids.

National PFAS Receivers Issue Joint Letter, Ask Congress for CERCLA Exemption

On April 24, a group referring to themselves as "passive receivers" of PFAS, wrote a joint letter to Congress, asking for statutory relief from


LETTERS

Letter: New PFAS law is misguided and unsustainable

"Ignoring the science and regulators makes for bad policy. The ineffectiveness and significant unintended consequences of this bill will soon come to light."

the liability provisions of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), commonly known as the Superfund Law. NEBRA, NEWEA, the Solid Waste Association of North America (SWANA), and the National League of Cities were among the 30 organizations that signed the letter.

EPA has proposed to designate several PFAS compounds as hazardous under CERCLA and plans to add more to the list. EPA has said it would use its discretionary authority to target the sources of PFAS contamination, but that does not prevent private parties from bringing passive receivers into a CERCLA cleanup action. The letter to Senator Tom Carper, chair of the Committee on Environment and Public Works, and Ranking Member Shelly Moore Capito directly asks Congress to afford passive receivers a "narrow exemption" from CERCLA liability for their roles in managing PFAS in the environment. Without that exemption, the letter argues that dealing with PFAS will shift from a "polluter pays" model to a "community pays" model.

The letter followed an in-person congressional briefing, "PFAS Policy and Practice: The Role of Local Government and Essential Public Services," held on March 27. That briefing involved many of the same organizations signing the April 24 letter, including the U.S. Composting Council, the U.S. Conference of Mayors, and SWANA. Also participating in the congressional briefing was Eric Labelle, who is with the Wastewater Department for the town of Kennebunkport, Maine, where PFAS is an issue. According to NEBRA's sources, the Maine congressional delegation supports exempting passive receivers such as the WRRFs and especially farmers from PFAS liability under CERCLA.

New and Recommended on NEBRA YouTube Station


Thomas Darby, Heritage Municipal Authority, speaking at the 4/14 NEDR

NEBRA recommends the following:

- April 14 North East Digestion Roundtable on Food Waste Digestion Trends, featuring Thomas Darby with the Hermitage (PA) Municipal Authority wastewater treatment facility which processes food wastes in its anaerobic digesters: youtu.be/70xLVX0ztL8
- Lunch & Learn About: Chitosan, a polymer made from seafood residuals that can be used in water treatment applications: youtu.be/VkzaSwFeOcs

Read more on these topics and stay abreast of the latest biosolids/residuals news and events at nebiosolids.org/news. For upcoming events, go to nebiosolids.org/events.

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

nebra
North East Biosolids & Residuals Association

Innovation Highlights

by Megan Goldsmith, NEWEA, and Michael Murphy, NEWEA Innovation Council Director

Birth of a Newfound Focus on Innovation

In 2020, NEWEA merged with the Northeast Water Innovation Network (NEWIN) and formed the Innovation Council. The beginning of 2023 marked the third anniversary of the council's creation, starting with the leadership of Marianne Langridge, PhD, who became the first Innovation Council director. With her guidance, the Innovation Council devised a plan to increase collaboration, decrease the challenges of developing new water and environmental technology businesses, and bring essential solutions to the market. With Marianne's direction and the hiring of Megan Goldsmith, NEWEA has continued to focus on advancing water innovation in New England. It now maintains a database of researchers, nonprofits, private companies, and government entities focused on water and the environment in New England.

From the start, the mission of NEWEA's Innovation Council has been to connect members with innovators and bring solutions to the market for our most pressing water quality challenges. Several events have been hosted, including the Annual Innovation Pavilion, technical sessions, pitch/reverse pitch events, and expert-led panel discussions. The Innovation Council and its members solve water challenges, convene stakeholders, function as a technical resource, provide an industry voice, respond to industry challenges, advocate for a One Water concept, and, most importantly, serve as a trusted organization. This mission has continued with the introduction of Michael Murphy, who began as Innovation Council director in January 2023.

A New Chapter on Innovation: Introducing Michael Murphy

Michael Murphy comes to NEWEA after spending two-and-a-half years as the CEO of X2O, an early-stage water quality sensing and data science company. Michael oversaw all aspects of X2O's early growth, staff development, and strategy implementation. Previously, Michael was the director of water innovation at the Massachusetts Clean Energy Center. He provided leadership and strategy development in formulating and delivering the Massachusetts vision to become a global leader in accelerating cutting-edge water technologies into the market. Before moving to Massachusetts in 2012, Michael worked on water initiatives at The World Bank, Global Environment Facility, Woodrow

Michael Murphy, NEWEA Innovation Council Director

Wilson International Center for Scholars, Pacific Institute, and the United States Business Council for Sustainable Development, and he was a Peace Corps volunteer in Bolivia. Additionally, Michael was invited to participate in the White House Water Summit in 2016 under the Obama Administration. Michael holds a Bachelor of Science in Biology from Texas State University and an MBA and Master of Arts from the Middlebury Institute at Monterey.

Michael will continue to advance the mission of the Innovation Council. Additionally, he will leverage his knowledge, expertise, and network to help build partnerships that enable municipal, state, and federal agencies to rapidly adopt solutions to water and environmental challenges that promote public and environmental health and establish New England as a thriving economic cluster for water and ecological technology innovators. These goals will be achieved with the help of many factors, including increased collaboration.

Five C's of Collaboration and How Partnerships Can Accelerate Innovation

NEWEA's Innovation Council aims to formalize processes to match organizations facing challenges protecting the environment in New England with innovative technologies that can address those challenges. For many reasons, the water and environmental industries can sometimes be risk-averse and reluctant to adopt new technologies. Avoidance of risk makes it challenging to build water and environmental technology businesses and bring solutions to critical issues to the market. Forming collaborative partnerships can help reduce barriers that slow innovation, and the five C's of collaboration (Common goals, Communication, Connections, Collective action, Complete innovation) can guide developing alliances.

With collaboration in mind, NEWEA's Innovation Council has helped to form partnerships among the entities in the water innovation ecosystem. From academia alone, NEWEA has identified around 200 individuals currently conducting water sector research. After performing outreach, the Innovation Council has formed partnerships with 17 water researchers. Many of these academics have agreed to become advisors to innovators when needed, providing advice, mentorship, and assistance to support water innovation.

The Innovation Council has successfully contacted and formed partnerships with eight funding and support organizations. These groups specialize in supporting and accelerating water technology startups and provide additional resources, including funding, office space, investments, consulting services, networking, business development, and more. In addition, NEWEA is an active subscriber to the Water Research Foundation (WRF). This nonprofit organization aims to advance the science of water to meet the needs of professionals in the industry. WRF's Innovation Program hosts a database of new water technologies that NEWEA will leverage for New England members searching for specific water quality solutions.

The Innovation Council has also formed partnerships with individuals with connections to other nonprofits, including WEF, the American Water Works Association (AWWA), and the National Alliance for Water Innovation (NAWI), as well as New England-based member associations for all sectors of water. These partnerships will further assist members with networking, forming connections, and accelerating new water technologies to market, thus improving water quality for all New England residents.

In addition, the Innovation Council has been trying to increase the number of business partnerships whose leaders are motivated and enthusiastic about improving water quality and who wish to dedicate funds to the council's and NEWEA's overall mission. In return, the Innovation Council will customize support for research issues important to the participating business, customize recognition as part of NEWEA's Sponsorship and Advertising Program based on business preferences, welcome input on topics and themes at quarterly innovation events, and enable participation in the Innovation Pavilion at NEWEA's Annual Conference.

Pushing New Water Technology Innovations

Water technology innovations will serve and affect specific stakeholder groups: municipalities, state and federal agencies, the water profession, and the public. The Innovation Council's goal is to positively affect New England citizens through the organiza-

Every community in New England is directly affected, including historically underserved populations in inner cities and rural areas; these communities have the greatest need for technological improvements

tion's efforts to bring new water technologies to market. Municipalities are responsible for providing potable water or treating wastewater to return to the environment for reuse. Their concerns will drive the direction of new technology in the water and wastewater sector. In addition, state and federal agencies are often responsible for enforcing regulations to protect environmental and public health. Technological improvements to treatment systems would affect these agencies. Each member of the water profession will be affected since these individuals all bring value. Water industry professionals and their skill sets can leverage resources from an association such as NEWEA. Finally, the public would be affected by this project because clean water is essential for health. Every community in New England is directly affected, including historically underserved populations in inner cities and rural areas; these communities have the greatest need for technological improvements in their drinking water and wastewater systems.

Looking Toward the Future and Improving Water Quality

An achievable goal for the Innovation Council is to successfully identify potential technological solutions for at least two market needs per year. For 2023 these focus areas are "forever chemicals" known as perfluorooctanoic acid (PFOA), perfluorooctane sulfonate (PFOS), innovative/alternative on-site water treatment systems, and energy consumption of water treatment. These needs were chosen based on member concerns and feedback during the previous year via surveys, meetings, conference events, and ongoing communication with members.

One important metric will be the number of technological solutions identified for each market over three years. The organizational infrastructure to accomplish this is under ongoing development. This goal can be achieved with additional resources by enhancing membership collaboration, outside partnerships, industry events, and other networking opportunities. This is relevant to NEWEA's overall objective—improve water quality and protect the environment while advancing technological solutions for the water industry.

The Innovation Council will continue with its mission and goals by engaging additional business partners; hosting conferences, webinars, and other events; increasing the available collaborative partnerships between organizations in the water sector; promoting infrastructure improvements for all water utilities; improving education and outreach through *Journal* articles and other means of communication; and focusing on "reverse pitch" events to discover vital problems. The NEWEA Innovation Council works collaboratively, with sustainability and environmental preservation at the forefront of all project goals and objectives. A sustainable water quality sector means a more sustainable planet.

Work for Water – New England

Establishing a regional water workforce planning structure

Seventeen members of the Work for Water Steering Committee, representing drinking water and clean water utilities across New England, participated in a day-long workshop held at the NEWWA offices on April 18

For years, the water industry in New England has been grappling with workforce challenges concerning clean water, stormwater, water reuse, and drinking water utilities. To address this issue, New England Water Works Association (NEWWA) and NEWEA worked together to explore various solutions. During this research, NEWWA and NEWEA recognized the potential benefits of regional collaboration, exemplified in programs like BAYWORK, a successful water workforce collaboration in Northern California, and The Water Tower in Georgia.

To explore this further, the workforce committees of NEWWA and NEWEA met in January 2022 to discuss establishing a regional water workforce planning structure. Because of various stakeholder interests in establishing a workforce development effort, NEWWA and NEWEA contacted the six New England states' professional drinking water and clean water associations to form collaborative partnerships.

Over the past year, utility leaders from participating partner organizations collaborated closely with NEWWA's and NEWEA's executive leadership to form a Work for Water – New England planning structure that included a Steering Committee of utility leaders representing water professionals in all six states.

As of January 2023, Work for Water – New England has embarked on the development of a Regional Water Workforce Strategic Plan, which follows a three-phase approach:

- Phase I – Information Gathering (January to April 2023)
- Phase II – Investigation of Opportunities and Issues (May to August 2023)
- Phase III – Development of Strategic Plan (September to December 2023)

During Phase I – Information Gathering, perspectives on New England water workforce priorities and potential solutions were shared. This included an online survey completed by more than 200 utilities in New England using a tool developed by WEF with input from the American Water Works Association (AWWA). NEWWA also collected data on New England water workforce challenges, and online meetings were held with the leadership group of the Steering Committee. The group consists of Mary Barry (NEWEA), Kirsten King (NEWWA), Dan Bisson (Tighe and Bond), Don Ware (Pennichuck Corporation), and Bill Boornazian (City of Portland, Maine).

The following organizations are partnering on the Work for Water – New England collaboration to accelerate this effort and are committed financially to the cause:

- **New England Water Environment Association (NEWEA)**
- **New England Water Works Association (NEWWA)**
- **National Association of Water Companies, New England Chapter (NE NAWC)**
- **CT Section of American Water Works Association (CTAWWA)**
- **Connecticut Water Environment Association (CTWEA)**
- **Green Mountain Water Environment Association (GMWEA)**
- **Maine Water Utilities Association (MWUA)**
- **Maine Water Environment Association (MEWEA)**
- **Massachusetts Water Environment Association (MAWEA)**
- **Massachusetts Water Works Association (MWWA)**
- **New Hampshire Water Pollution Control Association (NHWPCA)**
- **New Hampshire Water Works Association (NHWWA)**
- **Rhode Island Clean Water Association (RICWA)**
- **Rhode Island Water Works Association (RIWWA)**

In addition, Work for Water – New England has engaged in video conversations with Steering Committee members from states involved in the collaboration; participated in a Utility Management Conference workshop on effective strategies for the development, recruitment, and retention of qualified staff; and held in-person meetings with regional water workforce collaboration efforts.

The workshop was facilitated by Cheryl Davis, former senior manager at the San Francisco Public Utilities Commission

Before an in-person workshop was held at the NEWWA offices on April 18, the leadership group shared these findings with Steering Committee members. This allowed participants to provide valuable input on key areas, including workforce challenges, potential initiatives, implementation issues, potential barriers, and suggestions for next steps. The workshop offered an opportunity for the Steering Committee to provide their insights and expertise on these crucial topics.

Seventeen members of the 25-member Steering Committee participated in the day-long workshop, representing drinking water and clean water utilities across New England. The workshop was facilitated by Cheryl Davis, principal at CKD Consulting and former senior manager at the San Francisco Public Utilities Commission, who was integral to the BAYWORK founding. BAYWORK's success in workforce reliability has affected the drinking water and clean water operations in Northern California.

The following Steering Committee members participated in the workshop on April 18:

- Art Simonian, Executive Director for Mattabassett District (CT)
- Dionne Hector-Dale, Director, HR Business Partner & Talent, Employee Relations for Regional Water Authority (CT)
- Tom Tyler, Director of Facilities & Maintenance for Hartford MDC (CT)
- Bill Boornazian, Water Resources Manager for the City of Portland (ME)
- Stacy Thompson, Deputy Director, Water Resources Recovery Department for the City of Saco (ME)
- Shannon Johnson, Employee Services, Portland Water District (ME)
- Dan Bisson, Vice President, Tighe and Bond (ME)
- Josh Schimmel, Executive Director, Springfield Water & Sewer (MA)
- Karla Sangrey, Director, Upper Blackstone Clean Water (MA)
- Liz Mailhot, Human Resources Manager, Upper Blackstone Clean Water (MA)
- Charles Ryan, Director, Wastewater Operations & Maintenance for MWRA (MA)
- Don Ware, Director, Pennichuck Corporation (NH)
- Boyd Smith, Executive Director, NHWWA (NH)
- Megan Moyer, Director, City of Burlington (VT)
- Liz Royer, Executive Director, Vermont Rural Water Association (VTRWA)
- Meg Goulet, Director, Operations & Maintenance, Narragansett Bay Commission (RI)
- Steve Harrison, Senior Manager of Operations and Programs, Water Environment Federation (DC)
- Jessica Lynch, General Manager & Chief Engineer, Portsmouth Water & Fire District (RI)

Preliminary results from the workshop have brought forth common themes and trends in workforce development. Highlights include the not necessarily positive standard views of the water industry as a viable career; working conditions and requirements of water jobs; limited collaboration among the water sectors; lack of diversity, equity, and inclusion; and the public's lack of appreciation of the value of water.

The data will contribute to Phase II – Investigation of Opportunities and Issues and Phase III – Development of the Strategic Plan. New updates from the Work for Water – New England Strategic Plan will be released periodically when action items and next steps are established.

We thank all the partner organizations and the Steering Committee members for their time and support of this important initiative.

Student Design Competition

NEWEA held another successful virtual Student Design Competition (SDC) this year on May 1. Four teams participated, representing universities around New England. This competition, organized by the Student Activities Committee (SAC), promotes "real world" design experience for students interested in pursuing education or careers in water engineering and sciences. There are two categories, one for wastewater that includes treatment process design, and one for water environment that includes just about anything else related to water in the environment.

The competition tasked teams of NEWEA student members to design a project that they worked on together. Most of the teams based their written reports and presentations on their senior capstone design projects. The teams presented their designs in front of judges, peers, and mentors during the SDC reception and presentation. The team determined to have the best combined report and presentation in each category will represent NEWEA at the national competition to be held during WEFTEC in Chicago this October. Congratulations to all the teams for a robust competition—the future of the industry is in good hands with these bright students! The participating teams were as follows:

Wastewater Category: from Northeastern University, "Ex-Situ Biodegradation of 1,4-Dioxane," by team members Shannon Butler, Anna LeClair, Katie Moloney, and Justin Seo.

Water Environment Category: from Quinnipiac University, "West River Restoration," by team members Nikolai Bofinger, Jeremey Conboy, William Eydman, Matthew Flaim, and Nicholas Tokmanian.

From Northeastern University, "Proposed Design for a Sustainable Mixed-Use Development in the City of Salem, MA" by team members Bella D'Ascoli, Alex Renaud, Grace Pattarini, Chris Perron, and Chris Merrikin.

From Northeastern University, "Understanding and Addressing Pending Stormwater Regulation in the Charles River Watershed" by team members Harrison DuBois, Jaclyn Helliwell, William Gray, and Rosa Delgado.

The winning team project in the Wastewater category was the sole entry, "Ex-Situ Biodegradation of 1,4-Dioxane" from Northeastern University. The team's project was focused on the research, design, construction, operation, and testing of two bench-scale bioreactors for biodegradation of 1,4-dioxane. The team worked with Allonnia, LLC, and the company's proprietary microbe (referred to as "Winnie") to design a continuously stirred tank reactor (CSTR) and packed bed bioreactor (PBBR) for bench-scale testing. The team's preliminary results showed that both bioreactors were capable of degrading dioxane. The maximum degradation rate was observed to be 45 percent when using a 2.5-day hydraulic retention time in the CSTR. However, the team's findings resulted in a recommendation for future testing to be performed using the PBBR because microbial washout issues were observed in the CSTR.

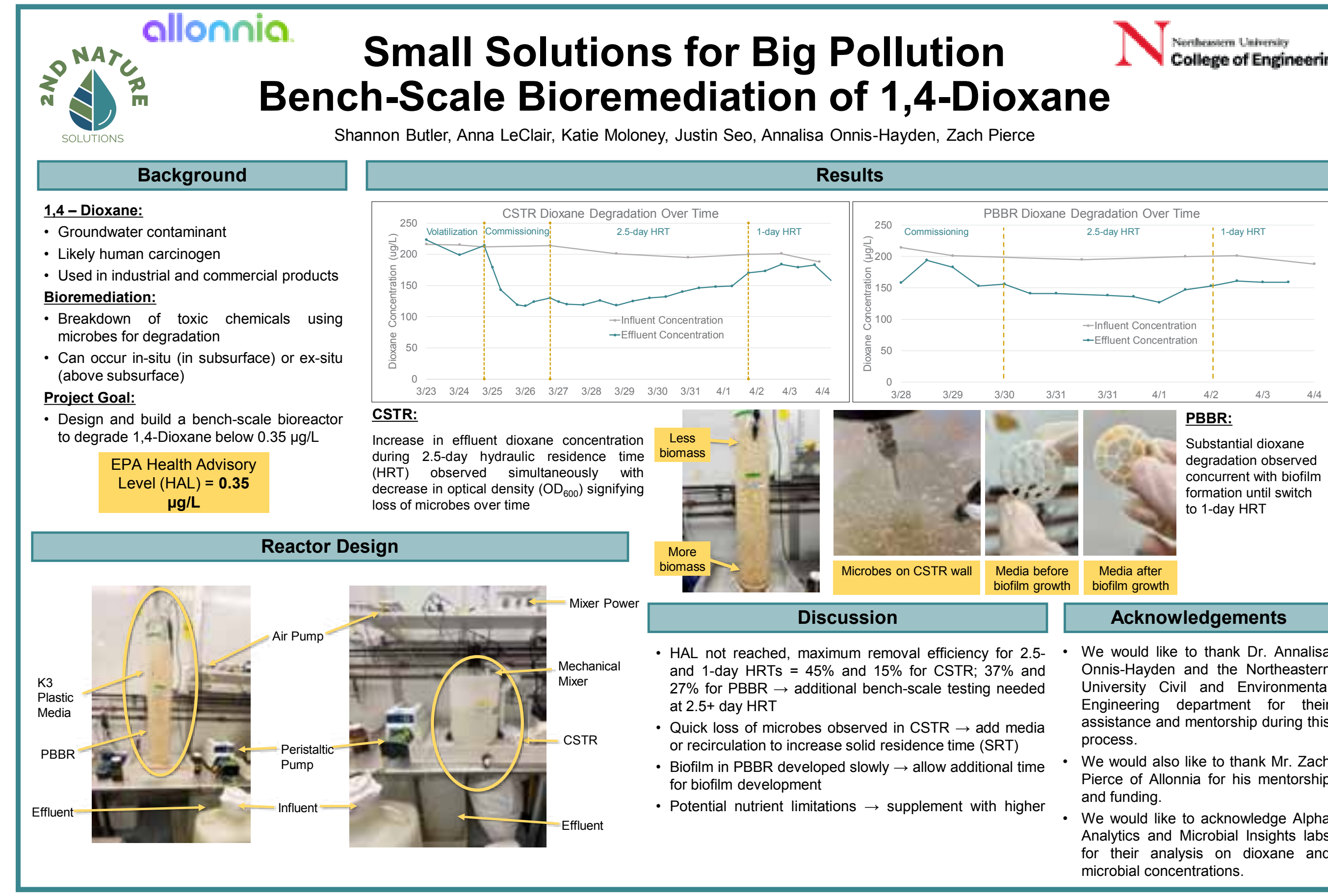
The winning team project in the Water Environment category, amid stiff competition, was "Proposed Design for a Sustainable Mixed-Use Development in the City of Salem, MA." from Northeastern University. The team's project included the design of a sustainable mixed-use development in a currently abandoned boat yard adjacent to Rosie's Pond in Salem, Massachusetts. The design was driven by five overarching goals—climate resiliency, resource circularity, education, community integration, and affordability. The final design included a constructed wetland, a riparian buffer, a low-impact site design for stormwater management and flood mitigation, solar panels, energy storage, anaerobic digestion, and garden space to create closed-loop systems for energy, nutrients, and waste. The design also included educational outreach opportunities throughout the site to provide for public engagement, as well as multi-modal roadways and active walking paths throughout the development.

The winning teams will each receive a travel allowance to attend WEFTEC 2023 in Chicago where they will compete against other teams from around the world. Good luck to the teams; we know you will do a great job and make NEWEA proud! A huge thanks to our volunteer judges for the competition: Helen Gordon (Environmental Partners), Adam Higgins (Wright-Pierce), Udayarka Karra (Arcadis), David Gleason (Hazen and Sawyer), and Emily Korot (CDM Smith).

We recognize and extend our appreciation to the companies that sponsored this event

AECOM
Brown and Caldwell
CDM Smith
Dewberry
Environmental Partners
EST Associates, Inc.
Flow Assessment Services
GHD, Inc.
Jacobs
Tech Sales NE
Tighe & Bond
Weston & Sampson
Wright-Pierce

For more information about sponsoring our NEWEA student design teams in preparing and presenting their projects at WEFTEC, please contact Joanna Sullivan (joannasullivan@vhb.com) or Jordan Gosselin (jgosselin@newea.org).



YP Spotlight—*Joanna Sullivan*

For this edition of the *Journal*, we reached out to a Young Professional (YP) with firsthand experience with small systems. Joanna Sullivan, a water resources designer at VHB, grew up in a small (and somewhat rural) community. As a child, she spent much of her free time exploring the woods, walking along the central Massachusetts rail trails, and swimming with friends and family in the area's lakes and ponds. We asked her about these experiences, and how they shaped her connection to New England and the clean water industry.

Journal *How did growing up in a small community shape your understanding of water and wastewater?*

My childhood home was (and still is) on septic and well water, which I think helped me to appreciate the work required to maintain our clean water resources. I could directly see the impact of a septic system failure in my backyard, so I understood the importance of maintaining the system and being conscious of what went down the pipes. I also learned the importance of monitoring water quality, as often in small communities it is the individual's responsibility to ensure that their drinking water is clean and safe for consumption. This also encouraged me to think more about equity in clean water, as there can be vast discrepancies in access to clean water in small communities as a function of socioeconomic status and other factors.

■ *What have been the most exciting parts of your job and your involvement with NEWEA?*

I think one of the most exciting parts of this industry is the people! Each day, at my job and through NEWEA, I get to work and share ideas with the brightest and most passionate community of water resources professionals, devoted to improving water quality within our communities. My involvement with NEWEA has introduced me to so many amazing and motivated people, who are dedicated to making the industry the best it can be—not only for the communities we serve but also for the people we work with. I've been lucky to work with Stephen King, the Diversity, Equity, and Inclusion (DEI) Committee chair, on a few different initiatives centered around improving diversity, equity, inclusion, and belonging within NEWEA and our industry. Stephen has done such a remarkable job leading the committee and turning ideas into action, and I am so excited about the work that he and the committee are doing.

It's also incredibly exciting and rewarding to work in a field where there is a tangible benefit. Seeing the human impact of the work we do—whether that be improving recreational opportunities through surface water quality improvements, providing clean water at the tap, or effectively collecting and treating our wastewater—is what makes me so proud to be a part of this industry.

■ *When did you first get involved with NEWEA?*

I first got involved in NEWEA during college through Northeastern's NEWEA Student Chapter. I had just taken my first course with the chapter's faculty advisor, Dr. Annalisa Onnis-Hayden (the woman, the myth, the legend!), when I decided to get involved in the student group. I tested the waters of involvement first by taking on the small role of "Webmaster" on the club's leadership board. As I got deeper into my major and more excited about my future in the industry, I got more involved with the student chapter, ultimately becoming the group's president my senior year.

A few years later, it came time for my incredible friend and mentor, Dr. Nick Tooker to step down as Student Activities Committee chair, and he encouraged me to step out of my comfort zone and take on the role. This opportunity gave me the confidence to get more involved in the organization, joining other committees (including DEI, and YP) and building my network of friends and colleagues within NEWEA.

■ *What's your favorite thing about the YP Committee?*

I used to balk at the idea that networking could be fun, until I started getting involved in this committee. I've made so many friends through the committee, and I finally feel like I'm at the point in my career where going to a conference is not just a learning opportunity but also a great excuse to catch up with friends. The committee provides an incredibly approachable avenue for getting more involved in the organization, and I highly encourage others who are new to the industry to get involved.

■ *Tell us a fun fact about yourself.*

My hometown small community (shout out to Sterling, Massachusetts!) also happens to be the hometown of Mary and her little lamb. Mary Sawyer (whose house was on the National Register of Historic Places before it burned down in 2007) is believed to have been the Mary in the nursery rhyme. I did learn from Wikipedia that this story may not be entirely uncontested; however, those of us from Sterling are sticking to it! They've even installed a statue in the center of town in the lamb's honor.

New England Water Environment Association, Inc.

Statement of activities
For the years ended September 30, 2022 and 2021

Changes in unrestricted net assets:	2022	2021
Revenues and gains:		
Registration Fees	$ 357,596	$ 159,380
Exhibitor Fees	225,595	17,750
Membership Dues	56,437	57,682
Pass Through Dues	50,909	47,244
Advertising and Subscriptions	60,998	64,705
Sponsorships	115,571	111,260
Certification Fees	12,265	6,900
Investment Income	(42,181)	74,007
Other Income	38,656	173,727
Total unrestricted revenues and gains	**898,005**	**783,430**
Total unrestricted revenues, gains and other support	**898,005**	**783,430**
Expenses:		
Program services	972,083	416,384
Management and general	366,254	293,588
Pass Through Dues	32,946	34,578
Total expenses	**1,371,283**	**744,550**
(Decrease) Increase in unrestricted net assets	(473,279)	38,880
Net assets, beginning of year	**827,840**	**788,960**
Net assets, end of year	**$ 354,561**	**$ 827,840**

WEF Delegate Report

Spring is busy season for your NEWEA delegates. The work of the many communities and groups is gaining momentum, and the WEFMAX conferences are underway. You will hear the delegates refer to WEFMAX: What exactly is that? It is easiest understood when you break the acronym into the three parts: **WEF** is the easy part—Water Environment Federation; **MA** refers to Member Association—NEWEA is one of WEF's MAs; and the **X** stands for exchange. So, the WEFMAX events are a forum where delegates come together to collaborate, exchange ideas, and share updates on the work of the different communities and work groups.

Our mission as delegates is to function as a conduit of information between WEF and the NEWEA membership—in both directions. We have a great team of delegates, and plan to be active at the four WEFMAX events this year on your behalf.

On a side note, on behalf of NEWEA, we thank Jim Barsanti for stepping into the delegate role for 2023 on an interim basis while we wish Delegate Ray Vermette success in dealing with a difficult health issue.

Peter Garvey

The past several months have been active for this NEWEA delegate. There is too much to cover in detail in this short article, so I will focus on the following key items discussed below.

I was fortunate, at the start of the third and final year of my term as delegate, to be selected as co-chair of the Water Advocacy work group. We have a team of over 20 delegates focusing on goals of the work group. Areas of focus include participation in the DC Fly-in (that took place in late April), involving advocacy efforts across federal, state, and local jurisdictions, and preparing position statements for advocacy. We are making great progress, and I had the opportunity to report on that progress at the recent WEFMAX conference in St. Louis, Missouri. Please scan the QR code to access a link to WEF's Water Advocacy Toolkit.

Speaking of the St. Louis WEFMAX, over 50 delegates and WEF staff gathered for two days right next to the Gateway Arch with a packed agenda of topics. The theme was collaboration and partnership, and we participated in several activities to identify areas where WEF and its MAs are collaborating internally and with external stakeholders—and how we can do more to advance the water "conversation." There was a great presentation on the rollout of WEF's Strategic Plan. Expect to see a communications program promoting this plan later in the year. Finally, our current speaker of the House of Delegates (HOD) Donnell Duncan has convened a work group to envision the "House of Delegates of the Future": We look forward to hearing the group's findings and recommendations.

Janine Burke-Wells

I am just starting to get my feet wet with my new duties as WEF delegate. I have been enjoying meeting new people, especially the movers and shakers on the WEF HOD, and have been familiarizing myself with the HOD policies and procedures. In addition to attending quarterly HOD meetings, I have been participating in the HOD's Strategic Planning task force where I am learning about WEF's new vision of "life free of water challenges" and how the new mission and strategic plan should overlap and interact with many NEWEA programs and activities. I have also been helping the other WEF delegates with surveys and other assignments, and I look forward to participating in another WEFMAX.

Among other changes included in its Strategic Plan, WEF is rolling out organizational vocabulary changes to encourage a more inclusive and less formal atmosphere. (See sidebar)

Strategic Plan Vocabulary

Former Term	New Term
Committee	Community
Subcommittee	Focus Group
WEFCOM (Committee Info Website)	WEF UNITY

James Barsanti

Although I completed my three-year term as an elected WEF delegate at last October's WEFTEC meeting in New Orleans, I have been asked by the NEWEA Executive Committee to continue to serve in 2023 on an interim basis while my close friend and fellow WEF delegate Ray Vermette recovers from a health challenge.

I have been busy with interesting and challenging WEF activities. I am a member of the HOD WEFMAX community, which has been collaborating with the host MAs in Missouri, the Rocky Mountain region (Colorado, New Mexico, and Wyoming), and Atlantic Canada (Nova Scotia, New Brunswick, Prince Edward Island, Newfoundland, and Labrador) to develop programs for each event. Along with Peter Garvey and other delegates, I attended the WEFMAX in St. Louis that focused on improving MAs through collaboration and partnerships. We heard interesting presentations on joint conferences between Alabama and Mississippi, the regional student design competition of the Chesapeake Water Environment Association (Delaware, Maryland, and the District of Columbia), and the Rocky Mountain Water Environment Association's efforts to collaborate across state lines. I also presented on our successful Young Professional (YP) Summit and initiated a new connection between Chesapeake's YP chair and our NEWEA YP chair Daryl Coppola.

We also discussed WEF's rollout of its Strategic Plan and its direct connections to our MAs. Our own Howard Carter, WEF vice president, shared his insights on the plan and other WEF initiatives. As always, the WEFMAX experience included reconnecting with familiar WEF colleagues and establishing new friendships with others from many MAs. The common theme I have observed is that our colleagues from across the United States and Canada share our same passion for our work and its foundational importance to society.

I am serving on the HOD of the Future work group. Our work group is challenged with aligning the efforts of the HOD with the WEF Strategic Plan, increasing delegate participation in communities and work groups (see vocabulary sidebar), and developing a vision for the future of the HOD. Examples have included determining how the needs of our MAs are changing and how the HOD should adapt and evolve to meet those changes. We are also aiming to increase the visibility of our delegates, at both the MA and the WEF level. I look forward to presenting the results after we complete our work at WEFTEC later this year.

In addition to my duties as an interim delegate, I was selected in 2022 to serve on the WEF Community Leadership Council (CLC – formerly the Committee Leadership Council) as a community of practice (CoP) director for operations and maintenance. The CLC comprises all the chairs and vice-chairs of WEF's communities and the CoP directors. The CLC was created by the Board of Trustees to provide a mechanism for WEF communities to share ideas, improve communications within WEF, and serve as a communication link between the communities and the Board of Trustees. My role is similar to our NEWEA council director position. I work with the Laboratory Practices, Plant Operations and Maintenance, and Operations Challenge communities, and the Operators Advisory Panel (of which I am a member). My role is to help the communities coordinate and develop their activities, promote collaboration between the WEF and MA communities, and develop future community leaders.

Please address questions about the WEF Strategic Plan and other activities to any of your WEF delegates or access the WEF Strategic Plan directly at wefwaterfuture.org.

2023 Joint Spring Meeting & Exhibit Proceedings

NEWEA and New York Water Environment Association co-hosted their Joint Spring Meeting on June 7–9, 2023, at the Saratoga Hilton in Saratoga Springs, New York. Meeting registrations totaled 731. Eleven teams from New York and New England competed in the Operations Challenge. The meeting also featured 57 exhibitors.

Keynote Lunch

Welcome
- Donna Grudier, NYWEA President
- Robert Fischer, NEWEA President

Keynote Speaker
- George Hawkins, President and CEO of Moonshot Missions

Session 1: Utility Management

Moderators:
- Mike Lannon, Siewert Equipment
- Will Stradling, Siewert Equipment

Maintaining Service During Water Reclamation Facility Upgrades
- David Nowak, Delve Underground
- Joseph Rigney, Delve Underground
- Solai Sundaram, Greeley and Hansen

GHG 101: Measuring and Mitigating Climate Impacts from Wastewater Operations
- Bill Brower, Brown and Caldwell
- Janine Burke-Wells, North East Biosolids & Residuals Association

Overcoming the Challenges of a Minimum Continuous UV Dose Requirement for Disinfection of Secondary Effluent
- Matthew Hross, Hazen and Sawyer

Sewer Systems Are Like Your Arteries: You Want to Keep Them Flowing
- Kara Keleher, Weston & Sampson
- Donald Gallucci, Weston & Sampson
- Dylan Ludy, City of Worcester

Session 2: Sustainability Panels

Moderators:
- Courtney Eaton, Kleinfelder
- Wayne Bates, Tighe & Bond

Session 1A: The Meaning of Sustainability
- Wayne Bates, Tighe & Bond, Presenter and Moderator

Panelists:
- Howard Carter, Saco WRRF
- Anastasia Rudenko, GHD, NEWEA Water Reuse Chair
- Stephen King, Danvers Town Engineer, NEWEA DEI Chair
- James Plummer, NEIWPCC

Session 1B: Applying the Meaning of Sustainability – Panel Discussion

Session 2A: Sustainability Metrics
- Courtney Eaton, Kleinfelder, Presenter and Moderator

Panelists:
- Erika Jozwiak, NYC Mayor's Office, NYWEA Sustainability Chair
- Jen Muir, JK Muir, NEWEA Sustainability Committee
- Paul Knowles, Hazen & Sawyer, NYWEA Sustainability Committee
- Shawn Syde, City of New Bedford

Session 2B: Applying Sustainability Metrics – Panel Discussion

Session 3: Collections System

Moderators:
- David Barnes, Jacobs
- Scott Lander, Retain It

Leveraging Intermunicipal Cooperation to Fund and Construct a Sewage Collection System
- Greg Levasseur, H2M architects + engineers
- James M. Vierling, H2M architects + engineers

Setting Up for Success: Using the EPA's Sanitary Sewer Overflow Analysis and Planning (SSOAP) Toolbox to Extract Key Flow Metrics and Inform an I/I Source Reduction Program
- Julia Manzano, Arcadis
- Savannah Steinly, Arcadis

A City with a Plan is a City with a Vision: Developing the City-Wide Sewer Separation Master Plan in Chelsea, Massachusetts
- Steven Perdios, Dewberry Engineers Inc.
- Peter Garvey, Dewberry Engineers Inc.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Opposite page: NYWEA President Donna Grudier and NEWEA President Bob Fischer perform the official "ribbon-cutting" to open the conference **1.** Assoc. Prof, Doug Daley poses with alumni of SUNY College of Environmental Science and Forestry: Cameron Daley, Doug Daley, Jessica Buhrie, Briana Brackett, and Mackenzie Klaben **2.** Andrea Braga and Virgil Lloyd talk over morning coffee **3.** The full-house audience anticipates the conference keynote presentation

Eliminating the Wet Well with Direct In-Line Pumping
- James Huck, Industrial Flow Solutions
- Brad Hitselberger, Industrial Flow Solutions

Session 4: Nutrient Removal

Moderators:
- Nancy Struzenski, Alpha Labs
- Chris Pierce, Wright-Pierce

Advanced Controls at a NY WWTP Achieve Ultra-Low Nitrogen Levels without Supplemental Carbon
- Dave Holland, Aqua-Aerobic Systems, Inc.
- Tim Allen, City of Riverhead, NY
- Timothy Nordberg, H2M architects + engineers
- Ben Antrim, Koch Separation Solutions

Ammonium Sensor Placement for Improved Ammonia-Based Aeration Control at Brockton AWRF
- Benjamin Barker, YSI Inc., a Xylem brand
- John Downey, Veolia Brockton, AWRF

Planning and Piloting New England's First Granular Activated Sludge Plant to Provide Nitrogen Removal, Improve Plant Resiliency, and Reduce Combined Sewer Overflows on a Small Site
- Frederick Mueller, Tighe & Bond
- Kyle Coolidge, Tighe & Bond
- Howard Carter, Saco, Maine WRRF
- Stacy Thompson, Saco, Maine WRRF

Successful Full-Scale Continuous Flow Densification of Activated Sludge at Crooked Creek Water Reclamation Facility without Physical Selection
- Micah Blate, Hazen and Sawyer
- Wendell Khunjar, Hazen and Sawyer

Session 4A: Young Professionals—YP Leadership Training

This interactive, small-group leadership training and discussion focused on the following leadership topics: Emotional intelligence, Professional credibility, Ability to inspire, and Communication.

Session 5: Residuals & Biosolids 1

Moderators:
- Magdalena Gasior, Greeley & Hansen
- Colin O'Brien, Brown & Caldwell

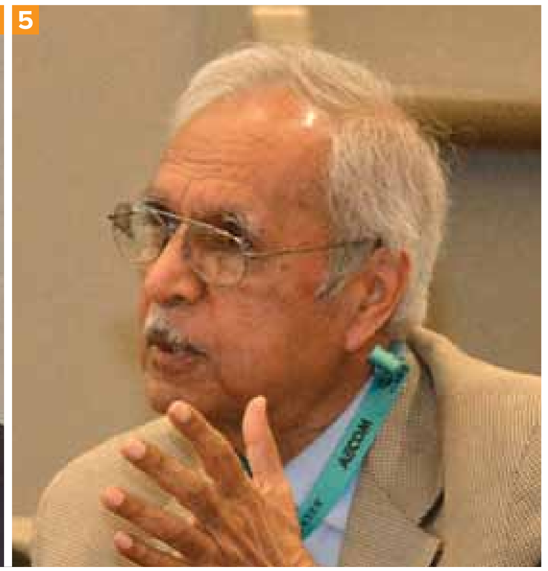
Future of Biosolids Management: Biochar
- George Bevington, Barton & Loguidice
- Richard Straut, Barton & Loguidice
- Sean Sweeney, Barton & Loguidice

The Evolution of Gasification as a Proven Method for WWTP Biosolid Carbon Conversion
- Dion Banks, Ecoremedy
- Christopher Holcomb, Ecoremedy

Sludge Dewatering and Sludge Drying: What Bellows Falls, Vermont, Has Gained in Five Years of Dewatering and Two Years of Drying Sludge
- Chris Hubbard, PW Tech
- Paul Russell, Russell Resources
- Bill Bennett, Bellows Falls, Vermont WWTP
- Robert Wheeler, Bellows Falls, Vermont WWTP

Ultra-High Temperature Gasification for Biosolids Treatment, PFAS Destruction, and Hydrogen Production
- Jim Henderson, Heartland Water Technology
- Brandon Davis, Heartland Water Technology
- Jeff Snyder, Heartland Water Technology



1. Matthew Hross discusses UV disinfection **2.** Keith Kelly treats of delicate infrastructure work in Great South Bay, New York **3.** Keynote speaker George Hawkins **4.** Ecoremedy's Dion Banks discusses biosolids gasification **5.** Ram Shrivastavsa makes a point at the Sustainability Session 1A **6.** Panelist Jen Muir offers advice on sustainable project planning

Session 6: Asset Management/Unique Retrofits

Moderators:
- Arthur Simonian, Mattabassett District
- Jim Barsanti, Hazen & Sawyer

Asset Management Implementation for Saratoga County Sewer District
- Danielle Grennon, Barton & Loguidice
- Andrew Marsden, Saratoga County Sewer District
- Daniel Rourke, Saratoga County Sewer District

Monroe County – Investing in the Future
- Matthew Czora, Arcadis
- Corky Kelsey, Monroe County

Optimizing Secondary Clarifiers – From Conception to Field Testing
- Hannah Rockwell, Arcadis
- Alan Oates, Monroe County

Now We Are in Over Our Heads! A New Deep Outfall at the Kingston WWTP
- Erin K. Moore, Tighe & Bond
- David Seche, Tighe & Bond
- David Railsback, Schnabel Engineering
- John Schultheis, City of Kingston
- Allen Winchell, City of Kingston

Session 7: Operator Perspectives

Moderators:
- Phil Tucker, York Sewer District
- Sana Barakat, Arcadis

Are Masking Agents and Counteractants Good Odor Management Technologies?
- Michael Lannan, Tech Environmental

Don't Get Burned on Chemical Storage Tank Inspections
- Gary Arthur, Fiberglass Reinforced Plastics Institute, Inc.

Out with the Old, in with the New: Challenges and Efficiencies of Decontaminating, Upgrading and Storm Hardening a 50-Year-Old Wastewater Pump Station
- Ryan Palzere, Tighe & Bond
- Kiari Williams, Town of Southington

WWTP Hauled Waste Receiving and Treatment Impacts
- Jeff Tudini, AECOM
- Alex Emmerson, Buffalo Sewer Authority

Session 8: Resiliency

Moderators:
- Danyel J. King, NYSDEC
- Peter Garvey, Dewberry Engineers Inc.

How Bangor, Maine Expanded a 20-Year-Old Storage Facility Threefold along a Vibrant Waterfront
- Gregory Heath, AECOM

Separation vs. Storage: Dawn of CSO Abatement
- Jess Locke, Wright-Pierce
- Matthew Corbin, Wright-Pierce

Using Smart Systems to Meet Stormwater Requirements and Preserve the Aesthetic Character of Two Historic Ponds in Harrisburg, Pennsylvania – An Update on Actual System Performance
- Andrea Braga, Jacobs
- Susan Beck, Jacobs
- Claire Maulhardt, Capital Region Water
- Andy Potts, Jacobs

Challenges in Upgrading the City of Chicopee's Largest Wastewater Pump Station
- Joe Popielarczyk, Tighe & Bond
- Quinn Lonczak, City of Chicopee




1. Nadia Mugisha at a session break **2.** Wayne Bates, James Plummer, Joanna Sullivan, Udayarka Karra, Sam Taugher, and Ryan Palzere at the Young Professional (YP) networking event **3.** Bob Adamski and Timothy Burns compare historical notes **4.** Matt Oster, Lindsey Wilcox, Courtney Eaton, and Zack Henderson at the YP networking event

Session 9: Wastewater in a Digital Age

Moderators:
- Kevin Garvey, Wright-Pierce
- Maureen Neville, Woodard & Curran

Machine Learning in the Water Industry
- Micah Blate, Hazen and Sawyer
- Katya Bilyk, Hazen and Sawyer

Digital Approaches to Improving Collection System Asset Management in an Ever-Evolving World
- Jennifer Baldwin, Jacobs

Benefits of 3D Laser Survey in the Design of Vertical Upgrades
- Kyle Coolidge, Tighe & Bond
- Sam Taugher, Tighe & Bond
- Colin Powers, Tighe & Bond

MWRA Nut Island Headworks Odor Control – Using Lasers and Power BI to Build, Startup and Operate New Systems in an Existing Facility
- Nicholas Ellis, Hazen and Sawyer

Session 10: Sustainability

Moderators:
- Bonnie Starr, NYSDEC
- Adam Yanulis, Tighe & Bond

Navigating Greenhouse Gas Reporting, Justice40, and Other Policy Drivers to Inform Sustainable Water Treatment and Biosolids Management
- Melissa Harclerode, CDM Smith
- Chris Campbell, CDM Smith
- Megan Schlosser, CDM Smith
- Davonna Moore, CDM Smith

Low-Carbon, Clean Construction Trends
- Jen Muir, JK Muir, LLC
- Megan Coleman, JK Muir, LLC

Stormwater Biofiltration for Nutrient Control: A Summary of Three Years of Field-based Investigations
- Douglas Daley, SUNY College of Environmental Science and Forestry (SUNY ESF)
- Jessica Buhrle, SUNY College of Environmental Science and Forestry (SUNY ESF)

Sustainable Practices for Odor Control Systems
- Raymond Porter, Porter Odor Control
- Michael Lannan, Tech Environmental

Session 11: Pretreatment/Industrial

Moderators:
- Tim Clayton, Surpass Chemical
- Matt Dickson, Haley Ward

Industrial Wastewater Pretreatment Programs 101
- Alexandre Remnek, United States Environmental Protection Agency

Industrial Wastewater Pretreatment Panel Discussion
- Craig Hurteau, Albany County Water Purification District

Industrial Wastewater Pretreatment Systems
- Kevin Hickey, Wright-Pierce

Session 12: Water Reclamation

Moderators:
- Deborah Mahoney, Brown & Caldwell
- Silvia Marpicati, Arcadis

Improving Infrastructure While Protecting the Great South Bay
- Keith Kelly, CDM Smith NY Inc.
- Janice McGovern, Suffolk County Department of Public Works

Quenching the Data Center Thirst – Emerging Trends for Managing Cooling Water Demands
- Darcy Sachs, Carollo Engineers, Inc.
- Brandon Yallaly, Carollo Engineers, Inc.

Strategies for Meeting the Extreme Effluent Phosphorus Limits at Several New Hampshire Fish & Game Fish Hatcheries
- Samuel Brown, HDR
- Mahsa Mehrdad, HDR

Solving Problems in Wastewater – One Dirty Picture at a Time
- Steve McCuskey, VEGA

Session 13: PFAS

Moderators:
- Brian Skidmore, Barton & Loguidice
- Brian Olsen, Carlsen Systems

Programmatic Approach to Implementing PFAS Treatment in Rockland and Putnam Counties
- Jonathan Tardiff, Veolia North America
- Keith F. Kelly, CDM Smith NY Inc.

PFAS Contamination in the New England and New York Areas: Impact of Regulations and What Utilities Can Do
- Ken Sansone, SL Environmental Law Group

All Hands On Deck! How Biosolids Associations Are Helping Members Manage PFAS Challenges
- Janine Burke-Wells, North East Biosolids & Residuals Association
- Mary Firestone, Mid-Atlantic Biosolids Association (MABA)

Research Update on the Fate of PFAS through Pyrolysis, Gasification and Incineration
- Lloyd Winchell, Brown and Caldwell
- John Ross, Brown and Caldwell

Session 14: Residuals & Biosolids 2

Moderators:
- Kathryn Serra, C.T. Male
- Vatche Minassian, HDR

Maximizing Polymer Performance
- Steve Wardell, Clean Waters, Inc.
- Ryan Peebles, Clean Waters, Inc.

Energy Reduction with Thermal Dryers
- Julie Barown, J.A. Lange, Inc.
- Chip Pless, LCI Corporation

Design and Performance Evaluation of a Solar-Assisted Dryer with Decentralized Thermal Recovery Gasification System
- Alexander Kraemer, Harvest Technology, LLC
- Steffen Ritterbusch, engineering4environment

Manufactured Biosolids and the Circular Economy
- Christina Adams, RMI

Session 15: Infrastructure Funding

Moderators:
- Elaine Yarbrough, GA Fleet
- Peter Ozzolek, Methuen Construction

Effective Funding and Finance Technical Assistance Approaches: Insights from New York and New England Environmental Finance Centers
- Tess Clark, Syracuse University Environmental Finance Center
- Martha Shiels, New England Environmental Finance Center at the University of Southern Maine
- Chloe Shields, New England Environmental Finance Center at the University of Southern Maine

Modern Investments in Water and Sewer Infrastructure, A Review of Two of the Primary Infrastructure Investment Laws in the Nation with Examples of Their Implementation in New England
- Sebastian Amenta, Comprehensive Environmental Inc.
- Jillian Jagling, West Group Law PLLC
- Teno West, West Group Law PLLC

Financing the Springfield Water and Wastewater Infrastructure Renewal Program with USEPA's WIFIA Program
- Jorianne Jernberg, US Environmental Protection Agency
- Joshua Schimmel, Springfield Water and Sewer Commission

Infrastructure Funding: Competing with the Big Guys
- Jessica Richard, Wright-Pierce

Session 16: Stormwater

Moderators:
- Michael Manning, Ramboll
- Joanna Sullivan, VHB

New Bedford Green Infrastructure Master Strategy and Implementation Roadmap
- Virginia Roach, CDM Smith
- Michael Dodson, CDM Smith
- Nicholas Watkins, CDM Smith
- Shawn Syde, City of New Bedford Department of Public Infrastructure

Needle in the Haystack? Found It! How to Locate Green Infrastructures in Dense Urban Environments
- Peter Garvey, Dewberry Engineers Inc.
- Michael Hanley, Dewberry Engineers Inc.

Engaging Stakeholders to Identify Sustainable Solutions for Flooding in Newport's Prescott Hall Neighborhood
- McKenzie Schmitz, Jacobs
- Robert Schultz, City of Newport

The Why, the What, and the How of Stormwater Conveyance Tunnel Design
- Zachary R. Hollenbeck, Howard County Government
- Christopher Brooks, Water Resources
- McCormick Taylor, Water Resources
- Edward Cronin, Brown and Caldwell
- Christopher Nelsen, Delve Underground

Session 17: Equitable Leadership

Moderators:
- Kathleen O'Connor, NYSERDA
- Katie McKitrick, City of Albany Department of Water and Water Supply

Navigating Parallel Career Paths towards Equitable Leadership in Water Industries and Associations
- Stephen King, Town of Danvers, MA
- Walt A. Walker, Greeley and Hansen

Constructing Confidence in the Field
- Sydney Lewis, Tighe & Bond

Tours

Two tours were offered to attendees. The Saratoga Spa State Park Tour highlighted the brook trout habitat restoration of Geyser Creek with a focus on stormwater best management practices (BMPs) in the park. The Skidmore Green Infrastructure Tour showcased green infrastructure practices at Skidmore.

Operations Challenge

Operations Challenge Committee:
Jason Swain, Chair
Rick Hartenstein, Vice Chair

Operations Challenge was held on June 7 and 8. Eleven teams participated in the competition:

NYWEA/Long Island Chapter—Brown Tide: Jake Miller (Cpt.), Nick Barresi, Hector Soto, Kyle Barresi, Rob Jentz

Digested Dragons
Kevin Peterson (Cpt.), Ian Downing, Joseph Halik, Victor Estrella, Maaz Hafeji, Joseph Cappetti (Coach)

NYWEA/Genesee Chapter—Genesee Valley Water Recyclers
Angelo DiNottia (Cpt.), Jeff Wallace, Will Monier, Rafael Santiago, Tyler Richardson, Taylor Listowski

NYWEA/Met Chapter—Coney Island Sludge Hustlers
Robert Ferland, Ettore (Ray) Antenucci Robert Ortiz, Nicholas Sullivan, Michael Orloff

Bowery Bay Coyotes
Chris Reyes (Cpt.), Anthony Quadrino, Michael Prats, Paraminder Mander, Michael Leone (Alt.)

NYWEA/Central Chapter—Watertown Water Bears
Seth Foster (Cpt.), JR (Richard) Lacey, Jay Slate, Angel French, Bruce Eliopoulos

New Jersey WEA—Cake Breakers
Keith Wagner (Cpt.), Kevin Barstow, Adam Scheick, Matt Priest, Jim Knox

NEWEA/Rhode Island—RIsing Sludge
Dave Bruno (Cpt.), Shaun Collum, Rob Norton, Max Maher, Courtney Lawa-Savage (Alt.), Eddie Davies (Coach)

NEWEA/Maine—Force Maine
Rob Pontau (Cpt.), Jeff Warden, Dan Munsey, Matt Szuter, Darren Lauletta

NEWEA/Massachusets—Mass Chaos
Scott Urban (Cpt.), Roel Figueroa, Kelly Olanyk, Josh Figueroa, Paul Russell

NEWEA/Connecticut—Storm Surge
Nick Stevens (Cpt.), Kevin Mauricin, John McGarty, Bradford Vasseur, John Kaminski

The Operations Challenge Awards Reception was held on Thursday, June 8. Winning teams were presented with trophies for first place in each individual category as well as for overall. The NEWEA team results are as follows:

First Place Individual Events
- Collection Systems: Rising Sludge
- Laboratory: Rising Sludge
- Maintenance: Rising Sludge
- Process Control: Rising Sludge
- Safety: Rising Sludge

Overall Competition
- Third Place: Mass Chaos
- Second Place: Storm Surge
- First Place: Rising Sludge

Event Coordinators
- Overall Coordinators: Bill Grandner and Jason Swain
- Score Keeping Judges: John Fortin, Bill Sedutto and Joseph Massaro
- Process: Bob Wither, Alex Buechner, and Bill Sedutto
- Safety: Rick Hartenstein and Steve Reiter
- Collection Systems: Mike Armes and Joseph Atkins
- Lab: Michelle Hess and Nora Lough
- Maintenance: Kevin McCormick and Alex King

1. Brad Vasseur and Kevin Mauricin of Connecticut Storm Surge
2. Rob Norton, Dave Bruno, and Shaun Collum of Rising Sludge
3. Darren Lauletta and Matt Szuter of Force Maine

Judges
- Lab: Bill Sedutto, John Fortin, Chris Mulford, Gary Brown, Marylee Santoro, Dennis Palumbo, Jason Nenninger, Nicole LaBoy
- Collection System: Howard Robinson, Dan O'Sullivan, Pat Chesebrough, Evan Karsberg, Wayne LaVair, Jody Ian, Erik Albano, Bruce Decker
- Maintenance: Dale Grudier, Larry Brincat, Chris Mulford, Dan Laflamme, Vivian Matkivich, Ryan Harrold, Rich Fiedler, Eugene Buckley, Erik Coddington
- Safety: Tony Coppola, Mike Burkett, Scott Goodinson, Mike Burke, Kim Sandbach, Diana Mendez, Joseph Massaro, George Sullivan, Walter Westhoff
- Process: Paul Dombrowski, Claudia Buchard, Udayarka Karra, Alex Buechner

During the reception, it was announced that NEWEA would support the first-, second-, and third-place New England teams in the 2023 WEF National Operations Challenge competition.

Select Society of Sanitary Sludge Shovelers

During the Thursday reception, Influent Integrator Charles W. Tyler inducted four new members into the Select Society of Sanitary Sludge Shovelers: Jim DeLuca, Jeff Kalmes, Eddie Davies, Scott Lander

Meeting Management

- Director: Amy Anderson George
- Sponsor: Larry Scola

Meeting Planners

- Conference Arrangements: Ron Tiberi
- Program: Maureen Neville
- Registration: Scott Neesen, NEWEA and NYWEA Staff
- Operations Challenge: Jason Swain

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USP Technologies
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EXHIBITORS

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Surpass Chemical
Troup Environmental Alternatives LLC
U.S. Pipe
Underground Solutions, Inc.
VEGA Americas
Veolia
Victaulic Company
Xylem Dewatering Solutions, Inc
Xylem Water Solutions
Xypex

New Members December 2022 – April 2023

Philip Allen
Nantucket, MA (PWO)

Robert Amaral
Woodard & Curran
Providence, RI (PRO)

Carmela Antonellis
CDM Smith
Manchester, NH (YP)

Isaac Balinski
Trinnex
Boston, MA (YP)

David Banda
Town of Billerica
N. Billerica, MA (PWO)

Antonio Barbosa
BWSC
Boston, MA (YP)

Josh Basso
LAWPCA
Lewiston, ME (PWO)

John Beatty
H2M
West Hartford, CT (YP)

Richard Berlandy
AECOM
Farmington, CT (PRO)

Kaustubh Bhasme
Chelmsford, MA (YP)

Tyler Bissonnette
NBC
Providence, RI (UPP)

Chloe Blanchette
South Portland, ME (STU)

Sylvie Bousquet
Environmental Partners
Quincy, MA (YP)

Joseph Brennan
Portsmouth, RI (PRO)

Ryan Buckley
NEIWPCC
Lowell, MA (YP)

Mark Byrns
Connecticut Water
Southbury, CT (PRO)

Mollie Caliri
Environmental Partners
Quincy, MA (PRO)

Michael Camadeco
Woodard & Curran
Andover, MA (PWO)

Paul Campbell
Rocky Hill, CT (YP)

John Choukas
BWSC
Boston, MA (YP)

Emiily Chuang
Cambridge, MA (YP)

Abigail Cohen
Wasted* P.B.C.
Williston, VT (STU)

Matthew Collins
Lowell, MA (PWO)

Mark Corliss
NHDES
Franklin, NH (PWO)

Ethan Cox
Millbury, MA (PWO)

Collin Crecco
Fox Rothschild
Atlantic City, NJ (YP)

Timothy Cronin
South Windsor, CT (PWO)

Jose Cunha
Jersey City, NJ (PWO)

Michael Curry
Portsmouth, NH (PRO)

Naeem Dale
BWSC
Boston, MA (YP)

Thomas Daly
BWSC
Boston, MA (PRO)

Ross Dean
NBC
Providence, RI (YP)

Nathan Dean
NBC
Providence, RI (UPP)

Amy DeCola
Hoyle Tanner
Burlington, VT (YP)

Amelia DeGrace
City of Dover
Dover, NH (PRO)

Ashley Demarey
Springfield, MA (PWO)

Bernard Deras
City of Worcester
Worcester, MA (PWO)

Danielle Desmarais
(PRO)

Alexander Diehl
Connecticut Water
Southbury, CT (PWO)

Maeve Dineen
Reading, MA (YP)

Danielle Dolan
MA Rivers Alliance
Hull, MA (PRO)

Seveing Doung
Evoqua Water
Tewksbury, MA (YP)

Sam Downes
Town of Brookline
Brookline, MA (YP)

Colby Dufour
Vortex Companies
Livermore, ME (PRO)

Carley Dykstra
Kleinfelder
Boston, MA (YP)

Stephen Echaria
Connecticut Water
Orange, CT (PWO)

Sami El Khatib
Environmental Partners
Woburn, MA (YP)

Andrew Elderbrock
Arcadis
Worcester, MA (YP)

Abigail Ernest-Beck
(PRO)

Tricia Fabrizio
NBC
Providence, RI (PRO)

Gary Farquharson
North Attleboro, MA (PWO)

Joshua Figueroa
Veolia
Enfield, CT (YP)

Kevin Fitzgerald
MWRA
Derry, NH (YP)

Cate Fox-Lent
City of Chelsea
Chelsea, MA (PRO)

August Frechette
Duke University
Woodstock, CT (STU)

Daumanic Fucile
(PRO)

Jim Gavin
Littleton Water
Littleton, MA (UPP)

Ian Gervais
Kleinfelder
Dover, NH (YP)

Shea Gibbs
Town of Great Barrington
Great Barrington, MA (PWO)

Angelina Glator
Providence, RI (PRO)

Aaron Golab
Hartford, CT (YP)

Sandra Gonneville
Weston Public Works
Framingham, MA (PRO)

Michael Greeley
MWRA
Chelsea, MA (PWO)

Rosa Gwinn
AECOM
Germantown, MD (PRO)

Robert Hart
Barrington, RI (PRO)

Dilara Hatinoglu
University of Maine
Orono, ME (STU)

Keith Hodsden
(PRO)

Lauren Howe
Environmental Partners
Woburn, MA (YP)

James Huck
Industrial Flow Solutions
New Haven, CT (PRO)

Monika Ingalls
City of South Burlington
South Burlington, VT (YP)

Matt Jensen
(PRO)

Sheila Joyce
Arcadis
Burlington, MA (YP)

Evan Kane
Portland Water District
Portland, ME (UPP)

Lucas Kasperowicz
RED Rochester
Rochester, NY (YP)

Tricia Keegan
Veolia
Boston, MA (PRO)

Annaliese Keimel
Tighe&Bond
Westwood, MA (YP)

Patricia Kelliher
Hazen and Sawyer
New Boston, NH (YP)

Sadia Khan
Boston, MA (YP)

Steven King
Quonset Development
North Kingstown, RI (PRO)

Jason Knox
GNHWPCA
New Haven, CT (UPP)

Sophia Kostoulas
Worcester, MA (YP)

Anilkumar Krosuri
Aclarity
Mansfield, MA (YP)

Matthew Labovites
Holden, MA (PWO)

Mariana Lanzarini-Lopes
Amherst, MA (ACAD)

Philip Larocque
BWSC
Boston, MA (PRO)

Dexter Lefavour
Lefavour PC
Middlesex, VT (PRO)

Jaclyn Lemieux
Hazen and Sawyer
Marshfield, MA (YP)

Lauren Lessuck
NBC
Providence, RI (PRO)

Kenneth Levinsky
Portland Water District
Portland, ME (UPP)

Liz Mailhot
Upper Blackstone
Millbury, MA (PWO)

Sara Maloney
AqueoUS Vets
Leicester, MA (YP)

Babs Marquis
Methuen, MA (PRO)

Mitchell Martin
Hazen and Sawyer
Boston, MA (YP)

Dana Martin
City Of Gloucester
Gloucester, MA (YP)

Ken Mavrogeorge
City of Dover
Dover, NH (PRO)

David McNally
Lewiston, ME (PWO)

Mark McNamara
Fitchburg, MA (PWO)

Jennifer Miller
Woodard & Curran
Kennebunk, ME (PRO)

Elizabeth Mitchell
Tighe & Bond
Westwood, MA (YP)

Rebecca Mongada
Weston & Sampson
Reading, MA (YP)

Connor Morey
Town of Billerica
N. Billerica, MA (YP)

David Mullins
EnviroMix
Charleston, SC (YP)
Michael Murphy
(PRO)

Keith Newman
Engineered Concepts
North Stonington, CT
(EXEC)

Vinh Nguyen
BWSC
Boston, MA (YP)

Matthew Nolen-Parkhouse
Southwick, MA (PWO)

Christopher Norton
ADS Environmental
Hampton, NH (PRO)

Diego Novoa
Wright-Pierce
Andover, MA (YP)

Kelly Olanyk
(PRO)

Timothy Onuh
Amherst, MA (STU)

Lillian Orelup
Weston & Sampson
Reading, MA (YP)

Alex Paille
Rhode Island Rural Water
North Kingstown, RI (YP)

Xiaodi Pan
Stantec
Woburn, MA (YP)

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Steven Parrillo Jr.
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Portland, ME (UPP)

Travis Pelletier
York Sewer District
York Beach, ME (PWO)

Matt Perras
Norwich Public Utilities
Norwich, CT (UPP)

Ornela Piluri
Upper Blackstone Millbury, MA (PWO)

Carrie Prescott
(PRO)

New Members (continued)

Denise Prouty
Upper Blackstone Millbury, MA (PWO)

Kaavya Raghavan Ram
Black & Veatch
Burlington, MA (YP)

Mallory Rakwoski
Hoyle Tanner
Burlington, VT (YP)

Bobby Ray
Rhode Island Rural Water
North Kingstown, RI (YP)

Kayla Repucci
Bobrek Engineering Danvers, MA (YP)

James Reynoso
Mount Vernon, NY (STU)

Travis Rivera
Schott Lighting & Imaging
Worcester, MA (PWO)

Armando Rivera-Concepcion
New Britain, CT (PRO)

Max Rome
Charles River Watershed
Boston, MA (PRO)

Marisa Rorabaugh
Burlington, VT (YP)

Alex Rosenberg
Boston, MA (PRO)

Alexie Rudman
Barnstable County
Buzzards Bay, MA (YP)

Stephanie Samaha
Evoqua Water
Boston, MA (YP)

Jonathan Sano
Bobrek Engineering
Lawrence, MA (YP)

Timothy Santos
Somerset, MA (PRO)

Julio Segarra
Veolia
Newtown, CT (PWO)

Jillian Semprini
City of Dover
Dover, NH (PRO)

Hudson Sewall
Wellesley, MA (STU)

Charles Shattuck-Heidorn
Portland Water District
Portland, ME (COMP)

Gabriela Sibel
Arcadis
Ellington, CT (YP)

Jaclyn Sidman
Brown and Caldwell
Rocky Hill, CT (YP)

Isabella Silverman
Cumberland, RI (YP)

Daryll Sirleaf
NBC
Providence, RI (UPP)

William Snyder
Orenco Systems
Sutherlin, OR (PRO)

Maryann Sourivong
NBC
Providence, RI (UPP)

Bethany Spangler
MWSC
Marblehead, MA (YP)

Ryan Staples
Portland Water District
Portland, ME (UPP)

Jasmine Strout
Green International
Tewksbury, MA (YP)

Daniel Sullivan-Xenos
Veolia
Orleans, MA (YP)

Colin Talbot
BWSC
Boston, MA (YP)

Mary Tchamkina
Warren, RI (PRO)

David Thompson
Vineyard Haven, MA (PWO)

Bethany Thompson
Kasco Marine
Sanford, ME (EXEC)

Joseph Tracy
Town of Westport
Stratford, CT (PWO)

Cambria Ung
Cambridge, MA (PRO)

Traci Vaillancourt
Weston & Sampson
Reading, MA (YP)

Christopher Valenti
GVC Construction
Lunenburg, MA (PRO)

Sara Vargas
City Of Gloucester
Gloucester, MA (YP)

Jamie Veillette
Environmental Partners
Greenfield, MA (YP)

Sierra Walsh
ARCADIS
Middletown, CT (YP)

Joshua Walsh
Ramboll
Merrimac, MA (YP)

Jane Ward
Uniformed Services
Centerville, MA (ACAD)

Richard Weare
Portland, ME (RET)

Katie Webster
Practical Applications.
Woburn, MA (YP)

Jaysen Wetherbee
Veolia
Fall River, MA (PRO)

Maggie Wheeler
Town of Marblehead
Marblehead, MA (YP)

Ethan Widrick
Concord, NH (PRO)

Jane Wilson
United South & Eastern Tribes
Nashville, TN (EXEC)

Devon Winkler
MWRA
Boston, MA (PRO)

Anna Wojcik
Weston & Sampson
Reading, MA (YP)

Steve Wolosoff
GEI Consultants
Woburn, MA (PRO)

Gretchen Young
City of Dover
Dover, NH (PRO)

Amr Zaky
BioMicrobics
Lenexa, KS (PRO)

Jennifer Zoppo
Stantec
Boston, MA (PRO)

Academic (ACAD)
Affiliate (AFF)
Complimentary (COMP)
Corporate (COR)
Dual (DUAL)
Executive (EXEC)
Honorary (HON)
Life (LIFE)
Public Official (POFF)
Professional (PRO)
Wastewater Treatment Plant Operators (PWO)
Retired (RET)
Student (STU)
Utility Partnership Program (UPP)
Young Professional (YP)

Upcoming Meetings & Events

NEWEA SOURCE WATER BREWERS COMPETITION
Mayflower Brewery, Plymouth MA
July 26, 2023

CEC/PLANT OPS SPECIALITY CONFERENCE
The Publick House, Sturbridge, MA
September 13, 2023

NEWEA GOLF CLASSIC
Derryfield Country Club, Manchester, NH
September 29, 2023

WEFTEC CHICAGO
McCormick Place, Chicago, IL
September 30–October 4, 2023

JOINT NY/NEWEA COLLECTION SYSTEMS, ASSET MANAGEMENT & SUSTAINABLITY SPECIALITY CONFERENCE
The Stamford Hotel, Stamford, CT
October 24–25, 2023

NORTHEAST RESIDUALS & BIOSOLIDS CONFERENCE & EXHIBIT
The Venue, Portsmouth, NH
November 1–2, 2023

JOINT NEWEA/NEWWA TECHNOLOGY & ASSET MANAGEMENT FAIR
NEWWA Office, Holliston, MA
November 8, 2023

AFFILIATED STATE ASSOCIATIONS AND OTHER EVENTS

NHWPCA FISHER CATS GAME
Manchester, NH
July 29, 2023

NHWPCA GOLF TOURNAMENT
Beaver Meadow Golf Course, Concord, NH
August 3, 2023

CTWEA SUMMER OUTING
Hartford, CT
August 4, 2023

RICWA CHOWDER COOKOFF
Narragansett, RI
August 11, 2023

GMWEA GOLF TOURNAMENT
Cedar Knoll CC in Hinesburg, VT
August 18, 2023

RICWA TRADE SHOW
Crowne Plaza, Warwick, RI
September 8, 2023

GSRWA FIELD DAY
Mount Sunapee Resort
September 12, 2023

NEWWA ANNUAL CONFERENCE
Hilton Burlington, Burlington, VT
September 17–20, 2023

MEWEA GOLF TOURNAMENT
Sunday River, Newry, ME
September 20, 2023

MEWEA FALL CONVENTION
Sunday River, Newry, ME
September 21–22, 2023

NHWPCA FALL MEETING
3 Chimney, Durham, NH
September 28, 2023

NHWPCA CONSTRUCTION CAREER DAY
Hillsborough County 4H Youth Center, New Boston, NH
September 28–29, 2023

NEW ENGLAND REGIONAL PRETREATMENT COORDINATOR ASSOCIATION
UMass Lowell Inn & Conference Center
October 24–26, 2023

NHWPCA WINTER MEETING
Puritan Conference Center, Manchester, NH
December 8, 2023

Measurement unit conversions and (abbreviations) used in the *Journal*

U.S.	International System of Units (SI)	U.S.	International System of Units (SI)
Liquid volume		**Length**	
gallon (gal)	liter (L)	inches (in.)	centimeters (cm)
cubic feet (ft^3)	cubic meters (m^3)	feet (ft)	meters (m)
cubic yards (yd^3)	cubic meters (m^3)	miles (mi)	kilometers (km)
acre-feet (ac ft)	cubic meters (m^3)	**Area**	
Flow		square feet (ft^2) or yards (yd^2)	square meters (m^2)
million gallons per day (mgd)	million liters per day (ML/d)	acre (ac)	hectare (ha)
for larger flows (over 264 mgd)	cubic meters per day (m^3/d)	square miles (mi^2)	square kilometers (km^2)
gallons per minute (gpm)	liters per minute (L/min)	**Weight**	
Power		pounds (lb)	kilograms (kg)
horsepower (hp)	kilowatts (kW)	pounds per day (lb/d)	kilograms per day (kg/d)
British Thermal Units (BTUs)	kilojoules (kJ) / watt-hours (Wh)	ton – aka short ton (tn)	metric ton or tonne (MT)
Velocity		**Pressure**	
feet per second (fps)	meters per second (m/s)	pounds/square inch (psi)	kiloPascals (kPa)
miles per hour (mph)	kilometers per hour (km/h)	Inches water column (in wc)	kiloPascals (kPa)
Gas		**Head**	
cubic feet per minute (ft^3/min)	cubic meters per minute (m^3/min)	feet of head (ft of head)	meters of head (m of head)

THANK YOU
TO ALL OUR 2023 ANNUAL SPONSOR PROGRAM PARTICIPANTS

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

Join NEWEA's 2024 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
- NEWEA Golf Classic
- 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 before 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 Jordan Gosselin
Email: jgosselin@newea.org
Phone: 781-939-0908

NEWEA
WORKING FOR WATER QUALITY

Advertiser Index

Upcoming *Journal* Themes

Fall 2023—**Nutrient Control**

Winter 2023—**Innovative Solutions**

NEWEA/WEF* Membership Application

Water Environment Federation — the water quality people
NEWEA — WORKING FOR WATER QUALITY

Personal Information (please print clearly)

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

Business Name (if applicable) | Job Title

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

City, State, Zip, Country

Home Phone | Cell Phone | Business Phone

Email Address | Date of Birth (mm/dd/yyyy)

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

☐ Check here if you do NOT wish to receive information on special offers, discounts, training and educational events, and new product information to enhance your career.

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

ACQ. Code (for WEF use only) | WEF23

Membership Categories (select one only)

		Dues
☐ **Professional**	Individuals involved in or interested in water quality	$215
☐ **Young Professional**	Water quality professionals, with fewer than five years working experience and under the age of 35, are eligible to join. This program is available for new member applicants and Student Members and is available for 3 years..	$88
☐ **Professional Operator**	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. License # ______________	$127
☐ **Academic**	Instructors/Professors interested in subjects related to water quality.	$215
☐ **Student**	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.	$27.50
☐ **Executive**	Upper level managers interested in an expanded suite of WEF products/services.	$385
☐ **Corporate** (member benefits for one person)	Companies engaged in the design, construction, operation or management of water quality systems. Designate one membership contact.	$446
☐ **Dual**	If you are already a member of WEF and wish to join NEWEA	$50
☐ **Associate Membership**	This membership category is a NEWEA only membership reserved for the general public who have an interest in water and the environment but are NOT currently employed in the industry (e.g., attorney or supplier). Examples of Associate Members include: teachers; journalists who cover water quality issues; citizen samplers/members of various watershed/sportsman/conservation organizations, etc.	$45
☐ **New England Regulator**	This membership category is a NEWEA only membership reserved for New England Environmental Regulatory Agencies, including: USEPA Region 1, CT Department of Energy and Environmental Protection, ME Department of Environmental Protection, MA Department of Environmental Protection, NH Department of Environmental Services, VT Department of Environmental Conservation, and RI Department of Environmental Management	$50

All memberships receive these:
- Water Environment & Technology
- Water Environment Research Online
- WEF Conference Proceedings Archive Online
- WEF SmartBrief
- Complimentary WEF Webcasts

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 upp@wef.org to join.

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
www.newea.org

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☐ Master Card
☐ Discover

Card # | Security/CVC

Signature | Exp. Date

Name on Card (please print)

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.
By joining NEWEA/WEF, you acknowledge the WEF Code of Conduct (www.wef.org/wef-member-code-of-conduct) is applicable for all members.

NEWEA/WEF Membership Application

MEMBERSHIP PROFILE

Please take a few moments to tell us about your background and professional interests.

What is the nature of your ORGANIZATION? (select only one–required) (ORG)

1 Consulting, Contracting, Planning Services
2 Educational Institution
3 Industrial Systems/ Plants
4 Manufacturer or Distributor of Equipment & Supplies (including representatives)
5 Non-profits/NGOs
6 Finance, Investment, and Banking
7 Laboratories
8 State or Federal Government
9 Utility: Wastewater
10 Utility: Drinking Water
11 Utility: Stormwater
12 Utility: Wastewater, Drinking Water, and Stormwater
13 Utility: Wastewater and Drinking Water
14 Utility: Wastewater and Stormwater
15 Other ______________ (please define)

What is your Primary JOB FUNCTION? (select only one) (JOB)

1 Executive Level
2 Management Level
3 Elected or Appointed Official
4 Educator
5 Student
6 Consultant/Contractor
7 Engineering/Design
8 Operator
9 Scientist/Researcher
10 Legislator/Regulator
11 Analyst
12 Sales/Marketing
13 Manufacturer's Representative
14 Communications/ Public Relations
15 IT/OT
16 Other ______________ (please define)

What are your KEY FOCUS AREAS? (circle all that apply) (FOC)

1 Air Quality and Odor Control
2 Biosolids and Residuals
3 Climate
4 Collection Systems and Conveyance
5 Disinfection and Public Health
6 Drinking Water
7 Energy
8 Finance and Investment
9 Industrial Water Resources
10 Intelligent Water Technology
11 Laboratory Analysis and Practices
12 Nutrients
13 Operations
14 Public Communications and Outreach
15 Regulation, Policy, Legislation
16 Research and Innovation
17 Resource Recovery
18 Safety, Security, Resilience
19 Small Communities
20 Stormwater and Watershed
21 Utility Management and Leadership
22 Watershed Management
23 Wastewater Treatment, Design, and Modeling
24 Water and Wastewater Treatment
25 Workforce

Demographic Information (Check box) The following is requested for informational purposes only.

Gender: ☐ Female ☐ Male ☐ Non-binary

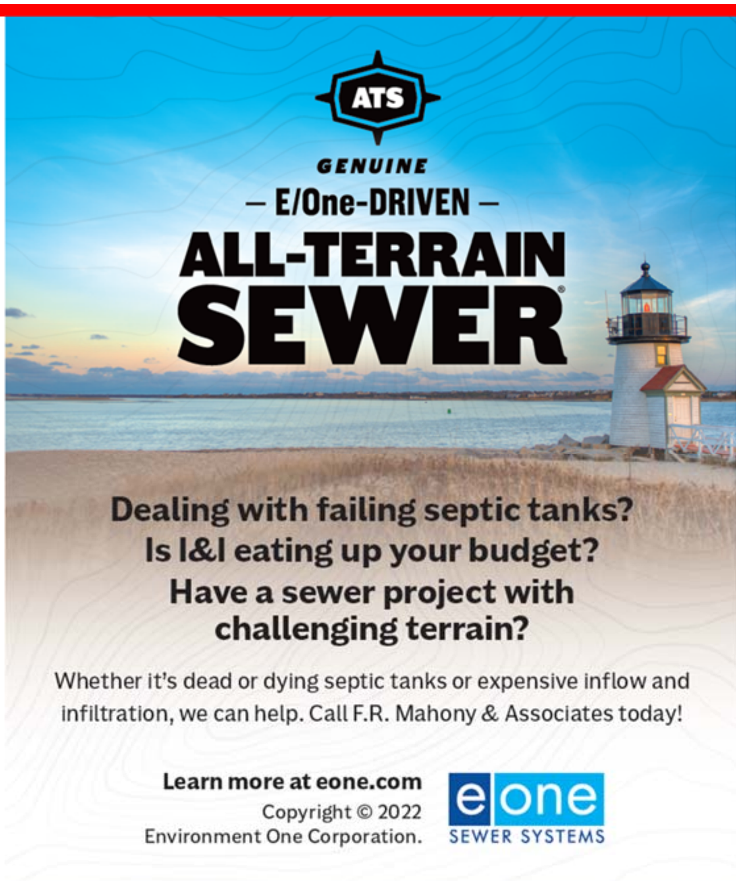
Education: ☐ Doctorate ☐ MA/MBA/MS ☐ BA/BS ☐ AA/AAS ☐ Technical School ☐ High School

Race/Ethnic Origin (Check box) The following is requested for informational purposes only.

☐ African-American (Not of Hispanic Origin) ☐ American Indian or Alaskan Native ☐ Asian ☐ Caucasian ☐ Hispanic/Latino ☐ Pacific Islander or Native Hawaiian ☐ Other

How Did You Learn About NEWEA/WEF?

Referring member's name: ______________________ Referring member's email: ______________________



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